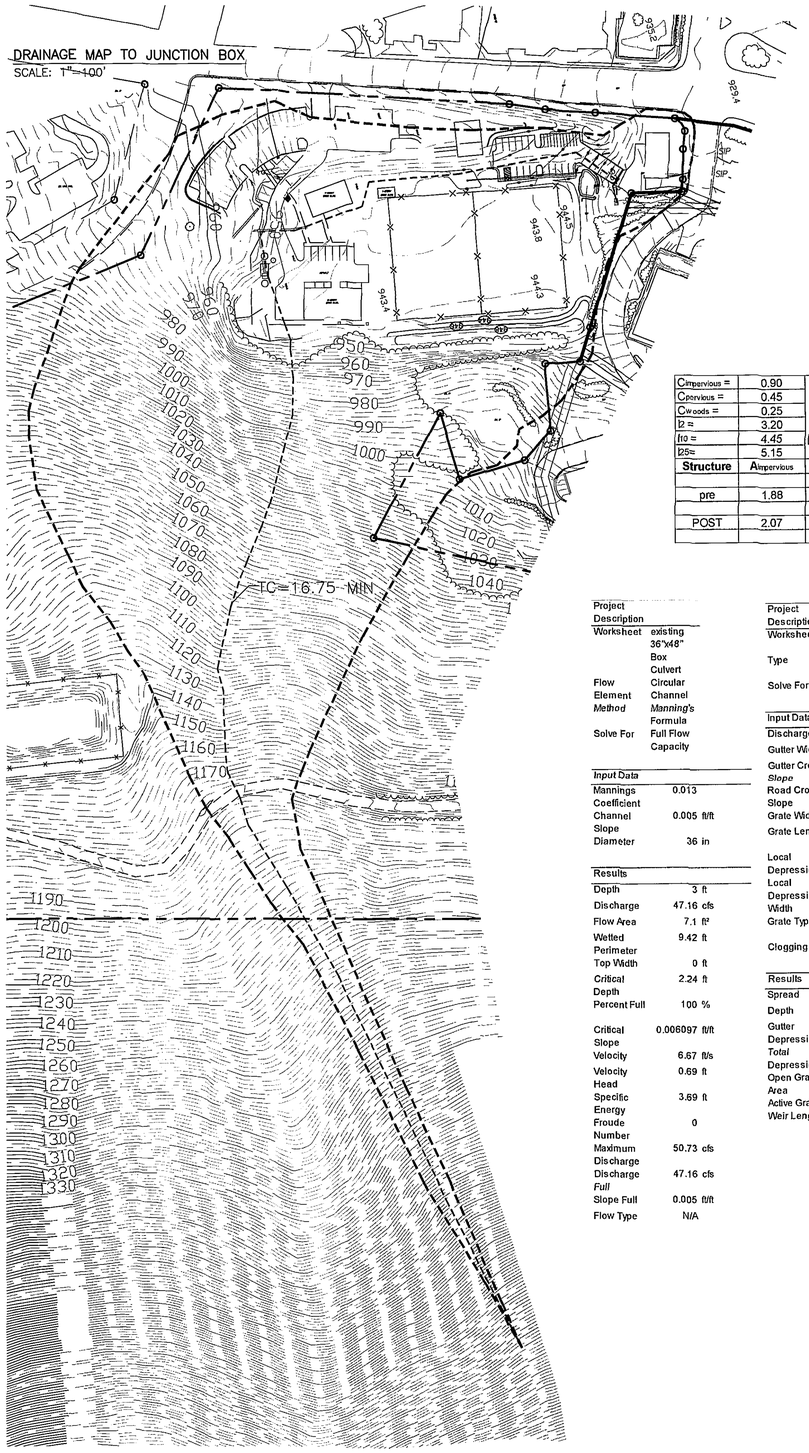
DRAINAGE MAP TO JUNCTION BOX

SCALE: 1"=100'



TIME OF CONCENTRATION CALCULATIONS

OVERLAND FLOW TIME
LENGTH=200'
"C" VALUE=0.35
PERCENT SLOPE= 48.0%
INLET CONCNETRATION= 6.75 MIN.

TRAVEL TIME FOR CHANNEL FLOW (1)
HEIGHT ABOVE OUTLET=14.0'
LENGTH OF TRAVEL= 712.0'
TIME OF CONCENTRATION=4.00 MIN.

TRAVEL TIME FOR CHANNEL FLOW (2)
HEIGHT ABOVE OUTLET=448.0'
LENGTH OF TRAVEL=1551.0'
TIME OF CONCENTRATION=6.00 MIN.

