INTRODUCTION

Dan Buck Development, LLC is the owner of a 18 acre tract of property that lies along Voigt Road east of Oak Hill Road. The property is being proposed as a single family residential subdivision. The construction of this project will increase the storm runoff. The purpose of this report is to address the storm detention needs for this project and to demonstrate that the runoff generated from this project will be handled in an acceptable manner in accordance with the current Vanderburgh County drainage ordinance.

SITE CONDITIONS

The proposed development lies in an area that has a small hill located on its central portion. The runoff flows off said hill and toward the east. The development plan for this site shows two (2) separate basins to be constructed along the east line of the subdivision and will provide storm detention for the project. The basins will be substantially oversized and have much more than the required capacity to offset the fact that they partially lie within the fringe of the flood plain. The pool elevation will be set 1' below the existing grade to offset any flood plain volume lost to dam construction. The outlet structures will be sized to limit the outflows in excess of the requirements set forth in the drainage ordinance. The design will limit the discharge form a 100 year storm (developed conditions) to that of a 1 year storm (existing conditions). These larger than needed basins with smaller outlet pipes will make them much more effective during storms of lessor magnitude than that required by ordinance. Furthermore, the outlet to the basin will **not** contain a backflow mechanism so that the areas being a floodplain fringe area can continue to function as though the basin were not in place. As previously stated, the small amount of floodplain displaced by the short dam is insignificant compared to the amount of additional storage made available by the excavation and the lower pool elevation of 379.00.

METHOD

The storm detention analysis which follows is intended to quantify the proper amount of storm detention necessary to prevent additional downstream flooding caused by the development of the subject property.

The Rational Method ($Q = cia$) will be used as outlined in the HERPIC Manual (Chapter 6, particularly) to determine the storage requirements for the site. The undeveloped 10 year storm will be calculated, but a much smaller 1 year storm will also be analyzed and used as the allowable outflow rate under low flow conditions in the outlet ditch. The neighboring ditch that runs along the north end of the property will be cross sectioned. Mannings Formula will be used to determine the depth of flow in the ditch during a 25 and 100 year storm event.

These flow depths in the ditch will be analyzed and at any location where overtopping occurs a berm will be constructed so that this runoff does not cross over into the internal drainage network resulting in routing it through the lakes. The corresponding ditch elevation at the outlet location will then be used as the base elevatiopn from which all required detention will be calculated. Basin volumes will be computed from this established base elevation up to the top of dam elevation. The final dam height will be established at an elevation needed to provide adequate ponding has been made available. The undeveloped ***("c")*** value used will be taken from Table 804 of the Vanderburgh County Drainage Ordinance as a value indicative of the existing soil type, land use and terrain. The developed ***("c")*** values will be based on weighted ***("c")*** values calculated as shown in ***Appendix "B"***. The developed 25 year storm will be used to calculate the required storage volumes but the basins will be sized to a 100 year storm.

The inflow/outflow hydrographs for the 10/25, 10/100, 1/25 and 1/100 storms will be subsequently generated and the storage volume requirements tabulated (***See Appendix "C"***).

RESULTS

The owner will construct the holding basins in accordance with the attached grading plan. The majority of the project will be storm sewered to the basins. Some small perimeter areas may be routed to the basins in swales or pipes as needed to adequately convey it to the basins. The basin will be sized and designed to capture all of the required runoff and release it at an allowable runoff rate reflective of the entire site. The flow depths in the existing ditch along the north property line were analyzed to verify that the runoff in this ditch did not carry over into the project. In the area around Station 6+00 some overtopping is expected. This area and the area to the east will be built up to elevation 384 to act as the dam for Basin 2. This should eliminate any further cross over into the project.

All of the runoff from the developed part of the site including that not directly contributory to the basins will be assumed in the storage calculation to provide the proper amount of storage for the entire site.

The north basin (Basin 2) will contain a dual outlet structure with primary outlet sized to limit the discharge to the allowable outflow rate for the basins combined.

Basin 2 will be interconnected to the north basin (Basin 1) by way of a 12" RCP pipe with concrete end sections. This will enable the basins to act more uniformly and distribute all storm water throughout a larger area. The single discharge point in Basin 2 will route all stormwater

from the development north from Basin 1 through Basin 2 and away from the downstream landowners.

The outlet from Basin 2 will be set back at least 10 feet from the receiving ditch and said outlet channel shall be lined with riprap to allow for adequate dissipation of the energy of the storm water as it exits the outlet pipe. The bank opposite the outlet pipe will also be riprapped for a short section to eliminate any concerns regarding erosion of the channel at thsi location attributable to the potential for turbulence in the ditch where the two flows merge.

A summary of the outflow rates/outlet control devices, required storage and basin capacity for each lake and combined analysis follows:

Required storage:

(25 year storm) (based on ordinance 10 yr. outflow = 10.87) 32,960 cf
(based on < 1 yr outflow = 4.15) 56,018 cf

(100 year storm) (based on ordinance 10 yr. outflow = 10.87) 45,340 cf
(based on < 1 yr outflow = 4.15) 73,631 cf

Basins 1 & 2 Combined

Available storage (total pond volume from pool elevation to emergency spillway elevation)	Base elevations	379.00	(zero volume)
	To elevation	380.00	97,570 cf = (2.24 ac ft)
	To elevation	381.00	211,575 cf = (4.86 ac ft)
	To elevation	382.00	343,337 cf = (7.88 ac ft)
	To elevation (spillway)	383.00	494,791 cf = (11.35 ac ft)
	Top Dam	384.00	

The neighboring ditch to which the pond will outlet was cross sectioned at Sta. 7+50, 200' upstream from the location where the pond will discharge and again at Sta. 9+50 where the pond will discharge. The slope of the channel between these two points was calculated and the 25 and 100 year ditch flows and depths at each location 7+50 and 9+50 were determined as reported in Appendix F.

The results show:

@ Sta. 7+50 25 year storm (42 cfs) Water surface elevation = 381.23
@ Sta. 7+50 100 yr. storm (62.5 crs) Water surface elevation = 381.77
The channel elevation at Station 7+50 is 378.78'

@ Sta. 9+50 25 year storm (42 cfs) water surface elevation = 380.17
@ Sta. 9+50 100 yr. storm (62.5 cfs) water surface elevation = 380.55

Available storage (beyond 100 year storm elevation in outlet ditch at station 7+50 estimated to be @ elevation 381.77 ≈ 382.00)

Storage Base Elevation (100 yr) 382.00 (zero volume)
383.00 151,454 cf (3.48 acre/feet)

Note: 151,454 cf exceeds required storage for both 25 and 100 year storms listed on the previous page.

Note: Basin exceeds capacity required for both 25 and 100 year storms from elevation 382.00 to elevation 383.00.

A dual outlet structure is recommended with a 12" primary spillway and a 15" secondary spillway. Since the ponds from elevation 379.00 up to elevation 283.00 cannot be used to account for storage, it is recommended that the outlet pipe not contain any backflow device. This will allow the entire flood plain to continue to provide storage during large storm events as it currently does.

The basins are primarily to be constructed in ground with very few feet acting as a dam proper. No side slopes in the basin will exceed 3:1 with 4:1 constructed above the pool line unless site conditions dictate otherwise. The combined slopes on the dam front and back will not exceed 6:1. Minimum top width = 8'.

In summary, a 1 year vs. 100 year storm (worst storm analyzed) will require 91,561 (2.10 acre/feet) of storage, yet basin can store this amount with only 1' of rise between elevation 382.00, which is the estimated 100 year storm elevation in outlet ditch, and elevation 383.00 emergency spillway in lakes. Therefore, basin has more than adequate surplus capacity above the 25 year flow elevation in the adjoining ditch to allow for flood plain fringe installation.

APPENDICES INDEX

APPENDIX "A"

OVERALL DRAINAGE PLAN

APPENDIX "B"
RUNOFF COEFFICIENTS
TIME OF CONCENTRATION

TIME OF CONCENTRATION

$$TC = .827\left[\frac{(N)(L)}{\sqrt{S}}\right]^{.467}$$ (Kerby's Formula)

N = 0.4 Mowed
L = Length
S = Slope

L = 900'
H = 394 - 381 = 13"
S = 13 ÷ 900 = .0144

$$Tc = .827\left[\frac{(0.4)(900)}{\sqrt{.0144}}\right]^{.467} = 35 \text{ minutes}$$

INTENSITY

$$i( ) = \frac{C(T)^{\alpha}}{(Tc+d)^{\beta}}$$

Factors for Evansville

C = 1.9533 T = duration
α = 0.1747 Tc = Time of Concentration (10 yr. undeveloped)
d = 0.522
β = 1.6408

$$i_{10} = \frac{1.9533(10)^{0.1747}}{(35/60+0.522)^{1.6408}} = \frac{2.9206}{1.1786} = 2.48$$

$$i_{2} = \frac{1.9533(1)^{0.1747}}{(35/60+0.522)^{1.6408}} = \frac{1.9533}{1.1786} = 1.66$$

$$i_{1\ mo} = \frac{1.9533(1)\ (0.833)^{0.1747}}{(35/60+0.522)^{1.6408}} = \frac{1.2654}{1.1786} = 1.0737$$

APPENDIX "C"

STORAGE VOLUME OUTPUT DATA

PROJECT: ASHTON PARK SOUTH BASIN DATE: 05/14/99
ENGINEER:BERNARDIN LOCHMUELLER AND ASSOCIATES, INC

DESIGN RETURN PERIOD: 5\10\25\100
RELEASE RATE PERIOD: 5\10\25\100
WATERSHED AREA (ACRES): 14.62
TIME OF CONCENTRATION UNDEV. (min): 35
RAINFALL INTENSITY (INCHES/HR): 2.88 2.478022 2.443380
UNDEVELOPED RUNOFF COEFFICIENT: 0.3
UNDEVELOPED RUNOFF RATE (CFS): 10.87
DEVELOPED RUNOFF COEFFICIENT: 0.53

← 10 yr intensity (drain. ordinance)

25 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	8.02	62.11	10.87	51.24	0.342
0.17	6.20	48.03	10.87	37.16	0.526
0.25	5.26	40.79	10.87	29.93	0.623
0.33	4.62	35.79	10.87	24.93	0.685
0.42	4.09	31.66	10.87	20.80	0.728
0.50	3.72	28.83	10.87	17.96	0.748
0.58	3.42	26.52	10.87	15.65	0.757
0.67	3.15	24.39	10.87	13.52	0.755
0.75	2.94	22.79	10.87	11.92	0.745
0.83	2.76	21.41	10.87	10.54	0.729
0.92	2.59	20.06	10.87	9.19	0.705
1.00	2.45	19.01	10.87	8.14	0.679
1.25	2.11	16.38	10.87	5.51	0.574
1.50	1.86	14.43	10.87	3.56	0.445
1.75	1.67	12.91	10.87	2.05	0.298
2.00	1.51	11.70	10.87	0.83	0.138
2.50	1.27	9.86	10.87	-1.01	-0.210
3.00	1.10	8.53	10.87	-2.34	-0.585
4.00	0.87	6.72	10.87	-4.15	-1.384
5.00	0.71	5.54	10.87	-5.33	-2.222
6.00	0.61	4.70	10.87	-6.17	-3.083
7.00	0.53	4.08	10.87	-6.79	-3.959
8.00	0.46	3.60	10.87	-7.27	-4.846
9.00	0.41	3.22	10.87	-7.65	-5.740
10.00	0.37	2.90	10.87	-7.97	-6.639
11.00	0.34	2.64	10.87	-8.23	-7.542
12.00	0.31	2.42	10.87	-8.45	-8.449
24.00	0.15	1.16	10.87	-9.71	-19.413

PEAK STORAGE (ACRE/FT): 0.76
PEAK STORAGE (CUBIC FT): 32959.72 ← 25YR (10 YR outflow)

100 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	9.52	73.79	10.87	62.92	0.419
0.17	7.40	57.31	10.87	46.44	0.658
0.25	6.30	48.81	10.87	37.94	0.790
0.33	5.54	42.92	10.87	32.05	0.881
0.42	4.91	38.04	10.87	27.18	0.951
0.50	4.48	34.69	10.87	23.82	0.993
0.58	4.12	31.96	10.87	21.09	1.019
0.67	3.80	29.42	10.87	18.55	1.036
0.75	3.55	27.52	10.87	16.65	1.041
0.83	3.34	25.88	10.87	15.01	1.038
0.92	3.13	24.28	10.87	13.41	1.028
1.00	2.97	23.03	10.87	12.16	1.013
1.25	2.57	19.89	10.87	9.02	0.940
1.50	2.27	17.55	10.87	6.69	0.836
1.75	2.03	15.74	10.87	4.87	0.710
2.00	1.84	14.28	10.87	3.41	0.568
2.50	1.56	12.06	10.87	1.20	0.249
3.00	1.35	10.46	10.87	-0.41	-0.103
4.00	1.07	8.27	10.87	-2.60	-0.867
5.00	0.88	6.83	10.87	-4.03	-1.681
6.00	0.75	5.82	10.87	-5.05	-2.524
7.00	0.65	5.06	10.87	-5.81	-3.388
10.00	0.47	3.62	10.87	-7.25	-6.043
24.00	0.19	1.47	10.87	-9.40	-18.800

PEAK STORAGE (ACRE/FT): 1.04
PEAK STORAGE (CUBIC FT): 45339.79 ← 100YR (10YR outflow)

PROJECT: ASHTON PARK SOUTH BASIN DATE: 05/14/99
ENGINEER: BERNARDIN LOCHMUELLER AND ASSOCIATES, INC

DESIGN RETURN PERIOD: 5\10\25\100
RELEASE RATE PERIOD: 5\10\25\100
WATERSHED AREA (ACRES): 14.62
TIME OF CONCENTRATION UNDEV. (min): 88
RAINFALL INTENSITY (INCHES/HR): 1.57 0.945340 1.388453
UNDEVELOPED RUNOFF COEFFICIENT: 0.3
UNDEVELOPED RUNOFF RATE (CFS): 4.15
DEVELOPED RUNOFF COEFFICIENT: 0.53

1mo intensity

25 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	8.02	62.11	4.15	57.96	0.386
0.17	6.20	48.03	4.15	43.88	0.622
0.25	5.26	40.79	4.15	36.65	0.763
0.33	4.62	35.79	4.15	31.65	0.870
0.42	4.09	31.66	4.15	27.52	0.963
0.50	3.72	28.83	4.15	24.68	1.028
0.58	3.42	26.52	4.15	22.38	1.082
0.67	3.15	24.39	4.15	20.24	1.130
0.75	2.94	22.79	4.15	18.64	1.165
0.83	2.76	21.41	4.15	17.26	1.194
0.92	2.59	20.06	4.15	15.91	1.220
1.00	2.45	19.01	4.15	14.86	1.239
1.25	2.11	16.38	4.15	12.24	1.275
1.50	1.86	14.43	4.15	10.28	1.286
1.75	1.67	12.91	4.15	8.77	1.279
2.00	1.51	11.70	4.15	7.55	1.259
2.50	1.27	9.86	4.15	5.71	1.190
3.00	1.10	8.53	4.15	4.38	1.095
4.00	0.87	6.72	4.15	2.57	0.857
5.00	0.71	5.54	4.15	1.39	0.579
6.00	0.61	4.70	4.15	0.56	0.278
7.00	0.53	4.08	4.15	-0.07	-0.038

Peak storage (Ac/ft): 1.286 cf 25YR (1mo outflow)
Peak storage (cubic ft): 56,018 cf

100 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	9.52	73.79	4.15	69.64	0.464
0.17	7.40	57.31	4.15	53.16	0.753
0.25	6.30	48.81	4.15	44.67	0.931
0.33	5.54	42.92	4.15	38.77	1.066
0.42	4.91	38.04	4.15	33.90	1.186
0.50	4.48	34.69	4.15	30.54	1.273
0.58	4.12	31.96	4.15	27.81	1.344
0.67	3.80	29.42	4.15	25.28	1.411
0.75	3.55	27.52	4.15	23.38	1.461
0.83	3.34	25.88	4.15	21.73	1.503
0.92	3.13	24.28	4.15	20.13	1.543
1.00	2.97	23.03	4.15	18.88	1.573
1.25	2.57	19.89	4.15	15.74	1.640
1.50	2.27	17.55	4.15	13.41	1.676
1.75	2.03	15.74	4.15	11.59	1.690
2.00	1.84	14.28	4.15	10.13	1.688
2.50	1.56	12.06	4.15	7.92	1.650
3.00	1.35	10.46	4.15	6.31	1.578
4.00	1.07	8.27	4.15	4.12	1.374
5.00	0.88	6.83	4.15	2.69	1.120
6.00	0.75	5.82	4.15	1.67	0.837
7.00	0.65	5.06	4.15	0.92	0.534
10.00	0.47	3.62	4.15	-0.53	-0.441
24.00	0.19	1.47	4.15	-2.68	-5.355

PEAK STORAGE (ACRE/FT): 1.69
PEAK STORAGE (CUBIC FT): 73631.88

PROJECT: ASHTON PARK SOUTH BASIN DATE: 05/14/99
ENGINEER: BERNARDIN LOCHMUELLER AND ASSOCIATES, INC

DESIGN RETURN PERIOD:	5\10\25\100		
RELEASE RATE PERIOD:	5\10\25\100		
WATERSHED AREA (ACRES):	14.62		
TIME OF CONCENTRATION UNDEV. (min):	53.2		
RAINFALL INTENSITY (INCHES/HR):	2.22	1.664578	1.920673
UNDEVELOPED RUNOFF COEFFICIENT:	0.3		
UNDEVELOPED RUNOFF RATE (CFS):	7.30		
DEVELOPED RUNOFF COEFFICIENT:	0.53		

