Automatic Fire Sprinkler Systems

REGIONAL FIRE SERVICES OF NC LLC

3101-310 Poplarwood Court - Raleigh, NC 27604
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www.regionalfirenc.com

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Certified Engineering Tech.
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Water-Based Systems Layout, Level III

AJITH ZACHARIAS
N.C. REGISTERED CONTRACTOR
35525
FIRE SPRINKLER SYSTEM
RALEIGH, NC

HYDRAULIC CALCULATIONS

For:

HARBOR FREIGHT TOOLS
129 W. Cornelius Harnett Blvd.
Lillington, NC 27546

Submitted by:

Jack Harlow

Automatic Fire Sprinkler Systems

Hydraulic Calculations by HydraCALC

REGIONAL FIRE SERVICES OF NC
3101 POPLARWOOD CT.
SUITE - 310
RALEIGH, NC 27604
919-212-2722

Job Name	:	Harbor Freight Tools
Drawing	:	FP-2
Location	:	129 W. Cornelius Harnett Blvd., Lillington, NC 27546
Remote Area	:	1
Contract	:	24026
Data File	:	REMOTE AREA #1 _ SALES_ Harbor Freight.WXF
Date/Time	:	05/29/2024 - 03:46 PM

HYDRAULIC CALCULATIONS
for

JOB NAME Harbor Freight Tools
Location 129 W. Cornelius Harnett Blvd., Lillington, NC 27546
Drawing # FP-2
Contract # 24026
Date 05-29-24

DESIGN

Remote area # 1
Remote area location Sales Area 101
Occupancy classification Mercantile
Density 0.20 - Gpm/SqFt
Area of application 1500 - SqFt
Coverage/sprinkler 256 Max. - SqFt
Type of sprinkler calculated 14.0K Extended Coverage Upright
 # Sprinklers calculated 8
In-rack demand N/A - GPM
Hose streams 250 - GPM
Total water required (including hose streams) 665.073 - GPM @ 43.6443 - Psi
Type of system EXISTING WET SYSTEM
Volume of system (dry or pre-action) N/A - Gal

WATER SUPPLY INFORMATION

Test date 05-23-24
Location 129 W. Cornelius Harnett Blvd.
Source of info Regional Fire Services of NC, LLC

CONTRACTOR INFO REGIONAL FIRE SERVICES OF NC
Address 3101 POPLARWOOD CT. / SUITE - 310 / RALEIGH, NC 27604
Phone # 919-212-2722
Name of designer Jack Harlow
Authority having jurisdiction Harnett County
NOTES:

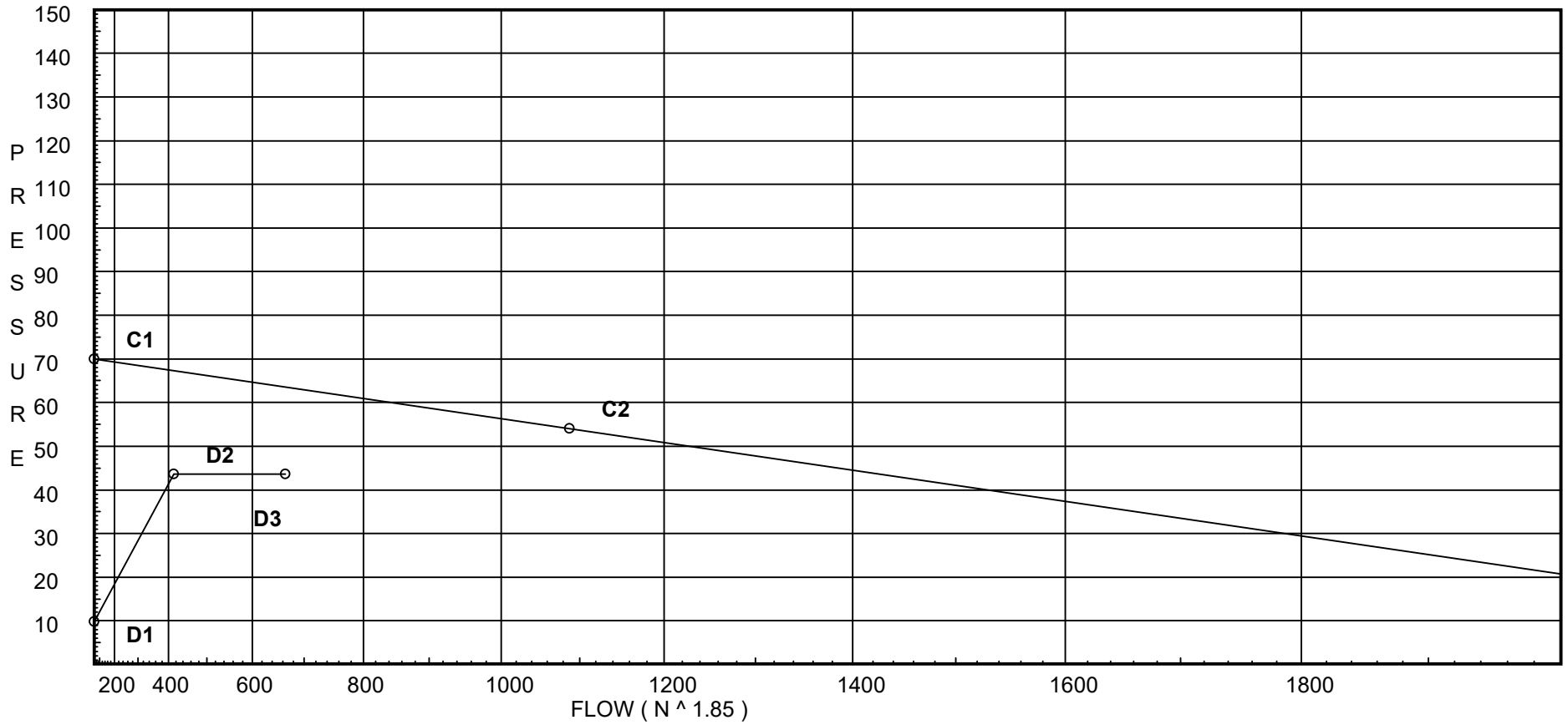
text1(35) - invisible

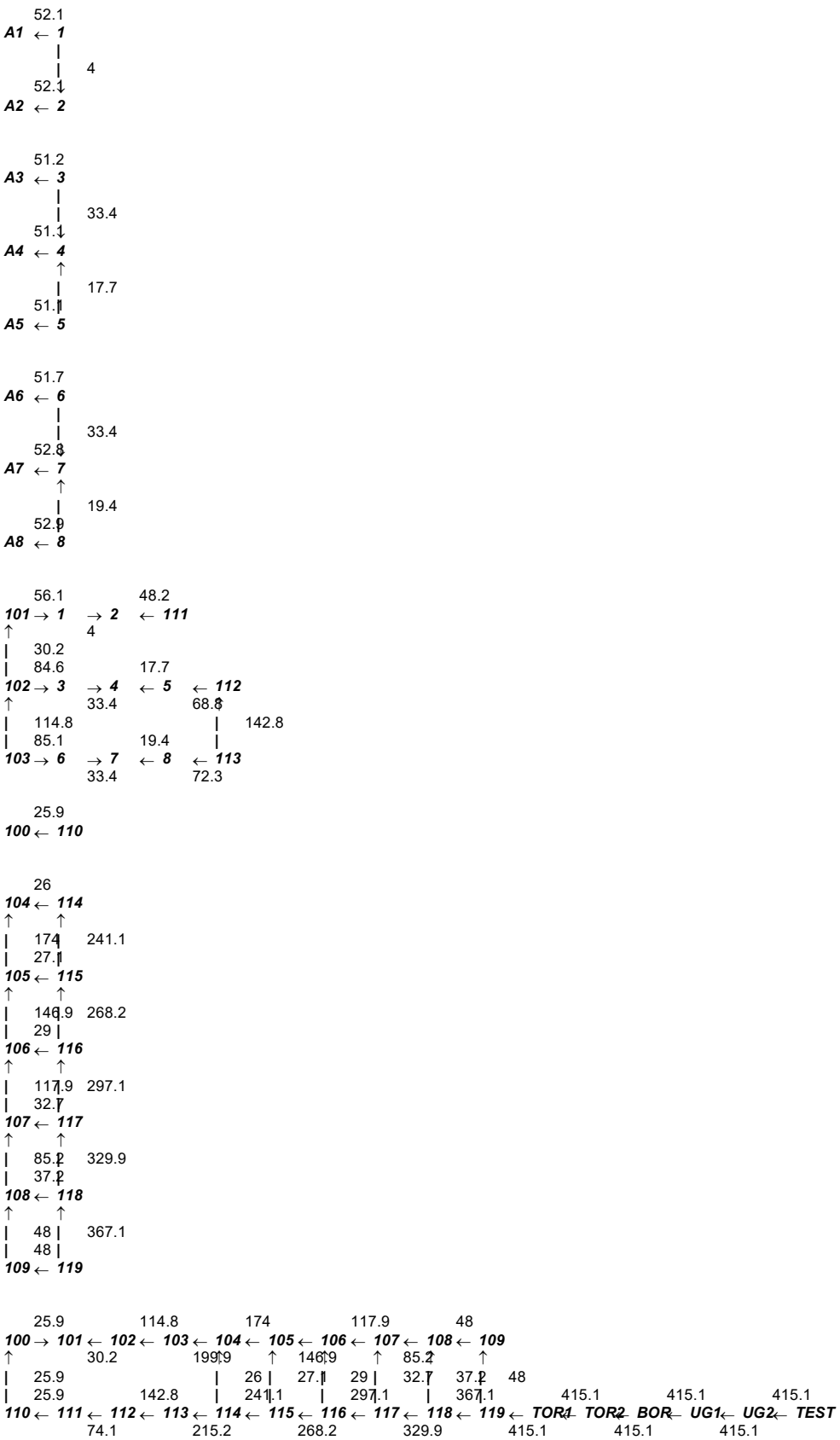
Water Supply Curve

REGIONAL FIRE SERVICES OF NC
Harbor Freight Tools

City Water Supply:
- C1 - Static Pressure : 70
- C2 - Residual Pressure: 54
- C2 - Residual Flow : 1088

Demand:
- D1 - Elevation : 9.745
- D2 - System Flow : 415.073
- D2 - System Pressure : 43.644
- Hose (Demand) : 250
- D3 - System Demand : 665.073
- Safety Margin : 19.919




52.1
A1 ← 1
4
52.1
A2 ← 2
51.2
A3 ← 3
33.4
51.1
A4 ← 4
17.7
51.1
A5 ← 5
51.7
A6 ← 6
33.4
52.8
A7 ← 7
19.4
52.9
A8 ← 8
56.1
48.2
101 → 1 → 2 ← 111
4
30.2
84.6
17.7
102 → 3 → 4 ← 5 ← 112
33.4
68.8
114.8
142.8
85.1
19.4
103 → 6 → 7 ← 8 ← 113
33.4
72.3
25.9
100 ← 110
26
104 ← 114
174
241.1
27.1
105 ← 115
146.9
268.2
29
106 ← 116
117.9
297.1
32.7
107 ← 117
85.2
329.9
37.2
108 ← 118
48
367.1
48
109 ← 119
25.9
114.8
174
117.9
48
100 → 101 ← 102 ← 103 ← 104 ← 105 ← 106 ← 107 ← 108 ← 109
30.2
199.9
146.9
85.2
25.9
26
27.1
29
32.7
37.2
48
25.9
142.8
241.1
297.1
367.1
415.1
415.1
415.1
110 ← 111 ← 112 ← 113 ← 114 ← 115 ← 116 ← 117 ← 118 ← 119 ← TOR1 ← TOR2 ← BOR ← UG1 ← UG2 ← TEST
74.1
215.2
268.2
329.9
415.1
415.1
415.1

Fittings Used Summary

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
G	NFPA 13 Gate Valve	0	0	0	0	0	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13
T	NFPA 13 90' Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121
Zic	Wilkins 350ADA	Fitting generates a Fixed Loss Based on Flow																			

Units Summary

Diameter Units	Inches
Length Units	Feet
Flow Units	US Gallons per Minute
Pressure Units	Pounds per Square Inch

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.
The diameter modification was turned off by the operator when the job was calculated.

