

DRAINAGE REPORT
AND
STORM WATER SYSTEM DESIGN
FOR

**SHADOW BLUFF
ESTATES**
Darmstadt, Indiana

Report by:
SITECON, Inc.
600 SE 8th Street, Suite 2
Evansville, IN 47713-1774

May 13, 1996



Shadow Bluff Estates Drainage Plan

Project Name and Location

Shadow Bluff Estates Subdivision
0.42 miles west of the intersection of Hoing Road and
Boonville-New Harmony Road.
Scott Township, Section 7, T 5 S, R 10 W
Darmstadt, IN

Landowner Name and Address

John Elpers, Jr.
4700 St. Wendel-Cynthiana Road
Wadesville, IN 47638
(812) 963-8000

Drainage Plan Preparer

SITECON, Inc.
600 SE 8th Street, Suite 2
Evansville, IN 47713-1774
(812) 423-2320

Site Location:

The proposed 26 lot residential subdivision is a 32 acre site located in Darmstadt, Indiana approximately 0.42 miles west of the intersection of Hoing Road and Boonville-New Harmony Road. The majority of the site, approximately 26.14 acres, is currently, and historically, cultivated. A portion of the site, approximately 5.40 acres, is wooded. The remainder of the site, approximately 0.46 acres, is used for an existing residence and access. The current zoning of the site agricultural.

Existing Site Conditions:

The site is divided by an existing ridge running approximately north-south. The ridge divides the site roughly 64% to the east, 36% to the west.

The portion east of the ridge drains entirely to an existing sizable ditch immediately east of the site's east boundary line. Approximately 15.4 acres of this eastern watershed is cultivated, 4.9 acres wooded.

The portion west of the ridge drains in two patterns. The north portion of the "western ridge area", approximately 5.9 acres and all cultivated, drains to an existing flowline and exits the site along the west boundary line. The south portion of the "western ridge area", approximately 5.6 acres (0.70 acres cultivated) leaves the property in sheet flow to the west and to the south. These flows eventually reach the roadside ditch along Boonville-New Harmony Road and flow to the west.

The entire site is comprised of gently rolling terrain at both 2-5% and 5-10% grades. Wooded areas exist at the southern portion of the property, at the proposed entrance area, and south of the north boundary line (approximately centered east-west). It is the intent of the developer to keep disturbance of the wooded areas at a practical minimum. All cultivated areas, as well as cleared areas, not improved, will be "converted to grassy lawns. According to the Soil Survey of Vanderburgh County, Indiana, issued June, 1976, the site consists of Hosmer silt loam (HoB2, HoC2, HoC3), Stendal silt loam (St), and Zanesville silt loam (ZaC3). See locations and details of soil types on Erosion Control Plan.

Significant Existing or Anticipated Drainage Problems:

No new significant drainage problems are anticipated by the development of the proposed residential subdivision once the new drainage system is operational. This is due in part to the relative size of the lots in comparison to the proposed impervious improvements. All lots will be in excess of 1 acre. In reality,

approximately 22.1 acres of cultivated land will be converted to grassy lawn areas and should result in a $\pm 10\%$ reduction in runoff. This should assist in offsetting runoff resulting from approximately 4.5 acres of proposed improvements. Some calculations may, however, show an increase of runoff resulting from the comparison of a 25 year "post-developed" storm, to a 10 year "pre-developed storm". This comparison is in accordance with the current Vanderburgh County Drainage Ordinance, adopted November 1994.

Analysis Procedure:

The Rational Method, valid for watershed areas up to 200 acres, was used for computations of storm water runoff. The post development controlled peak release rate of storm water runoff during a twenty-five (25) year return period storm from the project was designed to not exceed the peak release rate during a ten (10) year return period storm from the same land area in its existing condition.

A 3,000 sf footprint was used for the proposed structures, 120 sf for patios, 840 sf for drives, 29' width for pavement. On almost every lot, one half of the house is proposed to drain to the street.

Assumptions and Special Conditions:

Under the twenty-five (25) year developed conditions, the assumption was made that all of the proposed improvements would be 100% developed. For simplicity, all impervious slopes were assumed to be between 2-5% with an average coefficient of 0.94 for all undeveloped and developed calculations.

For undeveloped drainage analysis, the site was divided into twelve (12) individual drainage basins, weighted on the percentage of terrain slope, and cover, and analyzed for storm water detention requirements. Both undeveloped, and developed, watershed maps are available in the attached calculations.

There is a significant off-site watershed, undeveloped Basin #1, that passes through the extreme northeast corner of the site. An undeveloped flowrate of 44.70 cfs enters the site, then exits, some 80' later, at an undeveloped flowrate of 45.77 cfs. This flow will not be controlled or "passed through" any proposed drainage feature of this subdivision. See "Offsite Pass-Thru" section for undeveloped flow calculations.

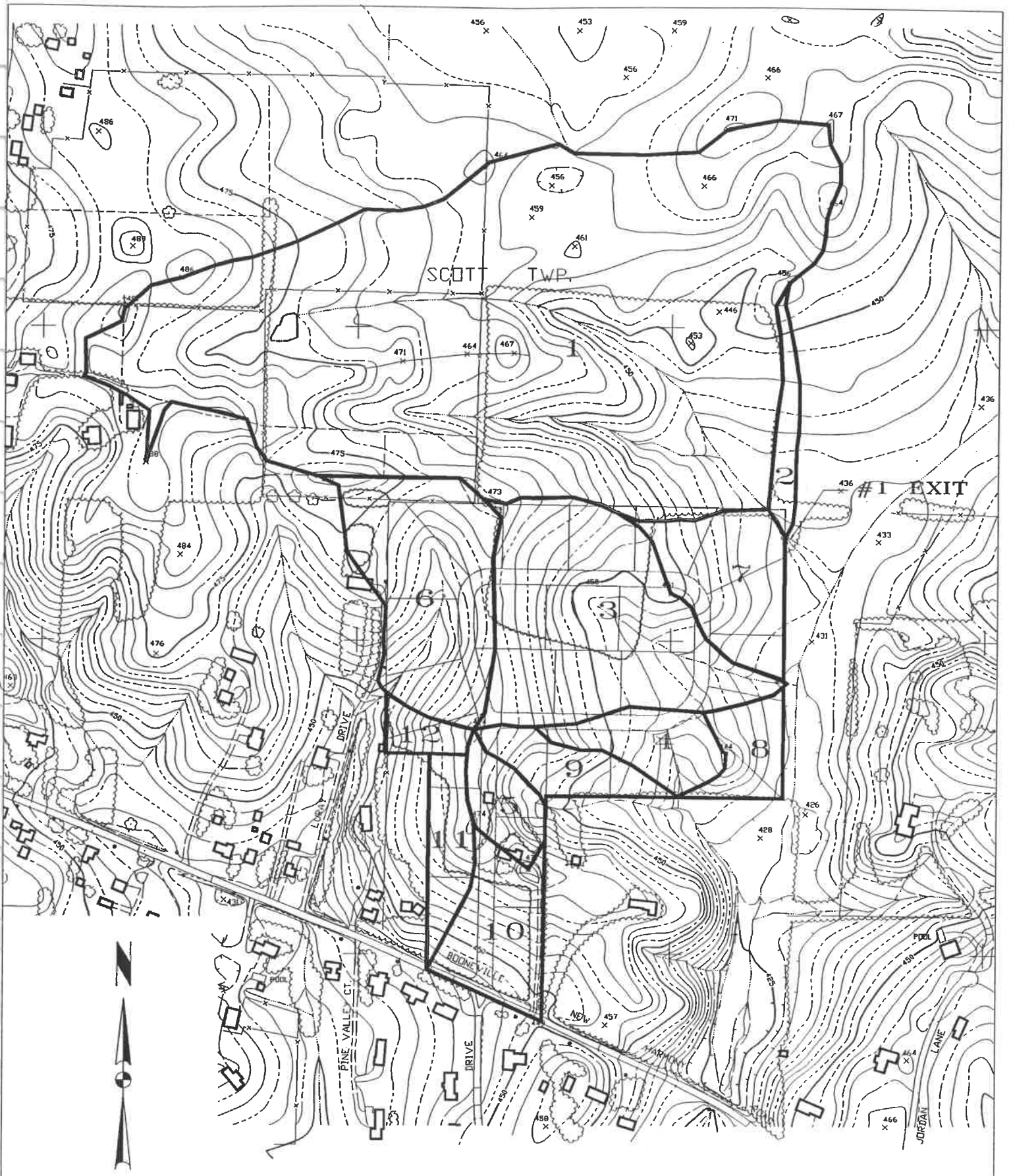
Proposed Design:

The majority of stormwater runoff will be conveyed to the retention area by sloping lawns and pavement, reinforced concrete pipe, or a series of swales and ditches.

Detention basins will be located on site “downstream” from the proposed improvements. The basins will provide the necessary storm water storage capacity, and predeveloped release rate, for the majority of developed site. The detention basin capacities are summarized in TABLE 1 of this report.

It should be noted that portions of lots 1 thru 7, 20, 10-12, and 14-16 are proposed to release undetained. The developed area that runs off to Basin #1 is larger than the predeveloped area. This, for the most part, is due to proposed grade changes and the inclusion of “1/2 of the house” and area between the house and proposed street. The reduction in area, combined with the conversion of cultivated ground to grass, resulted in a decrease of runoff for the majority of the watershed comparisons related to the areas proposed for release.

Stabilized earthen fill dams will be constructed with an outlet releasing at a rate not to exceed the combined total of the required 10-year release rate. A ten foot (10') wide emergency spillway will allow release for extreme events over the design. The spillway elevations are typically 0.5 feet lower than the basin berm elevation. The developer proposes to build Basin #1 with vertical wall on three sides. These walls will be constructed of portland cement concrete and faced with decorative stone. Refer to the storm drainage details for basin detail.



