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JOY VIEW ACRES

DRAINAGE REVIEW

COLUMBIA, ILLINOIS

Prepared For:

THE CITY OF COLUMBIA

Prepared:

April 14, 2023

Index

Overview

The purpose of this report is to analyze the existing drainage system at the Joy View Acres Subdivision in Columbia, Illinois. The report also provides potential solutions to alleviate some of the flooding causing concerns to homeowners of the subdivision. A report documenting the concerns was provided by the homeowners to the City on October 21, 2022.

In this report, Millennia reviewed the existing drainage system using the City's as-built information for the storm sewers and the original design firm's drawings for the subdivision. Any additional changes made to individual lots beyond what is shown in the design drawings or individual finish floor elevations was not considered, as this information was not available. Millennia was not able to obtain the original design firm's storm sewer design calculations.

Existing Site Drainage

Based on the design drawings, drainage areas and time of concentration paths were calculated for each inlet in the existing storm sewer system, as seen in the "Inlet Drainage Areas" exhibit. Calculations were done to find the time of concentration using the Rational Method for the 10-year design storm per Illinois Bulletin 75 rainfall data. Note that rainfall data was upgraded recently from Bulletin 70 to Bulletin 75; however, this report did not attempt to document differences. The pervious and impervious areas were also calculated based on average impervious areas per residence. This information served as inputs for the StormCAD Models discussed below.

The existing design drawings do not appear to show drainage areas offsite to the north. Based on a "General Drainage Area" exhibit obtained from the firm responsible for the original design, it is apparent that they were aware of the offsite area to the north that would flow to the site. However, for unknown reason, it seems they chose to not consider this area in their final design shown in their grading and drainage plan (also attached). As stated above, the actual original drainage calculations were not available for our review.

Original improvement plans do show overflow pathways designed from storm sewers at Carr Creek Drive. It appears some of these overflow paths were blocked by homeowner grading. Home pads are also noted to be two-feet higher than curbs. By visual observation, it appears some homes are relatively flat from curbs and potentially lower than the overflow paths.

StormCAD Models

By utilizing the StormCAD V8i computer program, the storm sewer system was analyzed under the 10-year design storm condition. Structures were placed according to design plans. All pipe sizes and inverts were obtained from As-Built information. The following StormCAD models were created and analyzed:

As-Built Model:

This model contains all as-built information for the storm sewer system and all information for the areas detailed in the “Inlet Drainage Areas” exhibit. This model utilizes Bulletin 75, containing the most recent rainfall data for Illinois. All other models were created with this as the base.

Summary of Results

Based on the results of the As-Built model, the system design capacity of EP-14 is exceeded at the 10-year storm. The flooding of the EP-14 system correlates to the concerns raised by the residents at 340 Carr Creek Drive, 150 Maxwell Drive, 145 Adam Lane, and 139 Adam Lane.

The system design capacity of EP-13 is exceeded at the 10-year storm. The flooding of System EP-13 correlates to the concerns of 145 Adam Lane as well as 379 and 385 Carr Creek Drive.

The system design capacity of EP-09 is also exceeded at the 10-year storm. Specific flooding was not noted by homeowners at this location; according to the model, structure CI-15 is overflowing at an elevation of approximately 446.34.

The system design capacity of EP-05 (Carr Creek Drive at Gall Road), EP-105 (Webster Drive at Gall Road), and EP-07 (north cul-de-sac Grant Drive) are all able to convey the 10-year storm without exceeding capacity.

Tailwater elevations for systems EP-14, EP-13, and EP-09 were obtained from the FEMA Effective Flood Insurance Rate Map that referenced a HEC-RAS Model of Carr Creek.

Proposed Solutions

Based on the limited analysis completed for this study, replacement of storm sewers was analyzed assuming inverts would stay the same. Actual design would require determining utility conflicts with existing water mains and sanitary sewers. The solutions analyzed were completed to determine magnitudes of changes required to improve flooding in the neighborhood.

Solution Concept 1A – Downstream Pipe Increase Model:

The most critical flooding area was identified as the EP-14 system between EP-14 and AI-25. The proposed Solution Concept 1A model is the same as in the As-Built Model, but the two pipes on the downstream end of system EP-14 were increased to 36” diameter. The solution will help partially address some of the concerns related to this system (described in the As-Built Model’s Summary of Results section).

Summary of Results

The StormCAD profiles and table of results both come from routing the 100-year storm through the system. As can be seen by the profiles, these larger pipes reduce flooding at AI-25 and allow the full 100-year flow to be captured and conveyed through the system at structure CI-24. The structures would also be replaced to allow all street overflow to be captured.

The StormCAD – Street Overflow spreadsheet shows the modeled amount of water overflowing into the street at the 2-year storm. It lists the flow being captured (conveyed) into the system at each structure and how much flow bypasses the structure. The highest accumulative flow in the street for the 2-year storm is approximately 11.60 cfs. Based on the attached table for determining spread, the encroachment on the street at this flow would be about 12 feet.

Solution Concept 1B – Bypass with Pipe Increase Model:

Further benefitting the EP-14 to AI-25 system would be to eliminate the offsite flowthrough area. The proposed Solution Concept 1B model contains the same information as the Solution 1A model but has the offsite area to the north being redirected away from the system. This model utilizes the areas and time of concentrations highlighted in the “Bypass Areas” exhibit. Only the areas labeled in this exhibit differ from the “Inlet Drainage Areas” exhibit.

Summary of Results

As explained in the Solution 1A summary, the two pipes on the downstream end of system EP-14 were increased to 36-inch diameters. The Bypass Area Exhibit highlights the smaller drainage area utilized in this model for EP-11. The remaining offsite area would be routed away from this system. The StormCAD profiles and table of results provided utilize both the new areas and the 36-inch pipes.

Similar to Solution 1A, the StormCAD – Street Overflow spreadsheet attempts to show the amount of water overflowing into the street at the 2-year storm. This spreadsheet also takes into consideration less offsite area draining into the system. The flood spread on the road for this solution is about 9 feet, which in comparison to Solution 1A had a spread of 12 feet.

Solution 1C – Outlet Protection:

Based on the As-Built model, it is recognized there is a need for upgraded erosion protection at the outlet structures EP-14, EP-13, and EP-09. Solution 1C proposed adding protection at the system outlets in the form of riprap aprons.

Calculations are included for riprap aprons and their appropriate sizes. The sizes are based on the velocity of the flow exiting these structures at the 10-year design storm. The spreadsheet with these calculations as well as chart from the Illinois Urban Manual reference are included at the end of this report.

Solution Concept 2 - As-Built_Corrected Model:

This model shows the pipe sizes that would need to be utilized for the system to properly convey flow within the full system of storm sewers at EP-14, EP-13, and EP-09. By comparing this model and the As-Built Model, it can be determined how many pipes are below capacity.

Summary of Results

A similar approach to Solution 1 was used by beginning with the As-Built model and increasing pipe sizes until no structures were shown as flooding. As can be seen in the table below, the pipe sizes from the As-Built model were compared to those of the Solution 1 model. Of the 6 systems modeled, only the three systems of pipes shown in this table below are the ones that would need to increase in size to properly convey flow during the 10-year storm.

Pipe	Structure		Pipe Size	
ID	Upstream	Downstream	As-Built	Corrected
System EP-09				
P08	EP-08	EP-08	15	24
P15	CI-15	CI-16	15	18
P16	CI-16	MH-17	18	24
P17	MH-17	EP-09	18	24
System EP-14				
P11	EP-11	CI-20	15	18
P12	EP-12	CI-31	15	24
P19	CI-19	CI-20	15	18
P20	CI-20	CI-21	15	30
P21	CI-21	CI-22	15	30
P22	CI-22	CI-24	18	30
P23	CI-23	EP-14	24	36
P24	CI-24	CI-23	18	36
System EP-13				
P27	CI-27	CI-31	18	30
P28	CI-28	CI-30	15	24
P30	CI-30	CI-27	15	24
P31	CI-31	CI-32	18	30
P32	CI-32	EP-13	24	36
P111	CI-111	MH-112	15	18
P112	MH-112	CI-28	15	24

Conclusions and Recommendations

Typical storm sewer systems are designed to handle the 10-year storm. Overflow pathways are then required for flows that exceed the 10-year event. Homes are then required to be built higher than the overflow paths.

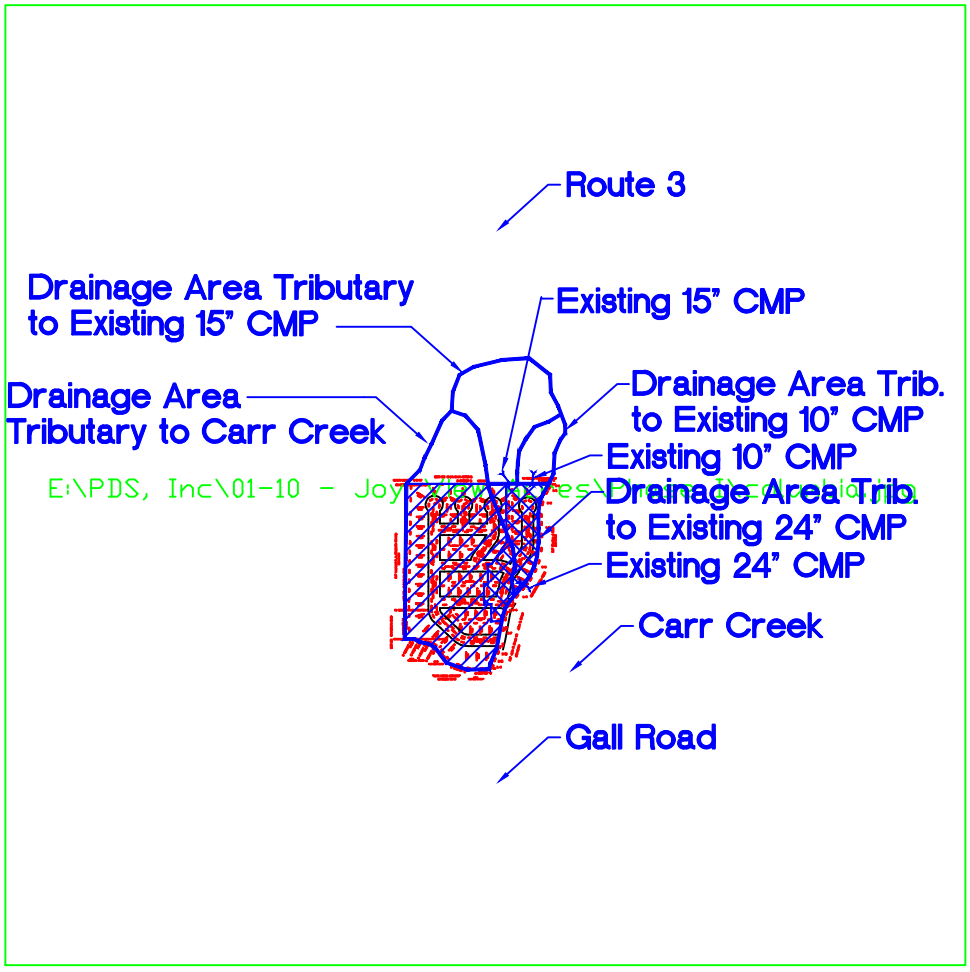
It is apparent several homes within Joy View Acres are built below overflow paths. Equally apparent though is that the original design of the subdivisions western storm sewer systems was inadequate for conveying the 10-year storm. Since raising the homes to proper elevations is unlikely, reducing flow areas to the storm sewers, adding capacity to the systems, and improving overflow pathways is necessary to reduce flooding.

Due to being the most feasible solution, we recommend the north bypass (Solution 1B) be pursued for improvement first. Subsequently, we recommend Solutions 1A and 1C then be pursued for the most beneficial effect.

Solution 2 may not have the large incremental benefit obtained from Solution 1. It may be more beneficial to construct only portions of Solution 2. Improvements upstream of Car Creek Drive may be mostly limited to reduced spread in the streets and might not be worth the upgrade when compared with the disturbance required of homeowner yards.

Diligence in maintaining overflow pathways is an imperative to reducing flooding at homes. It may be feasible to allow the streets to overflow at lower elevations if these pathways can be lowered in any way.

H.J. Frierdich and Sons, Inc.
Proposed Development-Joy View Acres (Phase I)
General Drainage Area Map



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SCALE FEET

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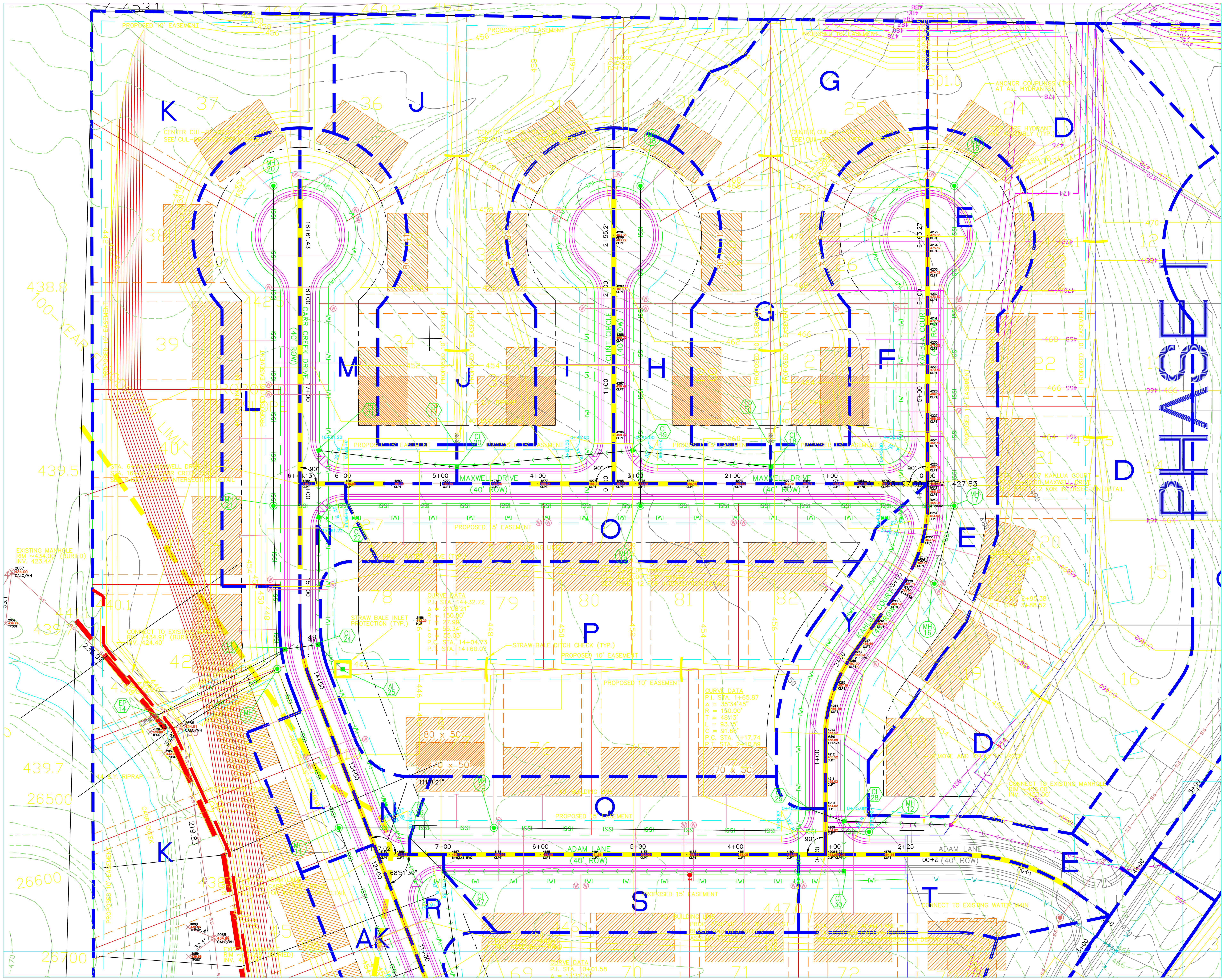
Precision Design & Survey, Inc.
Engineers ✧ Surveyors
315 North Main Street
Columbia, Illinois 62236
(618) 281-2355



NOTES:

1) SEE FINAL PLAT FOR LOT DIMENSIONS.

2) EXISTING UTILITIES SHOWN OR INDICATED ON THESE PLANS ARE BASED ON INFORMATION AND DATA FURNISHED BY THE OWNERS OF SUCH UNDERGROUND FACILITIES AND UTILITIES OR BY OTHERS. THESE LOCATIONS MUST BE CONSIDERED APPROXIMATE AND NO GUARANTEE IS IMPLIED TO THE ACCURACY. FIELD MARKING OF UNDERGROUND UTILITIES MAY BE OBTAINED BY PROVIDING A MINIMUM OF 48 HOURS ADVANCE NOTICE THROUGH THE J.U.L.I.E. SYSTEM BY CALLING 1-800-892-0123 OR BY DIRECT CONTACT WITH NON-MEMBERS OF J.U.L.I.E.

3) SEE SHEET 14 FOR EROSION CONTROL DETAILS.

50 0 50 100
SCALE FEET

Precision Design & Survey, Inc.
Engineers ✦ Surveyors
315 North Main Street
Columbia, Illinois 62236
(618) 281-2355

JOY VIEW ACRES - PHASE II

DATE: MAY 2002	JOB NO.: 02-003	DRAWN BY: TJH
CHECKED BY: WCH		SCALE: AS NOTED

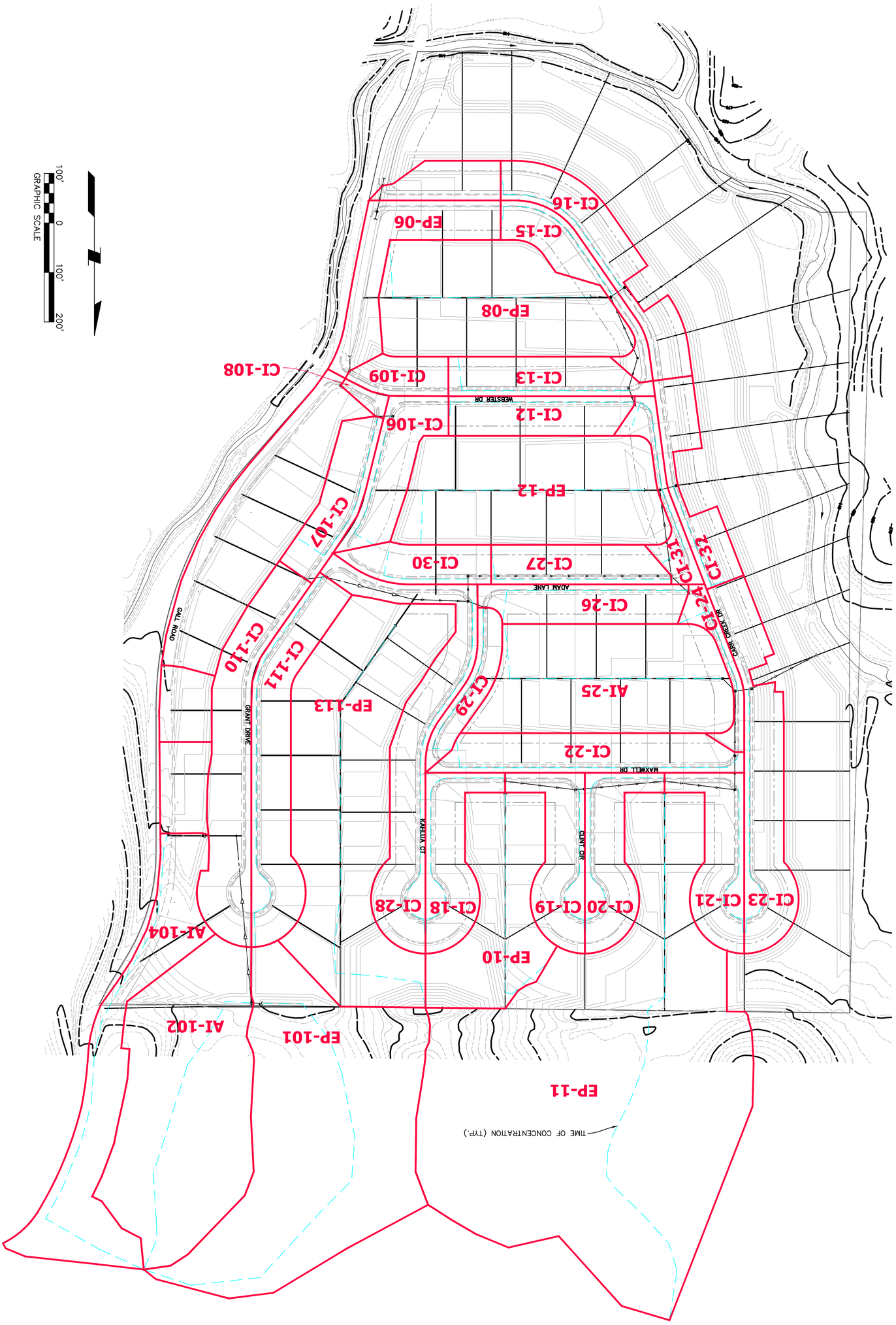
GRADING AND DRAINAGE PLAN

REV.:

SHEET: 2 OF 14

As-Built Condition Calculations

March 17, 2023



Sheet Title: INLET DRAINAGE AREAS

Sheet: 1 of 1

Joyview Drainage Review
Columbia, Illinois

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Drawing Issue

02/28/23	Drainage Review Report

Millennia Project No.:

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: EP-101

Determine Time of concentration (Tc):

T (overland):	T (overland)=	56L^0.6 n^0.6 / I^0.4 s^0.3	L=	100	ft.
			n=	0.45	
			s=	0.020	ft/ft
			I (10 year)=	5.15	in/hr
			I (100 year)=	8.31	in/hr
	T10 (overland)=	15.38	min.		
	T100 (overland)=	12.70	min.		
T (shallow):	Paved= 1		L=	633	ft.
	Unpaved= 2		s=	0.050	ft/ft
	Paved or Unpaved?	2	V=	3.61	ft/sec
	T (shallow)=	2.92	min.		
T (channel):	Actual or		L=	243	ft.
	assumed velocity?	Assumed	V=	4.00	ft/sec
	T (channel)=	1.01	min.		

Tc (10 year)=	19.32	min.
I (10 year)=	5.15	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: AI-102

Determine Time of concentration (Tc):

T (overland):	T (overland)=	56L^0.6 n^0.6 / I^0.4 s^0.3	L=	100	ft.
			n=	0.45	
			s=	0.020	ft/ft
			I (10 year)=	5.42	in/hr
			I (100 year)=	8.75	in/hr
	T10 (overland)=	15.07	min.		
	T100 (overland)=	12.44	min.		
T (shallow):	Paved= 1		L=	330	ft.
	Unpaved= 2		s=	0.070	ft/ft
	Paved or Unpaved?	2	V=	4.27	ft/sec
	T (shallow)=	1.29	min.		
T (channel):	Actual or		L=	201	ft.
	assumed velocity?	Assumed	V=	4.50	ft/sec
	T (channel)=	0.74	min.		

Tc (10 year)=	17.10	min.
I (10 year)=	5.42	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: AI-104

Determine Time of concentration (Tc):

T (overland):	T (overland)=	56L^0.6 n^0.6 / I^0.4 s^0.3	L=	100	ft.
			n=	0.24	
			s=	0.020	ft/ft
			I (10 year)=	5.97	in/hr
			I (100 year)=	9.50	in/hr
	T10 (overland)=	9.94	min.		
	T100 (overland)=	8.26	min.		
T (shallow):	Paved= 1		L=	124	ft.
	Unpaved= 2		s=	0.060	ft/ft
	Paved or Unpaved?	2	V=	3.95	ft/sec
	T (shallow)=	0.52	min.		
T (channel):	Actual or		L=	825	ft.
	assumed velocity?	Assumed	V=	4.50	ft/sec
	T (channel)=	3.06	min.		

Tc (10 year)=	13.52	min.
I (10 year)=	5.97	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: EP-10

Determine Time of Concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	100	ft.
			n=	0.24	
			s=	0.050	ft/ft
			I (10 year)=	6.77	in/hr
			I (100 year)=	10.55	in/hr
	T10 (overland)=	7.18	min.		
	T100 (overland)=	6.01	min.		
T (channel):	Paved= 1		L=	402	ft.
	Unpaved= 2		s=	0.035	ft/ft
	Paved or Unpaved?	2	V=	3.02	ft/sec
	T (shallow)=	2.22	min.		

