

DRAINAGE PLAN
COPPER GATE
ESTATES
TO
WICHITA, SEDGWICK COUNTY, KANSAS

Prepared By

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July 22, 2002

INTRODUCTION

This report provides information and calculations to support the "Drainage Plan" for the property located in the Northeast Quarter of Section 14, T-27-S, R-2-W in Sedgwick County, Kansas.

The "Drainage Plan" being submitted herein is intended to serve as a guide for the design of detention facilities and storm water sewer improvements to the proposed developments. Modifications to structures, pipes, etc. may be necessary during the final design in order to obtain the most economical design and construction possible.

Hydrologic Summary

Return Period years	Existing Conditions Peak Discharge at 135th St. W. cfs	Develeped Conditions Peak Discharge at 135th St. W. W/O Detention cfs	Develeped Conditions Peak Discharge at 135th St. W. W/O Detention cfs
2	160	200	100
5	260	300	180
100	610	670	460

**Existing Conditions
Hydrologic Model**

Type.... Master Network Summary

Page 1.01

Name.... Watershed

File.... C:\HAESTAD\PPKW\PROJECTS\COPPERGATE\EXISTING.PPW

MASTER DESIGN STORM SUMMARY

Default Network Design Storm File, ID WICHITA.RNQ COW25100

Return Event	Total Depth in	Rainfall Type	RNF File	RNF ID
Pre..2	3.6000	Synthetic Curve	SCSTYPES	TypeII 24hr
Pre..5	4.5600	Synthetic Curve	SCSTYPES	TypeII 24hr
Pre100	7.6800	Synthetic Curve	SCSTYPES	TypeII 24hr

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Storage Node ID	Return Type	Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond ac-ft
*135TH ST.	JCT	2	31.644		12.7000	163.33		
*135TH ST.	JCT	5	48.783		12.7000	260.20		
*135TH ST.	JCT	100	112.147		12.6500	612.69		
BASIN	AREA	2	31.644		12.7000	163.33		
BASIN	AREA	5	48.783		12.7000	260.20		
BASIN	AREA	100	112.147		12.6500	612.69		

**Developed Conditions
Without Detention
Hydrologic Model**

MASTER DESIGN STORM SUMMARY

Default Network Design Storm File, ID WICHITA.RNQ COW25100

Return Event	Total Depth in	Rainfall Type	RNF File	RNF ID	
Dev..2	3.6000	Synthetic Curve	SCSTYPES	TypeII	24hr
Dev..5	4.5600	Synthetic Curve	SCSTYPES	TypeII	24hr
Dev100	7.6800	Synthetic Curve	SCSTYPES	TypeII	24hr

MASTER NETWORK SUMMARY
 SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
 (Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Storage Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond ac-ft
*135TH	JCT	2	33.500		12.1000	199.56		
*135TH	JCT	5	50.793		12.1000	303.32		
*135TH	JCT	100	114.069		12.1000	672.42		
MAJORBASIN	AREA	2	20.789		12.6000	114.64		
MAJORBASIN	AREA	5	32.350		12.6000	185.54		
MAJORBASIN	AREA	100	75.455		12.6000	445.12		
NODE	JCT	2	33.500		12.1000	199.56		
NODE	JCT	5	50.793		12.1000	303.32		
NODE	JCT	100	114.069		12.1000	672.42		
OFFSITE SOUTH	AREA	2	1.091		12.2000	10.73		
OFFSITE SOUTH	AREA	5	1.682		12.2000	17.00		
OFFSITE SOUTH	AREA	100	3.867		12.2000	39.59		
ONSITE DS	AREA	2	6.067		12.0500	88.07		
ONSITE DS	AREA	5	8.612		12.0500	124.07		
ONSITE DS	AREA	100	17.366		12.0500	242.79		
ONSITEUS	AREA	2	3.371		12.0500	48.93		
ONSITEUS	AREA	5	4.785		12.0500	68.93		
ONSITEUS	AREA	100	9.648		12.0500	134.88		

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Storage Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond ac-ft
POND	IN	POND 2	32.409		12.1000	190.23		
POND	IN	POND 5	49.111		12.1000	288.17		
POND	IN	POND 100	110.202		12.1000	636.00		
POND	OUT	POND 2	32.409		12.1000	190.23		
POND	OUT	POND 5	49.111		12.1000	288.17		
POND	OUT	POND 100	110.202		12.1000	636.00		
RCBC	IN	POND 2	26.342		12.5000	131.11		
RCBC	IN	POND 5	40.499		12.5000	210.95		
RCBC	IN	POND 100	92.837		12.4500	504.65		
RCBC	OUT	POND 2	26.342		12.5000	131.11		
RCBC	OUT	POND 5	40.499		12.5000	210.95		
RCBC	OUT	POND 100	92.837		12.4500	504.65		
UPSTREAM		JCT 2	24.159		12.6000	121.27		
UPSTREAM		JCT 5	37.134		12.6000	194.56		
UPSTREAM		JCT 100	85.103		12.5000	463.71		
WEST OFFSITE	AREA	2	2.182		12.2000	21.47		
WEST OFFSITE	AREA	5	3.364		12.2000	34.01		
WEST OFFSITE	AREA	100	7.734		12.2000	79.17		

**Developed Conditions
With Detention
Hydrologic Model**

MASTER DESIGN STORM SUMMARY

Default Network Design Storm File, ID WICHITA.RNQ COW25100

Return Event	Total Depth in	Rainfall Type	RNF File	RNF ID
A...2	3.6000	Synthetic Curve	SCSTYPES	TypeII 24hr
A...5	4.5600	Synthetic Curve	SCSTYPES	TypeII 24hr
A..100	7.6800	Synthetic Curve	SCSTYPES	TypeII 24hr

ICPM CALCULATION TOLERANCES

 Target Convergence= .000 cfs +/-
 Max. Iterations = 35 loops
 ICPM Time Step = .0500 hrs
 Output Time Step = .0500 hrs
 ICPM Ending Time = 35.0000 hrs

MASTER NETWORK SUMMARY
 SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
 (Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

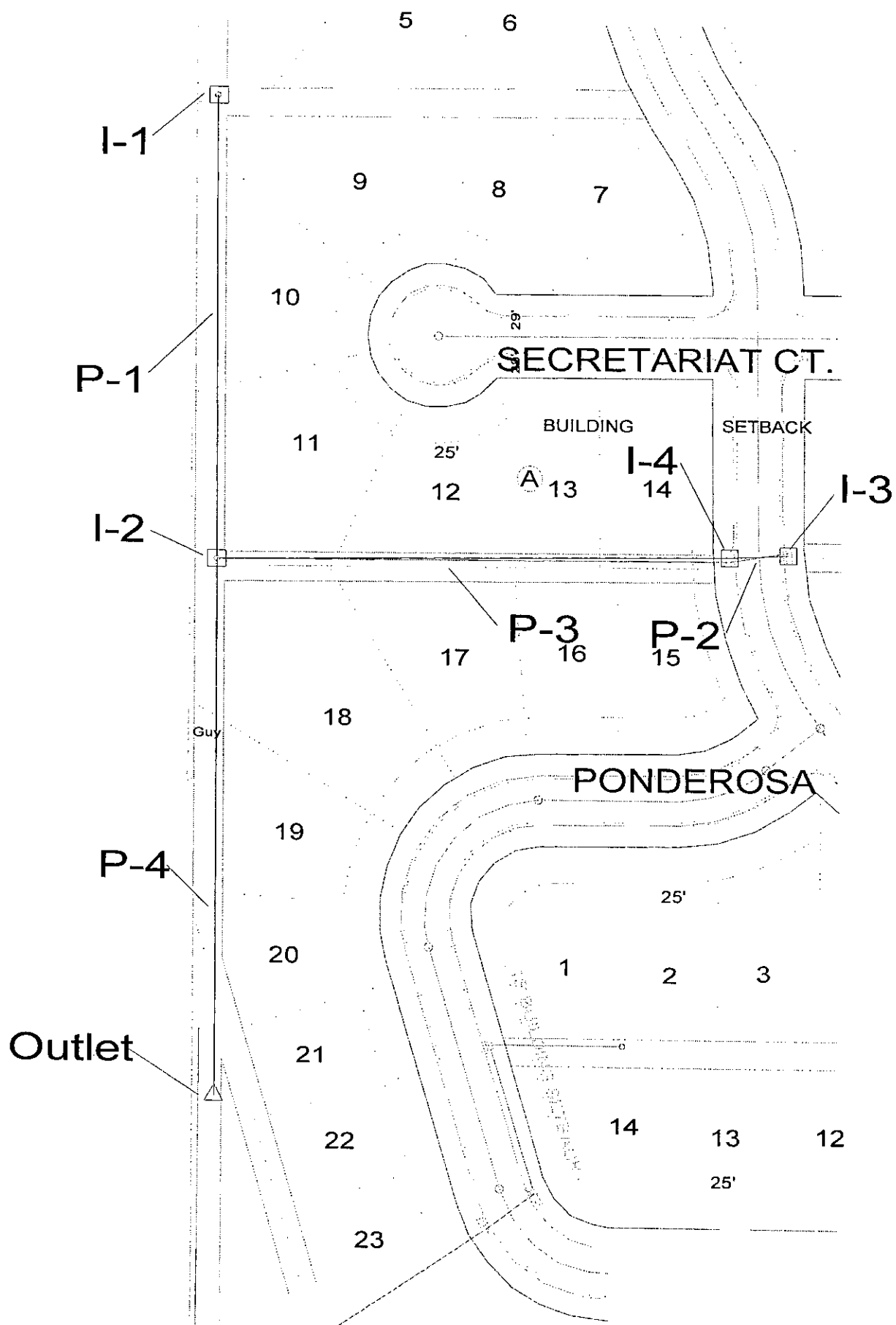
Storage Node ID	Return Type	Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond ac-ft
*135TH	JCT	2	33.498		13.1000	104.19		
*135TH	JCT	5	50.791		13.0000	176.32		
*135TH	JCT	100	114.065		12.8500	458.10		
MAJORBASIN	AREA	2	20.789		12.6000	114.64		
MAJORBASIN	AREA	5	32.350		12.6000	185.54		
MAJORBASIN	AREA	100	75.455		12.6000	445.12		
NODE	JCT	2	33.498		13.1000	104.19		
NODE	JCT	5	50.791		13.0000	176.32		
NODE	JCT	100	114.065		12.8500	458.10		
OFFSITE SOUTH	AREA	2	1.091		12.2000	10.73		
OFFSITE SOUTH	AREA	5	1.682		12.2000	17.00		
OFFSITE SOUTH	AREA	100	3.867		12.2000	39.59		

MASTER NETWORK SUMMARY
 SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
 (Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Storage Node ID	Return Type Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond ac-ft
ONSITE DS	AREA 2	6.067		12.0500	88.07		
ONSITE DS	AREA 5	8.612		12.0500	124.07		
ONSITE DS	AREA 100	17.366		12.0500	242.79		
ONSITEUS	AREA 2	3.371		12.0500	48.93		
ONSITEUS	AREA 5	4.785		12.0500	68.93		
ONSITEUS	AREA 100	9.648		12.0500	134.88		
POND	POND 2	32.410		12.1000	152.53		
POND	POND 5	49.112		12.1000	237.77		
POND	POND 100	110.202		12.1000	543.53		
POND	OUT POND 2	32.407		13.1000	102.31	160.13	7.383
POND	OUT POND 5	49.108		13.0000	173.19	160.81	10.505
POND	OUT POND 100	110.198		12.9000	449.77	162.88	19.888
RCBC	POND 2	26.342		12.5000	131.11		
RCBC	POND 5	40.499		12.5000	210.95		
RCBC	POND 100	92.837		12.4500	504.65		
RCBC	OUT POND 2	26.343		12.6500	128.15	161.70	1.171
RCBC	OUT POND 5	40.500		12.6000	206.51	162.53	1.614
RCBC	OUT POND 100	92.837		12.5500	494.30	164.96	2.910
UPSTREAM	JCT 2	24.159		12.6000	121.27		
UPSTREAM	JCT 5	37.134		12.6000	194.56		
UPSTREAM	JCT 100	85.103		12.5000	463.71		
WEST OFFSITE	AREA 2	2.182		12.2000	21.47		
WEST OFFSITE	AREA 5	3.364		12.2000	34.01		
WEST OFFSITE	AREA 100	7.734		12.2000	79.17		

**Stormwater Sewer Analysis
Developed Conditions**



System Report

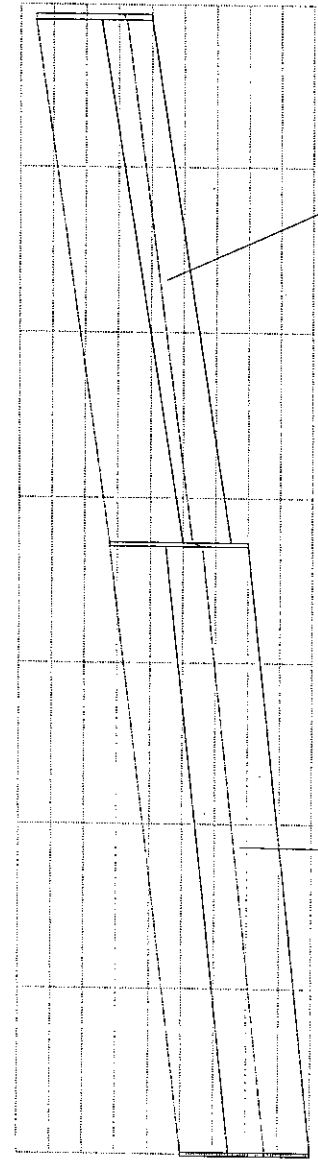
Pipe	Additional Flow (cfs)	Total Upstream Added (cfs)	Structure Discharge (cfs)	-Node- Upstream Downstream	-Section- Shape Size	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	Length (ft)	Average Velocity (ft/s)	Description
P-2	4.50	0.00	4.50	I-3	Circular	170.50	170.00	174.40	171.31	0.007716	4.50	41.00	3.80	
P-3	5.80	4.50	10.30	I-4	18 inch Circular	169.80	167.50	174.40	171.19	0.012195	11.60	359.00	5.43	
P-1	3.80	0.00	3.80	I-2	24 inch Circular	170.00	167.50	171.20	168.68	0.006407	18.11	320.00	3.44	
P-4	2.90	14.10	17.00	I-2	18 inch Circular	167.00	165.00	171.20	168.68	0.007813	9.28	372.00	6.04	
				Outlet	30 inch Circular			169.00	166.39	0.005376	30.07			

Inlet: I-1
 Rim: 173.50 ft
 Sump: 170.00 ft

Inlet: I-2
 Rim: 171.20 ft
 Sump: 167.00 ft

Outlet: Outlet
 Rim: 169.00 ft
 Sump: 165.00 ft

174.00
 173.00
 172.00
 171.00
 170.00
 169.00
 168.00
 167.00
 166.00



Elevation ft

0+00 1+00 2+00 3+00 4+00 5+00 6+00 7+00
 Station ft

Pipe: P-1
 Up Invert: 170.00 ft
 Dn Invert: 167.50 ft
 Length: 320.00 ft
 Size: 18 inch

