

PARKER RIDGE **SUBDIVISION**

REDFORD PLACE DRIVE
Rolesville, NC, 27571

DRAINAGE AND EROSION CONTROL CALCULATIONS

PREPARED FOR:

LENNAR CORPORATION
1100 Perimeter Park Drive, Suite 112
Morrisville, NC 27596

PREPARED BY:

BGE, INC.
5440 Wade Park Boulevard, Suite 102
Raleigh, NC 27607



Initial Submittal: 06/01/2023
Second Submittal: 08/01/2023



TABLE OF CONTENTS

ATTACHMENT 1: DRAINAGE AREA MAPS – SCM 1	3
SCM 1 - 10 YR STORM	5
SCM 1 - 25 YR STORM	29
SCM 1 – INLET SPREAD.....	53
ATTACHMENT 2: DRAINAGE AREA MAPS – SCM 2	56
SCM 2 – 10 YR STORM	58
SCM 2 – 25 YR STORM	91
SCM 2 – INLET SPREAD.....	124
ATTACHMENT 3: DRAINAGE AREA MAPS – SCM 3	128
SCM 3 – 10 YR STORM	130
SCM 3 – 25 YR STORM	147
SCM 3 – INLET SPREAD.....	164
ATTACHMENT 4: DRAINAGE AREA MAPS – SCM 4	167
SCM 4 – 10 YR STORM	169
SCM 4 – 25 YR STORM	187
SCM 4 – INLET SPREAD.....	205
CULVERT CALCULATIONS	208
CULVERT 1	209
CULVERT 2	217
CULVERT 3	225
CULVERT 4.....	231
EROSION CONTROL DA MAP	239
SKIMMER BASIN CALCULATIONS	241
TEMPORARY DIVERSIONS	253
DISSIPATORS	272

ATTACHMENT 1: DRAINAGE AREA MAPS – SCM 1



#31- Label proposed contours so drainage areas can easily be read.
Repeat comment: Please show and label existing contours.

#94- Response to comment #164 refers to a separate grading plan to be completed, what is this in reference to? We are not aware of an additional grading plan.
#95- As these are the construction drawings, it is expected that the drainage areas take into account the drainage that is to occur on site. This includes expected roof drainage. The current drainage areas shown do not reflect what we expect the final drainage to look like and should be updated so all storm pipes and structures are properly sized.
Once areas are updated to match contours and/or expected roof drainage design a full review can be completed.

#96- Recommend including townhome outlines like in the previous submittal so it's easier to understand where drainage will be directed.

#95- This area should be included in CB-101/CB-101A drainage areas

#96- Include this area of the road in the appropriate drainage areas.

#96- Repeat comment. This section of the road should be included in drainage areas. Verify contours are directing water to DI so nothing is pooling up

#96- Include this area in the appropriate drainage areas

G:\NCA\Projects\Lennar\8430-03 - Lennar - School Street - Rolesville\04 - Calculations\Storm\StormCAD\RAINAGE AREAS.dwg



5440 WADE PARK BLVD, SUITE 102
RALEIGH NC 27607
www.bgeinc.com
NC LICENSE #C-4397

SCM 1 DRAINAGE MAP

DATE: 7/27/2023

0 50' 100' 150'
SCALE: 1" = 50'

SCM 1 - 10 YR STORM

10-YEAR ANALYSIS**CATCHMENTS - Time: 0.00 hours**

Outflow Element	Scaled Area (acres)	Flow (Total Out) (cfs)	Time of Concentration (hours)	Runoff Coefficient (Rational)
CB-116A	0.022	0.14	0.083	0.870
CB-116B	0.023	0.14	0.083	0.870
DI-127	0.057	0.36	0.083	0.870
DI-126	0.053	0.33	0.083	0.870
DI-125	0.211	1.33	0.083	0.870
DI-124	0.183	1.15	0.083	0.870
DI-123	0.322	2.03	0.083	0.870
CB-122	0.073	0.46	0.083	0.870
CB-116	0.001	0.01	0.083	0.870
DI-117	0.054	0.34	0.083	0.870
DI-118	0.162	1.02	0.083	0.870
DI-119	0.644	4.06	0.083	0.870
DI-120	0.030	0.19	0.083	0.870
DI-121	0.068	0.43	0.083	0.870
YI-114C	0.490	3.09	0.083	0.870
CB-112	0.380	2.39	0.083	0.870
YI-114B	0.011	0.07	0.083	0.870
CB-114	0.368	2.32	0.083	0.870
CB-115	0.272	1.72	0.083	0.870
CB-108A	0.243	1.53	0.083	0.870
YI-114A	0.015	0.09	0.083	0.870
CB-108	0.103	0.65	0.083	0.870
CB-109A	0.030	0.19	0.083	0.870
CB-110	0.122	0.77	0.083	0.870
CB-110A	0.090	0.57	0.083	0.870
CB-111	0.045	0.28	0.083	0.870
CB-110B	0.238	1.50	0.083	0.870
CB-105A	0.196	1.24	0.083	0.870
CB-105	0.040	0.25	0.083	0.870
CB-104	0.153	0.96	0.083	0.870
CB-103	0.106	0.67	0.083	0.870

#97- For most accurate results, runoff coefficients should be determined for each structure (and therefore be different for each of these drainage areas). See City of Raleigh Stormwater Management Design Manual for more information on how to get the composite runoff coefficient

10-YEAR ANALYSIS

CATCHMENTS - Time: 0.00 hours

Outflow Element	Scaled Area (acres)	Flow (Total Out) (cfs)	Time of Concentration (hours)	Runoff Coefficient (Rational)
CB-102A	0.238	1.50	0.083	0.870
CB-102	0.214	1.35	0.083	0.870
CB-101	0.207	1.31	0.083	0.870
CB-111A	0.075	0.47	0.083	0.870
CB-102B	0.134	0.85	0.083	0.870
CB-113	0.009	0.06	0.083	0.870
CB-109	0.012	0.07	0.083	0.870
CB-101A	0.384	2.42	0.083	0.870
DI-119A	0.280	1.22	0.083	0.600
DI-110C	0.067	0.29	0.083	0.600
DI-105B	0.119	0.52	0.083	0.600
DI-105C	0.075	0.33	0.083	0.600
DI-101B	0.325	1.41	0.083	0.600
DI-101C	0.565	2.46	0.083	0.600
CB-127A	0.161	0.93	0.083	0.800

10-YEAR ANALYSIS

Inlets - Time: 0.00 hours

Label	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Grate Length (ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)
CB-109A	0.19	0.00	0.19	100.0	400.72	400.72	3.0	1.94	1.94
CB-109	0.07	0.00	5.55	100.0	397.73	397.73	3.0	4.90	4.61
CB-127A	0.88	0.06	0.88	93.8	393.79	393.79	3.0	2.81	2.81
CB-110	0.74	0.03	5.37	96.0	398.21	398.21	3.0	3.78	4.59
CB-110A	0.56	0.01	2.09	98.5	398.82	398.82	3.0	3.43	3.64
CB-111	0.31	0.00	2.63	100.0	399.73	399.73	3.0	2.06	3.86
CB-110B	1.30	0.19	1.55	87.0	398.95	398.95	3.0	0.86	3.37
DI-110C	0.29	0.00	0.29	100.0	399.19	399.19	3.0	2.09	2.09
CB-111A	0.47	0.00	0.47	99.5	399.82	399.82	3.0	2.38	2.38
CB-108	0.63	0.02	6.05	97.6	397.11	397.11	3.0	4.96	4.82
CB-112	1.89	0.50	1.89	79.0	400.35	400.35	3.0	3.66	3.66
CB-108A	1.33	0.20	22.84	86.6	387.43	387.43	3.0	6.63	6.75
DI-127	0.36	0.00	1.21	100.0	393.30	393.30	3.0	2.85	3.20
DI-105C	0.33	0.00	0.33	100.0	395.26	395.26	3.0	2.22	2.22
CB-113	0.06	0.00	16.20	100.0	388.28	388.28	3.0	5.99	5.92
CB-105	0.27	0.00	0.27	100.0	392.69	392.69	3.0	2.05	2.05
CB-105A	1.26	0.18	24.72	87.6	386.79	386.79	3.0	5.65	6.05
DI-126	0.33	0.00	1.52	100.0	392.95	392.95	3.0	3.48	3.34
CB-116A	0.14	0.00	0.28	100.0	389.70	389.70	3.0	1.06	2.07
CB-116B	0.14	0.00	0.14	100.0	391.64	391.64	3.0	1.75	1.75
DI-125	1.18	0.15	2.60	88.9	392.42	392.42	3.0	2.94	4.06
CB-104	0.90	0.06	0.90	93.4	392.85	392.85	3.0	2.83	2.83
CB-114	1.85	0.47	16.38	79.6	388.87	388.87	3.0	0.08	5.84
CB-116	0.01	0.00	5.73	100.0	389.26	389.26	3.0	0.78	4.54
DI-105B	0.51	0.00	0.83	99.1	391.93	391.93	3.0	1.81	2.83
CB-103	0.80	0.04	25.99	95.0	386.62	386.62	3.0	5.60	5.89
YI-114B	0.07	0.00	2.36	100.0	389.33	389.33	3.0	8.06	3.73
CB-122	0.46	0.00	11.16	99.5	389.17	389.17	3.0	4.36	5.38
DI-124	1.16	0.14	3.66	89.2	391.48	391.48	3.0	5.21	4.28
CB-115	1.77	0.43	12.64	80.6	389.01	389.01	3.0	4.41	5.00

10-YEAR ANALYSIS

Inlets - Time: 0.00 hours

Label	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Grate Length (ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)
CB-102	1.23	0.16	28.69	88.2	386.44	386.44	3.0	5.61	6.20
DI-123	1.75	0.42	5.17	80.8	390.65	390.65	3.0	3.97	4.83
CB-102A	1.35	0.21	2.14	86.3	386.38	386.38	3.0	2.77	3.62
YI-114C	2.30	0.79	2.30	74.5	391.77	391.77	3.0	3.70	3.70
DI-117	0.34	0.00	5.51	100.0	389.47	389.47	3.0	4.39	4.59
CB-101A	2.01	0.58	32.69	77.7	386.02	386.02	3.0	5.99	6.83
DI-121	0.43	0.00	0.43	99.7	390.98	390.98	3.0	2.39	2.39
DI-120	0.19	0.00	0.62	100.0	390.41	390.41	3.0	3.15	2.59
CB-101	1.32	0.20	33.69	86.8	385.87	385.87	3.0	6.86	7.06
DI-119A	1.10	0.12	1.10	90.2	390.56	390.56	3.0	3.06	3.06
DI-101C	1.93	0.53	1.93	78.6	388.10	388.10	3.0	3.56	3.56
DI-118	0.95	0.08	5.26	92.7	389.87	389.87	3.0	4.46	4.56
DI-101B	1.24	0.17	3.08	87.9	387.52	387.52	3.0	2.50	4.00
CB-102B	0.80	0.04	0.80	95.0	388.59	388.59	3.0	2.75	2.75
DI-119	2.86	1.27	4.42	69.2	390.31	390.31	3.0	1.47	4.38
YI-114A	0.09	0.00	0.09	100.0	389.12	389.12	3.0	1.60	1.60

10-YEAR ANALYSIS **Conduit Results - Time: 0.00 hours**

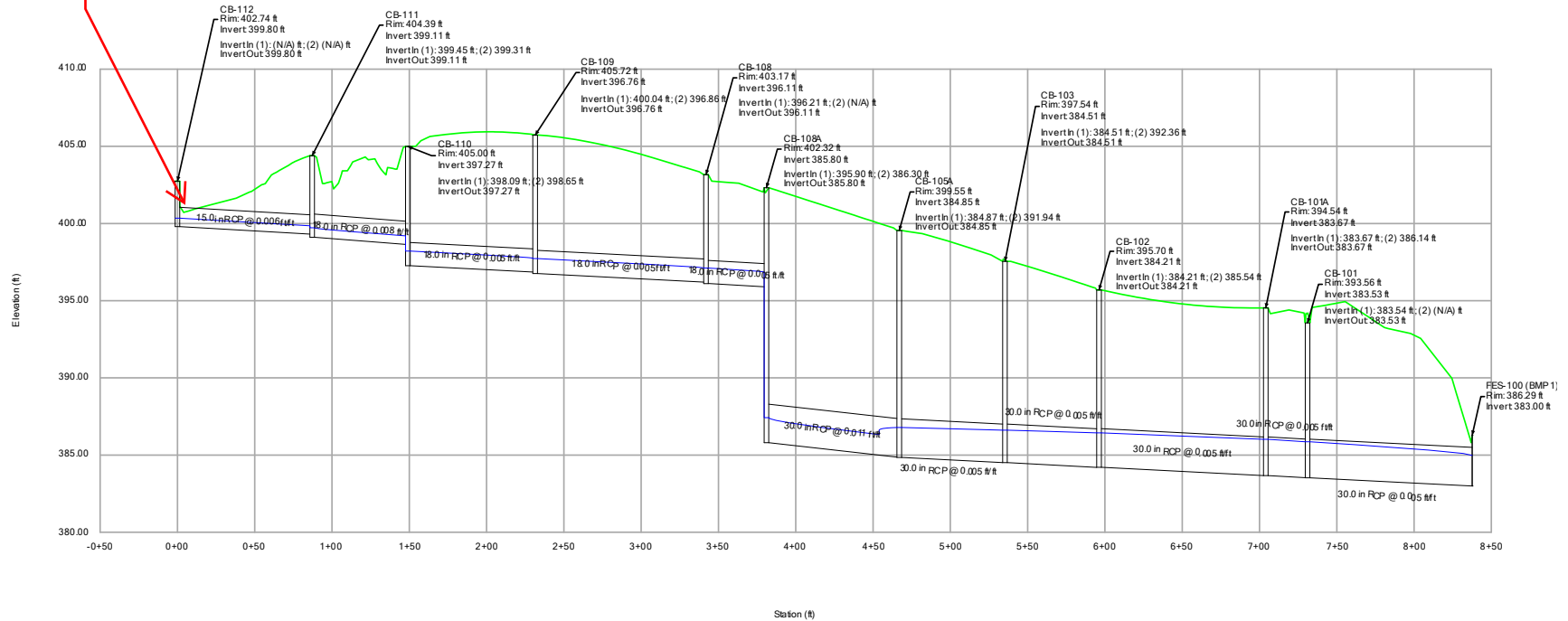
Label	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
CB-109 TO CB-109A	15.0	0.019	1.94	2.92	0.19	8.85	400.72	400.17
CB-109 TO CB-110	18.0	0.005	4.59	4.90	5.37	7.44	398.21	397.75
CB-108 TO CB-109	18.0	0.005	4.61	4.96	5.55	7.43	397.73	397.12
DI-127 TO CB-127A	18.0	0.005	2.81	2.85	0.88	7.54	393.79	393.32
CB-110 TO CB-110A	15.0	0.005	3.64	3.78	2.09	4.57	398.82	398.67
CB-110 TO CB-111	18.0	0.008	3.86	4.46	2.63	9.11	399.73	399.20
CB-110A TO CB-110B	15.0	0.005	3.37	3.43	1.55	4.57	398.95	398.82
CB-111 TO CB-111A	18.0	0.007	2.38	2.06	0.47	8.53	399.82	399.73
CB-111 TO CB-112	15.0	0.006	3.66	3.70	1.89	4.83	400.35	399.86
CB-110B TO DI-110C	15.0	0.005	2.09	0.86	0.29	4.57	399.19	398.95
CB-108A TO CB-108	18.0	0.005	4.82	5.13	6.05	7.70	397.11	396.85
CB-105A TO CB-108A	30.0	0.011	6.75	5.65	22.84	42.66	387.43	386.79
CB-108A TO CB-113	24.0	0.005	5.92	6.63	16.20	15.99	388.28	387.75
DI-126 TO DI-127	15.0	0.007	3.20	3.48	1.21	5.26	393.30	392.96
DI-105B TO DI-105C	15.0	0.038	2.22	1.81	0.33	12.67	395.26	391.93
CB-113 TO CB-114	24.0	0.005	5.84	5.99	16.38	15.99	388.87	388.28
CB-105A TO CB-105	18.0	0.020	2.05	3.22	0.27	14.85	392.69	392.08
CB-103 TO CB-105A	30.0	0.005	6.05	5.60	24.72	28.95	386.79	386.62
CB-105A TO DI-105B	15.0	0.005	2.83	2.87	0.83	4.57	391.93	391.30
DI-125 TO DI-126	15.0	0.005	3.34	2.94	1.52	4.55	392.95	392.42
CB-116A TO CB-116B	18.0	0.074	1.75	1.06	0.14	28.55	391.64	389.70
CB-116 TO CB-116A	18.0	0.010	2.07	0.78	0.28	10.50	389.70	389.26
DI-124 TO DI-125	15.0	0.011	4.06	5.21	2.60	6.87	392.42	391.38
CB-103 TO CB-104	18.0	0.005	2.83	2.84	0.90	7.43	392.85	392.71
CB-114 TO CB-115	24.0	0.005	5.00	4.50	12.64	15.88	389.01	388.87
CB-114 TO YI-114A	15.0	0.027	1.60	0.08	0.09	10.53	389.12	388.87
CB-114 TO YI-114B	18.0	0.027	3.73	3.40	2.36	17.41	389.33	388.87
CB-116 TO DI-117	18.0	0.005	4.59	4.39	5.51	7.43	389.47	389.26
CB-122 TO CB-116	18.0	0.005	4.54	4.36	5.73	7.43	389.26	389.17
CB-102 TO CB-103	30.0	0.005	5.89	5.61	25.99	29.00	386.62	386.44

10-YEAR ANALYSIS
Conduit Results - Time: 0.00 hours

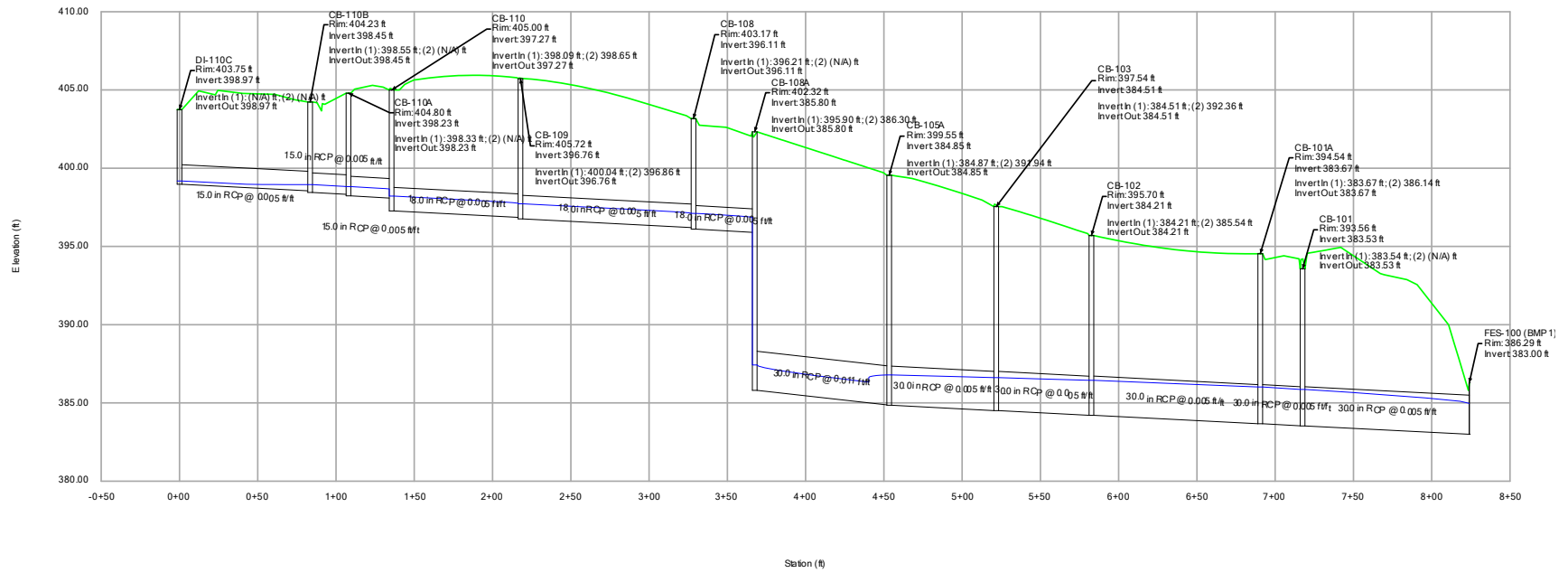
Label	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
YI-114B TO YI-114C	18.0	0.044	3.70	8.06	2.30	21.98	391.77	389.18
CB-122 TO DI-123	18.0	0.008	4.83	5.54	5.17	9.67	390.65	390.28
CB-115 TO CB-122	24.0	0.005	5.38	4.41	11.16	16.02	389.17	389.01
DI-123 TO DI-124	18.0	0.006	4.28	3.97	3.66	8.04	391.48	390.65
CB-101A TO CB-102	30.0	0.005	6.20	5.99	28.69	29.00	386.44	386.02
CB-102 TO CB-102A	18.0	0.010	3.62	1.94	2.14	10.32	386.38	386.44
CB-102A TO CB-102B	18.0	0.005	2.75	2.77	0.80	7.51	388.59	388.46
DI-117 TO DI-118	18.0	0.005	4.56	4.39	5.26	7.43	389.87	389.47
CB-101 TO CB-101A	30.0	0.005	6.83	6.86	32.69	29.00	386.02	385.87
CB-101A TO DI-101B	15.0	0.005	4.00	4.31	3.08	4.57	387.52	386.85
DI-120 TO DI-121	15.0	0.012	2.39	3.15	0.43	6.99	390.98	390.41
DI-119 TO DI-120	15.0	0.005	2.59	0.82	0.62	4.57	390.41	390.31
FES-100 TO CB-101	30.0	0.005	7.06	8.10	33.69	29.00	385.87	384.97
DI-119 TO DI-119A	15.0	0.005	3.06	1.47	1.10	4.57	390.56	390.31
DI-101B TO DI-101C	15.0	0.005	3.56	2.50	1.93	4.57	388.10	387.52
DI-118 TO DI-119	18.0	0.005	4.38	4.46	4.42	7.43	390.31	389.87

#84- Ensure
minimum cover
requirements are met

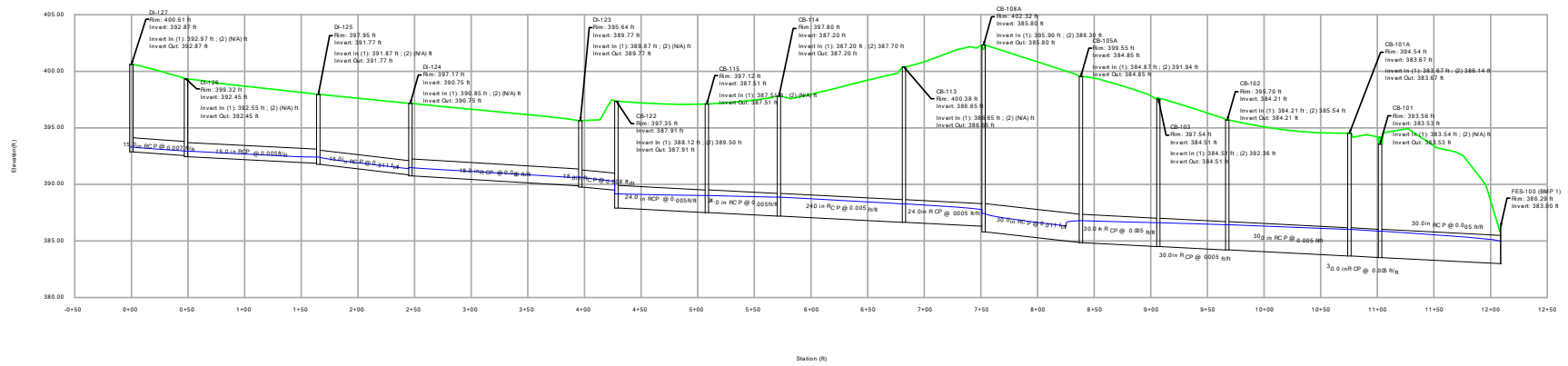
10-YEAR ANALYSIS



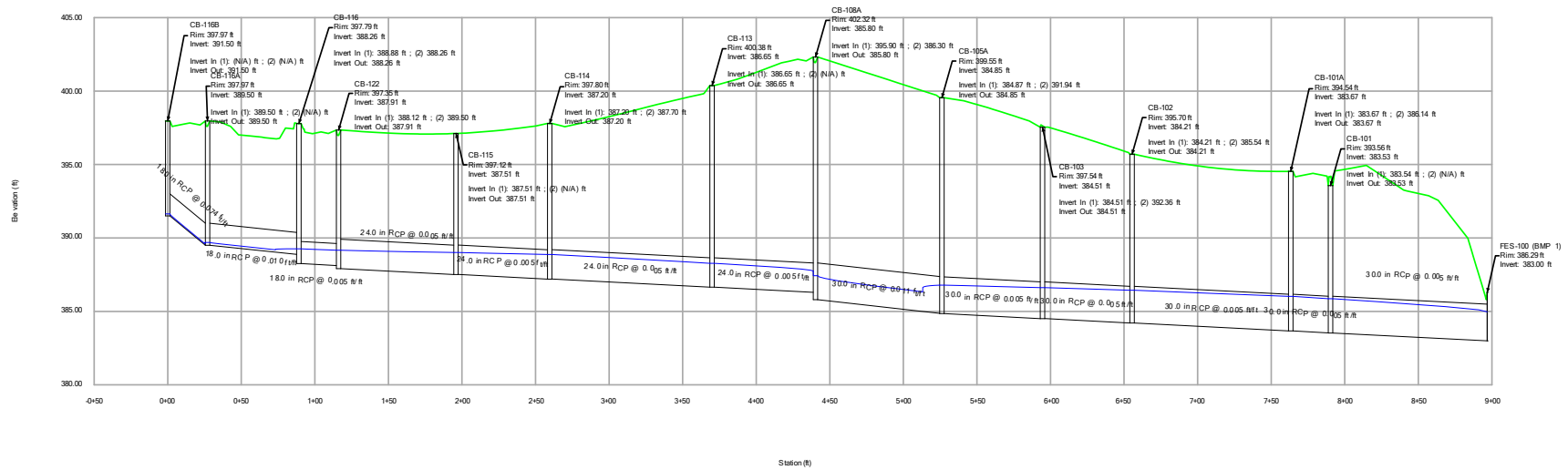
10-YEAR ANALYSIS



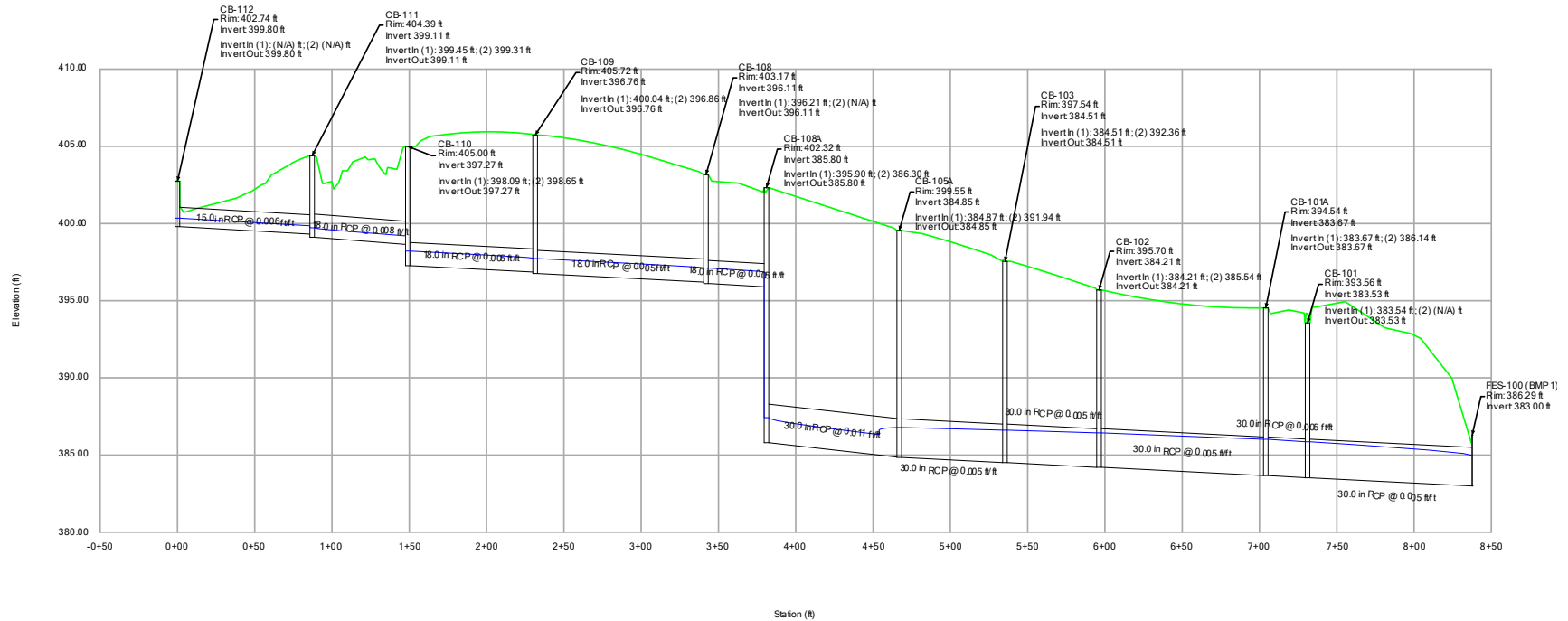
10-YEAR ANALYSIS



10-YEAR ANALYSIS

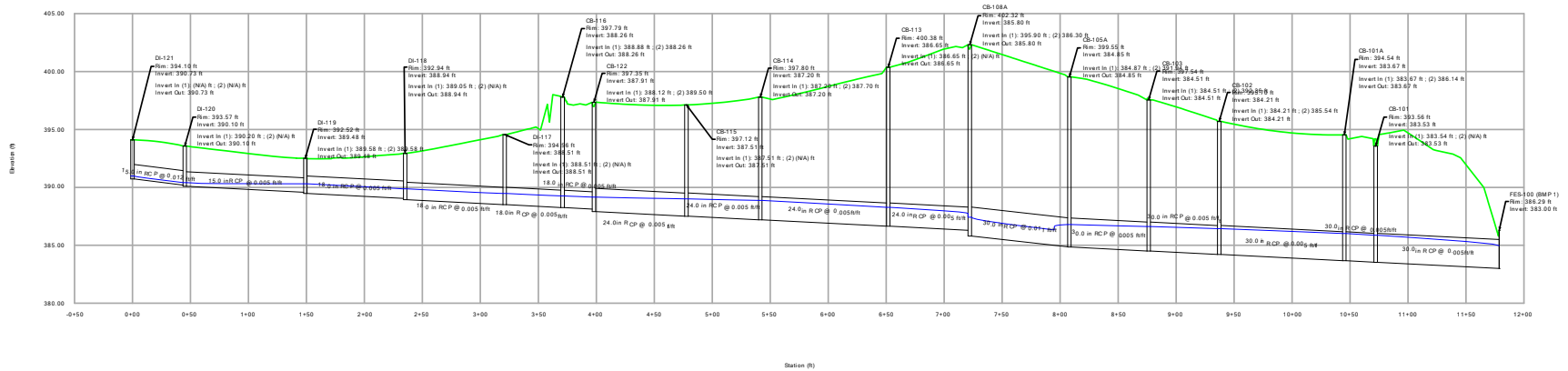


10-YEAR ANALYSIS

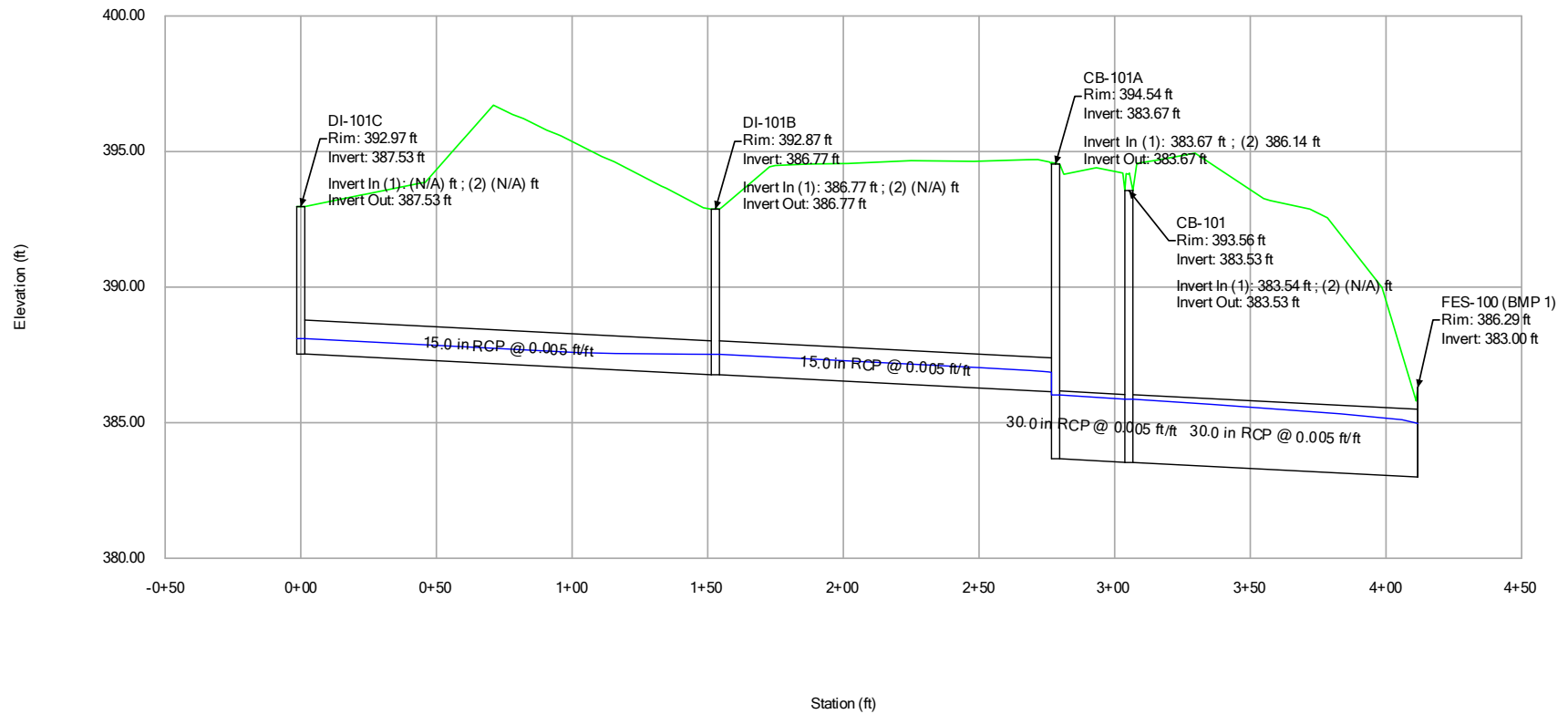


#98- This is a repeat profile

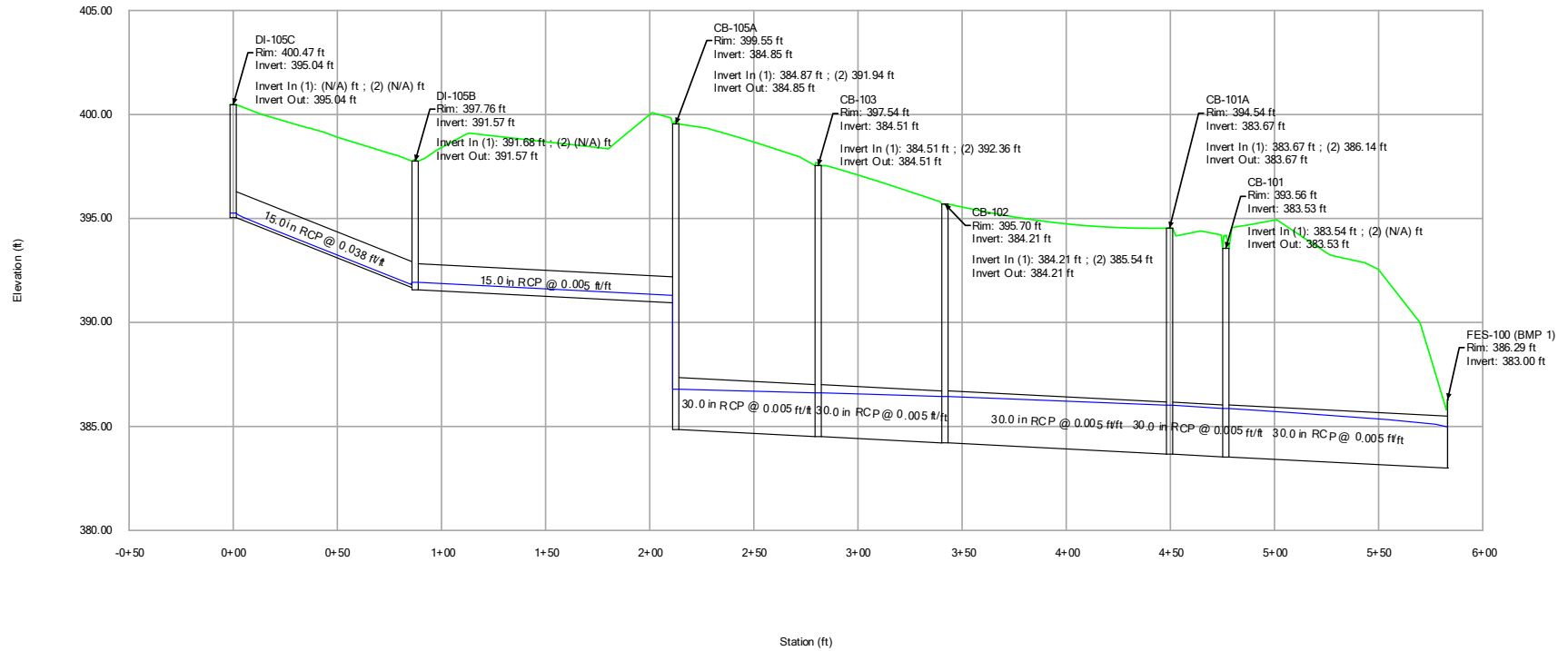
10-YEAR ANALYSIS

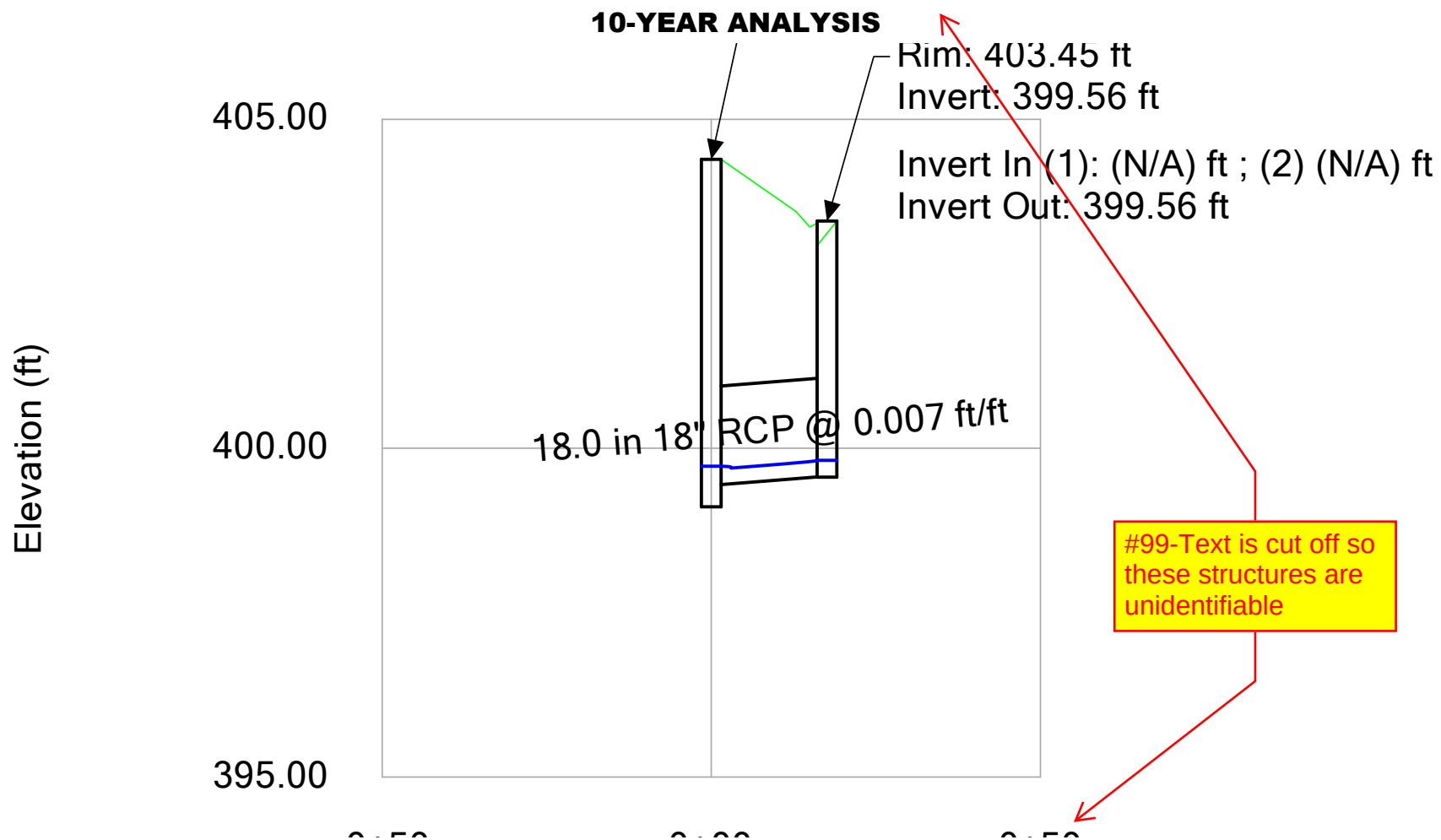


10-YEAR ANALYSIS

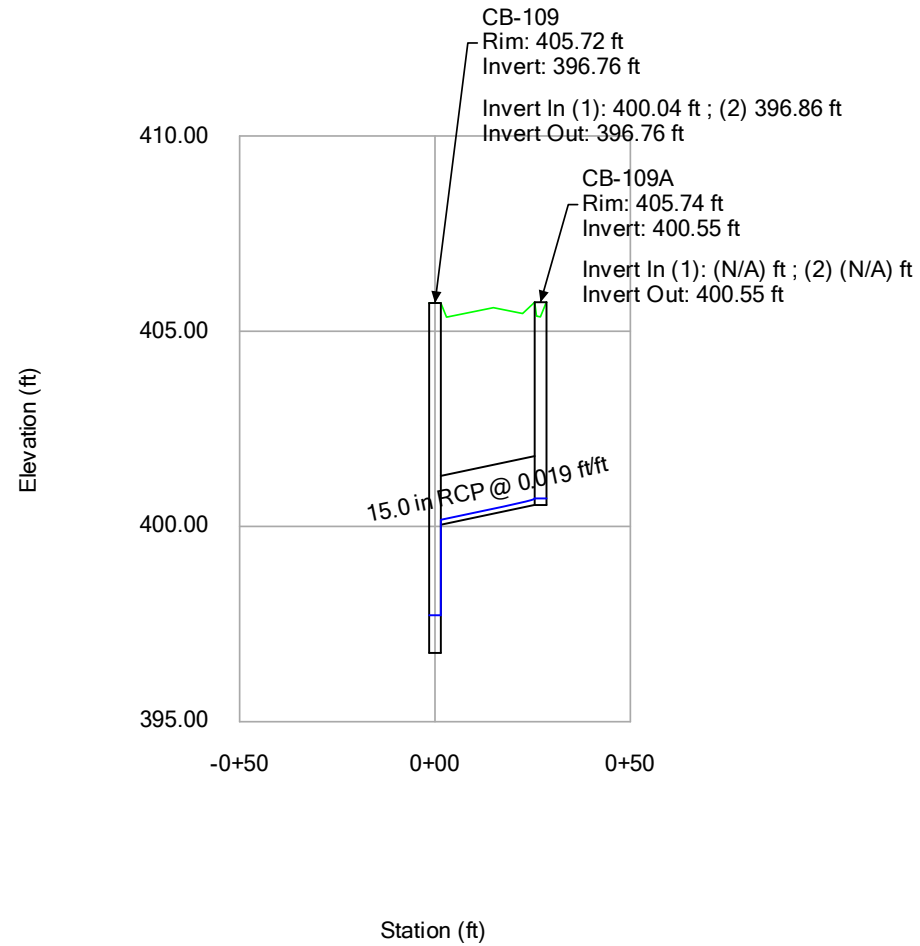


10-YEAR ANALYSIS





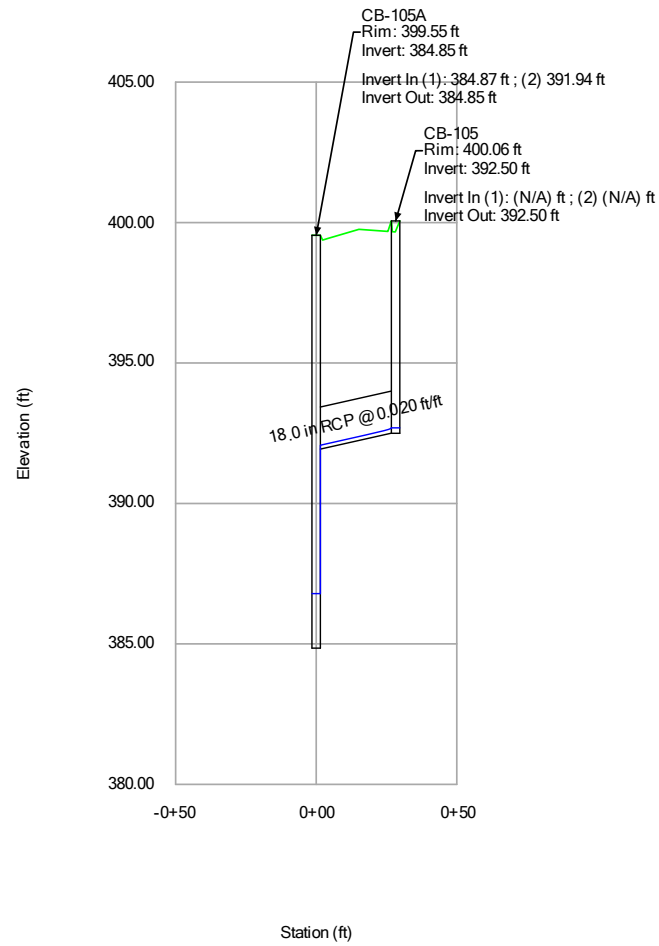
10-YEAR ANALYSIS



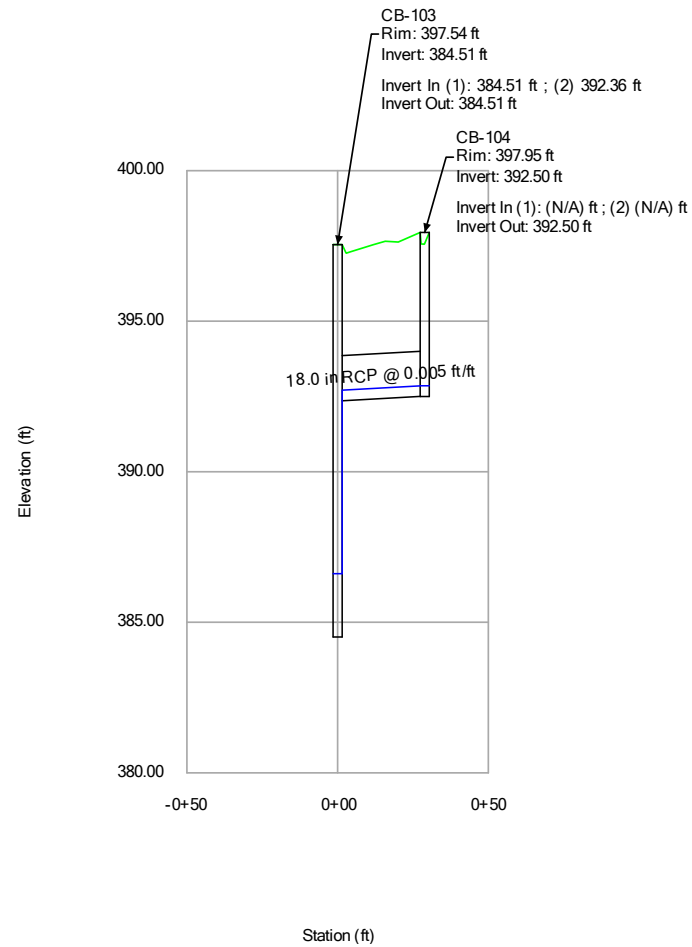
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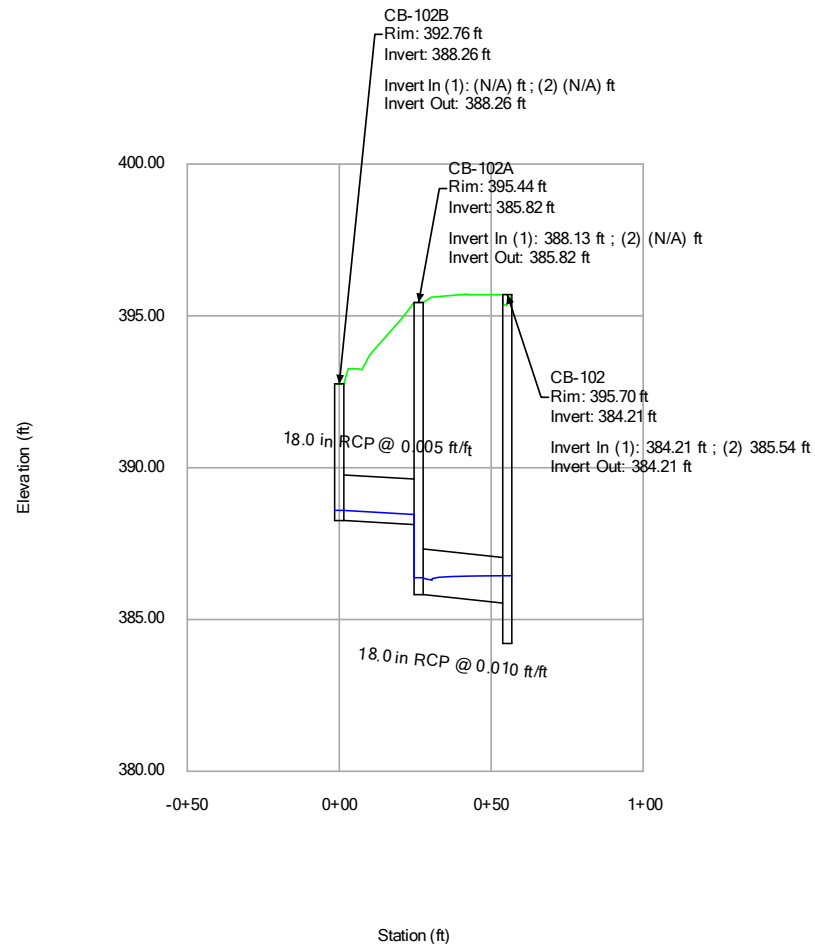
10-YEAR ANALYSIS



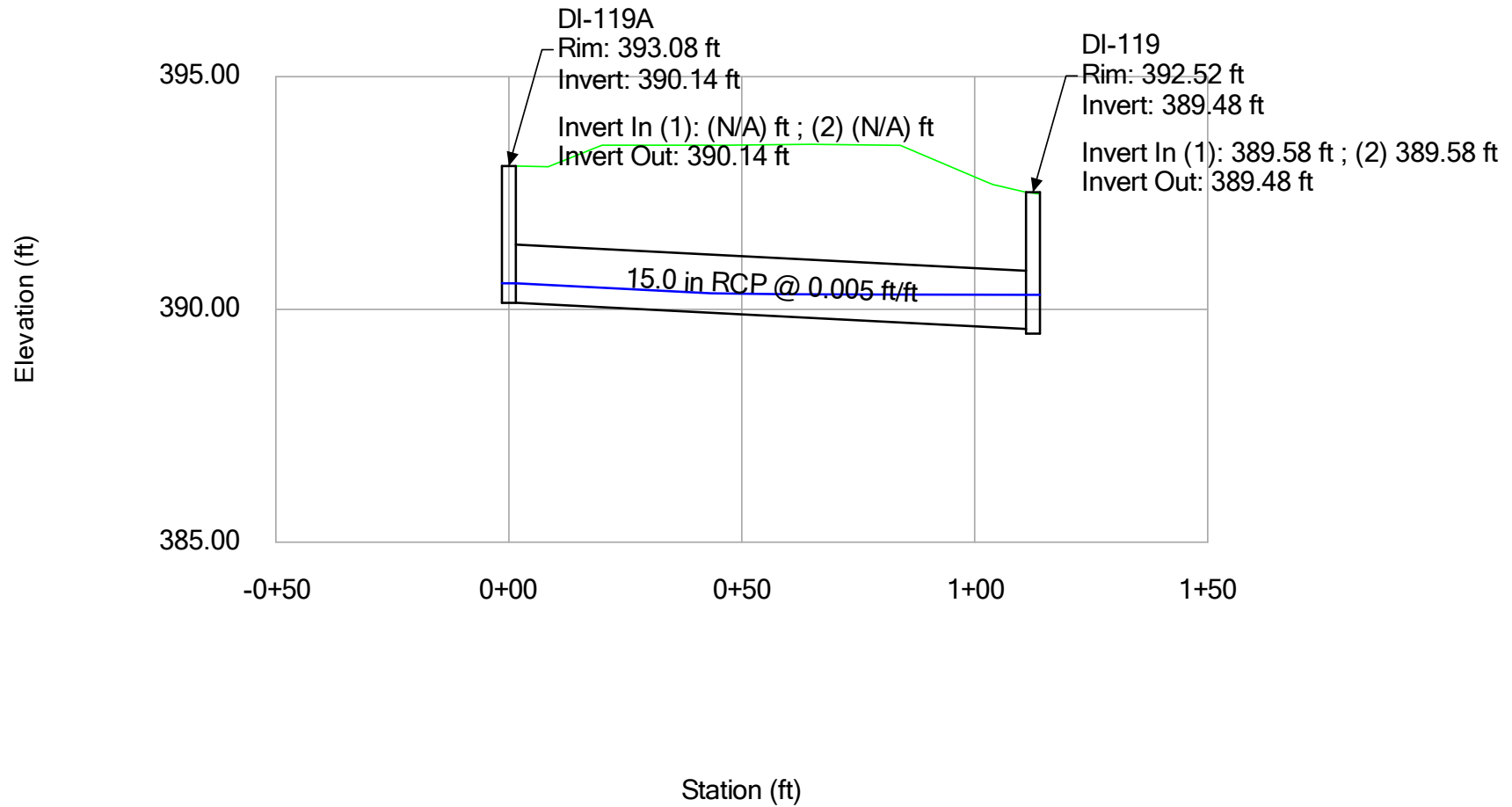
10-YEAR ANALYSIS



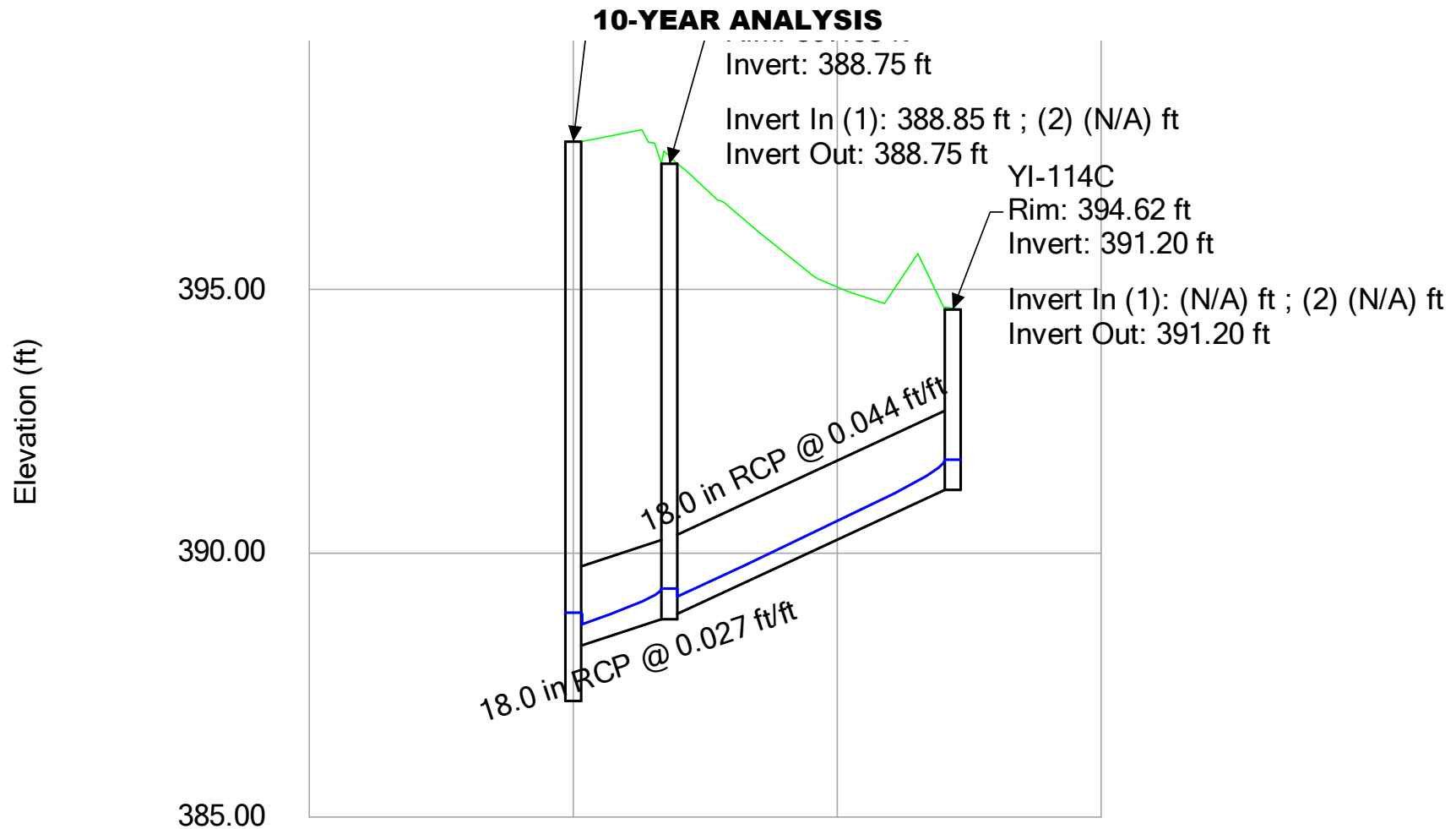
10-YEAR ANALYSIS



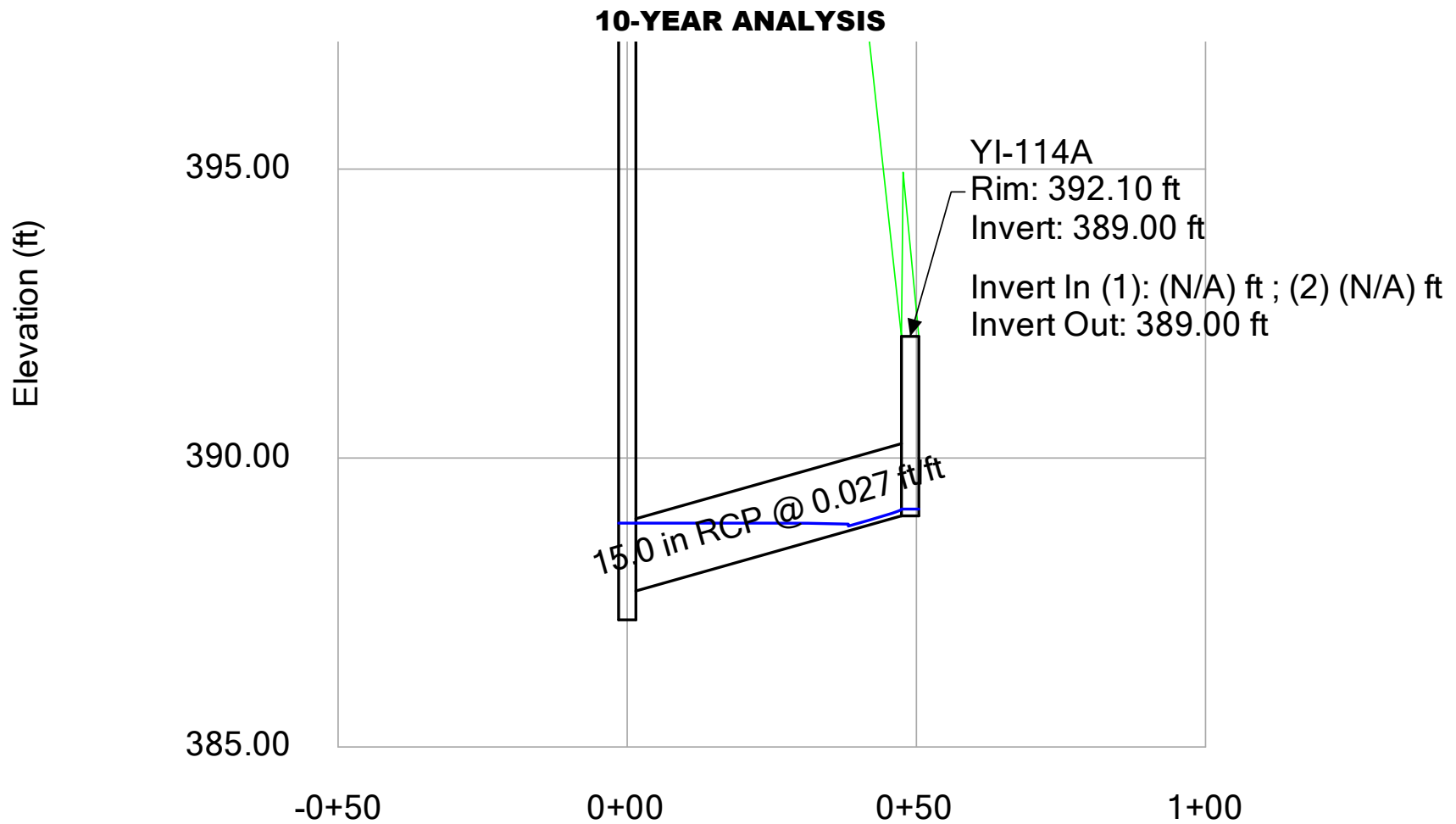
10-YEAR ANALYSIS



#99- Text cut off



#99- Profile cut off



SCM 1 - 25 YR STORM

25-YEAR ANALYSIS

CATCHMENTS - Time: 0.00 hours

Outflow Element	Scaled Area (acres)	Flow (Total Out) (cfs)	Time of Concentration (hours)	Runoff Coefficient (Rational)
CB-116A	0.022	0.15	0.083	0.870
CB-116B	0.023	0.16	0.083	0.870
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DI-126	0.053	0.37	0.083	0.870
DI-125	0.211	1.48	0.083	0.870
DI-124	0.183	1.28	0.083	0.870
DI-123	0.322	2.25	0.083	0.870
CB-122	0.073	0.51	0.083	0.870
CB-116	0.001	0.01	0.083	0.870
DI-117	0.054	0.38	0.083	0.870
DI-118	0.162	1.13	0.083	0.870
DI-119	0.644	4.51	0.083	0.870
DI-120	0.030	0.21	0.083	0.870
DI-121	0.068	0.48	0.083	0.870
YI-114C	0.490	3.43	0.083	0.870
CB-112	0.380	2.66	0.083	0.870
YI-114B	0.011	0.08	0.083	0.870
CB-114	0.368	2.58	0.083	0.870
CB-115	0.272	1.90	0.083	0.870
CB-108A	0.243	1.70	0.083	0.870
YI-114A	0.015	0.10	0.083	0.870
CB-108	0.103	0.72	0.083	0.870
CB-109A	0.030	0.21	0.083	0.870
CB-110	0.122	0.86	0.083	0.870
CB-110A	0.090	0.63	0.083	0.870
CB-111	0.045	0.31	0.083	0.870
CB-110B	0.238	1.66	0.083	0.870
CB-105A	0.196	1.37	0.083	0.870
CB-105	0.040	0.28	0.083	0.870
CB-104	0.153	1.07	0.083	0.870
CB-103	0.106	0.74	0.083	0.870

#97- For most accurate results, runoff coefficients should be determined for each structure (and therefore be different for each of these drainage areas). See City of Raleigh Stormwater Management Design Manual for more information on how to get the composite runoff coefficient

25-YEAR ANALYSIS

CATCHMENTS - Time: 0.00 hours

Outflow Element	Scaled Area (acres)	Flow (Total Out) (cfs)	Time of Concentration (hours)	Runoff Coefficient (Rational)
CB-102A	0.238	1.67	0.083	0.870
CB-102	0.214	1.50	0.083	0.870
CB-101	0.207	1.45	0.083	0.870
CB-111A	0.075	0.52	0.083	0.870
CB-102B	0.134	0.94	0.083	0.870
CB-113	0.009	0.07	0.083	0.870
CB-109	0.012	0.08	0.083	0.870
CB-101A	0.384	2.69	0.083	0.870
DI-119A	0.280	1.35	0.083	0.600
DI-110C	0.067	0.32	0.083	0.600
DI-105B	0.119	0.57	0.083	0.600
DI-105C	0.075	0.36	0.083	0.600
DI-101B	0.325	1.57	0.083	0.600
DI-101C	0.565	2.73	0.083	0.600
CB-127A	0.161	1.04	0.083	0.800

25-YEAR ANALYSIS

Inlets - Time: 0.00 hours

Label	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Grate Length (ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)
CB-109A	0.21	0.00	0.21	100.0	400.73	400.73	3.0	1.99	1.99
CB-109	0.08	0.00	6.09	100.0	397.79	397.79	3.0	5.07	4.69
CB-127A	0.96	0.08	0.96	92.5	393.80	393.80	3.0	2.88	2.88
CB-110	0.81	0.04	5.88	94.8	398.28	398.28	3.0	3.89	4.67
CB-110A	0.62	0.01	2.29	97.8	398.86	398.86	3.0	3.45	3.72
CB-111	0.36	0.00	2.88	100.0	399.76	399.76	3.0	1.98	3.97
CB-110B	1.42	0.24	1.70	85.3	398.98	398.98	3.0	0.88	3.45
DI-110C	0.32	0.00	0.32	100.0	399.20	399.20	3.0	2.15	2.15
CB-111A	0.52	0.01	0.52	99.0	399.83	399.83	3.0	2.44	2.44
CB-108	0.69	0.02	6.64	96.7	397.18	397.18	3.0	5.01	4.91
CB-112	2.05	0.61	2.05	77.2	400.37	400.37	3.0	3.76	3.76
CB-108A	1.45	0.26	24.98	84.9	387.50	387.50	3.0	6.93	7.01
DI-127	0.40	0.00	1.33	99.9	393.33	393.33	3.0	2.92	3.29
DI-105C	0.36	0.00	0.36	100.0	395.27	395.27	3.0	2.29	2.29
CB-113	0.07	0.00	17.71	100.0	388.41	388.41	3.0	6.13	6.06
CB-105	0.30	0.00	0.30	100.0	392.70	392.70	3.0	2.12	2.12
CB-105A	1.40	0.23	27.07	85.6	387.52	387.52	3.0	5.09	5.52
DI-126	0.37	0.00	1.67	100.0	392.97	392.97	3.0	3.57	3.43
CB-116A	0.15	0.00	0.31	100.0	389.71	389.71	3.0	1.09	2.13
CB-116B	0.16	0.00	0.16	100.0	391.65	391.65	3.0	1.79	1.79
DI-125	1.29	0.19	2.85	87.2	392.45	392.45	3.0	3.01	4.19
CB-104	0.98	0.09	0.98	92.0	392.87	392.87	3.0	2.90	2.90
CB-114	2.00	0.57	17.92	77.7	389.06	389.06	3.0	0.08	5.89
CB-116	0.01	0.00	6.25	100.0	389.46	389.46	3.0	0.49	4.12
DI-105B	0.56	0.01	0.92	98.5	391.95	391.95	3.0	1.81	2.91
CB-103	0.91	0.07	28.44	93.3	387.22	387.22	3.0	5.52	5.79
YI-114B	0.08	0.00	2.55	100.0	389.36	389.36	3.0	8.25	3.82
CB-122	0.50	0.00	12.23	99.1	389.39	389.39	3.0	3.93	4.92
DI-124	1.28	0.19	4.02	87.3	391.52	391.52	3.0	5.34	4.42
CB-115	1.95	0.54	13.86	78.4	389.23	389.23	3.0	4.25	4.82

25-YEAR ANALYSIS

Inlets - Time: 0.00 hours

Label	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Grate Length (ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)
CB-102	1.35	0.21	31.35	86.3	386.93	386.93	3.0	5.79	6.39
DI-123	1.92	0.52	5.69	78.7	390.69	390.69	3.0	4.07	5.00
CB-102A	1.48	0.27	2.35	84.5	386.93	386.93	3.0	2.85	1.68
YI-114C	2.49	0.94	2.49	72.6	391.80	391.80	3.0	3.79	3.79
DI-117	0.38	0.00	6.01	100.0	389.60	389.60	3.0	4.18	4.38
CB-101A	2.19	0.71	35.66	75.6	386.30	386.30	3.0	6.39	7.26
DI-121	0.47	0.00	0.47	99.4	391.00	391.00	3.0	2.46	2.46
DI-120	0.21	0.00	0.68	100.0	390.43	390.43	3.0	3.25	2.67
CB-101	1.46	0.26	36.78	84.7	386.10	386.10	3.0	7.26	7.49
DI-119A	1.20	0.15	1.20	88.6	390.58	390.58	3.0	3.14	3.14
DI-101C	2.09	0.63	2.09	76.7	388.13	388.13	3.0	3.64	3.64
DI-118	1.03	0.10	5.73	91.2	389.93	389.93	3.0	4.47	4.64
DI-101B	1.35	0.21	3.35	86.3	387.56	387.56	3.0	2.54	4.06
CB-102B	0.88	0.06	0.88	93.7	388.61	388.61	3.0	2.82	2.82
DI-119	3.10	1.51	4.81	67.2	390.36	390.36	3.0	1.49	4.47
YI-114A	0.10	0.00	0.10	100.0	389.12	389.12	3.0	1.65	1.65

25-YEAR ANALYSIS

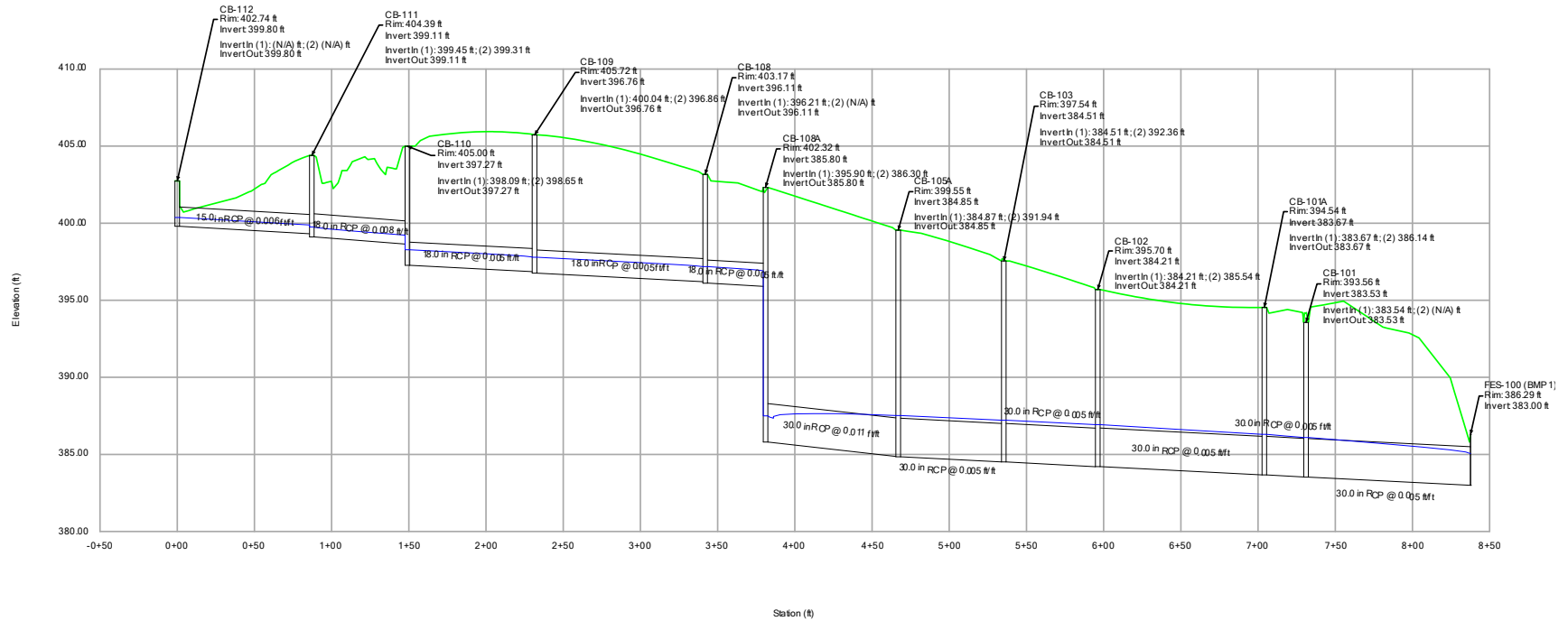
Conduit Results - Time: 0.00 hours

Label	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
CB-109 TO CB-109A	15.0	0.019	1.99	3.02	0.21	8.85	400.73	400.18
CB-109 TO CB-110	18.0	0.005	4.67	5.07	5.88	7.44	398.28	397.79
CB-108 TO CB-109	18.0	0.005	4.69	5.01	6.09	7.43	397.79	397.18
DI-127 TO CB-127A	18.0	0.005	2.88	2.92	0.96	7.54	393.80	393.33
CB-110 TO CB-110A	15.0	0.005	3.72	3.89	2.29	4.57	398.86	398.70
CB-110 TO CB-111	18.0	0.008	3.97	4.57	2.88	9.11	399.76	399.23
CB-110A TO CB-110B	15.0	0.005	3.45	3.45	1.70	4.57	398.98	398.86
CB-111 TO CB-111A	18.0	0.007	2.44	1.98	0.52	8.53	399.83	399.76
CB-111 TO CB-112	15.0	0.006	3.76	3.78	2.05	4.83	400.37	399.88
CB-110B TO DI-110C	15.0	0.005	2.15	0.88	0.32	4.57	399.20	398.98
CB-108A TO CB-108	18.0	0.005	4.91	5.32	6.64	7.70	397.18	396.90
CB-105A TO CB-108A	30.0	0.011	7.01	5.09	24.98	42.66	387.50	387.52
CB-108A TO CB-113	24.0	0.005	6.06	6.93	17.71	15.99	388.41	387.82
DI-126 TO DI-127	15.0	0.007	3.29	3.57	1.33	5.26	393.33	392.98
DI-105B TO DI-105C	15.0	0.038	2.29	1.81	0.36	12.67	395.27	391.95
CB-113 TO CB-114	24.0	0.005	5.89	6.13	17.92	15.99	389.06	388.41
CB-105A TO CB-105	18.0	0.020	2.12	3.35	0.30	14.85	392.70	392.08
CB-103 TO CB-105A	30.0	0.005	5.52	5.52	27.07	28.95	387.52	387.22
CB-105A TO DI-105B	15.0	0.005	2.91	2.95	0.92	4.57	391.95	391.32
DI-125 TO DI-126	15.0	0.005	3.43	3.01	1.67	4.55	392.97	392.45
CB-116A TO CB-116B	18.0	0.074	1.79	1.09	0.16	28.55	391.65	389.71
CB-116 TO CB-116A	18.0	0.010	2.13	0.49	0.31	10.50	389.71	389.46
DI-124 TO DI-125	15.0	0.011	4.19	5.34	2.85	6.87	392.45	391.41
CB-103 TO CB-104	18.0	0.005	2.90	2.92	0.98	7.43	392.87	392.73
CB-114 TO CB-115	24.0	0.005	4.82	4.55	13.86	15.88	389.23	389.06
CB-114 TO YI-114A	15.0	0.027	1.65	0.08	0.10	10.53	389.12	389.06
CB-114 TO YI-114B	18.0	0.027	3.82	2.62	2.55	17.41	389.36	389.06
CB-116 TO DI-117	18.0	0.005	4.38	3.97	6.01	7.43	389.60	389.46
CB-122 TO CB-116	18.0	0.005	4.12	3.93	6.25	7.43	389.46	389.39
CB-102 TO CB-103	30.0	0.005	5.79	5.79	28.44	29.00	387.22	386.93

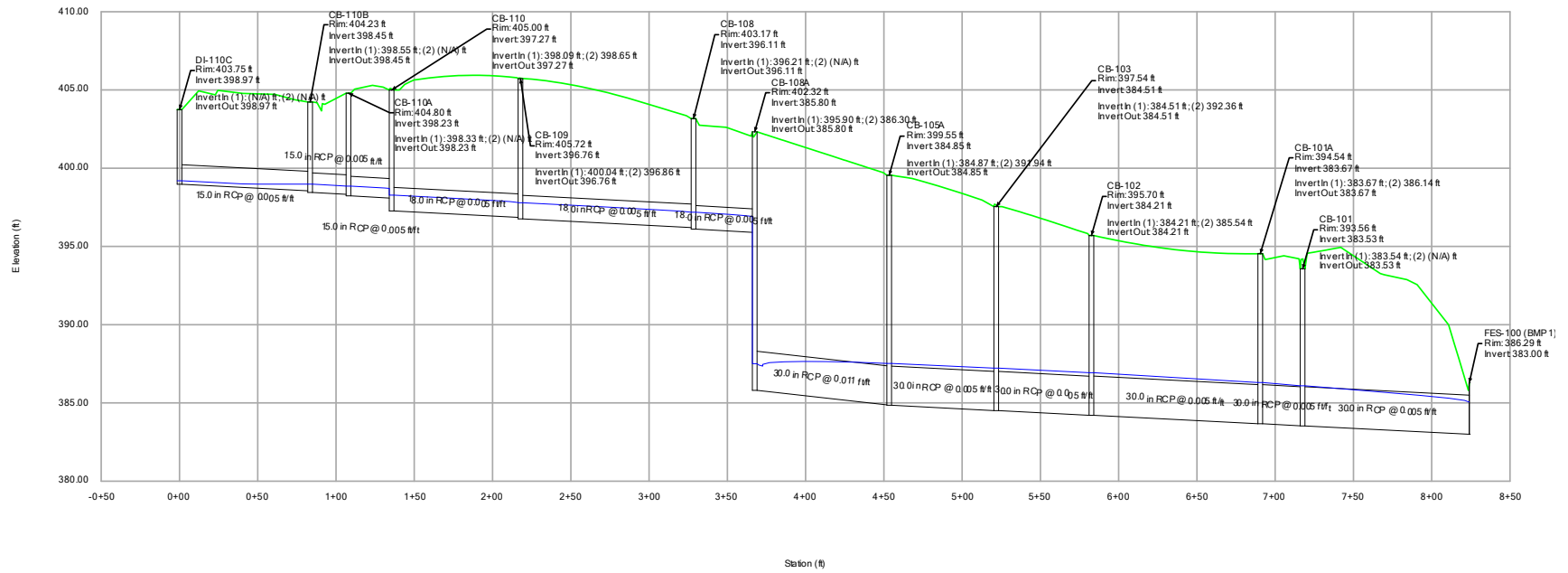
25-YEAR ANALYSIS
Conduit Results - Time: 0.00 hours

Label	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
YI-114B TO YI-114C	18.0	0.044	3.79	8.25	2.49	21.98	391.80	389.19
CB-122 TO DI-123	18.0	0.008	5.00	5.67	5.69	9.67	390.69	390.33
CB-115 TO CB-122	24.0	0.005	4.92	4.25	12.23	16.02	389.39	389.23
DI-123 TO DI-124	18.0	0.006	4.42	4.07	4.02	8.04	391.52	390.69
CB-101A TO CB-102	30.0	0.005	6.39	6.39	31.35	29.00	386.93	386.30
CB-102 TO CB-102A	18.0	0.010	1.68	1.37	2.35	10.32	386.93	386.93
CB-102A TO CB-102B	18.0	0.005	2.82	2.85	0.88	7.51	388.61	388.47
DI-117 TO DI-118	18.0	0.005	4.64	4.18	5.73	7.43	389.93	389.60
CB-101 TO CB-101A	30.0	0.005	7.26	7.26	35.66	29.00	386.30	386.10
CB-101A TO DI-101B	15.0	0.005	4.06	4.44	3.35	4.57	387.56	386.88
DI-120 TO DI-121	15.0	0.012	2.46	3.25	0.47	6.99	391.00	390.42
DI-119 TO DI-120	15.0	0.005	2.67	0.85	0.68	4.57	390.43	390.36
FES-100 TO CB-101	30.0	0.005	7.49	8.52	36.78	29.00	386.10	385.05
DI-119 TO DI-119A	15.0	0.005	3.14	1.49	1.20	4.57	390.58	390.36
DI-101B TO DI-101C	15.0	0.005	3.64	2.54	2.09	4.57	388.13	387.56
DI-118 TO DI-119	18.0	0.005	4.47	4.47	4.81	7.43	390.36	389.93