← 14YR intensity

25 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	8.02	62.11	7.30	54.81	0.365
0.17	6.20	48.03	7.30	40.73	0.577
0.25	5.26	40.79	7.30	33.49	0.698
0.33	4.62	35.79	7.30	28.49	0.784
0.42	4.09	31.66	7.30	24.36	0.853
0.50	3.72	28.83	7.30	21.53	0.897
0.58	3.42	26.52	7.30	19.22	0.929
0.67	3.15	24.39	7.30	17.08	0.954
0.75	2.94	22.79	7.30	15.49	0.968
0.83	2.76	21.41	7.30	14.11	0.976
0.92	2.59	20.06	7.30	12.76	0.978
1.00	2.45	19.01	7.30	11.71	0.976
1.25	2.11	16.38	7.30	9.08	0.946
1.50	1.86	14.43	7.30	7.13	0.891
1.75	1.67	12.91	7.30	5.61	0.819
2.00	1.51	11.70	7.30	4.40	0.733
2.50	1.27	9.86	7.30	2.56	0.533
3.00	1.10	8.53	7.30	1.23	0.307
4.00	0.87	6.72	7.30	-0.58	-0.194
5.00	0.71	5.54	7.30	-1.76	-0.735
6.00	0.61	4.70	7.30	-2.60	-1.299
7.00	0.53	4.08	7.30	-3.22	-1.878

100 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	9.52	73.79	7.30	66.49	0.443
0.17	7.40	57.31	7.30	50.01	0.708
0.25	6.30	48.81	7.30	41.51	0.865
0.33	5.54	42.92	7.30	35.62	0.980
0.42	4.91	38.04	7.30	30.74	1.076
0.50	4.48	34.69	7.30	27.39	1.141
0.58	4.12	31.96	7.30	24.66	1.192
0.67	3.80	29.42	7.30	22.12	1.235
0.75	3.55	27.52	7.30	20.22	1.264
0.83	3.34	25.88	7.30	18.58	1.285
0.92	3.13	24.28	7.30	16.98	1.302
1.00	2.97	23.03	7.30	15.73	1.310
1.25	2.57	19.89	7.30	12.59	1.311
1.50	2.27	17.55	7.30	10.25	1.282
1.75	2.03	15.74	7.30	8.44	1.230
2.00	1.84	14.28	7.30	6.98	1.163
2.50	1.56	12.06	7.30	4.76	0.992
3.00	1.35	10.46	7.30	3.16	0.789
4.00	1.07	8.27	7.30	0.97	0.322
5.00	0.88	6.83	7.30	-0.47	-0.194
6.00	0.75	5.82	7.30	-1.48	-0.741
7.00	0.65	5.06	7.30	-2.24	-1.306
10.00	0.47	3.62	7.30	-3.68	-3.070
24.00	0.19	1.47	7.30	-5.83	-11.664

PEAK STORAGE (ACRE/FT): 1.31
PEAK STORAGE (CUBIC FT): 57122.43 ← 100 yr (1 yr outflow)

PROJECT: ASHTON PARK NORTH &SOUTH COMB DATE: 05/14/99
ENGINEER:BERNARDIN LOCHMUELLER AND ASSOCIATES, INC

DESIGN RETURN PERIOD: 5\10\25\100
RELEASE RATE PERIOD: 5\10\25\100
WATERSHED AREA (ACRES): 18.18
TIME OF CONCENTRATION UNDEV. (min): 40
RAINFALL INTENSITY (INCHES/HR): 2.66 2.199431 2.270212
UNDEVELOPED RUNOFF COEFFICIENT: 0.3
UNDEVELOPED RUNOFF RATE (CFS): 12.00
DEVELOPED RUNOFF COEFFICIENT: 0.53

← 10YR Intensity (drain Ordinance)

25 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	8.02	77.23	12.00	65.24	0.435
0.17	6.20	59.72	12.00	47.72	0.676
0.25	5.26	50.73	12.00	38.73	0.807
0.33	4.62	44.51	12.00	32.51	0.894
0.42	4.09	39.38	12.00	27.38	0.958
0.50	3.72	35.85	12.00	23.85	0.994
0.58	3.42	32.98	12.00	20.99	1.014
0.67	3.15	30.32	12.00	18.33	1.023
0.75	2.94	28.34	12.00	16.34	1.021
0.83	2.76	26.62	12.00	14.62	1.012
0.92	2.59	24.95	12.00	12.95	0.993
1.00	2.45	23.64	12.00	11.64	0.970
1.25	2.11	20.37	12.00	8.38	0.873
1.50	1.86	17.94	12.00	5.95	0.744
1.75	1.67	16.06	12.00	4.06	0.593
2.00	1.51	14.55	12.00	2.55	0.425
2.50	1.27	12.26	12.00	0.26	0.055
3.00	1.10	10.60	12.00	-1.39	-0.348
4.00	0.87	8.35	12.00	-3.64	-1.214
5.00	0.71	6.89	12.00	-5.11	-2.129
6.00	0.61	5.85	12.00	-6.15	-3.074
7.00	0.53	5.07	12.00	-6.92	-4.037
8.00	0.46	4.48	12.00	-7.52	-5.013
9.00	0.41	4.00	12.00	-8.00	-5.998
10.00	0.37	3.61	12.00	-8.39	-6.990
11.00	0.34	3.28	12.00	-8.71	-7.986
12.00	0.31	3.01	12.00	-8.99	-8.986
24.00	0.15	1.45	12.00	-10.55	-21.101

PEAK STORAGE (ACRE/FT): 1.02
PEAK STORAGE (CUBIC FT): 44575.66 ← 25YR (10 YR outflow)

100 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	9.52	91.75	12.00	79.76	0.532
0.17	7.40	71.26	12.00	59.27	0.840
0.25	6.30	60.70	12.00	48.70	1.015
0.33	5.54	53.37	12.00	41.38	1.138
0.42	4.91	47.31	12.00	35.31	1.236
0.50	4.48	43.14	12.00	31.14	1.298
0.58	4.12	39.74	12.00	27.74	1.341
0.67	3.80	36.59	12.00	24.59	1.373
0.75	3.55	34.22	12.00	22.23	1.389
0.83	3.34	32.18	12.00	20.19	1.396
0.92	3.13	30.19	12.00	18.19	1.395
1.00	2.97	28.63	12.00	16.64	1.386
1.25	2.57	24.73	12.00	12.74	1.327
1.50	2.27	21.83	12.00	9.83	1.229
1.75	2.03	19.57	12.00	7.57	1.104
2.00	1.84	17.75	12.00	5.76	0.960
2.50	1.56	15.00	12.00	3.01	0.626
3.00	1.35	13.00	12.00	1.01	0.252
4.00	1.07	10.28	12.00	-1.71	-0.571
5.00	0.88	8.50	12.00	-3.50	-1.457
6.00	0.75	7.24	12.00	-4.76	-2.379
7.00	0.65	6.29	12.00	-5.70	-3.326
10.00	0.47	4.50	12.00	-7.50	-6.248
24.00	0.19	1.83	12.00	-10.17	-20.339

PEAK STORAGE (ACRE/FT): 1.40
PEAK STORAGE (CUBIC FT): 60821.98 ← 100 yr (10yr outflow)

PROJECT: ASHTON PARK NORTH &SOUTH COMB DATE: 05/14/99
ENGINEER:BERNARDIN LOCHMUELLER AND ASSOCIATES. INC

DESIGN RETURN PERIOD: 5\10\25\100
RELEASE RATE PERIOD: 5\10\25\100
WATERSHED AREA (ACRES): 18.18
TIME OF CONCENTRATION UNDEV. (min): 88
RAINFALL INTENSITY (INCHES/HR): 1.57 0.945340 1.388453
UNDEVELOPED RUNOFF COEFFICIENT: 0.3
UNDEVELOPED RUNOFF RATE (CFS): 5.16
DEVELOPED RUNOFF COEFFICIENT: 0.53

Intensity Reduced to less than 1YR storm outflow rate reduced to 5.16CFS

25 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	8.02	77.23	5.16	72.08	0.481
0.17	6.20	59.72	5.16	54.56	0.773
0.25	5.26	50.73	5.16	45.57	0.949
0.33	4.62	44.51	5.16	39.35	1.082
0.42	4.09	39.38	5.16	34.22	1.198
0.50	3.72	35.85	5.16	30.69	1.279
0.58	3.42	32.98	5.16	27.83	1.345
0.67	3.15	30.32	5.16	25.17	1.405
0.75	2.94	28.34	5.16	23.18	1.449
0.83	2.76	26.62	5.16	21.46	1.485
0.92	2.59	24.95	5.16	19.79	1.517
1.00	2.45	23.64	5.16	18.48	1.540
1.25	2.11	20.37	5.16	15.22	1.585
1.50	1.86	17.94	5.16	12.79	1.599
1.75	1.67	16.06	5.16	10.90	1.590
2.00	1.51	14.55	5.16	9.39	1.565
2.50	1.27	12.26	5.16	7.10	1.480
3.00	1.10	10.60	5.16	5.45	1.362
4.00	0.87	8.35	5.16	3.20	1.066
5.00	0.71	6.89	5.16	1.73	0.720
6.00	0.61	5.85	5.16	0.69	0.346
7.00	0.53	5.07	5.16	-0.08	-0.047
8.00	0.46	4.48	5.16	-0.68	-0.453
9.00	0.41	4.00	5.16	-1.16	-0.868
10.00	0.37	3.61	5.16	-1.55	-1.290
11.00	0.34	3.28	5.16	-1.87	-1.716
12.00	0.31	3.01	5.16	-2.15	-2.147
24.00	0.15	1.45	5.16	-3.71	-7.422

PEAK STORAGE (ACRE/FT): 1.60
PEAK STORAGE (CUBIC FT): 69636.28

← 25YR (1HO. outflow)

100 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	9.52	91.75	5.16	86.60	0.577
0.17	7.40	71.26	5.16	66.11	0.937
0.25	6.30	60.70	5.16	55.54	1.157
0.33	5.54	53.37	5.16	48.22	1.326
0.42	4.91	47.31	5.16	42.15	1.475
0.50	4.48	43.14	5.16	37.98	1.582
0.58	4.12	39.74	5.16	34.58	1.672
0.67	3.80	36.59	5.16	31.43	1.755
0.75	3.55	34.22	5.16	29.07	1.817
0.83	3.34	32.18	5.16	27.03	1.869
0.92	3.13	30.19	5.16	25.03	1.919
1.00	2.97	28.63	5.16	23.48	1.956
1.25	2.57	24.73	5.16	19.58	2.039
1.50	2.27	21.83	5.16	16.67	2.084
1.75	2.03	19.57	5.16	14.41	2.102
2.00	1.84	17.75	5.16	12.60	2.100
2.50	1.56	15.00	5.16	9.85	2.051
3.00	1.35	13.00	5.16	7.85	1.962
4.00	1.07	10.28	5.16	5.13	1.709
5.00	0.88	8.50	5.16	3.34	1.393
6.00	0.75	7.24	5.16	2.08	1.041
7.00	0.65	6.29	5.16	1.14	0.664
10.00	0.47	4.50	5.16	-0.66	-0.548
24.00	0.19	1.83	5.16	-3.33	-6.659

PEAK STORAGE (ACRE/FT): 2.10
PEAK STORAGE (CUBIC FT): 91561.39 ← 100yr (1MO outflow)

PROJECT: ASHTON PARK NORTH &SOUTH COMB DATE: 05/14/99
ENGINEER:BERNARDIN LOCHMUELLER AND ASSOCIATES, INC

DESIGN RETURN PERIOD:	5\10\25\100		
RELEASE RATE PERIOD:	5\10\25\100		
WATERSHED AREA (ACRES):	18.18		
TIME OF CONCENTRATION UNDEV. (min):	60		
RAINFALL INTENSITY (INCHES/HR):	2.05	1.466097	1.783001
UNDEVELOPED RUNOFF COEFFICIENT:	0.3		
UNDEVELOPED RUNOFF RATE (CFS):	8.00		
DEVELOPED RUNOFF COEFFICIENT:	0.53		

1YR outflow

25 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	8.02	77.23	8.00	69.24	0.462
0.17	6.20	59.72	8.00	51.72	0.733
0.25	5.26	50.73	8.00	42.73	0.890
0.33	4.62	44.51	8.00	36.51	1.004
0.42	4.09	39.38	8.00	31.38	1.098
0.50	3.72	35.85	8.00	27.85	1.161
0.58	3.42	32.98	8.00	24.99	1.208
0.67	3.15	30.32	8.00	22.33	1.247
0.75	2.94	28.34	8.00	20.34	1.271
0.83	2.76	26.62	8.00	18.62	1.288
0.92	2.59	24.95	8.00	16.95	1.299
1.00	2.45	23.64	8.00	15.64	1.304
1.25	2.11	20.37	8.00	12.38	1.289
1.50	1.86	17.94	8.00	9.95	1.244
1.75	1.67	16.06	8.00	8.06	1.176
2.00	1.51	14.55	8.00	6.55	1.092
2.50	1.27	12.26	8.00	4.26	0.888
3.00	1.10	10.60	8.00	2.61	0.652
4.00	0.87	8.35	8.00	0.36	0.119
5.00	0.71	6.89	8.00	-1.11	-0.463
6.00	0.61	5.85	8.00	-2.15	-1.074
7.00	0.53	5.07	8.00	-2.92	-1.704
8.00	0.46	4.48	8.00	-3.52	-2.347
9.00	0.41	4.00	8.00	-4.00	-2.998
10.00	0.37	3.61	8.00	-4.39	-3.657
11.00	0.34	3.28	8.00	-4.71	-4.320
12.00	0.31	3.01	8.00	-4.99	-4.987
24.00	0.15	1.45	8.00	-6.55	-13.102

PEAK STORAGE (ACRE/FT): 1.30
PEAK STORAGE (CUBIC FT): 56786.81 ← 25 YR (1 YR outflow)

100 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	9.52	91.75	8.00	83.76	0.558
0.17	7.40	71.26	8.00	63.27	0.896
0.25	6.30	60.70	8.00	52.70	1.098
0.33	5.54	53.37	8.00	45.38	1.248
0.42	4.91	47.31	8.00	39.31	1.376
0.50	4.48	43.14	8.00	35.14	1.464
0.58	4.12	39.74	8.00	31.74	1.534
0.67	3.80	36.59	8.00	28.59	1.596
0.75	3.55	34.22	8.00	26.23	1.639
0.83	3.34	32.18	8.00	24.19	1.673
0.92	3.13	30.19	8.00	22.19	1.701
1.00	2.97	28.63	8.00	20.64	1.720
1.25	2.57	24.73	8.00	16.74	1.743
1.50	2.27	21.83	8.00	13.83	1.729
1.75	2.03	19.57	8.00	11.57	1.688
2.00	1.84	17.75	8.00	9.76	1.626
2.50	1.56	15.00	8.00	7.01	1.460
3.00	1.35	13.00	8.00	5.01	1.252
4.00	1.07	10.28	8.00	2.29	0.762
5.00	0.88	8.50	8.00	0.50	0.210
6.00	0.75	7.24	8.00	-0.76	-0.380
7.00	0.65	6.29	8.00	-1.70	-0.993
10.00	0.47	4.50	8.00	-3.50	-2.915
24.00	0.19	1.83	8.00	-6.17	-12.340

PEAK STORAGE (ACRE/FT): 1.74
PEAK STORAGE (CUBIC FT): 75943.78 ← 100 YR (1 YR outflow

APPENDIX "D"
OUTLET CONTROL STRUCTURE ANALYSIS

BERNARDIN, LOCHMUELLER & ASSOCIATES, INC.
6200 Vogel Rd ■ Evansville IN 47715-4006
(812) 479-6200 ■ (800) 423-7411 ■ (812) 479-6262 FAX

FAX

TO: Bill Jeffers FROM: Jerry Campbell

COMPANY: PAGES: 4

FAX: 435-5023 DATE: 5-22-99

RE: Dalton Park PROJECT NUMBER: 198-0288

☒ URGENT ☐ FOR REVIEW ☐ PLEASE COMMENT ☒ PLEASE REPLY

COMMENTS:

Insert these pages in Appendix "D".

I put 2 printouts for 15" ϕ pipes instead of 1 for 12" and 1 for 15."

Sorry for inconvenience!