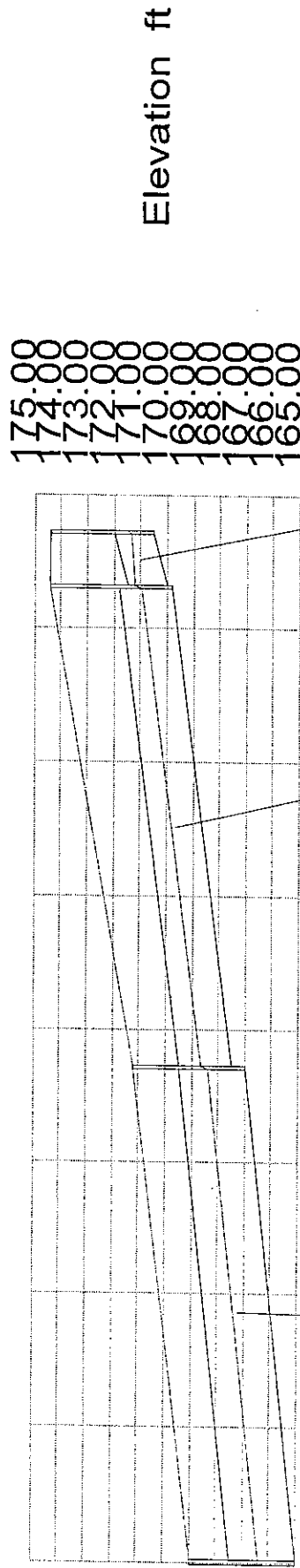
Pipe: P-4
 Up Invert: 167.00 ft
 Dn Invert: 165.00 ft
 Length: 372.00 ft
 Size: 30 inch

Inlet: I-3
 Rim: 174.40 ft
 Sump: 170.50 ft

Inlet: I-4
 Rim: 174.40 ft
 Sump: 169.80 ft

Inlet: I-2
 Rim: 171.20 ft
 Sump: 167.00 ft

Outlet: Outlet
 Rim: 169.00 ft
 Sump: 165.00 ft



0+00 1+00 2+00 3+00 4+00 5+00 6+00 7+00 8+00

Station ft

Elevation ft

Pipe: P-4
 Up Invert: 167.00 ft
 Dn Invert: 165.00 ft
 Length: 372.00 ft
 Size: 30 inch

Pipe: P-3
 Up Invert: 169.80 ft
 Dn Invert: 167.50 ft
 Length: 359.00 ft
 Size: 24 inch

Pipe: P-2
 Up Invert: 170.50 ft
 Dn Invert: 170.00 ft
 Length: 41.00 ft
 Size: 18 inch

System Report

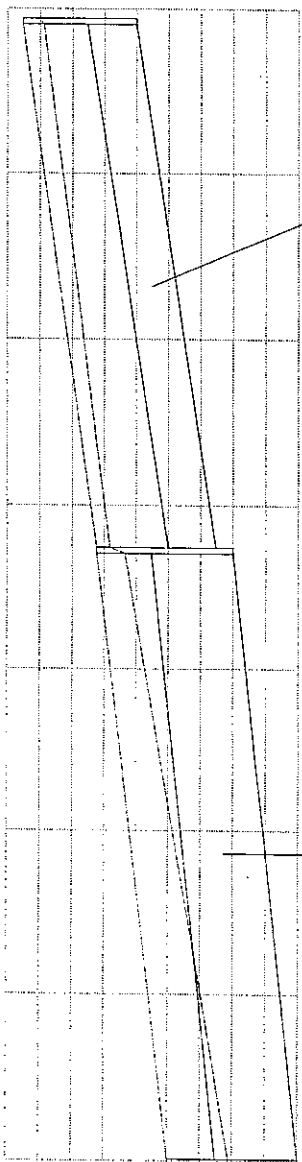
Pipe	Additional Flow (cfs)	Total Upstream Added (cfs)	Structure Discharge (cfs)	-Node- Upstream Downstream	-Section- Shape Size	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	Length (ft)	Average Velocity (ft/s)	Description
P-2	9.90	0.00	9.90	I-3	Circular	170.50	170.00	174.40	174.76	0.008883	9.90	41.00	5.60	
P-3	12.80	9.90	22.70	I-4	18 inch Circular	169.80	167.50	174.40	174.40	0.012195	11.60	359.00	7.23	
P-1	8.40	0.00	8.40	I-2	24 inch Circular	170.00	167.50	171.20	170.81	0.006407	18.11	320.00	4.75	
P-4	6.40	31.10	37.50	I-2	18 inch Circular	167.00	165.00	173.50	172.86	0.006396	8.40	372.00	8.13	
				Outlet	30 inch Circular			171.20	170.36	0.007813	37.50			
								169.00	167.07	0.005376	30.07			

Inlet: I-1
 Rim: 173.50 ft
 Sump: 170.00 ft

Inlet: I-2
 Rim: 171.20 ft
 Sump: 167.00 ft

Outlet: Outlet
 Rim: 169.00 ft
 Sump: 165.00 ft

174.00
 173.00
 172.00
 171.00
 170.00
 169.00
 168.00
 167.00
 166.50



Elevation ft

0+00 1+00 2+00 3+00 4+00 5+00 6+00 7+00
 Station ft

Pipe: P-1
 Up Invert: 170.00 ft
 Dn Invert: 167.50 ft
 Length: 320.00 ft
 Size: 18 inch

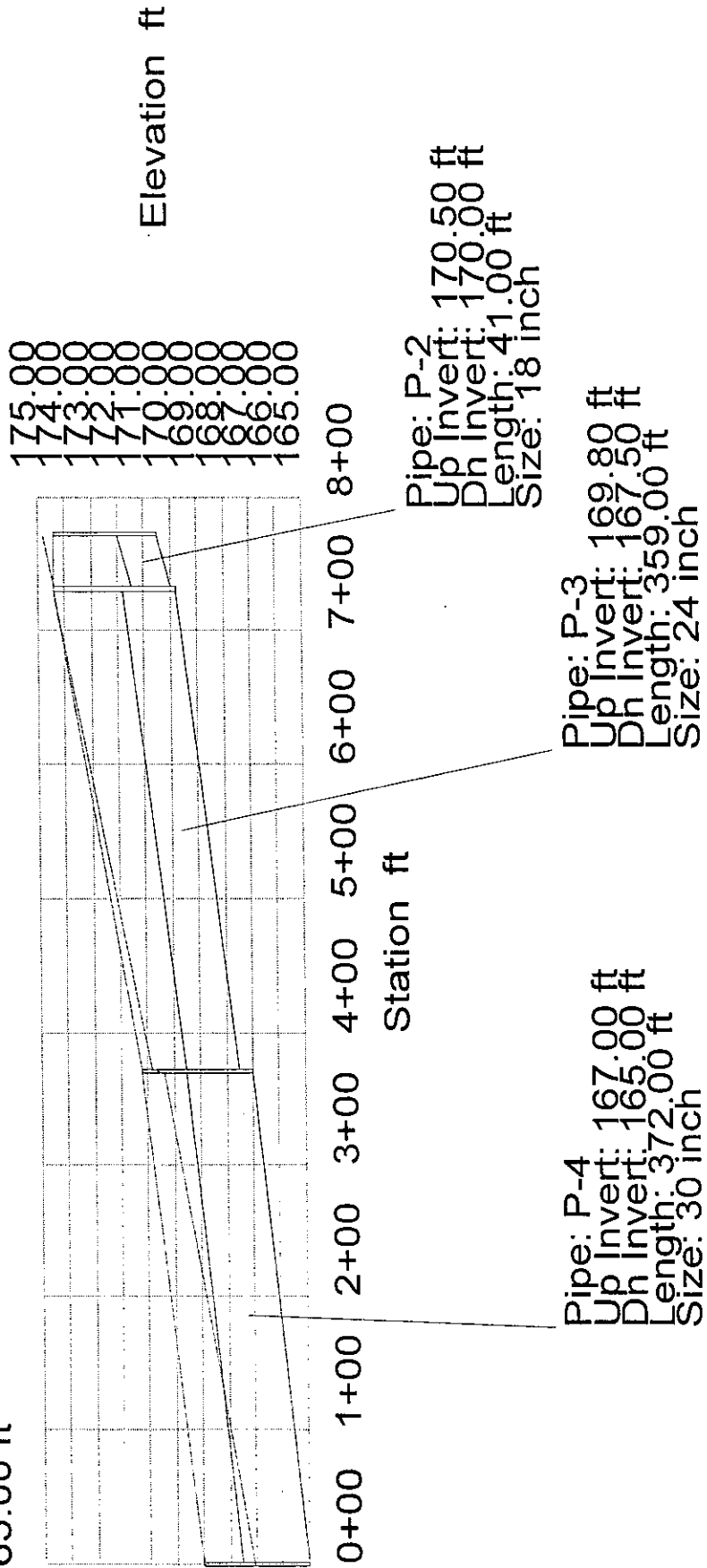
Pipe: P-4
 Up Invert: 167.00 ft
 Dn Invert: 165.00 ft
 Length: 372.00 ft
 Size: 30 inch

Inlet: I-3
 Rim: 174.40 ft
 Sump: 170.50 ft

Inlet: I-4
 Rim: 174.40 ft
 Sump: 169.80 ft

Inlet: I-2
 Rim: 171.20 ft
 Sump: 167.00 ft

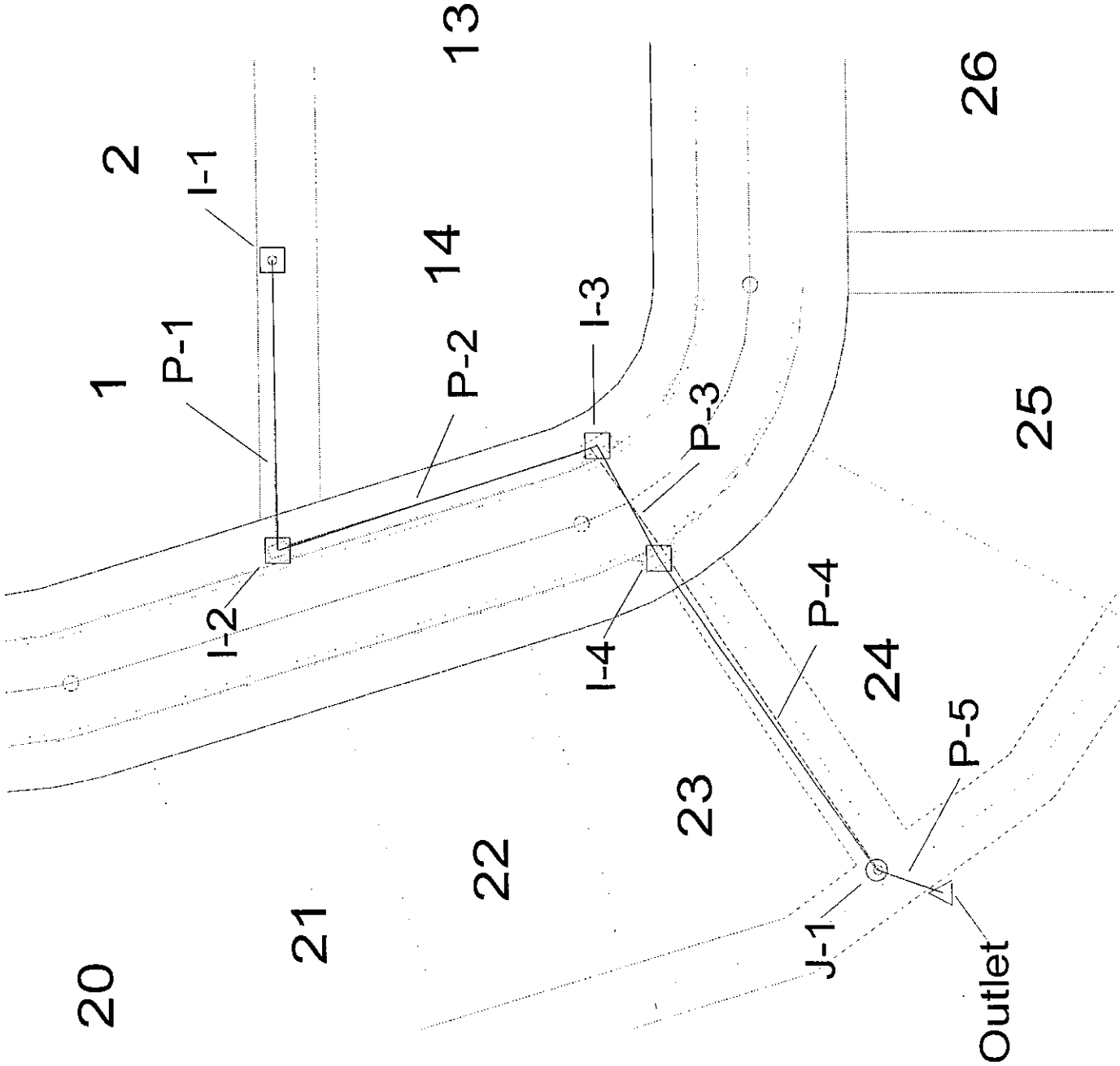
Outlet: Outlet
 Rim: 169.00 ft
 Sump: 165.00 ft



Pipe: P-4
 Up Invert: 167.00 ft
 Dn Invert: 165.00 ft
 Length: 372.00 ft
 Size: 30 inch

Pipe: P-3
 Up Invert: 169.80 ft
 Dn Invert: 167.50 ft
 Length: 359.00 ft
 Size: 24 inch

Pipe: P-2
 Up Invert: 170.50 ft
 Dn Invert: 170.00 ft
 Length: 41.00 ft
 Size: 18 inch



Coppergate 2nd Addition
 Stormwater Sewer System #2
 Inlet I-2

Drainage area, acres	0.4
Li = Inlet Length	5
So = street grade, ft/ft	0.005
Sx = cross slope, ft/ft	0.03125
Manning's n	0.022
Z in Izzard's Eq. = 1/Sx	32

	2-yr	5-yr	100-yr
Rainfall Intensity, in/hr	3.83	4.56	7.37
Rational "C"	0.46	0.49	0.67
Flowrate, cfs	0.7	0.9	2.0
Additional Flow, cfs	0.0	0.0	0.0
Total Flowrate, cfs	0.7	0.9	2.0
depth of flow, ft	0.19	0.21	0.28
Flow width, ft	6.14	6.71	9.03
Froude Number	0.63950	0.64907	0.68205
Length 1, ft	3.46	3.83	5.42
Length 2, ft	2.27	2.52	3.56
Length 3, ft	6.48	7.19	10.17
case 1, Li < L2 intercepted flow bypassed flow	NO GOOD 1.0 0.0	NO GOOD 1.2 0.0	NO GOOD 1.8 0.2
case 2, Li > L2 intercepted flow bypassed flow	VALID 0.6 0.1	VALID 0.8 0.1	VALID 1.5 0.5

System Report

Pipe	Additional Flow (cfs)	Total Upstream Added (cfs)	Structure Discharge (cfs)	-Node- Upstream Downstream	-Section- Shape Size	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	Length (ft)	Average Velocity (ft/s)	Description
P-1	4.20	0.00	4.20	I-1	Circular	164.40	164.00	167.90	165.25	0.004386	4.20	93.00	4.29	
P-2	0.80	4.20	5.00	I-2	18 inch Circular	163.50	163.10	168.50	164.79	0.004301	6.89	110.00	4.37	
P-3	1.90	5.00	6.90	I-3	18 inch Circular	162.60	162.40	169.40	163.96	0.003636	6.33	41.00	3.53	
P-4	4.90	6.90	11.80	I-4	24 inch Circular	162.20	161.00	169.40	163.71	0.002086	6.90	124.00	6.49	
P-5	N/A	11.80	11.80	J-1	24 inch Circular	160.50	160.00	168.10	162.04	0.009677	22.25	23.00	4.44	
				J-1	24 inch Circular			166.00	162.00	0.002777	11.80			
				Outlet	24 inch					0.021739	33.35			