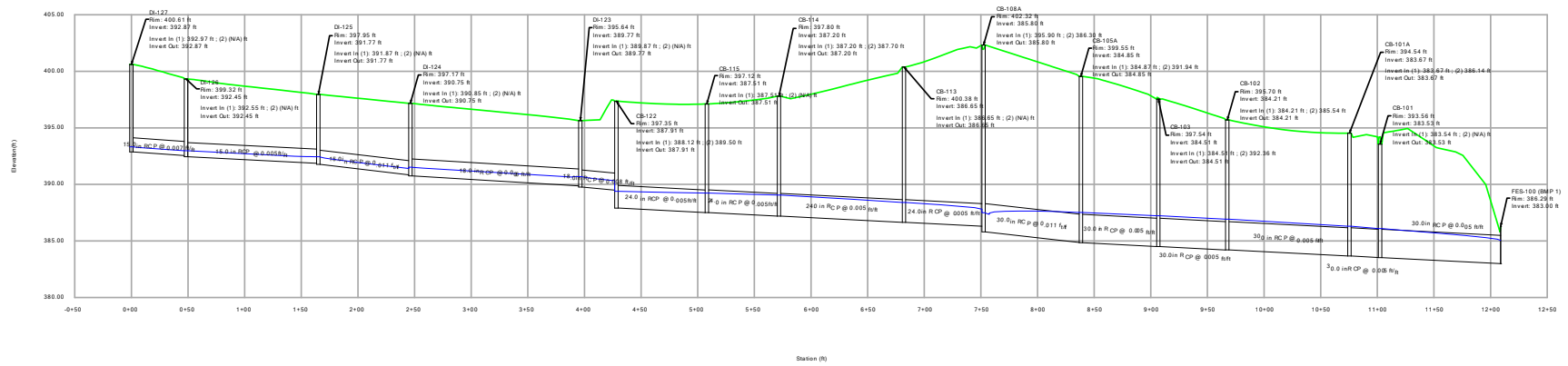
25-YEAR ANALYSIS



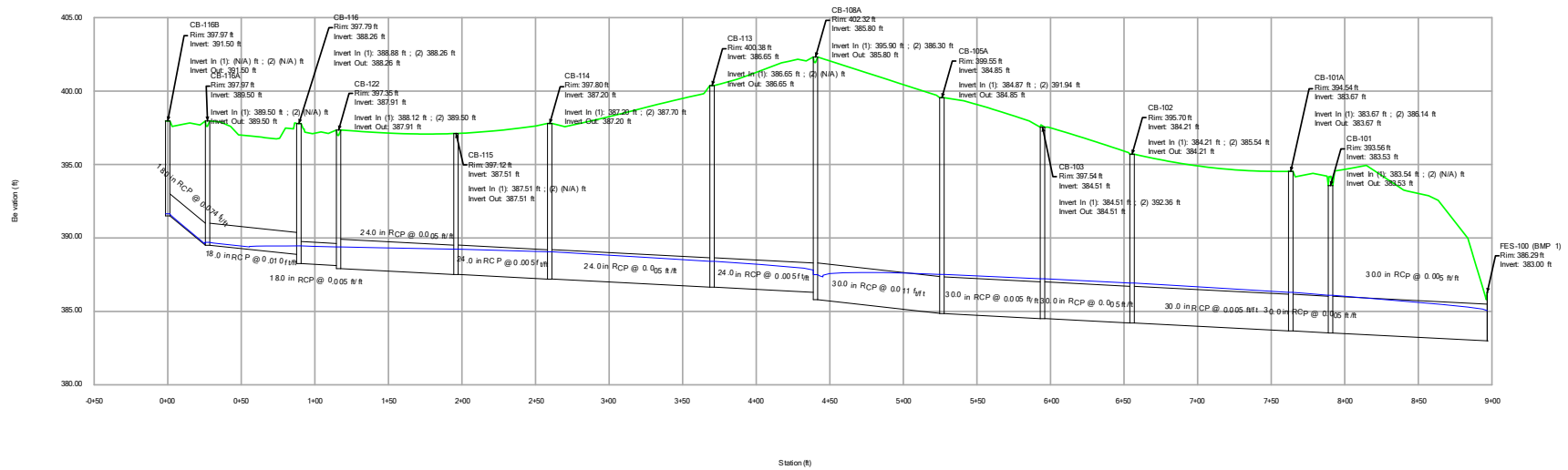
25-YEAR ANALYSIS



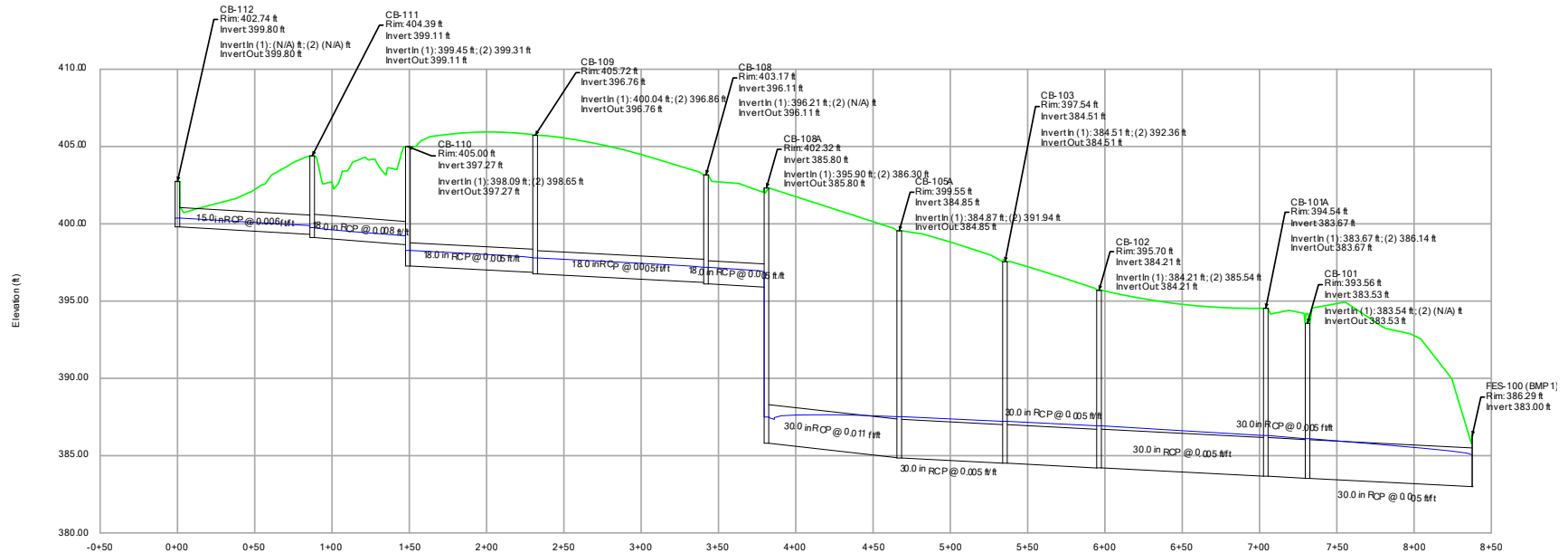
25-YEAR ANALYSIS



25-YEAR ANALYSIS

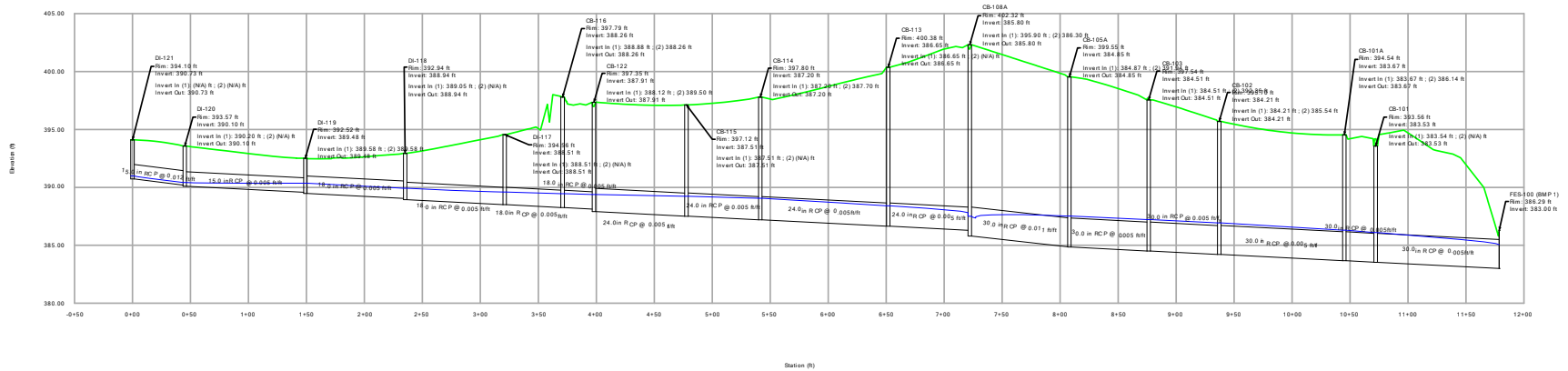


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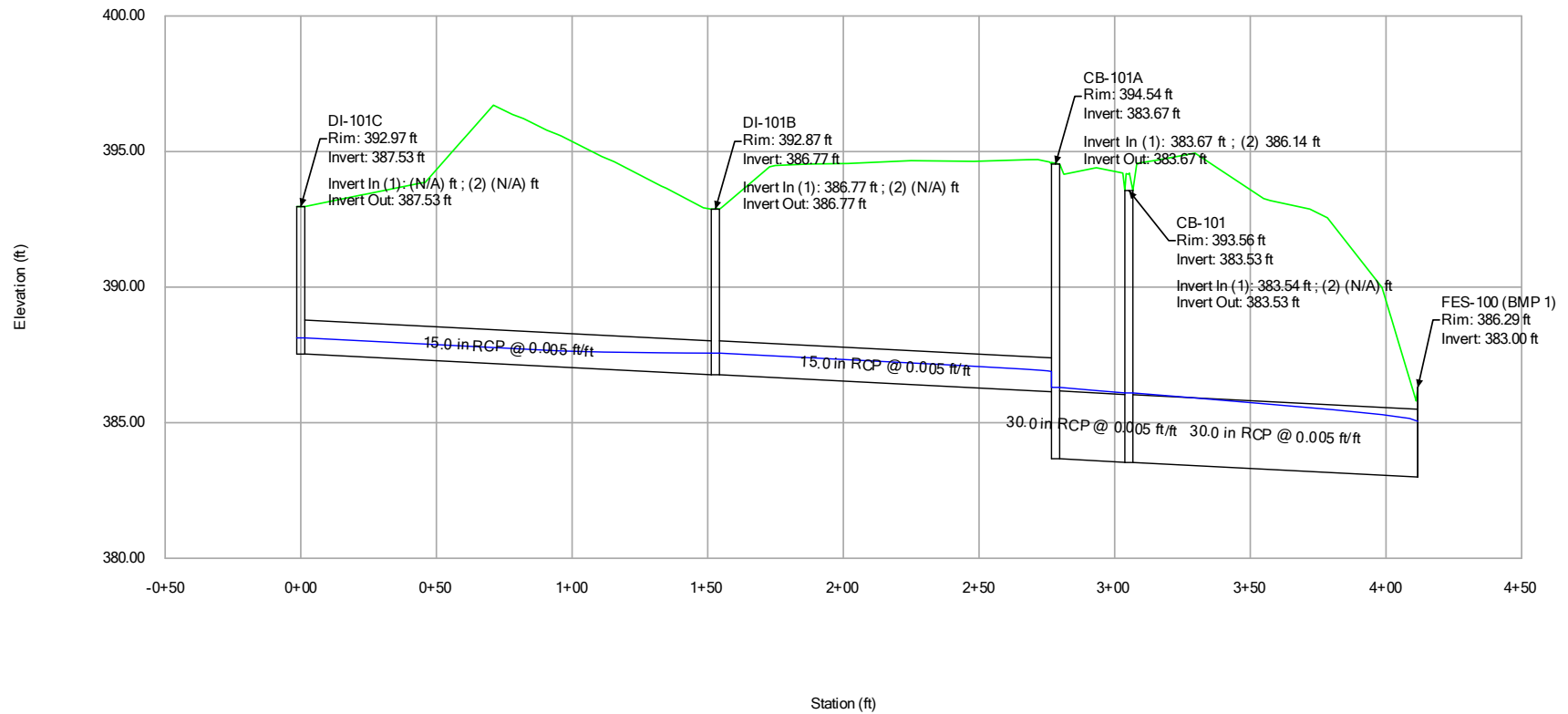


#98- This is a repeat profile

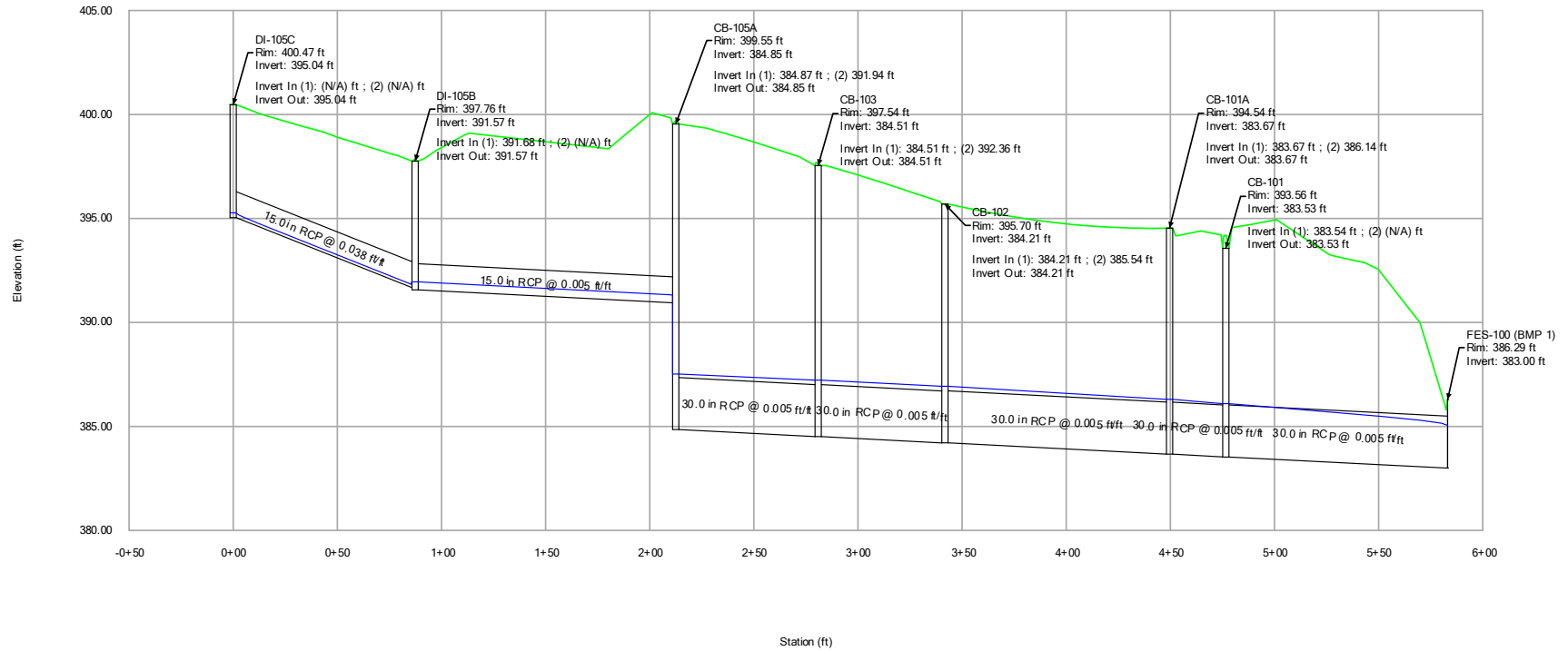
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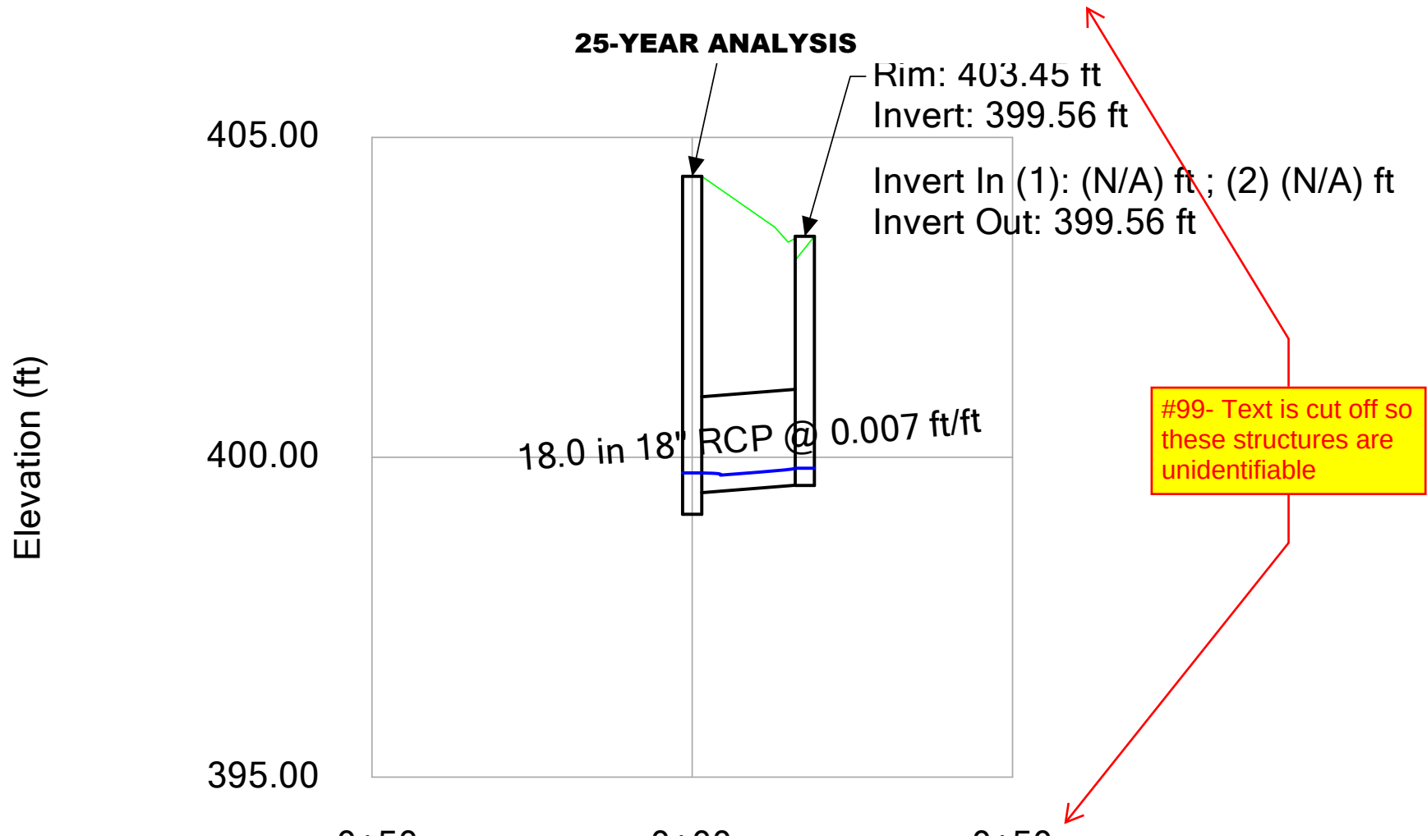


25-YEAR ANALYSIS

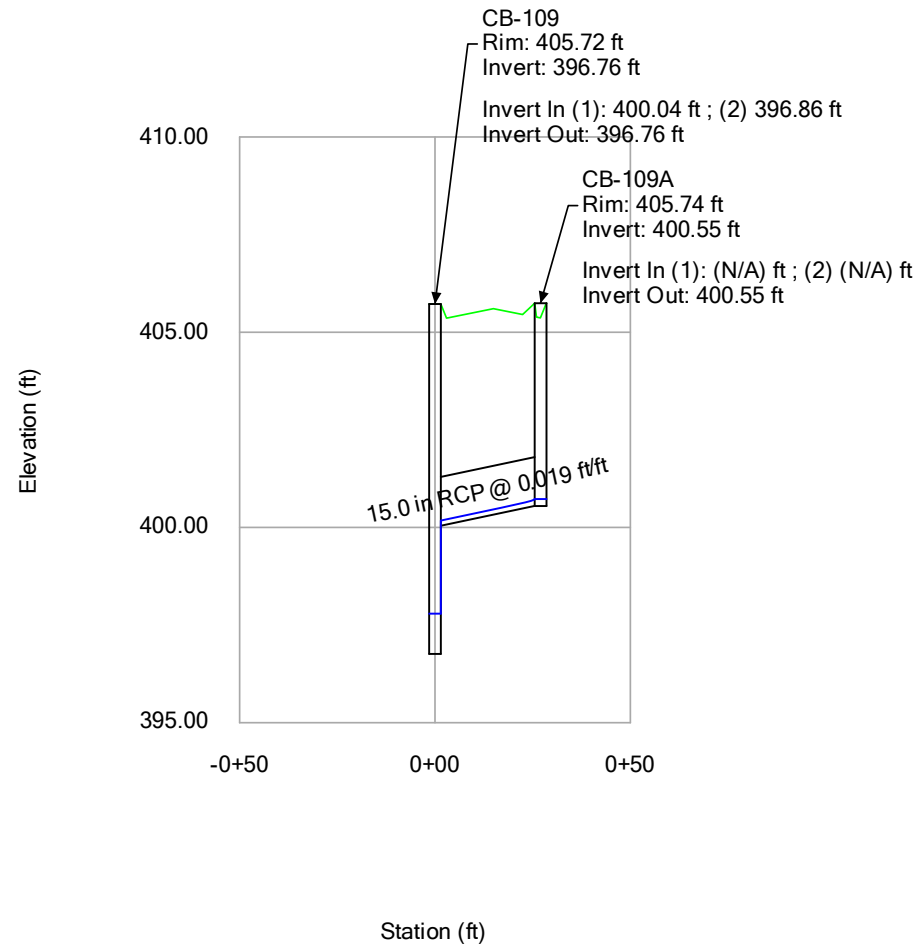


25-YEAR ANALYSIS



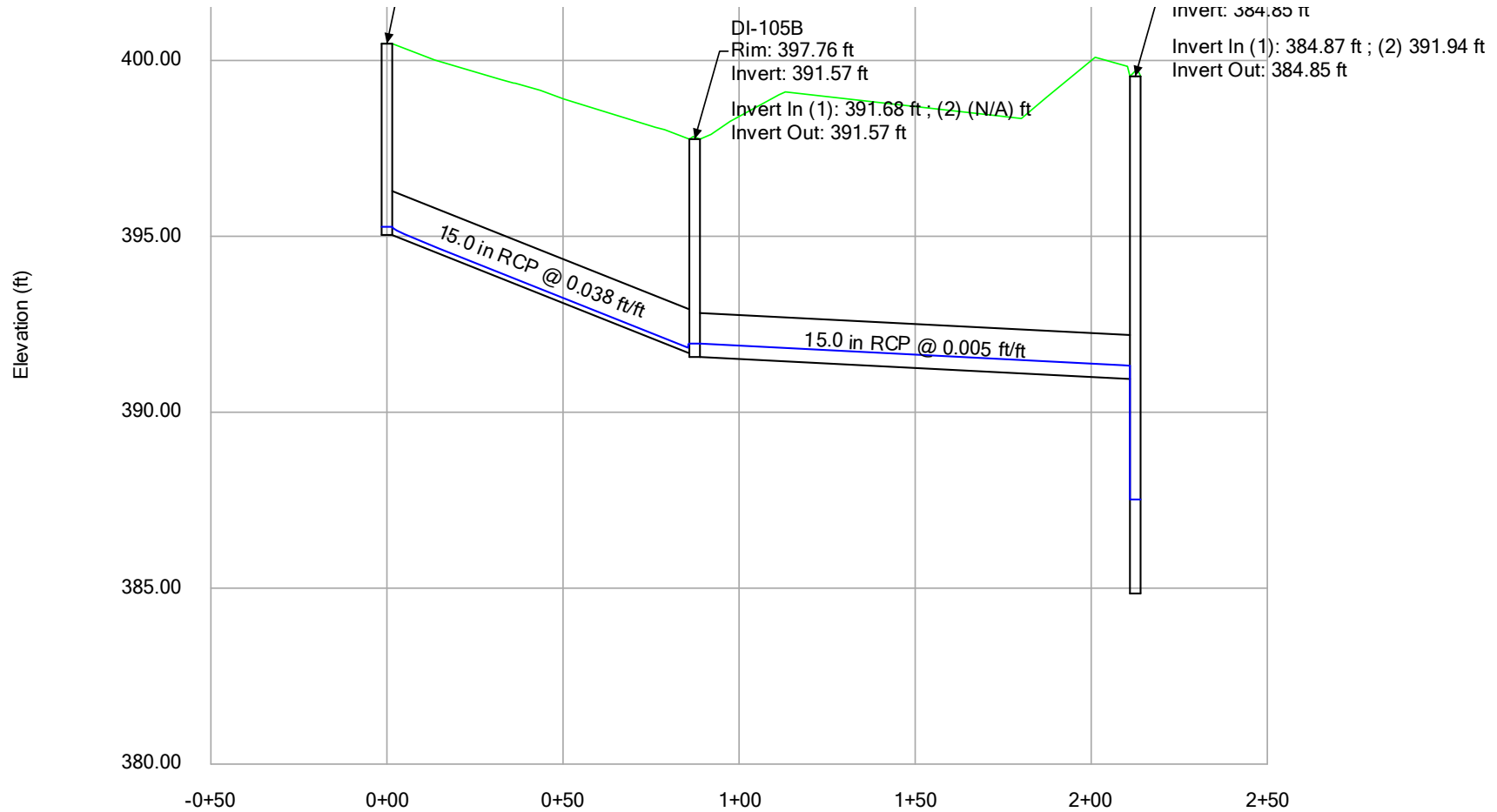


25-YEAR ANALYSIS

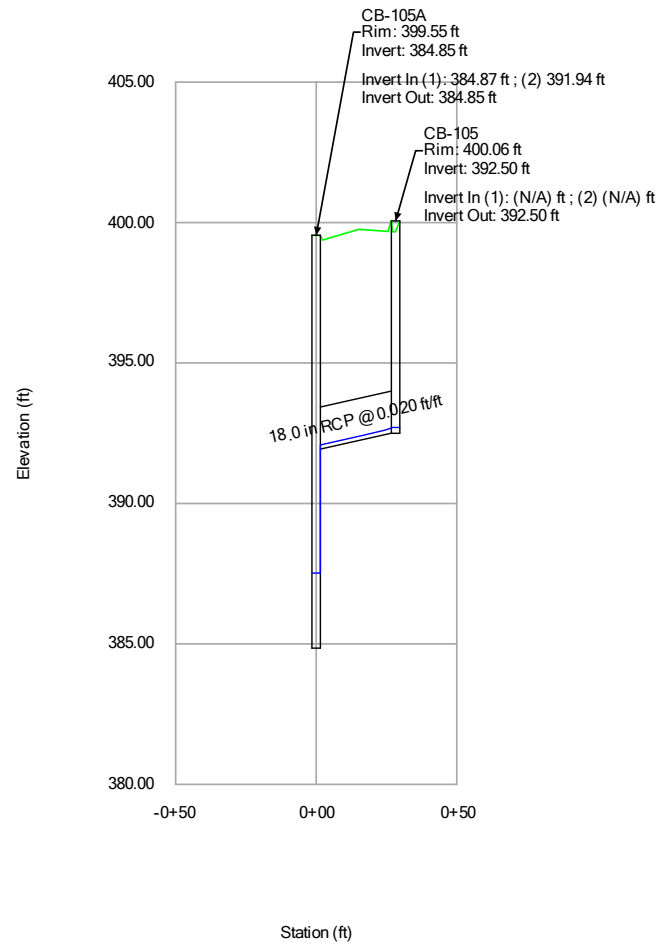


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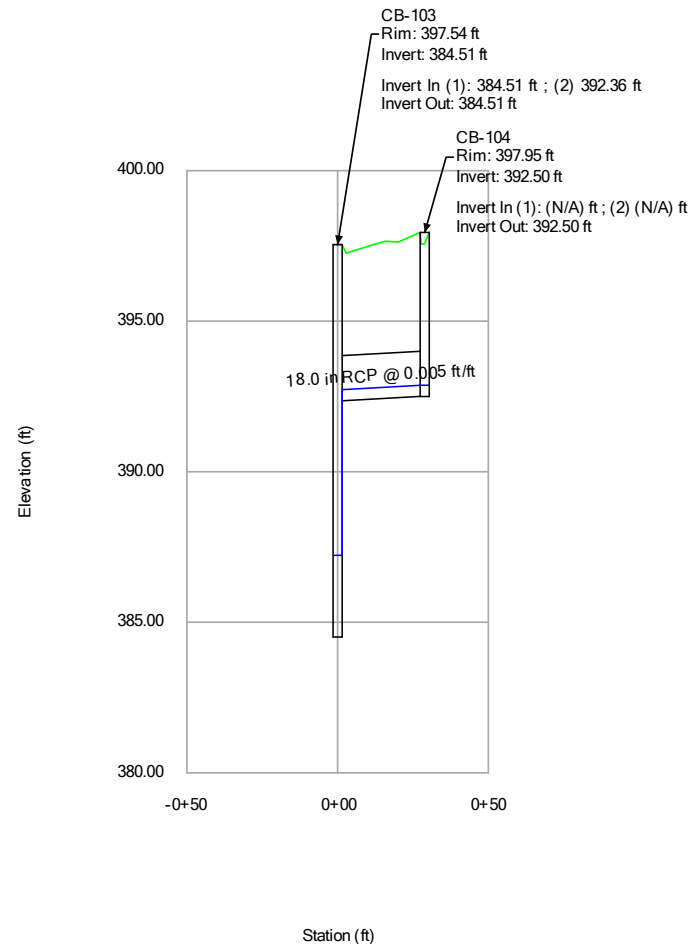
25-YEAR ANALYSIS



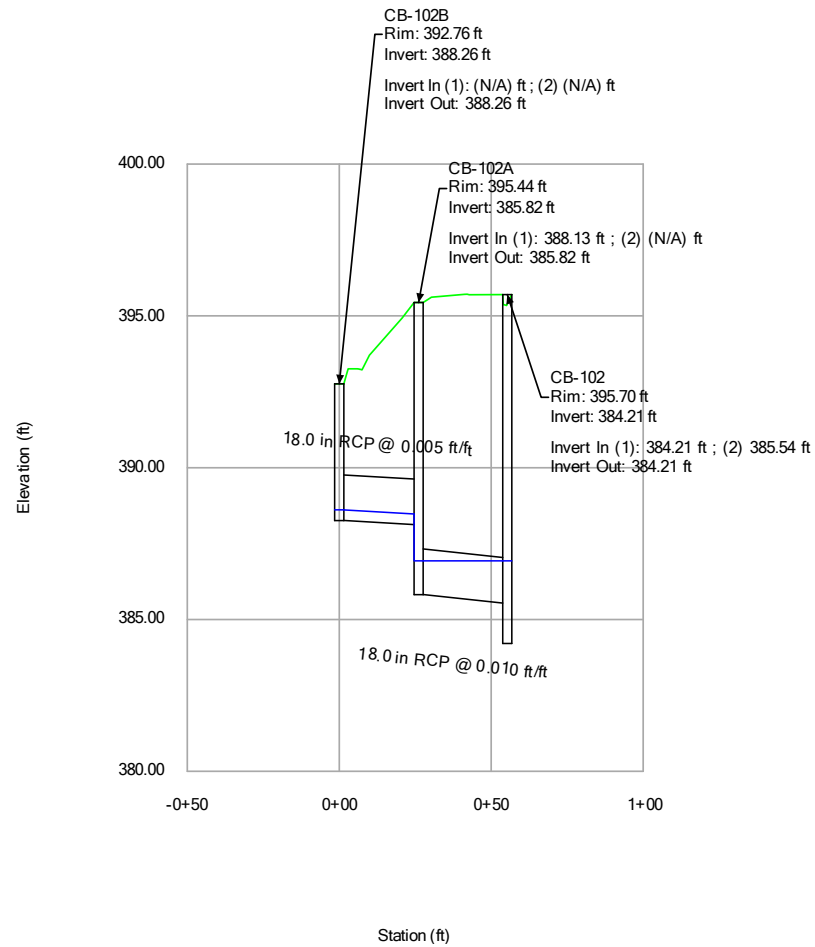
25-YEAR ANALYSIS



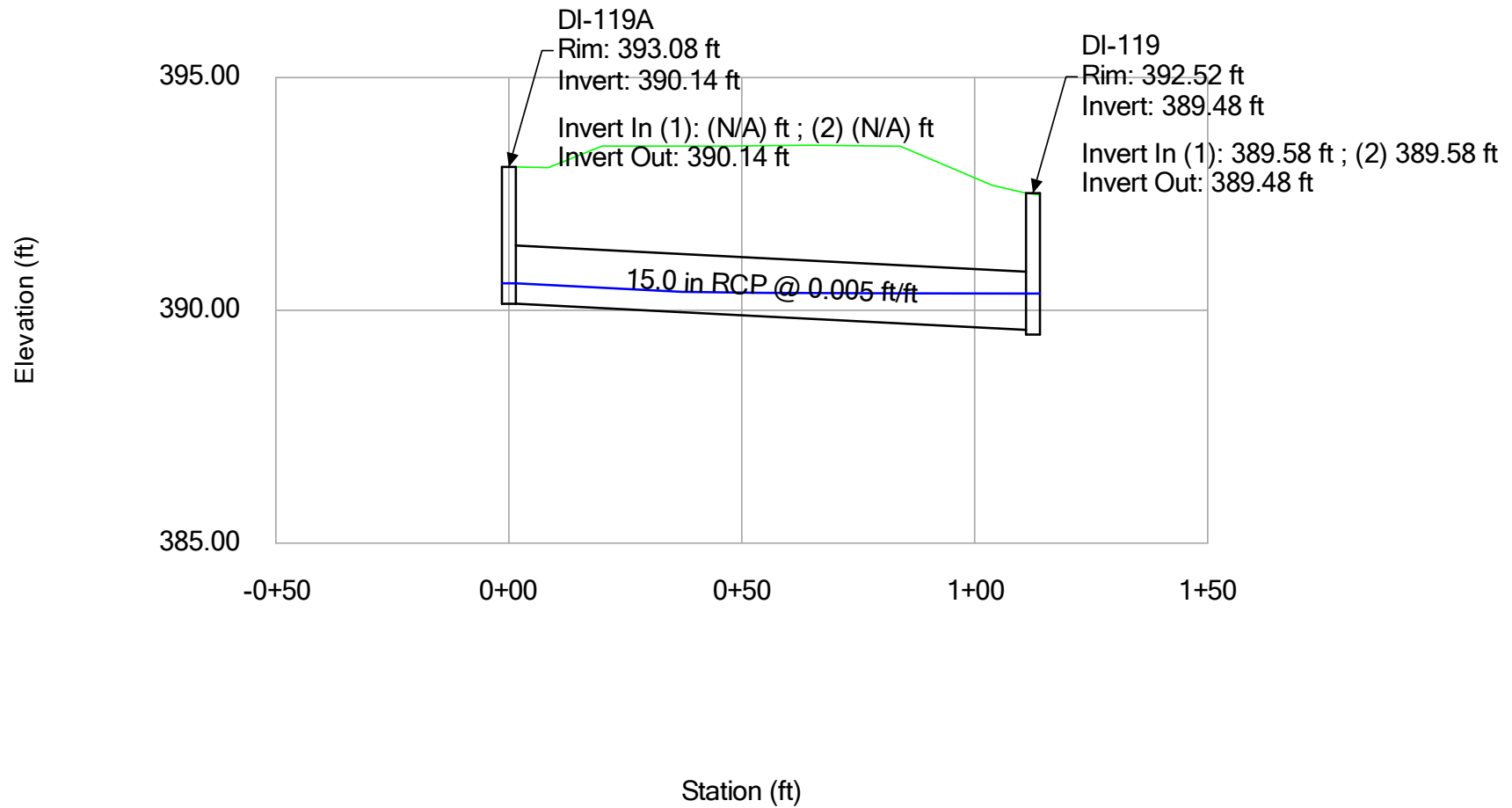
25-YEAR ANALYSIS



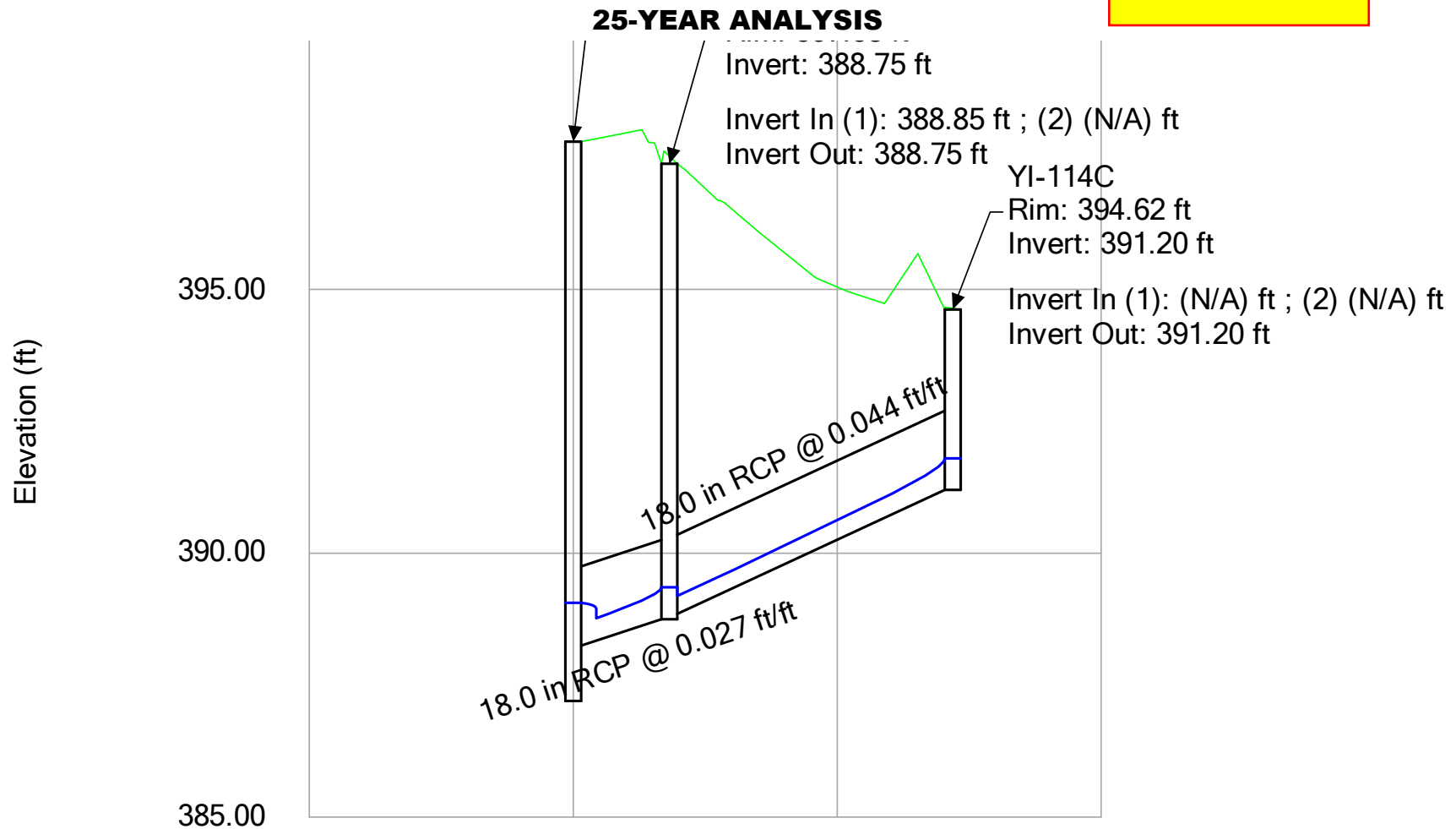
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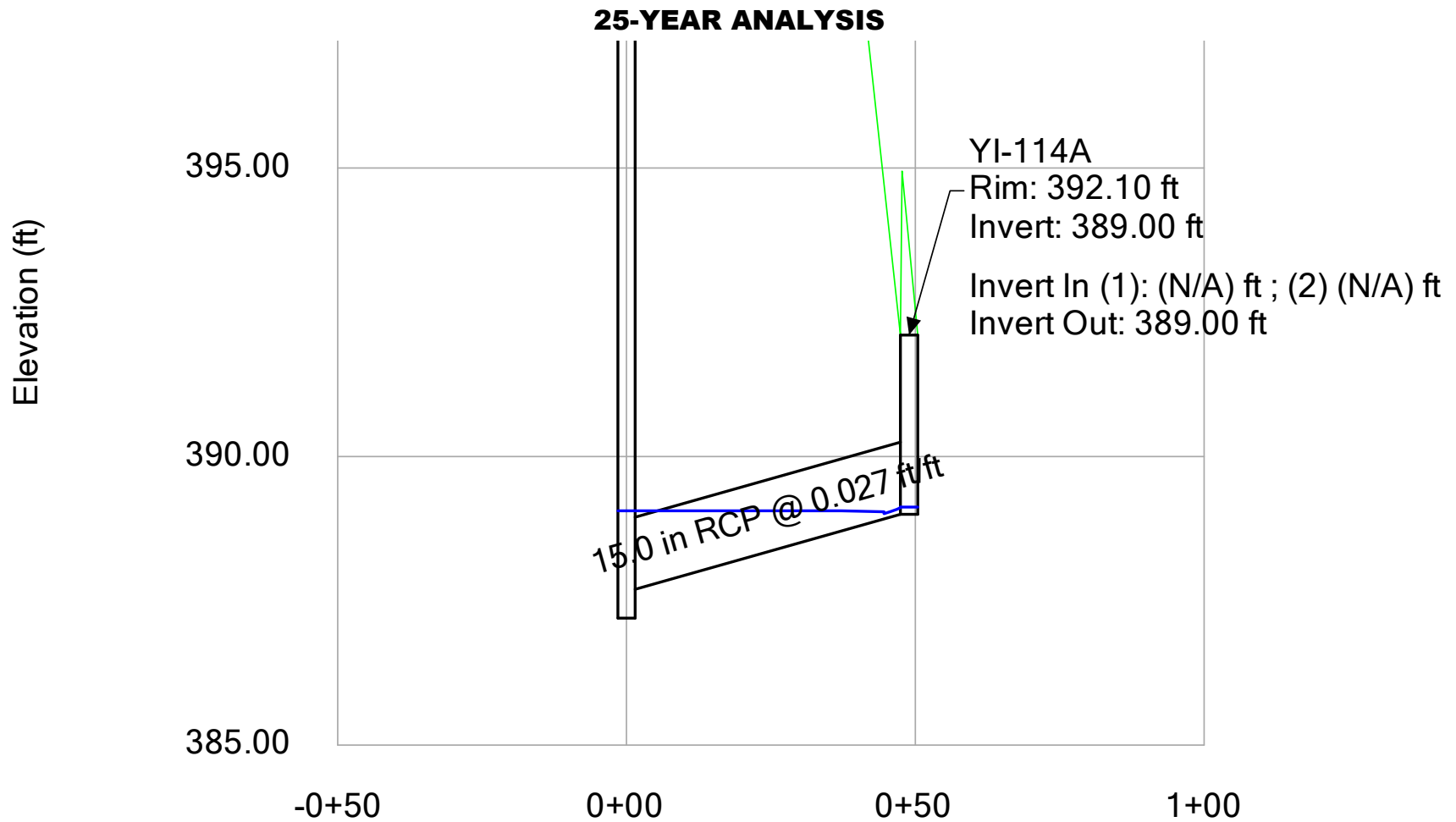
25-YEAR ANALYSIS



#99- Text cut off



#99- Profile cut off



SCM 1 – INLET SPREAD

#100- Where was
this value obtained?
Per NOAA estimates
the 5min 2yr storm is
~5.62 in/hr (applies to
all inlet spread calcs)

4IN/HR

Head - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)	Spread / Top Width (ft)	Depth (Gutter) (in)
CB-109A	0.030	0.026	0.11	0.00	0.11	1.6	0.8
CB-109	0.012	0.010	0.04	0.00	3.45	1.2	0.6
CB-127A	0.161	0.128	0.51	0.01	0.51	3.4	1.4
CB-110	0.122	0.106	0.43	0.00	3.30	3.0	1.3
CB-110A	0.090	0.078	0.32	0.00	1.27	2.5	1.2
CB-111	0.045	0.039	0.16	0.00	1.60	1.9	0.9
CB-110B	0.238	0.197	0.79	0.04	0.95	4.5	1.7
DI-110C	0.067	0.040	0.16	0.00	0.16	1.9	0.9
CB-111A	0.075	0.065	0.26	0.00	0.26	2.3	1.1
CB-108	0.103	0.089	0.36	0.00	3.81	2.7	1.2
CB-112	0.380	0.294	1.18	0.15	1.18	5.7	2.0
CB-108A	0.243	0.201	0.81	0.04	15.64	4.6	1.7
DI-127	0.057	0.050	0.20	0.00	0.71	2.1	1.0
DI-105C	0.075	0.045	0.18	0.00	0.18	2.0	1.0
CB-113	0.009	0.008	0.03	0.00	11.02	1.1	0.5
CB-105	0.040	0.035	0.14	0.00	0.14	1.8	0.9
CB-105A	0.196	0.175	0.71	0.03	16.96	4.2	1.6
DI-126	0.053	0.046	0.18	0.00	0.90	2.0	1.0
CB-116A	0.022	0.019	0.08	0.00	0.16	1.4	0.7
CB-116B	0.023	0.020	0.08	0.00	0.08	1.5	0.7
DI-125	0.211	0.177	0.71	0.03	1.61	4.2	1.6
CB-104	0.153	0.132	0.53	0.01	0.53	3.5	1.4
CB-114	0.368	0.286	1.15	0.14	10.99	5.6	2.0
CB-116	0.001	0.001	0.00	0.00	3.72	0.4	0.2
DI-105B	0.119	0.071	0.29	0.00	0.47	2.4	1.1
CB-103	0.106	0.098	0.40	0.00	17.88	2.9	1.3
YI-114B	0.011	0.009	0.04	0.00	1.49	1.1	0.5
CB-122	0.073	0.063	0.26	0.00	7.29	2.3	1.1
DI-124	0.183	0.161	0.65	0.02	2.26	4.0	1.6
CB-115	0.272	0.249	1.00	0.09	8.29	5.2	1.8
CB-102	0.214	0.179	0.72	0.03	19.87	4.3	1.6

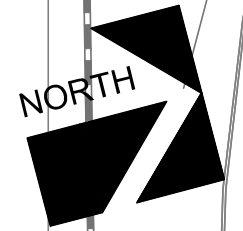
4IN/HR

Inlet Spread - Time: 0.00 hours

#101- Spread of
water should not
exceed one half of a
lane width

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)	Spread / Top Width (ft)	Depth (Gutter) (in)
DI-123	0.322	0.259	1.05	0.10	3.31	5.3	1.9
CB-102A	0.238	0.198	0.80	0.04	1.27	4.5	1.7
YI-114C	0.490	0.361	1.46	0.26	1.46	6.5	2.1
DI-117	0.054	0.047	0.19	0.00	3.57	2.0	1.0
CB-101A	0.384	0.301	1.21	0.16	23.05	5.8	2.0
DI-121	0.068	0.059	0.24	0.00	0.24	2.2	1.1
DI-120	0.030	0.026	0.11	0.00	0.35	1.6	0.8
CB-101	0.207	0.183	0.74	0.03	23.79	4.3	1.6
DI-119A	0.280	0.163	0.66	0.02	0.66	4.0	1.6
DI-101C	0.565	0.300	1.21	0.16	1.21	5.8	2.0
DI-118	0.162	0.139	0.56	0.01	3.38	3.6	1.5
DI-101B	0.325	0.187	0.75	0.03	1.96	4.4	1.6
CB-102B	0.134	0.116	0.47	0.00	0.47	3.2	1.4
DI-119	0.644	0.450	1.81	0.45	2.82	7.3	2.4
YI-114A	0.015	0.013	0.05	0.00	0.05	1.3	0.6

ATTACHMENT 2: DRAINAGE AREA MAPS – SCM 2



#31- Repeat comment: Please provide existing contours so drainage areas extending outside of the disturbed area can be verified. Contour labels should be added to both existing and proposed contours.

#94- Response to comment #164 refers to a separate grading plan to be completed, what is this in reference to? We are not aware of an additional grading plan.

#95- As these are the construction drawings, it is expected that the drainage areas take into account the drainage that is to occur on site. While final building footprints may not be known, reasonable assumptions as to where roof drainage and any additional line grading may go can be reflected in the drainage areas. The current drainage areas shown do not reflect what we expect the final drainage to look like and should be updated so all storm pipes and structures are properly sized.

Once areas are updated to match contours and/or reasonably expected future design a full review can be completed.

#95- There is a large area here draining towards the property that is not being taken into account in drainage areas.

#95- Show drainage area

#102- Fix contours/wall to match grading plan

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SCM 2 DRAINAGE MAP

DATE: 7/27/2023
SCALE: 1" = 50'

SCM 2 – 10 YR STORM

10-YEAR ANALYSIS

CATCHMENTS - Time: 0.00 hours

Outflow Element	Scaled Area (acres)	Flow (Total Out) (cfs)	Time of Concentration (hours)	Runoff Coefficient (Rational)
DI-201B	0.001	0.00	0.083	0.810
CB-237	0.053	0.31	0.083	0.810
DI-221B	0.027	0.16	0.083	0.810
CB-201A	0.527	3.10	0.083	0.810
CB-203A	0.250	1.47	0.083	0.810
CB-202A	0.263	1.54	0.083	0.810
CB-202	0.180	1.06	0.083	0.810
CB-203	0.160	0.94	0.083	0.810
CB-201	0.330	1.94	0.083	0.810
CB-204	0.049	0.29	0.083	0.810
CB-205	0.070	0.41	0.083	0.810
CB-206	0.077	0.45	0.083	0.810
CB-204A	0.388	2.28	0.083	0.810
CB-242B	0.168	0.99	0.083	0.810
DCB-242A	0.419	2.46	0.083	0.810
CB-206A	0.129	0.75	0.083	0.810
CB-224	0.146	0.86	0.083	0.810
CB-217A	0.290	1.70	0.083	0.810
CB-213	0.293	1.72	0.083	0.810
CB-236	0.010	0.06	0.083	0.810
CB-214A	0.271	1.59	0.083	0.810
CB-229	0.341	2.00	0.083	0.810
CB-232A	0.000	0.00	0.083	0.810
CB-232	0.143	0.84	0.083	0.810
CB-234	0.198	1.17	0.083	0.810
CB-231	0.117	0.69	0.083	0.810
CB-230	0.168	0.99	0.083	0.810
CB-230A	0.156	0.92	0.083	0.810
CB-241A	0.142	0.83	0.083	0.810
CB-241	0.276	1.62	0.083	0.810
CB-239	0.432	2.54	0.083	0.810

#97- For most accurate results, runoff coefficients should be determined for each structure (and therefore be different for each of these drainage areas). See City of Raleigh Stormwater Management Design Manual for more information on how to get the composite runoff coefficient

#103- Ensure all structures are included. The storm tables show DI-200A, however it is not on this list

10-YEAR ANALYSIS

CATCHMENTS - Time: 0.00 hours

Outflow Element	Scaled Area (acres)	Flow (Total Out) (cfs)	Time of Concentration (hours)	Runoff Coefficient (Rational)
CB-238	0.172	1.01	0.083	0.810
CB-238A	0.511	3.00	0.083	0.810
CB-208	0.026	0.16	0.083	0.810
CB-209	0.255	1.50	0.083	0.810
DI-209A	0.185	1.09	0.083	0.810
DI-209B	0.229	1.34	0.083	0.810
DI-209C	0.265	1.56	0.083	0.810
CB-210	0.134	0.79	0.083	0.810
CB-211	0.217	1.28	0.083	0.810
CB-214	0.140	0.82	0.083	0.810
CB-217	0.143	0.84	0.083	0.810
CB-218	0.620	3.64	0.083	0.810
CB-218A	0.488	2.87	0.083	0.810
CB-219A	0.125	0.73	0.083	0.810
CB-220	0.103	0.60	0.083	0.810
CB-219	0.324	1.90	0.083	0.810
CB-220A	0.043	0.25	0.083	0.810
DI-242C	0.186	1.09	0.083	0.810
DI-242B	0.214	1.26	0.083	0.810
DI-242E	0.002	0.01	0.083	0.810
DI-217B	0.002	0.01	0.083	0.810
CB-223	0.199	1.17	0.083	0.810
DCB-242	0.451	2.65	0.083	0.810
CB-243	0.405	2.38	0.083	0.810
CB-243A	0.424	2.49	0.083	0.810
CB-244	0.128	0.75	0.083	0.810
CB-244A	0.168	0.99	0.083	0.810
DI-213C	0.028	0.17	0.083	0.810
DI-212B	0.146	0.86	0.083	0.810
DI-212A	0.247	1.45	0.083	0.810
CB-226	0.407	2.39	0.083	0.810

10-YEAR ANALYSIS

CATCHMENTS - Time: 0.00 hours

Outflow Element	Scaled Area (acres)	Flow (Total Out) (cfs)	Time of Concentration (hours)	Runoff Coefficient (Rational)
CB-227	0.038	0.23	0.083	0.810
CB-222	0.161	0.95	0.083	0.810
CB-221	0.206	1.21	0.083	0.810
CB-221A	0.152	0.89	0.083	0.810
CB-215	0.124	0.73	0.083	0.810
CB-216	0.178	1.04	0.083	0.810
CB-234A	0.295	1.73	0.083	0.810
CB-232B	0.252	1.48	0.083	0.810
DI-220B	0.083	0.49	0.083	0.810
DI-221E	0.026	0.15	0.083	0.810
DI-221D	0.110	0.64	0.083	0.810
DI-221C	0.193	1.13	0.083	0.810
DI-201G	0.087	0.38	0.083	0.600
DI-201F	0.175	0.76	0.083	0.600
DI-201E	0.165	0.72	0.083	0.600
DI-201D	0.324	1.41	0.083	0.600
DI-201C	0.118	0.51	0.083	0.600

10-YEAR ANALYSIS

Inlets - Time: 0.00 hours

Label	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Grate Length (ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)
DI-242C	1.00	0.09	1.00	91.7	398.87	398.87	3.0	2.92	2.92
CB-244	0.72	0.03	1.63	96.2	396.98	396.98	3.0	2.70	3.50
CB-244A	0.92	0.07	0.92	93.1	397.13	397.13	3.0	2.91	2.91
CB-241A	0.79	0.04	0.79	95.2	396.76	396.76	3.0	2.83	2.83
CB-241	1.39	0.23	2.17	85.7	396.75	396.75	3.0	1.40	3.83
DI-209C	1.34	0.21	1.34	86.4	394.56	394.56	3.0	3.30	3.30
CB-234A	1.47	0.27	1.47	84.6	394.18	394.18	3.0	3.39	3.39
CB-234	1.06	0.11	2.51	90.8	394.06	394.06	3.0	2.34	4.01
DI-242B	1.20	0.15	2.10	88.7	392.23	392.23	3.0	2.27	3.60
CB-227	0.23	0.00	0.23	100.0	392.79	392.79	3.0	2.02	2.02
CB-232A	0.27	0.00	1.56	100.0	393.26	393.26	3.0	3.79	3.18
DI-221E	0.15	0.00	0.15	100.0	392.69	392.69	3.0	1.82	1.82
CB-232	0.89	0.06	4.90	93.6	393.30	393.30	3.0	1.75	4.73
CB-239	2.12	0.65	4.18	76.4	392.90	392.90	3.0	5.98	4.48
DI-209B	1.34	0.21	2.66	86.4	392.50	392.50	3.0	2.56	4.09
CB-232B	1.29	0.19	1.29	87.2	393.49	393.49	3.0	3.26	3.26
CB-238A	2.27	0.77	2.27	74.8	391.91	391.91	3.0	3.01	3.01
CB-238	1.42	0.24	7.72	85.3	391.88	391.88	3.0	2.64	5.69
DI-242E	0.01	0.00	0.01	100.0	392.23	392.23	3.0	0.05	0.05
CB-243	1.90	0.51	5.41	78.9	389.82	389.82	3.0	3.72	4.46
CB-237	0.31	0.00	7.99	100.0	388.80	388.80	3.0	8.69	5.78
CB-236	0.06	0.00	19.96	100.0	388.25	388.25	3.0	6.79	7.39
CB-243A	1.99	0.57	1.99	77.9	390.83	390.83	3.0	3.60	3.60
DI-213C	0.17	0.00	0.17	100.0	390.91	390.91	3.0	1.86	1.86
CB-231	0.72	0.03	5.57	96.3	390.77	390.77	3.0	9.05	4.96
CB-224	0.81	0.04	0.81	94.8	391.40	391.40	3.0	2.85	2.85
DCB-242	2.34	0.82	12.46	74.1	389.49	389.49	3.0	2.83	5.93
DCB-242A	2.32	0.81	5.18	74.2	390.23	390.23	3.0	3.30	4.83
CB-208	0.16	0.00	0.16	100.0	387.69	387.69	3.0	1.78	1.78
DI-209A	1.16	0.14	3.77	89.2	389.27	389.27	3.0	3.86	4.65

10-YEAR ANALYSIS

Inlets - Time: 0.00 hours

Label	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Grate Length (ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)
CB-242B	1.04	0.10	3.05	91.2	390.41	390.41	3.0	3.46	4.04
CB-226	1.89	0.50	3.88	79.1	388.49	388.49	3.0	3.68	4.37
CB-223	1.06	0.11	1.87	90.8	388.64	388.64	3.0	2.08	3.65
CB-206A	0.73	0.03	20.51	96.2	387.16	387.16	3.0	8.96	7.50
DI-221D	0.63	0.02	0.76	97.6	388.32	388.32	3.0	0.92	2.80
CB-206	0.45	0.00	20.86	99.6	386.98	386.98	3.0	6.65	6.76
CB-209	1.30	0.19	5.17	87.0	386.21	386.21	3.0	0.16	4.39
CB-220A	0.25	0.00	0.72	100.0	379.24	379.24	3.0	2.47	2.71
CB-220	0.59	0.01	1.29	98.1	379.12	379.12	3.0	2.46	3.20
CB-230A	0.86	0.05	0.86	94.0	387.38	387.38	3.0	2.90	2.90
CB-230	0.94	0.07	7.30	92.7	387.42	387.42	3.0	0.78	5.54
DI-212B	0.81	0.04	0.96	94.8	387.37	387.37	3.0	0.52	2.99
CB-210	0.91	0.07	14.85	93.2	385.67	385.67	3.0	2.22	6.38
CB-222	1.27	0.18	5.09	87.6	386.36	386.36	3.0	3.66	4.80
CB-229	1.64	0.36	8.87	82.2	386.21	386.21	3.0	8.77	5.23
CB-205	0.41	0.00	21.04	99.8	386.18	386.18	3.0	7.55	7.62
CB-211	1.19	0.15	15.92	88.7	383.74	383.74	3.0	10.34	6.58
DI-221C	1.03	0.10	1.74	91.2	385.66	385.66	3.0	2.11	3.56
CB-221A	0.99	0.09	8.79	92.0	380.84	380.84	3.0	2.24	6.06
CB-221	1.17	0.14	1.17	89.1	384.99	384.99	3.0	3.17	3.17
CB-204	0.29	0.00	22.91	100.0	384.16	384.16	3.0	13.21	8.03
DI-212A	1.30	0.19	2.23	87.1	384.13	384.13	3.0	1.67	3.86
CB-204A	1.82	0.46	1.82	79.9	384.35	384.35	3.0	3.62	3.62
CB-219	1.59	0.33	3.42	82.9	378.67	378.67	3.0	1.99	4.48
CB-219A	0.71	0.03	0.71	96.5	383.59	383.59	3.0	2.58	2.58
CB-214A	1.37	0.22	3.56	86.1	381.50	381.50	3.0	2.85	4.54
DI-201G	0.38	0.00	0.38	99.9	381.73	381.73	3.0	2.25	2.25
CB-213	1.56	0.31	17.27	83.4	380.90	380.90	3.0	6.31	6.84
CB-215	0.82	0.05	5.24	94.6	376.24	376.24	3.0	5.78	2.54
CB-216	1.03	0.10	14.70	91.3	376.23	376.23	3.0	2.27	5.88

10-YEAR ANALYSIS

Inlets - Time: 0.00 hours

Label	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Grate Length (ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)
CB-214	0.96	0.08	4.47	92.4	380.38	380.38	3.0	4.22	4.58
CB-203A	1.28	0.19	1.28	87.3	382.39	382.39	3.0	3.25	3.25
CB-203	0.88	0.06	24.74	93.7	380.36	380.36	3.0	7.84	8.47
DI-220B	0.48	0.00	0.48	99.3	381.67	381.67	3.0	2.42	2.42
CB-217A	1.65	0.36	41.47	82.1	375.44	375.44	3.0	5.42	9.20
CB-217	0.86	0.06	23.45	94.0	375.51	375.51	3.0	2.79	5.55
CB-218A	2.39	0.86	2.39	73.5	375.51	375.51	3.0	1.41	1.41
CB-218	2.80	1.22	8.14	69.7	375.52	375.52	3.0	1.04	3.29
DI-221B	0.16	0.00	1.88	100.0	381.02	381.02	3.0	8.79	3.49
CB-202A	1.33	0.21	1.33	86.5	379.96	379.96	3.0	3.29	3.29
CB-202	0.98	0.08	26.71	92.2	376.97	376.97	3.0	14.09	8.96
CB-201A	2.30	0.79	5.38	74.4	359.79	359.79	3.0	3.53	4.90
DI-201F	0.73	0.03	1.09	96.1	375.79	375.79	3.0	1.58	2.99
CB-201	1.60	0.33	33.28	82.7	359.06	359.06	3.0	7.69	8.05
CB-200A	0.00	0.00	33.17	100.0	355.19	355.19	3.0	15.38	8.03
DI-201B	0.00	0.00	3.35	100.0	360.85	360.85	3.0	4.77	4.16
DI-201E	0.72	0.03	1.78	96.3	370.90	370.90	3.0	2.87	3.43
DI-217B	0.01	0.00	41.27	100.0	357.16	357.16	3.0	20.83	9.17
DI-201C	0.51	0.00	3.37	99.1	361.42	361.42	3.0	4.00	4.17
DI-201D	1.26	0.18	2.96	87.7	362.06	362.06	3.0	2.97	3.96
DI-200A	0.00	0.00	33.13	100.0	353.96	353.96	3.0	12.45	8.03

10-YEAR ANALYSIS **Conduit Results - Time: 0.00 hours**

Label	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
DI-242B TO DI-242C	18.0	0.030	2.92	2.27	1.00	18.13	398.87	392.23
CB-244 TO CB-244A	15.0	0.005	2.91	2.70	0.92	4.57	397.13	396.98
CB-243 TO CB-244	15.0	0.035	3.50	6.84	1.63	12.01	396.98	391.21
CB-241 TO CB-241A	15.0	0.008	2.83	1.40	0.79	5.77	396.76	396.75
CB-239 TO CB-241	15.0	0.019	3.83	5.98	2.17	8.89	396.75	392.79
DI-209B TO DI-209C	15.0	0.021	3.30	2.56	1.34	9.47	394.56	392.50
CB-234 TO CB-234A	15.0	0.008	3.39	2.34	1.47	5.90	394.18	394.06
CB-232 TO CB-234	15.0	0.010	4.01	3.79	2.51	6.43	394.06	393.30
DI-242B TO DI-242E	18.0	0.004	0.05	0.02	0.01	6.44	392.23	392.23
CB-242B TO DI-242B	18.0	0.018	3.60	3.46	2.10	13.97	392.23	390.41
CB-226 TO CB-227	15.0	0.033	2.02	0.29	0.23	11.77	392.79	388.49
CB-232A TO CB-232B	15.0	0.008	3.26	3.79	1.29	5.78	393.49	393.23
CB-232 TO CB-232A	15.0	0.008	3.18	1.75	1.56	5.84	393.26	393.30
DI-221D TO DI-221E	15.0	0.032	1.82	0.92	0.15	11.51	392.69	388.32
CB-231 TO CB-232	18.0	0.033	4.73	9.05	4.90	19.10	393.30	390.48
CB-238 TO CB-239	18.0	0.020	4.48	3.08	4.18	14.75	392.90	391.88
DI-209A TO DI-209B	15.0	0.035	4.09	3.86	2.66	12.06	392.50	389.27
CB-238 TO CB-238A	15.0	0.004	3.01	2.64	2.27	4.33	391.91	391.88
CB-237 TO CB-238	18.0	0.025	5.69	8.69	7.72	16.74	391.88	390.55
CB-243 TO CB-243A	15.0	0.005	3.60	3.72	1.99	4.57	390.83	390.63
DCB-242 TO CB-243	24.0	0.007	4.46	2.83	5.41	18.79	389.82	389.49
CB-236 TO CB-237	18.0	0.011	5.78	6.79	7.99	11.23	388.80	388.25
CB-206A TO CB-236	24.0	0.013	7.39	8.96	19.96	26.02	388.25	387.07
CB-236 TO DCB-242	24.0	0.011	5.93	4.92	12.46	24.15	389.49	388.25
DI-212B TO DI-213C	15.0	0.042	1.86	0.52	0.17	13.31	390.91	387.37
CB-230 TO CB-231	18.0	0.041	4.96	4.74	5.57	21.32	390.77	387.42
CB-223 TO CB-224	15.0	0.114	2.85	2.08	0.81	21.83	391.40	388.64
DCB-242 TO DCB-242A	18.0	0.010	4.83	5.86	5.18	10.50	390.23	389.75
DCB-242A TO CB-242B	18.0	0.006	4.04	3.30	3.05	8.38	390.41	390.23
CB-209 TO CB-208	18.0	0.027	1.78	0.16	0.16	17.26	387.69	386.21

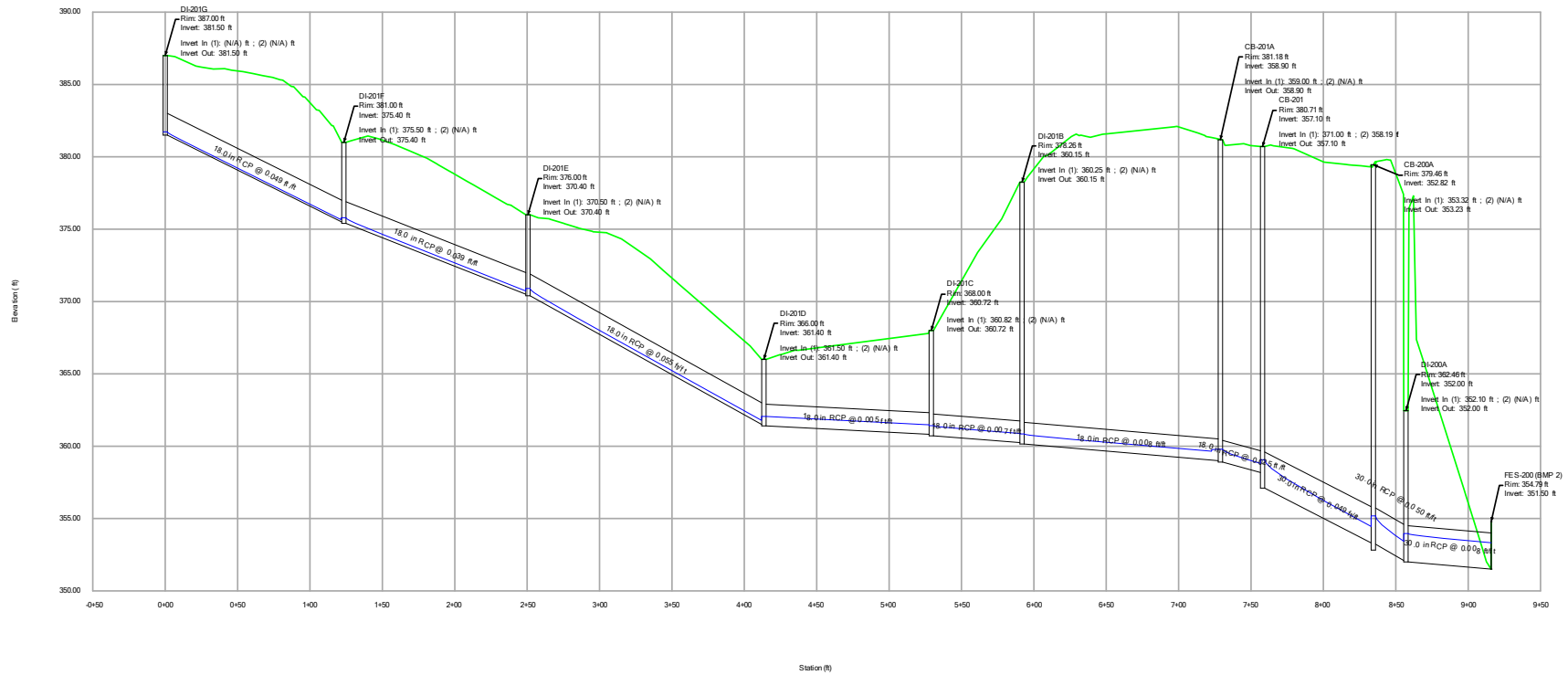
10-YEAR ANALYSIS **Conduit Results - Time: 0.00 hours**

Label	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
CB-209 TO DI-209A	15.0	0.026	4.65	7.81	3.77	10.42	389.27	387.18
CB-226 TO CB-223	15.0	0.006	3.65	3.68	1.87	4.81	388.64	388.49
CB-222 TO CB-226	18.0	0.030	4.37	3.66	3.88	18.32	388.49	386.36
CB-206 TO CB-206A	24.0	0.013	7.50	6.65	20.51	25.74	387.16	386.98
DI-221C TO DI-221D	15.0	0.024	2.80	2.11	0.76	10.00	388.32	385.66
CB-205 TO CB-206	24.0	0.006	6.76	7.55	20.86	18.21	386.98	386.18
CB-210 TO CB-209	24.0	0.018	4.39	2.22	5.17	30.62	386.21	385.67
CB-220 TO CB-220A	15.0	0.005	2.71	2.46	0.72	4.57	379.24	379.12
CB-220A TO DI-220B	15.0	0.005	2.42	2.47	0.48	4.57	381.67	381.27
CB-219 TO CB-220	15.0	0.005	3.20	1.99	1.29	4.57	379.12	378.67
CB-230 TO CB-230A	15.0	0.019	2.90	0.78	0.86	8.91	387.38	387.42
CB-229 TO CB-230	18.0	0.027	5.54	8.77	7.30	17.10	387.42	385.97
DI-212A TO DI-212B	15.0	0.050	2.99	1.67	0.96	14.46	387.37	384.13
CB-211 TO CB-210	24.0	0.024	6.38	10.34	14.85	35.14	385.67	383.33
CB-210 TO CB-229	24.0	0.009	5.23	6.33	8.87	21.40	386.21	385.77
CB-221A TO CB-222	18.0	0.035	4.80	9.33	5.09	19.63	386.36	383.59
CB-204 TO CB-205	24.0	0.057	7.62	13.21	21.04	53.86	386.18	383.57
CB-213 TO CB-211	24.0	0.022	6.58	6.31	15.92	33.18	383.74	380.90
DI-221B TO DI-221C	15.0	0.067	3.56	8.79	1.74	16.66	385.66	380.87
CB-221A TO CB-221	15.0	0.055	3.17	7.31	1.17	15.13	384.99	383.31
CB-216 TO CB-221A	18.0	0.009	6.06	6.44	8.79	10.10	380.84	379.95
CB-221A TO DI-221B	18.0	0.005	3.49	2.24	1.88	7.47	381.02	380.84
CB-204 TO CB-204A	15.0	0.010	3.62	2.78	1.82	6.46	384.35	384.16
CB-203 TO CB-204	24.0	0.045	8.03	7.84	22.91	47.96	384.16	380.36
CB-214A TO DI-212A	15.0	0.080	3.86	2.85	2.23	18.27	384.13	381.50
CB-218 TO CB-219	15.0	0.010	4.48	5.33	3.42	6.45	378.67	376.90
CB-219 TO CB-219A	15.0	0.004	2.58	2.74	0.71	4.29	383.59	383.46
CB-214 TO CB-214A	15.0	0.020	4.54	4.22	3.56	9.06	381.50	380.38
DI-201F TO DI-201G	18.0	0.049	2.25	1.58	0.38	23.16	381.73	375.79
CB-217A TO CB-213	24.0	0.023	6.84	10.79	17.27	34.05	380.90	377.81

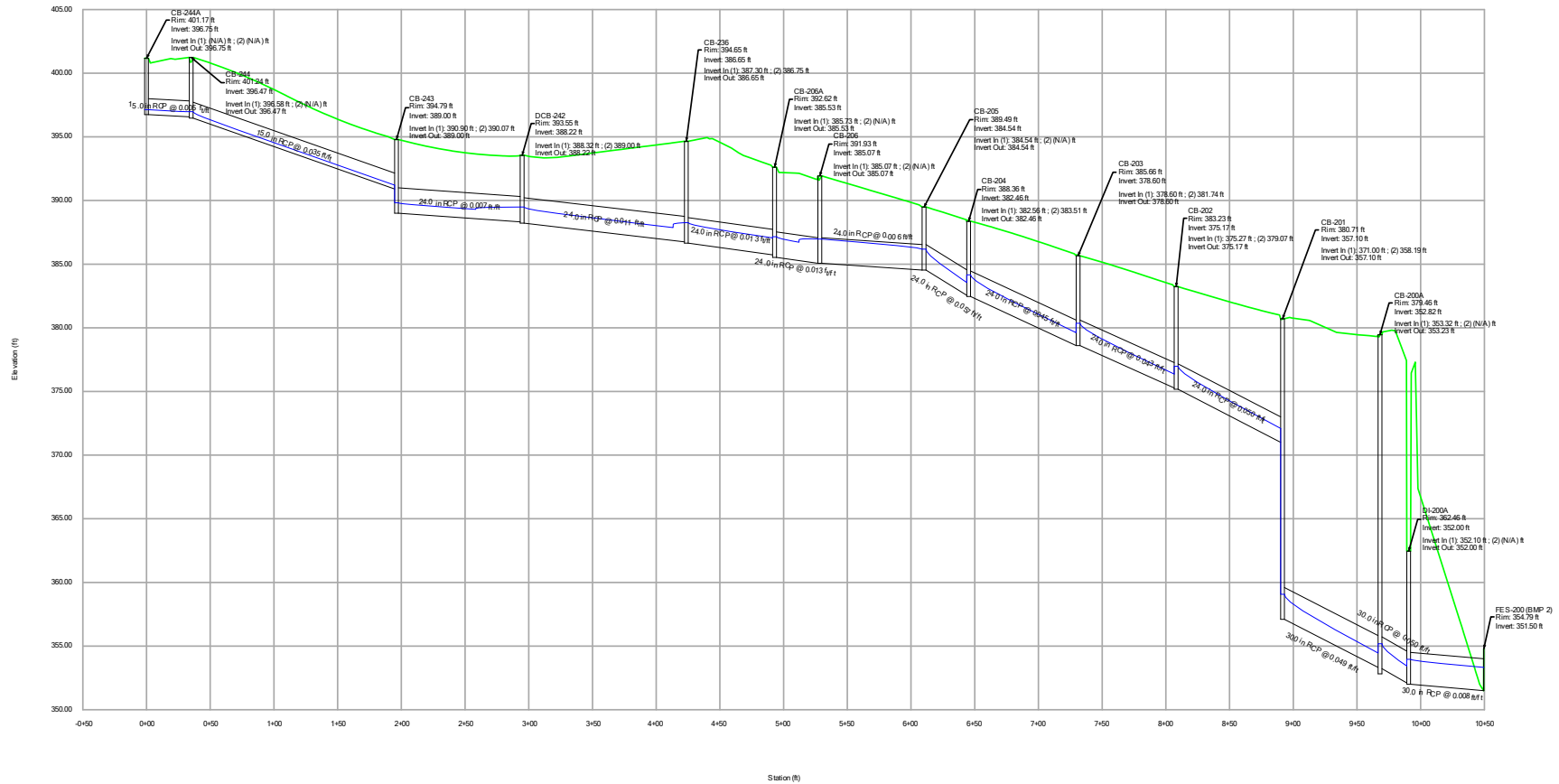
10-YEAR ANALYSIS **Conduit Results - Time: 0.00 hours**

Label	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
CB-215 TO CB-214	18.0	0.010	4.58	5.78	4.47	10.75	380.38	379.78
CB-216 TO CB-215	24.0	0.005	2.54	2.27	5.24	16.00	376.24	376.23
CB-217 TO CB-216	24.0	0.005	5.88	6.35	14.70	16.22	376.23	375.88
CB-203 TO CB-203A	15.0	0.007	3.25	3.65	1.28	5.49	382.39	382.15
CB-202 TO CB-203	24.0	0.043	8.47	14.09	24.74	47.05	380.36	376.36
CB-217A TO CB-217	30.0	0.010	5.55	5.42	23.45	41.05	375.51	375.44
DI-217B TO CB-217A	30.0	0.077	9.20	20.83	41.47	113.60	375.44	363.06
CB-217 TO CB-218	24.0	0.007	3.29	2.79	8.14	18.34	375.52	375.51
CB-218 TO CB-218A	24.0	0.011	1.41	1.04	2.39	23.86	375.51	375.52
CB-202 TO CB-202A	15.0	0.015	3.29	4.78	1.33	7.90	379.96	379.42
CB-201 TO CB-202	24.0	0.050	8.96	15.21	26.71	50.55	376.97	372.09
CB-201A TO DI-201B	18.0	0.008	4.16	3.53	3.35	9.62	360.85	359.79
CB-201 TO CB-201A	18.0	0.025	4.90	7.69	5.38	16.45	359.79	358.81
DI-201E TO DI-201F	18.0	0.039	2.99	2.87	1.09	20.62	375.79	370.90
CB-200A TO CB-201	30.0	0.049	8.05	15.38	33.28	91.15	359.06	354.45
DI-200A TO CB-200A	30.0	0.050	8.03	12.45	33.17	91.65	355.19	353.43
DI-201B TO DI-201C	18.0	0.007	4.17	4.77	3.37	9.10	361.42	360.88
DI-201D TO DI-201E	18.0	0.055	3.43	2.97	1.78	24.54	370.90	362.06
FES-250 TO DI-217B	30.0	0.038	9.17	15.09	41.27	80.13	357.16	352.86
DI-201C TO DI-201D	18.0	0.005	3.96	4.00	2.96	7.43	362.06	361.48
FES-200 TO DI-200A	30.0	0.008	8.03	8.64	33.13	37.78	353.96	353.32