CURRENT DATE: 05-20-1999
CURRENT TIME: 15:12:48

FILE DATE: 05-20-1999
FILE NAME: ASHTON1

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.0

SITE DATA — CULVERT SHAPE, MATERIAL, INLET

NO.	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS	SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	379.00	378.50	64.00	1	RCP	1.00	1.00	.012	CONVENTIONAL
2									
3									
4									
5									
6									

12" ϕ pipe
TAILWATER = 381.75
See Appx F

SUMMARY OF CULVERT FLOWS (cfs) FILE: ASHTON1 DATE: 05-20-1999

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
381.75	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
381.83	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
382.07	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
382.48	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
383.04	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
383.76	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
383.89	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
385.69	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
386.90	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
388.27	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
389.80	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	OVERTOPPING

Too High
Above Emergency Flood

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: ASHTON1 DATE: 05-20-1999

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
381.75	0.000	0.00	0.00	0.00
381.83	0.000	1.00	0.00	0.00
382.07	0.000	2.00	0.00	0.00
382.48	0.000	3.00	0.00	0.00
383.04	0.000	4.00	0.00	0.00
383.76	0.000	5.00	0.00	0.00
383.89	0.000	5.16	0.00	0.00
385.69	0.000	7.00	0.00	0.00
386.90	0.000	8.00	0.00	0.00
388.27	0.000	9.00	0.00	0.00
389.80	0.000	10.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

05-20-1999 FILE DATE: 05-20-1999
: 15:12:48 FILE NAME: ASHTON1

DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD

RMANCE CURVE FOR CULVERT 1 - 1(1.00 (ft) BY 1.00 (ft)) RCP

DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD

	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
00	381.75	0.00	2.75	0-NF	0.00	0.00	0.00	3.25	0.00	0.00
..00	381.83	0.60	2.83	4-FFt	0.37	0.42	1.00	3.25	1.27	0.00
2.00	382.07	0.92	3.07	4-FFt	0.55	0.60	1.00	3.25	2.55	0.00
3.00	382.48	1.25	3.48	4-FFt	0.73	0.74	1.00	3.25	3.82	0.00
4.00	383.04	1.69	4.04	4-FFt	1.00	0.84	1.00	3.25	5.09	0.00
5.00	383.76	2.27	4.76	4-FFt	1.00	0.92	1.00	3.25	6.37	0.00
5.16	383.89	2.38	4.89	4-FFt	1.00	0.94	1.00	3.25	6.57	0.00
7.00	385.69	3.82	6.69	4-FFt	1.00	1.00	1.00	3.25	8.91	0.00
8.00	386.90	4.79	7.90	4-FFt	1.00	1.00	1.00	3.25	10.19	0.00
9.00	388.27	5.94	9.27	4-FFt	1.00	1.00	1.00	3.25	11.46	0.00
10.00	389.80	7.42	10.80	4-FFt	1.00	1.00	1.00	3.25	12.73	0.00

DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD

El. inlet face invert 379.00 ft El. outlet invert 378.50 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD

***** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	379.00 ft
OUTLET STATION	64.00 ft
OUTLET ELEVATION	378.50 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0078
CULVERT LENGTH ALONG SLOPE	64.00 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	1.00 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD

CURRENT DATE: 05-20-1999
CURRENT TIME: 15:12:48

FILE DATE: 05-20-1999
FILE NAME: ASHTON1

DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD
DDDDDDDDDDDDDDDDDDDDDDDDDD TAILWATER DDDDDDDDDDDDDDDDDDDDDDDDDD
DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD
DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD

CONSTANT WATER SURFACE ELEVATION
381.75 CONSTANT TAILWATER

DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD
DDDDDDDDDDDDDDDDDDDDDDDDDD ROADWAY OVERTOPPING DATA DDDDDDDDDDDDDDDDDDDDDDDDDD
DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	0.00 ft
CREST LENGTH	20.00 ft
OVERTOPPING CREST ELEVATION	383.00 ft

DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD

BERNARDIN · LOCHMUELLER & ASSOCIATES, INC.
ENGINEERING · SURVEYING · PLANNING · ENVIRONMENTAL SERVICES
6200 VOGEL ROAD
EVANSVILLE, INDIANA 47715-4006
TEL. (812) 479-6200 · TOLL FREE (800) 423-7411 · FAX (812) 479-6262

May 20, 1999

Vanderburgh County Surveyor
Attn: Mr. Bill Jeffers
Room 325 Civic Center Complex
Evansville, IN 47708

RE: Ashton Park Subdivision
Drainage Plan Submittal
BLA No. 198-0288-0PD

Dear Bill,

Enclosed is a revised Storm Drainage Analysis report and plan for your review. Following is a list of revisions made to the drainage report for the above referenced project which is numbered coinciding with the numbering in your review comments. Please review the report to confirm that all areas of concern have been addressed.

Comments:

1. Zone A has been added to the drainage plan.
2. The 25 year flood elevation cannot be determined without an extensive study. What has been determined is the 25 year flow depth in the north ditch at various locations throughout. All storage in the lake is to be accounted for above the 25 year ditch flowline elevation during a 25 year storm at a point 200 feet upstream from the pond outlet location. However, no back water analysis is accounted for in this ditch flow.
3. Outfall elevation at Structure #118 = 378.50
4. The ditch was analyzed every 200 feet along the north property line, Station 0+00 being the northwest corner of the subject property. 25 year and 100 year flows were entered into the analysis and the results are shown in Appendix F of the report.
5. Structure #118 will have a primary spillway pipe 12 inches in diameter and a 15" diameter secondary outlet pipe. These pipes were sized assuming a tailwater of 381.75 feet as the ditch elevation at Station 7+50, 200 feet upstream of the outfall (see Appendix D of the report).
6. Interconnect pipe (Str. 115/116) will be a 12" diameter pipe.
7. Owner suggests that all swales 0.8 or steeper will not be paved, but will be lined with an erosion control mat in accordance with the erosion control plan when prepared.
8. Easements on plat will be revisited to coincide with basins, pipes, etc.
9. Structure #115/116 was originally submerged to minimize lake shore maintenance. The pipe will be reestablished at pool so that a visual inspection of the pipe can be easily made at any given time.
10. Pipe will be RCP—length may be shortened if SIGECO will allow encroachment into their easement.
11. Ditch cross sections shown in Appendix F of report.
12. Capacity of ditch shown in Appendix F of report.
13. Emergency outflow will be designated on drainage plan
14. Depth of lakes will be a minimum of 6'—developer will excavate deeper than 6' as needed for structural fill and as soils will allow.
15. Individual lot owners will be responsible for abiding by current ordinances and established erosion control practices and to install acceptable means of controlling erosion until such time that vegetation is reestablished.

16, 17, & 20 *The following notes will appear on the plat:*

"Erosion Control for Ditches

- Slopes of 0% - 2% shall be mulched and seeded with forty-five (45) days of disturbance.
- Slopes of 2% - 8% shall be sodded or stabilized with an erosion control mat at the completion of ditch grading.

- Slopes of more than 6% shall be mulched and seeded and shall have straw bales and/or erosion blankets in place within five (5) days of disturbance of soil which must remain in place until final grading and seeding.

Storm Drainage Maintenance. The Ashton Park Homeowners Association shall be responsible financially, including repair and maintenance of the entire storm water drainage system, its parts and easements within this subdivision and outside the Vanderburgh County accepted rights-of-way, including:

a. Enforcing the mowing and cleaning obligations of the individual lot owners, plus mowing, controlling weeds, and maintaining the designated cover of the waterways, basin areas and easements within this subdivision.
b. Keeping all parts of the storm water drainage system operating at all times as designed and as constructed; and free of all trash, debris, and obstructions to the flow of water.
c. Keeping the channels, embankments, shorelines, and bottoms of waterways and basins free of all erosion and sedimentation.
d. Maintaining and repairing the storm water drainage system, including pipes, inlets, outlets and riprap in accordance with the conditions described on the approved street and/or drainage plans on file in the County Engineer's or County Surveyor's office; and in compliance with the Vanderburgh County Drainage Ordinance.
e. Preventing all persons or parties from causing any unauthorized alterations, obstructions or detrimental actions from occurring to any part of the storm water drainage system and easements within this subdivision.
f. Any pipe, fence, wall, building, pool, patio, planting, stored material, excavation, fill or other construction, improvement, addition to, or alternation of the land within a drainage easement in this subdivision requires the prior written approval of the Vanderburgh County Drainage Board.
g. The foregoing obligation for Storm Drainage Maintenance is a requirement of Vanderburgh County and is enforceable by Vanderburgh County.

The exception to the above storm drainage maintenance is that those lakeshore areas and rear yard swales that lie within the individual lots will be mowed by individual lot owners. This does not apply to those areas within lots that lie on the opposite side of the lake away from what would be considered the lot owner's back yard. Mowing and maintenance of these areas will be the responsibility of the homeowner's association."

18. The grading plan has been reworked to allow for greater separation between the onsite drainage swale and the offsite drainage ditch.
19&22 The outlet will be pulled back away from the receiving ditch and the outlet channel lined with riprap.
21. The purpose of Area Drain 105 is to minimize erosion on downslope to lake

One additional concern not outlined in your comments is the runoff in the roadside ditch along Voigt Road. This roadside ditch will be diverted into Basin 1.

If you have any additional questions or concerns, please do not hesitate to call me.

Sincerely,

BERNARDIN·LOCHMUELLER & ASSOCIATES, INC.

James A. Farny, P.E., L.S.
Project Engineer III

jaf/tac

Encls.
cc: File

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CURRENT DATE: 05-20-1999
CURRENT TIME: 15:09:36

FILE DATE: 05-20-1999
FILE NAME: ASHTON1

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.0

SITE DATA

CULVERT SHAPE, MATERIAL, INLET

NO.	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	SHAPE	MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	379.00	378.50	64.00	1	RCP	1.25	1.25	.012	CONVENTIONAL
2									
3									
4									
5									
6									

3 BARRELS

15" ϕ PIPE
TAILWATER = 381.75
See Appx F

SUMMARY OF CULVERT FLOWS (cfs) FILE: ASHTON1 DATE: 05-20-1999

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
381.75	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
381.78	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
381.86	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
382.01	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
382.21	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
382.46	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
382.51	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
383.15	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
383.57	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
384.06	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
384.60	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

HW = 382.51 OK

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: ASHTON1 DATE: 05-20-1999

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
381.75	0.000	0.00	0.00	0.00
381.78	0.000	1.00	0.00	0.00
381.86	0.000	2.00	0.00	0.00
382.01	0.000	3.00	0.00	0.00
382.21	0.000	4.00	0.00	0.00
382.46	0.000	5.00	0.00	0.00
382.51	0.000	5.16	0.00	0.00
383.15	0.000	7.00	0.00	0.00
383.57	0.000	8.00	0.00	0.00
384.06	0.000	9.00	0.00	0.00
384.60	0.000	10.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 05-20-1999
CURRENT TIME: 15:09:36

FILE DATE: 05-20-1999
FILE NAME: ASHTON1

PERFORMANCE CURVE FOR CULVERT 1 - 1(1.25 (ft) BY 1.25 (ft)) RCP

DISCHARGE FLOW (cfs)	HEADWATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	381.75	0.00	2.75	0-NF	0.00	0.00	0.00	3.25	0.00	0.00
1.00	381.78	0.52	2.78	4-FFt	0.34	0.39	1.25	3.25	0.81	0.00
2.00	381.86	0.81	2.86	4-FFt	0.49	0.56	1.25	3.25	1.63	0.00
3.00	382.01	1.04	3.01	4-FFt	0.61	0.69	1.25	3.25	2.44	0.00
4.00	382.21	1.26	3.21	4-FFt	0.73	0.81	1.25	3.25	3.26	0.00
5.00	382.46	1.50	3.46	4-FFt	0.85	0.90	1.25	3.25	4.07	0.00
5.16	382.51	1.54	3.51	4-FFt	0.87	0.92	1.25	3.25	4.20	0.00
7.00	383.15	2.12	4.15	4-FFt	1.25	1.05	1.25	3.25	5.70	0.00
8.00	383.57	2.51	4.57	4-FFt	1.25	1.11	1.25	3.25	6.52	0.00
9.00	384.06	2.96	5.06	4-FFt	1.25	1.17	1.25	3.25	7.33	0.00
10.00	384.60	3.47	5.60	4-FFt	1.25	1.23	1.25	3.25	8.15	0.00

El. inlet face invert 379.00 ft El. outlet invert 378.50 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION	0.00 ft
INLET ELEVATION	379.00 ft
OUTLET STATION	64.00 ft
OUTLET ELEVATION	378.50 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0078
CULVERT LENGTH ALONG SLOPE	64.00 ft

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	1.25 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 05-20-1999
CURRENT TIME: 15:09:36

FILE DATE: 05-20-1999
FILE NAME: ASHTON1

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DDDDDDDDDDDDDDDDDDDDDDDDDD TAILWATER DDDDDDDDDDDDDDDDDDDDDDDDDD
DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD
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CONSTANT WATER SURFACE ELEVATION
381.75 CONSTANT TAILWATER

DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD
DDDDDDDDDDDDDDDDDDDDDDDDDD ROADWAY OVERTOPPING DATA DDDDDDDDDDDDDDDDDDDDDDDDDD
DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	0.00 ft
CREST LENGTH	20.00 ft
OVERTOPPING CREST ELEVATION	383.00 ft

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CURRENT DATE: 05-20-1999
CURRENT TIME: 15:09:36

FILE DATE: 05-20-1999
FILE NAME: ASHTON1

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.0

SITE DATA — CULVERT SHAPE, MATERIAL, INLET

NO.	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	SHAPE	MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	379.00	378.50	64.00	1	RCP	1.25	1.25	.012	CONVENTIONAL
2									
3									
4									
5									
6									

15" ϕ PIPE
TAILWATER = 381.75
See Appx F

SUMMARY OF CULVERT FLOWS (cfs) FILE: ASHTON1 DATE: 05-20-1999

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
381.75	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
381.78	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
381.86	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
382.01	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
382.21	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
382.46	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
382.51	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
383.15	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
383.57	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
384.06	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
384.60	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

HW = 382.51 OK

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: ASHTON1 DATE: 05-20-1999

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
381.75	0.000	0.00	0.00	0.00
381.78	0.000	1.00	0.00	0.00
381.86	0.000	2.00	0.00	0.00
382.01	0.000	3.00	0.00	0.00
382.21	0.000	4.00	0.00	0.00
382.46	0.000	5.00	0.00	0.00
382.51	0.000	5.16	0.00	0.00
383.15	0.000	7.00	0.00	0.00
383.57	0.000	8.00	0.00	0.00
384.06	0.000	9.00	0.00	0.00
384.60	0.000	10.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 05-20-1999
CURRENT TIME: 15:09:36

FILE DATE: 05-20-1999
FILE NAME: ASHTON1

PERFORMANCE CURVE FOR CULVERT 1 - 1(1.25 (ft) BY 1.25 (ft)) RCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	381.75	0.00	2.75	0-NF	0.00	0.00	0.00	3.25	0.00	0.00
1.00	381.78	0.52	2.78	4-FFt	0.34	0.39	1.25	3.25	0.81	0.00
2.00	381.86	0.81	2.86	4-FFt	0.49	0.56	1.25	3.25	1.63	0.00
3.00	382.01	1.04	3.01	4-FFt	0.61	0.69	1.25	3.25	2.44	0.00
4.00	382.21	1.26	3.21	4-FFt	0.73	0.81	1.25	3.25	3.26	0.00
5.00	382.46	1.50	3.46	4-FFt	0.85	0.90	1.25	3.25	4.07	0.00
5.16	382.51	1.54	3.51	4-FFt	0.87	0.92	1.25	3.25	4.20	0.00
7.00	383.15	2.12	4.15	4-FFt	1.25	1.05	1.25	3.25	5.70	0.00
8.00	383.57	2.51	4.57	4-FFt	1.25	1.11	1.25	3.25	6.52	0.00
9.00	384.06	2.96	5.06	4-FFt	1.25	1.17	1.25	3.25	7.33	0.00
10.00	384.60	3.47	5.60	4-FFt	1.25	1.23	1.25	3.25	8.15	0.00

El. inlet face invert 379.00 ft El. outlet invert 378.50 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION	0.00 ft
INLET ELEVATION	379.00 ft
OUTLET STATION	64.00 ft
OUTLET ELEVATION	378.50 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0078
CULVERT LENGTH ALONG SLOPE	64.00 ft

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	1.25 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 05-20-1999
CURRENT TIME: 15:09:36

FILE DATE: 05-20-1999
FILE NAME: ASHTON1

DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD
DDDDDDDDDDDDDDDDDDDDDDDDDD TAILWATER DDDDDDDDDDDDDDDDDDDDDDDDDD
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CONSTANT WATER SURFACE ELEVATION
381.75 CONSTANT TAILWATER

DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD
DDDDDDDDDDDDDDDDDDDDDDDDDD ROADWAY OVERTOPPING DATA DDDDDDDDDDDDDDDDDDDDDDDDDD
DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	0.00 ft
CREST LENGTH	20.00 ft
OVERTOPPING CREST ELEVATION	383.00 ft

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APPENDIX "E"
BASIN GEOMETRY

BASIN 1

ELEVATION	SURFACE AREA (square feet)	STAGED VOLUME (cubic feet)	ACCUMULATED VOLUME (cubic feet)	ACCUMULATED VOLUME (acre/feet)
Pool - 379.00	77,061	0	0	0
380.00	87,843	82,452	82,452	1.89
381.00	99,353	93,598	176,050	4.04
382.00	111,385	105,369	281,419	6.46
Emergency Spillway 383.00	124,145	117,765	399,184	9.16
Top Dam 384.00				

BASINS 1 & 2 COMBINED

ELEVATION	SURFACE AREA (square feet)	STAGED VOLUME (cubic feet)	ACCUMULATED VOLUME (cubic feet)	ACCUMULATED VOLUME (acre/feet)
Pool 379.00	89,720	0	0	0
380.00	105,419	97,570	97,570	2.24
381.00	122,592	114,005	211,575	4.86
382.00	140,931	131,762	343,337	7.88
Emergency Spillway 383.00	161,976	151,454	494,791	11.35
Top Dam 384.00				

NOTE:0 During 25 year storm the tailwater in the outlet ditch at Sta. 7+50 is at elevation 381.23 and during a 100 year storm is at elevation 381.77. A tailwater of 382.00 was assumed, therefore, only volumes from elevation 382.00 to elevation 383.00 can be used for storage.