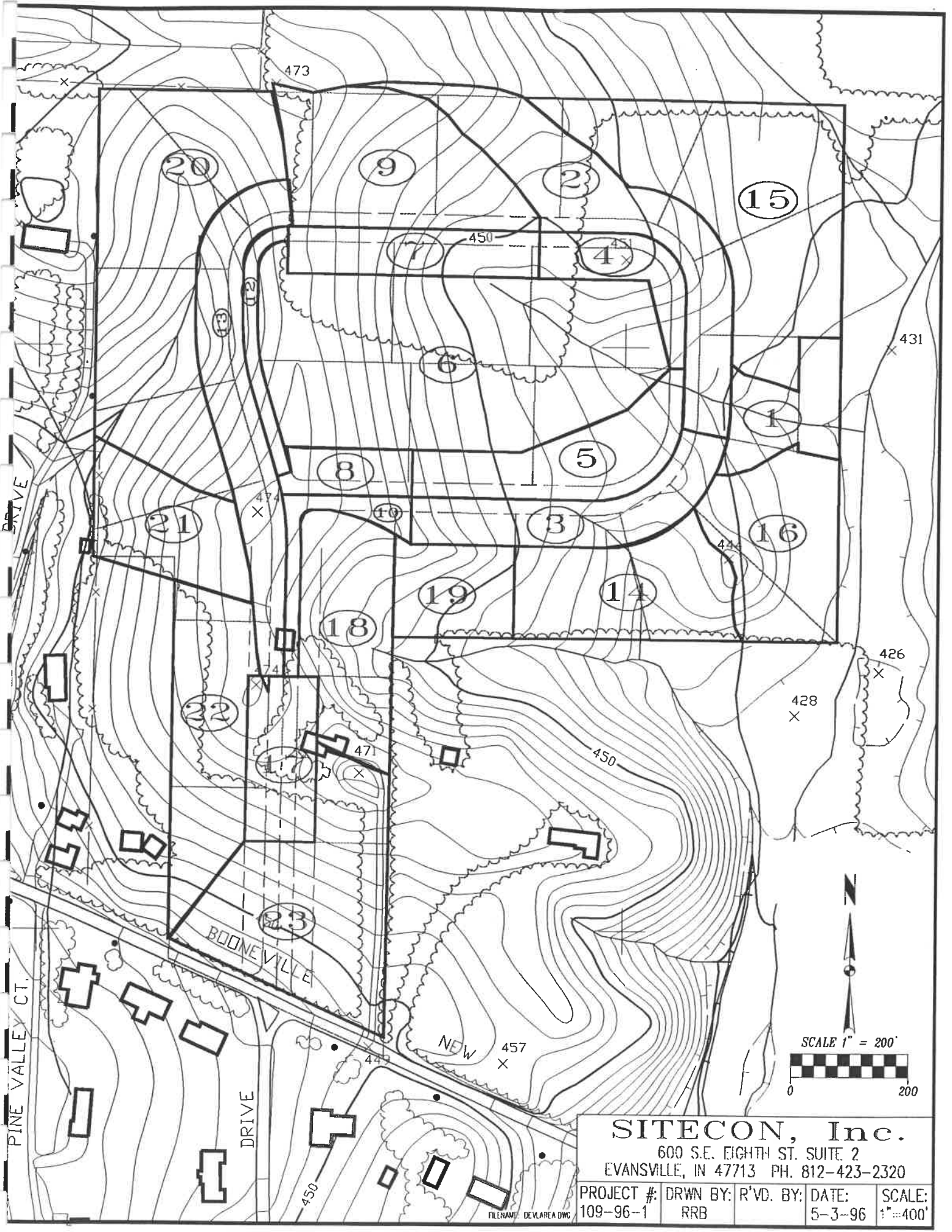
**UNDEVELOPED
WATER SHED MAP**

SITECON, Inc.

600 S.E. EIGHTH ST. SUITE 2
EVANSVILLE, IN 47713 PH. 812-423-2320

PROJECT #:	DRWN BY:	R'VD. BY:	DATE:	SCALE:
109-96-1	RRB		5-3-96	1"=400'

FILENAME: UNDEVAREA.DWG



PINE VALLEY CT.
DRIVE

BOONEVILLE

NEW

SITECON, Inc.

600 S.E. EIGHTH ST. SUITE 2
EVANSVILLE, IN 47713 PH. 812-423-2320

PROJECT #:	DRWN BY:	R'VD. BY:	DATE:	SCALE:
109-96-1	RRB		5-3-96	1"=400'

FILENAME: DEVLAREA.DWG

Results:

The following tables have been provided to summarize the most significant figures mentioned in this report

**TABLE 1
DETENTION REQUIREMENTS**

	10 year Undev. Release Rate	25 year Dev. Release Rate	Required Storage	Available Storage
Basin #1	12.52 cfs	12.00 cfs	25,073.00 cf	30,995.00 cf
Basin #2	3.31 cfs	3.30 cfs	1,694.00 cf	4,458.00 cf

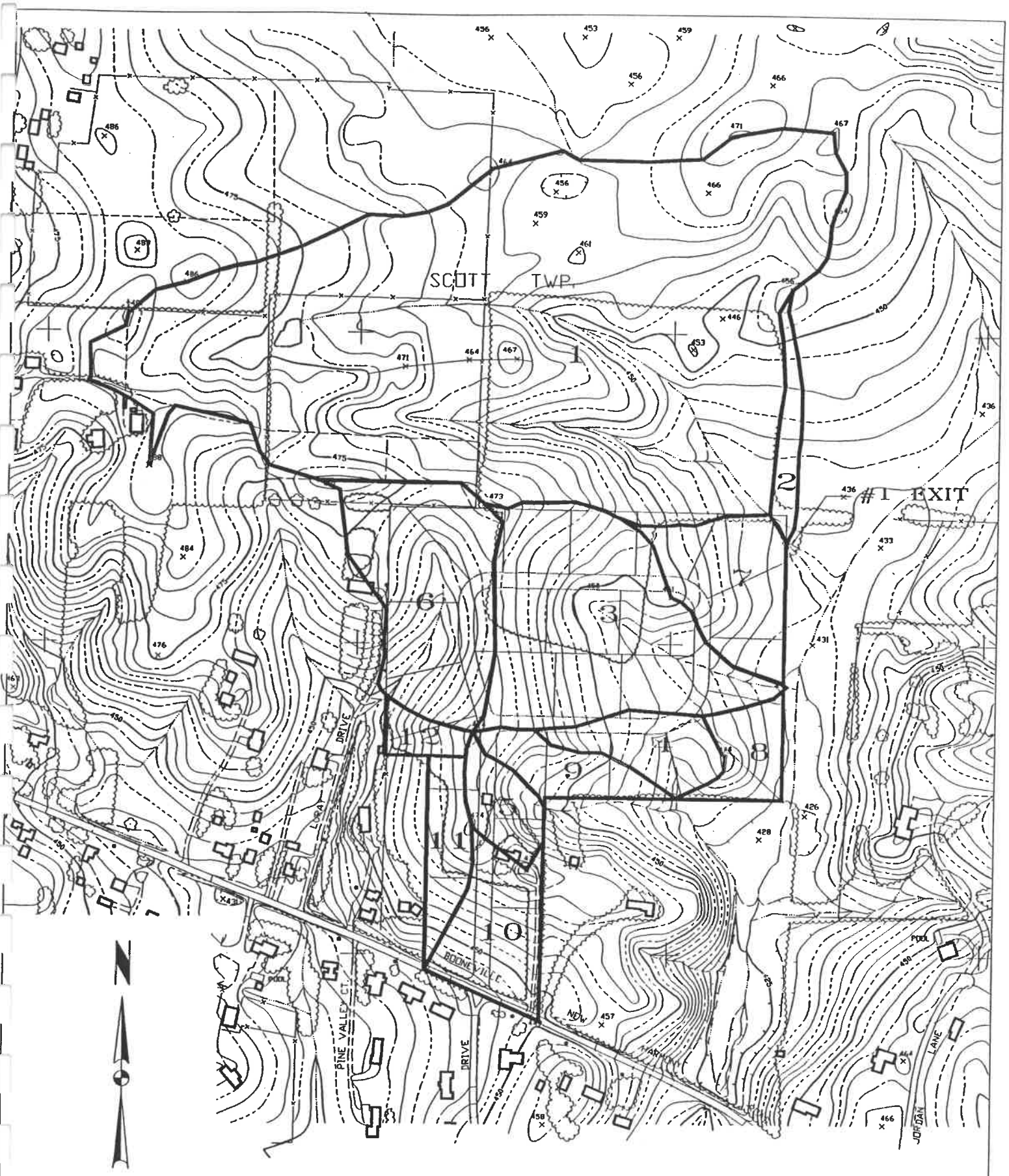
**TABLE 2 (Undetained Areas)
"East Ridge Released Areas"**

UNDEVELOPED BASIN		CORRESPONDING DEVELOPED BASIN	
	10 year Undev. Release Rate		25 year Dev. Release Rate
Basin #9	3.67 cfs	Basin #19	1.63 cfs
Basin #4	3.84 cfs	Basin #14	2.17 cfs
Basin #7	7.23 cfs	Basin #15	3.64 cfs
Basin #8	3.91 cfs	Basin #16	2.76 cfs

**TABLE 3 (Undetained Areas)
"West Ridge Released Areas"**

UNDEVELOPED BASIN		CORRESPONDING DEVELOPED BASIN	
	10 year Undev. Release Rate		25 year Dev. Release Rate
Basin #6	13.04 cfs	Basin #20	5.83 cfs
Basin #12	2.01 cfs	Basin #21	2.26 cfs
Basin #11	3.03 cfs	Basin #22	2.80 cfs
Basin #10	5.01 cfs	Basin #23	5.08 cfs

OFFSITE "PASS-THRU"



SCOTT TWP

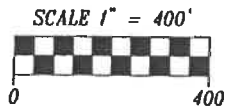
#1 EXIT

PINE VALLEY CT

DRIVE

ROENEVILLE

JORDAN LANE



**UNDEVELOPED
WATER SHED MAP**

SITECON, Inc.