Tc (10 year)=	9.40	min.
I (10 year)=	6.77	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: CI-18

Determine Time of concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	70	ft.
			n=	0.24	
			s=	0.030	ft/ft
			I (10 year)=	6.84	in/hr
			I (100 year)=	10.65	in/hr
	T10 (overland)=	6.73	min.		
	T100 (overland)=	5.64	min.		
T (channel):	Paved= 1		L=	450	ft.
	Unpaved= 2		s=	0.027	ft/ft
	Paved or Unpaved?	1	V=	3.34	ft/sec
	T (shallow)=	2.25	min.		

Tc (10 year)=	8.98	min.
I (10 year)=	6.84	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: CI-19

Determine Time of concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	70	ft.
			n=	0.24	
			s=	0.030	ft/ft
			I (10 year)=	7.02	in/hr
			I (100 year)=	10.94	in/hr
	T10 (overland)=	6.66	min.		
	T100 (overland)=	5.58	min.		
T (channel):	Paved= 1		L=	295	ft.
	Unpaved= 2		s=	0.032	ft/ft
	Paved or Unpaved?	1	V=	3.64	ft/sec
	T (shallow)=	1.35	min.		

Tc (10 year)=	8.01	min.
I (10 year)=	7.02	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: EP-11

Determine Time of concentration (Tc):

T (overland):	T (overland)=	56L^0.6 n^0.6 / I^0.4 s^0.3	L=	100	ft.
			n=	0.24	
			s=	0.020	ft/ft
			I (10 year)=	5.63	in/hr
			I (100 year)=	8.96	in/hr
	T10 (overland)=	10.18	min.		
	T100 (overland)=	8.45	min.		
T (shallow):	Paved= 1		L=	294	ft.
	Unpaved= 2		s=	0.080	ft/ft
	Paved or Unpaved?	2	V=	4.56	ft/sec
	T (shallow)=	1.07	min.		
T (channel):	Actual or		L=	755	ft.
	assumed velocity?	Assumed	V=	3.00	ft/sec
	T (channel)=	4.19	min.		

Tc (10 year)=	15.45	min.
I (10 year)=	5.63	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: CI-20

Determine Time of concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	70	ft.
			n=	0.24	
			s=	0.030	ft/ft
			I (10 year)=	6.88	in/hr
			I (100 year)=	10.71	in/hr
	T10 (overland)=	6.72	min.		
	T100 (overland)=	5.63	min.		
T (channel):	Paved= 1		L=	451	ft.
	Unpaved= 2		s=	0.032	ft/ft
	Paved or Unpaved?	1	V=	3.64	ft/sec
	T (shallow)=	2.07	min.		

Tc (10 year)=	8.78	min.
I (10 year)=	6.88	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: CI-21

Determine Time of Concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	70	ft.
			n=	0.24	
			s=	0.030	ft/ft
			I (10 year)=	7.02	in/hr
			I (100 year)=	10.95	in/hr
	T10 (overland)=	6.66	min.		
	T100 (overland)=	5.58	min.		
T (channel):	Paved= 1		L=	292	ft.
	Unpaved= 2		s=	0.032	ft/ft
	Paved or Unpaved?	1	V=	3.64	ft/sec
	T (shallow)=	1.34	min.		

Tc (10 year)=	8.00	min.
I (10 year)=	7.02	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: CI-22

Determine Time of Concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	59	ft.
			n=	0.24	
			s=	0.060	ft/ft
			I (10 year)=	7.07	in/hr
			I (100 year)=	10.94	in/hr
	T10 (overland)=	4.87	min.		
	T100 (overland)=	4.09	min.		
T (channel):	Paved= 1		L=	572	ft.
	Unpaved= 2		s=	0.027	ft/ft
	Paved or Unpaved?	1	V=	3.34	ft/sec
	T (shallow)=	2.85	min.		

Tc (10 year)=	7.72	min.
I (10 year)=	7.07	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: CI-24

Determine Time of Concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	68	ft.
			n=	0.24	
			s=	0.020	ft/ft
			I (10 year)=	6.98	in/hr
			I (100 year)=	10.92	in/hr
	T10 (overland)=	7.41	min.		
	T100 (overland)=	6.20	min.		
T (channel):	Paved= 1		L=	173	ft.
	Unpaved= 2		s=	0.032	ft/ft
	Paved or Unpaved?	1	V=	3.64	ft/sec
	T (shallow)=	0.79	min.		

Tc (10 year)=	8.20	min.
I (10 year)=	6.98	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: AI-25

Determine Time of Concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	100	ft.
			n=	0.24	
			s=	0.020	ft/ft
			I (10 year)=	6.17	in/hr
			I (100 year)=	9.78	in/hr
	T10 (overland)=	9.81	min.		
	T100 (overland)=	8.16	min.		
T (channel):	Paved= 1		L=	428	ft.
	Unpaved= 2		s=	0.027	ft/ft
	Paved or Unpaved?	2	V=	2.65	ft/sec
	T (shallow)=	2.69	min.		

Tc (10 year)=	12.50	min.
I (10 year)=	6.17	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: CI-23

Determine Time of concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	71	ft.
			n=	0.24	
			s=	0.030	ft/ft
			I (10 year)=	6.69	in/hr
			I (100 year)=	10.40	in/hr
	T10 (overland)=	6.85	min.		
	T100 (overland)=	5.74	min.		
T (channel):	Paved= 1		L=	490	ft.
	Unpaved= 2		s=	0.018	ft/ft
	Paved or Unpaved?	1	V=	2.73	ft/sec
	T (shallow)=	2.99	min.		

Tc (10 year)=	9.84	min.
I (10 year)=	6.69	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: CI-111

Determine Time of concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	70	ft.
			n=	0.24	
			s=	0.050	ft/ft
			I (10 year)=	6.48	in/hr
			I (100 year)=	10.03	in/hr
	T10 (overland)=	5.90	min.		
	T100 (overland)=	4.95	min.		
T (channel):	Paved= 1		L=	748	ft.
	Unpaved= 2		s=	0.015	ft/ft
	Paved or Unpaved?	1	V=	2.49	ft/sec
	T (shallow)=	5.01	min.		

Tc (10 year)=	10.91	min.
I (10 year)=	6.48	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: EP-113

Determine Time of concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	100	ft.
			n=	0.24	
			s=	0.016	ft/ft
			I (10 year)=	5.60	in/hr
			I (100 year)=	8.94	in/hr
	T10 (overland)=	10.91	min.		
	T100 (overland)=	9.04	min.		
T (channel):	Paved= 1		L=	739	ft.
	Unpaved= 2		s=	0.026	ft/ft
	Paved or Unpaved?	2	V=	2.59	ft/sec
	T (shallow)=	4.76	min.		

Tc (10 year)=	15.67	min.
I (10 year)=	5.60	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: CI-28

Determine Time of concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	71	ft.
			n=	0.24	
			s=	0.030	ft/ft
			I (10 year)=	6.71	in/hr
			I (100 year)=	10.44	in/hr
	T10 (overland)=	6.84	min.		
	T100 (overland)=	5.73	min.		
T (channel):	Paved= 1		L=	702	ft.
	Unpaved= 2		s=	0.040	ft/ft
	Paved or Unpaved?	1	V=	4.07	ft/sec
	T (shallow)=	2.88	min.		

Tc (10 year)=	9.72	min.
I (10 year)=	6.71	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: CI-29

Determine Time of Concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	39	ft.
			n=	0.24	
			s=	0.020	ft/ft
			I (10 year)=	7.22	in/hr
			I (100 year)=	11.21	in/hr
	T10 (overland)=	5.24	min.		
	T100 (overland)=	4.39	min.		
T (channel):	Paved= 1		L=	312	ft.
	Unpaved= 2		s=	0.024	ft/ft
	Paved or Unpaved?	1	V=	3.15	ft/sec
	T (shallow)=	1.65	min.		

Tc (10 year)=	6.89	min.
I (10 year)=	7.22	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: CI-30

Determine Time of Concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	51	ft.
			n=	0.24	
			s=	0.020	ft/ft
			I (10 year)=	7.10	in/hr
			I (100 year)=	11.06	in/hr
	T10 (overland)=	6.19	min.		
	T100 (overland)=	5.19	min.		
T (channel):	Paved= 1		L=	171	ft.
	Unpaved= 2		s=	0.011	ft/ft
	Paved or Unpaved?	1	V=	2.13	ft/sec
	T (shallow)=	1.34	min.		

Tc (10 year)=	7.53	min.
I (10 year)=	7.10	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: CI-26

Determine Time of Concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	69	ft.
			n=	0.24	
			s=	0.020	ft/ft
			I (10 year)=	6.53	in/hr
			I (100 year)=	10.20	in/hr
	T10 (overland)=	7.68	min.		
	T100 (overland)=	6.42	min.		
T (channel):	Paved= 1		L=	366	ft.
	Unpaved= 2		s=	0.010	ft/ft
	Paved or Unpaved?	1	V=	2.04	ft/sec
	T (shallow)=	2.99	min.		

Tc (10 year)=	10.66	min.
I (10 year)=	6.53	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: CI-27

Determine Time of Concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	70	ft.
			n=	0.24	
			s=	0.020	ft/ft
			I (10 year)=	6.53	in/hr
			I (100 year)=	10.21	in/hr
	T10 (overland)=	7.74	min.		
	T100 (overland)=	6.48	min.		
T (channel):	Paved= 1		L=	356	ft.
	Unpaved= 2		s=	0.010	ft/ft
	Paved or Unpaved?	1	V=	2.04	ft/sec
	T (shallow)=	2.90	min.		

Tc (10 year)=	10.65	min.
I (10 year)=	6.53	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: EP-12

Determine Time of Concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	100	ft.
			n=	0.24	
			s=	0.020	ft/ft
			I (10 year)=	6.28	in/hr
			I (100 year)=	9.94	in/hr
	T10 (overland)=	9.74	min.		
	T100 (overland)=	8.11	min.		
T (channel):	Paved= 1		L=	250	ft.
	Unpaved= 2		s=	0.014	ft/ft
	Paved or Unpaved?	2	V=	1.91	ft/sec
	T (shallow)=	2.18	min.		

Tc (10 year)=	11.93	min.
I (10 year)=	6.28	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: CI-31

Determine Time of Concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	53	ft.
			n=	0.24	
			s=	0.020	ft/ft
			I (10 year)=	7.23	in/hr
			I (100 year)=	11.27	in/hr
	T10 (overland)=	6.29	min.		
	T100 (overland)=	5.27	min.		
T (channel):	Paved= 1		L=	128	ft.
	Unpaved= 2		s=	0.035	ft/ft
	Paved or Unpaved?	1	V=	3.80	ft/sec
	T (shallow)=	0.56	min.		

Tc (10 year)=	6.85	min.
I (10 year)=	7.23	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: CI-32

Determine Time of Concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	69	ft.
			n=	0.24	
			s=	0.130	ft/ft
			I (10 year)=	7.55	in/hr
			I (100 year)=	11.52	in/hr
	T10 (overland)=	4.13	min.		
	T100 (overland)=	3.49	min.		
T (channel):	Paved= 1		L=	214	ft.
	Unpaved= 2		s=	0.035	ft/ft
	Paved or Unpaved?	1	V=	3.80	ft/sec
	T (shallow)=	0.94	min.		

Tc (10 year)=	5.07	min.
I (10 year)=	7.55	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: CI-106

Determine Time of Concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	47	ft.
			n=	0.24	
			s=	0.020	ft/ft
			I (10 year)=	7.14	in/hr
			I (100 year)=	11.11	in/hr
	T10 (overland)=	5.88	min.		
	T100 (overland)=	4.93	min.		
T (channel):	Paved= 1		L=	250	ft.
	Unpaved= 2		s=	0.020	ft/ft
	Paved or Unpaved?	1	V=	2.87	ft/sec
	T (shallow)=	1.45	min.		

Tc (10 year)=	7.33	min.
I (10 year)=	7.14	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: CI-107

Determine Time of Concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	61	ft.
			n=	0.24	
			s=	0.020	ft/ft
			I (10 year)=	6.89	in/hr
			I (100 year)=	10.74	in/hr
	T10 (overland)=	6.98	min.		
	T100 (overland)=	5.84	min.		
T (channel):	Paved= 1		L=	304	ft.
	Unpaved= 2		s=	0.020	ft/ft
	Paved or Unpaved?	1	V=	2.87	ft/sec
	T (shallow)=	1.76	min.		

Tc (10 year)=	8.74	min.
I (10 year)=	6.89	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: CI-12

Determine Time of Concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	68	ft.
			n=	0.24	
			s=	0.020	ft/ft
			I (10 year)=	6.55	in/hr
			I (100 year)=	10.22	in/hr
	T10 (overland)=	7.60	min.		
	T100 (overland)=	6.36	min.		
T (channel):	Paved= 1		L=	372	ft.
	Unpaved= 2		s=	0.011	ft/ft
	Paved or Unpaved?	1	V=	2.08	ft/sec
	T (shallow)=	2.98	min.		

Tc (10 year)=	10.58	min.
I (10 year)=	6.55	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: CI-13

Determine Time of Concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	69	ft.
			n=	0.24	
			s=	0.020	ft/ft
			I (10 year)=	6.59	in/hr
			I (100 year)=	10.29	in/hr
	T10 (overland)=	7.65	min.		
	T100 (overland)=	6.40	min.		
T (channel):	Paved= 1		L=	337	ft.
	Unpaved= 2		s=	0.011	ft/ft
	Paved or Unpaved?	1	V=	2.08	ft/sec
	T (shallow)=	2.70	min.		

Tc (10 year)=	10.35	min.
I (10 year)=	6.59	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: EP-08

Determine Time of Concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	100	ft.
			n=	0.24	
			s=	0.020	ft/ft
			I (10 year)=	5.99	in/hr
			I (100 year)=	9.52	in/hr
	T10 (overland)=	9.93	min.		
	T100 (overland)=	8.25	min.		
T (channel):	Paved= 1		L=	401	ft.
	Unpaved= 2		s=	0.014	ft/ft
	Paved or Unpaved?	2	V=	1.91	ft/sec
	T (shallow)=	3.50	min.		

Tc (10 year)=	13.43	min.
I (10 year)=	5.99	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: CI-15

Determine Time of Concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	69	ft.
			n=	0.24	
			s=	0.020	ft/ft
			I (10 year)=	6.82	in/hr
			I (100 year)=	10.66	in/hr
	T10 (overland)=	7.54	min.		
	T100 (overland)=	6.31	min.		
T (channel):	Paved= 1		L=	303	ft.
	Unpaved= 2		s=	0.026	ft/ft
	Paved or Unpaved?	1	V=	3.28	ft/sec
	T (shallow)=	1.54	min.		

Tc (10 year)=	9.09	min.
I (10 year)=	6.82	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: CI-16

Determine Time of Concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	68	ft.
			n=	0.24	
			s=	0.020	ft/ft
			I (10 year)=	6.81	in/hr
			I (100 year)=	10.64	in/hr
	T10 (overland)=	7.48	min.		
	T100 (overland)=	6.26	min.		
T (channel):	Paved= 1		L=	326	ft.
	Unpaved= 2		s=	0.026	ft/ft
	Paved or Unpaved?	1	V=	3.28	ft/sec
	T (shallow)=	1.66	min.		

Tc (10 year)=	9.14	min.
I (10 year)=	6.81	in/hr

Project Name: Joyview Drainage Review Date: 03/01/23

Basin ID: EP-06

Determine Time of Concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	55	ft.
			n=	0.24	
			s=	0.220	ft/ft
			I (10 year)=	7.56	in/hr
			I (100 year)=	11.52	in/hr
	T10 (overland)=	3.08	min.		
	T100 (overland)=	2.60	min.		
T (channel):	Actual or assumed velocity?	Assumed	L=	263	ft.
			V=	6.00	ft/sec
	T (channel)=	0.73	min.		

Tc (10 year)=	3.81	min.
I (10 year)=	7.56	in/hr

Tc (100 year)=	3.33	min.
I (100 year)=	11.52	in/hr

* Flow from EP-105 =	6.83	cfs
* Time from EP-105 =	9.11	min
* CA from EP-105 =	0.994	

Total time =	12.92	min
Intensity =	6.09	in/hr
Total CA =	1.443	

* Values taken from StormCAD for the EP-105 system

Inlet Hydrology

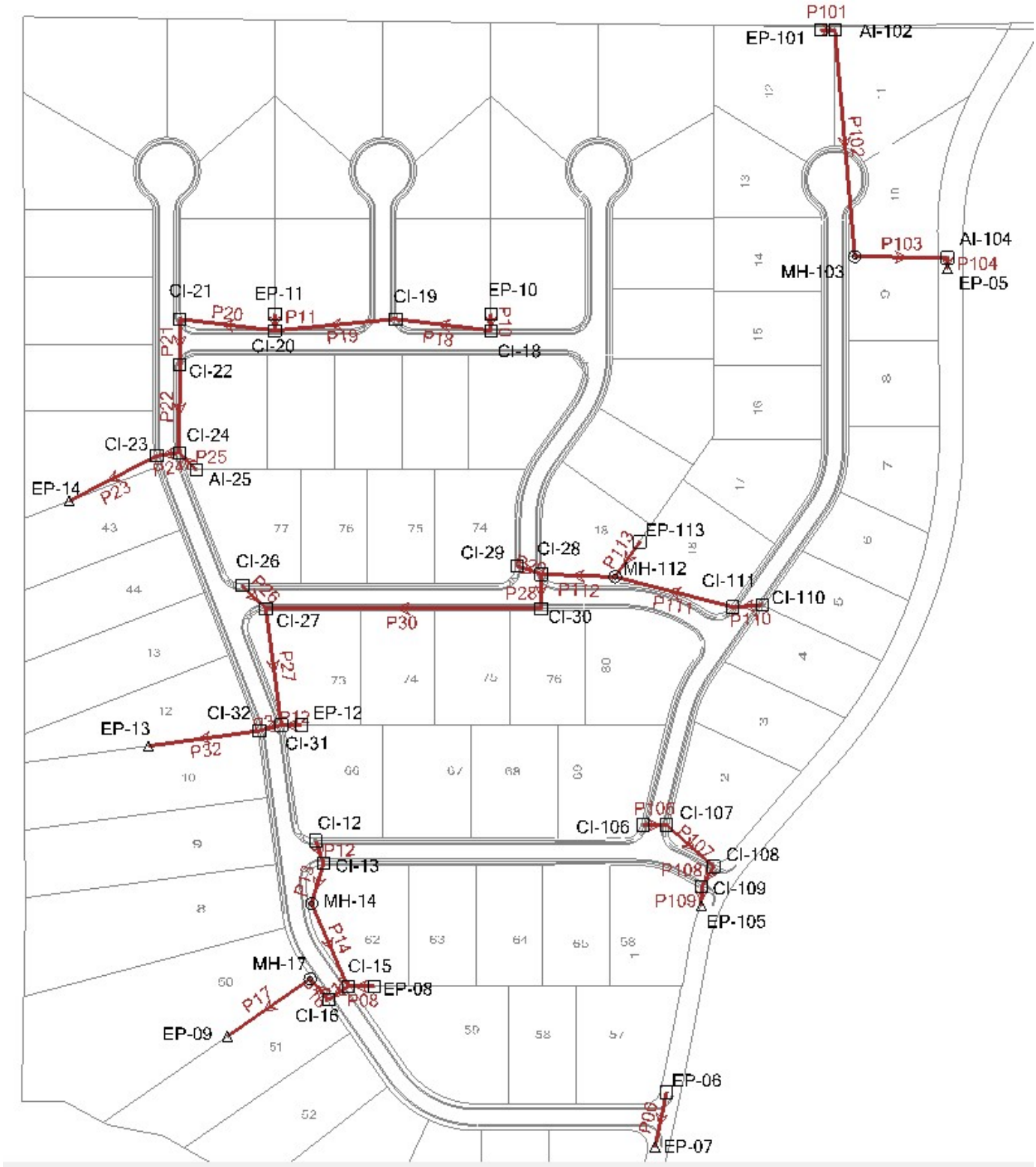
Project: Joyview Drainage Review TJL Date: 2/23/2023
Location: Columbia, IL Date:

Structure ID	Pervious C = 0.2		Aggregate C = 0.7		Impervious C = 0.9		Total		10-Year Storm			100-Year Storm		
	Area	C x A	Area	C x A	Area	C x A	Area	CA	Tc	I	Q	Tc	I	Q
EP-101	4.419	0.884	0.063	0.044	0.38	0.344	4.81	**1.272**	19.32	5.15	**6.55**	16.64	8.31	**10.57**
AI-102	2.813	0.563	0.046	0.032	0.61	0.545	3.46	**1.139**	17.10	5.42	**6.17**	14.47	8.75	**9.97**
AI-104	1.458	0.292	0.015	0.011	0.60	0.540	2.07	**0.842**	13.52	5.97	**5.03**	11.83	9.50	**8.00**
EP-10	1.455	0.291	0.000	0.000	0.18	0.165	1.64	**0.456**	9.40	6.77	**3.09**	8.23	10.55	**4.81**
CI-18	0.356	0.071	0.000	0.000	0.44	0.397	0.80	**0.468**	8.98	6.84	**3.20**	7.88	10.65	**4.98**
CI-19	0.356	0.071	0.000	0.000	0.44	0.397	0.80	**0.468**	8.01	7.02	**3.28**	6.93	10.94	**5.12**
EP-11	8.870	1.774	0.126	0.088	0.50	0.451	9.50	**2.313**	15.45	5.63	**13.02**	13.72	8.96	**20.73**
CI-20	0.356	0.071	0.000	0.000	0.44	0.397	0.80	**0.468**	8.78	6.88	**3.22**	7.69	10.71	**5.01**
CI-21	0.356	0.071	0.000	0.000	0.44	0.397	0.80	**0.468**	9.00	7.02	**3.28**	6.91	10.95	**5.12**
CI-22	0.438	0.088	0.000	0.000	0.63	0.564	1.06	**0.651**	7.72	7.07	**4.60**	6.94	10.94	**7.12**
CI-24	0.124	0.025	0.000	0.000	0.15	0.131	0.27	**0.156**	8.20	6.98	**1.09**	6.99	10.92	**1.71**
AI-25	2.107	0.421	0.000	0.000	0.30	0.270	2.41	**0.691**	12.50	6.17	**4.26**	10.85	9.78	**6.76**
CI-23	0.637	0.127	0.000	0.000	0.75	0.675	1.39	**0.803**	9.84	6.69	**5.37**	8.74	10.40	**8.35**
CI-110	1.301	0.260	0.000	0.000	0.23	0.204	1.53	**0.464**	10.88	6.49	**3.01**	9.94	10.04	**4.66**
CI-111	0.910	0.182	0.000	0.000	0.56	0.504	1.47	**0.686**	10.91	6.48	**4.44**	9.96	10.03	**6.88**
EP-113	3.497	0.699	0.000	0.000	0.45	0.404	3.95	**1.104**	15.67	5.6	**6.18**	13.81	8.94	**9.87**
CI-28	0.605	0.121	0.000	0.000	0.97	0.869	1.57	**0.990**	9.72	6.71	**6.64**	8.61	10.44	**10.34**
CI-29	0.244	0.049	0.000	0.000	0.14	0.127	0.39	**0.176**	6.89	7.22	**1.27**	6.04	11.21	**1.97**
CI-30	0.283	0.057	0.000	0.000	0.22	0.195	0.50	**0.252**	7.53	7.1	**1.79**	6.52	11.06	**2.79**
CI-26	0.261	0.052	0.000	0.000	0.47	0.425	0.73	**0.478**	10.66	6.53	**3.12**	9.41	10.20	**4.87**
CI-27	0.270	0.054	0.000	0.000	0.36	0.324	0.63	**0.378**	10.65	6.53	**2.47**	9.38	10.21	**3.86**
EP-12	2.300	0.460	0.000	0.000	0.28	0.255	2.58	**0.715**	11.93	6.28	**4.49**	10.29	9.94	**7.10**
CI-31	0.183	0.037	0.000	0.000	0.19	0.174	0.38	**0.210**	6.85	7.23	**1.52**	5.83	11.27	**2.37**
CI-32	0.187	0.037	0.000	0.000	0.42	0.382	0.61	**0.420**	5.07	7.55	**3.17**	5.00	11.52	**4.84**
CI-106	0.363	0.073	0.000	0.000	0.33	0.293	0.69	**0.366**	7.33	7.14	**2.61**	6.38	11.11	**4.06**
CI-107	0.280	0.056	0.000	0.000	0.36	0.322	0.64	**0.378**	8.74	6.89	**2.60**	7.61	10.74	**4.06**
CI-108	0.022	0.004	0.000	0.000	0.05	0.048	0.08	**0.052**	5.00	7.56	**0.40**	5.00	11.52	**0.60**