Available storage volume from elev. 382 to 383 = 151,454 CF = 3.48 acre/feet

APPENDIX "F"
NORTH DITCH
FLOOR DEPTH ANALYSIS

NORTH DITCH FLOW SUMMARY

STATION	FLOW DITCH ELEVATION	TOP OF BANK LT.	TOP OF BANK RT.	25 YEAR FLOW DEPTH	100 YEAR FLOW DEPTH
0+00	381.03	385.08	386.56	383.56	384.06
2+50	380.16	384.44	384.22	382.44	382.83
4+00	379.94	383.90	383.37	382.38	382.76
5+00	379.71	383.52	382.51	382.20	*382.81
† 6+00	379.51	383.29	382.06	*382.27	*382.38
† 7+50	379.53	382.84	381.46	381.23	*381.77
† 9+50	377.62	382.47	381.87	380.17	380.55

* Denotes bank overflow

† From Station 6+00 to 9+50 earthen dam construction to elevation 384.00 will eliminate overtopping which currently exists along right bank

Worksheet
Worksheet for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 0+00
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.003500	ft/ft
Discharge	62.50	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.045	
Water Surface Elevation	384.06	ft
Elevation Range	381.03 to 386.56	
Flow Area	24.1	ft²
Wetted Perimeter	15.80	ft
Top Width	14.23	ft
Actual Depth	3.03	ft
Critical Elevation	382.80	ft
Critical Slope	0.032334	ft/ft
Velocity	2.59	ft/s
Velocity Head	0.10	ft
Specific Energy	384.16	ft
Froude Number	0.35	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
-0+20	-0+10	0.035
-0+10	0+14	0.045
0+14	0+87	0.035

Natural Channel Points

Station (ft)	Elevation (ft)
-0+20	385.20
-0+10	385.08
-0+06	383.02
-0+03	381.03
0+00	381.03
0+04	383.36
0+14	386.56
0+25	386.26
0+63	385.94

Worksheet
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+87	386.12

Table
Rating Table for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 0+00
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.003500	ft/ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

Attribute	Minimum	Maximum	Increment
Discharge (cfs)	0.00	70.00	5.00

Discharge (cfs)	Water Surface Elevation (ft)	Velocity (ft/s)	Flow Area (ft^2)	Wetted Perimeter (ft)	Top Width (ft)
0.00	381.03	0.00	0.0	0.00	0.00
5.00	381.89	1.38	3.6	6.13	5.65
10.00	382.27	1.67	6.0	7.59	6.89
15.00	382.55	1.86	8.1	8.68	7.83
20.00	382.78	2.01	10.0	9.57	8.59
25.00	382.98	2.13	11.8	10.35	9.26
30.00	383.16	2.23	13.5	11.05	9.86
35.00	383.32	2.32	15.1	11.69	10.41
40.00	383.48	2.38	16.8	12.53	11.18
45.00	383.63	2.43	18.5	13.37	11.96
50.00	383.76	2.48	20.2	14.13	12.67
55.00	383.89	2.52	21.8	14.84	13.33
60.00	384.00	2.57	23.4	15.49	13.94
65.00	384.11	2.61	24.9	16.10	14.51
70.00	384.21	2.65	26.4	16.68	15.05

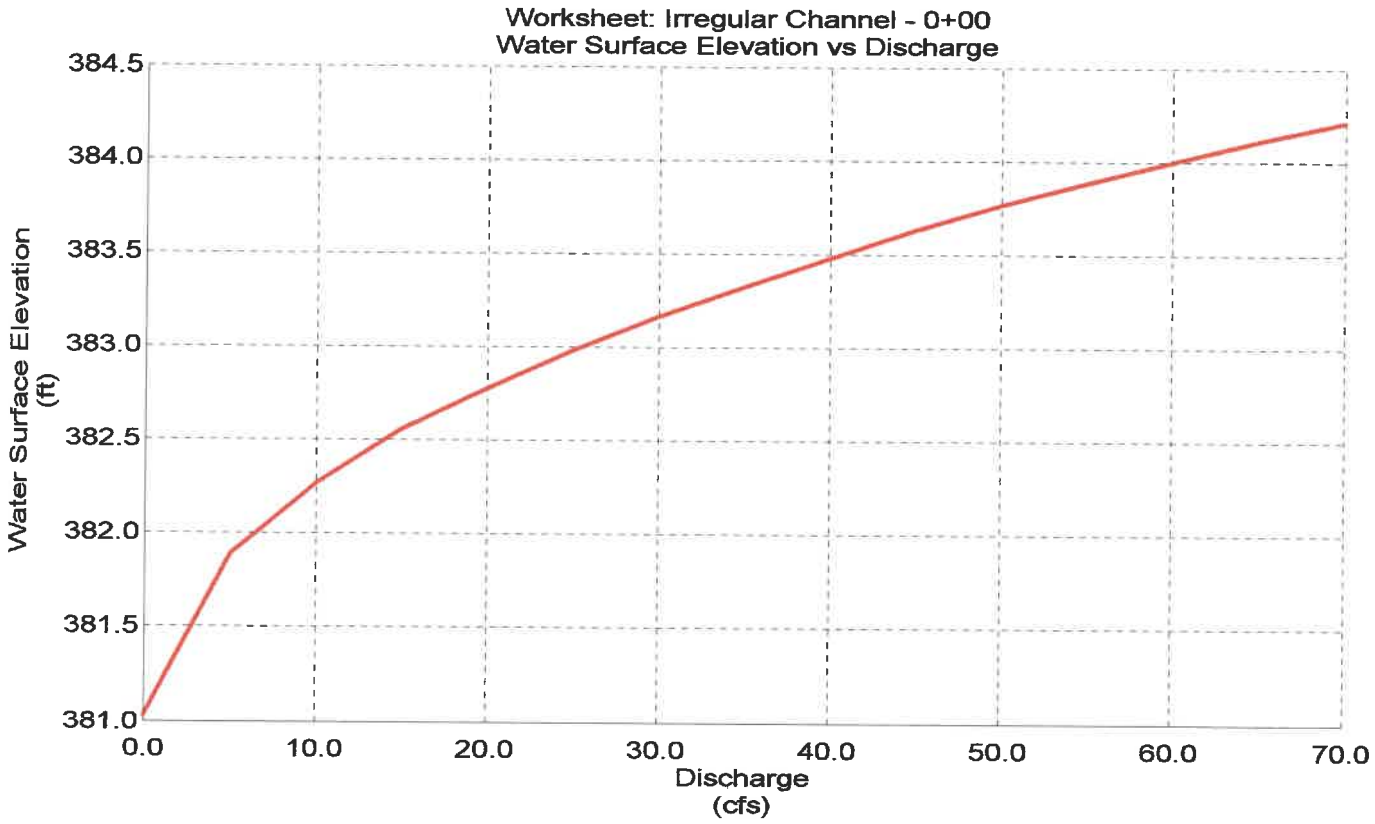
Curve
Plotted Curves for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 0+00
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.003500 ft/ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

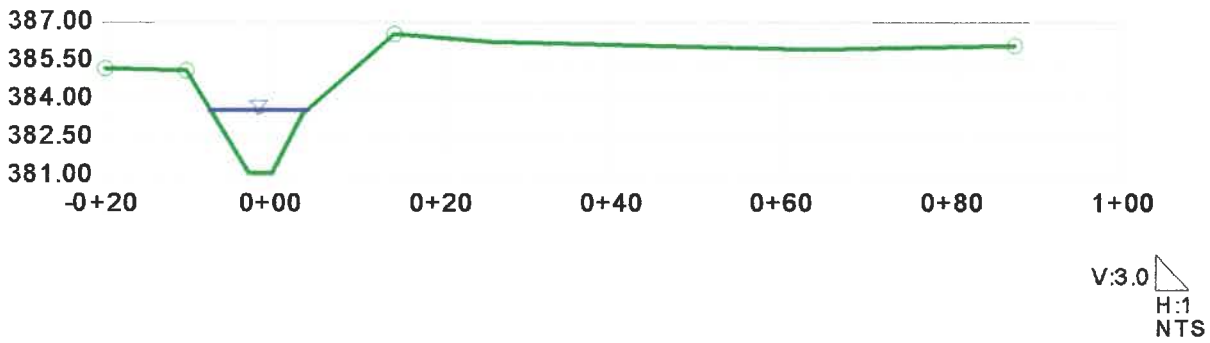
Attribute	Minimum	Maximum	Increment
Discharge (cfs)	0.00	70.00	5.00



25yr flow 0+00
Cross Section for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 0+00
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

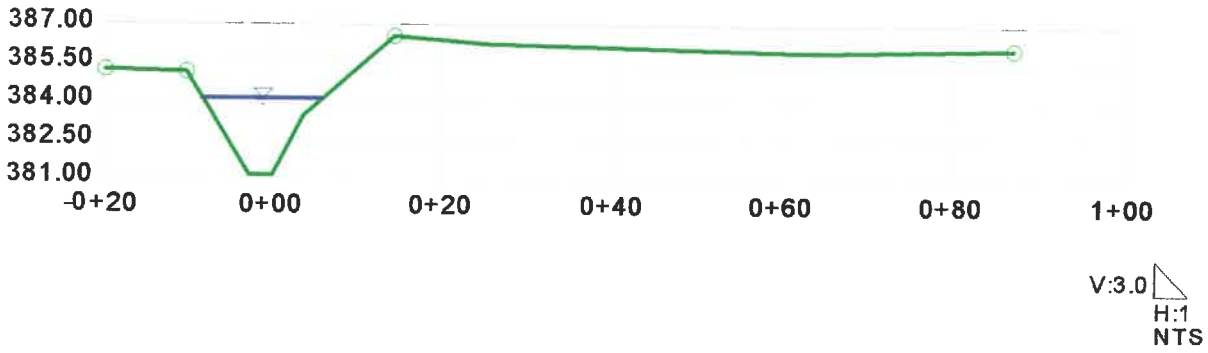
Section Data		
Mannings Coefficient	0.045	
Slope	0.003500	ft/ft
Water Surface Elevation	383.56	ft
Elevation Range	381.03 to 386.56	
Discharge	42.80	cfs



100yr flow 0+00
Cross Section for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 0+00
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.045	
Slope	0.003500	ft/ft
Water Surface Elevation	384.06	ft
Elevation Range	381.03 to 386.56	
Discharge	62.50	cfs



Worksheet
Worksheet for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 2+50
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.003500	ft/ft
Discharge	62.50	cfs

Options	
Current Roughness Method	mproved Lotter's Method
Open Channel Weighting Metho	mproved Lotter's Method
Closed Channel Weighting Meth	Horton's Method

Results		
Mannings Coefficient	0.045	
Water Surface Elevation	382.83	ft
Elevation Range	380.16 to 384.44	
Flow Area	25.4	ft²
Wetted Perimeter	18.04	ft
Top Width	17.11	ft
Actual Depth	2.67	ft
Critical Elevation	381.83	ft
Critical Slope	0.031773	ft/ft
Velocity	2.46	ft/s
Velocity Head	0.09	ft
Specific Energy	382.93	ft
Froude Number	0.36	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
-0+42	-0+17	0.035
-0+17	0+09	0.045
0+09	0+70	0.035

Natural Channel Points

Station (ft)	Elevation (ft)
-0+42	384.16
-0+17	384.44
-0+05	380.83
-0+03	380.16
-0+01	380.16
0+09	384.22
0+10	384.21
0+45	384.13
0+70	384.27

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Table
Rating Table for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 2+50
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.003500 ft/ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Attribute	Minimum	Maximum	Increment
Discharge (cfs)	0.00	70.00	5.00

Discharge (cfs)	Water Surface Elevation (ft)	Velocity (ft/s)	Flow Area (ft^2)	Wetted Perimeter (ft)	Top Width (ft)
0.00	380.16	0.00	0.0	0.00	0.00
5.00	381.03	1.29	3.9	7.17	6.87
10.00	381.37	1.55	6.5	9.18	8.76
15.00	381.61	1.71	8.7	10.64	10.14
20.00	381.81	1.84	10.8	11.83	11.25
25.00	381.97	1.95	12.8	12.84	12.21
30.00	382.12	2.04	14.7	13.73	13.05
35.00	382.25	2.12	16.5	14.54	13.81
40.00	382.38	2.20	18.2	15.28	14.51
45.00	382.49	2.26	19.9	15.96	15.16
50.00	382.60	2.32	21.5	16.60	15.76
55.00	382.70	2.38	23.1	17.20	16.32
60.00	382.79	2.43	24.7	17.77	16.86
65.00	382.88	2.48	26.2	18.31	17.36
70.00	382.96	2.53	27.7	18.82	17.85

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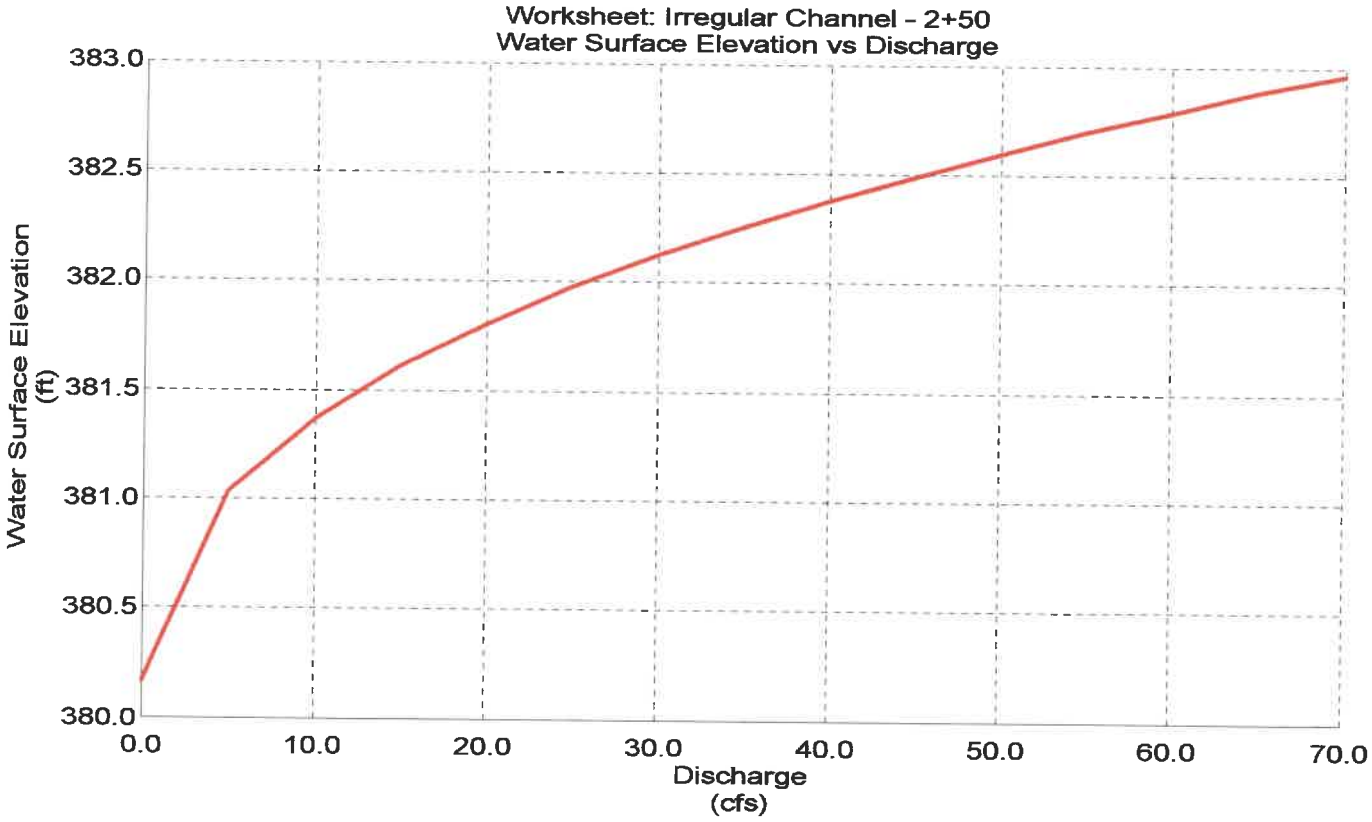
Curve
Plotted Curves for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 2+50
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.003500 ft/ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

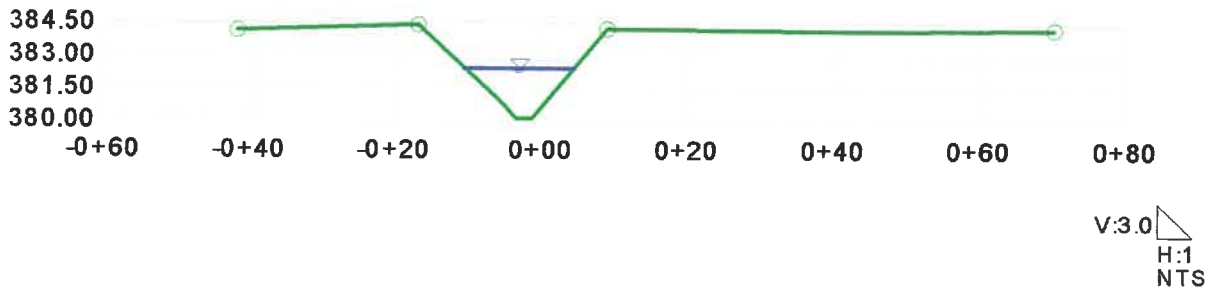
Attribute	Minimum	Maximum	Increment
Discharge (cfs)	0.00	70.00	5.00



25yr flow 2+50
Cross Section for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 2+50
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

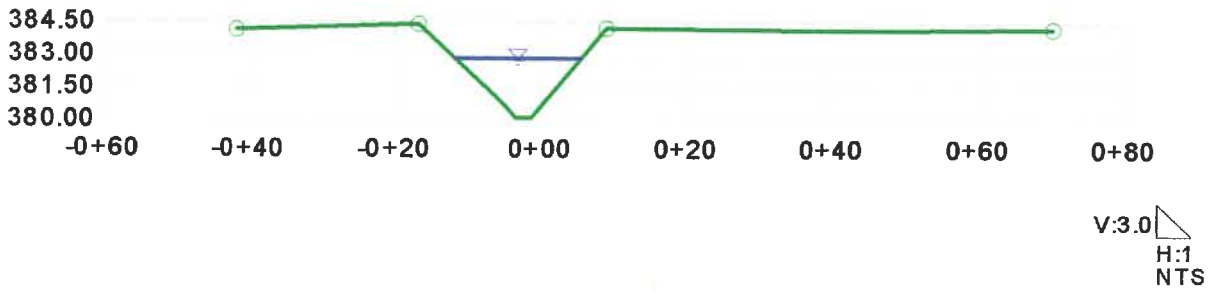
Section Data		
Mannings Coefficient	0.045	
Slope	0.003500	ft/ft
Water Surface Elevation	382.44	ft
Elevation Range	380.16 to 384.44	
Discharge	42.80	cfs



100yr flow 2+50
Cross Section for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 2+50
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.045	
Slope	0.003500	ft/ft
Water Surface Elevation	382.83	ft
Elevation Range	380.16 to 384.44	
Discharge	62.50	cfs



Worksheet
Worksheet for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 4+00
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.002300	ft/ft
Discharge	62.50	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.045	
Water Surface Elevation	382.76	ft
Elevation Range	379.94 to 383.92	
Flow Area	31.6	ft²
Wetted Perimeter	22.64	ft
Top Width	21.76	ft
Actual Depth	2.82	ft
Critical Elevation	381.61	ft
Critical Slope	0.032437	ft/ft
Velocity	1.98	ft/s
Velocity Head	0.06	ft
Specific Energy	382.82	ft
Froude Number	0.29	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
-0+40	-0+15	0.035
-0+15	0+12	0.045
0+12	1+11	0.035