600 S.E. EIGHTH ST. SUITE 2
EVANSVILLE, IN 47713 PH. 812-423-2320

PROJECT #:	DRWN BY:	R'VD. BY:	DATE:	SCALE:
109-96-1	RRB		5-3-96	1" = 400'

FILENAME: UNDEVAREA.DWG

UNDEVELOPED CALCULATIONS FLOW FOR A 10 YEAR STORM

Job Name/Basin #: **Shadow Bluff Basin #1 Entry**

1,966,595 Total SF 45.15 AC

Impervious surfaces (2-5%) C=0.94

Structures	0 Total	0 SF	0 Total SF	0.00 AC
Drives	0 Total	0 SF	0 Total SF	0.00 AC
Pavement	0 Width (ft)	0 L (ft)	0 Total SF	0.00 AC
Patios	0 Total	0 SF	0 Total SF	0.00 AC
Sidewalks	0 Width (ft)		0 Total SF	0.00 AC
			0 TOTAL	0.00 AC

For cultivated fields:

0-2% slope	C=0.20	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.35	693,212 SF	693,212 Total SF	15.91 AC
5-10% slope	C=0.50	460,567 SF	460,567 Total SF	10.57 AC
10+% slope	C=0.65	0 SF	0 Total SF	0.00 AC
			1,153,779 TOTAL	26.49 AC

For woodland areas:

0-2% slope	C=0.12	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.24	29,130 SF	29,130 Total SF	0.67 AC
5-10% slope	C=0.36	783,684 SF	783,684 Total SF	17.99 AC
10+% slope	C=0.48	0 SF	0 Total SF	0.00 AC
			812,814 TOTAL	18.66 AC

Check 1,966,593 GT

Wt'd C = 0.39
 Wt'd N = 0.37
 High Pt El 491.00 ft
 Inlet El 435.00 ft
 Length 2,200.00 ft
 Slope 0.0255
 tc 44.30 min

0 1	Is 5<tc<10?	i 10=	0.00 in/hr
0 1	Is 10<tc<15?	i 10=	0.00 in/hr
0 1	Is 15<tc<30?	i 10=	0.00 in/hr
1 1	Is 30<tc<60?	i 10=	2.56 in/hr

Q10= 44.70 cfs

Date: 5/9/96

UNDEVELOPED CALCULATIONS FLOW FOR A 10 YEAR STORM

Job Name/Basin #: **Shadow Bluff Basin #1 Exit**

2,038,828 Total SF 46.81 AC

Impervious surfaces (2-5%) C=0.94

Structures	0 Total	0 SF	0 Total SF	0.00 AC
Drives	0 Total	0 SF	0 Total SF	0.00 AC
Pavement	0 Width (ft)	0 L (ft)	0 Total SF	0.00 AC
Patios	0 Total	0 SF	0 Total SF	0.00 AC
Sidewalks	0 Width (ft)		0 Total SF	0.00 AC
			0 TOTAL	0.00 AC

For cultivated fields:

0-2% slope	C=0.20	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.35	739,746 SF	739,746 Total SF	16.98 AC
5-10% slope	C=0.50	474,169 SF	474,169 Total SF	10.89 AC
10+% slope	C=0.65	0 SF	0 Total SF	0.00 AC
			1,213,915 TOTAL	27.87 AC

For woodland areas:

0-2% slope	C=0.12	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.24	39,161 SF	39,161 Total SF	0.90 AC
5-10% slope	C=0.36	785,752 SF	785,752 Total SF	18.04 AC
10+% slope	C=0.48	0 SF	0 Total SF	0.00 AC
			824,913 TOTAL	18.94 AC

Check 2,038,828 GT

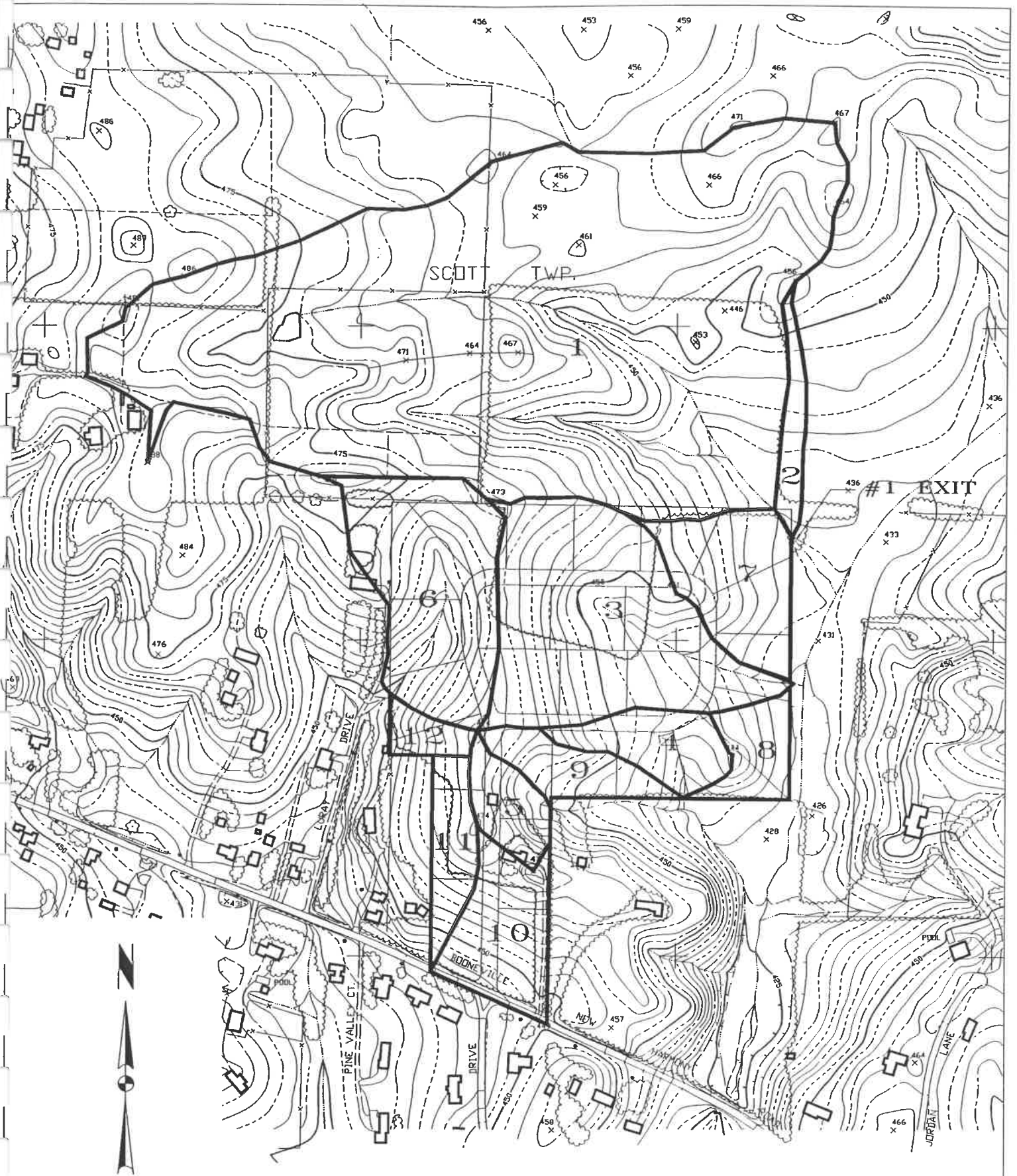
Wt'd C = 0.39
 Wt'd N = 0.36
 High Pt El 491.00 ft
 Inlet El 433.00 ft
 Length 2,280.00 ft
 Slope 0.0254
 tc 44.85 min

0 1	Is 5<tc<10?	i 10=	0.00 in/hr
0 1	Is 10<tc<15?	i 10=	0.00 in/hr
0 1	Is 15<tc<30?	i 10=	0.00 in/hr
1 1	Is 30<tc<60?	i 10=	2.53 in/hr

Q10= 45.77 cfs

Date: 5/9/96

**“EAST” RIDGE RUNOFF
to BASIN #1**



**UNDEVELOPED
WATER SHED MAP**

SITECON, Inc.

600 S.E. EIGHTH ST. SUITE 2
EVANSVILLE, IN 47713 PH. 812-423-2320

PROJECT #:	DRWN BY:	R'VD. BY:	DATE:	SCALE:
109-96-1	RRB		5-3-96	1"=400'

FILENAME: UNDEVAREA.DWG

UNDEVELOPED CALCULATIONS FLOW FOR A 10 YEAR STORM

Job Name/Basin #: **Shadow Bluff Basin #3**

442,687 Total SF 10.16 AC

Impervious surfaces (2-5%) C=0.94

Structures	0	Total	0	SF	0	Total SF	0.00	AC
Drives	0	Total	0	SF	0	Total SF	0.00	AC
Pavement	0	Width (ft)	0	L (ft)	0	Total SF	0.00	AC
Patios	0	Total	0	SF	0	Total SF	0.00	AC
Sidewalks	0	Width (ft)	0		0	Total SF	0.00	AC
							0 TOTAL	0.00 AC

For cultivated fields:

0-2% slope	C=0.20	0	SF	0	Total SF	0.00	AC	
2-5% slope	C=0.35	126,991	SF	126,991	Total SF	2.92	AC	
5-10% slope	C=0.50	107,408	SF	107,408	Total SF	2.47	AC	
10+% slope	C=0.65	0	SF	0	Total SF	0.00	AC	
							234,399 TOTAL	5.38 AC

For woodland areas:

0-2% slope	C=0.12	0	SF	0	Total SF	0.00	AC	
2-5% slope	C=0.24	46,356	SF	46,356	Total SF	1.06	AC	
5-10% slope	C=0.36	161,933	SF	161,933	Total SF	3.72	AC	
10+% slope	C=0.48	0	SF	0	Total SF	0.00	AC	
							208,289 TOTAL	4.78 AC