Inlet Hydrology

Project: Joyview Drainage Review TJL Date: 2/23/2023
Location: Columbia, IL Date:

Structure ID	Pervious C = 0.2		Aggregate C = 0.7		Impervious C = 0.9		Total		10-Year Storm			100-Year Storm		
	Area	C x A	Area	C x A	Area	C x A	Area	CA	Tc	I	Q	Tc	I	Q
CI-109	0.138	0.028	0.000	0.000	0.19	0.170	0.33	**0.198**	5.00	7.56	**1.49**	5.00	11.52	**2.28**
CI-12	0.294	0.059	0.000	0.000	0.36	0.328	0.66	**0.387**	10.58	6.55	**2.54**	9.34	10.22	**3.96**
CI-13	0.267	0.053	0.000	0.000	0.43	0.384	0.69	**0.437**	10.35	6.59	**2.88**	9.10	10.29	**4.50**
EP-08	2.058	0.412	0.000	0.000	0.27	0.240	2.32	**0.651**	13.43	5.99	**3.90**	11.75	9.52	**6.20**
CI-15	0.297	0.059	0.000	0.000	0.27	0.244	0.57	**0.303**	9.09	6.82	**2.07**	7.85	10.66	**3.23**
CI-16	0.389	0.078	0.000	0.000	0.57	0.514	0.96	**0.592**	9.14	6.81	**4.03**	7.92	10.64	**6.30**
EP-06	0.539	0.108	0.000	0.000	0.38	0.342	0.92	**0.449**	5.00	7.56	**3.40**	5.00	11.52	**5.18**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EP-101
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CI-15
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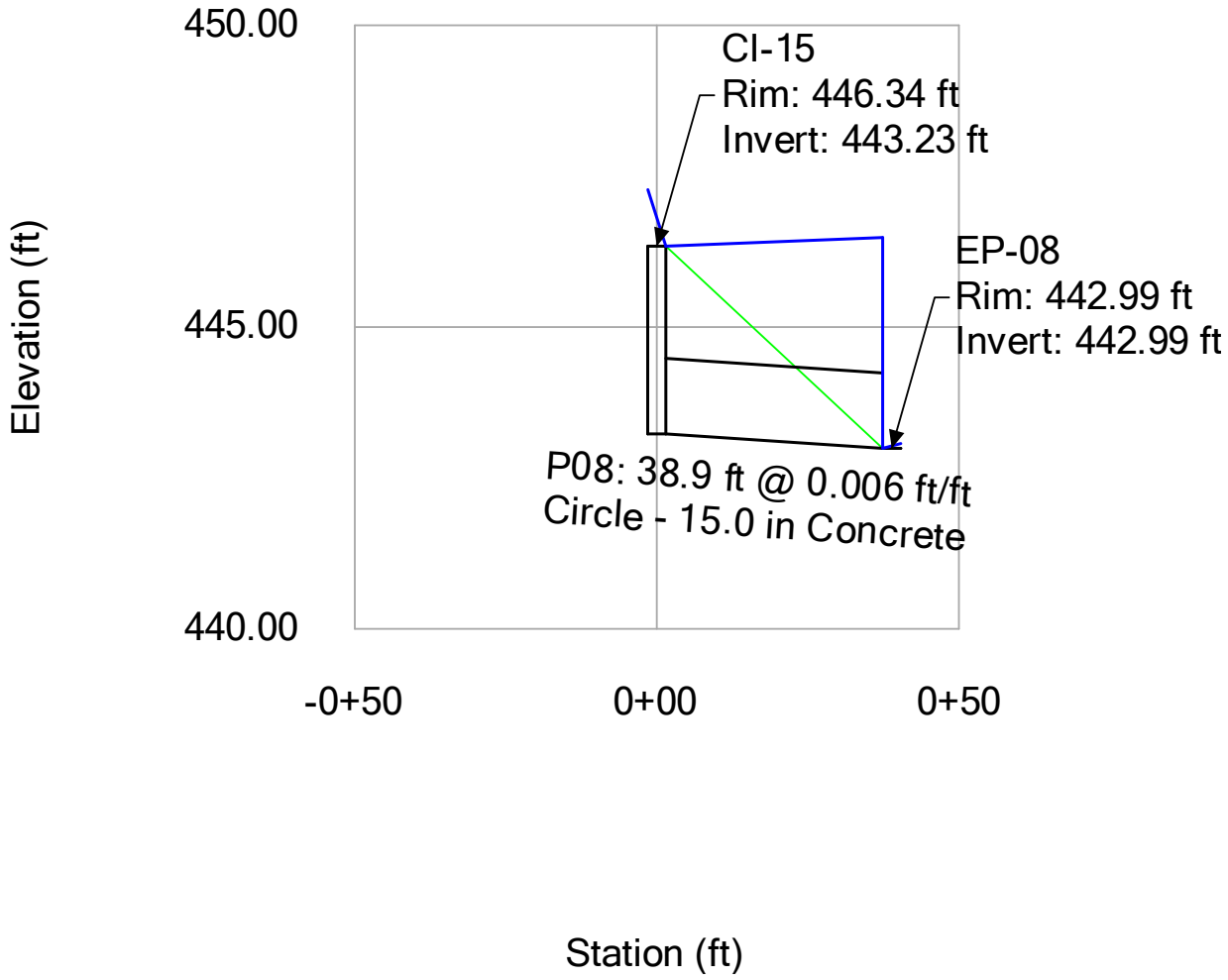
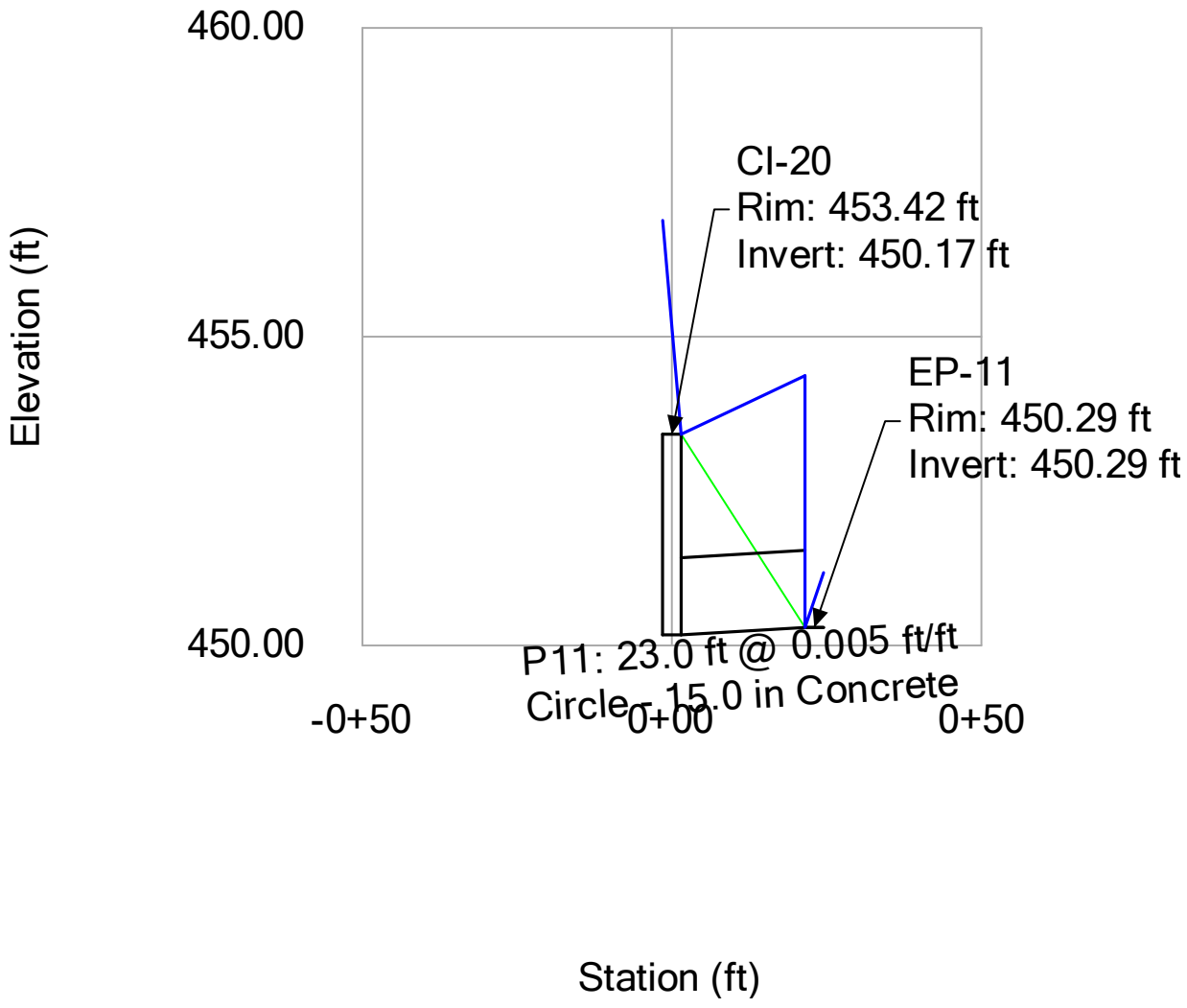
EP-07

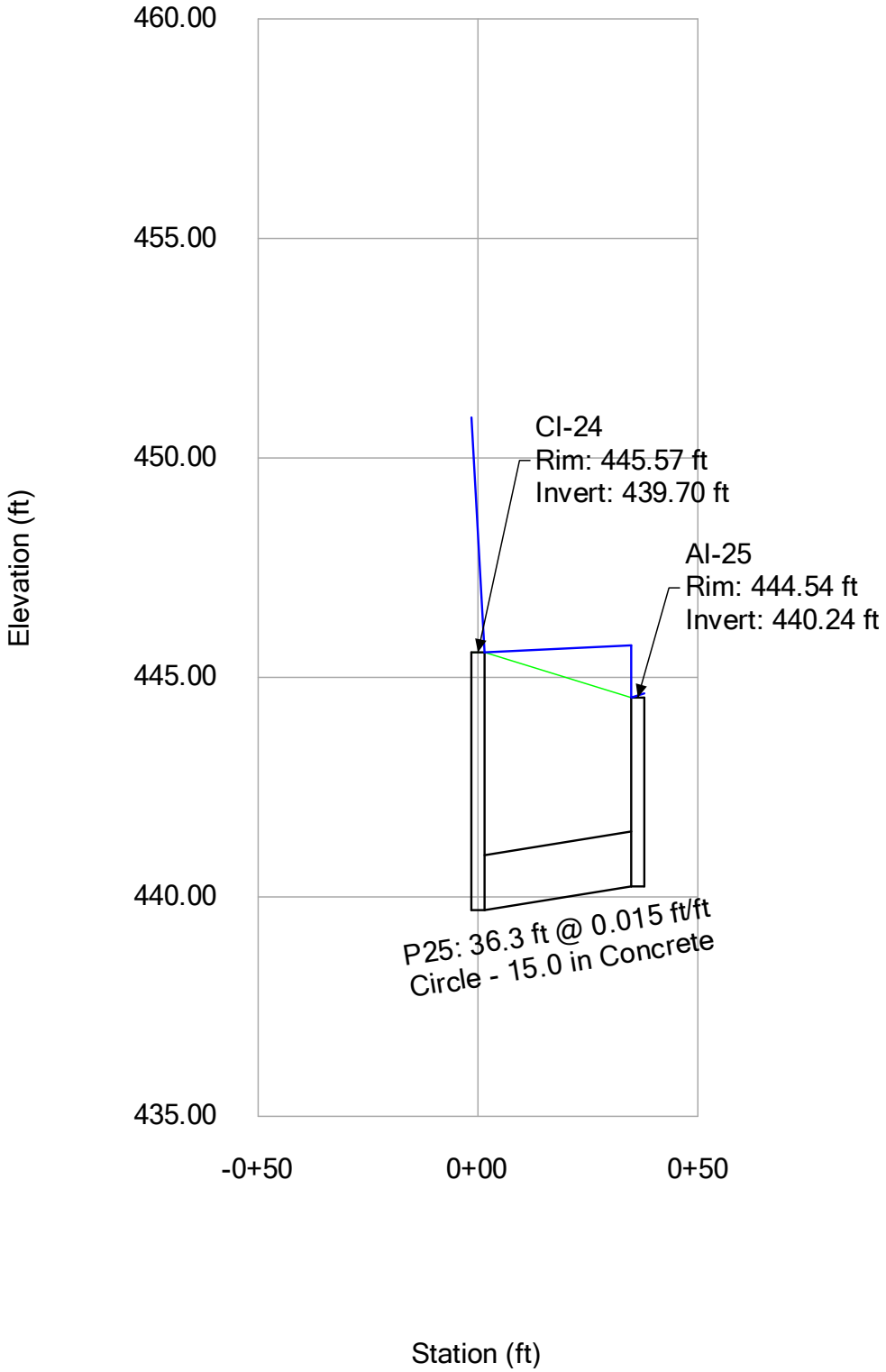
Profile Report
Engineering Profile - CI-15 to EP-08 (As-Built Storm.stsw)



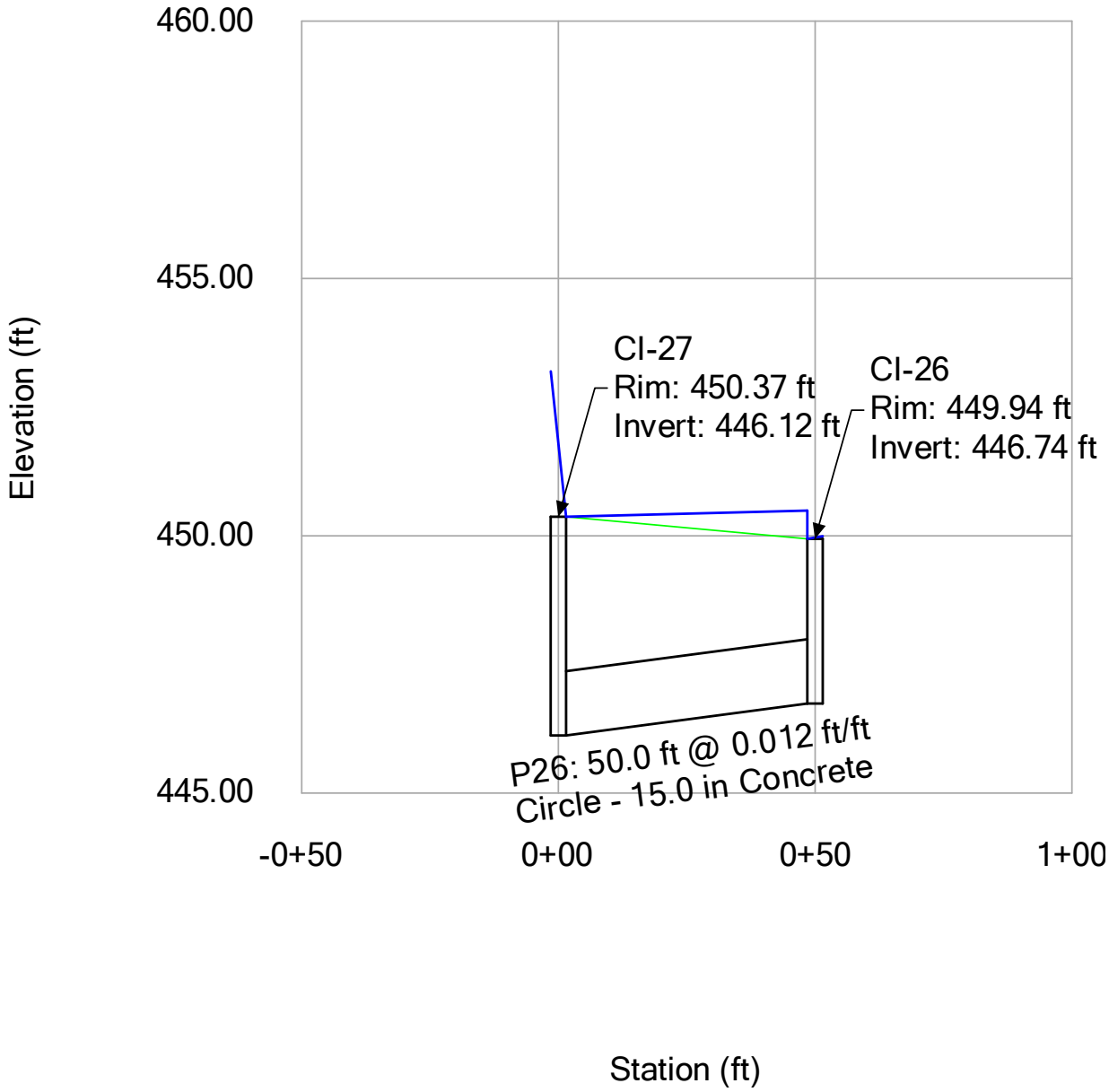
Profile Report
Engineering Profile - CI-20 to EP-11 (As-Built Storm.stsw)



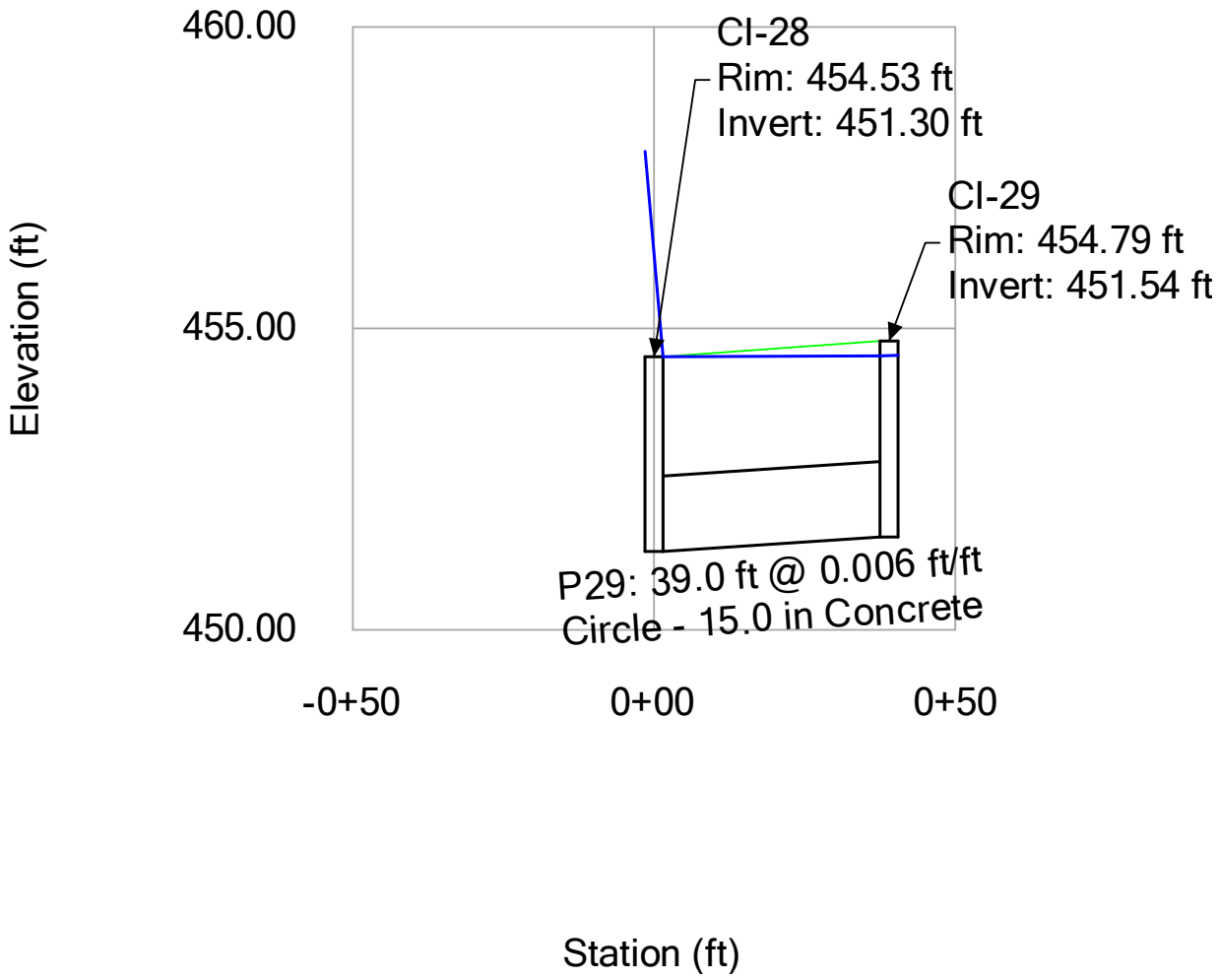
Profile Report
Engineering Profile - CI-24 to AI-25 (As-Built Storm.stsw)



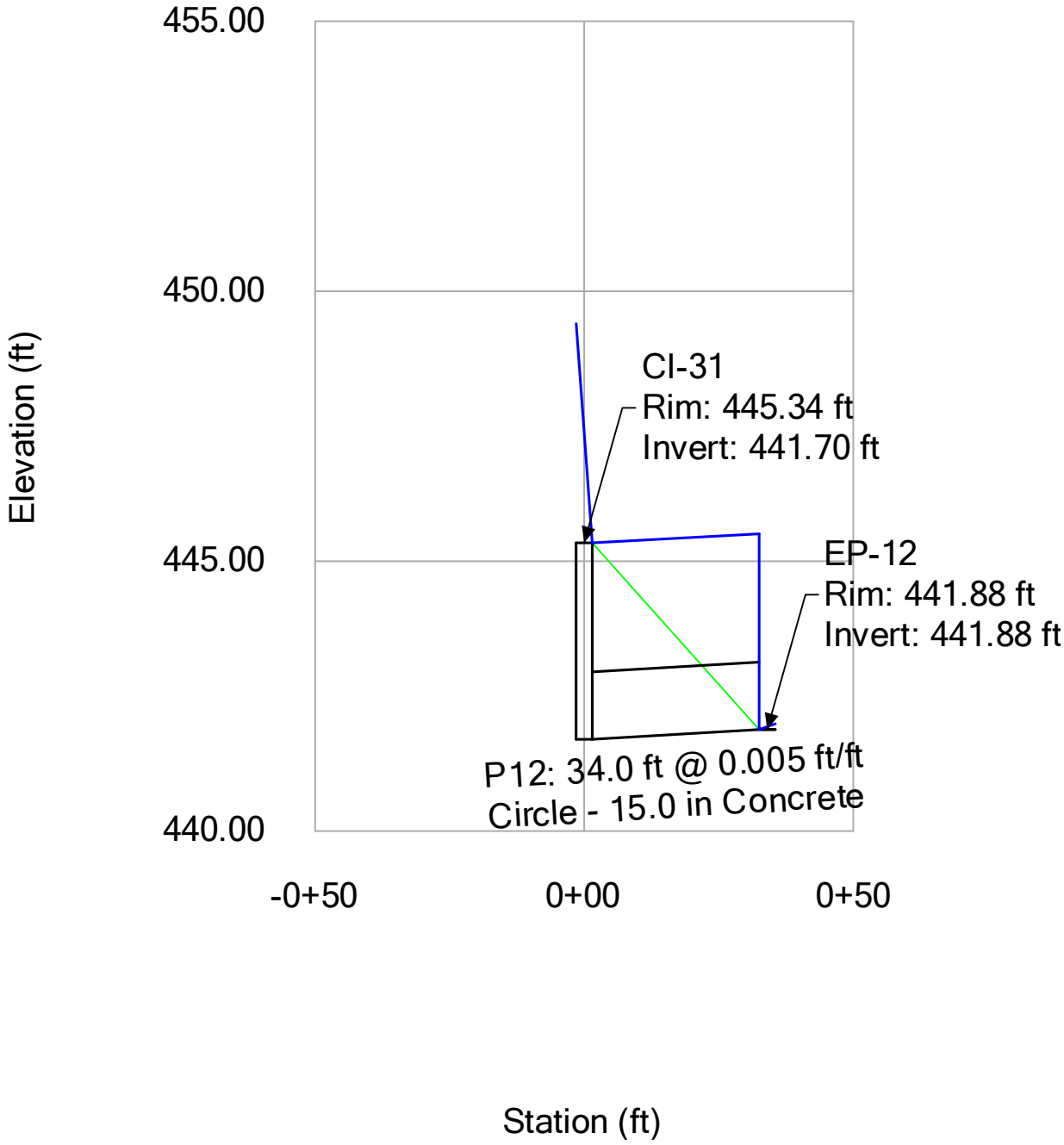
Profile Report
Engineering Profile - CI-27 to CI-26 (As-Built Storm.stsw)