Inlet: I-1
 Rim: 167.90 ft
 Sump: 164.40 ft

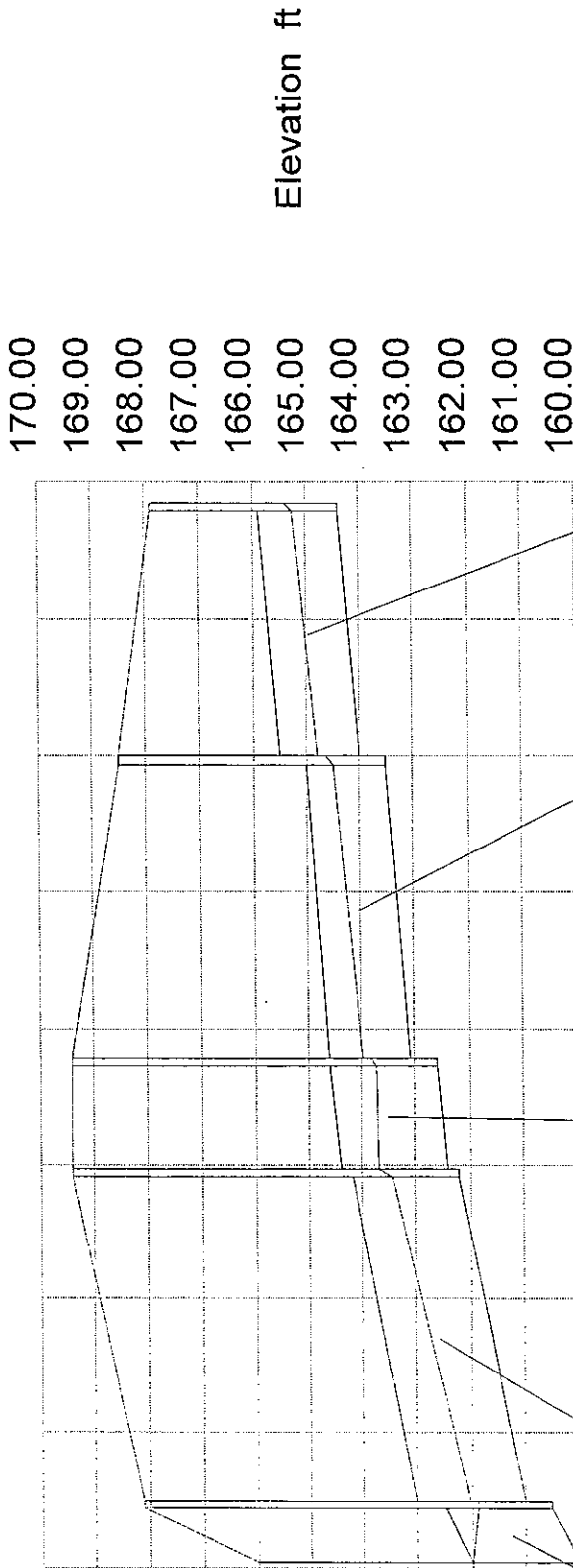
Inlet: I-3
 Rim: 169.40 ft
 Sump: 162.60 ft

Inlet: I-2
 Rim: 168.50 ft
 Sump: 163.50 ft

Inlet: I-4
 Rim: 169.40 ft
 Sump: 162.20 ft

Junction: J-1
 Rim: 168.10 ft
 Sump: 160.50 ft

Outlet: Outlet
 Rim: 166.00 ft
 Sump: 160.00 ft



Pipe: P-1
 Up Invert: 164.40 ft
 Dn Invert: 164.00 ft
 Length: 93.00 ft
 Size: 18 inch

Pipe: P-2
 Up Invert: 163.50 ft
 Dn Invert: 163.10 ft
 Length: 110.00 ft
 Size: 18 inch

Pipe: P-3
 Up Invert: 162.60 ft
 Dn Invert: 162.40 ft
 Length: 41.00 ft
 Size: 24 inch

Pipe: P-4
 Up Invert: 162.20 ft
 Dn Invert: 161.00 ft
 Length: 124.00 ft
 Size: 24 inch

Pipe: P-5
 Up Invert: 160.50 ft
 Dn Invert: 160.00 ft
 Length: 23.00 ft
 Size: 24 inch

System Report

Pipe	Additional Flow (cfs)	Total Upstream Added (cfs)	Structure Discharge (cfs)	-Node- Upstream Downstream	-Section- Shape Size	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	Length (ft)	Average Velocity (ft/s)	Description
P-1	9.40	0.00	9.40	I-1	Circular 18 inch	164.40	164.00	167.90 168.50	167.68 166.93	0.008009 0.004301	9.40 6.89	93.00	5.32	
P-2	1.50	9.40	10.90	I-2 I-3	Circular 18 inch	163.50	163.10	168.50 169.40	166.64 165.45	0.010769 0.003636	10.90 6.33	110.00	6.17	
P-3	4.40	10.90	15.30	I-3 I-4	Circular 24 inch	162.60	162.40	169.40 169.40	165.27 165.08	0.004575 0.004878	15.30 15.80	41.00	4.87	
P-4	10.90	15.30	26.20	I-4 J-1	Circular 24 inch	162.20	161.00	169.40 168.10	164.54 162.79	0.013040 0.009677	26.20 22.25	124.00	8.58	
P-5	N/A	26.20	26.20	J-1 Outlet	Circular 24 inch	160.50	160.00	168.10 166.00	162.29 162.00	0.018339 0.021739	26.20 33.35	23.00	8.58	

Junction: J-1
 Rim: 168.10 ft
 Sump: 160.50 ft

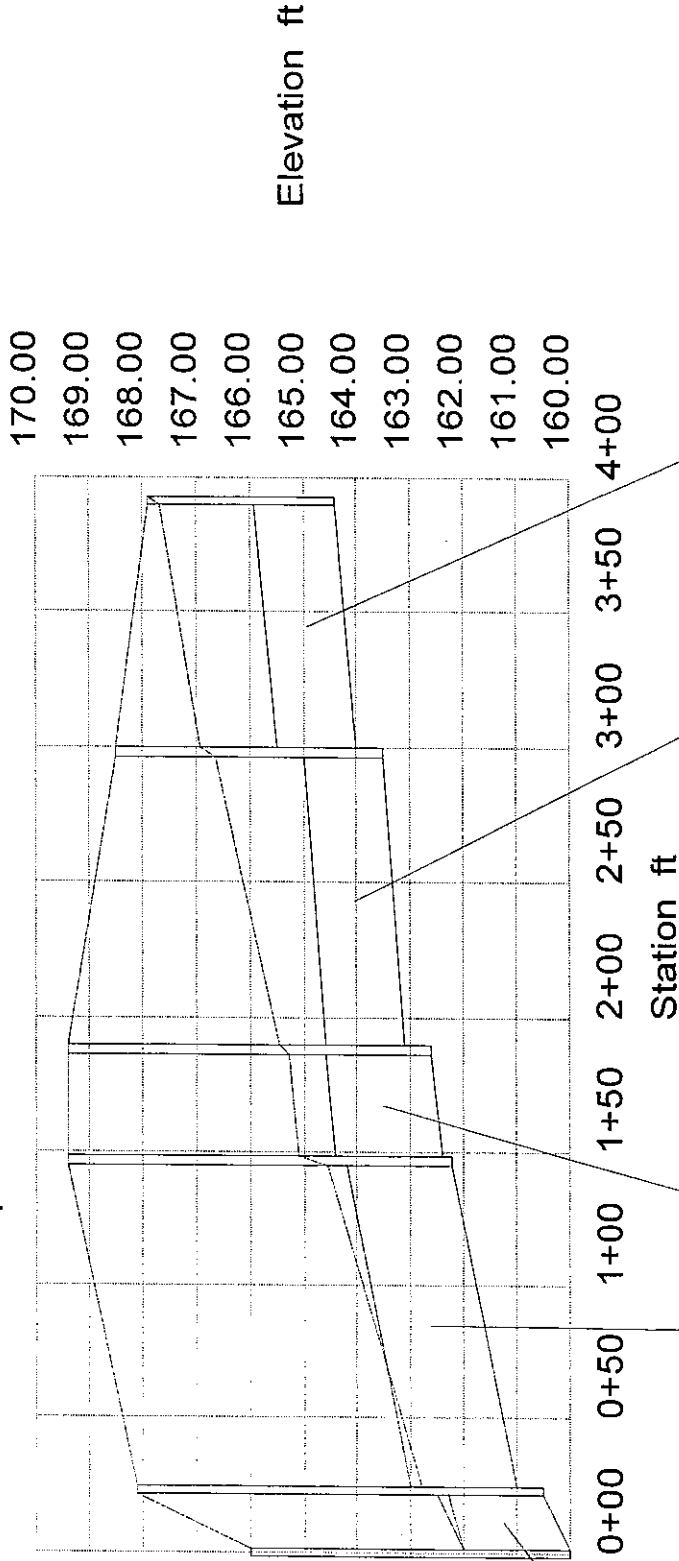
Inlet: I-3
 Rim: 169.40 ft
 Sump: 162.60 ft

Inlet: I-1
 Rim: 167.90 ft
 Sump: 164.40 ft

Inlet: I-2
 Rim: 168.50 ft
 Sump: 163.50 ft

Inlet: I-4
 Rim: 169.40 ft
 Sump: 162.20 ft

Outlet: Outlet
 Rim: 166.00 ft
 Sump: 160.00 ft



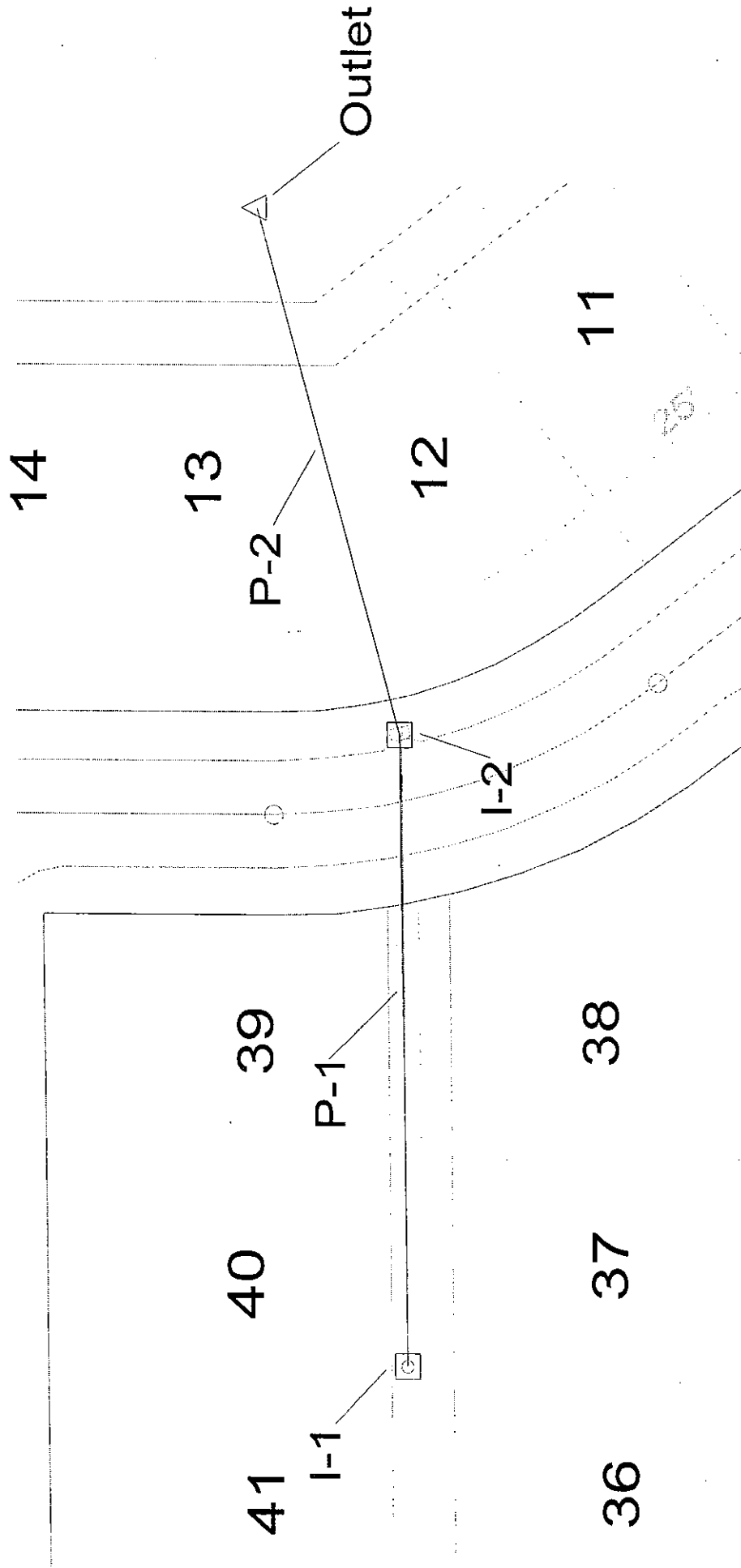
Pipe: P-5
 Up Invert: 160.50 ft
 Dn Invert: 160.00 ft
 Length: 23.00 ft
 Size: 24 inch

Pipe: P-3
 Up Invert: 162.60 ft
 Dn Invert: 162.40 ft
 Length: 41.00 ft
 Size: 24 inch

Pipe: P-4
 Up Invert: 162.20 ft
 Dn Invert: 161.00 ft
 Length: 124.00 ft
 Size: 24 inch

Pipe: P-2
 Up Invert: 163.50 ft
 Dn Invert: 163.10 ft
 Length: 110.00 ft
 Size: 18 inch

Pipe: P-1
 Up Invert: 164.40 ft
 Dn Invert: 164.00 ft
 Length: 93.00 ft
 Size: 18 inch



Coppergate 2nd Addition
 Stormwater Sewer System #3
 Inlet I-2

Drainage area, acres	0.2
Li = Inlet Length	5
So = street grade, ft/ft	0.00527
Sx = 'cross slope, ft/ft	0.03125
Manning's n	0.022
Z in Izzard's Eq. = 1/Sx	32

	2-yr	5-yr	100-yr
Rainfall Intensity, in/hr	3.83	4.56	7.37
Rational "C"	0.46	0.49	0.67
Flowrate, cfs	0.4	0.4	1.0
Additional Flow, cfs	0.0	0.0	0.0
Total Flowrate, cfs	0.4	0.4	1.0
depth of flow, ft	0.15	0.16	0.22
Flow width, ft	4.69	5.12	6.90
Froude Number	0.62767	0.63706	0.66943
Length 1, ft	2.59	2.87	4.06
Length 2, ft	1.70	1.89	2.67
Length 3, ft	4.85	5.39	7.62
case 1, Li < L2 intercepted flow bypassed flow	NO GOOD 0.7 0.0	NO GOOD 0.8 0.0	NO GOOD 1.2 0.0
case 2, Li > L2 intercepted flow bypassed flow	VALID 0.4 0.0	VALID 0.4 0.0	VALID 0.8 0.2