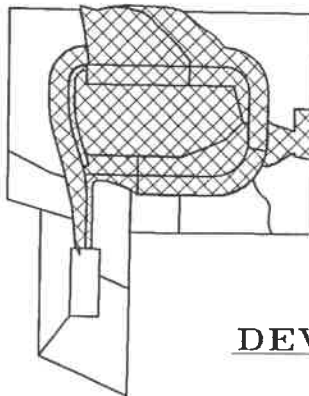
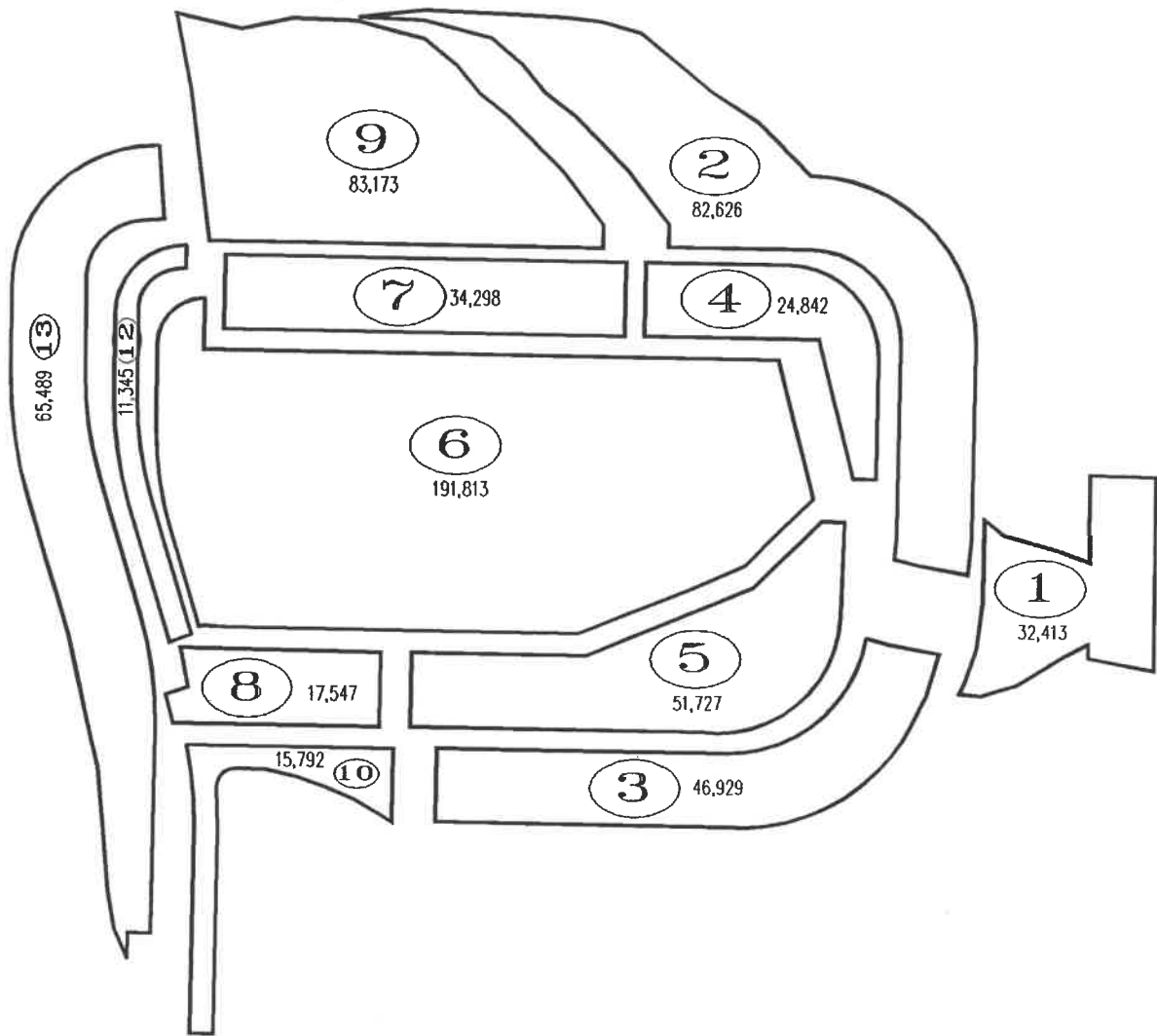
Check 442,688 GT

Wt'd C = 0.38
 Wt'd N = 0.39
 High Pt El 473.00 ft
 Inlet El 429.00 ft
 Length 1,100.00 ft
 Slope 0.0400
 tc 29.67 min

0	1	Is 5<tc<10?	i 10=	0.00 in/hr
0	1	Is 10<tc<15?	i 10=	0.00 in/hr
1	1	Is 15<tc<30?	i 10=	3.25 in/hr
1	0	Is 30<tc<60?	i 10=	0.00 in/hr

Q10= 12.52 cfs

Date: 5/9/96



DEVELOPED WATERSHED MAP

SITECON, Inc.

600 S.E. EIGHTH ST. SUITE 2
EVANSVILLE, IN 47713 PH. 812-423-2320

PROJECT #:	DRWN BY:	R'VD. BY:	DATE:	SCALE:
109-96-1	RRB		5-10-96	1"=200'

DEVELOPED CALCULATIONS FLOW FOR A 25 YEAR STORM

Job Name/Basin #: Basin #1

32,413 Total SF 0.74 AC

Exist. Impervious surfaces (2-5%) C=0.94

Structures	0	Total	0	SF	0	Total SF	0.00	AC
Drives	0	Total	0	SF	0	Total SF	0.00	AC
Pavement	0	Width (ft)	0	L (ft)	0	Total SF	0.00	AC
							0 TOTAL	0.00 AC

Proposed Impervious surfaces (2-5%) C=0.94

Structures	1	Total	1,500	SF	1,500	Total SF	0.03	AC
Drives	0	Total	0	SF	0	Total SF	0.00	AC
Pavement	0	Width (ft)	0	L (ft)	0	Total SF	0.00	AC
Patios	1	Total	120	SF	120	Total SF	0.00	AC
Sidewalks	0	Width (ft)	0	L (ft)	0	Total SF	0.00	AC
							1,620 TOTAL	0.04 AC

Exist cultivated fields:

0-2% slope	C=0.20	0	SF	0	Total SF	0.00	AC	
2-5% slope	C=0.35	0	SF	0	Total SF	0.00	AC	
5-10% slope	C=0.50	0	SF	0	Total SF	0.00	AC	
10+% slope	C=0.65	0	SF	0	Total SF	0.00	AC	
							0 TOTAL	0.00 AC

For lawn areas:

0-2% slope	C=0.15	0	SF	0	Total SF	0.00	AC	
2-5% slope	C=0.25	16,093	SF	16,093	Total SF	0.37	AC	
5-10% slope	C=0.40	0	SF	0	Total SF	0.00	AC	
10+% slope	C=0.55	0	SF	0	Total SF	0.00	AC	
							16,093 TOTAL	0.37 AC

Lake areas C=1.00 14,700 SF

14,700 TOTAL 0.34 AC

For woodland areas:

0-2% slope	C=0.12	0	SF	0	Total SF	0.00	AC	
2-5% slope	C=0.24	0	SF	0	Total SF	0.00	AC	
5-10% slope	C=0.36	0	SF	0	Total SF	0.00	AC	
10+% slope	C=0.48	0	SF	0	Total SF	0.00	AC	
							0 TOTAL	0.00 AC

Check 32,413 GT

Wt'd C = 0.62
 Wt'd N = 0.20
 High Pt El 440.00 ft
 Inlet El 430.00 ft
 Length 190.00 ft
 Slope 0.0526
 tc 8.98 min

1 1	Is 5<tc<10?	i 25=	6.19 in/hr
1 0	Is 10<tc<15?	i 25=	0.00 in/hr
1 0	Is 15<tc<30?	i 25=	0.00 in/hr
1 0	Is 30<tc<60?	i 25=	0.00 in/hr

Q25= 2.88 cfs

Date: 5/8/96

DEVELOPED CALCULATIONS FLOW FOR A 25 YEAR STORM

Job Name/Basin #: **Shadow Bluff Basin #2**

82,626 Total SF 1.90 AC

Exist. Impervious surfaces (2-5%) C=0.94

Structures	0 Total	0 SF	0 Total SF	0.00 AC
Drives	0 Total	0 SF	0 Total SF	0.00 AC
Pavement	0 Width (ft)	0 L (ft)	0 Total SF	0.00 AC
			0 TOTAL	0.00 AC

Proposed Impervious surfaces (2-5%) C=0.94

Structures	5 Total	1,650 SF	8,250 Total SF	0.19 AC
Drives	4 Total	840 SF	3,360 Total SF	0.08 AC
Pavement	14.5 Width (ft)	562 L (ft)	8,149 Total SF	0.19 AC
Patios	1 Total	120 SF	120 Total SF	0.00 AC
Sidewalks	0 Width (ft)		0 Total SF	0.00 AC
			19,879 TOTAL	0.46 AC

Exist cultivated fields:

0-2% slope	C=0.20	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.35	0 SF	0 Total SF	0.00 AC
5-10% slope	C=0.50	0 SF	0 Total SF	0.00 AC
10+% slope	C=0.65	0 SF	0 Total SF	0.00 AC
			0 TOTAL	0.00 AC

For lawn areas:

0-2% slope	C=0.15	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.25	27,036 SF	27,036 Total SF	0.62 AC
5-10% slope	C=0.40	11,574 SF	11,574 Total SF	0.27 AC
10+% slope	C=0.55	0 SF	0 Total SF	0.00 AC
			38,610 TOTAL	0.89 AC

For woodland areas:

0-2% slope	C=0.12	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.24	463 SF	463 Total SF	0.01 AC
5-10% slope	C=0.36	23,675 SF	23,675 Total SF	0.54 AC
10+% slope	C=0.48	0 SF	0 Total SF	0.00 AC
			24,138 TOTAL	0.55 AC

Check **82,627 GT**

Wt'd C = 0.47
 Wt'd N = 0.37
 High Pt El **473.00** ft
 Inlet El **440.00** ft
 Length **917.00** ft
 Slope 0.0360
 tc 27.21 min

0	1	Is 5<tc<10?	i 25=	0.00 in/hr
0	1	Is 10<tc<15?	i 25=	0.00 in/hr
1	1	Is 15<tc<30?	i 25=	3.90 in/hr
1	0	Is 30<tc<60?	i 25=	0.00 in/hr