TIME OF CONCENTRATION = 16.75 MIN

Cimpervious =	0.90
Cpervious =	0.45
Cwoods =	0.25
I2 =	3.20
Ito =	4.45
I25=	5.15

[Based on Tc = 16.75]

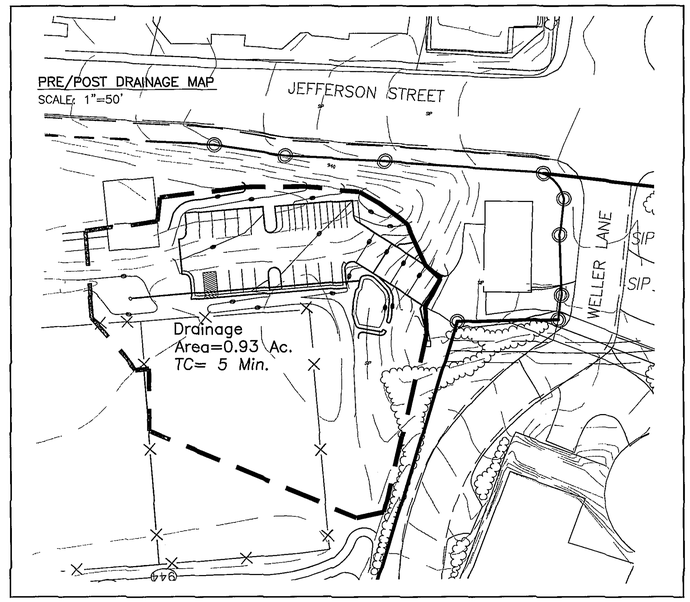
Structure	Aimpervious	Apervious	Awoods	Atotal	Cweighted	Q2	Q10	Q25
pre	1.88	4.25	6.64	12.77	0.41	16.8	23.4	27.1
POST	2.07	4.06	6.64	12.77	0.42	17.1	23.8	27.6

Project Description	
Worksheet	existing 36"x48" Box Culvert
Flow Element	Channel
Method	Manning's Formula
Solve For	Full Flow Capacity
Input Data	
Mannings Coefficient	0.013
Channel Slope	0.005 ft/ft
Diameter	36 in
Results	
Depth	3 ft
Discharge	47.16 cfs
Flow Area	7.1 ft²
Wetted Perimeter	9.42 ft
Top Width	0 ft
Critical Depth	2.24 ft
Percent Full	100 %
Critical Slope	0.006097 ft/ft
Velocity	6.67 ft/s
Velocity Head	0.69 ft
Specific Energy	3.69 ft
Froude Number	0
Maximum Discharge	50.73 cfs
Discharge Full	47.16 cfs
Slope Full	0.005 ft/ft
Flow Type	N/A

Project Description	
Worksheet	Existing Grate Inlet
Type	Grate Inlet In Sag
Solve For	Spread
Input Data	
Discharge	17.1 cfs
Gutter Width	5 ft
Gutter Cross Slope	0.1 ft/ft
Road Cross Slope	0.1 ft/ft
Grate Width	5 ft
Grate Length	5 ft
Local Depression	2.5 in
Local Depression Width	5 ft
Grate Type	P-50 mm (P-1-7/8")
Clogging	0 %
Results	
Spread	7.74 ft
Depth	0.77 ft
Gutter Depression	0 in
Total Depression	2.5 in
Open Grate Area	22.5 ft²
Active Grate Weir Length	15 ft

PRE/POST DRAINAGE MAP

SCALE: 1"=50'



HYDROLOGY WORKSHEET

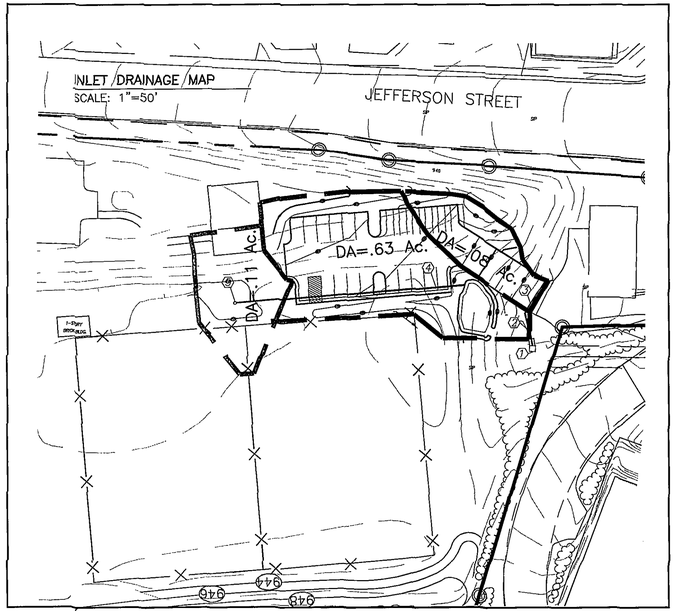
Cimpervious =	0.90
Cpervious =	0.45
I2 =	5.20
Ito =	6.80

[Based on Tc = 5.0 Roanoke City]

