

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: June 1, 2023

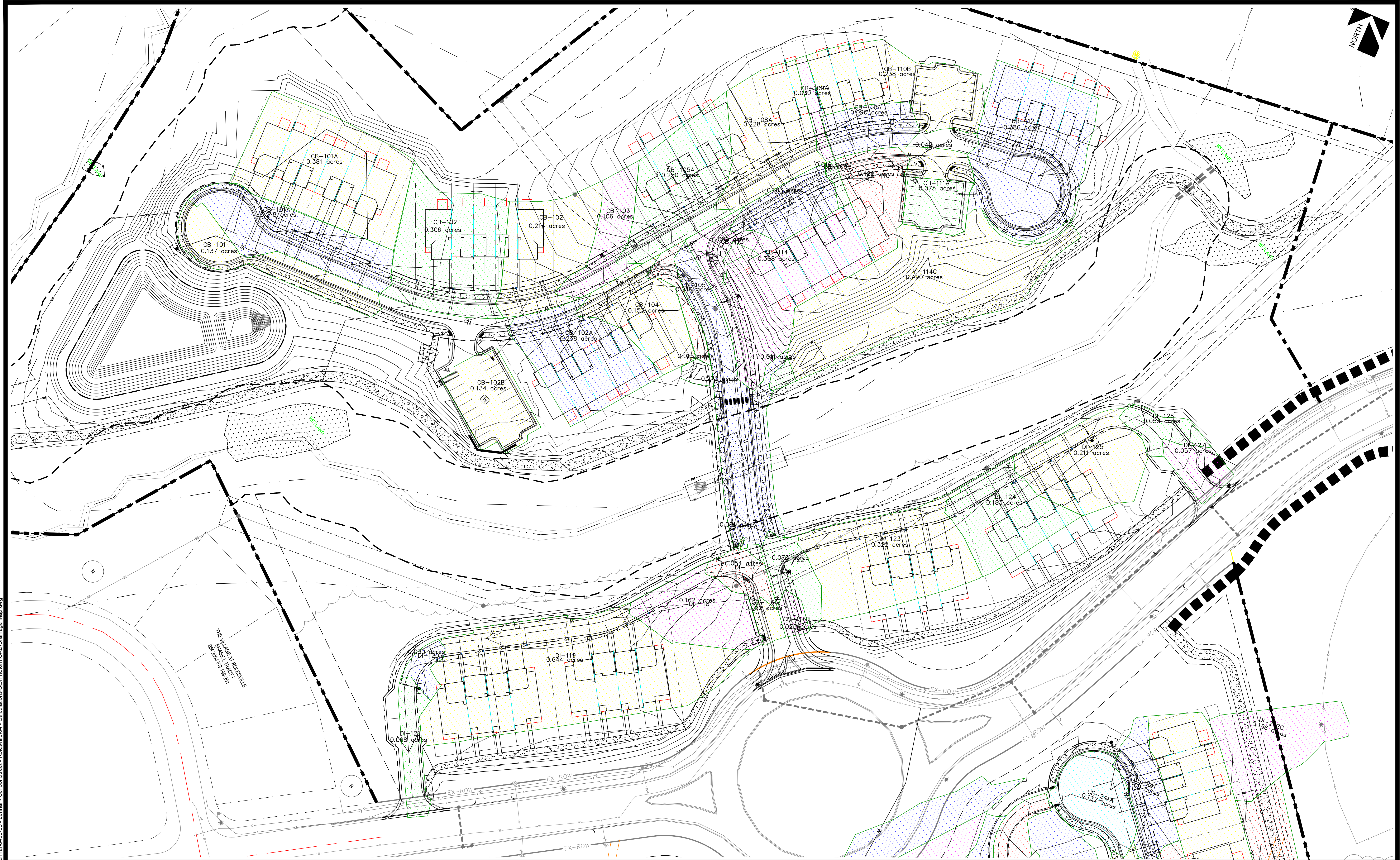


TABLE OF CONTENTS

ATTACHMENT 1: DRAINAGE AREA MAPS – SCM 1	4
SCM 1 - 10 YR STORM	5
SCM 1 - 25 YR STORM	16
SCM 1 – INLET SPREAD.....	27
ATTACHMENT 2: DRAINAGE AREA MAPS – SCM 2	30
SCM 2 – 10 YR STORM	32
SCM 2 – 25 YR STORM	49
SCM 2 – INLET SPREAD.....	66
ATTACHMENT 3: DRAINAGE AREA MAPS – SCM 3	69
SCM 3 – 10 YR STORM	71
SCM 3 – 25 YR STORM	82
SCM 3 – INLET SPREAD.....	90
ATTACHMENT 4: DRAINAGE AREA MAPS – SCM 4	92
SCM 4 – 10 YR STORM	94
SCM 4 – 25 YR STORM	105
SCM 4 – INLET SPREAD.....	18
EROSION CONTROL DA MAP.....	119
SKIMMER BASIN CALCULATIONS	121
TEMPORARY DIVERSIONS	133
DISSIPATORS	152

ATTACHMENT 1: DRAINAGE AREA MAPS – SCM 1

G:\NCAP\Projects\Lemnar\8430-03 - Lemnar - School Street - Rolesville\04 - Calculations\Storm\StormCAD\Drainage Map.dwg



SCM 1 DRAINAGE MAP

SCM 1 - 10 YR STORM

SCM1 STORM SEWER ANALYSIS

10-YEAR ANALYSIS

Inlet Results - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)
CB-109A	0.030	0.026	0.19	0.00	0.19
CB-109	0.012	0.010	0.07	0.00	4.59
CB-110B	0.238	0.151	1.10	0.40	1.10
CB-111A	0.075	0.059	0.43	0.04	0.43
CB-110	0.122	0.089	0.65	0.12	4.39
CB-110A	0.090	0.069	0.50	0.07	1.60
CB-112	0.380	0.216	1.56	0.83	1.56
CB-111	0.045	0.037	0.27	0.01	2.23
CB-108	0.103	0.077	0.56	0.09	5.04
CB-108A	0.228	0.147	1.06	0.38	6.02
DI-127	0.057	0.047	0.34	0.02	0.34
DI-126	0.053	0.046	0.33	0.02	0.66
DI-125	0.211	0.140	1.01	0.34	1.61
CB-113	0.009	0.008	0.06	0.00	14.33
CB-105	0.040	0.034	0.24	0.01	14.41
DI-124	0.183	0.151	1.09	0.40	2.62
CB-116B	0.023	0.020	0.14	0.00	0.14
CB-116A	0.022	0.019	0.14	0.00	0.28
CB-105A	0.250	0.157	1.14	0.44	20.95
CB-116	0.001	0.001	0.01	0.00	4.02
DI-123	0.322	0.218	1.58	0.85	4.01
CB-122	0.073	0.136	0.99	0.32	8.88
YI-114B	0.011	0.009	0.07	0.00	1.95
CB-114	0.368	0.211	1.53	0.79	14.49
CB-104	0.153	0.108	0.78	0.19	0.78
DI-117	0.054	0.044	0.32	0.02	3.79
CB-115	0.272	0.390	2.83	0.00	11.36
DI-121	0.068	0.054	0.39	0.03	0.39
CB-103	0.106	0.119	0.86	0.24	22.21

SCM1 STORM SEWER ANALYSIS

10-YEAR ANALYSIS

Inlet Results - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)
DI-120	0.030	0.030	0.22	0.00	0.61
CB-101	0.137	0.098	0.71	0.15	27.53
CB-101A	0.598	0.301	2.19	1.59	27.01
DI-118	0.162	0.114	0.82	0.22	3.54
DI-119	0.644	0.318	2.31	1.76	2.81
CB-102B	0.134	0.096	0.70	0.15	0.70
CB-102	0.519	0.286	2.08	1.44	25.50
CB-102A	0.238	0.166	1.20	0.49	1.89
YI-114A	0.015	0.013	0.09	0.00	0.09
YI-114C	0.490	0.261	1.89	1.20	1.89
CB-127A	(N/A)	0.000	0.00	0.00	0.00

SCM1 STORM SEWER ANALYSIS

10-YEAR ANALYSIS

Conduit Results - Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)
Pipe - (189)	CB-109A	CB-109	15.0	0.020	1.93	2.98	0.19	9.13
Pipe - (185)	CB-110	CB-109	15.0	0.005	4.26	4.95	4.39	4.57
Pipe - (184)	CB-109	CB-108	18.0	0.005	4.42	4.62	4.59	7.43
Pipe - (188)	CB-110B	CB-110A	15.0	0.041	3.11	2.80	1.10	13.05
Pipe - (227)	CB-111A	CB-111	18.0	0.007	2.32	2.09	0.43	8.53
Pipe - (185) (1)	CB-110A	CB-110	15.0	0.010	3.10	1.74	1.60	6.46
Pipe - (187)	CB-111	CB-110	15.0	0.008	3.86	4.30	2.23	5.60
Pipe - (186)	CB-112	CB-111	15.0	0.006	3.45	3.51	1.56	4.83
Pipe - (190)	CB-108	CB-108A	18.0	0.007	4.78	4.29	5.04	8.60
Pipe - (228)	CB-108A	CB-105A	18.0	0.064	5.11	12.18	6.02	26.65
Pipe - (173)	DI-127	DI-126	18.0	0.007	2.18	2.35	0.34	8.56
Pipe - (259)	CB-127A	DI-127	18.0	0.005	0.00	0.00	0.00	7.54
Pipe - (172)	DI-126	DI-125	18.0	0.005	2.59	1.90	0.66	7.40
Pipe - (171)	DI-125	DI-124	18.0	0.011	3.33	3.00	1.61	11.18
Pipe - (210)	CB-114	CB-113	24.0	0.005	5.76	6.31	14.49	15.99
Pipe - (192)	CB-113	CB-105	30.0	0.005	5.69	5.65	14.33	29.13
Pipe - (193)	CB-105	CB-105A	30.0	0.010	5.70	4.39	14.41	40.59
Pipe - (170)	DI-124	DI-123	18.0	0.006	3.85	3.46	2.62	8.04
Pipe - (261)	CB-116B	CB-116A	18.0	0.005	1.64	1.75	0.14	7.43
Pipe - (260)	CB-116A	CB-116	18.0	0.005	2.00	2.06	0.28	7.43
Pipe - (197)	CB-105A	CB-103	30.0	0.005	6.39	6.30	20.95	28.75
Pipe - (174)	CB-116	CB-122	18.0	0.010	4.42	2.99	4.02	10.58
Pipe - (175)	DI-117	CB-116	18.0	0.005	4.16	4.14	3.79	7.27
Pipe - (169)	DI-123	CB-122	18.0	0.008	4.41	5.19	4.01	9.67
Pipe - (168)	CB-122	CB-115	24.0	0.008	5.23	4.09	8.88	19.80
Pipe - (231)	YI-114B	CB-114	15.0	0.058	3.70	1.59	1.95	15.50
Pipe - (246)	YI-114C	YI-114B	18.0	0.044	3.49	7.61	1.89	21.99
Pipe - (181)	CB-115	CB-114	24.0	0.005	5.25	4.52	11.36	15.93

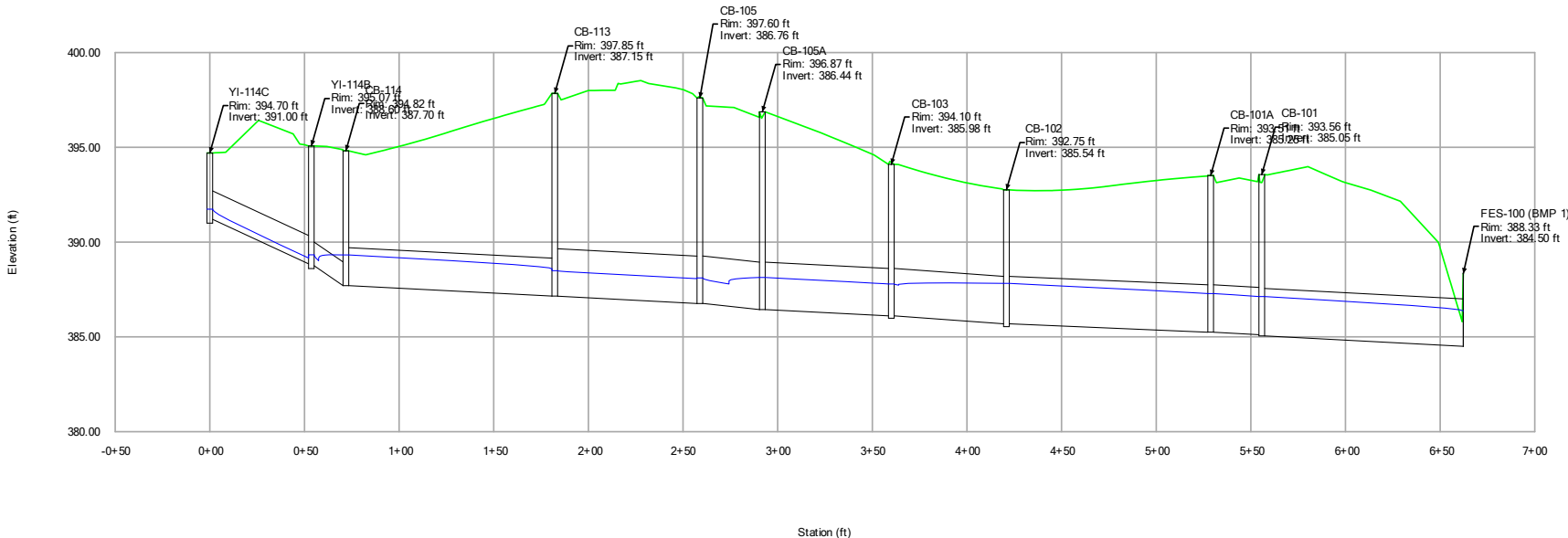
SCM1 STORM SEWER ANALYSIS **10-YEAR ANALYSIS**

Conduit Results - Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)
Pipe - (230)	YI-114A	CB-114	15.0	0.027	0.82	0.08	0.09	10.53
Pipe - (198)	CB-104	CB-103	30.0	0.004	0.23	0.21	0.78	27.45
Pipe - (176)	DI-118	DI-117	18.0	0.005	4.16	3.89	3.54	7.43
Pipe - (179)	DI-121	DI-120	15.0	0.005	2.34	1.62	0.39	4.78
Pipe - (199)	CB-103	CB-102	30.0	0.007	6.68	5.39	22.21	33.91
Pipe - (178)	DI-120	DI-119	15.0	0.005	2.54	0.85	0.61	4.45
Pipe - (239)	CB-101A	CB-101	30.0	0.005	6.80	6.92	27.01	29.00
Pipe - (201)	CB-101	FES-100 (BMP 1)	30.0	0.005	6.82	7.32	27.53	29.46
Pipe - (200)	CB-102	CB-101A	30.0	0.004	6.18	6.42	25.50	26.32
Pipe - (177)	DI-119	DI-118	15.0	0.005	3.91	3.78	2.81	4.57
Pipe - (226)	CB-102B	CB-102A	18.0	0.005	2.64	1.71	0.70	7.43
Pipe - (205)	CB-102A	CB-102	18.0	0.083	3.49	1.07	1.89	30.33

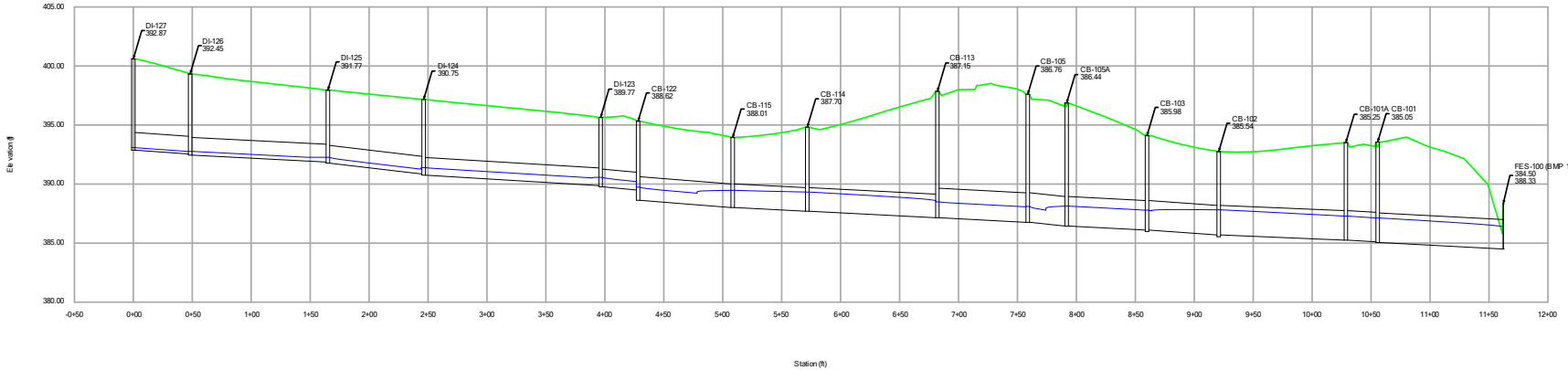
SCM1 STORM SEWER ANALYSIS

10-YEAR ANALYSIS



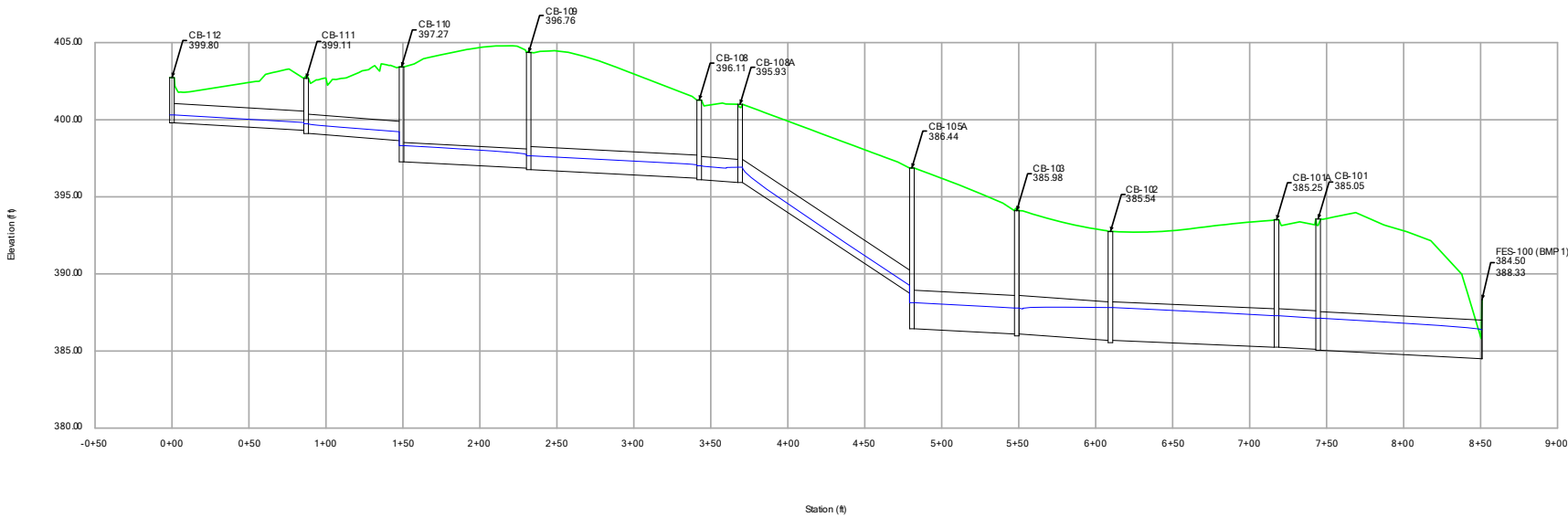
SCM1 STORM SEWER ANALYSIS

10-YEAR ANALYSIS



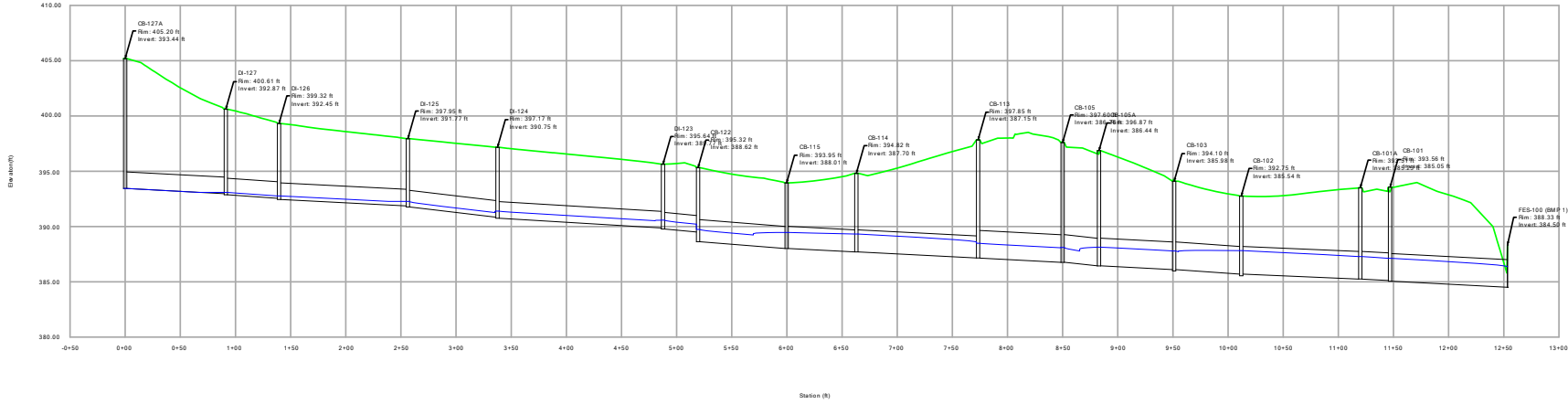
SCM1 STORM SEWER ANALYSIS

10-YEAR ANALYSIS

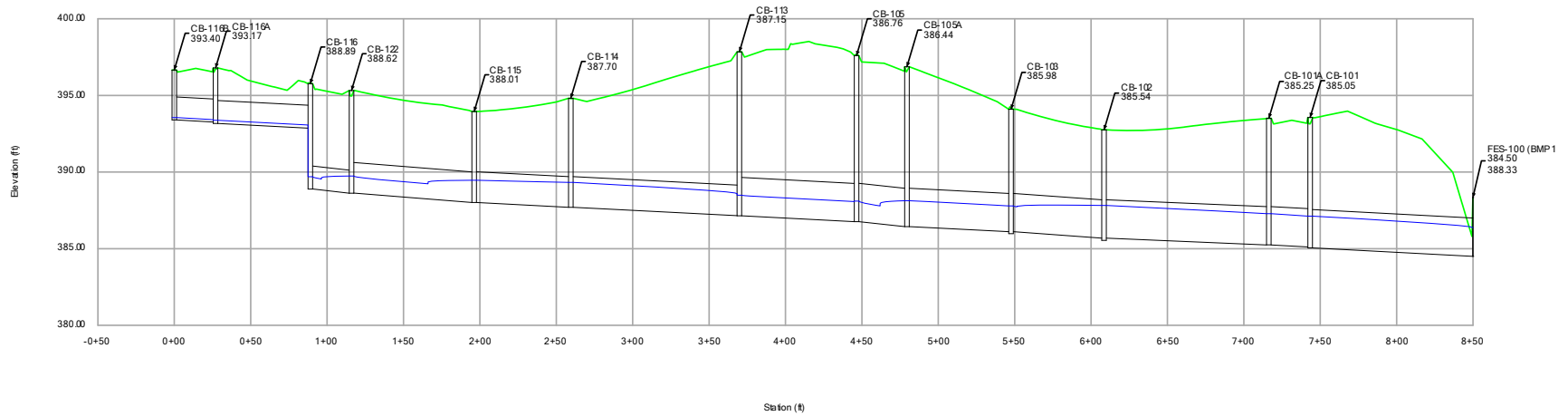


SCM1 STORM SEWER ANALYSIS

10-YEAR ANALYSIS

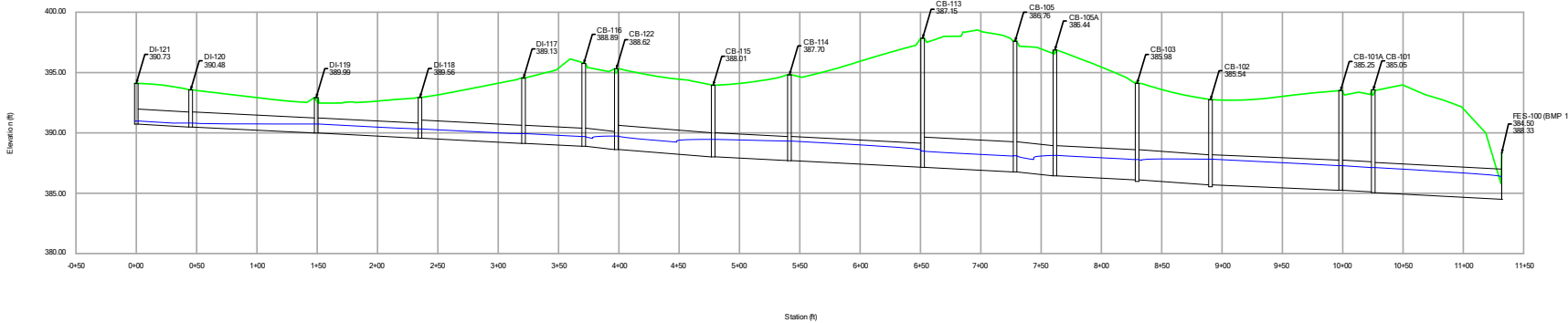


SCM1 STORM SEWER ANALYSIS 10-YEAR ANALYSIS



SCM1 STORM SEWER ANALYSIS

10-YEAR ANALYSIS



SCM 1 - 25 YR STORM

SCM1 STORM SEWER ANALYSIS

25-YEAR ANALYSIS

Inlet Results - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)
CB-109A	0.030	0.026	0.21	0.00	0.21
CB-109	0.012	0.010	0.08	0.00	4.99
CB-110B	0.238	0.148	1.19	0.48	1.19
CB-111A	0.075	0.058	0.47	0.06	0.47
CB-110	0.122	0.087	0.70	0.15	4.77
CB-110A	0.090	0.068	0.55	0.08	1.73
CB-112	0.380	0.210	1.69	0.97	1.69
CB-111	0.045	0.037	0.30	0.01	2.42
CB-108	0.103	0.076	0.61	0.11	5.48
CB-108A	0.228	0.143	1.15	0.45	6.54
DI-127	0.057	0.046	0.37	0.03	0.37
DI-126	0.053	0.046	0.37	0.03	0.73
DI-125	0.211	0.137	1.10	0.40	1.76
CB-113	0.009	0.008	0.07	0.00	15.79
CB-105	0.040	0.033	0.27	0.01	15.87
DI-124	0.183	0.149	1.20	0.49	2.87
CB-116B	0.023	0.020	0.16	0.00	0.16
CB-116A	0.022	0.019	0.15	0.00	0.31
CB-105A	0.250	0.153	1.23	0.51	23.00
CB-116	0.001	0.001	0.01	0.00	4.37
DI-123	0.322	0.215	1.73	1.01	4.39
CB-122	0.073	0.138	1.11	0.41	9.73
YI-114B	0.011	0.009	0.08	0.00	2.11
CB-114	0.368	0.205	1.65	0.92	15.96
CB-104	0.153	0.105	0.85	0.23	0.85
DI-117	0.054	0.044	0.35	0.02	4.12
CB-115	0.272	0.403	3.24	0.00	12.58
DI-121	0.068	0.054	0.43	0.04	0.43
CB-103	0.106	0.119	0.95	0.30	24.38

SCM1 STORM SEWER ANALYSIS

25-YEAR ANALYSIS

Inlet Results - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)
DI-120	0.030	0.031	0.25	0.01	0.67
CB-101	0.137	0.096	0.77	0.19	30.14
CB-101A	0.598	0.293	2.36	1.83	29.58
DI-118	0.162	0.111	0.90	0.26	3.85
DI-119	0.644	0.309	2.49	2.03	3.04
CB-102B	0.134	0.094	0.76	0.18	0.76
CB-102	0.519	0.280	2.25	1.68	27.96
CB-102A	0.238	0.163	1.31	0.58	2.06
YI-114A	0.015	0.013	0.10	0.00	0.10
YI-114C	0.490	0.253	2.04	1.39	2.04
CB-127A	(N/A)	0.000	0.00	0.00	0.00

SCM1 STORM SEWER ANALYSIS

25-YEAR ANALYSIS

Conduit Results - Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)
Pipe - (189)	CB-109A	CB-109	15.0	0.020	1.98	3.07	0.21	9.13
Pipe - (185)	CB-110	CB-109	15.0	0.005	4.32	5.13	4.77	4.57
Pipe - (184)	CB-109	CB-108	18.0	0.005	4.51	4.76	4.99	7.43
Pipe - (188)	CB-110B	CB-110A	15.0	0.041	3.18	2.30	1.19	13.05
Pipe - (227)	CB-111A	CB-111	18.0	0.007	2.38	1.99	0.47	8.53
Pipe - (185) (1)	CB-110A	CB-110	15.0	0.010	2.70	1.73	1.73	6.46
Pipe - (187)	CB-111	CB-110	15.0	0.008	3.96	4.40	2.42	5.60
Pipe - (186)	CB-112	CB-111	15.0	0.006	3.54	3.59	1.69	4.83
Pipe - (190)	CB-108	CB-108A	18.0	0.007	4.93	4.44	5.48	8.60
Pipe - (228)	CB-108A	CB-105A	18.0	0.064	5.29	12.47	6.54	26.65
Pipe - (173)	DI-127	DI-126	18.0	0.007	2.23	2.42	0.37	8.56
Pipe - (259)	CB-127A	DI-127	18.0	0.005	0.00	0.00	0.00	7.54
Pipe - (172)	DI-126	DI-125	18.0	0.005	2.67	1.93	0.73	7.40
Pipe - (171)	DI-125	DI-124	18.0	0.011	3.42	3.04	1.76	11.18
Pipe - (210)	CB-114	CB-113	24.0	0.005	5.85	6.59	15.96	15.99
Pipe - (192)	CB-113	CB-105	30.0	0.005	5.88	5.85	15.79	29.13
Pipe - (193)	CB-105	CB-105A	30.0	0.010	5.90	4.49	15.87	40.59
Pipe - (170)	DI-124	DI-123	18.0	0.006	3.96	3.53	2.87	8.04
Pipe - (261)	CB-116B	CB-116A	18.0	0.005	1.70	1.79	0.16	7.43
Pipe - (260)	CB-116A	CB-116	18.0	0.005	2.07	2.12	0.31	7.43
Pipe - (197)	CB-105A	CB-103	30.0	0.005	6.51	6.55	23.00	28.75
Pipe - (174)	CB-116	CB-122	18.0	0.010	4.55	3.09	4.37	10.58
Pipe - (175)	DI-117	CB-116	18.0	0.005	4.24	4.26	4.12	7.27
Pipe - (169)	DI-123	CB-122	18.0	0.008	4.55	5.32	4.39	9.67
Pipe - (168)	CB-122	CB-115	24.0	0.008	5.40	3.97	9.73	19.80
Pipe - (231)	YI-114B	CB-114	15.0	0.058	3.79	1.72	2.11	15.50
Pipe - (246)	YI-114C	YI-114B	18.0	0.044	3.57	7.78	2.04	21.99
Pipe - (181)	CB-115	CB-114	24.0	0.005	5.15	4.61	12.58	15.93

SCM1 STORM SEWER ANALYSIS

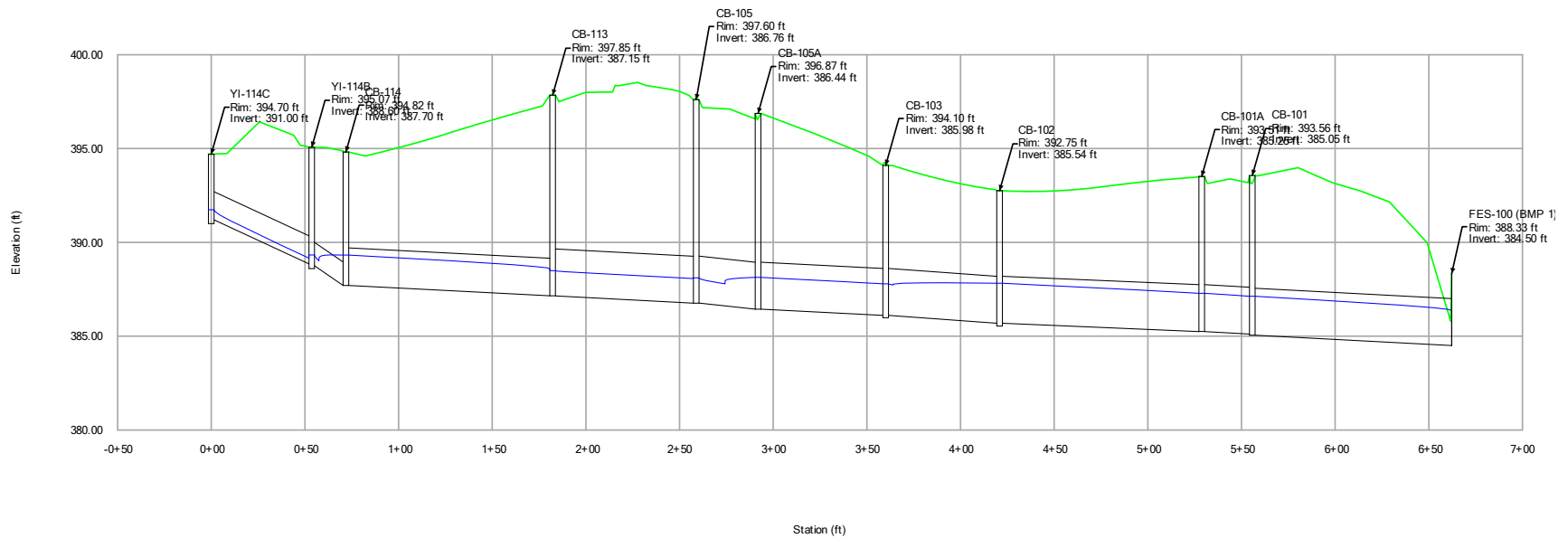
25-YEAR ANALYSIS

Conduit Results - Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)
Pipe - (230)	YI-114A	CB-114	15.0	0.027	0.42	0.08	0.10	10.53
Pipe - (198)	CB-104	CB-103	30.0	0.004	0.24	0.22	0.85	27.45
Pipe - (176)	DI-118	DI-117	18.0	0.005	4.24	3.97	3.85	7.43
Pipe - (179)	DI-121	DI-120	15.0	0.005	2.40	1.65	0.43	4.78
Pipe - (199)	CB-103	CB-102	30.0	0.007	6.94	5.47	24.38	33.91
Pipe - (178)	DI-120	DI-119	15.0	0.005	2.61	0.88	0.67	4.45
Pipe - (239)	CB-101A	CB-101	30.0	0.005	6.90	6.98	29.58	29.00
Pipe - (201)	CB-101	FES-100 (BMP 1)	30.0	0.005	6.92	7.65	30.14	29.46
Pipe - (200)	CB-102	CB-101A	30.0	0.004	6.28	6.52	27.96	26.32
Pipe - (177)	DI-119	DI-118	15.0	0.005	3.98	3.87	3.04	4.57
Pipe - (226)	CB-102B	CB-102A	18.0	0.005	2.70	1.73	0.76	7.43
Pipe - (205)	CB-102A	CB-102	18.0	0.083	3.58	1.17	2.06	30.33