Q25= 3.47 cfs

Date: 5/9/96

DEVELOPED CALCULATIONS FLOW FOR A 25 YEAR STORM

Job Name/Basin #: **Shadow Bluff Basin #3**

46,928 Total SF 1.08 AC

Exist. Impervious surfaces (2-5%) C=0.94

Structures	0 Total	0 SF	0 Total SF	0.00 AC
Drives	0 Total	0 SF	0 Total SF	0.00 AC
Pavement	0 Width (ft)	0 L (ft)	0 Total SF	0.00 AC
			0 TOTAL	0.00 AC

Proposed Impervious surfaces (2-5%) C=0.94

Structures	4 Total	1,500 SF	6,000 Total SF	0.14 AC
Drives	4 Total	840 SF	3,360 Total SF	0.08 AC
Pavement	14.5 Width (ft)	563 L (ft)	8,164 Total SF	0.19 AC
Patios	0 Total	0 SF	0 Total SF	0.00 AC
Sidewalks	0 Width (ft)		0 Total SF	0.00 AC
			17,524 TOTAL	0.40 AC

Exist cultivated fields:

0-2% slope	C=0.20	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.35	0 SF	0 Total SF	0.00 AC
5-10% slope	C=0.50	0 SF	0 Total SF	0.00 AC
10+% slope	C=0.65	0 SF	0 Total SF	0.00 AC
			0 TOTAL	0.00 AC

For lawn areas:

0-2% slope	C=0.15	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.25	20,729 SF	20,729 Total SF	0.48 AC
5-10% slope	C=0.40	8,674 SF	8,674 Total SF	0.20 AC
10+% slope	C=0.55	0 SF	0 Total SF	0.00 AC
			29,403 TOTAL	0.68 AC

For woodland areas:

0-2% slope	C=0.12	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.24	0 SF	0 Total SF	0.00 AC
5-10% slope	C=0.36	0 SF	0 Total SF	0.00 AC
10+% slope	C=0.48	0 SF	0 Total SF	0.00 AC
			0 TOTAL	0.00 AC

Check **46,927 GT**

Wt'd C = 0.54
 Wt'd N = 0.26
 High Pt El **458.00** ft
 Inlet El **440.00** ft
 Length **563.00** ft
 Slope 0.0320
 tc 18.90 min

0	1	Is 5<tc<10?	i 25=	0.00 in/hr
0	1	Is 10<tc<15?	i 25=	0.00 in/hr
1	1	Is 15<tc<30?	i 25=	4.67 in/hr
1	0	Is 30<tc<60?	i 25=	0.00 in/hr

Q25= 2.69 cfs

Date: 5/9/96

DEVELOPED CALCULATIONS FLOW FOR A 25 YEAR STORM

Job Name/Basin #: **Shadow Bluff Basin #4**

24,842 Total SF 0.57 AC

Exist. Impervious surfaces (2-5%) C=0.94

Structures	0 Total	0 SF	0 Total SF	0.00 AC
Drives	0 Total	0 SF	0 Total SF	0.00 AC
Pavement	0 Width (ft)	0 L (ft)	0 Total SF	0.00 AC
			0 TOTAL	0.00 AC

Proposed Impervious surfaces (2-5%) C=0.94

Structures	1 Total	1,500 SF	1,500 Total SF	0.03 AC
Drives	1 Total	840 SF	840 Total SF	0.02 AC
Pavement	14.5 Width (ft)	518 L (ft)	7,511 Total SF	0.17 AC
Patios	0 Total	0 SF	0 Total SF	0.00 AC
Sidewalks	0 Width (ft)		0 Total SF	0.00 AC
			9,851 TOTAL	0.23 AC

Exist cultivated fields:

0-2% slope	C=0.20	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.35	0 SF	0 Total SF	0.00 AC
5-10% slope	C=0.50	0 SF	0 Total SF	0.00 AC
10+% slope	C=0.65	0 SF	0 Total SF	0.00 AC
			0 TOTAL	0.00 AC

For lawn areas:

0-2% slope	C=0.15	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.25	6,880 SF	6,880 Total SF	0.16 AC
5-10% slope	C=0.40	6,872 SF	6,872 Total SF	0.16 AC
10+% slope	C=0.55	0 SF	0 Total SF	0.00 AC
			13,752 TOTAL	0.32 AC

For woodland areas:

0-2% slope	C=0.12	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.24	1,033 SF	1,033 Total SF	0.02 AC
5-10% slope	C=0.36	206 SF	206 Total SF	0.00 AC
10+% slope	C=0.48	0 SF	0 Total SF	0.00 AC
			1,239 TOTAL	0.03 AC

Check 24,842 GT

Wt'd C = 0.57
 Wt'd N = 0.26
 High Pt El 448.50 ft
 Inlet El 440.00 ft
 Length 518.00 ft
 Slope 0.0164
 tc 21.29 min

0 1	Is 5<tc<10?	i 25=	0.00 in/hr
0 1	Is 10<tc<15?	i 25=	0.00 in/hr
1 1	Is 15<tc<30?	i 25=	4.45 in/hr
1 0	Is 30<tc<60?	i 25=	0.00 in/hr

Q25= 1.44 cfs

Date: 5/9/96

DEVELOPED CALCULATIONS FLOW FOR A 25 YEAR STORM

Job Name/Basin #: **Shadow Bluff Basin #5**

51,727 Total SF 1.19 AC

Exist. Impervious surfaces (2-5%) C=0.94

Structures	0 Total	0 SF	0 Total SF	0.00 AC
Drives	0 Total	0 SF	0 Total SF	0.00 AC
Pavement	0 Width (ft)	0 L (ft)	0 Total SF	0.00 AC
			0 TOTAL	0.00 AC

Proposed Impervious surfaces (2-5%) C=0.94

Structures	2 Total	2,250 SF	4,500 Total SF	0.10 AC
Drives	2 Total	840 SF	1,680 Total SF	0.04 AC
Pavement	14.5 Width (ft)	514 L (ft)	7,453 Total SF	0.17 AC
Patios	0 Total	0 SF	0 Total SF	0.00 AC
Sidewalks	0 Width (ft)		0 Total SF	0.00 AC
			13,633 TOTAL	0.31 AC

Exist cultivated fields:

0-2% slope	C=0.20	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.35	0 SF	0 Total SF	0.00 AC
5-10% slope	C=0.50	0 SF	0 Total SF	0.00 AC
10+% slope	C=0.65	0 SF	0 Total SF	0.00 AC
			0 TOTAL	0.00 AC

For lawn areas:

0-2% slope	C=0.15	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.25	25,396 SF	25,396 Total SF	0.58 AC
5-10% slope	C=0.40	12,698 SF	12,698 Total SF	0.29 AC
10+% slope	C=0.55	0 SF	0 Total SF	0.00 AC
			38,094 TOTAL	0.87 AC

For woodland areas:

0-2% slope	C=0.12	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.24	0 SF	0 Total SF	0.00 AC
5-10% slope	C=0.36	0 SF	0 Total SF	0.00 AC
10+% slope	C=0.48	0 SF	0 Total SF	0.00 AC
			0 TOTAL	0.00 AC

Check **51,727 GT**

Wt'd C = 0.47
 Wt'd N = 0.30
 High Pt El. 458.00 ft
 Inlet El. 440.00 ft
 Length 514.00 ft
 Slope 0.0350
 tc 19.02 min

0	1	Is 5<tc<10?	i 25=	0.00 in/hr
0	1	Is 10<tc<15?	i 25=	0.00 in/hr
1	1	Is 15<tc<30?	i 25=	4.66 in/hr
1	0	Is 30<tc<60?	i 25=	0.00 in/hr

Q25= 2.59 cfs

Date: 5/9/96

DEVELOPED CALCULATIONS FLOW FOR A 25 YEAR STORM

Job Name/Basin #: **Shadow Bluff Basin #6**

191,813 Total SF **4.40** AC

Exist. Impervious surfaces (2-5%) C=0.94

Structures	0 Total	0 SF	0 Total SF	0.00 AC
Drives	0 Total	0 SF	0 Total SF	0.00 AC
Pavement	0 Width (ft)	0 L (ft)	0 Total SF	0.00 AC
			0 TOTAL	0.00 AC

Proposed Impervious surfaces (2-5%) C=0.94

Structures	5 Total	1,500 SF	7,500 Total SF	0.17 AC
Drives	0 Total	0 SF	0 Total SF	0.00 AC
Pavement	0 Width (ft)	0 L (ft)	0 Total SF	0.00 AC
Patios	5 Total	120 SF	600 Total SF	0.01 AC
Sidewalks	0 Width (ft)		0 Total SF	0.00 AC
			8,100 TOTAL	0.19 AC

Exist cultivated fields:

0-2% slope	C=0.20	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.35	0 SF	0 Total SF	0.00 AC
5-10% slope	C=0.50	0 SF	0 Total SF	0.00 AC
10+% slope	C=0.65	0 SF	0 Total SF	0.00 AC
			0 TOTAL	0.00 AC

For lawn areas:

0-2% slope	C=0.15	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.25	55,290 SF	55,290 Total SF	1.27 AC
5-10% slope	C=0.40	76,968 SF	76,968 Total SF	1.77 AC
10+% slope	C=0.55	0 SF	0 Total SF	0.00 AC
			132,258 TOTAL	3.04 AC

For woodland areas:

0-2% slope	C=0.12	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.24	24,901 SF	24,901 Total SF	0.57 AC
5-10% slope	C=0.36	26,554 SF	26,554 Total SF	0.61 AC
10+% slope	C=0.48	0 SF	0 Total SF	0.00 AC
			51,455 TOTAL	1.18 AC

Check **191,813 GT**

Wt'd C = 0.35
 Wt'd N = 0.44
 High Pt El 460.00 ft
 Inlet El 437.00 ft
 Length 700.00 ft
 Slope 0.0329
 tc 26.60 min

0	1	Is 5<tc<10?	i 25=	0.00 in/hr
0	1	Is 10<tc<15?	i 25=	0.00 in/hr
1	1	Is 15<tc<30?	i 25=	3.96 in/hr
1	0	Is 30<tc<60?	i 25=	0.00 in/hr