Structure	Aimpervious	Apervious	Atotal	Cweighted	Q2	Q10
pre	0.39	0.54	0.93	0.64	3.09	4.04
POST	0.54	0.39	0.93	0.71	3.44	4.50

INLET /DRAINAGE /MAP

SCALE: 1"=50'



HYDROLOGY WORKSHEET

Cimpervious =	0.90
Cpervious =	0.35
I2 =	5.20
Ito =	6.80

[Based on Tc = 5.0 Roanoke City]

Structure	Aimpervious	Apervious	Atotal	Cweighted	Q2	Q10
1 ex str	0.14	0.14	0.28	0.63	0.91	1.19
3 trench	0.08	0.00	0.08	0.90	0.37	0.49
5 yard inlet	0.01	0.10	0.11	0.40	0.23	0.30

INLET CALCULATIONS

Project Description	
Worksheet	str #3
Type	Grate Inlet On Grade
Solve For	Efficiency
Input Data	
Discharge	0.37 cfs
Channel Slope	0.01 ft/ft
Gutter Width	24 ft
Gutter Cross Slope	0.14 ft/ft
Road Cross Slope	0.14 ft/ft
Mannings Coefficient	0.013
Grate Width	2 ft
Grate Length	24 ft
Grate Type	P-50 mm (P-1-7/8")
Clogging	0 %
Options	
Grate Flow Option	Exclude None
Results	
Efficiency	1.01
Total Intercepted Flow	0.37 cfs
Bypass Flow	0 cfs
Spread	1.36 ft
Depth	0.19 ft
Flow Area	0.1 ft²
Gutter Depression	0 in
Total Depression	0 in
Velocity	2.85 ft/s
Splash Over Velocity	493.59 ft/s
Frontal Flow Factor	1
Side Flow Factor	1
Grate Flow Ratio	2.15
Active Grate Length	24 ft

Project Description	
Worksheet	str #5
Type	Grate Inlet In Sag
Solve For	Spread
Input Data	
Discharge	0.23 cfs
Gutter Width	2 ft
Gutter Cross Slope	0.02 ft/ft
Road Cross Slope	0.02 ft/ft
Grate Width	2 ft
Grate Length	2 ft
Local Depression	2 in
Local Depression Width	2 ft
Grate Type	P-50 mm (P-1-7/8")
Clogging	0 %
Results	
Spread	1.61 ft
Depth	0 ft
Gutter Depression	0 in
Total Depression	2 in
Open Grate Area	3.6 ft²
Active Grate Weir Length	6 ft

PIPE CALCULATIONS

Project Description	
Worksheet	pipe #2
Flow Element	Channel
Method	Manning's Formula
Solve For	Channel Depth
Input Data	
Mannings Coefficient	0.012
Channel Slope	0.02 ft/ft
Diameter	6 in
Discharge	0.49 cfs
Results	
Depth	0.27 ft
Flow Area	0.1 ft²
Wetted Perimeter	0.83 ft
Top Width	0 ft
Critical Depth	0.36 ft
Percent Full	54.1 %
Critical Slope	0.008803 ft/ft
Velocity	4.52 ft/s
Velocity Head	0.32 ft
Specific Energy	0.59 ft
Froude Number	1.71
Maximum Discharge	0.92 cfs
Discharge Full	0.86 cfs
Slope Full	0.008499 ft/ft
Flow Type	Supercritical

Project Description	
Worksheet	pipe #4
Flow Element	Channel
Method	Manning's Formula
Solve For	Channel Depth
Input Data	
Mannings Coefficient	0.012
Channel Slope	0.0101 ft/ft
Diameter	6 in
Discharge	0.3 cfs
Results	
Depth	0.25 ft
Flow Area	0.1 ft²
Wetted Perimeter	0.78 ft
Top Width	0 ft
Critical Depth	0.28 ft
Percent Full	49.5 %
Critical Slope	0.008944 ft/ft
Velocity	3.1 ft/s
Velocity Head	0.15 ft
Specific Energy	0.4 ft
Froude Number	1.24
Maximum Discharge	0.66 cfs
Discharge Full	0.61 cfs
Slope Full	0.002436 ft/ft
Flow Type	Supercritical

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JACK DURRELL ELLINWOOD
No. 001107
COMMONWEALTH OF VIRGINIA
LANDSCAPE ARCHITECT
9/15/05

WVWA ID# 6L6GUJ

No.	Revision	By	Appd.	Date
1	REV / COMMENTS OF 9-6-05	DRB	JDE	9/15/05

Drawn DRB
Designed DRB/JDE
Checked JDE
Approved JDE

WESTERN VIRGINIA WATER AUTHORITY
LOWER PARKING LOT EXPANSION
DRAINAGE CALCULATIONS
ROANOKE, VIRGINIA

AS SHOWN
AUGUST 18, 2005
PROJECT: 05052
2