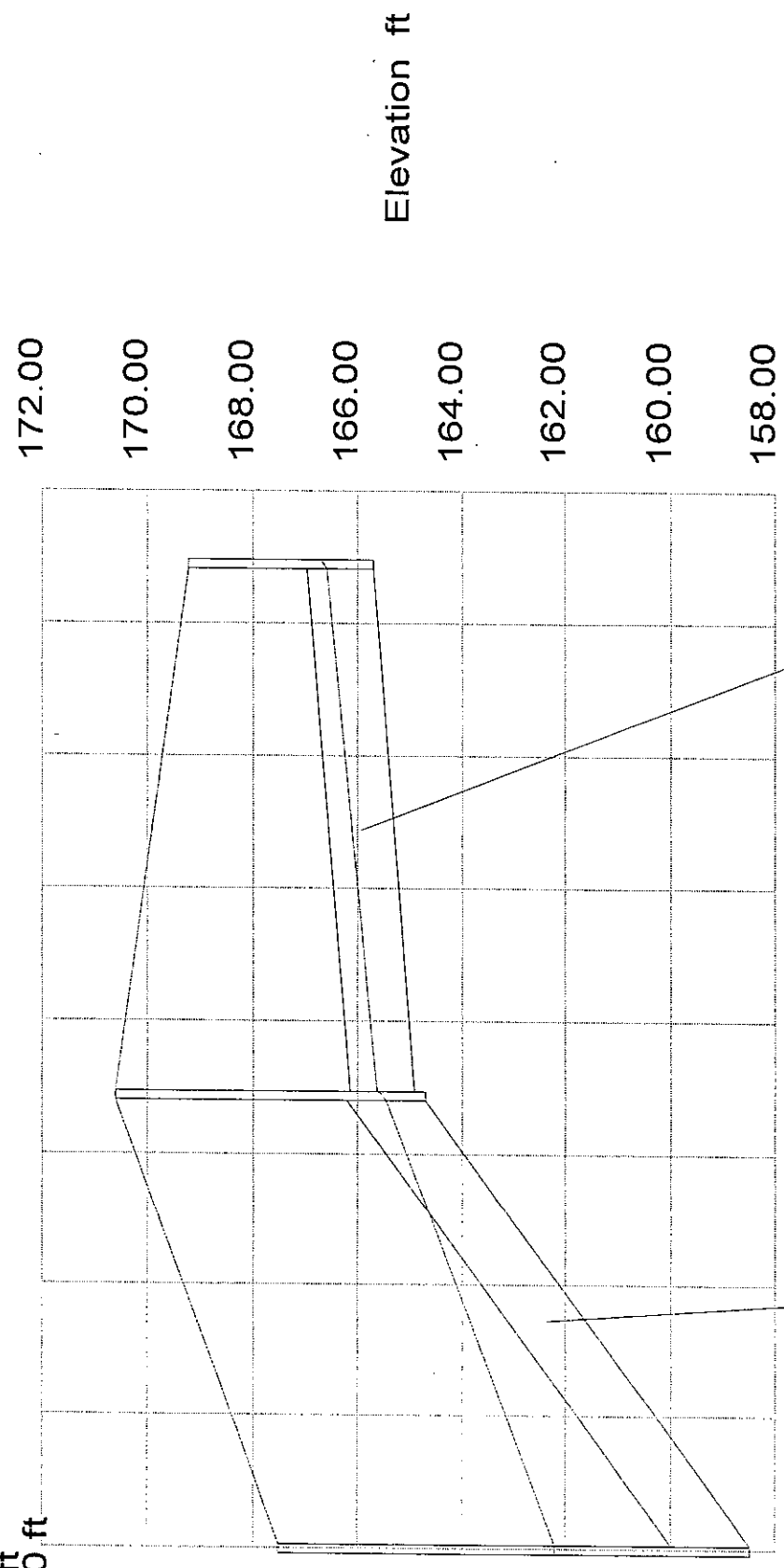
System Report

Pipe	Additional Flow (cfs)	Total Upstream Added (cfs)	Structure Discharge (cfs)	-Node- Upstream Downstream	-Section- Shape Size	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	Length (ft)	Average Velocity (ft/s)	Description
P-1	3.40	0.00	3.40	I-1	Circular	165.70	164.90	169.20	166.57	0.004163	3.40	200.00	4.10	
P-2	0.40	3.40	3.80	I-2	15 inch	164.70	158.50	170.60	165.64	0.004000	4.09	172.00	3.24	
				Outlet	Circular			170.60	165.45	0.020148	3.80			
					18 inch			167.50	162.20	0.036047	19.94			

Inlet: I-1
 Rim: 169.20 ft
 Sump: 165.70 ft

Inlet: I-2
 Rim: 170.60 ft
 Sump: 164.70 ft

Outlet: Outlet
 Rim: 167.50 ft
 Sump: 158.50 ft



Pipe: P-1
 Up Invert: 165.70 ft
 Dn Invert: 164.90 ft
 Length: 200.00 ft
 Size: 15 inch

Pipe: P-2
 Up Invert: 164.70 ft
 Dn Invert: 158.50 ft
 Length: 172.00 ft
 Size: 18 inch

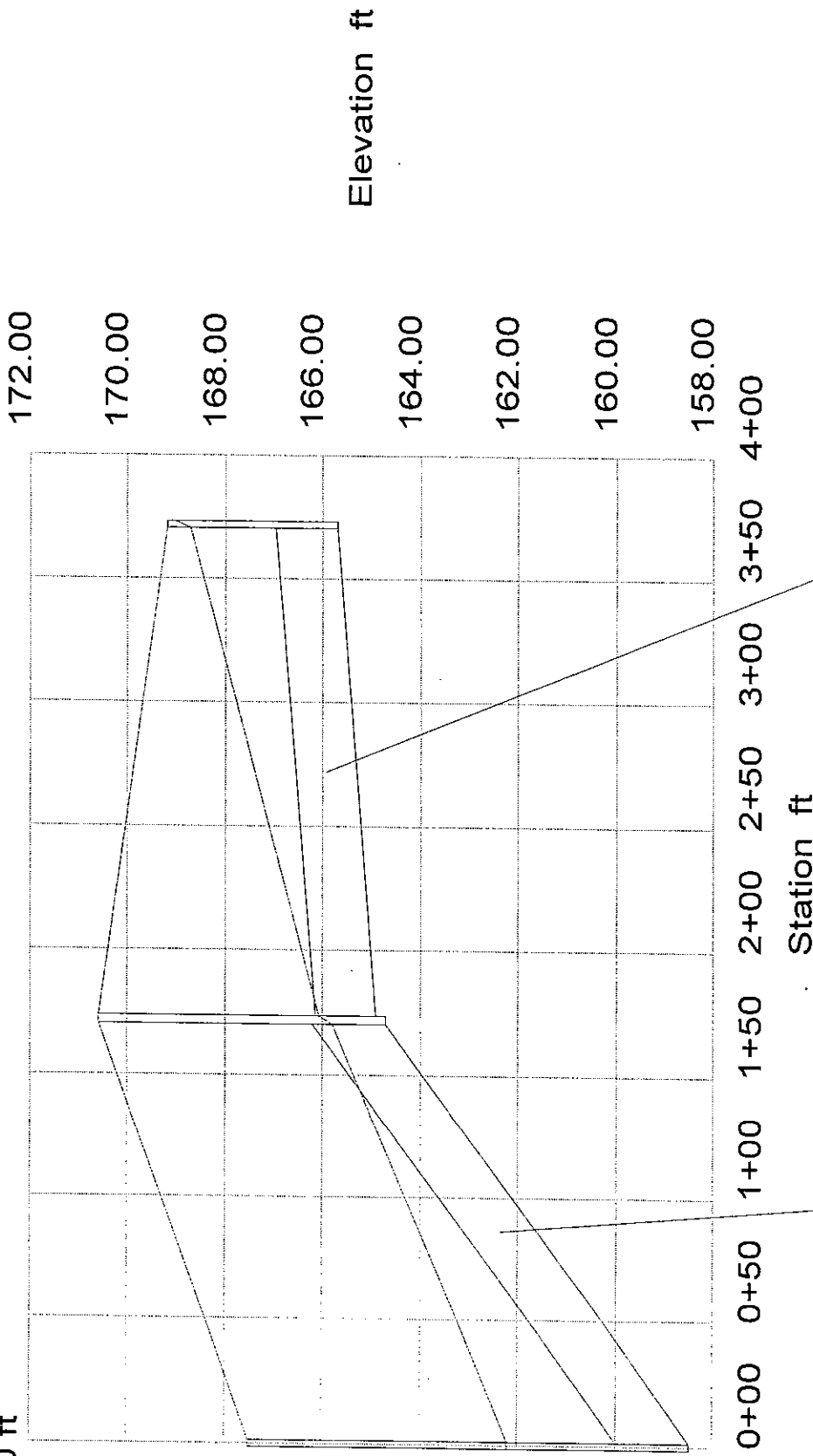
System Report

Pipe	Additional Flow (cfs)	Total Upstream Added (cfs)	Structure Discharge (cfs)	-Node- Upstream Downstream	-Section- Shape Size	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	Length (ft)	Average Velocity (ft/s)	Description
P-1	7.40	0.00	7.40	I-1	Circular 15 inch	165.70	164.90	169.20 170.60	168.72 166.08	0.013086 0.004000	7.40 4.09	200.00	6.11	
P-2	0.80	7.40	8.20	I-2 Outlet	Circular 18 inch	164.70	158.50	170.60 167.50	165.81 162.20	0.022133 0.036047	8.20 19.94	172.00	5.25	

Inlet: I-1
 Rim: 169.20 ft
 Sump: 165.70 ft

Inlet: I-2
 Rim: 170.60 ft
 Sump: 164.70 ft

Outlet: Outlet
 Rim: 167.50 ft
 Sump: 158.50 ft

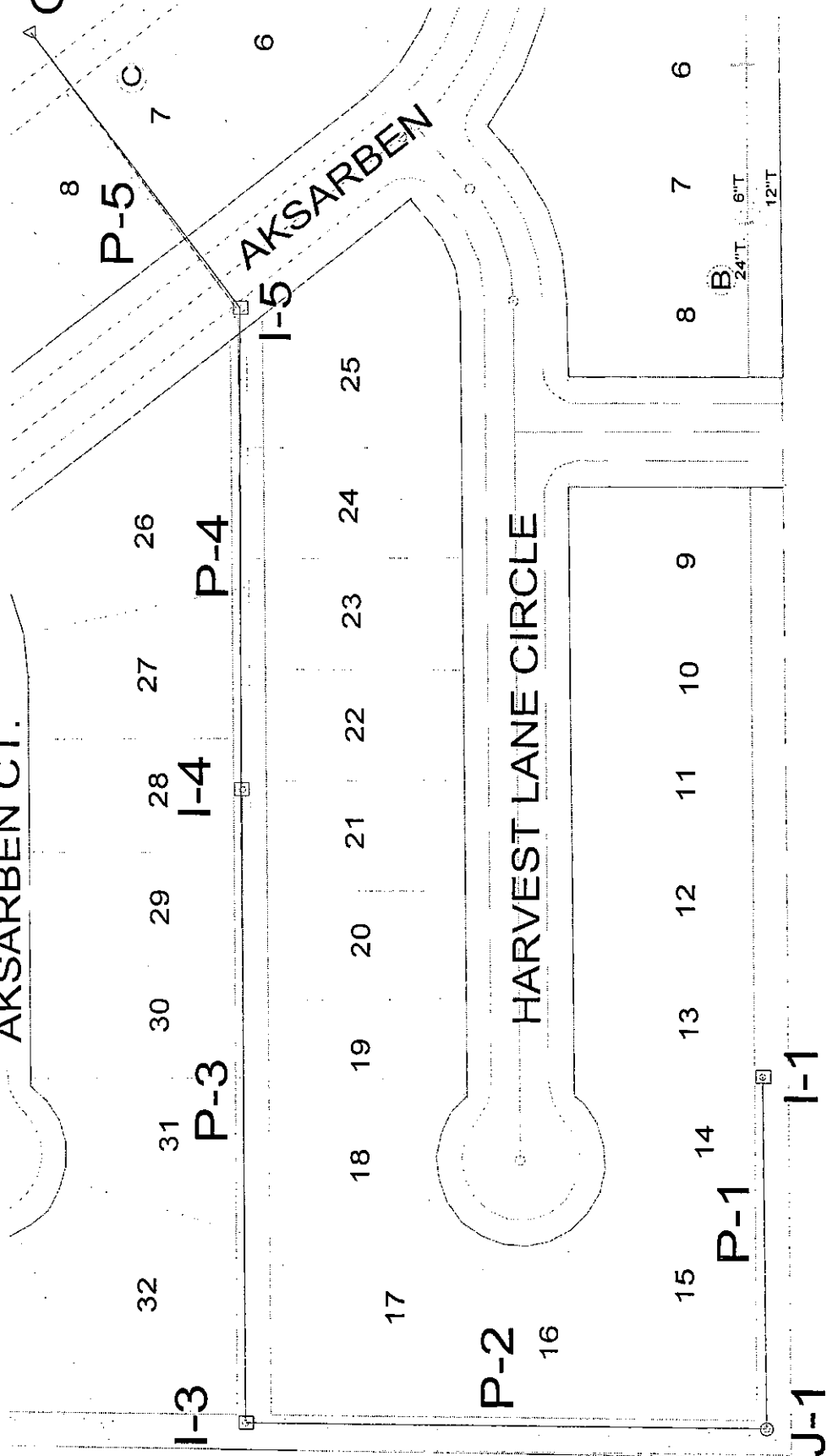


Pipe: P-1
 Up Invert: 165.70 ft
 Dn Invert: 164.90 ft
 Length: 200.00 ft
 Size: 15 inch

Pipe: P-2
 Up Invert: 164.70 ft
 Dn Invert: 158.50 ft
 Length: 172.00 ft
 Size: 18 inch

AKSARBEN CT.

Outlet



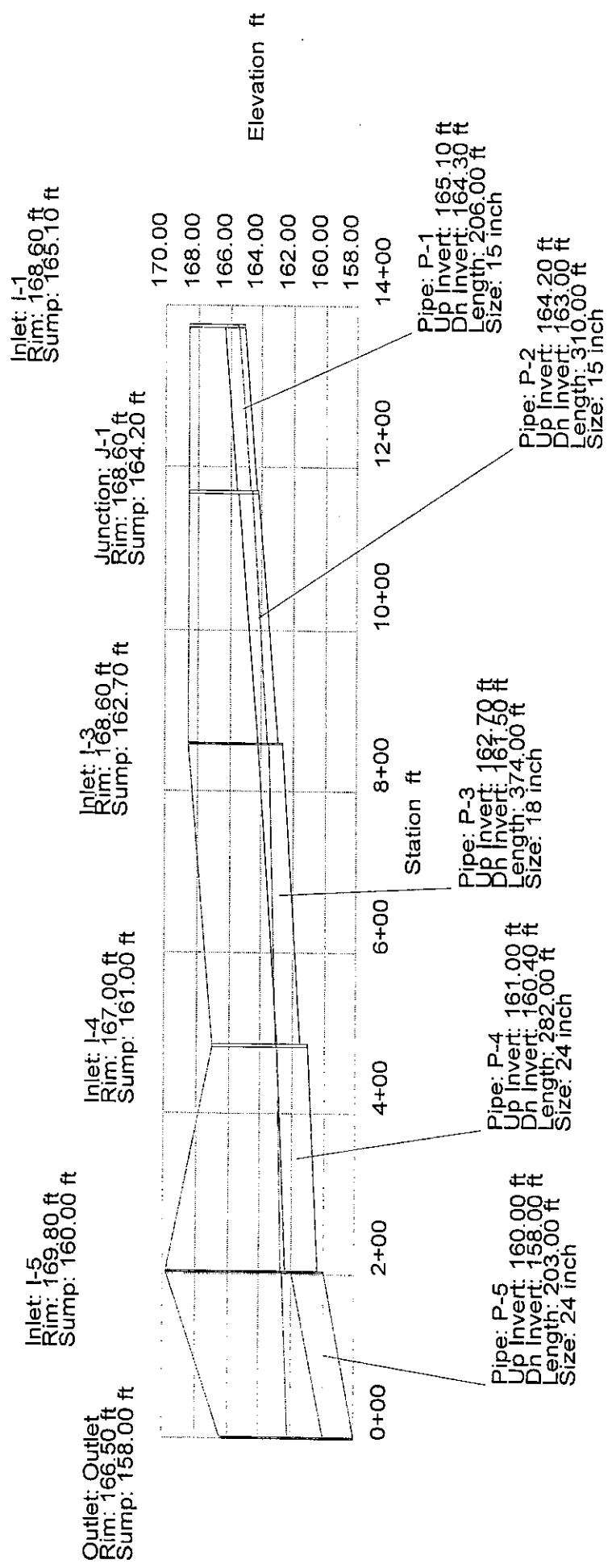
Coppergate 2nd Addition
 Stormwater Sewer System #4
 Inlet I-5

Drainage area, acres	1.1
Li = Inlet Length	10
So = street grade, ft/ft	0.01421
Sx = 'cross slope, ft/ft	0.03125
Manning's n	0.022
Z in Izzard's Eq. = 1/Sx	32