Q25= 6.16 cfs

Date: 5/9/96

DEVELOPED CALCULATIONS FLOW FOR A 25 YEAR STORM

Job Name/Basin #: **Shadow Bluff Basin #7**

34,298 Total SF 0.79 AC

Exist. Impervious surfaces (2-5%) C=0.94

Structures	0 Total	0 SF	0 Total SF	0.00 AC
Drives	0 Total	0 SF	0 Total SF	0.00 AC
Pavement	0 Width (ft)	0 L (ft)	0 Total SF	0.00 AC
			0 TOTAL	0.00 AC

Proposed Impervious surfaces (2-5%) C=0.94

Structures	2 Total	1,500 SF	3,000 Total SF	0.07 AC
Drives	2 Total	840 SF	1,680 Total SF	0.04 AC
Pavement	14.5 Width (ft)	416 L (ft)	6,032 Total SF	0.14 AC
Patios	0 Total	0 SF	0 Total SF	0.00 AC
Sidewalks	0 Width (ft)		0 Total SF	0.00 AC
			10,712 TOTAL	0.25 AC

Exist cultivated fields:

0-2% slope	C=0.20	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.35	0 SF	0 Total SF	0.00 AC
5-10% slope	C=0.50	0 SF	0 Total SF	0.00 AC
10+% slope	C=0.65	0 SF	0 Total SF	0.00 AC
			0 TOTAL	0.00 AC

For lawn areas:

0-2% slope	C=0.15	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.25	5,987 SF	5,987 Total SF	0.14 AC
5-10% slope	C=0.40	12,490 SF	12,490 Total SF	0.29 AC
10+% slope	C=0.55	0 SF	0 Total SF	0.00 AC
			18,477 TOTAL	0.42 AC

For woodland areas:

0-2% slope	C=0.12	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.24	1,656 SF	1,656 Total SF	0.04 AC
5-10% slope	C=0.36	3,453 SF	3,453 Total SF	0.08 AC
10+% slope	C=0.48	0 SF	0 Total SF	0.00 AC
			5,109 TOTAL	0.12 AC

Check 34,298 GT

Wt'd C = 0.53
 Wt'd N = 0.31
 High Pt El 467.00 ft
 Inlet El 448.50 ft
 Length 416.00 ft
 Slope 0.0445
 tc 16.58 min

0 1	Is 5<tc<10?	i 25=	0.00 in/hr
0 1	Is 10<tc<15?	i 25=	0.00 in/hr
1 1	Is 15<tc<30?	i 25=	4.89 in/hr
1 0	Is 30<tc<60?	i 25=	0.00 in/hr

Q25= 2.04 cfs

Date: 5/9/96

DEVELOPED CALCULATIONS FLOW FOR A 25 YEAR STORM

Job Name/Basin #: **Shadow Bluff Basin #8**

17,548 Total SF 0.40 AC

Exist. Impervious surfaces (2-5%) C=0.94

Structures	0	Total	0	SF	0	Total SF	0.00	AC
Drives	0	Total	0	SF	0	Total SF	0.00	AC
Pavement	0	Width (ft)	0	L (ft)	0	Total SF	0.00	AC
					0 TOTAL	0.00	AC	

Proposed Impervious surfaces (2-5%) C=0.94

Structures	1	Total	1,500	SF	1,500	Total SF	0.03	AC
Drives	1	Total	840	SF	840	Total SF	0.02	AC
Pavement	14.5	Width (ft)	220	L (ft)	3,190	Total SF	0.07	AC
Patios	0	Total	0	SF	0	Total SF	0.00	AC
Sidewalks	0	Width (ft)	0	L (ft)	0	Total SF	0.00	AC
					5,530 TOTAL	0.13	AC	

Exist cultivated fields:

0-2% slope	C=0.20	0	SF	0	Total SF	0.00	AC
2-5% slope	C=0.35	0	SF	0	Total SF	0.00	AC
5-10% slope	C=0.50	0	SF	0	Total SF	0.00	AC
10+% slope	C=0.65	0	SF	0	Total SF	0.00	AC
					0 TOTAL	0.00	AC

For lawn areas:

0-2% slope	C=0.15	0	SF	0	Total SF	0.00	AC
2-5% slope	C=0.25	0	SF	0	Total SF	0.00	AC
5-10% slope	C=0.40	12,018	SF	12,018	Total SF	0.28	AC
10+% slope	C=0.55	0	SF	0	Total SF	0.00	AC
					12,018 TOTAL	0.28	AC

For woodland areas:

0-2% slope	C=0.12	0	SF	0	Total SF	0.00	AC
2-5% slope	C=0.24	0	SF	0	Total SF	0.00	AC
5-10% slope	C=0.36	0	SF	0	Total SF	0.00	AC
10+% slope	C=0.48	0	SF	0	Total SF	0.00	AC
					0 TOTAL	0.00	AC

Check 17,548 GT

Wt'd C = 0.57
 Wt'd N = 0.28
 High Pt El 468.90 ft
 Inlet El 458.00 ft
 Length 220.00 ft
 Slope 0.0495
 tc 11.43 min

0 1	Is 5<tc<10?	i 25=	0.00 in/hr
1 1	Is 10<tc<15?	i 25=	5.67 in/hr
1 0	Is 15<tc<30?	i 25=	0.00 in/hr
1 0	Is 30<tc<60?	i 25=	0.00 in/hr

Q25= 1.30 cfs

Date: 5/9/96

DEVELOPED CALCULATIONS FLOW FOR A 25 YEAR STORM

Job Name/Basin #: **Shadow Bluff Basin #9**

83,173 Total SF 1.91 AC

Exist. Impervious surfaces (2-5%) C=0.94

Structures	0	Total	0	SF	0	Total SF	0.00	AC
Drives	0	Total	0	SF	0	Total SF	0.00	AC
Pavement	0	Width (ft)	0	L (ft)	0	Total SF	0.00	AC
							0 TOTAL	0.00 AC

Proposed Impervious surfaces (2-5%) C=0.94

Structures	2	Total	2,250	SF	4,500	Total SF	0.10	AC
Drives	2	Total	840	SF	1,680	Total SF	0.04	AC
Pavement	14.5	Width (ft)	416	L (ft)	6,032	Total SF	0.14	AC
Patios	0	Total	0	SF	0	Total SF	0.00	AC
Sidewalks	0	Width (ft)	0	L (ft)	0	Total SF	0.00	AC
							12,212 TOTAL	0.28 AC

Exist cultivated fields:

0-2% slope	C=0.20	0	SF	0	Total SF	0.00	AC	
2-5% slope	C=0.35	0	SF	0	Total SF	0.00	AC	
5-10% slope	C=0.50	0	SF	0	Total SF	0.00	AC	
10+% slope	C=0.65	0	SF	0	Total SF	0.00	AC	
							0 TOTAL	0.00 AC

For lawn areas:

0-2% slope	C=0.15	0	SF	0	Total SF	0.00	AC	
2-5% slope	C=0.25	0	SF	0	Total SF	0.00	AC	
5-10% slope	C=0.40	16,609	SF	16,609	Total SF	0.38	AC	
10+% slope	C=0.55	0	SF	0	Total SF	0.00	AC	
							16,609 TOTAL	0.38 AC

For woodland areas:

0-2% slope	C=0.12	0	SF	0	Total SF	0.00	AC	
2-5% slope	C=0.24	0	SF	0	Total SF	0.00	AC	
5-10% slope	C=0.36	54,352	SF	54,352	Total SF	1.25	AC	
10+% slope	C=0.48	0	SF	0	Total SF	0.00	AC	
							54,352 TOTAL	1.25 AC

Check **83,173 GT**

Wt'd C = 0.45
 Wt'd N = 0.47
 High Pt El 473.00 ft
 Inlet El 448.50 ft
 Length 500.00 ft
 Slope 0.0490
 tc 21.51 min

0	1	Is 5<tc<10?	i 25=	0.00 in/hr
0	1	Is 10<tc<15?	i 25=	0.00 in/hr
1	1	Is 15<tc<30?	i 25=	4.43 in/hr
1	0	Is 30<tc<60?	i 25=	0.00 in/hr

Q25= 3.83 cfs

Date: 5/9/96

DEVELOPED CALCULATIONS FLOW FOR A 25 YEAR STORM

Job Name/Basin #: **Shadow Bluff Basin #10**

15,792 Total SF 0.36 AC

Exist. Impervious surfaces (2-5%) C=0.94

Structures	0 Total	0 SF	0 Total SF	0.00 AC
Drives	0 Total	0 SF	0 Total SF	0.00 AC
Pavement	0 Width (ft)	0 L (ft)	0 Total SF	0.00 AC
			0 TOTAL	0.00 AC

Proposed Impervious surfaces (2-5%) C=0.94

Structures	0 Total	0 SF	0 Total SF	0.00 AC
Drives	1 Total	840 SF	840 Total SF	0.02 AC
Pavement	14.5 Width (ft)	520 L (ft)	7,540 Total SF	0.17 AC
Patios	0 Total	0 SF	0 Total SF	0.00 AC
Sidewalks	0 Width (ft)		0 Total SF	0.00 AC
			8,380 TOTAL	0.19 AC

Exist cultivated fields:

0-2% slope	C=0.20	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.35	0 SF	0 Total SF	0.00 AC
5-10% slope	C=0.50	0 SF	0 Total SF	0.00 AC
10+% slope	C=0.65	0 SF	0 Total SF	0.00 AC
			0 TOTAL	0.00 AC

For lawn areas:

0-2% slope	C=0.15	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.25	0 SF	0 Total SF	0.00 AC
5-10% slope	C=0.40	7,412 SF	7,412 Total SF	0.17 AC
10+% slope	C=0.55	0 SF	0 Total SF	0.00 AC
			7,412 TOTAL	0.17 AC

For woodland areas:

0-2% slope	C=0.12	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.24	0 SF	0 Total SF	0.00 AC
5-10% slope	C=0.36	0 SF	0 Total SF	0.00 AC
10+% slope	C=0.48	0 SF	0 Total SF	0.00 AC
			0 TOTAL	0.00 AC

Check 15,792 GT

Wt'd C = 0.69
 Wt'd N = 0.20
 High Pt El 471.00 ft
 Inlet El 458.00 ft
 Length 520.00 ft
 Slope 0.0250
 tc 17.06 min

0 1	Is 5<tc<10?	i 25=	0.00 in/hr
0 1	Is 10<tc<15?	i 25=	0.00 in/hr
1 1	Is 15<tc<30?	i 25=	4.84 in/hr
1 0	Is 30<tc<60?	i 25=	0.00 in/hr

Q25= 1.21 cfs

Date: 5/9/96

DEVELOPED CALCULATIONS FLOW FOR A 25 YEAR STORM

Job Name/Basin #: **Shadow Bluff Basin #12**

11,345 Total SF 0.26 AC

Exist. Impervious surfaces (2-5%) C=0.94

Structures	0 Total	0 SF	0 Total SF	0.00 AC
Drives	0 Total	0 SF	0 Total SF	0.00 AC
Pavement	0 Width (ft)	0 L (ft)	0 Total SF	0.00 AC
			0 TOTAL	0.00 AC

Proposed Impervious surfaces (2-5%) C=0.94

Structures	0 Total	0 SF	0 Total SF	0.00 AC
Drives	0 Total	0 SF	0 Total SF	0.00 AC
Pavement	14.5 Width (ft)	481 L (ft)	6,975 Total SF	0.16 AC
Patios	0 Total	0 SF	0 Total SF	0.00 AC
Sidewalks	0 Width (ft)		0 Total SF	0.00 AC
			6,975 TOTAL	0.16 AC

Exist cultivated fields:

0-2% slope	C=0.20	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.35	0 SF	0 Total SF	0.00 AC
5-10% slope	C=0.50	0 SF	0 Total SF	0.00 AC
10+% slope	C=0.65	0 SF	0 Total SF	0.00 AC
			0 TOTAL	0.00 AC

For lawn areas:

0-2% slope	C=0.15	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.25	4,367 SF	4,367 Total SF	0.10 AC
5-10% slope	C=0.40	0 SF	0 Total SF	0.00 AC
10+% slope	C=0.55	0 SF	0 Total SF	0.00 AC
			4,367 TOTAL	0.10 AC

For woodland areas:

0-2% slope	C=0.12	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.24	0 SF	0 Total SF	0.00 AC
5-10% slope	C=0.36	0 SF	0 Total SF	0.00 AC
10+% slope	C=0.48	0 SF	0 Total SF	0.00 AC
			0 TOTAL	0.00 AC

Check **11,342 GT**

Wt'd C = 0.67
 Wt'd N = 0.17
 High Pt El 467.00 ft
 Inlet El 460.00 ft
 Length 279.00 ft
 Slope 0.0251
 tc 11.73 min

0 1	Is 5<tc<10?	i 25=	0.00 in/hr
1 1	Is 10<tc<15?	i 25=	5.62 in/hr
1 0	Is 15<tc<30?	i 25=	0.00 in/hr
1 0	Is 30<tc<60?	i 25=	0.00 in/hr

Q25= 0.99 cfs

Date: 5/9/96

DEVELOPED CALCULATIONS FLOW FOR A 25 YEAR STORM

Job Name/Basin #: **Shadow Bluff Basin #13**

65,489 Total SF 1.50 AC

Exist. Impervious surfaces (2-5%) C=0.94

Structures	0 Total	0 SF	0 Total SF	0.00 AC
Drives	0 Total	0 SF	0 Total SF	0.00 AC
Pavement	0 Width (ft)	0 L (ft)	0 Total SF	0.00 AC
			0 TOTAL	0.00 AC

Proposed Impervious surfaces (2-5%) C=0.94

Structures	6 Total	1,375 SF	8,250 Total SF	0.19 AC
Drives	6 Total	770 SF	4,620 Total SF	0.11 AC
Pavement	14.5 Width (ft)	899 L (ft)	13,036 Total SF	0.30 AC
Patios	5.5 Total	120 SF	660 Total SF	0.02 AC
Sidewalks	0 Width (ft)		0 Total SF	0.00 AC
			26,566 TOTAL	0.61 AC

Exist cultivated fields:

0-2% slope	C=0.20	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.35	0 SF	0 Total SF	0.00 AC
5-10% slope	C=0.50	0 SF	0 Total SF	0.00 AC
10+% slope	C=0.65	0 SF	0 Total SF	0.00 AC
			0 TOTAL	0.00 AC

For lawn areas:

0-2% slope	C=0.15	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.25	38,923 SF	38,923 Total SF	0.89 AC
5-10% slope	C=0.40	0 SF	0 Total SF	0.00 AC
10+% slope	C=0.55	0 SF	0 Total SF	0.00 AC
			38,923 TOTAL	0.89 AC

For woodland areas:

0-2% slope	C=0.12	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.24	0 SF	0 Total SF	0.00 AC
5-10% slope	C=0.36	0 SF	0 Total SF	0.00 AC
10+% slope	C=0.48	0 SF	0 Total SF	0.00 AC
			0 TOTAL	0.00 AC

Check **65,489 GT**

Wt'd C = 0.53
 Wt'd N = 0.25
 High Pt El 471.00 ft
 Inlet El 459.50 ft
 Length 622.00 ft
 Slope 0.0185
 tc 22.00 min

0	1	Is 5<tc<10?	i 25=	0.00 in/hr
0	1	Is 10<tc<15?	i 25=	0.00 in/hr
1	1	Is 15<tc<30?	i 25=	4.39 in/hr
1	0	Is 30<tc<60?	i 25=	0.00 in/hr

Q25= 3.49 cfs

Date: 5/9/96

DEVELOPED CALCULATIONS FLOW FOR A 25 YEAR STORM

Job Name/Basin #: Basin #'s 1-10, 12, & 13

657,994 Total SF 15.11 AC

Exist. Impervious surfaces (2-5%) C=0.94

Structures	0 Total	0 SF	0 Total SF	0.00 AC
Drives	0 Total	0 SF	0 Total SF	0.00 AC
Pavement	0 Width (ft)	0 L (ft)	0 Total SF	0.00 AC
			0 TOTAL	0.00 AC

Proposed Impervious surfaces (2-5%) C=0.94

Structures	29 Total	1,603 SF	46,487 Total SF	1.07 AC
Drives	23 Total	822 SF	18,906 Total SF	0.43 AC
Pavement	14.5 Width (ft)	5,109 L (ft)	74,081 Total SF	1.70 AC
Patios	12.5 Total	120 SF	1,500 Total SF	0.03 AC
Sidewalks	0 Width (ft)		0 Total SF	0.00 AC
			140,974 TOTAL	3.24 AC

Exist cultivated fields:

0-2% slope	C=0.20	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.35	0 SF	0 Total SF	0.00 AC
5-10% slope	C=0.50	0 SF	0 Total SF	0.00 AC
10+% slope	C=0.65	0 SF	0 Total SF	0.00 AC
			0 TOTAL	0.00 AC

For lawn areas:

0-2% slope	C=0.15	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.25	200,712 SF	200,712 Total SF	4.61 AC
5-10% slope	C=0.40	165,315 SF	165,315 Total SF	3.80 AC
10+% slope	C=0.55	0 SF	0 Total SF	0.00 AC
			366,027 TOTAL	8.40 AC

Lake areas

C=1.00 14,700 SF 14,700 TOTAL 0.34 AC

For woodland areas:

0-2% slope	C=0.12	0 SF	0 Total SF	0.00 AC
2-5% slope	C=0.24	28,053 SF	28,053 Total SF	0.64 AC
5-10% slope	C=0.36	108,240 SF	108,240 Total SF	2.48 AC
10+% slope	C=0.48	0 SF	0 Total SF	0.00 AC
			136,293 TOTAL	3.13 AC

Check 657,994 GT

Wt'd C = 0.47
 Wt'd N = 0.35
 High Pt El 100.50 ft
 Inlet El 100.00 ft
 Length 1,000.00 ft
 Slope 0.0005
 tc 75.34 min

0 1	Is 5<tc<10?	i 25=	0.00 in/hr
0 1	Is 10<tc<15?	i 25=	0.00 in/hr
0 1	Is 15<tc<30?	i 25=	0.00 in/hr
0 1	Is 30<tc<60?	i 25=	0.00 in/hr

Q25= 0.00 cfs

Date: 5/9/96

**Vanderburgh County Drainage Board
Form 800**

Computation Sheet for Detention Storage Using the Rational Method

Project: Basin #1

Detention Facility Design Return Period 25 years

Release Rate Return Period 10 years

Watershed Area	15.11 acres
Undeveloped Time of Concentration	29.67 minutes
Undeveloped Rainfall Intensity (iu)	3.25 inches/hour
Weighted Undeveloped Runoff Coefficient (Cu)	0.26
Undeveloped Runoff Rate (O=Cu x iu x Au)	12.52 cfs
Developed Runoff Coefficient (Cd)	0.47

Storm Duration td	Rainfall Intensity id	Inflow Rate I(td) Cd x id x Ad	Outflow Rate O Cu x iu x Au	Storage Rate (I x td) - O	Required Storage [I(td)-O]x[td/12]
min	inches/hr	cfs	cfs	cfs	acre-ft
5	7.208	51.06	12.52	38.54	0.2676
10	5.925	41.97	12.52	29.45	0.4090
15	5.033	35.65	12.52	23.13	0.4819
20	4.571	32.38	12.52	19.86	0.5516
25	4.108	29.10	12.52	16.58	0.5756
30	3.646	25.83	12.52	13.30	0.5543
40	3.123	22.12	12.52	9.60	0.5333
50	2.601	18.42	12.52	5.90	0.4099
60	2.078	14.72	12.52	2.20	0.1831
90	1.578	11.18	12.52	-1.34	-0.1681