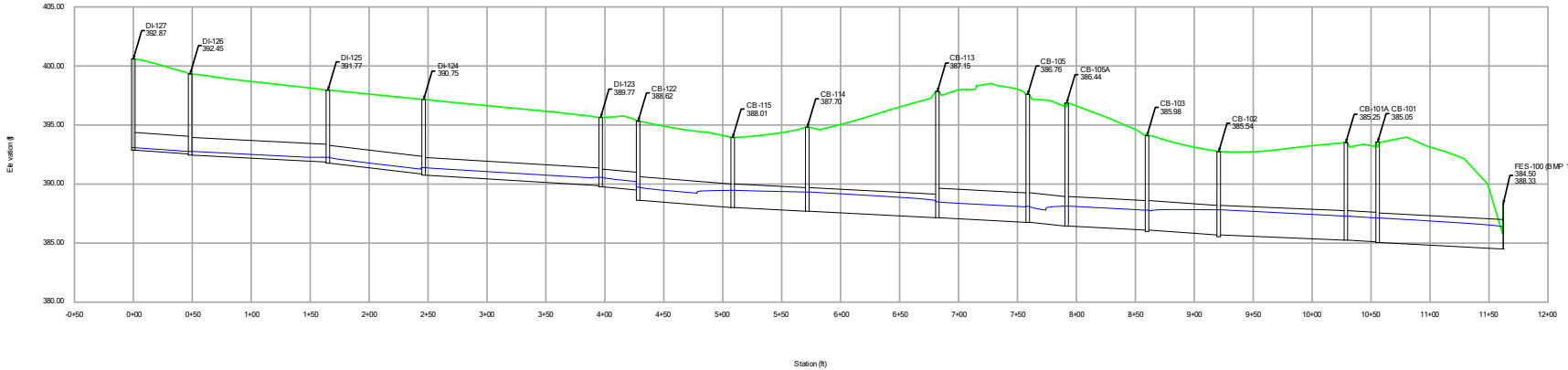
SCM1 STORM SEWER ANALYSIS

25-YEAR ANALYSIS



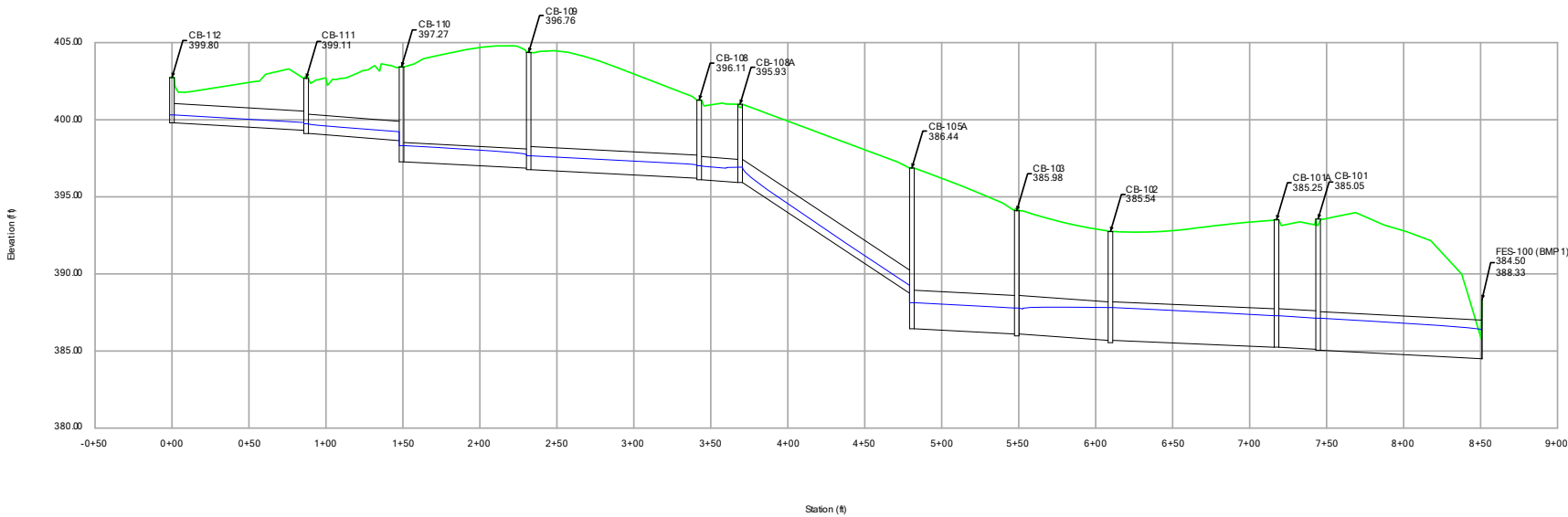
SCM1 STORM SEWER ANALYSIS

25-YEAR ANALYSIS



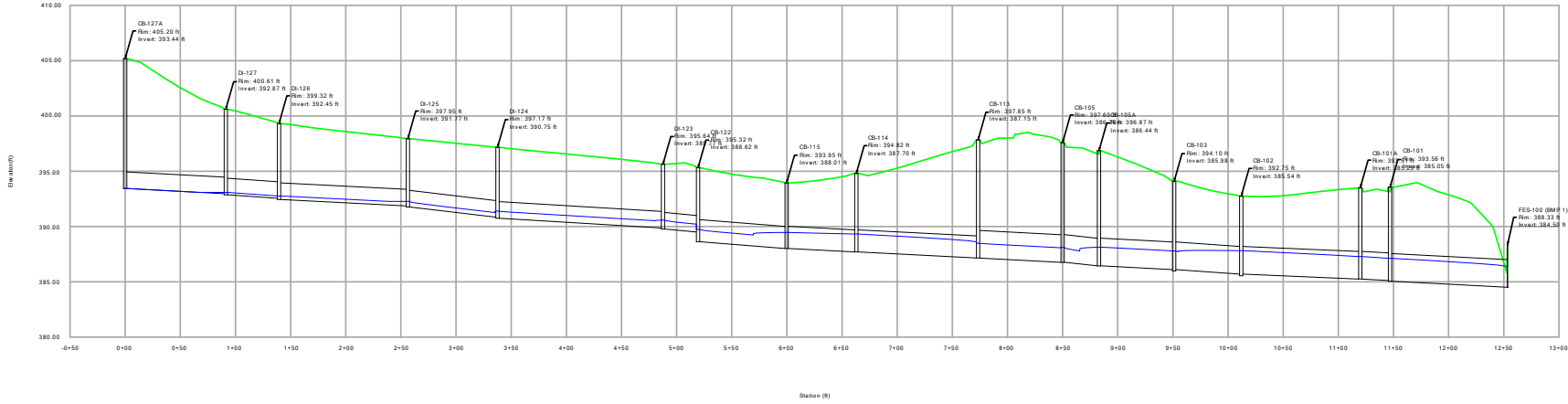
SCM1 STORM SEWER ANALYSIS

25-YEAR ANALYSIS



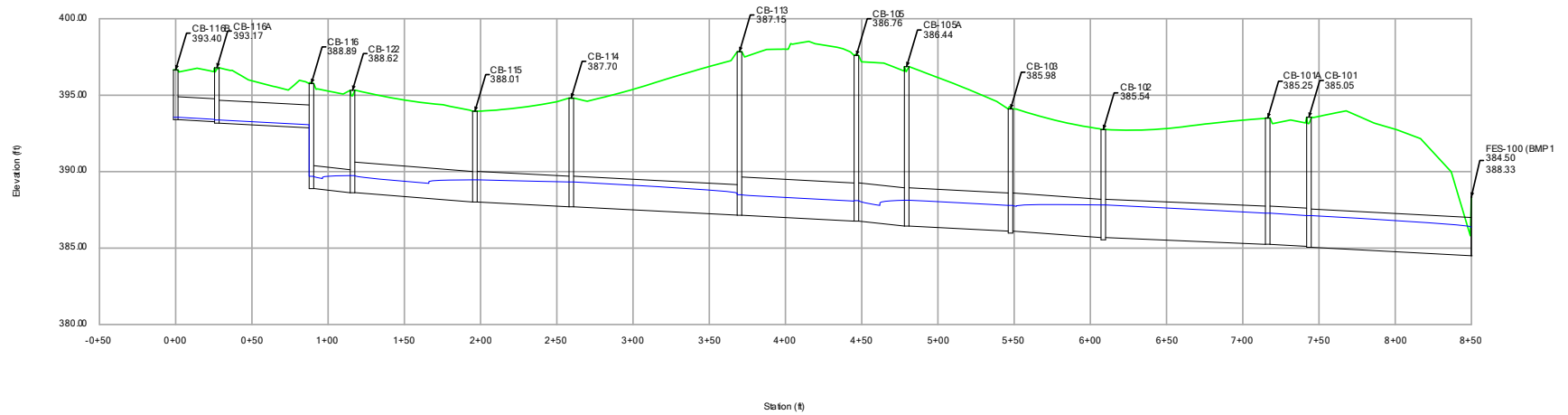
SCM1 STORM SEWER ANALYSIS

25-YEAR ANALYSIS



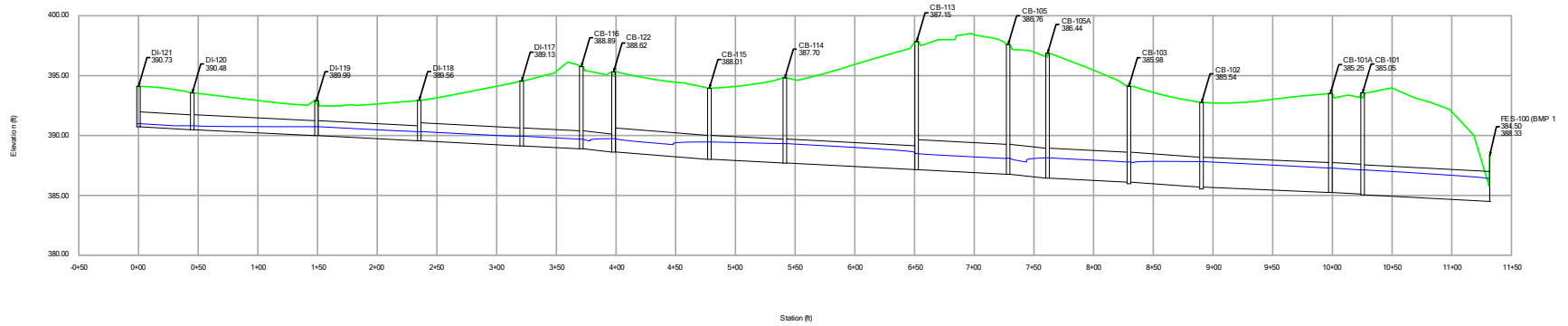
SCM1 STORM SEWER ANALYSIS

25-YEAR ANALYSIS



SCM1 STORM SEWER ANALYSIS

25-YEAR ANALYSIS



SCM 1 – INLET SPREAD

SCM1 STORM SEWER ANALYSIS

Inlet Spread - Time: 0.00 hours

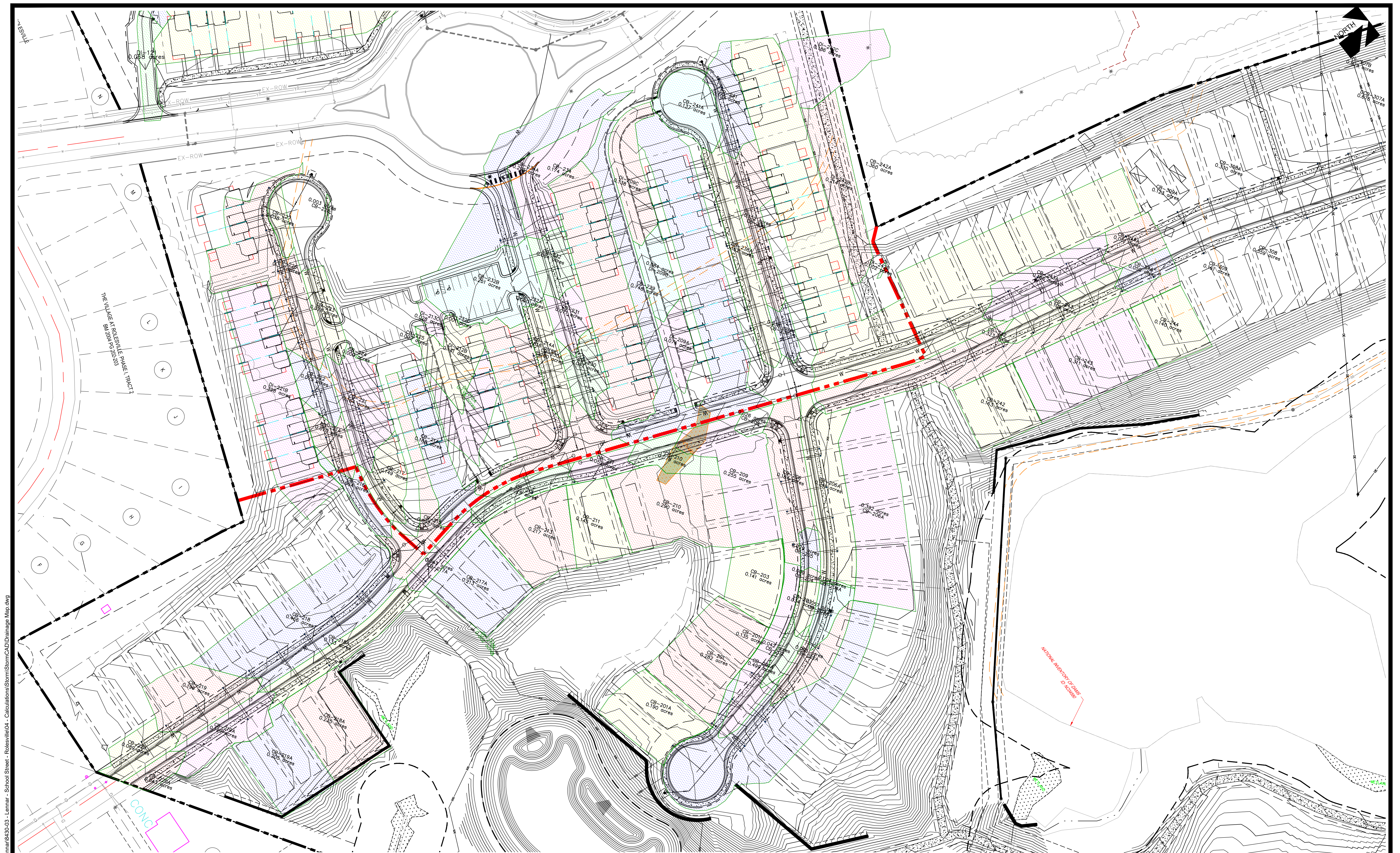
Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Spread / Top Width (ft)
CB-109A	0.030	0.026	0.15	0.00	2.9
CB-109	0.012	0.010	0.06	0.00	2.0
CB-110B	0.238	0.160	0.90	0.27	6.2
CB-111A	0.075	0.061	0.35	0.02	4.0
CB-110	0.122	0.093	0.53	0.08	4.8
CB-110A	0.090	0.072	0.41	0.04	4.3
CB-112	0.380	0.229	1.30	0.57	7.4
CB-111	0.045	0.038	0.22	0.00	3.3
CB-108	0.103	0.080	0.45	0.05	4.5
CB-108A	0.228	0.154	0.88	0.25	6.1
DI-127	0.057	0.048	0.27	0.01	3.6
DI-126	0.053	0.046	0.26	0.01	3.6
DI-125	0.211	0.146	0.83	0.22	6.0
CB-113	0.009	0.008	0.05	0.00	1.9
CB-105	0.040	0.034	0.19	0.00	3.2
DI-124	0.183	0.154	0.87	0.25	6.1
CB-116B	0.023	0.020	0.11	0.00	2.6
CB-116A	0.022	0.019	0.11	0.00	2.5
CB-105A	0.250	0.166	0.94	0.29	6.3
CB-116	0.001	0.001	0.00	0.00	0.7
DI-123	0.322	0.226	1.28	0.55	7.4
CB-122	0.073	0.131	0.74	0.17	5.7
YI-114B	0.011	0.009	0.05	0.00	1.9
CB-114	0.368	0.224	1.27	0.55	7.3
CB-104	0.153	0.112	0.64	0.12	5.3
DI-117	0.054	0.045	0.26	0.01	3.6
CB-115	0.272	0.363	2.06	0.00	12.1
DI-121	0.068	0.056	0.32	0.02	3.9
CB-103	0.106	0.119	0.67	0.14	5.4
DI-120	0.030	0.029	0.17	0.00	3.0
CB-101	0.137	0.102	0.58	0.10	5.0

SCM1 STORM SEWER ANALYSIS

Inlet Spread - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Spread / Top Width (ft)
CB-101A	0.598	0.322	1.83	1.12	8.8
DI-118	0.162	0.118	0.67	0.14	5.4
DI-119	0.644	0.340	1.93	1.25	9.0
CB-102B	0.134	0.101	0.57	0.09	5.0
CB-102	0.519	0.302	1.71	0.99	8.5
CB-102A	0.238	0.173	0.98	0.32	6.4
YI-114A	0.015	0.013	0.07	0.00	2.2
YI-114C	0.490	0.278	1.57	0.84	8.1
CB-127A	(N/A)	0.000	0.00	0.00	0.0

ATTACHMENT 2: DRAINAGE AREA MAPS – SCM 2



G:\NCAP\Projects\Lemlar\8430-03 - Lemlar - School Street - Rolesville\04 - Calculations\Storm\StormCAD\Drainage Map.dwg



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

SCM 2 DRAINAGE MAP

DATE: 6/1/2023
SCALE: 1" = 50'

THIS DOCUMENT, TOGETHER WITH THE CONCEPTS AND DESIGNS PRESENTED HEREIN, AS AN INSTRUMENT OF SERVICE, IS INTENDED ONLY FOR THE SPECIFIC PURPOSE AND CLIENT FOR WHICH IT WAS PREPARED. REUSE OF AND IMPROPER RELIANCE ON THIS DOCUMENT WITHOUT WRITTEN AUTHORIZATION AND ADAPTATION BY BGE INC. SHALL BE WITHOUT LIABILITY TO BGE INC.

SCM 2 – 10 YR STORM

10-YEAR ANALYSIS

Inlet Results - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)
CB-244	0.190	0.121	0.88	0.24	1.30
CB-244A	0.081	0.060	0.43	0.04	0.43
CB-241A	0.137	0.093	0.67	0.13	0.67
CB-241	0.109	0.077	0.56	0.08	1.22
CB-228	0.003	0.002	0.02	0.00	0.02
CB-227	0.038	0.030	0.22	0.00	0.23
CB-234	0.174	0.113	0.82	0.20	2.05
CB-234A	0.295	0.171	1.24	0.49	1.24
CB-232C	0.001	0.001	0.01	0.00	0.01
CB-232	0.084	0.083	0.60	0.10	3.89
CB-232A	0.000	0.062	0.45	0.05	1.44
CB-239	0.152	0.109	0.79	0.19	1.94
CB-225	0.002	0.002	0.01	0.00	0.01
CB-232B	0.251	0.151	1.09	0.38	1.03
CB-243	0.420	0.239	1.73	0.97	3.84
CB-243A	0.186	0.123	0.89	0.24	0.89
CB-203A	0.057	0.044	0.32	0.02	0.32
CB-238A	0.162	0.118	0.86	0.23	0.86
CB-238	0.038	0.052	0.38	0.03	3.10
CB-231	0.071	0.064	0.46	0.05	4.29
CB-204A	0.004	0.003	0.02	0.00	0.02
CB-236	(N/A)	0.000	0.00	0.00	19.90
CB-237	(N/A)	0.000	0.00	0.00	3.09
CB-204	0.009	0.007	0.05	0.00	24.16
CB-205	0.029	0.023	0.17	0.00	24.18
CB-224	0.000	0.000	0.00	0.00	0.01
CB-242	0.486	0.527	3.82	0.00	16.94
CB-242A	1.360	1.135	8.23	0.00	9.60
CB-206A	0.633	0.513	3.72	0.00	23.20
CB-206	0.184	0.150	1.08	0.00	24.17
CB-208	0.026	0.021	0.15	0.00	0.15

10-YEAR ANALYSIS

Inlet Results - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)
CB-203	0.176	0.114	0.83	0.21	25.01
CB-226	0.330	0.187	1.35	0.59	1.91
CB-223	0.078	0.058	0.42	0.04	0.42
CB-209	0.255	0.153	1.11	0.39	2.85
CB-202A	0.095	0.070	0.51	0.07	0.51
CB-220A	0.043	0.034	0.24	0.01	0.24
CB-220	0.089	0.065	0.47	0.05	0.71
CB-230	0.087	0.069	0.50	0.06	5.22
CB-230A	0.100	0.076	0.55	0.08	0.55
CB-210	0.368	0.229	1.66	0.89	11.58
CB-229	0.748	0.341	2.47	1.92	7.45
CB-222	0.075	0.114	0.82	0.21	2.67
CB-211	0.197	0.194	1.41	0.64	12.78
CB-221A	0.070	0.075	0.54	0.08	5.36
CB-221	0.164	0.111	0.80	0.20	0.80
CB-202	0.042	0.058	0.42	0.04	25.69
CB-219	0.196	0.129	0.93	0.27	2.95
CB-219A	0.333	0.188	1.36	0.60	1.36
CB-214A	0.816	0.363	2.63	2.16	4.08
CB-213	0.296	0.217	1.58	0.80	14.06
CB-215	0.092	0.086	0.63	0.11	6.52
CB-216	0.064	0.057	0.41	0.04	11.91
CB-214	0.168	0.267	1.94	1.20	5.94
CB-201	0.417	0.225	1.63	0.86	27.07
CB-217A	0.280	0.222	1.61	0.84	36.02
CB-217	0.149	0.100	0.72	0.15	21.53
CB-218A	0.369	0.497	3.60	0.00	3.60
CB-218	0.466	0.436	3.16	0.00	9.39
CB-201A	0.689	0.322	2.33	1.71	29.09

10-YEAR ANALYSIS

Conduit Results - Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)
Pipe - (77) (BMP 2)	CB-244	CB-243	15.0	0.047	3.26	1.69	1.30	13.94
Pipe - (82) (BMP 2)	CB-244A	CB-244	15.0	0.010	2.39	1.08	0.43	6.36
Pipe - (249) (BMP 2)	DI-242C	DI-242B	18.0	0.021	2.80	4.68	0.86	15.32
Pipe - (70) (BMP 2)	CB-241A	CB-241	15.0	0.008	2.70	1.77	0.67	5.70
Pipe - (69) (BMP 2)	CB-241	CB-239	15.0	0.009	3.21	3.97	1.22	6.29
Pipe - (206) (BMP 2)	DI-209C	DI-209B	15.0	0.021	2.71	2.58	0.68	9.47
Pipe - (167) (BMP 2)	CB-228	CB-227	15.0	0.036	1.02	0.46	0.02	12.30
Pipe - (39) (BMP 2)	CB-227	CB-226	15.0	0.033	2.02	0.47	0.23	11.77
Pipe - (53) (BMP 2)	CB-234	CB-232	15.0	0.010	3.75	4.66	2.05	6.44
Pipe - (213) (BMP 2)	CB-234A	CB-234	15.0	0.008	3.22	2.27	1.24	5.77
Pipe - (161) (BMP 2)	CB-232C	CB-232B	15.0	0.004	0.26	0.03	0.01	3.93
Pipe - (248) (BMP 2)	DI-242B	CB-242A	18.0	0.013	3.44	3.05	1.78	11.94
Pipe - (250) (BMP 2)	DI-242D	DI-242B	18.0	0.005	0.06	0.03	0.01	7.43
Pipe - (54) (BMP 2)	CB-232	CB-231	18.0	0.033	4.37	8.48	3.89	19.09
Pipe - (59) (BMP 2)	CB-232A	CB-232	15.0	0.008	3.37	1.86	1.44	5.78
Pipe - (162) (BMP 2)	CB-232B	CB-232A	15.0	0.008	3.05	3.55	1.03	5.78

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

Label	Start Node	Stop Node	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)
Pipe - (67) (BMP 2)	CB-239	CB-238	18.0	0.020	3.52	2.54	1.94	14.76
Pipe - (163) (BMP 2)	CB-225	CB-224	15.0	0.026	0.94	1.40	0.01	10.37
Pipe - (207) (BMP 2)	DI-209B	DI-209A	15.0	0.035	3.19	6.28	1.21	12.06
Pipe - (74) (BMP 2)	CB-243	CB-242	18.0	0.008	4.35	3.36	3.84	9.66
Pipe - (80) (BMP 2)	CB-243A	CB-243	15.0	0.024	2.93	1.15	0.89	9.98
Pipe - (26) (BMP 2)	CB-203A	CB-203	15.0	0.192	2.20	0.26	0.32	28.32
Pipe - (72) (BMP 2)	CB-238A	CB-238	15.0	0.014	2.90	4.16	0.86	7.76
Pipe - (66) (BMP 2)	CB-238	CB-237	18.0	0.025	4.06	7.08	3.10	16.74
Pipe - (55) (BMP 2)	CB-231	CB-230	18.0	0.041	4.52	9.42	4.29	21.29
Pipe - (28) (BMP 2)	CB-204A	CB-204	15.0	0.157	1.10	0.02	0.02	25.62
Pipe - (218) (BMP 2)	CB-236	CB-206A	30.0	0.006	6.40	6.74	19.90	31.24
Pipe - (65) (BMP 2)	CB-237	CB-236	18.0	0.087	4.05	2.43	3.09	30.93
Pipe - (73) (BMP 2)	CB-242	CB-236	24.0	0.025	6.78	10.97	16.94	35.57
Pipe - (23) (BMP 2)	CB-204	CB-203	30.0	0.007	6.91	6.78	24.16	34.28
Pipe - (24) (BMP 2)	CB-205	CB-204	30.0	0.013	6.92	9.11	24.18	47.60
Pipe - (204) (BMP 2)	DI-213C	DI-212B	15.0	0.051	1.86	0.58	0.17	14.58

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

Label	Start Node	Stop Node	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)
Pipe - (25) (BMP 2)	CB-206	CB-205	30.0	0.008	6.91	6.91	24.17	36.63
Pipe - (164) (1) (BMP 2)	CB-224	CB-223	15.0	0.118	0.98	0.16	0.01	22.18
Pipe - (78) (BMP 2)	CB-242A	CB-242	24.0	0.015	5.38	3.84	9.60	27.29
Pipe - (211) (BMP 2)	CB-206A	CB-206	30.0	0.017	6.80	6.64	23.20	53.53
Pipe - (62) (1) (BMP 2)	CB-208	CB-209	18.0	0.027	1.78	0.24	0.15	17.27
Pipe - (22) (BMP 2)	CB-203	CB-202	30.0	0.010	7.02	6.91	25.01	41.45
Pipe - (207) (1) (BMP 2)	DI-209A	CB-209	15.0	0.026	3.50	6.20	1.64	10.42
Pipe - (40) (BMP 2)	CB-223	CB-226	15.0	0.006	2.37	1.75	0.42	4.81
Pipe - (42) (BMP 2)	CB-226	CB-222	18.0	0.030	3.51	2.77	1.91	18.31
Pipe - (62) (BMP 2)	CB-209	CB-210	24.0	0.018	3.69	1.42	2.85	30.69
Pipe - (21) (BMP 2)	CB-202A	CB-202	15.0	0.035	2.51	0.71	0.51	12.10
Pipe - (214) (BMP 2)	CB-220A	CB-220	15.0	0.012	2.06	0.95	0.24	7.06
Pipe - (30) (BMP 2)	CB-220	CB-219	15.0	0.046	2.74	1.59	0.71	13.89
Pipe - (56) (BMP 2)	CB-230	CB-229	18.0	0.028	4.84	8.23	5.22	17.50
Pipe - (61) (BMP 2)	CB-230A	CB-230	15.0	0.019	2.56	0.60	0.55	8.80
Pipe - (58) (BMP 2)	CB-210	CB-211	24.0	0.024	5.76	9.79	11.58	35.17

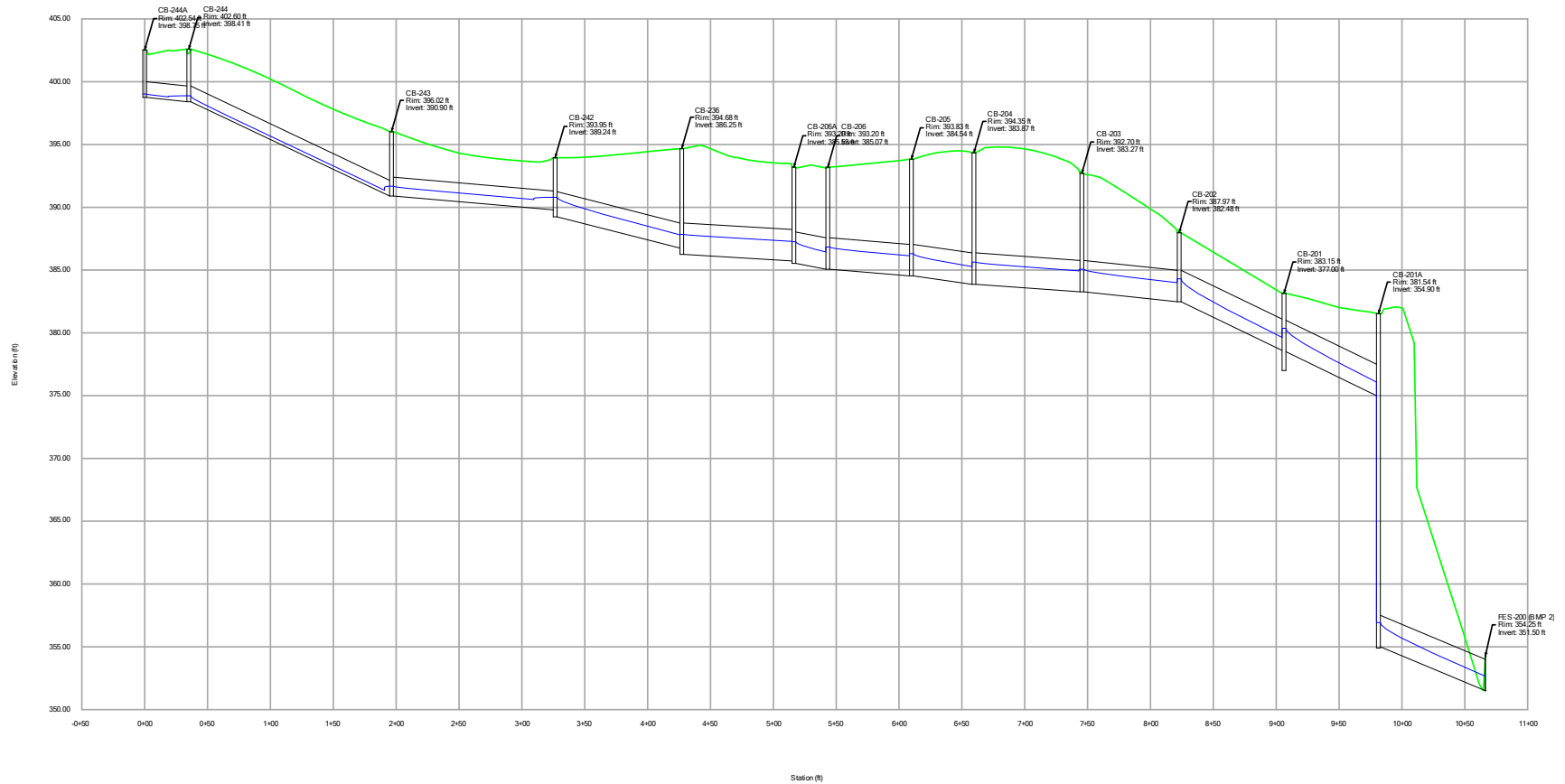
10-YEAR ANALYSIS **Conduit Results - Time: 0.00 hours**