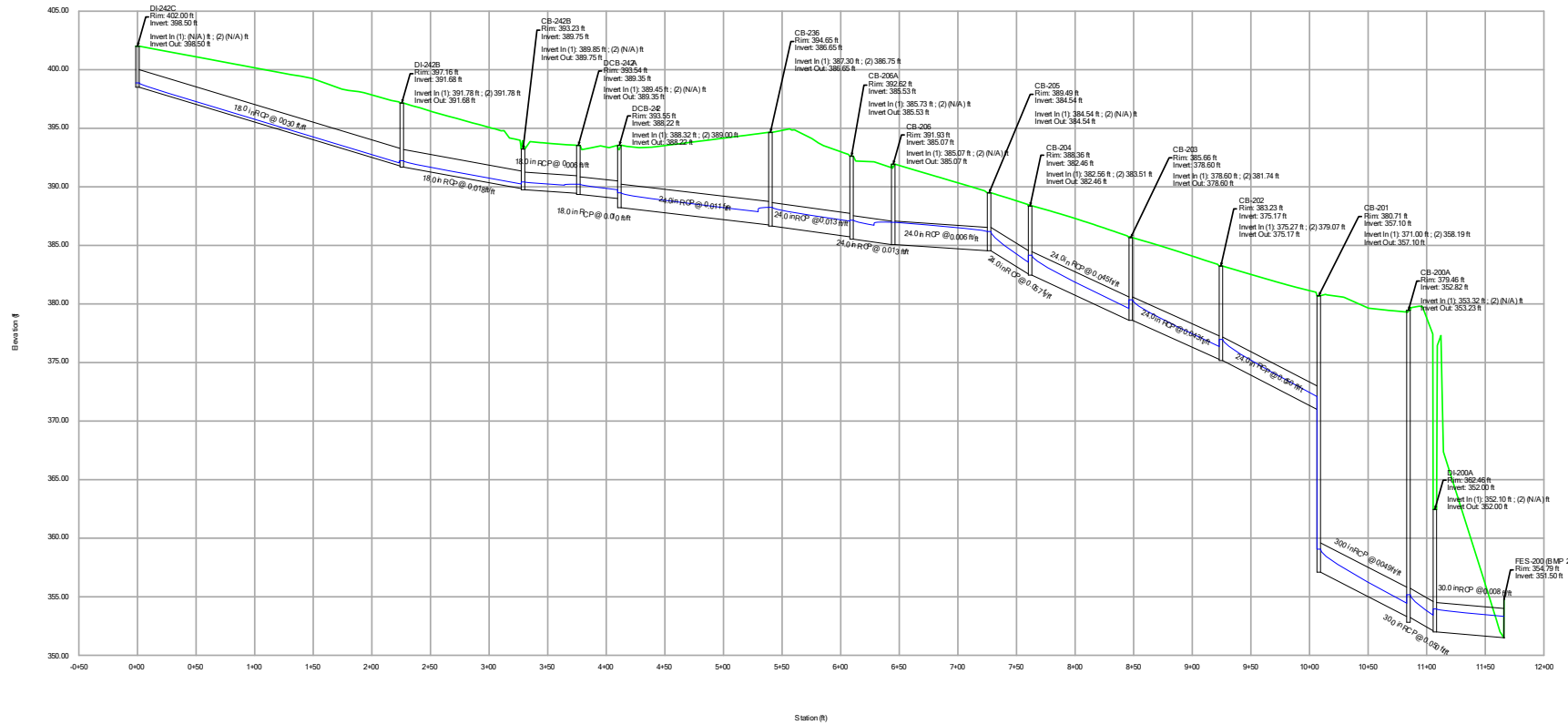
10-YEAR ANALYSIS



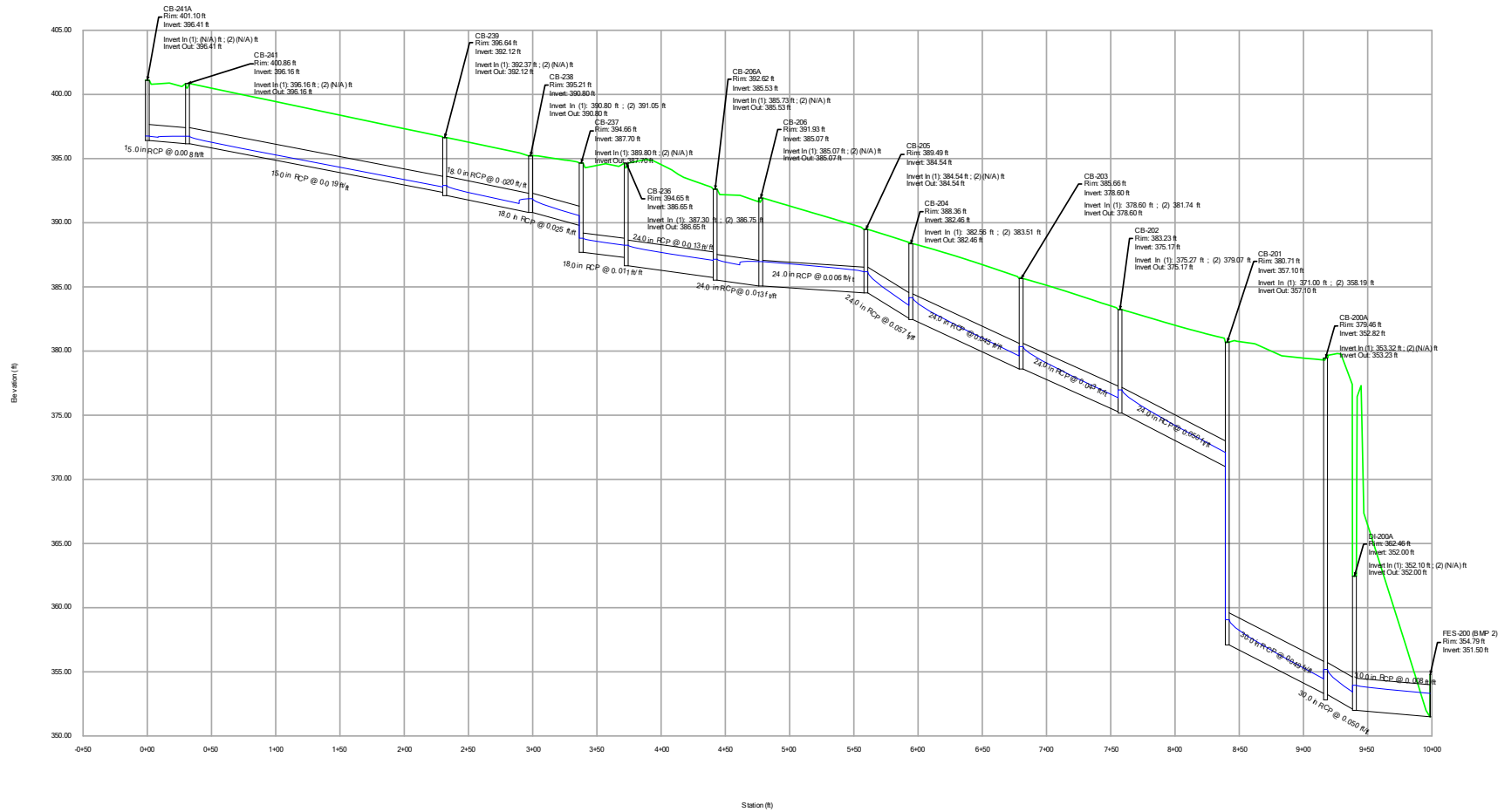
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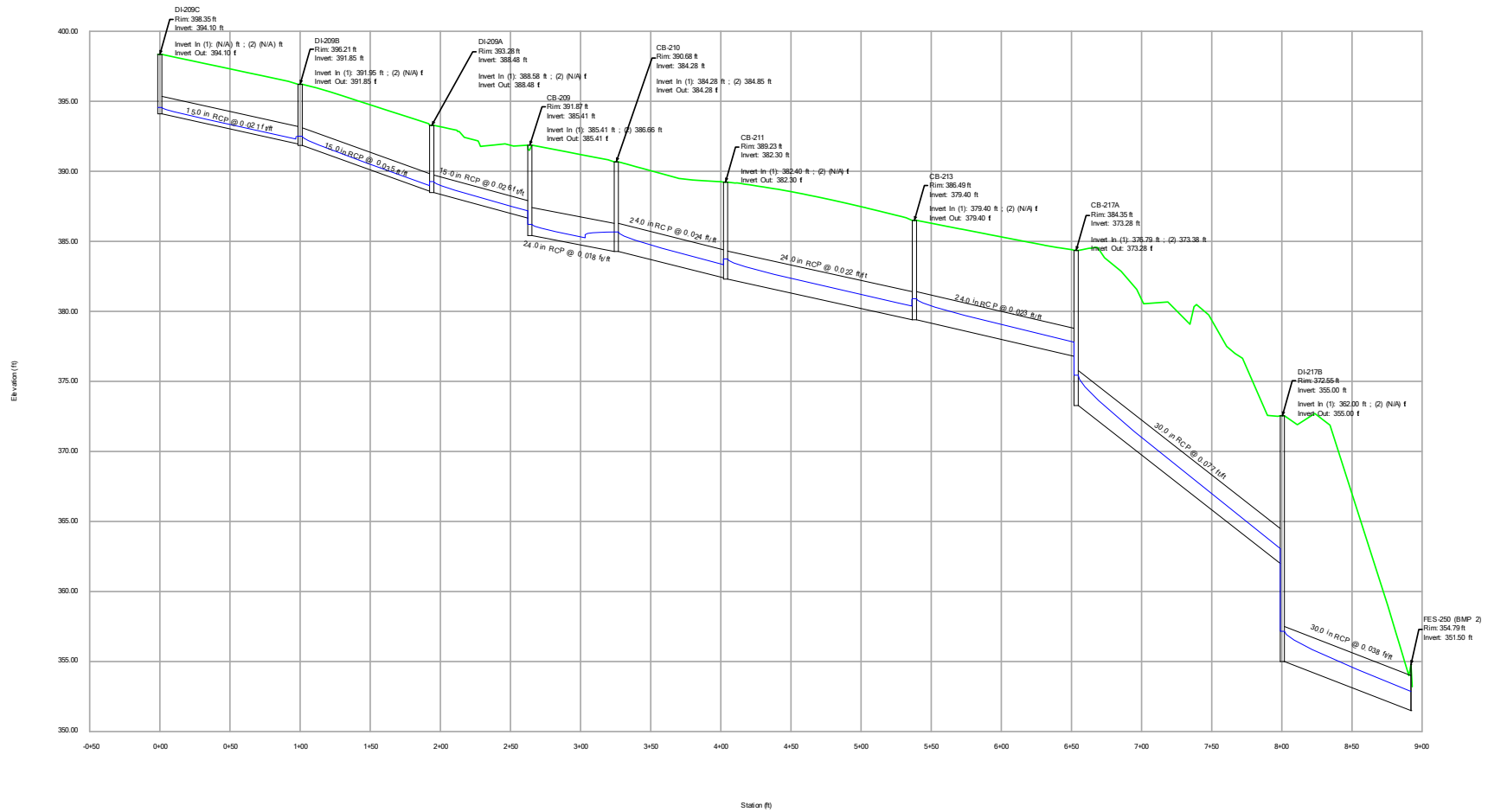
10-YEAR ANALYSIS



10-YEAR ANALYSIS

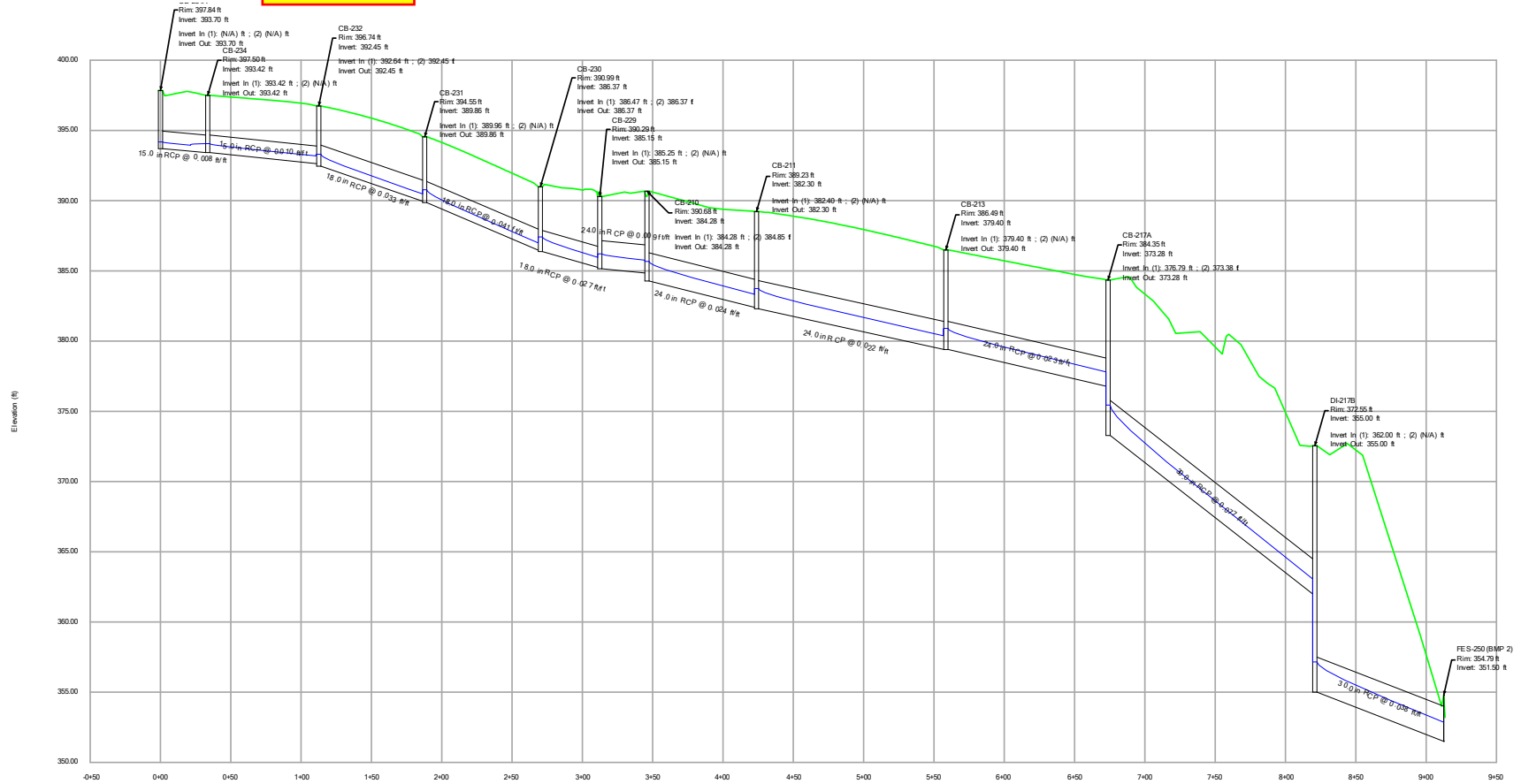


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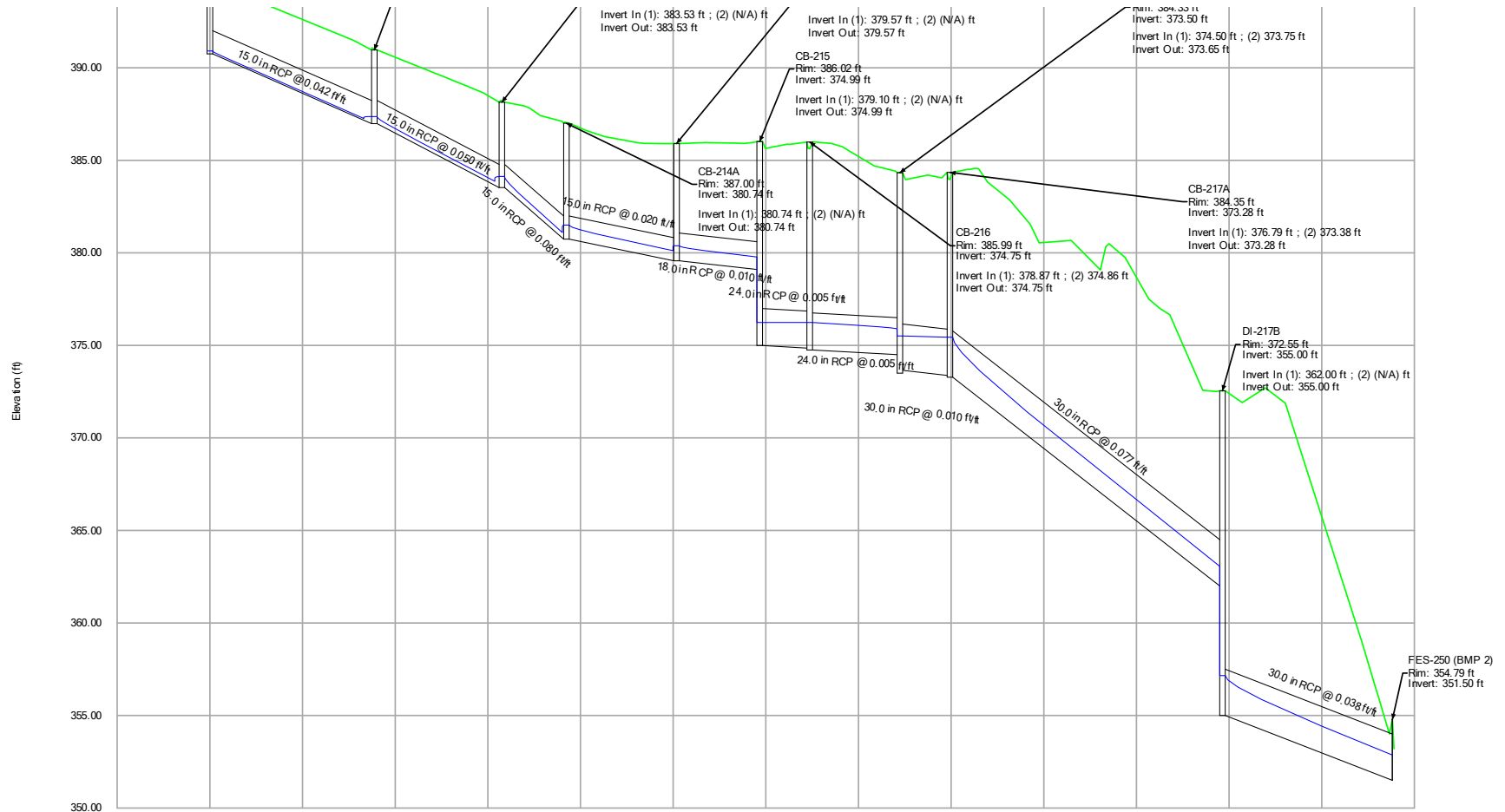


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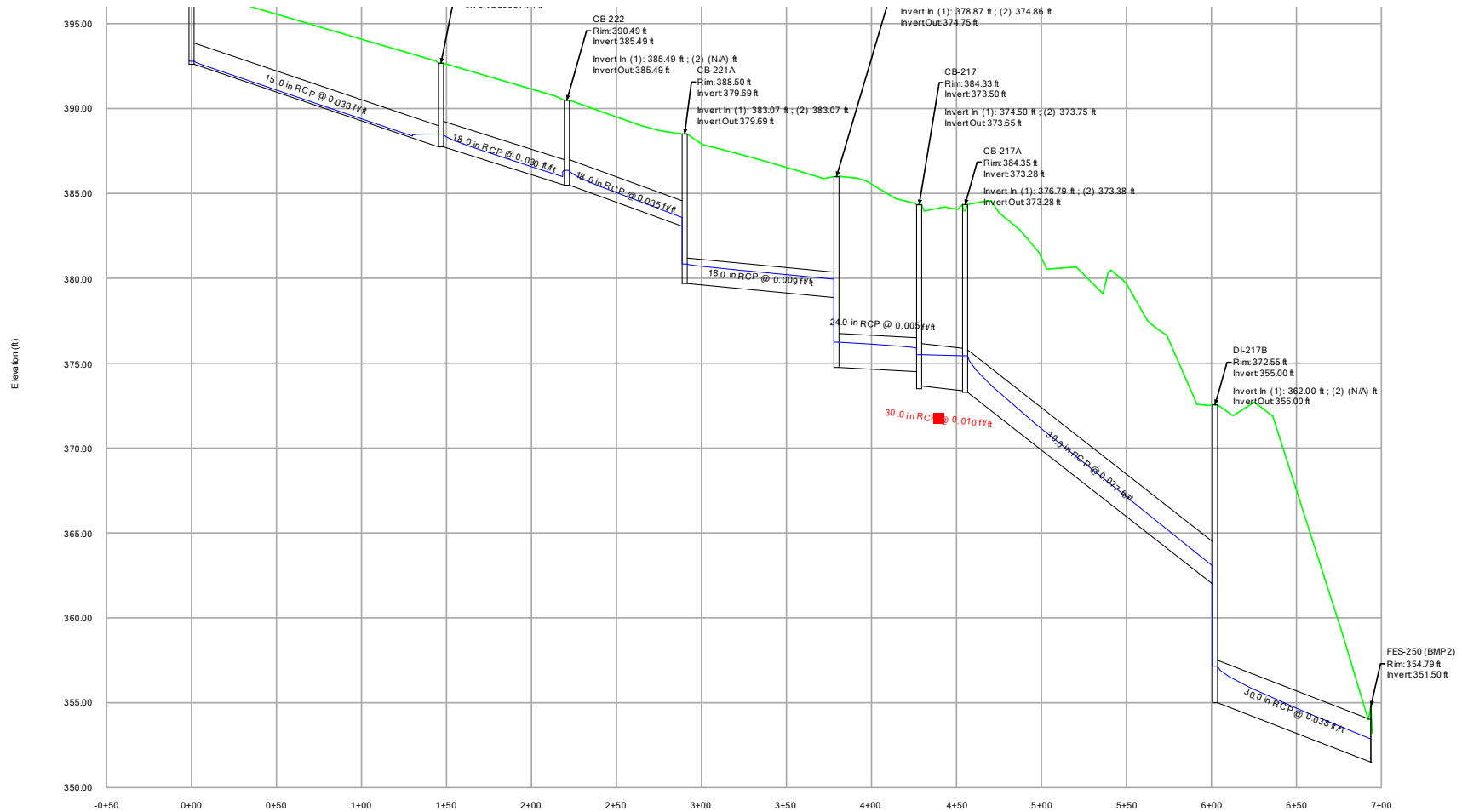


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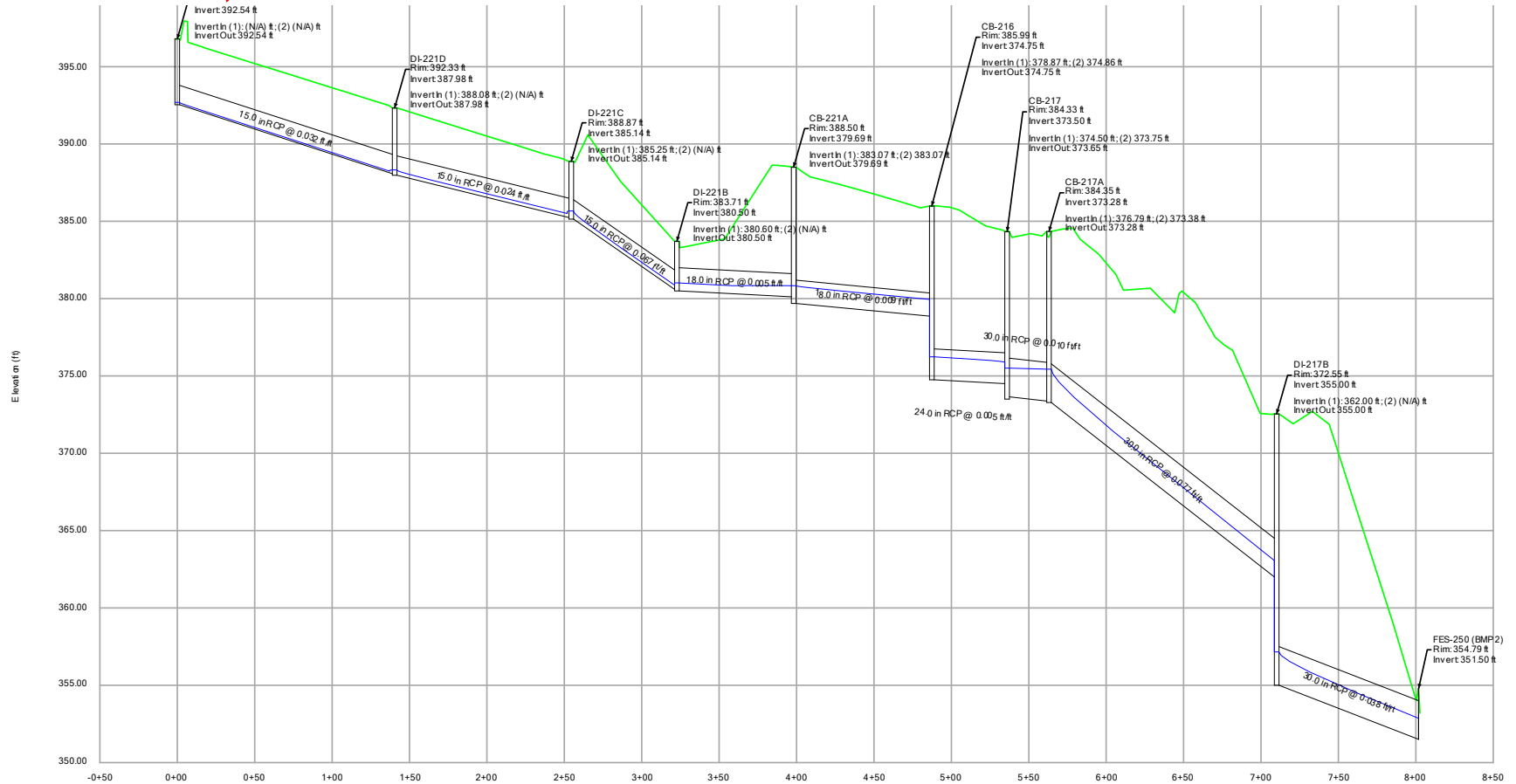
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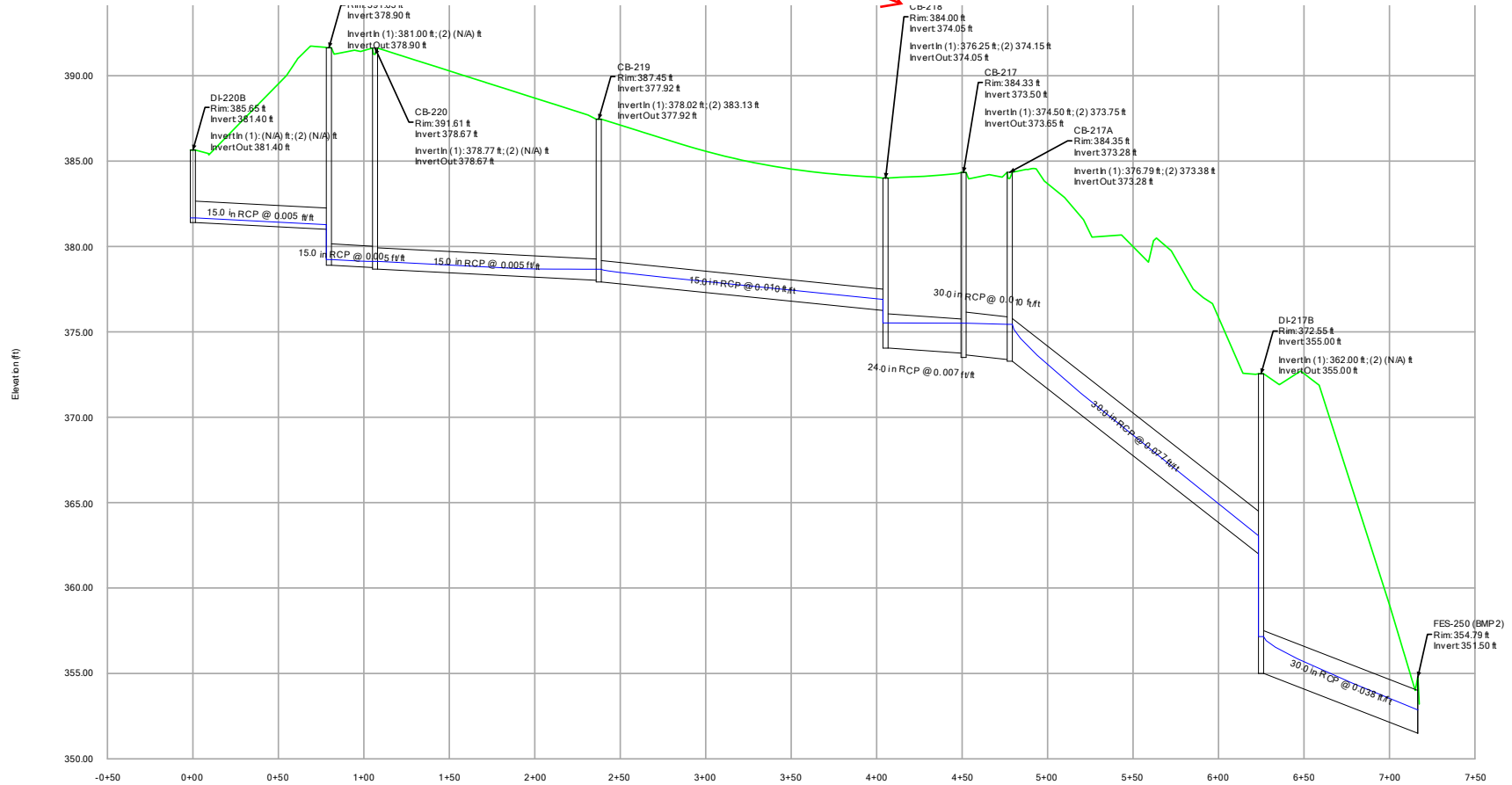
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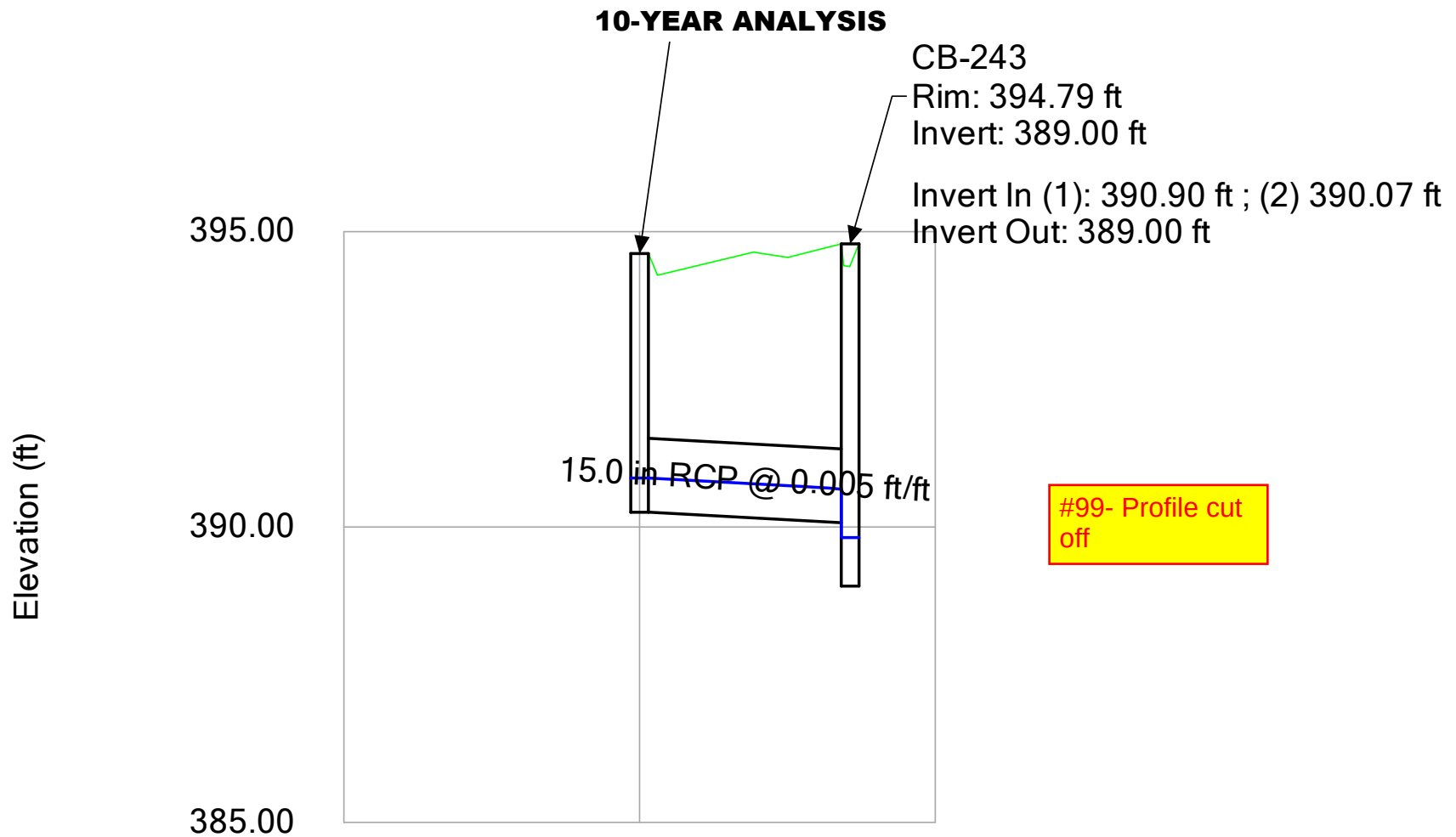
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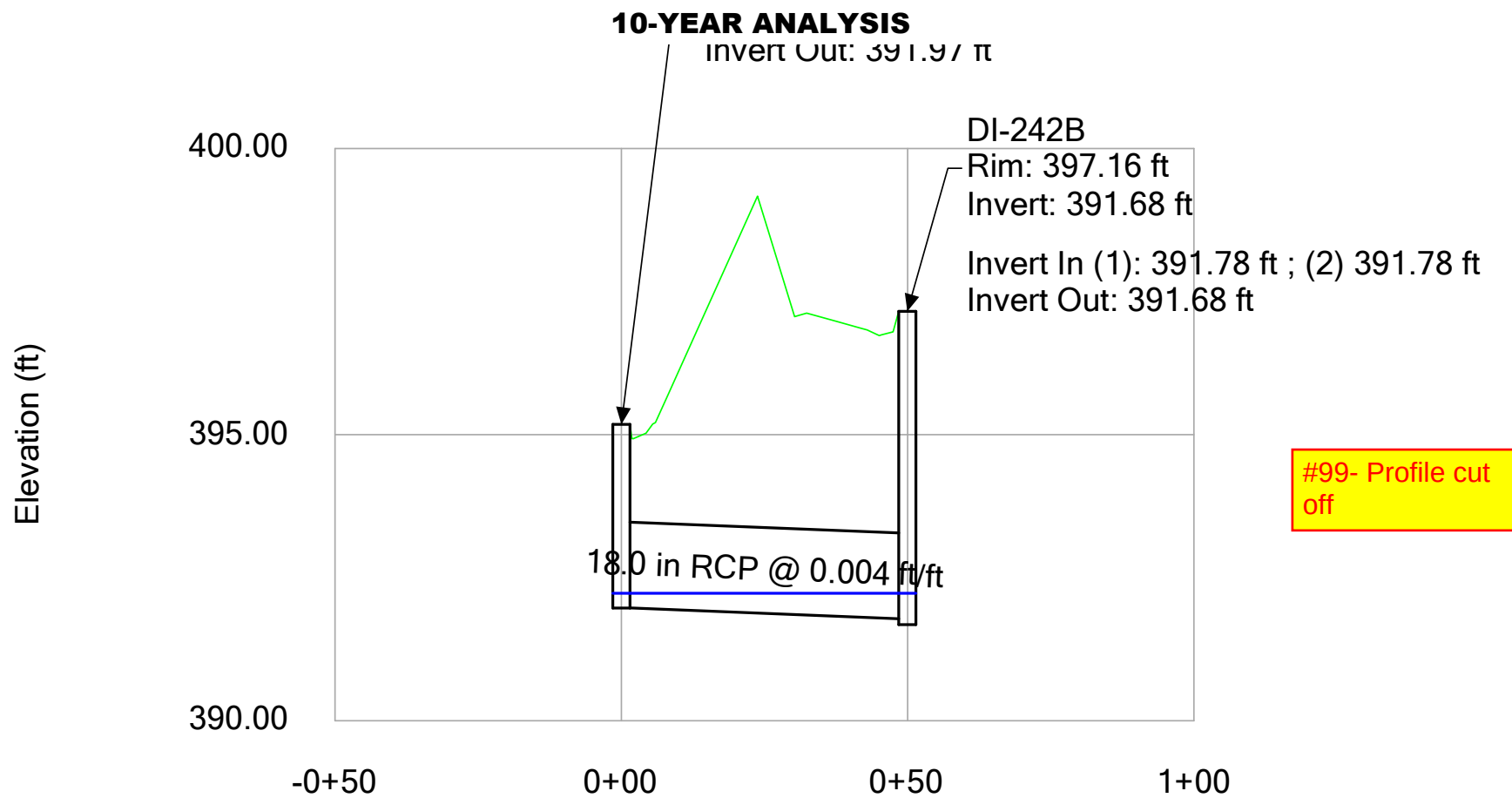


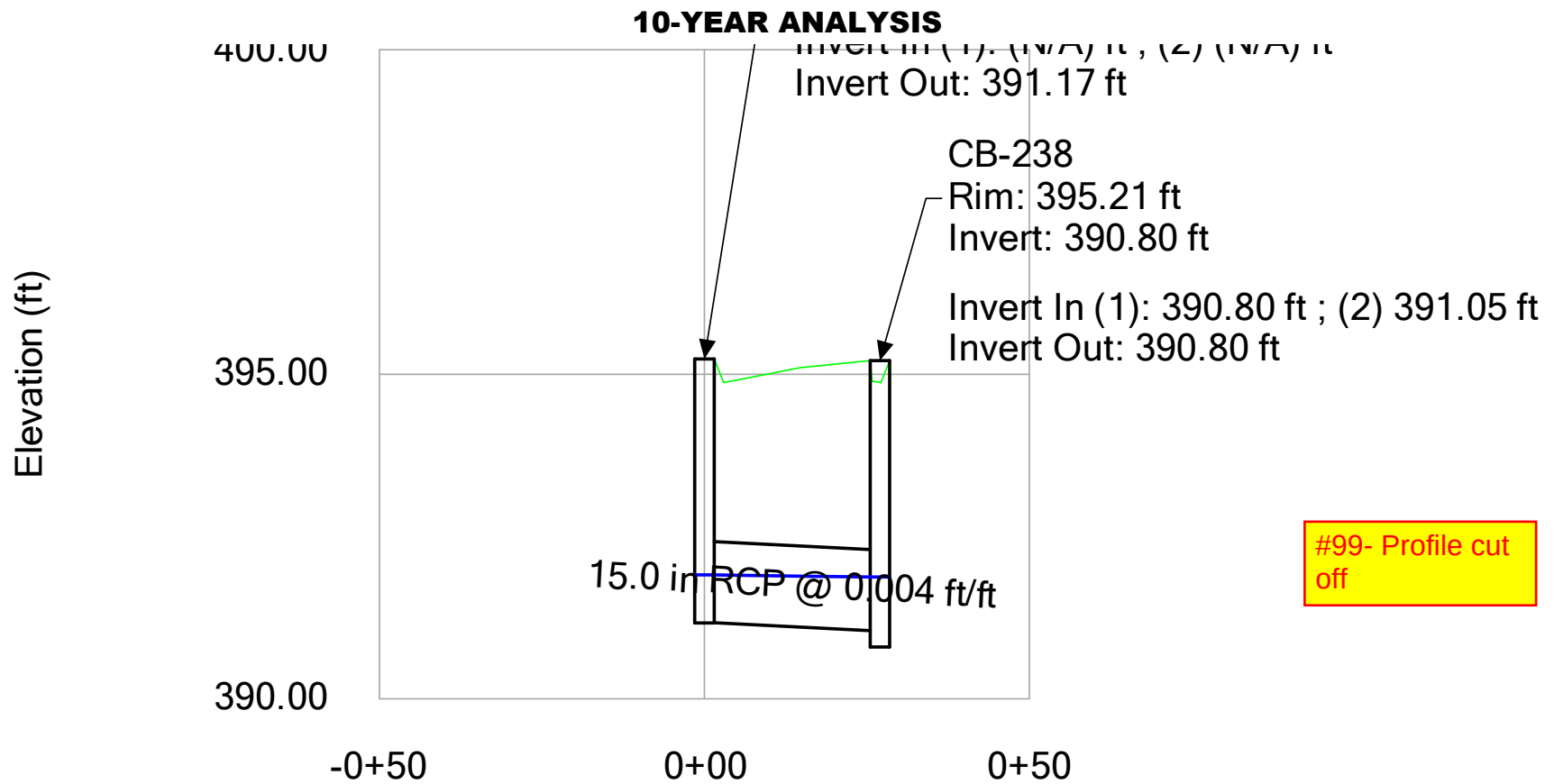
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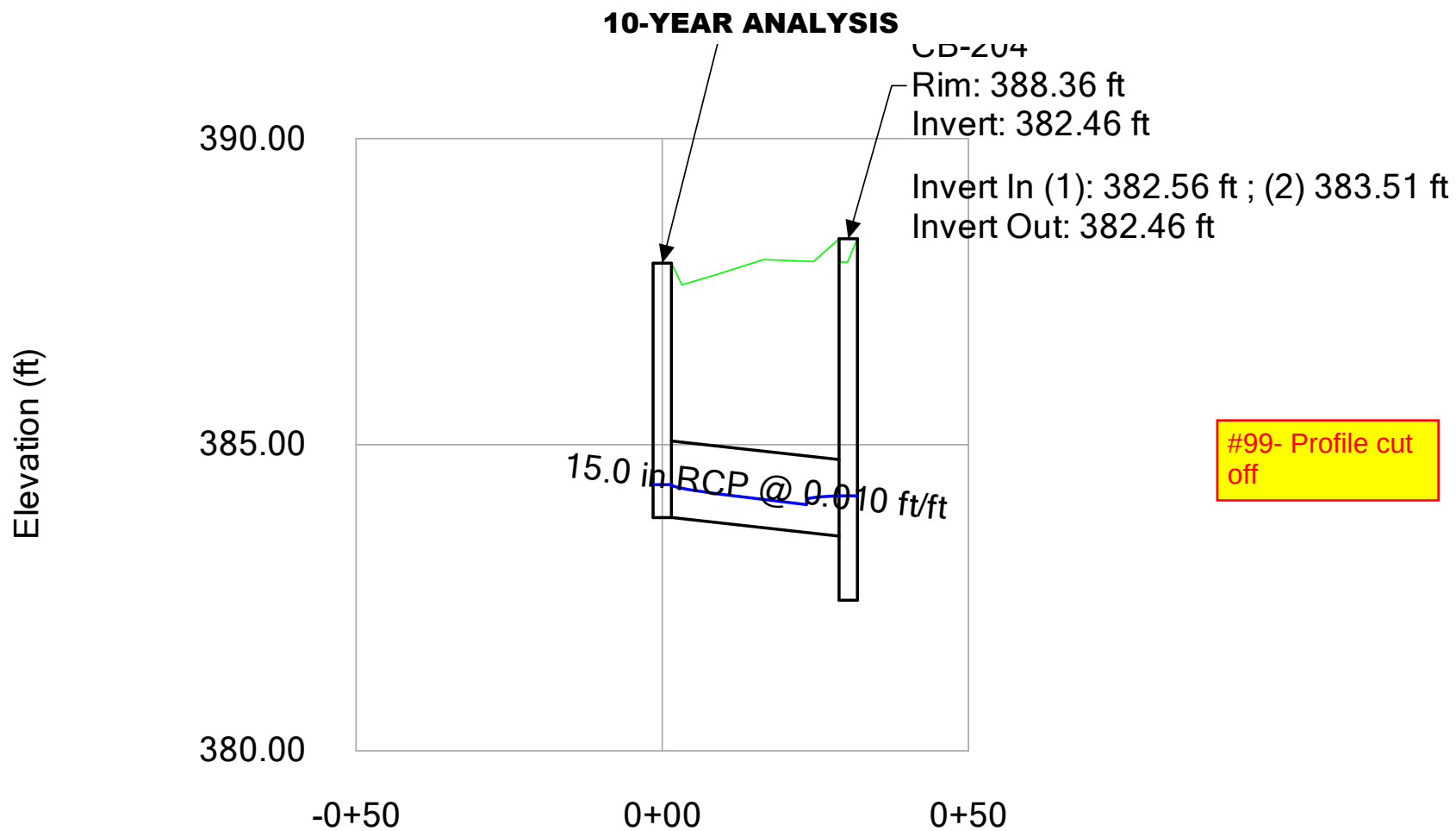
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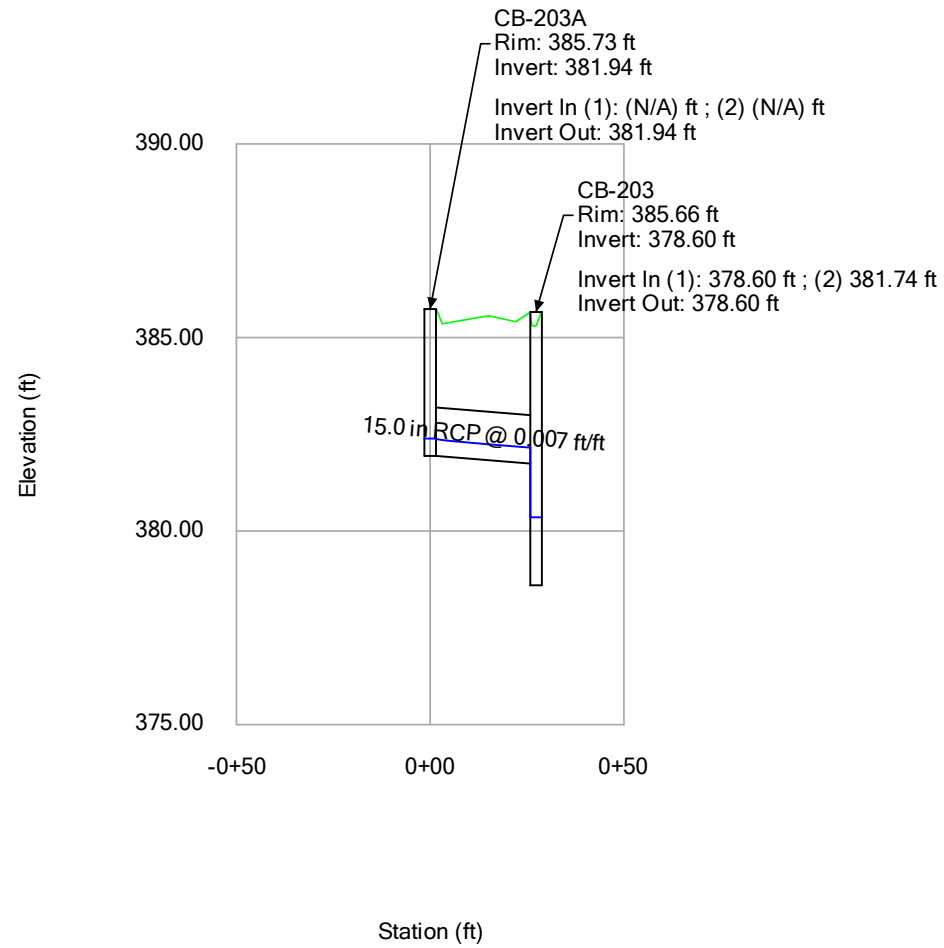


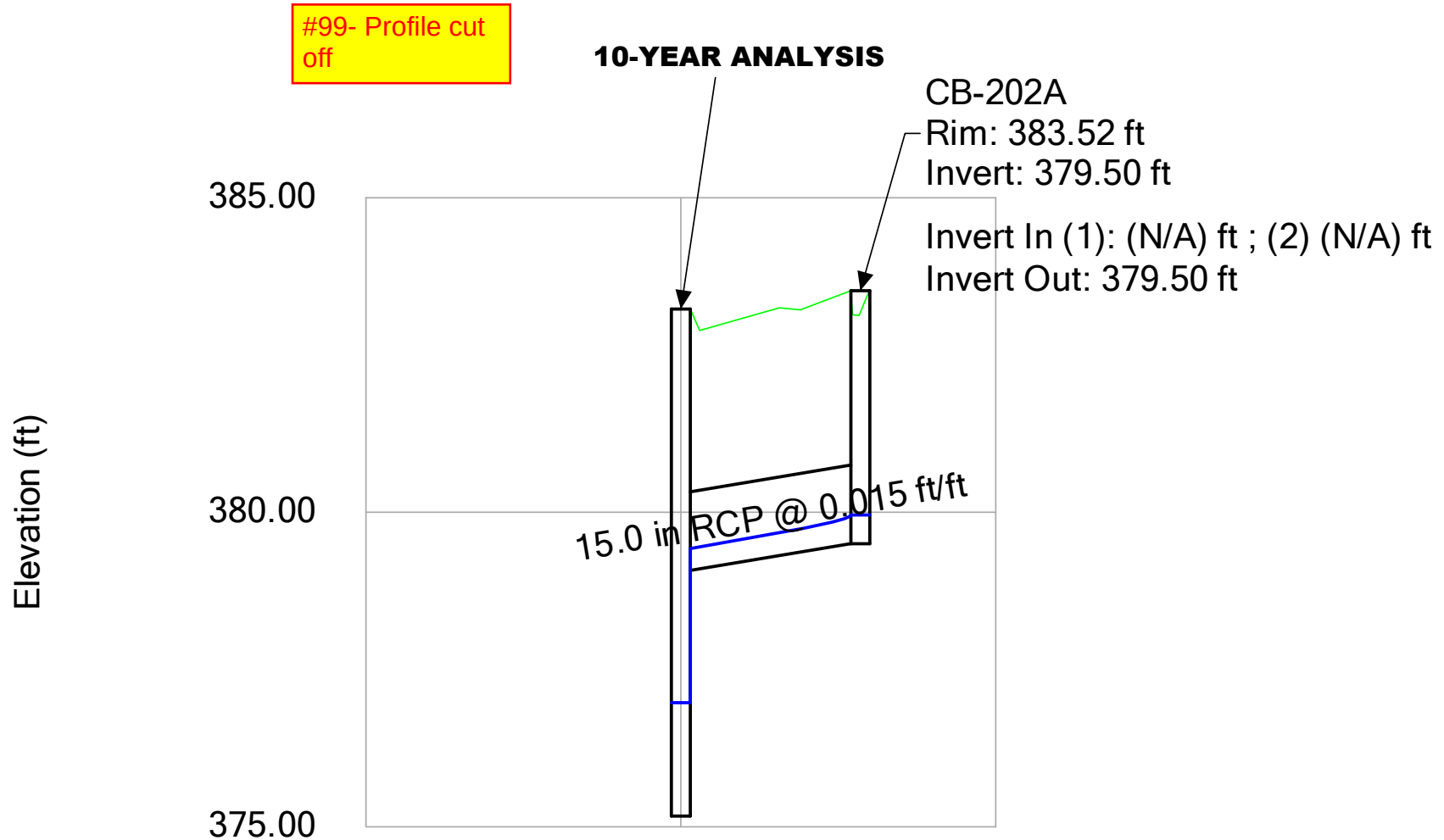


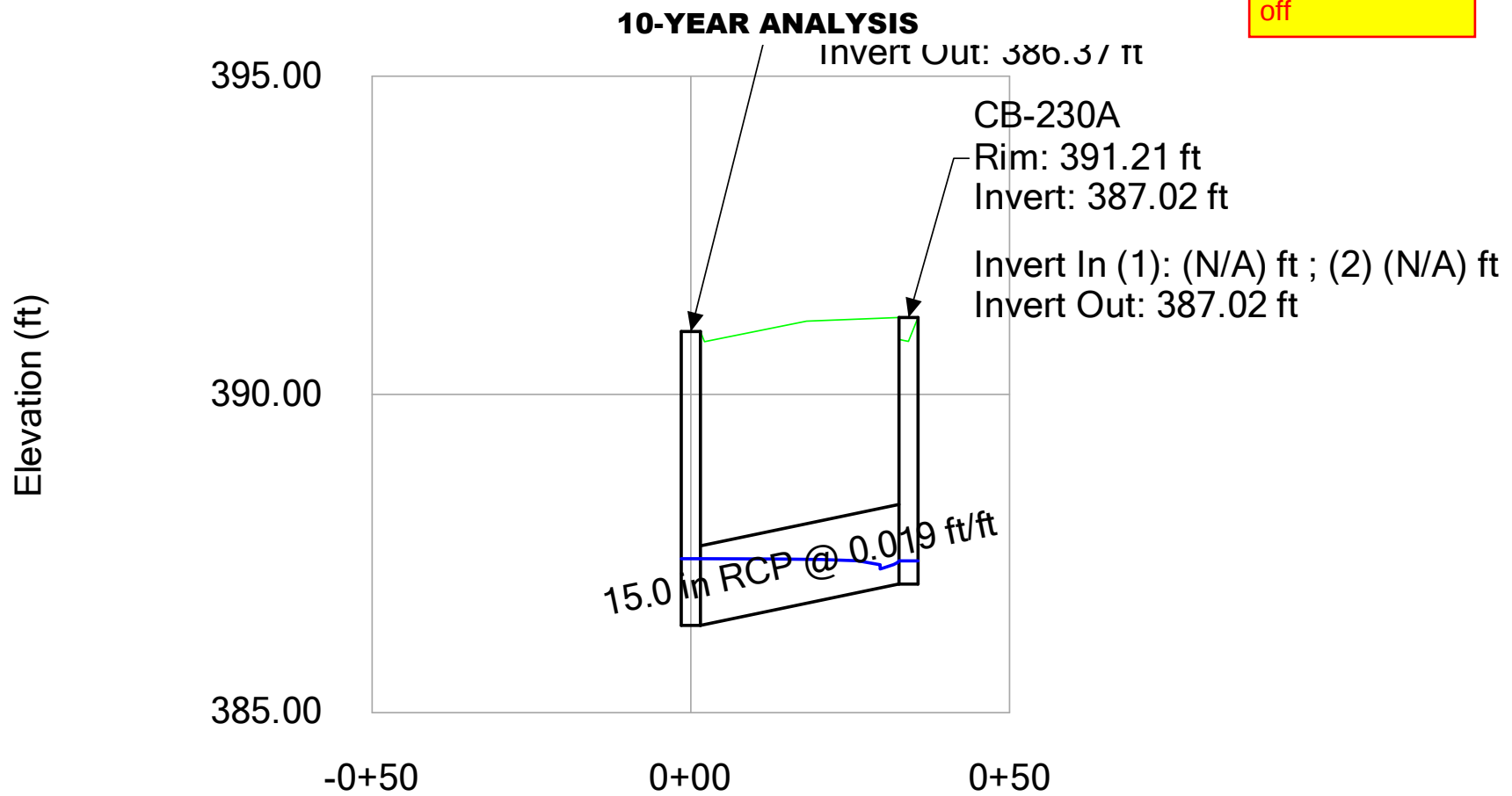




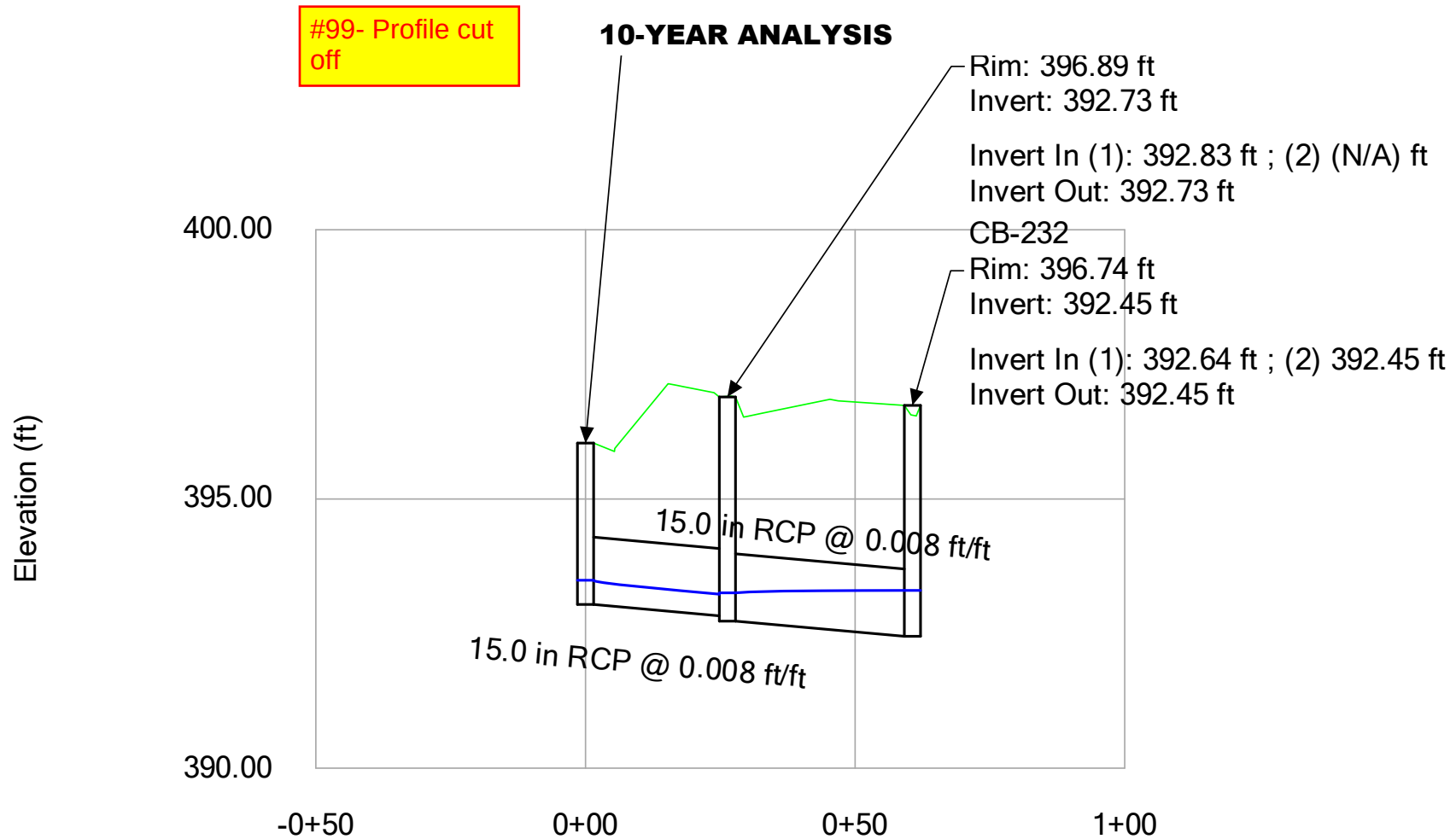
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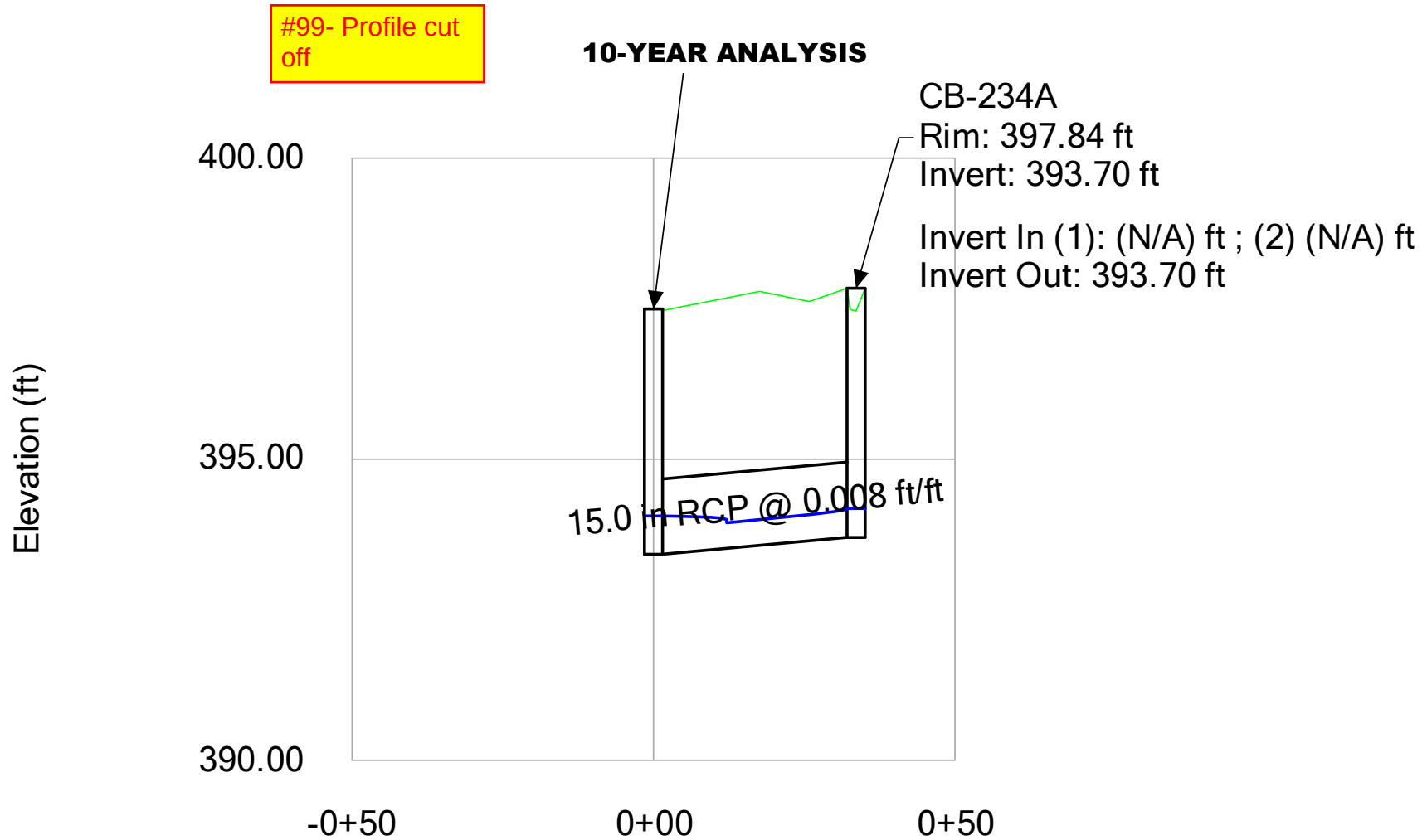






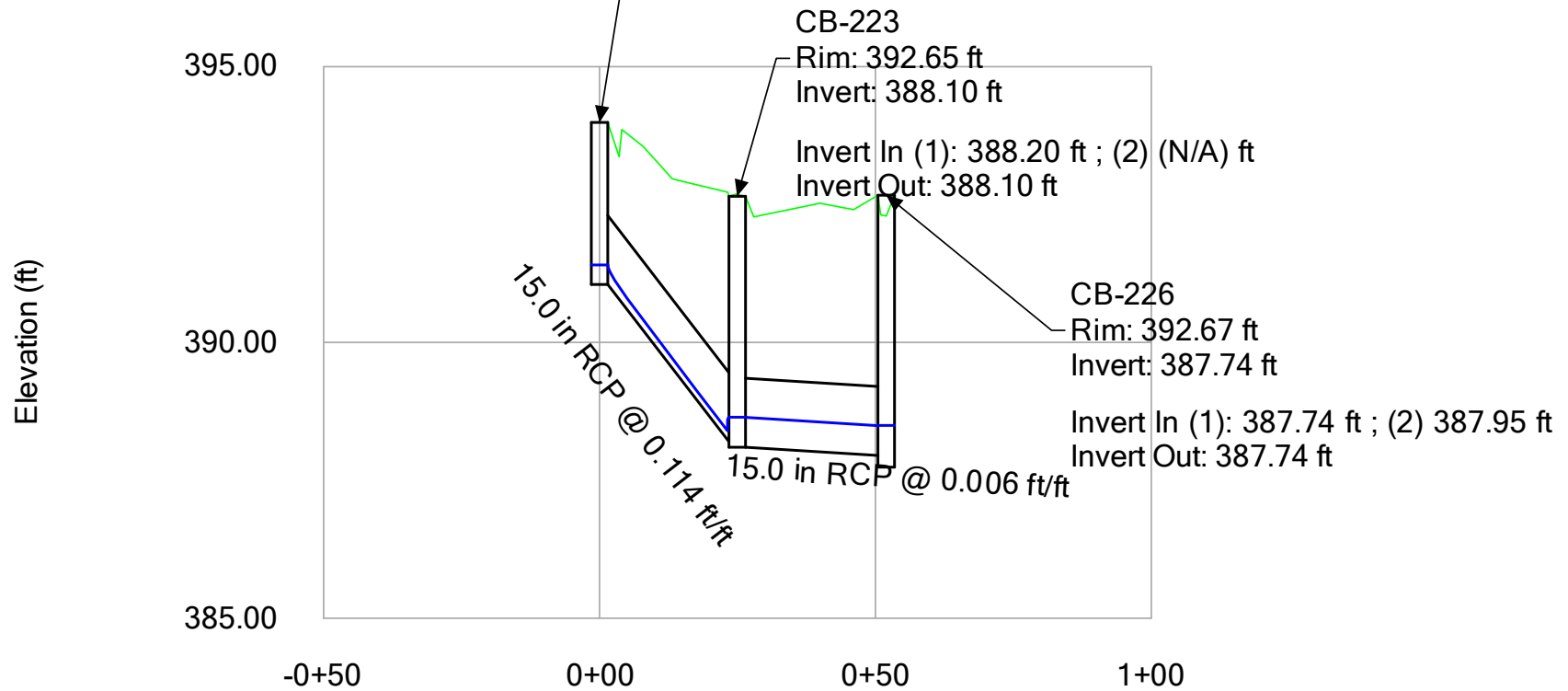
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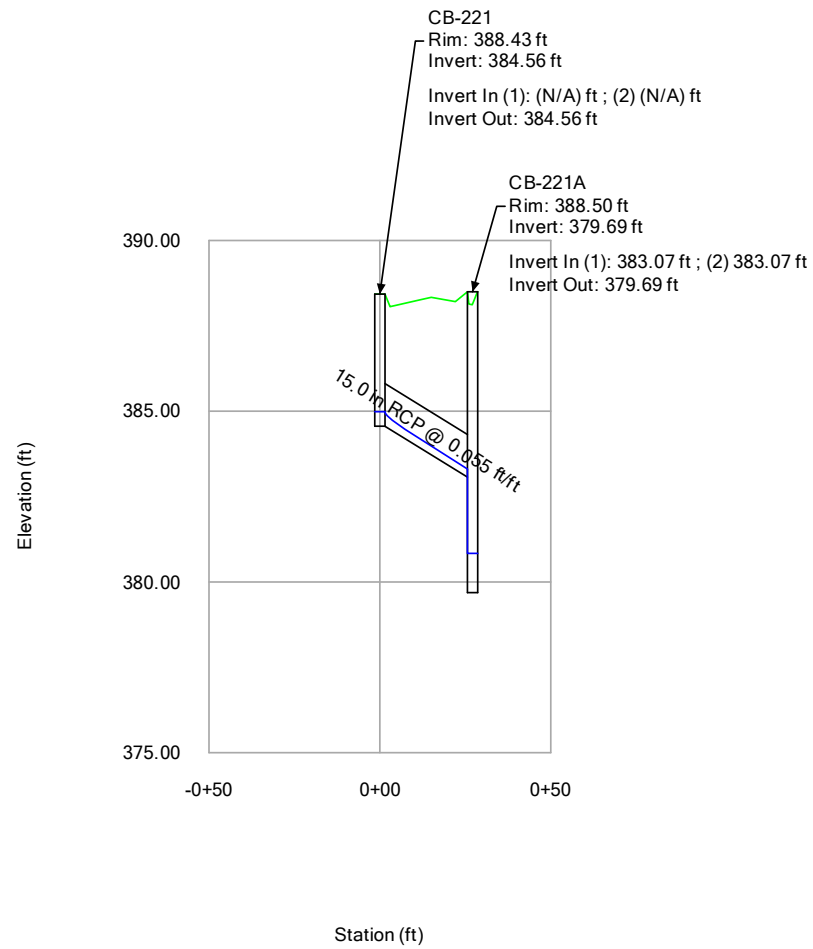


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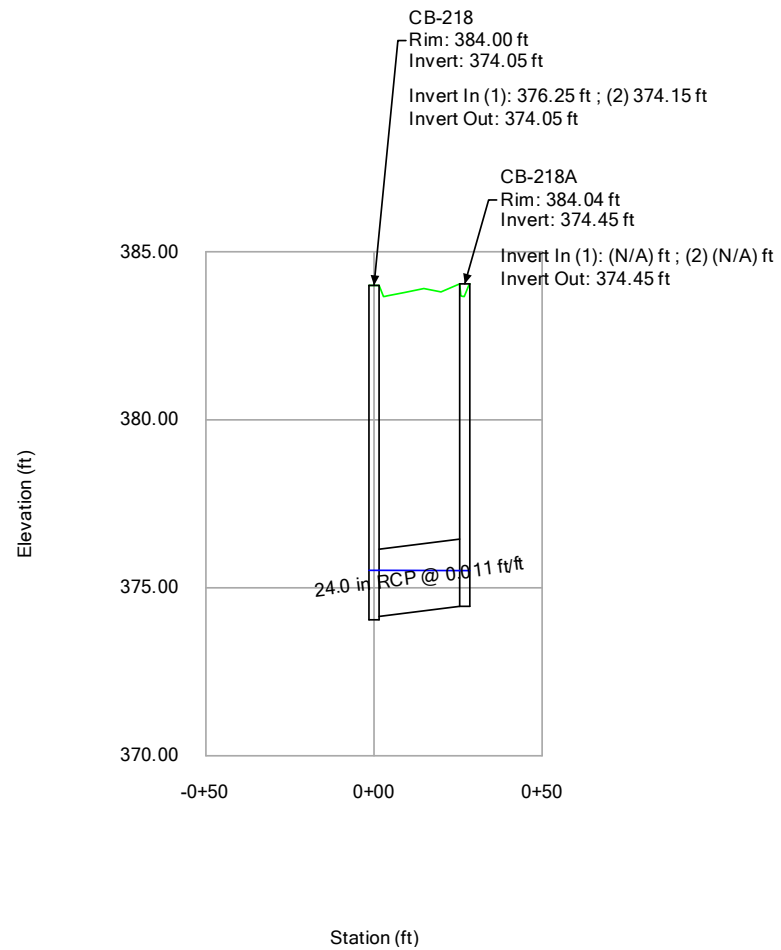
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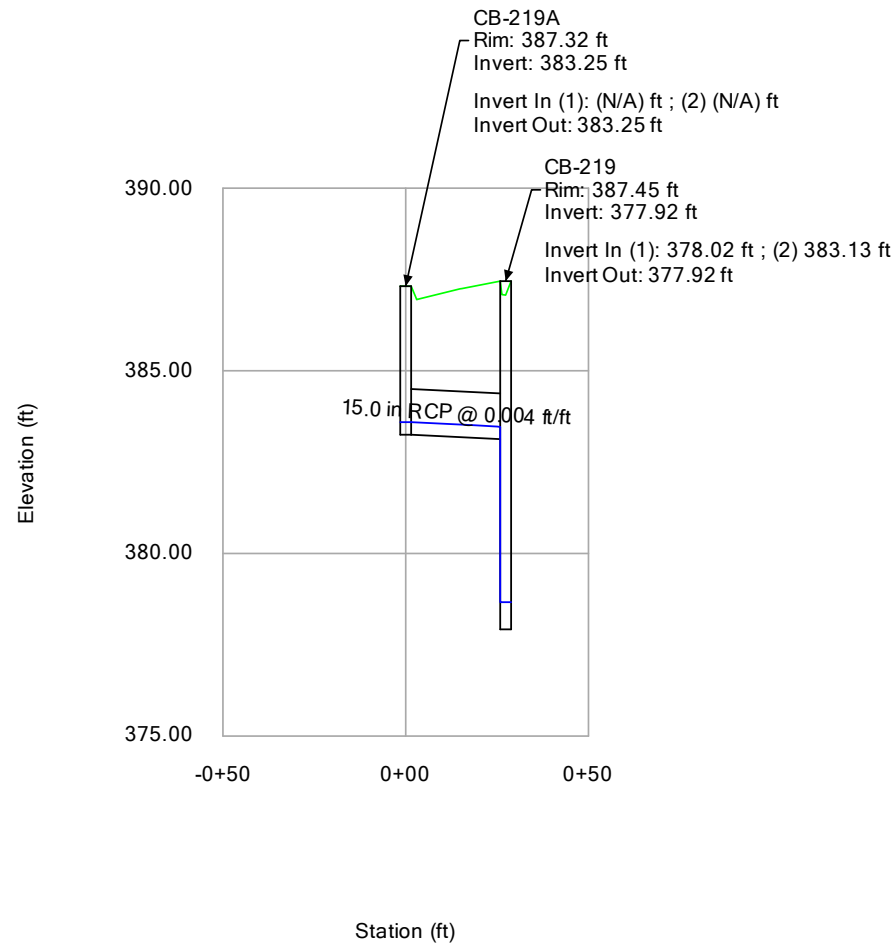
10-YEAR ANALYSIS



10-YEAR ANALYSIS



10-YEAR ANALYSIS



SCM 2 – 25 YR STORM

25-YEAR ANALYSIS

CATCHMENTS - Time: 0.00 hours

Outflow Element	Scaled Area (acres)	Flow (Total Out) (cfs)	Time of Concentration (hours)	Runoff Coefficient (Rational)
DI-201B	0.001	0.00	0.083	0.810
CB-237	0.053	0.35	0.083	0.810
DI-221B	0.027	0.18	0.083	0.810
CB-201A	0.527	3.44	0.083	0.810
CB-203A	0.250	1.63	0.083	0.810
CB-202A	0.263	1.71	0.083	0.810
CB-202	0.180	1.17	0.083	0.810
CB-203	0.160	1.04	0.083	0.810
CB-201	0.330	2.15	0.083	0.810
CB-204	0.049	0.32	0.083	0.810
CB-205	0.070	0.46	0.083	0.810
CB-206	0.077	0.50	0.083	0.810
CB-204A	0.388	2.53	0.083	0.810
CB-242B	0.168	1.10	0.083	0.810
DCB-242A	0.419	2.73	0.083	0.810
CB-206A	0.129	0.84	0.083	0.810
CB-224	0.146	0.95	0.083	0.810
CB-217A	0.290	1.89	0.083	0.810
CB-213	0.293	1.91	0.083	0.810
CB-236	0.010	0.06	0.083	0.810
CB-214A	0.271	1.76	0.083	0.810
CB-229	0.341	2.22	0.083	0.810
CB-232A	0.000	0.00	0.083	0.810
CB-232	0.143	0.93	0.083	0.810
CB-234	0.198	1.29	0.083	0.810
CB-231	0.117	0.76	0.083	0.810
CB-230	0.168	1.10	0.083	0.810
CB-230A	0.156	1.02	0.083	0.810
CB-241A	0.142	0.92	0.083	0.810
CB-241	0.276	1.80	0.083	0.810
CB-239	0.432	2.82	0.083	0.810

25-YEAR ANALYSIS

CATCHMENTS - Time: 0.00 hours

Outflow Element	Scaled Area (acres)	Flow (Total Out) (cfs)	Time of Concentration (hours)	Runoff Coefficient (Rational)
CB-238	0.172	1.12	0.083	0.810
CB-238A	0.511	3.33	0.083	0.810
CB-208	0.026	0.17	0.083	0.810
CB-209	0.255	1.66	0.083	0.810
DI-209A	0.185	1.21	0.083	0.810
DI-209B	0.229	1.49	0.083	0.810
DI-209C	0.265	1.73	0.083	0.810
CB-210	0.134	0.87	0.083	0.810
CB-211	0.217	1.42	0.083	0.810
CB-214	0.140	0.91	0.083	0.810
CB-217	0.143	0.93	0.083	0.810
CB-218	0.620	4.04	0.083	0.810
CB-218A	0.488	3.18	0.083	0.810
CB-219A	0.125	0.81	0.083	0.810
CB-220	0.103	0.67	0.083	0.810
CB-219	0.324	2.11	0.083	0.810
CB-220A	0.043	0.28	0.083	0.810
DI-242C	0.186	1.21	0.083	0.810
DI-242B	0.214	1.40	0.083	0.810
DI-242E	0.002	0.01	0.083	0.810
DI-217B	0.002	0.01	0.083	0.810
CB-223	0.199	1.29	0.083	0.810
DCB-242	0.451	2.94	0.083	0.810
CB-243	0.405	2.64	0.083	0.810
CB-243A	0.424	2.76	0.083	0.810
CB-244	0.128	0.83	0.083	0.810
CB-244A	0.168	1.10	0.083	0.810
DI-213C	0.028	0.18	0.083	0.810
DI-212B	0.146	0.95	0.083	0.810
DI-212A	0.247	1.61	0.083	0.810
CB-226	0.407	2.65	0.083	0.810

25-YEAR ANALYSIS

CATCHMENTS - Time: 0.00 hours

Outflow Element	Scaled Area (acres)	Flow (Total Out) (cfs)	Time of Concentration (hours)	Runoff Coefficient (Rational)
CB-227	0.038	0.25	0.083	0.810
CB-222	0.161	1.05	0.083	0.810
CB-221	0.206	1.34	0.083	0.810
CB-221A	0.152	0.99	0.083	0.810
CB-215	0.124	0.81	0.083	0.810
CB-216	0.178	1.16	0.083	0.810
CB-234A	0.295	1.92	0.083	0.810
CB-232B	0.252	1.64	0.083	0.810
DI-220B	0.083	0.54	0.083	0.810
DI-221E	0.026	0.17	0.083	0.810
DI-221D	0.110	0.71	0.083	0.810
DI-221C	0.193	1.26	0.083	0.810
DI-201G	0.087	0.42	0.083	0.600
DI-201F	0.175	0.84	0.083	0.600
DI-201E	0.165	0.80	0.083	0.600
DI-201D	0.324	1.56	0.083	0.600
DI-201C	0.118	0.57	0.083	0.600

25-YEAR ANALYSIS

Inlets - Time: 0.00 hours

Label	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Grate Length (ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)
DI-242C	1.09	0.12	1.09	90.3	398.89	398.89	3.0	2.99	2.99
CB-244	0.79	0.04	1.79	95.1	397.00	397.00	3.0	2.72	3.60
CB-244A	1.00	0.09	1.00	91.7	397.15	397.15	3.0	2.98	2.98
CB-241A	0.87	0.06	0.87	93.9	396.78	396.78	3.0	2.91	2.91
CB-241	1.51	0.29	2.37	84.0	396.78	396.78	3.0	1.44	3.93
DI-209C	1.46	0.26	1.46	84.7	394.58	394.58	3.0	3.38	3.38
CB-234A	1.59	0.33	1.59	82.9	394.20	394.20	3.0	3.47	3.47
CB-234	1.15	0.14	2.74	89.3	394.08	394.08	3.0	2.41	4.13
DI-242B	1.32	0.20	2.30	86.8	392.25	392.25	3.0	2.29	3.70
CB-227	0.25	0.00	0.25	100.0	392.80	392.80	3.0	2.07	2.07
CB-232A	0.33	0.00	1.73	100.0	393.31	393.31	3.0	3.23	3.10
DI-221E	0.17	0.00	0.17	100.0	392.70	392.70	3.0	1.87	1.87
CB-232	0.99	0.09	5.39	92.0	393.35	393.35	3.0	1.84	4.90
CB-239	2.31	0.80	4.56	74.4	392.94	392.94	3.0	6.13	4.61
DI-209B	1.48	0.27	2.91	84.4	392.54	392.54	3.0	2.59	4.22
CB-232B	1.41	0.24	1.41	85.5	393.51	393.51	3.0	3.34	3.34
CB-238A	2.46	0.92	2.46	72.8	391.96	391.96	3.0	3.02	3.02
CB-238	1.59	0.33	8.45	82.9	391.93	391.93	3.0	2.68	5.94
DI-242E	0.01	0.00	0.01	100.0	392.25	392.25	3.0	0.05	0.05
CB-243	2.06	0.62	5.89	77.0	389.86	389.86	3.0	3.82	4.58
CB-237	0.35	0.00	8.75	100.0	388.85	388.85	3.0	8.87	6.05
CB-236	0.06	0.00	21.89	100.0	388.32	388.32	3.0	6.93	7.80
CB-243A	2.17	0.69	2.17	75.9	390.86	390.86	3.0	3.67	3.67
DI-213C	0.18	0.00	0.18	100.0	390.92	390.92	3.0	1.91	1.91
CB-231	0.80	0.04	6.15	95.0	390.82	390.82	3.0	9.29	5.16
CB-224	0.89	0.06	0.89	93.6	391.42	391.42	3.0	2.93	2.93
DCB-242	2.56	1.00	13.66	71.9	389.55	389.55	3.0	2.90	6.15
DCB-242A	2.56	1.00	5.72	71.9	390.27	390.27	3.0	3.38	5.01
CB-208	0.17	0.00	0.17	100.0	387.69	387.69	3.0	1.83	1.83
DI-209A	1.29	0.19	4.15	87.2	389.31	389.31	3.0	3.94	4.83

25-YEAR ANALYSIS

Inlets - Time: 0.00 hours

Label	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Grate Length (ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)
CB-242B	1.16	0.14	3.36	89.3	390.45	390.45	3.0	3.50	4.17
CB-226	2.05	0.60	4.23	77.2	388.53	388.53	3.0	0.31	4.50
CB-223	1.16	0.14	2.04	89.3	388.67	388.67	3.0	2.11	3.75
CB-206A	0.80	0.04	22.50	95.1	387.56	387.56	3.0	7.27	7.16
DI-221D	0.69	0.02	0.84	96.7	388.34	388.34	3.0	0.92	2.88
CB-206	0.50	0.00	22.86	99.2	387.21	387.21	3.0	7.16	7.28
CB-209	1.42	0.24	5.68	85.3	386.25	386.25	3.0	0.17	4.52
CB-220A	0.28	0.00	0.79	100.0	379.25	379.25	3.0	2.54	2.79
CB-220	0.65	0.02	1.42	97.3	379.15	379.15	3.0	2.48	3.28
CB-230A	0.94	0.07	0.94	92.7	387.40	387.40	3.0	2.97	2.97
CB-230	1.04	0.10	8.04	91.1	387.47	387.47	3.0	0.82	5.80
DI-212B	0.89	0.06	1.06	93.6	387.39	387.39	3.0	0.54	3.07
CB-210	1.02	0.10	16.34	91.4	385.74	385.74	3.0	2.32	6.66
CB-222	1.41	0.24	5.58	85.4	386.40	386.40	3.0	3.77	4.97
CB-229	1.78	0.44	9.75	80.4	386.27	386.27	3.0	8.96	5.41
CB-205	0.46	0.00	23.08	99.6	386.25	386.25	3.0	8.00	8.07
CB-211	1.31	0.20	17.52	86.9	383.81	383.81	3.0	10.55	6.89
DI-221C	1.13	0.13	1.90	89.7	385.69	385.69	3.0	2.14	3.67
CB-221A	1.11	0.12	9.68	90.0	380.89	380.89	3.0	2.25	6.38
CB-221	1.29	0.19	1.29	87.2	385.01	385.01	3.0	3.26	3.26
CB-204	0.32	0.00	25.11	100.0	384.23	384.23	3.0	13.48	8.56
DI-212A	1.42	0.25	2.44	85.2	384.16	384.16	3.0	1.72	3.98
CB-204A	1.97	0.55	1.97	78.1	384.37	384.37	3.0	3.71	3.71
CB-219	1.73	0.40	3.75	81.1	378.70	378.70	3.0	2.06	4.64
CB-219A	0.78	0.04	0.78	95.4	383.61	383.61	3.0	2.65	2.65
CB-214A	1.49	0.28	3.89	84.3	381.54	381.54	3.0	2.95	4.70
DI-201G	0.42	0.00	0.42	99.8	381.74	381.74	3.0	2.31	2.31
CB-213	1.71	0.39	19.00	81.3	380.97	380.97	3.0	6.63	7.19
CB-215	0.93	0.07	5.78	93.0	376.36	376.36	3.0	5.92	2.53
CB-216	1.15	0.14	16.21	89.4	376.35	376.35	3.0	2.30	6.02

25-YEAR ANALYSIS

Inlets - Time: 0.00 hours

Label	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Grate Length (ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)
CB-214	1.08	0.11	4.91	90.5	380.42	380.42	3.0	4.36	4.74
CB-203A	1.40	0.23	1.40	85.6	382.41	382.41	3.0	3.34	3.34
CB-203	0.96	0.08	27.12	92.4	380.41	380.41	3.0	8.39	9.07
DI-220B	0.53	0.01	0.53	98.8	381.69	381.69	3.0	2.49	2.49
CB-217A	1.83	0.46	45.69	79.9	375.52	375.52	3.0	5.77	9.86
CB-217	0.96	0.08	25.80	92.4	375.38	375.38	3.0	3.25	7.11
CB-218A	2.62	1.06	2.62	71.3	375.37	375.37	3.0	1.86	1.86
CB-218	3.06	1.47	8.92	67.6	375.39	375.39	3.0	1.29	4.00
DI-221B	0.18	0.00	2.06	100.0	381.04	381.04	3.0	9.03	3.59
CB-202A	1.45	0.26	1.45	84.8	379.98	379.98	3.0	3.38	3.38
CB-202	1.07	0.11	29.27	90.7	377.02	377.02	3.0	14.36	9.64
CB-201A	2.49	0.94	5.89	72.5	359.84	359.84	3.0	3.64	5.07
DI-201F	0.80	0.04	1.20	95.0	375.81	375.81	3.0	1.59	3.07
CB-201	1.74	0.41	36.45	80.9	359.15	359.15	3.0	4.93	8.47
CB-200A	0.00	0.00	36.33	100.0	355.27	355.27	3.0	15.66	8.46
DI-201B	0.00	0.00	3.69	100.0	360.88	360.88	3.0	4.89	4.29
DI-201E	0.80	0.04	1.96	95.0	370.93	370.93	3.0	2.89	3.53
DI-217B	0.01	0.00	45.47	100.0	357.23	357.23	3.0	21.21	9.82
DI-201C	0.56	0.01	3.72	98.5	361.46	361.46	3.0	4.12	4.30
DI-201D	1.38	0.23	3.26	85.9	362.10	362.10	3.0	3.01	4.07
DI-200A	0.00	0.00	36.29	100.0	354.04	354.04	3.0	12.73	8.45