Required Storage = 0.5756 x 43,560 sf/ac = 25,073 cubic feet

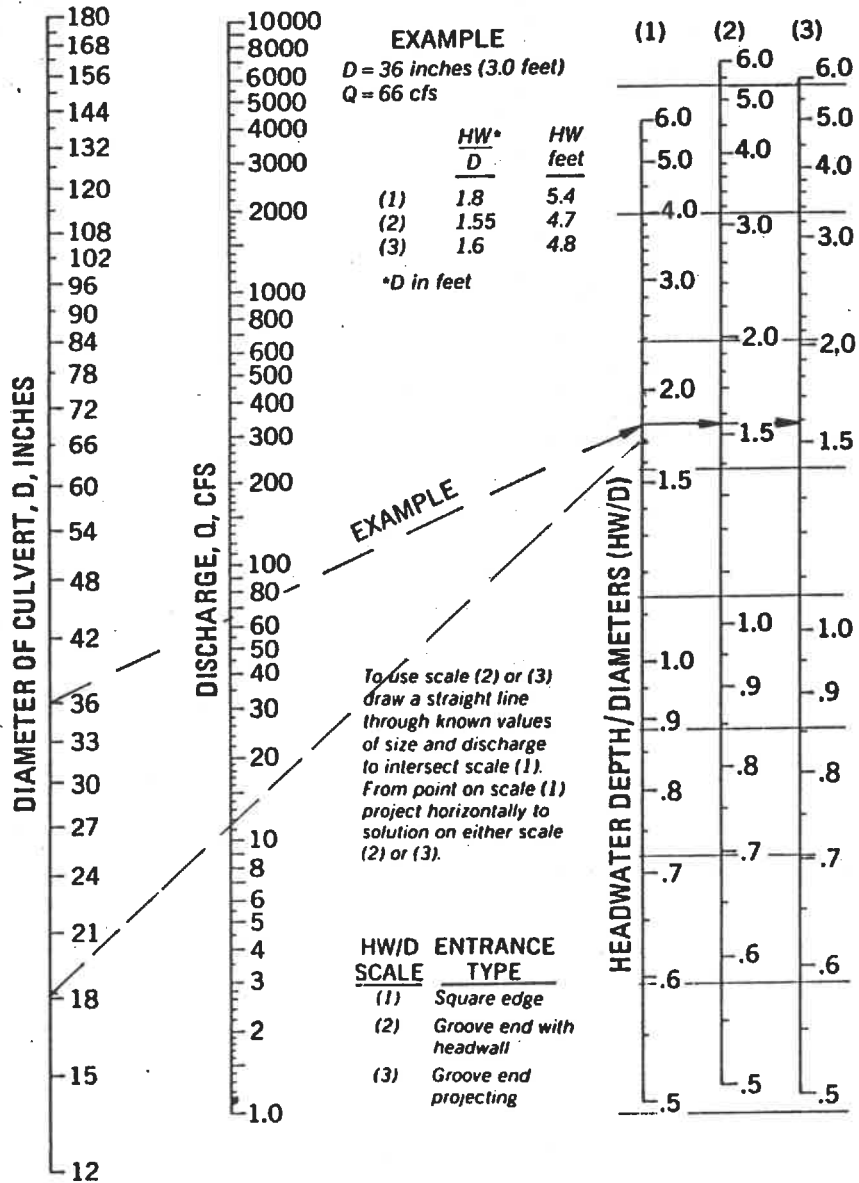


Figure 3.25. Headwater Depth for Circular Concrete Pipe Culverts with Inlet Control.

$HW = 2.5'$
 $D = 18" = 1.5'$
 $HW/D = 1.7$

DISCHARGE = ±12.0 CFS

PROJECT SHADOW BLUFF DATE 5/7/96 SHEET OF

ENGINEER C. WEIL DESIGN STORM 25 YR MANNINGS .013

Line Number	Upstream Manhole	Downstream Manhole	Length (ft)	C ₁	A ₁ (Acres)	C ₁ /A ₁	I _c /A ₁	S ₁ (ft/ft)	T ₁ (min)	I ₁ [Inches/Year]	Q (cfs)	Q (MGD)	Pipe Slope (%)	Pipe Capacity (cfs)	Velocity (ft/sec)	Travel Time (min)	Rim Elevation Upstream	Rim Elevation Downstream	Invert Elevation Upstream	Invert Elevation Downstream	Pipe Cover Upstream	Pipe Cover Downstream	
1	611	612	29	.53	1.5	.795	.795	22.0	22.0	4.31	3.41	12	14	15	3.6	4.45	.10	18	19	20	21	22	23
2	612	613	267	.67	.26	.17	.97	11.73	22.1	4.38	4.74	17	21.3	5.20	6.62	1.67							
3	614	615	20	.69	.30	.25	.25	17.00	17.00	4.84	12.1	12	.5	2.52	3.21	.15							
4	615	613	211	.57	.40	.23	.48	11.43	17.30	4.81	2.31	12	7.29	5.15	6.56	.53							
5	618	614	29	.45	1.91	.80	.80	21.51	21.51	4.42	3.83	12	1.16	3.84	4.89	.10							
6	619	620	100	.53	.79	.42	1.28	16.58	21.61	4.42	5.65	15	.96	16.33	5.14	.32							
7	621	622	80	---	---	---	---	---	---	---	16.10 (FROM BASIN 6)	12											
8	622	625	100	---	---	---	---	---	---	---	18.36	24	.60	18.37	5.85	.23							
9	623	625	5	.47	1.19	.56	.56	19.02	19.02	4.66	2.59	12	.53	2.59	3.30	.02							
10	624	626	5	.54	1.08	.58	.58	18.90	18.90	4.67	2.69	12	.57	2.69	3.43	.02							
11	625	626	29	.57	.57	.52	.88	21.29	21.29	4.05	3.91	24	2.96	38.91	12.39	---							
12	626	627	190	---	---	---	---	---	---	---	22.27	24	2.96	38.91	12.39	---							

Figure 7.2.1/
Storm Sewer Design Sheet - Rational Method

Flow Calculations for: **Line #1**

Mannings Flow Calculations, Pipes Flowing Full $V=0.59/n (D^{2/3}) (S^{1/2})$

Mannings = 0.013

Req'd Cap **3.49** cfs

Pipe Size = 12 Inches
Slope = 0.0096 ft/ft
Capacity = 3.49 cfs
Velocity = 4.45 fps

Flow Calculations for: **Line #2**

Mannings Flow Calculations, Pipes Flowing Full $V=0.59/n (D^{2/3}) (S^{1/2})$

Mannings = 0.013

Req'd Cap **4.24** cfs

Pipe Size = 12 Inches
Slope = 0.0213 ft/ft
Capacity = 5.20 cfs
Velocity = 6.62 fps

Flow Calculations for: **Line #3**

Mannings Flow Calculations, Pipes Flowing Full $V=0.59/n (D^{2/3}) (S^{1/2})$

Mannings = 0.013

Req'd Cap **1.21** cfs

Pipe Size = 12 Inches
Slope = 0.0050 ft/ft
Capacity = 2.52 cfs
Velocity = 3.21 fps

Flow Calculations for: **Line #4**

Mannings Flow Calculations, Pipes Flowing Full $V=0.59/n (D^{2/3}) (S^{1/2})$

Mannings = 0.013

Req'd Cap **2.31** cfs

Pipe Size = 12 Inches
Slope = 0.0209 ft/ft
Capacity = 5.15 cfs
Velocity = 6.56 fps

Flow Calculations for: **Line #5**

Mannings Flow Calculations, Pipes Flowing Full $V=0.59/n (D^{2/3}) (S^{1/2})$

Mannings = 0.013

Req'd Cap **3.83** cfs

Pipe Size = 12 Inches
Slope = 0.0116 ft/ft
Capacity = 3.84 cfs
Velocity = 4.89 fps

Flow Calculations for: **Line #6**

Mannings Flow Calculations, Pipes Flowing Full $V=0.59/n (D^{2/3}) (S^{1/2})$

Mannings = 0.013

Req'd Cap **5.65** cfs

Pipe Size = 15 Inches
Slope = 0.0096 ft/ft
Capacity = 6.33 cfs
Velocity = 5.16 fps

Flow Calculations for: **Line #7**

Mannings Flow Calculations, Pipes Flowing Full $V=0.59/n (D^{2/3}) (S^{1/2})$

Mannings = 0.013

Req'd Cap **18.36** cfs

Pipe Size = 24 Inches
Slope = 0.0066 ft/ft
Capacity = 18.37 cfs
Velocity = 5.85 fps

Flow Calculations for: **Line #8**

Mannings Flow Calculations, Pipes Flowing Full $V=0.59/n (D^{2/3}) (S^{1/2})$

Mannings = 0.013

Req'd Cap **18.36** cfs

Pipe Size = 21 Inches
Slope = 0.0264 ft/ft
Capacity = 25.74 cfs
Velocity = 10.71 fps

Flow Calculations for: **Line #9**

Mannings Flow Calculations, Pipes Flowing Full $V=0.59/n (D^{2/3}) (S^{1/2})$
Mannings = 0.013

Req'd Cap **2.59** cfs

Pipe Size = 12 Inches
Slope = 0.0053 ft/ft
Capacity = 2.59 cfs
Velocity = 3.30 fps

Flow Calculations for: **Line #10**

Mannings Flow Calculations, Pipes Flowing Full $V=0.59/n (D^{2/3}) (S^{1/2})$
Mannings = 0.013

Req'd Cap **2.69** cfs

Pipe Size = 12 Inches
Slope = 0.0057 ft/ft
Capacity = 2.69 cfs
Velocity = 3.43 fps

Flow Calculations for: **Line #11**

Mannings Flow Calculations, Pipes Flowing Full $V=0.59/n (D^{2/3}) (S^{1/2})$
Mannings = 0.013

Req'd Cap **3.91** cfs

Pipe Size = 24 Inches
Slope = 0.0296 ft/ft
Capacity = 38.91 cfs
Velocity = 12.39 fps

Flow Calculations for: **Line #12**

Mannings Flow Calculations, Pipes Flowing Full $V=0.59/n (D^{2/3}) (S^{1/2})$
Mannings = 0.013

Req'd Cap **21.83** cfs

Pipe Size = 24 Inches
Slope = 0.0296 ft/ft
Capacity = 38.91 cfs
Velocity = 12.39 fps