Profile Report
Engineering Profile - CI-28 to CI-29 (As-Built Storm.stsw)

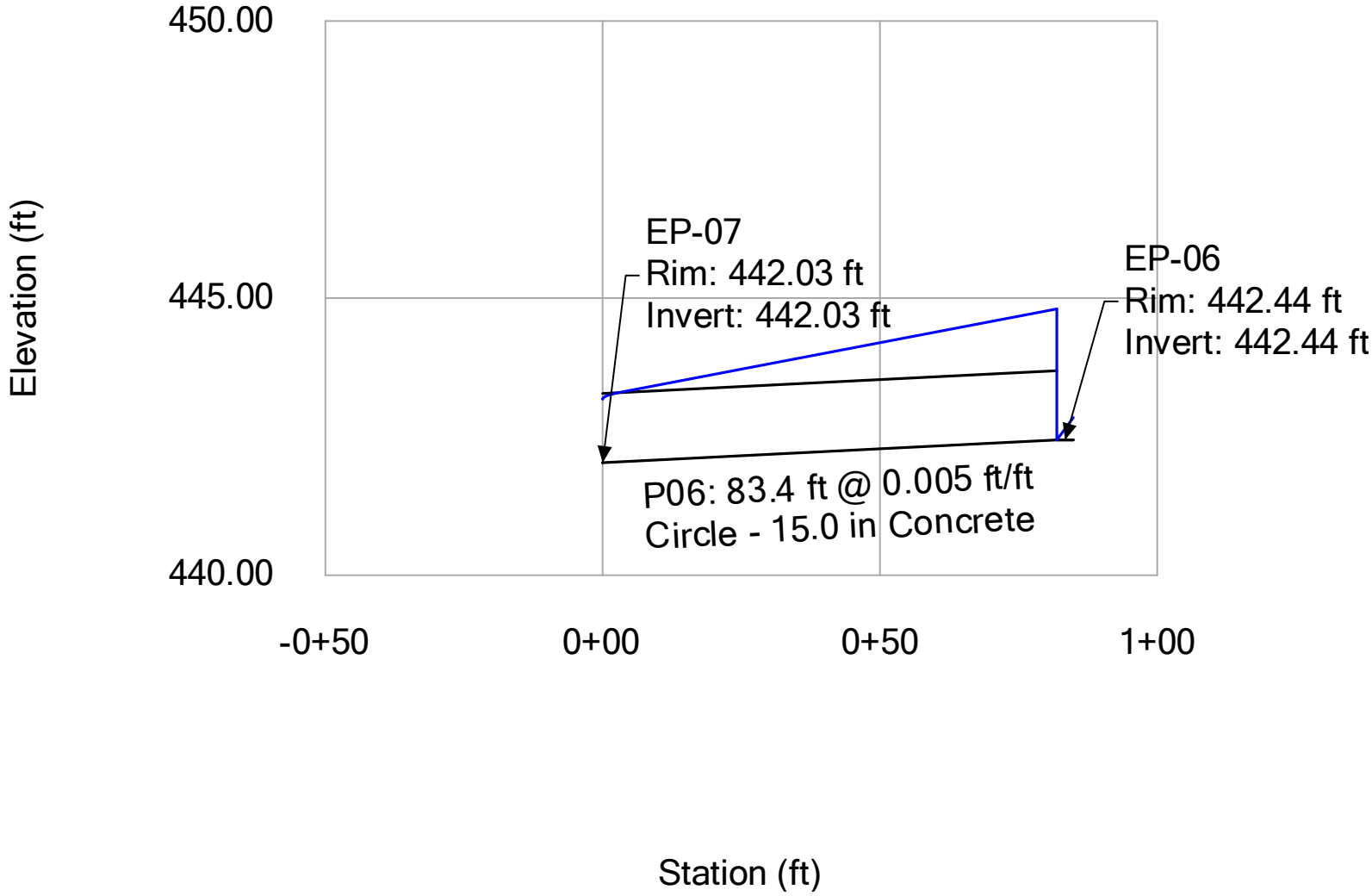


Profile Report
Engineering Profile - CI-31 to EP-12 (As-Built Storm.stsw)

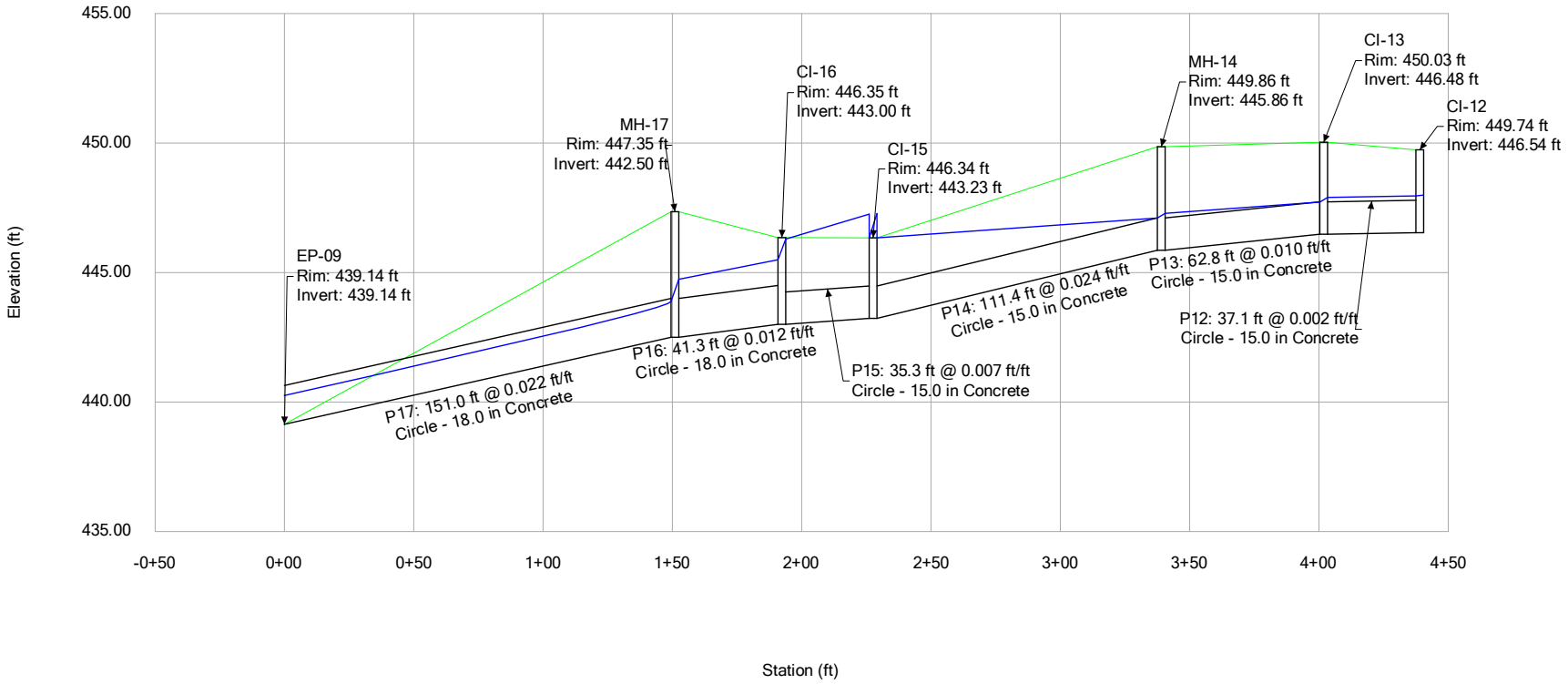


Profile Report

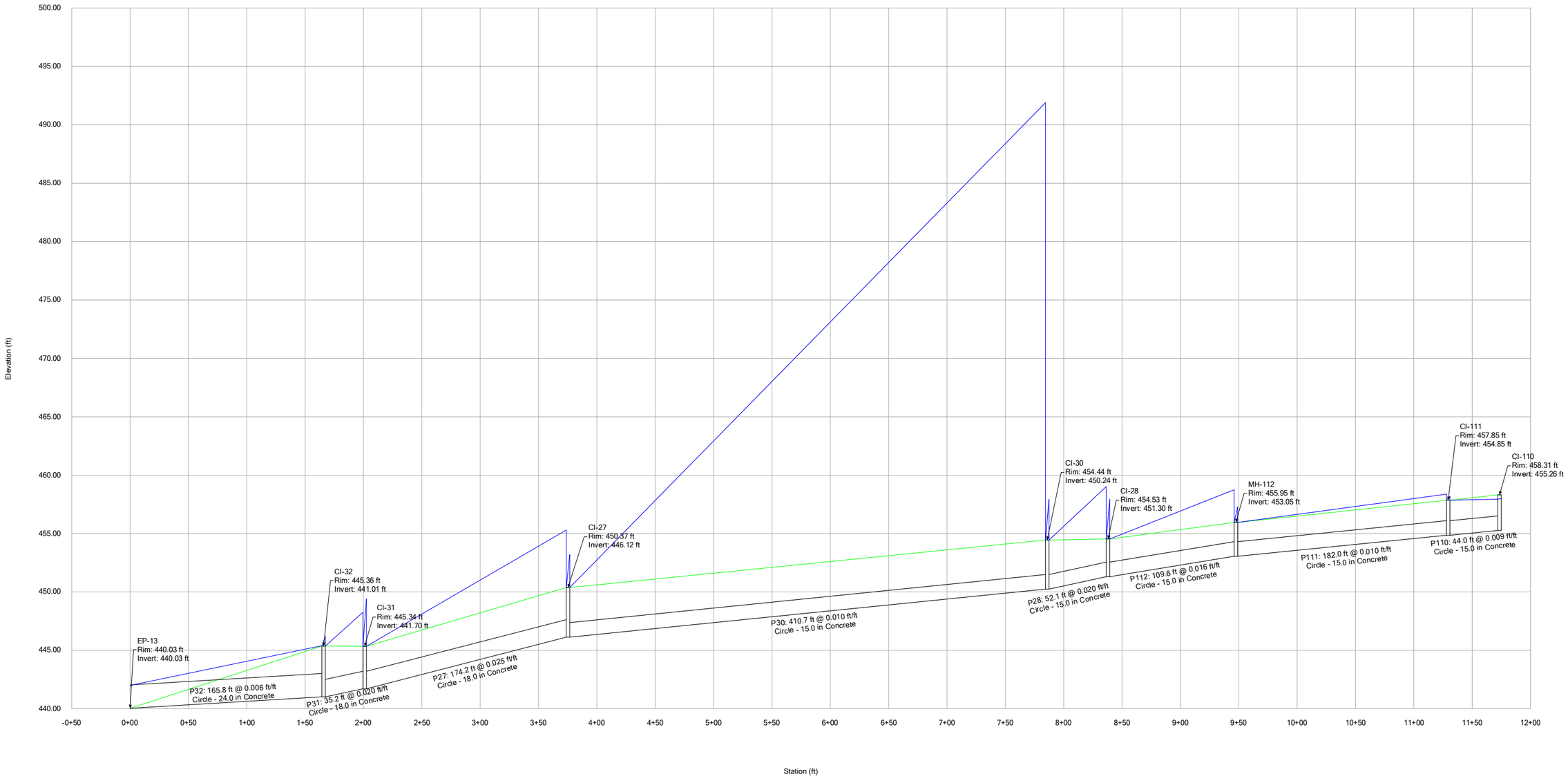
Engineering Profile - EP-07 to EP-06 (As-Built Storm.stsw)



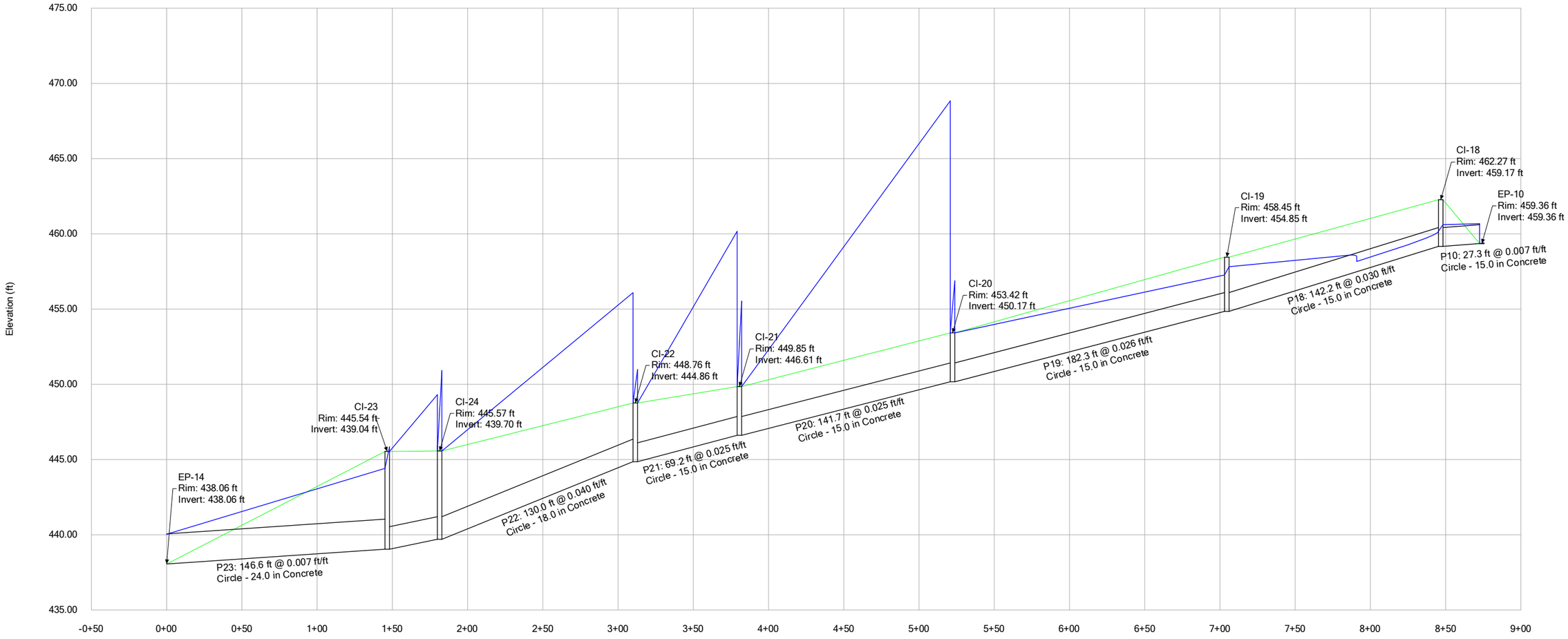
Profile Report
Engineering Profile - EP-09 to CI-12 (As-Built Storm.stsw)



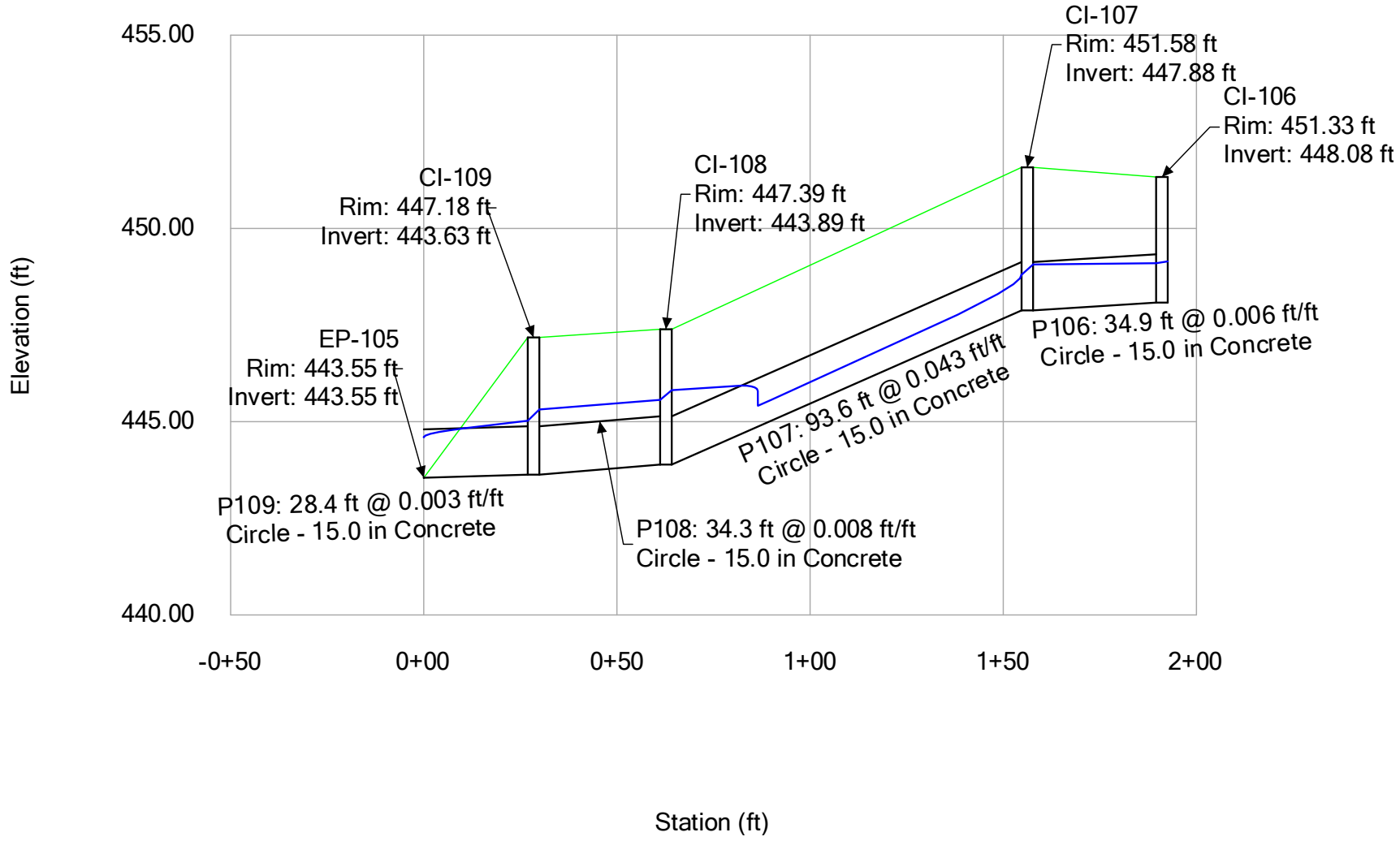
Profile Report
Engineering Profile - EP-13 to CI-110 (As-Built Storm.stsw)



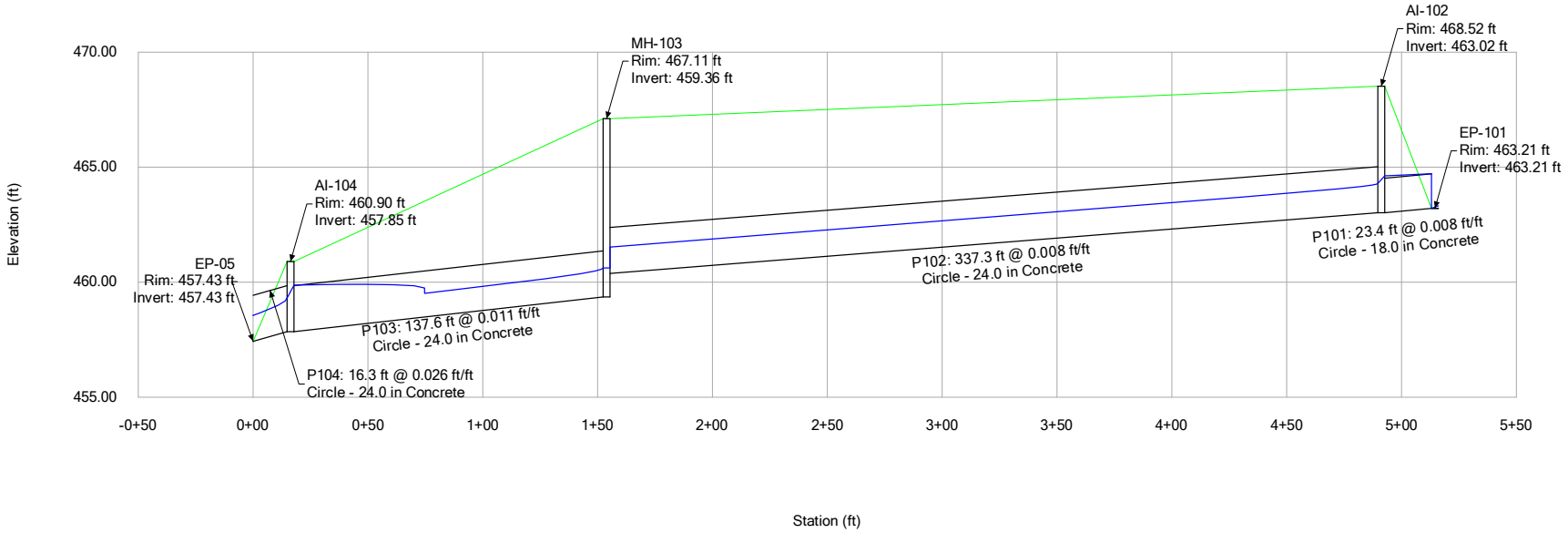
Profile Report
Engineering Profile - EP-14 to EP-10 (As-Built Storm.stsw)



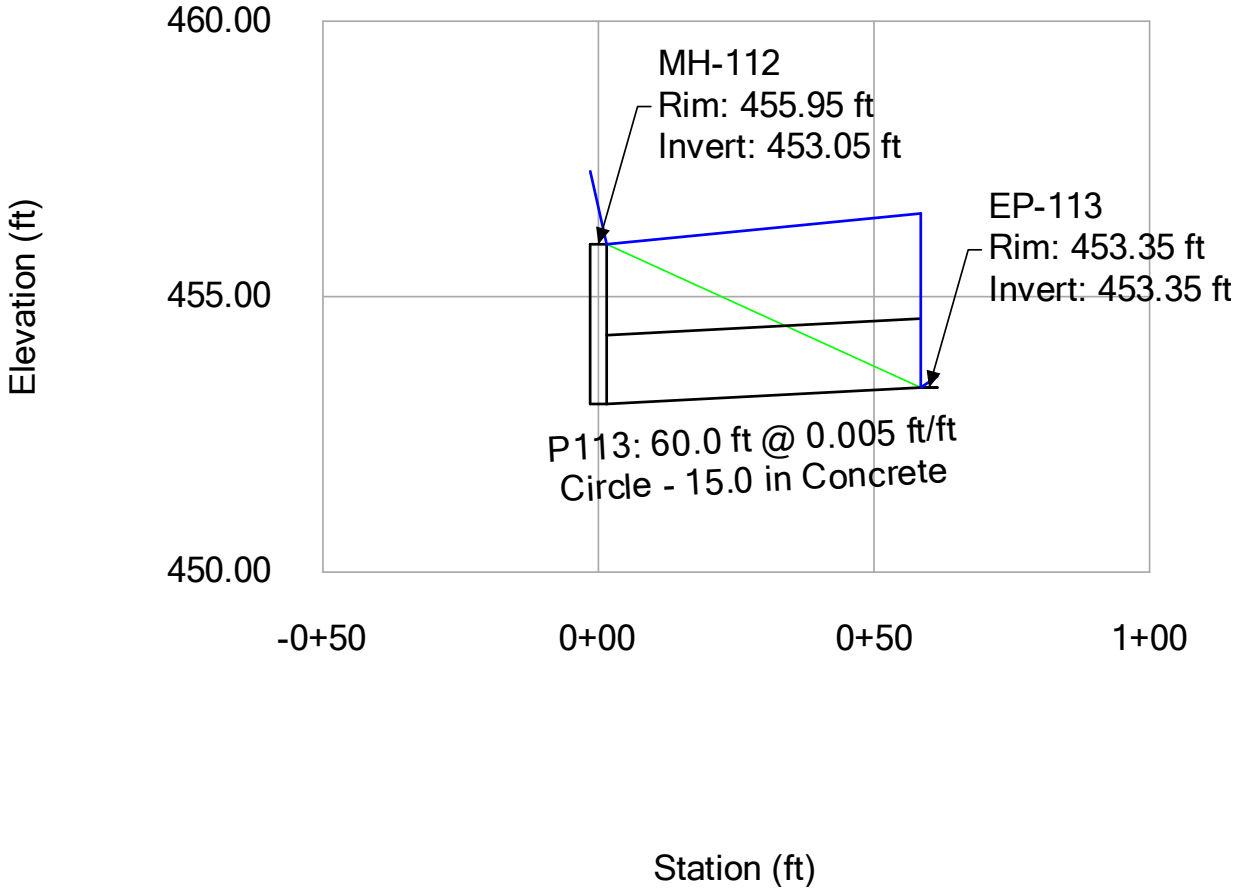
Profile Report
Engineering Profile - EP-105 to CI-106 (As-Built Storm.stsw)