Natural Channel Points

Station (ft)	Elevation (ft)
-0+40	383.62
-0+21	383.90
-0+17	383.92
-0+15	383.37
-0+02	379.94
0+00	379.94
0+01	380.57
0+12	383.37
0+33	383.09
0+61	383.39
1+11	383.61

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Table
Rating Table for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 4+00
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.002300 ft/ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Attribute	Minimum	Maximum	Increment
Discharge (cfs)	0.00	70.00	5.00

Discharge (cfs)	Water Surface Elevation (ft)	Velocity (ft/s)	Flow Area (ft^2)	Wetted Perimeter (ft)	Top Width (ft)
0.00	379.94	0.00	0.0	0.00	0.00
5.00	380.95	1.08	4.6	8.31	7.91
10.00	381.30	1.26	7.9	11.09	10.59
15.00	381.55	1.39	10.8	13.04	12.48
20.00	381.74	1.49	13.4	14.60	13.99
25.00	381.91	1.58	15.8	15.93	15.27
30.00	382.06	1.65	18.2	17.09	16.40
35.00	382.19	1.71	20.4	18.14	17.41
40.00	382.31	1.77	22.6	19.09	18.33
45.00	382.42	1.82	24.7	19.97	19.18
50.00	382.53	1.87	26.7	20.79	19.98
55.00	382.63	1.92	28.7	21.56	20.72
60.00	382.72	1.96	30.6	22.29	21.43
65.00	382.81	2.00	32.5	22.98	22.09
70.00	382.89	2.03	34.4	23.63	22.73

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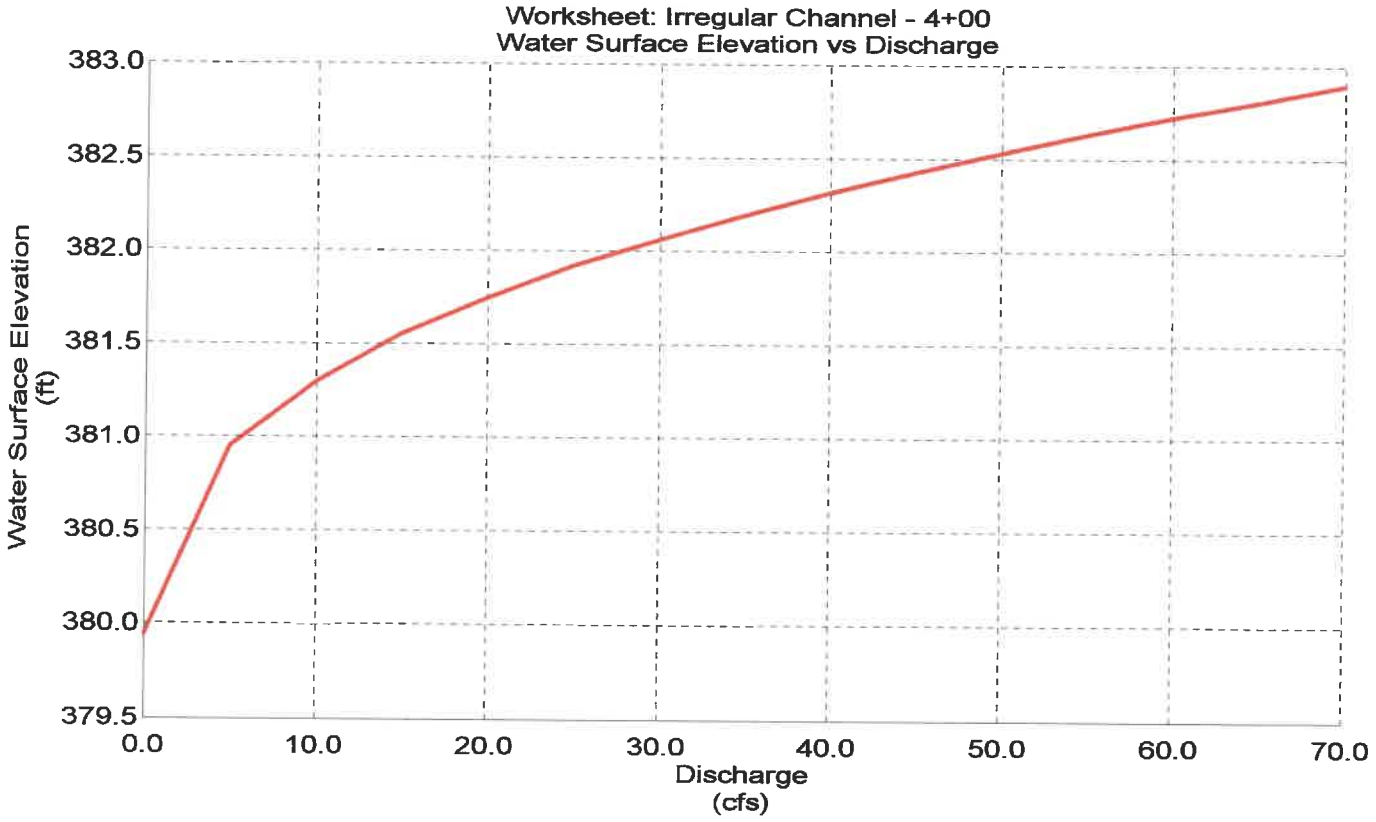
Curve
Plotted Curves for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 4+00
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.002300 ft/ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

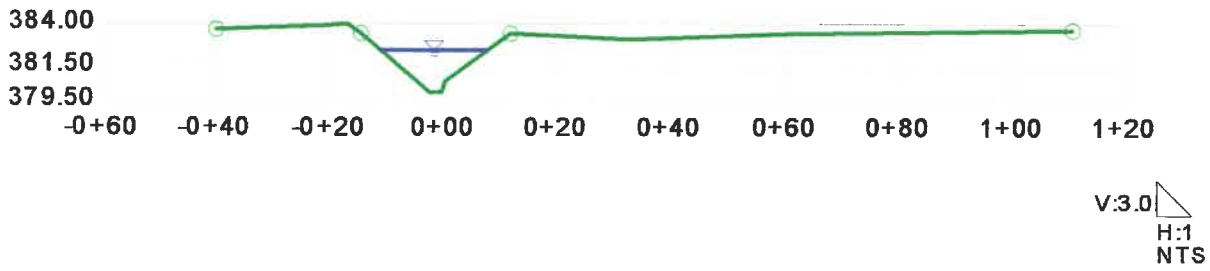
Attribute	Minimum	Maximum	Increment
Discharge (cfs)	0.00	70.00	5.00



25yr flow 4+00
Cross Section for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 4+00
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

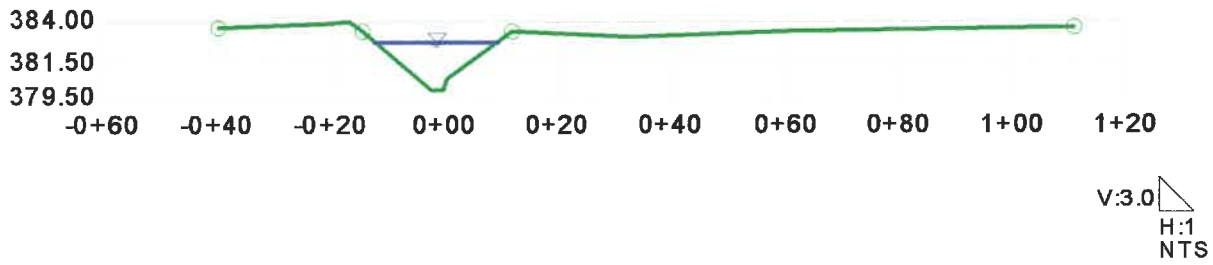
Section Data		
Mannings Coefficient	0.045	
Slope	0.002300	ft/ft
Water Surface Elevation	382.38	ft
Elevation Range	379.94 to 383.92	
Discharge	42.80	cfs



100yr flow 4+00
Cross Section for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 4+00
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.045	
Slope	0.002300	ft/ft
Water Surface Elevation	382.76	ft
Elevation Range	379.94 to 383.92	
Discharge	62.50	cfs



Worksheet
Worksheet for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 5+00
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.001800	ft/ft
Discharge	62.50	cfs

Options	
Current Roughness Method	mproved Lotter's Method
Open Channel Weighting Metho	mproved Lotter's Method
Closed Channel Weighting Meth	Horton's Method

Results		
Mannings Coefficient	0.037	
Water Surface Elevation	382.81	ft
Elevation Range	379.71 to 383.52	
Flow Area	56.9	ft²
Wetted Perimeter	107.60	ft
Top Width	106.63	ft
Actual Depth	3.10	ft
Critical Elevation	381.36	ft
Critical Slope	0.022446	ft/ft
Velocity	1.10	ft/s
Velocity Head	0.02	ft
Specific Energy	382.83	ft
Froude Number	0.27	
Flow Type	Subcritical	

Calculation Messages:
Water elevation exceeds lowest end station by 0.2107655 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
-0+39	-0+13	0.035
-0+13	0+12	0.045
0+12	0+94	0.035

Natural Channel Points	
Station (ft)	Elevation (ft)
-0+39	383.44
-0+24	383.52
-0+13	383.11
-0+06	381.09
0+00	379.71
0+01	379.71
0+05	381.00
0+09	381.63

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Worksheet
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+12	382.51
0+20	382.68
0+30	382.62
0+94	382.60

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Table
Rating Table for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 5+00
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.001800 ft/ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Attribute	Minimum	Maximum	Increment
Discharge (cfs)	0.00	70.00	5.00

Discharge (cfs)	Water Surface Elevation (ft)	Velocity (ft/s)	Flow Area (ft^2)	Wetted Perimeter (ft)	Top Width (ft)
0.00	379.71	0.00	0.0	0.00	0.00
5.00	380.74	0.98	5.1	8.80	8.51
10.00	381.11	1.15	8.7	11.71	11.31
15.00	381.37	1.25	12.0	14.35	13.90
20.00	381.58	1.33	15.1	16.40	15.91
25.00	381.74	1.40	17.8	17.86	17.33
30.00	381.89	1.47	20.4	19.05	18.48
35.00	382.02	1.53	22.9	20.12	19.52
40.00	382.14	1.58	25.3	21.11	20.48
45.00	382.25	1.63	27.6	22.02	21.37
50.00	382.35	1.67	29.9	22.87	22.19
55.00	382.77	1.05	52.6	107.40	106.47
60.00	382.54	1.76	34.2	25.49	24.77
65.00	382.82	1.12	58.2	107.66	106.68
70.00	382.85	1.15	60.9	107.79	106.78

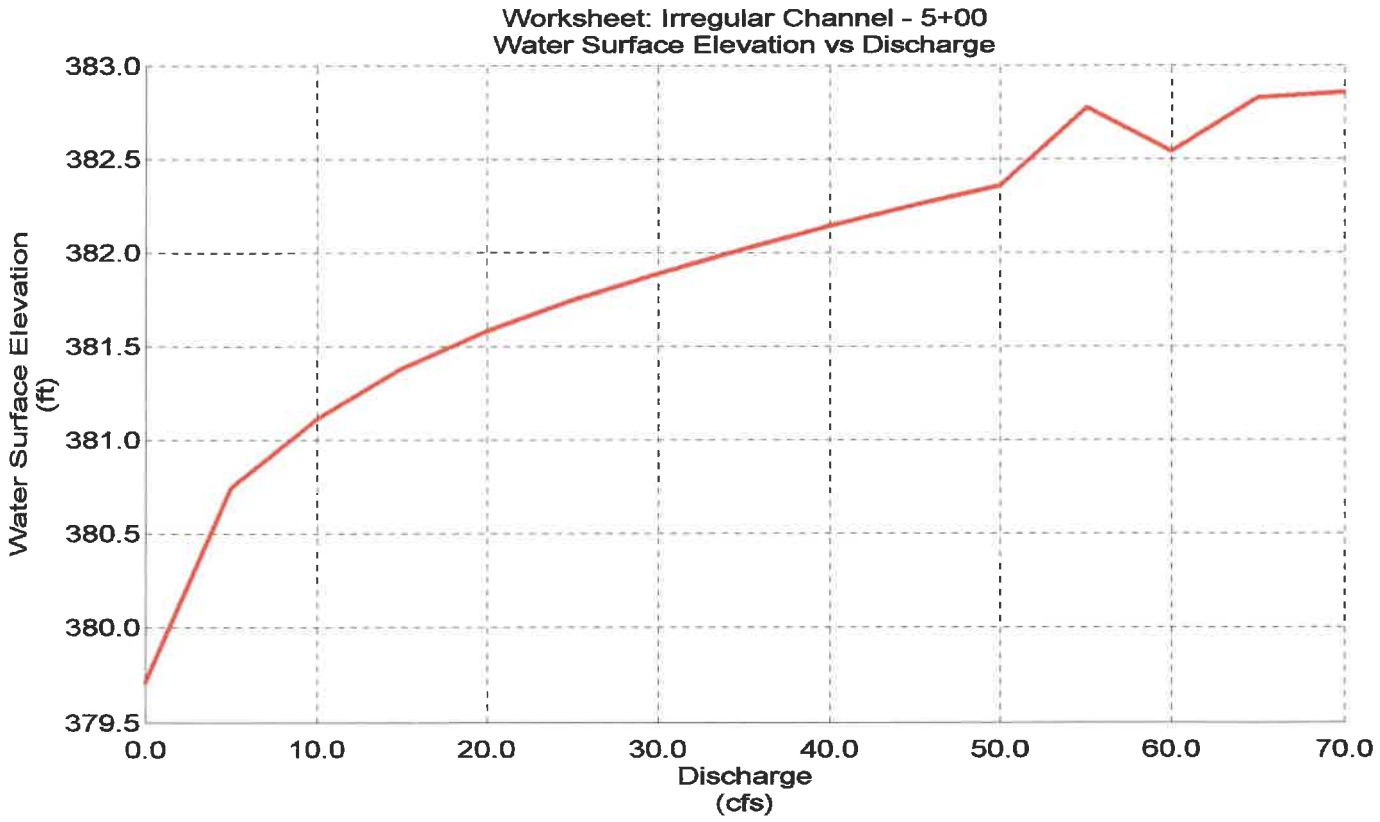
Curve
Plotted Curves for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 5+00
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.001800 ft/ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

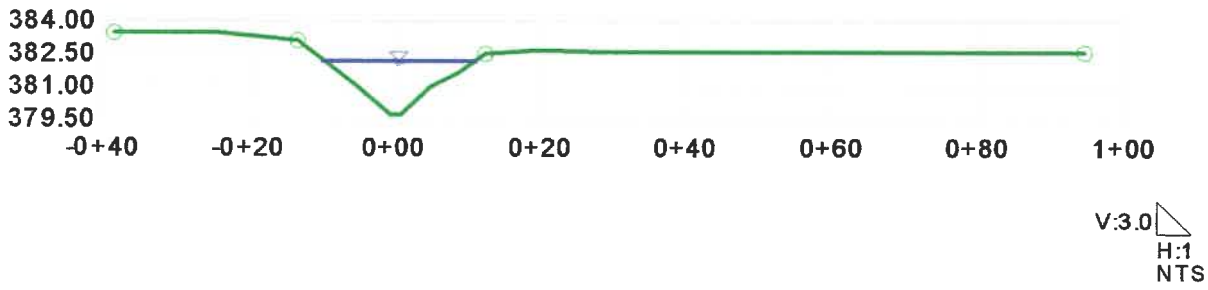
Attribute	Minimum	Maximum	Increment
Discharge (cfs)	0.00	70.00	5.00



25yr flow 5+00
Cross Section for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 5+00
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.045	
Slope	0.001800	ft/ft
Water Surface Elevation	382.20	ft
Elevation Range	379.71 to 383.52	
Discharge	42.80	cfs



100yr flow 5+00
Cross Section for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 5+00
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.037	
Slope	0.001800	ft/ft
Water Surface Elevation	382.81	ft
Elevation Range	379.71 to 383.52	
Discharge	62.50	cfs

Worksheet
Worksheet for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 6+00
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.002000	ft/ft
Discharge	62.50	cfs

Options	
Current Roughness Method	mproved Lotter's Method
Open Channel Weighting Metho	mproved Lotter's Method
Closed Channel Weighting Meth	Horton's Method

Results		
Mannings Coefficient	0.038	
Water Surface Elevation	382.38	ft
Elevation Range	379.51 to 383.29	
Flow Area	52.6	ft²
Wetted Perimeter	95.68	ft
Top Width	94.86	ft
Actual Depth	2.87	ft
Critical Elevation	381.16	ft
Critical Slope	0.022378	ft/ft
Velocity	1.19	ft/s
Velocity Head	0.02	ft
Specific Energy	382.40	ft
Froude Number	0.28	
Flow Type	Subcritical	

Calculation Messages:
Water elevation exceeds lowest end station by 0.16120484 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
-0+49	-0+15	0.035
-0+15	0+13	0.045
0+13	0+86	0.035

Natural Channel Points	
Station (ft)	Elevation (ft)
-0+49	382.42
-0+20	382.54
-0+16	383.06
-0+15	383.29
-0+04	381.52
-0+01	380.32
0+02	379.51
0+03	379.51

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Worksheet
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+08	380.67
0+13	381.76
0+26	382.06
0+47	382.14
0+65	382.22
0+86	382.22

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Table
Rating Table for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 6+00
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.002000 ft/ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Attribute	Minimum	Maximum	Increment
Discharge (cfs)	0.00	70.00	5.00

