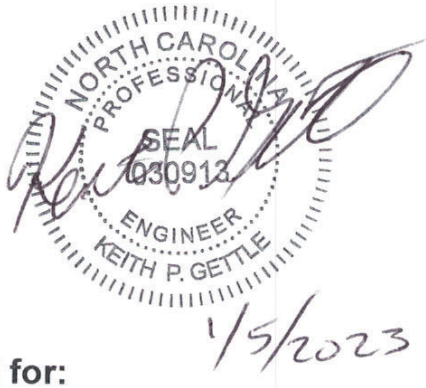
South Main
403 South Main

Rolesville, NC
Wake County

Pipe (Q25) HGL Calculations

September 29, 2022
Revised: January 5, 2023



Prepared for:

Toy Storage, LLC
2700 Gresham lake Rd.
Raleigh, NC 27615

South Main
HGL Analysis

Project Name:	**South Main**
Project Address:	**403 South Main Street Rolesville, NC**
Pins:	**1758784708 (1.8 acres) 1758785571 (.23 acres)**
Latitude: **Longitude:**	**N 35.916120** **W -78.468430**
Zoning:	**GC**
River Basin:	**Neuse**
Watershed:	**Milburnie Lake**
HUC:	**0302020107**
Developer:	**Toy Storage, LLC 2700 Gresham lake Rd. Raleigh, NC 27615**
Telephone:	**(919) 604-0505**
Email:	**Storit@AOL.com**

Site Description

The project consists of a single parcel located at the intersection of Wall Creek Drive and South Main Street in downtown Rolesville. The lot is approximately 1.80 acres (78,408 sq feet) and a portion of the lot on the south property line will be used for the BMP (approximately 0.23 acres from parcel 1758.08-78-5571). The parcel is vacant with grassy vegetation with approximately 4195 sq ft of impervious area. The project will consist of a commercial / residential building.

The site is in the Neuse River Basin, Milburnie Lake Watershed and subject to those rules regarding nutrient management and post storm water runoff.

The parcel is not located within a flood zone as noted per FEMA map 3720175800K, Dated July 19, 2022.

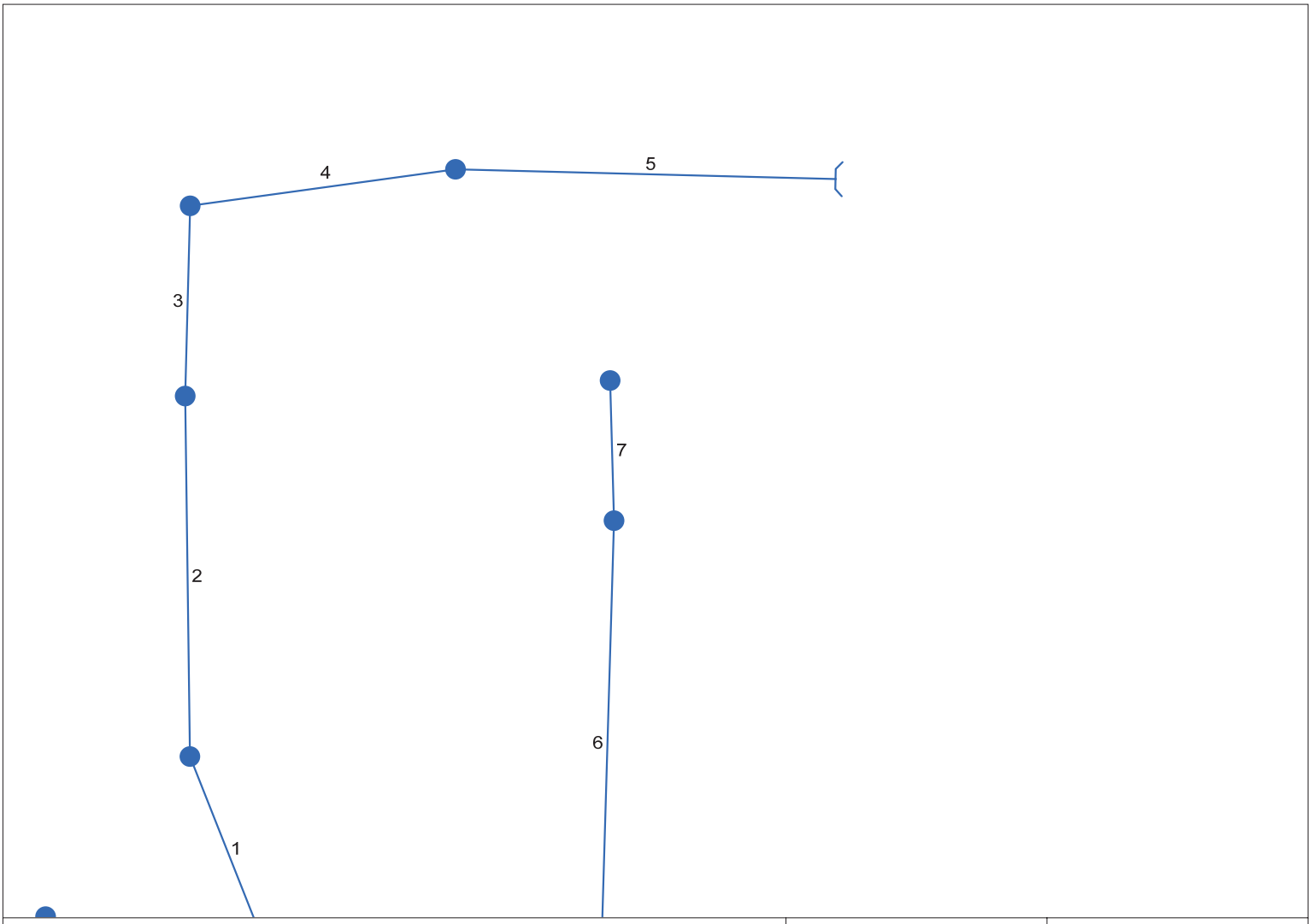
Based on the Wake County SCS soils map (attached) the onsite soils are primarily Durham Series (DuB), soil group B, throughout the tract. The Durham Series soil type is considered to be well drained soils.

Pipe Summary:

The analysis uses a “C” value of 0.95 for the pavement and 0.75 for the open areas. Time of concentration of 5 minutes is considered in the review and the drainage areas noted in the Hydrflow data.

The pipes were reviewed using a Q25 flow and the HGL is within the pipe network system and are sized appropriately.

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



Project File: Rolesville Massey Revised 1. modified 010623gpw.stm	Number of lines: 8	Date: 1/6/2023

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	A5-A6	3.94	12	Cir	40.000	409.00	409.30	0.750	409.84*	410.41*	0.25	410.67	End	Generic
2	A4-A5	2.87	12	Cir	72.000	409.50	410.70	1.667	410.67	411.43	n/a	411.43 j	1	Generic
3	A3-A4	2.36	12	Cir	38.000	410.90	411.09	0.500	411.67	411.86	0.20	412.06	2	Manhole
4	A2-A3	2.39	12	Cir	57.000	411.29	411.57	0.491	412.07	412.35	0.10	412.46	3	DropGrate
5	A1-A2	1.41	12	Cir	81.000	411.77	412.30	0.654	412.46	412.80	0.20	412.80	4	OpenHeadwall
6	C2C3	2.40	12	Cir	89.000	409.00	409.44	0.494	409.66	410.30	0.03	410.33	End	Manhole
7	C1-C2	2.41	12	Cir	28.000	409.64	409.78	0.500	410.42	410.56	0.21	410.77	6	Curb-Horiz
8	B1-B2	0.62	12	Cir	11.500	409.00	409.30	2.609	409.33	409.63	n/a	409.63 j	End	Curb-Horiz

Project File: Rolesville Massey Revised 1. modified 010623gpw.stm | Number of lines: 8 | Run Date: 1/6/2023

NOTES: Return period = 25 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

MyReport

Line No.	Area Dn (sqft)	Area Up (sqft)	Byp Ln No	Coeff C1 (C)	Coeff C2 (C)	Coeff C3 (C)	Capac Full (cfs)	Crit Depth (ft)	Cross Sl, Sw (ft/ft)	Cross Sl, Sx (ft/ft)	Curb Len (ft)	Defl Ang (Deg)	Depth Dn (ft)	Depth Up (ft)	DnStm Ln No	Drng Area (ac)	Easting X (ft)	EGL Dn (ft)	EGL Up (ft)	Energy Loss (ft)	
1	0.71	0.79	Sag	0.20	0.50	0.90	3.08	0.84	0.100	0.030	....	-112.900	0.84	1.00	Outfall	0.15	-2.56	410.33	410.80	0.478	
2	0.61	0.61	Sag	0.20	0.50	0.90	4.60	0.73	0.100	0.030	....	22.100	1.00	0.73**	1	0.09	-3.57	410.88	411.77	0.538	
3	0.65	0.65	n/a	0.20	0.50	0.90	2.52	0.66	....	....	....	2.397	0.77	0.77	2	0.00	-2.51	411.88	412.07	0.190	
4	0.66	0.66	Sag	0.20	0.50	0.90	2.50	0.66	0.020	0.020	....	81.058	0.78	0.78	3	0.17	54.02	412.28	412.56	0.280	
5	0.40	0.40	n/a	0.20	0.50	0.90	2.88	0.50	....	....	....	8.719	0.69	0.50**	4	0.23	135.00	412.65	413.00	0.000	
6	0.55	0.72	n/a	0.20	0.50	0.90	2.50	0.66	....	....	....	-88.200	0.66	0.86	Outfall	0.00	87.80	409.96	410.48	0.520	
7	0.66	0.66	Sag	0.20	0.50	0.90	2.52	0.66	0.100	0.030	4.00	-3.500	0.78	0.78	6	0.31	86.96	410.63	410.77	0.140	
8	0.22	0.22	Sag	0.20	0.50	0.90	5.75	0.33	0.100	0.030	4.00	-129.500	0.33	0.33**	Outfall	0.08	-33.31	409.45	409.75	0.000	

Project File: Rolesville Massey Revised 1. modified 010623gpw.stm | Number of lines: 8 | Date: 1/6/2023

NOTES: ** Critical depth

MyReport

Flow Rate (cfs)	Sf Ave (ft/ft)	Sf Dn (ft/ft)	Grate Area (sqft)	Grate Len (ft)	Grate Width (ft)	Gnd/Rim El Dn (ft)	Gnd/Rim El Up (ft)	Gutter Depth (ft)	Gutter Slope (ft/ft)	Gutter Spread (ft)	Gutter Width (ft)	HGL Dn (ft)	HGL Up (ft)	HGL Jnct (ft)	HGL Jmp Dn (ft)	HGL Jmp Up (ft)	Incr CxA	Incr Q (cfs)	Inlet Depth (ft)	Inlet Eff (%)
3.94	1.196	1.170	....	....	....	0.00	411.80	0.30	Sag	5.33	2.00	409.84	410.41	410.67	....	....	0.14	1.17	0.30	100
2.87	0.748	0.650	....	....	....	411.80	413.70	0.30	Sag	5.33	2.00	410.67	411.43 j	411.43	410.74	410.40	0.07	0.55	0.30	69
2.36	0.499	0.500	....	....	....	413.70	413.50	....	....	....	....	411.67	411.86	412.06	....	....	0.00	0.00	....	....
2.39	0.491	0.491	2.00	2.00	2.00	413.50	414.30	0.12	Sag	14.35	2.00	412.07	412.35	412.46	....	....	0.13	1.04	0.12	100
1.41	0.000	0.000	....	....	....	414.30	412.30	....	....	....	....	412.46	412.80	412.80	....	....	0.17	1.41	....	100
2.40	0.584	0.751	....	....	....	0.00	413.73	....	....	....	....	409.66	410.30	410.33	....	....	0.00	0.00	....	....
2.41	0.500	0.500	....	....	....	413.73	413.07	0.41	Sag	8.89	2.00	410.42	410.56	410.77	....	....	0.29	2.41	0.57	100
0.62	0.000	0.000	....	....	....	0.00	411.50	0.25	Sag	3.60	2.00	409.33	409.63 j	409.63	409.36	409.35	0.08	0.62	0.41	100

Project File: Rolesville Massey Revised 1. modified 010623gpw.stm | Number of lines: 8 | Date: 1/6/2023

NOTES: ** Critical depth

MyReport

Inlet ID	Inlet Loc	(ft)	Inlet Time (min)	i Sys (in/hr)	i Inlet (in/hr)	Invert Dn (ft)	Invert Up (ft)	Jump Loc (ft)	Jump Len (ft)	Vel Hd Jmp Dn (ft)	Vel Hd Jmp Up (ft)	J-Loss Coeff	Junct Type	Known Q (cfs)	Cost RCP	Cost CMP	Cost PVC	Line ID	Line Length (ft)
A5	Sag		5.0	7.72	8.19	409.00	409.30	....	....	0.00	0.00	0.65	Generic	0.00	1,220	1,098	1,037	A5-A6	40.000
A4	Sag		5.0	7.81	8.19	409.50	410.70	14.40	5.00	0.21	0.59	0.50 z	Generic	0.00	2,116	1,904	1,799	A4-A5	72.000
A3	Sag		5.0	7.87	0.00	410.90	411.09	....	....	0.00	0.00	0.99	MH	0.00	1,164	1,048	989	A3-A4	38.000
A2	Sag		5.0	7.96	8.19	411.29	411.57	....	....	0.00	0.00	0.50	Dp-Grate	0.00	1,696	1,526	1,442	A2-A3	57.000
A1	Sag		5.0	8.19	8.19	411.77	412.30	....	....	0.00	0.00	1.00 z	Hdwall	0.00	2,268	2,041	1,928	A1-A2	81.000
C2	Sag		5.0	8.14	0.00	409.00	409.44	....	....	0.00	0.00	0.15	MH	0.00	2,613	2,352	2,221	C2C3	89.000
C1	Sag		5.0	8.19	8.19	409.64	409.78	....	....	0.00	0.00	1.00	Curb	0.00	890	801	757	C1-C2	28.000
B1	Sag		5.0	8.19	8.19	409.00	409.30	1.15	1.65	0.12	0.19	1.00 z	Curb	0.00	422	380	359	B1-B2	11.500

Project File: Rolesville Massey Revised 1. modified 010623gpw.stm | Number of lines: 8 | Date: 1/6/2023

NOTES: Intensity = 118.93 / (Inlet time + 17.60) ^ 0.86 -- Return period = 25 Yrs. ; ** Critical depth

MyReport

Line Size (in)	Line Slope (%)	Line Type	Local Depr (in)	n-val Gutter	n-val Pipe	Minor Loss (ft)	Northing Y (ft)	Pipe Travel (min)	Q Byp (cfs)	Q Capt (cfs)	Q Carry (cfs)	Line Rise (in)	Runoff Coeff (C)	Line Span (in)	Area A1 (ac)	Area A2 (ac)	Area A3 (ac)	Tc (min)	Throat Ht (in)	Total Area (ac)	Total CxA	Total Runoff (cfs)	
12	0.75	Cir	0.0	....	0.013	0.25	-10.15	0.13	0.00	1.17	0.00	12	0.95	12	0.00	0.00	0.00	6.6	....	0.64	0.51	3.94	
12	1.67	Cir	0.0	....	0.013	n/a	61.84	0.33	0.17	0.38	0.00	12	0.75	12	0.00	0.00	0.00	6.3	....	0.49	0.37	2.87	
12	0.50	Cir	....	....	0.013	0.20	99.83	0.21	....	....	....	12	0.75	12	0.00	0.00	0.00	6.1	....	0.40	0.30	2.36	
12	0.49	Cir	....	....	0.013	0.10	107.11	0.31	0.00	1.04	0.00	12	0.75	12	0.00	0.00	0.00	5.8	....	0.40	0.30	2.39	
12	0.65	Cir	....	....	0.013	0.20	105.17	0.75	0.00	1.41	0.00	12	0.75	12	0.00	0.00	0.00	5.0	....	0.23	0.17	1.41	
12	0.49	Cir	....	....	0.013	0.03	36.96	0.49	....	....	....	12	0.95	12	0.00	0.00	0.00	5.2	....	0.31	0.29	2.40	
12	0.50	Cir	2.0	....	0.013	0.21	64.94	0.15	0.00	2.41	0.00	12	0.95	12	0.00	0.00	0.00	5.0	6.0	0.31	0.29	2.41	
12	2.61	Cir	2.0	....	0.013	n/a	-42.13	0.24	0.00	0.62	0.00	12	0.95	12	0.00	0.00	0.00	5.0	6.0	0.08	0.08	0.62	

Project File: Rolesville Massey Revised 1. modified 010623gpw.stm | Number of lines: 8 | Date: 1/6/2023

NOTES: ** Critical depth

MyReport

Vel Ave (ft/s)	Vel Dn (ft/s)	Vel Hd Dn (ft)	Vel Hd Up (ft)	Vel Up (ft/s)	Cover Dn (ft)	Cover Up (ft)	Storage (cft)
5.30	5.58	0.48	0.39	5.01	n/a	1.50	30.76
4.18	3.66	0.21	0.34	4.70	1.30	2.00	53.67
3.64	3.64	0.21	0.21	3.64	1.80	1.41	24.63
3.62	3.62	0.20	0.20	3.62	1.21	1.73	37.63
3.02	2.46	0.20	0.20	3.57	1.53	-1.00	39.32
3.83	4.34	0.29	0.17	3.32	n/a	3.29	57.05
3.65	3.65	0.21	0.21	3.65	3.09	2.29	18.50
2.76	2.75	0.12	0.12	2.78	n/a	1.20	2.59

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
(1)	(in) (2)	(cfs) (3)	(ft) (4)	(ft) (5)	(ft) (6)	(sqft) (7)	(ft/s) (8)	(ft) (9)	(ft) (10)	(%) (11)	(ft) (12)	(ft) (13)	(ft) (14)	(ft) (15)	(sqft) (16)	(ft/s) (17)	(ft) (18)	(ft) (19)	(%) (20)	(%) (21)	(ft) (22)	(K) (23)	(ft) (24)
1	12	3.94	409.00	409.84	0.84	0.71	5.58	0.48	410.33	1.170	40.000	409.30	410.41	1.00	0.79	5.01	0.39	410.80	1.223	1.196	0.478	0.65	0.25
2	12	2.87	409.50	410.67	1.00	0.61	3.66	0.21	410.88	0.650	72.000	410.70	411.43 j	0.73**	0.61	4.70	0.34	411.77	0.845	0.748	n/a	0.50	n/a
3	12	2.36	410.90	411.67	0.77*	0.65	3.64	0.21	411.88	0.500	38.000	411.09	411.86	0.77	0.65	3.64	0.21	412.07	0.499	0.499	0.190	0.99	0.20
4	12	2.39	411.29	412.07	0.78*	0.66	3.62	0.20	412.28	0.491	57.000	411.57	412.35	0.78	0.66	3.62	0.20	412.56	0.491	0.491	0.280	0.50	0.10
5	12	1.41	411.77	412.46	0.69	0.40	2.46	0.20	412.65	0.000	81.000	412.30	412.80	0.50**	0.40	3.57	0.20	413.00	0.000	0.000	n/a	1.00	0.20
6	12	2.40	409.00	409.66	0.66*	0.55	4.34	0.29	409.96	0.751	89.000	409.44	410.30	0.86	0.72	3.32	0.17	410.48	0.417	0.584	0.520	0.15	0.03
7	12	2.41	409.64	410.42	0.78*	0.66	3.65	0.21	410.63	0.500	28.000	409.78	410.56	0.78	0.66	3.65	0.21	410.77	0.499	0.500	0.140	1.00	0.21
8	12	0.62	409.00	409.33	0.33	0.22	2.75	0.12	409.45	0.000	11.500	409.30	409.63 j	0.33**	0.22	2.78	0.12	409.75	0.000	0.000	n/a	1.00	n/a

Project File: Rolesville Massey Revised 1. modified 010623gpw.stm | Number of lines: 8 | Run Date: 1/6/2023

Notes: * Normal depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Hydraflow HGL Computation Procedure

General Procedure:

Hydraflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydraflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is temporarily assumed at the upstream end. A supercritical flow Profile is then computed using the same procedure in a downstream direction using momentum principles.

Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.

Col. 2 The line size. In the case of non-circular pipes, the line rise is printed above the span.

Col. 3 Total flow rate in the line.

Col. 4 The elevation of the downstream invert.

Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.

Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 7 Cross-sectional area of the flow at the downstream end.

Col. 8 The velocity of the flow at the downstream end, (Col. 3 / Col. 7).

Col. 9 Velocity head (Velocity squared / 2g).

Col. 10 The elevation of the energy grade line at the downstream end, HGL + Velocity head, (Col. 5 + Col. 9).

Col. 11 The friction slope at the downstream end (the S or Slope term in Manning's equation).

Col. 12 The line length.

Col. 13 The elevation of the upstream invert.

Col. 14 Elevation of the hydraulic grade line at the upstream end.

Col. 15 The upstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 16 Cross-sectional area of the flow at the upstream end.

Col. 17 The velocity of the flow at the upstream end, (Col. 3 / Col. 16).

Col. 18 Velocity head (Velocity squared / 2g).

Col. 19 The elevation of the energy grade line at the upstream end, HGL + Velocity head, (Col. 14 + Col. 18) .

Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).

Col. 21 The average of the downstream and upstream friction slopes.

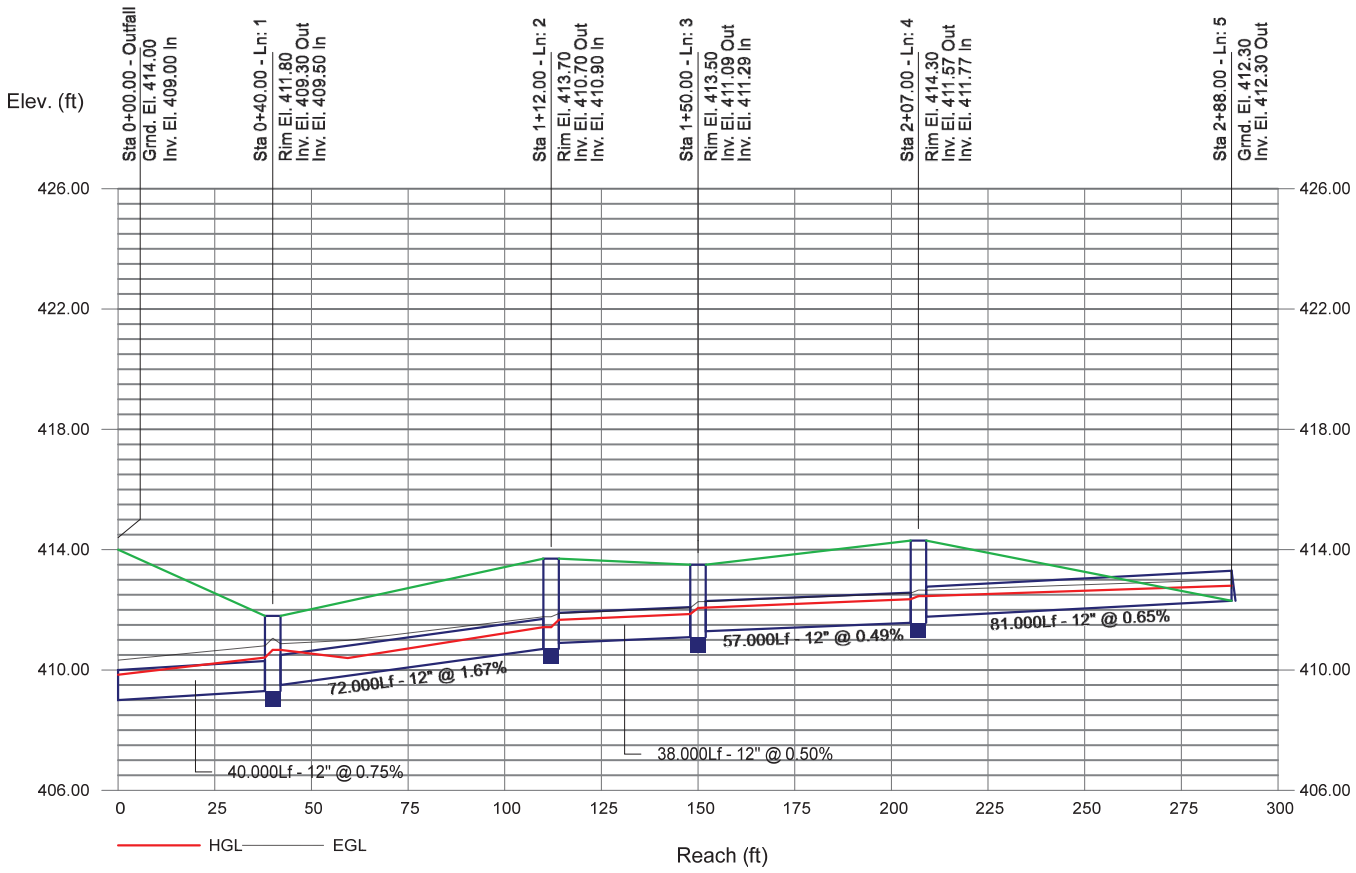
Col. 22 Energy loss. Average Sf/100 x Line Length (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.

Col. 23 The junction loss coefficient (K).

Col. 24 Minor loss. (Col. 23 x Col. 18). Is added to upstream HGL and used as the starting HGL for the next upstream line(s).

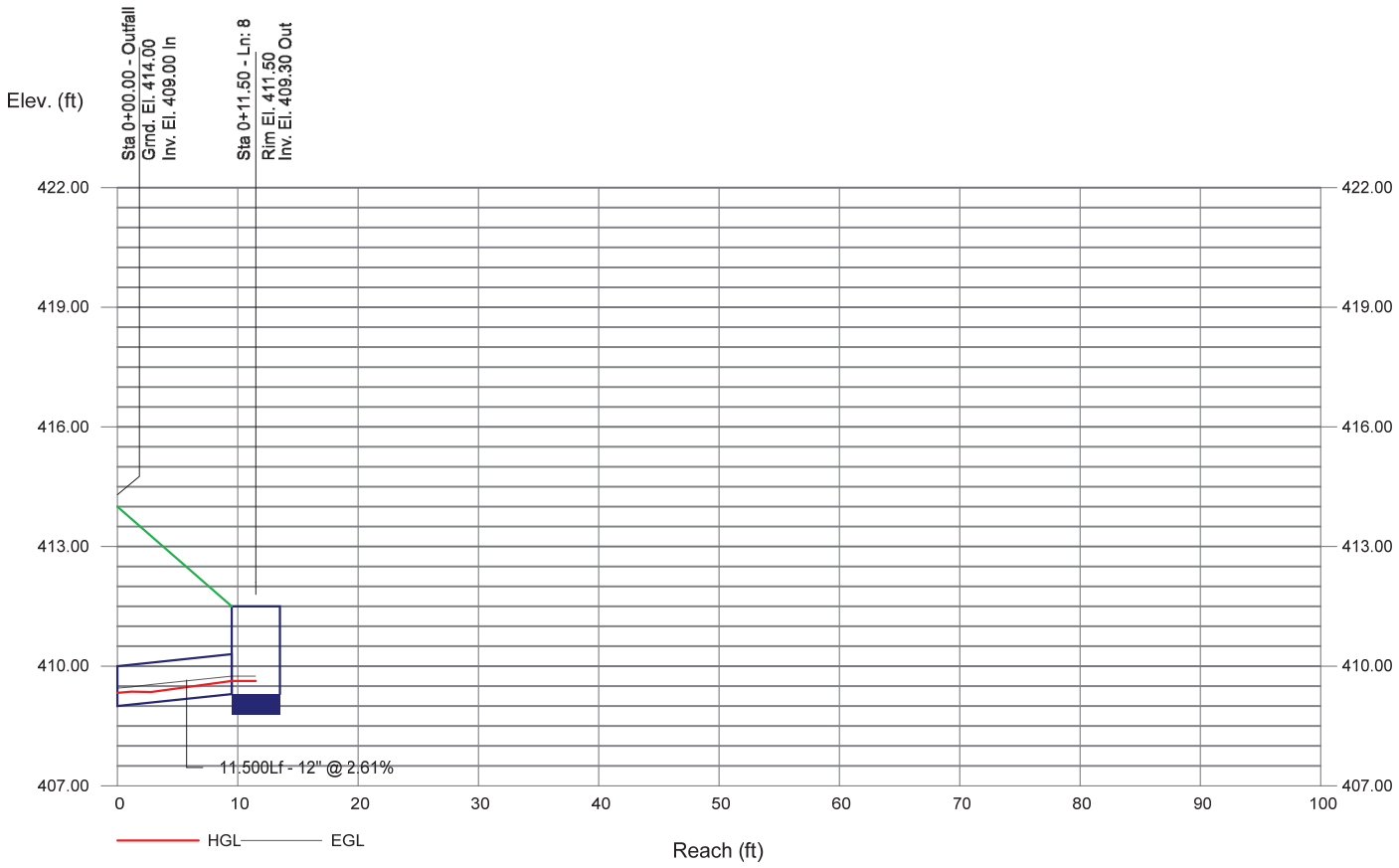
Storm Sewer Profile

Proj. file: Rolesville Massey Revised 1. modified 010623gpw.stm



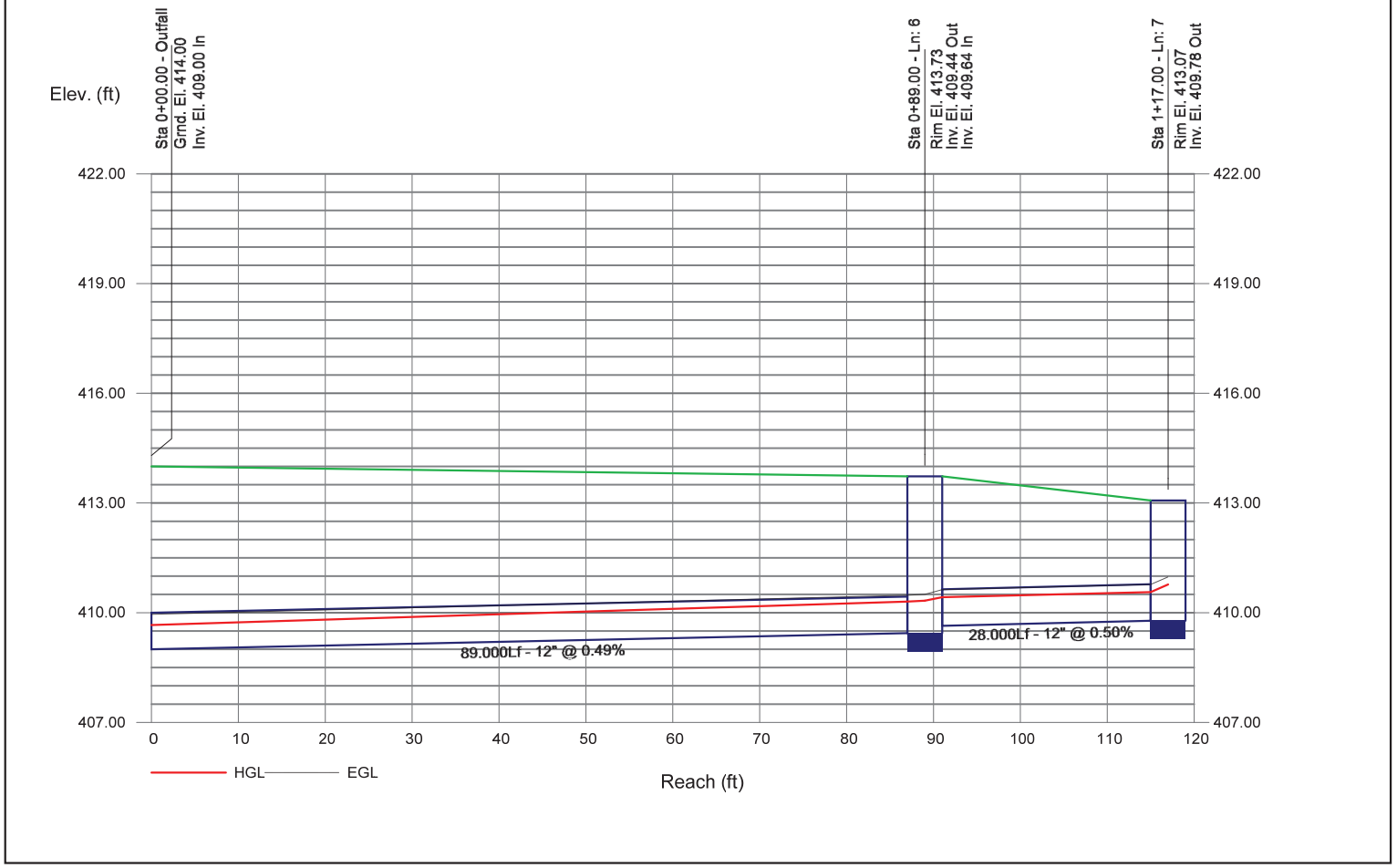
Storm Sewer Profile

Proj. file: Rolesville Massey Revised 1. modified 010623gpw.stm



Storm Sewer Profile

Proj. file: Rolesville Massey Revised 1. modified 010623gpw.stm

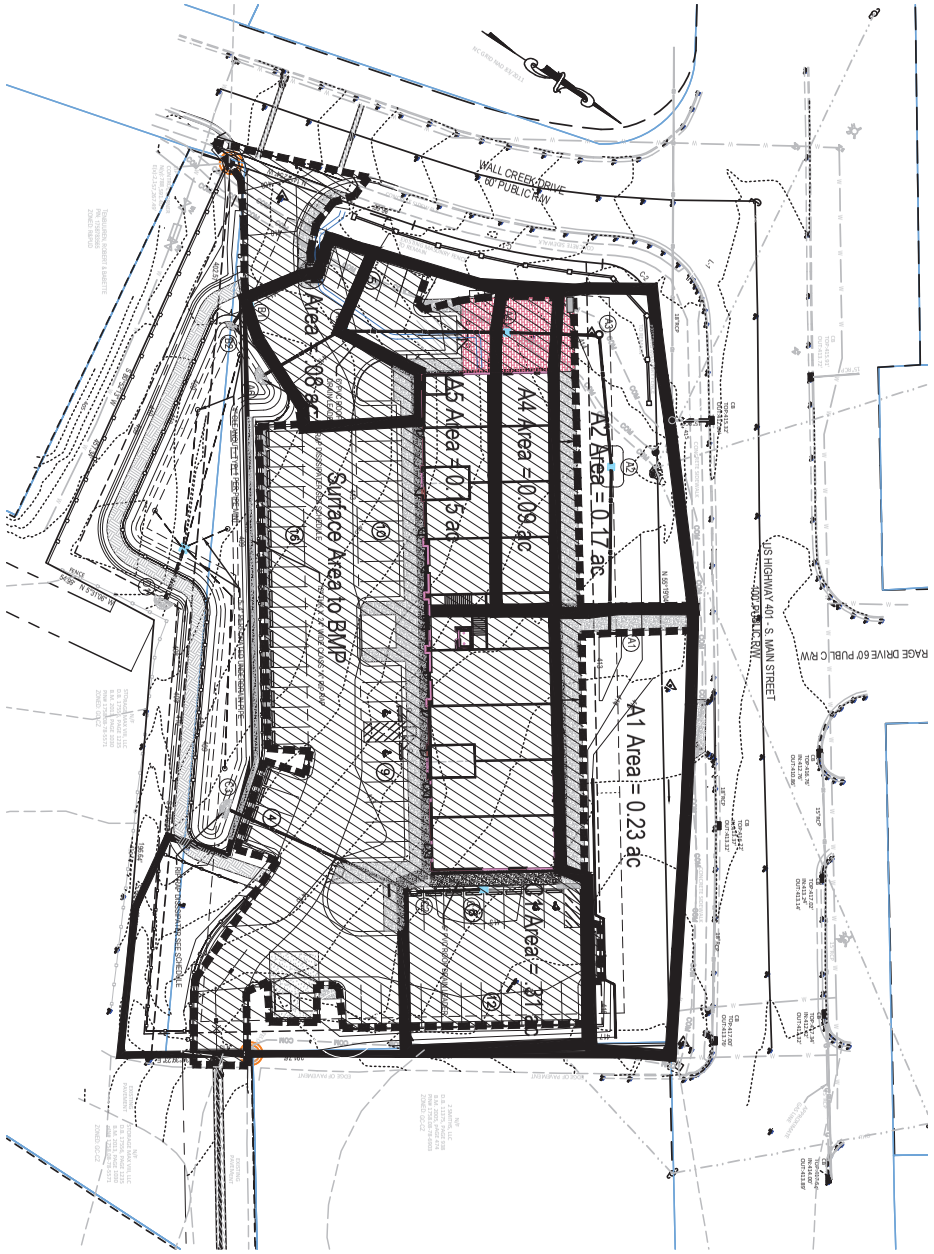


Gettle Engineering and Design, PLLC
3616 Waxwing Court,
Wake Forest, North Carolina 27587
(919) 210-3934
Firm License P-2538

NO.	DATE	ITEM / DESCRIPTION	BY
1	11/15/22	PER CITY COMMENTS	EJT
2	12/5	PER CITY COMMENTS	EJT
3	12/5	PER CITY COMMENTS	EJT
4	12/5	PER CITY COMMENTS	EJT
5	12/5	PER CITY COMMENTS	EJT
6	12/5	PER CITY COMMENTS	EJT
7	12/5	PER CITY COMMENTS	EJT
8	12/5	PER CITY COMMENTS	EJT
9	12/5	PER CITY COMMENTS	EJT
10	12/5	PER CITY COMMENTS	EJT
11	12/5	PER CITY COMMENTS	EJT
12	12/5	PER CITY COMMENTS	EJT
13	12/5	PER CITY COMMENTS	EJT
14	12/5	PER CITY COMMENTS	EJT
15	12/5	PER CITY COMMENTS	EJT
16	12/5	PER CITY COMMENTS	EJT
17	12/5	PER CITY COMMENTS	EJT
18	12/5	PER CITY COMMENTS	EJT
19	12/5	PER CITY COMMENTS	EJT
20	12/5	PER CITY COMMENTS	EJT

Drainage Map
South Main
503 South Main Street
Rolesville, Wake County, North Carolina

Project No. 22003
Dwg No. EX1



Drainage Areas - Storm Drain
South Main
503 South Main Street
Rolesville, Wake County, North Carolina

Project No. 22003
Dwg No. EX2

NO.	DATE	REVISION DESCRIPTION	BY
7	07-28-2022	RFP#2, SUBMITTAL	RPD
6	10-3-2022	Combined per Town / CORCom ment	RPD
5	DATE	COMMENT	BY
4	DATE	COMMENT	BY
3	DATE	COMMENT	BY
2	DATE	COMMENT	BY
1	DATE	COMMENT	BY
A	DWN	Comment	By

Gettle Engineering and Design, PLLC
3616 Waxwing Court,
Wake Forest, North Carolina 27587
(919) 210-3934 Firm License P-2538