Profile Report
Engineering Profile - EP-05 to EP-101 (As-Built Storm.stsw)



Profile Report
Engineering Profile - MH-112 to EP-113 (As-Built Storm.stsw)



Conduit FlexTable: Report

-Node- Upstream Downstream	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Invert- Upstream Downstream (ft)	Slope (Calculated) (ft/ft)	Section Type	Material	System CA (acres)	System Intensity (in/h)	Flow (cfs)	Length (User Defined) (ft)	Velocity (ft/s)	Diameter (in)
EP-10	459.36	460.68	459.36	0.007	Circle	Concrete	0.456	6.768	3.11	27.3	2.53	15.0
CI-18	462.27	460.61	459.17		<None>							
CI-18	462.27	460.18	459.17	0.030	Circle	Concrete	0.924	6.736	6.27	142.2	9.42	15.0
CI-19	458.45	457.82	454.85		<None>							
CI-19	458.45	457.27	454.85	0.026	Circle	Concrete	1.392	6.690	9.39	182.3	7.65	15.0
CI-20	453.42	453.42	450.17		<None>							
CI-20	453.42	468.84	450.17	0.025	Circle	Concrete	4.173	5.622	23.65	141.7	19.27	15.0
CI-21	449.85	449.85	446.61		<None>							
CI-21	449.85	460.17	446.61	0.025	Circle	Concrete	4.641	5.608	26.23	69.2	21.38	15.0
CI-22	448.76	448.76	444.86		<None>							
CI-22	448.76	456.09	444.86	0.040	Circle	Concrete	5.292	5.601	29.88	130.0	16.91	18.0
CI-24	445.57	445.57	439.70		<None>							
CI-24	445.57	449.31	439.70	0.019	Circle	Concrete	6.139	5.586	34.57	34.8	19.56	18.0
CI-23	445.54	445.54	439.04		<None>							
CI-23	445.54	444.41	439.04	0.007	Circle	Concrete	6.942	5.583	39.06	146.6	12.43	24.0
EP-14	438.06	440.01	438.06		<None>							
AI-25	444.54	445.73	440.24	0.015	Circle	Concrete	0.691	6.170	4.30	36.3	3.50	15.0
CI-24	445.57	445.57	439.70		<None>							
EP-11	450.29	454.37	450.29	0.005	Circle	Concrete	2.313	5.627	13.12	23.0	10.69	15.0
CI-20	453.42	453.42	450.17		<None>							
CI-29	454.79	454.55	451.54	0.006	Circle	Concrete	0.176	7.220	1.28	39.0	1.04	15.0
CI-28	454.53	454.53	451.30		<None>							
CI-28	454.53	459.02	451.30	0.020	Circle	Concrete	3.420	5.556	19.15	52.1	15.61	15.0
CI-30	454.44	454.44	450.24		<None>							
CI-30	454.44	491.90	450.24	0.010	Circle	Concrete	3.672	5.550	20.54	410.7	16.74	15.0
CI-27	450.37	450.37	446.12		<None>							
CI-27	450.37	455.29	446.12	0.025	Circle	Concrete	4.528	5.501	25.11	174.2	14.21	18.0
CI-31	445.34	445.34	441.70		<None>							
CI-31	445.34	448.25	441.70	0.020	Circle	Concrete	5.453	5.477	30.10	35.2	17.04	18.0
CI-32	445.36	445.36	441.01		<None>							
CI-32	445.36	445.39	441.01	0.006	Circle	Concrete	5.873	5.473	32.40	165.8	10.31	24.0
EP-13	440.03	441.92	440.03		<None>							

Conduit FlexTable: Report

-Node- Upstream Downstream	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Invert- Upstream Downstream (ft)	Slope (Calculated) (ft/ft)	Section Type	Material	System CA (acres)	System Intensity (in/h)	Flow (cfs)	Length (User Defined) (ft)	Velocity (ft/s)	Diameter (in)
EP-12	441.88	445.51	441.88	0.005	Circle	Concrete	0.715	6.282	4.53	34.0	3.69	15.0
CI-31	445.34	445.34	441.70		<None>							
MH-112	455.95	458.75	453.05	0.016	Circle	Concrete	2.254	5.577	12.67	109.6	10.33	15.0
CI-28	454.53	454.53	451.30		<None>							
EP-113	453.35	456.51	453.35	0.005	Circle	Concrete	1.104	5.600	6.23	60.0	5.08	15.0
MH-112	455.95	455.95	453.05		<None>							
CI-111	457.85	458.37	454.85	0.010	Circle	Concrete	1.150	6.429	7.45	182.0	6.07	15.0
MH-112	455.95	455.95	453.05		<None>							
CI-110	458.31	457.95	455.26	0.009	Circle	Concrete	0.464	6.488	3.03	44.0	2.47	15.0
CI-111	457.85	457.85	454.85		<None>							
CI-12	449.74	447.96	446.54	0.002	Circle	Concrete	0.387	6.546	2.55	37.1	2.08	15.0
CI-13	450.03	447.90	446.48		<None>							
CI-13	450.03	447.72	446.48	0.010	Circle	Concrete	0.824	6.488	5.39	62.8	5.86	15.0
MH-14	449.86	447.28	445.86		<None>							
MH-14	449.86	447.11	445.86	0.024	Circle	Concrete	0.824	6.453	5.36	111.4	8.24	15.0
CI-15	446.34	446.34	443.23		<None>							
CI-15	446.34	446.48	443.23	0.006	Circle	Concrete	0.651	5.988	3.93	38.9	3.20	15.0
EP-08	442.99	446.34	442.99		<None>							
MH-17	447.35	443.89	442.50	0.022	Circle	Concrete	2.370	5.918	14.14	151.0	10.04	18.0
EP-09	439.14	440.25	439.14		<None>							
CI-16	446.35	445.49	443.00	0.012	Circle	Concrete	2.370	5.935	14.18	41.3	8.02	18.0
MH-17	447.35	444.74	442.50		<None>							
CI-15	446.34	447.25	443.23	0.007	Circle	Concrete	1.778	5.948	10.66	35.3	8.69	15.0
CI-16	446.35	446.29	443.00		<None>							
CI-26	449.94	450.49	446.74	0.012	Circle	Concrete	0.478	6.531	3.15	50.0	2.56	15.0
CI-27	450.37	450.37	446.12		<None>							
MH-103	467.11	460.62	459.36	0.011	Circle	Concrete	2.411	5.056	12.29	137.6	7.61	24.0
AI-104	460.90	459.87	457.85		<None>							
AI-102	468.52	464.29	463.02	0.008	Circle	Concrete	2.411	5.155	12.53	337.3	6.72	24.0
MH-103	467.11	461.53	459.36		<None>							
EP-101	463.21	464.71	463.21	0.008	Circle	Concrete	1.272	5.167	6.63	23.4	3.75	18.0
AI-102	468.52	464.62	463.02		<None>							

Conduit FlexTable: Report

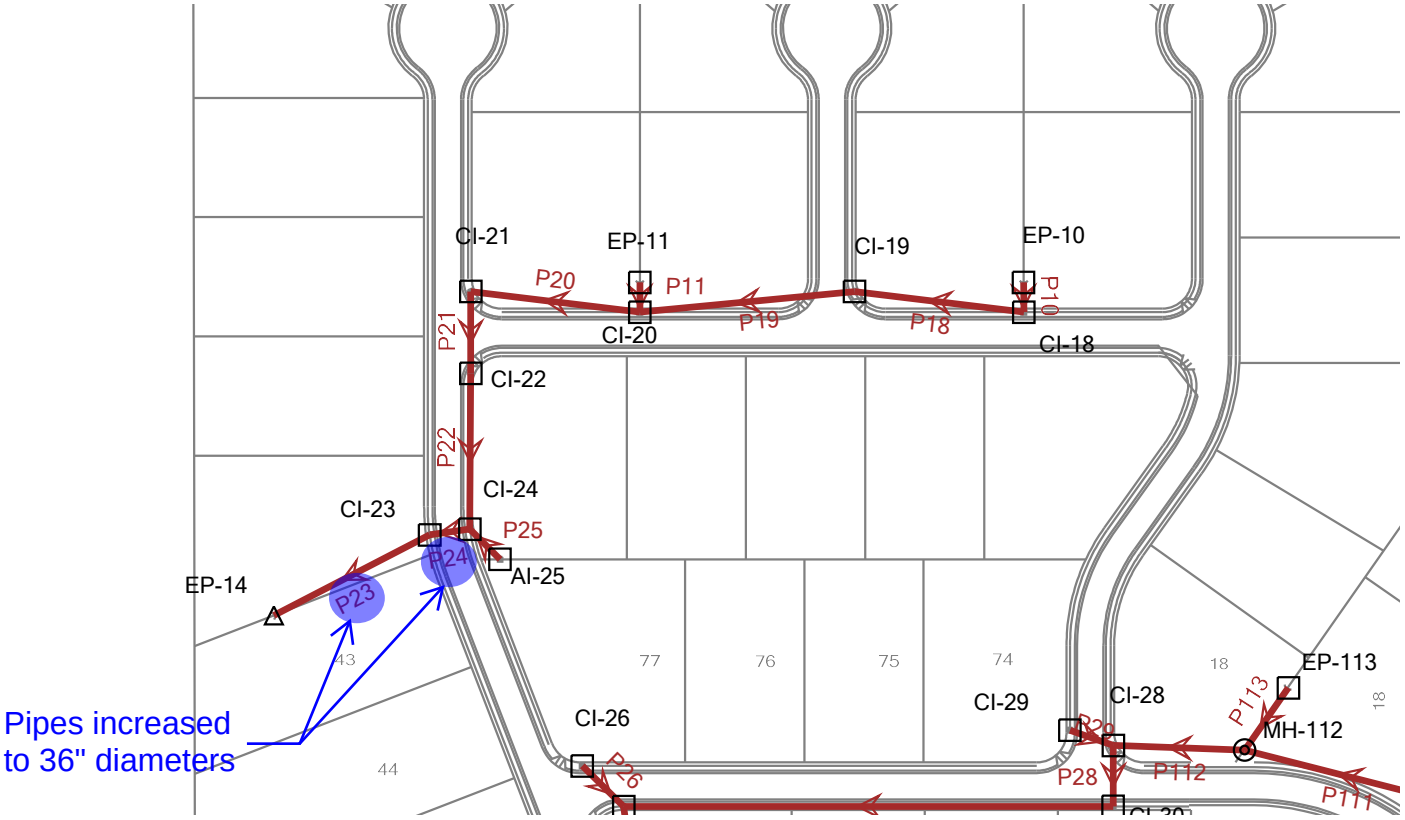
-Node- Upstream Downstream	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Invert- Upstream Downstream (ft)	Slope (Calculated) (ft/ft)	Section Type	Material	System CA (acres)	System Intensity (in/h)	Flow (cfs)	Length (User Defined) (ft)	Velocity (ft/s)	Diameter (in)
CI-106	451.33	449.10	448.08	0.006	Circle	Concrete	0.366	7.141	2.63	34.9	4.06	15.0
CI-107	451.58	449.07	447.88		<None>							
CI-107	451.58	448.80	447.88	0.043	Circle	Concrete	0.744	6.887	5.16	93.6	10.18	15.0
CI-108	447.39	445.81	443.89		<None>							
CI-108	447.39	445.56	443.89	0.008	Circle	Concrete	0.796	6.859	5.50	34.3	4.48	15.0
CI-109	447.18	445.32	443.63		<None>							
CI-109	447.18	445.02	443.63	0.003	Circle	Concrete	0.994	6.836	6.85	28.4	5.58	15.0
EP-105	443.55	444.60	443.55		<None>							
AI-104	460.90	459.31	457.85	0.026	Circle	Concrete	3.253	5.020	16.46	16.3	11.28	24.0
EP-05	457.43	458.56	457.43		<None>							
EP-06	442.44	444.81	442.44	0.005	Circle	Concrete	1.443	6.088	8.85	0.0	7.22	15.0
EP-07	442.03	443.18	442.03		<None>							

Solutions

Solution 1A – Downstream Pipe Increase

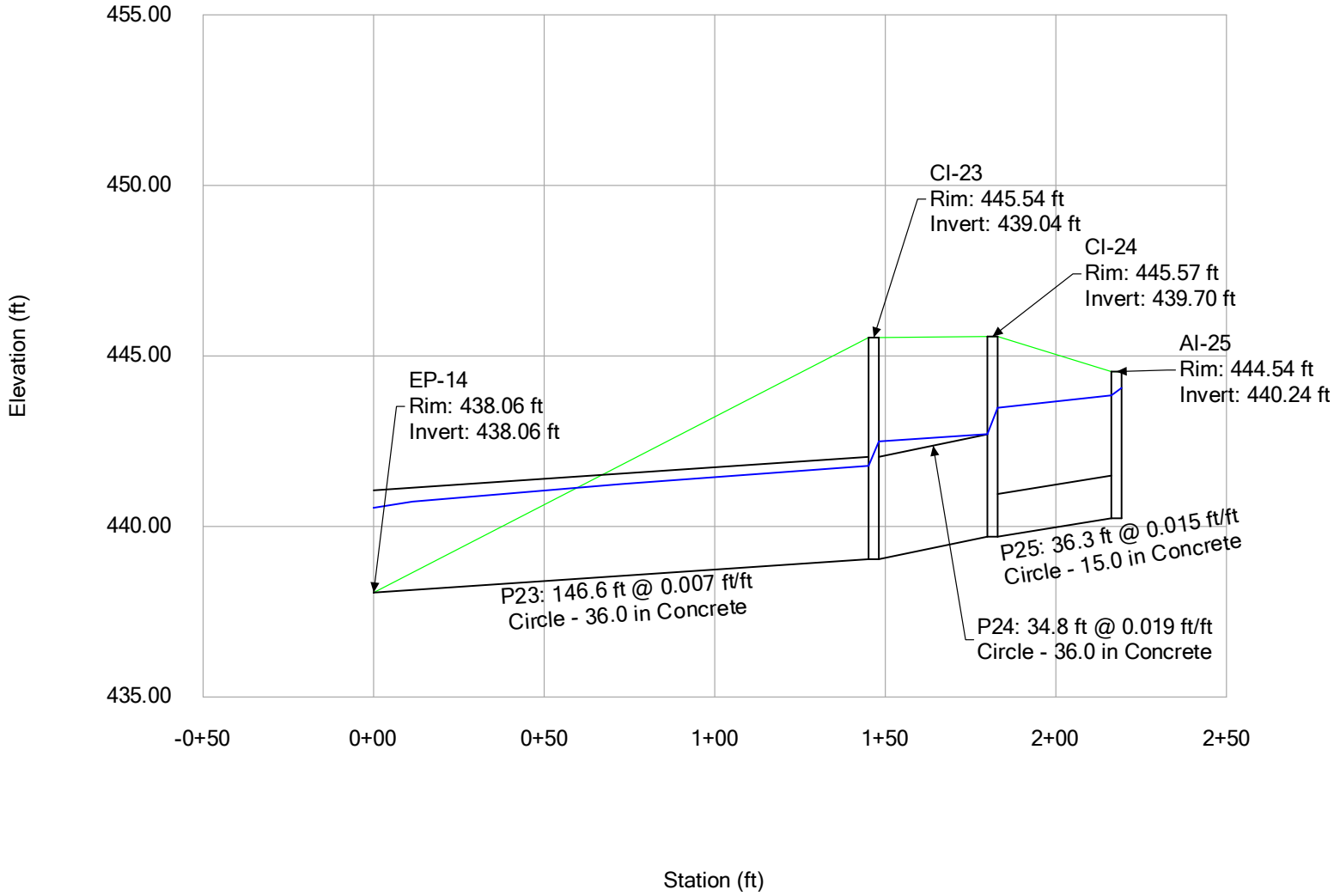
March 17, 2023

Scenario: Base



Profile Report

Engineering Profile - DS EP-14 (As-Built_DS pipe increase.stsw)



Downstream Pipe Increase Model Results

System EP-14

-Node- Upstream Downstream	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Invert- Upstream Downstream (ft)	Slope (Calculated) (ft/ft)	Section Type	Material	System CA (acres)	System Intensity (in/h)	Flow (cfs)	Length (User Defined) (ft)	Velocity (ft/s)	Diameter (in)
AI-25	444.54	443.84	440.24	0.015	Circle	Concrete	0.691	9.31	6.48	36.3	5.28	15
CI-24	445.57	443.48	439.7									
EP-11	450.29	455.59	450.29	0.005	Circle	Concrete	2.313	8.519	19.86	23	16.19	15
CI-20	453.42	453.42	450.17									
EP-10	459.36	462.39	459.36	0.007	Circle	Concrete	0.456	10.2	4.69	27.3	3.82	15
CI-18	462.27	462.24	459.17									
CI-18	462.27	461.5	459.17	0.03	Circle	Concrete	0.924	10.164	9.47	142.2	7.71	15
CI-19	458.45	458.45	454.85									
CI-19	458.45	462.15	454.85	0.026	Circle	Concrete	1.392	10.072	14.13	182.3	11.52	15
CI-20	453.42	453.42	450.17									
C-20	453.42	493.4	450.17	0.025	Circle	Concrete	4.173	8.515	35.82	141.7	29.19	15
CI-21	449.85	449.85	446.61									
CI-21	449.85	474.98	446.61	0.025	Circle	Concrete	4.641	8.5	39.76	69.2	32.4	15
CI-22	448.76	448.76	444.86									
CI-22	448.76	467.67	444.86	0.04	Circle	Concrete	5.292	8.494	45.31	130	25.64	18
CI-24	445.57	443.48	439.7									
CI-24	445.57	442.71	439.7	0.019	Circle	Concrete	6.139	8.479	52.47	34.8	7.42	36
CI-23	445.54	442.49	439.04									
CI-23	445.54	441.78	439.04	0.007	Circle	Concrete	6.942	8.464	59.23	146.6	8.38	36
EP-14	438.06	440.55	438.06									

StormCAD - Street Overflow
No Bypass - 2 yr

Description: As-Built Model (utilizes full offsite area for EP-11) ran during the 2 year storm with 36" outlet

Structure	Inlet DA Flow	Flow Conveyed	Bypass Flow	Accumulative Street Flow		
EP-10	2.10	2.10	0.00	0.00		
CI-18	2.18	2.18	0.00	0.00		
CI-19	2.24	2.24	0.00	0.00		
EP-11	8.84	3.33	5.51	5.51		
CI-20	2.19	0.50	1.69	7.20		
CI-21	2.24	0.00	2.24	9.44		
CI-22	3.16	1.00	2.16	11.60		
At System Low Point					additional conveyed flow	total remaining flow
CI-24	0.74	0.74	0.00	11.60	11.60	0.00
CI-23	3.65	3.65	-	-	0.00	0.00

For Street Flow between CI-22 and CI-24

Flow	Cross Slope	Grade	Spread (ft)
11.60	0.02	0.0338	12

*Spread determined from attached spread vs percent of grade table

Q FLOW IN C F.S. FOR SPREAD vs. PERCENT OF GRADE

1/4"/ft. SLOPE, URBAN 1 ft. FLAG @ 3/4"/ft. n = .013

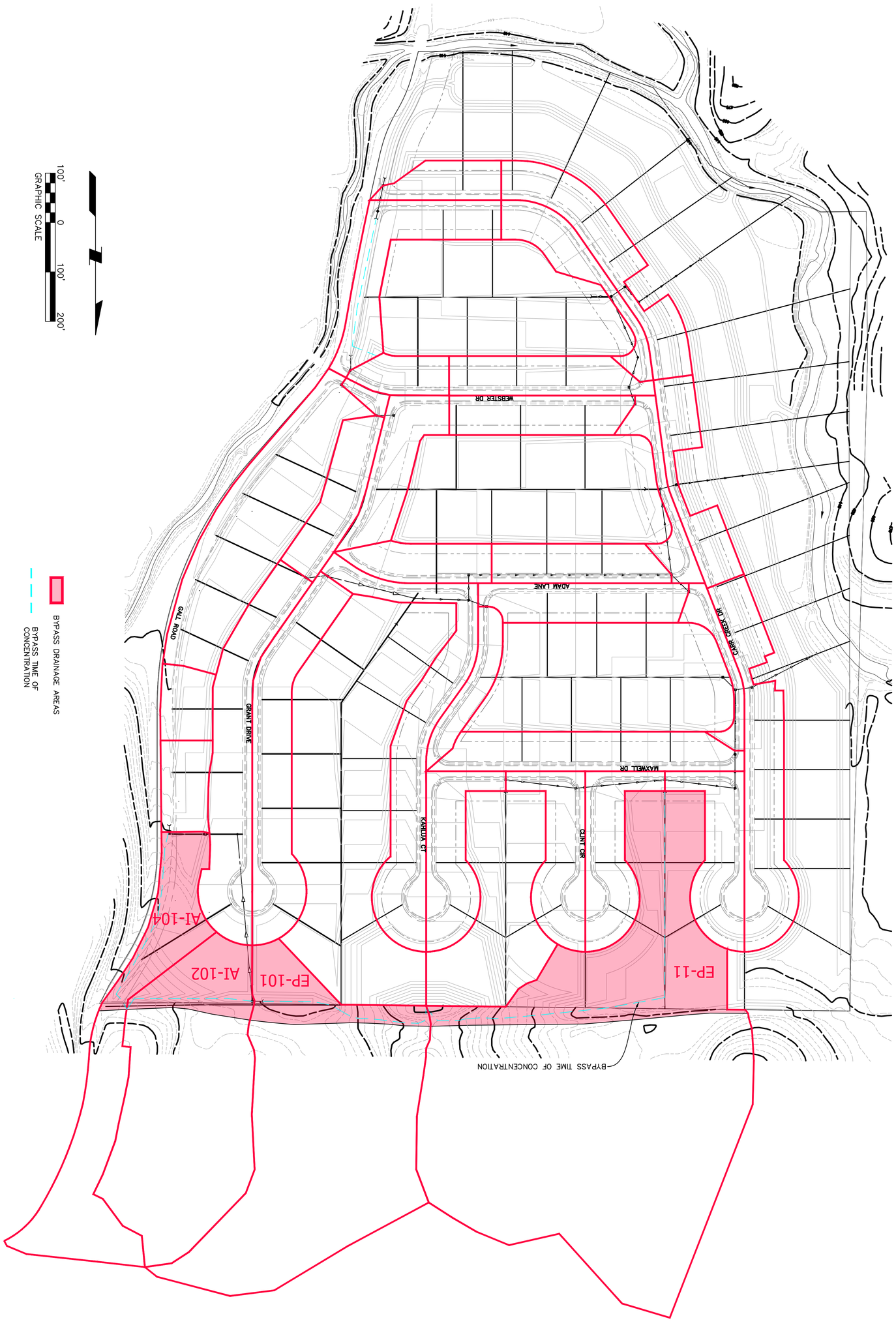
PERCENT OF GRADE

SPREAD FEET	0.5%	1.0%	1.5%	2.0%	2.5%	3.0%	3.5%	4.0%	4.5%	5.0%	5.5%	6.0%
0.0	0.030	0.042	0.052	0.060	0.067	0.073	0.079	0.085	0.090	0.095	0.099	0.104
0.5	0.046	0.065	0.079	0.091	0.102	0.112	0.121	0.129	0.137	0.145	0.152	0.158
1.0	0.068	0.096	0.117	0.136	0.152	0.166	0.179	0.192	0.203	0.214	0.225	0.235
1.5	0.098	0.138	0.169	0.196	0.219	0.240	0.259	0.277	0.294	0.309	0.325	0.339
2.0	0.137	0.194	0.238	0.275	0.307	0.337	0.364	0.389	0.412	0.435	0.456	0.476
2.5	0.188	0.266	0.325	0.376	0.420	0.460	0.497	0.531	0.563	0.594	0.623	0.651
3.0	0.250	0.354	0.434	0.501	0.560	0.613	0.662	0.708	0.751	0.792	0.830	0.867
3.5	0.326	0.461	0.565	0.652	0.729	0.799	0.863	0.922	0.978	1.031	1.082	1.130
4.0	0.416	0.589	0.721	0.833	0.931	1.020	1.101	1.177	1.249	1.316	1.381	1.442
4.5	0.522	0.738	0.904	1.044	1.167	1.279	1.381	1.476	1.566	1.651	1.731	1.808
5.0	0.644	0.911	1.116	1.288	1.440	1.578	1.704	1.822	1.932	2.037	2.136	2.231
5.5	0.784	1.109	1.358	1.568	1.753	1.920	2.074	2.217	2.352	2.479	2.600	2.715
6.0	0.942	1.332	1.632	1.884	2.106	2.308	2.492	2.664	2.826	2.979	3.124	3.263
6.5	1.120	1.583	1.939	2.239	2.504	2.743	2.962	3.167	3.359	3.541	3.714	3.879
7.0	1.318	1.864	2.282	2.635	2.946	3.228	3.486	3.727	3.953	4.167	4.370	4.565
7.5	1.537	2.174	2.662	3.074	3.437	3.765	4.067	4.347	4.611	4.860	5.098	5.324
8.0	1.778	2.515	3.080	3.557	3.977	4.356	4.705	5.030	5.335	5.624	5.899	6.161
8.5	2.043	2.889	3.539	4.086	4.568	5.004	5.405	5.778	6.129	6.460	6.776	7.077
9.0	2.331	3.297	4.038	4.663	5.213	5.711	6.168	6.594	6.994	7.372	7.732	8.076
9.5	2.645	3.740	4.580	5.289	5.913	6.478	6.997	7.480	7.934	8.363	8.771	9.161
10.0	2.983	4.219	5.167	5.966	6.671	7.307	7.893	8.438	8.950	9.434	9.894	10.334
10.5	3.348	4.735	5.799	6.696	7.487	8.201	8.858	9.470	10.045	10.588	11.105	11.598
11.0	3.740	5.290	6.479	7.481	8.364	9.162	9.896	10.579	11.221	11.828	12.405	12.957
11.5	4.160	5.884	7.206	8.321	9.303	10.191	11.008	11.768	12.481	13.157	13.799	14.412
12.0	4.609	6.519	7.984	9.219	10.307	11.290	12.195	13.037	13.828	14.576	15.287	15.967

