JM STEVENS ENT,LLC DRAINAGE REPORT

The 2003 approved drainage report for the Industrial Drive Subdivision by rational method showed an existing Q10 allowable release of 3.5cfs for a four acre site. The future conditions were based on 1.3 acres of impervious with and a Q100 peak flow of 8.5cfs. With a 3.5cfs release 0.26 acre feet of storage was required with 0.5 acre feet provided. This addition will add 0.17 acres of impervious area or a 13% increase which would imply 0.30 acre feet would be required. We reanalyzed the subdivision with a Huff distribution for multiple events using Cn= 68 for Crosby and Brookston soils at the originally listed time of concentration of 33 minutes. The original report did not take into account 0.65 acres of offsite impervious areas contributing for the existing condition. This resulted in a peak Q10 allowable release for a 6hr event of 2.88cfs. (reasonably close to the 3cfs release shown then) Based on a future Cn of 85 with the addition the Q100 peak for a one hour event was 7.99cfs. (reasonably close to the 8.5cfs in the original report. Using the two 0.25 acre foot detention areas with subbasin 12" pipe restrictive outlets we arrive at a required storage of 22281cf or 0.51 acre feet. (reasonably close to the 0.5 acre feet initially provided. The 22"x36"CMPA outlet for the site will accommodate a peak flow of up to 90cfs. Additional storage is available in the 5' concrete paved ditch leading to the outlet pipe, but because of its capacity will not be used. The original design called for a peak flood level of 764.39 with an allowable peak of 765.00 for floors at 767.00. Our reanalysis showed a peak of 764.37. (again reasonably close to the old report) The proposed disturbed area is less tha 0.2 acres not requiring any new water quality measures. Based on the reanalysis and the reasonable degree of accuracy we can expect from these assumptions I hereby certify the proposed addition complies with the intent of the ordinance.

Prepared by:

Steven B. Williams, PELS
5-15-12

STEVEN B. WILLIAMS
REGISTERED
No.
17207
STATE OF
INDIANA
PROFESSIONAL ENGINEER

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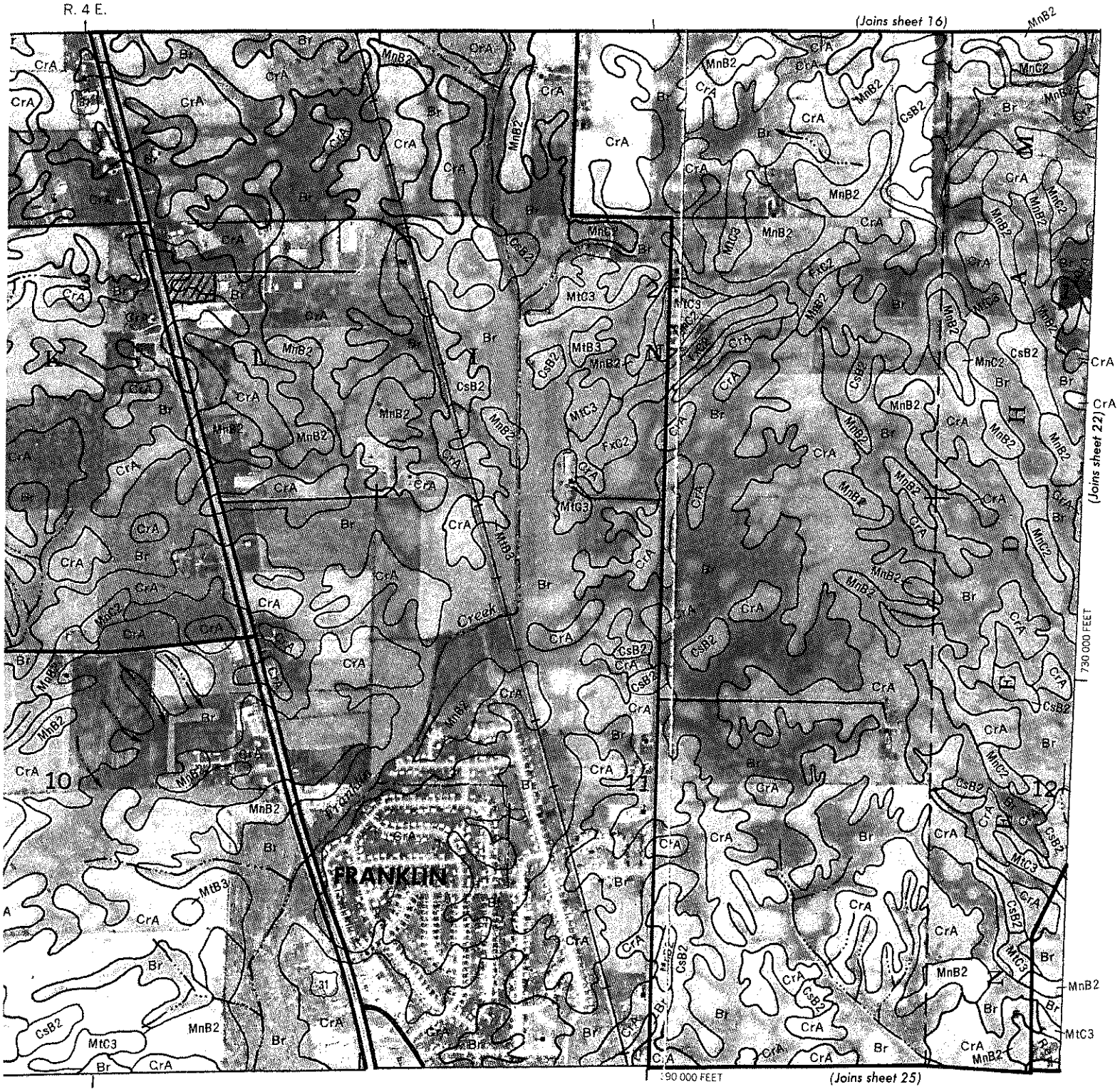
CITY OF FRANKLIN
DEPT OF PLANNING


R. 4 E.
(Joins sheet 16)
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(Joins sheet 25)
730 000 FEET
390 000 FEET
FRANKLIN
Creek
10
11
12
CrA
Br
MnB2
MnC2
MtC3
MtB3
CsB2
FxC2

Table 3.9 Curve Numbers for Various Cover and Soil Types [AMC=II] (NEH-4)

LAND USE DESCRIPTION		HYDROLOGIC SOIL GROUP A	B	C	D
Cultivated land: without conservation treatment		72	81	88	91
: with conservation treatment		62	71	78	81
Pasture or range land: poor condition		68	79	86	89
: good condition		39	61	74	80
Meadow: good condition		30	58	71	78
Wood or Forest land: thin stand, poor cover, no mulch		45	66	77	83
: good cover		25	55	70	77
Open spaces: lawns, parks, golf courses, cemeteries, etc.					
good condition: grass cover on 75% or more of the area		39	61 68	74	80
fair condition: grass cover on 50% to 75% of the area		49	69	79	84
Commercial and business areas (85% impervious)		89	92	94	95
Industrial districts (72% impervious)		81	88	91	93
Residential:[1] Average lot size	Average % Impervious[2]				
1/8 acre or less	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
Paved parking lots, roofs, driveways, etc.[3]		98	98	98	98
Streets and roads:					
paved with curbs and storm sewers[3]		98	98	98	98
gravel		76	85	89	91
dirt		72	82	87	89
Urban areas:					
Low density (15-18% impervious surfaces)		69-71	75-78	82-84	86
Medium density (21-27% impervious surfaces)		71-73	77-80	84-86	88
High density (50-75% impervious surfaces)		73-75	79-82	86-88	90

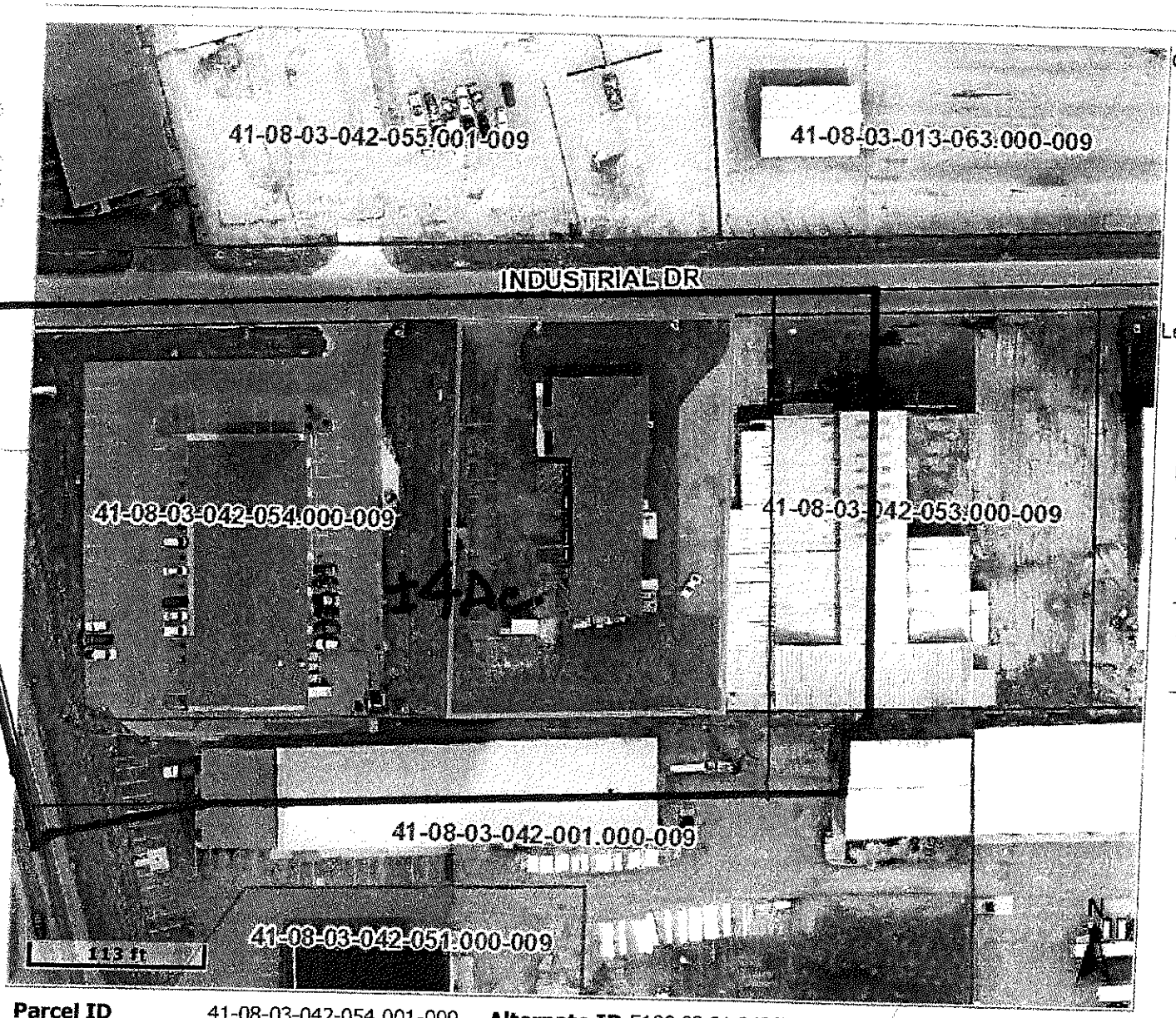
[1]Curve numbers are computed assuming the runoff from the house and drivew is directed towards the street with a minimum of roof water directed to lawns where additional infiltration could occur.

[2]The remaining pervious areas (lawn) are considered to be in good pasture condition for these curve numbers.

[3]In some warmer climates of the country a curve number of 95 may be used.

EXIST: PREEXIST. OFFSITE IMP. = .65 AC @ 98
GRASS 3.35 AC @ 68 NET = 73

FUTURE: IMPERVIOUS 2.25 AC @ 98 NET = 85
GRASS 1.75 AC @ 68



Parcel ID	41-08-03-042-054.001-009	**Alternate ID**	5100 03 01 043/03	**Owner Address**	JM STEVENS 4420 N 600 E FRANKLIN, IN
Sec/Twp/Rng	n/a	**Class**	Com Other retail structures		
Property Address	215 INDUSTRIAL DR FRANKLIN	**Acreage**	0.94		

District 009

Brief Tax Description INDUSTRIAL DRIVE SUB LOT 2

(Note: Not to be used on legal documents)

1" = 100'

IMPERVIOUS: EXIST. ON-SITE 1.43 Ac 2012 ADDITION = .17 AC IMPERVIOUS
FUTURE ON-SITE 1.60 Ac
(EXC. of FUTURE) OFFSITE: 0.65 Ac. Last Data Upload: 5/5/2012 12:04:10 AM
TOTAL FUTURE = 2.25 Ac.

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AIRT

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	SCS Runoff	-------	-------	0.33	-------	-------	0.80	-------	-------	1.53	existing 24hr
2	SCS Runoff	-------	-------	0.61	-------	-------	1.55	-------	-------	2.99	existing 12hr
3	SCS Runoff	-------	-------	1.13	-------	-------	2.88	-------	-------	5.60	existing 6hr
4	SCS Runoff	-------	-------	0.56	-------	-------	1.94	-------	-------	4.39	existing 3hr
5	SCS Runoff	-------	-------	0.52	-------	-------	1.99	-------	-------	4.60	existing 2hr
6	SCS Runoff	-------	-------	0.36	-------	-------	1.65	-------	-------	4.23	existing 1hr
7	SCS Runoff	-------	-------	0.64	-------	-------	1.22	-------	-------	2.06	future 24hr
8	SCS Runoff	-------	-------	1.07	-------	-------	2.02	-------	-------	3.31	future 12hr
9	SCS Runoff	-------	-------	1.42	-------	-------	3.06	-------	-------	5.21	future 6hr
10	SCS Runoff	-------	-------	1.74	-------	-------	3.95	-------	-------	7.16	future 3hr
11	SCS Runoff	-------	-------	1.81	-------	-------	4.30	-------	-------	7.94	future 2hr
12	SCS Runoff	-------	-------	1.64	-------	-------	4.11	-------	-------	7.99	future 1hr
13	Reservoir	12	-------	1.59	-------	-------	4.09	-------	-------	7.77	detention

Proj. file: stevens.gpw

Run date: 05-14-2012

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	1.53	6	648	46,248	----	------	------	existing 24hr
2	SCS Runoff	2.99	6	324	46,248	----	------	------	existing 12hr
3	SCS Runoff	5.60	6	174	46,248	----	------	------	existing 6hr
4	SCS Runoff	4.39	6	108	21,485	----	------	------	existing 3hr
5	SCS Runoff	4.60	6	84	17,663	----	------	------	existing 2hr
6	SCS Runoff	4.23	6	60	11,747	----	------	------	existing 1hr
7	SCS Runoff	2.06	6	582	64,425	----	------	------	future 24hr
8	SCS Runoff	3.31	6	312	52,651	----	------	------	future 12hr
9	SCS Runoff	5.21	6	174	43,561	----	------	------	future 6hr
10	SCS Runoff	7.16	6	102	35,068	----	------	------	future 3hr
11	SCS Runoff	7.94	6	78	30,193	----	------	------	future 2hr
12	SCS Runoff	7.99	6	54	22,281	----	------	------	future 1hr
13	Reservoir	7.77	6	60	22,281	12	764.37	1,396	detention

Proj. file: stevens.gpw	Return Period: 100 yr	Run date: 05-14-2012

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	0.80	6	648	23,735	----	------	------	existing 24hr
2	SCS Runoff	1.55	6	330	23,735	----	------	------	existing 12hr
3	SCS Runoff	2.88	6	180	23,735	----	------	------	existing 6hr
4	SCS Runoff	1.94	6	114	9,657	----	------	------	existing 3hr
5	SCS Runoff	1.99	6	90	7,702	----	------	------	existing 2hr
6	SCS Runoff	1.65	6	60	4,533	----	------	------	existing 1hr
7	SCS Runoff	1.22	6	588	37,875	----	------	------	future 24hr
8	SCS Runoff	2.02	6	324	31,501	----	------	------	future 12hr
9	SCS Runoff	3.06	6	174	25,299	----	------	------	future 6hr
10	SCS Runoff	3.95	6	102	19,330	----	------	------	future 3hr
11	SCS Runoff	4.30	6	78	16,461	----	------	------	future 2hr
12	SCS Runoff	4.11	6	54	11,469	----	------	------	future 1hr
13	Reservoir	4.09	6	60	11,469	12	763.67	595	detention

Proj. file: stevens.gpw	Return Period: 10 yr	Run date: 05-14-2012

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	0.33	6	654	9,657	----	------	------	existing 24hr
2	SCS Runoff	0.61	6	336	9,657	----	------	------	existing 12hr
3	SCS Runoff	1.13	6	186	9,657	----	------	------	existing 6hr
4	SCS Runoff	0.56	6	126	2,854	----	------	------	existing 3hr
5	SCS Runoff	0.52	6	96	2,035	----	------	------	existing 2hr
6	SCS Runoff	0.36	6	66	926	----	------	------	existing 1hr
7	SCS Runoff	0.64	6	648	19,330	----	------	------	future 24hr
8	SCS Runoff	1.07	6	330	16,461	----	------	------	future 12hr
9	SCS Runoff	1.42	6	180	11,687	----	------	------	future 6hr
10	SCS Runoff	1.74	6	108	8,529	----	------	------	future 3hr
11	SCS Runoff	1.81	6	84	6,956	----	------	------	future 2hr
12	SCS Runoff	1.64	6	60	4,527	----	------	------	future 1hr
13	Reservoir	1.59	6	66	4,527	12	763.24	275	detention

Proj. file: stevens.gpw	Return Period: 2 yr	Run date: 05-14-2012

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Hyd. No. 13

detention

Hydrograph type	= Reservoir	Peak discharge	= 4.09 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Inflow hyd. No.	= 12	Reservoir name	= ditches
Max. Elevation	= 763.67 ft	Max. Storage	= 595 cuft

Storage Indication method used.

Outflow hydrograph volume = 11,469 cuft

Hydrograph Discharge Table

Time (min)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
60	4.05	763.67 <<	4.09	-----	-----	-----	-----	-----	-----	-----	-----	4.09 <<

...End

Reservoir Report

Hydraflow Hydrographs by Intelisolve

Reservoir No. 1 - ditches

Pond Data

Bottom LxW = 100.0 x 1.0 ft Side slope = 3.0:1 Bottom elev. = 762.45 ft Depth = 3.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	762.45	100	0	0
0.15	762.60	192	22	22
0.30	762.75	285	36	58
0.45	762.90	380	50	107
0.60	763.05	477	64	172
0.75	763.20	575	79	250
0.90	763.35	675	94	344
1.05	763.50	776	109	453
1.20	763.65	879	124	577
1.35	763.80	984	140	717
1.50	763.95	1,090	156	872
1.65	764.10	1,198	172	1,044
1.80	764.25	1,307	188	1,232
1.95	764.40	1,419	204	1,436
2.10	764.55	1,531	221	1,657
2.25	764.70	1,646	238	1,896
2.40	764.85	1,762	256	2,151
2.55	765.00	1,879	273	2,424
2.70	765.15	1,999	291	2,715
2.85	765.30	2,120	309	3,024
3.00	765.45	2,242	327	3,351

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 12.0	0.0	0.0	0.0
Span in	= 12.0	0.0	0.0	0.0
No. Barrels	= 2	0	0	0
Invert El. ft	= 762.45	0.00	0.00	0.00
Length ft	= 10.0	0.0	0.0	0.0
Slope %	= 0.50	0.00	0.00	0.00
N-Value	= .024	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.00	0.00	0.00	0.00
Crest El. ft	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0.00	0.00	0.00	0.00
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	762.45	0.00	---	---	---	---	---	---	---	---	0.00
0.15	22	762.60	0.13	---	---	---	---	---	---	---	---	0.13
0.30	58	762.75	0.41	---	---	---	---	---	---	---	---	0.41
0.45	107	762.90	0.78	---	---	---	---	---	---	---	---	0.78
0.60	172	763.05	1.18	---	---	---	---	---	---	---	---	1.18
0.75	250	763.20	1.51	---	---	---	---	---	---	---	---	1.51
0.90	344	763.35	1.75	---	---	---	---	---	---	---	---	1.75
1.05	453	763.50	2.49	---	---	---	---	---	---	---	---	2.49
1.20	577	763.65	3.94	---	---	---	---	---	---	---	---	3.94
1.35	717	763.80	4.99	---	---	---	---	---	---	---	---	4.99
1.50	872	763.95	5.85	---	---	---	---	---	---	---	---	5.85
1.65	1,044	764.10	6.60	---	---	---	---	---	---	---	---	6.60
1.80	1,232	764.25	7.27	---	---	---	---	---	---	---	---	7.27
1.95	1,436	764.40	7.88	---	---	---	---	---	---	---	---	7.88
2.10	1,657	764.55	8.45	---	---	---	---	---	---	---	---	8.45
2.25	1,896	764.70	8.99	---	---	---	---	---	---	---	---	8.99
2.40	2,151	764.85	9.49	---	---	---	---	---	---	---	---	9.49
2.55	2,424	765.00	9.97	---	---	---	---	---	---	---	---	9.97
2.70	2,715	765.15	10.43	---	---	---	---	---	---	---	---	10.43
2.85	3,024	765.30	10.87	---	---	---	---	---	---	---	---	10.87
3.00	3,351	765.45	11.29	---	---	---	---	---	---	---	---	11.29

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Hyd. No. 13

detention

Hydrograph type	= Reservoir	Peak discharge	= 7.77 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Inflow hyd. No.	= 12	Reservoir name	= ditches
Max. Elevation	= 764.37 ft	Max. Storage	= 1,396 cuft

Storage Indication method used.

Outflow hydrograph volume = 22,281 cuft

Hydrograph Discharge Table

Time (min)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
60	7.69	764.37 <<	7.77	-----	-----	-----	-----	-----	-----	-----	-----	7.77 <<

...End

Reservoir Report

Hydraflow Hydrographs by Intelisolve

Reservoir No. 1 - ditches

Pond Data

Bottom LxW = 100.0 x 1.0 ft Side slope = 3.0:1 Bottom elev. = 762.45 ft Depth = 3.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	762.45	100	0	0
0.15	762.60	192	22	22
0.30	762.75	285	36	58
0.45	762.90	380	50	107
0.60	763.05	477	64	172
0.75	763.20	575	79	250
0.90	763.35	675	94	344
1.05	763.50	776	109	453
1.20	763.65	879	124	577
1.35	763.80	984	140	717
1.50	763.95	1,090	156	872
1.65	764.10	1,198	172	1,044
1.80	764.25	1,307	188	1,232
1.95	764.40	1,419	204	1,436
2.10	764.55	1,531	221	1,657
2.25	764.70	1,646	238	1,896
2.40	764.85	1,762	256	2,151
2.55	765.00	1,879	273	2,424
2.70	765.15	1,999	291	2,715
2.85	765.30	2,120	309	3,024
3.00	765.45	2,242	327	3,351

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 12.0	0.0	0.0	0.0
Span in	= 12.0	0.0	0.0	0.0
No. Barrels	= 2	0	0	0
Invert El. ft	= 762.45	0.00	0.00	0.00
Length ft	= 10.0	0.0	0.0	0.0
Slope %	= 0.50	0.00	0.00	0.00
N-Value	= .024	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.00	0.00	0.00	0.00
Crest El. ft	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0.00	0.00	0.00	0.00
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	762.45	0.00	---	---	---	---	---	---	---	---	0.00
0.15	22	762.60	0.13	---	---	---	---	---	---	---	---	0.13
0.30	58	762.75	0.41	---	---	---	---	---	---	---	---	0.41
0.45	107	762.90	0.78	---	---	---	---	---	---	---	---	0.78
0.60	172	763.05	1.18	---	---	---	---	---	---	---	---	1.18
0.75	250	763.20	1.51	---	---	---	---	---	---	---	---	1.51
0.90	344	763.35	1.75	---	---	---	---	---	---	---	---	1.75
1.05	453	763.50	2.49	---	---	---	---	---	---	---	---	2.49
1.20	577	763.65	3.94	---	---	---	---	---	---	---	---	3.94
1.35	717	763.80	4.99	---	---	---	---	---	---	---	---	4.99
1.50	872	763.95	5.85	---	---	---	---	---	---	---	---	5.85
1.65	1,044	764.10	6.60	---	---	---	---	---	---	---	---	6.60
1.80	1,232	764.25	7.27	---	---	---	---	---	---	---	---	7.27
1.95	1,436	764.40	7.88	---	---	---	---	---	---	---	---	7.88
2.10	1,657	764.55	8.45	---	---	---	---	---	---	---	---	8.45
2.25	1,896	764.70	8.99	---	---	---	---	---	---	---	---	8.99
2.40	2,151	764.85	9.49	---	---	---	---	---	---	---	---	9.49
2.55	2,424	765.00	9.97	---	---	---	---	---	---	---	---	9.97
2.70	2,715	765.15	10.43	---	---	---	---	---	---	---	---	10.43
2.85	3,024	765.30	10.87	---	---	---	---	---	---	---	---	10.87
3.00	3,351	765.45	11.29	---	---	---	---	---	---	---	---	11.29

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Hyd. No. 13

detention

Hydrograph type	= Reservoir	Peak discharge	= 1.59 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Inflow hyd. No.	= 12	Reservoir name	= ditches
Max. Elevation	= 763.24 ft	Max. Storage	= 275 cuft

Storage Indication method used.

Outflow hydrograph volume = 4,527 cuft

Hydrograph Discharge Table

Time (min)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
60	1.64 <<	763.24	1.59	-----	-----	-----	-----	-----	-----	-----	-----	1.59

...End

DRAINAGE REPORT
INDUSTRIAL DRIVE SUBDIVISION
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Existing Conditions:

C = .3 A = 4 Acres D = 600' S = .5% H = 3' T = 33 min.
I_{10} = 2.9
Q_{10} = 2.9 (.3) (4) = 3.5 cfs

Future Conditions:

Pavement & Buildings:	1.3 Acre @ C = .9	CA =	1.17
Grass:	2.7 Acres @ C = .3	CA =	.81
	Total	CA =	1.98

T = 33 min. I_{100} = 4.3
Q_{100} = 1.98 (4.3) = 8.5 cfs
Qstore = 5 cfs
Use 2 = 12" CMP and @ HW/D = 2 outletting from two dry detention areas
Qcap = 1.5 x 2 = 3 cfs
Peak Storage Required = .26 Acre/feet
Storage Provided = .5 Acre/feet.

Prepared by:

Steven B. Williams

INFALL INTENSITY VALUES

Indianapolis, Indiana

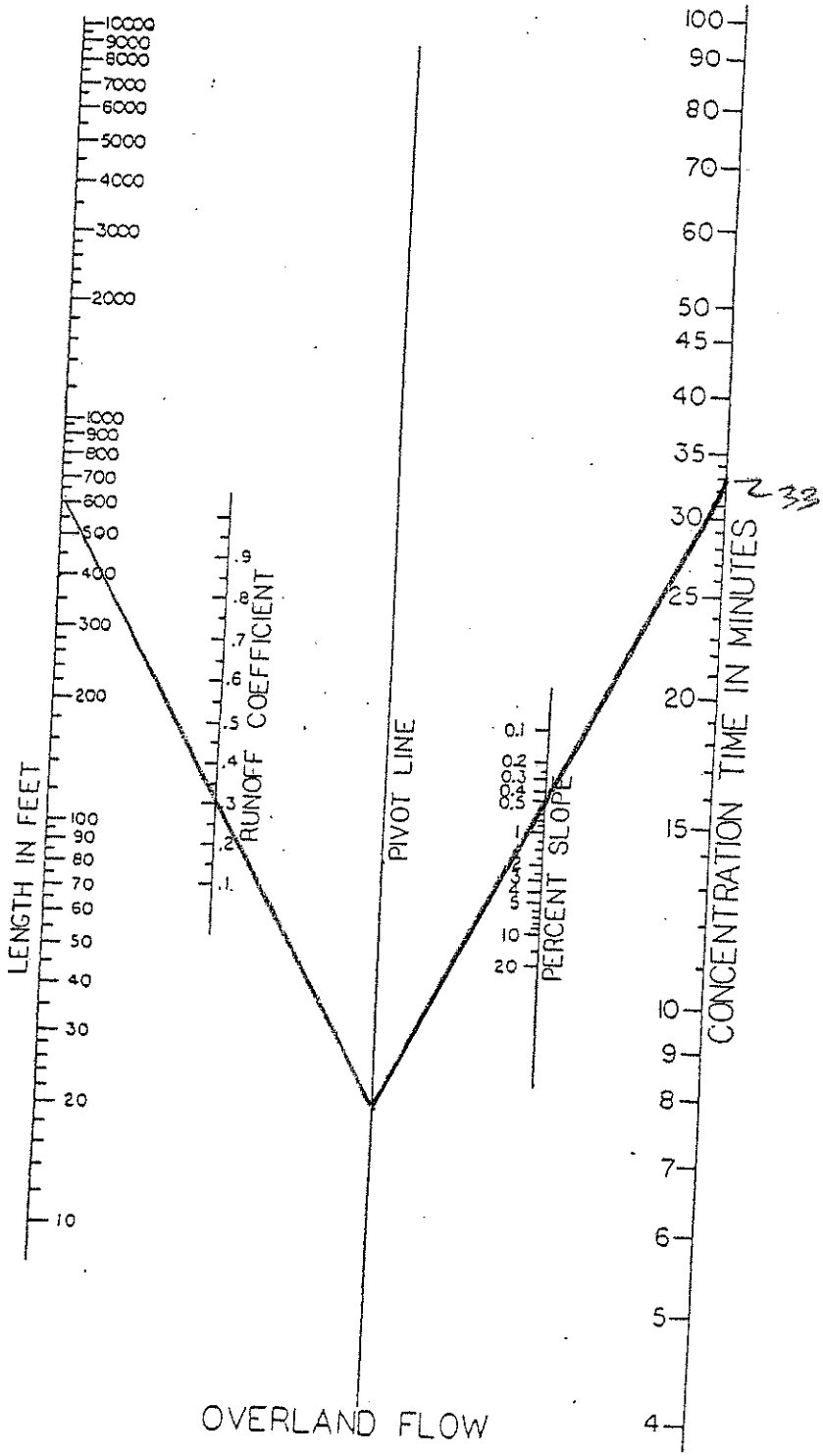
Duration (Minutes)	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
5	4.50	5.50	6.30	7.30	8.00	8.50
6	4.30	5.30	6.00	7.00	7.70	8.20
7	4.10	5.10	5.75	6.75	7.40	7.90
8	3.90	4.90	5.50	6.50	7.10	7.60
9	3.70	4.70	5.25	6.25	6.80	7.30
10	3.50	4.50	5.00	6.00	6.50	7.00
15	2.90	3.70	4.40	5.10	5.60	6.10
20	2.50	3.30	3.80	4.50	5.00	5.50
25	2.25	2.95	3.45	4.05	4.50	5.00
30	2.00	2.60	3.10	3.60	4.00	4.50
40	1.65	2.25	2.60	3.10	3.50	3.90
50	1.45	2.00	2.30	2.75	3.10	3.40
60	1.25	1.75	2.10	2.50	2.70	3.00
120	0.78	1.10	1.30	1.60	1.70	2.00
180	0.58	0.80	1.00	1.20	1.30	1.50
240	0.47	0.65	0.80	0.95	1.10	1.30

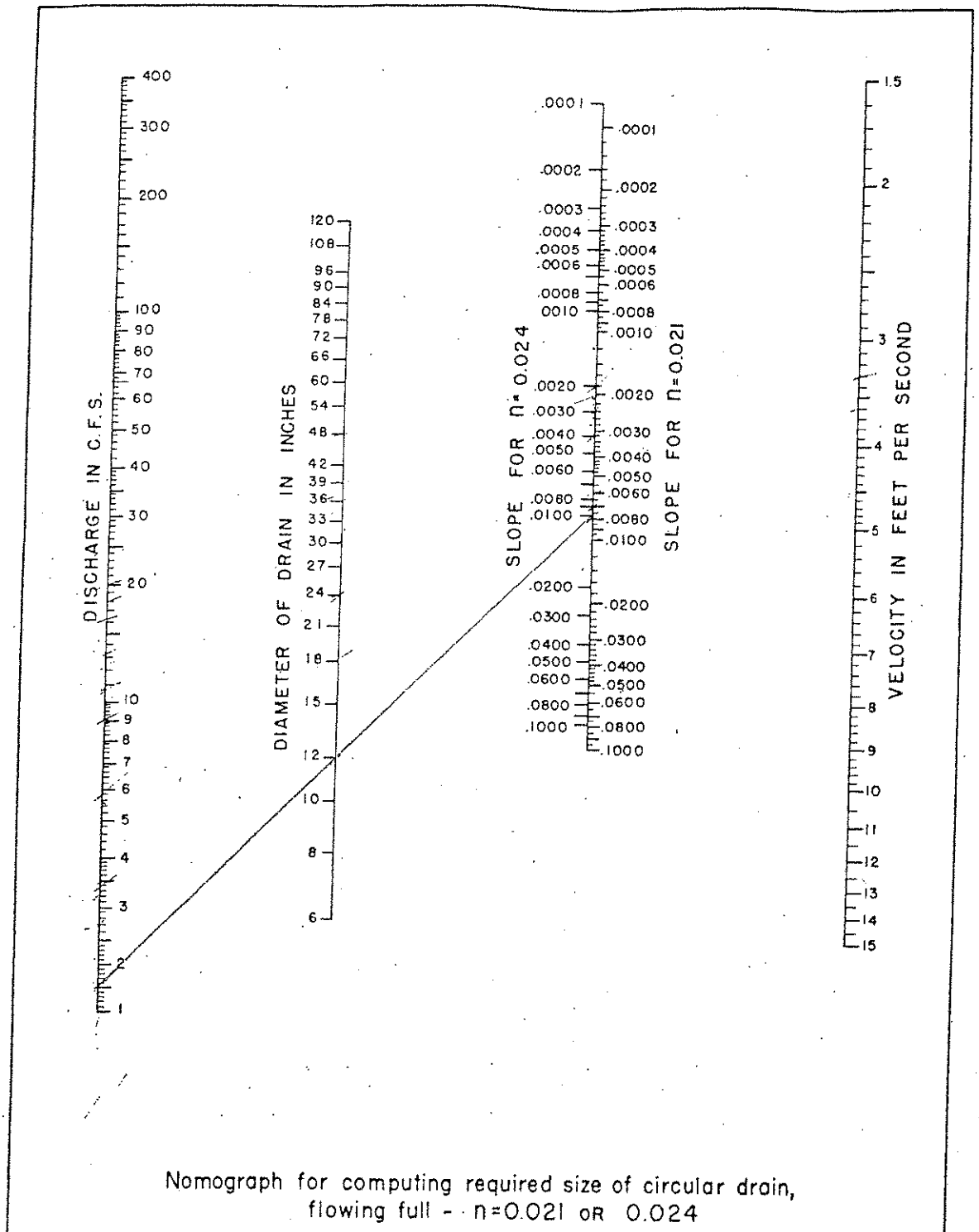
For Additional Values See Referenced Publications

Values taken from graph prepared by U.S. Department of Commerce Weather Bureau based on recorded rainfalls from 1903 to 1951 See Technical Paper No. 25, Page 14, or Indiana State Highway Commission Hydraulic Design of Drainage Culverts, Page 35

OVERLAND FLOW AND RUN-OFF COEFFICIENT

FIGURE 5.3





Nomograph for computing required size of circular drain, flowing full - - n=0.021 OR 0.024

FIGURE 10. Nomograph for computing required size of circular drain for n 0.021 or 0.024.

Project INDUSTRIAL DR. S. Detention Facility Design Return Period 100 yrs.

Designer SBW Release Rate Return Period 10 yrs.

Watershed Area 4 acres

Time of Concentration (undeveloped watershed) 33 minutes

Rainfall Intensity (i_U) 2.9 inches/hr

Undeveloped Runoff Coefficient (C_U) .3

Undeveloped Runoff Rate ($O = C_U i_U A_U$) 3.5 cfs

Developed Runoff Coefficient (C_D) .50

Storm Duration t_d (hrs)	Rainfall Intensity i_d (inches/hr)	Inflow Rate $I(t_d)$ $(C_D i_d A_D)$ (cfs) CA=1.98	Outflow Rate O $(C_U i_U A_U)$ (cfs) 3cfs	Storage Rate $I(t_d)-O$ (cfs)	Required Storage $\left[I(t_d)-O\right]\frac{t_d}{12}$ (acre-ft)
0.17	7.00	13.86		10.86	0.15
0.25	6.10	12.08		9.08	0.19
0.33	5.50	10.89		7.89	0.22
0.42	5.00	9.90		6.90	0.24
0.50	4.50	8.91		5.91	0.24
0.67	3.90	7.72		4.72	0.26 ← PK
0.83	3.40	6.73		3.73	0.26
1.00	3.00	5.94		2.94	0.24
1.25					
1.50					
1.75					
2.00					
2.25					
2.50					
2.75					
3.00					
3.25					

Figure 6.2 Computation Sheet for Detention Storage Calculations Using the Rational Method