Discharge (cfs)	Water Surface Elevation (ft)	Velocity (ft/s)	Flow Area (ft^2)	Wetted Perimeter (ft)	Top Width (ft)
0.00	379.51	0.00	0.0	0.00	0.00
5.00	380.54	1.01	4.9	8.73	8.45
10.00	380.89	1.20	8.3	11.40	11.02
15.00	381.14	1.32	11.4	13.47	13.01
20.00	381.34	1.41	14.2	15.12	14.60
25.00	381.51	1.49	16.8	16.51	15.96
30.00	381.67	1.54	19.5	18.36	17.77
35.00	381.81	1.59	22.0	21.59	20.98
40.00	382.25	1.00	40.0	94.74	94.06
45.00	382.28	1.05	43.0	94.96	94.25
50.00	382.31	1.09	45.9	95.18	94.43
55.00	382.34	1.13	48.6	95.38	94.61
60.00	382.37	1.17	51.3	95.58	94.78
65.00	382.39	1.21	53.9	95.77	94.94
70.00	382.42	1.24	56.5	96.57	95.71

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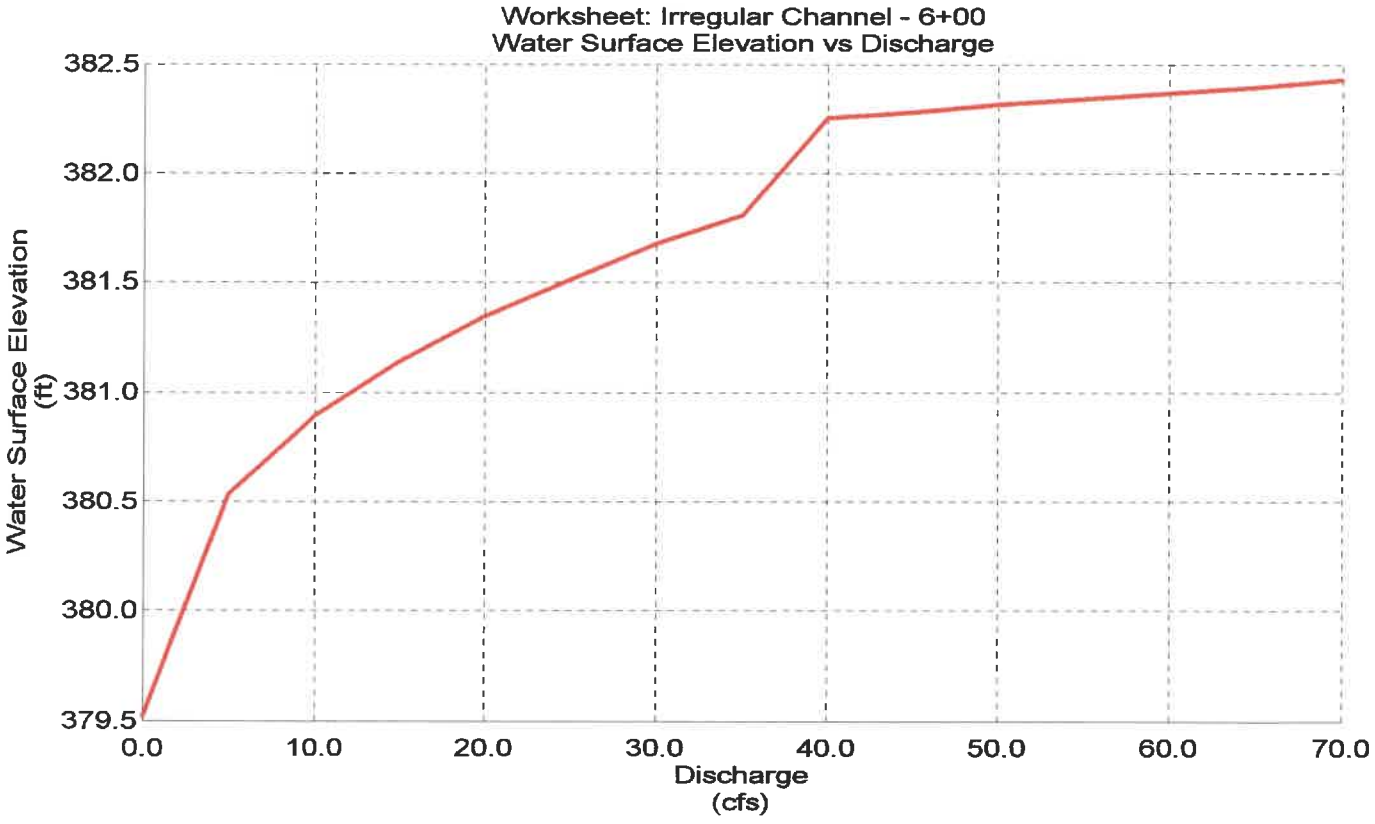
Curve
Plotted Curves for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 6+00
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.002000 ft/ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

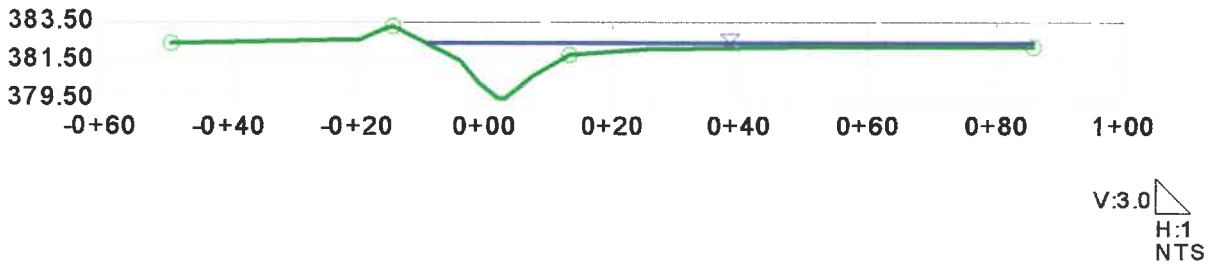
Attribute	Minimum	Maximum	Increment
Discharge (cfs)	0.00	70.00	5.00



100yr flow 6+00
Cross Section for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 6+00
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

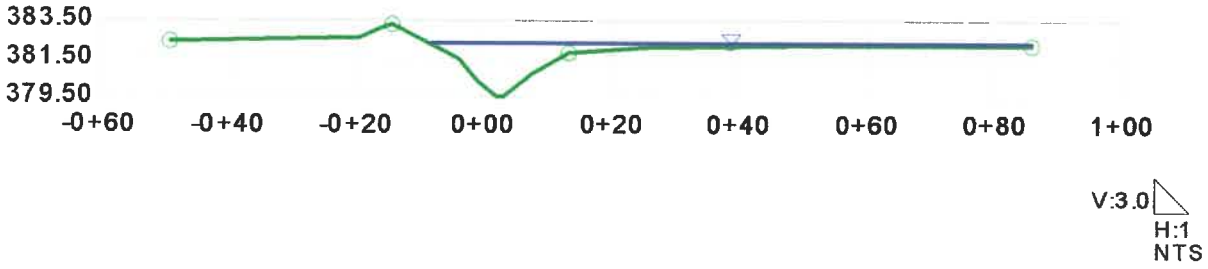
Section Data		
Mannings Coefficient	0.038	
Slope	0.002000	ft/ft
Water Surface Elevation	382.38	ft
Elevation Range	379.51 to 383.29	
Discharge	62.50	cfs



25yr flow 6+00
Cross Section for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 6+00
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.037	
Slope	0.002000	ft/ft
Water Surface Elevation	382.27	ft
Elevation Range	379.51 to 383.29	
Discharge	42.80	cfs



Ashton Park
Worksheet for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 7+50
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.005800	ft/ft
Discharge	62.50	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.037	
Water Surface Elevation	381.77	ft
Elevation Range	378.78 to 382.84	
Flow Area	32.9	ft²
Wetted Perimeter	66.05	ft
Top Width	64.74	ft
Actual Depth	2.99	ft
Critical Elevation	380.84	ft
Critical Slope	0.022128	ft/ft
Velocity	1.90	ft/s
Velocity Head	0.06	ft
Specific Energy	381.83	ft
Froude Number	0.47	
Flow Type	Subcritical	

Calculation Messages:
Water elevation exceeds lowest end station by 0.17069116 ft.

Roughness Segments

Start Station	End Station	Mannings Coefficient
-0+07	0+09	0.045
0+09	0+60	0.035

Natural Channel Points

Station (ft)	Elevation (ft)
-0+07	382.84
0+00	379.53
0+02	378.78
0+04	379.54
0+09	381.46
0+20	381.39
0+33	381.50
0+41	381.77
0+60	381.60

Bernardin Lochmueller Associates
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Table
Rating Table for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 7+50
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.005800 ft/ft

Options	
Current Roughness Method	mproved Lotter's Method
Open Channel Weighting Meth	omproved Lotter's Method
Closed Channel Weighting Meth	Horton's Method

Attribute	Minimum	Maximum	Increment
Discharge (cfs)	0.00	70.00	5.00

Discharge (cfs)	Water Surface Elevation (ft)	Velocity (ft/s)	Flow Area (ft^2)	Wetted Perimeter (ft)	Top Width (ft)
0.00	378.78	0.00	0.0	0.00	0.00
5.00	379.86	1.62	3.1	5.97	5.55
10.00	380.19	1.94	5.2	7.65	7.11
15.00	380.43	2.15	7.0	8.87	8.23
20.00	380.62	2.31	8.7	9.86	9.14
25.00	380.79	2.44	10.2	10.71	9.92
30.00	380.94	2.56	11.7	11.46	10.61
35.00	381.07	2.66	13.2	12.13	11.23
40.00	381.19	2.75	14.6	12.75	11.80
45.00	381.30	2.83	15.9	13.32	12.32
50.00	381.63	1.98	25.3	46.13	44.99
55.00	381.70	1.92	28.7	55.99	54.76
60.00	381.75	1.90	31.5	63.13	61.85
65.00	381.78	1.93	33.7	66.09	64.76
70.00	381.81	1.99	35.2	66.17	64.82

Bernardin Lochmueller Associates
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

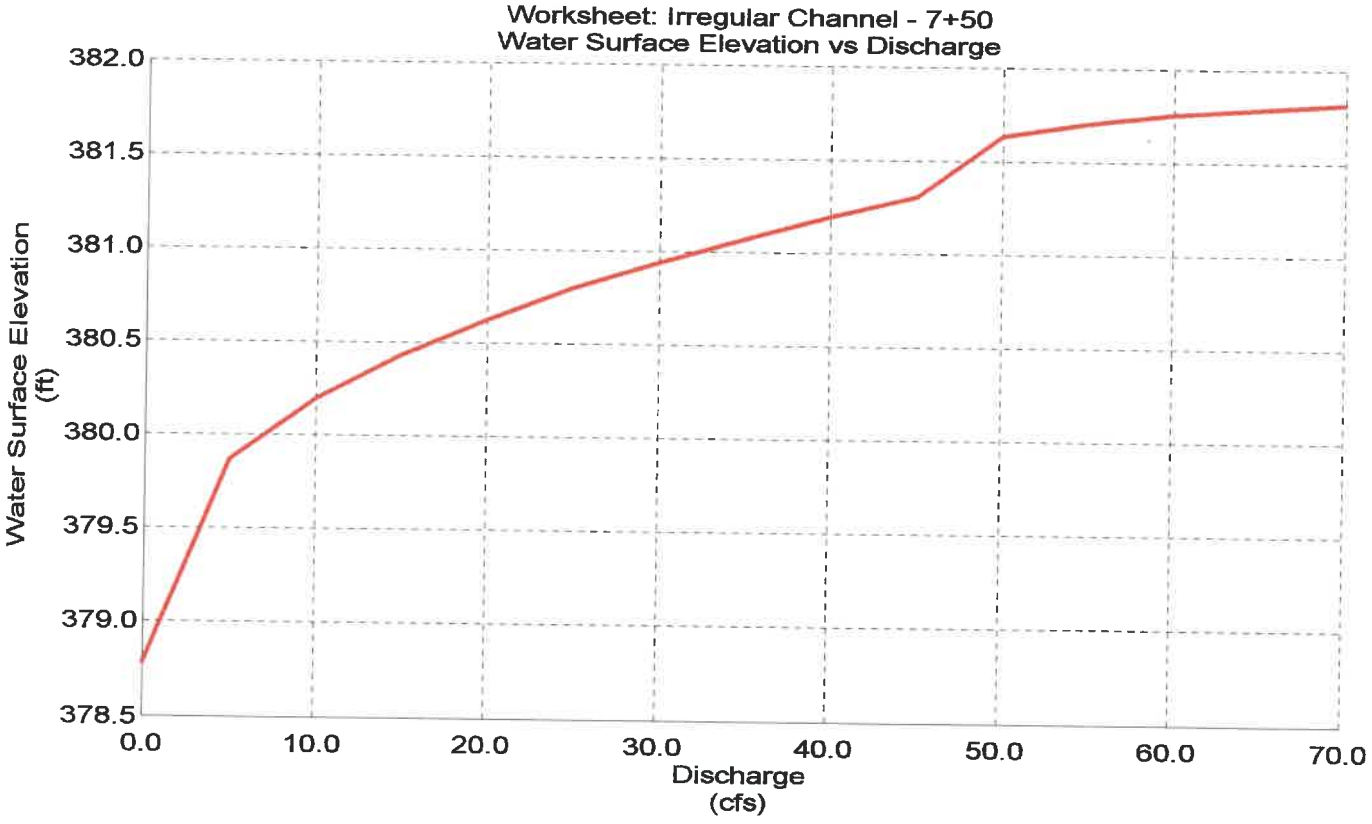
Curve
Plotted Curves for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 7+50
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.005800	ft/ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

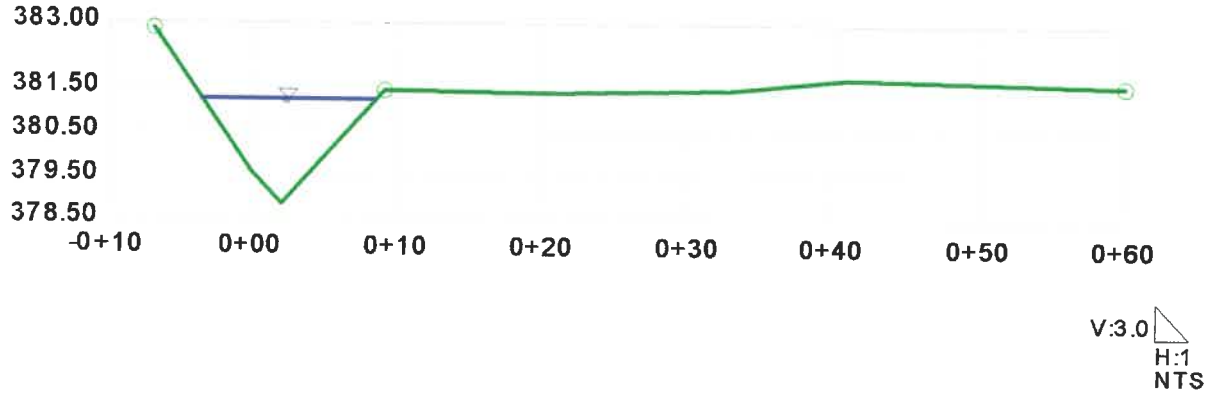
Attribute	Minimum	Maximum	Increment
Discharge (cfs)	0.00	70.00	5.00



25yr flow 7+50
Cross Section for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 7+50
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

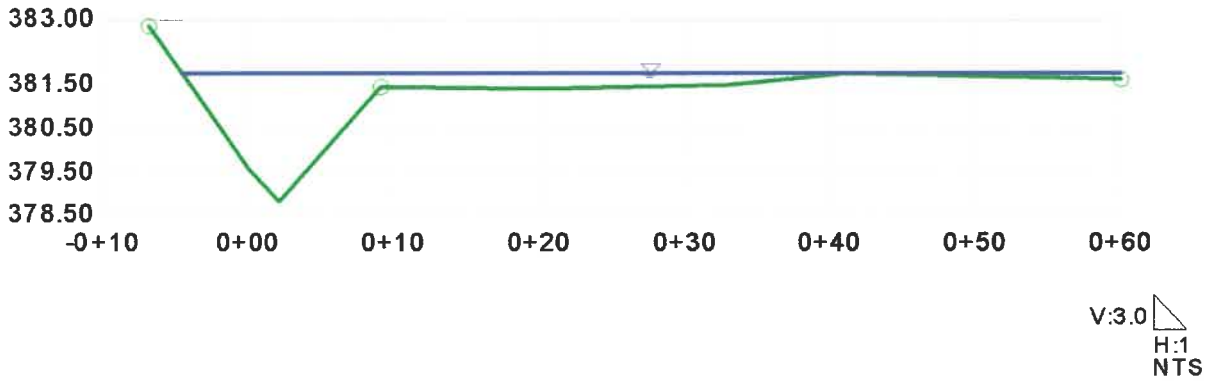
Section Data		
Mannings Coefficient	0.045	
Slope	0.005800	ft/ft
Water Surface Elevation	381.23	ft
Elevation Range	378.78 to 382.84	
Discharge	42.00	cfs



100yr flow 7+50
Cross Section for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 7+50
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.037	
Slope	0.005800	ft/ft
Water Surface Elevation	381.77	ft
Elevation Range	378.78 to 382.84	
Discharge	62.50	cfs



Ashton Park
Worksheet for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 9+50
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.005800	ft/ft
Discharge	62.50	cfs

Options	
Current Roughness Method	mproved Lotter's Method
Open Channel Weighting Meth	omproved Lotter's Method
Closed Channel Weighting Meth	Horton's Method

Results		
Mannings Coefficient	0.045	
Water Surface Elevation	380.55	ft
Elevation Range	377.62 to 382.47	
Flow Area	23.1	ft²
Wetted Perimeter	20.75	ft
Top Width	18.39	ft
Actual Depth	2.93	ft
Critical Elevation	379.63	ft
Critical Slope	0.035116	ft/ft
Velocity	2.70	ft/s
Velocity Head	0.11	ft
Specific Energy	380.67	ft
Froude Number	0.43	
Flow Type	Subcritical	

Calculation Messages:
Flow is divided.

Roughness Segments

Start Station	End Station	Mannings Coefficient
-0+34	-0+09	0.035
-0+09	0+19	0.045
0+19	0+90	0.035

Natural Channel Points

Station (ft)	Elevation (ft)
-0+34	380.63
-0+30	380.63
-0+14	381.22
-0+11	381.77
-0+09	382.47
-0+03	379.74
-0+01	377.62

Bernardin Lochmueller Associates
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Ashton Park
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+01	377.62
0+06	379.91
0+09	380.86
0+13	379.27
0+19	381.87
0+35	381.15
0+67	381.17
0+84	380.99
0+90	380.93

Bernardin Lochmueller Associates
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Table
Rating Table for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 9+50
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.005800 ft/ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Attribute	Minimum	Maximum	Increment
Discharge (cfs)	0.00	70.00	5.00

Discharge (cfs)	Water Surface Elevation (ft)	Velocity (ft/s)	Flow Area (ft^2)	Wetted Perimeter (ft)	Top Width (ft)
0.00	377.62	0.00	0.0	0.00	0.00
5.00	378.45	1.71	2.9	5.21	4.60
10.00	378.83	2.07	4.8	6.46	5.59
15.00	379.11	2.31	6.5	7.41	6.33
20.00	379.37	2.41	8.3	8.85	7.54
25.00	379.61	2.42	10.3	10.91	9.33
30.00	379.80	2.46	12.2	12.58	10.81
35.00	379.96	2.49	14.0	14.21	12.30
40.00	380.10	2.53	15.8	15.74	13.73
45.00	380.22	2.56	17.6	17.06	14.96
50.00	380.33	2.60	19.2	18.24	16.05
55.00	380.42	2.64	20.8	19.30	17.05
60.00	380.51	2.68	22.4	20.28	17.96
65.00	380.59	2.72	23.9	21.19	18.81
70.00	380.67	2.75	25.5	26.69	24.20

Bernardin Lochmueller Associates
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

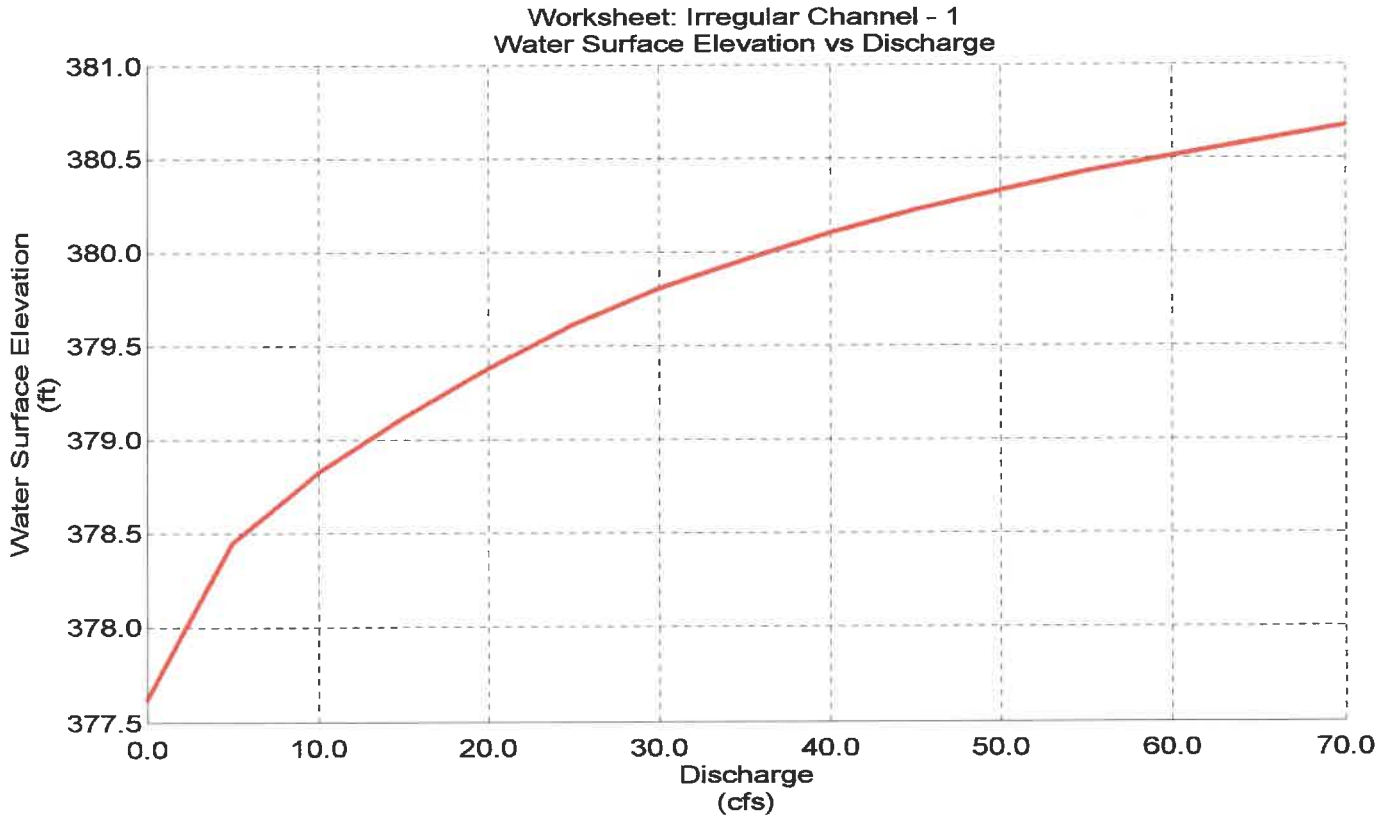
Ashton Park
Plotted Curves for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 1
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.005800 ft/ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

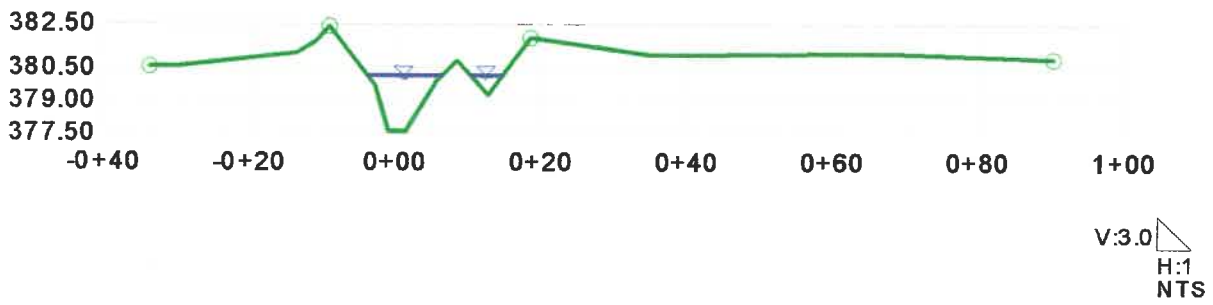
Attribute	Minimum	Maximum	Increment
Discharge (cfs)	0.00	70.00	5.00



25yr flow 9+50
Cross Section for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 1
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

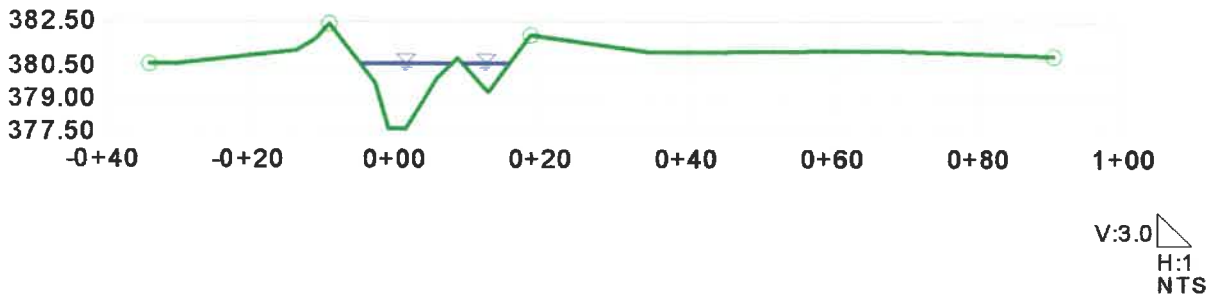
Section Data		
Mannings Coefficient	0.045	
Slope	0.005800	ft/ft
Water Surface Elevation	380.17	ft
Elevation Range	377.62 to 382.47	
Discharge	42.80	cfs



100yr flow 9+50
Cross Section for Irregular Channel

Project Description	
Worksheet	Irregular Channel - 9+50
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.045	
Slope	0.005800	ft/ft
Water Surface Elevation	380.55	ft
Elevation Range	377.62 to 382.47	
Discharge	62.50	cfs



VANDERBURGH COUNTY SURVEYOR
Room 325 Administration Building
Civic Center Complex
Evansville, Indiana 47708

Thursday, January 27, 2000

Mary L. Bates
Route 1, Box 97C
Burnt Prairie, IL 62820

RE: Ameritech's Requested Encroachment of Easement
Ashton Park Subdivision, Voigt Road, Evansville, IN

Dear Ms. Bates,

We acknowledge receipt of your request to construct an above ground facility at the southeast corner of Ashton Park Subdivision. A copy of your request is attached.

The requested location is within Outlot A, reserved for a storm water retention basin serving Ashton Park. A copy of the recorded plat of Ashton Park is enclosed.

The plat of Ashton Park was recorded by the Vanderburgh County Recorder on November 23, 1999. The recorded plat assigns certain responsibilities pertinent to the land and improvements within Ashton Park to an association of lot owners and others. (See highlighted statements of "General Notes" and "Owners Certificate" attached.)

Such responsibilities include the requirement to obtain prior written approval from the county drainage board for construction within drainage easements. The facility you wish to locate on Outlot A is subject the requirement for such prior written approval.

Ashton Park subdivision is located in Center Township. At this time the Center Township Assessor has not entered ownership of Outlot A into his records. Therefore, our office assumes ownership of Outlot A remains, as shown on the Owners Certificate, Dan Buck Development, L.L.C.; 4535 O'Hara Drive, Evansville, Indiana, 47711. If the indicated owner shares ownership of Outlot A, you will have to obtain such information from the indicated owner until such information is available from the Center Township Assessor.

Also please find enclosed with this letter a copy of "Drainage Easement Encroachment Agreement", a form currently used by the Vanderburgh County Drainage Board to facilitate requested encroachments of drainage easements in recorded subdivisions.

The encroachment agreement must be submitted to the drainage board signed by the owner(s) of Outlot A, with due consideration given to the assignment of certain rights and responsibilities enjoyed by and/or assigned to the lot owners' association and others.

Prior to submitting the completed encroachment agreement you may wish to consider:

1. Required inclusion of "Exhibit A", a legal description of the property upon which the encroachment is requested.

2. Required inclusion of "Exhibit B", a drawing depicting the drainage easement into which the encroachment is requested.

3. Required inclusion of "Exhibit C", an engineered drawing depicting and describing exactly the proposed cuts, fills, grading, and physical alterations and improvements with their exact dimensions and locations measured both vertically and horizontally to the existing and platted dimensions of the land within the easement to be encroached.

4. The existence of the 100 year flood plain (FEMA Zone A) within which you proposed to locate the encroachment and its designated elevation of 385.0' NGVD per the recorded plat for Ashton Park. You may wish to protect your facility from flooding.

5. The existence of a public utility easement west of, parallel and adjacent to the east line of Ashton Park. While the public utility easement is not described completely, we recall the easement planned to be either six (6) or eight (8) feet wide to allow a total width of ten (10) or twelve (12) feet when combined with the four (4) foot easement adjacent within Voigt's Subdivision. You may with to hold back sufficiently from the east line of Ashton Park to avoid acquiring written permission to encroach the public utility easement from another half dozen utility boards, agencies and corporations.

We remain at your service if you require additional information or assistance to facilitate the location of your utility service at the requested location.

Bill Jeffers, Chief Deputy
Vanderburgh County Surveyor

cc: Vanderburgh County Drainage Board
Dan Buck Development, L.L.C.
Vanderburgh County Area Plan Commission

Ameritech

Mary L. Bates
Route 1, Box 97C
Burnt Prairie, IL 62820

January 20, 2000

Mr. Bill Jeffers
County Surveyors Office Rm 325
#1 Martin Luther King Blvd.
Evansville, IN 47708

Dear Mr. Jeffers:

Per our conversation today, attached is a drawing of the area where we need to place an above ground telephone cabinet in Ashton Park Subdivision at Oakhill and Voight.

We need at least a 25' x 25' space in order to park our service vehicle off Voight Road. We will provide a culvert if needed and will either asphalt or rock the parking area per your choice. The cabinet sits on a concrete pad that is 14' x 19'.

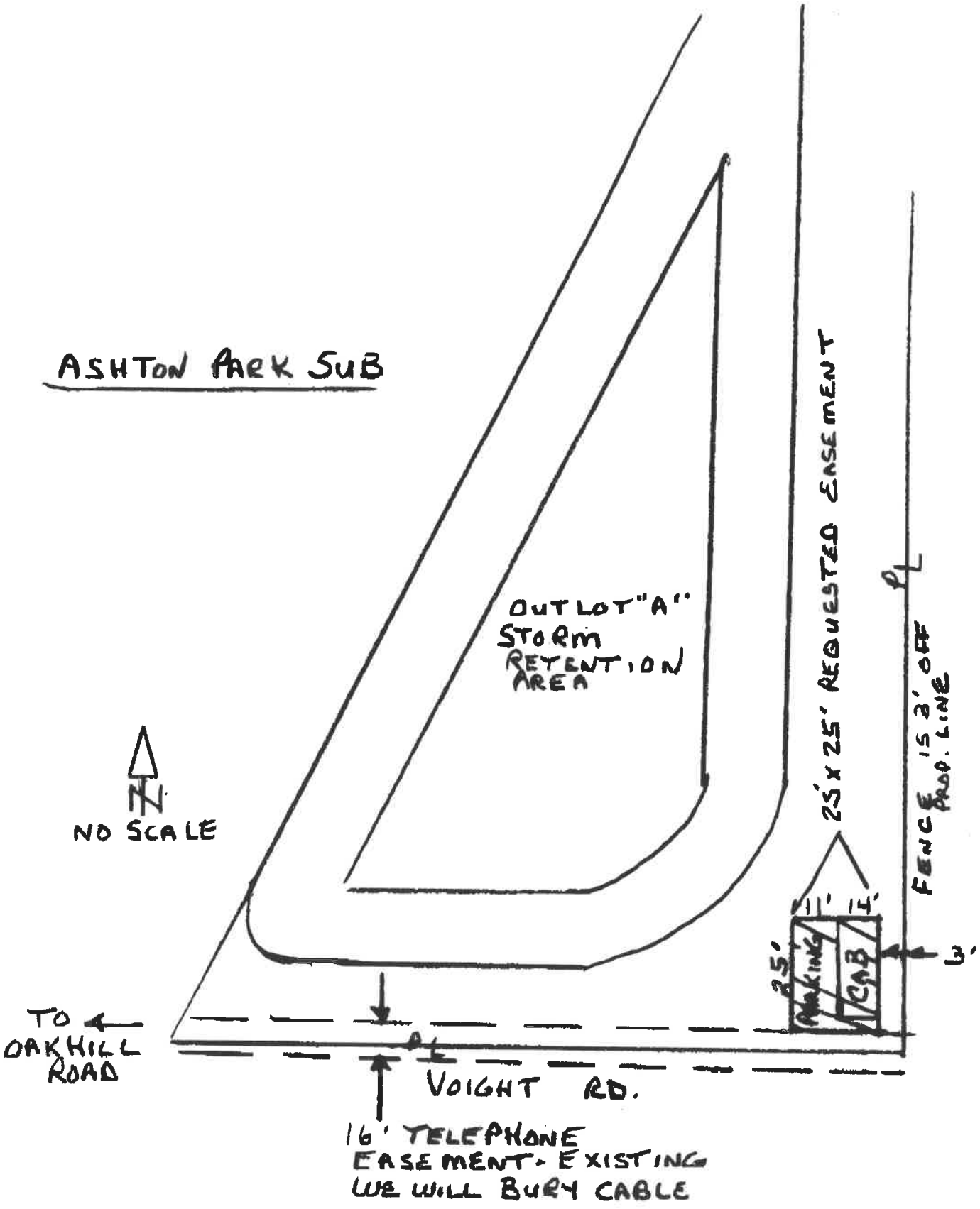
We may need to build the area up to protect the cabinet from water damage. If we build it up, we may need a few extra feet in width to still park a vehicle. If build up is necessary, we will either sod or seed the slope. The County has told us, we have a pretty good record of taking care of permit areas.