Solution 1B

Bypass with Pipe Increase

March 17, 2023



Joyview Drainage Review
Columbia, Illinois

City of Columbia
208 S Rapp Avenue,
Columbia, IL 62236

Sheet Title: BYPASS AREAS

Sheet: 1 of 1

MILLENNIA PROFESSIONAL SERVICES
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Metro-East Office:
11 Executive Dr, Ste 12
Fairview Heights, IL 62208
618.624.8610

St. Louis Office:
6439 Plymouth, W-129
St. Louis, MO 63133
314.531.3981

Drawing Issue

02/28/23	Drainage Review Report

Millennia Project No.:

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: EP-101

Determine Time of Concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	45	ft.
			n=	0.24	
			s=	0.200	ft/ft
			I (10 year)=	7.56	in/hr
			I (100 year)=	11.52	in/hr
	T10 (overland)=	2.81 min.			
	T100 (overland)=	2.37 min.			
T (shallow):	Paved= 1		L=	153	ft.
	Unpaved= 2		s=	0.105	ft/ft
	Paved or Unpaved?	2	V=	5.23	ft/sec
	T (shallow)=	0.49 min.			
T (channel):	Actual or		L=	170	ft.
	assumed velocity?	Assumed	V=	5.50	ft/sec
	T (channel)=	0.52 min.			

Tc (10 year)=	3.81	min.
I (10 year)=	7.56	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: AI-102

Determine Time of Concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	27	ft.
			n=	0.24	
			s=	0.300	ft/ft
			I (10 year)=	7.56	in/hr
			I (100 year)=	11.52	in/hr
	T10 (overland)=	1.83 min.			
	T100 (overland)=	1.55 min.			
T (shallow):	Paved= 1		L=	239	ft.
	Unpaved= 2		s=	0.083	ft/ft
	Paved or Unpaved?	2	V=	4.65	ft/sec
	T (shallow)=	0.86 min.			

Tc (10 year)=	2.69	min.
I (10 year)=	7.56	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: AI-104

Determine Time of Concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	51	ft.
			n=	0.24	
			s=	0.125	ft/ft
			I (10 year)=	7.56	in/hr
			I (100 year)=	11.52	in/hr
	T10 (overland)=	3.49	min.		
	T100 (overland)=	2.94	min.		
T (channel):	Paved= 1		L=	349	ft.
	Unpaved= 2		s=	0.060	ft/ft
	Paved or Unpaved?	2	V=	3.95	ft/sec
	T (shallow)=	1.47	min.		

Tc (10 year)=	4.96	min.
I (10 year)=	7.56	in/hr

Project Name: Joyview Drainage Review Date: 02/28/23

Basin ID: EP-11

Determine Time of Concentration (Tc):

T (overland):	T (overland)=	$\frac{56L^{0.6}n^{0.6}}{I^{0.4}s^{0.3}}$	L=	100	ft.
			n=	0.24	
			s=	0.130	ft/ft
			I (10 year)=	6.98	in/hr
			I (100 year)=	10.81	in/hr
	T10 (overland)=	5.33 min.			
	T100 (overland)=	4.47 min.			
T (shallow):	Paved= 1		L=	405	ft.
	Unpaved= 2		s=	0.079	ft/ft
	Paved or Unpaved?	2	V=	4.53	ft/sec
	T (shallow)=	1.49 min.			
T (channel):	Actual or		L=	426	ft.
	assumed velocity?	Assumed	V=	5.00	ft/sec
	T (channel)=	1.42 min.			

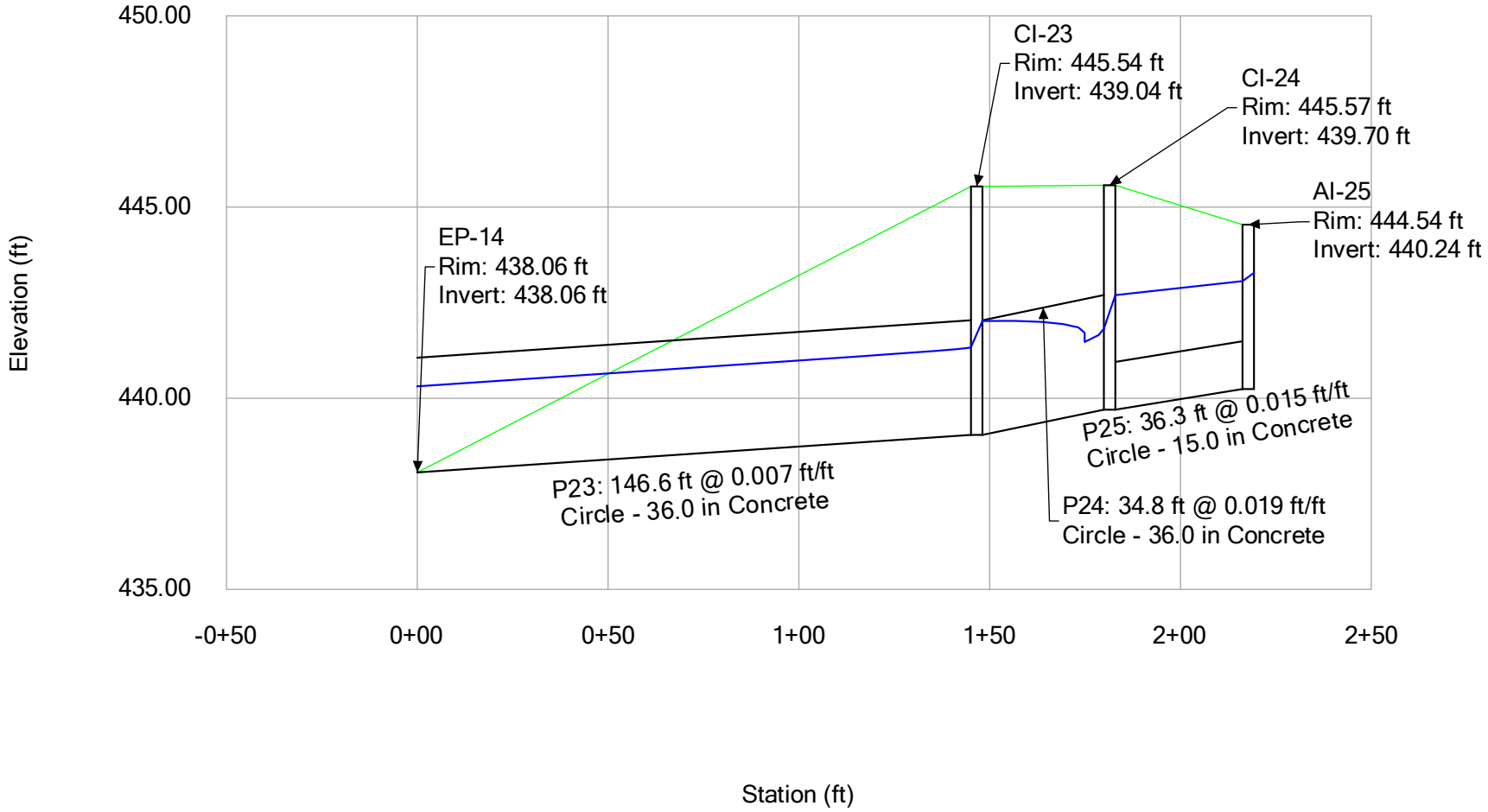
Tc (10 year)=	8.23	min.
I (10 year)=	6.98	in/hr

Bypass Areas - Inlet Hydrology

Project: Joyview Drainage Review TJL Date: 2/23/2023
Location: Columbia, IL Date:

Structure ID	Pervious C = 0.2		Aggregate C = 0.7		Impervious C = 0.9		Total		10-Year Storm			100-Year Storm		
	Area	C x A	Area	C x A	Area	C x A	Area	CA	Tc	I	Q	Tc	I	Q
EP-101	0.607	0.121	0.032	0.022	0.03	0.030	0.66	**0.174**	5.00	7.56	**1.31**	5.00	11.52	**2.00**
AI-102	0.566	0.113	0.023	0.016	0.03	0.030	0.62	**0.159**	5.00	7.56	**1.20**	5.00	11.52	**1.83**
AI-104	0.726	0.145	0.006	0.004	0.03	0.030	0.77	**0.179**	5.00	7.56	**1.36**	5.00	11.52	**2.07**
EP-11	2.268	0.454	0.068	0.048	0.22	0.195	2.55	**0.696**	8.23	6.98	**4.86**	7.38	10.81	**7.52**

Profile Report
Engineering Profile - EP-14 to AI-25 (As-Built_Bypass-DS pipe inc.stsw)



Bypass with Pipe Increase Model Results

System EP-14

-Node- Upstream Downstream	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Invert- Upstream Downstream (ft)	Slope (Calculated) (ft/ft)	Section Type	Material	System CA (acres)	System Intensity (in/h)	Flow (cfs)	Length (User Defined) (ft)	Velocity (ft/s)	Diameter (in)
AI-25	444.54	443.06	440.24	0.015	Circle	Concrete	0.691	9.31	6.48	36.3	5.28	15
CI-24	445.57	442.7	439.7									
EP-11	450.29	453.74	450.29	0.005	Circle	Concrete	0.696	10.926	7.67	23	6.25	15
CI-20	453.42	453.42	450.17									
EP-10	459.36	462.39	459.36	0.007	Circle	Concrete	0.456	10.2	4.69	27.3	3.82	15
CI-18	462.27	462.24	459.17									
CI-18	462.27	461.5	459.17	0.03	Circle	Concrete	0.924	10.164	9.47	142.2	7.71	15
CI-19	458.45	458.45	454.85									
CI-19	458.45	462.15	454.85	0.026	Circle	Concrete	1.392	10.072	14.13	182.3	11.52	15
CI-20	453.42	453.42	450.17									
C-20	453.42	472.36	450.17	0.025	Circle	Concrete	2.556	9.994	25.75	141.7	20.98	15
CI-21	449.85	449.85	446.61									
CI-21	449.85	464.05	446.61	0.025	Circle	Concrete	3.024	9.962	30.37	69.2	24.75	15
CI-22	448.76	448.76	444.86									
CI-22	448.76	458.7	444.86	0.04	Circle	Concrete	3.675	9.949	36.86	130	20.86	18
CI-24	445.57	442.7	439.7									
CI-24	445.57	441.82	439.7	0.019	Circle	Concrete	4.522	9.277	42.29	34.8	12.72	36
CI-23	445.54	442.02	439.04									
CI-23	445.54	441.34	439.04	0.007	Circle	Concrete	5.325	9.264	49.73	146.6	8.74	36
EP-14	438.06	440.31	438.06									

StormCAD - Street Overflow
Bypass - 2 yr

Description: As-Built Bypass Model (Bypass area utilized for EP-11) ran during the 2 year storm with 36" outlet

Structure	Inlet DA Flow	Flow Conveyed	Bypass Flow	Accumulative Street Flow		
EP-10	2.10	2.10	0.00	0.00		
CI-18	2.18	2.18	0.00	0.00		
CI-19	2.24	2.24	0.00	0.00		
EP-11	3.33	3.33	0.00	0.00		
CI-20	2.19	0.50	1.69	1.69		
CI-21	2.24	0.00	2.24	3.93		
CI-22	3.16	1.00	2.16	6.09		
At System Low Point					additional conveyed flow	total remaining flow
CI-24	0.74	0.74	0.00	6.09	6.09	0.00
CI-23	3.65	3.65	-	-	0.00	0.00

For Street Flow between CI-22 and CI-24

Flow	Cross Slope	Grade	Spread (ft)
6.09	0.02	0.0338	9

*Spread determined from attached spread vs percent of grade table

Solution 1C

Outlet Protection

March 17, 2023

Joyview Estates

System Outlet Rip Rap Apron Sizing

Outlet	Diameter (in)	Velocity (fps)	a (ft)	b (ft)	c (ft)	Rock Gradation	Min Thickness (in)
EP-14	36	8.39	9.00	25.00	22.00	RR-4	20
EP-13	24	10.53	6.00	19.00	17.00	RR-4	20
EP-09	18	8.08	4.50	17.50	16.00	RR-3	15

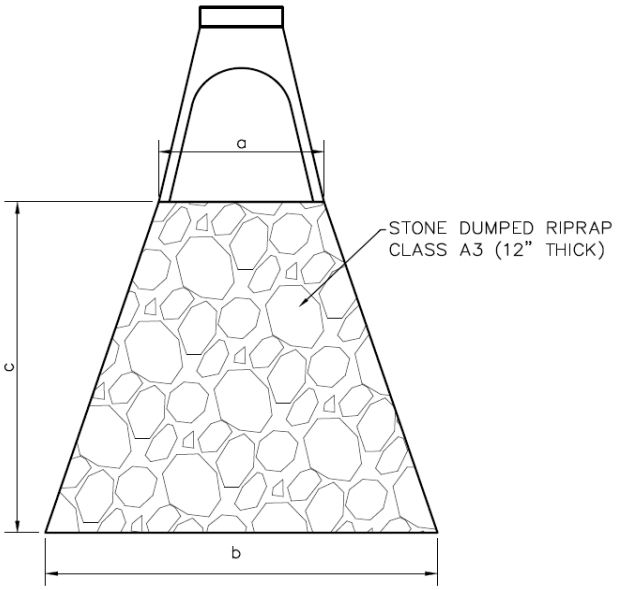


TABLE 1

ROCK RIPRAP SIZES AND THICKNESS

IDOT Gradation Number	d50 (in.)	dmax (in.)	Minimum Blanket Thickness (in.)
RR-3 1/	5	10	15
RR-4	9	14	20
RR-5	12	19	28
RR-6	15	22	32
RR-7	18	27	32

1/ Concrete block may be used to replace RR-3.

TABLE 2

MINIMUM IDOT ROCK SIZES AND APRON LENGTH
FOR MAXIMUM AND MINIMUM TAILWATER CONDITIONS

Culvert Dia. (in.)	Minimum Tailwater				Maximum Tailwater			
	5 fps 1/		10 fps 1/		5 fps 1/		10 fps 1/	
	Rock Gradation	La (ft.)	Rock Gradation	La (ft.)	Rock Gradation	La (ft.)	Rock Gradation	La (ft.)
12	No. 3	10	No. 3	12	No. 3	12	No. 3	15
18	No. 3	14	No. 4	16	No. 3	12	No. 3	16
24	No. 3	16	No. 4	20	No. 3	14	No. 4	17
30	No. 3	18	No. 4	22	No. 3	16	No. 4	20
36	No. 4	20	No. 5	24	No. 3	16	No. 4	22
48	No. 4	24	No. 6	28	No. 4	20	No. 4	24
60	No. 5	32	No. 6	36	No. 4	22	No. 5	26
72	No. 6	40	No. 6	44	No. 5	24	No. 5	29
96	No. 7	50	No. 7	54	No. 5	26	No. 5	32

1/ Maximum conduit velocity fps.

Upstream Apron Width = 3 x Pipe Diameter
Downstream Apron Width = Apron Length + Pipe Diameter

Joyview Drainage Review
Columbia, Illinois

City of Columbia
208 S Rapp Avenue,
Columbia, IL 62236

Sheet Title: SOLUTION 1 SUMMARY

Sheet: 1 of 1

MILLENNIA PROFESSIONAL SERVICES
www.millennia.pro
Professional Design Firm No.: 184.0040.70.0010

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Morton, IL 61550
309.321.8141

Metro-East Office:
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Fairview Heights, IL 62208
618.624.8610

St. Louis Office:
6439 Plymouth, W-129
St. Louis, MO 63133
314.531.3981

Drawing Issue

02/28/23	Drainage Review Report

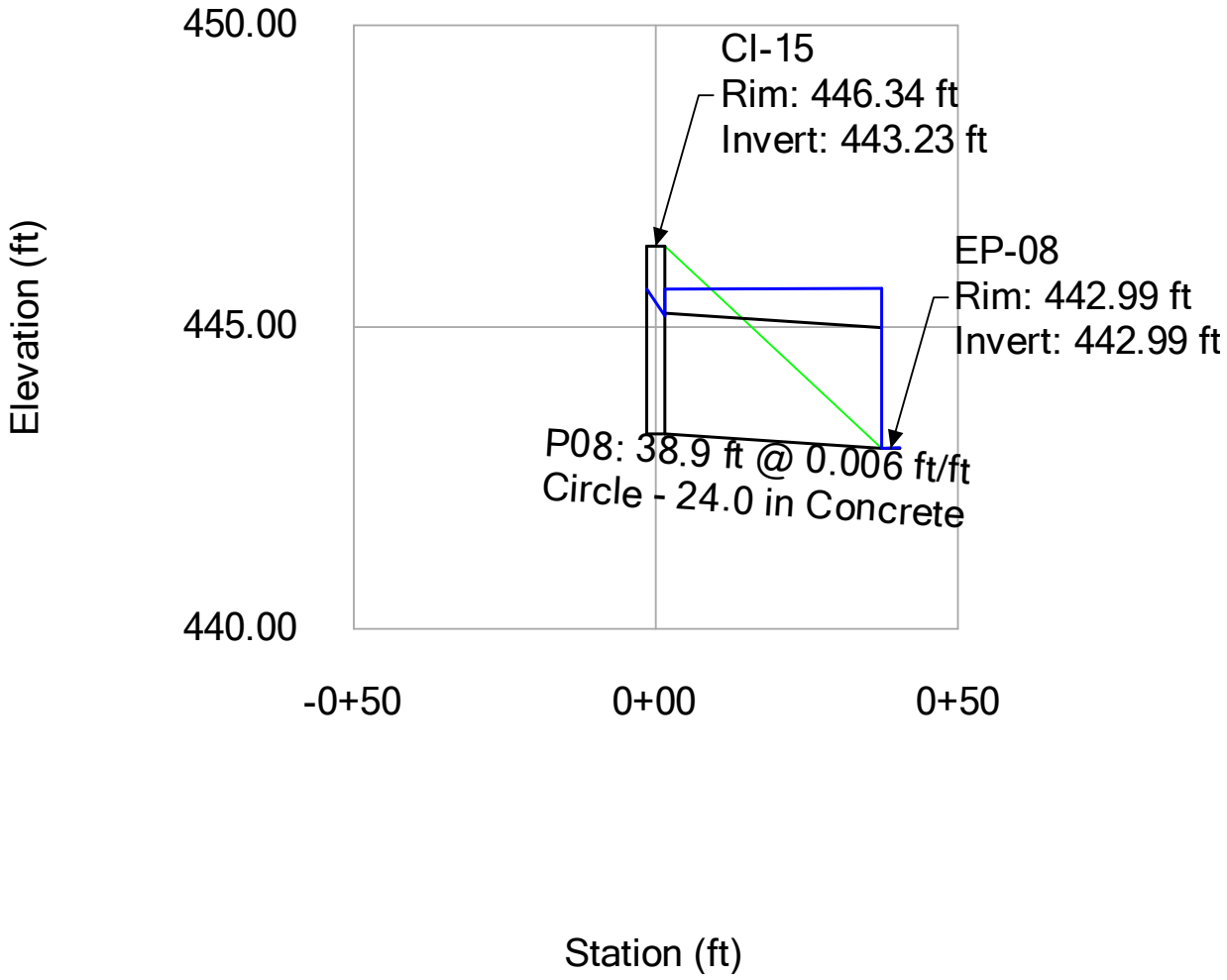
Millennia Project No.:

Solution 2

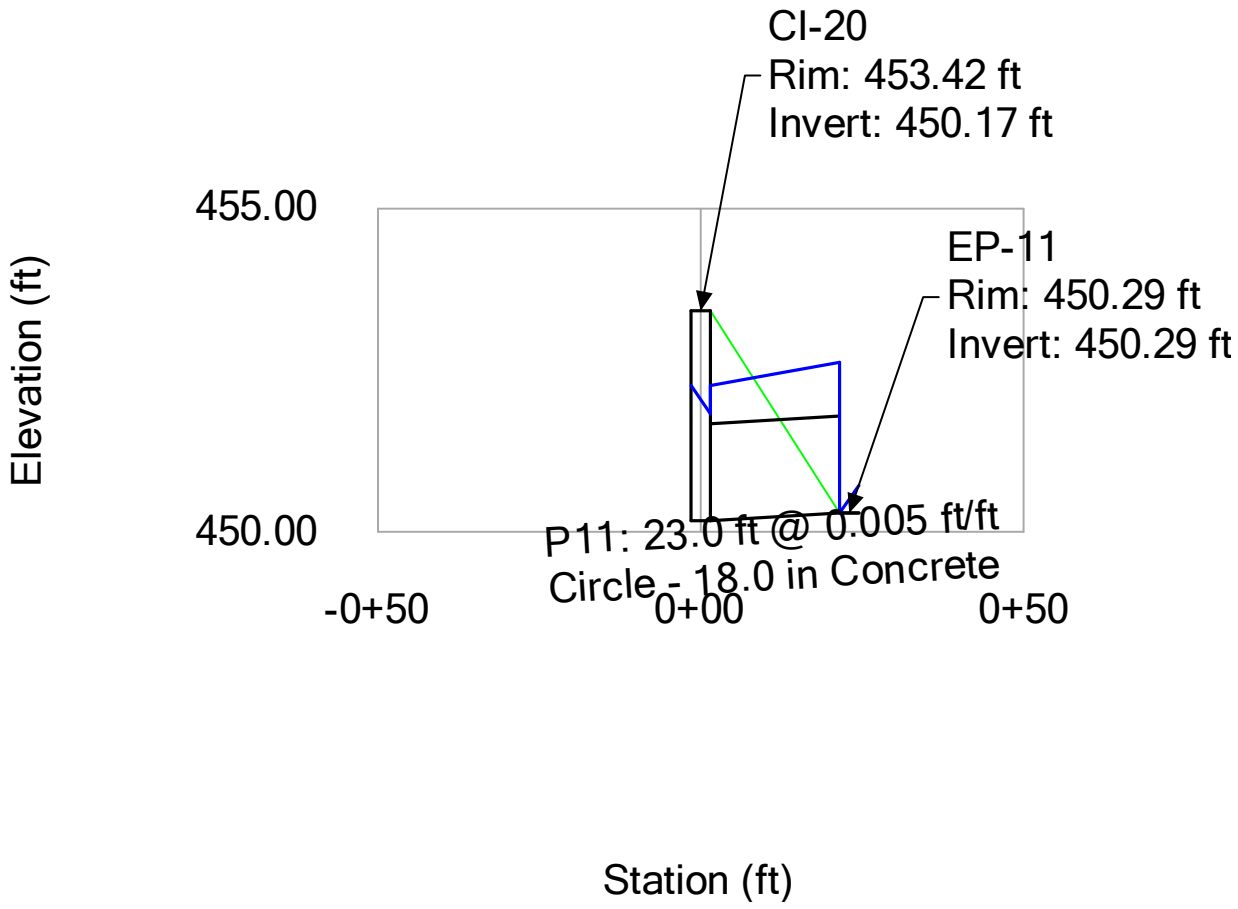
As-Built Corrected Model

March 17, 2023

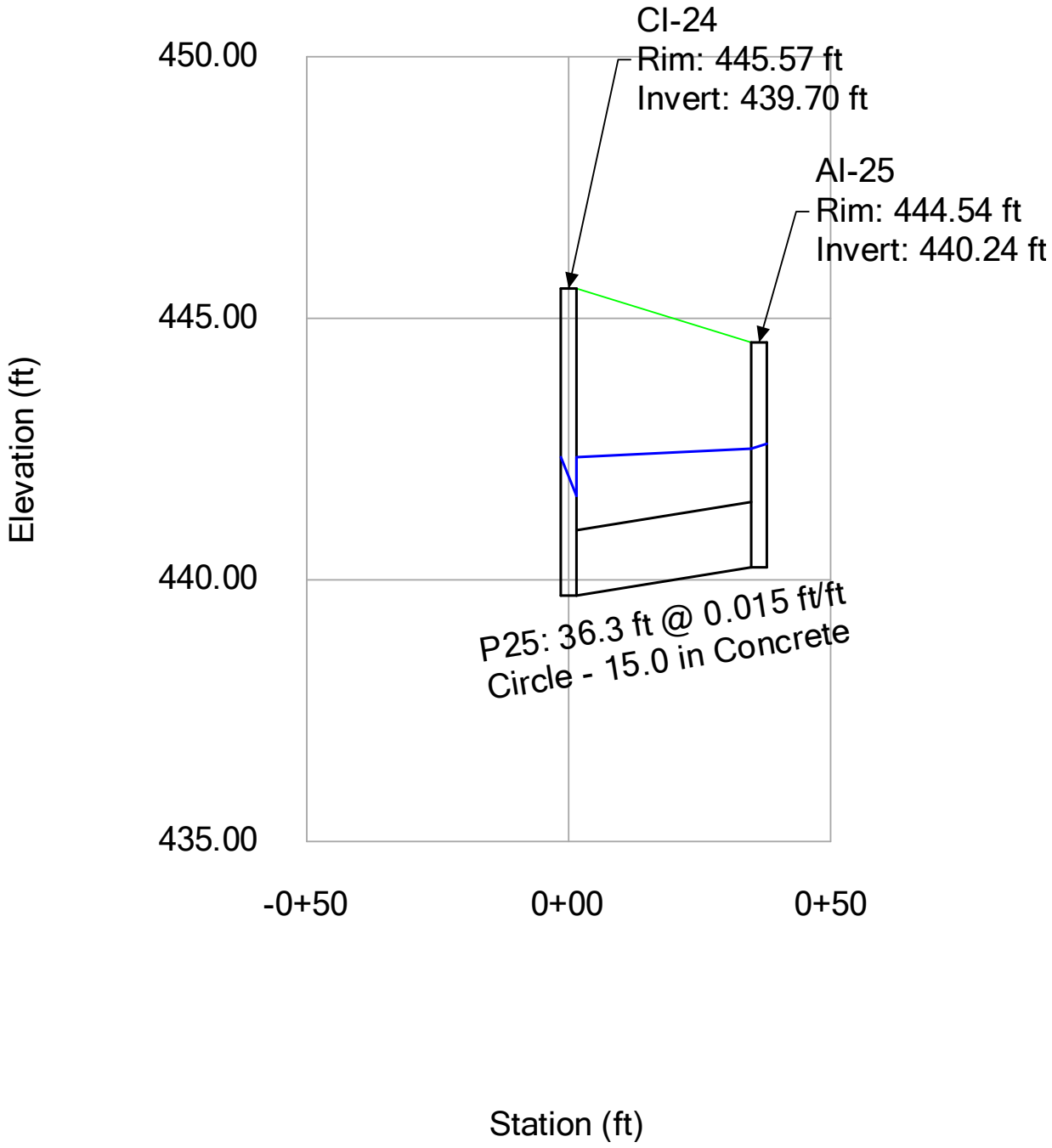
Profile Report
Engineering Profile - CI-15 to EP-08 (As-Built_Corrected.stsw)



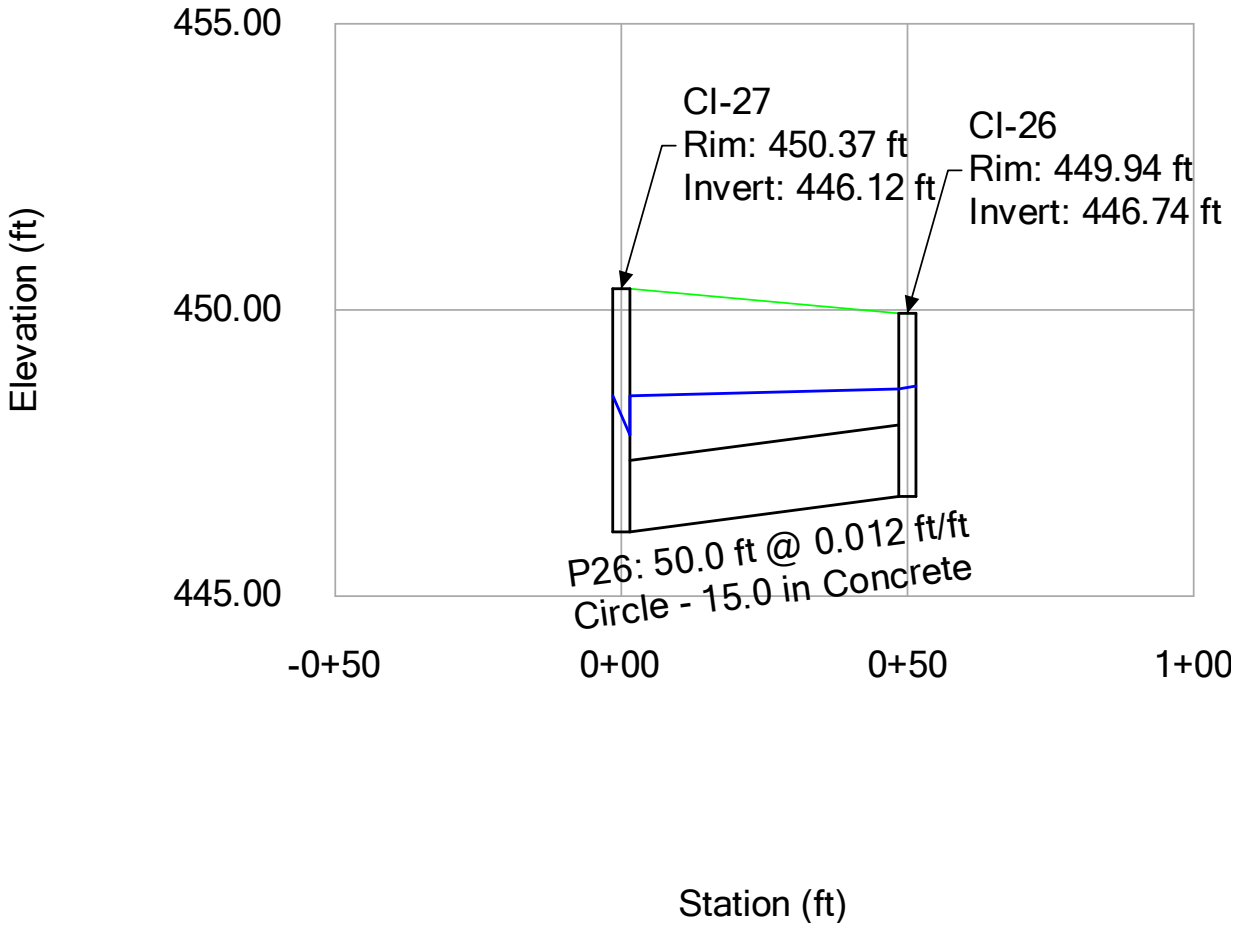
Profile Report
Engineering Profile - CI-20 to EP-11 (As-Built_Corrected.stsw)



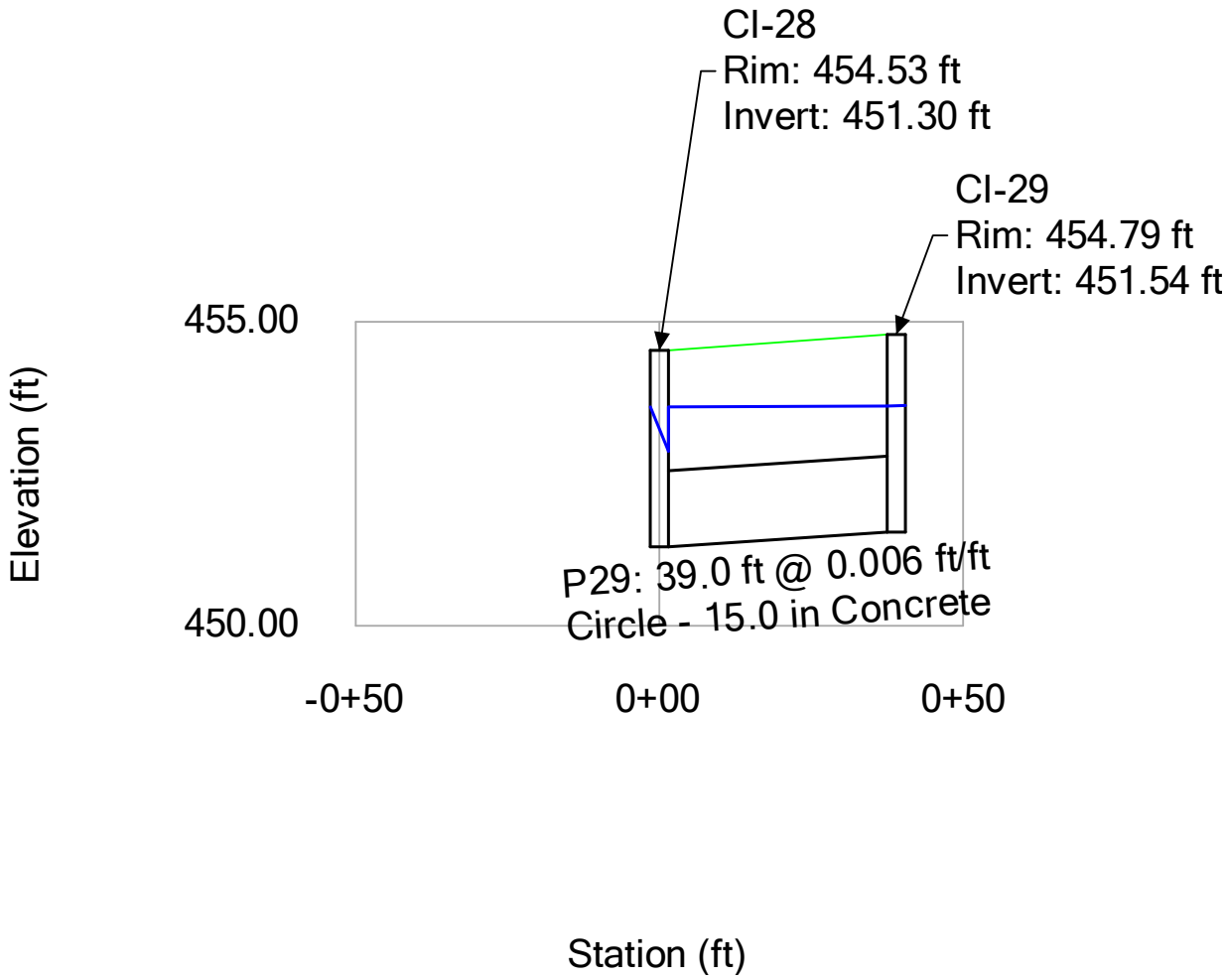
Profile Report
Engineering Profile - CI-24 to AI-25 (As-Built_Corrected.stsw)



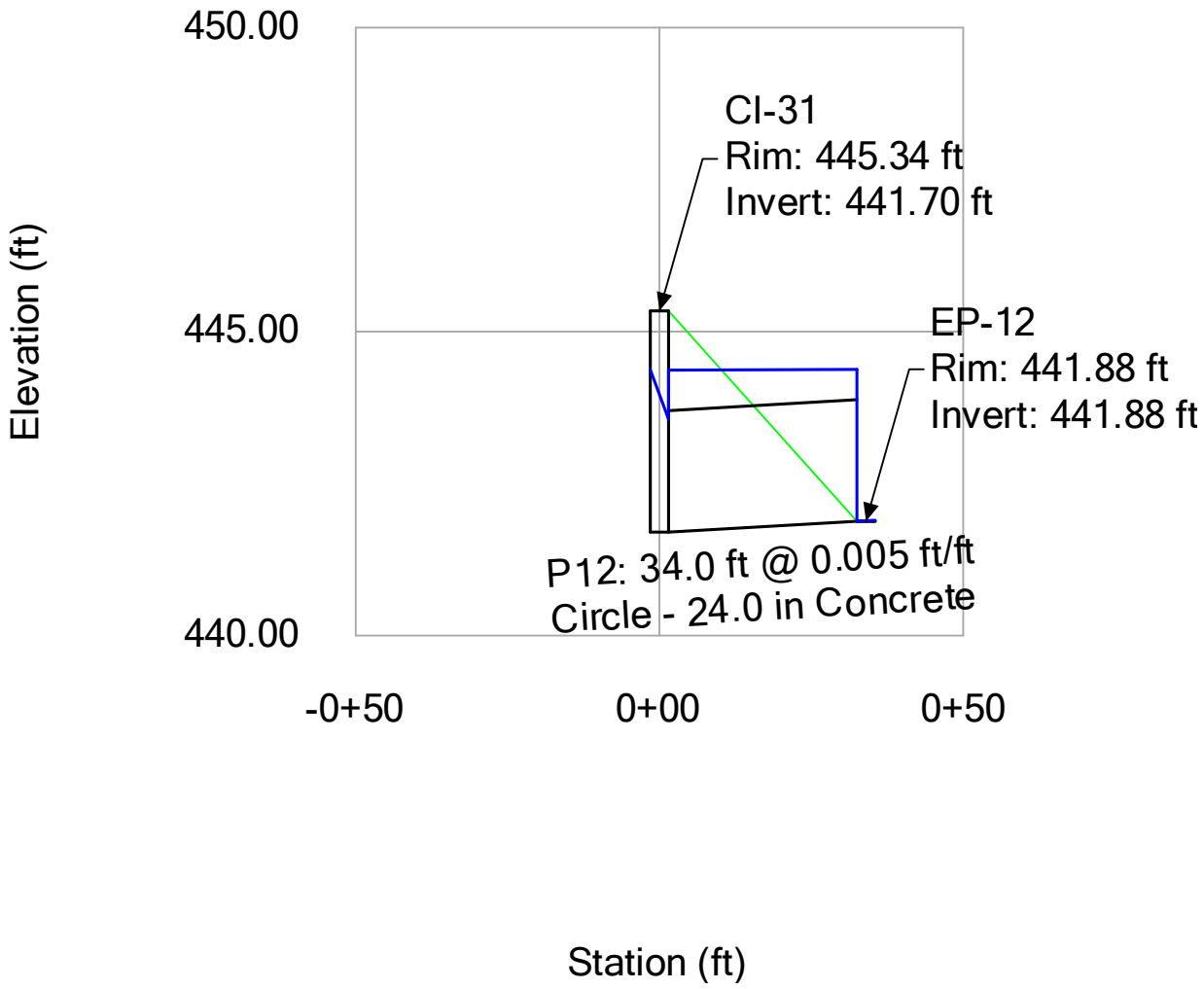
Profile Report
Engineering Profile - CI-27 to CI-26 (As-Built_Corrected.stsw)



Profile Report
Engineering Profile - CI-28 to CI-29 (As-Built_Corrected.stsw)

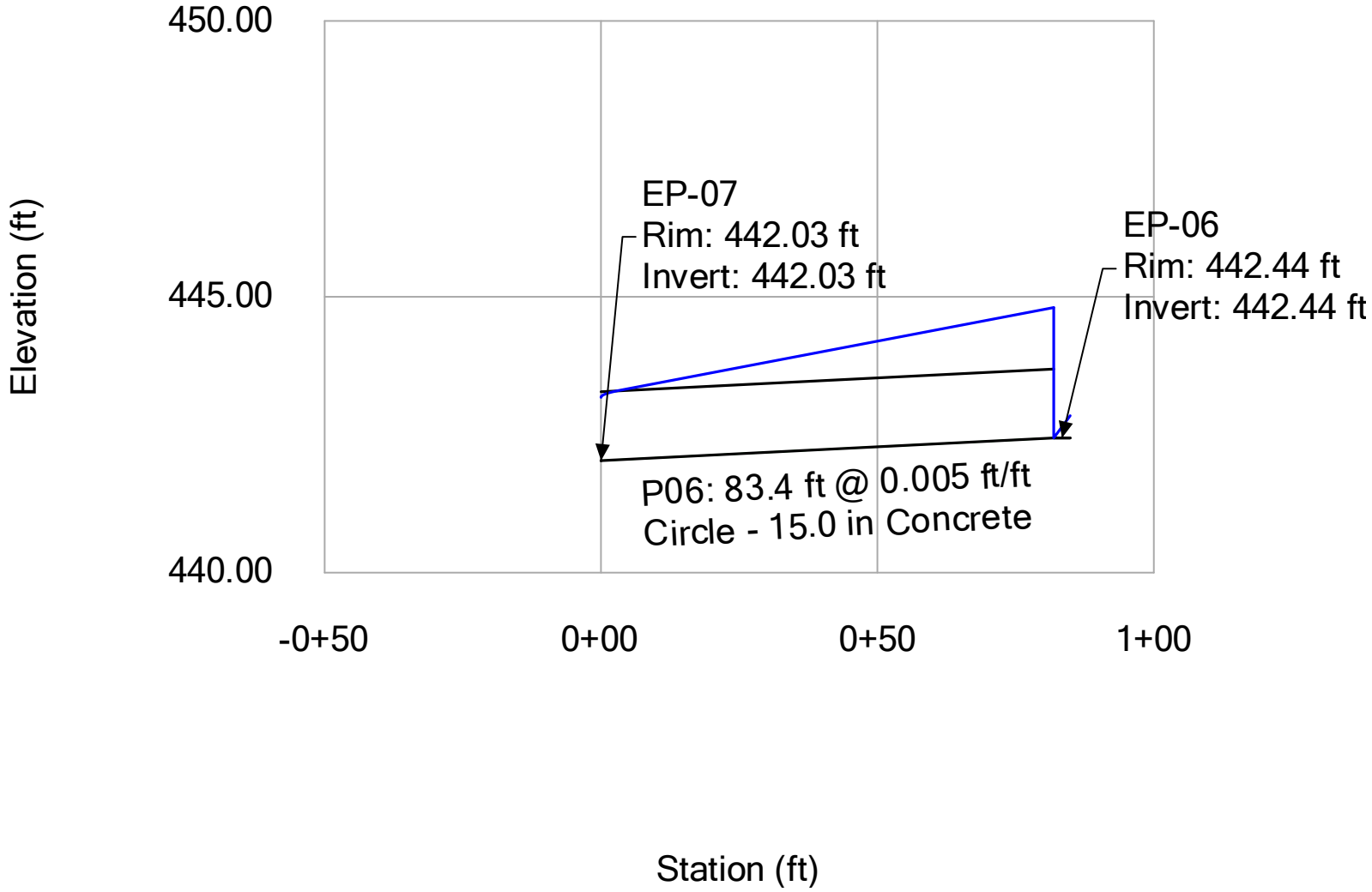


Profile Report
Engineering Profile - CI-31 to EP-12 (As-Built_Corrected.stsw)

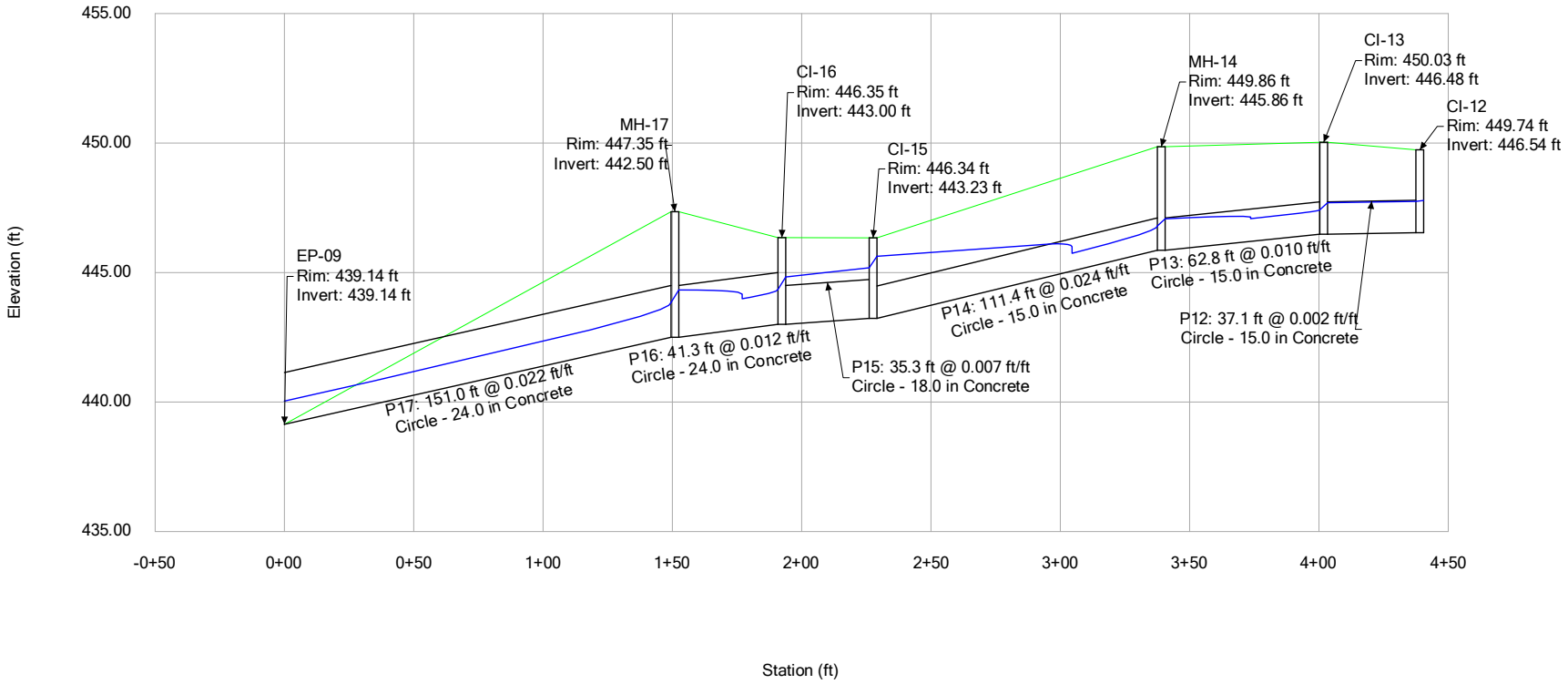


Profile Report

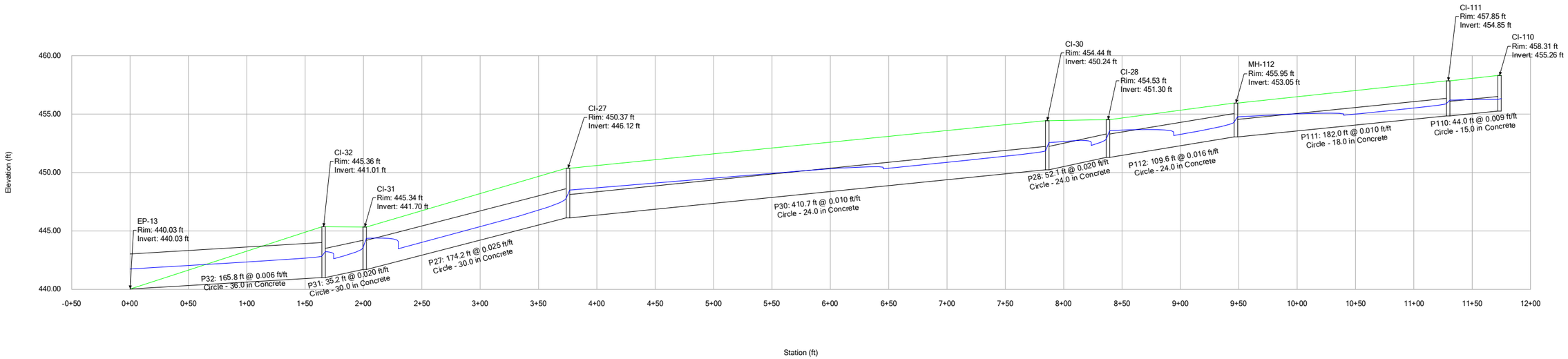
Engineering Profile - EP-07 to EP-06 (As-Built_Corrected.stsw)