Label	Start Node	Stop Node	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)
Pipe - (57) (BMP 2)	CB-229	CB-210	24.0	0.009	4.93	5.99	7.45	20.94
Pipe - (43) (BMP 2)	CB-222	CB-221A	18.0	0.035	3.88	7.76	2.67	19.61
Pipe - (203) (BMP 2)	DI-212B	DI-212A	15.0	0.050	2.84	1.81	0.80	14.46
Pipe - (52) (BMP 2)	CB-211	CB-213	24.0	0.021	5.99	5.66	12.78	33.12
Pipe - (48) (BMP 2)	CB-221	CB-221A	15.0	0.055	2.84	6.54	0.80	15.12
Pipe - (44) (BMP 2)	CB-221A	CB-216	18.0	0.009	4.89	3.55	5.36	10.11
Pipe - (267) (BMP 2)	DI-221B	CB-221A	18.0	0.005	1.62	1.05	1.56	7.43
Pipe - (20) (BMP 2)	CB-202	CB-201	30.0	0.047	7.10	14.51	25.69	88.48
Pipe - (31) (BMP 2)	CB-219	CB-218	15.0	0.015	4.24	5.98	2.95	7.91
Pipe - (35) (BMP 2)	CB-219A	CB-219	15.0	0.045	3.31	1.96	1.36	13.75
Pipe - (202) (BMP 2)	CB-214A	CB-214	15.0	0.020	4.80	4.12	4.08	9.06
Pipe - (202) (3) (BMP 2)	DI-212A	CB-214A	15.0	0.080	3.42	1.78	1.52	18.27
Pipe - (229) (BMP 2)	CB-213	CB-217A	24.0	0.023	6.23	5.74	14.06	34.08
Pipe - (50) (BMP 2)	CB-214	CB-215	18.0	0.010	5.09	4.49	5.94	10.76
Pipe - (45) (BMP 2)	CB-215	CB-216	18.0	0.005	4.44	4.28	6.52	7.43
Pipe - (46) (BMP 2)	CB-216	CB-217	18.0	0.027	7.27	9.92	11.91	17.13

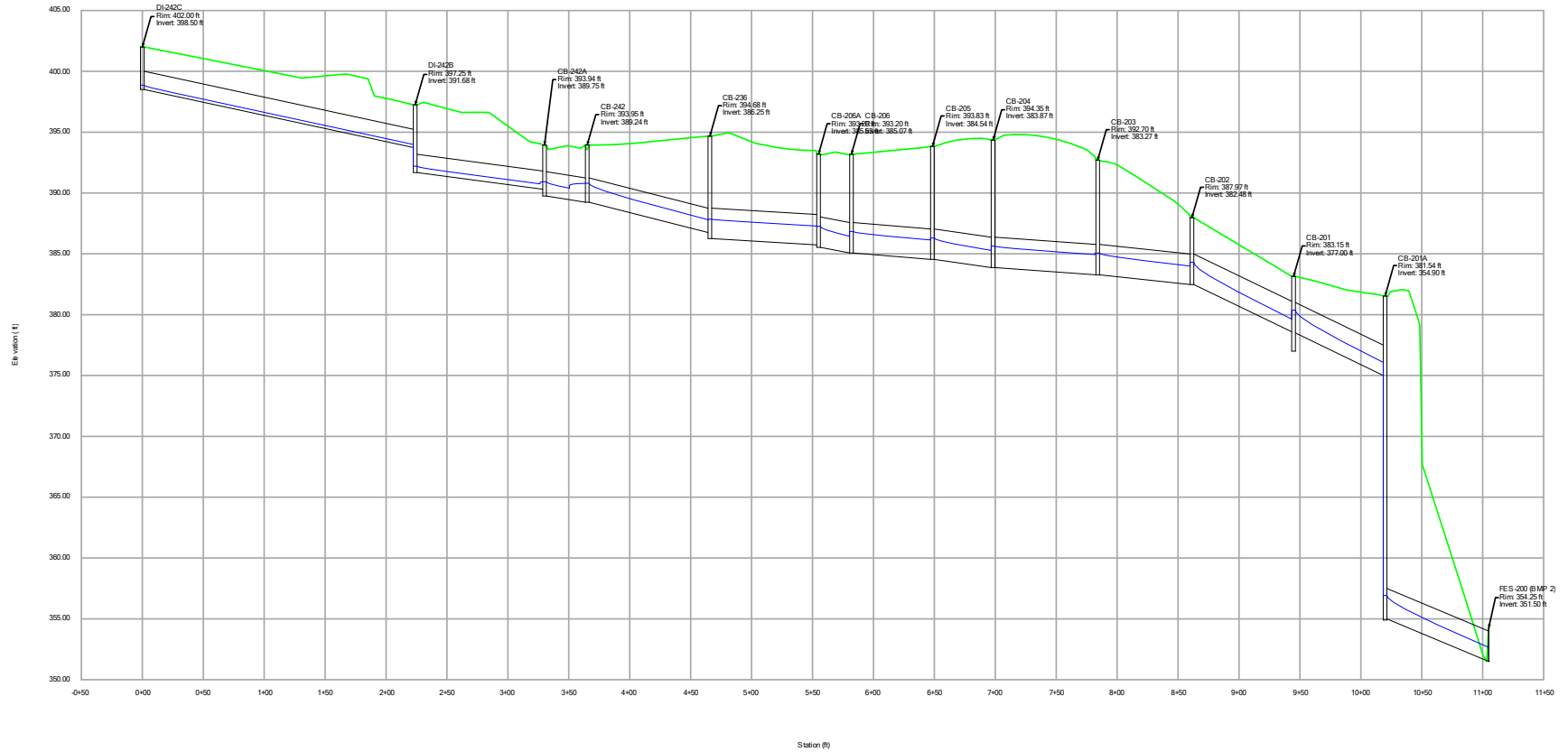
10-YEAR ANALYSIS
Conduit Results - Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)
Pipe - (222) (BMP 2)	CB-217	CB-217A	30.0	0.005	5.56	5.29	21.53	29.00
Pipe - (222) (1) (BMP 2)	CB-217A	DI-217B	30.0	0.048	8.41	16.66	36.02	89.66
Pipe - (32) (BMP 2)	CB-218	CB-217	24.0	0.010	4.75	3.25	9.39	22.39
Pipe - (36) (BMP 2)	CB-218A	CB-218	24.0	0.010	2.61	1.82	3.60	22.76
Pipe - (223) (BMP 2)	DI-217B	FES-250 (BMP 2)	30.0	0.169	8.39	26.40	35.82	168.44
Pipe - (19) (BMP 2)(1)	CB-201A	FES-200 (BMP 2)	30.0	0.041	7.51	14.27	29.09	83.21
Pipe - (19) (BMP 2)(2)	CB-201	CB-201A	30.0	0.047	7.27	14.43	27.07	88.54

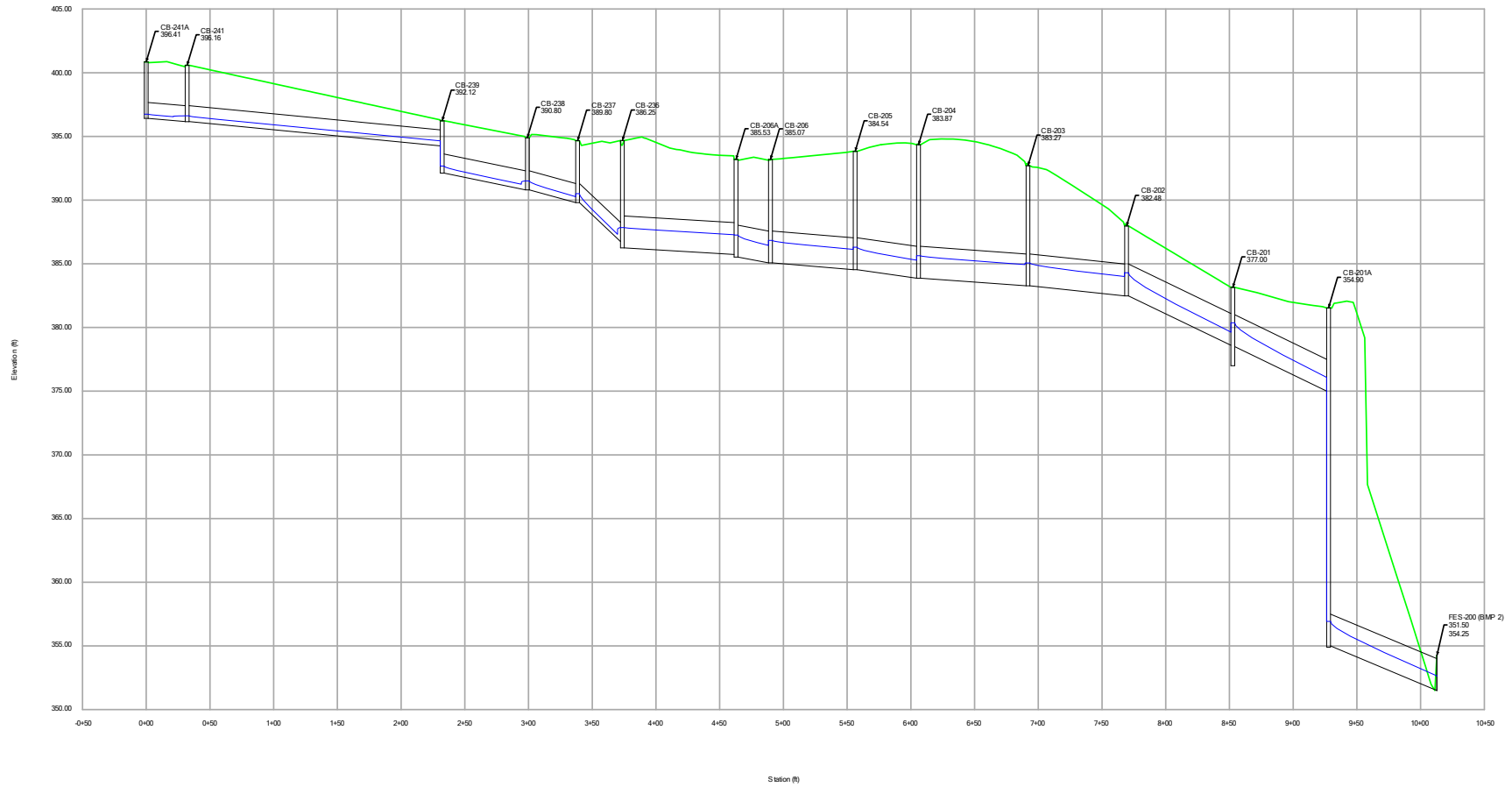
10-YEAR ANALYSIS



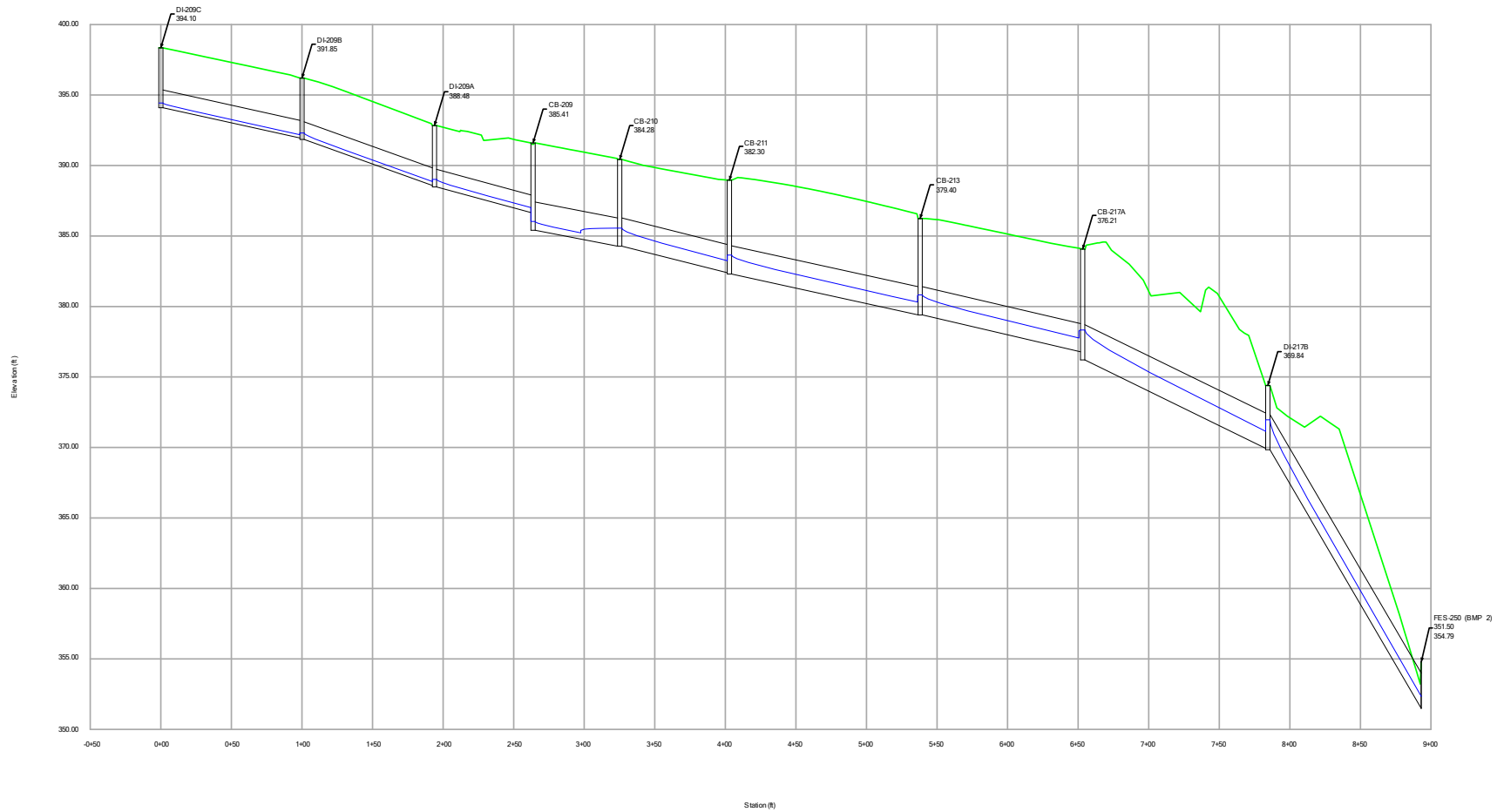
10-YEAR ANALYSIS



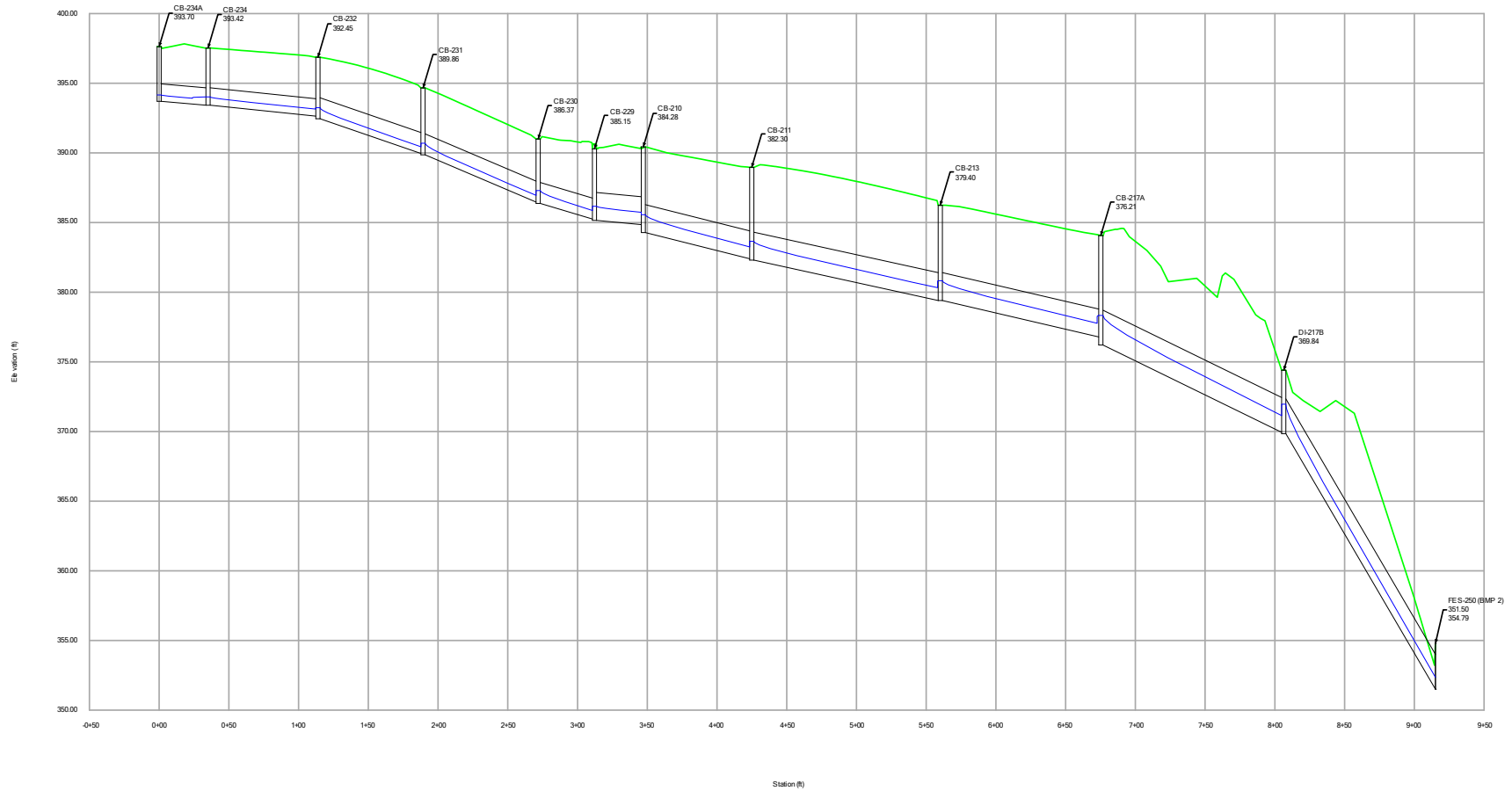
10-YEAR ANALYSIS



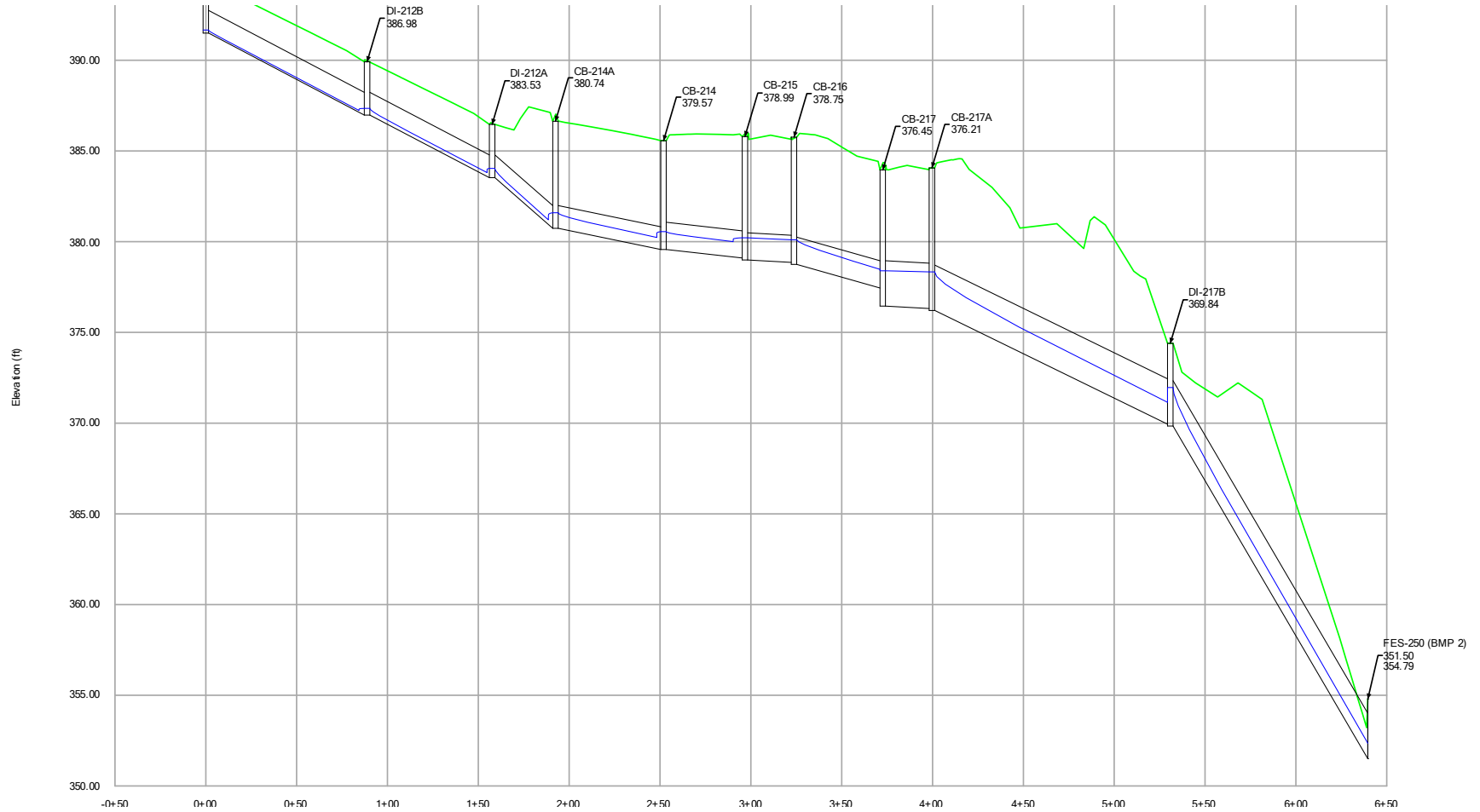
10-YEAR ANALYSIS



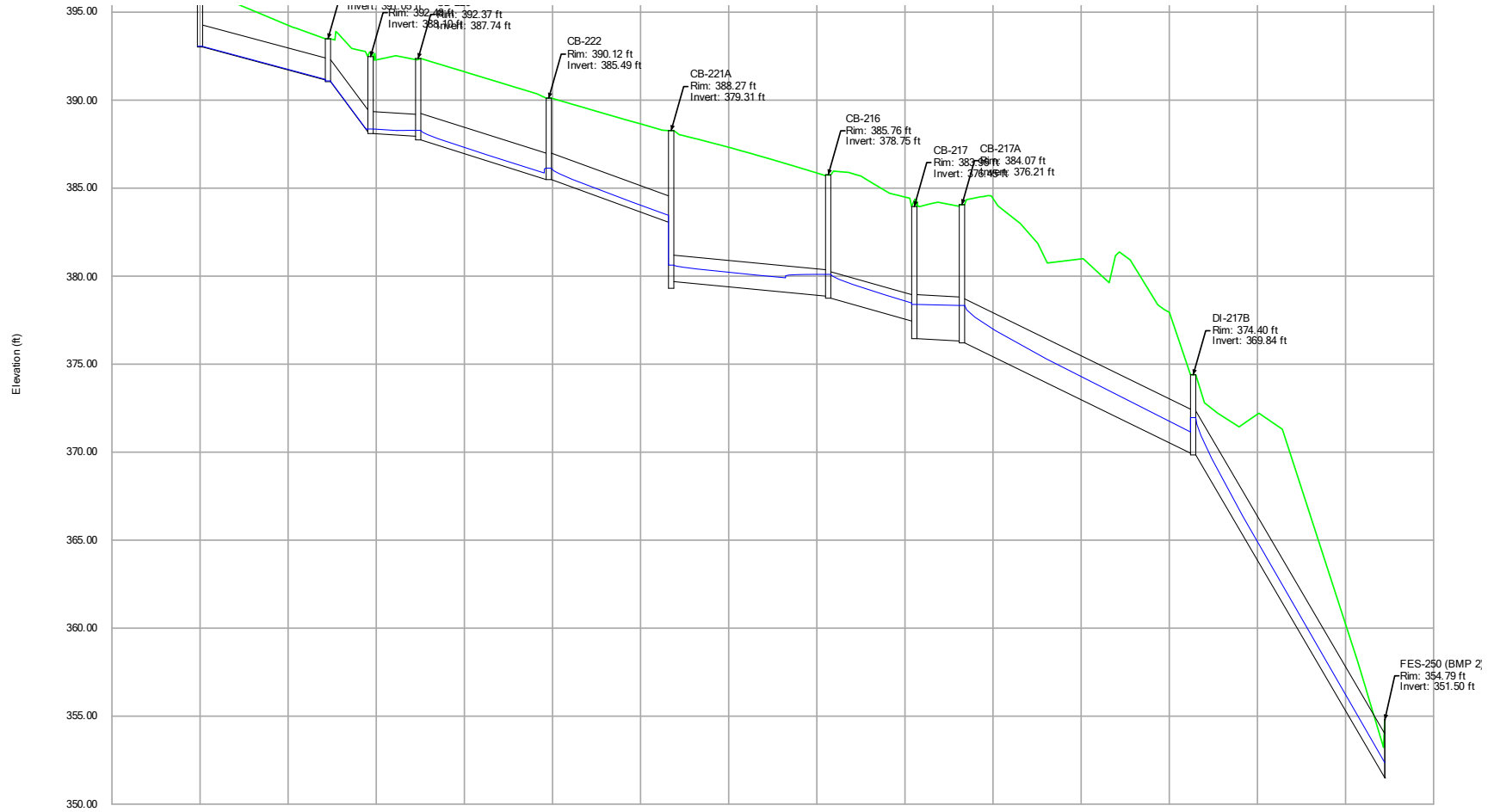
10-YEAR ANALYSIS



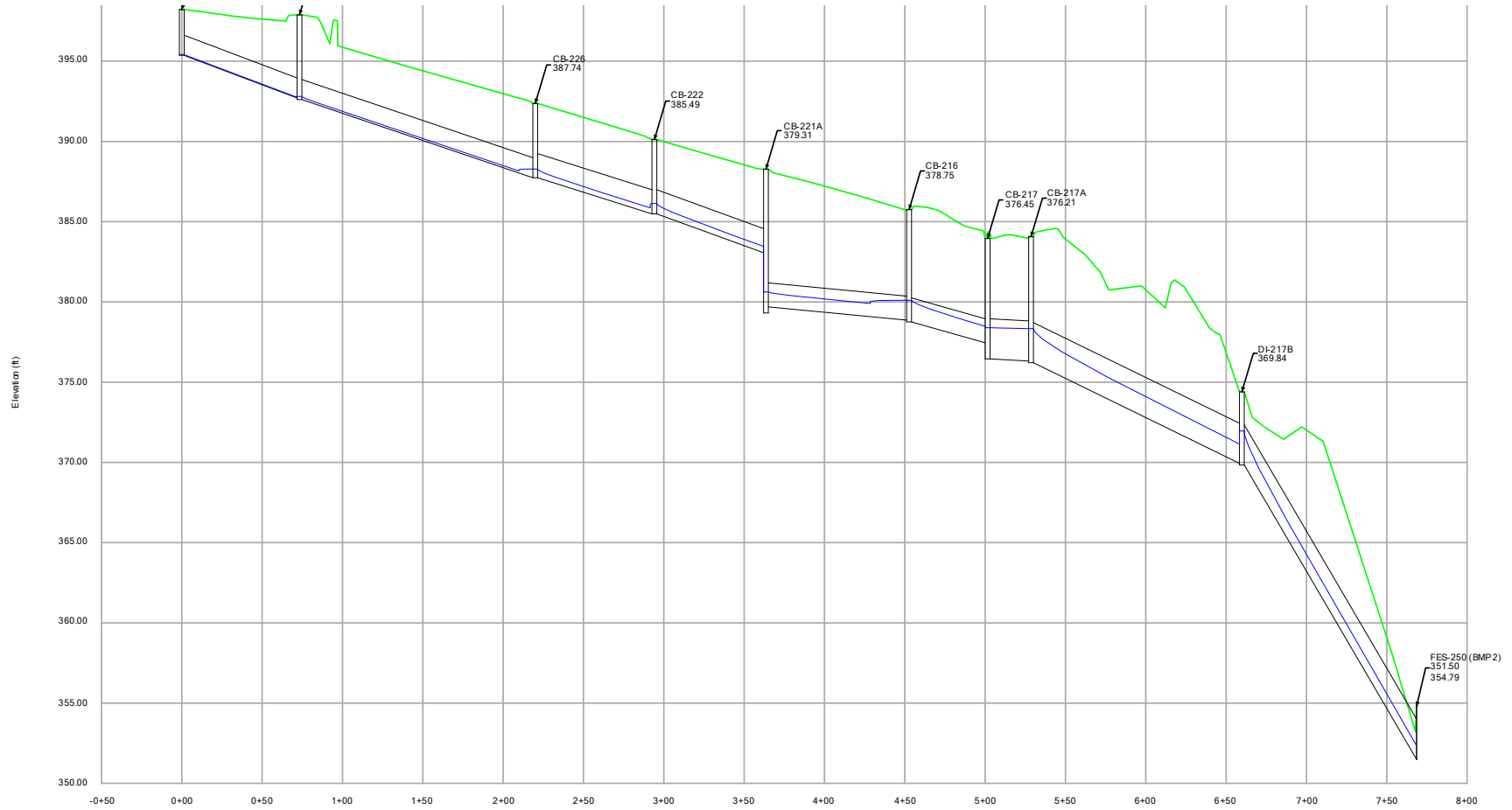
10-YEAR ANALYSIS



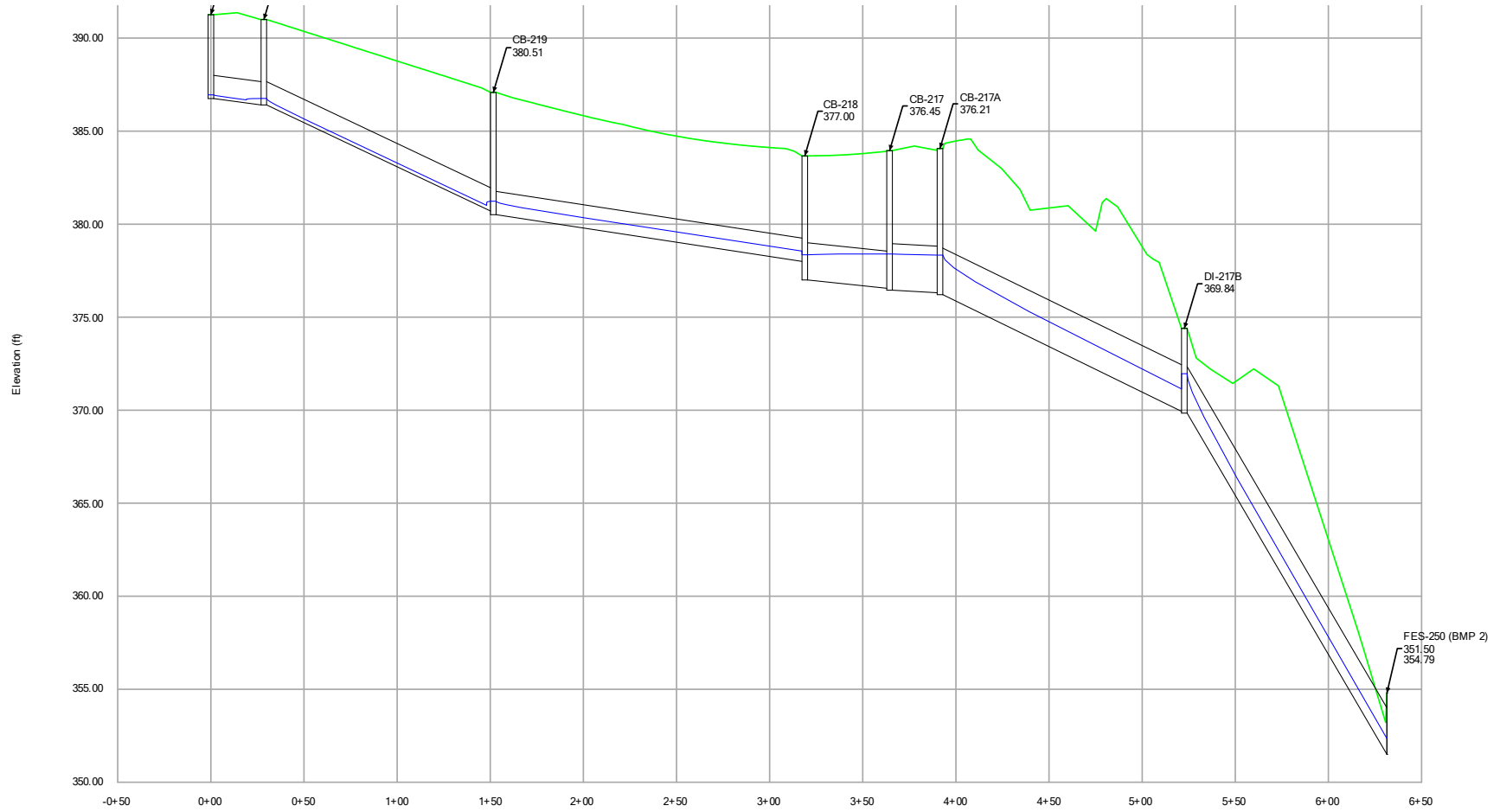
10-YEAR ANALYSIS



10-YEAR ANALYSIS



10-YEAR ANALYSIS



25-YEAR ANALYSIS

Inlet Results - Time: 0.00 hours

SCM 2 – 25 YR STORM

25-YEAR ANALYSIS

Inlet Results - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)
CB-244	0.190	0.119	0.95	0.28	1.42
CB-244A	0.081	0.059	0.47	0.05	0.47
CB-241A	0.137	0.091	0.73	0.16	0.73
CB-241	0.109	0.076	0.61	0.10	1.33
CB-228	0.003	0.002	0.02	0.00	0.02
CB-227	0.038	0.030	0.24	0.01	0.25
CB-234	0.174	0.111	0.89	0.24	2.22
CB-234A	0.295	0.167	1.34	0.58	1.34
CB-232C	0.001	0.001	0.01	0.00	0.01
CB-232	0.084	0.083	0.67	0.13	4.26
CB-232A	0.000	0.064	0.52	0.07	1.59
CB-239	0.152	0.107	0.86	0.23	2.12
CB-225	0.002	0.002	0.01	0.00	0.01
CB-232B	0.251	0.147	1.19	0.45	1.12
CB-243	0.420	0.234	1.88	1.14	4.18
CB-243A	0.186	0.120	0.97	0.29	0.97
CB-203A	0.057	0.043	0.35	0.02	0.35
CB-238A	0.162	0.117	0.94	0.28	0.94
CB-238	0.038	0.054	0.43	0.04	3.41
CB-231	0.071	0.065	0.52	0.07	4.71
CB-204A	0.004	0.003	0.02	0.00	0.02
CB-236	(N/A)	0.000	0.00	0.00	22.04
CB-237	(N/A)	0.000	0.00	0.00	3.40
CB-204	0.009	0.007	0.06	0.00	26.77
CB-205	0.029	0.023	0.19	0.00	26.79
CB-224	0.000	0.000	0.00	0.00	0.01
CB-242	0.486	0.535	4.30	0.00	18.77
CB-242A	1.360	1.138	9.15	0.00	10.64
CB-206A	0.633	0.513	4.12	0.00	25.69
CB-206	0.184	0.150	1.20	0.00	26.77
CB-208	0.026	0.021	0.17	0.00	0.17

25-YEAR ANALYSIS

Inlet Results - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)
CB-203	0.176	0.111	0.90	0.25	27.69
CB-226	0.330	0.182	1.46	0.69	2.08
CB-223	0.078	0.057	0.46	0.05	0.46
CB-209	0.255	0.149	1.20	0.46	3.13
CB-202A	0.095	0.069	0.56	0.08	0.56
CB-220A	0.043	0.033	0.27	0.01	0.27
CB-220	0.089	0.064	0.51	0.07	0.77
CB-230	0.087	0.069	0.55	0.08	5.75
CB-230A	0.100	0.076	0.61	0.10	0.61
CB-210	0.368	0.225	1.81	1.05	12.68
CB-229	0.748	0.332	2.67	2.21	8.15
CB-222	0.075	0.114	0.92	0.26	2.93
CB-211	0.197	0.193	1.55	0.78	14.01
CB-221A	0.070	0.076	0.61	0.10	5.88
CB-221	0.164	0.109	0.88	0.24	0.88
CB-202	0.042	0.059	0.47	0.05	28.46
CB-219	0.196	0.127	1.02	0.33	3.21
CB-219A	0.333	0.184	1.48	0.70	1.48
CB-214A	0.816	0.353	2.84	2.48	4.43
CB-213	0.296	0.216	1.74	0.97	15.42
CB-215	0.092	0.087	0.70	0.14	7.11
CB-216	0.064	0.058	0.47	0.05	13.05
CB-214	0.168	0.265	2.13	1.44	6.47
CB-201	0.417	0.219	1.76	1.00	29.95
CB-217A	0.280	0.221	1.78	1.02	39.74
CB-217	0.149	0.098	0.79	0.19	23.82
CB-218A	0.369	0.513	4.13	0.00	4.13
CB-218	0.466	0.442	3.55	0.00	10.53
CB-201A	0.689	0.313	2.51	1.98	32.13

25-YEAR ANALYSIS

Conduit Results - Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)
Pipe - (77) (BMP 2)	CB-244	CB-243	15.0	0.047	3.35	1.75	1.42	13.94
Pipe - (82) (BMP 2)	CB-244A	CB-244	15.0	0.010	2.46	1.12	0.47	6.36
Pipe - (249) (BMP 2)	DI-242C	DI-242B	18.0	0.021	2.87	4.80	0.94	15.32
Pipe - (70) (BMP 2)	CB-241A	CB-241	15.0	0.008	2.77	1.81	0.73	5.70
Pipe - (69) (BMP 2)	CB-241	CB-239	15.0	0.009	3.29	4.07	1.33	6.29
Pipe - (206) (BMP 2)	DI-209C	DI-209B	15.0	0.021	2.78	2.57	0.74	9.47
Pipe - (167) (BMP 2)	CB-228	CB-227	15.0	0.036	1.05	0.44	0.02	12.30
Pipe - (39) (BMP 2)	CB-227	CB-226	15.0	0.033	2.08	0.49	0.25	11.77
Pipe - (53) (BMP 2)	CB-234	CB-232	15.0	0.010	3.85	3.77	2.22	6.44
Pipe - (213) (BMP 2)	CB-234A	CB-234	15.0	0.008	3.30	2.33	1.34	5.77
Pipe - (161) (BMP 2)	CB-232C	CB-232B	15.0	0.004	0.21	0.03	0.01	3.93
Pipe - (248) (BMP 2)	DI-242B	CB-242A	18.0	0.013	3.52	2.87	1.94	11.94
Pipe - (250) (BMP 2)	DI-242D	DI-242B	18.0	0.005	0.06	0.03	0.01	7.43
Pipe - (54) (BMP 2)	CB-232	CB-231	18.0	0.033	4.51	8.70	4.26	19.09
Pipe - (59) (BMP 2)	CB-232A	CB-232	15.0	0.008	3.47	1.94	1.59	5.78
Pipe - (162) (BMP 2)	CB-232B	CB-232A	15.0	0.008	3.13	3.64	1.12	5.78

25-YEAR ANALYSIS

Conduit Results - Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)
Pipe - (67) (BMP 2)	CB-239	CB-238	18.0	0.020	3.61	2.60	2.12	14.76
Pipe - (163) (BMP 2)	CB-225	CB-224	15.0	0.026	0.98	1.44	0.01	10.37
Pipe - (207) (BMP 2)	DI-209B	DI-209A	15.0	0.035	3.29	6.46	1.32	12.06
Pipe - (74) (BMP 2)	CB-243	CB-242	18.0	0.008	4.48	3.34	4.18	9.66
Pipe - (80) (BMP 2)	CB-243A	CB-243	15.0	0.024	3.00	1.20	0.97	9.98
Pipe - (26) (BMP 2)	CB-203A	CB-203	15.0	0.192	2.26	0.28	0.35	28.32
Pipe - (72) (BMP 2)	CB-238A	CB-238	15.0	0.014	2.97	4.28	0.94	7.76
Pipe - (66) (BMP 2)	CB-238	CB-237	18.0	0.025	4.18	7.24	3.41	16.74
Pipe - (55) (BMP 2)	CB-231	CB-230	18.0	0.041	4.67	9.68	4.71	21.29
Pipe - (28) (BMP 2)	CB-204A	CB-204	15.0	0.157	1.13	0.02	0.02	25.62
Pipe - (218) (BMP 2)	CB-236	CB-206A	30.0	0.006	6.66	6.90	22.04	31.24
Pipe - (65) (BMP 2)	CB-237	CB-236	18.0	0.087	4.18	2.45	3.40	30.93
Pipe - (73) (BMP 2)	CB-242	CB-236	24.0	0.025	7.14	11.21	18.77	35.57
Pipe - (23) (BMP 2)	CB-204	CB-203	30.0	0.007	7.23	7.10	26.77	34.28
Pipe - (24) (BMP 2)	CB-205	CB-204	30.0	0.013	7.23	9.34	26.79	47.60
Pipe - (204) (BMP 2)	DI-213C	DI-212B	15.0	0.051	1.91	0.61	0.18	14.58

25-YEAR ANALYSIS

Conduit Results - Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)
Pipe - (25) (BMP 2)	CB-206	CB-205	30.0	0.008	7.23	7.23	26.77	36.63
Pipe - (164) (1) (BMP 2)	CB-224	CB-223	15.0	0.118	1.00	0.16	0.01	22.18
Pipe - (78) (BMP 2)	CB-242A	CB-242	24.0	0.015	5.58	4.05	10.64	27.29
Pipe - (211) (BMP 2)	CB-206A	CB-206	30.0	0.017	7.10	6.94	25.69	53.53
Pipe - (62) (1) (BMP 2)	CB-208	CB-209	18.0	0.027	1.82	0.25	0.17	17.27
Pipe - (22) (BMP 2)	CB-203	CB-202	30.0	0.010	7.34	7.24	27.69	41.45
Pipe - (207) (1) (BMP 2)	DI-209A	CB-209	15.0	0.026	3.61	6.37	1.81	10.42
Pipe - (40) (BMP 2)	CB-223	CB-226	15.0	0.006	2.43	1.73	0.46	4.81
Pipe - (42) (BMP 2)	CB-226	CB-222	18.0	0.030	3.59	2.83	2.08	18.31
Pipe - (62) (BMP 2)	CB-209	CB-210	24.0	0.018	3.79	1.47	3.13	30.69
Pipe - (21) (BMP 2)	CB-202A	CB-202	15.0	0.035	2.57	0.67	0.56	12.10
Pipe - (214) (BMP 2)	CB-220A	CB-220	15.0	0.012	2.11	0.97	0.27	7.06
Pipe - (30) (BMP 2)	CB-220	CB-219	15.0	0.046	2.81	1.60	0.77	13.89
Pipe - (56) (BMP 2)	CB-230	CB-229	18.0	0.028	5.02	8.41	5.75	17.50
Pipe - (61) (BMP 2)	CB-230A	CB-230	15.0	0.019	2.64	0.63	0.61	8.80
Pipe - (58) (BMP 2)	CB-210	CB-211	24.0	0.024	5.97	9.99	12.68	35.17

25-YEAR ANALYSIS
Conduit Results - Time: 0.00 hours

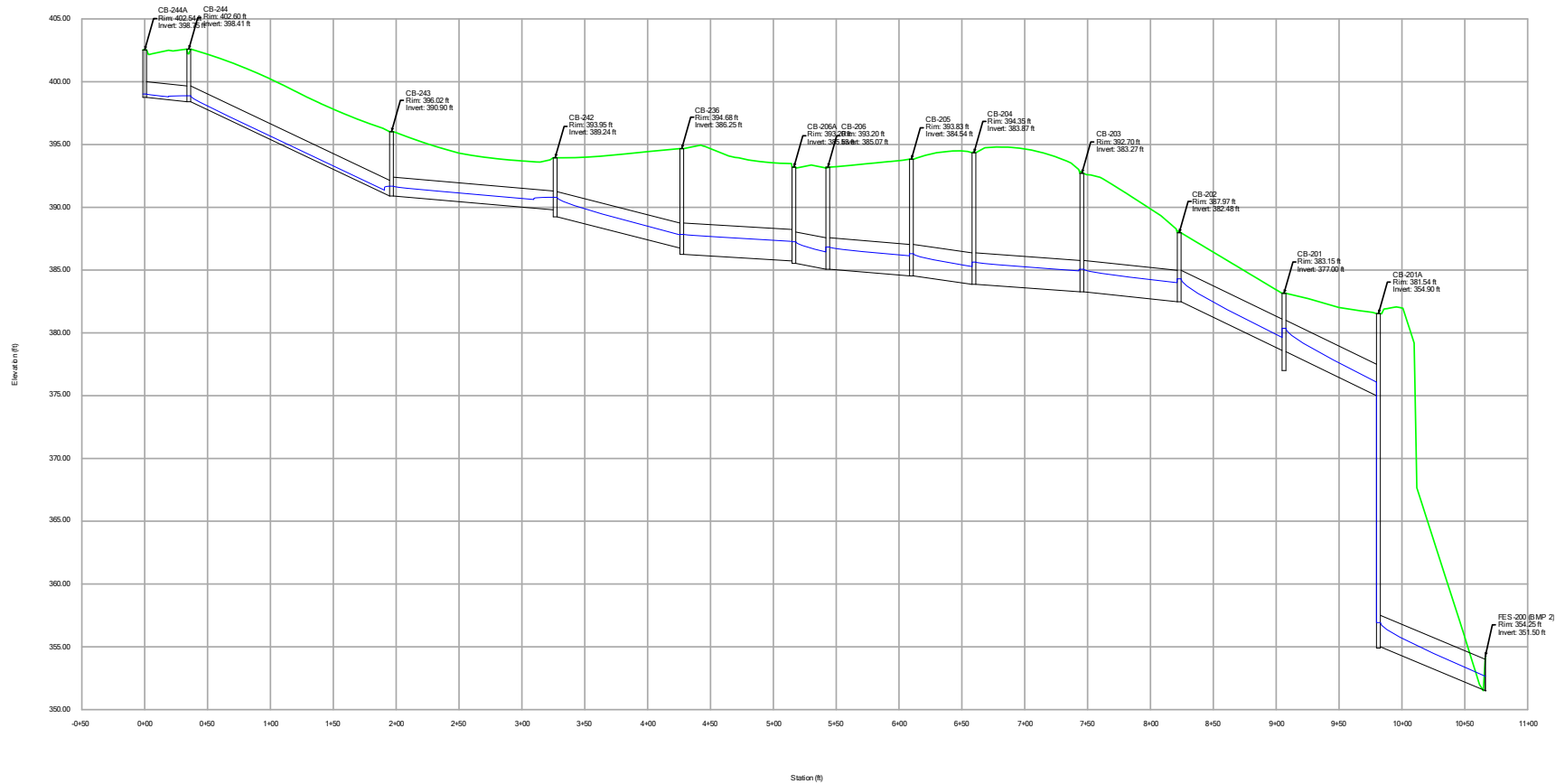
Label	Start Node	Stop Node	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)
Pipe - (57) (BMP 2)	CB-229	CB-210	24.0	0.009	5.08	6.13	8.15	20.94
Pipe - (43) (BMP 2)	CB-222	CB-221A	18.0	0.035	3.99	7.97	2.93	19.61
Pipe - (203) (BMP 2)	DI-212B	DI-212A	15.0	0.050	2.92	1.86	0.88	14.46
Pipe - (52) (BMP 2)	CB-211	CB-213	24.0	0.021	6.22	5.89	14.01	33.12
Pipe - (48) (BMP 2)	CB-221	CB-221A	15.0	0.055	2.92	6.71	0.88	15.12
Pipe - (44) (BMP 2)	CB-221A	CB-216	18.0	0.009	5.07	3.77	5.88	10.11
Pipe - (267) (BMP 2)	DI-221B	CB-221A	18.0	0.005	1.64	1.10	1.68	7.43
Pipe - (20) (BMP 2)	CB-202	CB-201	30.0	0.047	7.44	14.80	28.46	88.48
Pipe - (31) (BMP 2)	CB-219	CB-218	15.0	0.015	4.37	6.11	3.21	7.91
Pipe - (35) (BMP 2)	CB-219A	CB-219	15.0	0.045	3.39	2.01	1.48	13.75
Pipe - (202) (BMP 2)	CB-214A	CB-214	15.0	0.020	4.96	4.27	4.43	9.06
Pipe - (202) (3) (BMP 2)	DI-212A	CB-214A	15.0	0.080	3.52	1.86	1.66	18.27
Pipe - (229) (BMP 2)	CB-213	CB-217A	24.0	0.023	6.49	5.93	15.42	34.08
Pipe - (50) (BMP 2)	CB-214	CB-215	18.0	0.010	5.27	4.60	6.47	10.76
Pipe - (45) (BMP 2)	CB-215	CB-216	18.0	0.005	4.61	4.53	7.11	7.43
Pipe - (46) (BMP 2)	CB-216	CB-217	18.0	0.027	7.78	10.13	13.05	17.13

25-YEAR ANALYSIS

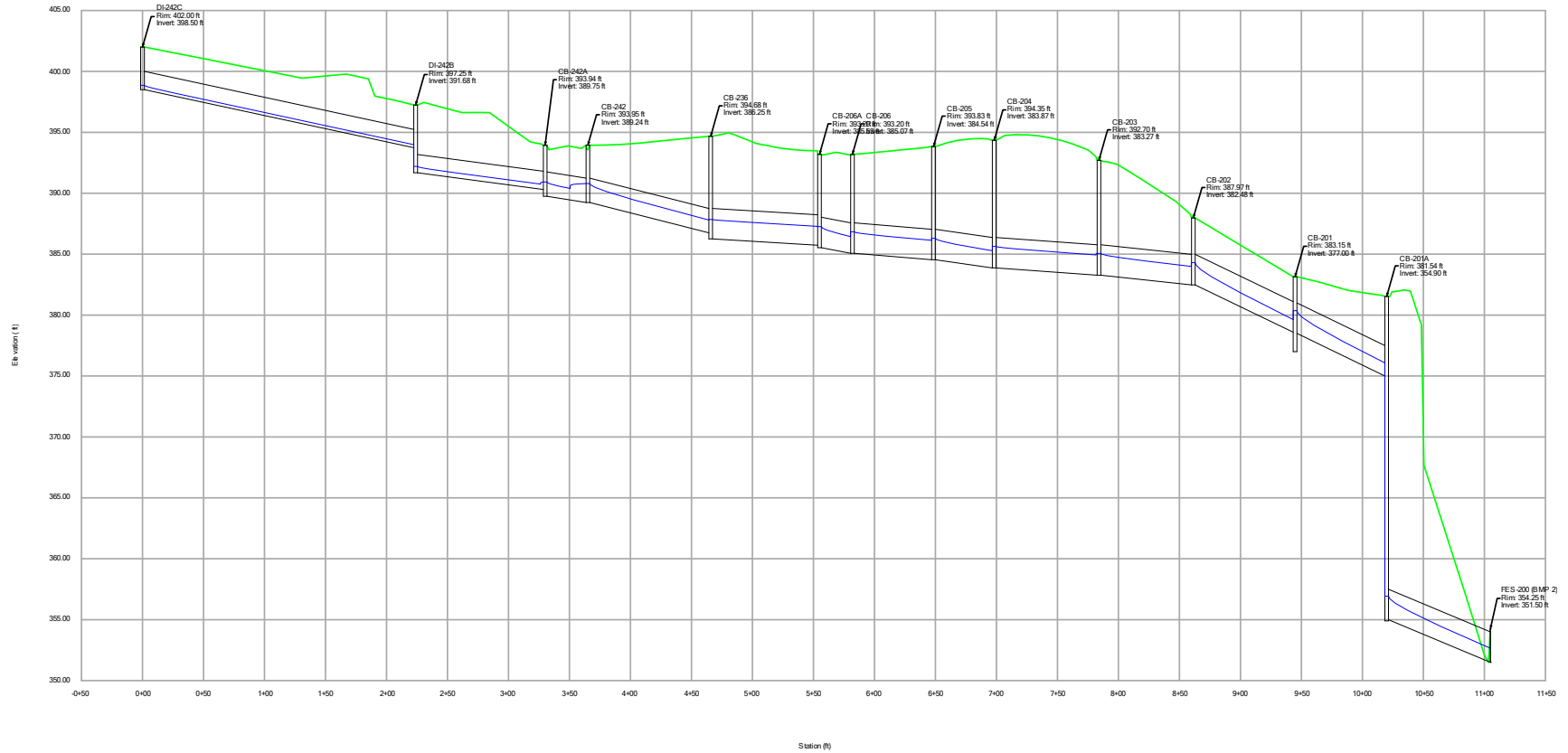
Conduit Results - Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)
Pipe - (222) (BMP 2)	CB-217	CB-217A	30.0	0.005	5.82	5.61	23.82	29.00
Pipe - (222) (1) (BMP 2)	CB-217A	DI-217B	30.0	0.048	8.94	16.99	39.74	89.66
Pipe - (32) (BMP 2)	CB-218	CB-217	24.0	0.010	4.65	3.48	10.53	22.39
Pipe - (36) (BMP 2)	CB-218A	CB-218	24.0	0.010	2.43	1.82	4.13	22.76
Pipe - (223) (BMP 2)	DI-217B	FES-250 (BMP 2)	30.0	0.169	8.91	26.87	39.52	168.44
Pipe - (19) (BMP 2)(1)	CB-201A	FES-200 (BMP 2)	30.0	0.041	7.90	14.56	32.13	83.21
Pipe - (19) (BMP 2)(2)	CB-201	CB-201A	30.0	0.047	7.62	14.72	29.95	88.54

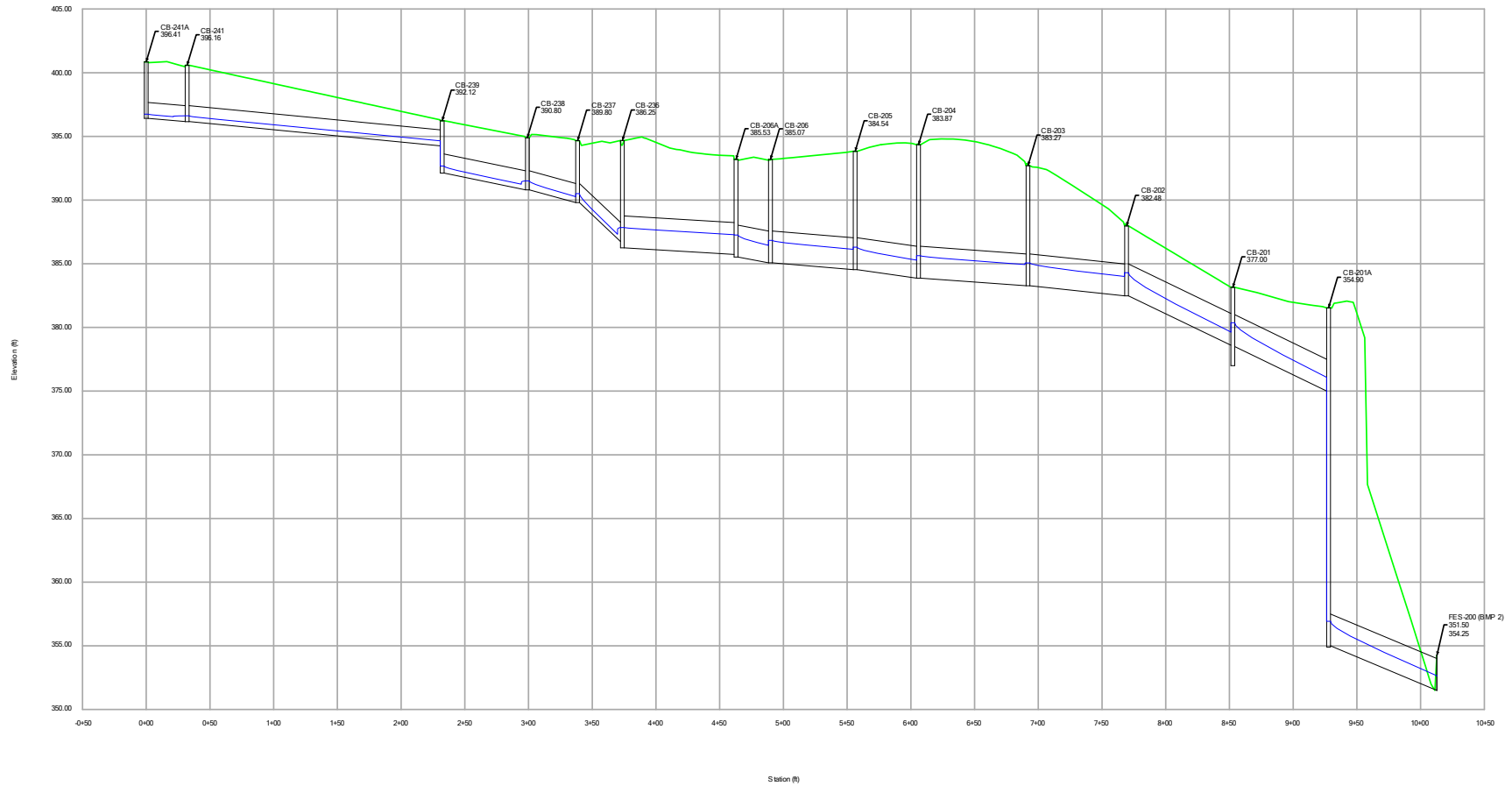
25-YEAR ANALYSIS



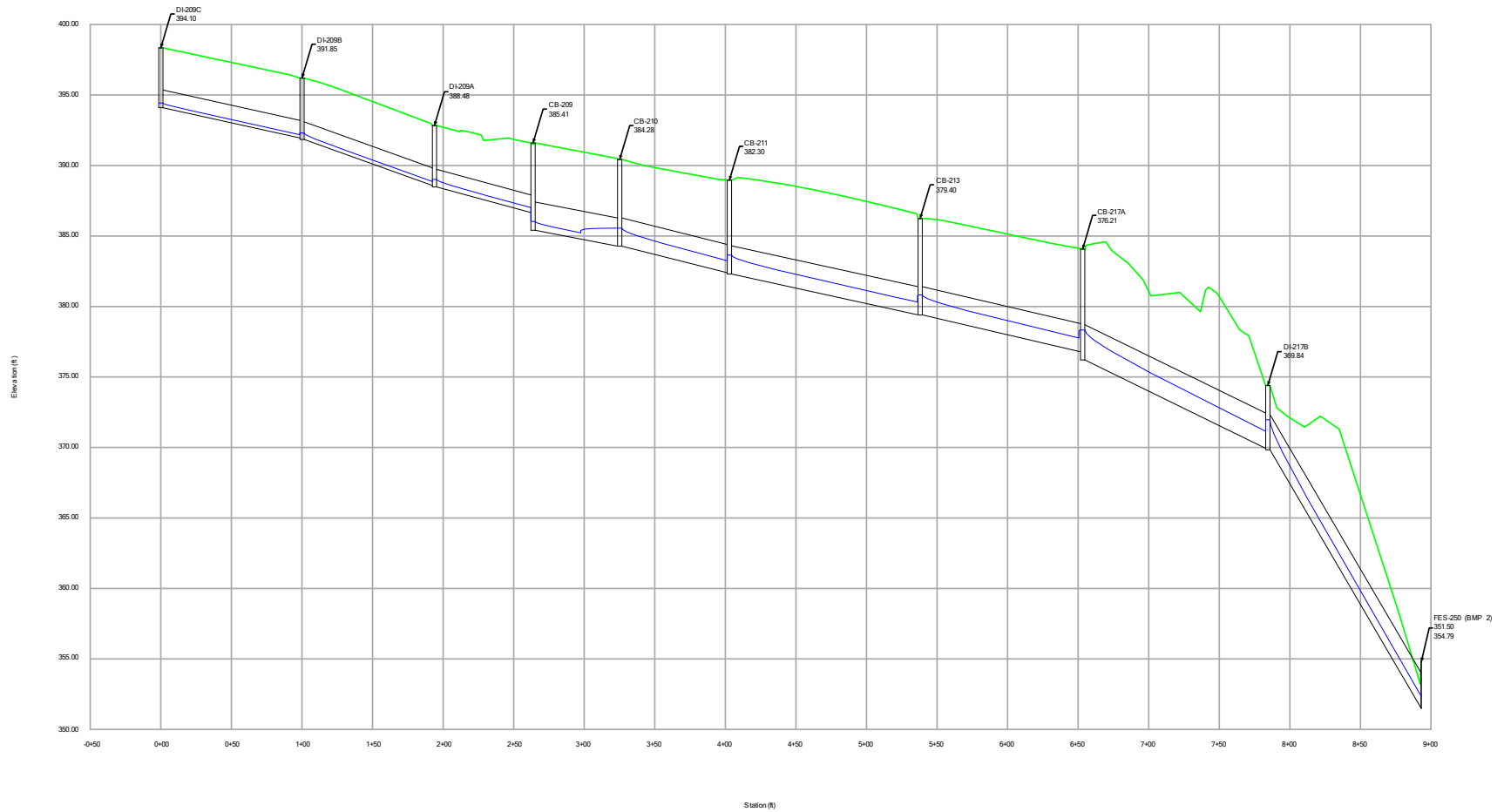
25-YEAR ANALYSIS



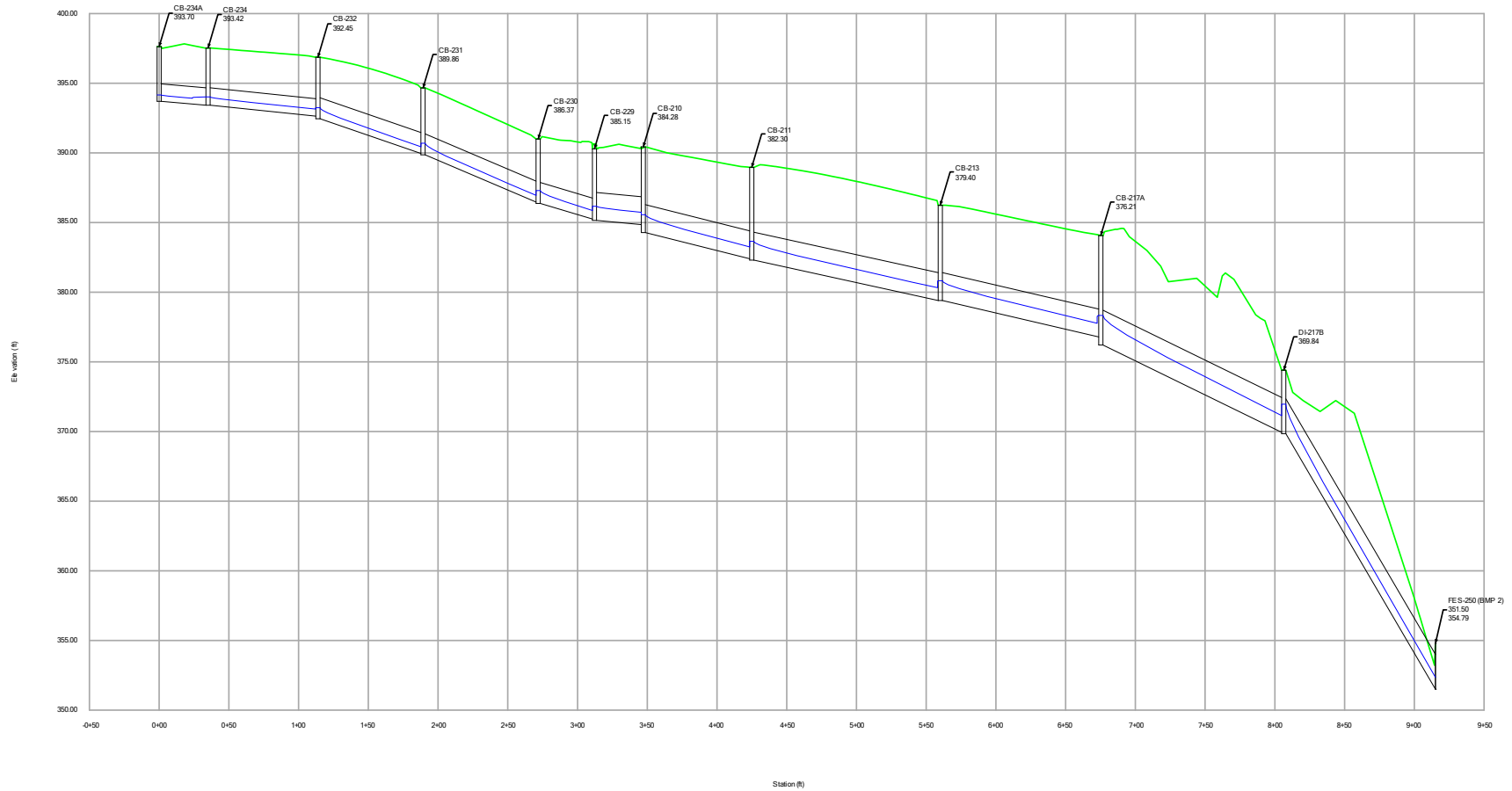
25-YEAR ANALYSIS



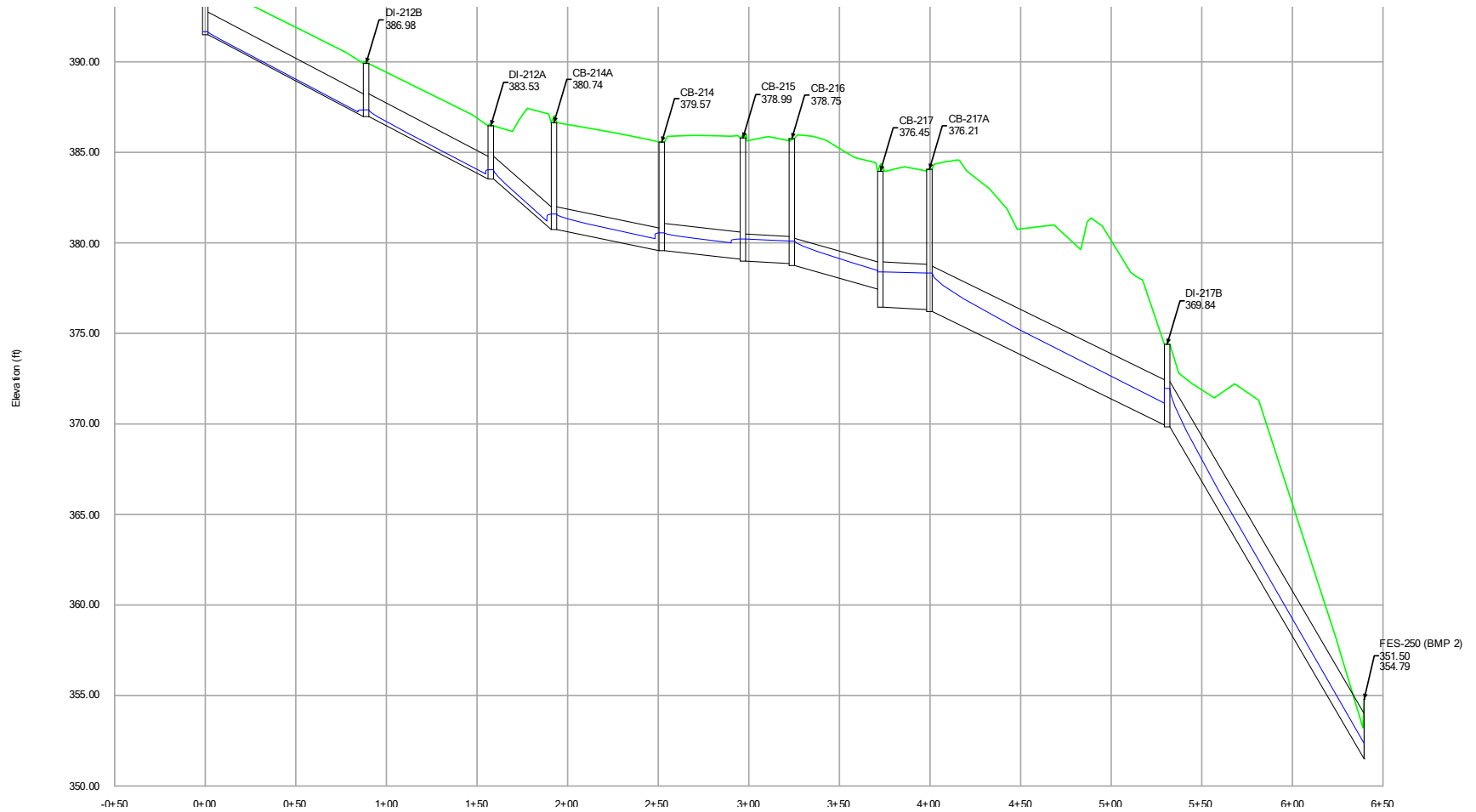
25-YEAR ANALYSIS



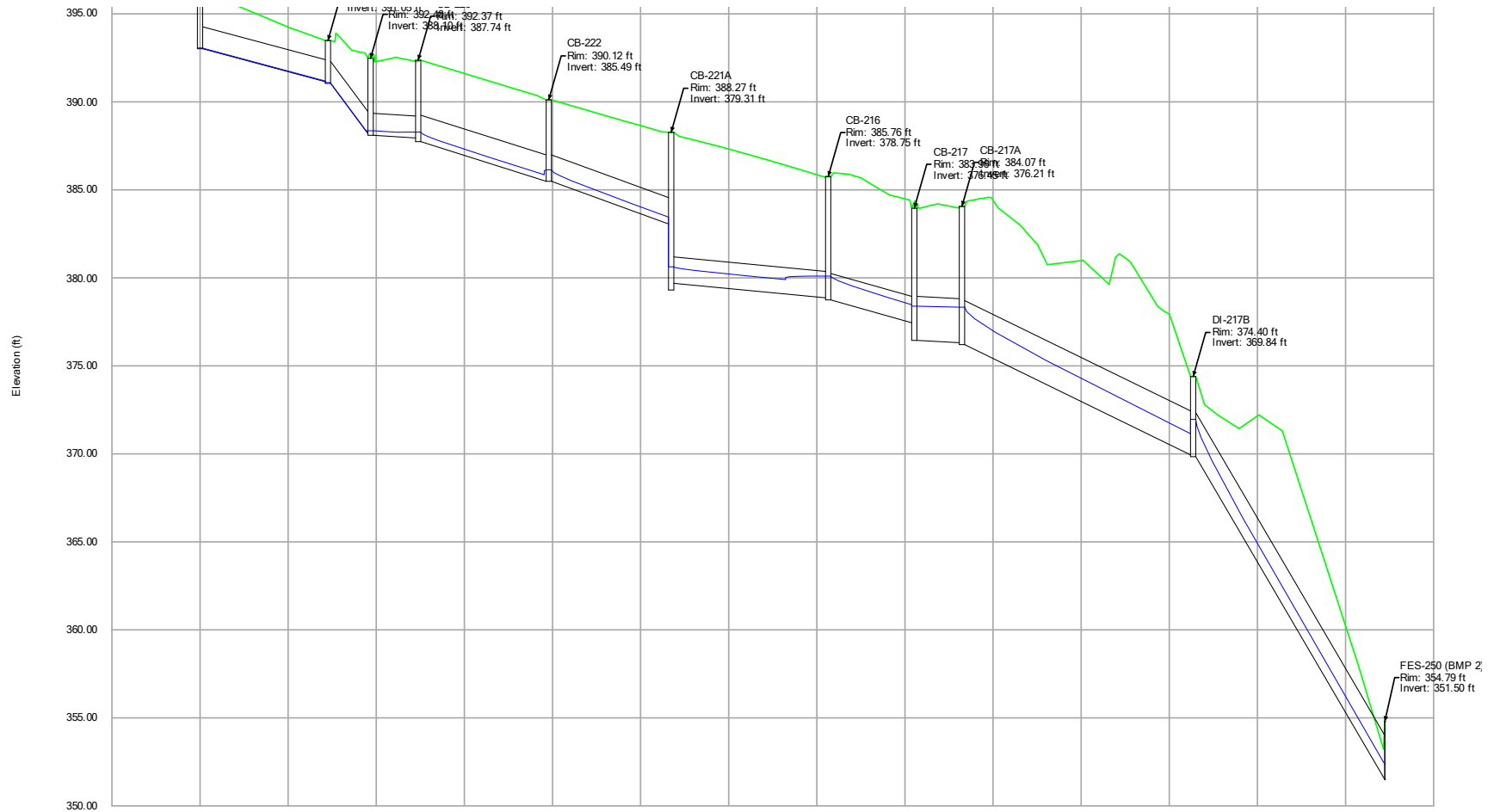
25-YEAR ANALYSIS



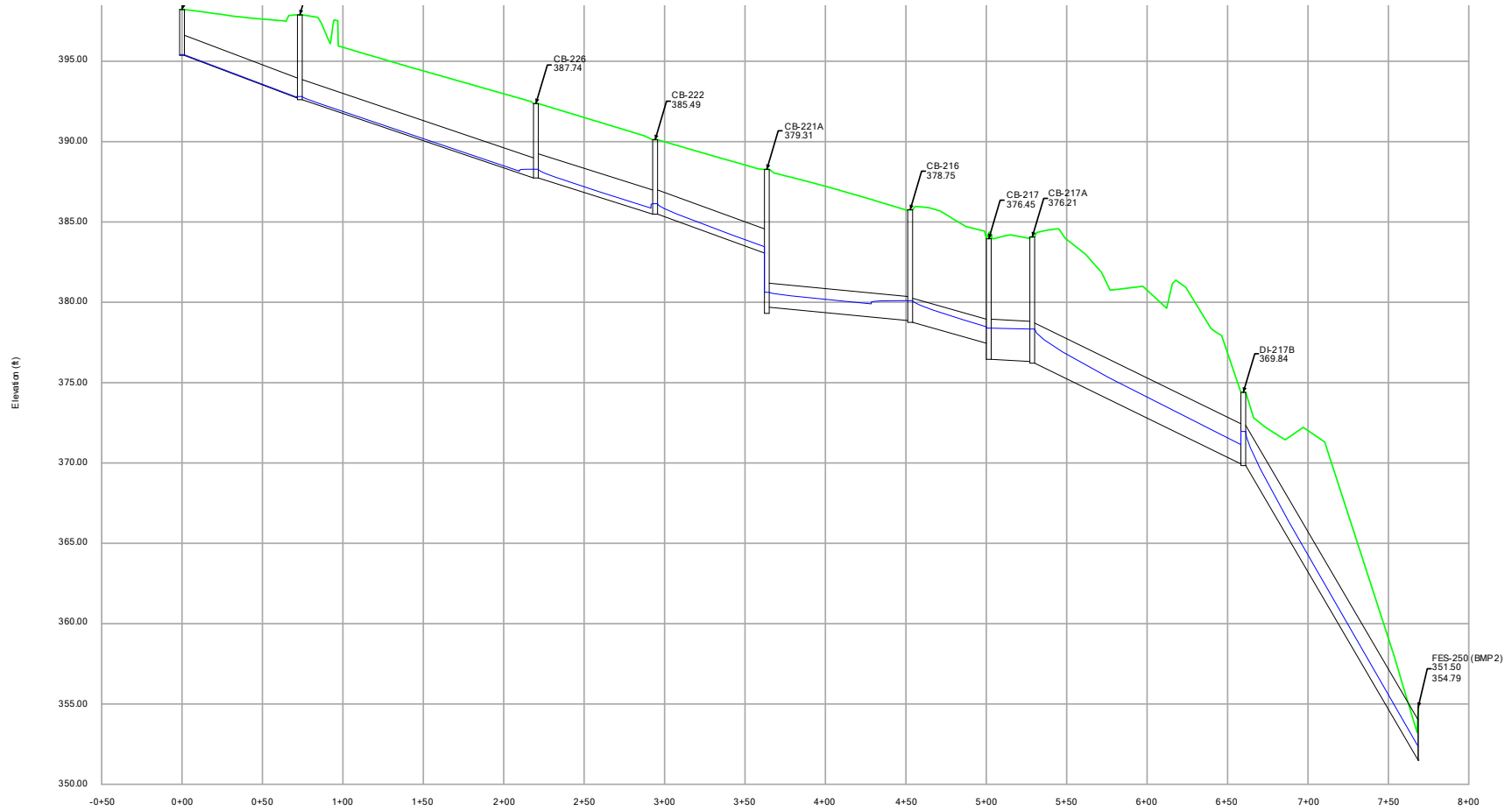
25-YEAR ANALYSIS



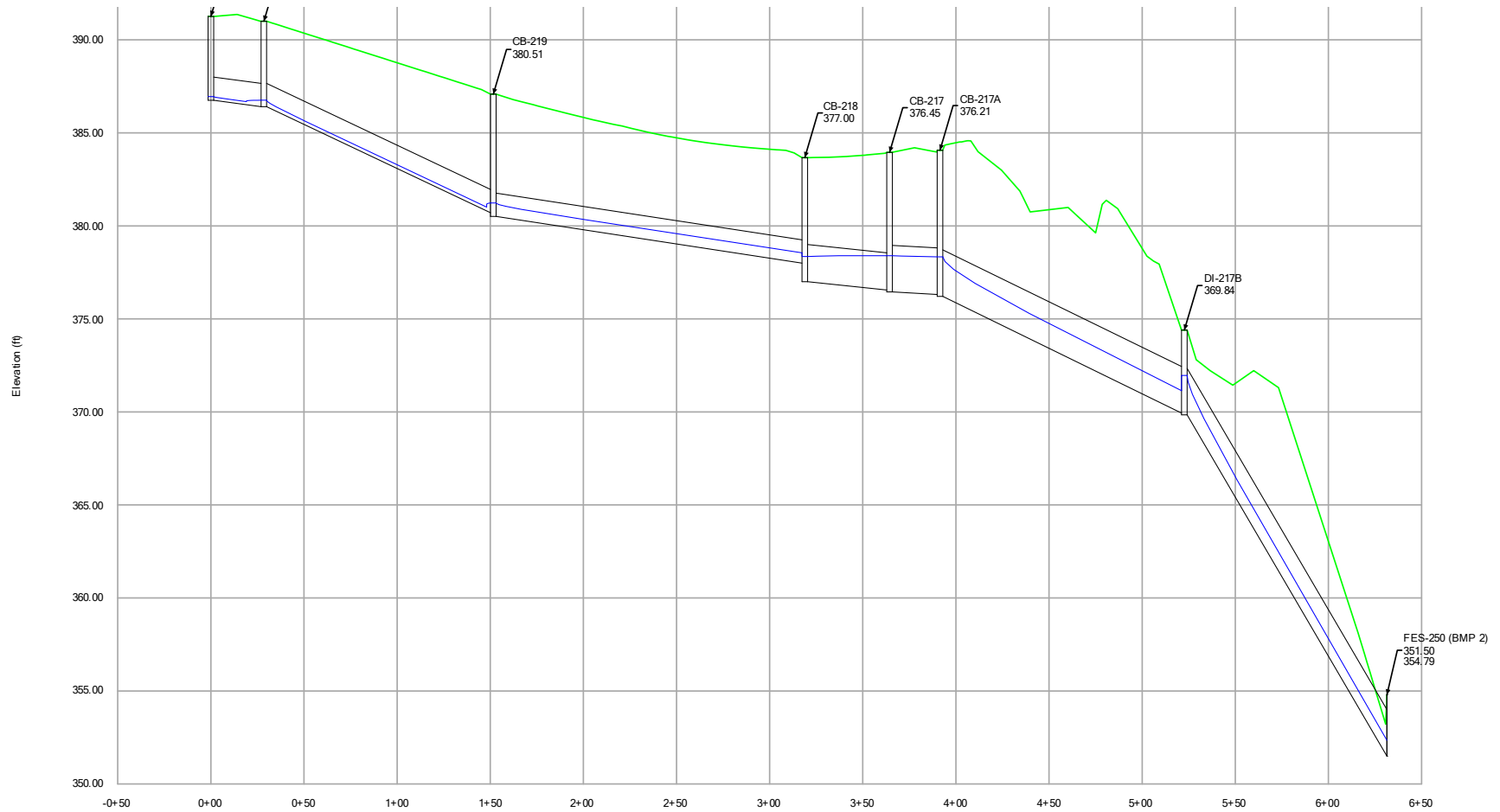
25-YEAR ANALYSIS



25-YEAR ANALYSIS



25-YEAR ANALYSIS



Inlet Spread - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Spread / Top Width (ft)
-------	-----------------------------	------------------------	-----------------------	-----------------------------	-------------------------

SCM 2 – INLET SPREAD

Inlet Spread - Time: 0.00 hours

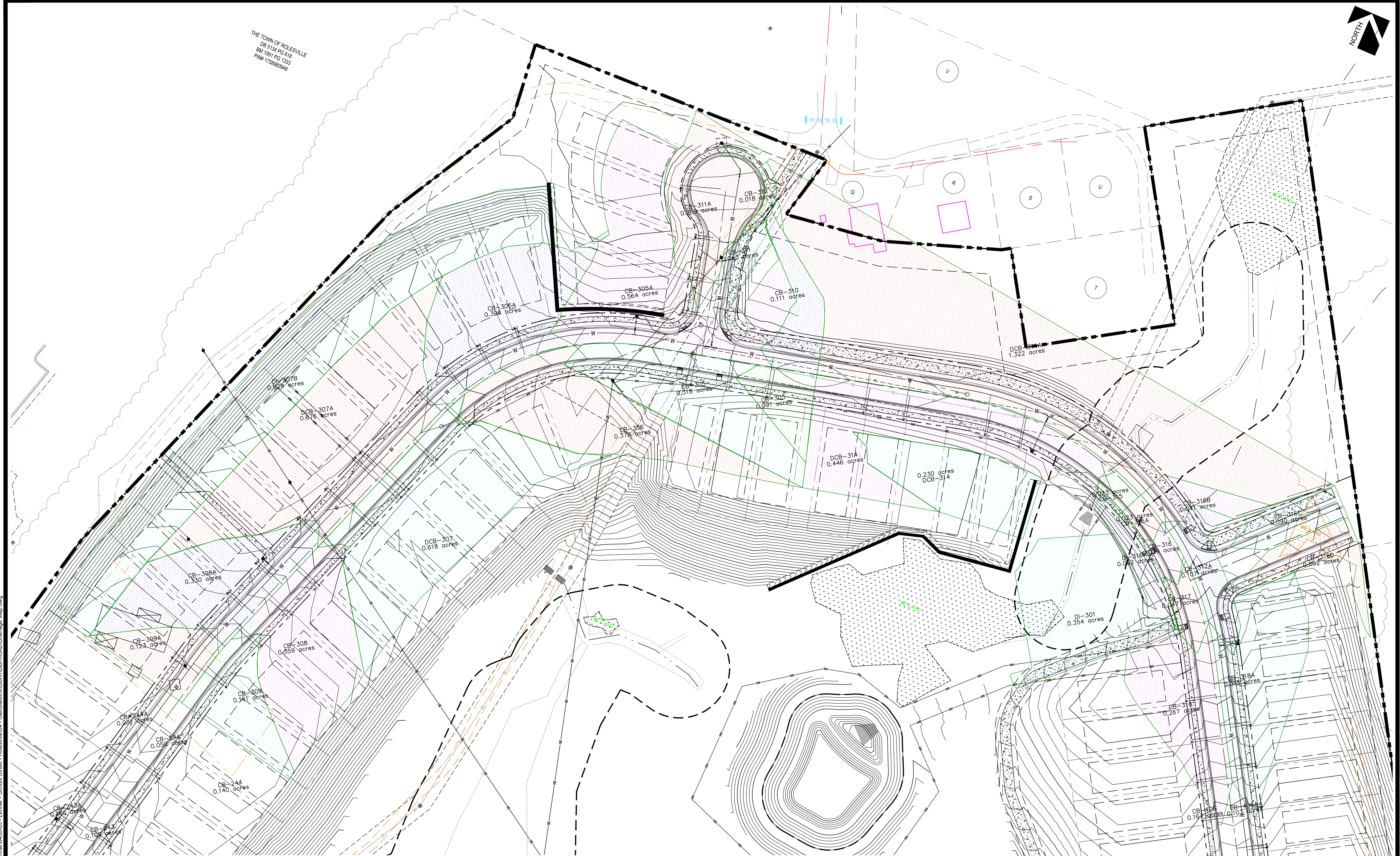
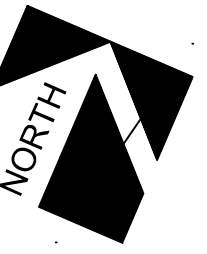
Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Spread / Top Width (ft)
CB-244	0.190	0.127	0.72	0.15	5.6
CB-244A	0.081	0.061	0.35	0.02	4.0
CB-241A	0.137	0.097	0.55	0.08	4.9
CB-241	0.109	0.080	0.45	0.05	4.5
CB-228	0.003	0.002	0.01	0.00	1.1
CB-227	0.038	0.030	0.17	0.00	3.0
CB-234	0.174	0.118	0.67	0.13	5.4
CB-234A	0.295	0.181	1.02	0.33	6.6
CB-232C	0.001	0.001	0.01	0.00	0.8
CB-232	0.084	0.082	0.46	0.05	4.6
CB-232A	0.000	0.056	0.32	0.02	3.9
CB-239	0.152	0.112	0.63	0.11	5.2
CB-225	0.002	0.002	0.01	0.00	1.0
CB-232B	0.251	0.159	0.90	0.25	6.2
CB-243	0.420	0.251	1.42	0.66	7.7
CB-243A	0.186	0.127	0.72	0.15	5.6
CB-203A	0.057	0.045	0.25	0.01	3.5
CB-238A	0.162	0.121	0.69	0.14	5.4
CB-238	0.038	0.048	0.27	0.01	3.7
CB-231	0.071	0.062	0.35	0.02	4.1
CB-204A	0.004	0.003	0.02	0.00	1.3
CB-236	(N/A)	0.000	0.00	0.00	0.0
CB-237	(N/A)	0.000	0.00	0.00	0.0
CB-204	0.009	0.007	0.04	0.00	1.8
CB-205	0.029	0.023	0.13	0.00	2.7
CB-224	0.000	0.000	0.00	0.00	0.5
CB-242	0.486	0.509	2.88	0.00	9.1
CB-242A	1.360	1.128	6.39	0.00	15.4
CB-206A	0.633	0.513	2.90	0.00	9.2
CB-206	0.184	0.149	0.85	0.00	3.9
CB-208	0.026	0.021	0.12	0.00	2.7
CB-203	0.176	0.119	0.68	0.13	5.4

Inlet Spread - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Spread / Top Width (ft)
CB-226	0.330	0.197	1.12	0.40	6.8
CB-223	0.078	0.060	0.34	0.02	4.0
CB-209	0.255	0.161	0.91	0.26	6.2
CB-202A	0.095	0.072	0.41	0.04	4.3
CB-220A	0.043	0.034	0.19	0.00	3.2
CB-220	0.089	0.067	0.38	0.03	4.2
CB-230	0.087	0.069	0.39	0.03	4.2
CB-230A	0.100	0.076	0.43	0.04	4.4
CB-210	0.368	0.239	1.36	0.59	7.5
CB-229	0.748	0.365	2.07	1.36	9.3
CB-222	0.075	0.111	0.63	0.11	5.2
CB-211	0.197	0.195	1.11	0.39	6.8
CB-221A	0.070	0.070	0.40	0.03	4.3
CB-221	0.164	0.115	0.65	0.12	5.3
CB-202	0.042	0.055	0.31	0.02	3.8
CB-219	0.196	0.134	0.76	0.17	5.7
CB-219A	0.333	0.199	1.13	0.40	6.9
CB-214A	0.816	0.389	2.20	1.54	9.6
CB-213	0.296	0.220	1.25	0.50	7.2
CB-215	0.092	0.086	0.49	0.06	4.7
CB-216	0.064	0.055	0.31	0.02	3.8
CB-214	0.168	0.272	1.54	0.77	8.0
CB-201	0.417	0.237	1.34	0.58	7.5
CB-217A	0.280	0.224	1.27	0.52	7.3
CB-217	0.149	0.104	0.59	0.09	5.1
CB-218A	0.369	0.462	2.62	0.00	8.5
CB-218	0.466	0.425	2.41	0.00	8.1
CB-201A	0.689	0.344	1.95	1.22	9.0

ATTACHMENT 3: DRAINAGE AREA MAPS – SCM 3

THE TOWN OF ROLESVILLE
CB 5134 PG 618
BM 1991 PG 1333
PIN# 1758880948



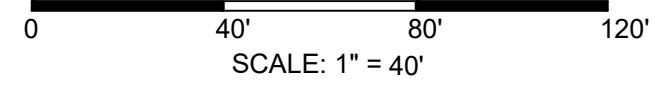
G:\NC\Projects\Lemnar\8430-03 - Lemnar - School Street - Rolesville\04 - Calculations\Storm\StormCAD\Drainage Map.dwg



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

SCM 3 DRAINAGE MAP

DATE: 6/1/2023



THIS DOCUMENT, TOGETHER WITH THE CONCEPTS AND DESIGNS PRESENTED HEREIN, AS AN INSTRUMENT OF SERVICE, IS INTENDED ONLY FOR THE SPECIFIC PURPOSE AND CLIENT FOR WHICH IT WAS PREPARED. REUSE OF AND IMPROPER RELIANCE ON THIS DOCUMENT WITHOUT WRITTEN AUTHORIZATION AND ADAPTATION BY BGE INC. SHALL BE WITHOUT LIABILITY TO BGE INC.

SCM 3 – 10 YR STORM

SCM 3 STORM SEWER ANALYSIS

10-YEAR ANALYSIS

Inlet Results - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)
CB-312	0.018	0.015	0.11	0.00	0.11
CB-311	0.043	0.034	0.25	0.01	1.45
CB-311A	0.259	0.155	1.12	0.40	1.12
CB-310	0.111	0.078	0.57	0.09	2.00
CB-303	0.091	0.066	0.48	0.06	21.29
CB-315	0.023	0.018	0.13	0.00	25.95
CB-316A	0.023	0.019	0.14	0.00	27.00
CB-316B	0.071	0.053	0.39	0.03	1.32
CB-314A	1.322	0.512	3.71	4.05	3.71
CB-314	0.676	0.317	2.30	1.67	26.06
CB-316	0.029	0.023	0.17	0.00	27.01
CB-316C	0.090	0.065	0.47	0.05	0.95
CB-316D	0.092	0.067	0.49	0.06	0.49
CB-309A	0.123	0.085	0.62	0.10	0.62
CB-309	0.161	0.106	0.77	0.18	1.37
CB-317	0.047	0.037	0.27	0.01	29.70
CB-305A	0.564	0.283	2.05	1.34	2.05
CB-305	0.318	0.185	1.34	0.58	19.30
CB-317A	0.107	0.076	0.55	0.08	0.55
DI-316A	0.000	0.000	0.00	0.00	0.00
CB-308A	0.330	0.194	1.41	0.64	1.41
CB-308	0.359	0.211	1.53	0.75	4.22
CB-306	0.378	0.246	1.78	1.02	16.27
CB-306A	0.396	0.300	2.17	1.49	2.17
CB-307A	0.676	0.432	3.13	2.97	5.69
CB-307	0.618	0.396	2.87	2.53	12.59
DI-307B	0.829	0.368	2.67	2.20	2.67
CB-318A	0.315	0.186	1.35	0.58	1.35
CB-318	0.267	0.159	1.15	0.42	2.49

SCM 3 STORM SEWER ANALYSIS

10-YEAR ANALYSIS

Inlet Results - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)
DI-301	0.000	0.000	0.00	0.00	29.07

SCM 3 STORM SEWER ANALYSIS

10-YEAR ANALYSIS

Conduit Results - Time: 0.00 hours

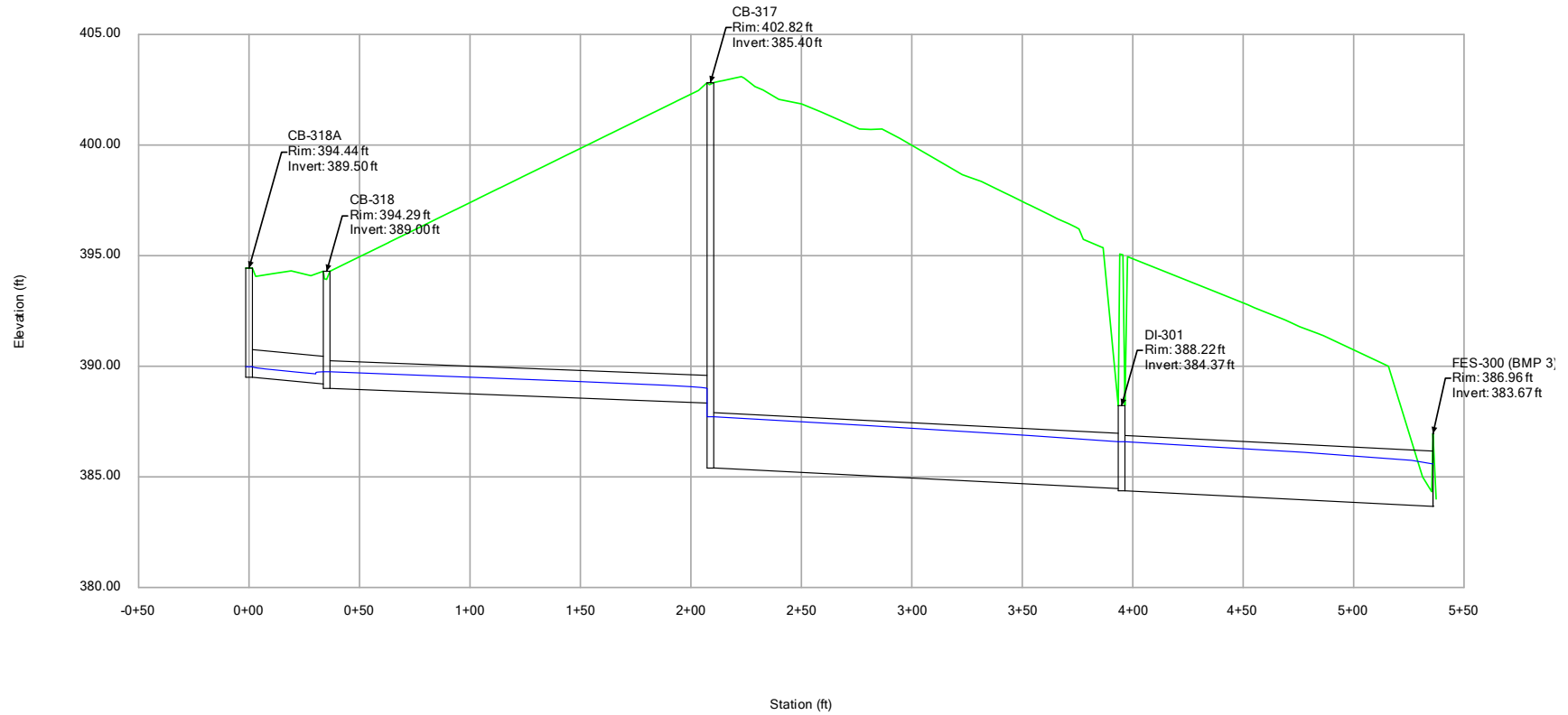
Label	Start Node	Stop Node	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)
Pipe - (92)	CB-312	CB-311	15.0	0.052	1.66	0.33	0.11	14.78
Pipe - (93)	CB-311	CB-310	15.0	0.005	3.31	3.38	1.45	4.57
Pipe - (251)	CB-311A	CB-311	18.0	0.020	3.01	4.91	1.12	14.71
Pipe - (94)	CB-310	CB-303	18.0	0.028	3.55	6.56	2.00	17.57
Pipe - (95)	CB-303	CB-314	30.0	0.006	6.57	5.77	21.29	31.78
Pipe - (109)	CB-305	CB-303	24.0	0.006	6.53	7.25	19.30	18.09
Pipe - (90)	CB-315	CB-316A	30.0	0.004	6.16	7.13	25.95	25.11
Pipe - (99)	CB-314	CB-315	30.0	0.005	6.66	6.49	26.06	29.00
Pipe - (91)	CB-316A	CB-316	30.0	0.007	7.26	7.00	27.00	34.28
Pipe - (255)	CB-316B	CB-316A	18.0	0.005	3.15	3.17	1.32	7.43
Pipe - (256)	CB-316C	CB-316B	18.0	0.005	2.88	2.28	0.95	7.43
Pipe - (254)	CB-314A	CB-314	18.0	0.237	4.30	16.83	3.71	51.09
Pipe - (89)	CB-316	CB-317	30.0	0.005	6.63	6.45	27.01	29.00
Pipe - (258)	DI-316A	CB-316	18.0	0.239	0.00	0.00	0.00	51.35
Pipe - (257)	CB-316D	CB-316C	18.0	0.038	2.40	4.83	0.49	20.53
Pipe - (103)	CB-309A	CB-309	15.0	0.005	2.60	2.11	0.62	4.57
Pipe - (101)	CB-309	CB-308	15.0	0.029	3.32	2.62	1.37	11.02
Pipe - (86)	CB-317A	CB-317	15.0	0.005	2.49	2.56	0.55	4.53
Pipe - (87)	CB-318	CB-317	15.0	0.004	3.43	4.00	2.49	4.00
Pipe - (85)	CB-317	DI-301	30.0	0.005	6.77	7.26	29.70	29.00
Pipe - (112)	CB-305A	CB-305	15.0	0.010	3.76	4.71	2.05	6.53
Pipe - (107)	CB-306	CB-305	24.0	0.008	6.65	5.79	16.27	19.98
Pipe - (104)	CB-308A	CB-308	15.0	0.005	2.61	1.90	1.41	4.57
Pipe - (102)	CB-308	CB-307	15.0	0.026	4.86	8.02	4.22	10.39
Pipe - (110)	CB-306A	CB-306	15.0	0.049	3.83	1.77	2.17	14.23
Pipe - (106)	CB-307	CB-306	24.0	0.007	5.95	5.56	12.59	19.10
Pipe - (105)	CB-307A	CB-307	18.0	0.005	4.18	3.84	5.69	7.43
Pipe - (253)	DI-307B	CB-307A	18.0	0.005	3.86	2.19	2.67	7.43
Pipe - (88)	CB-318A	CB-318	15.0	0.009	3.30	2.83	1.35	5.97

SCM 3 STORM SEWER ANALYSIS **10-YEAR ANALYSIS**

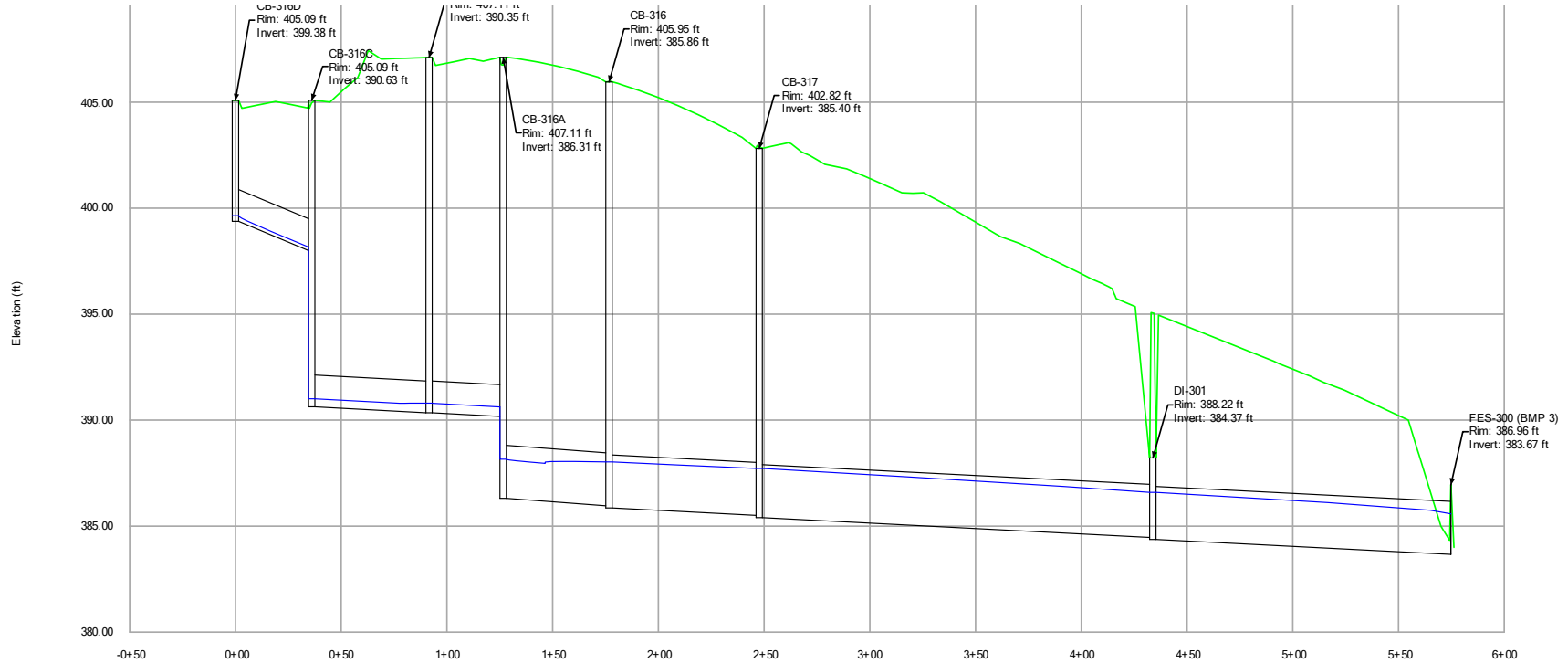
Conduit Results - Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)
Pipe - (84)	DI-301	FES-300 (BMP 3)	30.0	0.005	6.77	7.51	29.07	29.00

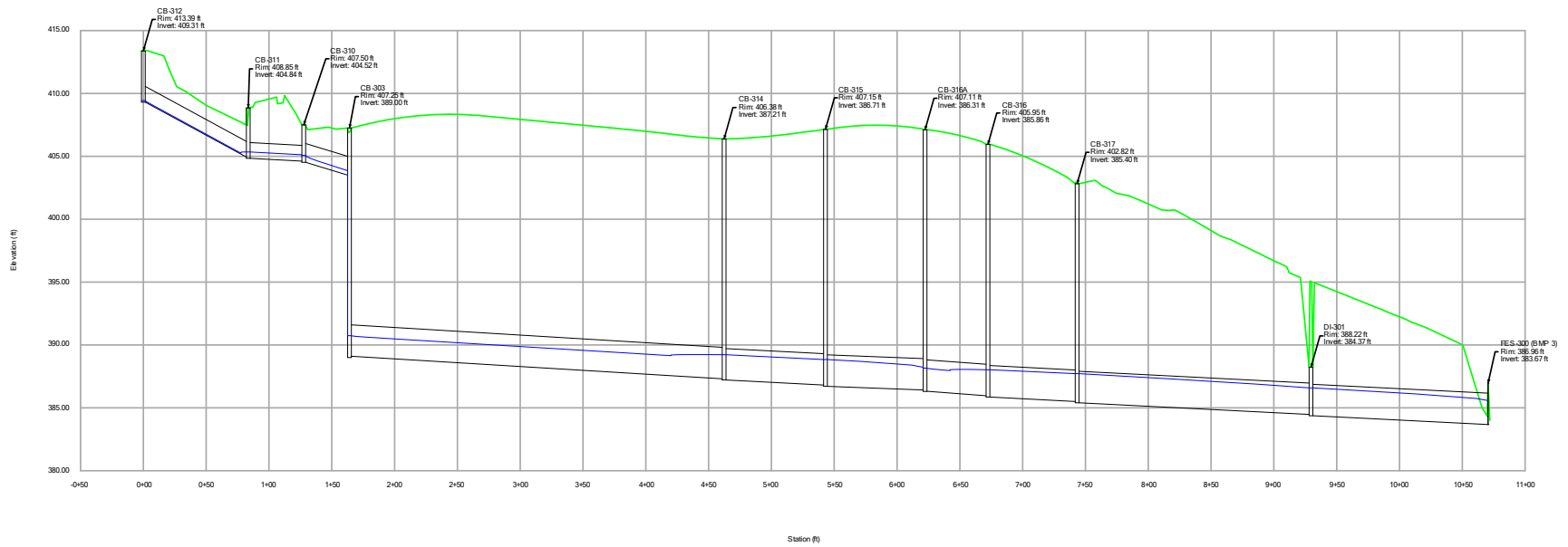
SCM 3 STORM SEWER ANALYSIS 10-YEAR ANALYSIS



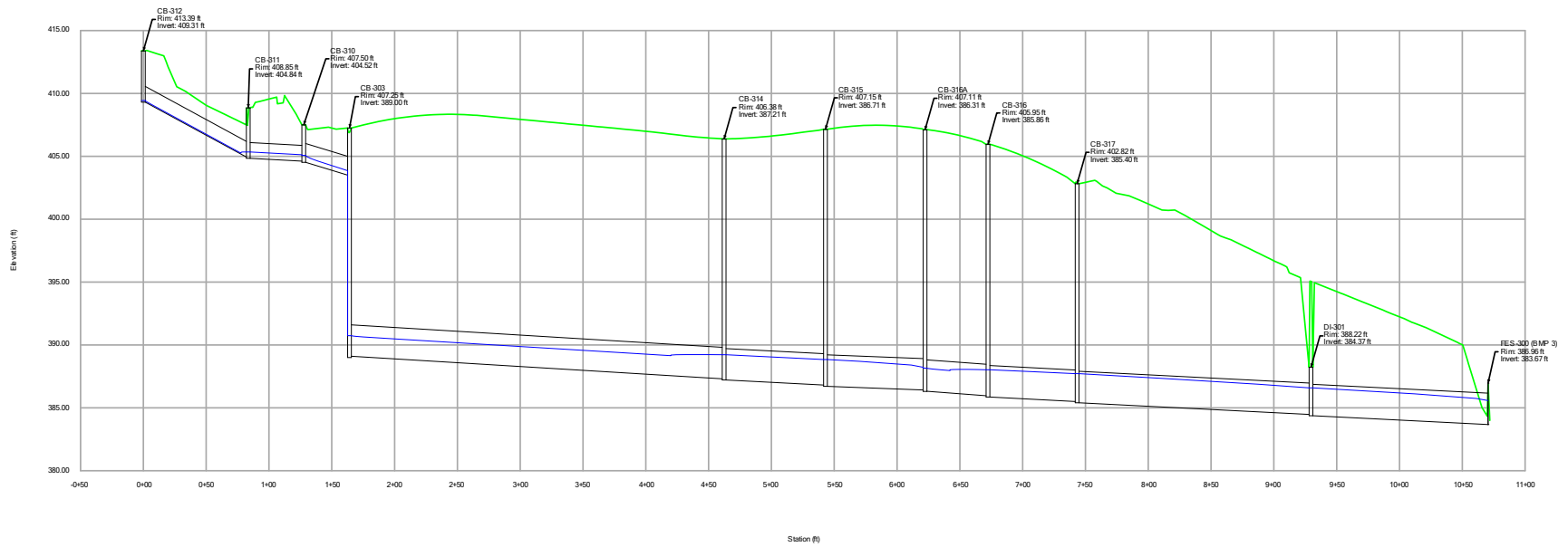
SCM 3 STORM SEWER ANALYSIS 10-YEAR ANALYSIS



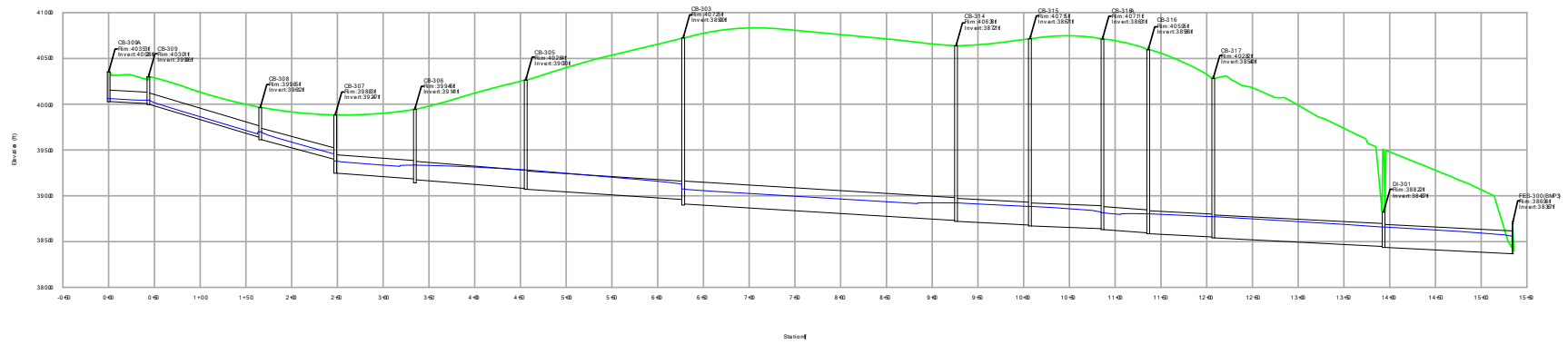
SCM 3 STORM SEWER ANALYSIS 10-YEAR ANALYSIS



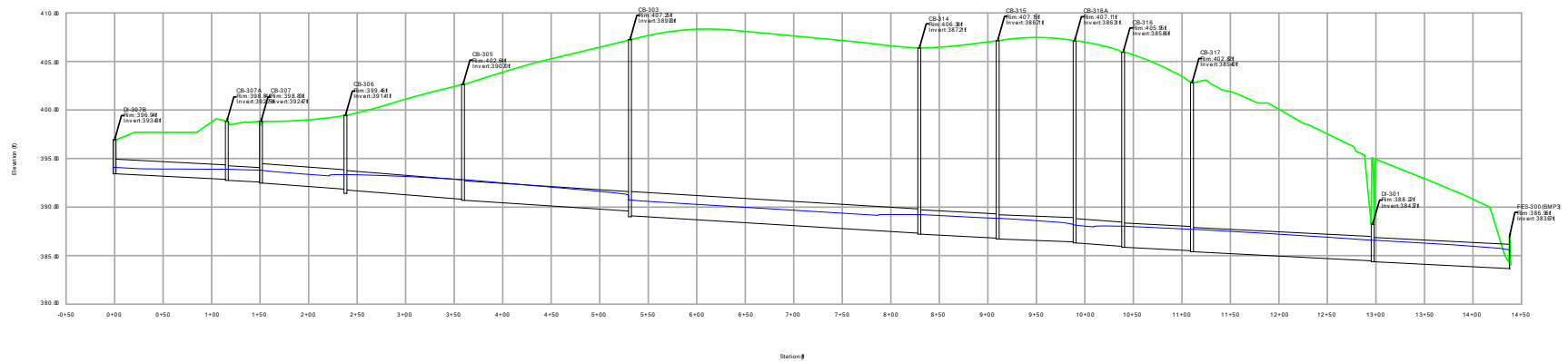
SCM 3 STORM SEWER ANALYSIS 25-YEAR ANALYSIS



SCM 3 STORM SEWER ANALYSIS 10-YEAR ANALYSIS



SCM 3 STORM SEWER ANALYSIS 10-YEAR ANALYSIS



25-YEAR ANALYSIS

Inlet Results - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)
CB-312	0.018	0.015	0.12	0.00	0.12

SCM 3 – 25 YR STORM

SCM 3 STORM SEWER ANALYSIS

25-YEAR ANALYSIS

Inlet Results - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)
CB-311	0.043	0.034	0.27	0.01	1.58
CB-311A	0.259	0.151	1.22	0.47	1.22
CB-310	0.111	0.077	0.62	0.11	2.17
CB-303	0.091	0.065	0.52	0.07	23.19
CB-315	0.023	0.018	0.15	0.00	28.20
CB-316A	0.023	0.019	0.15	0.00	29.35
CB-316B	0.071	0.052	0.42	0.04	1.44
CB-314A	1.322	0.496	3.99	4.62	3.99
CB-314	0.676	0.308	2.48	1.92	28.33
CB-316	0.029	0.023	0.19	0.00	29.37
CB-316C	0.090	0.064	0.52	0.07	1.04
CB-316D	0.092	0.066	0.53	0.07	0.53
CB-309A	0.123	0.083	0.67	0.13	0.67
CB-309	0.161	0.104	0.83	0.21	1.49
CB-317	0.047	0.037	0.30	0.01	32.28
CB-305A	0.564	0.276	2.22	1.56	2.22
CB-305	0.318	0.181	1.46	0.69	21.01
CB-317A	0.107	0.074	0.60	0.10	0.60
DI-316A	0.000	0.000	0.00	0.00	0.00
CB-308A	0.330	0.190	1.53	0.75	1.53
CB-308	0.359	0.207	1.66	0.89	4.59
CB-306	0.378	0.241	1.94	1.21	17.73
CB-306A	0.396	0.295	2.37	1.77	2.37
CB-307A	0.676	0.426	3.43	3.50	6.18
CB-307	0.618	0.390	3.14	2.98	13.71
DI-307B	0.829	0.357	2.87	2.53	2.87
CB-318A	0.315	0.182	1.46	0.69	1.46
CB-318	0.267	0.156	1.25	0.50	2.70
DI-301	0.000	0.000	0.00	0.00	31.58

SCM 3 STORM SEWER ANALYSIS

25-YEAR ANALYSIS

Conduit Results - Time: 0.00 hours

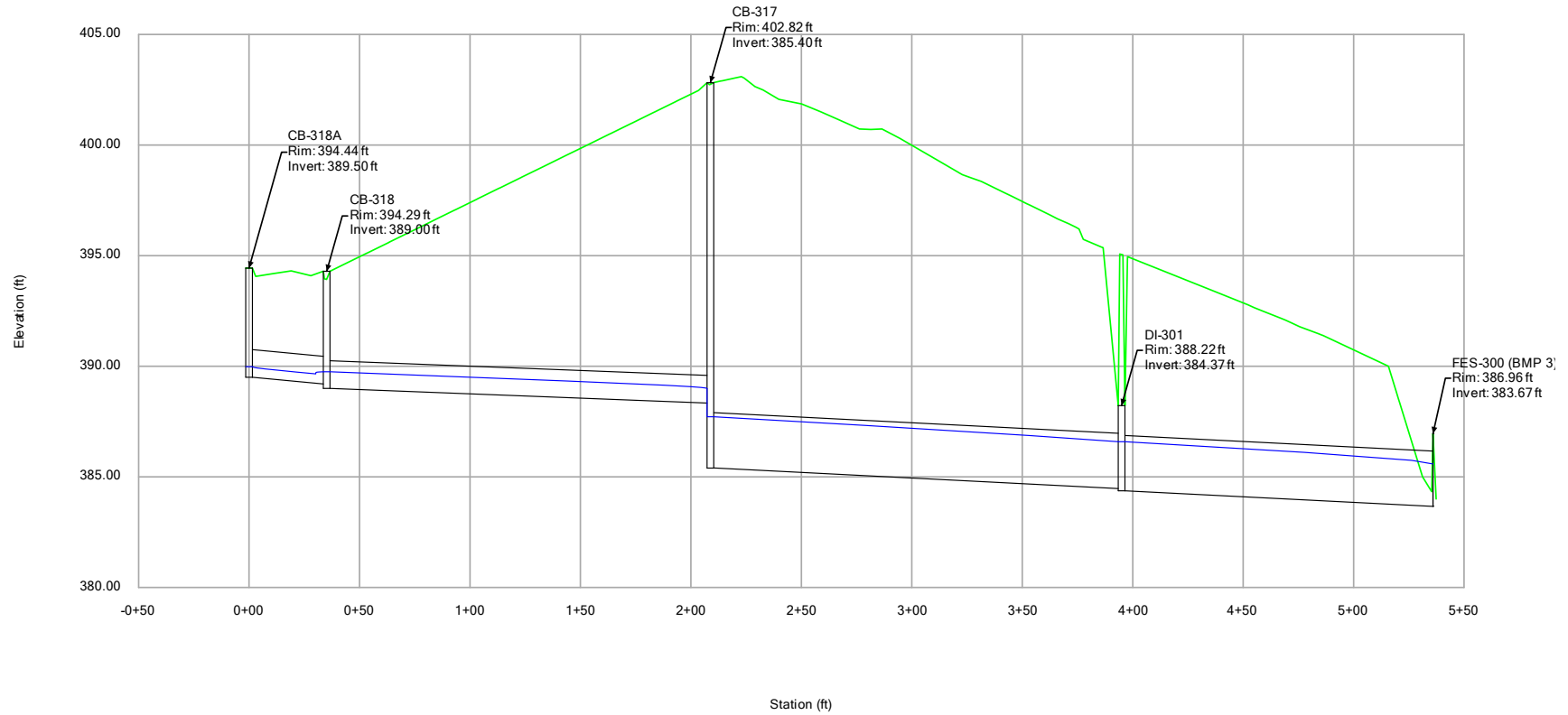
Label	Start Node	Stop Node	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)
Pipe - (92)	CB-312	CB-311	15.0	0.052	1.71	0.34	0.12	14.78
Pipe - (93)	CB-311	CB-310	15.0	0.005	3.38	3.47	1.58	4.57
Pipe - (251)	CB-311A	CB-311	18.0	0.020	3.08	5.01	1.22	14.71
Pipe - (94)	CB-310	CB-303	18.0	0.028	3.64	6.70	2.17	17.57
Pipe - (95)	CB-303	CB-314	30.0	0.006	6.80	5.76	23.19	31.78
Pipe - (109)	CB-305	CB-303	24.0	0.006	6.69	7.61	21.01	18.09
Pipe - (90)	CB-315	CB-316A	30.0	0.004	6.33	7.40	28.20	25.11
Pipe - (99)	CB-314	CB-315	30.0	0.005	6.70	6.63	28.33	29.00
Pipe - (91)	CB-316A	CB-316	30.0	0.007	7.55	6.76	29.35	34.28
Pipe - (255)	CB-316B	CB-316A	18.0	0.005	3.23	3.26	1.44	7.43
Pipe - (256)	CB-316C	CB-316B	18.0	0.005	2.95	2.33	1.04	7.43
Pipe - (254)	CB-314A	CB-314	18.0	0.237	4.41	17.10	3.99	51.09
Pipe - (89)	CB-316	CB-317	30.0	0.005	6.50	6.39	29.37	29.00
Pipe - (258)	DI-316A	CB-316	18.0	0.239	0.00	0.00	0.00	51.35
Pipe - (257)	CB-316D	CB-316C	18.0	0.038	2.45	4.96	0.53	20.53
Pipe - (103)	CB-309A	CB-309	15.0	0.005	2.66	2.12	0.67	4.57
Pipe - (101)	CB-309	CB-308	15.0	0.029	3.40	2.63	1.49	11.02
Pipe - (86)	CB-317A	CB-317	15.0	0.005	2.56	2.62	0.60	4.53
Pipe - (87)	CB-318	CB-317	15.0	0.004	3.50	4.11	2.70	4.00
Pipe - (85)	CB-317	DI-301	30.0	0.005	6.80	7.27	32.28	29.00
Pipe - (112)	CB-305A	CB-305	15.0	0.010	3.85	4.81	2.22	6.53
Pipe - (107)	CB-306	CB-305	24.0	0.008	6.58	5.64	17.73	19.98
Pipe - (104)	CB-308A	CB-308	15.0	0.005	2.61	1.95	1.53	4.57
Pipe - (102)	CB-308	CB-307	15.0	0.026	5.04	8.20	4.59	10.39
Pipe - (110)	CB-306A	CB-306	15.0	0.049	3.94	1.93	2.37	14.23
Pipe - (106)	CB-307	CB-306	24.0	0.007	6.16	5.43	13.71	19.10
Pipe - (105)	CB-307A	CB-307	18.0	0.005	4.25	3.99	6.18	7.43
Pipe - (253)	DI-307B	CB-307A	18.0	0.005	3.93	2.18	2.87	7.43
Pipe - (88)	CB-318A	CB-318	15.0	0.009	3.38	2.79	1.46	5.97

SCM 3 STORM SEWER ANALYSIS **25-YEAR ANALYSIS**

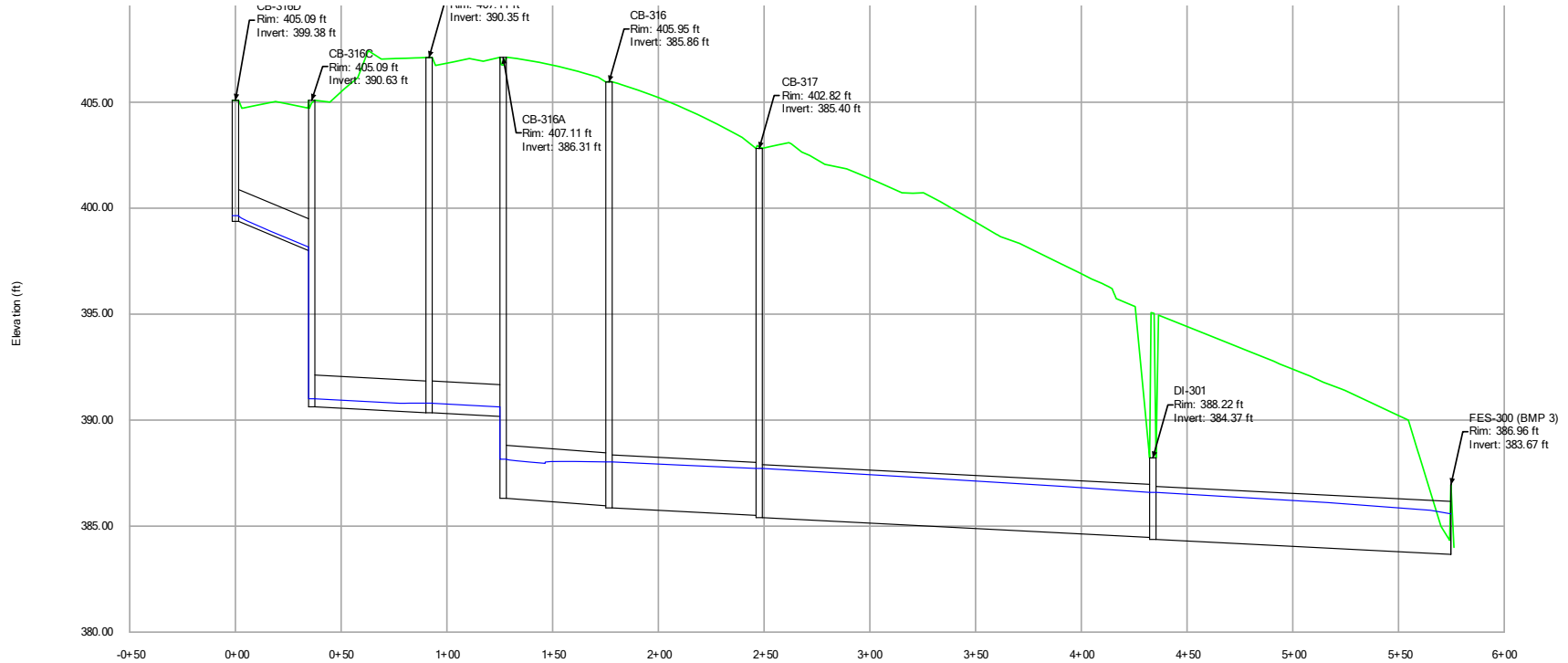
Conduit Results - Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)
Pipe - (84)	DI-301	FES-300 (BMP 3)	30.0	0.005	6.86	7.83	31.58	29.00

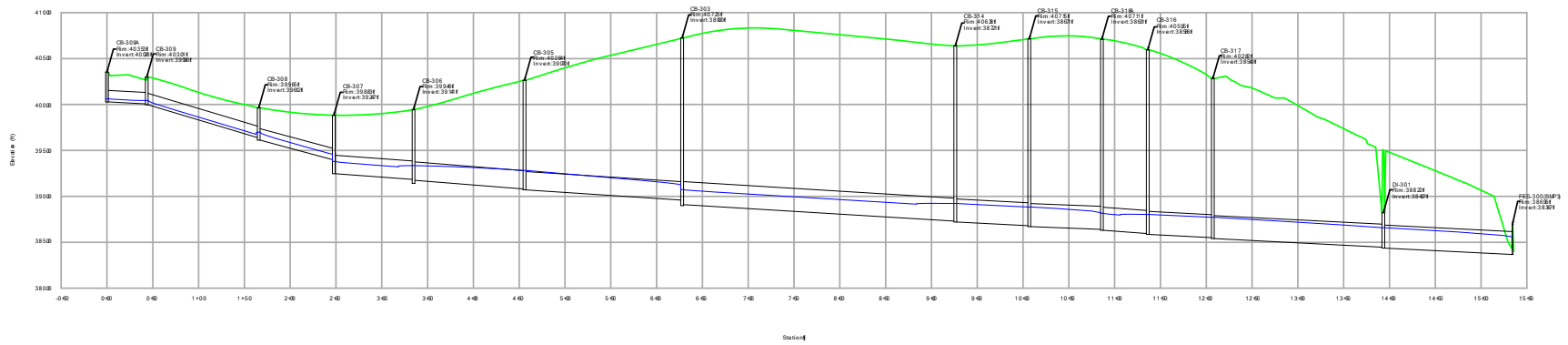
SCM 3 STORM SEWER ANALYSIS 25-YEAR ANALYSIS



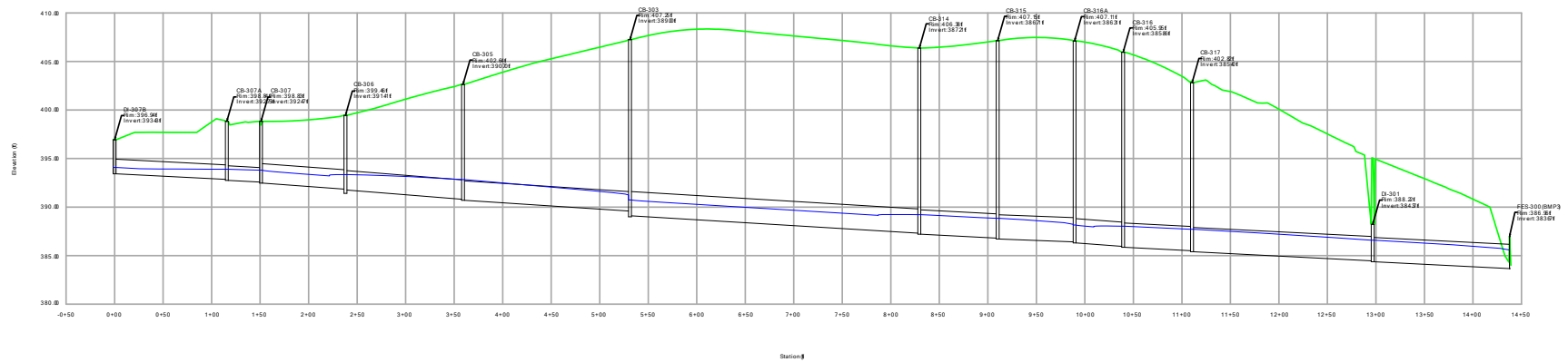
SCM 3 STORM SEWER ANALYSIS 25-YEAR ANALYSIS



SCM 3 STORM SEWER ANALYSIS 25-YEAR ANALYSIS



SCM 3 STORM SEWER ANALYSIS 25-YEAR ANALYSIS



Inlet Spread - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Spread / Top Width (ft)
CB-312	0.018	0.015	0.08	0.00	2.3
CB-311	0.043	0.035	0.20	0.00	3.2
CB-311A	0.259	0.163	0.92	0.27	6.3

SCM 3 – INLET SPREAD

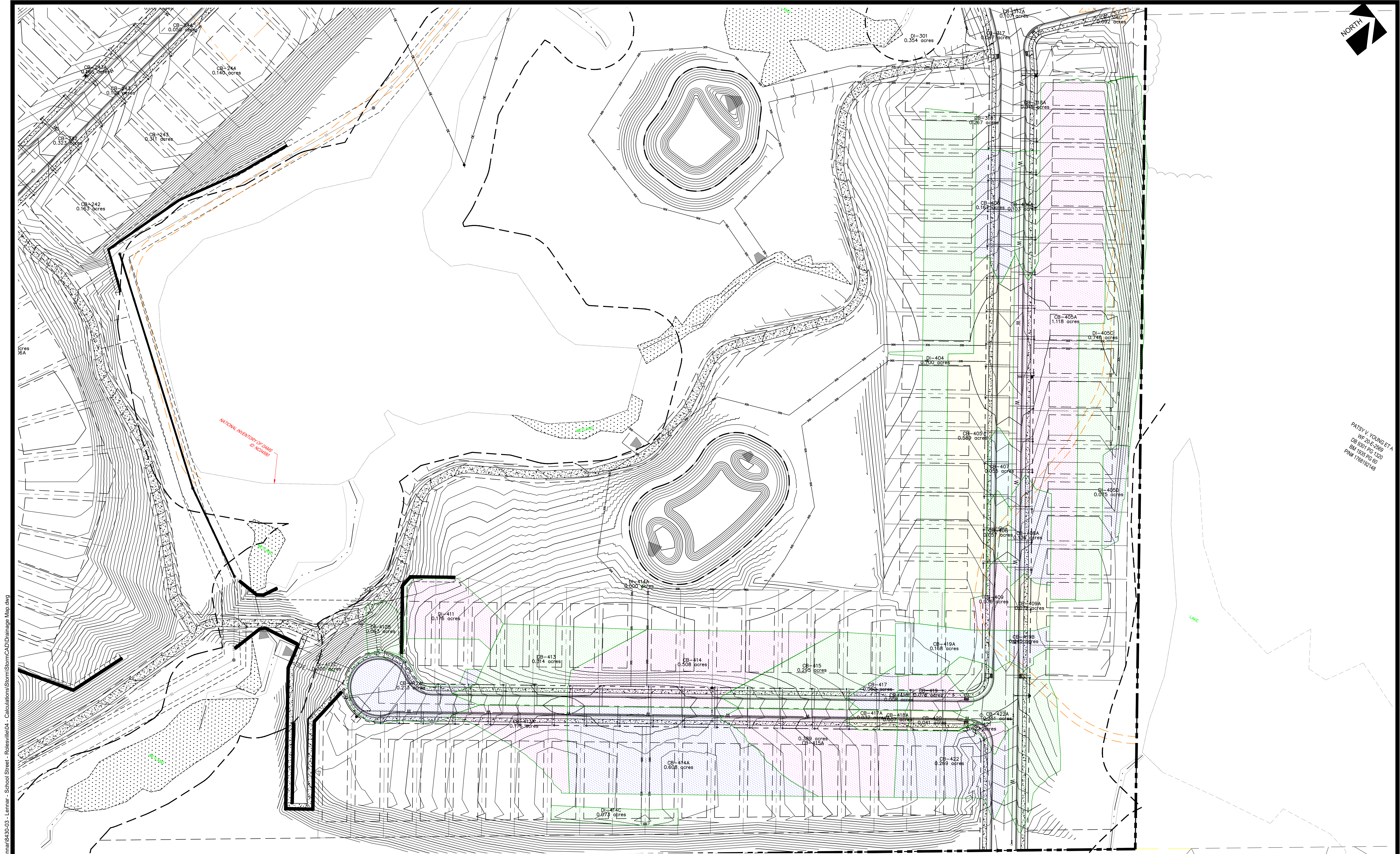
SCM 3 STORM SEWER ANALYSIS

Inlet Spread - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Spread / Top Width (ft)
CB-310	0.111	0.081	0.46	0.05	4.6
CB-303	0.091	0.068	0.39	0.03	4.2
CB-315	0.023	0.018	0.10	0.00	2.5
CB-316A	0.023	0.019	0.11	0.00	2.5
CB-316B	0.071	0.055	0.31	0.02	3.8
CB-314A	1.322	0.551	3.12	2.95	11.5
CB-314	0.676	0.339	1.92	1.18	9.0
CB-316	0.029	0.023	0.13	0.00	2.8
CB-316C	0.090	0.067	0.38	0.03	4.2
CB-316D	0.092	0.069	0.39	0.03	4.2
CB-309A	0.123	0.088	0.50	0.06	4.7
CB-309	0.161	0.111	0.63	0.11	5.2
CB-317	0.047	0.038	0.21	0.00	3.3
CB-305A	0.564	0.301	1.70	0.93	8.4
CB-305	0.318	0.195	1.10	0.39	6.8
CB-317A	0.107	0.078	0.44	0.05	4.5
DI-316A	0.000	0.000	0.00	0.00	0.0
CB-308A	0.330	0.204	1.15	0.42	6.9
CB-308	0.359	0.221	1.25	0.50	7.2
CB-306	0.378	0.255	1.45	0.67	7.8
CB-306A	0.396	0.310	1.76	0.99	8.6
CB-307A	0.676	0.446	2.53	1.99	10.3
CB-307	0.618	0.410	2.32	1.69	9.9
DI-307B	0.829	0.394	2.23	1.57	9.7
CB-318A	0.315	0.195	1.10	0.39	6.8
CB-318	0.267	0.167	0.95	0.28	6.3
DI-301	0.000	0.000	0.00	0.00	0.0

ATTACHMENT 4: DRAINAGE AREA MAPS – SCM 4

G:\NCA\Projects\Lemnar\8430-03 - Lemnar - School Street - Rolesville\04 - Calculations\Storm\StormCAD\Drainage Map.dwg



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

SCM 4 DRAINAGE MAP

DATE: 6/1/2023
SCALE: 1" = 50'

THIS DOCUMENT, TOGETHER WITH THE CONCEPTS AND DESIGNS PRESENTED HEREIN, AS AN INSTRUMENT OF SERVICE, IS INTENDED ONLY FOR THE SPECIFIC PURPOSE AND CLIENT FOR WHICH IT WAS PREPARED. REUSE OF AND IMPROPER RELIANCE ON THIS DOCUMENT WITHOUT WRITTEN AUTHORIZATION AND ADAPTATION BY BGE INC. SHALL BE WITHOUT LIABILITY TO BGE INC.

SCM 4 – 10 YR STORM

SCM4 STORM SEWER ANALYSIS

10-YEAR ANALYSIS

Inlet Results - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)
CB-418A	0.007	0.007	0.05	0.00	0.05
CB-418	0.008	0.012	0.08	0.00	4.45
CB-417A	0.032	0.026	0.19	0.00	0.19
CB-417	0.050	0.039	0.28	0.01	4.83
CB-419B	0.045	0.035	0.25	0.01	0.25
CB-419A	0.168	0.109	0.79	0.20	1.04
CB-409A	0.072	0.054	0.39	0.03	0.39
CB-420	0.041	0.033	0.24	0.01	3.00
CB-419	0.075	0.056	0.41	0.04	4.38
CB-409	0.076	0.056	0.41	0.04	0.79
DI-414C	0.073	0.055	0.40	0.03	0.40
CB-421	0.023	0.044	0.32	0.02	2.79
CB-408	0.057	0.048	0.35	0.02	1.80
DI-405D	0.075	0.055	0.40	0.04	0.40
CB-415A	0.389	0.209	1.51	0.78	1.51
CB-415	0.295	0.170	1.23	0.51	7.27
CB-408A	0.136	0.095	0.69	0.14	0.69
CB-414A	0.608	0.599	4.34	0.00	4.65
CB-406A	0.103	0.073	0.53	0.08	0.53
CB-407	0.055	0.045	0.33	0.02	2.09
CB-406	0.167	0.108	0.79	0.20	1.30
CB-422A	0.351	0.193	1.40	0.66	1.40
DI-414A	0.000	0.000	0.00	0.00	16.17
DI-405C	0.746	0.336	2.43	1.95	2.78
CB-414B	(N/A)	0.000	0.00	0.00	0.39
CB-414	0.508	0.482	3.49	0.00	16.42
CB-422	0.269	0.159	1.15	0.45	2.53
CB-405B	(N/A)	0.000	0.00	0.00	2.72
CB-405	0.589	0.507	3.67	0.00	15.97

SCM4 STORM SEWER ANALYSIS

10-YEAR ANALYSIS

Inlet Results - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)
CB-405A	1.118	0.936	6.78	0.00	9.21
CB-413	0.314	0.177	1.28	0.56	2.09
DI-404	0.700	0.321	2.32	1.79	17.95
CB-413A	0.176	0.113	0.82	0.21	0.82
DI-411	0.176	0.113	0.82	0.21	0.82
CB-412A	0.213	0.190	1.38	0.64	1.38
DI-412C	0.000	0.000	0.00	0.00	2.49
DI-412B	0.063	0.048	0.35	0.02	1.16

Conduit Results - Time: 0.00 hours

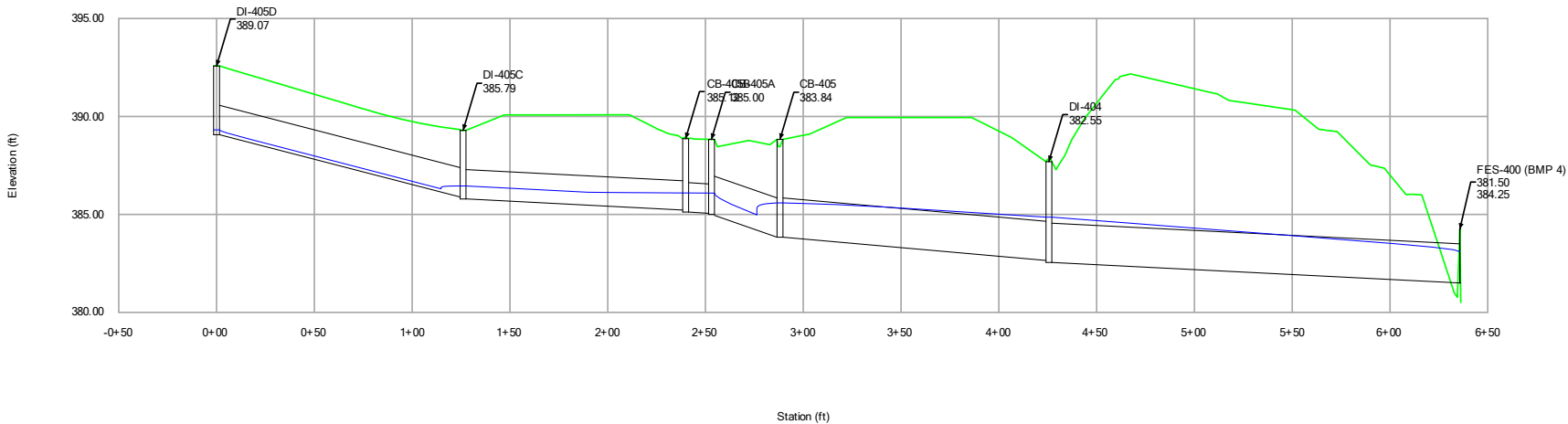
Label	Diameter (in)	Start Node	Stop Node	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)
Pipe - (150)	15.0	CB-418A	CB-418	0.005	1.21	1.35	0.05	4.57
Pipe - (208)	18.0	CB-418	CB-417	0.005	4.39	4.57	4.45	7.43
Pipe - (149)	18.0	CB-419	CB-418	0.005	4.37	4.55	4.38	7.43
Pipe - (209)	15.0	CB-417A	CB-417	0.005	1.83	1.92	0.19	4.57
Pipe - (208) (1)	18.0	CB-417	CB-415	0.006	4.71	4.89	4.83	8.33
Pipe - (152)	15.0	CB-419B	CB-419A	0.011	2.08	0.75	0.25	6.73
Pipe - (151)	15.0	CB-419A	CB-419	0.128	3.06	1.40	1.04	23.14
Pipe - (158)	15.0	CB-409A	CB-409	0.075	2.33	1.39	0.39	17.70
Pipe - (148)	15.0	CB-420	CB-419	0.005	3.97	4.07	3.00	4.57
Pipe - (147)	15.0	CB-421	CB-420	0.005	3.91	4.16	2.79	4.57
Pipe - (154)	15.0	CB-409	CB-408	0.017	2.83	1.49	0.79	8.51
Pipe - (270)	18.0	DI-414C	CB-414B	0.059	2.27	0.51	0.40	25.43
Pipe - (145)	15.0	CB-422	CB-421	0.005	3.82	4.02	2.53	4.57
Pipe - (159)	15.0	CB-408A	CB-408	0.011	2.72	1.29	0.69	6.90

SCM4 STORM SEWER ANALYSIS
10-YEAR ANALYSIS
Conduit Results - Time: 0.00 hours

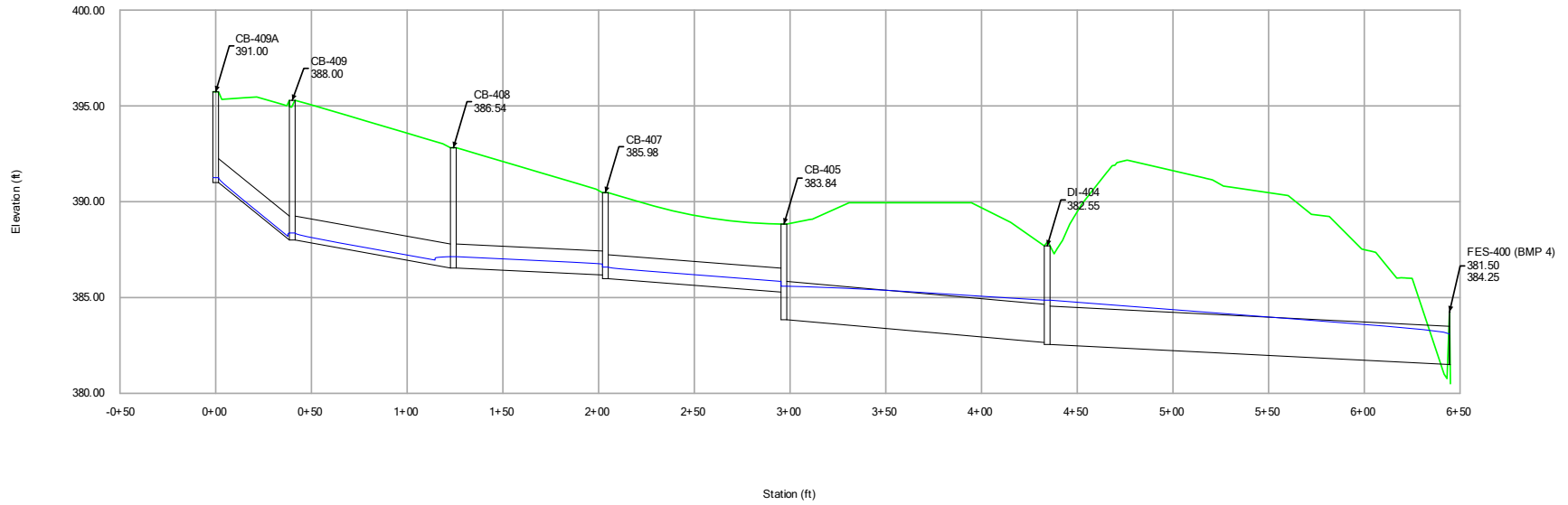
Label	Diameter (in)	Start Node	Stop Node	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)
Pipe - (160)	15.0	CB-408	CB-407	0.005	3.39	3.61	1.80	4.37
Pipe - (265)	18.0	DI-405D	DI-405C	0.025	2.28	0.71	0.40	16.68
Pipe - (131)	15.0	CB-415A	CB-415	0.005	3.34	3.42	1.51	4.57
Pipe - (125)	24.0	CB-415	CB-414	0.004	4.48	4.89	7.27	13.93
Pipe - (130)	18.0	CB-414A	CB-414	0.008	4.65	5.27	4.65	9.36
Pipe - (271)	18.0	CB-414B	CB-414A	0.005	0.50	0.46	0.39	7.43
Pipe - (139)	15.0	CB-406A	CB-406	0.008	2.53	1.32	0.53	5.77
Pipe - (137)	15.0	CB-407	CB-405	0.007	3.77	4.22	2.09	5.59
Pipe - (138)	15.0	CB-406	CB-405	0.017	3.27	1.91	1.30	8.46
Pipe - (262)	15.0	CB-422A	CB-422	0.005	3.27	2.61	1.40	4.57
Pipe - (225)	24.0	CB-414	DI-414A	0.007	6.68	6.52	16.42	19.02
Pipe - (225) (1)	24.0	DI-414A	FES-410 (BMP 4)	0.005	6.01	6.63	16.17	16.00
Pipe - (263)	18.0	DI-405C	CB-405B	0.005	3.90	2.82	2.78	7.43
Pipe - (124)	18.0	CB-413	CB-414	0.005	3.60	1.24	2.09	7.54
Pipe - (264)	18.0	CB-405B	CB-405A	0.005	2.40	2.23	2.72	7.43
Pipe - (140)	24.0	CB-405A	CB-405	0.032	5.30	3.80	9.21	40.28
Pipe - (135)	24.0	CB-405	DI-404	0.009	6.59	5.37	15.97	21.04
Pipe - (128)	15.0	CB-413A	CB-413	0.006	2.86	2.09	0.82	5.02
Pipe - (134)	24.0	DI-404	FES-400 (BMP 4)	0.005	5.83	6.98	17.95	16.00
Pipe - (235)	18.0	DI-411	DI-412B	0.091	2.76	7.67	0.82	31.70
Pipe - (244)	18.0	CB-412A	DI-412C	0.309	3.19	13.74	1.38	58.41
Pipe - (244) (1) (1)	24.0	DI-412C	FES-500 (BMP 4)	0.012	3.55	5.11	2.49	25.17
Pipe - (244) (1)	24.0	DI-412B	DI-412C	0.010	2.88	3.71	1.16	22.07

SCM4 STORM SEWER ANALYSIS

10-YEAR ANALYSIS

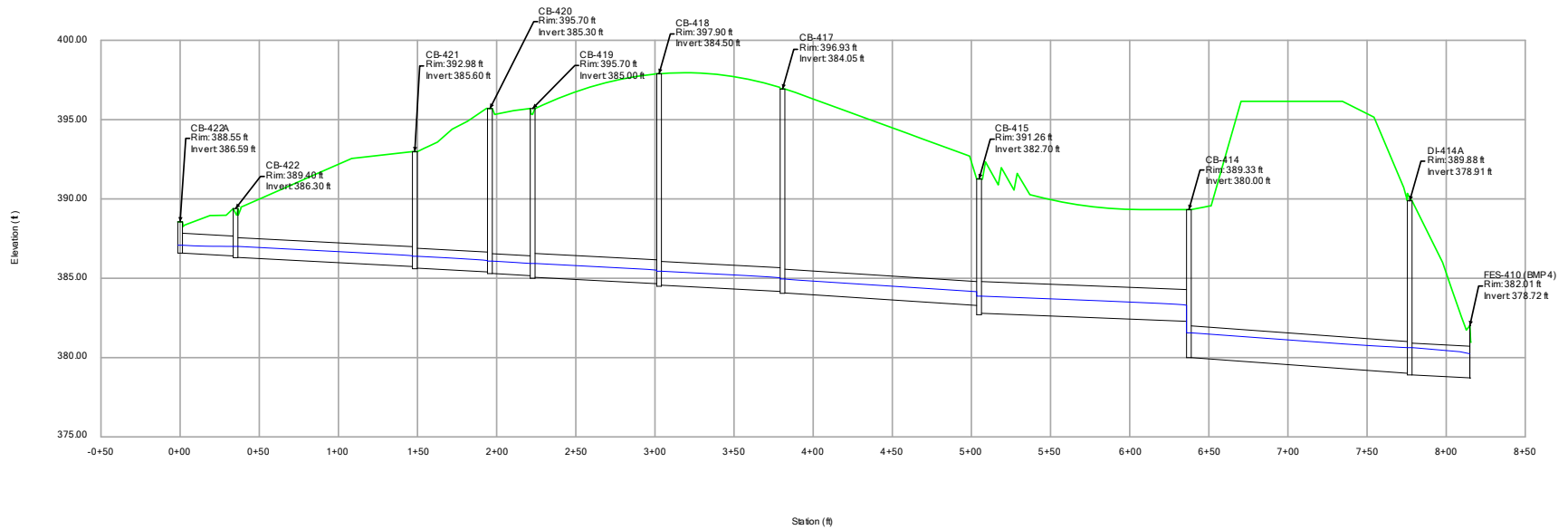


SCM4 STORM SEWER ANALYSIS 10-YEAR ANALYSIS



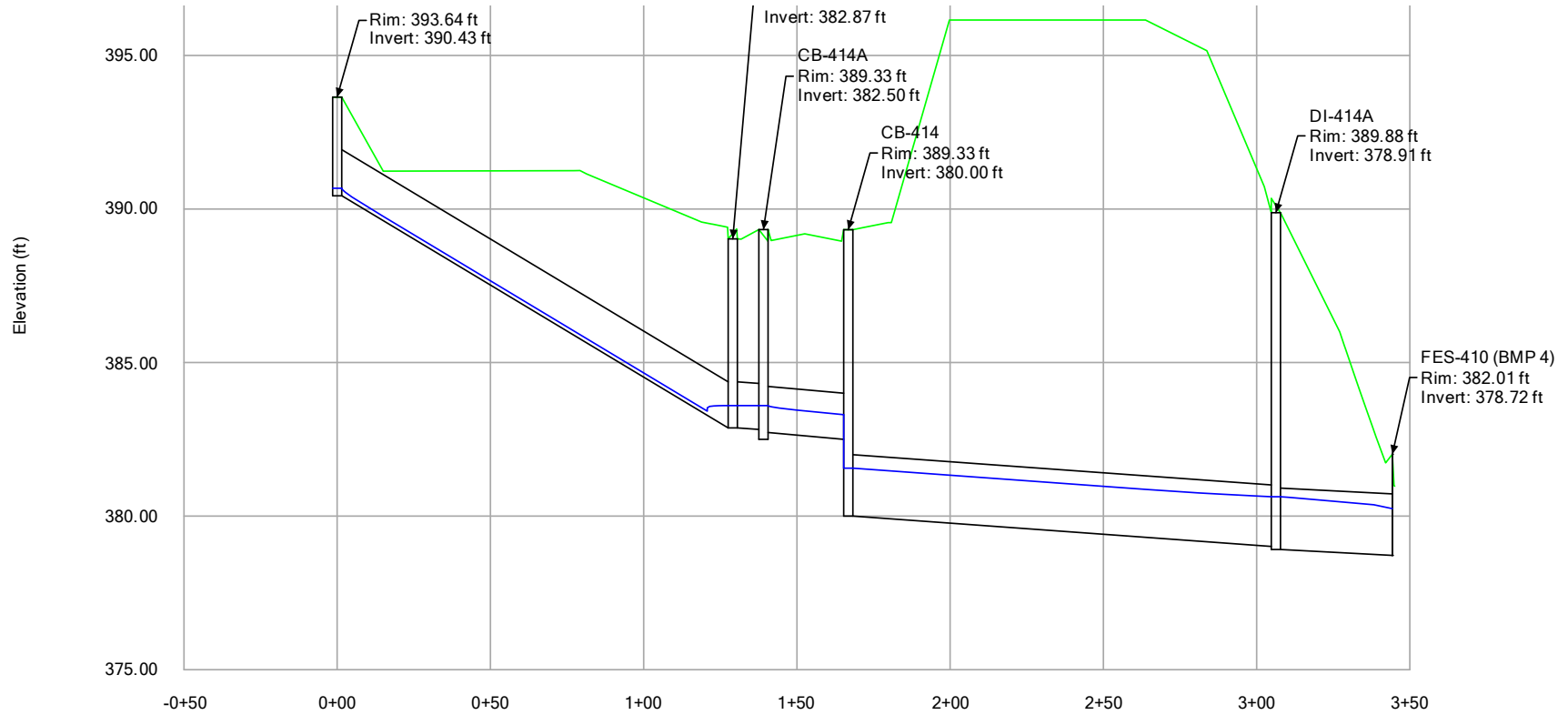
SCM4 STORM SEWER ANALYSIS

10-YEAR ANALYSIS



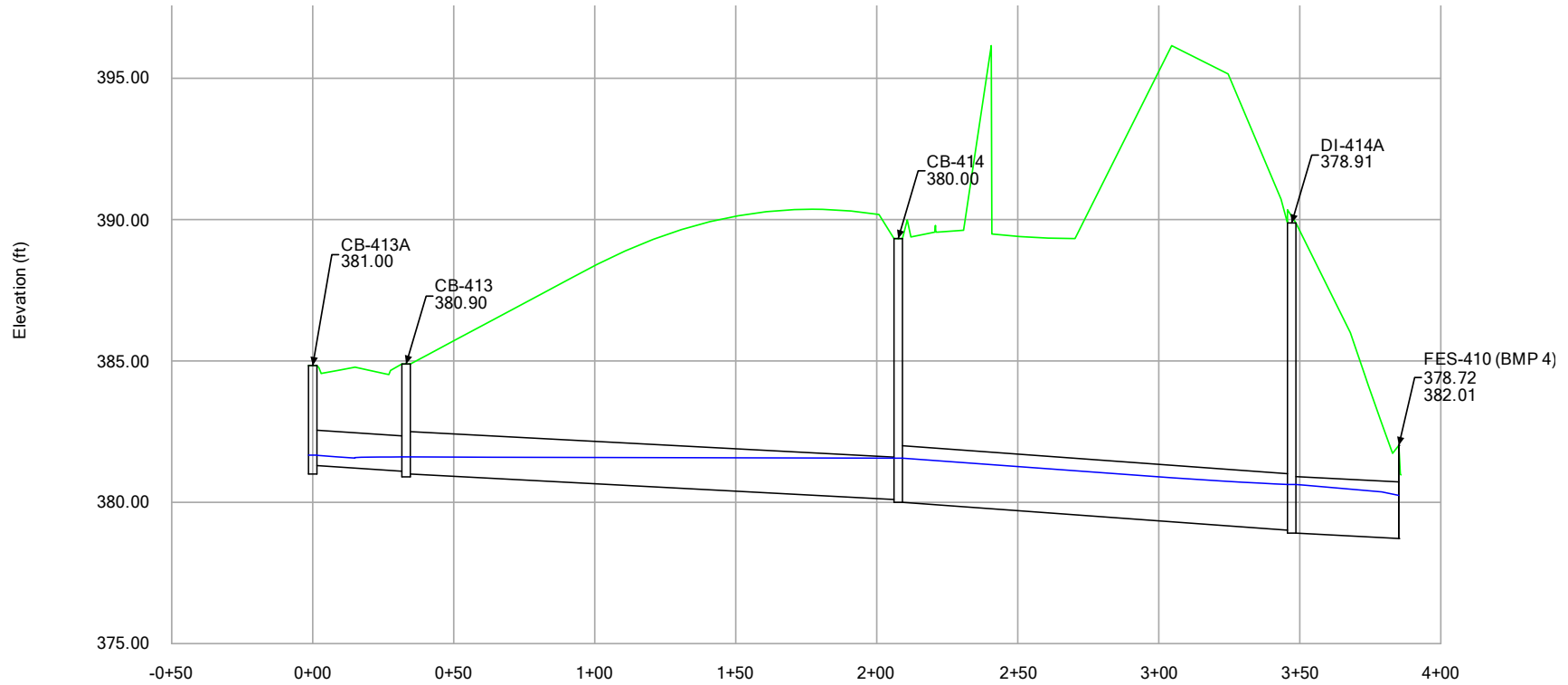
SCM4 STORM SEWER ANALYSIS

10-YEAR ANALYSIS

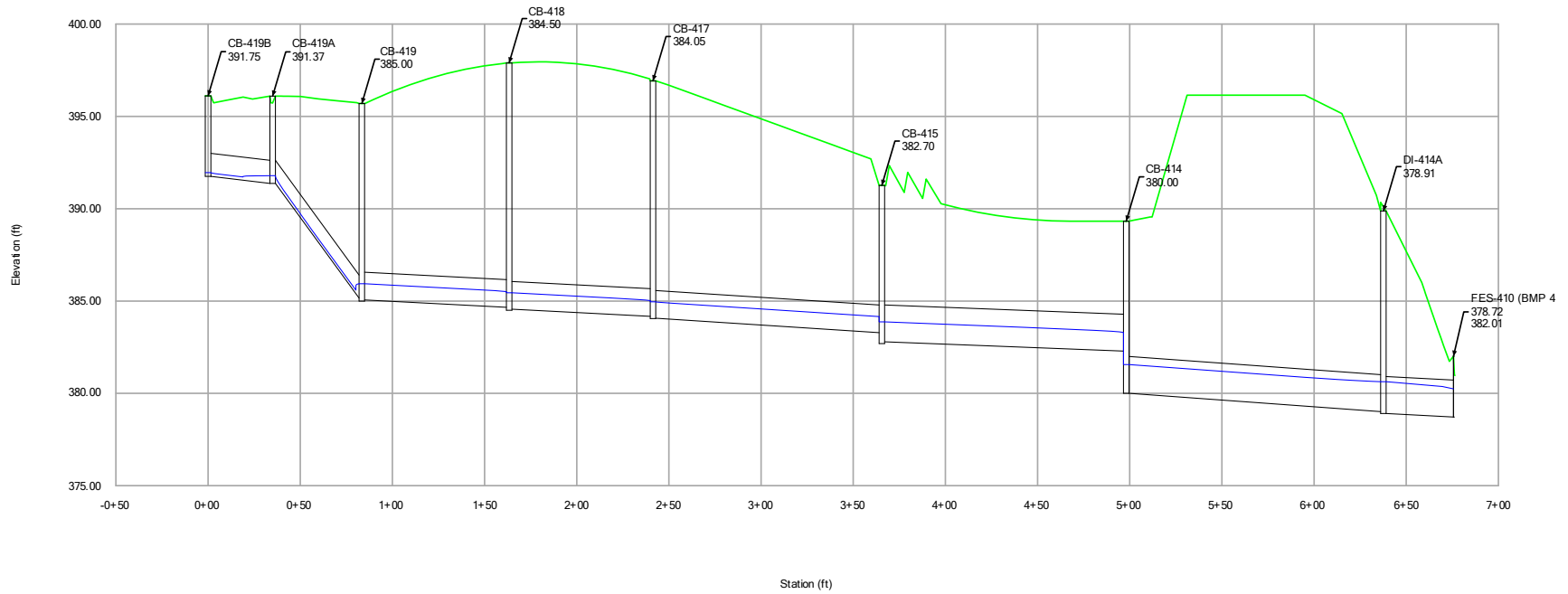


SCM4 STORM SEWER ANALYSIS

10-YEAR ANALYSIS

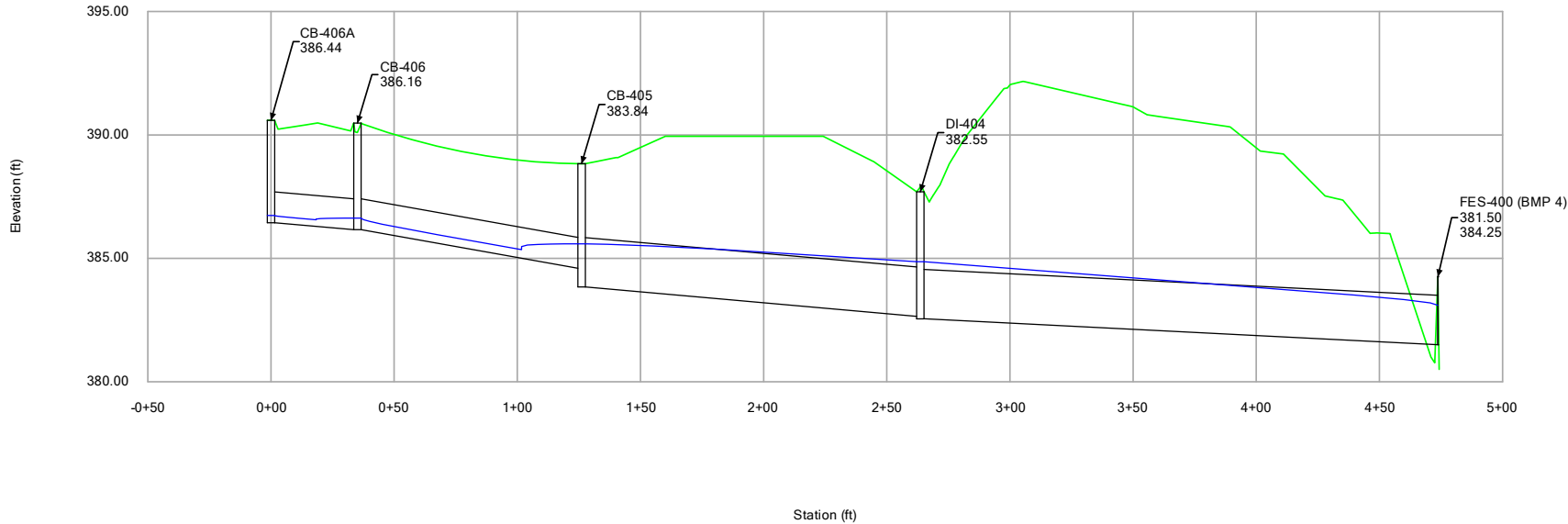


SCM4 STORM SEWER ANALYSIS 10-YEAR ANALYSIS



SCM4 STORM SEWER ANALYSIS

10-YEAR ANALYSIS



SCM 4 – 25 YR STORM

SCM4 STORM SEWER ANALYSIS

25-YEAR ANALYSIS

Inlet Results - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)
CB-418A	0.007	0.007	0.06	0.00	0.06
CB-418	0.008	0.012	0.10	0.00	4.86
CB-417A	0.032	0.026	0.21	0.00	0.21
CB-417	0.050	0.039	0.31	0.02	5.29
CB-419B	0.045	0.035	0.28	0.01	0.28
CB-419A	0.168	0.107	0.86	0.24	1.13
CB-409A	0.072	0.053	0.42	0.04	0.42
CB-420	0.041	0.032	0.26	0.01	3.27
CB-419	0.075	0.055	0.44	0.05	4.78
CB-409	0.076	0.055	0.44	0.05	0.87
DI-414C	0.073	0.054	0.43	0.04	0.43
CB-421	0.023	0.045	0.36	0.03	3.04
CB-408	0.057	0.048	0.39	0.03	1.97
DI-405D	0.075	0.055	0.44	0.05	0.44
CB-415A	0.389	0.203	1.63	0.90	1.63
CB-415	0.295	0.166	1.33	0.60	7.93
CB-408A	0.136	0.093	0.75	0.18	0.75
CB-414A	0.608	0.605	4.87	0.00	5.20
CB-406A	0.103	0.072	0.58	0.09	0.58
CB-407	0.055	0.045	0.36	0.03	2.29
CB-406	0.167	0.106	0.85	0.24	1.42
CB-422A	0.351	0.188	1.51	0.78	1.51
DI-414A	0.000	0.000	0.00	0.00	17.84
DI-405C	0.746	0.326	2.62	2.24	3.00
CB-414B	(N/A)	0.000	0.00	0.00	0.43
CB-414	0.508	0.487	3.91	0.00	18.11
CB-422	0.269	0.155	1.25	0.53	2.74
CB-405B	(N/A)	0.000	0.00	0.00	2.94
CB-405	0.589	0.510	4.10	0.00	17.66

SCM4 STORM SEWER ANALYSIS

25-YEAR ANALYSIS

Inlet Results - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)
CB-405A	1.118	0.939	7.55	0.00	10.17
CB-413	0.314	0.173	1.39	0.65	2.26
DI-404	0.700	0.312	2.51	2.06	19.79
CB-413A	0.176	0.110	0.89	0.26	0.89
DI-411	0.176	0.111	0.89	0.26	0.89
CB-412A	0.213	0.188	1.52	0.78	1.52
DI-412C	0.000	0.000	0.00	0.00	2.73
DI-412B	0.063	0.047	0.38	0.03	1.26

Conduit Results - Time: 0.00 hours

Label	Diameter (in)	Start Node	Stop Node	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)
Pipe - (150)	15.0	CB-418A	CB-418	0.005	1.26	1.40	0.06	4.57
Pipe - (208)	18.0	CB-418	CB-417	0.005	4.48	4.72	4.86	7.43
Pipe - (149)	18.0	CB-419	CB-418	0.005	4.46	4.69	4.78	7.43
Pipe - (209)	15.0	CB-417A	CB-417	0.005	1.89	1.97	0.21	4.57
Pipe - (208) (1)	18.0	CB-417	CB-415	0.006	4.87	4.99	5.29	8.33
Pipe - (152)	15.0	CB-419B	CB-419A	0.011	2.14	0.78	0.28	6.73
Pipe - (151)	15.0	CB-419A	CB-419	0.128	3.14	1.41	1.13	23.14
Pipe - (158)	15.0	CB-409A	CB-409	0.075	2.39	1.42	0.42	17.70
Pipe - (148)	15.0	CB-420	CB-419	0.005	4.05	4.12	3.27	4.57
Pipe - (147)	15.0	CB-421	CB-420	0.005	3.98	4.29	3.04	4.57
Pipe - (154)	15.0	CB-409	CB-408	0.017	2.91	1.52	0.87	8.51
Pipe - (270)	18.0	DI-414C	CB-414B	0.059	2.33	0.51	0.43	25.43
Pipe - (145)	15.0	CB-422	CB-421	0.005	3.89	4.14	2.74	4.57
Pipe - (159)	15.0	CB-408A	CB-408	0.011	2.79	1.32	0.75	6.90

SCM4 STORM SEWER ANALYSIS

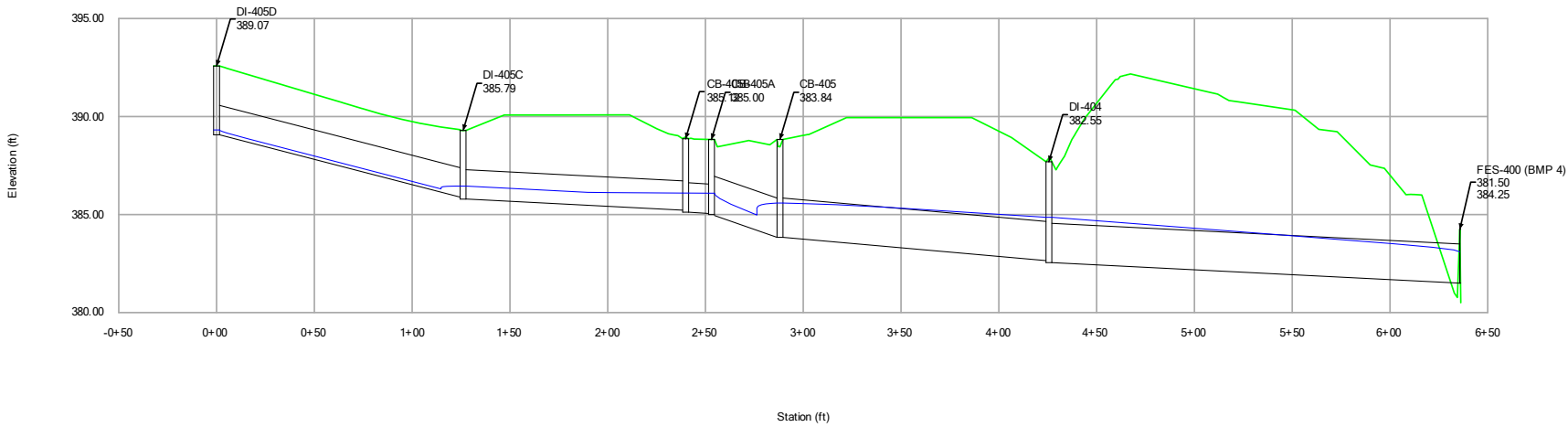
25-YEAR ANALYSIS

Conduit Results - Time: 0.00 hours

Label	Diameter (in)	Start Node	Stop Node	Slope (Calculated) (ft/ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Flow (cfs)	Capacity (Full Flow) (cfs)
Pipe - (160)	15.0	CB-408	CB-407	0.005	3.47	3.71	1.97	4.37
Pipe - (265)	18.0	DI-405D	DI-405C	0.025	2.34	0.72	0.44	16.68
Pipe - (131)	15.0	CB-415A	CB-415	0.005	3.41	3.50	1.63	4.57
Pipe - (125)	24.0	CB-415	CB-414	0.004	4.58	5.03	7.93	13.93
Pipe - (130)	18.0	CB-414A	CB-414	0.008	4.84	5.42	5.20	9.36
Pipe - (271)	18.0	CB-414B	CB-414A	0.005	0.50	0.46	0.43	7.43
Pipe - (139)	15.0	CB-406A	CB-406	0.008	2.59	1.36	0.58	5.77
Pipe - (137)	15.0	CB-407	CB-405	0.007	3.89	4.33	2.29	5.59
Pipe - (138)	15.0	CB-406	CB-405	0.017	3.35	1.36	1.42	8.46
Pipe - (262)	15.0	CB-422A	CB-422	0.005	3.34	2.61	1.51	4.57
Pipe - (225)	24.0	CB-414	DI-414A	0.007	6.89	6.66	18.11	19.02
Pipe - (225) (1)	24.0	DI-414A	FES-410 (BMP 4)	0.005	6.21	6.96	17.84	16.00
Pipe - (263)	18.0	DI-405C	CB-405B	0.005	3.98	2.80	3.00	7.43
Pipe - (124)	18.0	CB-413	CB-414	0.005	3.38	1.29	2.26	7.54
Pipe - (264)	18.0	CB-405B	CB-405A	0.005	2.41	2.25	2.94	7.43
Pipe - (140)	24.0	CB-405A	CB-405	0.032	5.49	3.49	10.17	40.28
Pipe - (135)	24.0	CB-405	DI-404	0.009	6.06	5.62	17.66	21.04
Pipe - (128)	15.0	CB-413A	CB-413	0.006	2.93	1.91	0.89	5.02
Pipe - (134)	24.0	DI-404	FES-400 (BMP 4)	0.005	6.30	7.35	19.79	16.00
Pipe - (235)	18.0	DI-411	DI-412B	0.091	2.82	7.86	0.89	31.70
Pipe - (244)	18.0	CB-412A	DI-412C	0.309	3.28	14.15	1.52	58.41
Pipe - (244) (1) (1)	24.0	DI-412C	FES-500 (BMP 4)	0.012	3.64	5.24	2.73	25.17
Pipe - (244) (1)	24.0	DI-412B	DI-412C	0.010	2.95	3.81	1.26	22.07