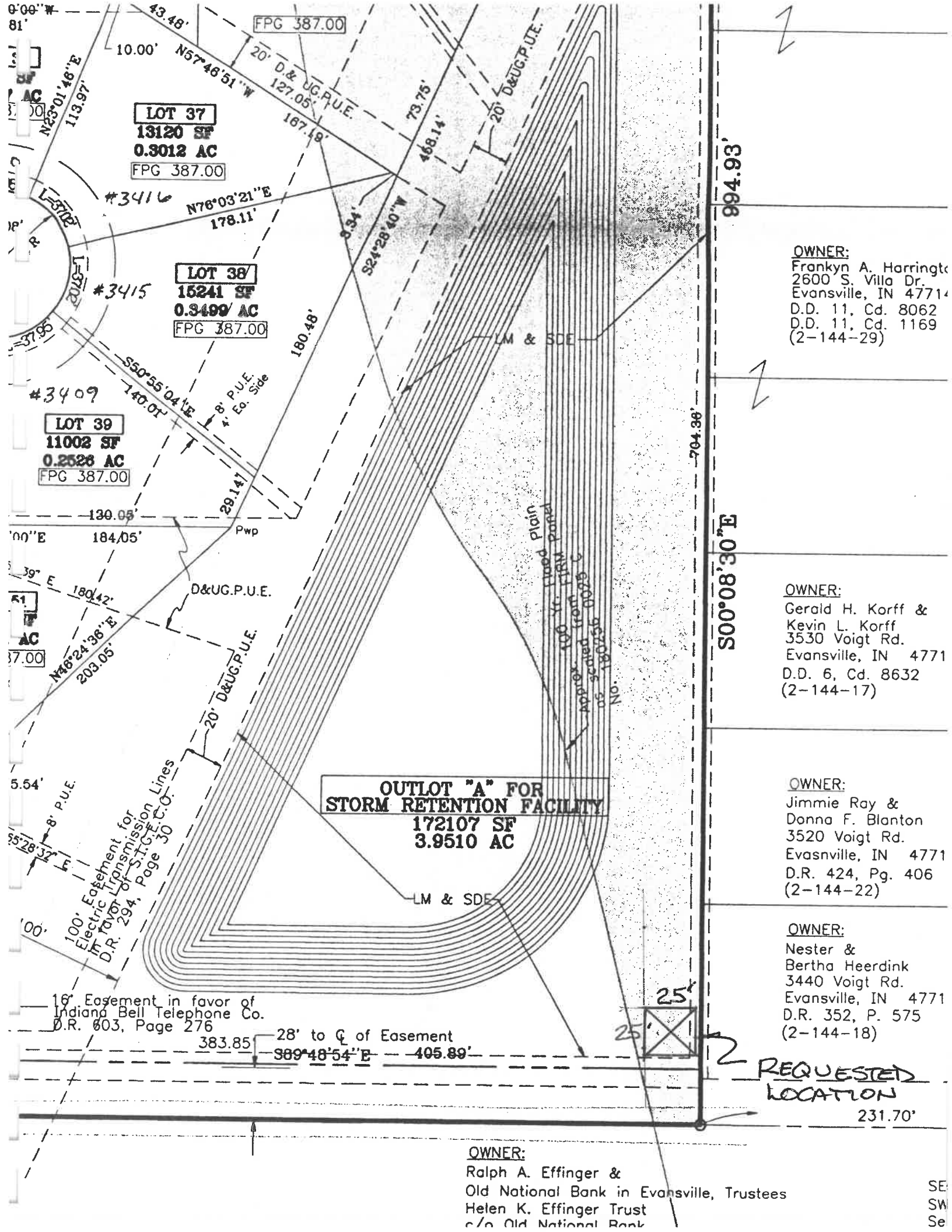
Please review the drawing and compare it with your grade level drawings. If you have questions, please call me on 618-896-5669 or you may reach our local engineer, Marc Clark on 464-6050.

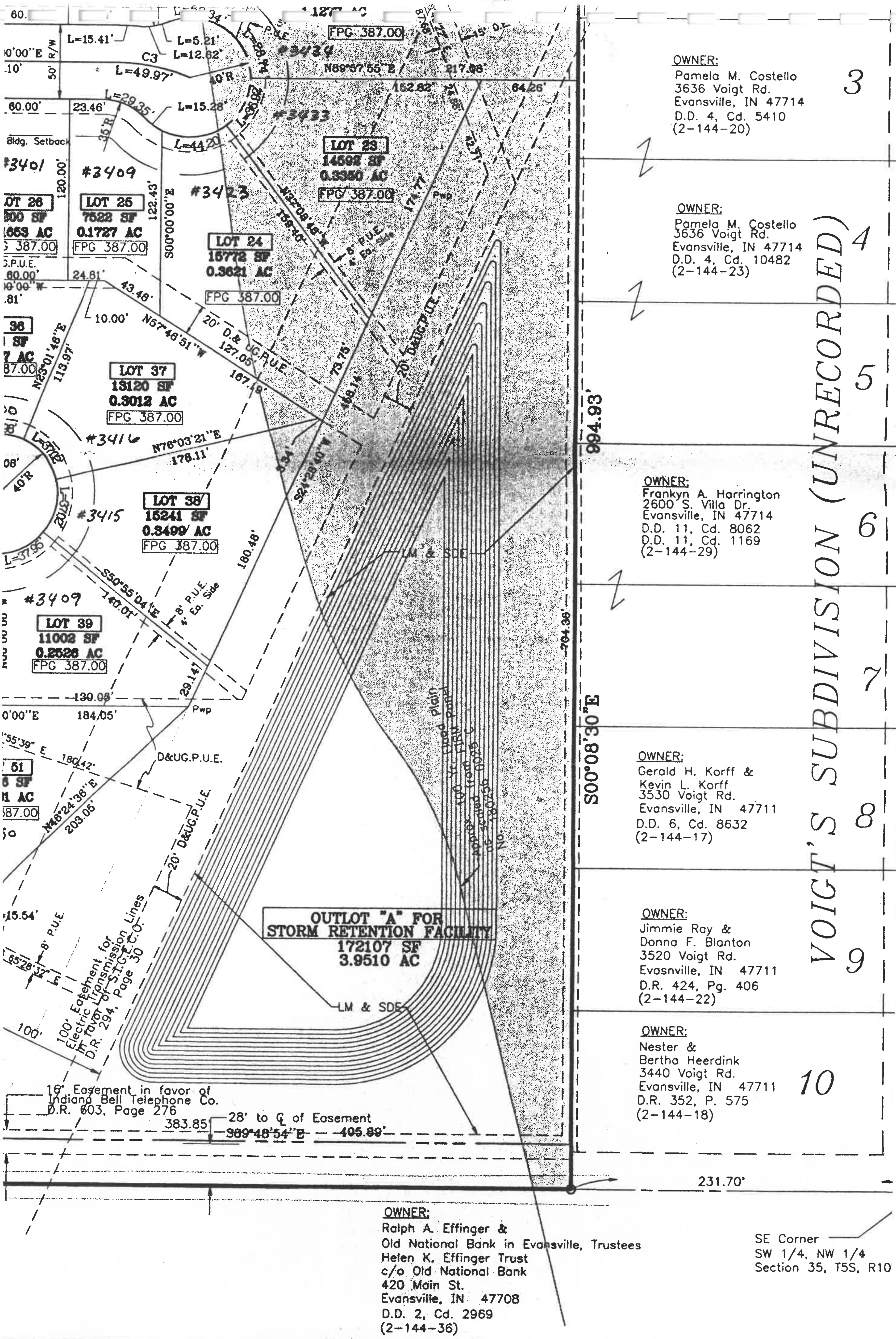
Sincerely,

Mary Bates

Right of Way Engineer


ASHTON PARK SUB
OUTLOT "A"
STORM
RETENTION
AREA
N
NO SCALE
25' X 25' REQUESTED EASEMENT
℄
FENCE IS 3' OFF PROP. LINE
25'
PARKING
CAB
3'
TO
OAKHILL
ROAD
VOIGHT RD.
16' TELEPHONE
EASEMENT - EXISTING
WE WILL BURY CABLE


LOT 37
13120 SF
0.3012 AC
FPG 387.00
#3416
LOT 38
15241 SF
0.3499 AC
FPG 387.00
#3415
LOT 39
11002 SF
0.2526 AC
FPG 387.00
#3409
OUTLOT "A" FOR
STORM RETENTION FACILITY
172107 SF
3.9510 AC
FPG 387.00
N57°46'51"W
127.05'
20' D.& UG.P.U.E.
10.00'
43.48'
113.97'
N23°01'46"E
187.48'
73.75'
468.14'
20' D&UG.P.U.E.
N76°03'21"E
178.11'
L=37.02'
L=37.02'
37.95'
S24°28'40"W
9.34'
180.48'
S50°55'04"E
140.01'
8' P.U.E. Ea. Side
29.14'
130.05'
184.05'
Pwp
D&UG.P.U.E.
180.42'
N46°24'36"E
203.05'
20' D&UG.P.U.E.
LM & SDE
LM & SDE
Approx. scaled location of 100 Yr. FIRM Flood Plain No. 180256 0025
994.93'
S00°08'30"E
704.38'
OWNER:
Frankyn A. Harringto
2600 S. Villa Dr.
Evansville, IN 47714
D.D. 11, Cd. 8062
D.D. 11, Cd. 1169
(2-144-29)
OWNER:
Gerald H. Korff &
Kevin L. Korff
3530 Voigt Rd.
Evansville, IN 4771
D.D. 6, Cd. 8632
(2-144-17)
OWNER:
Jimmie Ray &
Donna F. Blanton
3520 Voigt Rd.
Evasnville, IN 4771
D.R. 424, Pg. 406
(2-144-22)
OWNER:
Nester &
Bertha Heerdink
3440 Voigt Rd.
Evansville, IN 4771
D.R. 352, P. 575
(2-144-18)
100' Easement for Electric Transmission Lines in favor of S.I.G.E.C.O. D.R. 294, Page 30
8' P.U.E.
16' Easement in favor of Indiana Bell Telephone Co. D.R. 603, Page 276
383.85
28' to ℄ of Easement
S89°48'54"E
405.89'
25'
25'
REQUESTED LOCATION
231.70'
OWNER:
Ralph A. Effinger &
Old National Bank in Evansville, Trustees
Helen K. Effinger Trust
c/o Old National Bank



OUTLOT "A" FOR
STORM RETENTION FACILITY
172107 SF
3.9510 AC
LOT 23
14598 SF
0.3350 AC
FPG 387.00
LOT 24
15772 SF
0.3621 AC
FPG 387.00
LOT 25
7522 SF
0.1727 AC
FPG 387.00
LOT 37
13120 SF
0.3012 AC
FPG 387.00
LOT 38
15241 SF
0.3499 AC
FPG 387.00
LOT 39
11002 SF
0.2526 AC
FPG 387.00
#3434
#3433
#3423
#3409
#3401
#3416
#3415
#3409
N89°57'55"E
S00°00'00"E
N57°46'51"W
N23°01'46"E
N76°03'21"E
S24°28'40"W
S50°55'04"E
N48°24'36"E
N32°08'46"W
S00°08'30"E
994.93'
704.36'
231.70'
S89°48'54"E
405.89'
383.85
28' to ℄ of Easement
16' Easement in favor of
Indiana Bell Telephone Co.
D.R. 603, Page 276
100' Easement for
Electric Transmission Lines
in favor of S.I.G.E.C.O.
D.R. 294, Page 30
20' D&UG.P.U.E.
D&UG.P.U.E.
8' P.U.E.
4' Ea. Side
LM & SDE
Pwp
Approx. 100 Yr. Flood Plain
as scaled from FIRM Panel
No. 180256 0025 C
Bldg. Setback
50' R/W
OWNER:
Pamela M. Costello
3636 Voigt Rd.
Evansville, IN 47714
D.D. 4, Cd. 5410
(2-144-20)
OWNER:
Pamela M. Costello
3636 Voigt Rd.
Evansville, IN 47714
D.D. 4, Cd. 10482
(2-144-23)
OWNER:
Frankyn A. Harrington
2600 S. Villa Dr.
Evansville, IN 47714
D.D. 11, Cd. 8062
D.D. 11, Cd. 1169
(2-144-29)
OWNER:
Gerald H. Korff &
Kevin L. Korff
3530 Voigt Rd.
Evansville, IN 47711
D.D. 6, Cd. 8632
(2-144-17)
OWNER:
Jimmie Ray &
Donna F. Blanton
3520 Voigt Rd.
Evasnville, IN 47711
D.R. 424, Pg. 406
(2-144-22)
OWNER:
Nester &
Bertha Heerdink
3440 Voigt Rd.
Evansville, IN 47711
D.R. 352, P. 575
(2-144-18)
VOIGT'S SUBDIVISION (UNRECORDED)
3
4
5
6
7
8
9
10
OWNER:
Ralph A. Effinger &
Old National Bank in Evansville, Trustees
Helen K. Effinger Trust
c/o Old National Bank
420 Main St.
Evansville, IN 47708
D.D. 2, Cd. 2969
(2-144-36)
SE Corner
SW 1/4, NW 1/4
Section 35, T5S, R10

Strips or areas of land, of the dimensions shown on this plate and marked "P.U.E." (Public Utility Easement), are hereby dedicated to public utilities for the installation, maintenance, operation, enlargement and repair of utility facilities, whether above ground or below ground, with the right to trim or remove, at the discretion of the public utility, trees, overhanging branches, bushes underbrush and obstructions. No structures other than such utility facilities shall be located within said areas of land and any fence located within said areas of land is subject to removal by a public utility without liability in the use of said easements by said utility.

Strips or areas of land, of the dimensions shown on this plate and marked "D.E." (Drainage Easement), are hereby dedicated for conveyance of surface water and/or subsurface water; provided however, that public utilities are hereby permitted to cross such Drainage Easements with utility facilities provided, that such facilities are not placed in such manner as to impede the flow of water and further provided that such Drainage Easements may be used for ingress, egress and temporary staging areas for work by public utility so long as and damage caused to a drainage facility is repaired by the utility company. The property owner is responsible for maintenance and erosion control of said easements and shall not place landscaping, earth berms, fences or other obstructions that impede or reduce the flow of water.

Strips or areas of land, of the dimensions shown on this plate and marked "L.M.&S.D.E." (Lake Maintenance and Storm Detention Easement), are hereby dedicated for the maintenance of the storm detention lake and maintenance ,and storage of storm water. Any major alterations to the land within these easements must have the approval of the Drainage Board. Fences may not be extended across the Lake Maintenance and Storm Detention Easement.

All easements are dedicated with the right of ingress and egress over the lots within this subdivision to and from said easements for necessary construction, maintenance or reconstruction.

Dan Buck, Manager

Developer
Owner: Dan Buck Development, L.L.C.
4535 O'Hara Drive
Evansville, IN 47711

Q-53

NOTARY CERTIFICATE

STATE OF INDIANA, COUNTY OF VANDERBURGH ss:

Before me, the undersigned, a Notary Public in and for said County and State, personally appeared the said Owner(s) and Subdivider(s), who acknowledge the execution of the foregoing plat with the dedications and restrictions thereon, express to be their voluntary act and deed for the uses and purposes therein set forth.

Witness my hand and seal the 18th day of November, 1999.

My Commission Expires:
1-13-2001

Notary Public
Kendra L. Rakestraw

Notary Resides in
Vanderburgh Co IN
County, Indiana

Kendra L. Rakestraw
(typed or printed name)

NOTARY PUBLIC SEAL INDIANA

AREA PLAN COMMISSION CERTIFICATE

Under the authority provided by the Acts of 1981, Public Law #309, and enacted by the General Assembly of the State of Indiana, this plat has been given PRIMARY APPROVAL by the AREA PLAN COMMISSION OF EVANSVILLE and VANDERBURGH COUNTY at a meeting held on June 2, 1999.

President

Executive Director

Slopes of 0%-6% shall be mulched and seeded with a cover crop, i.e. rye, red top, or wheat within forty-five(45) days of disturbance of soil, which must remain in place until final grading and shaping.
Slopes of more than 6% shall be mulched and seeded and shall have silt fence, straw bales and/or erosion blankets in place within five(5) days of disturbance of soil which must remain in place until final grading and seeding.

Site Topography: In the center of the site lies a small hill. The contours radiate outward as shown on the plat.

Erosion Control for Ditches:
Slopes of 0% - 2% shall be mulched and seeded within 45 days of disturbance. Soils of 2% - 8% shall be sodded or stabilized with an erosion control mat at completion of ditch grading. Slopes over 8% require riprap or other approved stabilization at completion of ditch grading of the total ditch length at that point is greater than 100 feet.

Monuments: Monuments have been set at all boundary and lot corners.

The Lot Owner's Association shall be responsible, including financially, for the maintenance and repair of the entire storm water drainage system, it's parts, and easements within or attached to this subdivision and outside of county accepted road rights-of-way including:

1. Mowing grass, controlling weeds, and maintaining the designed cover of the waterways, storage basins, and easements in accordance with applicable ordinances.

2. Keeping all parts of the storm water drainage system operating at all times as designed and as constructed; and free of all trash, debris, and obstructions to the flow of water.

3. Keeping the channels, embankments, shorelines, and bottoms of waterways and basins free of all erosion and sedimentation.

4. Maintaining and repairing the storm water drainage system in accordance with the conditions described on the approved street and/or drainage plans on file in the County Surveyor's Office, and/or the County Engineer's Office; and in compliance with the County Drainage Ordinance.

5. Preventing all persons or parties from causing any unauthorized alterations, obstructions, or detrimental actions from occurring to any part of the storm water drainage system and easements within or attached to this subdivision.

6. Any pipe, fence, wall, building, pool, patio, planting, stored material, excavation, fill or other construction, improvements addition to, or alteration of the land within a drainage easement in this subdivision requires the prior written approval of the County Drainage Board.

Storm Drainage Plans were Approved by the Vanderburgh County Drainage Board On: June 28, 1999.

Sanitary Sewer Construction Plans were Approved by the Evansville Water & Sewer Utility On: September 21, 1999

Road Construction Plans were Approved by the Vanderburgh County Commissioners On: September 20, 1999

LEGEND

- ● 3/4" Rebar w/ plastic cap stamped "BLA FIRM 0030"
- ○ Fnd. Monuments
- ■ Set PP Spike

SW Corner
SW 1/4, NW 1/4
Section 35, T5S, R10W

D.R. 658, P. 534
(2-144-30)

OWNER:
Steven L. &
Cheryl M. McCrarey
7391 Oak Hill Rd.
Evansville, IN 47711
D.D. 2, Cd. 803
(2-144-26)

OWNER:
Timothy G. Hudak
7351 Oak Hill Rd.
Evansville, IN 47711
D.D. 7, Cd. 9259
(2-144-24)

OWNER:
Robert D. Dunn, Jr. &
Patricia Ann Dunn
7201 Oak Hill Rd.
Evansville, IN 47711
(2-144-28)

OWNER:
Robert D. Dunn, Jr. &
Patricia Ann Dunn
7201 Oak Hill Rd.
Evansville, IN 47711
D.D. 2, Cd. 6556
(2-144-39)

OWNER:
John M. Dunn, Trustee
100 S. Greenriver Rd.
Evansville, IN 47715
D.D. 6, Cd. 48
(2-144-44)

Oak Hill Road
Existing R/W
Existing R/W
30'
P.O.B.
N89°59'00"E
169.51'
N00°00'00"E 507.98'
N00°00'00"E 219.41'
N00°00'00"E 218.82'
N00°00'00"E 59.62'
60.00'
Bldg.
Bldg.
Bldg.
House
5' (S.I.G.E.C.O. Pipeline Esmt.)
150'