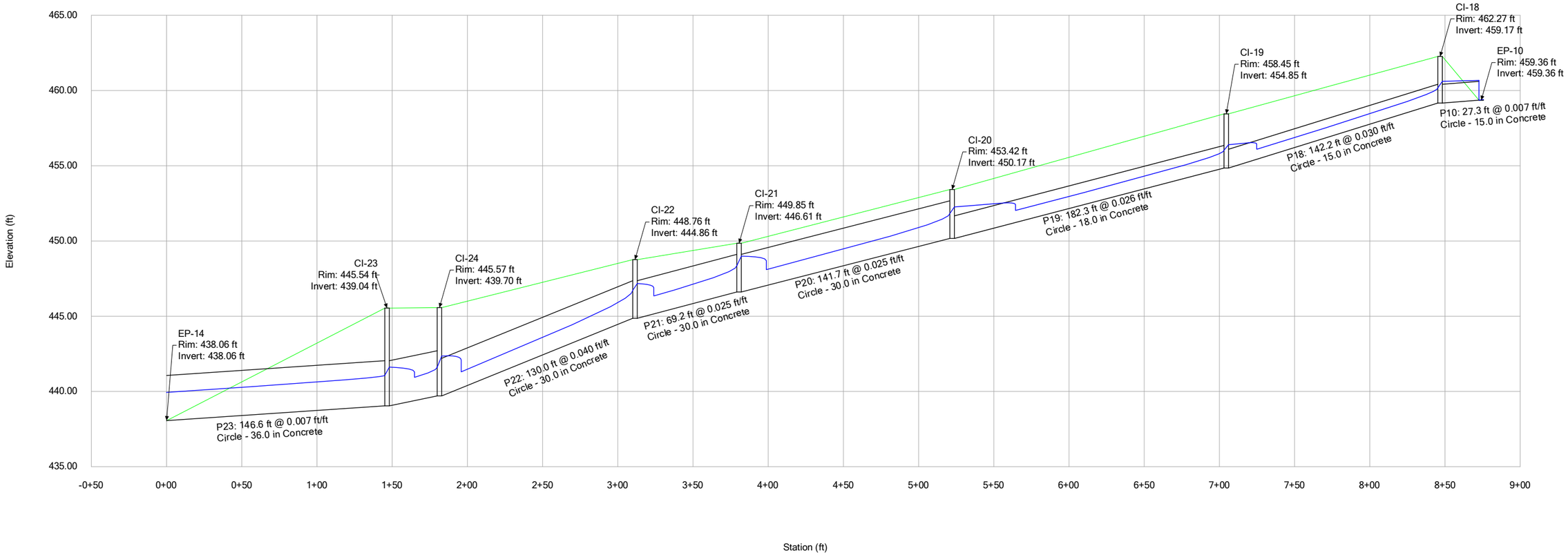
Profile Report
Engineering Profile - EP-09 to CI-12 (As-Built_Corrected.stsw)



Profile Report
Engineering Profile - EP-13 to CI-110 (As-Built_Corrected.stsw)

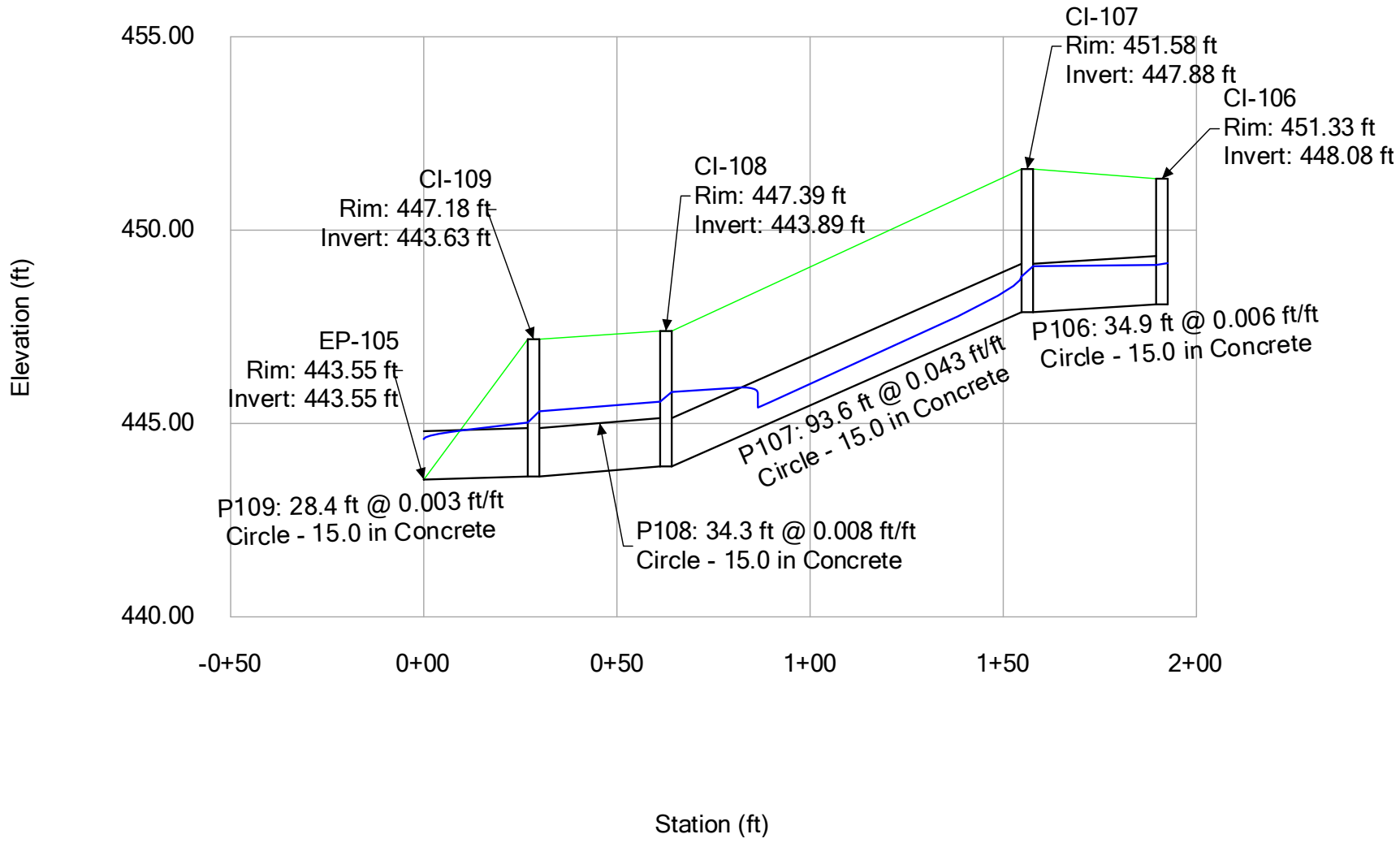


Profile Report
Engineering Profile - EP-14 to EP-10 (As-Built_Corrected.stsw)

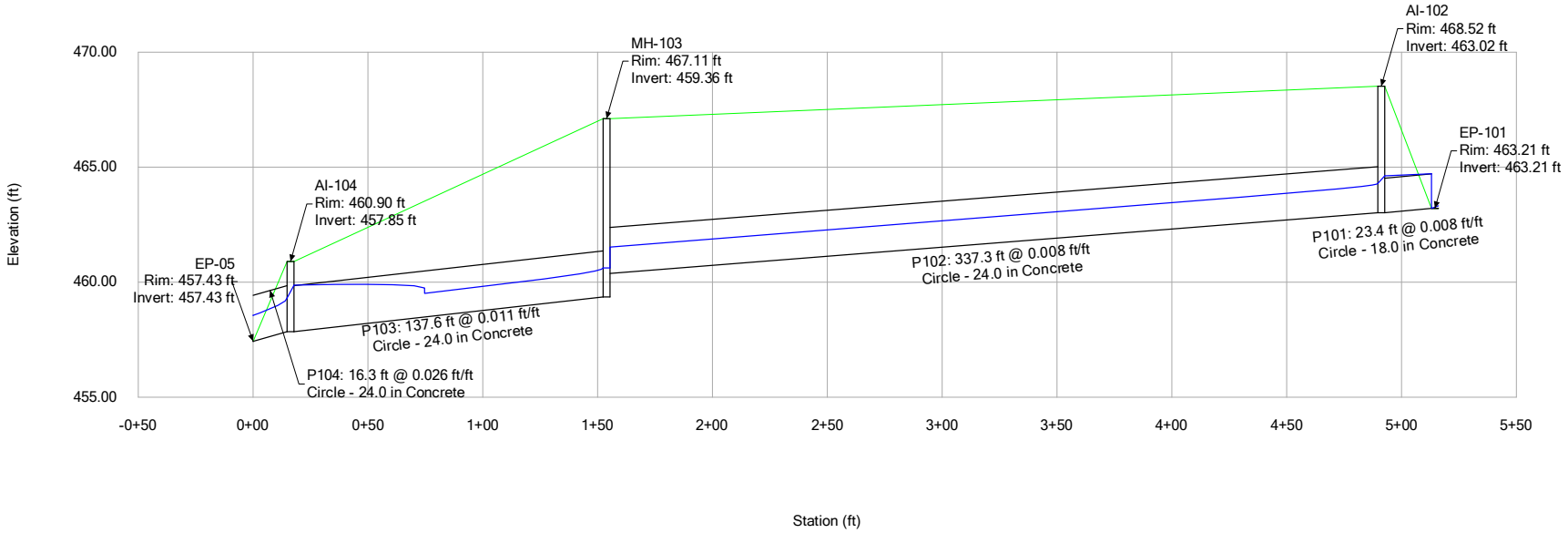


Profile Report

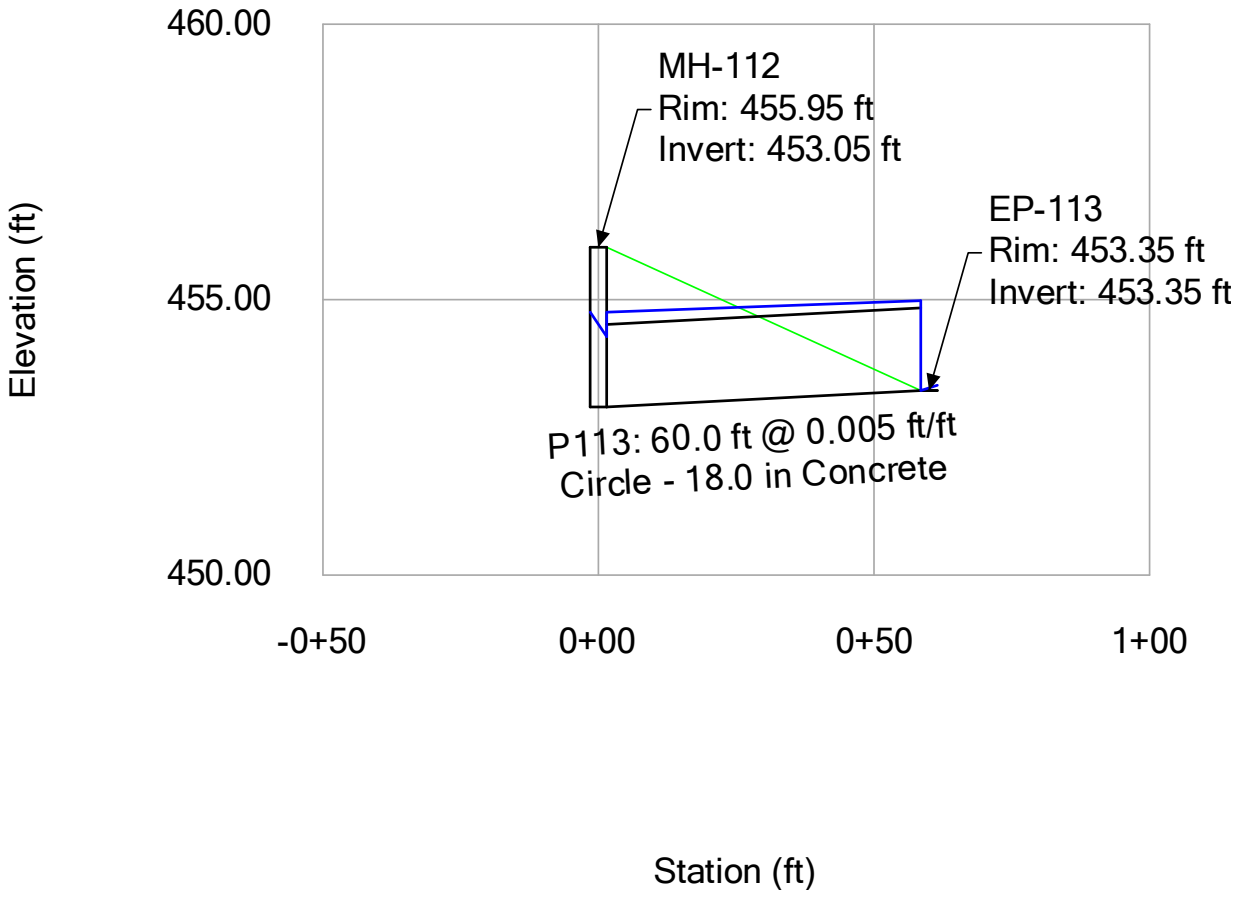
Engineering Profile - EP-105 to CI-106 (As-Built_Corrected.stsw)



Profile Report
Engineering Profile - EP-105 to EP-101 (As-Built_Corrected.stsw)



Profile Report
Engineering Profile - MH-112 to EP-113 (As-Built_Corrected.stsw)



Conduit FlexTable: Report

-Node- Upstream Downstream	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Invert- Upstream Downstream (ft)	Slope (Calculated) (ft/ft)	Section Type	Material	System CA (acres)	System Intensity (in/h)	Flow (cfs)	Length (User Defined) (ft)	Velocity (ft/s)	Diameter (in)
EP-10	459.36	460.68	459.36	0.007	Circle	Concrete	0.456	6.768	3.11	27.3	2.53	15.0
CI-18	462.27	460.61	459.17		<None>							
CI-18	462.27	460.18	459.17	0.030	Circle	Concrete	0.924	6.736	6.27	142.2	9.42	15.0
CI-19	458.45	456.40	454.85		<None>							
CI-19	458.45	456.03	454.85	0.026	Circle	Concrete	1.392	6.690	9.39	182.3	9.78	18.0
CI-20	453.42	452.26	450.17		<None>							
CI-20	453.42	451.83	450.17	0.025	Circle	Concrete	4.173	5.620	23.64	141.7	12.19	30.0
CI-21	449.85	448.99	446.61		<None>							
CI-21	449.85	448.35	446.61	0.025	Circle	Concrete	4.641	5.597	26.19	69.2	12.56	30.0
CI-22	448.76	447.17	444.86		<None>							
CI-22	448.76	446.72	444.86	0.040	Circle	Concrete	5.292	5.587	29.80	130.0	15.34	30.0
CI-24	445.57	442.35	439.70		<None>							
CI-24	445.57	441.61	439.70	0.019	Circle	Concrete	6.139	5.570	34.47	34.8	12.06	36.0
CI-23	445.54	441.62	439.04		<None>							
CI-23	445.54	441.07	439.04	0.007	Circle	Concrete	6.942	5.564	38.94	146.6	8.38	36.0
EP-14	438.06	439.93	438.06		<None>							
AI-25	444.54	442.51	440.24	0.015	Circle	Concrete	0.691	6.170	4.30	36.3	3.50	15.0
CI-24	445.57	442.35	439.70		<None>							
EP-11	450.29	452.62	450.29	0.005	Circle	Concrete	2.313	5.627	13.12	23.0	7.42	18.0
CI-20	453.42	452.26	450.17		<None>							
CI-29	454.79	453.62	451.54	0.006	Circle	Concrete	0.176	7.220	1.28	39.0	1.04	15.0
CI-28	454.53	453.60	451.30		<None>							
CI-28	454.53	452.87	451.30	0.020	Circle	Concrete	3.420	5.542	19.11	52.1	10.70	24.0
CI-30	454.44	452.56	450.24		<None>							
CI-30	454.44	451.86	450.24	0.010	Circle	Concrete	3.672	5.533	20.48	410.7	8.17	24.0
CI-27	450.37	448.50	446.12		<None>							
CI-27	450.37	447.82	446.12	0.025	Circle	Concrete	4.528	5.433	24.80	174.2	12.39	30.0
CI-31	445.34	444.36	441.70		<None>							
CI-31	445.34	443.56	441.70	0.020	Circle	Concrete	5.453	5.405	29.71	35.2	11.80	30.0
CI-32	445.36	443.23	441.01		<None>							
CI-32	445.36	442.84	441.01	0.006	Circle	Concrete	5.873	5.400	31.97	165.8	7.65	36.0
EP-13	440.03	441.75	440.03		<None>							

Conduit FlexTable: Report

-Node- Upstream Downstream	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Invert- Upstream Downstream (ft)	Slope (Calculated) (ft/ft)	Section Type	Material	System CA (acres)	System Intensity (in/h)	Flow (cfs)	Length (User Defined) (ft)	Velocity (ft/s)	Diameter (in)
EP-12	441.88	444.38	441.88	0.005	Circle	Concrete	0.715	6.282	4.53	34.0	1.44	24.0
CI-31	445.34	444.36	441.70		<None>							
MH-112	455.95	454.33	453.05	0.016	Circle	Concrete	2.254	5.567	12.65	109.6	8.82	24.0
CI-28	454.53	453.60	451.30		<None>							
EP-113	453.35	454.98	453.35	0.005	Circle	Concrete	1.104	5.600	6.23	60.0	3.53	18.0
MH-112	455.95	454.77	453.05		<None>							
CI-111	457.85	455.91	454.85	0.010	Circle	Concrete	1.150	6.459	7.49	182.0	6.43	18.0
MH-112	455.95	454.77	453.05		<None>							
CI-110	458.31	456.26	455.26	0.009	Circle	Concrete	0.464	6.488	3.03	44.0	5.05	15.0
CI-111	457.85	456.20	454.85		<None>							
CI-12	449.74	447.75	446.54	0.002	Circle	Concrete	0.387	6.546	2.55	37.1	2.41	15.0
CI-13	450.03	447.70	446.48		<None>							
CI-13	450.03	447.42	446.48	0.010	Circle	Concrete	0.824	6.496	5.40	62.8	5.86	15.0
MH-14	449.86	447.07	445.86		<None>							
MH-14	449.86	446.80	445.86	0.024	Circle	Concrete	0.824	6.461	5.37	111.4	8.25	15.0
CI-15	446.34	445.63	443.23		<None>							
CI-15	446.34	445.64	443.23	0.006	Circle	Concrete	0.651	5.988	3.93	38.9	1.25	24.0
EP-08	442.99	445.63	442.99		<None>							
MH-17	447.35	443.85	442.50	0.022	Circle	Concrete	2.370	5.850	13.98	151.0	10.24	24.0
EP-09	439.14	440.04	439.14		<None>							
CI-16	446.35	444.35	443.00	0.012	Circle	Concrete	2.370	5.867	14.02	41.3	8.16	24.0
MH-17	447.35	444.33	442.50		<None>							
CI-15	446.34	445.19	443.23	0.007	Circle	Concrete	1.778	5.886	10.55	35.3	5.97	18.0
CI-16	446.35	444.83	443.00		<None>							
CI-26	449.94	448.62	446.74	0.012	Circle	Concrete	0.478	6.531	3.15	50.0	2.56	15.0
CI-27	450.37	448.50	446.12		<None>							
MH-103	467.11	460.62	459.36	0.011	Circle	Concrete	2.411	5.056	12.29	137.6	7.61	24.0
AI-104	460.90	459.87	457.85		<None>							
AI-102	468.52	464.29	463.02	0.008	Circle	Concrete	2.411	5.155	12.53	337.3	6.72	24.0
MH-103	467.11	461.53	459.36		<None>							
EP-101	463.21	464.71	463.21	0.008	Circle	Concrete	1.272	5.167	6.63	23.4	3.75	18.0
AI-102	468.52	464.62	463.02		<None>							

Conduit FlexTable: Report

-Node- Upstream Downstream	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Invert- Upstream Downstream (ft)	Slope (Calculated) (ft/ft)	Section Type	Material	System CA (acres)	System Intensity (in/h)	Flow (cfs)	Length (User Defined) (ft)	Velocity (ft/s)	Diameter (in)
CI-106	451.33	449.10	448.08	0.006	Circle	Concrete	0.366	7.141	2.63	34.9	4.06	15.0
CI-107	451.58	449.07	447.88		<None>							
CI-107	451.58	448.80	447.88	0.043	Circle	Concrete	0.744	6.887	5.16	93.6	10.18	15.0
CI-108	447.39	445.81	443.89		<None>							
CI-108	447.39	445.56	443.89	0.008	Circle	Concrete	0.796	6.859	5.50	34.3	4.48	15.0
CI-109	447.18	445.32	443.63		<None>							
CI-109	447.18	445.02	443.63	0.003	Circle	Concrete	0.994	6.836	6.85	28.4	5.58	15.0
EP-105	443.55	444.60	443.55		<None>							
AI-104	460.90	459.31	457.85	0.026	Circle	Concrete	3.253	5.020	16.46	16.3	11.28	24.0
EP-05	457.43	458.56	457.43		<None>							
EP-06	442.44	444.81	442.44	0.005	Circle	Concrete	1.443	6.088	8.85	0.0	7.22	15.0
EP-07	442.03	443.18	442.03		<None>							

LEGEND

XX" CORRECTED PIPE DIAMETER

XX" AS-BUILT PIPE DIAMETER

PIPE TO BE CORRECTED

Joyview Drainage Review
Columbia, Illinois

City of Columbia
208 S Rapp Avenue,
Columbia, IL 62236

Sheet Title: SOLUTION 2 SUMMARY

Sheet: 1 of 1

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Drawing Issue

02/28/23	Drainage Review Report

Millennia Project No.: