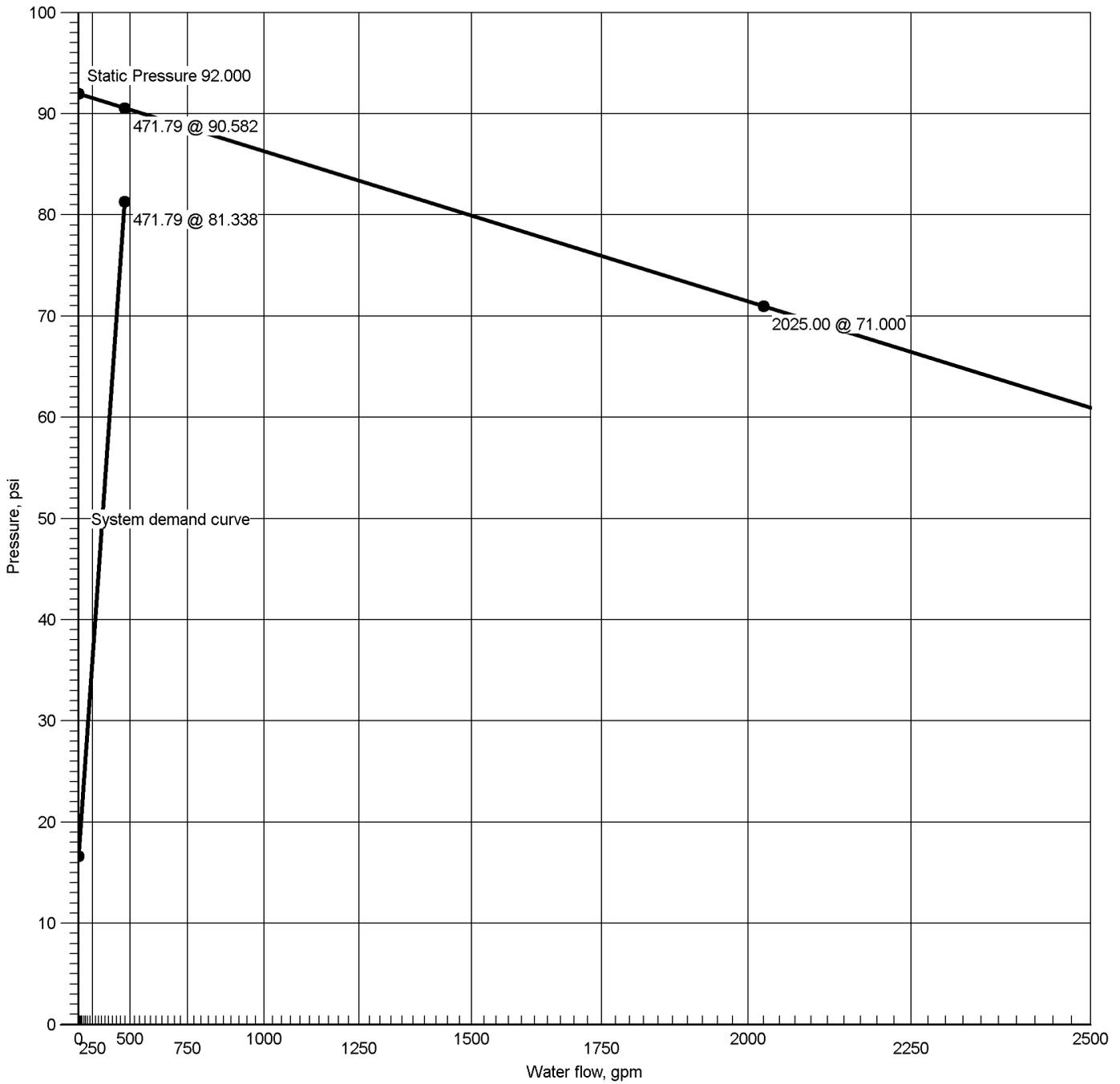




Water Supply at Node 1



Hydraulic Graph

Water Supply at Node 1

Static: Pressure
92.000

Residual: Pressure	Available Flow @ 20 PSI:
71.000 @ 2025.00	3939.00

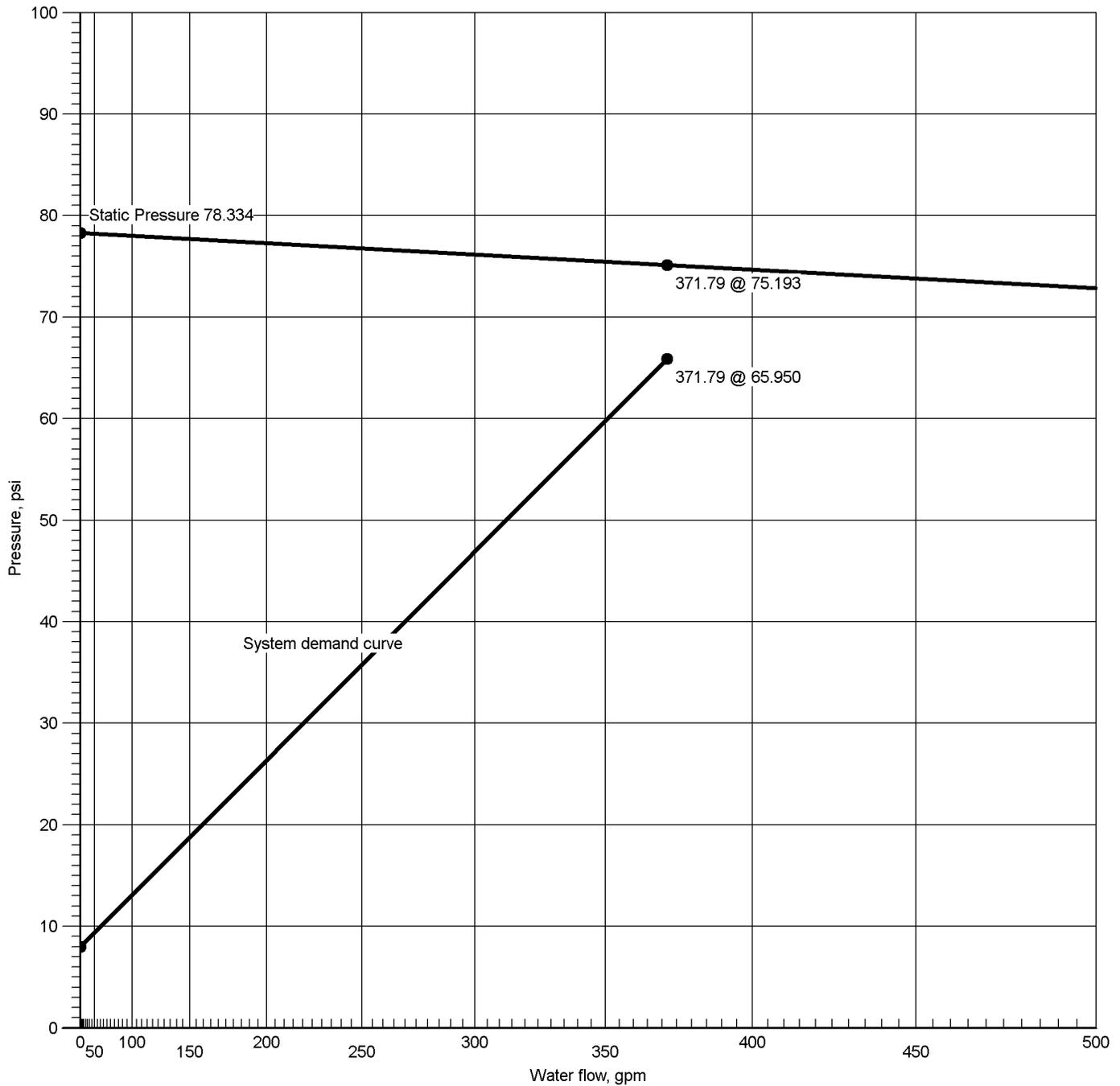
Available Pressure at System Demand
90.582 @ 471.79

Required Pressure at System Demand
81.338 @ 471.79

Required Pressure at System Demand (Including Hose Allowance at Source)
81.338 @ 471.79



BOR at Node 71



Hydraulic Graph

BOR at Node 71

Static: Pressure

78.334

Residual: Pressure

N/A

Available Pressure at System Demand

75.193 @ 371.79

Required Pressure at System Demand

65.950 @ 371.79

Required Pressure at System Demand (Including Hose Allowance at Source)

N/A



Summary Of Outflowing Devices

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)			
Hydrant	12	100.00	100.00	0	70.392			
Sprinkler	605	18.77	14.82	5.6	11.230			
Sprinkler	606	18.11	14.82	5.6	10.457			
Sprinkler	607	18.21	14.82	5.6	10.578			
Sprinkler	608	21.60	19.60	5.6	14.881			
Sprinkler	623	19.45	14.82	5.6	12.063			
Sprinkler	624	19.64	14.82	5.6	12.301			
Sprinkler	633	25.56	19.60	5.6	20.833			
Sprinkler	634	26.89	19.60	5.6	23.057			
Sprinkler	635	27.54	19.60	5.6	24.188			
Sprinkler	643	26.45	14.82	5.6	22.305			
Sprinkler	646	25.24	14.82	5.6	20.320			
Sprinkler	724	33.06	14.82	5.6	34.843			
Sprinkler	730	26.73	21.00	5.6	22.780			
Sprinkler	742	28.54	19.60	5.6	25.969			

⇒ Most Demanding Sprinkler Data



Node Analysis

Job Number: NC1514 - CAS
Report Description: Light Hazard (EAST SIDE_V1)

Node	Elevation(foot)	Fittings	Pressure(psi)	Discharge(gpm)
1	-14'-0	S	81.338	471.79
12	0'-10½	Hyd	70.392	100.00
605	9'-5	Spr(-11.230), fd(39'-0)	11.230	18.77
606	9'-5	Spr(-10.457), fd(39'-0)	10.457	18.11
607	9'-5	Spr(-10.578), fd(39'-0)	10.578	18.21
608	10'-0	Spr(-14.881), fd(39'-0)	14.881	21.60
623	10'-0	Spr(-12.063), fd(39'-0)	12.063	19.45
624	10'-0	Spr(-12.301), fd(39'-0)	12.301	19.64
633	12'-0	Spr(-20.833), fd(39'-0)	20.833	25.56
634	12'-0	Spr(-23.057), fd(39'-0)	23.057	26.89
635	12'-0	Spr(-24.188), fd(39'-0)	24.188	27.54
643	9'-5	Spr(-22.305), fd(39'-0)	22.305	26.45
646	12'-0	Spr(-20.320), fd(39'-0)	20.320	25.24
724	10'-0	Spr(-34.843), fd(39'-0)	34.843	33.06
730	10'-6	Spr(-22.780), fd(39'-0)	22.780	26.73
742	12'-0	Spr(-25.969), fd(39'-0)	25.969	28.54
746	24'-6	Spr(-20.250)	20.250	36.00
9	-6'-1	T(47'-3½)	73.440	
19	-14'-0	T(47'-3½)	81.317	
53	1'-0		69.657	
71	6'-0	BOR, PO(10'-0), f(-0.000)	65.950	
117	10'-0	T(22'-6)	59.158	
317	10'-0	E(9'-4½)	50.876	
329	10'-0	PO(5'-0)	14.973	
331	10'-0	PO(5'-0)	15.146	
333	10'-0	PO(5'-0)	16.072	
334	10'-0	PO(5'-0)	49.354	
337	10'-0	PO(7'-5)	51.170	
340	12'-7	T(7'-5)	18.720	
341	12'-7	PO(5'-0)	20.507	
345	12'-7	PO(7'-5)	41.776	
372	10'-0	E(10'-6)	48.326	
375	12'-7	E(9'-4½)	46.062	
389	12'-7	PO(5'-0)	16.386	
391	12'-7	PO(5'-0)	16.723	
403	12'-7	PO(5'-0)	31.671	
420	12'-7	PO(5'-0)	32.617	
421	12'-7	PO(5'-0)	32.709	
425	12'-7	PO(5'-0)	34.288	
430	12'-7	PO(13'-7½)	40.715	
443	12'-7	PO(5'-0)	30.172	
461	12'-7	PO(6'-0)	28.913	
466	12'-7	PO(5'-0)	28.880	
473	12'-7	E(3'-8½)	32.029	
479	12'-7	PO(5'-0)	36.773	
506	24'-6	E(2'-0)	21.519	



Hydraulic Analysis

Job Number: NC1514 - CAS
Report Description: Light Hazard (EAST SIDE_V1)

Pipe Type	Diameter	Flow	Velocity	HWC		Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Fittings	Eq. Length	Summary
Upstream							Total Length	
Route 1								
BL	1.0490	36.00	13.36	120		0.386043	1'-3½"	Pf 1.269
746	24'-6"	36.00	8	20.250		Sprinkler,	2'-0"	Pe
506	24'-6"			21.519		E(2'-0")	3'-3½"	Pv
BL	1.3800	36.00	7.72	120		0.101532	12'-11"	Pf 2.226
506	24'-6"			21.519			9'-0"	Pe 5.168
461	12'-7"			28.913		E(3'-0"), PO(6'-0")	21'-11"	Pv
BL	1.4420	61.24	12.03	120		0.219053	5'-9"	Pf 1.259
461	12'-7"	25.24		28.913		Flow (q) from Route 12		Pe
443	12'-7"			30.172			5'-9"	Pv
BL	1.4420	86.80	17.05	120		0.417624	0'-9"	Pf 1.857
443	12'-7"	25.56		30.172		Flow (q) from Route 8	3'-8½"	Pe
473	12'-7"			32.029		E(3'-8½")	4'-5½"	Pv
CM	2.2030	86.80	7.31	120		0.053023	11'-1"	Pf 0.588
473	12'-7"			32.029				Pe
420	12'-7"			32.617			11'-1"	Pv
CM	2.2030	113.25	9.53	120		0.086727	1'-0½"	Pf 0.092
420	12'-7"	26.45		32.617		Flow (q) from Route 14		Pe
421	12'-7"			32.709			1'-0½"	Pv
CM	2.2030	140.14	11.80	120		0.128623	12'-3½"	Pf 1.579
421	12'-7"	26.89		32.709		Flow (q) from Route 10		Pe
425	12'-7"			34.288			12'-3½"	Pv
BL	2.2030	167.68	14.11	120		0.179256	13'-10½"	Pf 2.485
425	12'-7"	27.54		34.288		Flow (q) from Route 11		Pe
479	12'-7"			36.773			13'-10½"	Pv
BL	2.2030	196.22	16.52	120		0.239744	2'-9½"	Pf 3.942
479	12'-7"	28.54		36.773		Flow (q) from Route 13	13'-7½"	Pe
430	12'-7"			40.715		PO(13'-7½")	16'-5½"	Pv
CM	2.7050	196.22	10.95	120		0.088221	12'-0½"	Pf 1.061
430	12'-7"			40.715				Pe
345	12'-7"			41.776			12'-0½"	Pv
CM	2.7050	338.73	18.91	120		0.242230	8'-4"	Pf 4.286
345	12'-7"	142.51		41.776		Flow (q) from Route 2	9'-4½"	Pe
375	12'-7"			46.062		E(9'-4½")	17'-8½"	Pv
CM	3.3340	338.73	12.45	120		0.087507	2'-7"	Pf 1.144
375	12'-7"			46.062			10'-6"	Pe 1.120
372	10'-0"			48.326		E(10'-6")	13'-1"	Pv
CM	2.7050	338.73	18.91	120		0.242230	1'-2"	Pf 2.550
372	10'-0"			48.326			9'-4½"	Pe
317	10'-0"			50.876		E(9'-4½")	10'-6½"	Pv
CM	3.3340	338.73	12.45	120		0.087507	3'-4"	Pf 0.293
317	10'-0"			50.876				Pe
337	10'-0"			51.170			3'-4"	Pv
CM	3.3340	371.79	13.66	120		0.103957	33'-4½"	Pf 7.988
337	10'-0"	33.06		51.170		Flow (q) from Route 15	43'-5½"	Pe
117	10'-0"			59.158		2E(10'-6"), T(22'-6")	76'-10"	Pv
FM	4.3100	371.79	8.18	120		0.029771	86'-3"	Pf 5.058
117	10'-0"			59.158			83'-7½"	Pe 1.734
71	6'-0"			65.950		3T(27'-10½"), BOR, f(-0.000)	169'-10½"	Pv
FR	4.3100	371.79	8.18	120		0.029771	4'-6"	Pf 1.544
71	6'-0"			65.950			47'-4½"	Pe 2.163
53	1'-0"			69.657		BV(16'-8½"), sCV(30'-8")	51'-10½"	Pv
UG	6.2800	371.79	3.85	140		0.003579	111'-8½"	Pf 0.716
53	1'-0"			69.657			88'-3"	Pe 3.067
9	-6'-1"			73.440		2E(22'-1"), 4EE(11'-0½")	199'-11½"	Pv
UG	6.2800	471.79	4.89	140		0.005561	229'-8½"	Pf 4.441
9	-6'-1"	100.00		73.440		Flow (q) from Route 16	74'-1"	Pe 3.436
19	-14'-0"			81.317		2EE(11'-0½"), BFP(-2.752), GV(4'-8½"), T(47'-3½")	303'-9½"	Pv
UG	12.4600	471.79	1.24	140		0.000198	34'-6½"	Pf 0.021
19	-14'-0"			81.317			73'-8½"	Pe
1	-14'-0"			81.338		GV(9'-10"), 3EE(21'-3½"), S	108'-3"	Pv
		0.00				Hose Allowance At Source		
1		471.79						
Route 2								



Hydraulic Analysis

Job Number: NC1514 - CAS
Report Description: Light Hazard (EAST SIDE_V1)

Pipe Type	Diameter	Flow	Velocity	HWC	Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Eq. Length	Summary
Upstream						Total Length	
BL	1.0490	21.60	8.02	120	0.150074	0'-11	Pf 6.742
608	10'-0	21.60	5.6	14.881	Sprinkler,	44'-0	Pe -1.115
341	12'-7			20.507	PO(5'-0), fd(39'-0)	44'-11	Pv
BL	1.4420	115.78	22.75	120	0.711594	15'-8½	Pf 11.164
341	12'-7	94.18		20.507	Flow (q) from Route 3		Pe
403	12'-7			31.671		15'-8½	Pv
BL	1.4420	142.51	28.00	120	1.044979	2'-3	Pf 10.104
403	12'-7	26.73		31.671	Flow (q) from Route 9	7'-5	Pe
345	12'-7			41.776	PO(7'-5)	9'-8	Pv
Route 3							
DY	1.0490	18.11	6.72	120	0.108287	0'-0	Pf 4.765
606	9'-5	18.11	5.6	10.457	Sprinkler,	44'-0	Pe -0.248
329	10'-0			14.973	PO(5'-0), fd(39'-0)	44'-0	Pv
BL	1.4420	18.11	3.56	120	0.022993	7'-6	Pf 0.172
329	10'-0			14.973			Pe
331	10'-0			15.146		7'-6	Pv
BL	1.4420	36.32	7.14	120	0.083333	11'-1½	Pf 0.926
331	10'-0	18.21		15.146	Flow (q) from Route 4		Pe
333	10'-0			16.072		11'-1½	Pv
BL	1.4420	55.09	10.82	120	0.180080	6'-0½	Pf 3.768
333	10'-0	18.77		16.072	Flow (q) from Route 5	14'-10½	Pe -1.120
340	12'-7			18.720	2E(3'-8½), T(7'-5)	20'-11	Pv
BL	1.4420	94.18	18.50	120	0.485643	3'-8	Pf 1.787
340	12'-7	39.09		18.720	Flow (q) from Route 6		Pe
341	12'-7			20.507		3'-8	Pv
Route 4							
DY	1.0490	18.21	6.76	120	0.109449	0'-0	Pf 4.816
607	9'-5	18.21	5.6	10.578	Sprinkler,	44'-0	Pe -0.248
331	10'-0			15.146	PO(5'-0), fd(39'-0)	44'-0	Pv
Route 5							
DY	1.0490	18.77	6.97	120	0.115676	0'-0	Pf 5.090
605	9'-5	18.77	5.6	11.230	Sprinkler,	44'-0	Pe -0.248
333	10'-0			16.072	PO(5'-0), fd(39'-0)	44'-0	Pv
Route 6							
DY	1.0490	19.45	7.22	120	0.123589	0'-0	Pf 5.438
623	10'-0	19.45	5.6	12.063	Sprinkler,	44'-0	Pe -1.115
389	12'-7			16.386	PO(5'-0), fd(39'-0)	44'-0	Pv
BL	1.4420	19.45	3.82	120	0.026242	12'-10	Pf 0.337
389	12'-7			16.386			Pe
391	12'-7			16.723		12'-10	Pv
BL	1.4420	39.09	7.68	120	0.095463	9'-9½	Pf 1.998
391	12'-7	19.64		16.723	Flow (q) from Route 7	11'-2	Pe
340	12'-7			18.720	E(3'-8½), T(7'-5)	20'-11	Pv
Route 7							
DY	1.0490	19.64	7.29	120	0.125842	0'-0	Pf 5.537
624	10'-0	19.64	5.6	12.301	Sprinkler,	44'-0	Pe -1.115
391	12'-7			16.723	PO(5'-0), fd(39'-0)	44'-0	Pv
Route 8							
BL	1.0490	25.56	9.49	120	0.204865	0'-9½	Pf 9.587
633	12'-0	25.56	5.6	20.833	Sprinkler,	46'-0	Pe -0.248
443	12'-7			30.172	E(2'-0), PO(5'-0), fd(39'-0)	46'-9½	Pv
Route 9							
DY	1.0490	26.73	9.92	120	0.222513	0'-0	Pf 9.791
730	10'-6	26.73	5.6	22.780	Sprinkler,	44'-0	Pe -0.899
403	12'-7			31.671	PO(5'-0), fd(39'-0)	44'-0	Pv
Route 10							
DY	1.0490	26.89	9.98	120	0.225015	0'-0	Pf 9.901
634	12'-0	26.89	5.6	23.057	Sprinkler,	44'-0	Pe -0.248
421	12'-7			32.709	PO(5'-0), fd(39'-0)	44'-0	Pv
Route 11							
DY	1.0490	27.54	10.22	120	0.235206	0'-0	Pf 10.349
635	12'-0	27.54	5.6	24.188	Sprinkler,	44'-0	Pe -0.248
425	12'-7			34.288	PO(5'-0), fd(39'-0)	44'-0	Pv
Route 12							
DY	1.0490	25.24	9.37	120	0.200191	0'-0	Pf 8.808
646	12'-0	25.24	5.6	20.320	Sprinkler,	44'-0	Pe -0.248
466	12'-7			28.880	PO(5'-0), fd(39'-0)	44'-0	Pv



Hydraulic Analysis

Job Number: NC1514 - CAS
Report Description: Light Hazard (EAST SIDE_V1)

Pipe Type	Diameter	Flow	Velocity	HWC	Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Eq. Length	Summary
Upstream						Total Length	
BL	1.4420	25.24	4.96	120	0.042507	0'-9½"	Pf 0.034
466	12'-7"			28.880			Pe
461	12'-7"			28.913		0'-9½"	Pv
Route 13							
DY	1.0490	28.54	10.59	120	0.251188	0'-0"	Pf 11.052
742	12'-0"	28.54	5.6	25.969	Sprinkler,	44'-0"	Pe -0.248
479	12'-7"			36.773	PO(5'-0), fd(39'-0)	44'-0"	Pv
Route 14							
BL	1.0490	26.45	9.82	120	0.218224	5'-6½"	Pf 11.680
643	9'-5"	26.45	5.6	22.305	Sprinkler,	48'-0"	Pe -1.368
420	12'-7"			32.617	2E(2'-0), PO(5'-0), fd(39'-0)	53'-6½"	Pv
Route 15							
DY	1.0490	33.06	12.27	120	0.329671	0'-0"	Pf 14.506
724	10'-0"	33.06	5.6	34.843	Sprinkler,	44'-0"	Pe 0.006
334	10'-0"			49.354	PO(5'-0), fd(39'-0)	44'-0"	Pv
BL	1.4420	33.06	6.49	120	0.070000	18'-6"	Pf 1.816
334	10'-0"			49.354		7'-5"	Pe
337	10'-0"			51.170	PO(7'-5)	25'-11½"	Pv
Route 16							
UG	6.2800	100.00	1.04	140	0.000315	15'-1"	Pf 0.028
12	0'-10½"	100.00		70.392	Hydrant,	74'-1"	Pe 3.020
9	-6'-1"			73.440	E(22'-1), GV(4'-8½), T(47'-3½)	89'-2"	Pv

Equivalent Pipe Lengths of Valves and Fittings (C=120 only)

$$\left(\frac{\text{Actual Inside Diameter}}{\text{Schedule 40 Steel Pipe Inside Diameter}} \right)^{4.87} = \text{Factor}$$

C Value Multiplier

Value Of C	100	130	140	150
Multiplying Factor	0.713	1.16	1.33	1.51



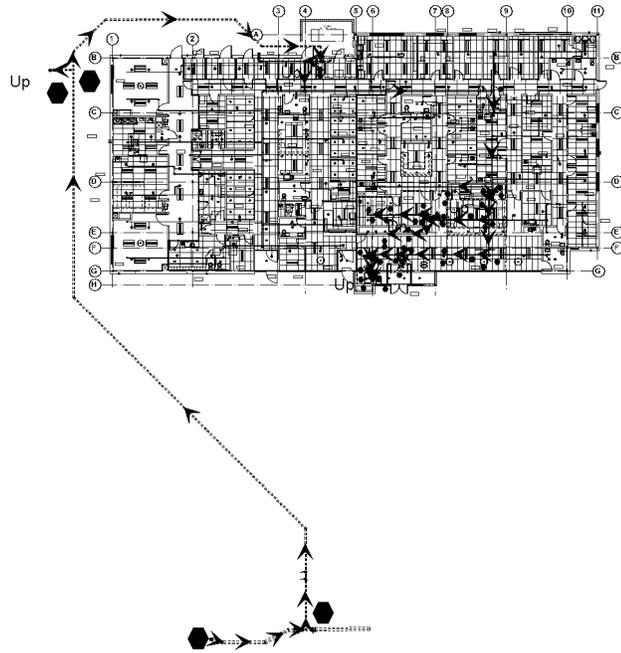
Hydraulic Analysis

Pipe Type	Diameter	Flow	Velocity	HWC	Friction Loss		Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Fittings	Eq. Length	Summary
Upstream							Total Length	

Pipe Type Legend	
AO	Arm-Over
BL	Branch Line
CM	Cross Main
DN	Drain
DR	Drop
DY	Dynamic
FM	Feed Main
FR	Feed Riser
MS	Miscellaneous
OR	Outrigger
RN	Riser Nipple
SN	Swing Nipple
SP	Sprig
ST	Stand Pipe
UG	Underground

Units Legend	
Diameter	Inch
Elevation	Foot
Flow	gpm
Discharge	gpm
Velocity	fps
Pressure	psi
Length	Foot
Friction Loss	psi/Foot
HWC	Hazen-Williams Constant
Pt	Total pressure at a point in a pipe
Pn	Normal pressure at a point in a pipe
Pf	Pressure loss due to friction between points
Pe	Pressure due to elevation difference between indicated points
Pv	Velocity pressure at a point in a pipe

Fittings Legend	
ALV	Alarm Valve
AngV	Angle Valve
b	Bushing
BalV	Ball Valve
BFP	Backflow Preventer
BV	Butterfly Valve
C	Cross Flow Turn 90°
cplg	Coupling
Cr	Cross Run
CV	Check Valve
DeV	Deluge Valve
DPV	Dry Pipe Valve
E	90° Elbow
EE	45° Elbow
Ee1	11¼° Elbow
Ee2	22½° Elbow
f	Flow Device
fd	Flex Drop
FDC	Fire Department Connection
fE	90° FireLock(TM) Elbow
fEE	45° FireLock(TM) Elbow
flg	Flange
FN	Floating Node
fT	FireLock(TM) Tee
g	Gauge
GloV	Globe Valve
GV	Gate Valve
Ho	Hose
Hose	Hose
HV	Hose Valve
Hyd	Hydrant
LtE	Long Turn Elbow
mecT	Mechanical Tee
Noz	Nozzle
P1	Pump In
P2	Pump Out
PIV	Post Indicating Valve
PO	Pipe Outlet
PrV	Pressure Relief Valve
PRV	Pressure Reducing Valve
red	Reducer/Adapter
S	Supply
sCV	Swing Check Valve
SFx	Seismic Flex
Spr	Sprinkler
St	Strainer
T	Tee Flow Turn 90°
Tr	Tee Run
U	Union
WirF	Wirsbo
WMV	Water Meter Valve
Z	Cap





Hydraulic Summary

Job Number: NC1514 - CAS
Report Description: Light Hazard (WEST SIDE_V2)

Job	
Job Number NC1514	Designer BG
Job Name: Associated Plastic Surgeons	State Certification/License Number
Address 1 2701 NE McBaine Drive	AHJ LS Codes
Address 2 Lee's Summit, MO 64064	Job Site/Building APS
Address 3	Drawing Name APS_FP PLAN_3-12-26_POST PE_d

System		Remote Area(s)					
Most Demanding Sprinkler Data 5.6 K-Factor 22.50 at 16.143		Occupancy Light Hazard	Job Suffix CAS				
Hose Allowance At Source 0.00		Density 0.10gpm/ft ²	Area of Application 1500ft ² (Actual 1015ft ²)				
Additional Hose Supplies		Number Of Sprinklers Calculated 12	Number Of Nozzles Calculated 0				
<table border="1"> <thead> <tr> <th>Node</th> <th>Flow(gpm)</th> </tr> </thead> <tbody> <tr> <td>Hydrant At Node 12</td> <td>100.00</td> </tr> </tbody> </table>		Node	Flow(gpm)	Hydrant At Node 12	100.00	Coverage Per Sprinkler 225ft ²	
Node	Flow(gpm)						
Hydrant At Node 12	100.00						
Total Hose Streams 100.00							
System Flow Demand 405.93	Total Water Required (Including Hose Allowance) 405.93						
Maximum Pressure Unbalance In Loops 0.000							
Maximum Velocity Above Ground 25.75 between nodes 219 and 363							
Maximum Velocity Under Ground 4.20 between nodes 19 and 9							
Volume capacity of Wet Pipes 1189.82gal	Volume capacity of Dry Pipes						

Supplies

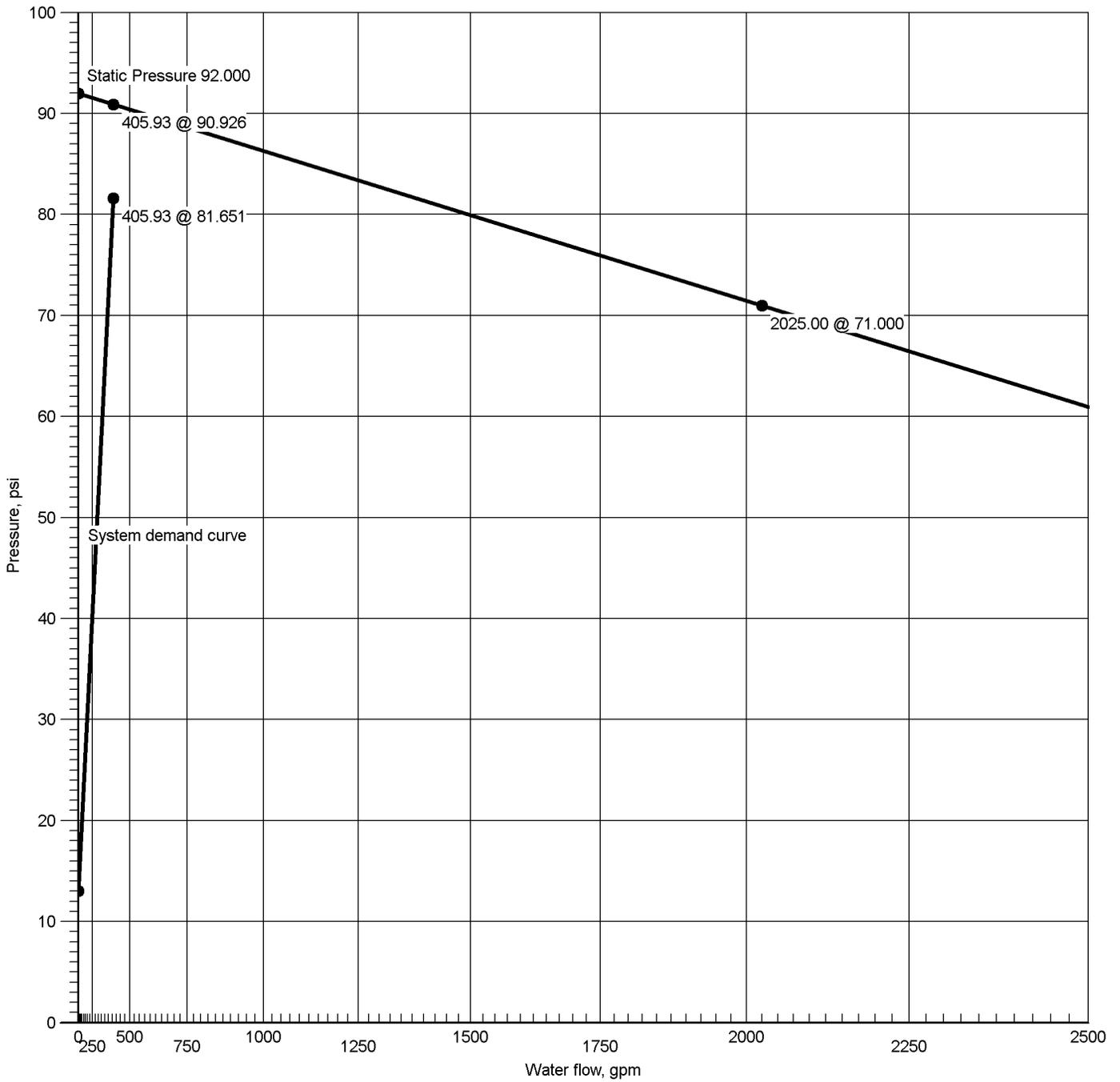
Node	Name	Hose Flow (gpm)	Static (psi)	Residual (psi) @	Flow (gpm)	Available (psi) @	Total Demand (gpm)	Required (psi)	Safety Margin (psi)
1	Water Supply		92.000	71.000	2025.00	90.926	405.93	81.651	9.275

Contractor

Contractor Number		Contact Name		Contact Title	
Name of Contractor: Dev INC		Phone		Extension	
Address 1 8807 Monrovia Street		FAX			
Address 2 Lenexa, KS 66212		E-mail			
Address 3		Web-Site			



Water Supply at Node 1



Hydraulic Graph

Water Supply at Node 1

Static: Pressure
92.000

Residual: Pressure	Available Flow @ 20 PSI:
71.000 @ 2025.00	3939.00

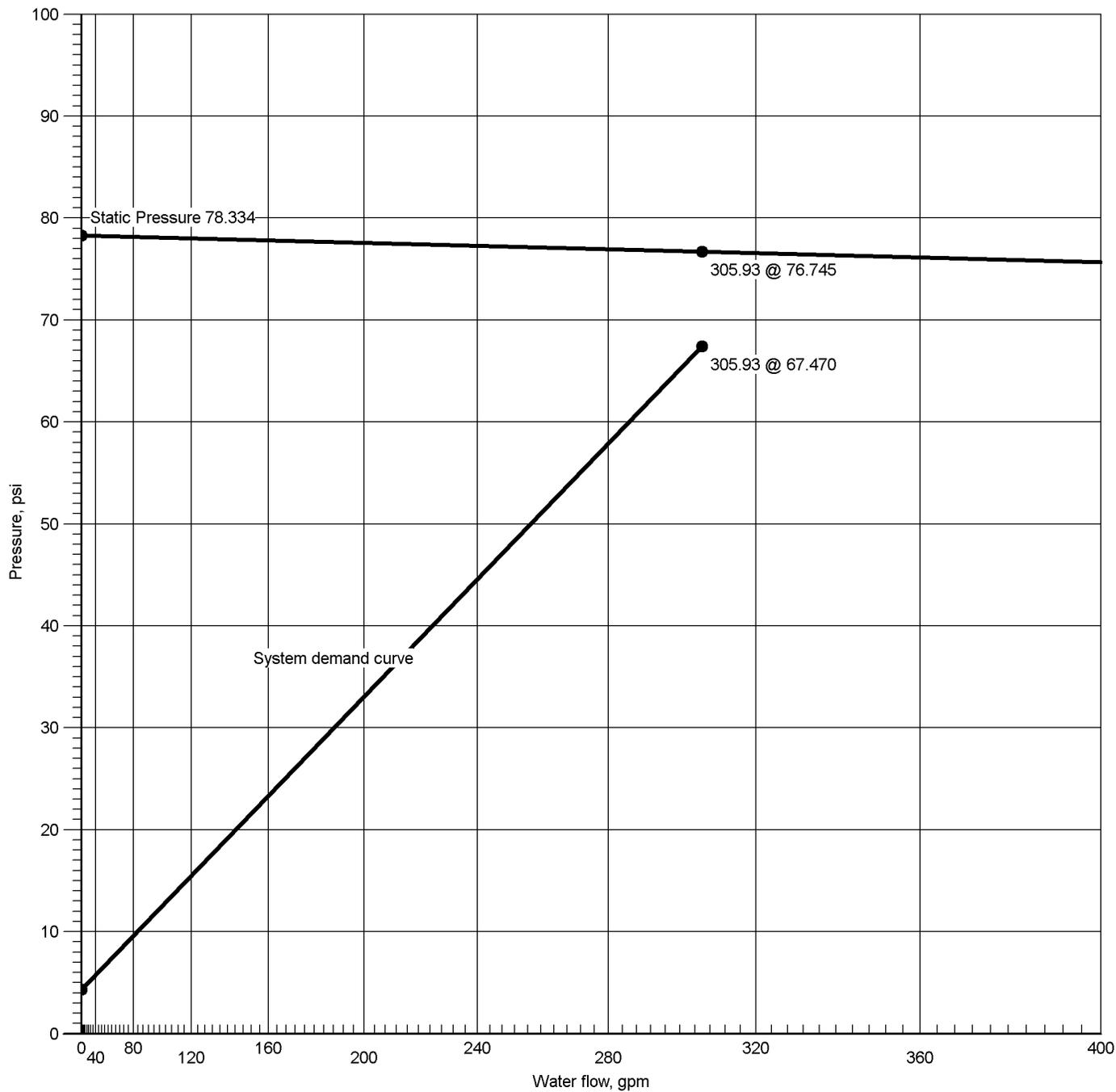
Available Pressure at System Demand
90.926 @ 405.93

Required Pressure at System Demand
81.651 @ 405.93

Required Pressure at System Demand (Including Hose Allowance at Source)
81.651 @ 405.93



BOR at Node 71



Hydraulic Graph

BOR at Node 71

Static: Pressure
78.334

Residual: Pressure
N/A

Available Pressure at System Demand
76.745 @ 305.93

Required Pressure at System Demand
67.470 @ 305.93

Required Pressure at System Demand (Including Hose Allowance at Source)
N/A



Summary Of Outflowing Devices

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)			
Hydrant	12	100.00	100.00	0	71.228			
Sprinkler	603	26.14	14.82	5.6	21.788			
Sprinkler	611	29.11	16.00	5.6	27.016			
Sprinkler	612	23.71	17.00	5.6	17.928			
Sprinkler	614	26.42	14.82	5.6	22.267			
Sprinkler	615	29.07	16.00	5.6	26.949			
Sprinkler	616	23.82	17.00	5.6	18.088			
Sprinkler	621	30.04	22.50	5.6	28.781			
Sprinkler	627	22.15	17.00	5.6	15.650			
Sprinkler	629	24.97	14.82	5.6	19.883			
⇒ Sprinkler	630	22.50	22.50	5.6	16.143			
Sprinkler	638	26.46	14.82	5.6	22.330			
Sprinkler	642	21.53	14.82	5.6	14.781			

⇒ Most Demanding Sprinkler Data



Node Analysis

Job Number: NC1514 - CAS
Report Description: Light Hazard (WEST SIDE V2)

Node	Elevation(foot)	Fittings	Pressure(psi)	Discharge(gpm)
1	-14'-0	S	81.651	405.93
12	0'-10½	Hyd	71.228	100.00
603	16'-1½	Spr(-21.788)	21.788	26.14
611	9'-5	Spr(-27.016), fd(39'-0)	27.016	29.11
612	10'-6	Spr(-17.928), fd(39'-0)	17.928	23.71
614	9'-5	Spr(-22.267), fd(39'-0)	22.267	26.42
615	9'-5	Spr(-26.949), fd(39'-0)	26.949	29.07
616	12'-0	Spr(-18.088), fd(39'-0)	18.088	23.82
621	9'-5	Spr(-28.781), fd(39'-0)	28.781	30.04
627	12'-0	Spr(-15.650), fd(39'-0)	15.650	22.15
629	12'-0	Spr(-19.883), fd(39'-0)	19.883	24.97
630	12'-0	Spr(-16.143), fd(39'-0)	16.143	22.50
638	9'-5	Spr(-22.330), fd(39'-0)	22.330	26.46
642	12'-0	Spr(-14.781), fd(39'-0)	14.781	21.53
9	-6'-1	T(47'-3½)	74.276	
19	-14'-0	T(47'-3½)	81.635	
53	1'-0		70.710	
71	6'-0	BOR, PO(10'-0), f(-0.000)	67.470	
126	10'-0		63.582	
219	10'-0		54.546	
358	10'-0	PO(5'-0)	38.139	
360	10'-0	PO(5'-0)	38.231	
363	10'-0	PO(7'-5)	41.284	
367	10'-0	PO(7'-5)	40.898	
369	10'-0	PO(5'-0)	31.605	
373	12'-8	PO(5'-0)	26.554	
374	12'-8	PO(5'-0)	25.712	
376	12'-8	PO(5'-0)	25.361	
378	10'-0	PO(5'-0)	40.687	
400	10'-0	PO(7'-5)	40.136	
401	10'-0	PO(5'-0)	32.336	
402	10'-0	PO(5'-0)	29.387	
406	12'-8	PO(5'-0)	22.977	
408	12'-8	PO(5'-0)	22.333	
410	12'-8	PO(5'-0)	22.282	



Hydraulic Analysis

Job Number: NC1514 - CAS
Report Description: Light Hazard (WEST SIDE_V2)

Pipe Type	Diameter	Flow	Velocity	HWC	Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Eq. Length	Summary
Upstream						Total Length	
Route 1							
DY	1.0490	22.50	8.35	120	0.161813	0'-0"	Pf 7.120
630	12'-0"	22.50	5.6	16.143	Sprinkler,	44'-0"	Pe -0.286
406	12'-8"			22.977	PO(5'-0), fd(39'-0)	44'-0"	Pv
BL	1.4420	66.18	13.00	120	0.252858	13'-4"	Pf 5.253
406	12'-8"	43.68		22.977	Flow (q) from Route 2	7'-5"	Pe 1.158
402	10'-0"			29.387	2E(3'-8½)	20'-9½"	Pv
BL	1.4420	91.15	17.91	120	0.457166	6'-5½"	Pf 2.949
402	10'-0"	24.97		29.387	Flow (q) from Route 7		Pe
401	10'-0"			32.336		6'-5½"	Pv
BL	1.4420	117.62	23.11	120	0.732583	3'-2½"	Pf 7.800
401	10'-0"	26.46		32.336	Flow (q) from Route 10	7'-5"	Pe
400	10'-0"			40.136	PO(7'-5)	10'-8"	Pv
CM	2.2030	117.62	9.90	120	0.093012	5'-11"	Pf 0.551
400	10'-0"			40.136			Pe
378	10'-0"			40.687		5'-11"	Pv
CM	2.2030	147.66	12.43	120	0.141678	1'-6"	Pf 0.211
378	10'-0"	30.04		40.687	Flow (q) from Route 6		Pe
367	10'-0"			40.898		1'-6"	Pv
CM	2.2030	247.75	20.85	120	0.369064	1'-0½"	Pf 0.387
367	10'-0"	100.09		40.898	Flow (q) from Route 4		Pe
363	10'-0"			41.284		1'-0½"	Pv
CM	2.2030	305.93	25.75	120	0.545220	24'-4"	Pf 13.261
363	10'-0"	58.18		41.284	Flow (q) from Route 11		Pe
219	10'-0"			54.546		24'-4"	Pv
CM	2.7050	305.93	17.08	120	0.200631	35'-8"	Pf 9.036
219	10'-0"			54.546		9'-4½"	Pe
126	10'-0"			63.582		45'-0½"	Pv
FR	4.3100	305.93	6.73	120	0.020756	20'-2"	Pf 2.154
126	10'-0"			63.582		83'-7½"	Pe 1.734
71	6'-0"			67.470	3T(27'-10½), BOR, f(-0.000)	103'-9½"	Pv
FR	4.3100	305.93	6.73	120	0.020756	4'-6"	Pf 1.077
71	6'-0"			67.470		47'-4½"	Pe 2.163
53	1'-0"			70.710	BV(16'-8½), sCV(30'-8)	51'-10½"	Pv
UG	6.2800	305.93	3.17	140	0.002495	111'-8½"	Pf 0.499
53	1'-0"			70.710		88'-3"	Pe 3.067
9	-6'-1"			74.276	2E(22'-1), 4EE(11'-0½)	199'-11½"	Pv
UG	6.2800	405.93	4.20	140	0.004211	229'-8½"	Pf 3.923
9	-6'-1"	100.00		74.276	Flow (q) from Route 13	74'-1"	Pe 3.436
19	-14'-0"			81.635	2EE(11'-0½), BFP(-2.644), GV(4'-8½), T(47'-3½)	303'-9½"	Pv
UG	12.4600	405.93	1.07	140	0.000150	34'-6½"	Pf 0.016
19	-14'-0"			81.635		73'-8½"	Pe
1	-14'-0"			81.651	GV(9'-10), 3EE(21'-3½), S	108'-3"	Pv
		0.00			Hose Allowance At Source		
1		405.93					
Route 2							
DY	1.0490	22.15	8.22	120	0.157231	0'-0"	Pf 6.918
627	12'-0"	22.15	5.6	15.650	Sprinkler,	44'-0"	Pe -0.286
410	12'-8"			22.282	PO(5'-0), fd(39'-0)	44'-0"	Pv
BL	1.4420	22.15	4.35	120	0.033385	1'-6½"	Pf 0.052
410	12'-8"			22.282			Pe
408	12'-8"			22.333		1'-6½"	Pv
BL	1.4420	43.68	8.58	120	0.117240	5'-6"	Pf 0.644
408	12'-8"	21.53		22.333	Flow (q) from Route 3		Pe
406	12'-8"			22.977		5'-6"	Pv
Route 3							
BL	1.0490	21.53	7.99	120	0.149143	4'-6½"	Pf 7.838
642	12'-0"	21.53	5.6	14.781	Sprinkler,	48'-0"	Pe -0.286
408	12'-8"			22.333	2E(2'-0), PO(5'-0), fd(39'-0)	52'-6½"	Pv
Route 4							
BL	1.0490	23.71	8.80	120	0.178294	0'-11½"	Pf 8.370
612	10'-6"	23.71	5.6	17.928	Sprinkler,	46'-0"	Pe -0.936
376	12'-8"			25.361	E(2'-0), PO(5'-0), fd(39'-0)	46'-11½"	Pv
BL	1.4420	23.71	4.66	120	0.037858	9'-3"	Pf 0.351
376	12'-8"			25.361			Pe
374	12'-8"			25.712		9'-3"	Pv



Hydraulic Analysis

Job Number: NC1514 - CAS
Report Description: Light Hazard (WEST SIDE_V2)

Pipe Type	Diameter	Flow	Velocity	HWC	Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Fittings	Eq. Length	Summary
Upstream				Pn		Total Length	
BL	1.4420	47.53	9.34	120	0.137040	6'-1½"	Pf 0.842
374	12'-8"	23.82		25.712	Flow (q) from Route 5		Pe
373	12'-8"			26.554		6'-1½"	Pv
BL	1.4420	73.67	14.47	120	0.308284	5'-2½"	Pf 3.893
373	12'-8"	26.14		26.554	Flow (q) from Route 8	7'-5"	Pe 1.158
369	10'-0"			31.605	2E(3'-8½")	12'-7½"	Pv
BL	1.4420	100.09	19.66	120	0.543543	9'-8"	Pf 9.293
369	10'-0"	26.42		31.605	Flow (q) from Route 9	7'-5"	Pe
367	10'-0"			40.898	PO(7'-5)	17'-1"	Pv
Route 5							
DY	1.0490	23.82	8.84	120	0.179768	0'-0"	Pf 7.910
616	12'-0"	23.82	5.6	18.088	Sprinkler,	44'-0"	Pe -0.286
374	12'-8"			25.712	PO(5'-0), fd(39'-0)	44'-0"	Pv
Route 6							
DY	1.0490	30.04	11.15	120	0.276243	0'-0"	Pf 12.155
621	9'-5"	30.04	5.6	28.781	Sprinkler,	44'-0"	Pe -0.248
378	10'-0"			40.687	PO(5'-0), fd(39'-0)	44'-0"	Pv
Route 7							
DY	1.0490	24.97	9.27	120	0.196207	0'-0"	Pf 8.633
629	12'-0"	24.97	5.6	19.883	Sprinkler,	44'-0"	Pe 0.871
402	10'-0"			29.387	PO(5'-0), fd(39'-0)	44'-0"	Pv
Route 8							
SP	1.0490	26.14	9.70	120	0.213537	8'-3½"	Pf 3.261
603	16'-1½"	26.14	5.6	21.788	Sprinkler,	7'-0"	Pe 1.505
373	12'-8"			26.554	E(2'-0), PO(5'-0)	15'-3½"	Pv
Route 9							
DY	1.0490	26.42	9.81	120	0.217873	0'-0"	Pf 9.586
614	9'-5"	26.42	5.6	22.267	Sprinkler,	44'-0"	Pe -0.248
369	10'-0"			31.605	PO(5'-0), fd(39'-0)	44'-0"	Pv
Route 10							
BL	1.0490	26.46	9.82	120	0.218448	0'-11½"	Pf 10.254
638	9'-5"	26.46	5.6	22.330	Sprinkler,	46'-0"	Pe -0.248
401	10'-0"			32.336	E(2'-0), PO(5'-0), fd(39'-0)	46'-11½"	Pv
Route 11							
DY	1.0490	29.07	10.79	120	0.259946	0'-0"	Pf 11.438
615	9'-5"	29.07	5.6	26.949	Sprinkler,	44'-0"	Pe -0.248
358	10'-0"			38.139	PO(5'-0), fd(39'-0)	44'-0"	Pv
BL	1.4420	29.07	5.71	120	0.055195	1'-8"	Pf 0.093
358	10'-0"			38.139			Pe
360	10'-0"			38.231		1'-8"	Pv
BL	1.4420	58.18	11.43	120	0.199205	7'-10½"	Pf 3.053
360	10'-0"	29.11		38.231	Flow (q) from Route 12	7'-5"	Pe
363	10'-0"			41.284	PO(7'-5)	15'-4"	Pv
Route 12							
DY	1.0490	29.11	10.81	120	0.260540	0'-0"	Pf 11.464
611	9'-5"	29.11	5.6	27.016	Sprinkler,	44'-0"	Pe -0.248
360	10'-0"			38.231	PO(5'-0), fd(39'-0)	44'-0"	Pv
Route 13							
UG	6.2800	100.00	1.04	140	0.000315	15'-1"	Pf 0.028
12	0'-10½"	100.00		71.228	Hydrant,	74'-1"	Pe 3.020
9	-6'-1"			74.276	E(22'-1), GV(4'-8½), T(47'-3½)	89'-2"	Pv

Equivalent Pipe Lengths of Valves and Fittings (C=120 only)

$$\left(\frac{\text{Actual Inside Diameter}}{\text{Schedule 40 Steel Pipe Inside Diameter}} \right)^{4.87} = \text{Factor}$$

C Value Multiplier

Value Of C	100	130	140	150
Multiplying Factor	0.713	1.16	1.33	1.51



Hydraulic Analysis

Pipe Type	Diameter	Flow	Velocity	HWC	Friction Loss		Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Fittings	Eq. Length	Summary
Upstream							Total Length	

Pipe Type Legend	
AO	Arm-Over
BL	Branch Line
CM	Cross Main
DN	Drain
DR	Drop
DY	Dynamic
FM	Feed Main
FR	Feed Riser
MS	Miscellaneous
OR	Outrigger
RN	Riser Nipple
SN	Swing Nipple
SP	Sprig
ST	Stand Pipe
UG	Underground

Units Legend	
Diameter	Inch
Elevation	Foot
Flow	gpm
Discharge	gpm
Velocity	fps
Pressure	psi
Length	Foot
Friction Loss	psi/Foot
HWC	Hazen-Williams Constant
Pt	Total pressure at a point in a pipe
Pn	Normal pressure at a point in a pipe
Pf	Pressure loss due to friction between points
Pe	Pressure due to elevation difference between indicated points
Pv	Velocity pressure at a point in a pipe

Fittings Legend	
ALV	Alarm Valve
AngV	Angle Valve
b	Bushing
BalV	Ball Valve
BFP	Backflow Preventer
BV	Butterfly Valve
C	Cross Flow Turn 90°
cplg	Coupling
Cr	Cross Run
CV	Check Valve
DeV	Deluge Valve
DPV	Dry Pipe Valve
E	90° Elbow
EE	45° Elbow
Ee1	11¼° Elbow
Ee2	22½° Elbow
f	Flow Device
fd	Flex Drop
FDC	Fire Department Connection
fE	90° FireLock(TM) Elbow
fEE	45° FireLock(TM) Elbow
flg	Flange
FN	Floating Node
fT	FireLock(TM) Tee
g	Gauge
GloV	Globe Valve
GV	Gate Valve
Ho	Hose
Hose	Hose
HV	Hose Valve
Hyd	Hydrant
LtE	Long Turn Elbow
mecT	Mechanical Tee
Noz	Nozzle
P1	Pump In
P2	Pump Out
PIV	Post Indicating Valve
PO	Pipe Outlet
PrV	Pressure Relief Valve
PRV	Pressure Reducing Valve
red	Reducer/Adapter
S	Supply
sCV	Swing Check Valve
SFx	Seismic Flex
Spr	Sprinkler
St	Strainer
T	Tee Flow Turn 90°
Tr	Tee Run
U	Union
WirF	Wirsbo
WMV	Water Meter Valve
Z	Cap