25-YEAR ANALYSIS

Conduit Results - Time: 0.00 hours

Label	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
DI-242B TO DI-242C	18.0	0.030	2.99	2.29	1.09	18.13	398.89	392.25
CB-244 TO CB-244A	15.0	0.005	2.98	2.72	1.00	4.57	397.15	397.00
CB-243 TO CB-244	15.0	0.035	3.60	7.02	1.79	12.01	397.00	391.23
CB-241 TO CB-241A	15.0	0.008	2.91	1.44	0.87	5.77	396.78	396.78
CB-239 TO CB-241	15.0	0.019	3.93	6.13	2.37	8.89	396.78	392.81
DI-209B TO DI-209C	15.0	0.021	3.38	2.59	1.46	9.47	394.58	392.54
CB-234 TO CB-234A	15.0	0.008	3.47	2.41	1.59	5.90	394.20	394.08
CB-232 TO CB-234	15.0	0.010	4.13	3.81	2.74	6.43	394.08	393.35
DI-242B TO DI-242E	18.0	0.004	0.05	0.02	0.01	6.44	392.25	392.25
CB-242B TO DI-242B	18.0	0.018	3.70	3.50	2.30	13.97	392.25	390.45
CB-226 TO CB-227	15.0	0.033	2.07	0.31	0.25	11.77	392.80	388.53
CB-232A TO CB-232B	15.0	0.008	3.34	3.23	1.41	5.78	393.51	393.31
CB-232 TO CB-232A	15.0	0.008	3.10	1.84	1.73	5.84	393.31	393.35
DI-221D TO DI-221E	15.0	0.032	1.87	0.92	0.17	11.51	392.70	388.34
CB-231 TO CB-232	18.0	0.033	4.90	9.29	5.39	19.10	393.35	390.51
CB-238 TO CB-239	18.0	0.020	4.61	3.21	4.56	14.75	392.94	391.93
DI-209A TO DI-209B	15.0	0.035	4.22	3.94	2.91	12.06	392.54	389.31
CB-238 TO CB-238A	15.0	0.004	3.02	2.68	2.46	4.33	391.96	391.93
CB-237 TO CB-238	18.0	0.025	5.94	8.87	8.45	16.74	391.93	390.60
CB-243 TO CB-243A	15.0	0.005	3.67	3.82	2.17	4.57	390.86	390.66
DCB-242 TO CB-243	24.0	0.007	4.58	2.90	5.89	18.79	389.86	389.55
CB-236 TO CB-237	18.0	0.011	6.05	6.93	8.75	11.23	388.85	388.31
CB-206A TO CB-236	24.0	0.013	7.80	7.27	21.89	26.02	388.32	387.56
CB-236 TO DCB-242	24.0	0.011	6.15	5.16	13.66	24.15	389.55	388.32
DI-212B TO DI-213C	15.0	0.042	1.91	0.54	0.18	13.31	390.92	387.39
CB-230 TO CB-231	18.0	0.041	5.16	4.92	6.15	21.32	390.82	387.47
CB-223 TO CB-224	15.0	0.114	2.93	2.11	0.89	21.83	391.42	388.67
DCB-242 TO DCB-242A	18.0	0.010	5.01	6.00	5.72	10.50	390.27	389.80
DCB-242A TO CB-242B	18.0	0.006	4.17	3.38	3.36	8.38	390.45	390.27
CB-209 TO CB-208	18.0	0.027	1.83	0.17	0.17	17.26	387.69	386.25

25-YEAR ANALYSIS

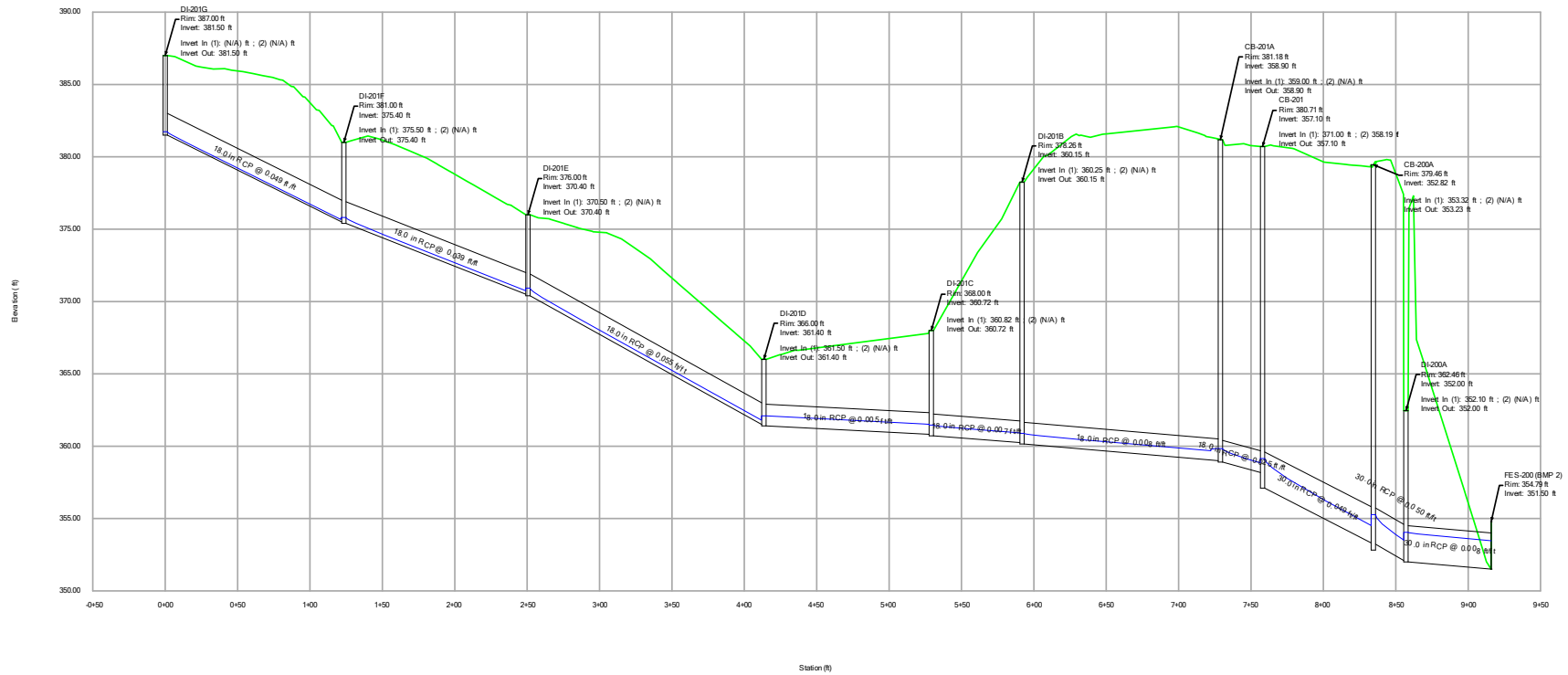
Conduit Results - Time: 0.00 hours

Label	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
CB-209 TO DI-209A	15.0	0.026	4.83	8.01	4.15	10.42	389.31	387.21
CB-226 TO CB-223	15.0	0.006	3.75	3.68	2.04	4.81	388.67	388.53
CB-222 TO CB-226	18.0	0.030	4.50	3.77	4.23	18.32	388.53	386.40
CB-206 TO CB-206A	24.0	0.013	7.16	7.16	22.50	25.74	387.56	387.21
DI-221C TO DI-221D	15.0	0.024	2.88	2.14	0.84	10.00	388.34	385.69
CB-205 TO CB-206	24.0	0.006	7.28	8.00	22.86	18.21	387.21	386.25
CB-210 TO CB-209	24.0	0.018	4.52	2.32	5.68	30.62	386.25	385.74
CB-220 TO CB-220A	15.0	0.005	2.79	2.48	0.79	4.57	379.25	379.15
CB-220A TO DI-220B	15.0	0.005	2.49	2.54	0.53	4.57	381.69	381.29
CB-219 TO CB-220	15.0	0.005	3.28	2.06	1.42	4.57	379.15	378.70
CB-230 TO CB-230A	15.0	0.019	2.97	0.82	0.94	8.91	387.40	387.47
CB-229 TO CB-230	18.0	0.027	5.80	8.96	8.04	17.10	387.47	386.01
DI-212A TO DI-212B	15.0	0.050	3.07	1.72	1.06	14.46	387.39	384.16
CB-211 TO CB-210	24.0	0.024	6.66	10.55	16.34	35.14	385.74	383.39
CB-210 TO CB-229	24.0	0.009	5.41	6.49	9.75	21.40	386.27	385.82
CB-221A TO CB-222	18.0	0.035	4.97	9.57	5.58	19.63	386.40	383.61
CB-204 TO CB-205	24.0	0.057	8.07	13.48	23.08	53.86	386.25	383.63
CB-213 TO CB-211	24.0	0.022	6.89	6.63	17.52	33.18	383.81	380.97
DI-221B TO DI-221C	15.0	0.067	3.67	9.03	1.90	16.66	385.69	380.89
CB-221A TO CB-221	15.0	0.055	3.26	7.49	1.29	15.13	385.01	383.32
CB-216 TO CB-221A	18.0	0.009	6.38	6.51	9.68	10.10	380.89	380.04
CB-221A TO DI-221B	18.0	0.005	3.59	2.25	2.06	7.47	381.04	380.89
CB-204 TO CB-204A	15.0	0.010	3.71	2.70	1.97	6.46	384.37	384.23
CB-203 TO CB-204	24.0	0.045	8.56	8.39	25.11	47.96	384.23	380.41
CB-214A TO DI-212A	15.0	0.080	3.98	2.95	2.44	18.27	384.16	381.54
CB-218 TO CB-219	15.0	0.010	4.64	5.45	3.75	6.45	378.70	376.93
CB-219 TO CB-219A	15.0	0.004	2.65	2.81	0.78	4.29	383.61	383.47
CB-214 TO CB-214A	15.0	0.020	4.70	4.36	3.89	9.06	381.54	380.42
DI-201F TO DI-201G	18.0	0.049	2.31	1.59	0.42	23.16	381.74	375.81
CB-217A TO CB-213	24.0	0.023	7.19	11.01	19.00	34.05	380.97	377.87

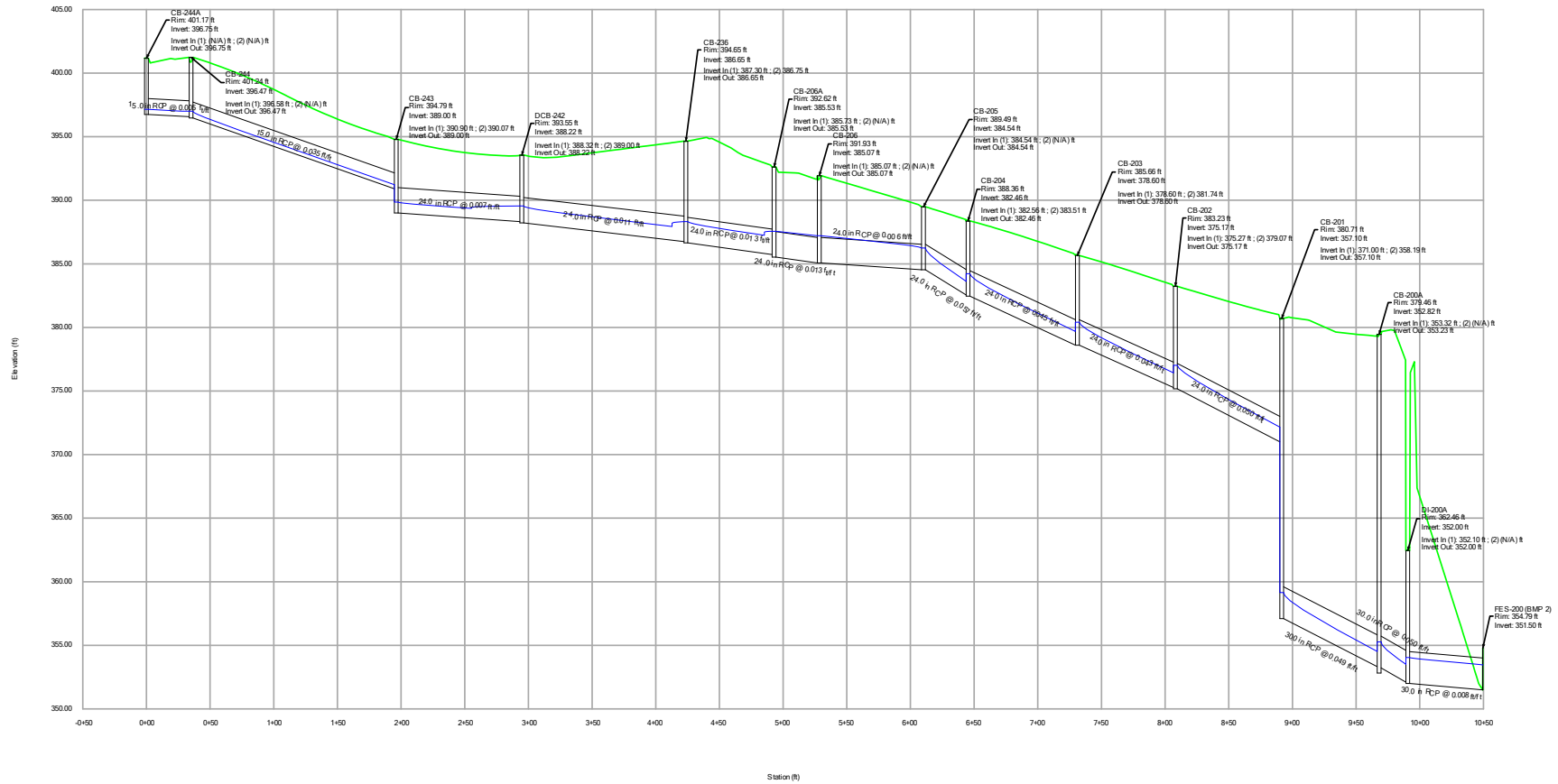
25-YEAR ANALYSIS
Conduit Results - Time: 0.00 hours

Label	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
CB-215 TO CB-214	18.0	0.010	4.74	5.92	4.91	10.75	380.42	379.81
CB-216 TO CB-215	24.0	0.005	2.53	2.30	5.78	16.00	376.36	376.35
CB-217 TO CB-216	24.0	0.005	6.02	6.64	16.21	16.22	376.35	375.95
CB-203 TO CB-203A	15.0	0.007	3.34	3.74	1.40	5.49	382.41	382.17
CB-202 TO CB-203	24.0	0.043	9.07	14.36	27.12	47.05	380.41	376.43
CB-217A TO CB-217	30.0	0.010	7.11	5.77	25.80	41.05	375.38	375.52
DI-217B TO CB-217A	30.0	0.077	9.86	21.21	45.69	113.60	375.52	363.13
CB-217 TO CB-218	24.0	0.007	4.00	3.25	8.92	18.34	375.39	375.38
CB-218 TO CB-218A	24.0	0.011	1.86	1.29	2.62	23.86	375.37	375.39
CB-202 TO CB-202A	15.0	0.015	3.38	4.88	1.45	7.90	379.98	379.44
CB-201 TO CB-202	24.0	0.050	9.64	15.50	29.27	50.55	377.02	372.16
CB-201A TO DI-201B	18.0	0.008	4.29	3.64	3.69	9.62	360.88	359.84
CB-201 TO CB-201A	18.0	0.025	5.07	4.93	5.89	16.45	359.84	359.15
DI-201E TO DI-201F	18.0	0.039	3.07	2.89	1.20	20.62	375.81	370.93
CB-200A TO CB-201	30.0	0.049	8.47	15.66	36.45	91.15	359.15	354.52
DI-200A TO CB-200A	30.0	0.050	8.46	12.73	36.33	91.65	355.27	353.51
DI-201B TO DI-201C	18.0	0.007	4.30	4.89	3.72	9.10	361.46	360.92
DI-201D TO DI-201E	18.0	0.055	3.53	3.01	1.96	24.54	370.93	362.10
FES-250 TO DI-217B	30.0	0.038	9.82	15.41	45.47	80.13	357.23	352.95
DI-201C TO DI-201D	18.0	0.005	4.07	4.12	3.26	7.43	362.10	361.51
FES-200 TO DI-200A	30.0	0.008	8.45	8.77	36.29	37.78	354.04	353.47

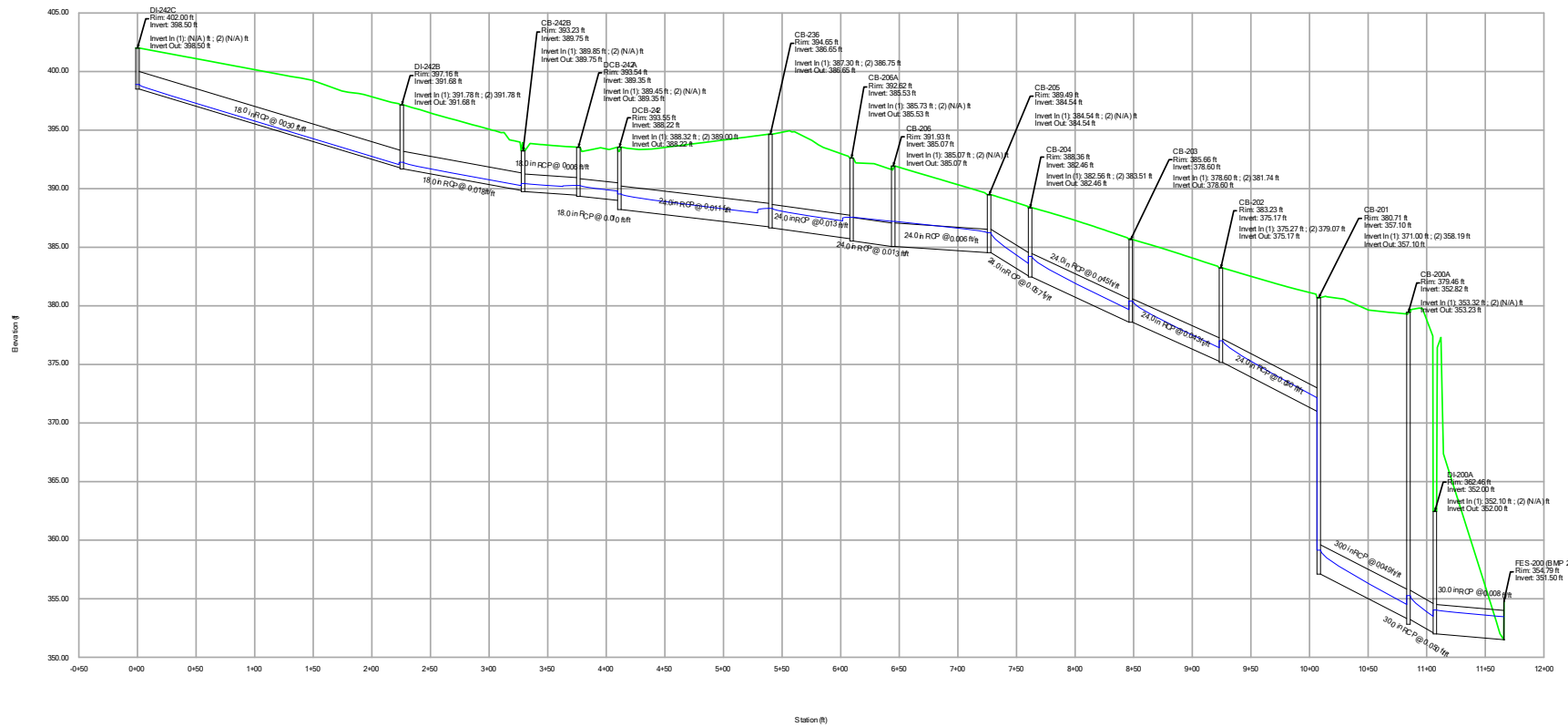
25-YEAR ANALYSIS



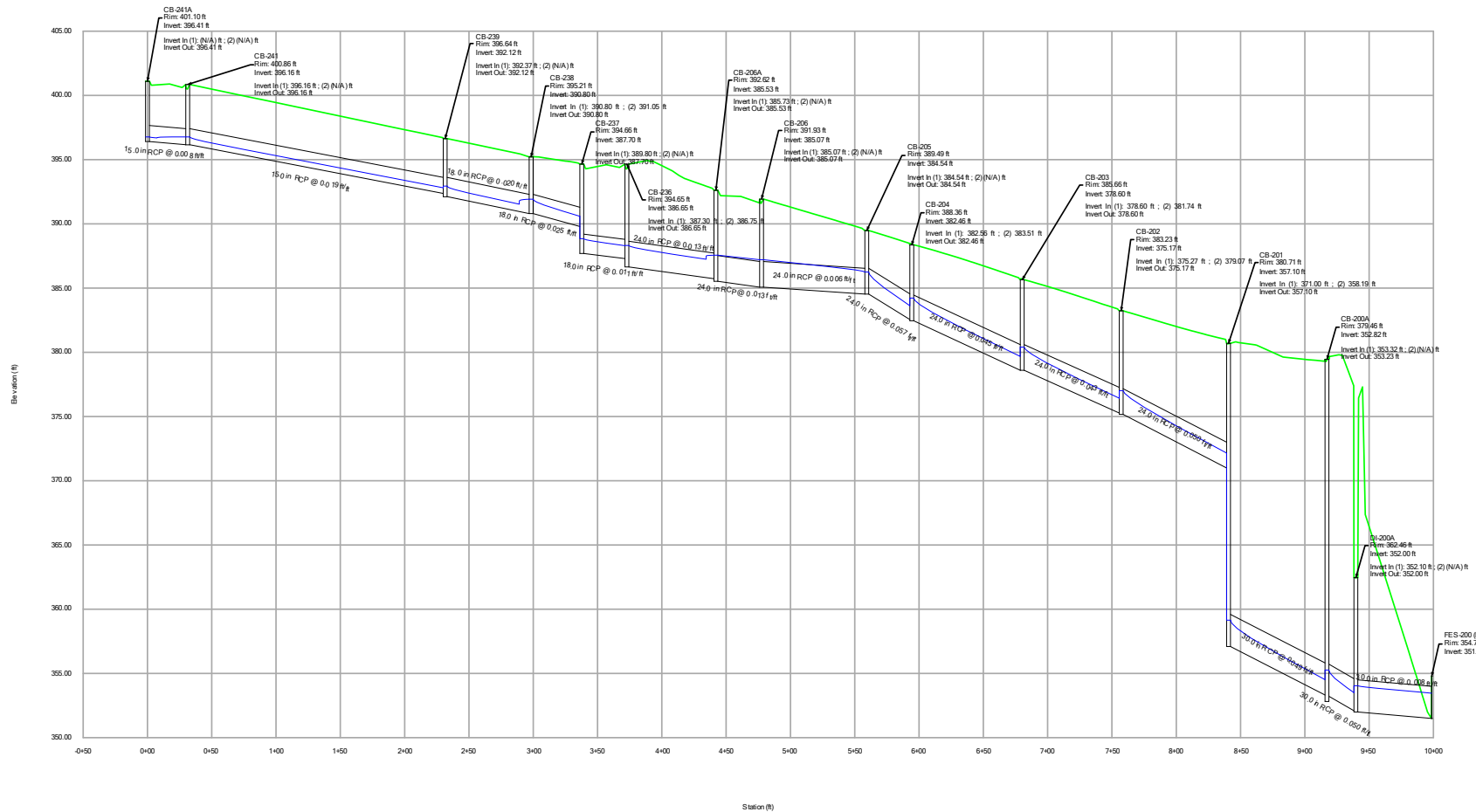
25-YEAR ANALYSIS



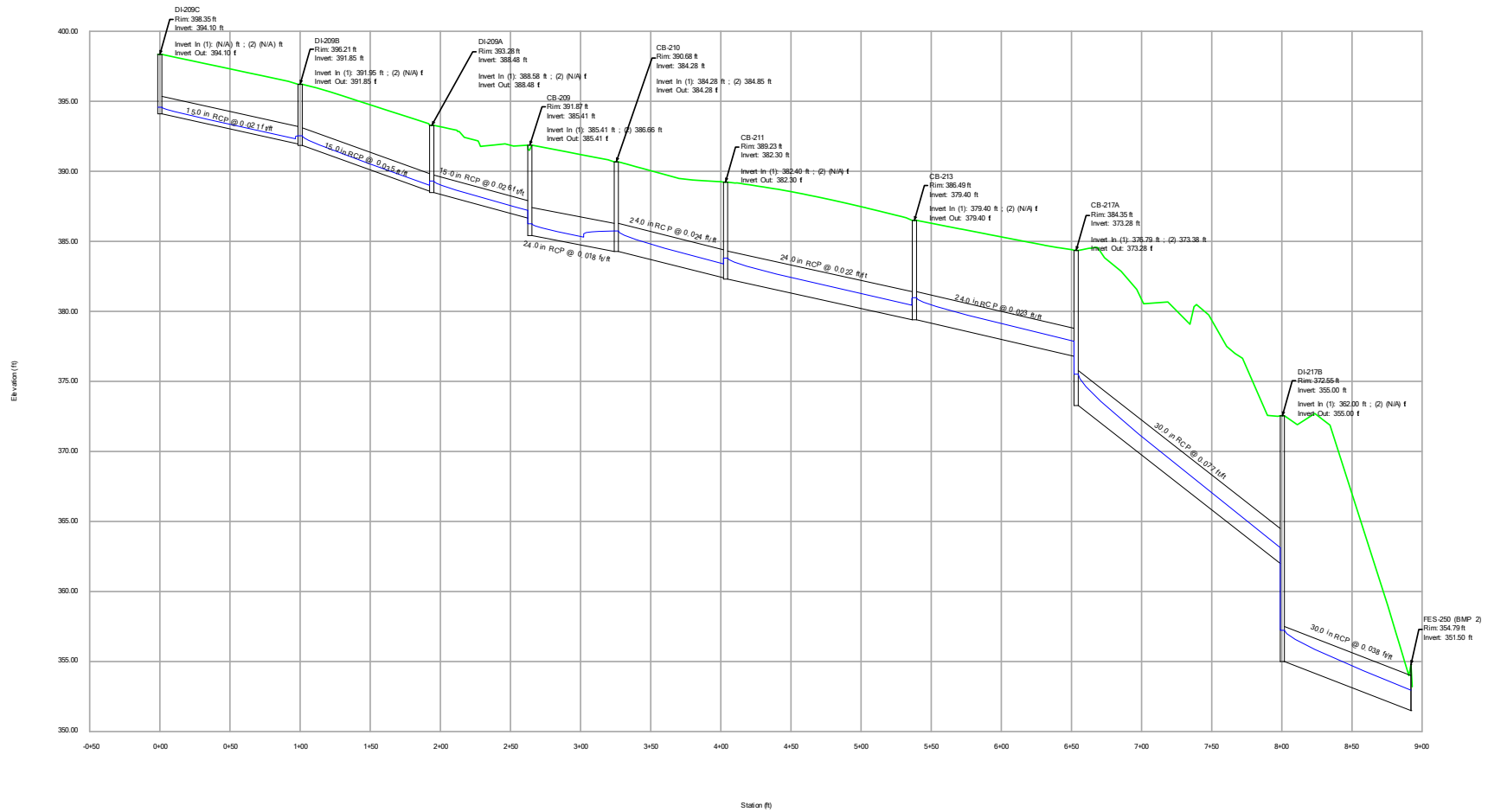
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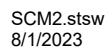
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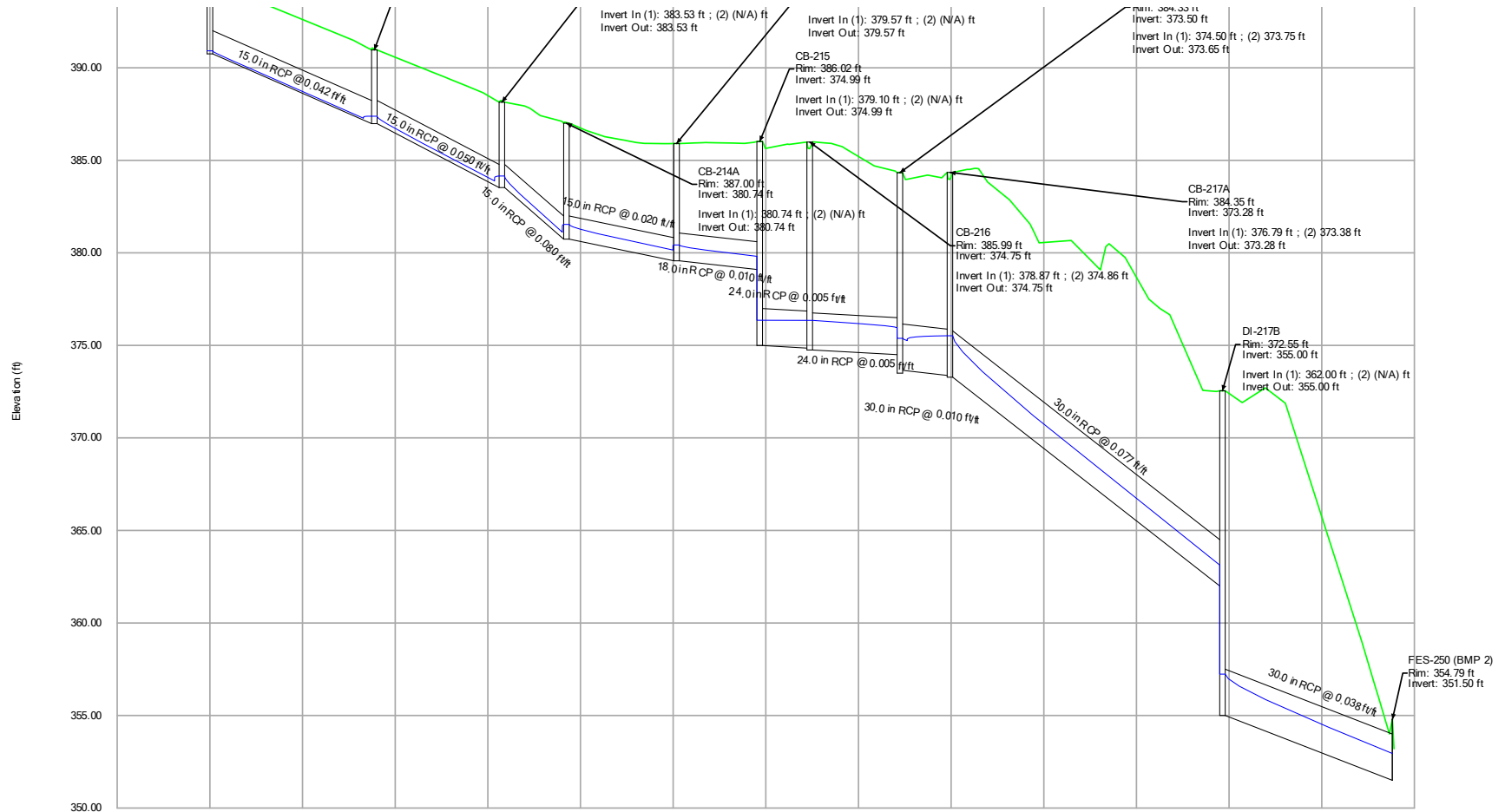
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25-YEAR ANALYSIS

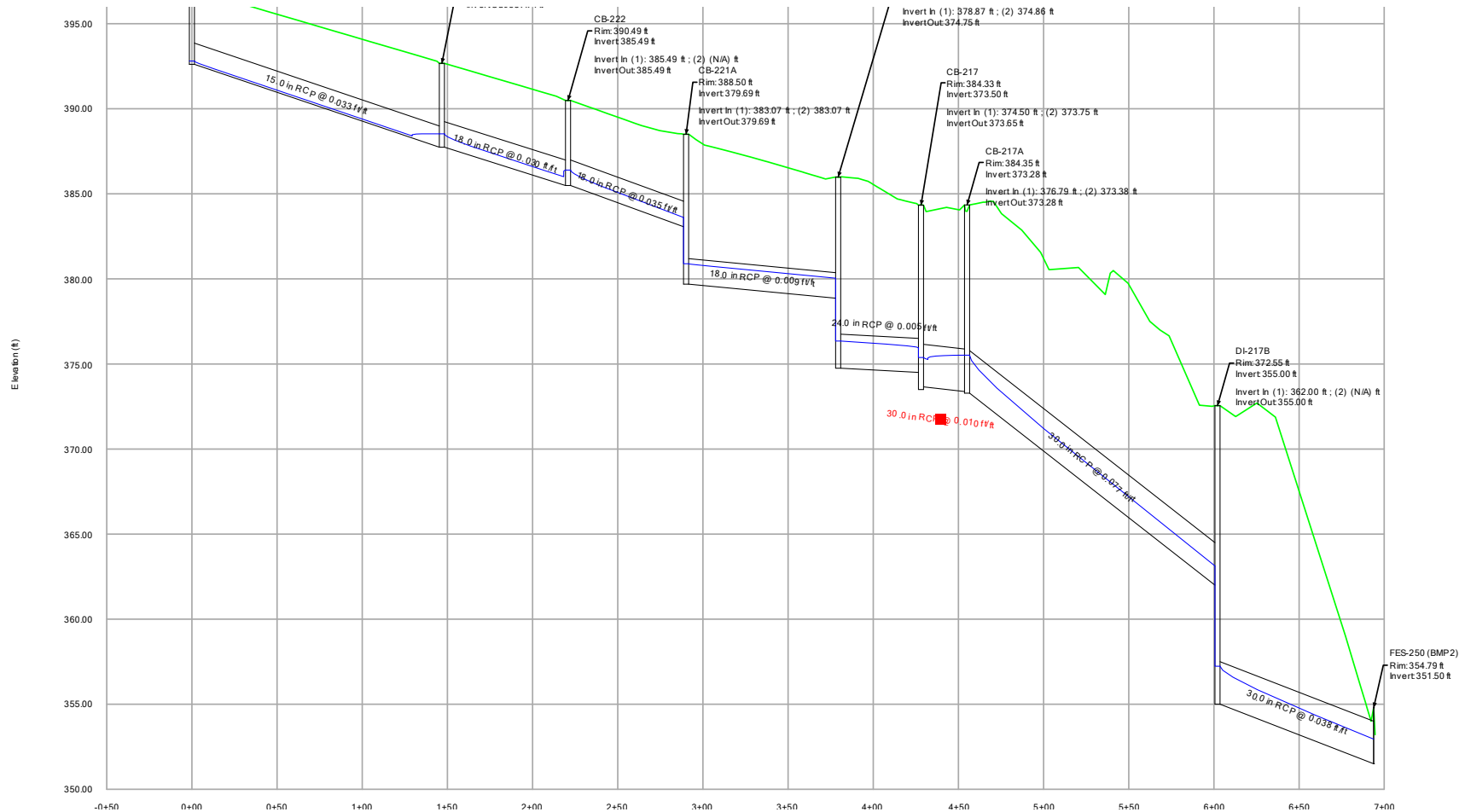


25-YEAR ANALYSIS



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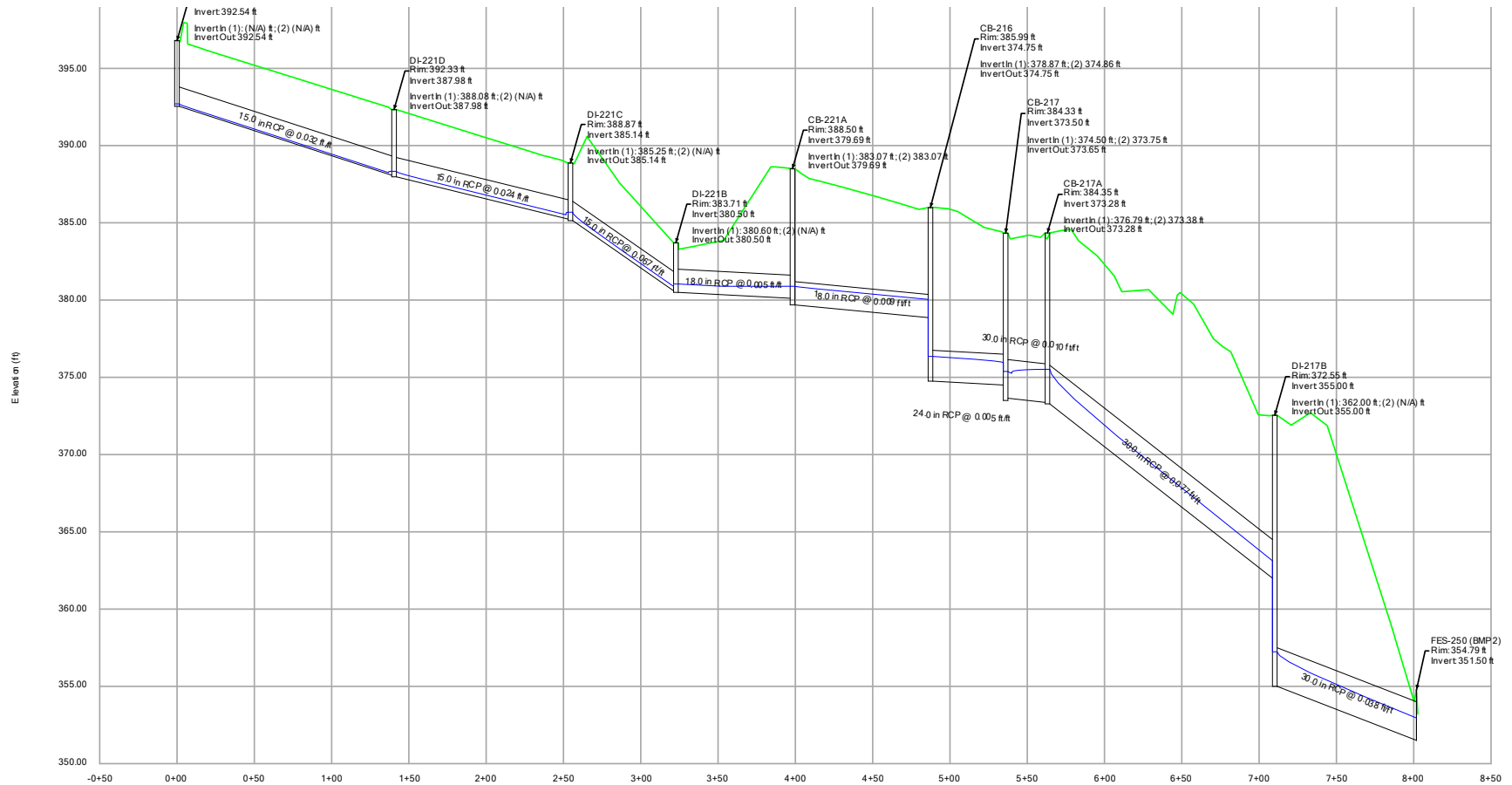
25-YEAR ANALYSIS



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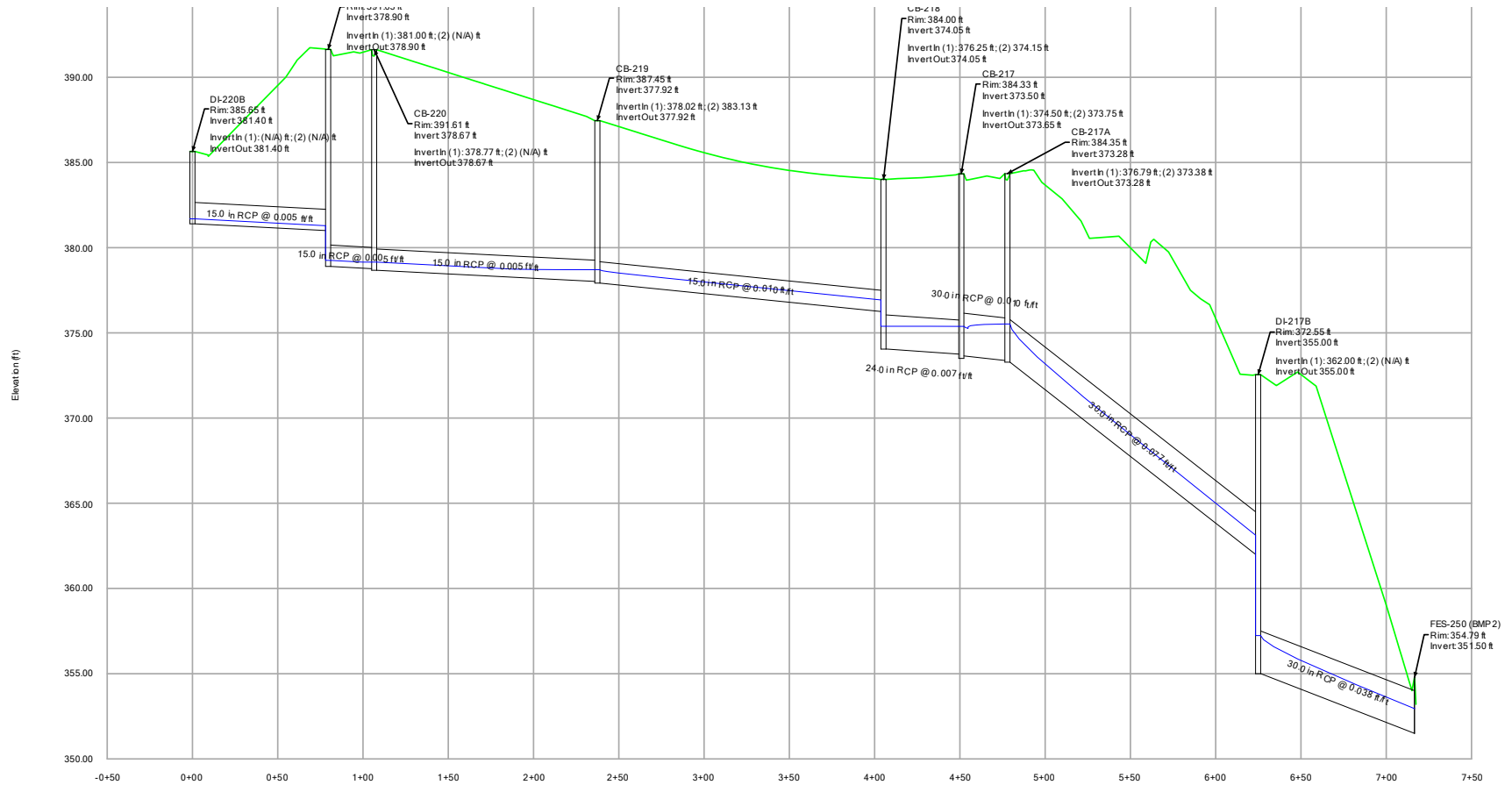
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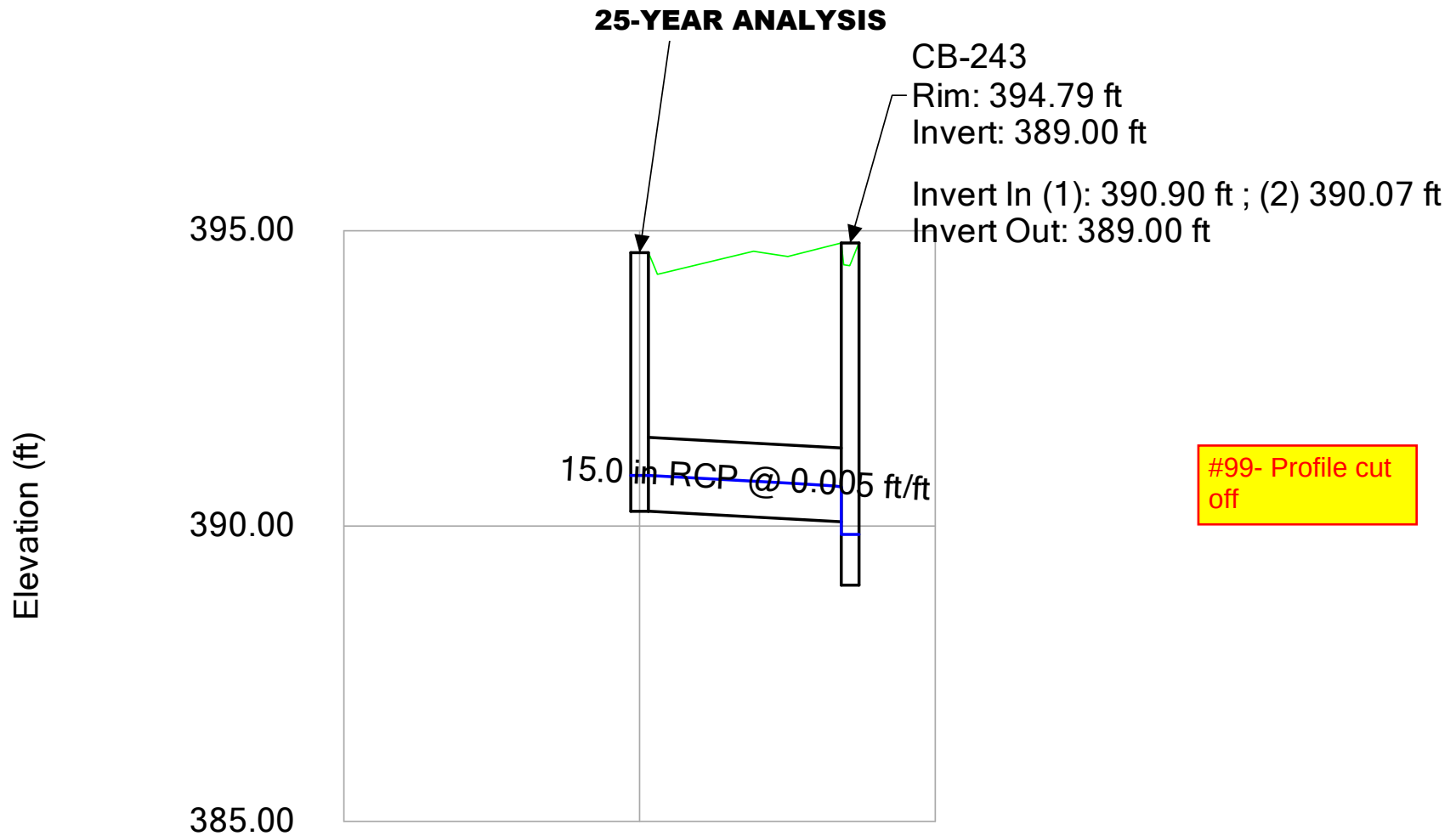
25-YEAR ANALYSIS

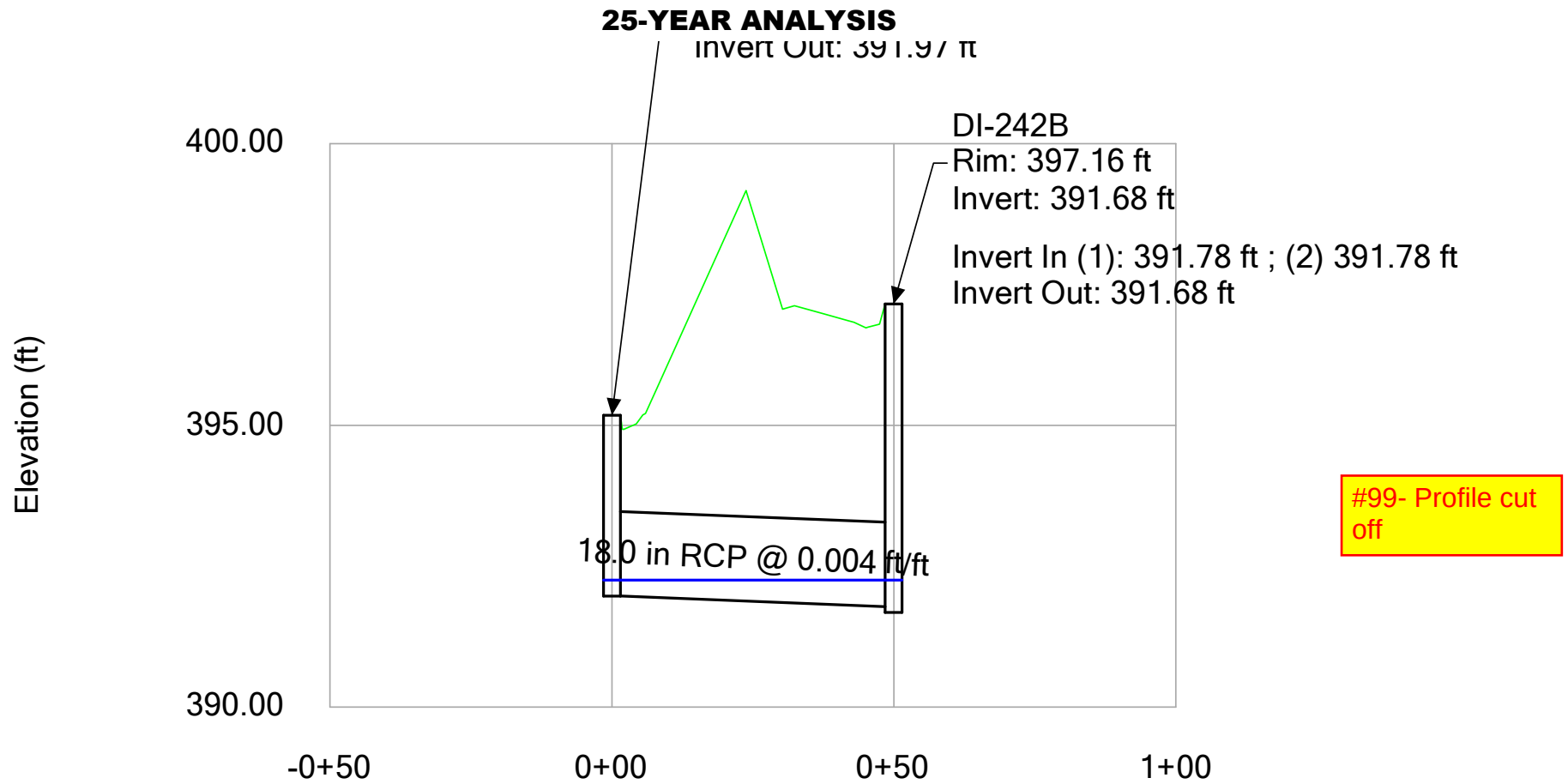


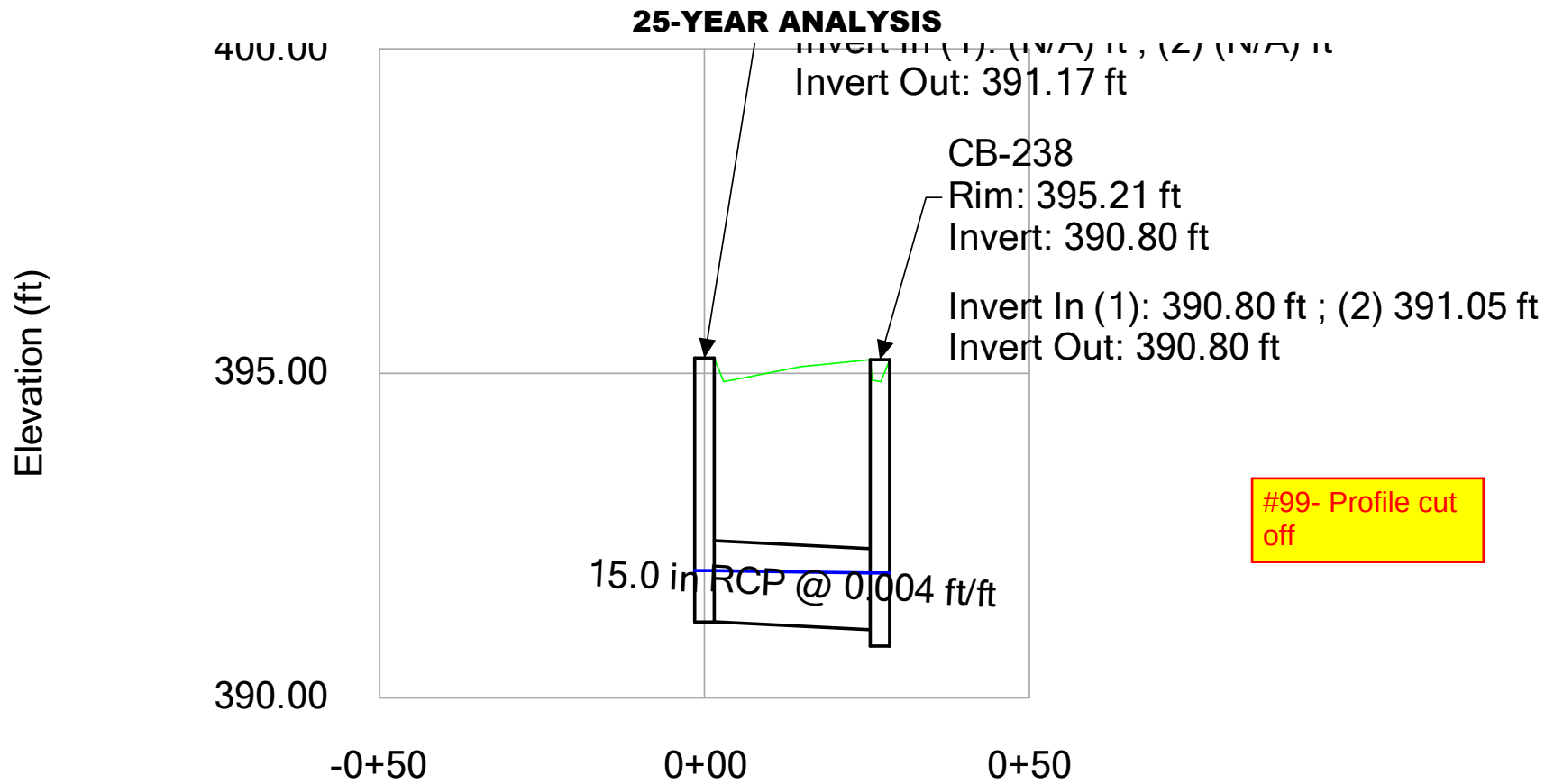
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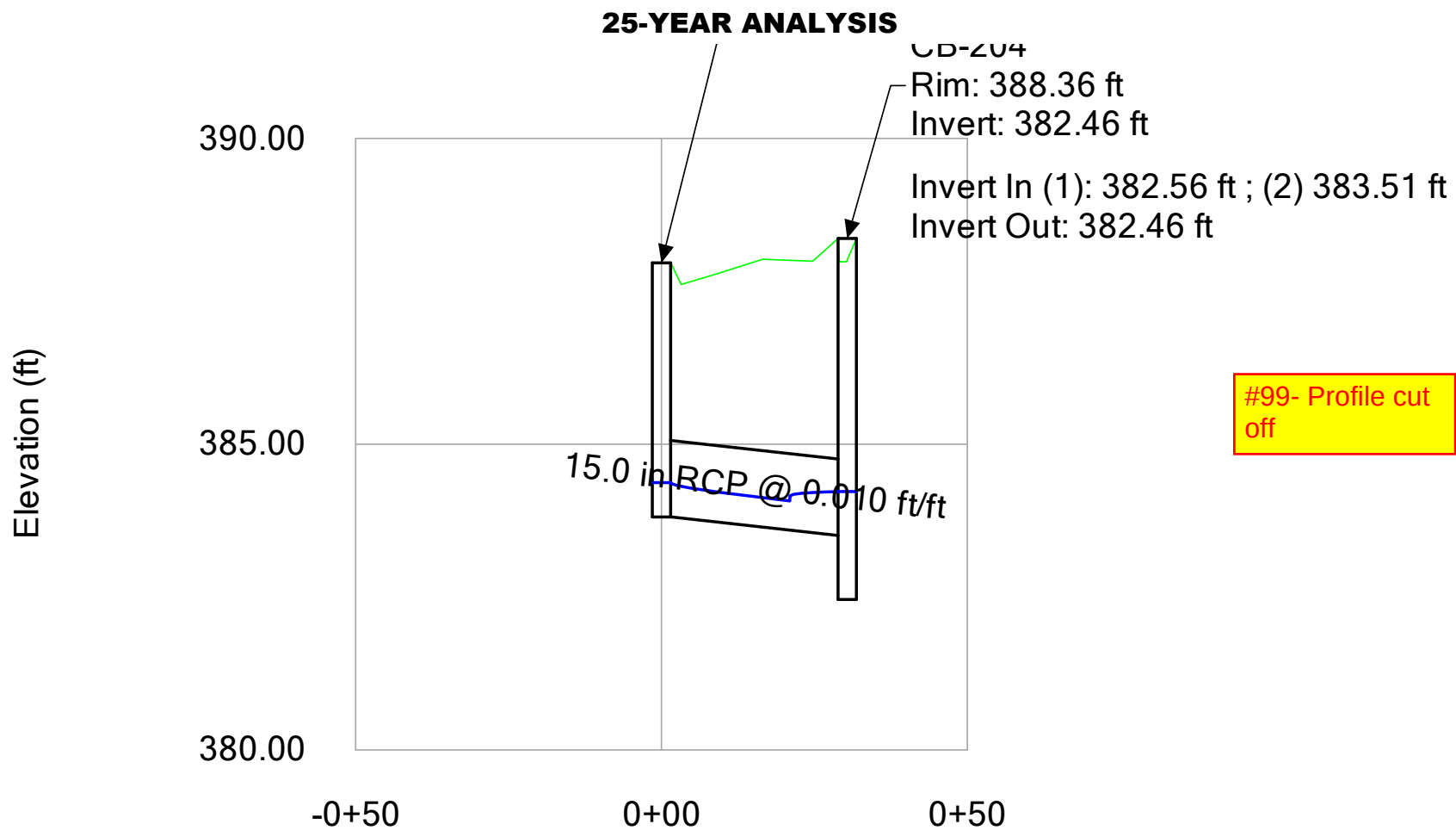
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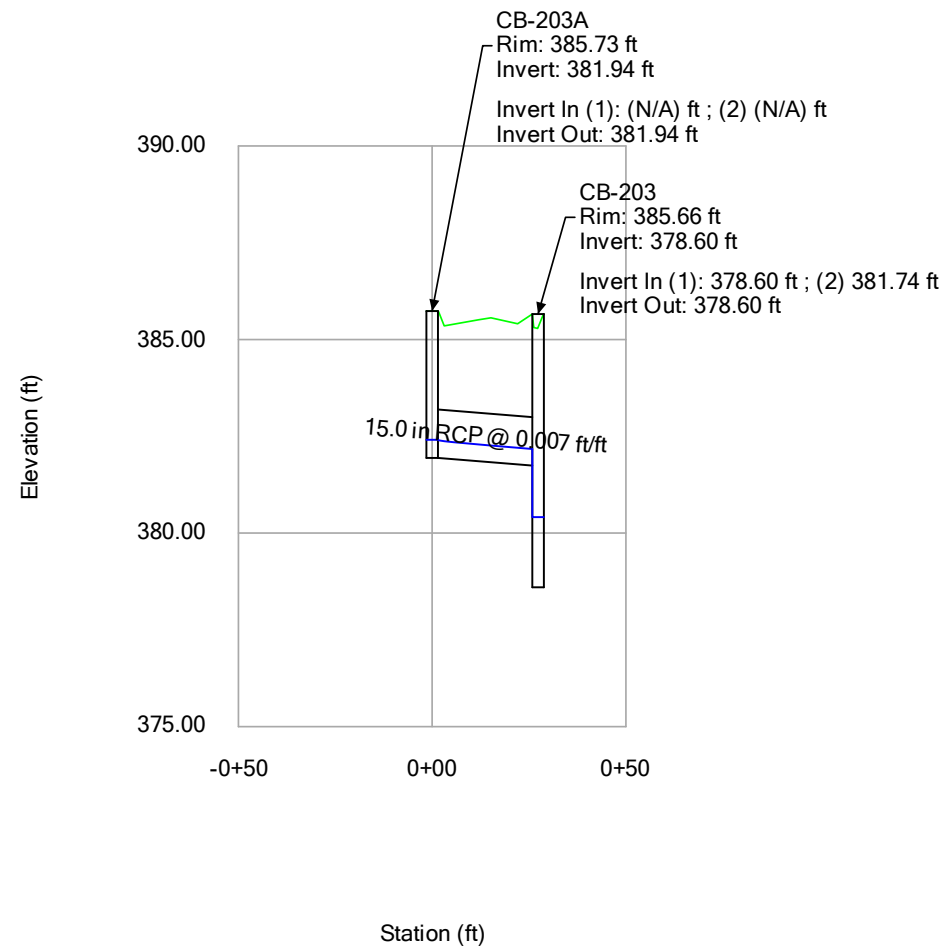






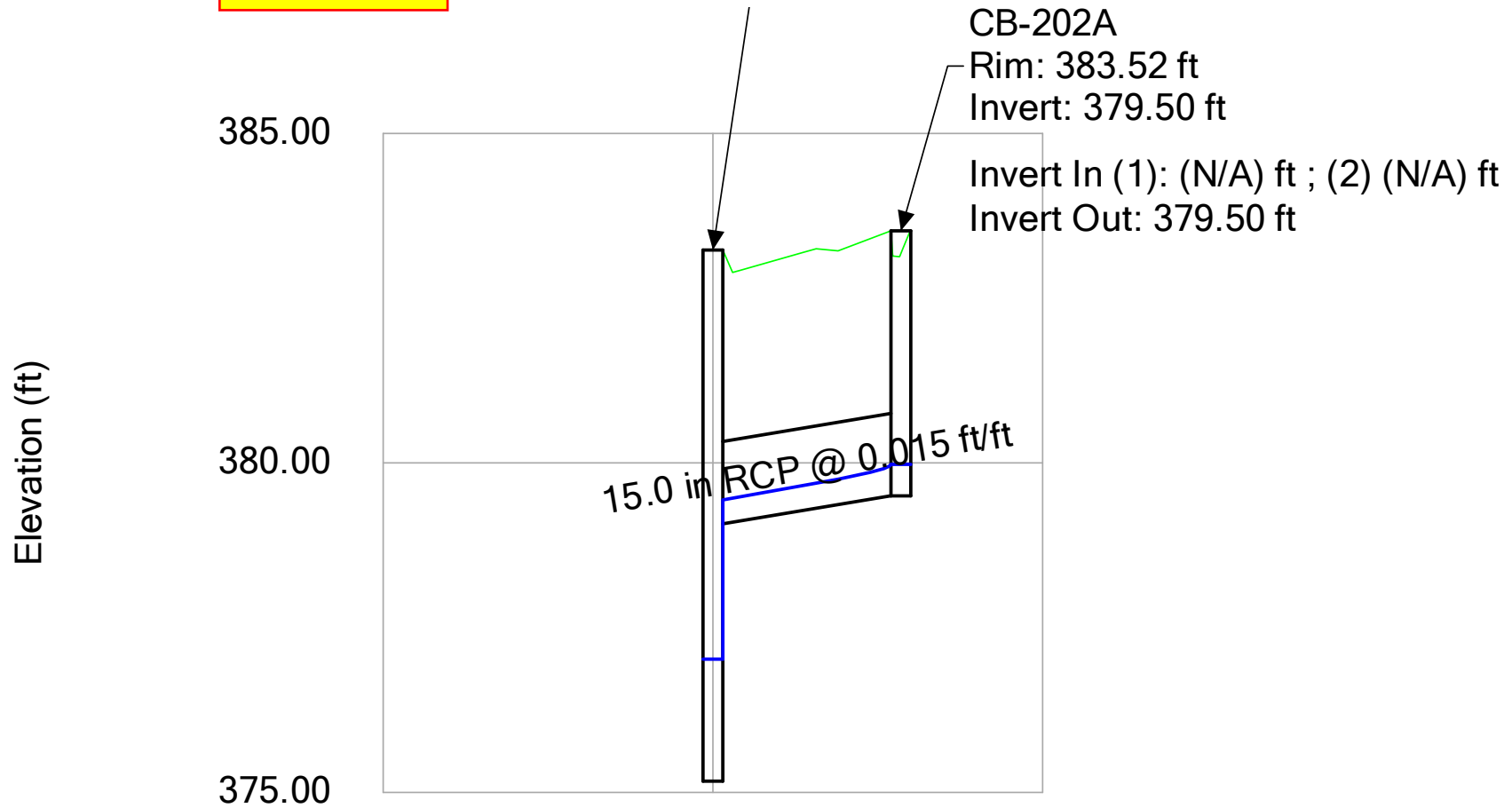


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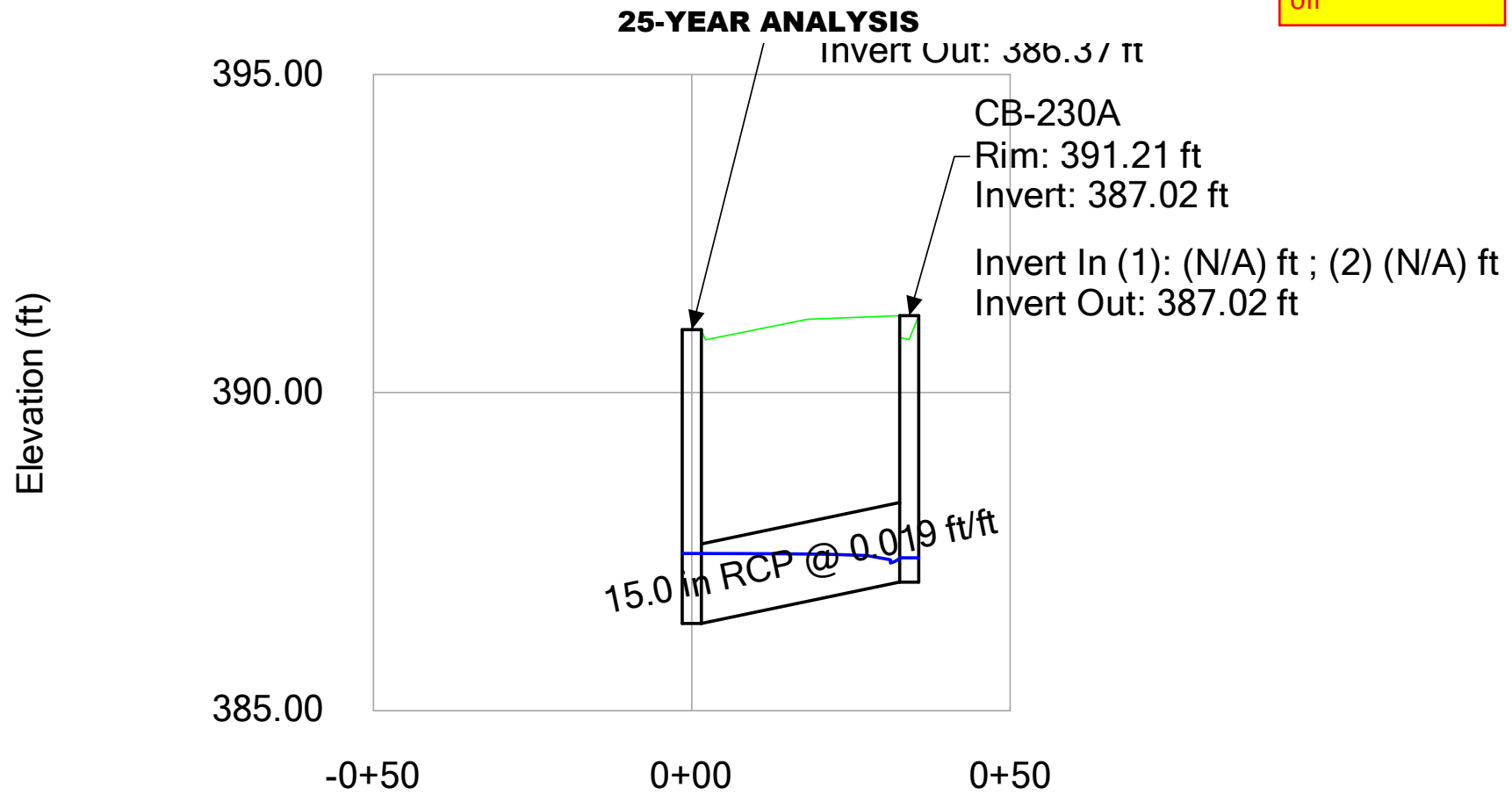


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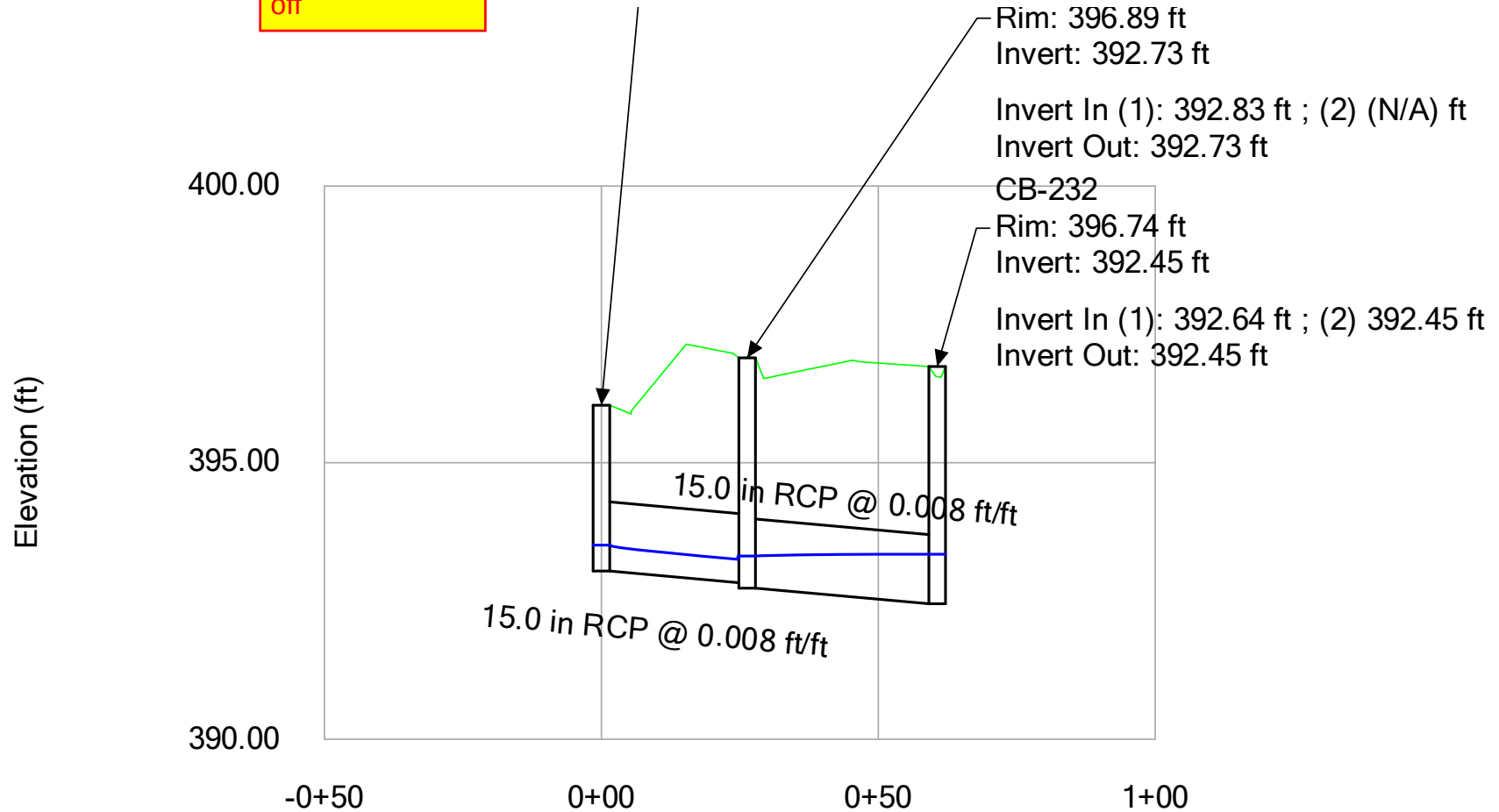


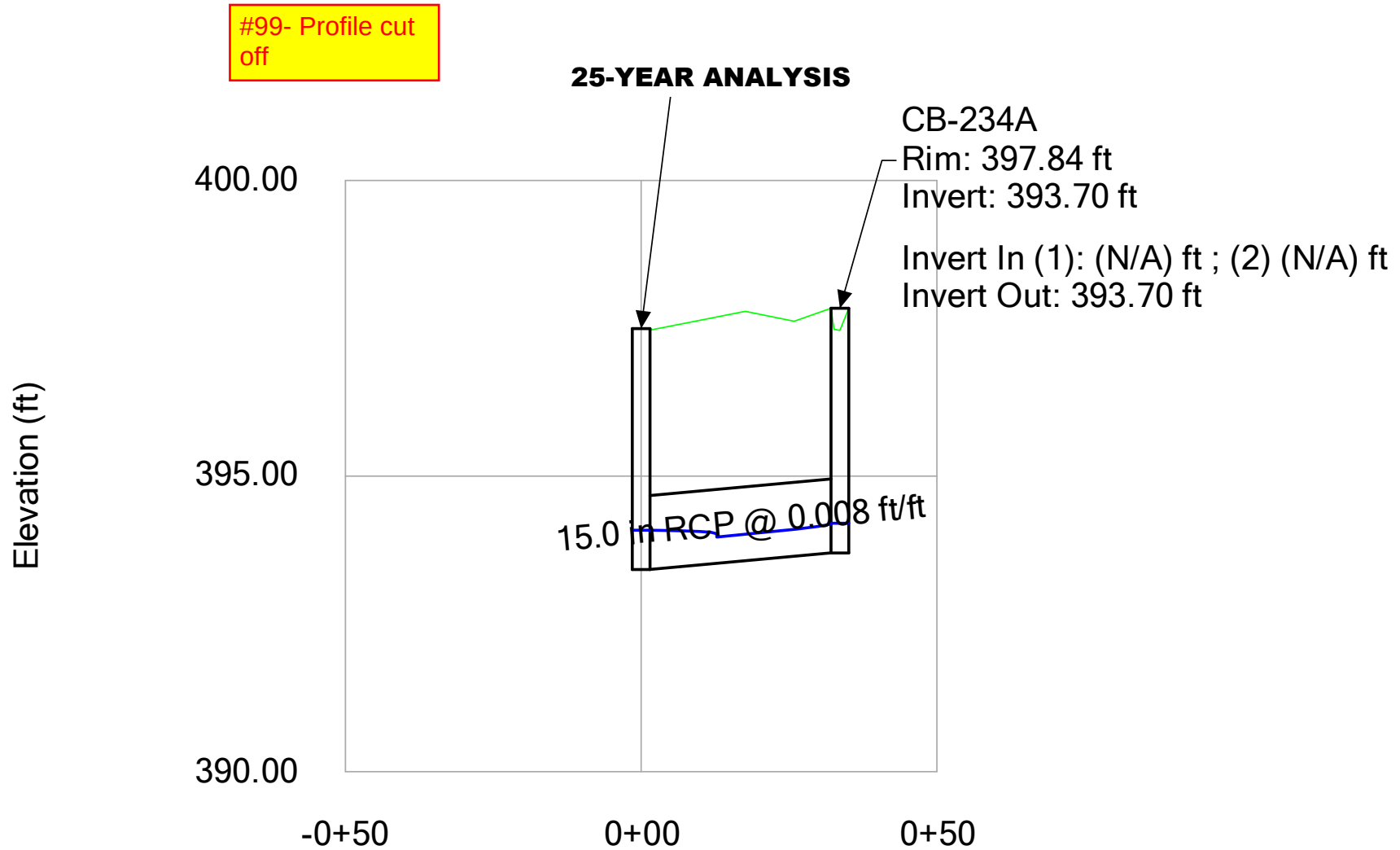
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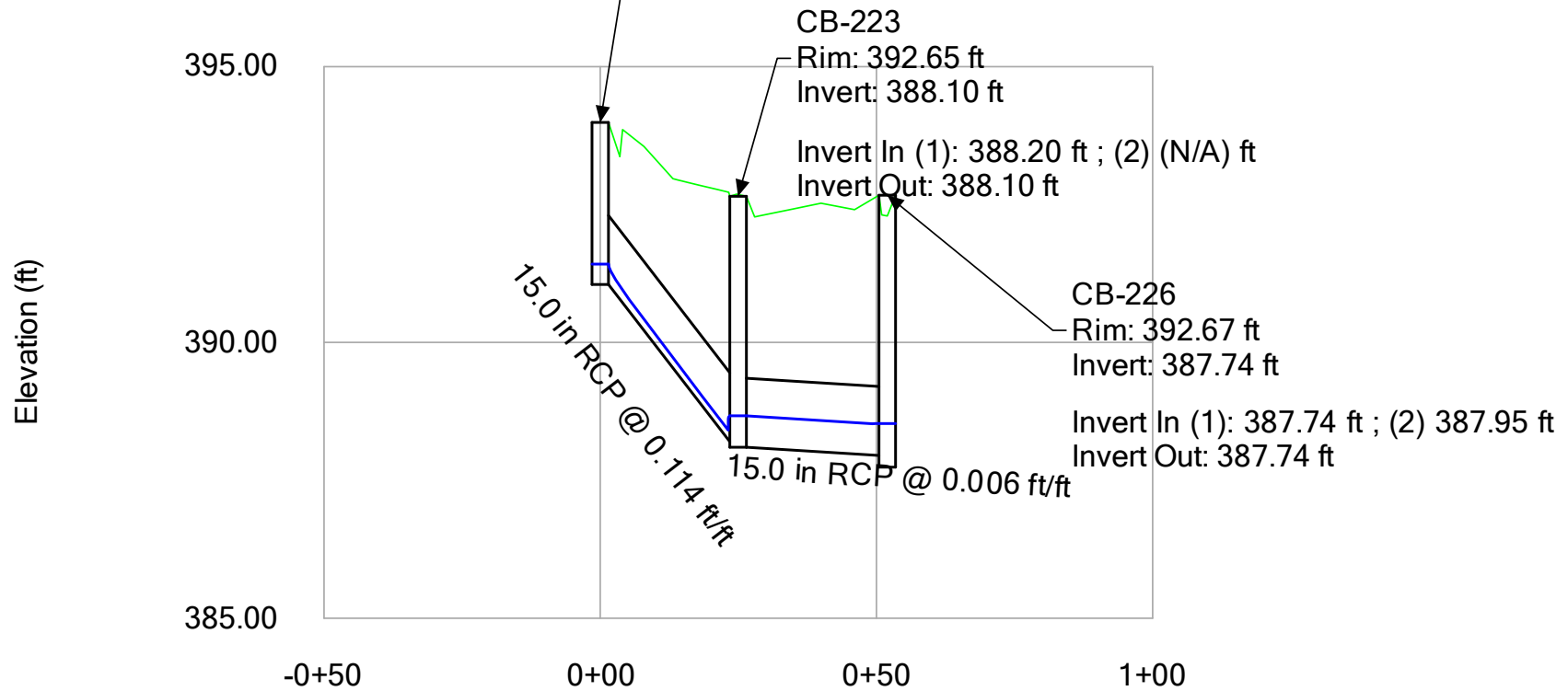
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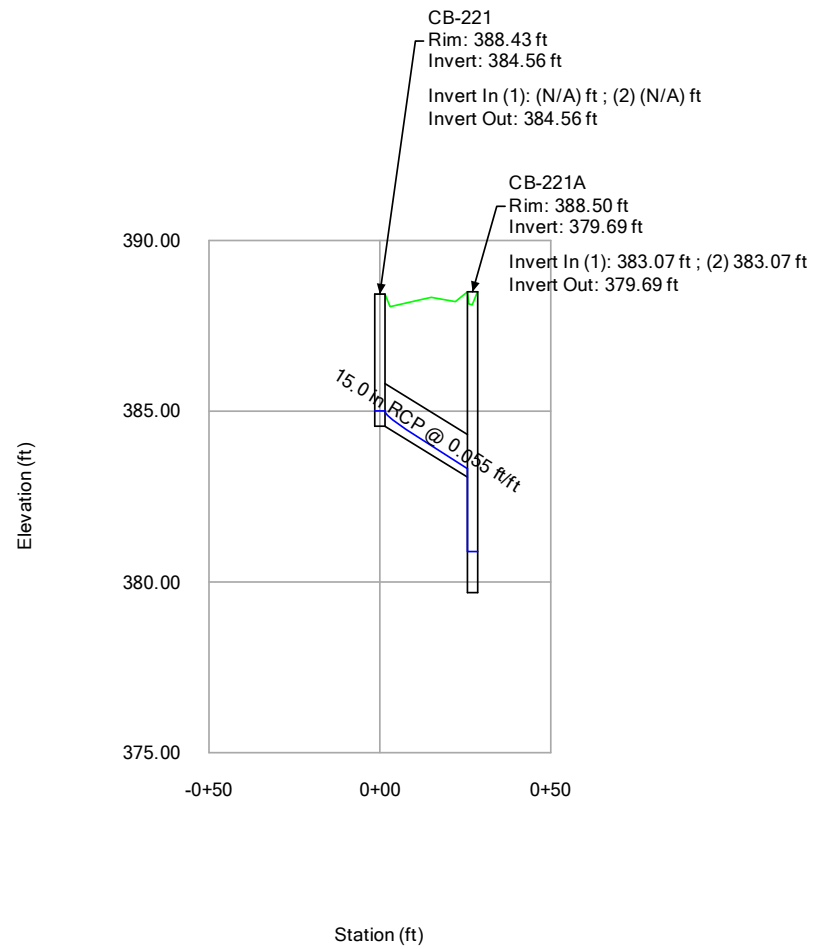


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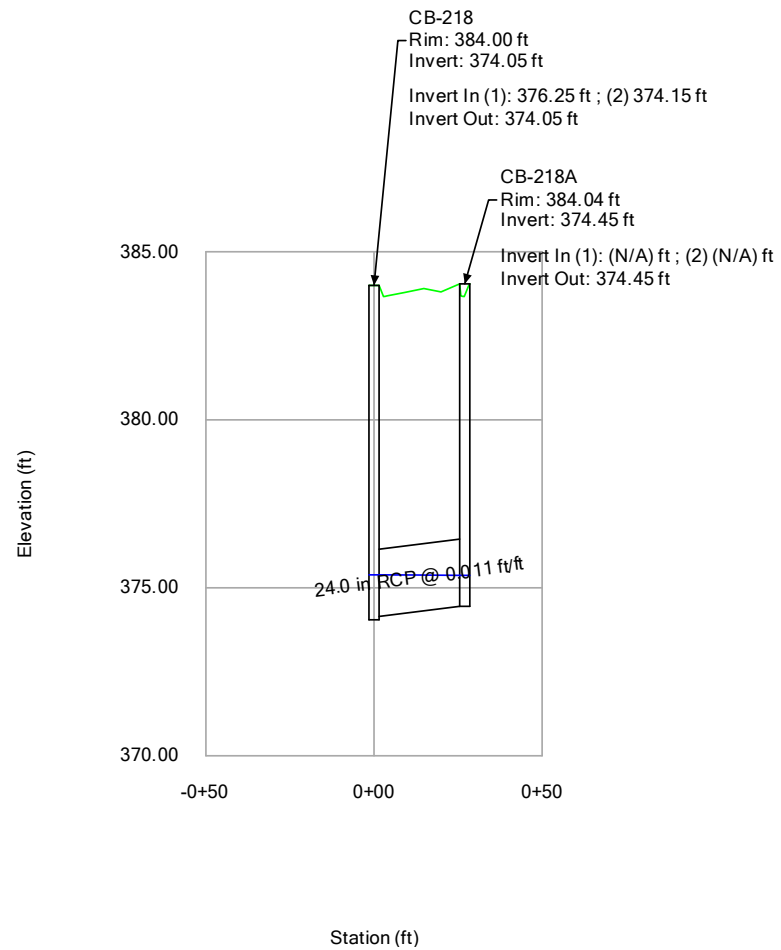
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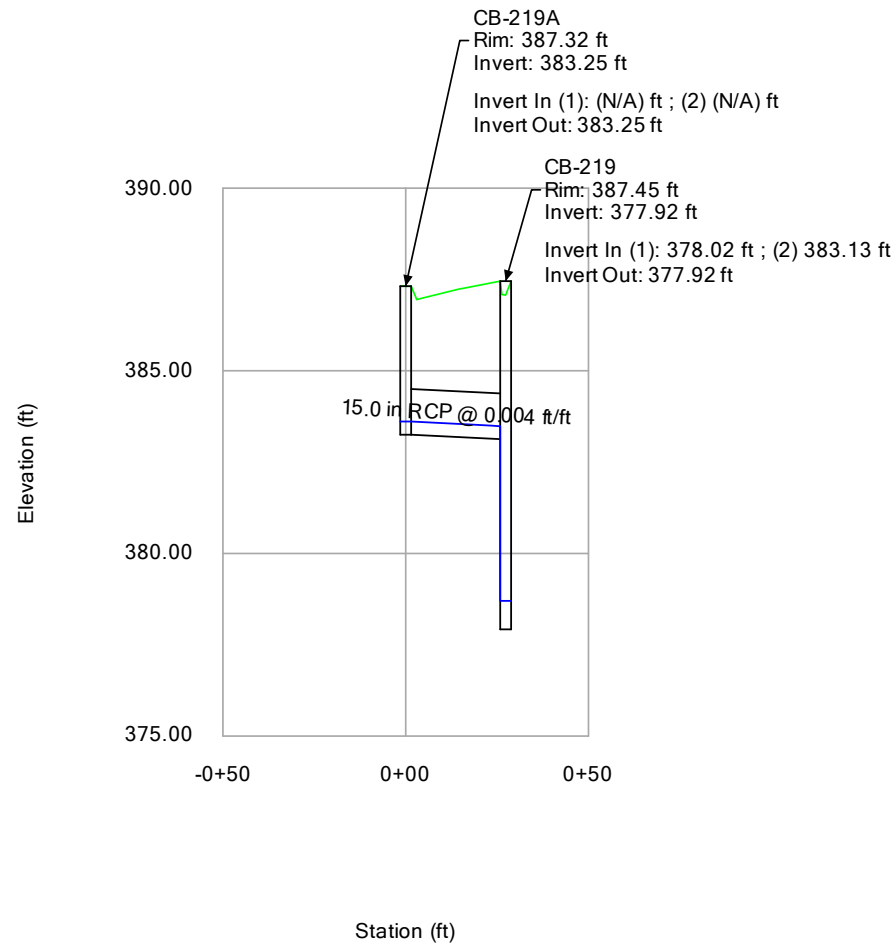
25-YEAR ANALYSIS



25-YEAR ANALYSIS



25-YEAR ANALYSIS



SCM 2 – INLET SPREAD

25-YEAR ANALYSIS

Inlet Spread - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)	Spread / Top Width (ft)	Depth (Gutter) (in)
DI-242C	0.186	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-244	0.128	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-244A	0.168	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-241A	0.142	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-241	0.276	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
DI-209C	0.265	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-234A	0.295	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-234	0.198	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
DI-242B	0.214	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-227	0.038	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-232A	0.000	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
DI-221E	0.026	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-232	0.143	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-239	0.432	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
DI-209B	0.229	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-232B	0.252	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-238A	0.511	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-238	0.172	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
DI-242E	0.002	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-243	0.405	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-237	0.053	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-236	0.010	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-243A	0.424	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
DI-213C	0.028	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-231	0.117	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-224	0.146	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
DCB-242	0.451	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
DCB-242A	0.419	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-208	0.026	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
DI-209A	0.185	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-242B	0.168	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)

**#104- Please show
data in tables**

25-YEAR ANALYSIS

Inlet Spread - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)	Spread / Top Width (ft)	Depth (Gutter) (in)
CB-226	0.407	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-223	0.199	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-206A	0.129	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
DI-221D	0.110	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-206	0.077	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-209	0.255	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-220A	0.043	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-220	0.103	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-230A	0.156	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-230	0.168	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
DI-212B	0.146	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-210	0.134	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-222	0.161	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-229	0.341	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-205	0.070	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-211	0.217	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
DI-221C	0.193	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-221A	0.152	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-221	0.206	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-204	0.049	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
DI-212A	0.247	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-204A	0.388	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-219	0.324	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-219A	0.125	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-214A	0.271	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
DI-201G	0.087	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-213	0.293	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-215	0.124	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-216	0.178	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-214	0.140	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-203A	0.250	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)

25-YEAR ANALYSIS

Inlet Spread - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)	Spread / Top Width (ft)	Depth (Gutter) (in)
CB-203	0.160	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
DI-220B	0.083	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-217A	0.290	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-217	0.143	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-218A	0.488	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-218	0.620	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
DI-221B	0.027	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-202A	0.263	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-202	0.180	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-201A	0.527	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
DI-201F	0.175	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-201	0.330	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
CB-200A	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
DI-201B	0.001	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
DI-201E	0.165	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
DI-217B	0.002	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
DI-201C	0.118	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
DI-201D	0.324	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
DI-200A	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)

4IN/HR

ATTACHMENT 3: DRAINAGE AREA MAPS – SCM 3



#31- Repeat comment: Please provide existing contours so drainage areas extending outside of the disturbed area can be verified. Contour labels should be added to both existing and proposed contours.

#94- Response to comment #164 refers to a separate grading plan to be completed, what is this in reference to? We are not aware of an additional grading plan.

#95- As these are the construction drawings, it is expected that the drainage areas take into account the drainage that is to occur on site. While final building footprints may not be known, reasonable assumptions as to where roof drainage and any additional fine grading may go can be reflected in the drainage areas. The current drainage areas shown do not reflect what we expect the final drainage to look like and should be updated so all storm pipes and structures are properly sized.

Once areas are updated to match contours and/or reasonably expected future design a full review can be completed.

#95- Large portions of drainage going towards site/storm structures are not being included in drainage areas

#95- In areas like this, it is unlikely for roof drainage to make its way to DCB-307A when there are other closer structures. Drainage areas should be adjusted as needed

#95- There's some area here that is not being included in either SCM 2 or SCM 3 drainage areas

G:\NCA\Projects\Lemnar\0430-03 - Lemnar - School Street - Rolesville\04 - Calculations\Storm\StormCAD\RAINAGE AREAS.dwg



5440 WADE PARK BLVD, SUITE 102
RALEIGH NC 27607
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NC LICENSE #C-4397

SCM 3 DRAINAGE MAP

DATE: 7/27/2023

0 50' 100' 150'

SCALE: 1" = 50'

SCM 3 – 10 YR STORM

10-YEAR ANALYSIS

CATCHMENTS - Time: 0.00 hours

Outflow Element	Scaled Area (acres)	Flow (Total Out) (cfs)	Time of Concentration (hours)	Runoff Coefficient (Rational)
DCB-314A	0.691	4.16	0.083	0.830
DCB-314	0.595	3.58	0.083	0.830
CB-315A	0.001	0.01	0.083	0.830
CB-315	0.001	0.00	0.083	0.830
CB-316A	0.042	0.25	0.083	0.830
CB-316B	0.055	0.33	0.083	0.830
CB-316C	0.098	0.59	0.083	0.830
CB-316D	0.081	0.49	0.083	0.830
CB-316	0.030	0.18	0.083	0.830
CB-317	0.046	0.28	0.083	0.830
CB-317A	0.052	0.31	0.083	0.830
CB-318	0.333	2.00	0.083	0.830
CB-318A	0.514	3.09	0.083	0.830
DI-301	0.003	0.02	0.083	0.830
DI-305C	0.003	0.02	0.083	0.830
DI-305B	0.002	0.01	0.083	0.830
DI-305A	0.002	0.01	0.083	0.830
CB-305	0.065	0.39	0.083	0.830
CB-303	0.326	1.96	0.083	0.830
CB-310	0.347	2.09	0.083	0.830
CB-305A	0.368	2.21	0.083	0.830
CB-306A	0.447	2.69	0.083	0.830
CB-311A	0.003	0.02	0.083	0.830
CB-311	0.073	0.44	0.083	0.830
CB-312	0.054	0.32	0.083	0.830
CB-306	0.241	1.45	0.083	0.830
DCB-307A	0.591	3.56	0.083	0.830
CB-308A	0.377	2.27	0.083	0.830
CB-309A	0.089	0.53	0.083	0.830
CB-309	0.144	0.86	0.083	0.830
DCB-307	0.524	3.15	0.083	0.830

#97- For most accurate results, runoff coefficients should be determined for each structure (and therefore be different for each of these drainage areas). See City of Raleigh Stormwater Management Design Manual for more information on how to get the composite runoff coefficient

10-YEAR ANALYSIS

CATCHMENTS - Time: 0.00 hours

Outflow Element	Scaled Area (acres)	Flow (Total Out) (cfs)	Time of Concentration (hours)	Runoff Coefficient (Rational)
CB-308	0.438	2.64	0.083	0.830
DI-307B	0.326	1.96	0.083	0.830

10-YEAR ANALYSIS

Inlets - Time: 0.00 hours

Label	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Grate Length (ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)
CB-312	0.32	0.00	0.32	99.2	403.97	403.97	3.0	2.21	2.21
CB-315	0.00	0.00	4.67	100.0	398.39	398.39	3.0	4.43	4.26
CB-316A	0.25	0.00	6.13	99.8	397.88	397.88	3.0	3.53	4.63
CB-316B	0.32	0.01	1.30	97.3	400.23	400.23	3.0	4.24	3.14
CB-315A	0.01	0.00	4.72	100.0	398.87	398.87	3.0	4.45	4.28
CB-311	0.42	0.02	0.73	95.1	400.34	400.34	3.0	1.20	2.72
CB-311A	0.02	0.00	0.74	100.0	400.10	400.10	3.0	2.77	2.78
CB-316	0.18	0.00	6.28	100.0	396.89	396.89	3.0	4.56	4.67
DCB-314	2.28	1.29	4.80	63.8	399.60	399.60	6.0	3.82	4.30
DCB-314A	2.55	1.61	2.55	61.2	400.11	400.11	6.0	3.81	3.81
CB-316C	0.54	0.05	0.99	92.2	401.17	401.17	3.0	3.20	2.91
CB-316D	0.46	0.03	0.46	94.1	401.68	401.68	3.0	2.37	2.37
CB-303	1.46	0.51	3.61	74.3	399.77	399.77	3.0	2.81	4.57
CB-310	1.53	0.56	2.22	73.2	399.80	399.80	3.0	1.64	3.85
CB-317	0.27	0.00	10.13	99.6	389.60	389.60	3.0	4.52	5.48
CB-317A	0.32	0.00	0.32	99.2	399.22	399.22	3.0	2.12	2.12
CB-309A	0.50	0.04	0.50	93.3	399.06	399.06	3.0	2.44	2.44
CB-305A	1.89	0.88	1.89	68.2	395.73	395.73	3.0	3.66	3.66
CB-305	0.78	0.12	20.53	86.9	390.70	390.70	3.0	6.35	6.45
CB-309	0.75	0.11	1.24	87.4	399.00	399.00	3.0	1.31	3.22
DI-305A	0.01	0.00	20.45	100.0	390.48	390.48	3.0	6.48	6.47
CB-306	1.22	0.34	14.74	78.1	391.77	391.77	3.0	4.87	5.78
CB-306A	2.28	1.29	2.28	63.8	391.83	391.83	3.0	3.61	3.61
CB-308A	1.65	0.66	1.65	71.5	393.00	393.00	3.0	2.08	2.08
CB-308	1.88	0.87	4.66	68.4	392.99	392.99	3.0	1.68	4.31
DCB-307	2.63	1.73	11.53	60.4	392.05	392.05	6.0	2.38	5.54
DCB-307A	3.11	2.39	4.47	56.5	392.00	392.00	6.0	3.37	4.20
DI-307B	1.46	0.50	1.46	74.3	393.88	393.88	3.0	3.24	3.24
DI-305C	0.02	0.00	20.01	100.0	386.30	386.30	3.0	11.71	6.41
YI-3002	0.00	0.00	0.00	100.0	380.50	380.50	3.0	0.00	0.00

10-YEAR ANALYSIS

Inlets - Time: 0.00 hours

Label	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Grate Length (ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)
DI-301	0.02	0.00	9.96	100.0	387.63	387.63	3.0	7.14	5.45
CB-318A	2.05	1.04	2.05	66.3	390.86	390.86	3.0	3.12	3.12
CB-318	1.48	0.52	3.51	73.9	390.85	390.85	3.0	2.32	3.97
DI-305B	0.01	0.00	20.15	100.0	389.62	389.62	3.0	6.80	6.43
OCS-3003	0.00	0.00	0.00	100.0	379.00	379.00	3.0	0.00	0.00
JB-3001	0.00	0.00	0.00	100.0	378.43	378.43	3.0	0.00	0.00

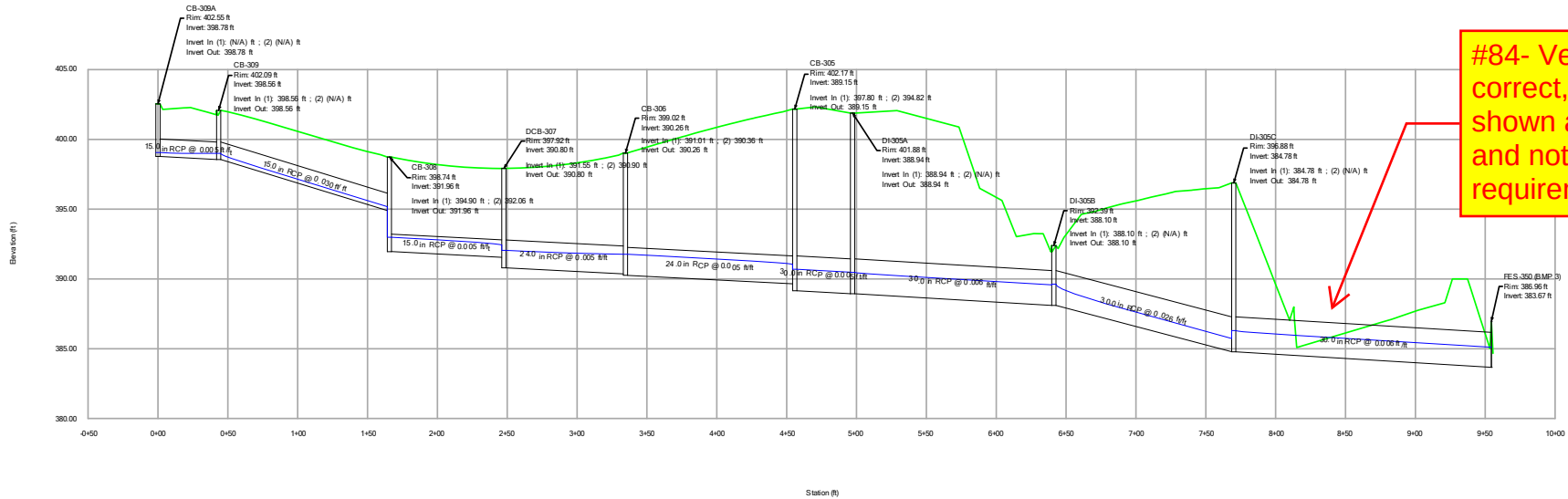
10-YEAR ANALYSIS **Conduit Results - Time: 0.00 hours**

Label	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
CB-311 TO CB-312	15.0	0.040	2.21	1.20	0.32	12.95	403.97	400.34
CB-315 TO CB-315A	24.0	0.005	4.28	4.43	4.72	16.00	398.87	398.48
CB-316A TO CB-315	24.0	0.008	4.26	3.53	4.67	20.17	398.39	397.88
CB-316A TO CB-316B	18.0	0.005	3.14	3.17	1.30	7.43	400.23	400.05
CB-316 TO CB-316A	24.0	0.020	4.63	4.56	6.13	31.97	397.88	396.89
CB-316B TO CB-316C	18.0	0.014	2.91	4.24	0.99	12.55	401.17	400.29
CB-315A TO DCB-314	24.0	0.005	4.30	4.45	4.80	16.00	399.60	398.96
CB-311A TO CB-311	15.0	-0.005	2.72	2.77	0.73	4.56	400.34	400.18
CB-310 TO CB-311A	15.0	0.011	2.78	1.64	0.74	6.71	400.10	399.80
CB-317 TO CB-316	24.0	0.020	4.67	7.89	6.28	32.04	396.89	395.18
DCB-314 TO DCB-314A	18.0	0.005	3.81	3.82	2.55	7.43	400.11	399.93
CB-316C TO CB-316D	18.0	0.012	2.37	3.20	0.46	11.64	401.68	401.20
CB-303 TO CB-310	15.0	0.006	3.85	2.81	2.22	4.88	399.80	399.77
CB-305 TO CB-303	15.0	0.013	4.57	5.94	3.61	7.30	399.77	398.42
CB-317 TO CB-317A	15.0	0.005	2.12	2.20	0.32	4.53	399.22	399.04
CB-317 TO CB-318	15.0	0.005	3.97	4.52	3.51	4.38	390.85	389.96
DI-301 TO CB-317	24.0	0.011	5.48	7.14	10.13	23.22	389.60	387.42
CB-309 TO CB-309A	15.0	0.005	2.44	1.31	0.50	4.57	399.06	399.00
CB-305 TO CB-305A	15.0	0.010	3.66	4.60	1.89	6.53	395.73	395.28
CB-305 TO CB-306	24.0	0.005	5.78	6.35	14.74	16.00	391.77	391.03
DI-305A TO CB-305	30.0	0.005	6.45	6.48	20.53	29.22	390.70	390.48
CB-308 TO CB-309	15.0	0.030	3.22	6.00	1.24	11.18	399.00	395.18
DI-305B TO DI-305A	30.0	0.006	6.47	6.80	20.45	31.32	390.48	389.57
CB-306 TO CB-306A	15.0	0.005	3.61	2.92	2.28	4.57	391.83	391.77
CB-306 TO DCB-307	24.0	0.005	5.54	4.87	11.53	16.00	392.05	391.77
CB-308 TO CB-308A	15.0	0.005	2.08	1.68	1.65	4.57	393.00	392.99
DCB-307 TO CB-308	15.0	0.005	4.31	5.08	4.66	4.57	392.99	392.43
DCB-307 TO DCB-307A	24.0	0.010	4.20	2.38	4.47	22.62	392.00	392.05
DCB-307A TO DI-307B	18.0	0.005	3.24	3.37	1.46	7.76	393.88	393.24
DI-305C TO DI-305B	30.0	0.026	6.43	11.71	20.15	65.85	389.62	385.73

10-YEAR ANALYSIS
Conduit Results - Time: 0.00 hours

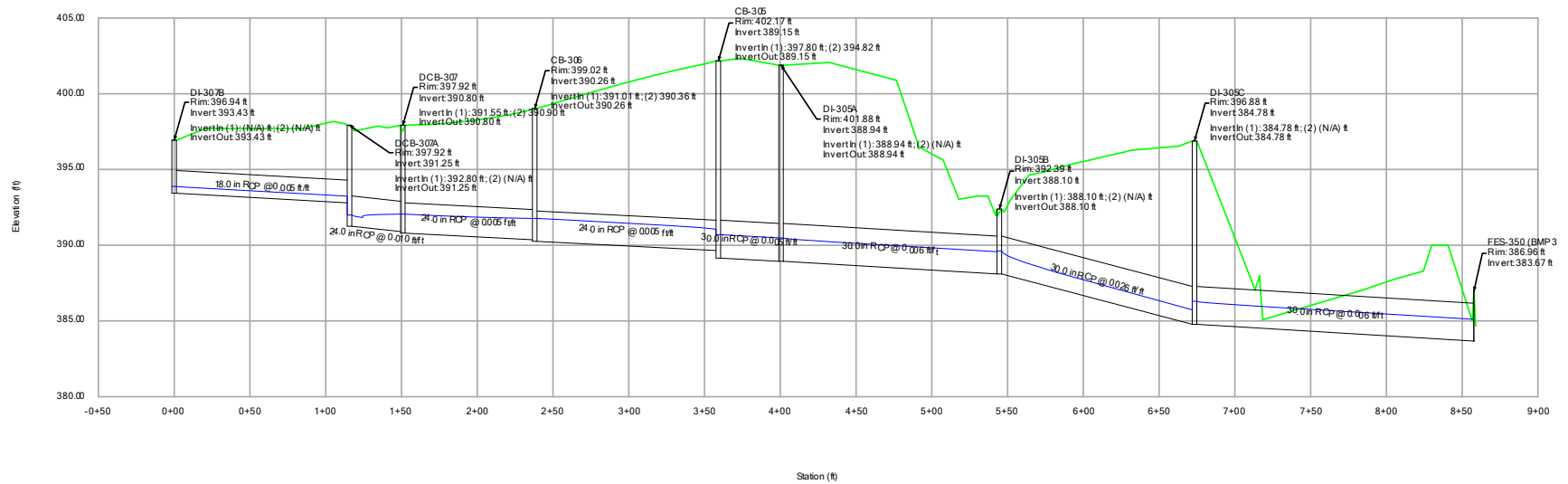
Label	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
FES-350 TO DI-305C	30.0	0.006	6.41	6.85	20.01	31.80	386.30	385.11
JB-3001 TO YI-3002	36.0	0.008	0.00	0.00	0.00	59.44	380.50	378.43
FES-300 TO DI-301	24.0	0.020	5.45	9.01	9.96	32.08	387.63	384.43
CB-318 TO CB-318A	15.0	0.006	3.12	2.32	2.05	4.87	390.86	390.85
JB-3001 TO OCS-3003	24.0	0.008	0.00	0.00	0.00	20.80	379.00	378.43
FES 3000 TO JB-3001	36.0	0.008	0.00	0.00	0.00	61.32	378.43	378.00

10-YEAR ANALYSIS

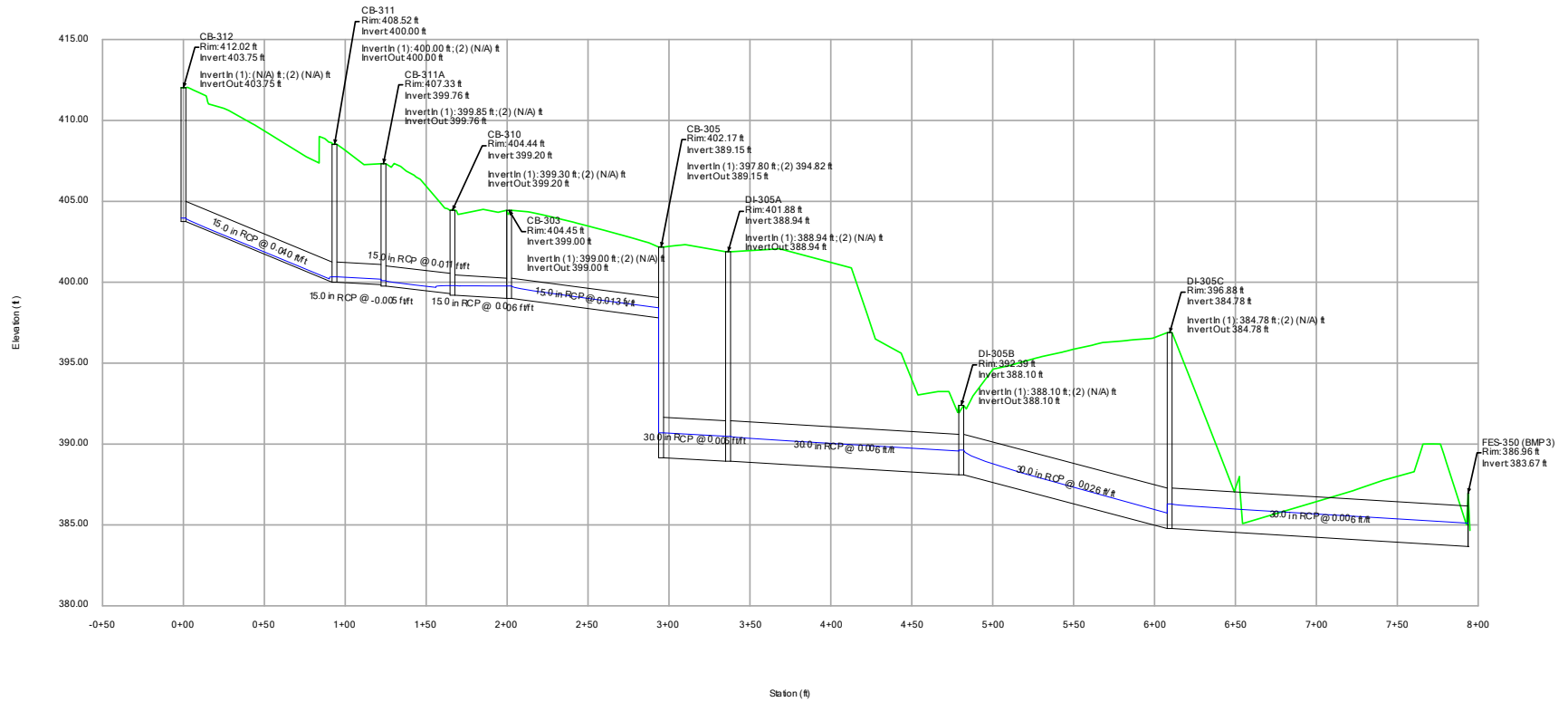


#84- Verify grade is correct, pipe is shown above grade and not meeting min. requirements

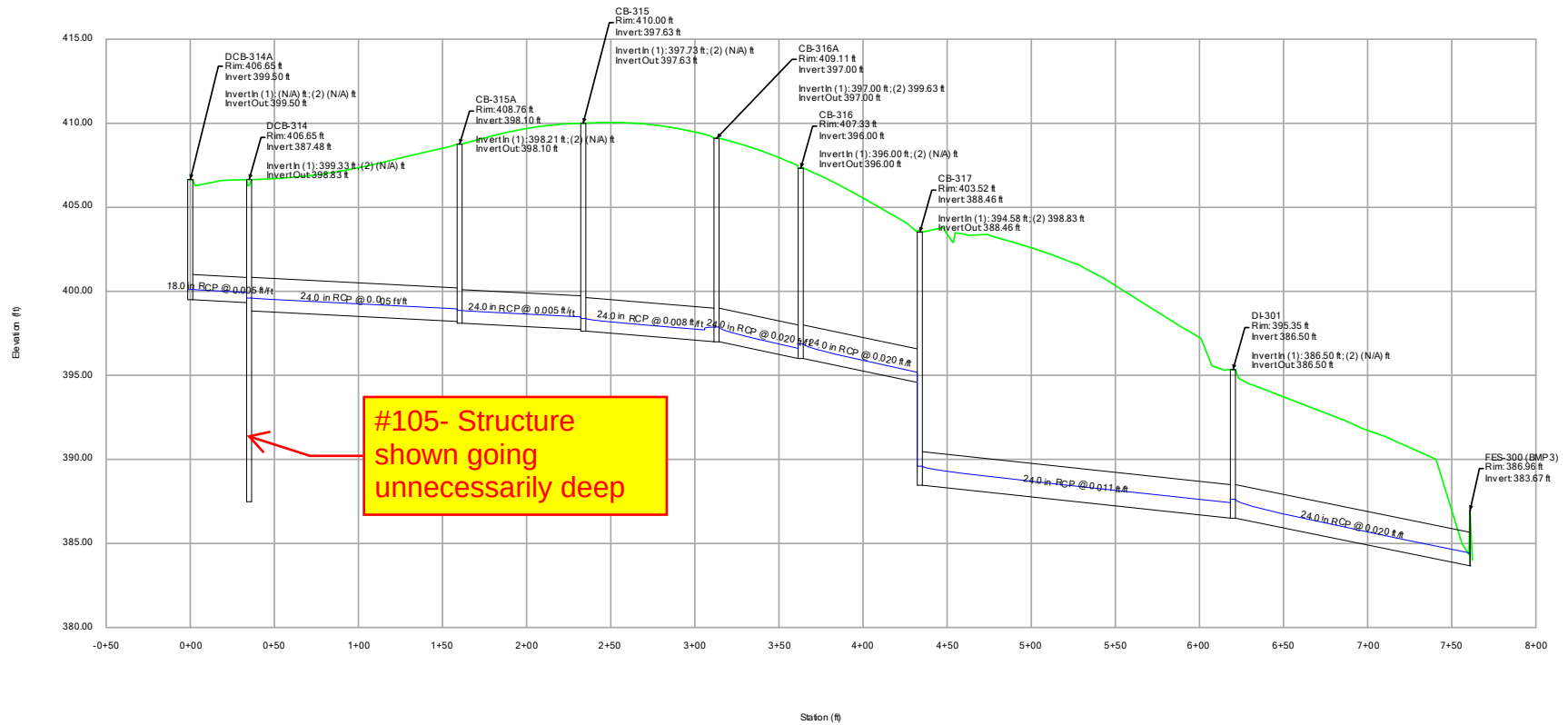
10-YEAR ANALYSIS



10-YEAR ANALYSIS

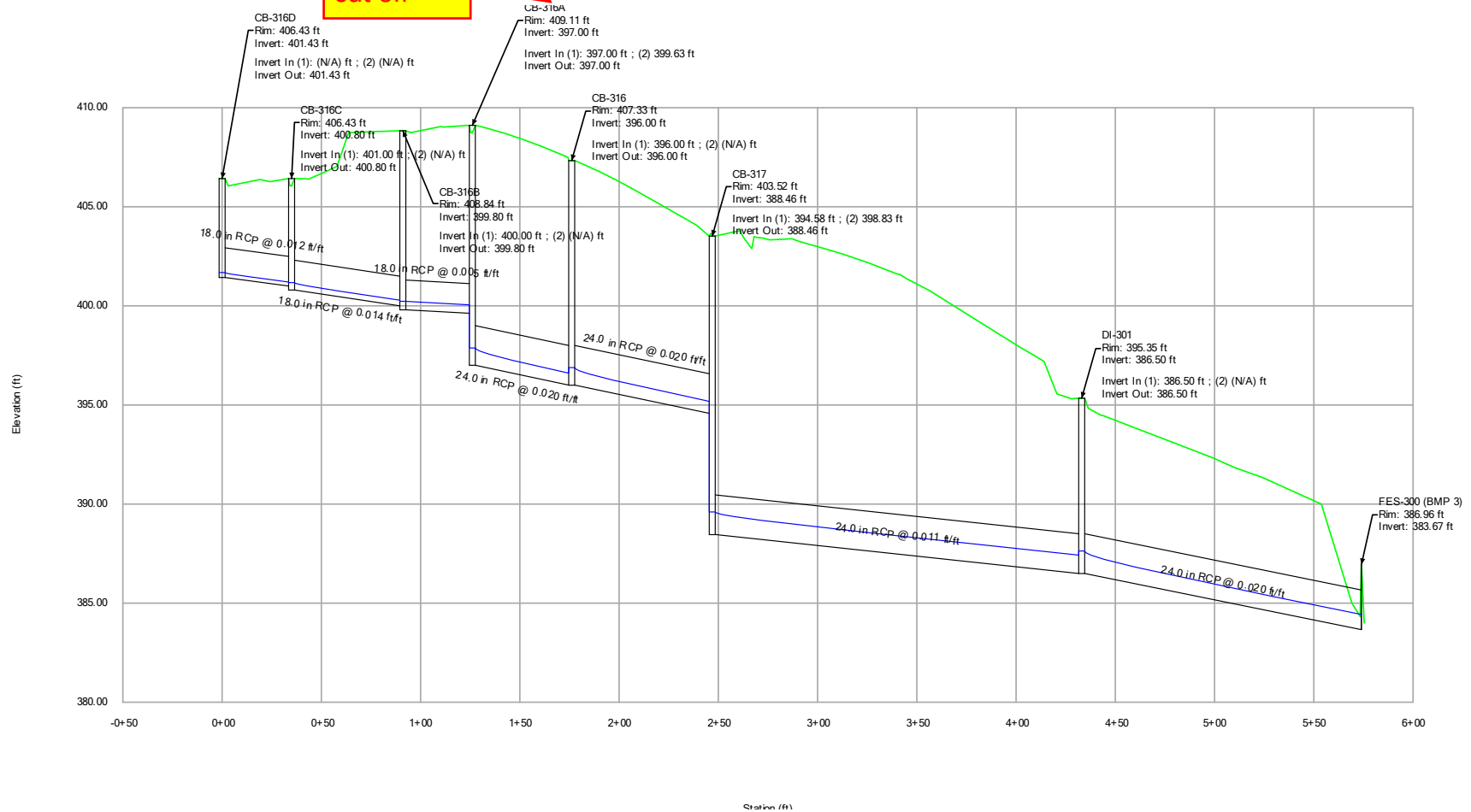


10-YEAR ANALYSIS

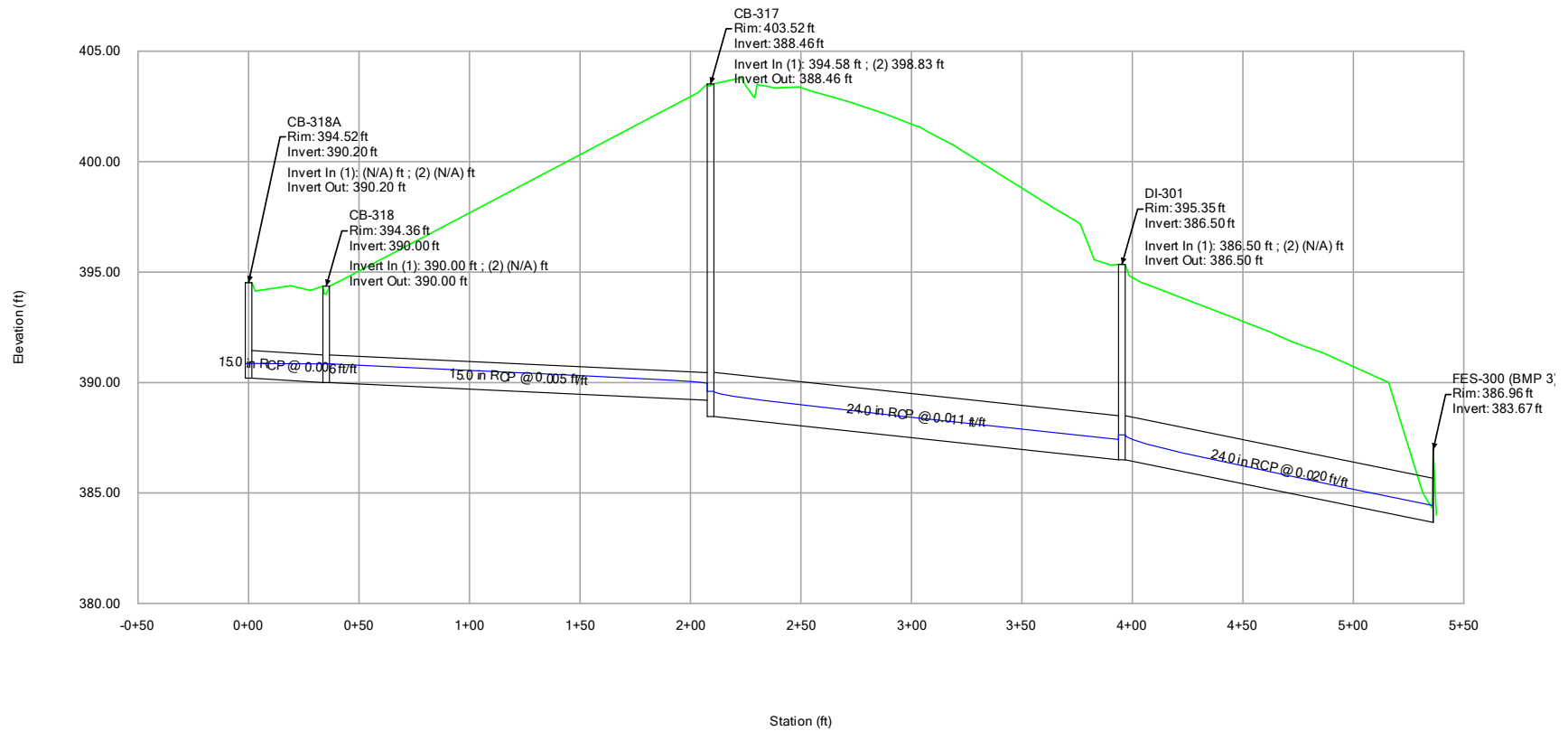


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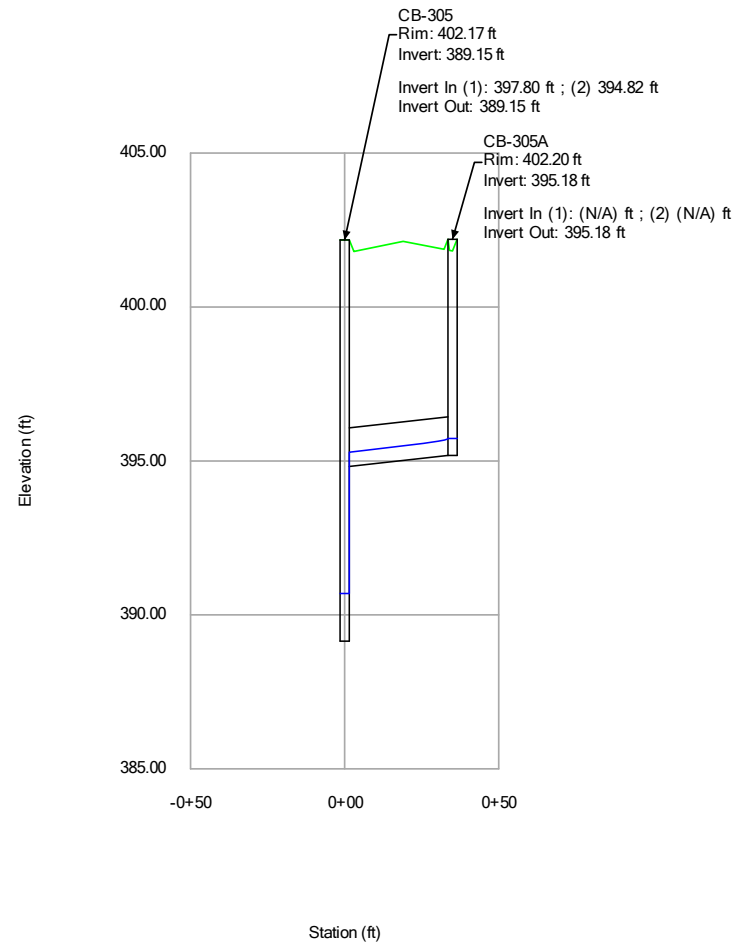
10-YEAR ANALYSIS

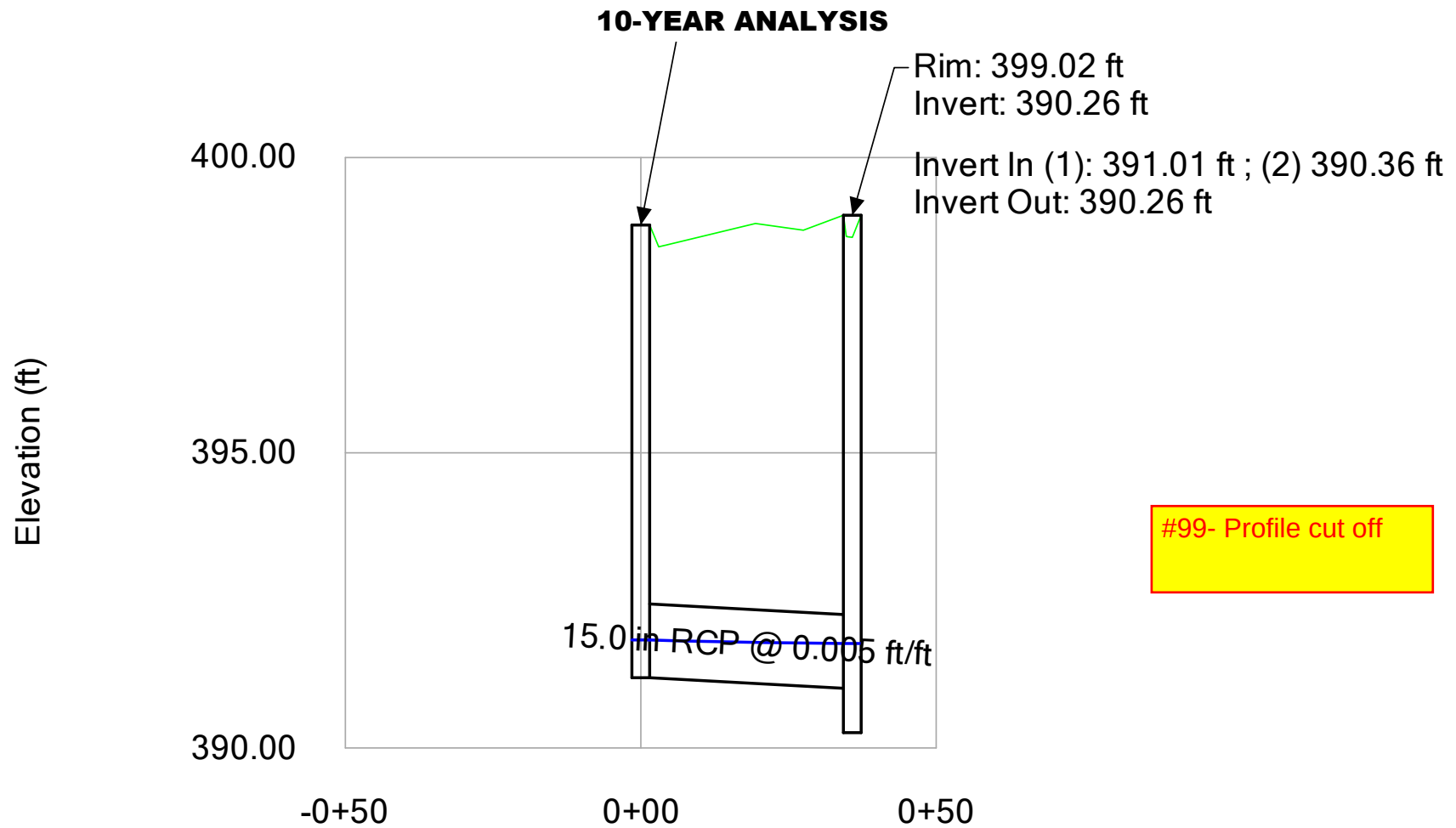


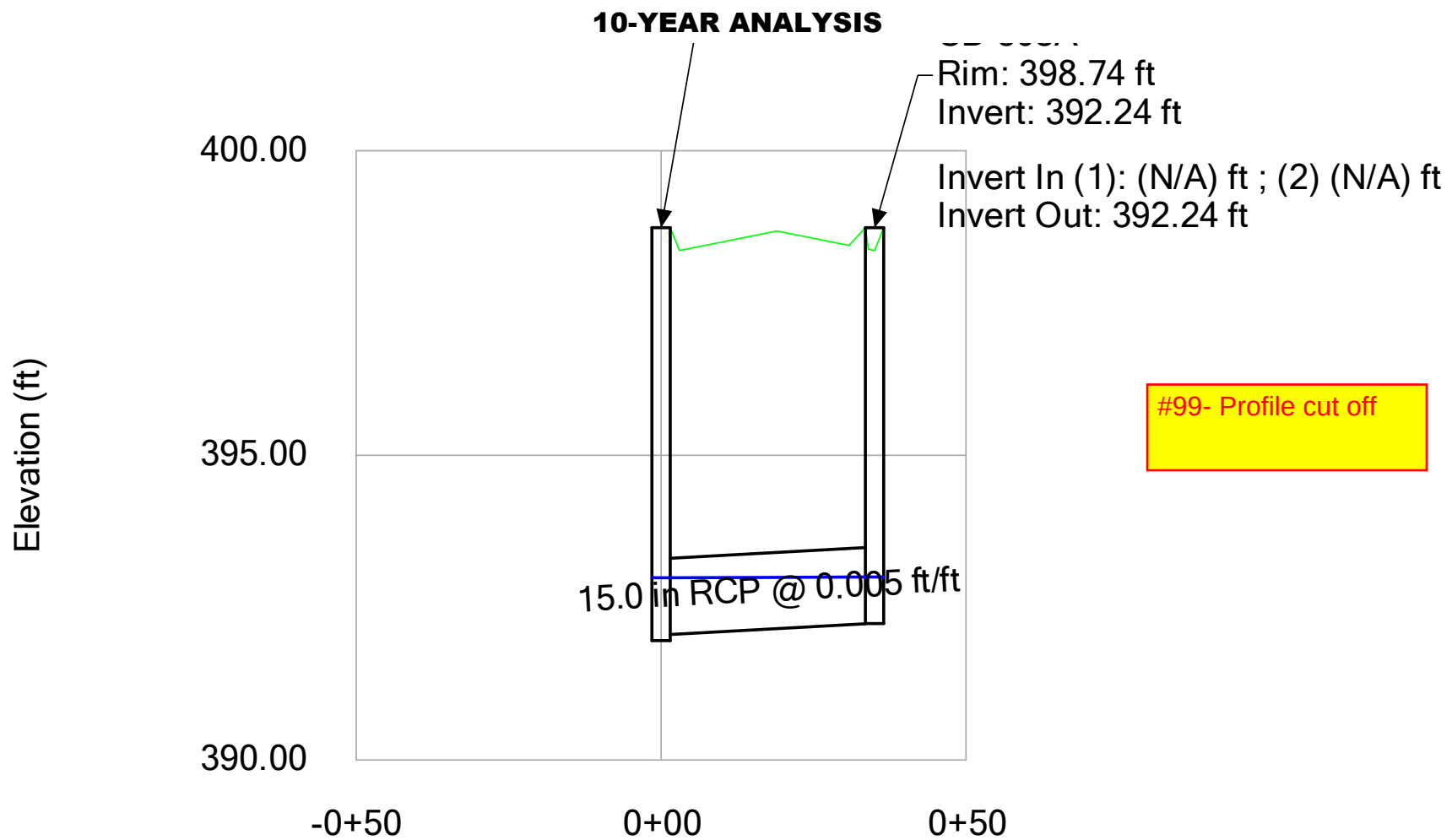
10-YEAR ANALYSIS



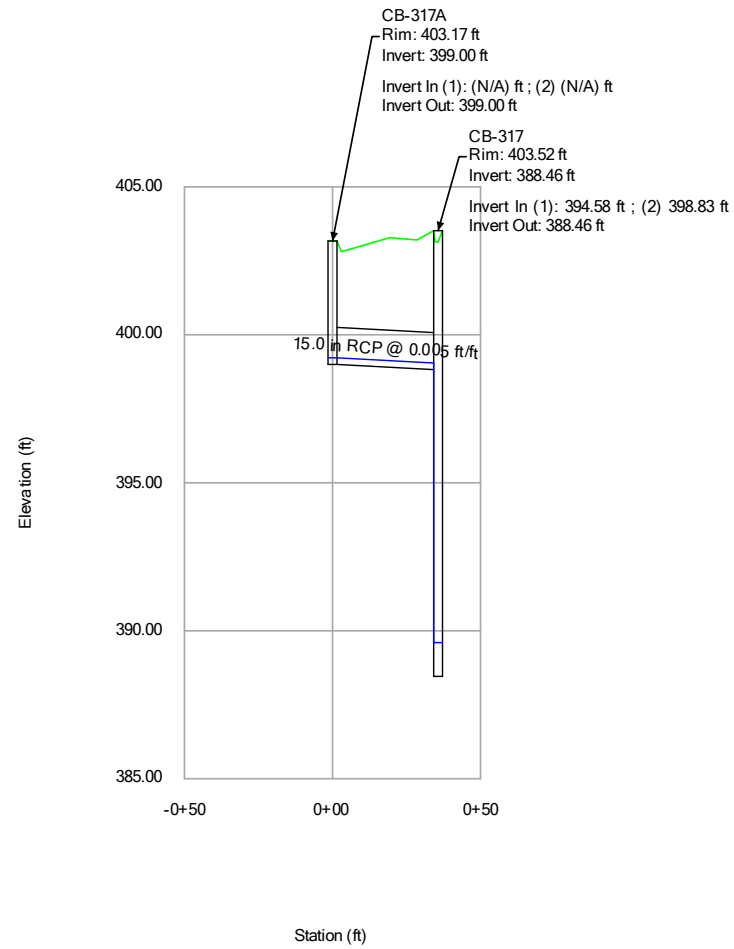
10-YEAR ANALYSIS







10-YEAR ANALYSIS



SCM 3 – 25 YR STORM

25-YEAR ANALYSIS

CATCHMENTS - Time: 0.00 hours

Outflow Element	Scaled Area (acres)	Flow (Total Out) (cfs)	Time of Concentration (hours)	Runoff Coefficient (Rational)
DCB-314A	0.691	4.61	0.083	0.830
DCB-314	0.595	3.97	0.083	0.830
CB-315A	0.001	0.01	0.083	0.830
CB-315	0.001	0.00	0.083	0.830
CB-316A	0.042	0.28	0.083	0.830
CB-316B	0.055	0.37	0.083	0.830
CB-316C	0.098	0.65	0.083	0.830
CB-316D	0.081	0.54	0.083	0.830
CB-316	0.030	0.20	0.083	0.830
CB-317	0.046	0.31	0.083	0.830
CB-317A	0.052	0.34	0.083	0.830
CB-318	0.333	2.22	0.083	0.830
CB-318A	0.514	3.43	0.083	0.830
DI-301	0.003	0.02	0.083	0.830
DI-305C	0.003	0.02	0.083	0.830
DI-305B	0.002	0.02	0.083	0.830
DI-305A	0.002	0.02	0.083	0.830
CB-305	0.065	0.43	0.083	0.830
CB-303	0.326	2.18	0.083	0.830
CB-310	0.347	2.32	0.083	0.830
CB-305A	0.368	2.46	0.083	0.830
CB-306A	0.447	2.99	0.083	0.830
CB-311A	0.003	0.02	0.083	0.830
CB-311	0.073	0.49	0.083	0.830
CB-312	0.054	0.36	0.083	0.830
CB-306	0.241	1.61	0.083	0.830
DCB-307A	0.591	3.95	0.083	0.830
CB-308A	0.377	2.52	0.083	0.830
CB-309A	0.089	0.59	0.083	0.830
CB-309	0.144	0.96	0.083	0.830
DCB-307	0.524	3.50	0.083	0.830

25-YEAR ANALYSIS

CATCHMENTS - Time: 0.00 hours

Outflow Element	Scaled Area (acres)	Flow (Total Out) (cfs)	Time of Concentration (hours)	Runoff Coefficient (Rational)
CB-308	0.438	2.93	0.083	0.830
DI-307B	0.326	2.18	0.083	0.830

25-YEAR ANALYSIS

Inlets - Time: 0.00 hours

Label	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Grate Length (ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)
CB-312	0.35	0.01	0.35	96.7	403.98	403.98	3.0	2.26	2.26
CB-315	0.00	0.00	5.04	100.0	398.42	398.42	3.0	4.52	4.36
CB-316A	0.28	0.00	6.64	99.6	397.91	397.91	3.0	3.60	4.75
CB-316B	0.36	0.01	1.43	96.5	400.25	400.25	3.0	4.36	3.23
CB-315A	0.01	0.00	5.09	100.0	398.90	398.90	3.0	4.54	4.37
CB-311	0.47	0.03	0.80	94.0	400.36	400.36	3.0	1.21	2.80
CB-311A	0.02	0.00	0.82	100.0	400.11	400.11	3.0	2.84	2.85
CB-316	0.20	0.00	6.81	100.0	396.93	396.93	3.0	4.67	4.79
DCB-314	2.46	1.51	5.18	62.0	399.63	399.63	6.0	3.91	4.40
DCB-314A	2.74	1.87	2.74	59.5	400.13	400.13	6.0	3.89	3.89
CB-316C	0.59	0.06	1.09	91.0	401.19	401.19	3.0	3.29	2.99
CB-316D	0.50	0.04	0.50	93.1	401.69	401.69	3.0	2.42	2.42
CB-303	1.58	0.60	3.92	72.5	399.80	399.80	3.0	2.91	4.72
CB-310	1.65	0.66	2.42	71.4	399.82	399.82	3.0	1.68	3.95
CB-317	0.30	0.00	10.99	99.4	389.65	389.65	3.0	4.66	5.65
CB-317A	0.35	0.01	0.35	96.8	399.23	399.23	3.0	2.18	2.18
CB-309A	0.55	0.05	0.55	92.1	399.07	399.07	3.0	2.51	2.51
CB-305A	2.06	1.05	2.06	66.2	395.75	395.75	3.0	3.76	3.76
CB-305	0.87	0.16	22.41	84.8	390.79	390.79	3.0	6.61	6.56
CB-309	0.82	0.14	1.35	85.9	399.02	399.02	3.0	1.34	3.31
DI-305A	0.02	0.00	22.32	100.0	390.55	390.55	3.0	6.70	6.69
CB-306	1.34	0.42	16.08	76.1	391.89	391.89	3.0	4.87	5.85
CB-306A	2.49	1.55	2.49	61.7	391.93	391.93	3.0	3.28	3.28
CB-308A	1.78	0.78	1.78	69.6	393.10	393.10	3.0	1.98	1.98
CB-308	2.04	1.03	5.06	66.5	393.08	393.08	3.0	1.66	4.36
DCB-307	2.88	2.06	12.57	58.3	392.15	392.15	6.0	2.37	5.56
DCB-307A	3.41	2.86	4.88	54.4	392.03	392.03	6.0	3.44	4.32
DI-307B	1.58	0.60	1.58	72.5	393.90	393.90	3.0	3.32	3.32
DI-305C	0.02	0.00	21.84	100.0	386.37	386.37	3.0	11.94	6.63
YI-3002	0.00	0.00	0.00	100.0	380.50	380.50	3.0	0.00	0.00

25-YEAR ANALYSIS

Inlets - Time: 0.00 hours

Label	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Grate Length (ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)
DI-301	0.02	0.00	10.81	100.0	387.68	387.68	3.0	7.29	5.61
CB-318A	2.22	1.22	2.22	64.5	390.92	390.92	3.0	3.04	3.04
CB-318	1.60	0.62	3.80	72.1	390.90	390.90	3.0	2.35	4.02
DI-305B	0.02	0.00	22.00	100.0	389.70	389.70	3.0	6.93	6.65
OCS-3003	0.00	0.00	0.00	100.0	379.00	379.00	3.0	0.00	0.00
JB-3001	0.00	0.00	0.00	100.0	378.43	378.43	3.0	0.00	0.00

25-YEAR ANALYSIS

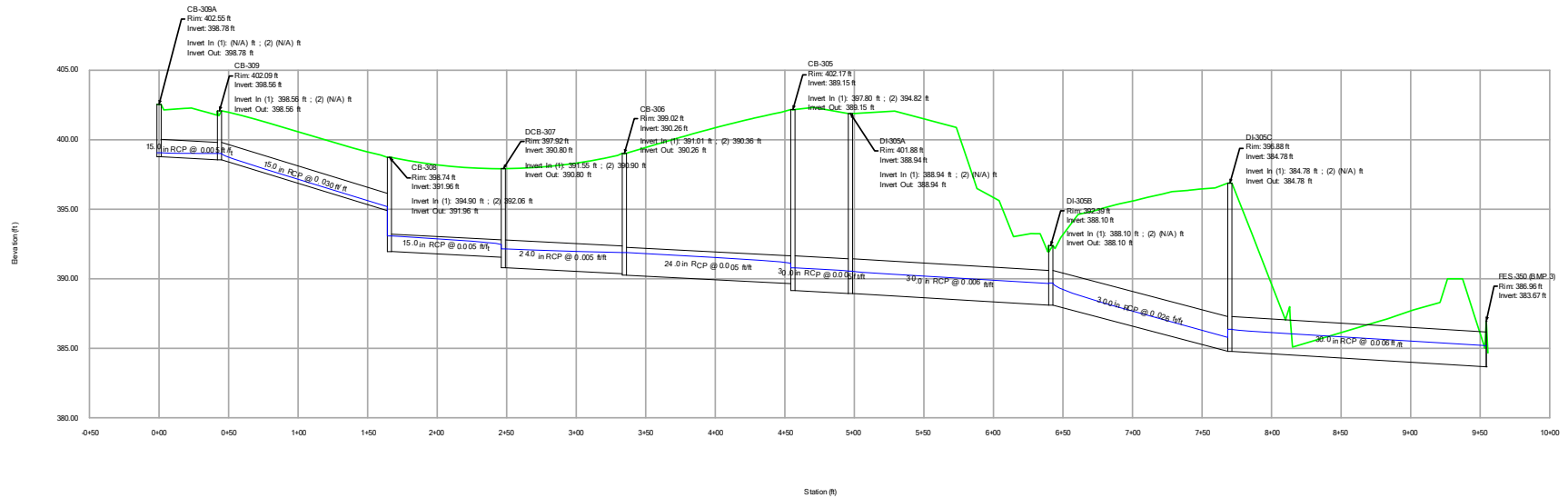
Conduit Results - Time: 0.00 hours

Label	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
CB-311 TO CB-312	15.0	0.040	2.26	1.21	0.35	12.95	403.98	400.36
CB-315 TO CB-315A	24.0	0.005	4.37	4.52	5.09	16.00	398.90	398.51
CB-316A TO CB-315	24.0	0.008	4.36	3.60	5.04	20.17	398.42	397.91
CB-316A TO CB-316B	18.0	0.005	3.23	3.25	1.43	7.43	400.25	400.07
CB-316 TO CB-316A	24.0	0.020	4.75	4.67	6.64	31.97	397.91	396.93
CB-316B TO CB-316C	18.0	0.014	2.99	4.36	1.09	12.55	401.19	400.30
CB-315A TO DCB-314	24.0	0.005	4.40	4.54	5.18	16.00	399.63	398.99
CB-311A TO CB-311	15.0	-0.005	2.80	2.84	0.80	4.56	400.36	400.20
CB-310 TO CB-311A	15.0	0.011	2.85	1.68	0.82	6.71	400.11	399.82
CB-317 TO CB-316	24.0	0.020	4.79	8.05	6.81	32.04	396.93	395.21
DCB-314 TO DCB-314A	18.0	0.005	3.89	3.91	2.74	7.43	400.13	399.95
CB-316C TO CB-316D	18.0	0.012	2.42	3.29	0.50	11.64	401.69	401.21
CB-303 TO CB-310	15.0	0.006	3.95	2.91	2.42	4.88	399.82	399.80
CB-305 TO CB-303	15.0	0.013	4.72	6.06	3.92	7.30	399.80	398.45
CB-317 TO CB-317A	15.0	0.005	2.18	2.26	0.35	4.53	399.23	399.05
CB-317 TO CB-318	15.0	0.005	4.02	4.66	3.80	4.38	390.90	389.99
DI-301 TO CB-317	24.0	0.011	5.65	7.29	10.99	23.22	389.65	387.47
CB-309 TO CB-309A	15.0	0.005	2.51	1.34	0.55	4.57	399.07	399.02
CB-305 TO CB-305A	15.0	0.010	3.76	4.71	2.06	6.53	395.75	395.31
CB-305 TO CB-306	24.0	0.005	5.85	6.61	16.08	16.00	391.89	391.10
DI-305A TO CB-305	30.0	0.005	6.56	6.70	22.41	29.22	390.79	390.55
CB-308 TO CB-309	15.0	0.030	3.31	6.16	1.35	11.18	399.02	395.19
DI-305B TO DI-305A	30.0	0.006	6.69	6.93	22.32	31.32	390.55	389.66
CB-306 TO CB-306A	15.0	0.005	3.28	2.70	2.49	4.57	391.93	391.89
CB-306 TO DCB-307	24.0	0.005	5.56	4.87	12.57	16.00	392.15	391.89
CB-308 TO CB-308A	15.0	0.005	1.98	1.66	1.78	4.57	393.10	393.08
DCB-307 TO CB-308	15.0	0.005	4.36	5.27	5.06	4.57	393.08	392.46
DCB-307 TO DCB-307A	24.0	0.010	4.32	2.37	4.88	22.62	392.03	392.15
DCB-307A TO DI-307B	18.0	0.005	3.32	3.44	1.58	7.76	393.90	393.26
DI-305C TO DI-305B	30.0	0.026	6.65	11.94	22.00	65.85	389.70	385.78

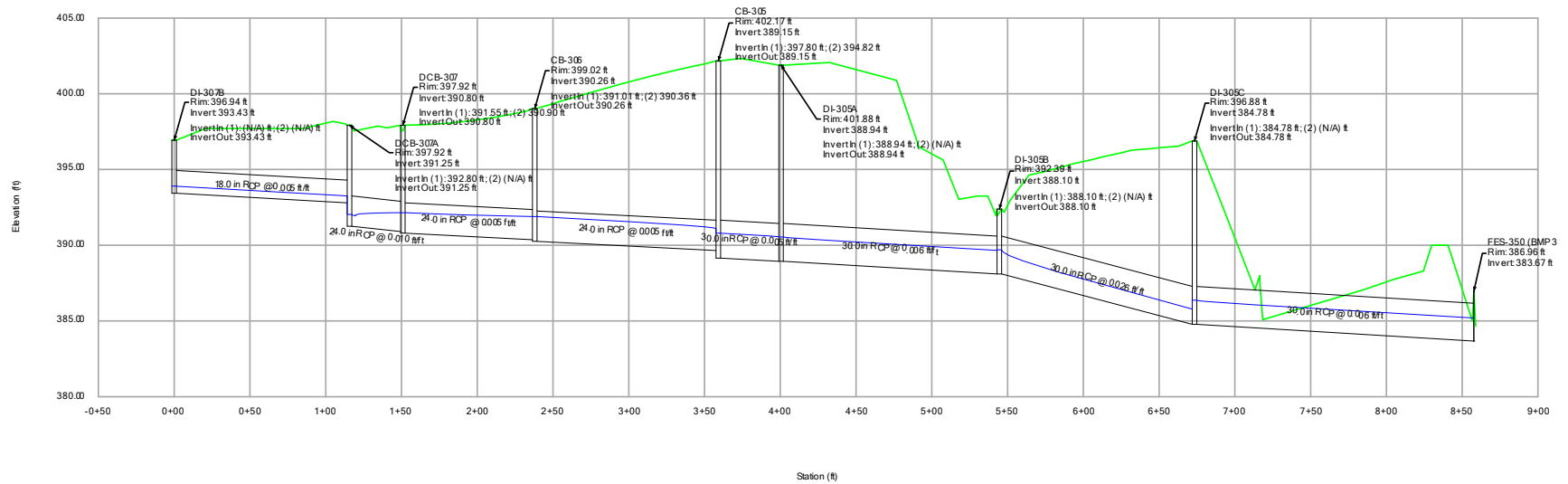
25-YEAR ANALYSIS
Conduit Results - Time: 0.00 hours

Label	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
FES-350 TO DI-305C	30.0	0.006	6.63	6.98	21.84	31.80	386.37	385.19
JB-3001 TO YI-3002	36.0	0.008	0.00	0.00	0.00	59.44	380.50	378.43
FES-300 TO DI-301	24.0	0.020	5.61	9.21	10.81	32.08	387.68	384.47
CB-318 TO CB-318A	15.0	0.006	3.04	2.35	2.22	4.87	390.92	390.90
JB-3001 TO OCS-3003	24.0	0.008	0.00	0.00	0.00	20.80	379.00	378.43
FES 3000 TO JB-3001	36.0	0.008	0.00	0.00	0.00	61.32	378.43	378.00

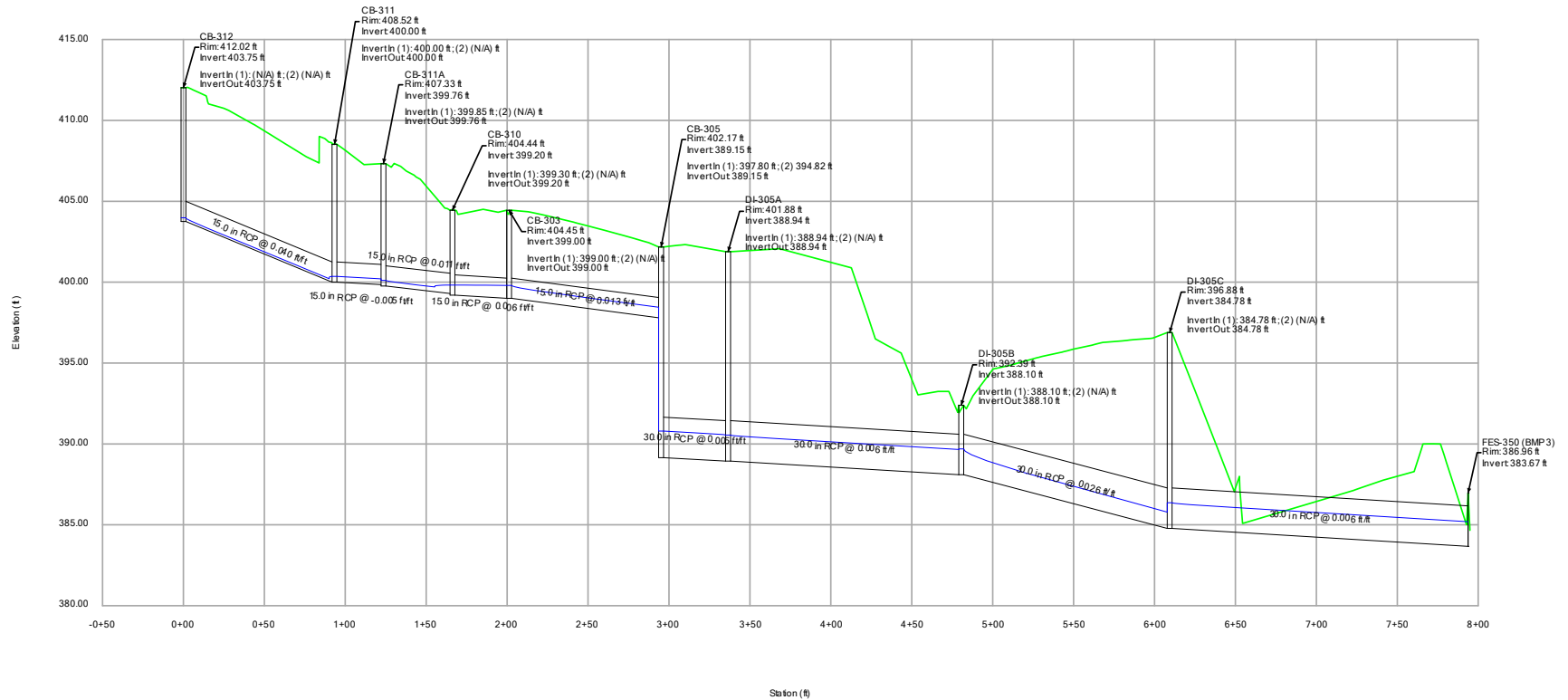
25-YEAR ANALYSIS



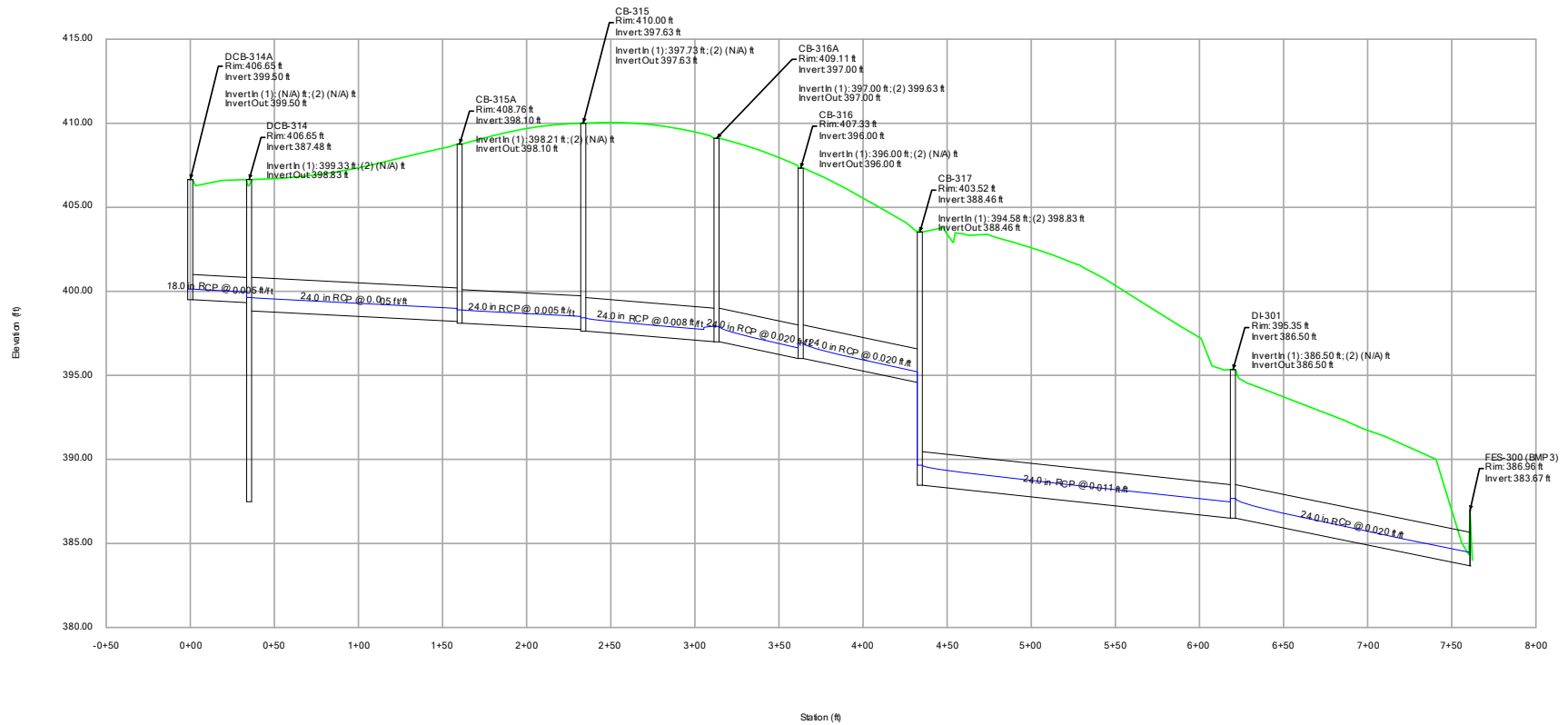
25-YEAR ANALYSIS



25-YEAR ANALYSIS

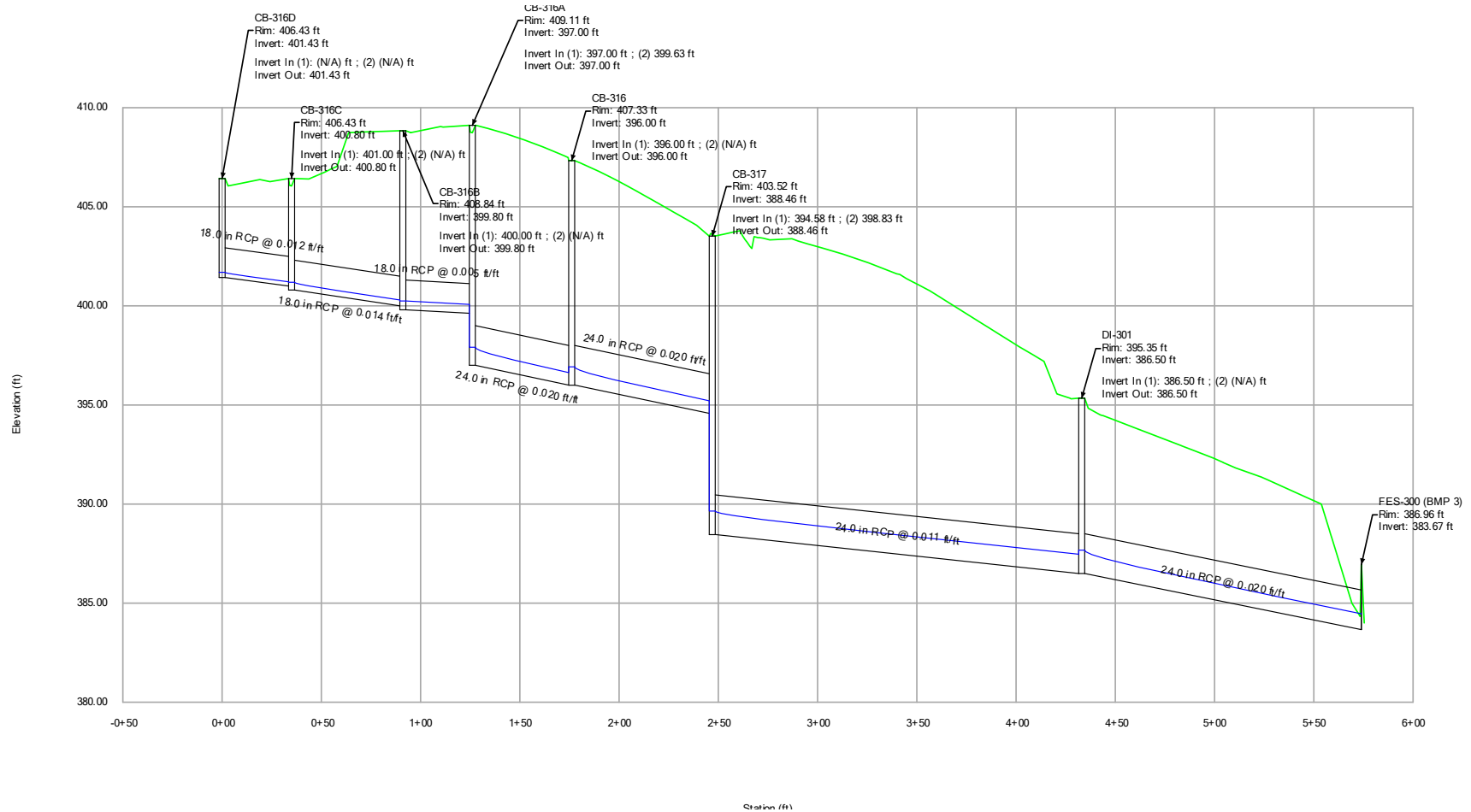


25-YEAR ANALYSIS

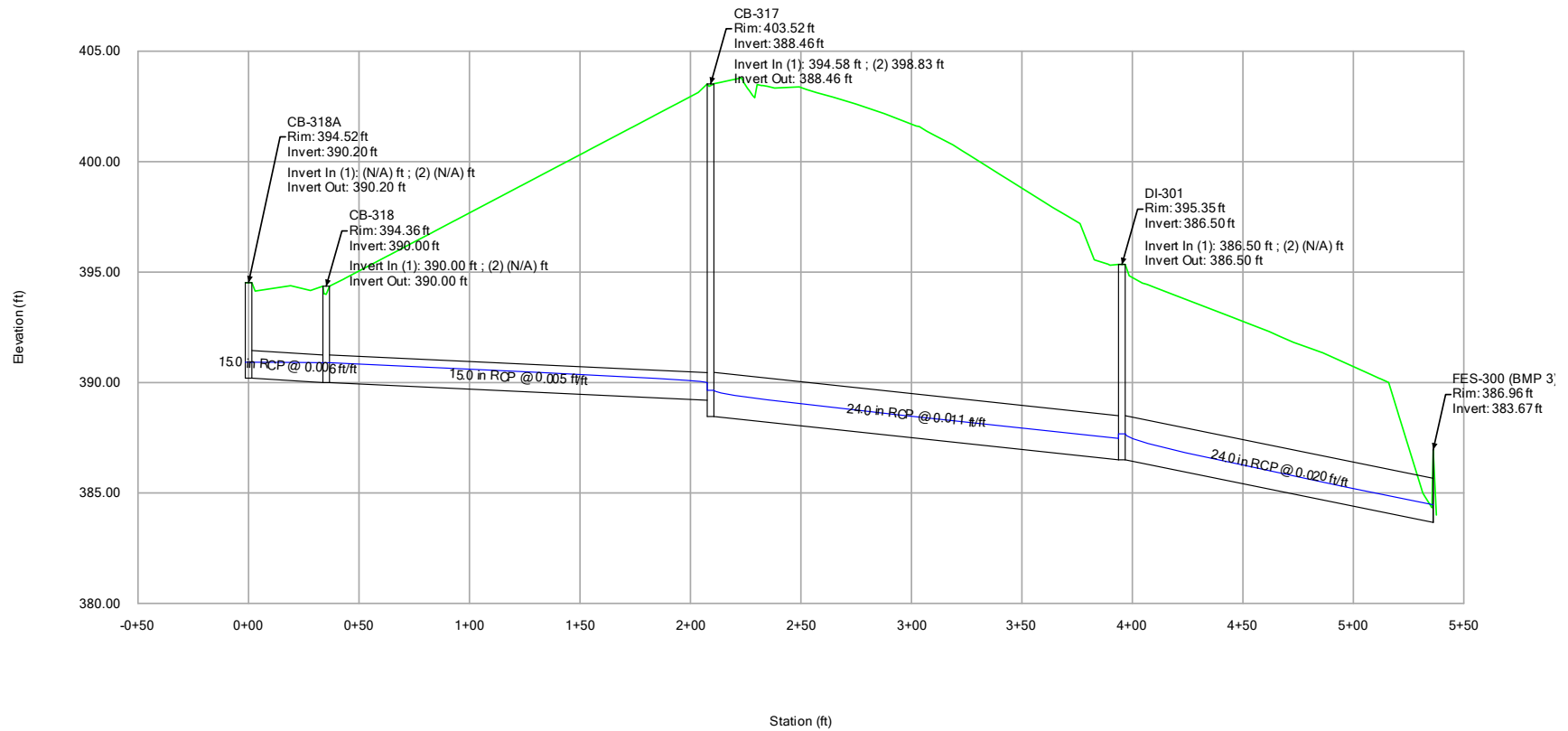


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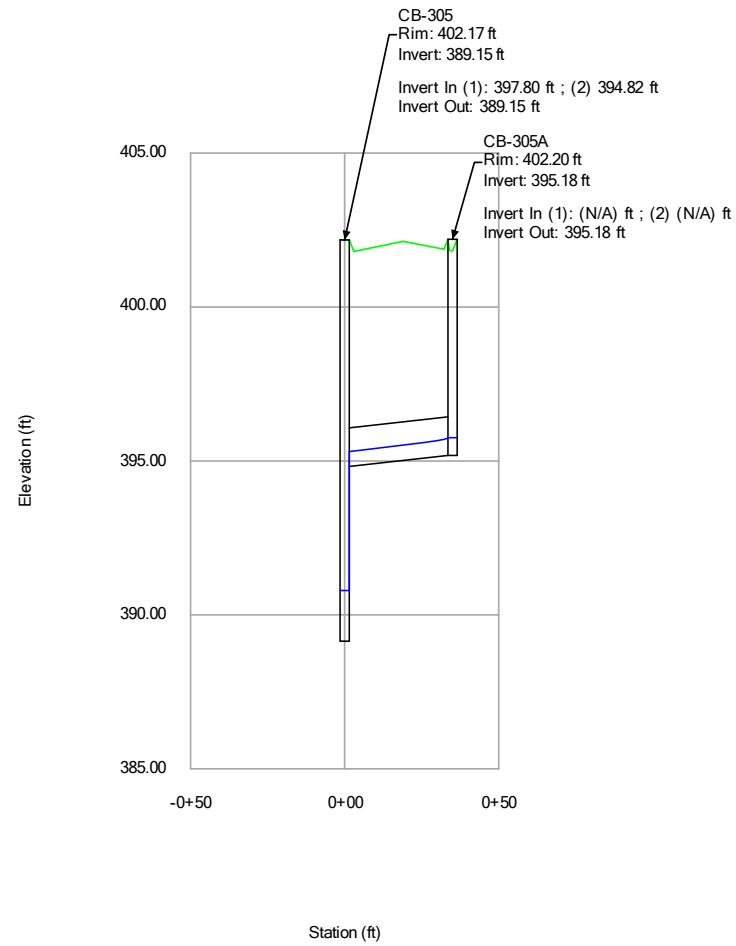
25-YEAR ANALYSIS

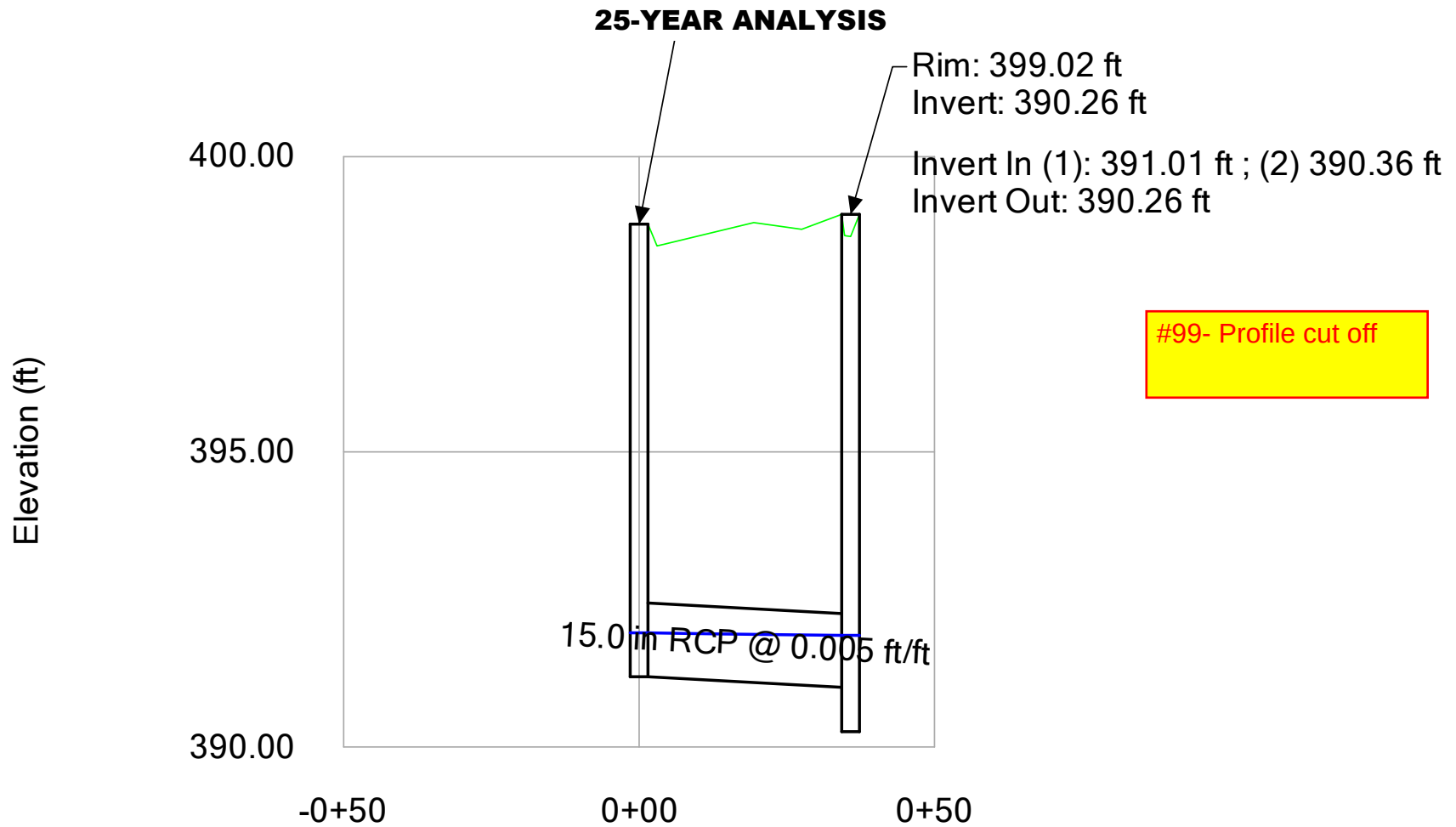


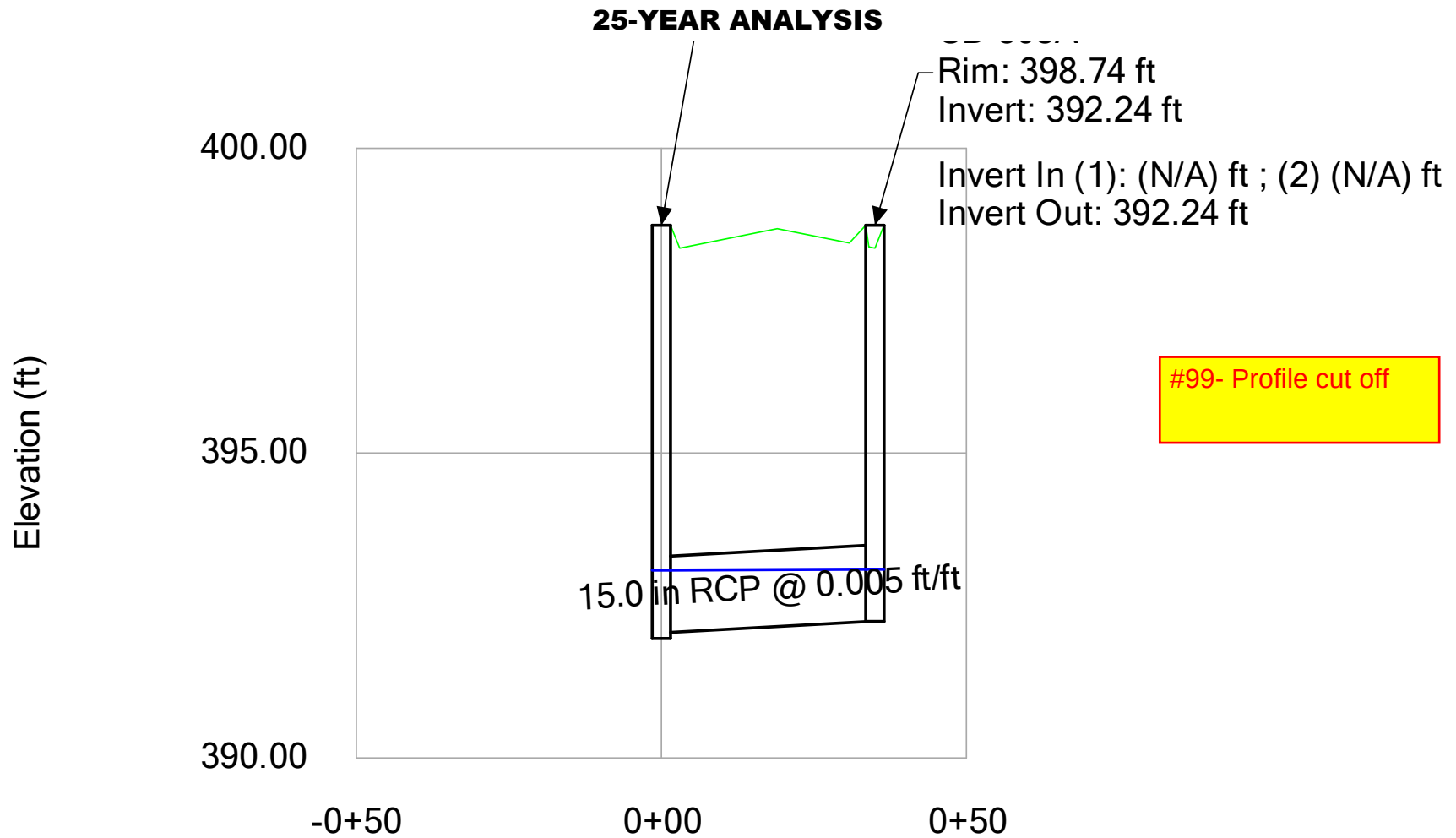
25-YEAR ANALYSIS



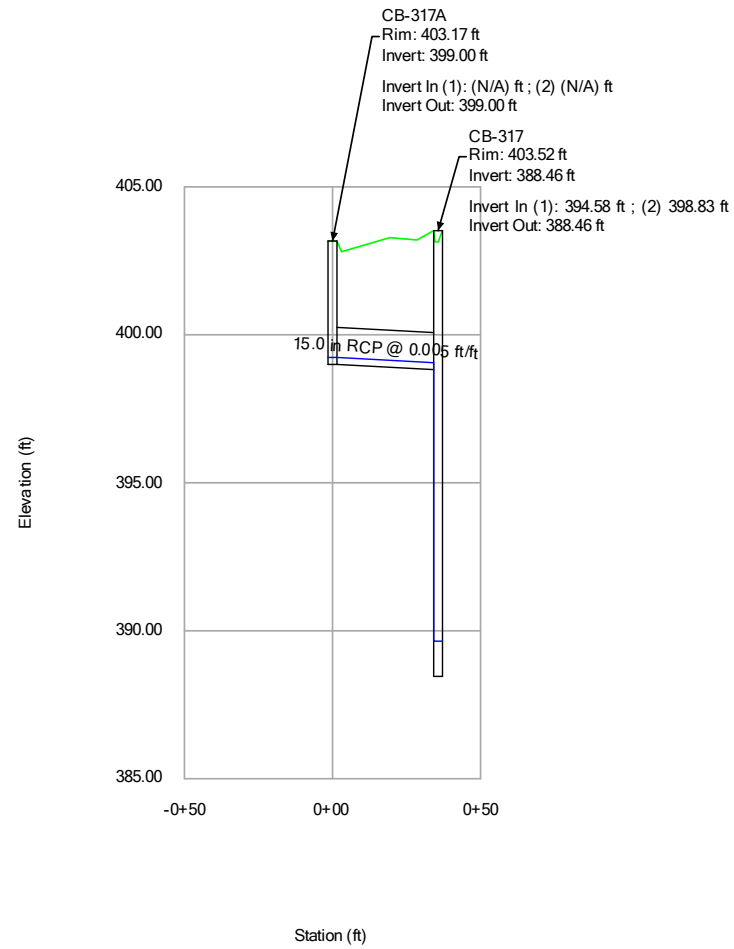
25-YEAR ANALYSIS







25-YEAR ANALYSIS



SCM 3 – INLET SPREAD

4IN/HR

Inlet Spread - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)	Spread / Top Width (ft)	Depth (Gutter) (in)
CB-312	0.054	0.045	0.18	0.00	0.18	2.0	1.0
CB-315	0.001	0.001	0.00	0.00	3.13	0.4	0.2
CB-316A	0.042	0.035	0.14	0.00	4.05	1.8	0.9
CB-316B	0.055	0.046	0.18	0.00	0.77	2.0	1.0
CB-315A	0.001	0.001	0.00	0.00	3.13	0.5	0.2
CB-311	0.073	0.060	0.24	0.00	0.42	2.2	1.1
CB-311A	0.003	0.002	0.01	0.00	0.43	0.6	0.3
CB-316	0.030	0.025	0.10	0.00	4.15	1.6	0.8
DCB-314	0.595	0.365	1.47	0.52	3.12	6.9	2.3
DCB-314A	0.691	0.410	1.65	0.66	1.65	7.4	2.4
CB-316C	0.098	0.079	0.32	0.01	0.59	2.5	1.2
CB-316D	0.081	0.067	0.27	0.00	0.27	2.3	1.1
CB-303	0.326	0.227	0.92	0.18	2.31	5.2	1.8
CB-310	0.347	0.239	0.96	0.20	1.40	5.4	1.9
CB-317	0.046	0.038	0.15	0.00	6.72	1.9	0.9
CB-317A	0.052	0.043	0.17	0.00	0.17	2.0	0.9
CB-309A	0.089	0.073	0.30	0.00	0.30	2.4	1.2
CB-305A	0.368	0.282	1.14	0.29	1.14	5.9	2.0
CB-305	0.065	0.093	0.38	0.02	13.18	2.9	1.3
CB-309	0.144	0.112	0.45	0.03	0.75	3.3	1.4
DI-305A	0.002	0.002	0.01	0.00	13.18	0.6	0.3
CB-306	0.241	0.179	0.72	0.10	9.35	4.5	1.7
CB-306A	0.447	0.336	1.36	0.43	1.36	6.6	2.2
CB-308A	0.377	0.256	1.03	0.23	1.03	5.6	1.9
CB-308	0.438	0.292	1.18	0.32	2.96	6.1	2.1
DCB-307	0.524	0.390	1.57	0.59	7.27	7.2	2.3
DCB-307A	0.591	0.453	1.83	0.82	2.74	7.8	2.5
DI-307B	0.326	0.227	0.92	0.18	0.92	5.2	1.8
DI-305C	0.003	0.003	0.01	0.00	13.20	0.7	0.3
YI-3002	(N/A)	0.000	0.00	0.00	0.00	0.0	0.0
DI-301	0.003	0.003	0.01	0.00	6.73	0.7	0.3

4IN/HR

Inlet Spread - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)	Spread / Top Width (ft)	Depth (Gutter) (in)
CB-318A	0.514	0.327	1.32	0.40	1.32	6.5	2.2
CB-318	0.333	0.231	0.93	0.18	2.25	5.2	1.9
DI-305B	0.002	0.002	0.01	0.00	13.19	0.6	0.3
OCS-3003	(N/A)	0.000	0.00	0.00	0.00	0.0	0.0
JB-3001	(N/A)	0.000	0.00	0.00	0.00	0.0	0.0

ATTACHMENT 4: DRAINAGE AREA MAPS – SCM 4

G:\NCAProjects\Lemnar\0430-03 - Lemnar - School Street - Rolesville\04 - Calculations\Storm\StormCAD\RAINAGE AREAS.dwg



5440 WADE PARK BLVD, SUITE 102
RALEIGH NC 27607
www.bgeinc.com
NC LICENSE #C-4397

SCM 4 DRAINAGE MAP

DATE: 7/27/2023

0 50' 100' 150'
SCALE: 1" = 50'

SCM 4 – 10 YR STORM

10-YEAR ANALYSIS

CATCHMENTS - Time: 0.00 hours

Outflow Element	Scaled Area (acres)	Flow (Total Out) (cfs)	Time of Concentration (hours)	Runoff Coefficient (Rational)
DI-405D	0.014	0.08	0.083	0.830
CB-406A	0.200	1.21	0.083	0.830
CB-406	0.256	1.54	0.083	0.830
CB-405	0.810	4.87	0.083	0.830
CB-407	0.291	1.75	0.083	0.830
CB-405B	0.318	1.92	0.083	0.830
CB-408A	0.336	2.02	0.083	0.830
CB-409A	0.204	1.23	0.083	0.830
CB-419B	0.087	0.53	0.083	0.830
CB-405A	0.610	3.67	0.083	0.830
DI-405C	0.093	0.56	0.083	0.830
CB-422A	0.241	1.45	0.083	0.830
CB-422	0.350	2.11	0.083	0.830
CB-419A	0.033	0.20	0.083	0.830
CB-409	0.130	0.78	0.083	0.830
CB-408	0.188	1.13	0.083	0.830
CB-419	0.328	1.97	0.083	0.830
CB-420	0.093	0.56	0.083	0.830
CB-421	0.088	0.53	0.083	0.830
CB-418	0.046	0.27	0.083	0.830
CB-417A	0.025	0.15	0.083	0.830
CB-417	0.027	0.17	0.083	0.830
CB-415A	0.414	2.49	0.083	0.830
CB-415	0.319	1.92	0.083	0.830
CB-414B	0.292	1.76	0.083	0.830
CB-414A	0.027	0.17	0.083	0.830
CB-413A	0.384	2.31	0.083	0.830
CB-413	0.485	2.92	0.083	0.830
CB-414	0.260	1.57	0.083	0.830
DI-404	0.012	0.05	0.083	0.600
DI-422B	0.035	0.15	0.083	0.600

#97- For most accurate results, runoff coefficients should be determined for each structure (and therefore be different for each of these drainage areas). See City of Raleigh Stormwater Management Design Manual for more information on how to get the composite runoff coefficient

#103- There are several structures shown on the plans/storm tables that are not included here

10-YEAR ANALYSIS

CATCHMENTS - Time: 0.00 hours

Outflow Element	Scaled Area (acres)	Flow (Total Out) (cfs)	Time of Concentration (hours)	Runoff Coefficient (Rational)
DI-414D	0.068	0.29	0.083	0.600
DI-414C	0.025	0.00	0.083	0.600
DI-414E	0.044	0.19	0.083	0.600

10-YEAR ANALYSIS

Inlets - Time: 0.00 hours

Label	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Grate Length (ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)
CB-417A	0.15	0.00	0.15	97.2	393.83	393.83	3.0	1.71	1.71
CB-417	0.16	0.01	5.52	96.7	384.98	384.98	3.0	4.87	4.95
CB-418	0.25	0.02	5.29	92.0	385.50	385.50	3.0	4.81	4.56
CB-419A	0.19	0.01	0.63	95.1	391.68	391.68	3.0	1.86	2.65
CB-419B	0.44	0.09	0.44	83.5	392.01	392.01	3.0	2.41	2.41
CB-409A	0.86	0.37	0.86	70.3	391.37	391.37	3.0	2.90	2.90
CB-419	1.25	0.75	5.11	62.5	385.98	385.98	3.0	3.93	4.51
CB-420	0.46	0.10	3.32	82.6	386.09	386.09	3.0	4.15	4.03
CB-409	0.61	0.18	1.47	77.5	388.48	388.48	3.0	2.00	3.39
CB-415A	1.47	1.02	1.47	58.9	388.50	388.50	3.0	3.32	3.32
CB-415	1.21	0.71	7.91	63.0	383.87	383.87	3.0	5.05	4.57
CB-421	0.44	0.09	2.89	83.5	386.36	386.36	3.0	4.30	3.95
DI-422B	0.15	0.00	0.15	97.1	389.30	389.30	3.0	1.81	1.81
CB-408	0.91	0.40	3.75	69.3	387.44	387.44	3.0	1.93	4.26
CB-408A	1.42	0.96	1.42	59.6	387.47	387.47	3.0	3.36	3.36
CB-422	1.34	0.86	2.49	61.0	386.94	386.94	3.0	2.07	4.00
DI-405D	0.08	0.00	0.08	99.7	388.18	388.18	3.0	1.52	1.52
CB-414B	1.59	1.19	1.89	57.2	383.39	383.39	3.0	0.81	3.49
CB-414	1.38	0.90	14.94	60.3	381.30	381.30	3.0	2.34	5.77
CB-414A	0.93	0.42	2.75	68.7	383.35	383.35	3.0	3.40	3.91
CB-406A	0.85	0.35	0.85	70.6	388.55	388.55	3.0	2.89	2.89
CB-407	1.32	0.83	4.98	61.3	386.90	386.90	3.0	4.64	5.15
CB-406	1.03	0.51	1.86	66.6	386.70	386.70	3.0	3.37	3.65
DI-405C	0.46	0.10	0.52	82.6	386.07	386.07	3.0	0.75	2.42
DI-414C	0.00	0.00	0.44	100.0	383.77	383.77	3.0	1.91	2.30
DI-414D	0.27	0.03	0.27	91.1	386.00	386.00	3.0	2.11	2.11
CB-405B	1.37	0.90	1.78	60.4	385.76	385.76	3.0	0.92	2.49
CB-405	2.82	3.40	13.20	45.4	385.15	385.15	3.0	3.60	6.07
CB-405A	2.60	2.93	4.19	47.0	385.76	385.76	3.0	2.19	4.33
CB-422A	1.03	0.51	1.03	66.7	387.00	387.00	3.0	2.90	2.90

10-YEAR ANALYSIS

Inlets - Time: 0.00 hours

Label	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Grate Length (ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)
DI-414E	0.18	0.01	0.18	95.5	384.30	384.30	3.0	1.82	1.82
DI-404	0.05	0.00	13.06	100.0	383.93	383.93	3.0	7.07	5.68
DI-414A	0.00	0.00	14.67	100.0	380.20	380.20	3.0	6.45	5.74
CB-413	2.00	1.82	3.55	52.4	381.72	381.72	3.0	2.59	4.24
CB-413A	1.57	1.16	1.57	57.5	381.80	381.80	3.0	3.46	3.46
DI-411	0.00	0.00	0.00	100.0	366.00	366.00	3.0	0.00	0.00
CB-412A	1.67	1.31	1.67	56.1	376.99	376.99	3.0	3.37	3.37
DI-412B	0.00	0.00	0.00	100.0	360.90	360.90	3.0	0.00	0.00
DI-412C	0.00	0.00	1.67	100.0	360.25	360.25	3.0	0.00	3.18

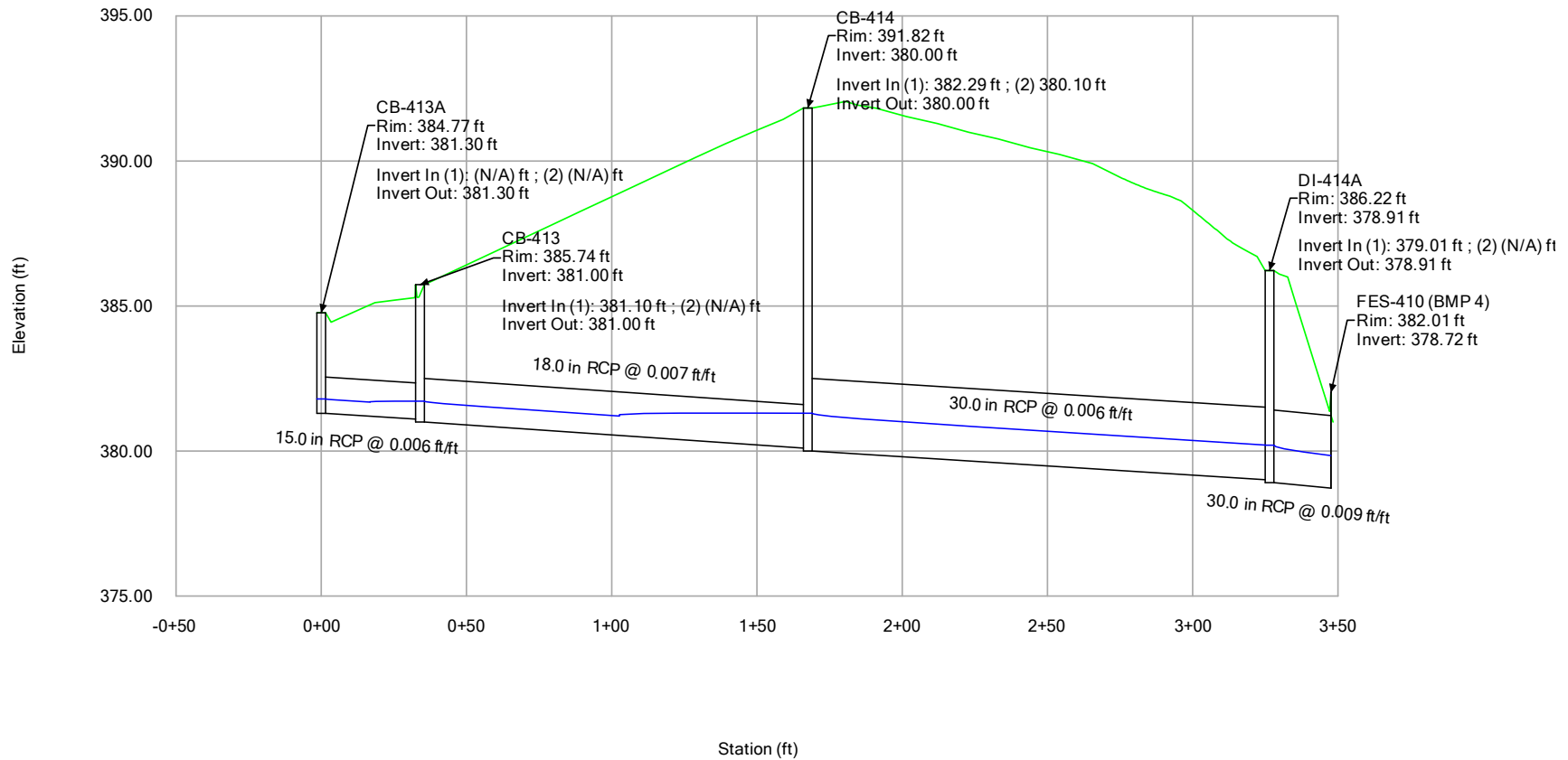
10-YEAR ANALYSIS **Conduit Results - Time: 0.00 hours**

Label	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
CB-417 TO CB-417A	15.0	0.005	1.71	1.80	0.15	4.57	393.83	393.69
CB-415 TO CB-417	18.0	0.006	4.95	5.05	5.52	8.34	384.98	384.18
CB-417 TO CB-418	18.0	0.005	4.56	4.87	5.29	7.43	385.50	385.06
CB-418 TO CB-419	18.0	0.005	4.51	4.81	5.11	7.39	385.98	385.53
CB-419A TO CB-419B	15.0	0.011	2.41	1.86	0.44	6.66	392.01	391.68
CB-419 TO CB-419A	15.0	0.091	2.65	7.27	0.63	19.50	391.68	387.15
CB-409 TO CB-409A	15.0	0.075	2.90	2.00	0.86	17.70	391.37	388.48
CB-419 TO CB-420	15.0	0.005	4.03	3.93	3.32	4.57	386.09	385.98
CB-420 TO CB-421	15.0	0.005	3.95	4.15	2.89	4.58	386.36	386.09
CB-408 TO CB-409	15.0	0.015	3.39	1.93	1.47	8.03	388.48	387.44
CB-415 TO CB-415A	15.0	0.005	3.32	3.39	1.47	4.57	388.50	388.36
CB-414 TO CB-415	24.0	0.004	4.57	5.03	7.91	13.91	383.87	383.29
CB-421 TO CB-422	15.0	0.007	4.00	4.30	2.49	5.38	386.94	386.34
CB-422 TO DI-422B	15.0	0.065	1.81	4.20	0.15	16.48	389.30	387.58
CB-408 TO CB-408A	15.0	0.007	3.36	1.88	1.42	5.57	387.47	387.44
CB-407 TO CB-408	15.0	0.005	4.26	4.64	3.75	4.71	387.44	386.96
CB-422 TO CB-422A	15.0	0.005	2.90	2.07	1.03	4.34	387.00	386.94
DI-405C TO DI-405D	18.0	0.017	1.52	0.75	0.08	13.72	388.18	386.07
CB-414B TO DI-414C	18.0	0.005	2.30	0.81	0.44	7.42	383.77	383.39
CB-414A TO CB-414B	18.0	0.005	3.49	3.40	1.89	7.44	383.39	383.35
CB-414 TO CB-413	18.0	0.007	4.24	2.34	3.55	8.62	381.72	381.30
CB-414 TO CB-414A	18.0	0.009	3.91	4.71	2.75	9.76	383.35	383.05
DI-414A TO CB-414	30.0	0.006	5.77	6.45	14.94	32.31	381.30	380.21
CB-406 TO CB-406A	15.0	0.008	2.89	3.37	0.85	5.77	388.55	388.24
CB-405 TO CB-407	15.0	0.007	5.15	5.23	4.98	5.59	386.90	386.19
CB-405 TO CB-406	15.0	0.017	3.65	3.60	1.86	8.46	386.70	385.15
CB-405B TO DI-405C	18.0	0.005	2.42	0.92	0.52	7.42	386.07	385.76
DI-414C TO DI-414D	15.0	0.022	2.11	3.43	0.27	9.61	386.00	384.41
DI-414C TO DI-414E	15.0	0.005	1.82	1.91	0.18	4.57	384.30	383.79
CB-405A TO CB-405B	18.0	0.005	2.49	2.19	1.78	7.43	385.76	385.76

10-YEAR ANALYSIS
Conduit Results - Time: 0.00 hours

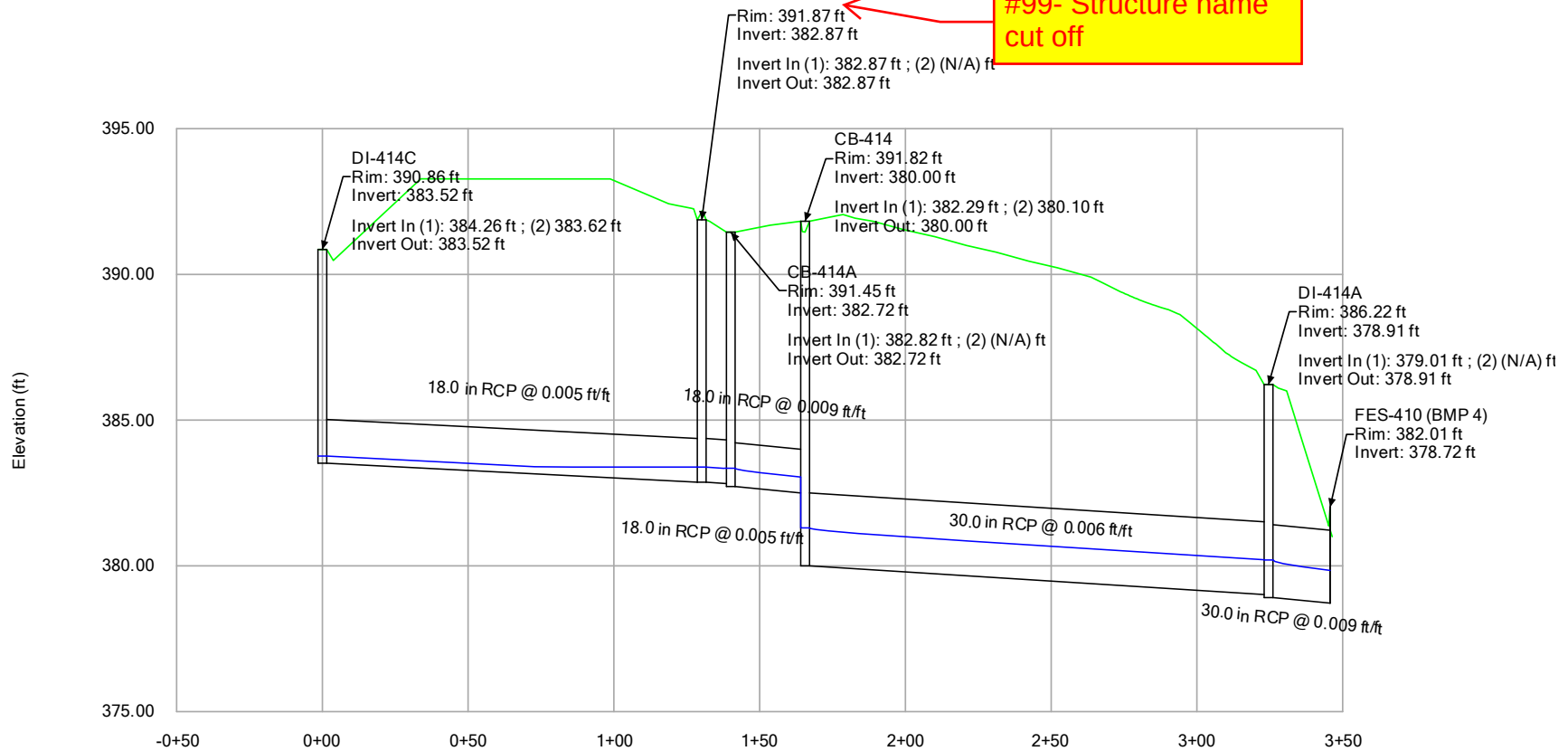
Label	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
CB-405 TO CB-405A	18.0	0.005	4.33	4.48	4.19	7.43	385.76	385.56
DI-404 TO CB-405	24.0	0.009	6.07	7.07	13.20	21.04	385.15	383.80
FES-400 TO DI-404	24.0	0.005	5.68	6.04	13.06	16.00	383.93	382.80
FES-410 TO DI-414A	30.0	0.009	5.74	6.86	14.67	38.88	380.20	379.84
CB-413 TO CB-413A	15.0	0.006	3.46	2.59	1.57	4.95	381.80	381.72
DI-412B TO DI-411	18.0	0.100	0.00	0.00	0.00	33.20	366.00	361.00
DI-412C TO CB-412A	18.0	0.309	3.37	14.57	1.67	58.41	376.99	364.18
DI-412C TO DI-412B	24.0	0.008	0.00	0.00	0.00	20.81	360.90	360.25
HW-500 TO DI-412C	24.0	0.012	3.18	4.55	1.67	25.20	360.25	359.65

10-YEAR ANALYSIS

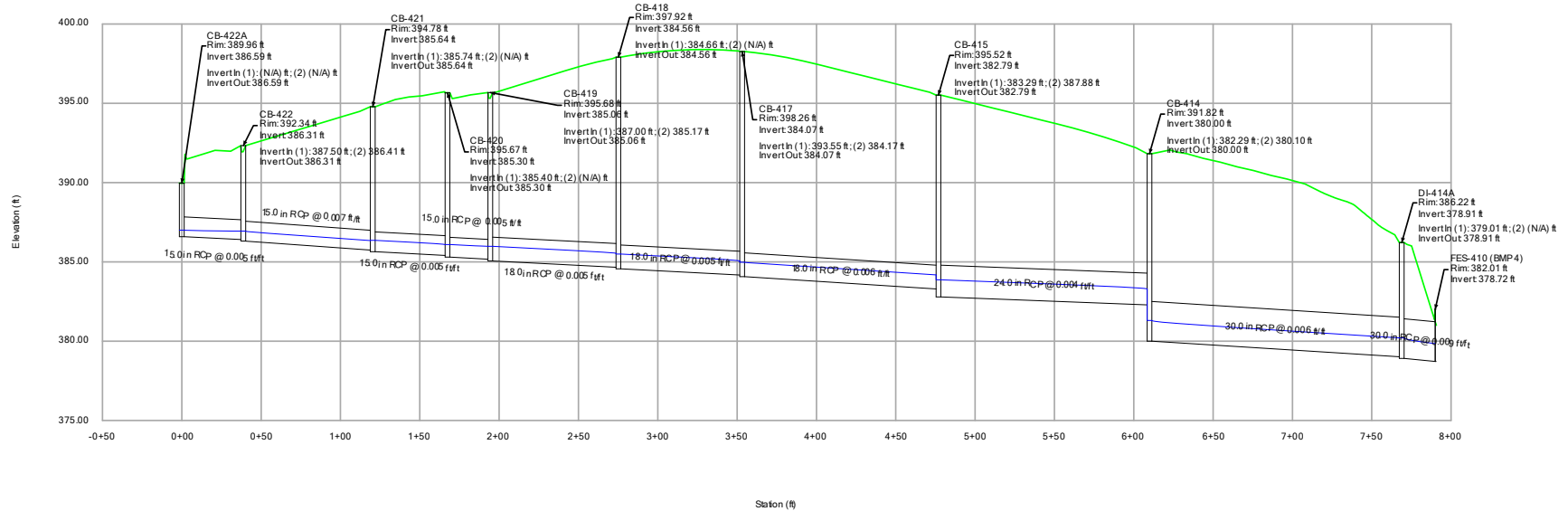


10-YEAR ANALYSIS

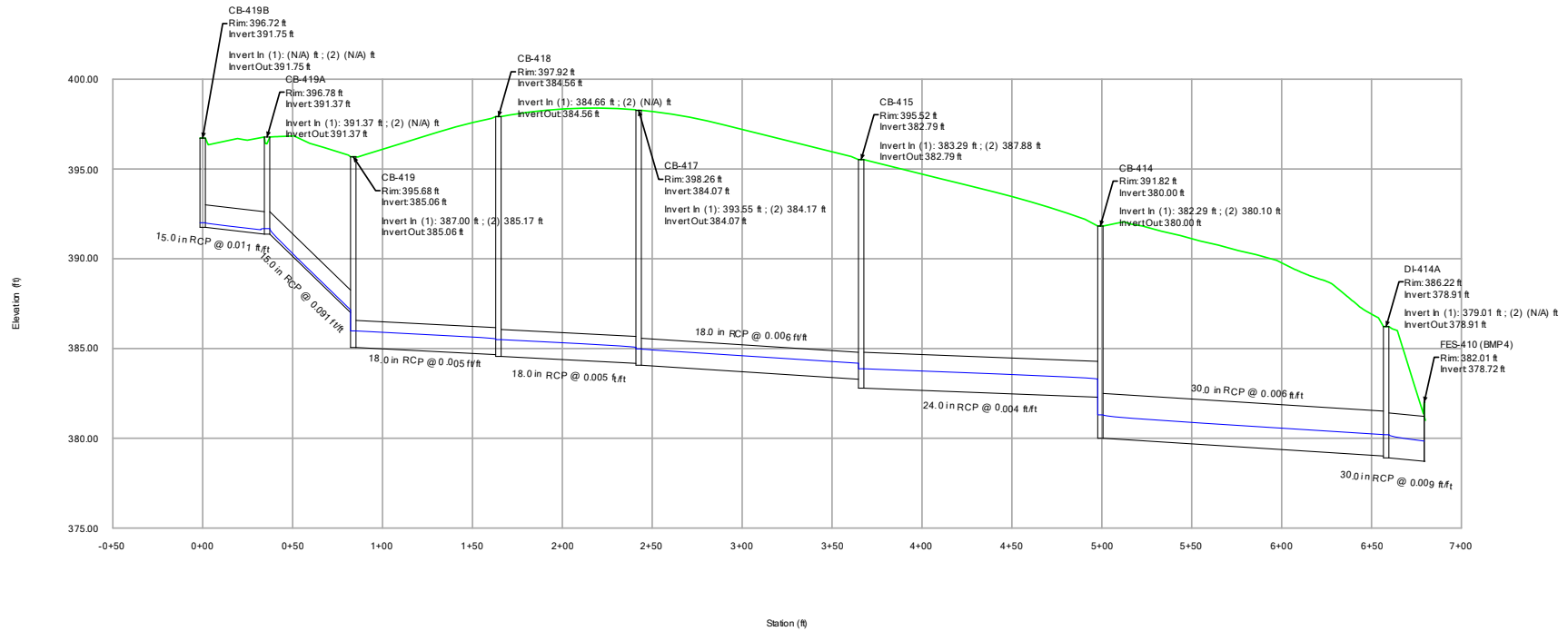
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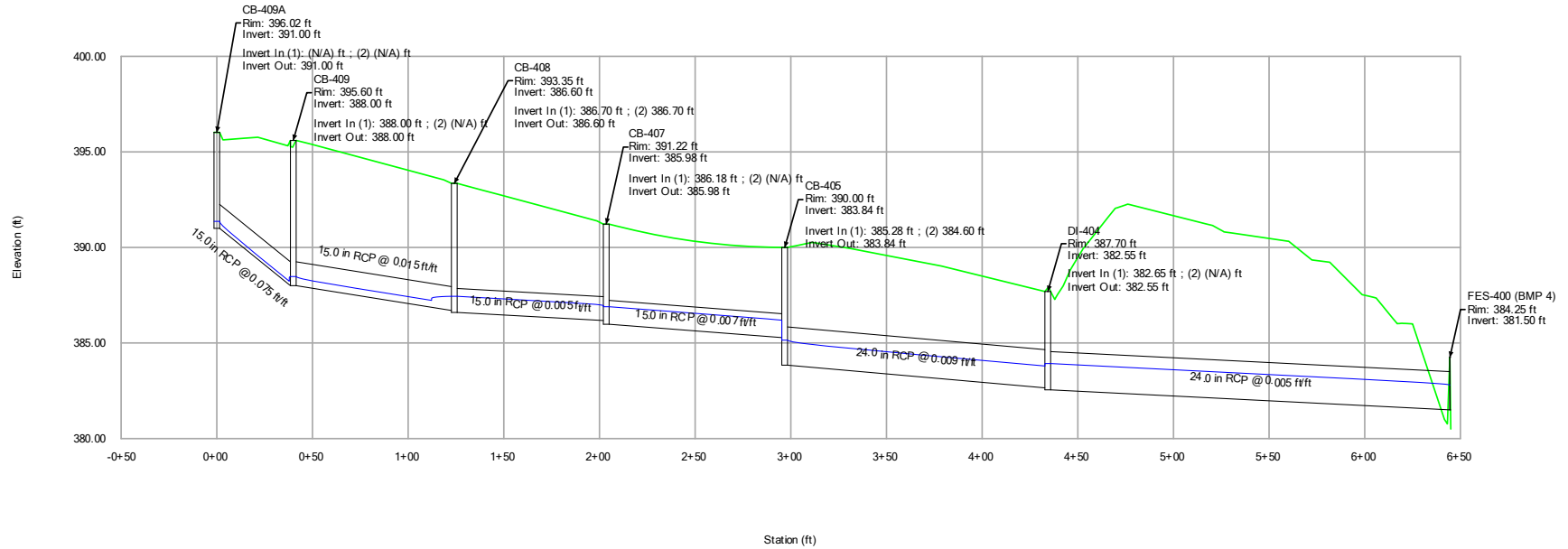
10-YEAR ANALYSIS



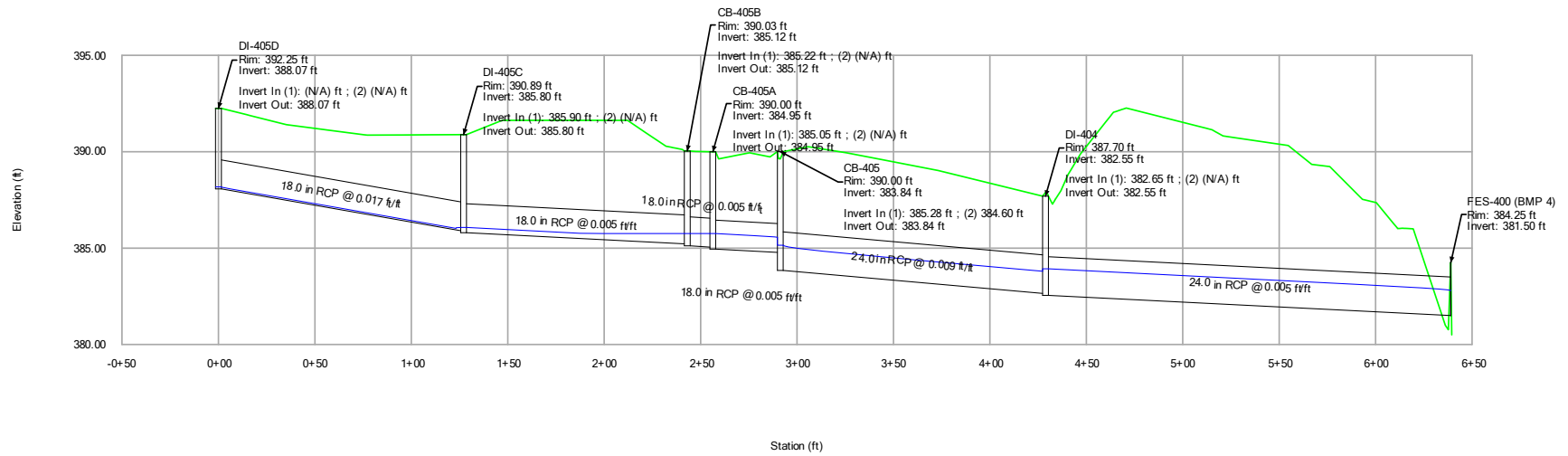
10-YEAR ANALYSIS



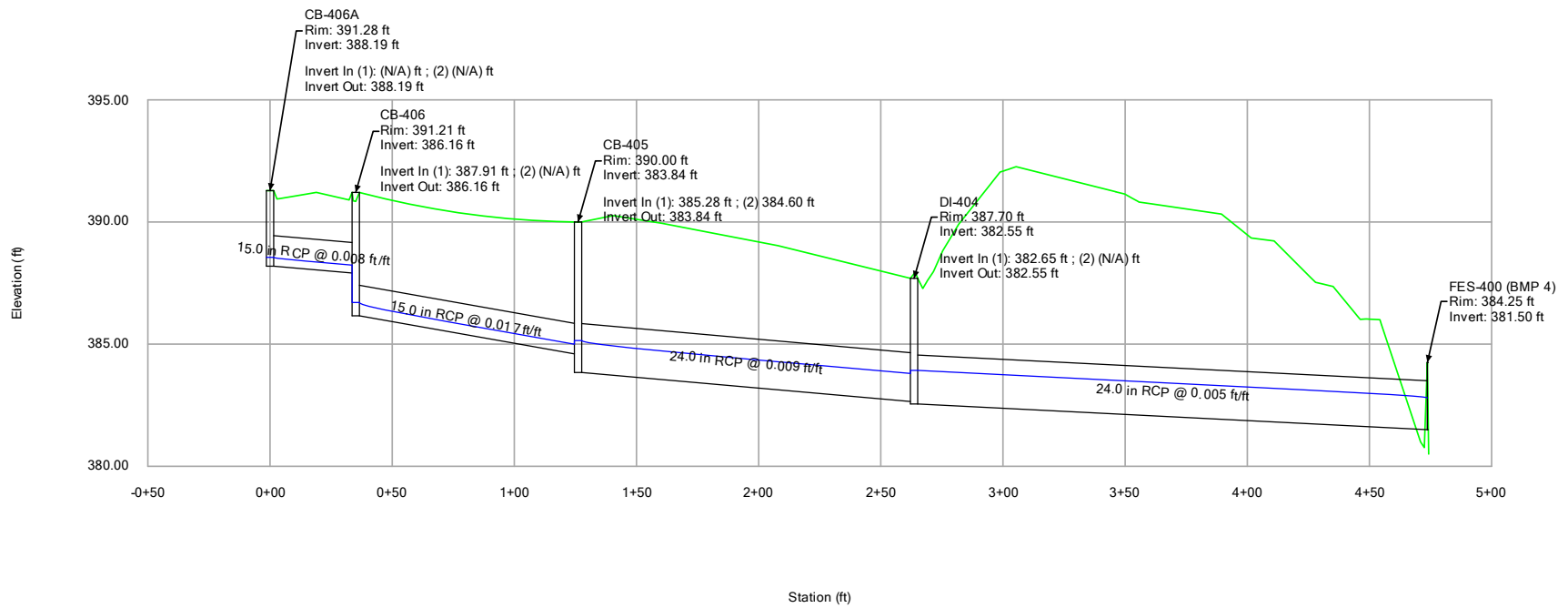
10-YEAR ANALYSIS

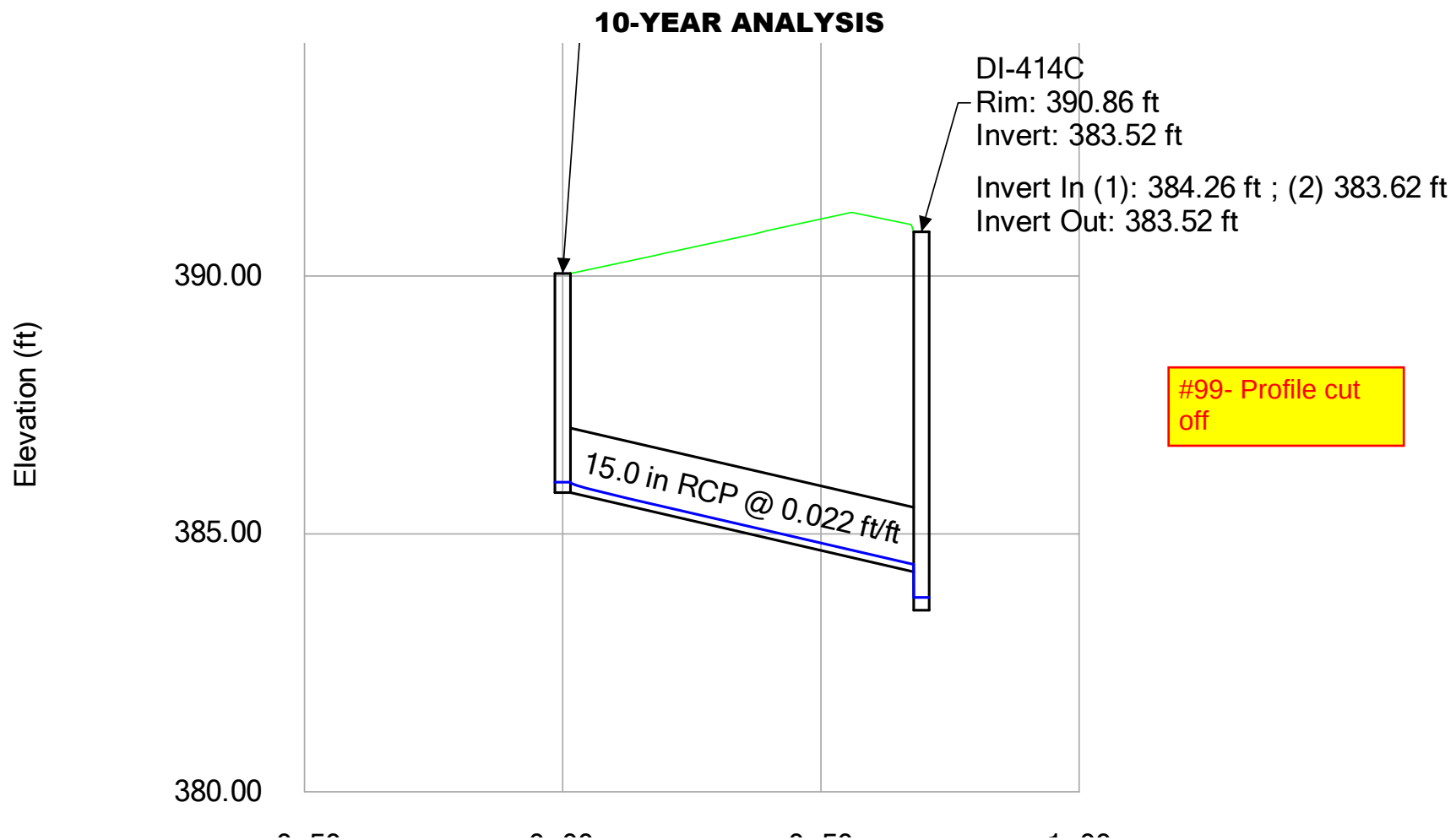


10-YEAR ANALYSIS



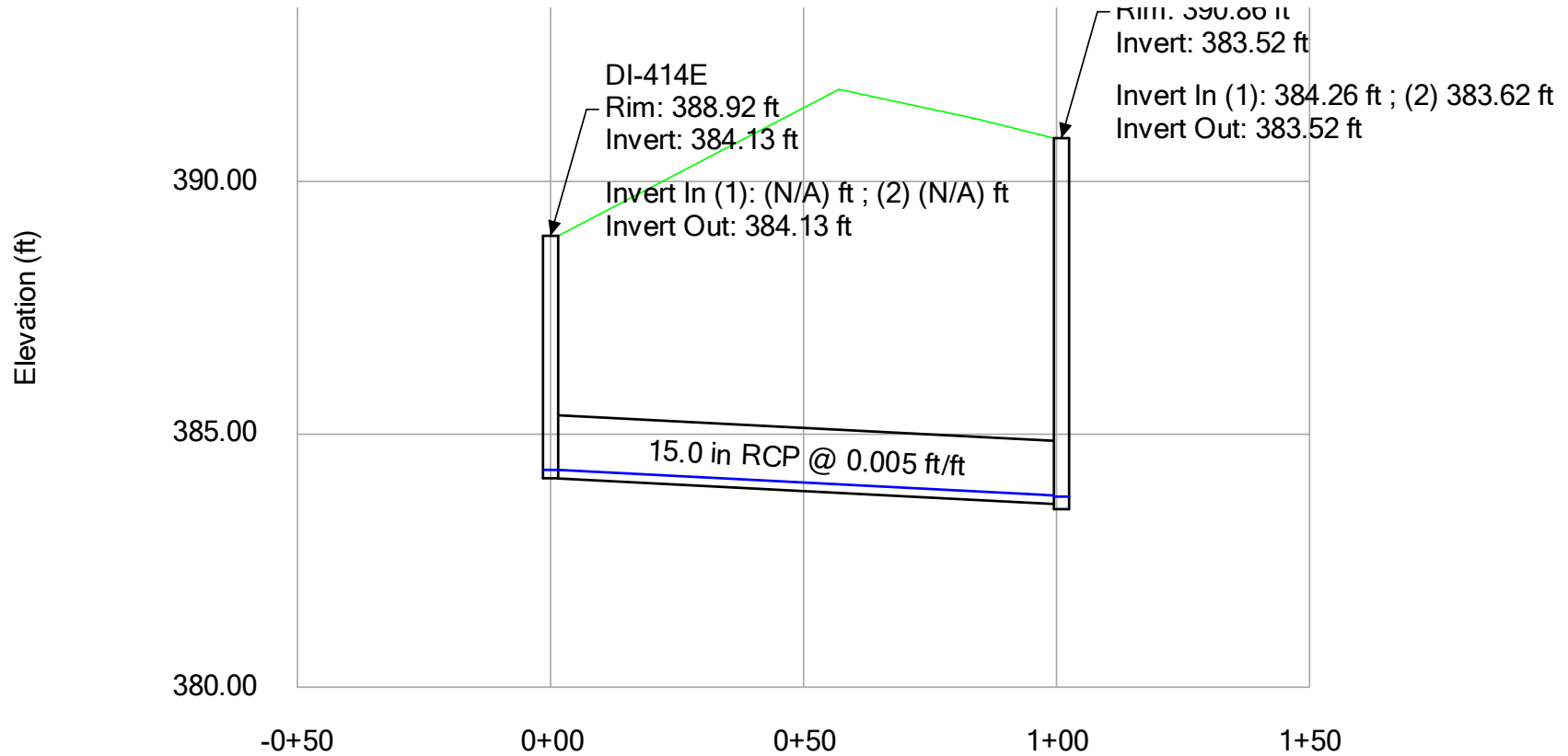
10-YEAR ANALYSIS

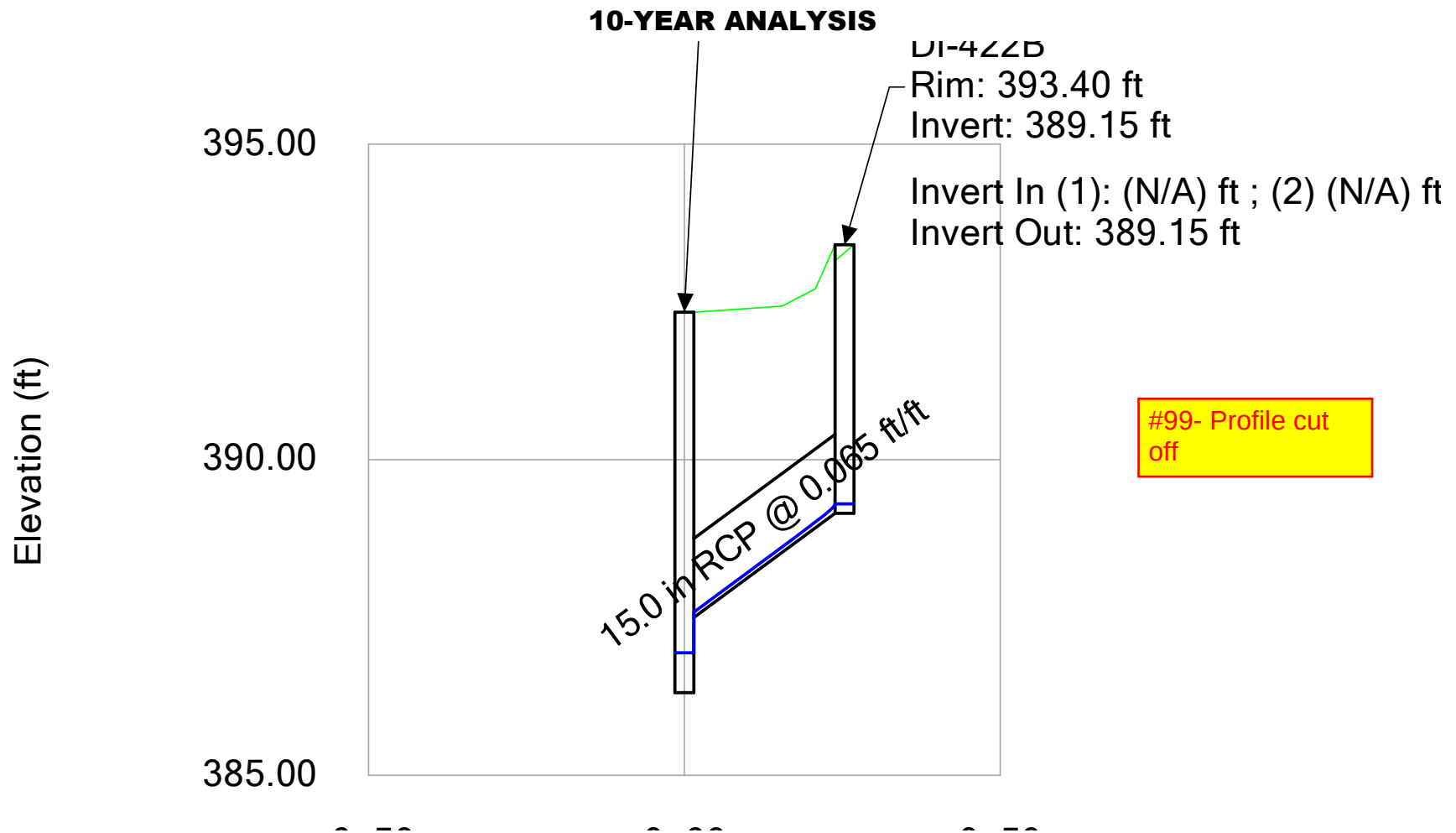




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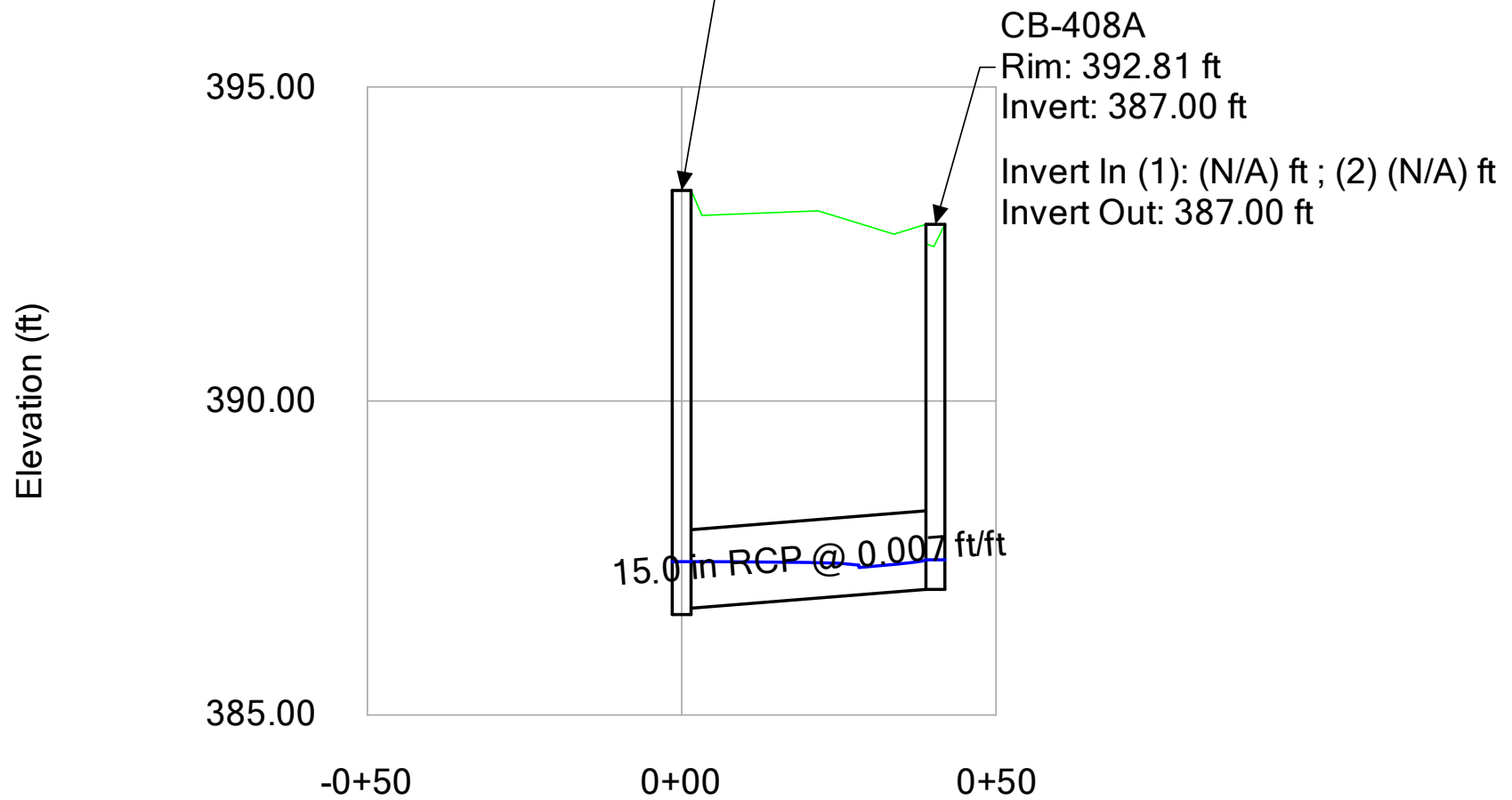
10-YEAR ANALYSIS





#99- Profile cut
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10-YEAR ANALYSIS



SCM 4 – 25 YR STORM

25-YEAR ANALYSIS

CATCHMENTS - Time: 0.00 hours

Outflow Element	Scaled Area (acres)	Flow (Total Out) (cfs)	Time of Concentration (hours)	Runoff Coefficient (Rational)
DI-405D	0.014	0.09	0.083	0.830
CB-406A	0.200	1.34	0.083	0.830
CB-406	0.256	1.71	0.083	0.830
CB-405	0.810	5.41	0.083	0.830
CB-407	0.291	1.94	0.083	0.830
CB-405B	0.318	2.13	0.083	0.830
CB-408A	0.336	2.25	0.083	0.830
CB-409A	0.204	1.36	0.083	0.830
CB-419B	0.087	0.58	0.083	0.830
CB-405A	0.610	4.08	0.083	0.830
DI-405C	0.093	0.62	0.083	0.830
CB-422A	0.241	1.61	0.083	0.830
CB-422	0.350	2.34	0.083	0.830
CB-419A	0.033	0.22	0.083	0.830
CB-409	0.130	0.87	0.083	0.830
CB-408	0.188	1.26	0.083	0.830
CB-419	0.328	2.19	0.083	0.830
CB-420	0.093	0.62	0.083	0.830
CB-421	0.088	0.59	0.083	0.830
CB-418	0.046	0.30	0.083	0.830
CB-417A	0.025	0.17	0.083	0.830
CB-417	0.027	0.18	0.083	0.830
CB-415A	0.414	2.76	0.083	0.830
CB-415	0.319	2.13	0.083	0.830
CB-414B	0.292	1.95	0.083	0.830
CB-414A	0.027	0.18	0.083	0.830
CB-413A	0.384	2.57	0.083	0.830
CB-413	0.485	3.24	0.083	0.830
CB-414	0.260	1.74	0.083	0.830
DI-404	0.012	0.06	0.083	0.600
DI-422B	0.035	0.17	0.083	0.600

#103- There are several structures shown on the plans/storm tables that are not included here

25-YEAR ANALYSIS

CATCHMENTS - Time: 0.00 hours

Outflow Element	Scaled Area (acres)	Flow (Total Out) (cfs)	Time of Concentration (hours)	Runoff Coefficient (Rational)
DI-414D	0.068	0.33	0.083	0.600
DI-414C	0.025	0.00	0.083	0.600
DI-414E	0.044	0.21	0.083	0.600

25-YEAR ANALYSIS

Inlets - Time: 0.00 hours

Label	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Grate Length (ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)
CB-417A	0.16	0.01	0.16	96.5	393.84	393.84	3.0	1.76	1.76
CB-417	0.18	0.01	6.00	95.9	385.02	385.02	3.0	5.02	5.11
CB-418	0.28	0.03	5.75	90.8	385.55	385.55	3.0	4.96	4.64
CB-419A	0.21	0.01	0.68	94.1	391.69	391.69	3.0	1.90	2.72
CB-419B	0.48	0.11	0.48	82.0	392.02	392.02	3.0	2.46	2.46
CB-409A	0.94	0.43	0.94	68.6	391.38	391.38	3.0	2.97	2.97
CB-419	1.35	0.87	5.56	60.8	386.03	386.03	3.0	3.97	4.59
CB-420	0.50	0.12	3.60	81.1	386.15	386.15	3.0	4.13	4.08
CB-409	0.66	0.21	1.59	75.9	388.50	388.50	3.0	2.04	3.47
CB-415A	1.59	1.18	1.59	57.3	388.52	388.52	3.0	3.38	3.38
CB-415	1.31	0.83	8.59	61.4	383.93	383.93	3.0	5.14	4.66
CB-421	0.48	0.11	3.14	81.9	386.40	386.40	3.0	4.39	4.02
DI-422B	0.17	0.01	0.17	96.4	389.31	389.31	3.0	1.86	1.86
CB-408	0.99	0.48	4.07	67.4	387.50	387.50	3.0	1.93	4.32
CB-408A	1.55	1.13	1.55	57.8	387.49	387.49	3.0	3.44	3.44
CB-422	1.45	1.00	2.70	59.2	386.97	386.97	3.0	2.10	4.12
DI-405D	0.09	0.00	0.09	99.5	388.18	388.18	3.0	1.56	1.56
CB-414B	1.73	1.40	2.07	55.4	383.41	383.41	3.0	0.83	3.59
CB-414	1.50	1.07	16.29	58.5	381.36	381.36	3.0	2.44	5.95
CB-414A	1.05	0.53	3.03	66.2	383.38	383.38	3.0	3.42	4.03
CB-406A	0.92	0.42	0.92	68.9	388.57	388.57	3.0	2.96	2.96
CB-407	1.44	0.98	5.42	59.4	386.97	386.97	3.0	4.79	5.19
CB-406	1.11	0.60	2.02	65.0	386.73	386.73	3.0	3.44	3.74
DI-405C	0.50	0.12	0.57	81.1	386.08	386.08	3.0	0.75	2.49
DI-414C	0.00	0.00	0.48	100.0	383.78	383.78	3.0	1.96	2.36
DI-414D	0.29	0.03	0.29	89.9	386.01	386.01	3.0	2.16	2.16
CB-405B	1.49	1.05	1.94	58.6	385.80	385.80	3.0	0.91	2.48
CB-405	3.06	3.93	14.37	43.8	385.21	385.21	3.0	3.42	6.29
CB-405A	2.83	3.42	4.56	45.3	385.80	385.80	3.0	2.21	4.42
CB-422A	1.11	0.60	1.11	64.9	387.02	387.02	3.0	2.94	2.94

25-YEAR ANALYSIS

Inlets - Time: 0.00 hours

Label	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)	Capture Efficiency (Calculated) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Grate Length (ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)
DI-414E	0.20	0.01	0.20	94.5	384.30	384.30	3.0	1.87	1.87
DI-404	0.06	0.00	14.22	100.0	384.02	384.02	3.0	6.27	5.75
DI-414A	0.00	0.00	16.00	100.0	380.26	380.26	3.0	6.60	5.91
CB-413	2.18	2.13	3.88	50.6	381.75	381.75	3.0	2.65	4.37
CB-413A	1.72	1.38	1.72	55.6	381.82	381.82	3.0	3.56	3.56
DI-411	0.00	0.00	0.00	100.0	366.00	366.00	3.0	0.00	0.00
CB-412A	1.88	1.62	1.88	53.7	377.02	377.02	3.0	3.49	3.49
DI-412B	0.00	0.00	0.00	100.0	360.90	360.90	3.0	0.00	0.00
DI-412C	0.00	0.00	1.88	100.0	360.28	360.28	3.0	0.00	3.29

25-YEAR ANALYSIS

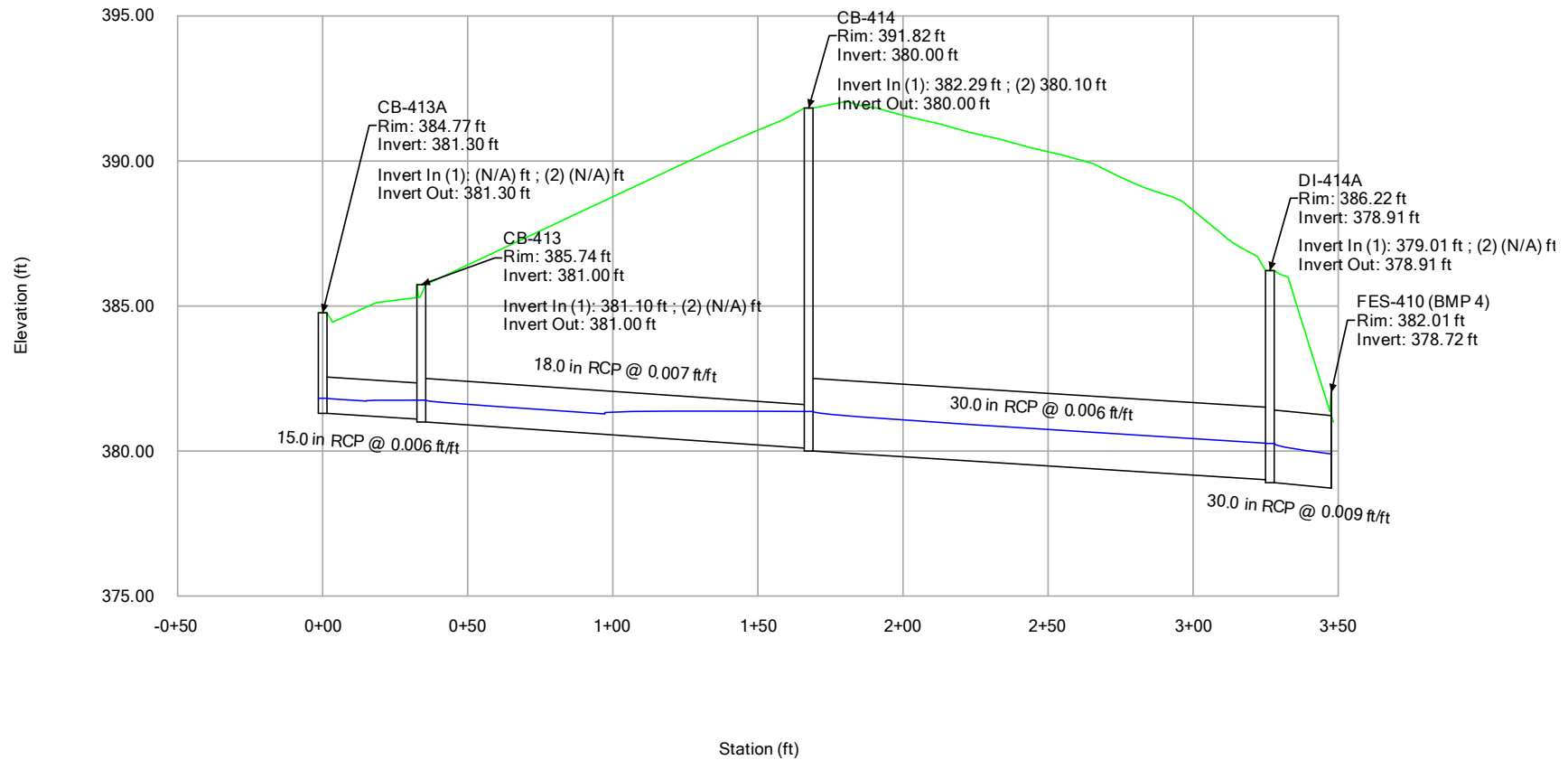
Conduit Results - Time: 0.00 hours

Label	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
CB-417 TO CB-417A	15.0	0.005	1.76	1.85	0.16	4.57	393.84	393.70
CB-415 TO CB-417	18.0	0.006	5.11	5.14	6.00	8.34	385.02	384.23
CB-417 TO CB-418	18.0	0.005	4.64	5.02	5.75	7.43	385.55	385.10
CB-418 TO CB-419	18.0	0.005	4.59	4.96	5.56	7.39	386.03	385.57
CB-419A TO CB-419B	15.0	0.011	2.46	1.90	0.48	6.66	392.02	391.69
CB-419 TO CB-419A	15.0	0.091	2.72	7.45	0.68	19.50	391.69	387.16
CB-409 TO CB-409A	15.0	0.075	2.97	2.04	0.94	17.70	391.38	388.50
CB-419 TO CB-420	15.0	0.005	4.08	3.97	3.60	4.57	386.15	386.03
CB-420 TO CB-421	15.0	0.005	4.02	4.13	3.14	4.58	386.40	386.15
CB-408 TO CB-409	15.0	0.015	3.47	1.93	1.59	8.03	388.50	387.50
CB-415 TO CB-415A	15.0	0.005	3.38	3.46	1.59	4.57	388.52	388.38
CB-414 TO CB-415	24.0	0.004	4.66	5.17	8.59	13.91	383.93	383.33
CB-421 TO CB-422	15.0	0.007	4.12	4.39	2.70	5.38	386.97	386.37
CB-422 TO DI-422B	15.0	0.065	1.86	4.32	0.17	16.48	389.31	387.59
CB-408 TO CB-408A	15.0	0.007	3.44	1.87	1.55	5.57	387.49	387.50
CB-407 TO CB-408	15.0	0.005	4.32	4.79	4.07	4.71	387.50	386.99
CB-422 TO CB-422A	15.0	0.005	2.94	2.10	1.11	4.34	387.02	386.97
DI-405C TO DI-405D	18.0	0.017	1.56	0.75	0.09	13.72	388.18	386.08
CB-414B TO DI-414C	18.0	0.005	2.36	0.83	0.48	7.42	383.78	383.41
CB-414A TO CB-414B	18.0	0.005	3.59	3.42	2.07	7.44	383.41	383.38
CB-414 TO CB-413	18.0	0.007	4.37	2.44	3.88	8.62	381.75	381.36
CB-414 TO CB-414A	18.0	0.009	4.03	4.83	3.03	9.76	383.38	383.08
DI-414A TO CB-414	30.0	0.006	5.95	6.60	16.29	32.31	381.36	380.27
CB-406 TO CB-406A	15.0	0.008	2.96	3.44	0.92	5.77	388.57	388.25
CB-405 TO CB-407	15.0	0.007	5.19	5.45	5.42	5.59	386.97	386.23
CB-405 TO CB-406	15.0	0.017	3.74	3.42	2.02	8.46	386.73	385.21
CB-405B TO DI-405C	18.0	0.005	2.49	0.91	0.57	7.42	386.08	385.80
DI-414C TO DI-414D	15.0	0.022	2.16	3.52	0.29	9.61	386.01	384.41
DI-414C TO DI-414E	15.0	0.005	1.87	1.96	0.20	4.57	384.30	383.79
CB-405A TO CB-405B	18.0	0.005	2.48	2.21	1.94	7.43	385.80	385.80

25-YEAR ANALYSIS
Conduit Results - Time: 0.00 hours

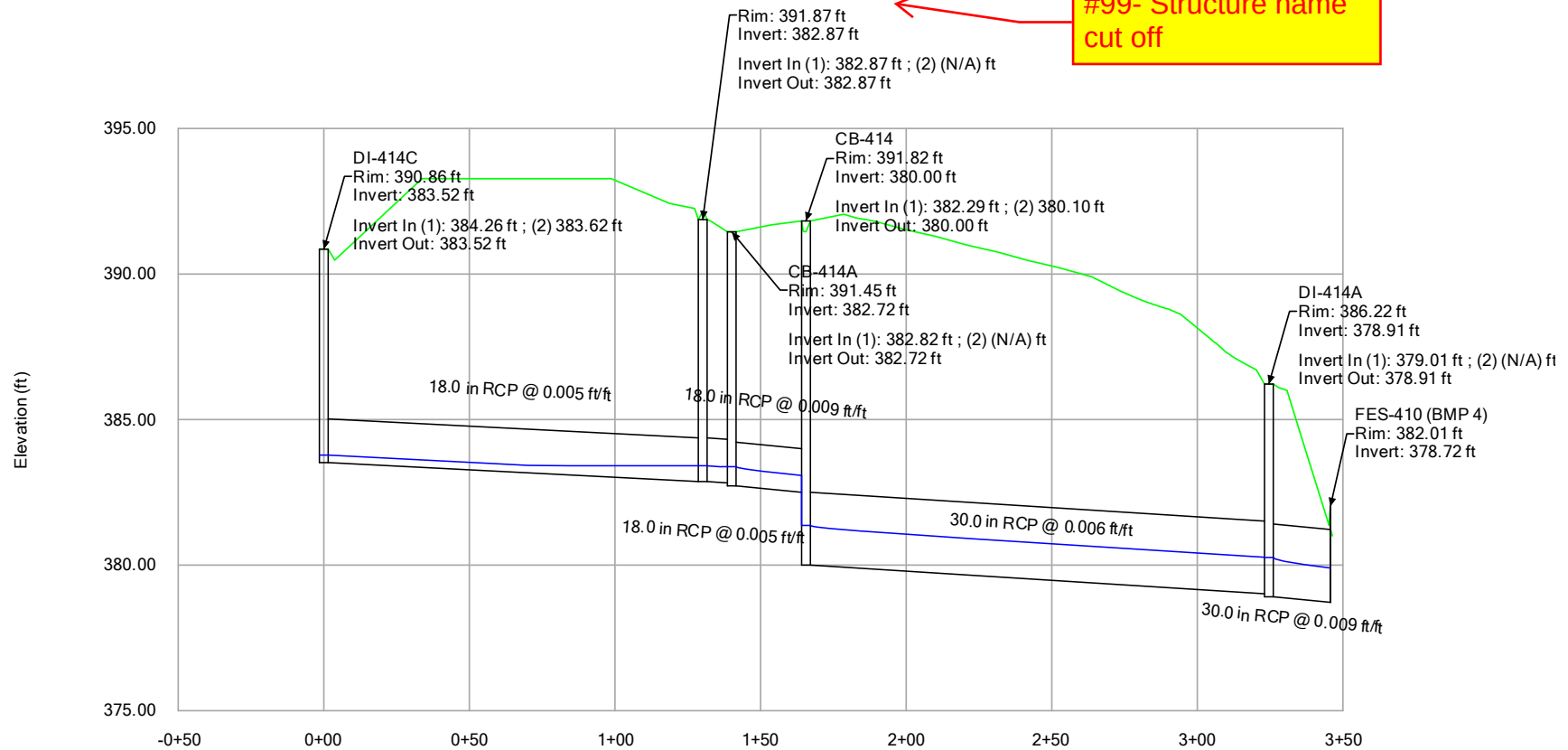
Label	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
CB-405 TO CB-405A	18.0	0.005	4.42	4.62	4.56	7.43	385.80	385.60
DI-404 TO CB-405	24.0	0.009	6.29	6.27	14.37	21.04	385.21	384.02
FES-400 TO DI-404	24.0	0.005	5.75	6.26	14.22	16.00	384.02	382.86
FES-410 TO DI-414A	30.0	0.009	5.91	7.02	16.00	38.88	380.26	379.90
CB-413 TO CB-413A	15.0	0.006	3.56	2.65	1.72	4.95	381.82	381.75
DI-412B TO DI-411	18.0	0.100	0.00	0.00	0.00	33.20	366.00	361.00
DI-412C TO CB-412A	18.0	0.309	3.49	15.13	1.88	58.41	377.02	364.18
DI-412C TO DI-412B	24.0	0.008	0.00	0.00	0.00	20.81	360.90	360.28
HW-500 TO DI-412C	24.0	0.012	3.29	4.71	1.88	25.20	360.28	359.67

25-YEAR ANALYSIS

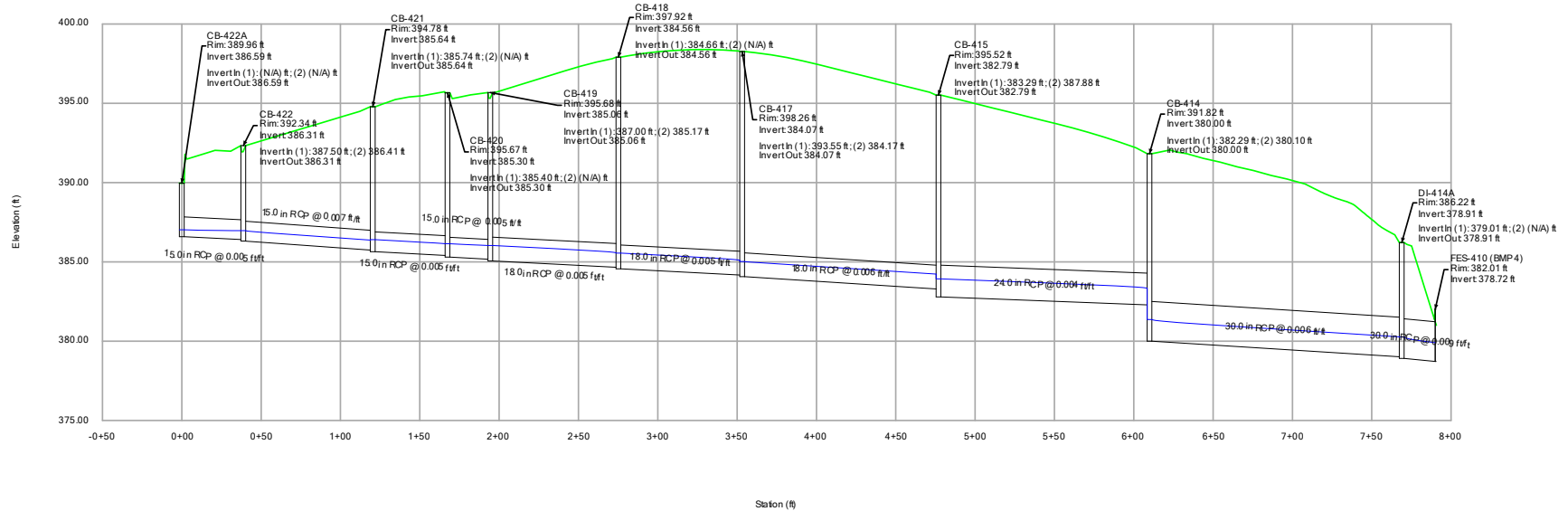


25-YEAR ANALYSIS

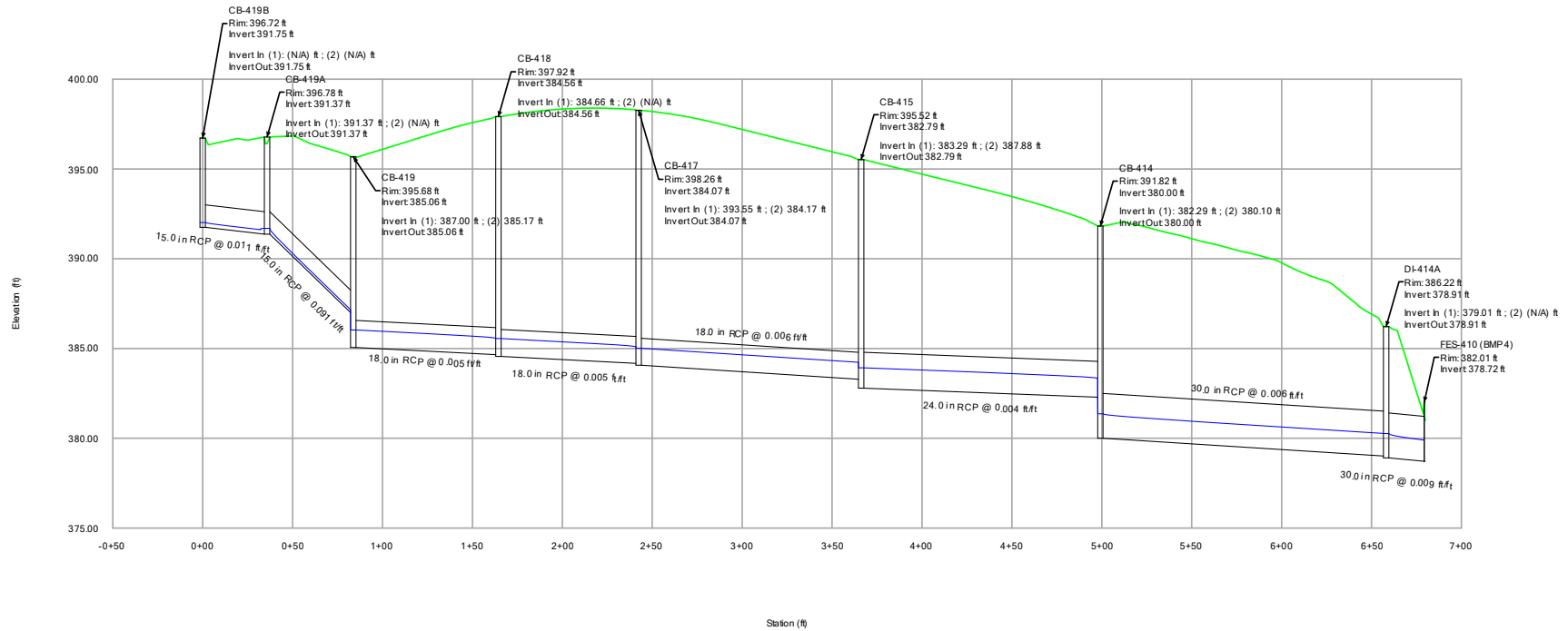
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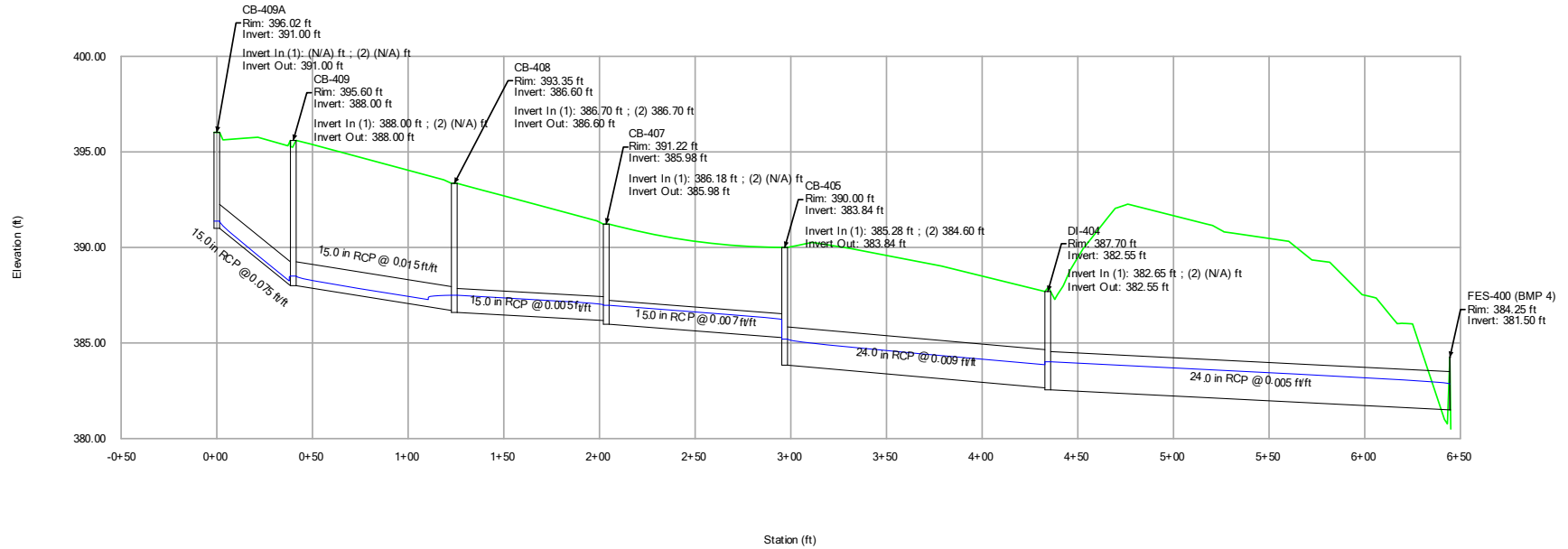
25-YEAR ANALYSIS



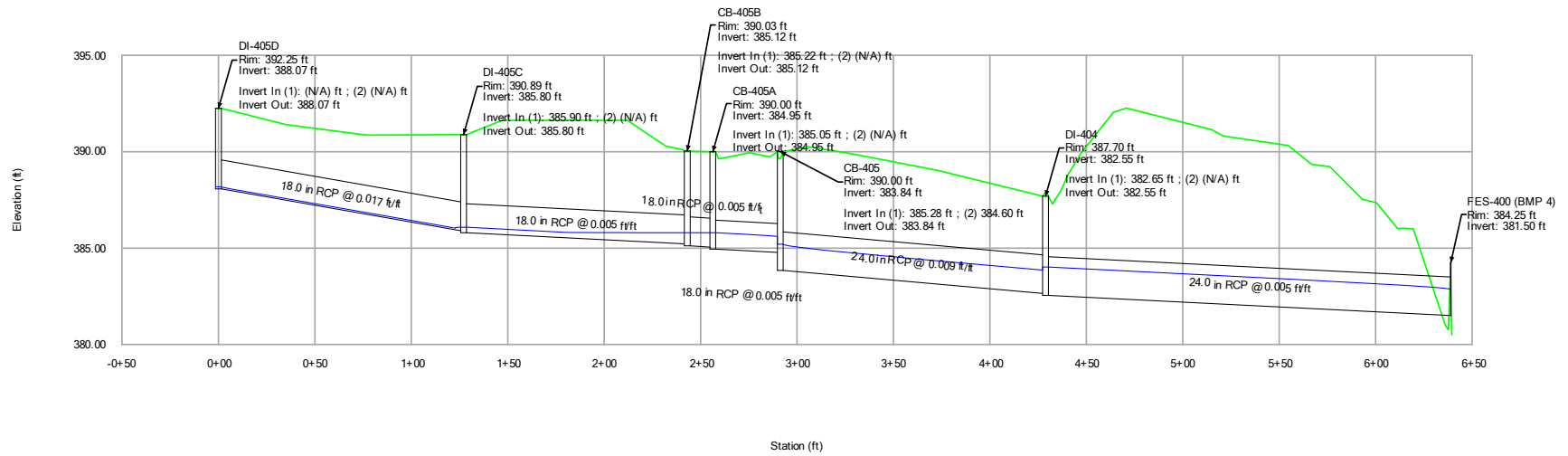
25-YEAR ANALYSIS



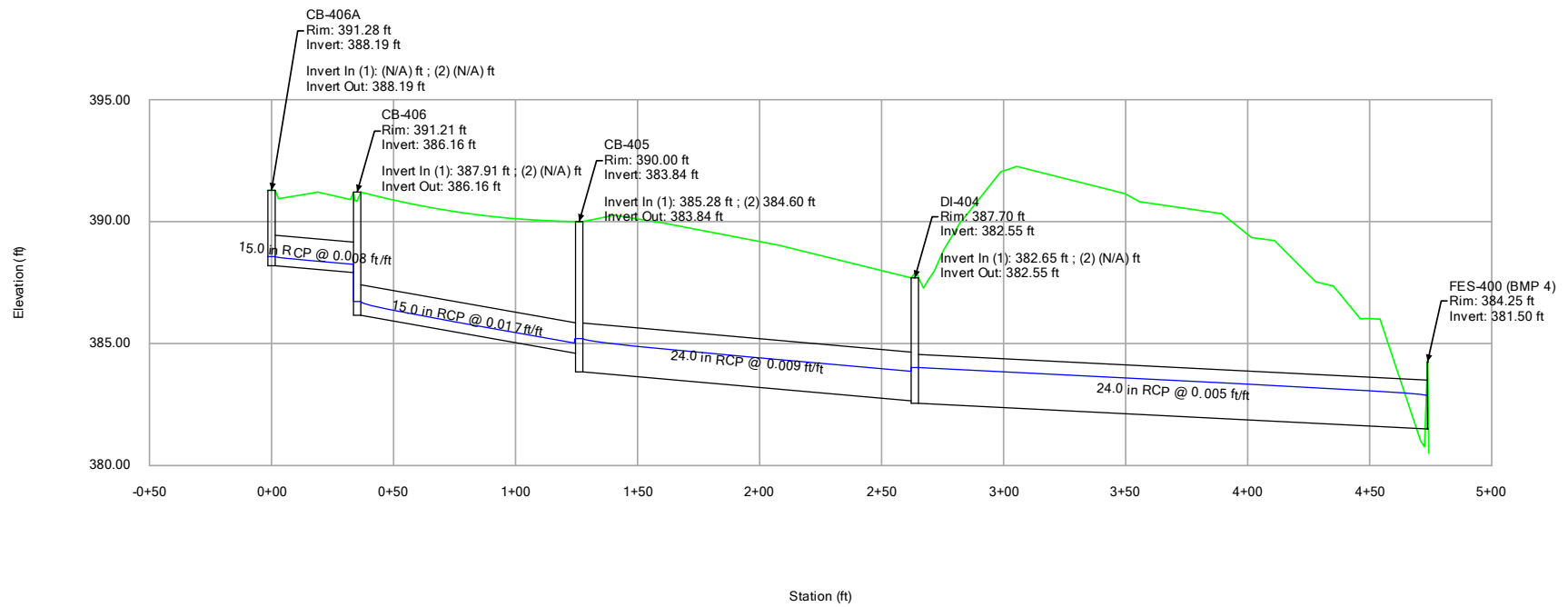
25-YEAR ANALYSIS

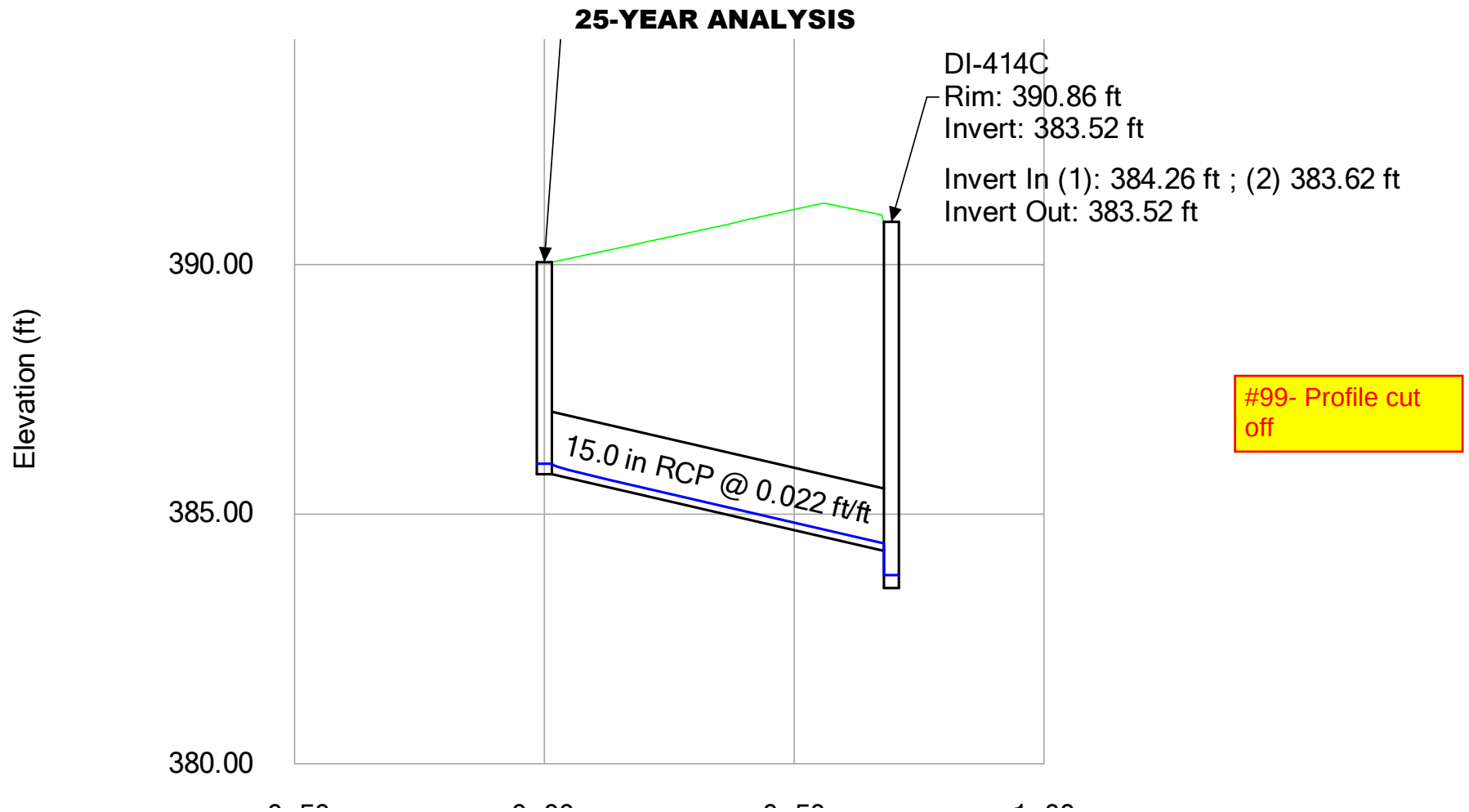


25-YEAR ANALYSIS

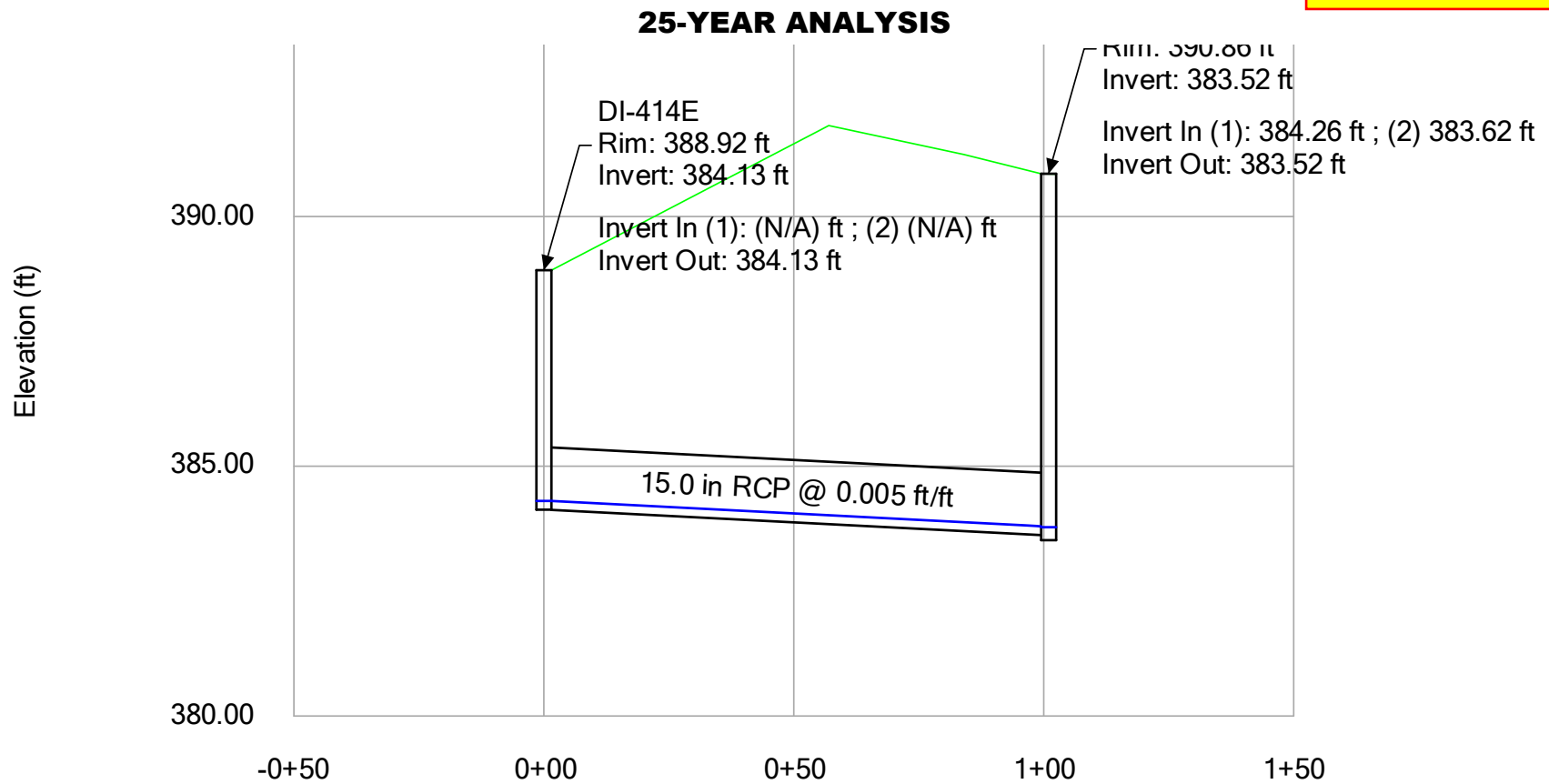


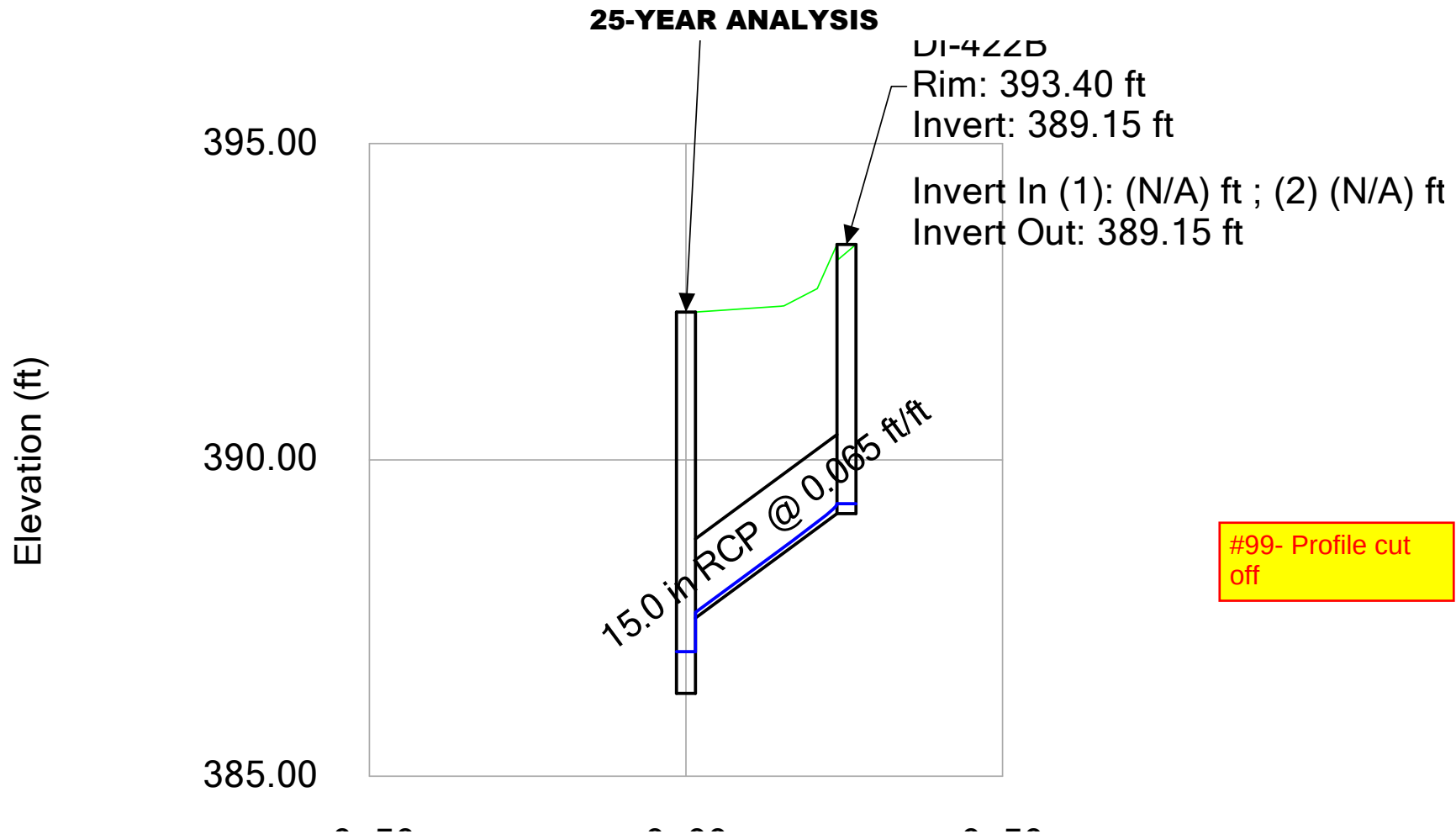
25-YEAR ANALYSIS

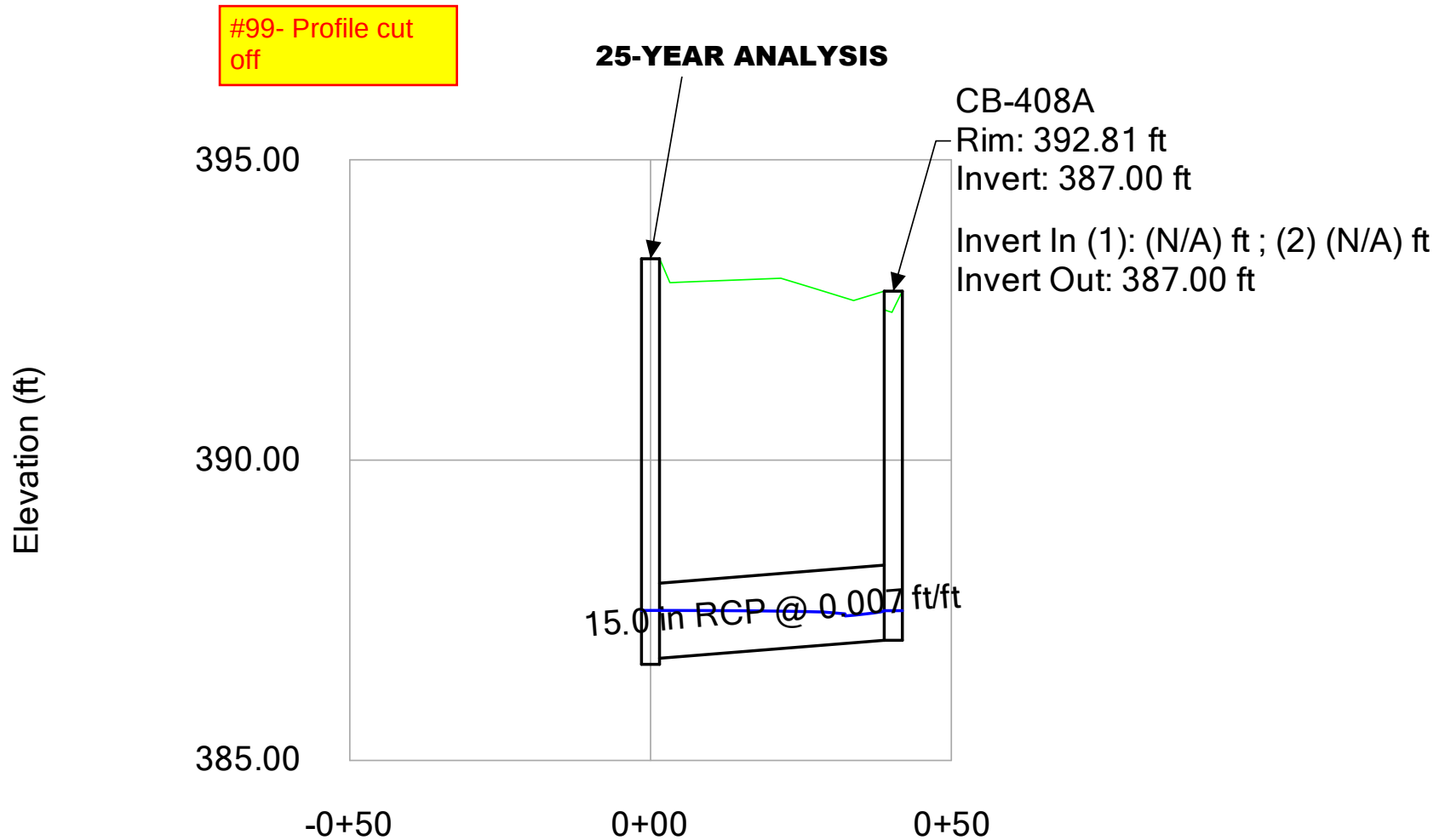




#99- Profile cut
off







SCM 4 – INLET SPREAD

4IN/HR

Inlet Spread - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)	Spread / Top Width (ft)	Depth (Gutter) (in)
CB-417A	0.025	0.021	0.08	0.00	0.08	2.3	0.6
CB-417	0.027	0.023	0.09	0.00	3.61	2.4	0.6
CB-418	0.046	0.037	0.15	0.00	3.44	2.9	0.7
CB-419A	0.033	0.027	0.11	0.00	0.38	2.6	0.6
CB-419B	0.087	0.066	0.27	0.03	0.27	3.7	0.9
CB-409A	0.204	0.135	0.54	0.14	0.54	5.1	1.2
CB-419	0.328	0.197	0.79	0.31	3.29	6.1	1.5
CB-420	0.093	0.070	0.28	0.03	2.12	3.8	0.9
CB-409	0.130	0.093	0.37	0.06	0.92	4.3	1.0
CB-415A	0.414	0.235	0.95	0.44	0.95	6.6	1.6
CB-415	0.319	0.192	0.78	0.29	5.34	6.0	1.4
CB-421	0.088	0.066	0.27	0.03	1.84	3.7	0.9
DI-422B	0.035	0.021	0.09	0.00	0.09	2.3	0.6
CB-408	0.188	0.136	0.55	0.14	2.35	5.1	1.2
CB-408A	0.336	0.219	0.88	0.38	0.88	6.4	1.5
CB-422	0.350	0.210	0.85	0.35	1.57	6.3	1.5
DI-405D	0.014	0.011	0.05	0.00	0.05	1.9	0.4
CB-414B	0.292	0.239	0.96	0.45	1.23	6.7	1.6
CB-414	0.260	0.206	0.83	0.34	10.02	6.2	1.5
CB-414A	0.027	0.112	0.45	0.09	1.68	4.7	1.1
CB-406A	0.200	0.133	0.54	0.13	0.54	5.0	1.2
CB-407	0.291	0.199	0.80	0.31	3.15	6.1	1.5
CB-406	0.256	0.161	0.65	0.20	1.19	5.5	1.3
DI-405C	0.093	0.070	0.28	0.03	0.33	3.8	0.9
DI-414C	0.000	0.000	0.00	0.00	0.26	0.0	0.0
DI-414D	0.068	0.039	0.16	0.01	0.16	3.0	0.7
CB-405B	0.318	0.210	0.85	0.35	1.18	6.3	1.5
CB-405	0.810	0.440	1.77	1.46	8.88	9.1	2.2
CB-405A	0.610	0.394	1.59	1.19	2.77	8.6	2.1
CB-422A	0.241	0.158	0.64	0.20	0.64	5.5	1.3
DI-414E	0.044	0.026	0.11	0.00	0.11	2.5	0.6

#101- Gutter spread should not exceed 1/2 of a lane width

4IN/HR

Inlet Spread - Time: 0.00 hours

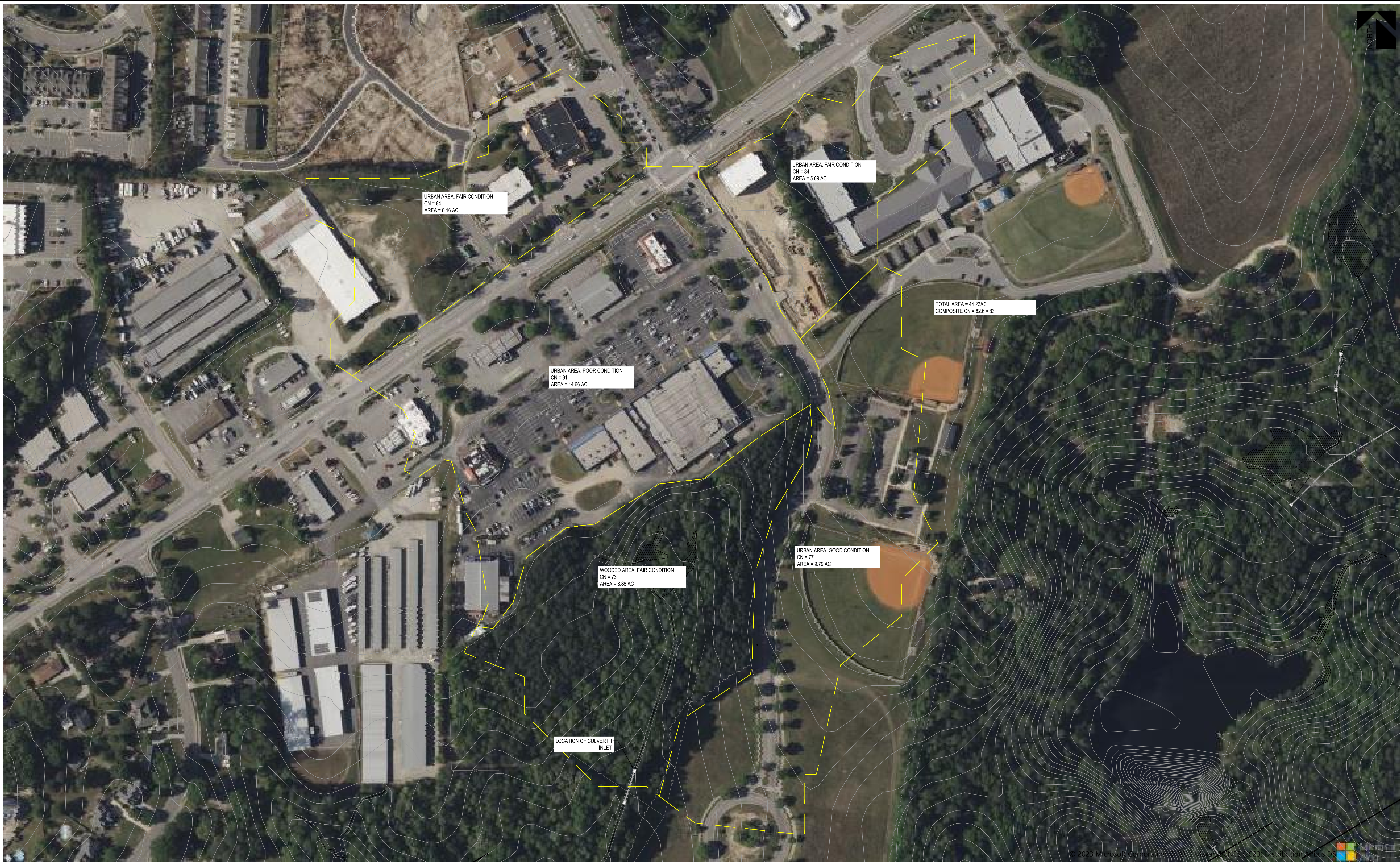
Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)	Spread / Top Width (ft)	Depth (Gutter) (in)
DI-404	0.012	0.007	0.03	0.00	8.91	1.5	0.4
DI-414A	(N/A)	0.000	0.00	0.00	10.02	0.0	0.0
CB-413	0.485	0.305	1.23	0.73	2.17	7.5	1.8
CB-413A	0.384	0.234	0.94	0.44	0.94	6.6	1.6
DI-411	(N/A)	0.000	0.00	0.00	0.00	0.0	0.0
CB-412A	(N/A)	0.206	0.83	0.34	0.83	6.2	1.5
DI-412B	(N/A)	0.000	0.00	0.00	0.00	0.0	0.0
DI-412C	(N/A)	0.000	0.00	0.00	0.83	0.0	0.0

#101- Gutter spread should not exceed 1/2 of a lane width

CULVERT CALCULATIONS

CULVERT 1

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CULVERT 1 DRAINAGE AREA

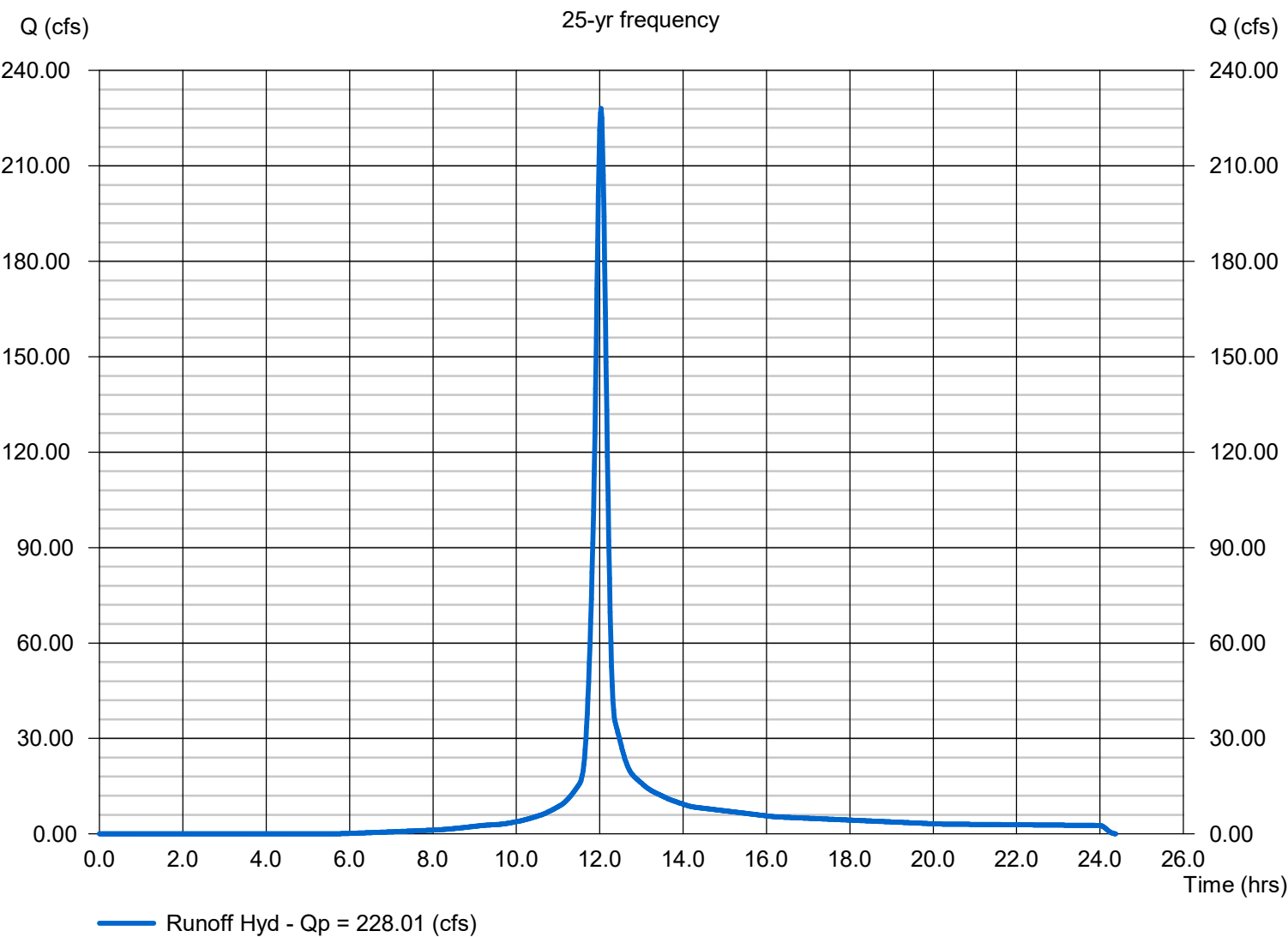
Hydrology Report

CULVERT 1 HYDROLOGY

Hydrograph type	=	SCS	Peak discharge (cfs)	=	228.01
Storm frequency (yrs)	=	25	Time interval (min)	=	1
Drainage area (ac)	=	44.230	Curve number (CN)	=	83
Basin Slope (%)	=	See Worksheet	Hydraulic length (ft)	=	See Worksheet
Tc method	=	TR55	Time of conc. (min)	=	15
Total precip. (in)	=	5.77	Storm Distribution	=	Type II
Storm duration (hrs)	=	24	Shape factor	=	484

Hydrograph Volume = 622,699 (cuft); 14.295 (acft)

Runoff Hydrograph



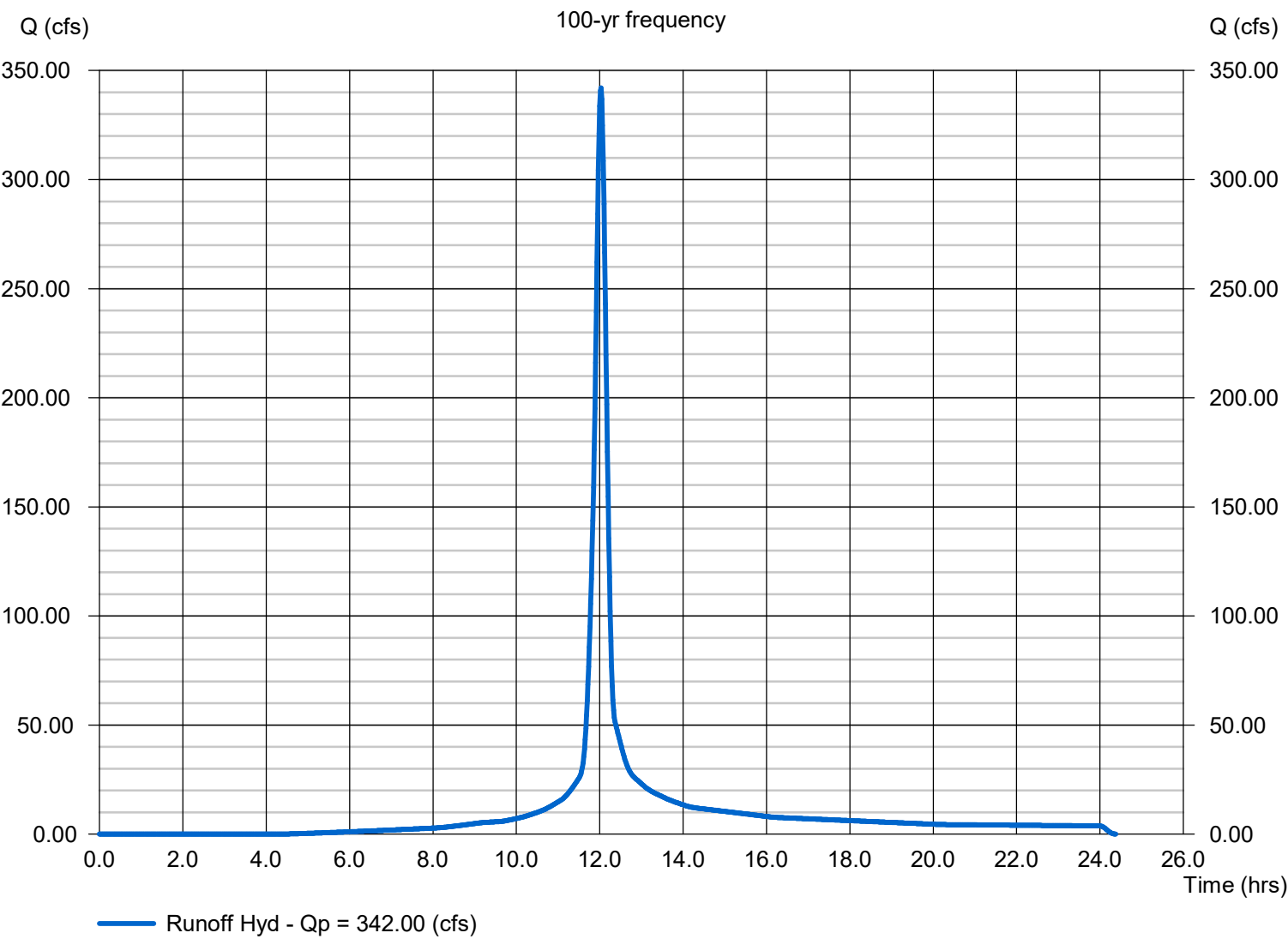
Hydrology Report

CULVERT 1 HYDROLOGY

Hydrograph type	=	SCS	Peak discharge (cfs)	=	342.00
Storm frequency (yrs)	=	100	Time interval (min)	=	1
Drainage area (ac)	=	44.230	Curve number (CN)	=	83
Basin Slope (%)	=	See Worksheet	Hydraulic length (ft)	=	See Worksheet
Tc method	=	TR55	Time of conc. (min)	=	15
Total precip. (in)	=	7.95	Storm Distribution	=	Type II
Storm duration (hrs)	=	24	Shape factor	=	484

Hydrograph Volume = 952,039 (cuft); 21.856 (acft)

Runoff Hydrograph



TR55 Tc Worksheet

Hydraflow Express by Intelisolve

SCS

CULVERT 1 HYDROLOGY

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>			
Sheet Flow							
Manning's n-value	= 0.011	0.400	0.011				
Flow length (ft)	= 300.0	0.0	0.0				
Two-year 24-hr precip. ((in))	= 2.20	0.00	0.00				
Land slope (%)	= 1.10	0.00	0.00				
Travel Time (min)	= 4.47	+	0.00	+	0.00	=	4.47
Shallow Concentrated Flow							
Flow length (ft)	= 791.00	0.00	0.00				
Watercourse slope (%)	= 1.50	0.00	0.00				
Surface description	= Paved	Paved	Paved				
Average velocity (ft/s)	= 2.49	0.00	0.00				
Travel Time (min)	= 5.30	+	0.00	+	0.00	=	5.30
Channel Flow							
X sectional flow area ((sqft))	= 8.70	0.00	0.00				
Wetted perimeter ((ft))	= 8.76	0.00	0.00				
Channel slope (%)	= 0.35	0.00	0.00				
Manning's n-value	= 0.045	0.015	0.015				
Velocity (ft/s)	= 1.95	0.00	0.00				
Flow length (ft)	= 573.0	0.0	0.0				
Travel Time (min)	= 4.8977380	0.00	0	+	0	=	4.90
Total Travel Time, Tc				15.00 min			

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc.

Monday, Jul 10 2023

CULVERT 1 (25-YR)

Invert Elev Dn (ft) = 390.20
Pipe Length (ft) = 89.75
Slope (%) = 0.89
Invert Elev Up (ft) = 391.00
Rise (in) = 36.0
Shape = Box
Span (in) = 48.0
No. Barrels = 4
n-Value = 0.013
Culvert Type = Flared Wingwalls
Culvert Entrance = 30D to 75D wingwall flares
Coeff. K,M,c,Y,k = 0.026, 1, 0.0347, 0.81, 0.4

Embankment

Top Elevation (ft) = 397.13
Top Width (ft) = 51.00
Crest Width (ft) = 120.00

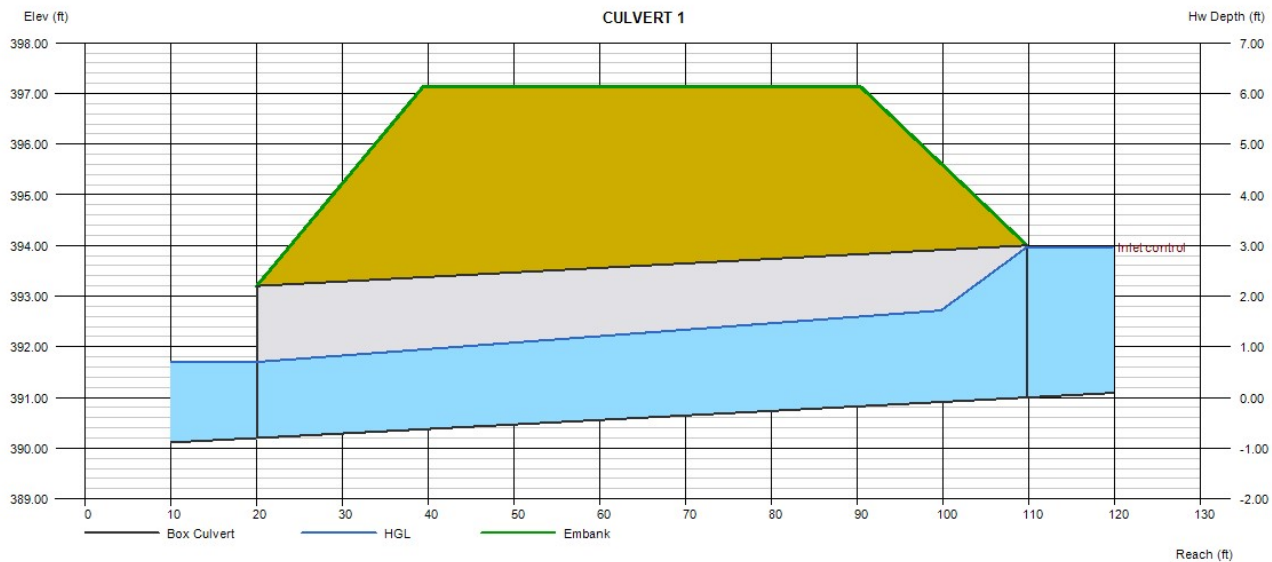
Calculations

Qmin (cfs) = 0.00
Qmax (cfs) = 228.01
Tailwater Elev (ft) = Normal

Highlighted

Qtotal (cfs) = 227.50
Qpipe (cfs) = 227.50
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 9.48
Veloc Up (ft/s) = 7.71
HGL Dn (ft) = 391.70
HGL Up (ft) = 392.84
Hw Elev (ft) = 393.97
Hw/D (ft) = 0.99
Flow Regime = Inlet Control

#106- 3 shown in plans



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc.

Monday, Jul 10 2023

CULVERT 1 (100-YR)

Invert Elev Dn (ft) = 390.20
Pipe Length (ft) = 89.75
Slope (%) = 0.89
Invert Elev Up (ft) = 391.00
Rise (in) = 36.0
Shape = Box
Span (in) = 48.0
No. Barrels = 4
n-Value = 0.013
Culvert Type = Flared Wingwalls
Culvert Entrance = 30D to 75D wingwall flares
Coeff. K,M,c,Y,k = 0.026, 1, 0.0347, 0.81, 0.4

Embankment

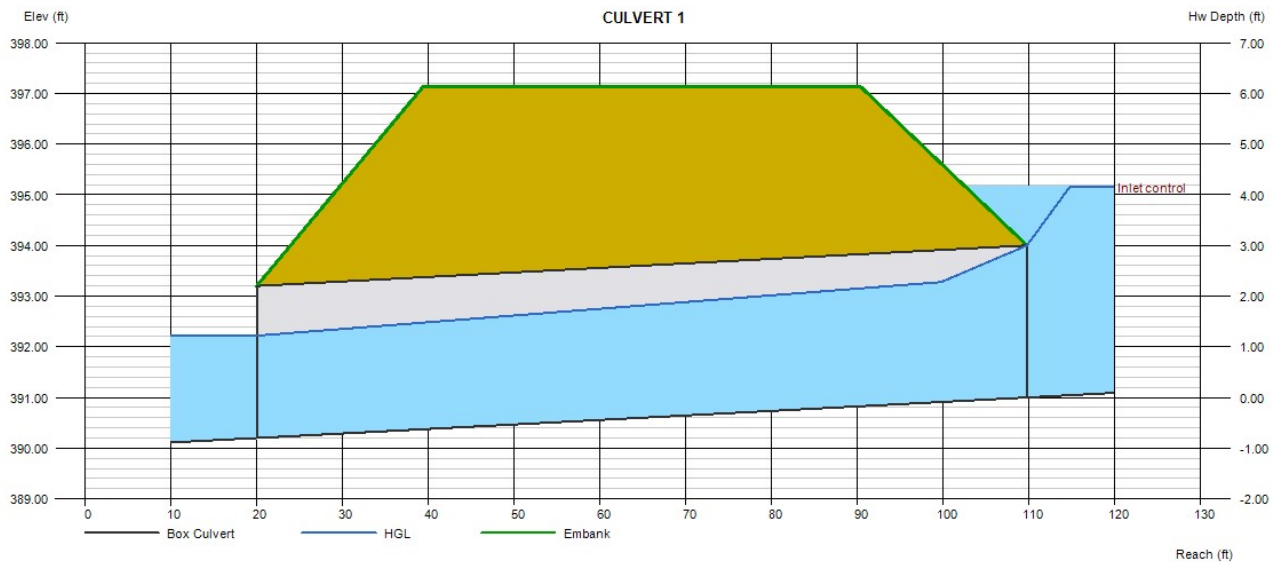
Top Elevation (ft) = 397.13
Top Width (ft) = 51.00
Crest Width (ft) = 120.00

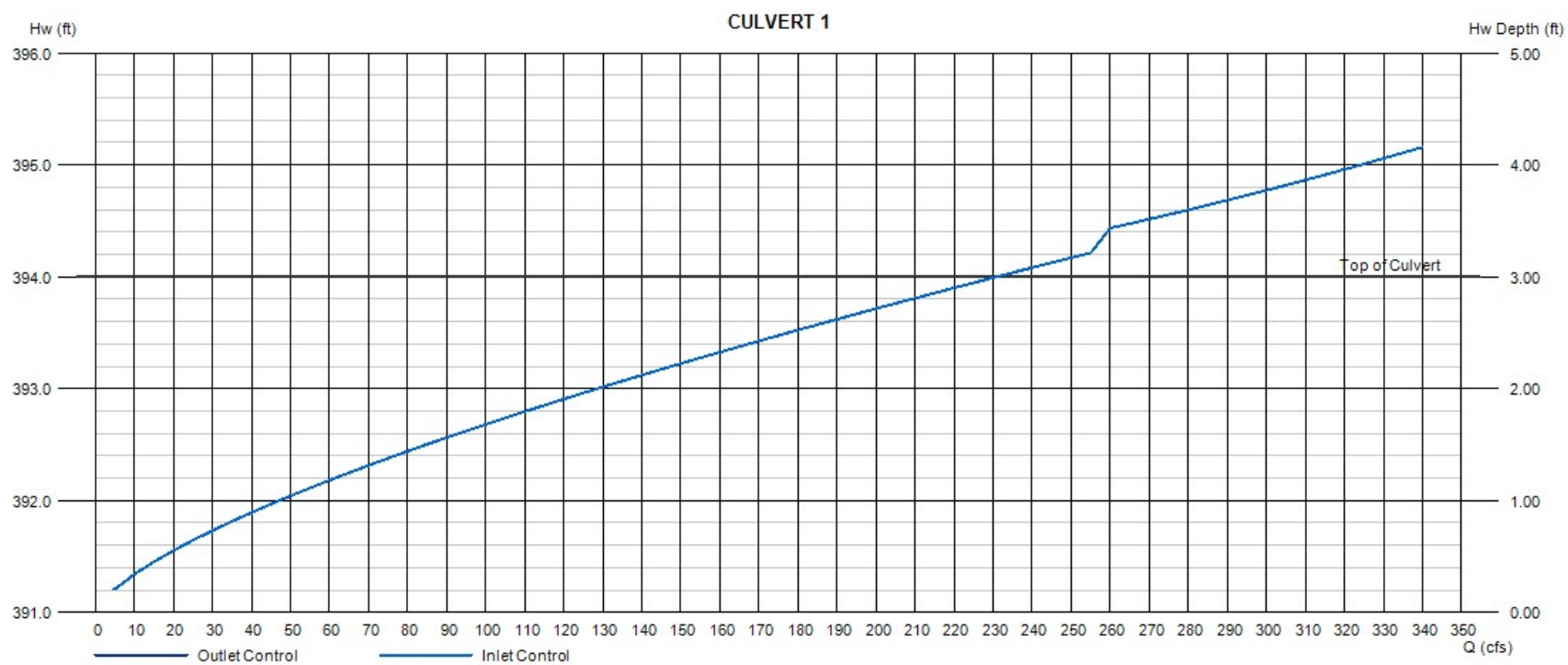
Calculations

Qmin (cfs) = 0.00
Qmax (cfs) = 342.00
Tailwater Elev (ft) = Normal

Highlighted

Qtotal (cfs) = 340.00
Qpipe (cfs) = 340.00
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 10.52
Veloc Up (ft/s) = 8.82
HGL Dn (ft) = 392.22
HGL Up (ft) = 393.41
Hw Elev (ft) = 395.16
Hw/D (ft) = 1.39
Flow Regime = Inlet Control





CULVERT 2



BGE 5440 WADE PARK BLVD, SUITE 102
RALEIGH NC 27607
www.bgeinc.com
NC LICENSE #C-4397

CULVERT 2 DRAINAGE AREA

DATE: 7/10/2023
0 100' 200' 300'
SCALE: 1" = 100'

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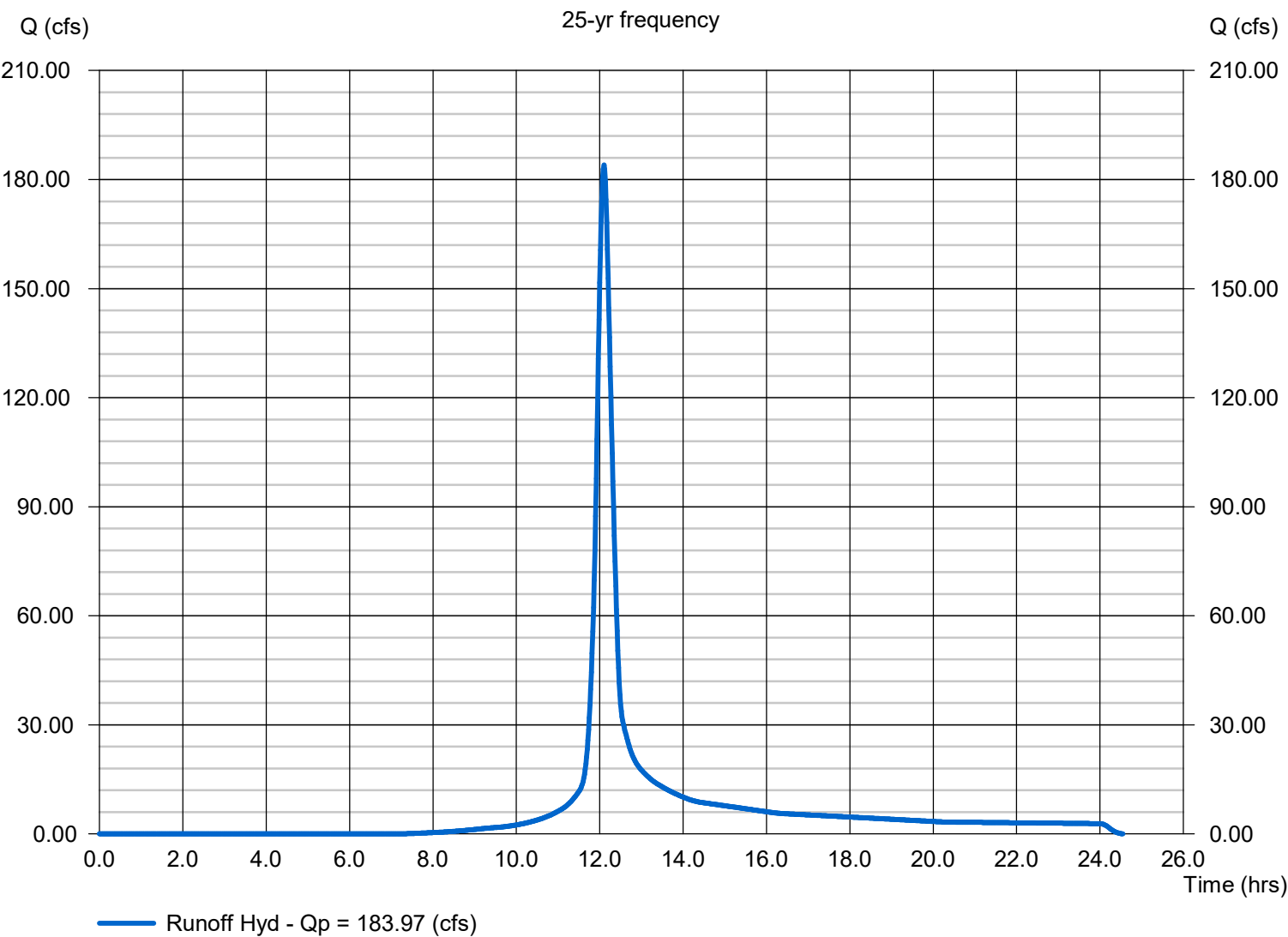
Hydrology Report

CULVERT 2 HYDROLOGY

Hydrograph type	=	SCS	Peak discharge (cfs)	=	183.97
Storm frequency (yrs)	=	25	Time interval (min)	=	1
Drainage area (ac)	=	47.400	Curve number (CN)	=	77
Basin Slope (%)	=	See Worksheet	Hydraulic length (ft)	=	See Worksheet
Tc method	=	TR55	Time of conc. (min)	=	21
Total precip. (in)	=	6.00	Storm Distribution	=	Type II
Storm duration (hrs)	=	24	Shape factor	=	484

Hydrograph Volume = 604,372 (cuft); 13.874 (acft)

Runoff Hydrograph



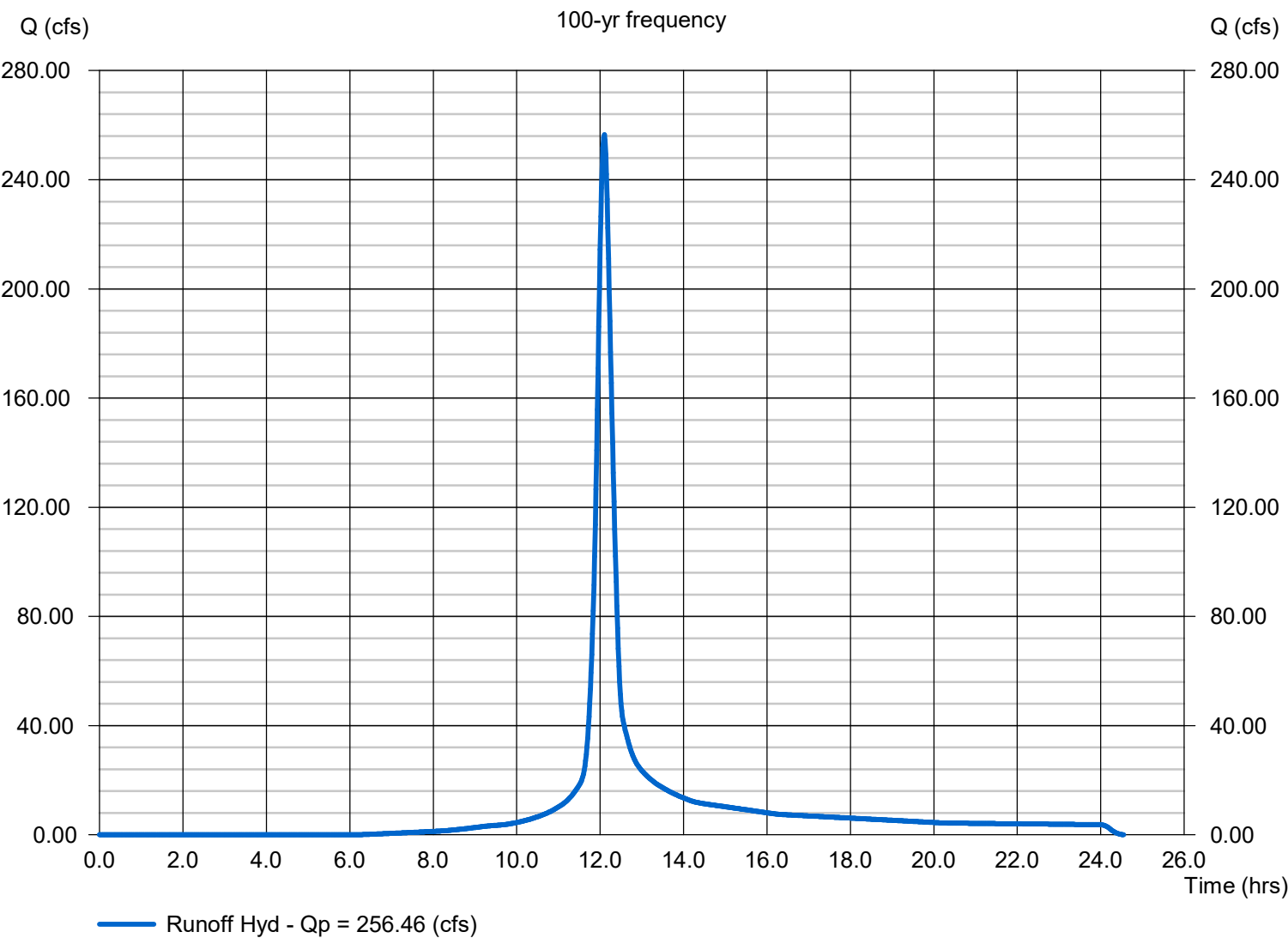
Hydrology Report

CULVERT 2 HYDROLOGY

Hydrograph type	=	SCS	Peak discharge (cfs)	=	256.46
Storm frequency (yrs)	=	100	Time interval (min)	=	1
Drainage area (ac)	=	47.400	Curve number (CN)	=	77
Basin Slope (%)	=	See Worksheet	Hydraulic length (ft)	=	See Worksheet
Tc method	=	TR55	Time of conc. (min)	=	21
Total precip. (in)	=	7.56	Storm Distribution	=	Type II
Storm duration (hrs)	=	24	Shape factor	=	484

Hydrograph Volume = 846,403 (cuft); 19.431 (acft)

Runoff Hydrograph



TR55 Tc Worksheet

Hydraflow Express by Intelisolve

SCS

CULVERT 2 HYDROLOGY

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>			
Sheet Flow							
Manning's n-value	= 0.050	0.011	0.011				
Flow length (ft)	= 300.0	0.0	0.0				
Two-year 24-hr precip. ((in))	= 3.46	0.00	0.00				
Land slope (%)	= 1.67	0.00	0.00				
Travel Time (min)	= 10.13	+	0.00	+	0.00	=	10.13
Shallow Concentrated Flow							
Flow length (ft)	= 1035.00	0.00	0.00				
Watercourse slope (%)	= 1.74	0.00	0.00				
Surface description	= Unpaved	Paved	Paved				
Average velocity (ft/s)	= 2.13	0.00	0.00				
Travel Time (min)	= 8.11	+	0.00	+	0.00	=	8.11
Channel Flow							
X sectional flow area ((sqft))	= 2.92	0.00	0.00				
Wetted perimeter ((ft))	= 6.67	0.00	0.00				
Channel slope (%)	= 1.30	0.00	0.00				
Manning's n-value	= 0.025	0.015	0.015				
Velocity (ft/s)	= 3.91	0.00	0.00				
Flow length (ft)	= 700.0	0.0	0.0				
Travel Time (min)	= 2.985979	0.00	0	+	0	=	2.99
Total Travel Time, Tc				21.00 min			

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc.

Tuesday, Jul 11 2023

CULVERT 2 (25-YR)

Invert Elev Dn (ft) = 402.30
Pipe Length (ft) = 96.70
Slope (%) = 1.24
Invert Elev Up (ft) = 403.50
Rise (in) = 48.0
Shape = Box
Span (in) = 48.0
No. Barrels = 2
n-Value = 0.012
Culvert Type = Flared Wingwalls,
Top Edge Bevel
Culvert Entrance = 18D to 33.7D wingwall flare,
d=0.083D
Coeff. K,M,c,Y,k = 0.486, 0.667, 0.0249, 0.83, 0.2

Embankment

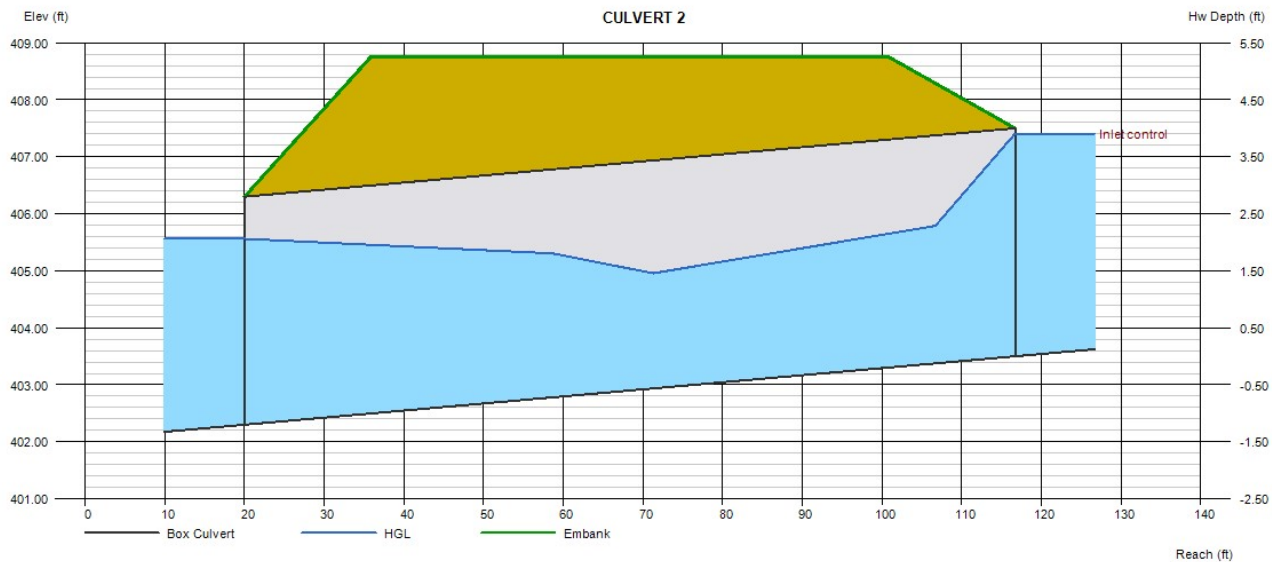
Top Elevation (ft) = 408.75
Top Width (ft) = 65.00
Crest Width (ft) = 110.00

Calculations

Qmin (cfs) = 0.00
Qmax (cfs) = 183.97
Tailwater Elev (ft) = (dc+D)/2

Highlighted

Qtotal (cfs) = 182.16
Qpipe (cfs) = 182.16
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 6.98
Veloc Up (ft/s) = 9.02
HGL Dn (ft) = 405.56
HGL Up (ft) = 406.02
Hw Elev (ft) = 407.41
Hw/D (ft) = 0.98
Flow Regime = Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc.

Tuesday, Jul 11 2023

CULVERT 2 (100-YR)

Invert Elev Dn (ft) = 402.30
Pipe Length (ft) = 96.70
Slope (%) = 1.24
Invert Elev Up (ft) = 403.50
Rise (in) = 48.0
Shape = Box
Span (in) = 48.0
No. Barrels = 2
n-Value = 0.012
Culvert Type = Flared Wingwalls,
Top Edge Bevel
Culvert Entrance = 18D to 33.7D wingwall flare,
d=0.083D
Coeff. K,M,c,Y,k = 0.486, 0.667, 0.0249, 0.83, 0.2

Embankment

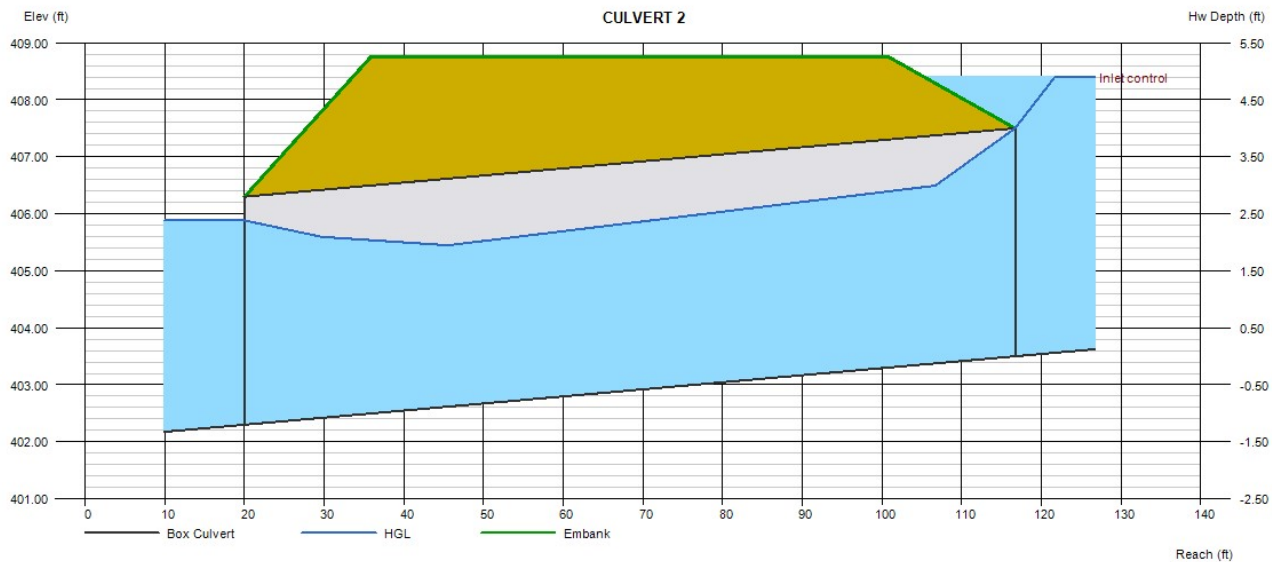
Top Elevation (ft) = 408.75
Top Width (ft) = 65.00
Crest Width (ft) = 110.00

Calculations

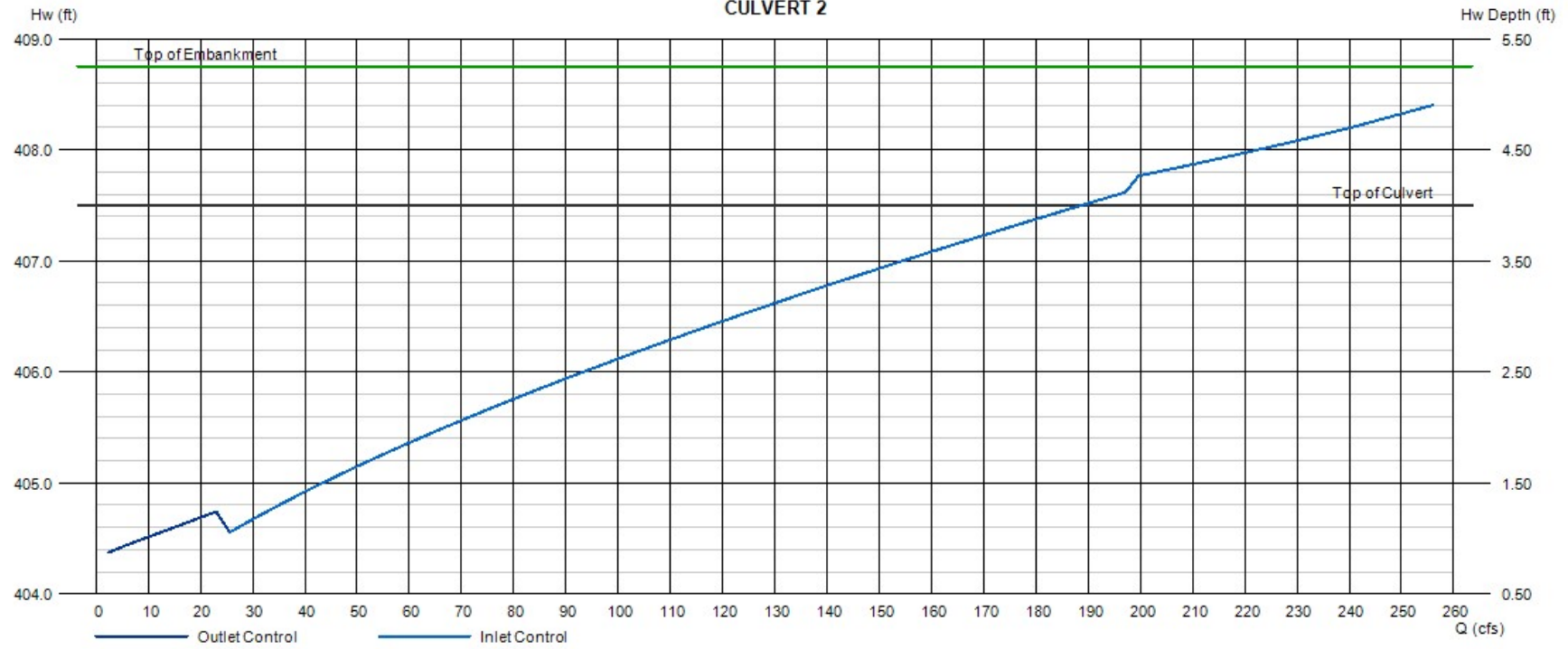
Qmin (cfs) = 0.00
Qmax (cfs) = 256.46
Tailwater Elev (ft) = (dc+D)/2

Highlighted

Qtotal (cfs) = 256.00
Qpipe (cfs) = 256.00
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 8.93
Veloc Up (ft/s) = 10.11
HGL Dn (ft) = 405.88
HGL Up (ft) = 406.67
Hw Elev (ft) = 408.40
Hw/D (ft) = 1.23
Flow Regime = Inlet Control



CULVERT 2



CULVERT 3

#107- Please show drainage area map similar to how it was shown for the other three culverts.

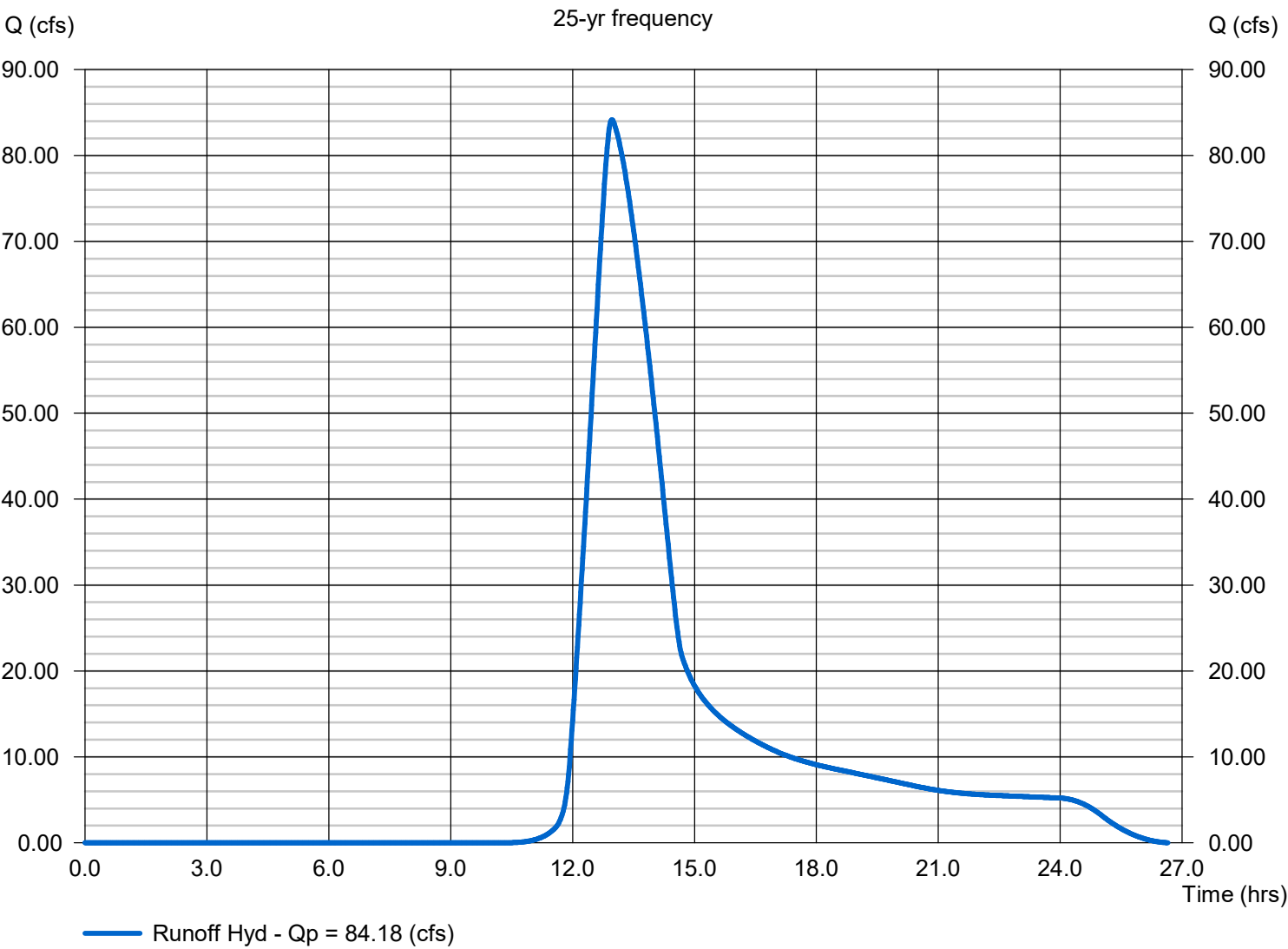
Hydrology Report

CULVERT 3 HYDROLOGY

Hydrograph type	=	SCS	Peak discharge (cfs)	=	84.18
Storm frequency (yrs)	=	25	Time interval (min)	=	1
Drainage area (ac)	=	108.800	Curve number (CN)	=	65
Basin Slope (%)	=	2.00	Hydraulic length (ft)	=	4000
Tc method	=	Lag	Time of conc. (min)	=	104
Total precip. (in)	=	5.77	Storm Distribution	=	Type II
Storm duration (hrs)	=	24	Shape factor	=	484

Hydrograph Volume = 861,417 (cuft); 19.775 (acft)

Runoff Hydrograph



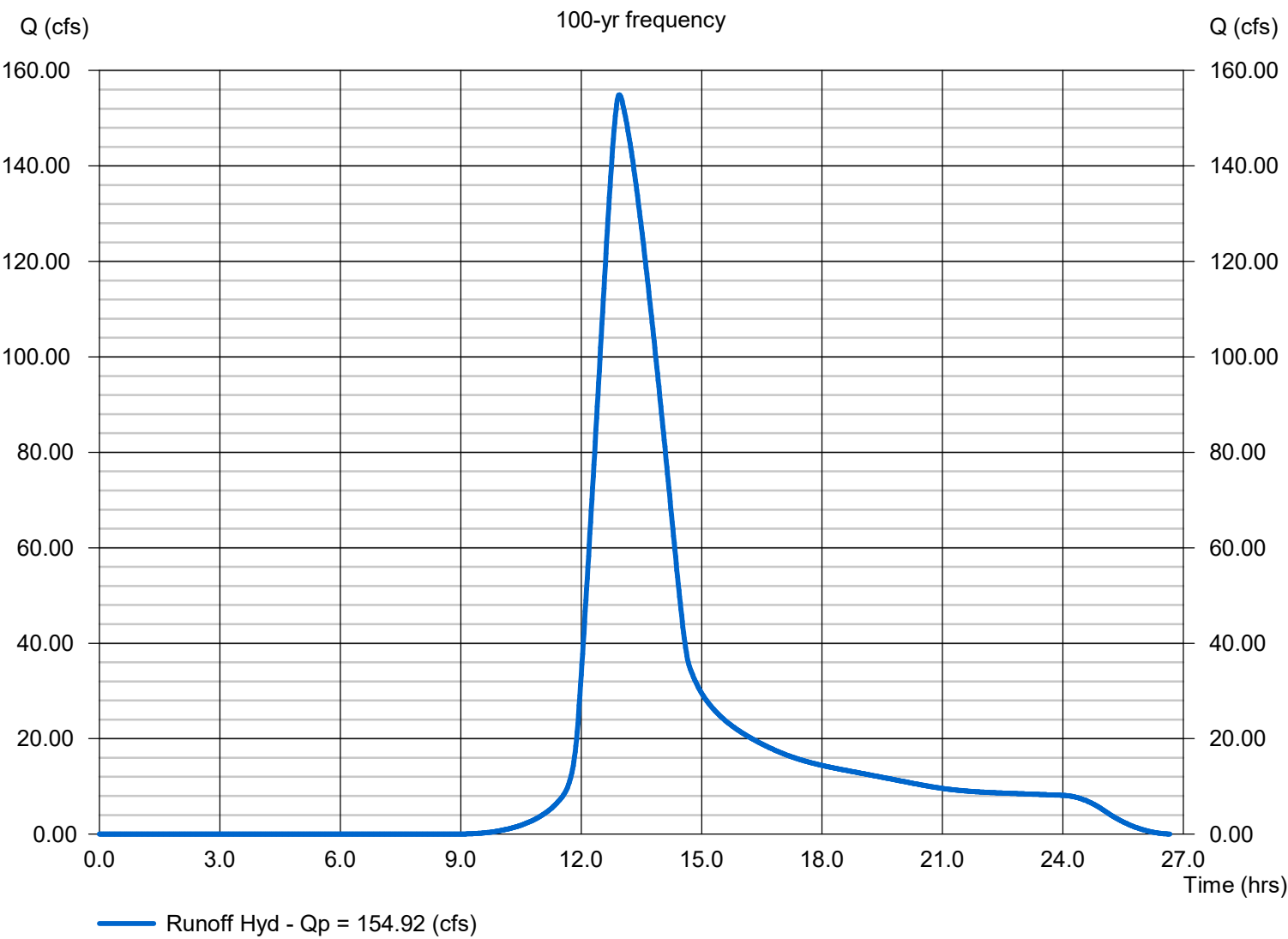
Hydrology Report

CULVERT 3 HYDROLOGY

Hydrograph type	=	SCS	Peak discharge (cfs)	=	154.92
Storm frequency (yrs)	=	100	Time interval (min)	=	1
Drainage area (ac)	=	108.800	Curve number (CN)	=	65
Basin Slope (%)	=	2.00	Hydraulic length (ft)	=	4000
Tc method	=	Lag	Time of conc. (min)	=	104
Total precip. (in)	=	7.95	Storm Distribution	=	Type II
Storm duration (hrs)	=	24	Shape factor	=	484

Hydrograph Volume = 1,518,982 (cuft); 34.871 (acft)

Runoff Hydrograph



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc.

Wednesday, Jul 26 2023

CULVERT 3

Invert Elev Dn (ft) = 346.23
Pipe Length (ft) = 44.60
Slope (%) = 0.83
Invert Elev Up (ft) = 346.60
Rise (in) = 30.0
Shape = Circular
Span (in) = 30.0
No. Barrels = 2
n-Value = 0.012
Culvert Type = Circular Concrete
Culvert Entrance = Groove end w/headwall (C)
Coeff. K,M,c,Y,k = 0.0018, 2, 0.0292, 0.74, 0.2

Embankment

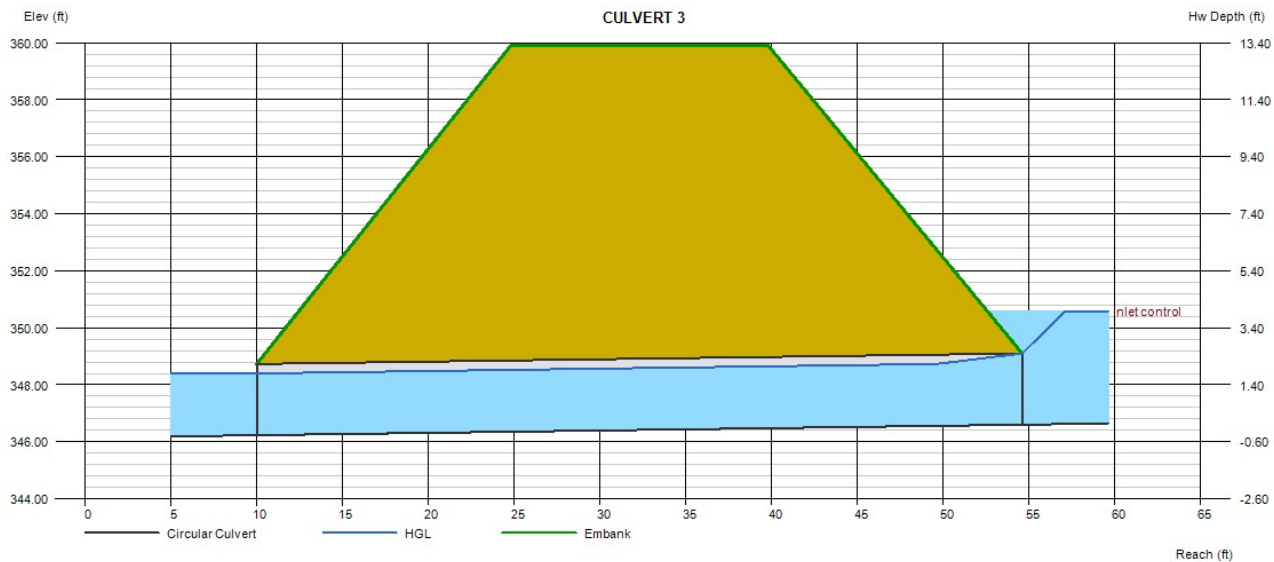
Top Elevation (ft) = 359.90
Top Width (ft) = 15.00
Crest Width (ft) = 40.00

Calculations

Qmin (cfs) = 0.00
Qmax (cfs) = 84.18
Tailwater Elev (ft) = Normal

Highlighted

Qtotal (cfs) = 84.00
Qpipe (cfs) = 84.00
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 9.29
Veloc Up (ft/s) = 9.27
HGL Dn (ft) = 348.40
HGL Up (ft) = 348.77
Hw Elev (ft) = 350.58
Hw/D (ft) = 1.59
Flow Regime = Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc.

Wednesday, Jul 26 2023

CULVERT 3

Invert Elev Dn (ft) = 346.23
Pipe Length (ft) = 44.60
Slope (%) = 0.83
Invert Elev Up (ft) = 346.60
Rise (in) = 30.0
Shape = Circular
Span (in) = 30.0
No. Barrels = 2
n-Value = 0.012
Culvert Type = Circular Concrete
Culvert Entrance = Groove end w/headwall (C)
Coeff. K,M,c,Y,k = 0.0018, 2, 0.0292, 0.74, 0.2

Embankment

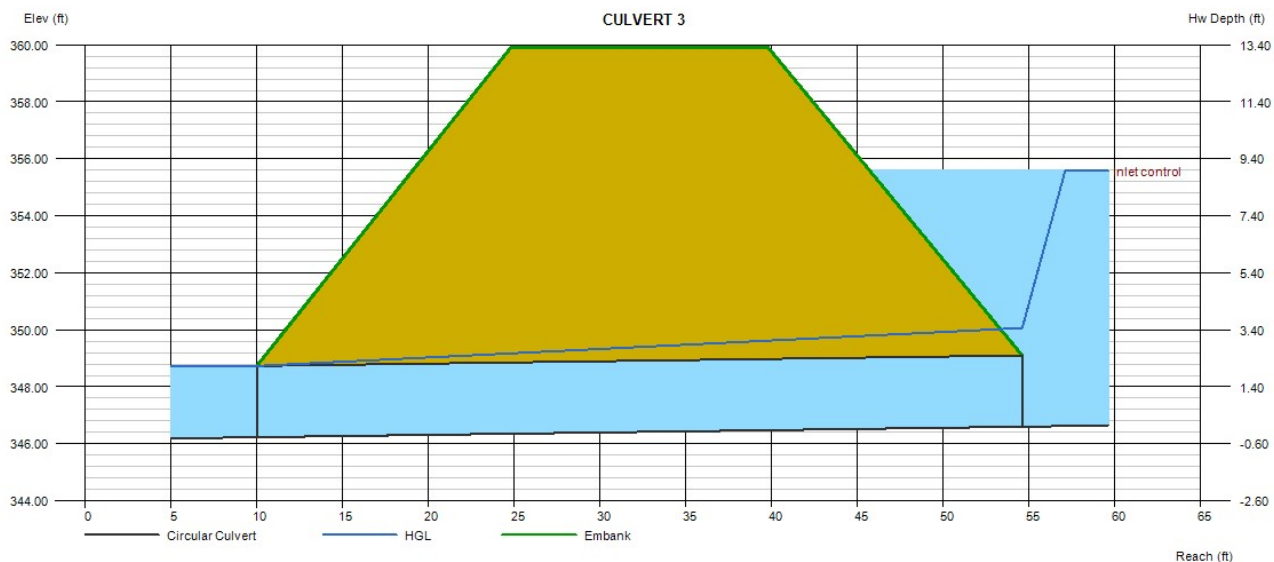
Top Elevation (ft) = 359.90
Top Width (ft) = 15.00
Crest Width (ft) = 40.00

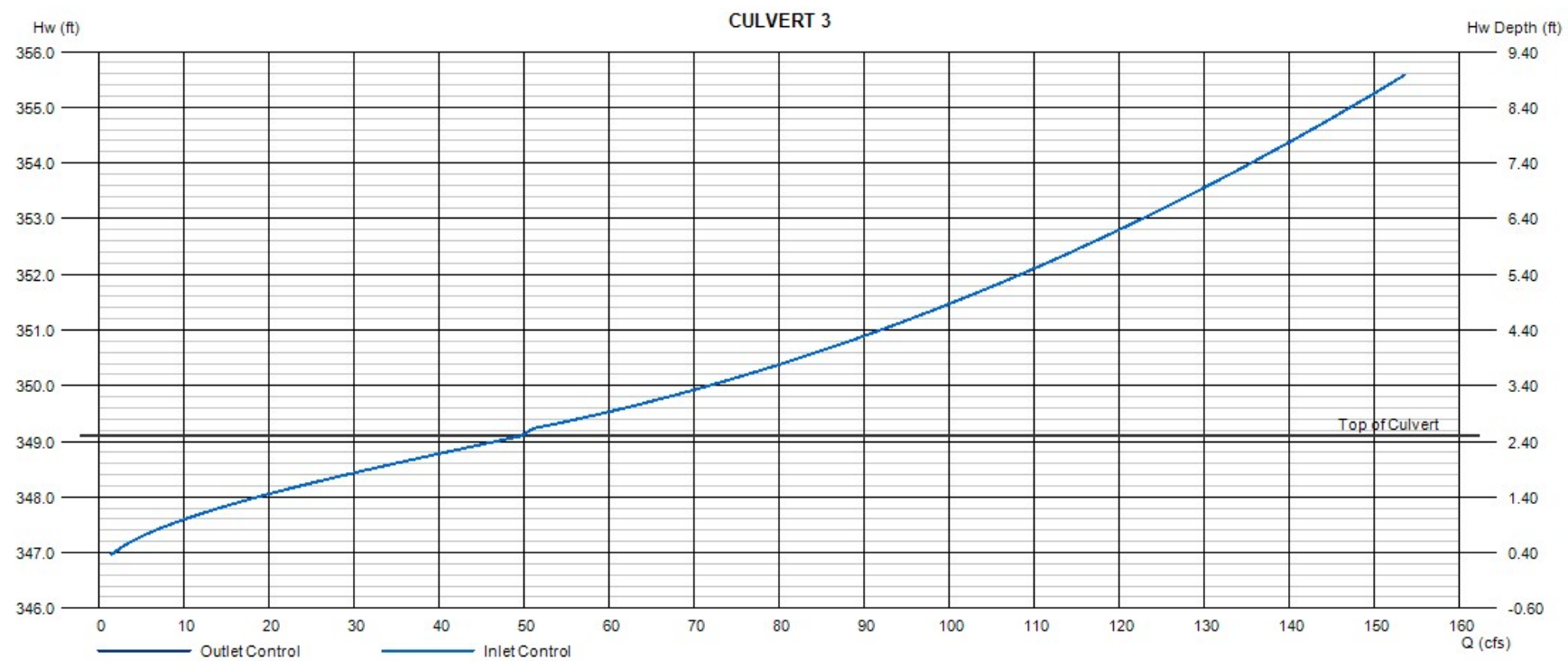
Calculations

Qmin (cfs) = 0.00
Qmax (cfs) = 154.92
Tailwater Elev (ft) = Normal

Highlighted

Qtotal (cfs) = 153.45
Qpipe (cfs) = 153.45
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 15.63
Veloc Up (ft/s) = 15.63
HGL Dn (ft) = 348.73
HGL Up (ft) = 350.06
Hw Elev (ft) = 355.57
Hw/D (ft) = 3.59
Flow Regime = Inlet Control





CULVERT 4

G:\NCA\Projects\Lennar\8430-03 - Lennar - School Street - Rolesville\04 - Calculations\Storm\Culverts\CULVERT DRAINAGE.dwg



CULVERT 4 DRAINAGE AREA

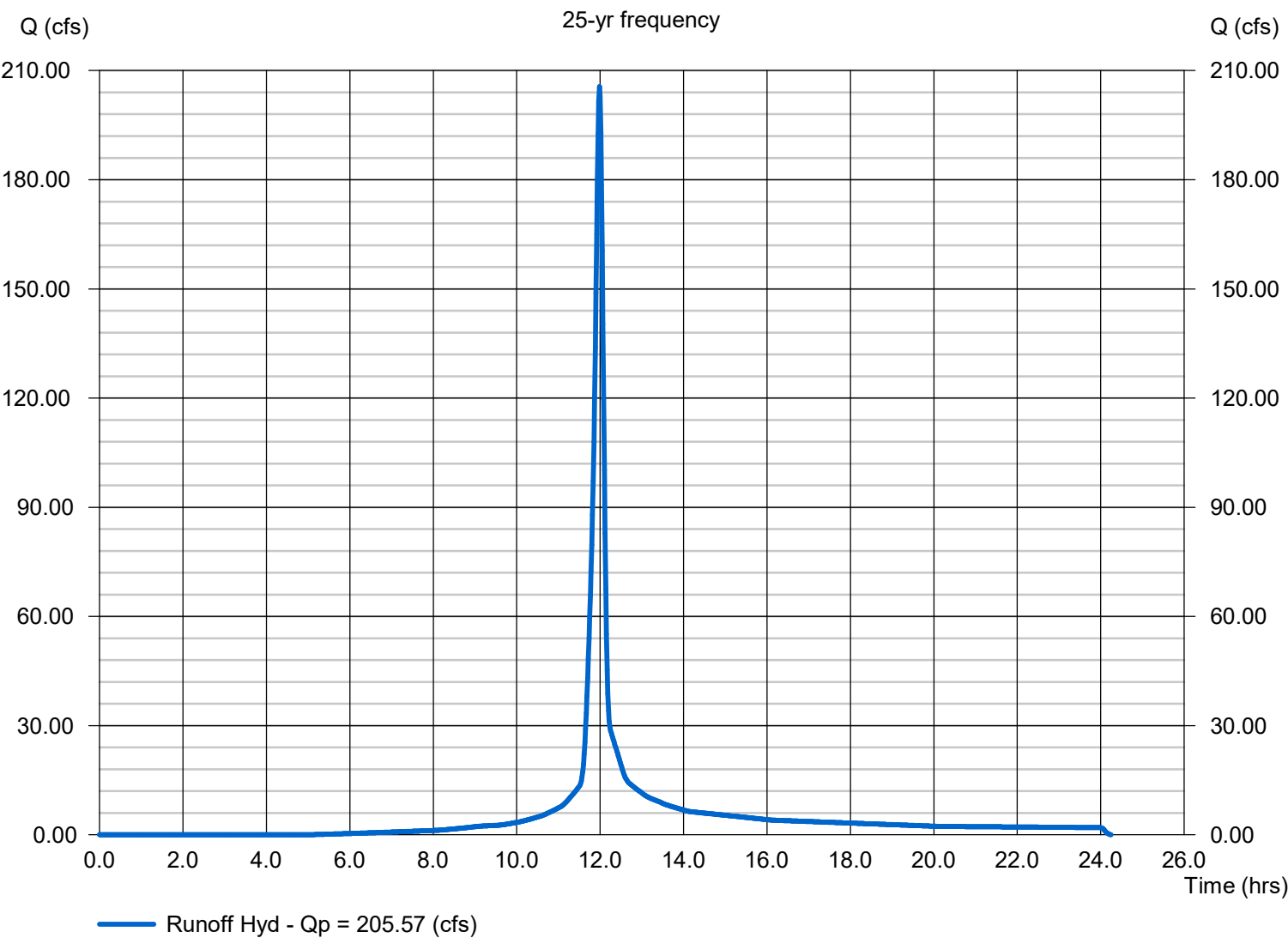
Hydrology Report

CULVERT 4

Hydrograph type	=	SCS	Peak discharge (cfs)	=	205.57
Storm frequency (yrs)	=	25	Time interval (min)	=	1
Drainage area (ac)	=	32.430	Curve number (CN)	=	85
Basin Slope (%)	=	See Worksheet	Hydraulic length (ft)	=	See Worksheet
Tc method	=	TR55	Time of conc. (min)	=	9
Total precip. (in)	=	5.77	Storm Distribution	=	Type II
Storm duration (hrs)	=	24	Shape factor	=	484

Hydrograph Volume = 481,005 (cuft); 11.042 (acft)

Runoff Hydrograph



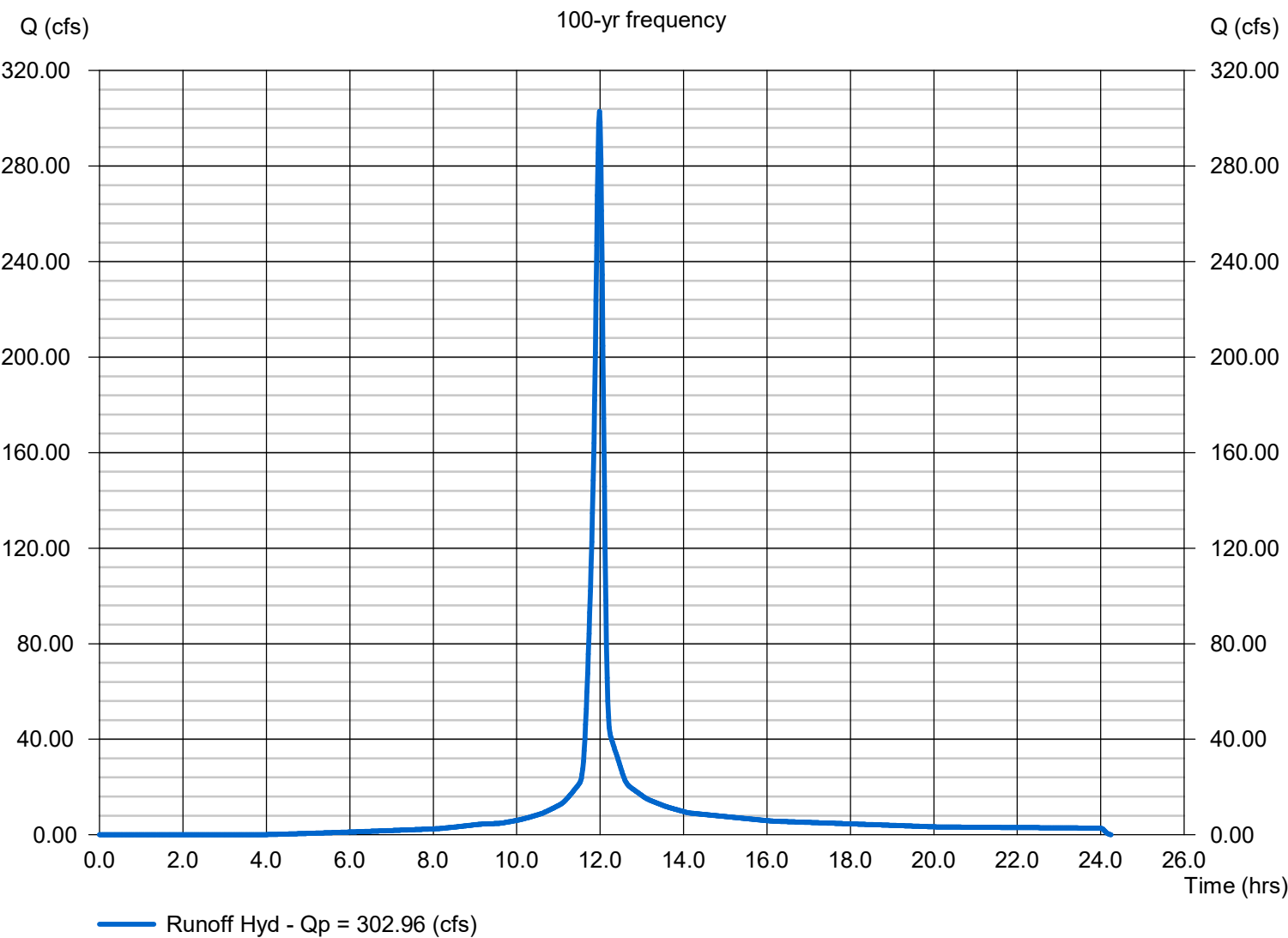
Hydrology Report

CULVERT 4

Hydrograph type	=	SCS	Peak discharge (cfs)	=	302.96
Storm frequency (yrs)	=	100	Time interval (min)	=	1
Drainage area (ac)	=	32.430	Curve number (CN)	=	85
Basin Slope (%)	=	See Worksheet	Hydraulic length (ft)	=	See Worksheet
Tc method	=	TR55	Time of conc. (min)	=	9
Total precip. (in)	=	7.95	Storm Distribution	=	Type II
Storm duration (hrs)	=	24	Shape factor	=	484

Hydrograph Volume = 725,749 (cuft); 16.661 (acft)

Runoff Hydrograph



TR55 Tc Worksheet

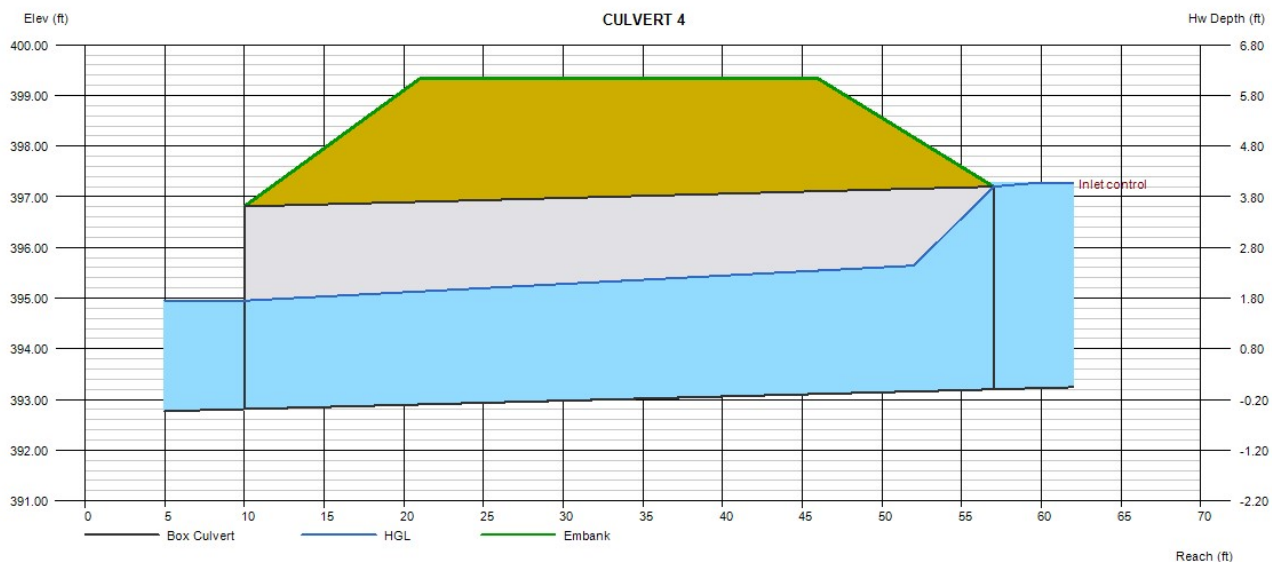
Hydraflow Express by Intelisolve

SCS

CULVERT 4

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>			
Sheet Flow							
Manning's n-value	= 0.011	0.011	0.011				
Flow length (ft)	= 300.0	0.0	0.0				
Two-year 24-hr precip. ((in))	= 2.20	0.00	0.00				
Land slope (%)	= 1.83	0.00	0.00				
Travel Time (min)	= 3.65	+	0.00	+	0.00	=	3.65
Shallow Concentrated Flow							
Flow length (ft)	= 775.00	160.00	0.00				
Watercourse slope (%)	= 1.68	7.50	0.00				
Surface description	= Paved	Unpaved	Paved				
Average velocity (ft/s)	= 2.63	4.42	0.00				
Travel Time (min)	= 4.90	+	0.60	+	0.00	=	5.51
Channel Flow							
X sectional flow area ((sqft))	= 0.00	0.00	0.00				
Wetted perimeter ((ft))	= 0.00	0.00	0.00				
Channel slope (%)	= 0.00	0.00	0.00				
Manning's n-value	= 0.015	0.015	0.015				
Velocity (ft/s)	= 0.00	0.00	0.00				
Flow length (ft)	= 0.0	0.0	0.0				
Travel Time (min)	= 0	+	0	+	0	=	0.00
Total Travel Time, Tc					9.00 min		

Tuesday, Jul 11 2023



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc.

Tuesday, Jul 11 2023

CULVERT 4 (100-YR)

Invert Elev Dn (ft) = 392.81
Pipe Length (ft) = 47.00
Slope (%) = 0.83
Invert Elev Up (ft) = 393.20
Rise (in) = 48.0
Shape = Box
Span (in) = 54.0
No. Barrels = 2
n-Value = 0.012
Culvert Type = Flared Wingwalls
Culvert Entrance = 30D to 75D wingwall flares
Coeff. K,M,c,Y,k = 0.026, 1, 0.0347, 0.81, 0.4

Embankment

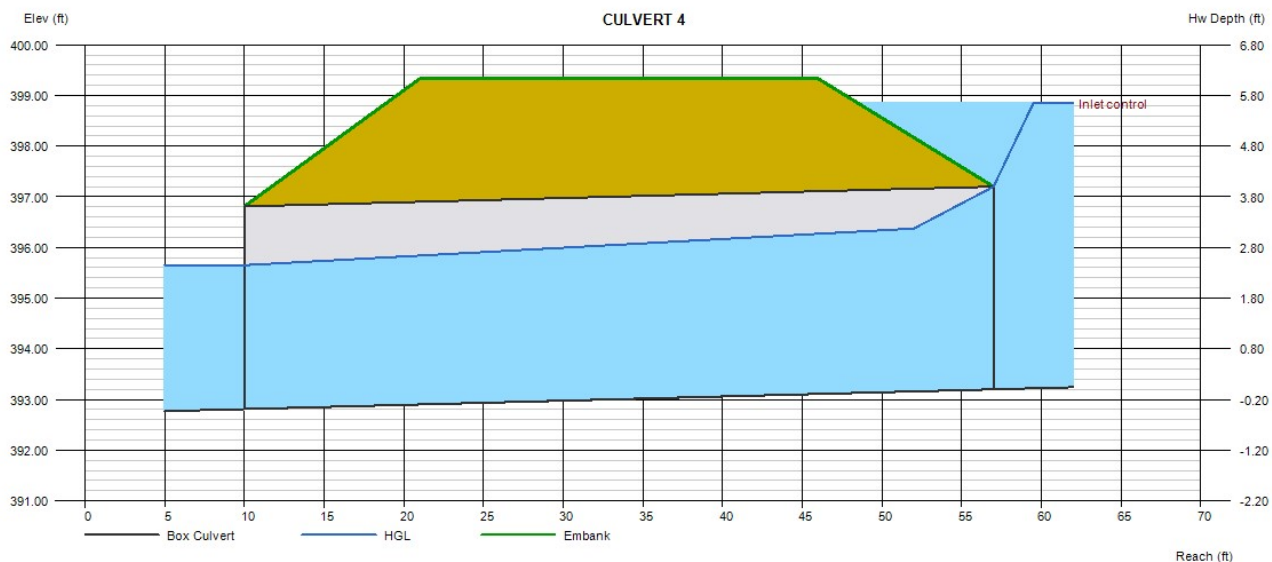
Top Elevation (ft) = 399.33
Top Width (ft) = 25.00
Crest Width (ft) = 62.00

Calculations

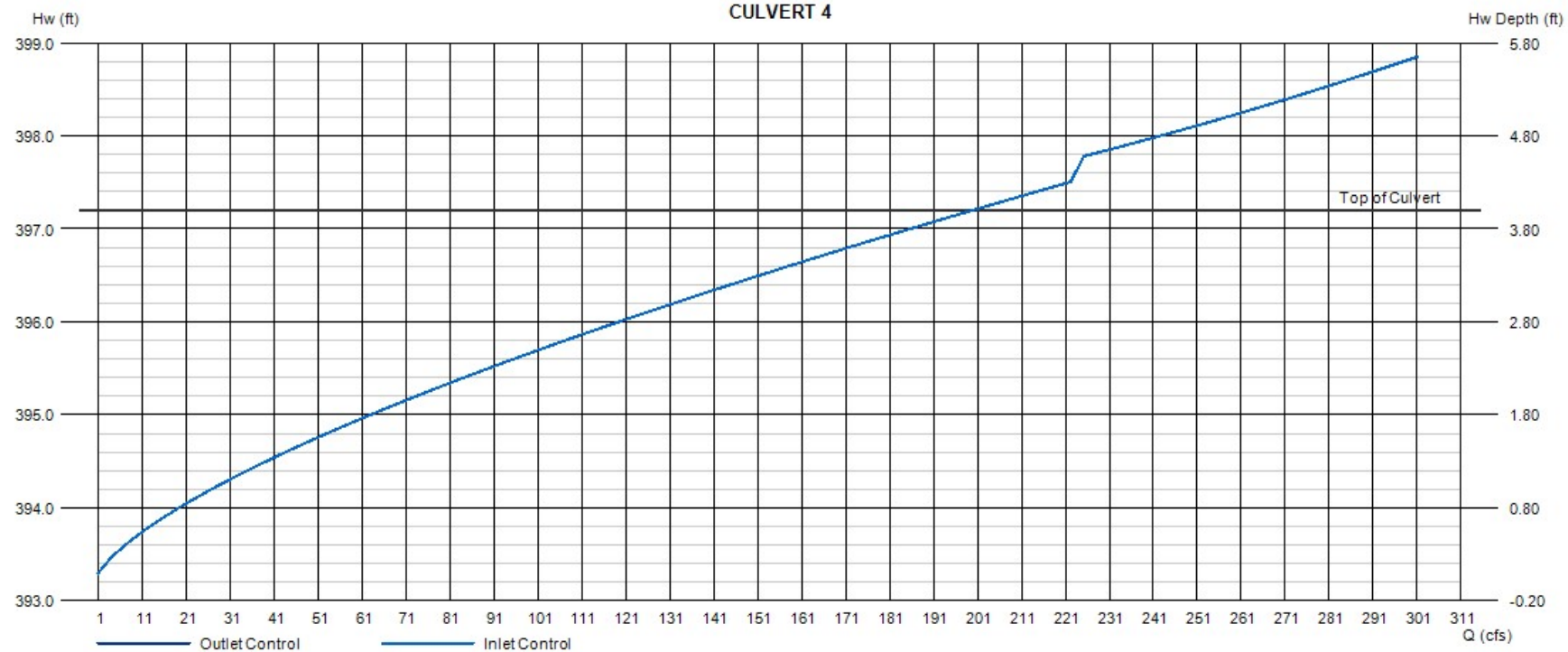
Qmin (cfs) = 1.00
Qmax (cfs) = 302.96
Tailwater Elev (ft) = Critical

Highlighted

Qtotal (cfs) = 300.97
Qpipe (cfs) = 300.97
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 11.78
Veloc Up (ft/s) = 10.26
HGL Dn (ft) = 395.65
HGL Up (ft) = 396.46
Hw Elev (ft) = 398.85
Hw/D (ft) = 1.41
Flow Regime = Inlet Control



CULVERT 4



EROSION CONTROL DA MAP

SKIMMER BASIN SUMMARY																	
BASIN	DRAINAGE	DENUDED	RUNOFF	SYSTEM	25-YEAR	BASIN DIMENSIONS			TOP OF	WEIR	AREA	AREA	VOLUME	VOLUME	SKIMMER	DEWATER	
NUMBER	AREA	AREA	COEFF.	INTENSITY	PEAK FLOW	DEPTH	LENGTH	WIDTH	DAM EL.	LENGTH	REQUIRED	PROVIDED	REQUIRED	PROVIDED	SIZE	ORIFICE	
	(AC)	(AC)		(INHR)	(CFS)	(FT)	(FT)	(FT)	(FT)	(FT)	(SF)	(SF)	(CF)	(CF)	(IN)	DIA.	
																TIME	
																(DAYS)	
SB #1	5.70	5.70	0.50	7.93	22.6	2.0	112	56	390	6	6,240	6,272	10,260	10,624	4	1.50	3.42
SB #2	10.60	10.60	0.50	7.93	42.0	2.0	156	78	357	18	11,604	12,168	19,080	21,624	4	2.00	3.58
SB #3	3.30	3.30	0.50	7.93	13.1	2.0	100	40	390	6	3,612	4,000	5,940	6,416	4	1.00	4.46
SB #4	4.70	4.70	0.50	7.93	18.6	2.0	104	52	386	10	5,145	5,408	8,460	9,040	4	1.25	4.06
SB #5	6.60	6.60	0.50	7.93	26.2	2.0	124	62	371	18	7,225	7,688	11,880	13,240	4	1.50	3.96
SB #6	3.30	3.30	0.50	7.93	13.1	2.0	88	44	377	10	3,612	3,872	5,940	6,256	3	1.25	3.29
SB #7	7.10	7.10	0.50	7.93	28.2	2.0	128	64	388	18	7,772	8,192	12,780	14,176	4	1.75	3.13
SB #8	4.40	4.40	0.50	7.93	17.4	2.0	100	50	392	10	4,817	5,000	7,920	8,296	4	1.25	3.80
SB #9	3.30	3.30	0.50	7.93	13.1	2.0	88	44	392	6	3,612	3,872	5,940	6,256	4	1.00	4.46

EROSION CONTROL LEGEND

- PROPERTY LINE
- EXISTING MINOR CONTOUR
- DRAINAGE AREA
- DRAINAGE AREA LABEL
- DIRECTION OF OVERLAND FLOW
- RIP RAP APRON
- DRAINAGE AREAS
- LIMITS OF DISTURBANCE
- TEMPORARY DIVERSION DITCH (TD)
- TEMP SILT FENCE WITH OUTLET
- TEMP SILT / TREE PROTECTION FENCE
- SILT FENCE OUTLET
- CHECK DAM



#108- Drainage areas should follow the contours. Existing contours indicate that drainage over here will be going towards TD#2

#108- Adjust drainage areas based on high point

#110- Silt fence not shown on erosion control plans. Please keep plans consistent.

#110- Make sure plans are consistent. This doesn't match what is shown in the erosion control sheets

#112- Repeat comment: Several leaders are not pointing to the correct items and some text does not make sense to be shown here. Please clean up annotation so it is clear and easy to read.

#108- Repeat comment: area should be included in drainage areas

#109- Repeat comment: please show what area is going to TD#1

#109- Repeat comment: What do the yellow areas represent? They extend past the drainage areas that would be routed to the basins. Please label and/or adjust these areas. This applies to the entire site.

#112- Remove comments that don't apply to this stage of construction, typ.

TEMPORARY DIVERSION DITCH																			
TD#	DA	L	High EL	Low EL	Slope	C	I	Q (25)	Bottom	Side	V	Normal D	Normal D	Depth	Shear Stress	Liner	Slope Drain	Check Dam	#
	(ac)	(ft)	(ft)	(ft)	(ft/ft)		(in/hr)	(cfs)	W (ft)	ppes (X)	(fps)	(in)	(ft)	(ft)	(lb/sf)	Reqd.	Size & Material	Sp. (ft)	Dams
1A	0.44	225	397	390	0.031	0.500	7.98	1.76	2.00	2.00	2.93	2.9	0.24	1	0.5	Am. Excelsior - 1 net	18" HDPE	96	2
1B	5.37	790	398	390	0.010	0.500	7.98	21.43	4.00	2.00	3.81	13.4	1.12	1	0.7	NAG Straw- 2 nets	18" HDPE	296	3
9	2.36	750	399	320	0.105	0.500	7.98	9.42	4.00	2.00	7.37	5.1	0.43	1	2.8	NGA 70% straw/30% coconut - 2 nets	18" HDPE	28	26
5A	0.14	200	396	383	0.065	0.500	7.98	0.56	4.00	2.00	2.53	1.2	0.10	1	0.4	Am. Excelsior - 1 net	18" HDPE	46	4
5B	3.02	340.00	383.00	376.00	0.021	0.50	7.98	12.05	2.00	2.00	4.94	10.90	0.91	0.50	1.17	NAG Straw- 2 nets	12" HDPE	145.71	2.33
2A	7.24	401.00	394.00	376.00	0.045	0.50	7.98	28.89	2.00	2.00	7.51	11.70	0.98	0.50	2.73	NGA 70% straw/30% coconut - 2 nets	12" HDPE	66.83	6.00
2B	0.32	407.00	400.00	380.00	0.049	0.50	7.98	1.28	2.00	2.00	3.08	2.10	0.18	0.50	0.54	Am. Excelsior - 1 net	12" HDPE	61.05	6.67
6A	1.05	233.00	386.00	379.00	0.030	0.50	7.98	4.19	2.00	2.00	3.71	4.60	0.38	0.50	0.72	NAG Straw- 2 nets	12" HDPE	99.86	2.33
6B	1.29	334.00	399.00	380.00	0.057	0.50	7.98	5.15	2.00	2.00	5.04	4.50	0.38	0.50	1.33	NAG Straw- 2 nets	12" HDPE	52.74	6.33
7A	1.38	237.00	399.00	389.00	0.042	0.50	7.98	5.51	2.00	2.00	4.62	5.00	0.42	0.50	1.10	NAG Straw- 2 nets	12" HDPE	71.10	3.33
7B	2.79	496.00	402.00	392.00	0.020	0.50	7.98	11.13	2.00	2.00	3.93	7.40	0.62	0.50	0.78	NAG Straw- 2 nets	12" HDPE	148.80	3.33
3A	0.44	312.00	408.00	393.00	0.048	0.50	7.98	1.76	2.00	2.00	3.40	2.60	0.22	0.50	0.65	Am. Excelsior - 1 net	12" HDPE	62.40	5.00
3B	1.93	515.00	401.00	393.00	0.016	0.50	7.98	7.70	2.00	2.00	3.60	7.80	0.65	0.50	0.63	NAG Straw- 2 nets	12" HDPE	193.13	2.67
4A	0.28	310.00	393.00	386.00	0.023	0.50	7.98	1.12	2.00	2.00	2.29	2.40	0.20	0.50	0.28	Am. Excelsior - 1 net	12" HDPE	132.86	2.33
4B	0.32	217.00	399.00	396.00	0.014	0.50	7.98	1.28	2.00	2.00	1.54	1.90	0.16	0.50	0.14	Grass	12" HDPE	217.00	1.00
8A	0.90	320.00	398.00	393.00	0.016	0.50	7.98	3.59	2.00	2.00	2.90	5.20	0.43	0.50	0.42	Am. Excelsior - 1 net	12" HDPE	192.00	1.67
8B	1.24	530.00	398.00	396.00	0.004	0.50	7.98	4.95	2.00	2.00	1.93	8.90	0.74	0.50	0.17	Grass	12" HDPE	795.00	0.67



5440 WADE PARK BLVD, SUITE 102
RALEIGH NC 27607
www.bgeinc.com
NC LICENSE #C-4397

TEMPORARY DIVERSION DRAINAGE AREAS

DATE: 8/1/2023

SCALE: 1" = ##'

SKIMMER BASIN CALCULATIONS

PROJECT: PARKER RIDGE

PROJ. NO: 08430-03

DATE: May 31, 2023

DESIGNED DF

SKIMMER BASIN SUMMARY																	
BASIN NUMBER	DRAINAGE	DENUDED	RUNOFF	SYSTEM	25-YEAR	BASIN DIMENSIONS			TOP OF	WEIR	AREA	AREA	VOLUME	VOLUME	SKIMMER	SKIMMER	DEWATER
	AREA	AREA	COEFF.	INTENSITY	PEAK FLOW	DEPTH	LENGTH	WIDTH	DAM EL.	LENGTH	REQUIRED	PROVIDED	REQUIRED	PROVIDED	SIZE	ORIFICE DIA.	TIME
	(AC)	(AC)		(IN/HR)	(CFS)	(FT)	(FT)	(FT)	(FT)	(FT)	(SF)	(SF)	(CF)	(CF)	(IN)	(IN)	(DAYS)
SB #1	5.70	5.70	0.50	7.93	22.6	2.0	112	56	390	6	6,240	6,272	10,260	10,624	4	1.50	3.42
RB #2	10.60	10.60	0.50	7.93	42.0	2.0	156	78	357	18	11,604	12,168	19,080	21,624	4	2.00	3.58
SB #3	3.30	3.30	0.50	7.93	13.1	2.0	100	40	390	6	3,612	4,000	5,940	6,416	4	1.00	4.46
SB #4	4.70	4.70	0.50	7.93	18.6	2.0	104	52	386	10	5,145	5,408	8,460	9,040	4	1.25	4.06
SB #5	6.60	6.60	0.50	7.93	26.2	2.0	124	62	371	18	7,225	7,688	11,880	13,240	4	1.50	3.96
SB #6	3.30	3.30	0.50	7.93	13.1	2.0	88	44	377	10	3,612	3,872	5,940	6,256	3	1.25	3.29
SB #7	7.10	7.10	0.50	7.93	28.2	2.0	128	64	388	18	7,772	8,192	12,780	14,176	4	1.75	3.13
SB #8	4.40	4.40	0.50	7.93	17.4	2.0	100	50	392	10	4,817	5,000	7,920	8,296	4	1.25	3.80
SB #9	3.30	3.30	0.50	7.93	13.1	2.0	88	44	392	6	3,612	3,872	5,940	6,256	4	1.00	4.46

NOTES:

1. One foot of free board is provided for all basins.
2. System Intensity calculated for Tc=5 min.
3. Orifice sizes calculated for a 3-5-day drawdown per reference of "Determining Orifice Size for the Faircloth Skimmer, Feb. 2001".

Skimmer Basin 1

Okay

0.35 C

7.19 i

5.7 Drainage Area (Acres)
14.34 Peak Flow from 10-year Storm (cfs)

10260 Required Volume (ft³)
6240 Required Surface Area (ft²)
55.9 Suggested Width (ft)
111.7 Suggested Length (ft)

56 Trial Top Width at Spillway Invert (ft)
112 Trial Top Length at Spillway Invert (ft)
3 Trial Side Slope Ratio Z:1
2 Trial Depth (ft) (2 to 3.5 feet above grade)

44 Bottom Width (ft)
100 Bottom Length (ft)
4400 Bottom Area (ft²)
10624 Actual Volume (ft³)
6272 Actual Surface Area (ft²)

Okay

Okay

6 Trial Weir Length (ft)
1 Suggested Trial Depth of Flow (ft)

18.0 Spillway Capacity (cfs)

Okay

4 Skimmer Size (inches)
0.333 Head on Skimmer (feet)
1.5 Orifice Size (1/4 inch increments)
3.42 Dewatering Time (days)
Required 3 to 5 days for Wake County

Skimmer Size
(Inches)
1.5
2
2.5
3
4
5
6
8

Riser Basin 2

Okay

0.35 C
7.19 i

10.6 Drainage Area (Acres)
26.67 Peak Flow from 10-year Storm (cfs)

19080 Required Volume (ft³)
11604 Required Surface Area (ft²)
76.2 Suggested Width (ft)
152.3 Suggested Length (ft)

78 Trial Top Width at Spillway Invert (ft)
156 Trial Top Length at Spillway Invert (ft)
3 Trial Side Slope Ratio Z:1
2 Trial Depth (ft) (2 to 3.5 feet above grade)

66 Bottom Width (ft)
144 Bottom Length (ft)
9504 Bottom Area (ft²)
21624 Actual Volume (ft³)
12168 Actual Surface Area (ft²)

Okay

Okay

18 Trial Weir Length (ft)
0.75 Suggested Trial Depth of Flow (ft)
35.1 Spillway Capacity (cfs)

Okay

4 Skimmer Size (inches)
0.333 Head on Skimmer (feet)
2 Orifice Size (1/4 inch increments)
3.58 Dewatering Time (days)
Required 3 to 5 days for Wake County

Skimmer Size
(Inches)
1.5
2
2.5
3
4
5
6
8

Skimmer Basin 3

Okay

0.35 C
7.19 i

3.3 Drainage Area (Acres)
8.30 Peak Flow from 10-year Storm (cfs)

5940 Required Volume (ft³)
3612 Required Surface Area (ft²)
42.5 Suggested Width (ft)
85.0 Suggested Length (ft)

40 Trial Top Width at Spillway Invert (ft)
100 Trial Top Length at Spillway Invert (ft)
3 Trial Side Slope Ratio Z:1
2 Trial Depth (ft) (2 to 3.5 feet above grade)

28 Bottom Width (ft)
88 Bottom Length (ft)
2464 Bottom Area (ft²)

6416 Actual Volume (ft³) **Okay**
4000 Actual Surface Area (ft²) **Okay**

6 Trial Weir Length (ft)
1 Suggested Trial Depth of Flow (ft)
18.0 Spillway Capacity (cfs) **Okay**

4 Skimmer Size (inches)
0.333 Head on Skimmer (feet)
1 Orifice Size (1/4 inch increments)
4.46 Dewatering Time (days)
Required 3 to 5 days for Wake County

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Skimmer Basin 4

Okay

0.35 C

7.19 i

4.7 Drainage Area (Acres)
11.83 Peak Flow from 10-year Storm (cfs)

8460 Required Volume (ft³)
5145 Required Surface Area (ft²)
50.7 Suggested Width (ft)
101.4 Suggested Length (ft)

52 Trial Top Width at Spillway Invert (ft)
104 Trial Top Length at Spillway Invert (ft)
3 Trial Side Slope Ratio Z:1
2 Trial Depth (ft) (2 to 3.5 feet above grade)

40 Bottom Width (ft)
92 Bottom Length (ft)
3680 Bottom Area (ft²)
9040 Actual Volume (ft³)
5408 Actual Surface Area (ft²)

Okay

Okay

10 Trial Weir Length (ft)
1 Suggested Trial Depth of Flow (ft)

30.0 Spillway Capacity (cfs)

Okay

4 Skimmer Size (inches)
0.333 Head on Skimmer (feet)
1.25 Orifice Size (1/4 inch increments)
4.06 Dewatering Time (days)
Required 3 to 5 days for Wake County

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Skimmer Basin 5

Okay

0.35 C
7.19 i

6.6 Drainage Area (Acres)
16.61 Peak Flow from 10-year Storm (cfs)

11880 Required Volume (ft³)
7225 Required Surface Area (ft²)
60.1 Suggested Width (ft)
120.2 Suggested Length (ft)

62 Trial Top Width at Spillway Invert (ft)
124 Trial Top Length at Spillway Invert (ft)
3 Trial Side Slope Ratio Z:1
2 Trial Depth (ft) (2 to 3.5 feet above grade)

50 Bottom Width (ft)
112 Bottom Length (ft)
5600 Bottom Area (ft²)
13240 Actual Volume (ft³)
7688 Actual Surface Area (ft²)

Okay

Okay

17.5 Trial Weir Length (ft)
0.5 Suggested Trial Depth of Flow (ft)
18.6 Spillway Capacity (cfs)

Okay

4 Skimmer Size (inches)
0.333 Head on Skimmer (feet)
1.5 Orifice Size (1/4 inch increments)
3.96 Dewatering Time (days)
Required 3 to 5 days for Wake County

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

Skimmer Basin 6

Okay

0.35 C
7.19 i

3.3 Drainage Area (Acres)
8.30 Peak Flow from 10-year Storm (cfs)

5940 Required Volume (ft³)
3612 Required Surface Area (ft²)
42.5 Suggested Width (ft)
85.0 Suggested Length (ft)

44 Trial Top Width at Spillway Invert (ft)
88 Trial Top Length at Spillway Invert (ft)
3 Trial Side Slope Ratio Z:1
2 Trial Depth (ft) (2 to 3.5 feet above grade)

32 Bottom Width (ft)
76 Bottom Length (ft)
2432 Bottom Area (ft²)

6256 Actual Volume (ft³) Okay
3872 Actual Surface Area (ft²) Okay

10 Trial Weir Length (ft)
0.5 Suggested Trial Depth of Flow (ft)

10.6 Spillway Capacity (cfs) Okay

3 Skimmer Size (inches)
0.25 Head on Skimmer (feet)
1.25 Orifice Size (1/4 inch increments)
3.29 Dewatering Time (days)
Required 3 to 5 days for Wake County

Skimmer Size
(Inches)
1.5
2
2.5
3
4
5
6
8

Skimmer Basin 7

Okay

0.35 C

7.19 i

7.1 Drainage Area (Acres)
17.87 Peak Flow from 10-year Storm (cfs)

12780 Required Volume (ft³)
7772 Required Surface Area (ft²)
62.3 Suggested Width (ft)
124.7 Suggested Length (ft)

64 Trial Top Width at Spillway Invert (ft)
128 Trial Top Length at Spillway Invert (ft)
3 Trial Side Slope Ratio Z:1
2 Trial Depth (ft) (2 to 3.5 feet above grade)

52 Bottom Width (ft)
116 Bottom Length (ft)
6032 Bottom Area (ft²)
14176 Actual Volume (ft³)
8192 Actual Surface Area (ft²)

Okay

Okay

17.5 Trial Weir Length (ft)
0.5 Suggested Trial Depth of Flow (ft)

18.6 Spillway Capacity (cfs)

Okay

4 Skimmer Size (inches)
0.333 Head on Skimmer (feet)
1.75 Orifice Size (1/4 inch increments)
3.13 Dewatering Time (days)
Required 3 to 5 days for Wake County

Skimmer Size
(Inches)
1.5
2
2.5
3
4
5
6
8

Skimmer Basin 8

Okay

0.35 C

7.19 i

4.4 Drainage Area (Acres)
11.07 Peak Flow from 10-year Storm (cfs)

7920 Required Volume (ft³)
4817 Required Surface Area (ft²)
49.1 Suggested Width (ft)
98.1 Suggested Length (ft)

50 Trial Top Width at Spillway Invert (ft)
100 Trial Top Length at Spillway Invert (ft)
3 Trial Side Slope Ratio Z:1
2 Trial Depth (ft) (2 to 3.5 feet above grade)

38 Bottom Width (ft)
88 Bottom Length (ft)
3344 Bottom Area (ft²)
8296 Actual Volume (ft³)
5000 Actual Surface Area (ft²)

Okay

Okay

10 Trial Weir Length (ft)
0.75 Suggested Trial Depth of Flow (ft)
19.5 Spillway Capacity (cfs)

Okay

4 Skimmer Size (inches)
0.333 Head on Skimmer (feet)
1.25 Orifice Size (1/4 inch increments)
3.80 Dewatering Time (days)
Required 3 to 5 days for Wake County

Skimmer Size
(Inches)
1.5
2
2.5
3
4
5
6
8

Skimmer Basin 9

Okay

0.35 C
7.19 i

3.3 Drainage Area (Acres)
8.30 Peak Flow from 10-year Storm (cfs)

5940 Required Volume (ft³)
3612 Required Surface Area (ft²)
42.5 Suggested Width (ft)
85.0 Suggested Length (ft)

44 Trial Top Width at Spillway Invert (ft)
88 Trial Top Length at Spillway Invert (ft)
3 Trial Side Slope Ratio Z:1
2 Trial Depth (ft) (2 to 3.5 feet above grade)

32 Bottom Width (ft)
76 Bottom Length (ft)
2432 Bottom Area (ft²)

6256 Actual Volume (ft³) Okay
3872 Actual Surface Area (ft²) Okay

10 Trial Weir Length (ft)
0.5 Suggested Trial Depth of Flow (ft)

10.6 Spillway Capacity (cfs) Okay

4 Skimmer Size (inches)
0.333 Head on Skimmer (feet)
1 Orifice Size (1/4 inch increments)
4.46 Dewatering Time (days)
Required 3 to 5 days for Wake County

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

TEMPORARY DIVERSIONS

TEMPORARY DIVERSION DITCH																			
TD#	DA	L	High El.	Low El.	Slope	C	I	Q (25)	Bottom	Side	V	Normal D	Normal D	Depth Req.	Shear Stress	Liner	Slope Drain	Check Dam	# Check
	(ac)	(ft)	(ft)	(ft)	(ft/ft)		(in/hr)	(cfs)	W (ft)	Slopes (X:1)	(fps)	(in)	(ft)	(ft)	(lb/sf)	Req.	Size & Material	Sp. (ft)	Dams
1A	0.44	225	397	390	0.031	0.500	7.98	1.76	2.00	2.00	2.93	2.9	0.24	1	0.5	Am. Excelsior - 1 net	18" HDPE	96	2
1B	5.37	790	398	390	0.010	0.500	7.98	21.43	4.00	2.00	3.81	13.4	1.12	1	0.7	NAG Straw- 2 nets	18" HDPE	296	3
9	2.36	750	399	320	0.105	0.500	7.98	9.42	4.00	2.00	7.37	5.1	0.43	1	2.8	NGA 70% straw/30% coconut - 2 nets	18" HDPE	28	26
5A	0.14	200	396	383	0.065	0.500	7.98	0.56	4.00	2.00	2.53	1.2	0.10	1	0.4	Am. Excelsior - 1 net	18" HDPE	46	4
5B	3.02	340.00	383.00	376.00	0.021	0.50	7.98	12.05	2.00	2.00	4.94	10.90	0.91	0.50	1.17	NAG Straw- 2 nets	12" HDPE	145.71	2.33
2A	7.24	401.00	394.00	376.00	0.045	0.50	7.98	28.89	2.00	2.00	7.51	11.70	0.98	0.50	2.73	NGA 70% straw/30% coconut - 2 nets	12" HDPE	66.83	6.00
2B	0.32	407.00	400.00	380.00	0.049	0.50	7.98	1.28	2.00	2.00	3.08	2.10	0.18	0.50	0.54	Am. Excelsior - 1 net	12" HDPE	61.05	6.67
6A	1.05	233.00	386.00	379.00	0.030	0.50	7.98	4.19	2.00	2.00	3.71	4.60	0.38	0.50	0.72	NAG Straw- 2 nets	12" HDPE	99.86	2.33
6B	1.29	334.00	399.00	380.00	0.057	0.50	7.98	5.15	2.00	2.00	5.04	4.50	0.38	0.50	1.33	NAG Straw- 2 nets	12" HDPE	52.74	6.33
7A	1.38	237.00	399.00	389.00	0.042	0.50	7.98	5.51	2.00	2.00	4.62	5.00	0.42	0.50	1.10	NAG Straw- 2 nets	12" HDPE	71.10	3.33
7B	2.79	496.00	402.00	392.00	0.020	0.50	7.98	11.13	2.00	2.00	3.93	7.40	0.62	0.50	0.78	NAG Straw- 2 nets	12" HDPE	148.80	3.33
3A	0.44	312.00	408.00	393.00	0.048	0.50	7.98	1.76	2.00	2.00	3.40	2.60	0.22	0.50	0.65	Am. Excelsior - 1 net	12" HDPE	62.40	5.00
3B	1.93	515.00	401.00	393.00	0.016	0.50	7.98	7.70	2.00	2.00	3.60	7.80	0.65	0.50	0.63	NAG Straw- 2 nets	12" HDPE	193.13	2.67
4A	0.28	310.00	393.00	386.00	0.023	0.50	7.98	1.12	2.00	2.00	2.29	2.40	0.20	0.50	0.28	Am. Excelsior - 1 net	12" HDPE	132.86	2.33
4B	0.32	217.00	399.00	396.00	0.014	0.50	7.98	1.28	2.00	2.00	1.54	1.90	0.16	0.50	0.14	Grass	12" HDPE	217.00	1.00
8A	0.90	320.00	398.00	393.00	0.016	0.50	7.98	3.59	2.00	2.00	2.90	5.20	0.43	0.50	0.42	Am. Excelsior - 1 net	12" HDPE	192.00	1.67
8B	1.24	530.00	398.00	396.00	0.004	0.50	7.98	4.95	2.00	2.00	1.93	8.90	0.74	0.50	0.17	Grass	12" HDPE	795.00	0.67

User Input
Flowmaster Results

If <0.5, make 1; if over, go up to the next 0.5'

Am. Excel Co; Straw; 2nets <= 4.5 ft/s
 Am. Excel; Curlex II.98; 2nets <= 8.5

Worksheet for 1A

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.030
Channel Slope	0.031 ft/ft
Left Side Slope	2.000 H:V
Right Side Slope	2.000 H:V
Bottom Width	2.00 ft
Discharge	1.76 cfs
Results	
Normal Depth	2.9 in
Flow Area	0.6 ft ²
Wetted Perimeter	3.1 ft
Hydraulic Radius	2.3 in
Top Width	2.97 ft
Critical Depth	3.2 in
Critical Slope	0.023 ft/ft
Velocity	2.93 ft/s
Velocity Head	0.13 ft
Specific Energy	0.38 ft
Froude Number	1.149
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	2.9 in
Critical Depth	3.2 in
Channel Slope	0.031 ft/ft
Critical Slope	0.023 ft/ft

Worksheet for 1B

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.030
Channel Slope	0.010 ft/ft
Left Side Slope	2.000 H:V
Right Side Slope	2.000 H:V
Bottom Width	2.00 ft
Discharge	17.92 cfs
Results	
Normal Depth	13.4 in
Flow Area	4.7 ft ²
Wetted Perimeter	7.0 ft
Hydraulic Radius	8.1 in
Top Width	6.45 ft
Critical Depth	11.8 in
Critical Slope	0.017 ft/ft
Velocity	3.81 ft/s
Velocity Head	0.23 ft
Specific Energy	1.34 ft
Froude Number	0.786
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	13.4 in
Critical Depth	11.8 in
Channel Slope	0.010 ft/ft
Critical Slope	0.017 ft/ft

Worksheet for 2A

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Roughness Coefficient	0.030
Channel Slope	0.045 ft/ft
Left Side Slope	2.000 H:V
Right Side Slope	2.000 H:V
Bottom Width	2.00 ft
Discharge	28.89 cfs
Results	
Normal Depth	11.7 in
Flow Area	3.8 ft ²
Wetted Perimeter	6.4 ft
Hydraulic Radius	7.3 in
Top Width	5.90 ft
Critical Depth	15.1 in
Critical Slope	0.016 ft/ft
Velocity	7.51 ft/s
Velocity Head	0.88 ft
Specific Energy	1.85 ft
Froude Number	1.640
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	11.7 in
Critical Depth	15.1 in
Channel Slope	0.045 ft/ft
Critical Slope	0.016 ft/ft

Worksheet for 2B

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.030
Channel Slope	0.049 ft/ft
Left Side Slope	2.000 H:V
Right Side Slope	2.000 H:V
Bottom Width	2.00 ft
Discharge	1.28 cfs
Results	
Normal Depth	2.1 in
Flow Area	0.4 ft ²
Wetted Perimeter	2.8 ft
Hydraulic Radius	1.8 in
Top Width	2.71 ft
Critical Depth	2.6 in
Critical Slope	0.024 ft/ft
Velocity	3.08 ft/s
Velocity Head	0.15 ft
Specific Energy	0.32 ft
Froude Number	1.387
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	2.1 in
Critical Depth	2.6 in
Channel Slope	0.049 ft/ft
Critical Slope	0.024 ft/ft

Worksheet for 3A

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.030
Channel Slope	0.048 ft/ft
Left Side Slope	2.000 H:V
Right Side Slope	2.000 H:V
Bottom Width	2.00 ft
Discharge	1.76 cfs
Results	
Normal Depth	2.6 in
Flow Area	0.5 ft ²
Wetted Perimeter	3.0 ft
Hydraulic Radius	2.1 in
Top Width	2.85 ft
Critical Depth	3.2 in
Critical Slope	0.023 ft/ft
Velocity	3.40 ft/s
Velocity Head	0.18 ft
Specific Energy	0.39 ft
Froude Number	1.407
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	2.6 in
Critical Depth	3.2 in
Channel Slope	0.048 ft/ft
Critical Slope	0.023 ft/ft

Worksheet for 3B

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.030
Channel Slope	0.016 ft/ft
Left Side Slope	2.000 H:V
Right Side Slope	2.000 H:V
Bottom Width	2.00 ft
Discharge	7.70 cfs
Results	
Normal Depth	7.8 in
Flow Area	2.1 ft ²
Wetted Perimeter	4.9 ft
Hydraulic Radius	5.2 in
Top Width	4.59 ft
Critical Depth	7.5 in
Critical Slope	0.019 ft/ft
Velocity	3.60 ft/s
Velocity Head	0.20 ft
Specific Energy	0.85 ft
Froude Number	0.932
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	7.8 in
Critical Depth	7.5 in
Channel Slope	0.016 ft/ft
Critical Slope	0.019 ft/ft

Worksheet for 4A

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Roughness Coefficient	0.030
Channel Slope	0.023 ft/ft
Left Side Slope	2.000 H:V
Right Side Slope	2.000 H:V
Bottom Width	2.00 ft
Discharge	1.12 cfs
Results	
Normal Depth	2.4 in
Flow Area	0.5 ft ²
Wetted Perimeter	2.9 ft
Hydraulic Radius	2.0 in
Top Width	2.81 ft
Critical Depth	2.4 in
Critical Slope	0.025 ft/ft
Velocity	2.29 ft/s
Velocity Head	0.08 ft
Specific Energy	0.28 ft
Froude Number	0.966
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	2.4 in
Critical Depth	2.4 in
Channel Slope	0.023 ft/ft
Critical Slope	0.025 ft/ft

Worksheet for 4B

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Roughness Coefficient	0.030
Channel Slope	0.014 ft/ft
Left Side Slope	2.000 H:V
Right Side Slope	2.000 H:V
Bottom Width	2.00 ft
Discharge	0.56 cfs
Results	
Normal Depth	1.9 in
Flow Area	0.4 ft ²
Wetted Perimeter	2.7 ft
Hydraulic Radius	1.6 in
Top Width	2.63 ft
Critical Depth	1.5 in
Critical Slope	0.028 ft/ft
Velocity	1.54 ft/s
Velocity Head	0.04 ft
Specific Energy	0.19 ft
Froude Number	0.729
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	1.9 in
Critical Depth	1.5 in
Channel Slope	0.014 ft/ft
Critical Slope	0.028 ft/ft

Worksheet for 5A

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.030
Channel Slope	0.065 ft/ft
Left Side Slope	2.000 H:V
Right Side Slope	2.000 H:V
Bottom Width	2.00 ft
Discharge	0.56 cfs
Results	
Normal Depth	1.2 in
Flow Area	0.2 ft ²
Wetted Perimeter	2.4 ft
Hydraulic Radius	1.1 in
Top Width	2.40 ft
Critical Depth	1.5 in
Critical Slope	0.028 ft/ft
Velocity	2.53 ft/s
Velocity Head	0.10 ft
Specific Energy	0.20 ft
Froude Number	1.471
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.2 in
Critical Depth	1.5 in
Channel Slope	0.065 ft/ft
Critical Slope	0.028 ft/ft

Worksheet for 5B

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.030
Channel Slope	0.021 ft/ft
Left Side Slope	2.000 H:V
Right Side Slope	2.000 H:V
Bottom Width	2.00 ft
Discharge	17.08 cfs
Results	
Normal Depth	10.9 in
Flow Area	3.5 ft ²
Wetted Perimeter	6.1 ft
Hydraulic Radius	6.9 in
Top Width	5.63 ft
Critical Depth	11.5 in
Critical Slope	0.017 ft/ft
Velocity	4.94 ft/s
Velocity Head	0.38 ft
Specific Energy	1.29 ft
Froude Number	1.112
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	10.9 in
Critical Depth	11.5 in
Channel Slope	0.021 ft/ft
Critical Slope	0.017 ft/ft

Worksheet for 6A

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.030
Channel Slope	0.030 ft/ft
Left Side Slope	2.000 H:V
Right Side Slope	2.000 H:V
Bottom Width	2.00 ft
Discharge	3.91 cfs
Results	
Normal Depth	4.6 in
Flow Area	1.1 ft ²
Wetted Perimeter	3.7 ft
Hydraulic Radius	3.4 in
Top Width	3.53 ft
Critical Depth	5.1 in
Critical Slope	0.020 ft/ft
Velocity	3.71 ft/s
Velocity Head	0.21 ft
Specific Energy	0.60 ft
Froude Number	1.196
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	4.6 in
Critical Depth	5.1 in
Channel Slope	0.030 ft/ft
Critical Slope	0.020 ft/ft

Worksheet for 6B

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.030
Channel Slope	0.057 ft/ft
Left Side Slope	2.000 H:V
Right Side Slope	2.000 H:V
Bottom Width	2.00 ft
Discharge	5.15 cfs
Results	
Normal Depth	4.5 in
Flow Area	1.0 ft ²
Wetted Perimeter	3.7 ft
Hydraulic Radius	3.3 in
Top Width	3.49 ft
Critical Depth	6.0 in
Critical Slope	0.020 ft/ft
Velocity	5.04 ft/s
Velocity Head	0.40 ft
Specific Energy	0.77 ft
Froude Number	1.644
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	4.5 in
Critical Depth	6.0 in
Channel Slope	0.057 ft/ft
Critical Slope	0.020 ft/ft

Worksheet for 7A

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.030
Channel Slope	0.042 ft/ft
Left Side Slope	2.000 H:V
Right Side Slope	2.000 H:V
Bottom Width	2.00 ft
Discharge	5.51 cfs
Results	
Normal Depth	5.0 in
Flow Area	1.2 ft ²
Wetted Perimeter	3.9 ft
Hydraulic Radius	3.7 in
Top Width	3.68 ft
Critical Depth	6.2 in
Critical Slope	0.019 ft/ft
Velocity	4.62 ft/s
Velocity Head	0.33 ft
Specific Energy	0.75 ft
Froude Number	1.432
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.0 in
Critical Depth	6.2 in
Channel Slope	0.042 ft/ft
Critical Slope	0.019 ft/ft

Worksheet for 7B

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.030
Channel Slope	0.020 ft/ft
Left Side Slope	2.000 H:V
Right Side Slope	2.000 H:V
Bottom Width	2.00 ft
Discharge	7.90 cfs
Results	
Normal Depth	7.4 in
Flow Area	2.0 ft ²
Wetted Perimeter	4.8 ft
Hydraulic Radius	5.1 in
Top Width	4.48 ft
Critical Depth	7.6 in
Critical Slope	0.019 ft/ft
Velocity	3.93 ft/s
Velocity Head	0.24 ft
Specific Energy	0.86 ft
Froude Number	1.036
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	7.4 in
Critical Depth	7.6 in
Channel Slope	0.020 ft/ft
Critical Slope	0.019 ft/ft

Worksheet for 8A

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.030
Channel Slope	0.016 ft/ft
Left Side Slope	2.000 H:V
Right Side Slope	2.000 H:V
Bottom Width	2.00 ft
Discharge	3.59 cfs
Results	
Normal Depth	5.2 in
Flow Area	1.2 ft ²
Wetted Perimeter	3.9 ft
Hydraulic Radius	3.8 in
Top Width	3.73 ft
Critical Depth	4.8 in
Critical Slope	0.021 ft/ft
Velocity	2.90 ft/s
Velocity Head	0.13 ft
Specific Energy	0.56 ft
Froude Number	0.887
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	5.2 in
Critical Depth	4.8 in
Channel Slope	0.016 ft/ft
Critical Slope	0.021 ft/ft

Worksheet for 8B

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.030
Channel Slope	0.004 ft/ft
Left Side Slope	2.000 H:V
Right Side Slope	2.000 H:V
Bottom Width	2.00 ft
Discharge	4.95 cfs
Results	
Normal Depth	8.9 in
Flow Area	2.6 ft ²
Wetted Perimeter	5.3 ft
Hydraulic Radius	5.8 in
Top Width	4.95 ft
Critical Depth	5.8 in
Critical Slope	0.020 ft/ft
Velocity	1.93 ft/s
Velocity Head	0.06 ft
Specific Energy	0.80 ft
Froude Number	0.473
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	8.9 in
Critical Depth	5.8 in
Channel Slope	0.004 ft/ft
Critical Slope	0.020 ft/ft

Worksheet for 9

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.030
Channel Slope	0.105 ft/ft
Left Side Slope	2.000 H:V
Right Side Slope	2.000 H:V
Bottom Width	2.00 ft
Discharge	8.94 cfs
Results	
Normal Depth	5.1 in
Flow Area	1.2 ft ²
Wetted Perimeter	3.9 ft
Hydraulic Radius	3.7 in
Top Width	3.70 ft
Critical Depth	8.1 in
Critical Slope	0.018 ft/ft
Velocity	7.37 ft/s
Velocity Head	0.84 ft
Specific Energy	1.27 ft
Froude Number	2.268
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.1 in
Critical Depth	8.1 in
Channel Slope	0.105 ft/ft
Critical Slope	0.018 ft/ft

DISSIPATORS

DESIGN OF RIPRAP OUTLET PROTECTION

User Input Data
Calculated Value
Reference Data

Designed By:	JWM	Date:	8/1/2023
Checked By:		Date:	
Company:	BGE		
Project Name:	PARKER RIDGE		
Project No.:	8430-03		

Site Location (City/Town)	Raleigh
Culvert Id.	FES100
Total Drainage Area (acres)	

Step 1. Determine the tailwater depth from channel characteristics below the pipe outlet for the design capacity of the pipe. If the tailwater depth is less than half the outlet pipe diameter, it is classified minimum tailwater condition. If it is greater than half the pipe diameter, it is classified maximum condition. Pipes that outlet onto wide flat areas with no defined channel are assumed to have a minimum tailwater condition unless reliable flood stage elevations show otherwise.

Outlet pipe diameter, D_o (in.)	36
Tailwater depth (in.)	7
Minimum/Maximum tailwater?	Min TW (Fig. 8.06a)
Discharge (cfs)	27.02
Velocity (ft/s)	7

Step 2. Based on the tailwater conditions determined in step 1, enter Figure 8.06a or Figure 8.06b, and determine d_{50} riprap size and minimum apron length (L_a). The d_{50} size is the median stone size in a well-graded riprap apron.

Step 3. Determine apron width at the pipe outlet, the apron shape, and the apron width at the outlet end from the same figure used in Step 2.

	Minimum TW Figure 8.06a	Maximum TW Figure 8.06b
Riprap d_{50} , (ft.)	0.6	
Minimum apron length, L_a (ft.)	19	
Apron width at pipe outlet (ft.)	9	9
Apron shape		
Apron width at outlet end (ft.)	22	3

Step 4. Determine the maximum stone diameter:

$$d_{max} = 1.5 \times d_{50}$$

	Minimum TW	Maximum TW
Max Stone Diameter, d_{max} (ft.)	0.9	0

Step 5. Determine the apron thickness:

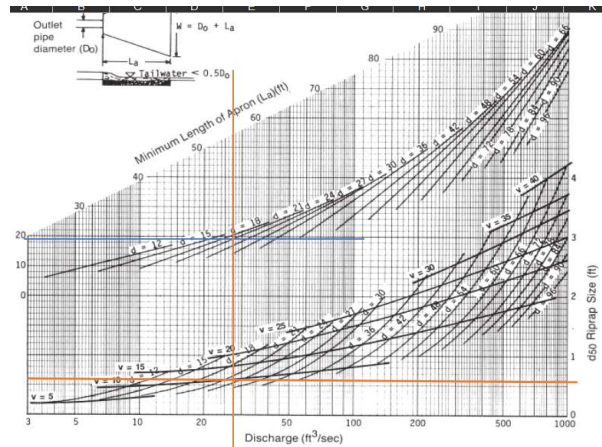
$$\text{Apron thickness} = 1.5 \times d_{max}$$

	Minimum TW	Maximum TW
Apron Thickness(ft.)	1.35	0

Step 6. Fit the riprap apron to the site by making it level for the minimum length, L_a , from Figure 8.06a or Figure 8.06b. Extend the apron farther downstream and along channel banks until stability is assured. Keep the apron as straight as possible and align it with the flow of the receiving stream. Make any necessary alignment bends near the pipe outlet so that the entrance into the receiving stream is straight.

Some locations may require lining of the entire channel cross section to assure stability.

It may be necessary to increase the size of riprap where protection of the channel side slopes is necessary (Appendix 8.05). Where overfalls exist at pipe outlets or flows are excessive, a plunge pool should be considered, see page 8.06.8.



DESIGN OF RIPRAP OUTLET PROTECTION

User Input Data

Calculated Value

Reference Data

Designed By:	JWM	Date:	8/1/2023
Checked By:		Date:	
Company:	BGE		
Project Name:	PARKER RIDGE		
Project No.:	8430-03		

Site Location (City/Town)	Raleigh
Culvert Id.	FES200
Total Drainage Area (acres)	

Step 1. Determine the tailwater depth from channel characteristics below the pipe outlet for the design capacity of the pipe. If the tailwater depth is less than half the outlet pipe diameter, it is classified minimum tailwater condition. If it is greater than half the pipe diameter, it is classified maximum condition. Pipes that outlet onto wide flat areas with no defined channel are assumed to have a minimum tailwater condition unless reliable flood stage elevations show otherwise.

Outlet pipe diameter, D_o (in.)	36
Tailwater depth (in.)	14.2
Minimum/Maximum tailwater?	Min TW (Fig. 8.06a)
Discharge (cfs)	37.81
Velocity (ft./s)	7.6

Step 2. Based on the tailwater conditions determined in step 1, enter Figure 8.06a or Figure 8.06b, and determine d_{50} riprap size and minimum apron length (L_a). The d_{50} size is the median stone size in a well-graded riprap apron.

Step 3. Determine apron width at the pipe outlet, the apron shape, and the apron width at the outlet end from the same figure used in Step 2.

	Minimum TW Figure 8.06a	Maximum TW Figure 8.06b
Riprap d_{50} , (ft.)	0.85	
Minimum apron length, L_a (ft.)	19	
Apron width at pipe outlet (ft.)	9	9
Apron shape		
Apron width at outlet end (ft.)	22	3

Step 4. Determine the maximum stone diameter:

$$d_{max} = 1.5 \times d_{50}$$

	Minimum TW	Maximum TW
Max Stone Diameter, d_{max} (ft.)	1.275	0

Step 5. Determine the apron thickness:

$$\text{Apron thickness} = 1.5 \times d_{max}$$

	Minimum TW	Maximum TW
Apron Thickness(ft.)	1.9125	0

Step 6. Fit the riprap apron to the site by making it level for the minimum length, L_a , from Figure 8.06a or Figure 8.06b. Extend the apron farther downstream and along channel banks until stability is assured. Keep the apron as straight as possible and align it with the flow of the receiving stream. Make any necessary alignment bends near the pipe outlet so that the entrance into the receiving stream is straight.

Some locations may require lining of the entire channel cross section to assure stability.

It may be necessary to increase the size of riprap where protection of the channel side slopes is necessary (*Appendix 8.05*). Where overfalls exist at pipe outlets or flows are excessive, a plunge pool should be considered, see page 8.06.8.

DESIGN OF RIPRAP OUTLET PROTECTION

User Input Data
Calculated Value
Reference Data

Designed By:	JWM	Date:	8/1/2023
Checked By:		Date:	
Company:	BGE		
Project Name:	PARKER RIDGE		
Project No.:	8430-03		

Site Location (City/Town)	Raleigh
Culvert Id.	FES300
Total Drainage Area (acres)	

Step 1. Determine the tailwater depth from channel characteristics below the pipe outlet for the design capacity of the pipe. If the tailwater depth is less than half the outlet pipe diameter, it is classified minimum tailwater condition. If it is greater than half the pipe diameter, it is classified maximum condition. Pipes that outlet onto wide flat areas with no defined channel are assumed to have a minimum tailwater condition unless reliable flood stage elevations show otherwise.

Outlet pipe diameter, D_o (in.)	36
Tailwater depth (in.)	14.2
Minimum/Maximum tailwater?	Min TW (Fig. 8.06a)
Discharge (cfs)	37.81
Velocity (ft./s)	7.6

Step 2. Based on the tailwater conditions determined in step 1, enter Figure 8.06a or Figure 8.06b, and determine d_{50} riprap size and minimum apron length (L_a). The d_{50} size is the median stone size in a well-graded riprap apron.

Step 3. Determine apron width at the pipe outlet, the apron shape, and the apron width at the outlet end from the same figure used in Step 2.

	Minimum TW Figure 8.06a	Maximum TW Figure 8.06b
Riprap d_{50} (ft.)	0.85	
Minimum apron length, L_a (ft.)	19	
Apron width at pipe outlet (ft.)	9	9
Apron shape		
Apron width at outlet end (ft.)	22	3

Step 4. Determine the maximum stone diameter:

$$d_{max} = 1.5 \times d_{50}$$

	Minimum TW	Maximum TW
Max Stone Diameter, d_{max} (ft.)	1.275	0

Step 5. Determine the apron thickness:

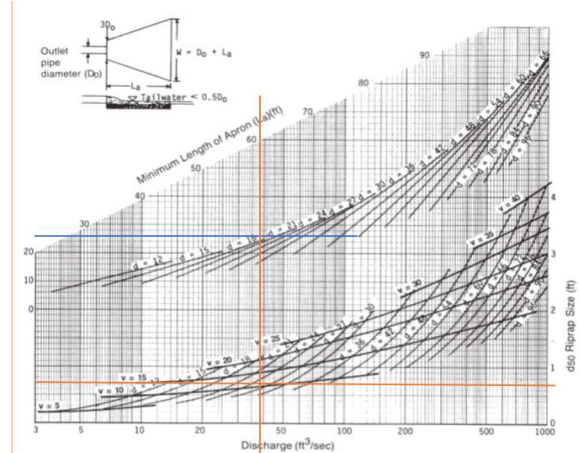
$$\text{Apron thickness} = 1.5 \times d_{max}$$

	Minimum TW	Maximum TW
Apron Thickness(ft.)	1.9125	0

Step 6. Fit the riprap apron to the site by making it level for the minimum length, L_a , from Figure 8.06a or Figure 8.06b. Extend the apron farther downstream and along channel banks until stability is assured. Keep the apron as straight as possible and align it with the flow of the receiving stream. Make any necessary alignment bends near the pipe outlet so that the entrance into the receiving stream is straight.

Some locations may require lining of the entire channel cross section to assure stability.

It may be necessary to increase the size of riprap where protection of the channel side slopes is necessary (Appendix 8.05). Where overfalls exist at pipe outlets or flows are excessive, a plunge pool should be considered, see page 8.06.8.



DESIGN OF RIPRAP OUTLET PROTECTION

User Input Data
Calculated Value
Reference Data

Designed By:	JWM	Date:	8/1/2023
Checked By:		Date:	
Company:	BGE		
Project Name:	PARKER RIDGE		
Project No.:	8430-03		

Site Location (City/Town)	Raleigh
Culvert Id.	FES350
Total Drainage Area (acres)	

Step 1. Determine the tailwater depth from channel characteristics below the pipe outlet for the design capacity of the pipe. If the tailwater depth is less than half the outlet pipe diameter, it is classified minimum tailwater condition. If it is greater than half the pipe diameter, it is classified maximum condition. Pipes that outlet onto wide flat areas with no defined channel are assumed to have a minimum tailwater condition unless reliable flood stage elevations show otherwise.

Outlet pipe diameter, D_o (in.)	36
Tailwater depth (in.)	14.2
Minimum/Maximum tailwater?	Min TW (Fig. 8.06a)
Discharge (cfs)	37.81
Velocity (ft./s)	7.6

Step 2. Based on the tailwater conditions determined in step 1, enter Figure 8.06a or Figure 8.06b, and determine d_{50} riprap size and minimum apron length (L_a). The d_{50} size is the median stone size in a well-graded riprap apron.

Step 3. Determine apron width at the pipe outlet, the apron shape, and the apron width at the outlet end from the same figure used in Step 2.

	Minimum TW Figure 8.06a	Maximum TW Figure 8.06b
Riprap d_{50} (ft.)	0.85	
Minimum apron length, L_a (ft.)	19	
Apron width at pipe outlet (ft.)	9	9
Apron shape		
Apron width at outlet end (ft.)	22	3

Step 4. Determine the maximum stone diameter:

$$d_{max} = 1.5 \times d_{50}$$

	Minimum TW	Maximum TW
Max Stone Diameter, d_{max} (ft.)	1.275	0

Step 5. Determine the apron thickness:

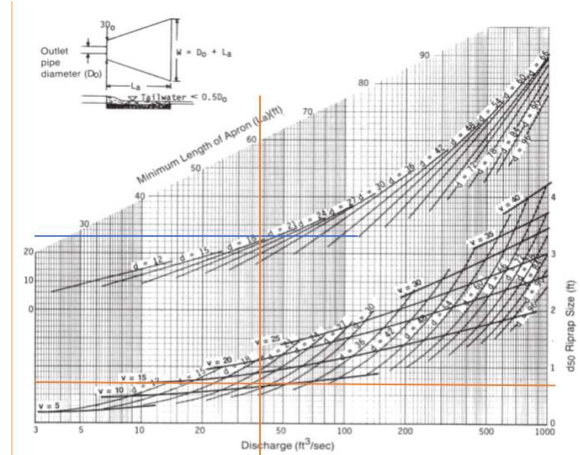
$$\text{Apron thickness} = 1.5 \times d_{max}$$

	Minimum TW	Maximum TW
Apron Thickness(ft.)	1.9125	0

Step 6. Fit the riprap apron to the site by making it level for the minimum length, L_a , from Figure 8.06a or Figure 8.06b. Extend the apron farther downstream and along channel banks until stability is assured. Keep the apron as straight as possible and align it with the flow of the receiving stream. Make any necessary alignment bends near the pipe outlet so that the entrance into the receiving stream is straight.

Some locations may require lining of the entire channel cross section to assure stability.

It may be necessary to increase the size of riprap where protection of the channel side slopes is necessary (Appendix 8.05). Where overfalls exist at pipe outlets or flows are excessive, a plunge pool should be considered, see page 8.06.8.



DESIGN OF RIPRAP OUTLET PROTECTION

User Input Data
Calculated Value
Reference Data

Designed By:	JWM	Date:	8/1/2023
Checked By:		Date:	
Company:	BGE		
Project Name:	PARKER RIDGE		
Project No.:	8430-03		

Site Location (City/Town)	Raleigh
Culvert Id.	FES400
Total Drainage Area (acres)	

Step 1. Determine the tailwater depth from channel characteristics below the pipe outlet for the design capacity of the pipe. If the tailwater depth is less than half the outlet pipe diameter, it is classified minimum tailwater condition. If it is greater than half the pipe diameter, it is classified maximum condition. Pipes that outlet onto wide flat areas with no defined channel are assumed to have a minimum tailwater condition unless reliable flood stage elevations show otherwise.

Outlet pipe diameter, D_o (in.)	24
Tailwater depth (in.)	0
Minimum/Maximum tailwater?	Min TW (Fig. 8.06a)
Discharge (cfs)	16.52
Velocity (ft/s)	6.78

Step 2. Based on the tailwater conditions determined in step 1, enter Figure 8.06a or Figure 8.06b, and determine d_{50} riprap size and minimum apron length (L_a). The d_{50} size is the median stone size in a well-graded riprap apron.

Step 3. Determine apron width at the pipe outlet, the apron shape, and the apron width at the outlet end from the same figure used in Step 2.

	Minimum TW Figure 8.06a	Maximum TW Figure 8.06b
Riprap d_{50} (ft.)	0.55	
Minimum apron length, L_a (ft.)	11	
Apron width at pipe outlet (ft.)	6	6
Apron shape		
Apron width at outlet end (ft.)	13	2

Step 4. Determine the maximum stone diameter:

$$d_{max} = 1.5 \times d_{50}$$

	Minimum TW	Maximum TW
Max Stone Diameter, d_{max} (ft.)	0.825	0

Step 5. Determine the apron thickness:

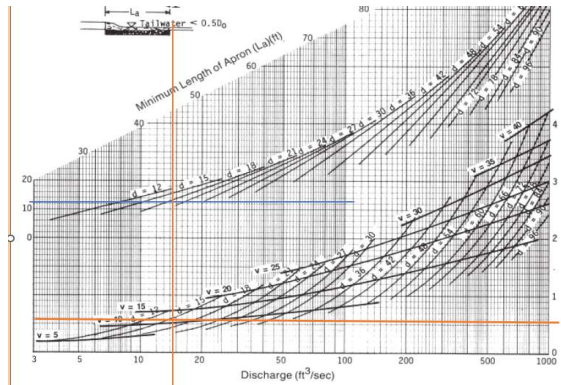
$$\text{Apron thickness} = 1.5 \times d_{max}$$

	Minimum TW	Maximum TW
Apron Thickness(ft.)	1.2375	0

Step 6. Fit the riprap apron to the site by making it level for the minimum length, L_a , from Figure 8.06a or Figure 8.06b. Extend the apron farther downstream and along channel banks until stability is assured. Keep the apron as straight as possible and align it with the flow of the receiving stream. Make any necessary alignment bends near the pipe outlet so that the entrance into the receiving stream is straight.

Some locations may require lining of the entire channel cross section to assure stability.

It may be necessary to increase the size of riprap where protection of the channel side slopes is necessary (Appendix 8.05). Where overfalls exist at pipe outlets or flows are excessive, a plunge pool should be considered, see page 8.06.8.



Curves may not be extrapolated.

Figure 8.06a Design of outlet protection protection from a round pipe flowing full, minimum tailwater condition ($T_w < 0.5$ diameter).

DESIGN OF RIPRAP OUTLET PROTECTION

User Input Data
Calculated Value
Reference Data

Designed By:	JWM	Date:	8/1/2023
Checked By:		Date:	
Company:	BGE		
Project Name:	PARKER RIDGE		
Project No.:	8430-03		

Site Location (City/Town)	Raleigh
Culvert Id.	FES410
Total Drainage Area (acres)	

Step 1. Determine the tailwater depth from channel characteristics below the pipe outlet for the design capacity of the pipe. If the tailwater depth is less than half the outlet pipe diameter, it is classified minimum tailwater condition. If it is greater than half the pipe diameter, it is classified maximum condition. Pipes that outlet onto wide flat areas with no defined channel are assumed to have a minimum tailwater condition unless reliable flood stage elevations show otherwise.

Outlet pipe diameter, D_o (in.)	30
Tailwater depth (in.)	0
Minimum/Maximum tailwater?	Min TW (Fig. 8.06a)
Discharge (cfs)	16.46
Velocity (ft./s)	12.75

Step 2. Based on the tailwater conditions determined in step 1, enter Figure 8.06a or Figure 8.06b, and determine d_{50} riprap size and minimum apron length (L_a). The d_{50} size is the median stone size in a well-graded riprap apron.

Step 3. Determine apron width at the pipe outlet, the apron shape, and the apron width at the outlet end from the same figure used in Step 2.

	Minimum TW Figure 8.06a	Maximum TW Figure 8.06b
Riprap d_{50} (ft.)	0.85	
Minimum apron length, L_a (ft.)	16	
Apron width at pipe outlet (ft.)	7.5	7.5
Apron shape		
Apron width at outlet end (ft.)	18.5	2.5

Step 4. Determine the maximum stone diameter:

$$d_{max} = 1.5 \times d_{50}$$

	Minimum TW	Maximum TW
Max Stone Diameter, d_{max} (ft.)	1.275	0

Step 5. Determine the apron thickness:

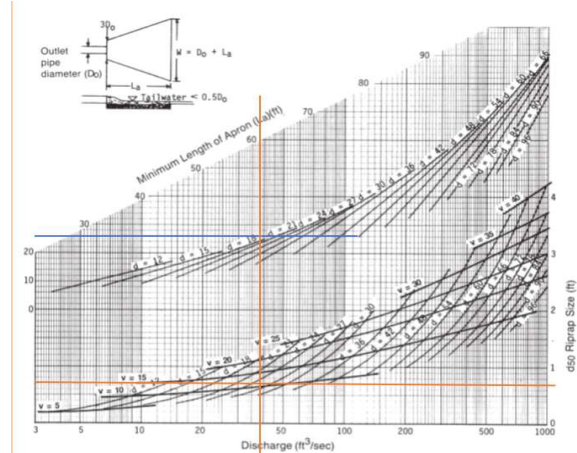
$$\text{Apron thickness} = 1.5 \times d_{max}$$

	Minimum TW	Maximum TW
Apron Thickness(ft.)	1.9125	0

Step 6. Fit the riprap apron to the site by making it level for the minimum length, L_a , from Figure 8.06a or Figure 8.06b. Extend the apron farther downstream and along channel banks until stability is assured. Keep the apron as straight as possible and align it with the flow of the receiving stream. Make any necessary alignment bends near the pipe outlet so that the entrance into the receiving stream is straight.

Some locations may require lining of the entire channel cross section to assure stability.

It may be necessary to increase the size of riprap where protection of the channel side slopes is necessary (Appendix 8.05). Where overfalls exist at pipe outlets or flows are excessive, a plunge pool should be considered, see page 8.06.8.



#113- Missing rip rap for several FES's (FES-1000, FES-2000, etc.)