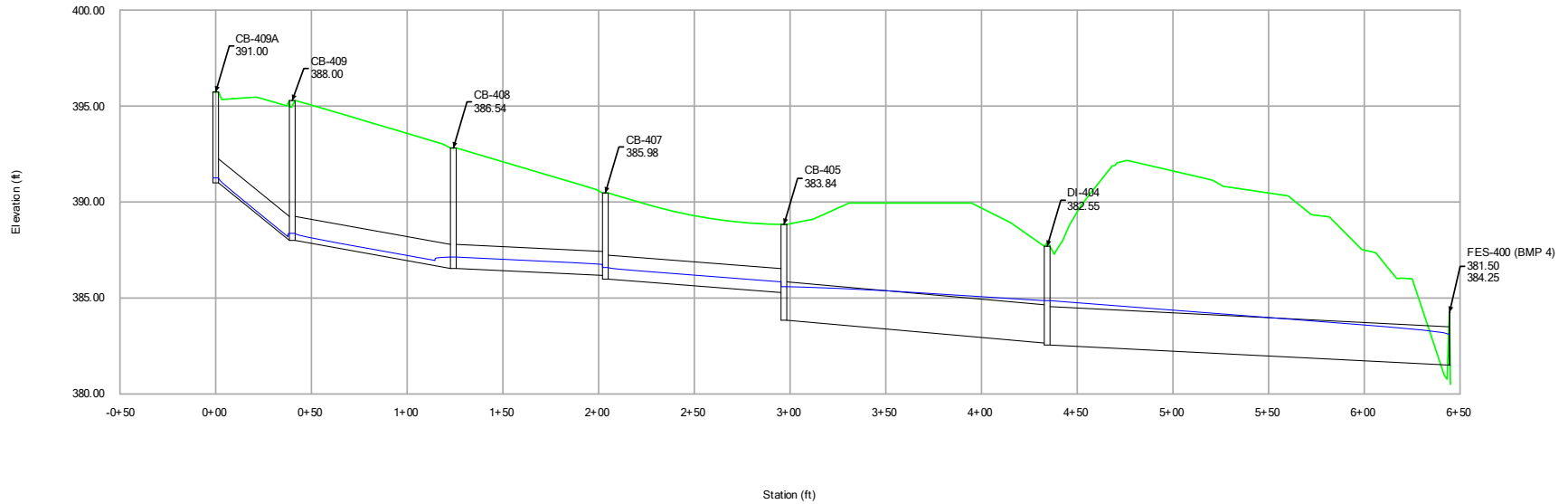
SCM4 STORM SEWER ANALYSIS

25-YEAR ANALYSIS



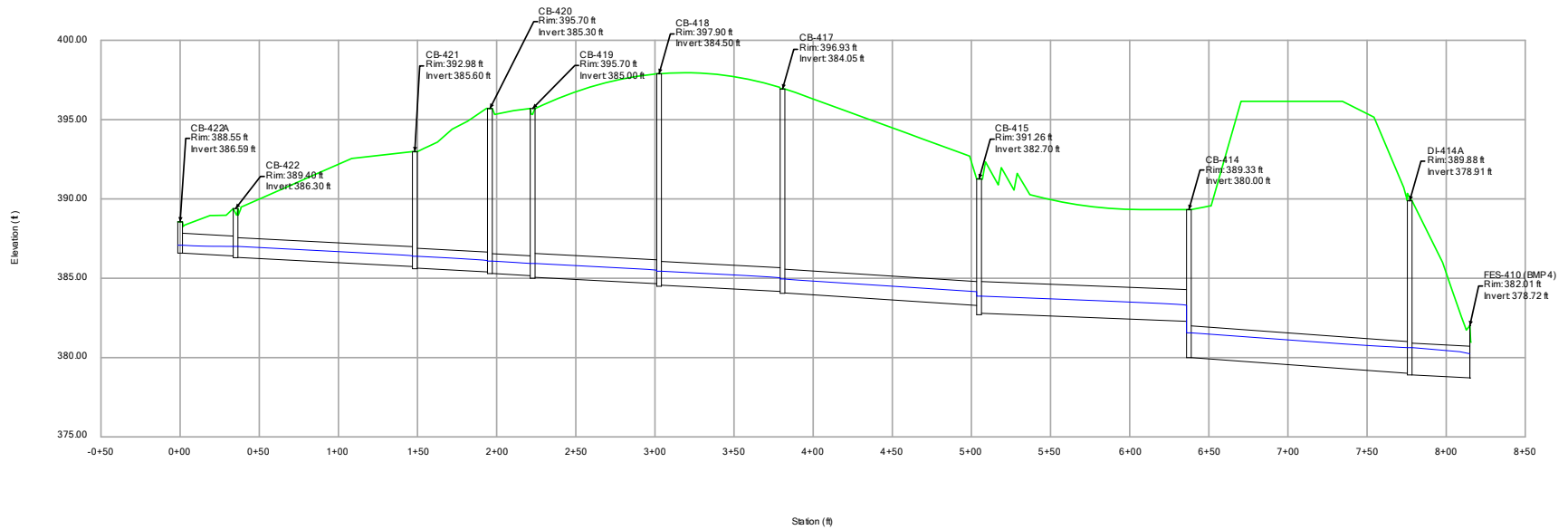
SCM4 STORM SEWER ANALYSIS

25-YEAR ANALYSIS

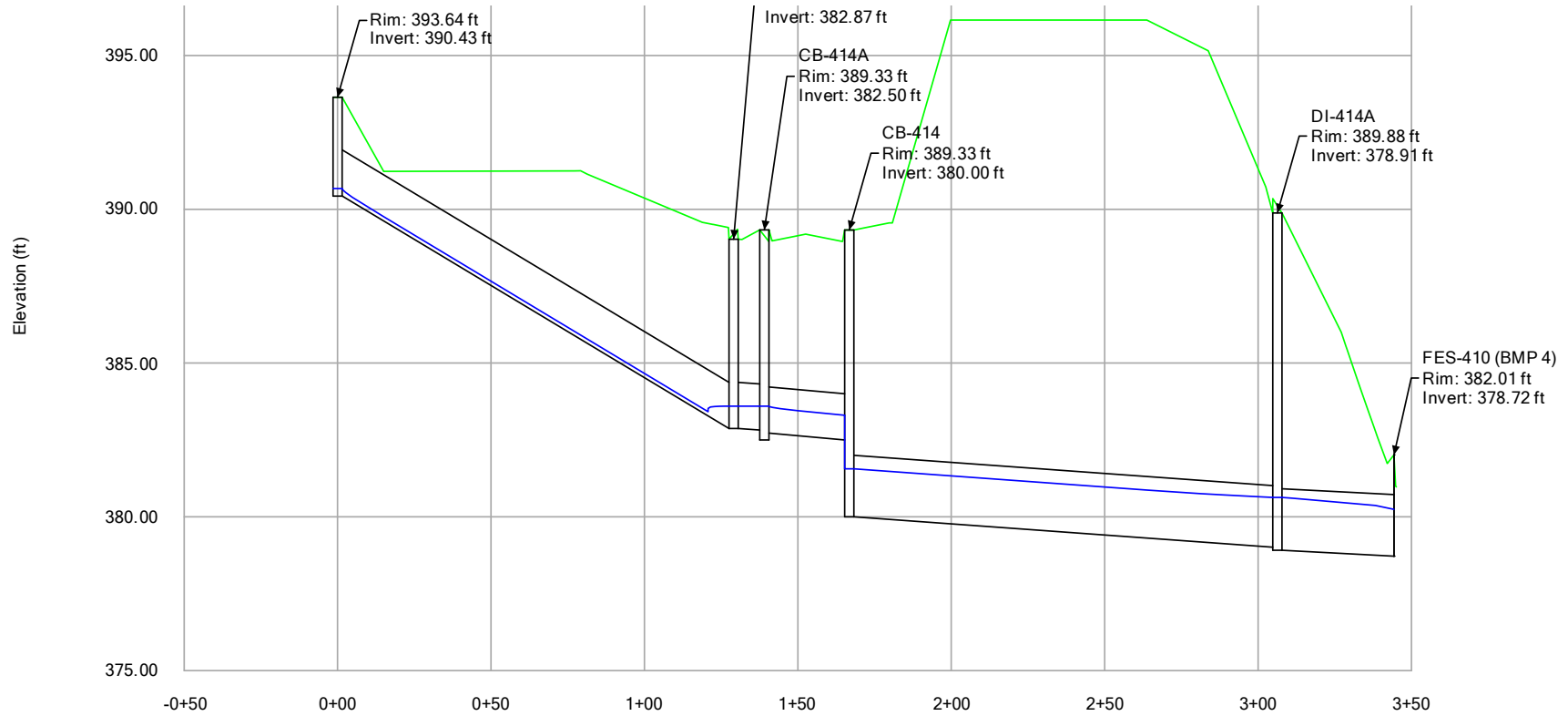


SCM4 STORM SEWER ANALYSIS

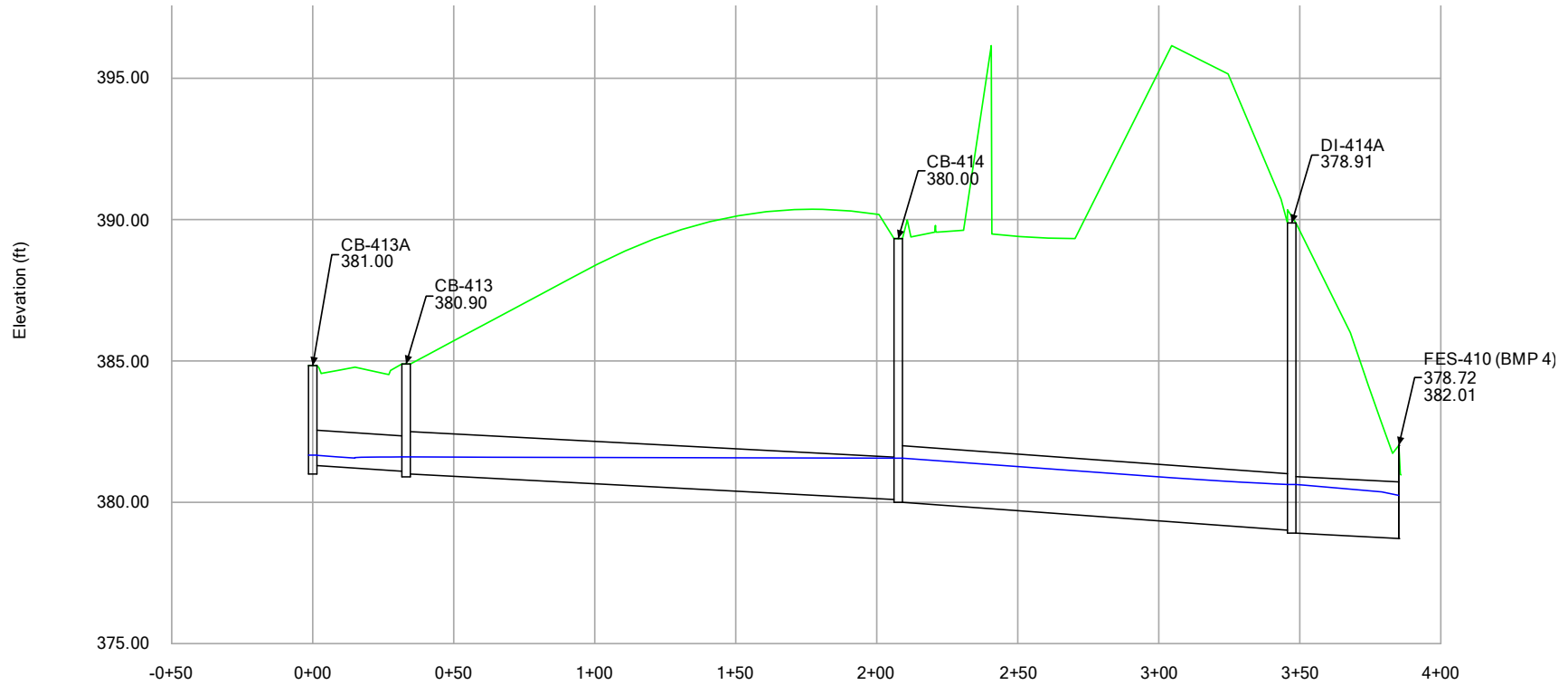
25-YEAR ANALYSIS



SCM4 STORM SEWER ANALYSIS 25-YEAR ANALYSIS

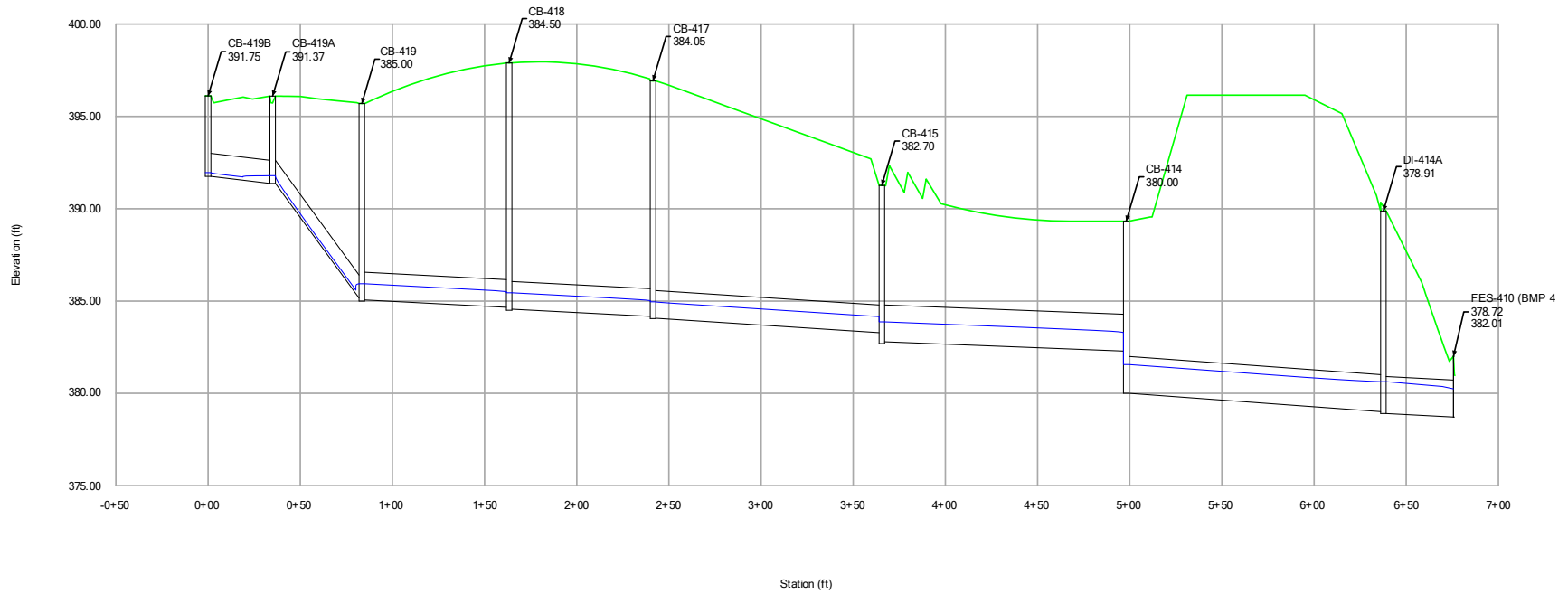


SCM4 STORM SEWER ANALYSIS 25-YEAR ANALYSIS



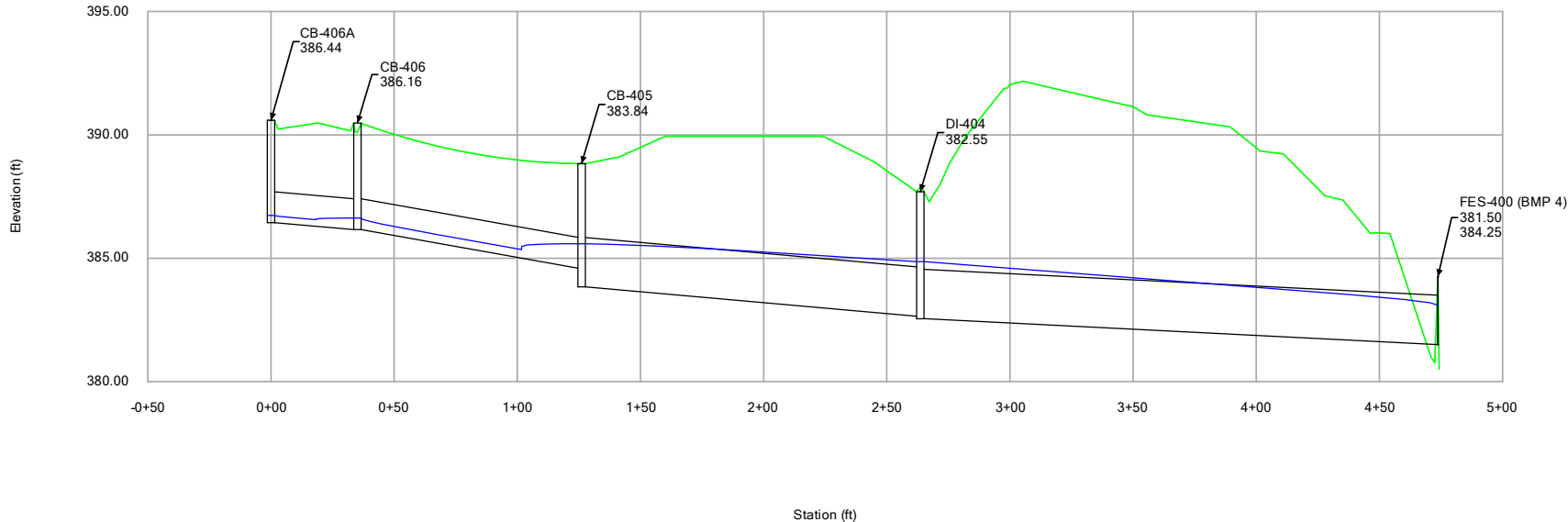
SCM4 STORM SEWER ANALYSIS

25-YEAR ANALYSIS



SCM4 STORM SEWER ANALYSIS

25-YEAR ANALYSIS



SCM 4 – INLET SPREAD

SCM4 STORM SEWER ANALYSIS

Inlet Spread Results - 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)
CB-418A	0.007	0.006	0.03	0.00	0.03	1.7
CB-418	0.008	0.010	0.06	0.00	3.58	2.0
CB-417A	0.032	0.026	0.15	0.00	0.15	2.9
CB-417	0.050	0.040	0.23	0.01	3.88	3.4
CB-419B	0.045	0.036	0.20	0.00	0.20	3.2
CB-419A	0.168	0.114	0.65	0.12	0.84	5.3
CB-409A	0.072	0.055	0.31	0.02	0.31	3.9
CB-420	0.041	0.033	0.19	0.00	2.43	3.1
CB-419	0.075	0.058	0.33	0.02	3.54	3.9
CB-409	0.076	0.058	0.33	0.02	0.64	3.9
DI-414C	0.073	0.056	0.32	0.02	0.32	3.9
CB-421	0.023	0.040	0.23	0.01	2.27	3.4
CB-408	0.057	0.048	0.27	0.01	1.44	3.6
DI-405D	0.075	0.057	0.32	0.02	0.32	3.9
CB-415A	0.389	0.221	1.25	0.53	1.25	7.3
CB-415	0.295	0.179	1.02	0.34	5.89	6.6
CB-408A	0.136	0.098	0.56	0.09	0.56	5.0
CB-414A	0.608	0.586	3.32	0.00	3.57	16.0
CB-406A	0.103	0.076	0.43	0.04	0.43	4.4
CB-407	0.055	0.045	0.25	0.01	1.66	3.5
CB-406	0.167	0.114	0.64	0.12	1.06	5.3
CB-422A	0.351	0.205	1.16	0.45	1.16	7.0
DI-414A	0.000	0.000	0.00	0.00	12.74	0.5
DI-405C	0.746	0.360	2.04	1.39	2.31	9.3
CB-414B	(N/A)	0.000	0.00	0.00	0.31	0.0
CB-414	0.508	0.472	2.67	0.00	12.95	14.0
CB-422	0.269	0.167	0.95	0.29	2.09	6.3
CB-405B	(N/A)	0.000	0.00	0.00	2.26	0.0
CB-405	0.589	0.501	2.84	0.00	12.58	14.5
CB-405A	1.118	0.928	5.26	0.00	7.28	21.1
CB-413	0.314	0.187	1.06	0.38	1.72	6.7

SCM4 STORM SEWER ANALYSIS

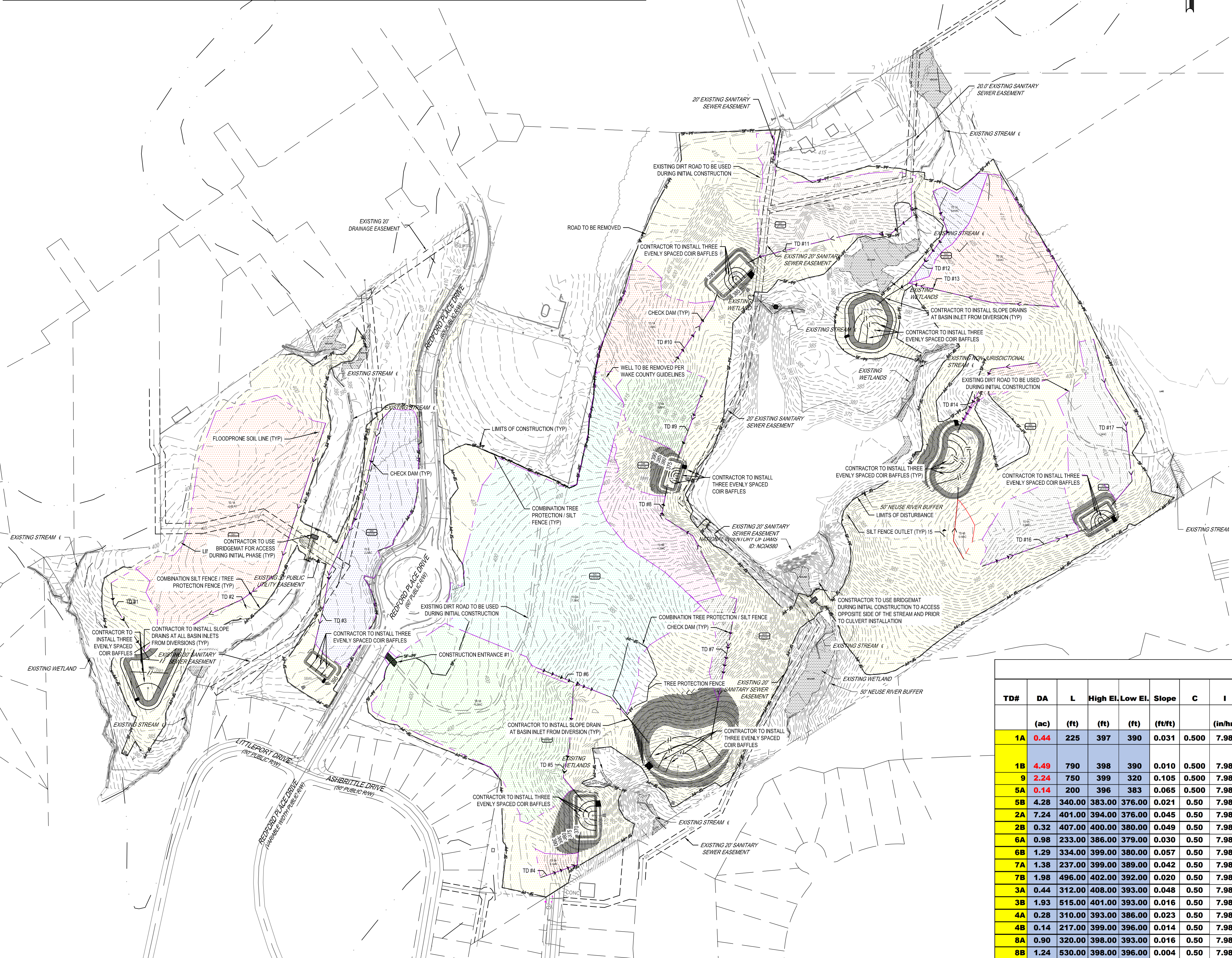
Inlet Spread Results - Time: 0.00 hours

Label	Inlet Drainage Area (acres)	Intercepted CA (acres)	Flow (Captured) (cfs)	Flow (Total Bypassed) (cfs)	Flow (Total Out) (cfs)	Spread / Top Width (ft)
DI-404	0.700	0.343	1.94	1.27	14.23	9.1
CB-413A	0.176	0.118	0.67	0.14	0.67	5.4
DI-411	0.176	0.119	0.67	0.14	0.67	5.4
CB-412A	0.213	0.192	1.09	0.40	1.09	6.8
DI-412C	0.000	0.000	0.00	0.00	1.99	0.6
DI-412B	0.063	0.049	0.28	0.01	0.94	3.7

EROSION CONTROL DA MAP

SKIMMER BASIN SUMMARY																	
BASIN NUMBER	DRAINAGE AREA	DENUDED AREA	RUNOFF COEFF.	SYSTEM INTENSITY	25-YEAR PEAK FLOW	BASIN DIMENSIONS			TOP OF DAM EL.	WEIR LENGTH	AREA REQUIRED	AREA PROVIDED	VOLUME REQUIRED	VOLUME PROVIDED	SKIMMER SIZE	SKIMMER ORIFICE DIA.	DEWATER TIME
						DEPTH	LENGTH	WIDTH									
	(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
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
RB #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



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	#
	(ac)	(ft)	(ft)	(ft)	(ft/ft)		(in/hr)	(cfs)	W (ft)	ppes (K)	(fps)	(in)	(ft)	(ft)	(lb/sf)	Reqd.	Size & Material	Dam 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	Grass	18" HDPE	96	2
1B	4.49	790	398	390	0.010	0.500	7.98	17.92	4.00	2.00	3.81	13.4	1.12	1	0.7	Am. Excelsior - 1 net	18" HDPE	296	3
9	2.24	750	399	320	0.105	0.500	7.98	8.94	4.00	2.00	7.37	5.1	0.43	1	2.8	Grass	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	Grass	18" HDPE	46	4
5B	4.28	340.00	383.00	376.00	0.021	0.50	7.98	17.08	2.00	2.00	4.94	10.90	0.91	0.50	1.17	Grass	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	Grass	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	Grass	12" HDPE	61.05	6.67
6A	0.98	233.00	386.00	379.00	0.030	0.50	7.98	3.91	2.00	2.00	3.71	4.60	0.38	0.50	0.72	Grass	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	Grass	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	Grass	12" HDPE	71.10	3.33
7B	1.98	496.00	402.00	392.00	0.020	0.50	7.98	7.90	2.00	2.00	3.93	7.40	0.62	0.50	0.78	Grass	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	Grass	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	Grass	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	Grass	12" HDPE	132.86	2.33
4B	0.14	217.00	399.00	396.00	0.014	0.50	7.98	0.56	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	Grass	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

TEMPORARY DIVERSION DRAINAGE AREAS

SKIMMER BASIN CALCULATIONS

DATE: June 1, 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	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
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
RB #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

248412 5.702754821

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 Reqd.	Shear Stress	Liner	Slope Drain	Check Dam	# Check
	(ac)	(ft)	(ft)	(ft)	(ft/ft)		(in/hr)	(cfs)	W (ft)	opes (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	Grass	18" HDPE	96	2
1B	4.49	790	398	390	0.010	0.500	7.98	17.92	4.00	2.00	3.81	13.4	1.12	1	0.7	Am. Excelsior - 1 net	18" HDPE	296	3
9	2.24	750	399	320	0.105	0.500	7.98	8.94	4.00	2.00	7.37	5.1	0.43	1	2.8	Grass	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	Grass	18" HDPE	46	4
5B	4.28	340.00	383.00	376.00	0.021	0.50	7.98	17.08	2.00	2.00	4.94	10.90	0.91	0.50	1.17	Grass	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	Grass	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	Grass	12" HDPE	61.05	6.67
6A	0.98	233.00	386.00	379.00	0.030	0.50	7.98	3.91	2.00	2.00	3.71	4.60	0.38	0.50	0.72	Grass	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	Grass	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	Grass	12" HDPE	71.10	3.33
7B	1.98	496.00	402.00	392.00	0.020	0.50	7.98	7.90	2.00	2.00	3.93	7.40	0.62	0.50	0.78	Grass	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	Grass	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	Grass	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	Grass	12" HDPE	132.86	2.33
4B	0.14	217.00	399.00	396.00	0.014	0.50	7.98	0.56	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	Grass	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
Solve For	Formula
	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:	3/21/2022
Checked By:		Date:	
Company:	BGE		
Project Name:	PARKER RIDGE		
Project No.:	8430-03		

Site Location (City/Town)	Raleigh
Culvert Id.	101
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:

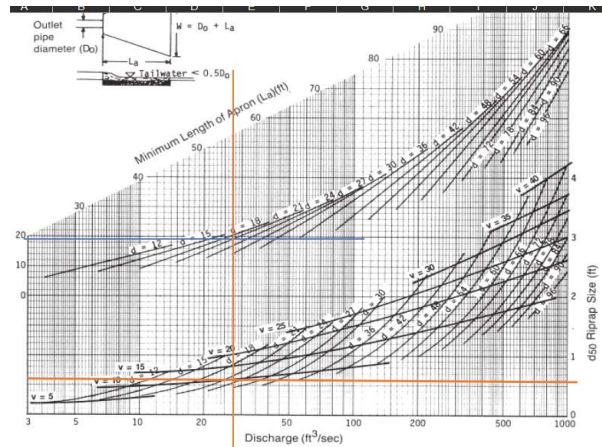
$$\text{Apron thickness} = 1.5 \times d_{max}$$

	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:	3/21/2022
Checked By:		Date:	
Company:	BGE		
Project Name:	PARKER RIDGE		
Project No.:	8430-03		

Site Location (City/Town)	Raleigh
Culvert Id.	101
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:	3/21/2022
Checked By:		Date:	
Company:	BGE		
Project Name:	PARKER RIDGE		
Project No.:	8430-03		

Site Location (City/Town)	Raleigh
Culvert Id.	101
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:

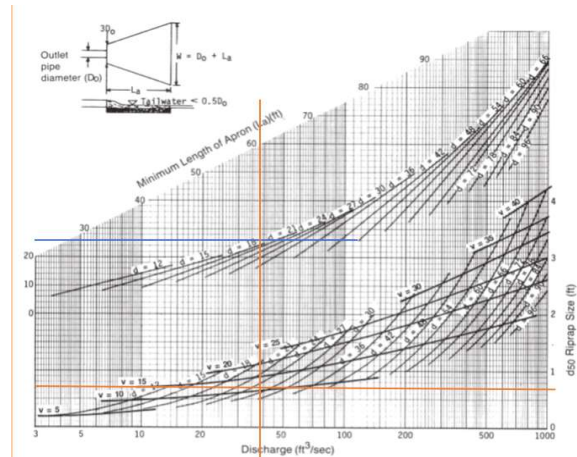
$$\text{Apron thickness} = 1.5 \times d_{max}$$

	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:	3/21/2022
Checked By:		Date:	
Company:	BGE		
Project Name:	PARKER RIDGE		
Project No.:	8430-03		

Site Location (City/Town)	Raleigh
Culvert Id.	101
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:

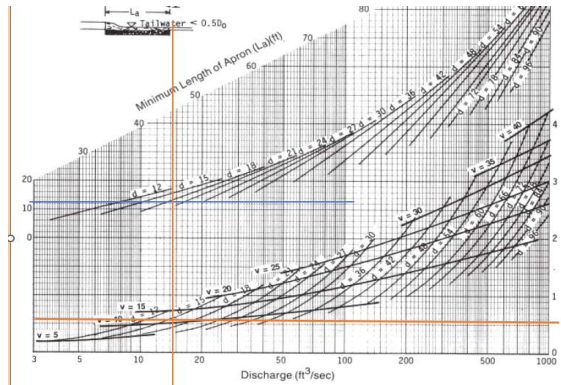
$$\text{Apron thickness} = 1.5 \times d_{max}$$

	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:	3/21/2022
Checked By:		Date:	
Company:	BGE		
Project Name:	PARKER RIDGE		
Project No.:	8430-03		

Site Location (City/Town)	Raleigh
Culvert Id.	101
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.