SUPPLY ANALYSIS

Node at Source	Static Pressure	Residual Pressure	Flow	Available Pressure	Total Demand	Required Pressure
TEST	70.0	54	1088.0	63.563	665.07	43.644

NODE ANALYSIS

Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes	
A1	19.75	14	13.86	52.13	0.2	139
A2	19.75	14	13.86	52.12	0.2	139
A3	19.5	14	13.39	51.22	0.2	222
A4	19.5	14	13.3	51.06	0.2	222
A5	19.5	14	13.33	51.11	0.2	253
A6	19.167	14	13.65	51.73	0.2	224
A7	19.167	14	14.23	52.81	0.2	256
A8	19.167	14	14.27	52.89	0.2	256
101	12.5		27.32			
1	12.5		26.38			
2	12.5		26.38			
102	12.5		27.32			
3	12.5		25.31			
4	12.5		25.17			
5	12.5		25.22			
103	12.5		27.38			
6	12.5		25.35			
7	14.0		24.45			
8	14.0		24.5			
100	12.5		27.32			
104	12.5		27.54			
105	12.5		27.63			
106	12.5		27.7			
107	12.5		27.75			
108	12.5		27.78			
109	12.5		27.79			
110	15.667		26.85			
111	15.667		26.85			
112	15.667		26.86			
113	15.667		26.95			
114	15.667		27.13			
115	15.667		27.3			
116	15.667		27.51			
117	15.667		27.76			
118	15.667		28.16			
119	15.667		29.32			
TOR1	15.667		29.93			
TOR2	12.5		31.43			
BOR	1.0		39.83			
UG1	-3.0		41.67			

NODE ANALYSIS (cont.)

Node Tag	*Elevation*	*Node Type*	*Pressure at Node*	*Discharge at Node*	*Notes*
UG2	-3.0		42.67		
TEST	-3.0		43.64	250.0	

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	******* Notes ******
*HEADS & SPRIGS										
A1	19.750	14.00	52.13	1	T	5.0	7.250	120	13.863	
to							5.000		3.140	
1	12.500		52.13	1.049			12.250	0.7656	9.379	Vel = 19.35
			0.0							
1			52.13						26.382	K Factor = 10.15
A2	19.750	14.00	52.12	1	T	5.0	7.250	120	13.861	
to							5.000		3.140	
2	12.500		52.12	1.049			12.250	0.7656	9.378	Vel = 19.35
			0.0							
2			52.12						26.379	K Factor = 10.15
A3	19.500	14.00	51.22	1	T	5.0	7.000	120	13.387	
to							5.000		3.032	
3	12.500		51.22	1.049			12.000	0.7412	8.895	Vel = 19.01
			0.0							
3			51.22						25.314	K Factor = 10.18
A4	19.500	14.00	51.06	1	T	5.0	7.000	120	13.300	
to							5.000		3.032	
4	12.500		51.06	1.049			12.000	0.7368	8.842	Vel = 18.95
			0.0							
4			51.06						25.174	K Factor = 10.18
A5	19.500	14.00	51.11	1	T	5.0	7.000	120	13.327	
to							5.000		3.032	
5	12.500		51.11	1.049			12.000	0.7382	8.858	Vel = 18.97
			0.0							
5			51.11						25.217	K Factor = 10.18
A6	19.167	14.00	51.73	1	T	5.0	6.667	120	13.655	
to							5.000		2.887	
6	12.500		51.73	1.049			11.667	0.7550	8.809	Vel = 19.20
			0.0							
6			51.73						25.351	K Factor = 10.27
A7	19.167	14.00	52.82	1	T	5.0	5.167	120	14.232	
to							5.000		2.238	
7	14		52.82	1.049			10.167	0.7844	7.975	Vel = 19.61
			0.0							
7			52.82						24.445	K Factor = 10.68
A8	19.167	14.00	52.89	1	T	5.0	5.167	120	14.271	
to							5.000		2.238	
8	14		52.89	1.049			10.167	0.7864	7.995	Vel = 19.63
			0.0							
8			52.89						24.504	K Factor = 10.68
*REMOTE GRID LINE 1										
101	12.500		-56.08	2	T	10.0	25.833	120	27.320	
to							10.000		0.0	
1	12.500		-56.08	2.157			35.833	-0.0262	-0.938	Vel = 4.92
1	12.500		52.13	2			14.000	120	26.382	
to									0.0	
2	12.500		-3.95	2.157			14.000	-0.0002	-0.003	Vel = 0.35

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	******* Notes ******
2	12.500		52.12	2	2E	10.0	73.000	120	26.379	
to					T	10.0	20.000		-1.372	
111	15.667		48.17	2.157			93.000	0.0198	1.839	Vel = 4.23
			0.0							
111			48.17						26.846	K Factor = 9.30
*REMOTE GRID LINE 2										
102	12.500		-84.63	2	T	10.0	25.833	120	27.323	
to							10.000		0.0	
3	12.500		-84.63	2.157			35.833	-0.0561	-2.009	Vel = 7.43
3	12.500		51.23	2			14.000	120	25.314	
to									0.0	
4	12.500		-33.4	2.157			14.000	-0.0100	-0.140	Vel = 2.93
4	12.500		51.05	2			14.000	120	25.174	
to									0.0	
5	12.500		17.65	2.157			14.000	0.0031	0.043	Vel = 1.55
5	12.500		51.11	2	2E	10.0	59.000	120	25.217	
to					T	10.0	20.000		-1.372	
112	15.667		68.76	2.157			79.000	0.0382	3.017	Vel = 6.04
			0.0							
112			68.76						26.862	K Factor = 13.27
*REMOTE GRID LINE 3										
103	12.500		-85.11	2	T	10.0	25.833	120	27.381	
to							10.000		0.0	
6	12.500		-85.11	2.157			35.833	-0.0567	-2.030	Vel = 7.47
6	12.500		51.74	2	2E	10.0	15.500	120	25.351	
to							10.000		-0.650	
7	14		-33.37	2.157			25.500	-0.0100	-0.256	Vel = 2.93
7	14		52.81	2			16.000	120	24.445	
to									0.0	
8	14		19.44	2.157			16.000	0.0037	0.059	Vel = 1.71
8	14		52.89	2	2E	10.0	55.500	120	24.504	
to					T	10.0	20.000		-0.722	
113	15.667		72.33	2.157			75.500	0.0419	3.166	Vel = 6.35
			0.0							
113			72.33						26.948	K Factor = 13.93
*GRID LINES										
100	12.500		25.90	2	2T	20.0	112.833	120	27.321	
to					2E	10.0	30.000		-1.372	
110	15.667		25.9	2.157			142.833	0.0063	0.896	Vel = 2.27
			0.0							
110			25.90						26.845	K Factor = 5.00
104	12.500		25.95	2	2T	20.0	112.833	120	27.541	
to					4E	20.0	40.000		-1.372	
114	15.667		25.95	2.157			152.833	0.0063	0.962	Vel = 2.28
			0.0							
114			25.95						27.131	K Factor = 4.98

Node1 / to / Node2	Elev1 / Elev2	K Fact	Qa / Qt	Nom / Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt / Pe / Pf	******* Notes ******
105	12.500		27.06	2	2T	20.0	112.833	120	27.634	
to					4E	20.0	40.000		-1.372	
115	15.667		27.06	2.157			152.833	0.0068	1.039	Vel = 2.38
			0.0							
115			27.06						27.301	K Factor = 5.18
106	12.500		28.95	2	2T	20.0	112.833	120	27.701	
to					4E	20.0	40.000		-1.372	
116	15.667		28.95	2.157			152.833	0.0077	1.179	Vel = 2.54
			0.0							
116			28.95						27.508	K Factor = 5.52
107	12.500		32.75	2	2T	20.0	112.833	120	27.746	
to					2E	10.0	30.000		-1.372	
117	15.667		32.75	2.157			142.833	0.0097	1.383	Vel = 2.88
			0.0							
117			32.75						27.757	K Factor = 6.22
108	12.500		37.24	2	2T	20.0	112.833	120	27.780	
to					2E	10.0	30.000		-1.372	
118	15.667		37.24	2.157			142.833	0.0123	1.754	Vel = 3.27
			0.0							
118			37.24						28.162	K Factor = 7.02
109	12.500		47.97	2	2T	20.0	118.083	120	27.788	
to					2E	10.0	30.000		-1.372	
119	15.667		47.97	2.157			148.083	0.0196	2.905	Vel = 4.21
			0.0							
119			47.97						29.321	K Factor = 8.86
*FLOAT MAIN										
100	12.500		-25.90	4			3.750	120	27.321	
to									0.0	
101	12.500		-25.9	4.26			3.750	-0.0003	-0.001	Vel = 0.58
101	12.500		56.08	4			10.000	120	27.320	
to									0.0	
102	12.500		30.18	4.26			10.000	0.0003	0.003	Vel = 0.68
102	12.500		84.62	4			16.000	120	27.323	
to									0.0	
103	12.500		114.8	4.26			16.000	0.0036	0.058	Vel = 2.58
103	12.500		85.11	4			16.000	120	27.381	
to									0.0	
104	12.500		199.91	4.26			16.000	0.0100	0.160	Vel = 4.50
104	12.500		-25.95	4			12.000	120	27.541	
to									0.0	
105	12.500		173.96	4.26			12.000	0.0078	0.093	Vel = 3.92
105	12.500		-27.06	4			12.000	120	27.634	
to									0.0	
106	12.500		146.9	4.26			12.000	0.0056	0.067	Vel = 3.31
106	12.500		-28.95	4			12.000	120	27.701	
to									0.0	
107	12.500		117.95	4.26			12.000	0.0038	0.045	Vel = 2.66

Node1 / to / Node2	Elev1 / Elev2	K Fact	Qa / Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt / Pe / Pf	******* Notes ******
107	12.500		-32.75	4			16.000	120	27.746	
to									0.0	
108	12.500		85.2	4.26			16.000	0.0021	0.034	Vel = 1.92
108	12.500		-37.23	4			12.333	120	27.780	
to									0.0	
109	12.500		47.97	4.26			12.333	0.0006	0.008	Vel = 1.08
			0.0							
109			47.97						27.788	K Factor = 9.10
*MAIN										
110	15.667		25.90	4			3.750	120	26.845	
to									0.0	
111	15.667		25.9	4.26			3.750	0.0003	0.001	Vel = 0.58
111	15.667		48.17	4			10.000	120	26.846	
to									0.0	
112	15.667		74.07	4.26			10.000	0.0016	0.016	Vel = 1.67
112	15.667		68.76	4			16.000	120	26.862	
to									0.0	
113	15.667		142.83	4.26			16.000	0.0054	0.086	Vel = 3.22
113	15.667		72.33	4			16.000	120	26.948	
to									0.0	
114	15.667		215.16	4.26			16.000	0.0114	0.183	Vel = 4.84
114	15.667		25.96	4			12.000	120	27.131	
to									0.0	
115	15.667		241.12	4.26			12.000	0.0142	0.170	Vel = 5.43
115	15.667		27.05	4			12.000	120	27.301	
to									0.0	
116	15.667		268.17	4.26			12.000	0.0172	0.207	Vel = 6.04
116	15.667		28.95	4			12.000	120	27.508	
to									0.0	
117	15.667		297.12	4.26			12.000	0.0208	0.249	Vel = 6.69
117	15.667		32.75	4			16.000	120	27.757	
to									0.0	
118	15.667		329.87	4.26			16.000	0.0253	0.405	Vel = 7.43
118	15.667		37.24	4	2E	20.0	17.667	120	28.162	
to							20.000		0.0	
119	15.667		367.11	4.26			37.667	0.0308	1.159	Vel = 8.26
119	15.667		47.96	4	E	10.0	5.833	120	29.321	
to							10.000		0.0	
TOR1	15.667		415.07	4.26			15.833	0.0387	0.612	Vel = 9.34
			0.0							
TOR1			415.07						29.933	K Factor = 75.87
*RISER										
TOR1	15.667		415.07	4			3.167	120	29.933	
to									1.372	
TOR2	12.500		415.07	4.26			3.167	0.0385	0.122	Vel = 9.34
TOR2	12.500		0.0	6	Zic	0.0	11.500	120	31.427	
to					B	10.0	10.000		8.281	* * Fixed Loss = 3.3
BOR	1		415.07	6.357			21.500	0.0054	0.117	Vel = 4.20

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*******	Notes	******
			0.0									
BOR			415.07						39.825	K Factor = 65.77		
*SUPPLY												
BOR	1		415.07	6	E	18.62	4.000	140	39.825			
to							18.620		1.732			
UG1	-3		415.07	6.16			22.620	0.0049	0.110	Vel = 4.47		
UG1	-3		0.0	6	2E	37.24	167.000	140	41.667			
to					G	3.99	41.230		0.0			
UG2	-3		415.07	6.16			208.230	0.0048	1.004	Vel = 4.47		
UG2	-3		0.0	6			202.000	140	42.671			
to									0.0			
TEST	-3		415.07	6.16			202.000	0.0048	0.973	Vel = 4.47		
			250.00							Qa = 250.00		
TEST			665.07						43.644	K Factor = 100.67		

Hydrant Flow Test Report

Test Date 5/23/2024 **Test Time** 9:30 am

Location

129 W. Cornelius Harnett Blvd.
Lillington, NC 27546

Tested by

Jack Harlow & Thomas Crowder
Regional Fire Services of NC, LLC

Notes

Residual hydrant (4311166)
Flow hydrant (4311166A)

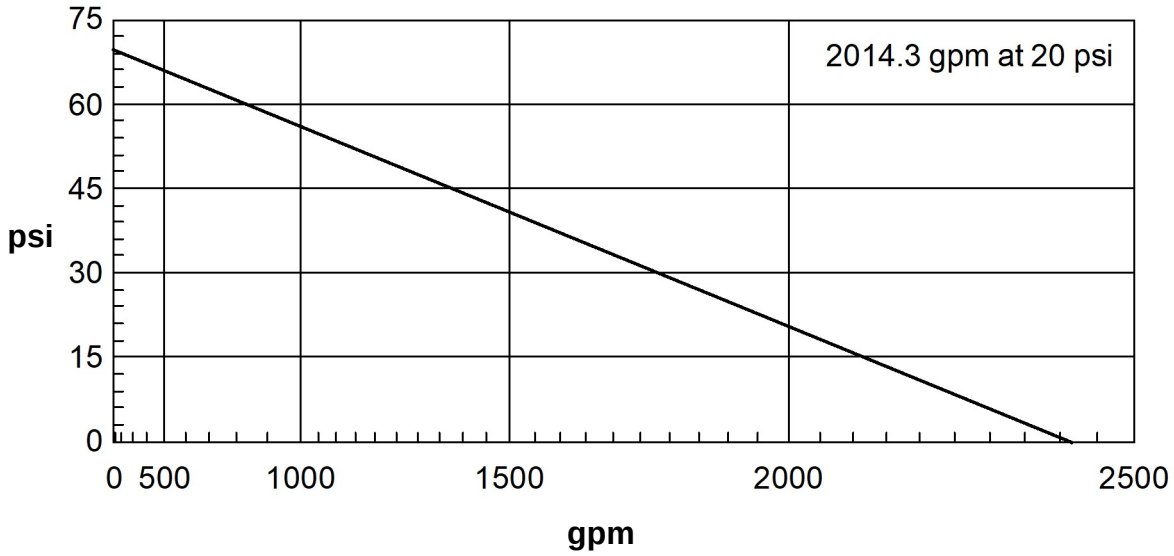
Read Hydrant

70 psi **static pressure**
54 psi **residual pressure**
180 ft **hydrant elevation**

Flow Hydrant(s)

Outlet	Elev	Size	C	Pitot Pressure	Flow
#1	180	2.5	.9	42	1088 gpm

Flow Graph



Harnett County GIS

Harnett COUNTY NORTH CAROLINA

Harnett.org/GIS

May 23, 2024

- County Boundary
- City Limits
- Address Numbers
- Fire Hydrants
- 6 - 36
- Road Centerlines
- US
- Parcels

N
W E
S

Feet
0 40