	2-yr	5-yr	100-yr
Rainfall Intensity, in/hr	3.83	4.56	7.37
Rational "C"	0.46	0.49	0.67
Flowrate, cfs	1.9	2.5	5.4
Additional Flow, cfs	0.0	0.0	0.0
Total Flowrate, cfs	1.9	2.5	5.4
depth of flow, ft	0.23	0.25	0.34
Flow width, ft	7.37	8.06	10.85
Froude Number	1.11156	1.12820	1.18552
Length 1, ft	7.22	8.01	11.33
Length 2, ft	4.74	5.26	7.44
Length 3, ft	13.52	15.01	21.23
case 1, Li < L2 intercepted flow bypassed flow	NO GOOD 2.7 0.0	NO GOOD 3.1 0.0	NO GOOD 4.8 0.6
case 2, Li > L2 intercepted flow bypassed flow	VALID 1.7 0.2	VALID 2.1 0.4	VALID 4.0 1.4

System Report

Pipe	Additional Flow (cfs)	Total Upstream Added (cfs)	Structure Discharge (cfs)	-Node- Upstream Downstream	-Section- Shape Size	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	Length (ft)	Average Velocity (ft/s)	Description
P-1	0.90	0.00	0.90	I-1	Circular	165.10	164.30	168.60	165.50	0.003903	0.90	206.00	2.79	
P-2	N/A	0.90	0.90	J-1	15 inch Circular	164.20	163.00	168.60	164.67	0.003883	4.03	310.00	2.02	
P-3	2.70	0.90	3.60	I-3	15 inch Circular	162.70	161.50	168.60	163.65	0.003871	4.02	374.00	2.75	
P-4	4.20	3.60	7.80	I-4	18 inch Circular	161.00	160.40	167.00	163.05	0.003209	5.95	282.00	2.48	
P-5	2.10	7.80	9.90	I-5	24 inch Circular	160.00	158.00	169.80	162.67	0.002128	10.43	203.00	3.15	
				Outlet	24 inch Circular			166.50	162.20	0.009852	22.45			



System Report

Pipe	Additional Flow (cfs)	Total Upstream Added (cfs)	Structure Discharge (cfs)	-Node- Upstream Downstream	-Section- Shape Size	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	Length (ft)	Average Velocity (ft/s)	Description
P-1	2.00	0.00	2.00	I-1	Circular 15 inch	165.10	164.30	168.60	168.80	0.000959	2.00	206.00	1.63	
P-2	N/A	2.00	2.00	J-1	Circular 15 inch	164.20	163.00	168.60	168.60	0.003883	4.03	310.00	1.63	
P-3	5.90	2.00	7.90	I-3	Circular 18 inch	162.70	161.50	168.60	168.36	0.005657	7.90	374.00	4.47	
P-4	9.40	7.90	17.30	I-4	Circular 24 inch	161.00	160.40	167.00	166.24	0.003209	17.30	282.00	5.51	
P-5	4.00	17.30	21.30	I-5	Circular 24 inch	160.00	158.00	169.80	164.36	0.002128	10.43	203.00	6.78	
				Outlet				166.50	162.20	0.009852	22.45			

Inlet: I-1
 Rim: 168.60 ft
 Sump: 165.10 ft

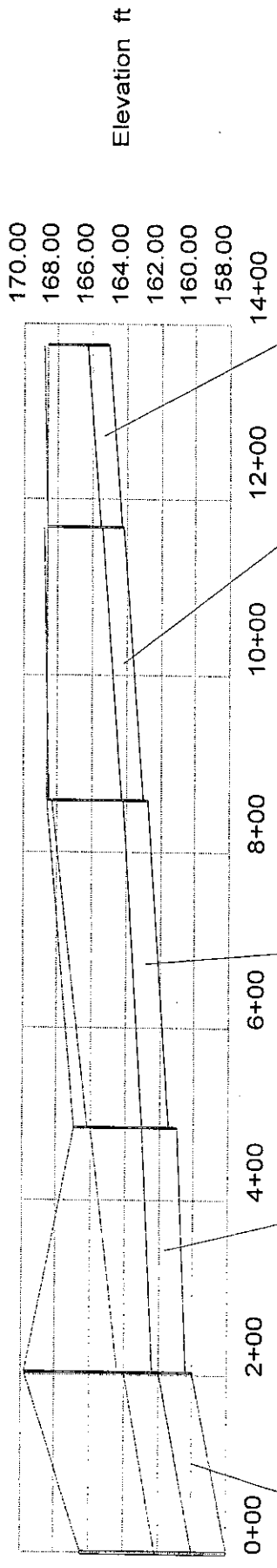
Junction: J-1
 Rim: 168.60 ft
 Sump: 164.20 ft

Inlet: I-3
 Rim: 168.60 ft
 Sump: 162.70 ft

Inlet: I-4
 Rim: 167.00 ft
 Sump: 161.00 ft

Inlet: I-5
 Rim: 169.80 ft
 Sump: 160.00 ft

Outlet: Outlet
 Rim: 166.50 ft
 Sump: 158.00 ft



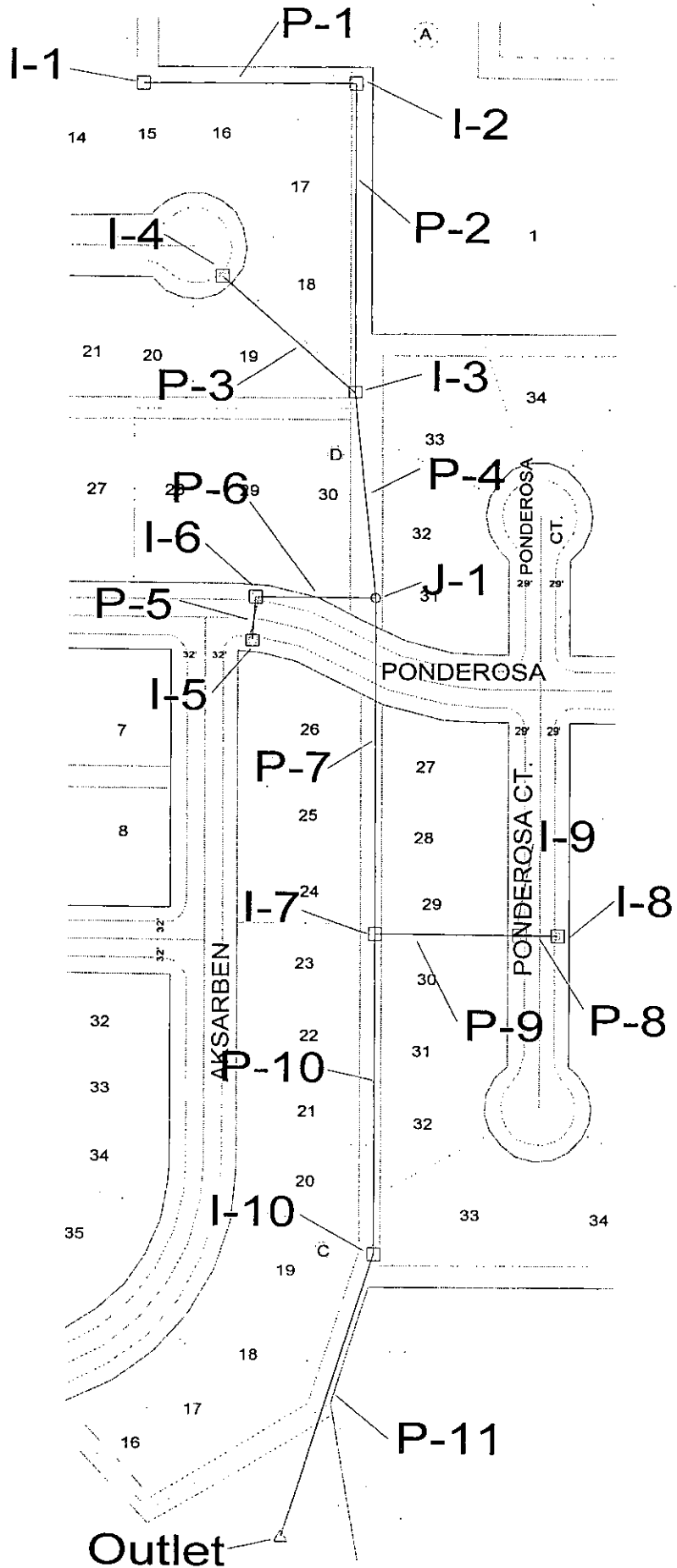
Pipe: P-1
 Up Invert: 165.10 ft
 Dn Invert: 164.30 ft
 Length: 206.00 ft
 Size: 15 inch

Pipe: P-2
 Up Invert: 164.20 ft
 Dn Invert: 163.00 ft
 Length: 310.00 ft
 Size: 15 inch

Pipe: P-3
 Up Invert: 162.70 ft
 Dn Invert: 161.50 ft
 Length: 374.00 ft
 Size: 18 inch

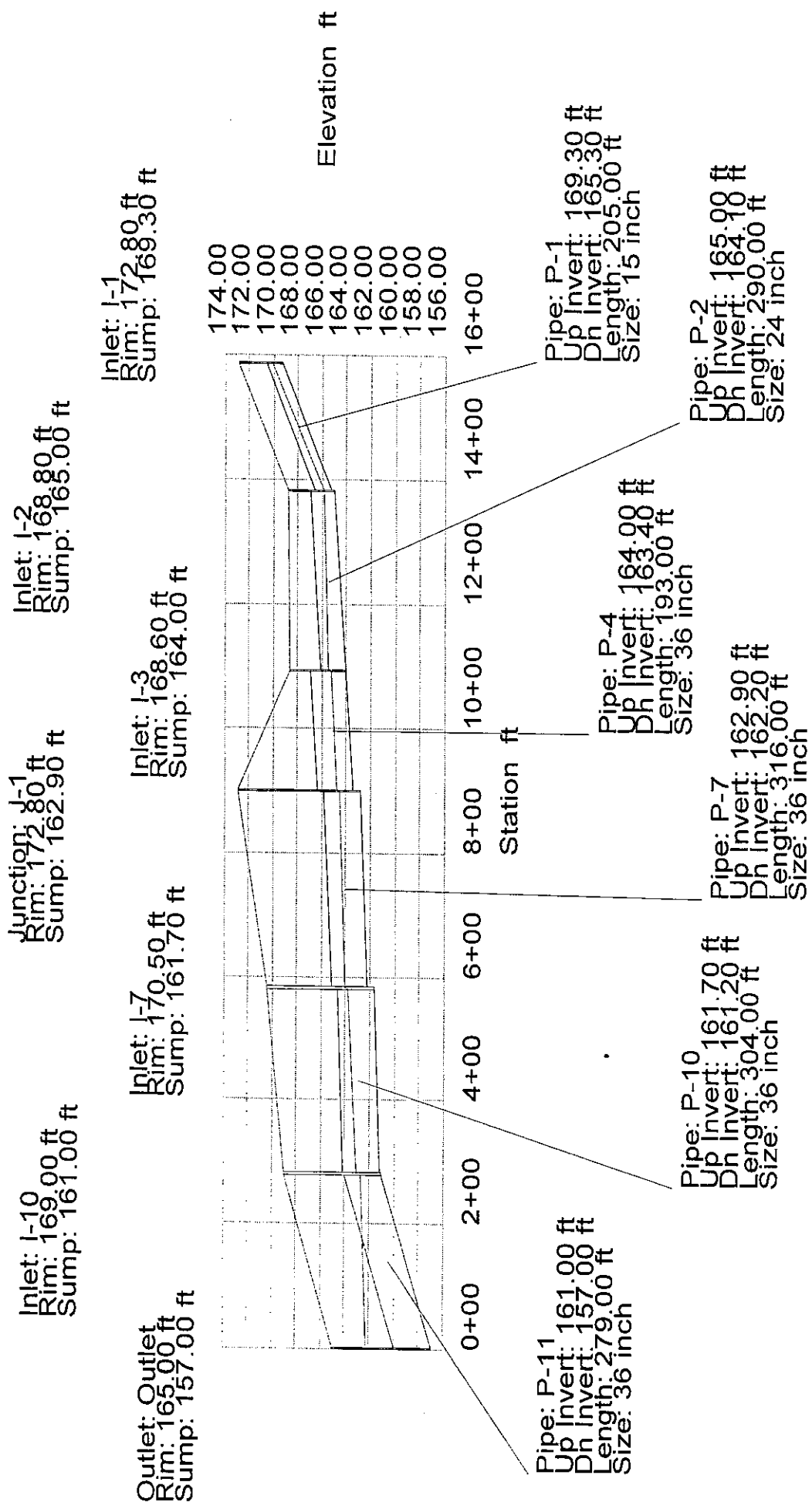
Pipe: P-4
 Up Invert: 161.00 ft
 Dn Invert: 160.40 ft
 Length: 282.00 ft
 Size: 24 inch

Pipe: P-5
 Up Invert: 160.00 ft
 Dn Invert: 158.00 ft
 Length: 203.00 ft
 Size: 24 inch



System Report

Pipe	Additional Flow (cfs)	Total Upstream Added (cfs)	Structure Discharge (cfs)	-Node- Upstream Downstream	-Section- Shape Size	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	Length (ft)	Average Velocity (ft/s)	Description
P-8	1.80	0.00	1.80	I-8	Circular	166.50	166.30	170.40	167.09	0.002386	1.80	35.00	2.69	
P-9	2.20	1.80	4.00	I-9	15 inch	166.10	162.50	170.40	167.09	0.005714	4.88	137.00	4.01	
P-5	2.20	0.00	2.20	I-7	Circular	168.50	168.30	170.50	166.91	0.022503	10.47	41.00	3.09	
P-6	1.80	2.20	4.00	I-5	15 inch	168.50	165.00	172.40	164.01	0.026277	2.20	116.00	6.38	
P-3	2.90	0.00	2.90	I-6	Circular	168.10	164.50	172.40	169.09	0.004878	4.00	168.00	3.50	
P-1	3.80	0.00	3.80	J-1	15 inch	169.30	165.30	172.80	168.91	0.023542	10.56	205.00	2.93	
P-2	1.10	3.80	4.90	I-4	Circular	169.30	164.10	173.20	165.53	0.026724	2.90	290.00	4.85	
P-4	6.70	7.80	14.50	I-3	15 inch	169.30	163.40	168.60	169.98	0.027681	10.92	193.00	4.35	
P-7	N/A	18.50	18.50	I-1	Circular	165.00	162.20	172.80	165.49	0.028571	3.80	316.00	5.03	
P-10	2.50	22.50	25.00	I-2	15 inch	164.00	161.20	168.80	170.09	0.018489	27.05	279.00	5.33	
P-11	2.90	25.00	27.90	I-10	36 inch	161.00	157.00	168.80	165.87	0.019512	9.02			
				Outlet	36 inch			168.80	165.87	0.001817	4.90			
								168.60	164.74	0.003103	12.60			
								168.60	164.74	0.003060	14.50			
								172.80	164.74	0.003109	37.19			
								172.80	164.57	0.001954	18.50			
								170.50	164.01	0.002215	31.39			
								170.50	163.85	0.002175	25.00			
								169.00	163.06	0.001645	27.05			
								169.00	162.71	0.003463	27.90			
								165.00	162.20	0.014337	79.86			



Inlet: I-6
Rim: 172.40 ft
Sump: 168.10 ft

Inlet: I-7
Rim: 170.50 ft
Sump: 161.70 ft

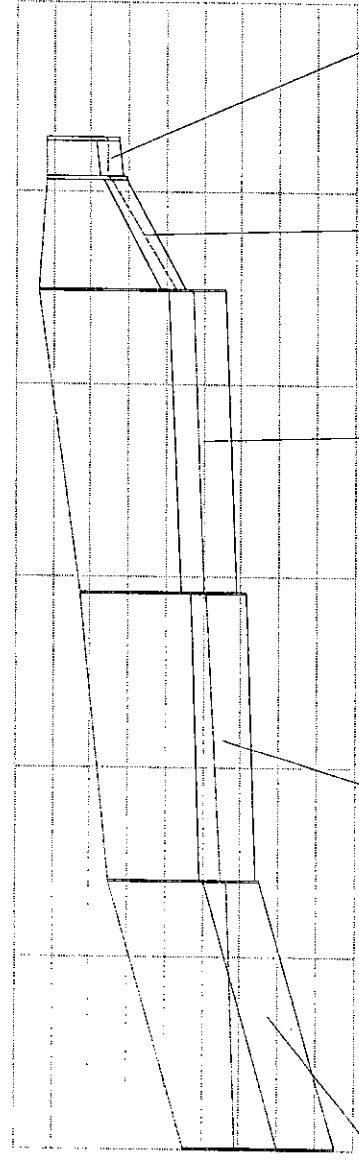
Inlet: I-5
Rim: 172.40 ft
Sump: 168.50 ft

Inlet: I-10
Rim: 169.00 ft
Sump: 161.00 ft

Outlet: Outlet
Rim: 165.00 ft
Sump: 157.00 ft

Junction: J-1
Rim: 172.80 ft
Sump: 162.90 ft

Station	Elevation ft
0+00	174.00
1+00	172.00
2+00	170.00
3+00	168.00
4+00	166.00
5+00	164.00
6+00	162.00
7+00	160.00
8+00	158.00
9+00	156.00



0+00 2+00 4+00 6+00 8+00 10+00 12+00

Station ft

Elevation ft

Pipe: P-11
Up Invert: 161.00 ft
Dn Invert: 157.00 ft
Length: 279.00 ft
Size: 36 inch

Pipe: P-10
Up Invert: 161.70 ft
Dn Invert: 161.20 ft
Length: 304.00 ft
Size: 36 inch

Pipe: P-7
Up Invert: 162.90 ft
Dn Invert: 162.20 ft
Length: 316.00 ft
Size: 36 inch

Pipe: P-6
Up Invert: 168.10 ft
Dn Invert: 165.00 ft
Length: 116.00 ft
Size: 15 inch

Pipe: P-5
Up Invert: 168.50 ft
Dn Invert: 168.30 ft
Length: 41.00 ft
Size: 15 inch

Inlet: I-8
 Rim: 170.40 ft
 Sump: 166.50 ft

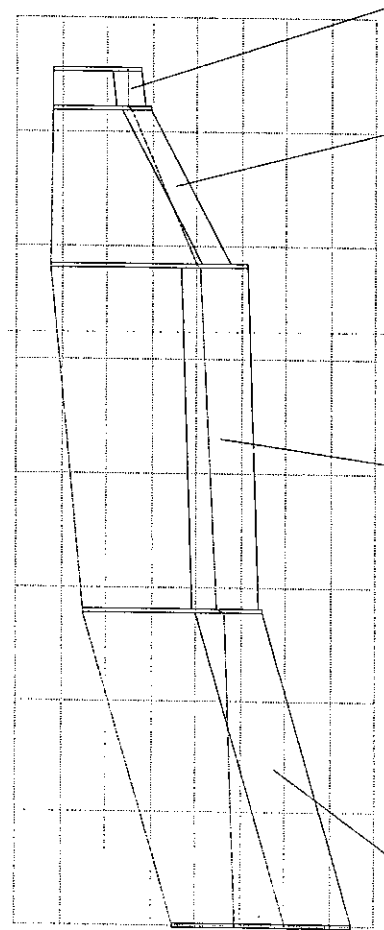
Inlet: I-7
 Rim: 170.50 ft
 Sump: 161.70 ft

Outlet: Outlet
 Rim: 165.00 ft
 Sump: 157.00 ft

Inlet: I-10
 Rim: 169.00 ft
 Sump: 161.00 ft

Inlet: I-9
 Rim: 170.40 ft
 Sump: 166.10 ft

172.00
 170.00
 168.00
 166.00
 164.00
 162.00
 160.00
 158.00
 156.00



0+001+002+003+004+005+006+007+008+00

Station ft

Elevation ft

Pipe: P-8
 Up Invert: 166.50 ft
 Dn Invert: 166.30 ft
 Length: 35.00 ft
 Size: 15 inch

Pipe: P-9
 Up Invert: 166.10 ft
 Dn Invert: 162.50 ft
 Length: 137.00 ft
 Size: 15 inch

Pipe: P-10
 Up Invert: 161.70 ft
 Dh Invert: 161.20 ft
 Length: 304.00 ft
 Size: 36 inch

Pipe: P-11
 Up Invert: 161.00 ft
 Dh Invert: 157.00 ft
 Length: 279.00 ft
 Size: 36 inch

System Report

Pipe	Additional Flow (cfs)	Total Upstream Added (cfs)	Structure Discharge (cfs)	-Node- Upstream Downstream	-Section- Shape Size	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	Length (ft)	Average Velocity (ft/s)	Description
P-8	4.00	0.00	4.00	I-8	Circular	166.50	166.30	170.40	170.53	0.003835	4.00	35.00	3.26	
P-9	4.90	4.00	8.90	I-9	15 inch Circular	166.10	162.50	170.40	170.40	0.005714	4.88	137.00	7.25	
P-5	4.90	0.00	4.90	I-7	15 inch Circular	168.50	168.30	170.50	167.75	0.018984	10.47	41.00	3.99	
P-6	4.00	4.90	8.90	I-6	15 inch Circular	168.10	165.00	172.40	172.05	0.005754	4.90	116.00	7.25	
P-3	6.40	0.00	6.40	J-1	15 inch Circular	169.30	164.50	172.80	171.81	0.004878	10.56	168.00	5.22	
P-1	8.40	0.00	8.40	I-3	15 inch Circular	169.30	165.30	172.80	171.40	0.018984	8.40	205.00	6.84	
P-2	2.50	8.40	10.90	I-2	15 inch Circular	165.00	164.10	168.80	169.20	0.019512	9.02	290.00	3.47	
P-4	14.80	17.30	32.10	I-3	24 inch Circular	164.00	163.40	168.60	169.87	0.002322	12.60	193.00	4.54	
P-7	N/A	41.00	41.00	J-1	36 inch Circular	162.90	162.20	172.80	169.20	0.003109	37.19	316.00	5.80	
P-10	5.40	49.90	55.30	I-7	36 inch Circular	161.70	161.20	170.50	168.94	0.002215	31.39	304.00	7.82	
P-11	6.40	55.30	61.70	I-10	36 inch Circular	161.00	157.00	169.00	167.27	0.006875	27.05	279.00	8.73	
				Outlet	36 inch Circular			165.00	162.20	0.001645	79.86			

Inlet: I-10
Rim: 169.00 ft
Sump: 161.00 ft

Inlet: I-3
Rim: 168.60 ft
Sump: 164.00 ft

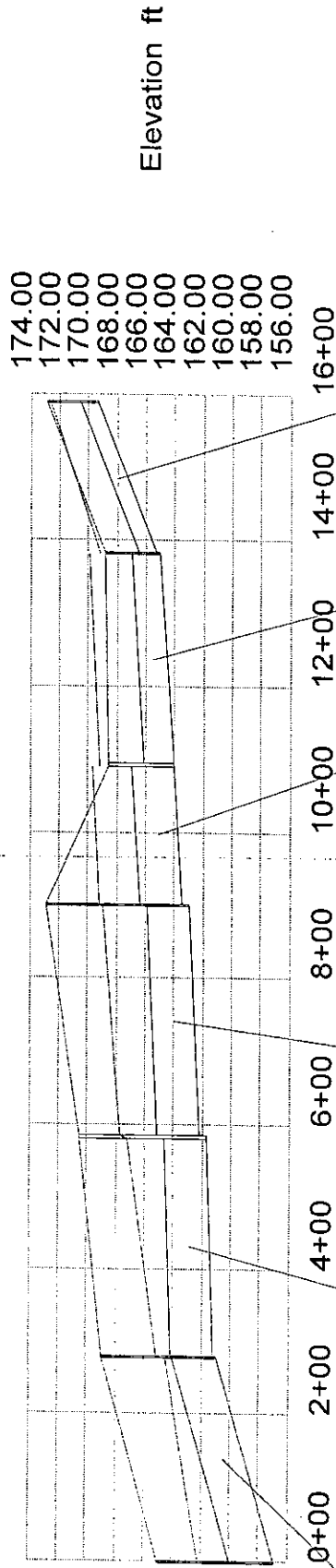
Inlet: I-1
Rim: 172.80 ft
Sump: 169.30 ft

Inlet: I-7
Rim: 170.50 ft
Sump: 161.70 ft

Junction: J-1
Rim: 172.80 ft
Sump: 162.90 ft

Inlet: I-2
Rim: 168.80 ft
Sump: 165.00 ft

Outlet: Outlet
Rim: 165.00 ft
Sump: 157.00 ft



Pipe: P-1
Up Invert: 169.30 ft
Dn Invert: 165.30 ft
Length: 205.00 ft
Size: 15 inch

Pipe: P-2
Up Invert: 165.00 ft
Dn Invert: 164.10 ft
Length: 290.00 ft
Size: 24 inch

Pipe: P-4
Up Invert: 164.00 ft
Dn Invert: 163.40 ft
Length: 193.00 ft
Size: 36 inch

Pipe: P-7
Up Invert: 162.90 ft
Dn Invert: 162.20 ft
Length: 316.00 ft
Size: 36 inch

Pipe: P-10
Up Invert: 161.70 ft
Dn Invert: 161.20 ft
Length: 304.00 ft
Size: 36 inch

Pipe: P-11
Up Invert: 161.00 ft
Dn Invert: 157.00 ft
Length: 279.00 ft
Size: 36 inch

Elevation ft

Station ft

Inlet: I-10
 Rim: 169.00 ft
 Sump: 161.00 ft

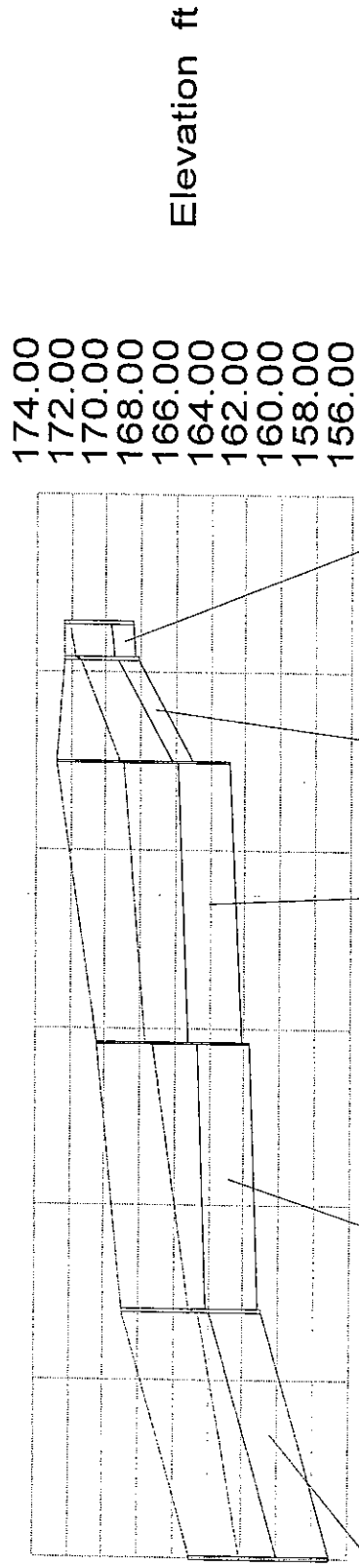
Junction: J-1
 Rim: 172.80 ft
 Sump: 162.90 ft

Inlet: I-5
 Rim: 172.40 ft
 Sump: 168.50 ft

Inlet: I-6
 Rim: 172.40 ft
 Sump: 168.10 ft

Inlet: I-7
 Rim: 170.50 ft
 Sump: 161.70 ft

Outlet: Outlet
 Rim: 165.00 ft
 Sump: 157.00 ft



Pipe: P-5
 Up Invert: 168.50 ft
 Dh Invert: 168.30 ft
 Length: 41.00 ft
 Size: 15 inch

Pipe: P-6
 Up Invert: 168.10 ft
 Dh Invert: 165.00 ft
 Length: 116.00 ft
 Size: 15 inch

Pipe: P-7
 Up Invert: 162.90 ft
 Dh Invert: 162.20 ft
 Length: 316.00 ft
 Size: 36 inch

Pipe: P-10
 Up Invert: 161.70 ft
 Dh Invert: 161.20 ft
 Length: 304.00 ft
 Size: 36 inch

Pipe: P-11
 Up Invert: 161.00 ft
 Dh Invert: 279.00 ft
 Length: 36 inch

Inlet: I-9
Rim: 170.40 ft
Sump: 166.10 ft

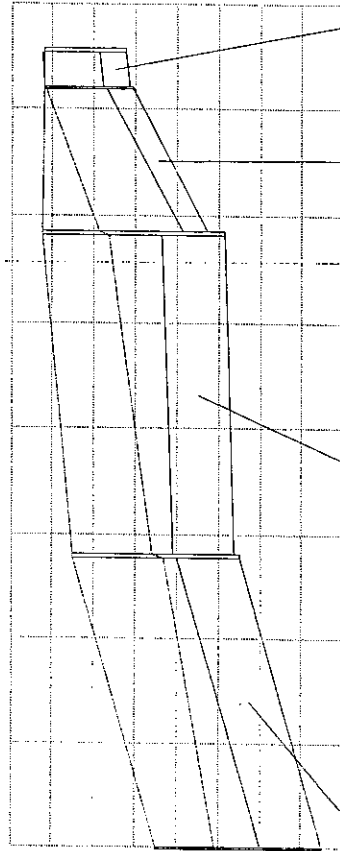
Inlet: I-10
Rim: 169.00 ft
Sump: 161.00 ft

Inlet: I-8
Rim: 170.40 ft
Sump: 166.50 ft

Inlet: I-7
Rim: 170.50 ft
Sump: 161.70 ft

Outlet: Outlet
Rim: 165.00 ft
Sump: 157.00 ft

Station	Elevation ft
0+00	172.00
0+01	170.00
0+02	168.00
0+03	166.00
0+04	164.00
0+05	162.00
0+06	160.00
0+07	158.00
0+08	156.00



0+001+002+003+004+005+006+007+008+00

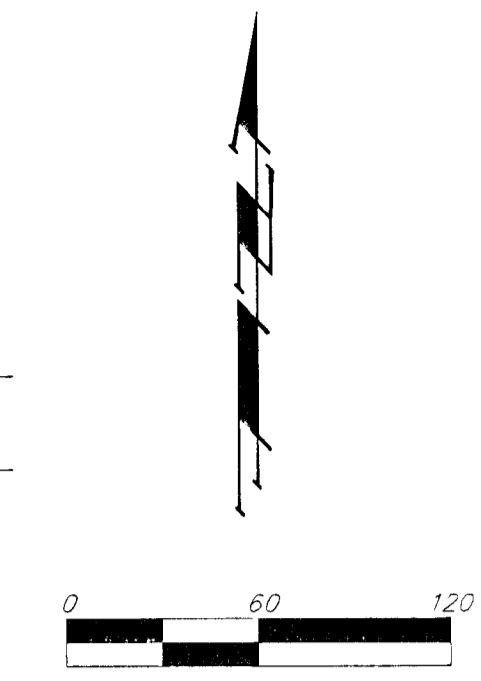
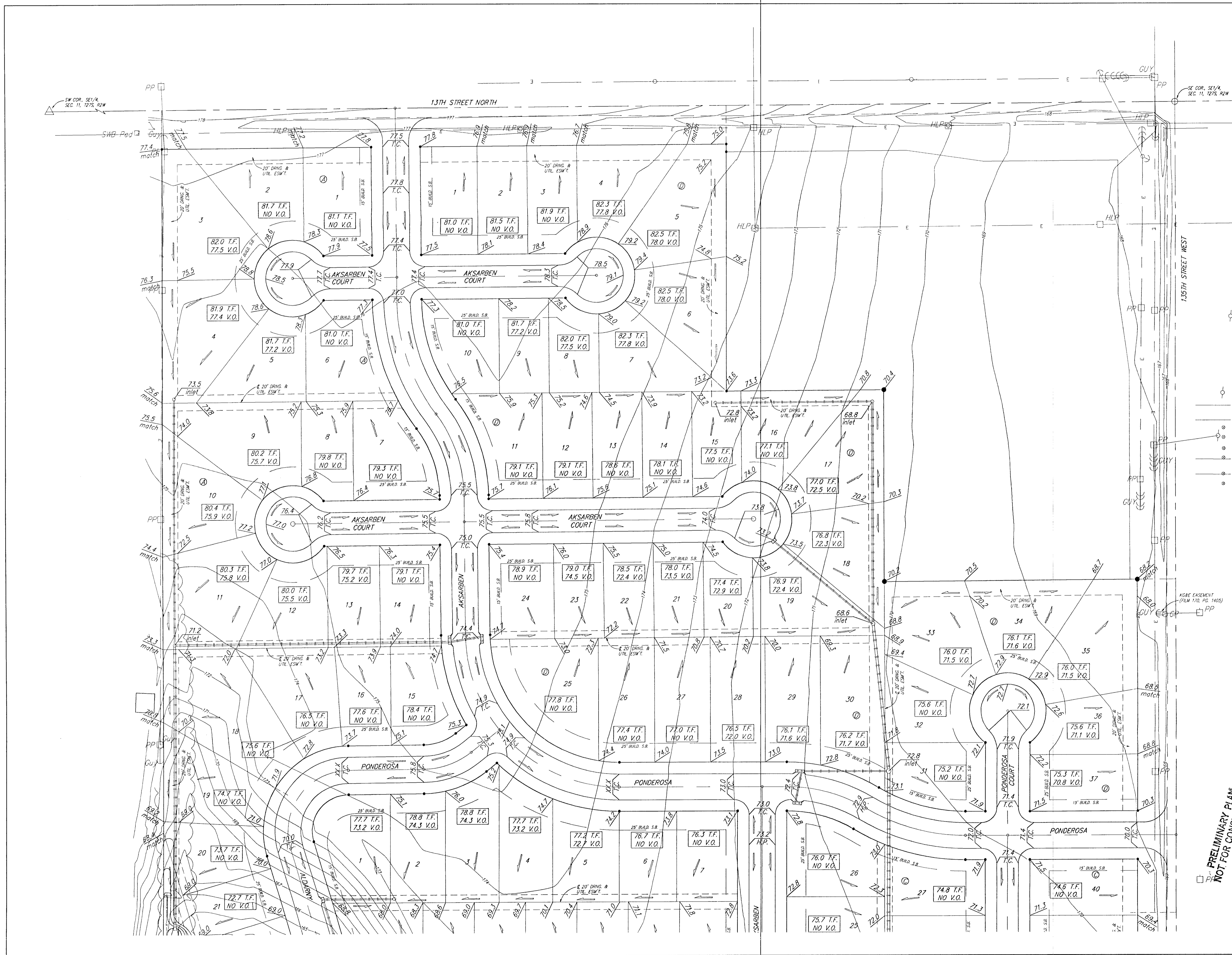
Station ft

Pipe: P-11
Up Invert: 161.00 ft
Dn Invert: 157.00 ft
Length: 279.00 ft
Size: 36 inch

Pipe: P-10
Up Invert: 161.70 ft
Dn Invert: 161.20 ft
Length: 304.00 ft
Size: 36 inch

Pipe: P-9
Up Invert: 166.10 ft
Dn Invert: 162.50 ft
Length: 137.00 ft
Size: 15 inch

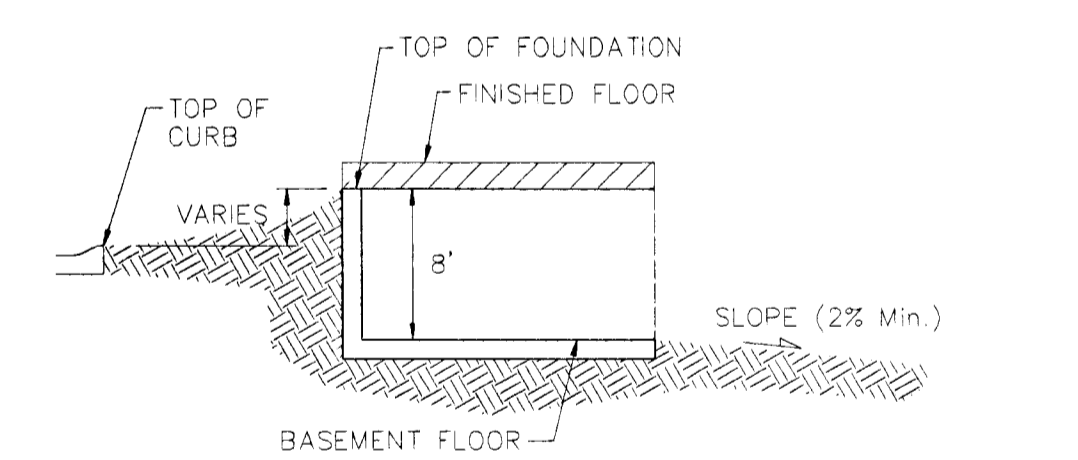
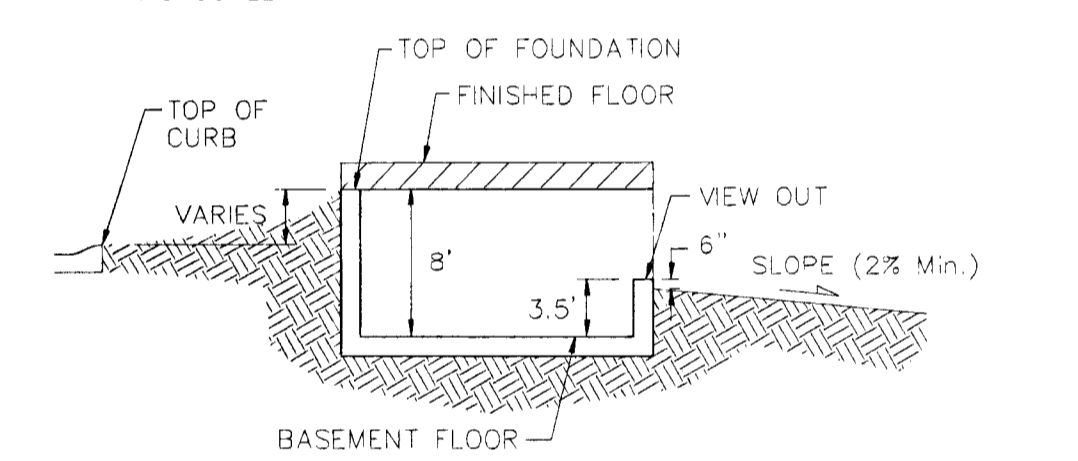
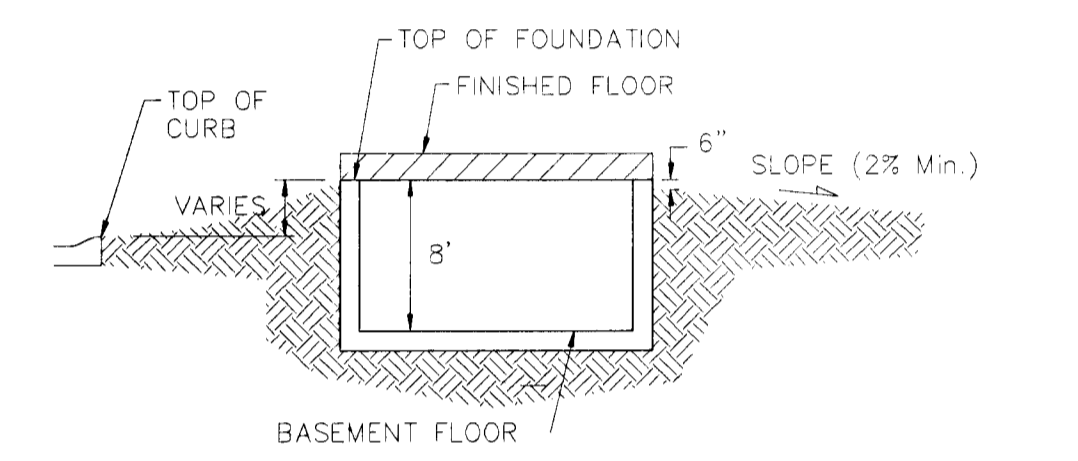
Pipe: P-8
Up Invert: 166.50 ft
Dn Invert: 166.30 ft
Length: 35.00 ft
Size: 15 inch



MINIMUM BUILDING PAD ELEVATIONS FOR LOWEST OPENING TO THE STRUCTURES

LOT	BLOCK	ELEVATION CITY DATUM
19,20	A	170.0
21,22	A	169.0
23,24	A	168.0
25	A	167.0
28,37,38	A	166.0
42	A	167.0
43	A	168.0
44	A	169.0
1-18	C	165.0
1	B	165.0

BENCHMARK
 City of Wichita Benchmark Disc - SE
 Corner of the intersection of
 135th St. W. & 13th St. N., 56 Feet
 east & 55 feet south of Centerline of
 60th St.
 Elev. = 167.83 City Datum
 = (1355.23 NGVD)



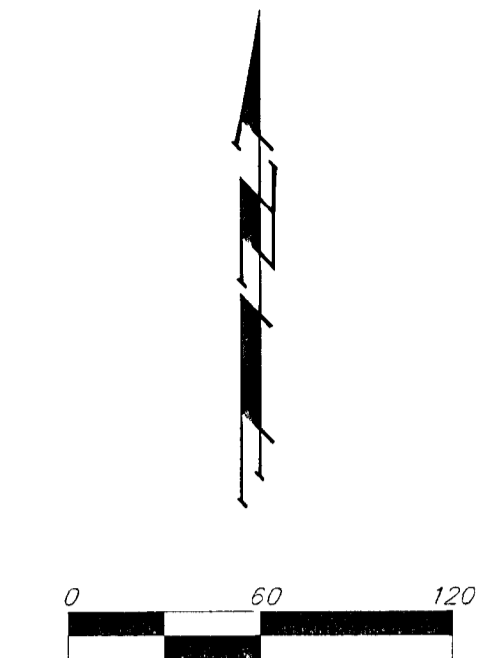
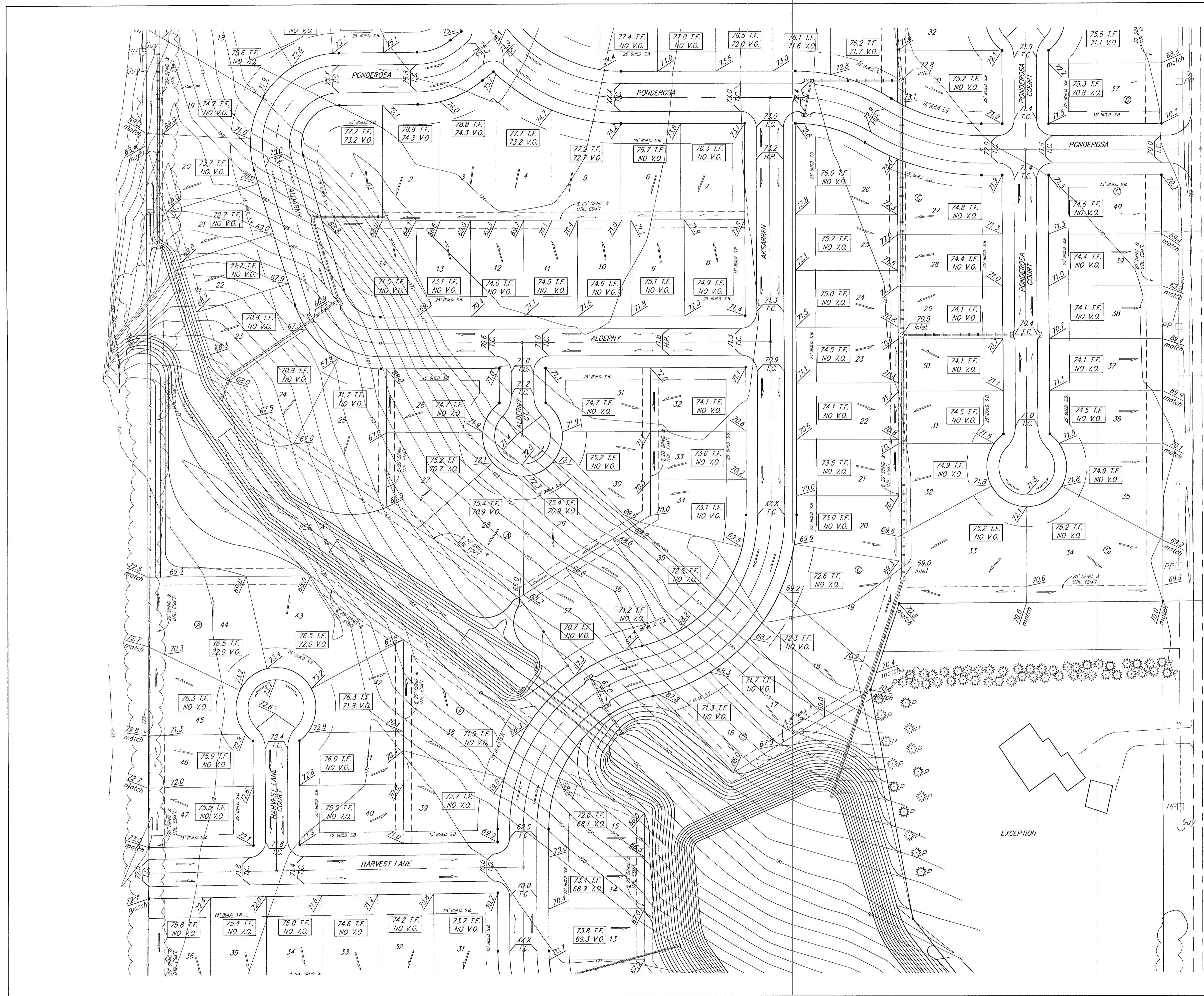
NOTES:
 Proposed Top of Foundation Elevations Are Shown on Plans. Contractor to Set Finished Floor Elevations.
 All Street Elevations Shown on Plans Are for Top of Curb (Full-Height).
 This Grading Plan is Designed with View-Outs. Elevations Shown at Rear of House (XX.X V.O.)
 Lot dimensions have been omitted on this plan, refer to the recorded plat for this information.

PRELIMINARY PLAN
 NOT FOR CONSTRUCTION

COPPERGATE 2ND ADDITION
GRADING PLAN
 WICHITA, KANSAS

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 ENGINEERING, SURVEYING, & PLANNING
 316-262-7271 • 315 ELLIS • WICHITA, KANSAS 67211

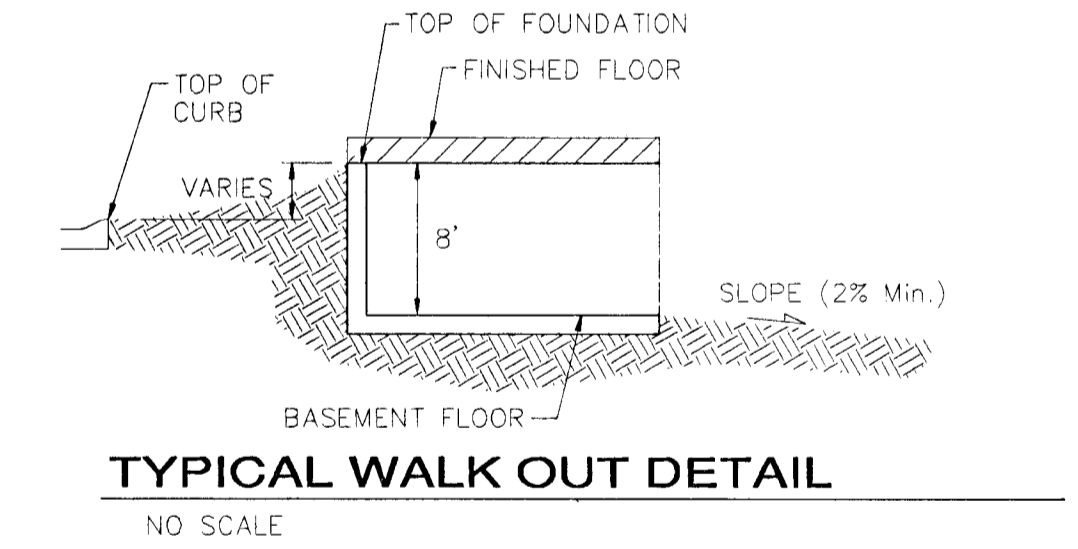
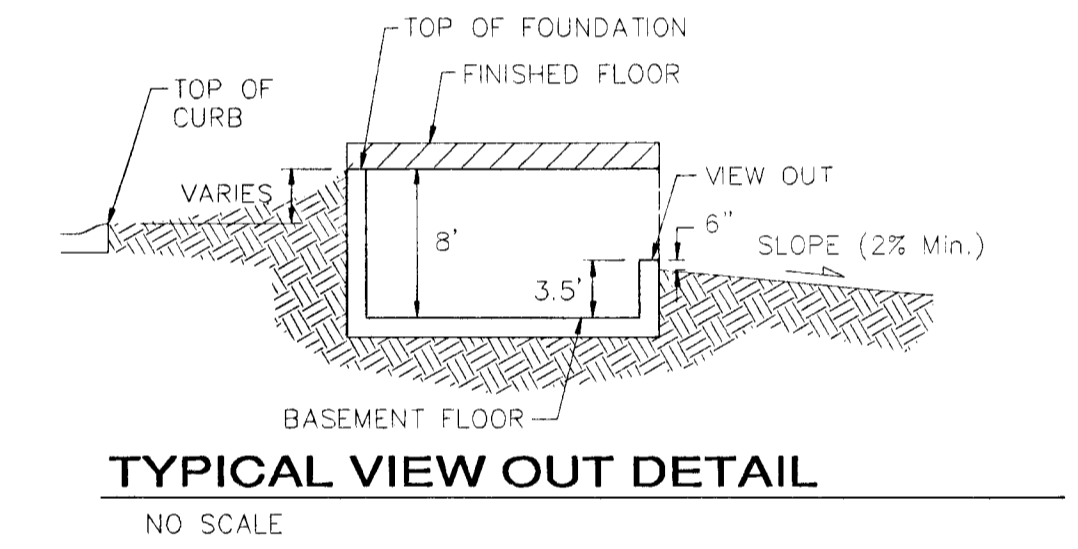
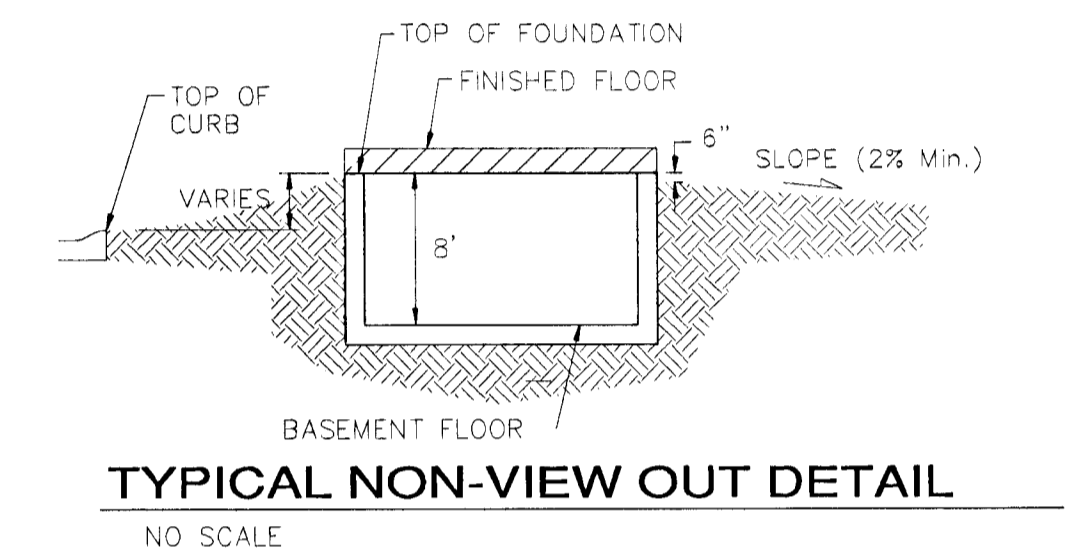
DESIGN	DRAWN	APPROVED	DATE	SCALE	SHEET
BLG	BLG		07/22/02	NOTED	1 OF 3



MINIMUM BUILDING PAD ELEVATIONS FOR LOWEST OPENING TO THE STRUCTURES

LOT	BLOCK	ELEVATION CITY DATUM
18,20	A	170.0
21,22	A	169.0
23,24	A	168.0
25	A	167.0
28,37,38	A	166.0
42	A	167.0
43	A	168.0
44	A	169.0
1-18	C	165.0
1	B	165.0

BENCHMARK:
City of Wichita Benchmark Disc - SE
Corner of the intersection of
135th St. W. & 13th St. N., 56 Feet
east & 55 feet south of Centerline of
both
Elev. = 167.83 City Datum
= (1355.23 NGVD)



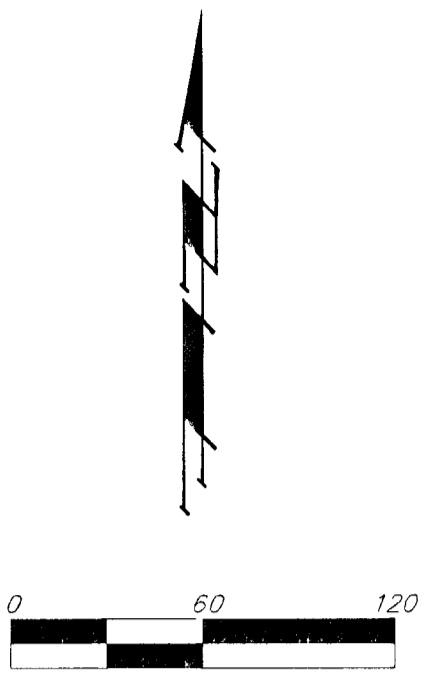
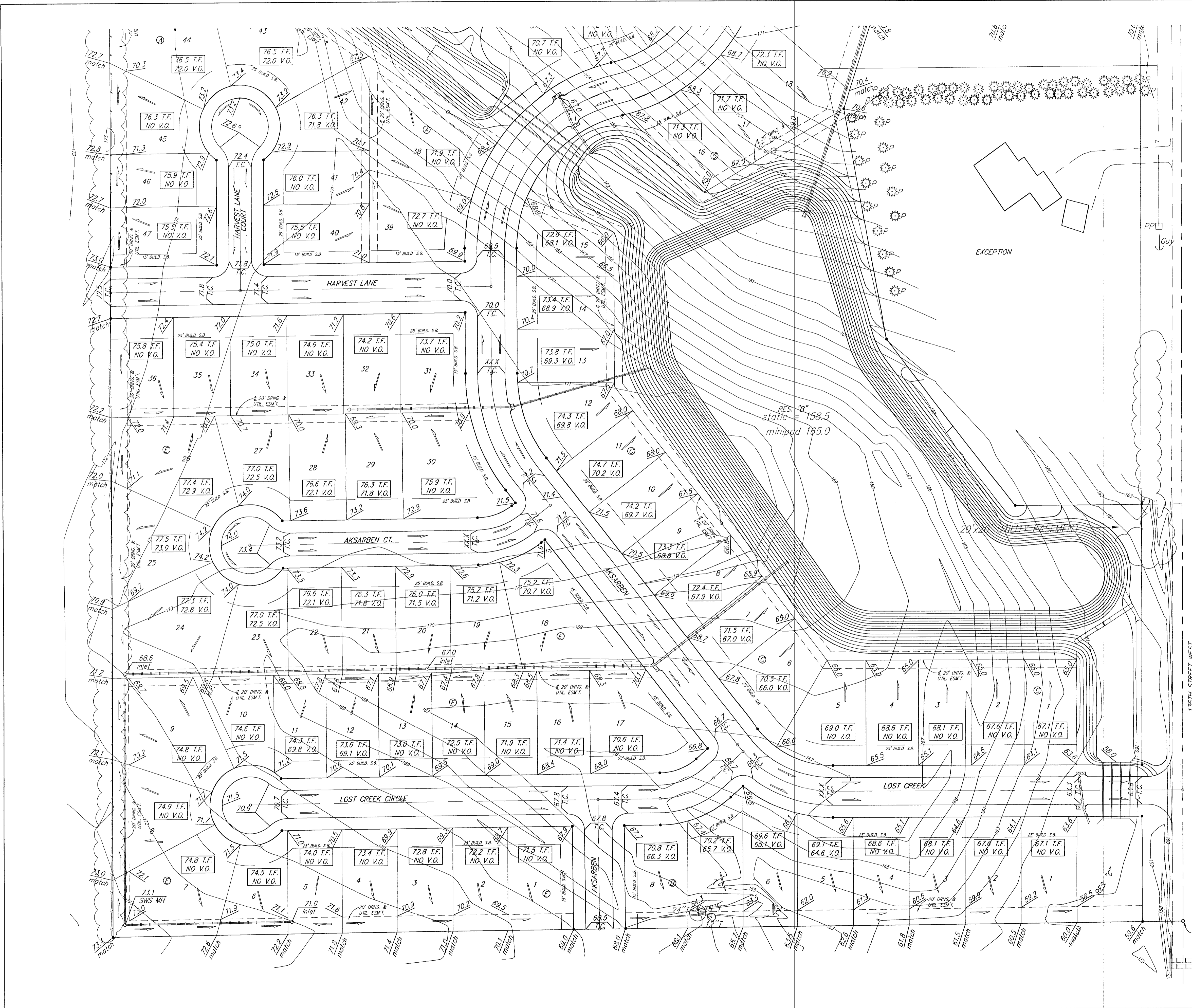
NOTES:
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PRELIMINARY PLAN NOT FOR CONSTRUCTION

COPPERGATE 2ND ADDITION
GRADING PLAN
WICHITA, KANSAS

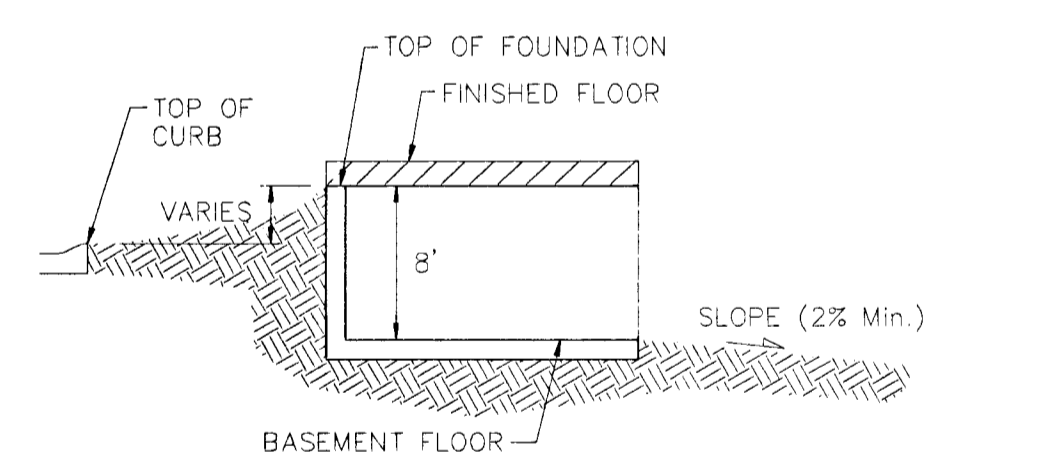
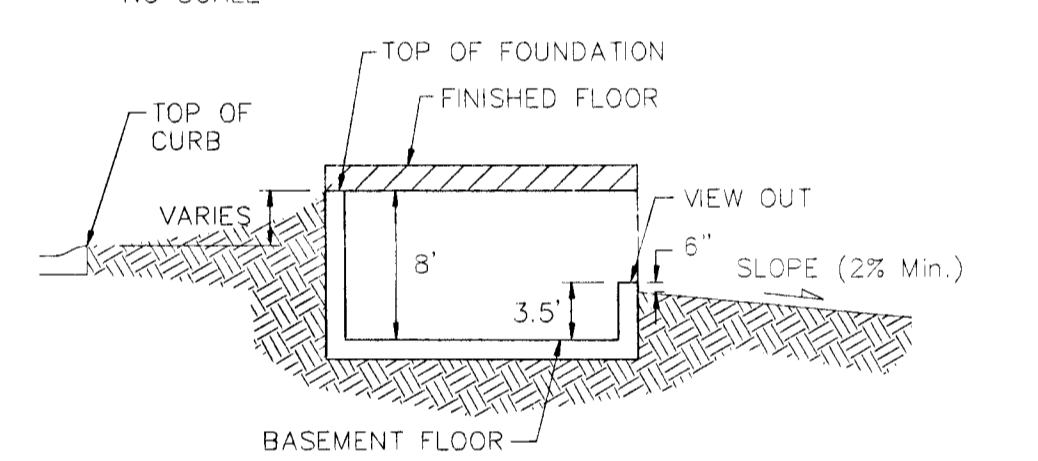
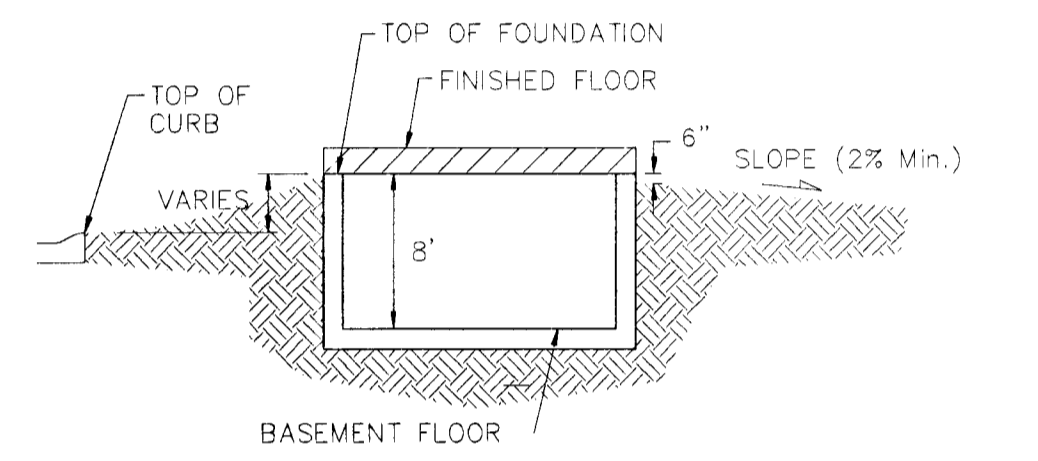
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DESIGN	DRAWN	APPROVED	DATE	SCALE	SHEET
BLG	BLG		07/22/02	NOTED	2 OF 3



BENCHMARK:
 City of Wichita Benchmark Disc - SE
 Corner of the intersection of
 135th St. W. & 13th St. N., 56 Feet
 east & 55 feet south of Centerline of
 both
 Elev. = 167.83 City Datum
 = (1,355.23 NGVD)

MINIMUM BUILDING PAD ELEVATIONS FOR LOWEST OPENING TO THE STRUCTURES		
LOT	BLOCK	ELEVATION CITY DATUM
19,20	A	170.0
21,22	A	169.0
23,24	A	168.0
25	A	167.0
28,37,38	A	166.0
42	A	157.0
43	A	168.0
44	A	169.0
1-18	C	165.0
1	B	165.0



NOTES:
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PRELIMINARY PLAN
NOT FOR CONSTRUCTION

COPPERGATE 2ND ADDITION
GRADING PLAN
 WICHITA, KANSAS

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DESIGN	DRAWN	APPROVED	DATE	SCALE	SHEET 3 OF 3
BLG	BLG		07/22/02	NOTED	