Hydrology / Erosion Control Calculations

For

Burger King - 5700 Fairburn Road
Douglasville, GA

May 1, 2019

LBYD ENGINEERS

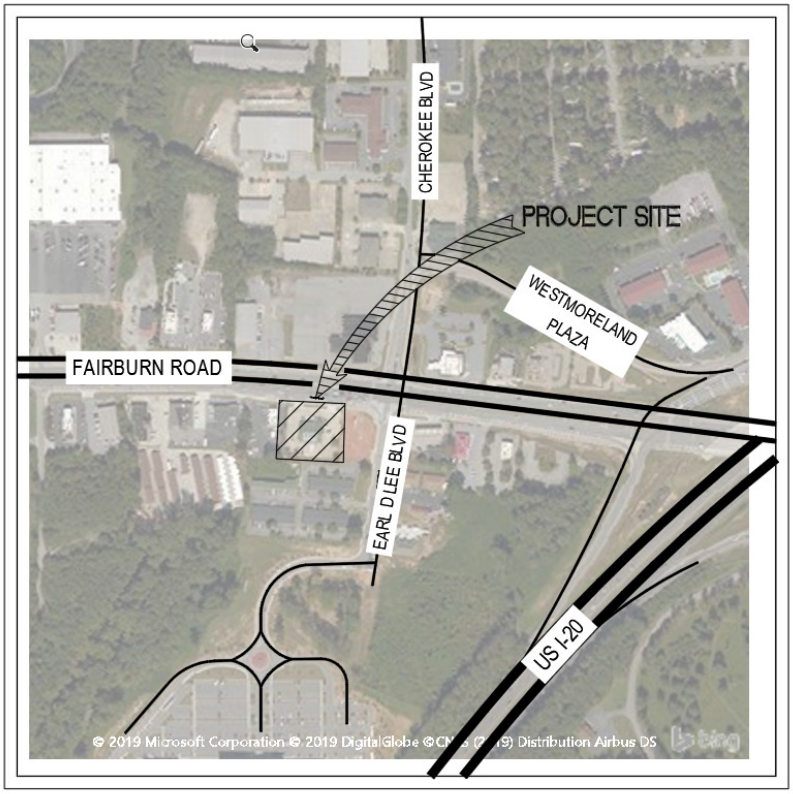
Project Number: 102-18-156.008

1.0 Project Description and Drainage Patterns

This project site is located at 5700 Fairburn Road, Douglasville, GA. The existing conditions of the site include the remains of the former Shoney's restaurant (majority of structure was destroyed in fire), parking lot, and associated utilities/drainage structures. Surrounding the site there is a Krystal's restaurant to the west, apartment complex to the south, undeveloped Douglas County owned property to the east, and GDOT Fairburn Rd to the north. The project site, Krystal, and apartment complex all share use of an existing regional detention pond to the southwest of the project site which ultimately outfalls to Slater Mill Creek.

The proposed redevelopment of the site is a prototypical Burger King restaurant. Site work will include demolition of existing building foundation, parking lot, and associated utilities as needed and construction of proposed building, paving, utilities, grading, drainage, erosion control measures, and landscaping. The work will take place on the previously developed ±0.90-acre tract, an existing 0.12-acre ingress-egress easement east of the site to connect to Earl Lee Blvd, and approximately 0.12 acres in the GDOT right-of-way to the north of the site. The total disturbed area of the project will be approximately 1.14 acres.

Current site topography includes slopes between 2-10% with the steeper grades occurring on the outer edges near the corner of the site. In general, the site drains from northeast to southwest toward the existing detention pond. Current runoff from the site and ingress-egress easement is collected in existing storm sewer that routes it to the pond in the southwest corner of the property. The proposed development and associated grading and drainage will mimic existing drainage patters with drainage away from the building towards proposed stormwater inlets which route to the existing detention pond. Existing conditions do not reflect current water quality standards, therefore, the proposed development will include a Contech CDS Inline device for treatment of the 1.2" storm per GSMM requirements. The site will also require permitting under the Georgia NPDES General Permit.



VICINITY MAP
N.T.S.

2.0 Storm Drainage Detention Design

Summary

The DDCWSA provided a previously submitted drainage report with supporting hydrograph information prepared by Volunteer Engineering of Georgia and cataloged 5000-030 Since information about adjacent properties and the existing detention pond is limited, a model was built to replicate the basins, pond storage, and outlet control structure from the previous drainage report (see Appendix A for full report). This strategy established a baseline from which the existing detention pond can be assessed against proposed changes.

Per the former report, the pre-development condition was represented by 5.407 acres of pasture land which models the project site and surrounding area in the completely undeveloped condition.

Post basins for the existing detention pond were separated into three areas:

- Existing Apartments - 2.857 acres
- Proposed Burger King development + Existing Krystal – 2.444 acres
- Basin bypassing detention – 0.106 acres

In the model, the existing apartments and proposed Burger King development + existing Krystal were combined and routed through the pond. The flows exiting the pond were then combined with the flow from the area bypassing detention. This cumulative flowrate was then used as the post-developed flow rate and compared to the undeveloped pre-developed flows. It may be noted that the current site with remains of a former restaurant and parking lot compared to the proposed development are extremely close in pervious/impervious land distribution (see further detail in Methods).

Methods

The software used to perform the site drainage analysis was the Hydraflow Hydrographs Extension for AutoCAD Civil 3D, 2019. The modified rational method was used for congruence with previous drainage report methods and acceptable per the DDCWSA design standards.

The following parameters were used in calculations:

- Minimum Time of Concentration: 5 minutes
- Rational coefficient (c) 0.95 Impervious Areas
  0.60 Landscape
  0.30 Pasture
- Rainfall Distribution (intensity) from NOAA data:

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.76 (3.79-5.93)	5.46 (4.34-6.79)	6.66 (5.28-8.32)	7.73 (6.10-9.66)	9.28 (7.14-11.9)	10.5 (7.94-13.7)	11.9 (8.68-15.6)	13.3 (9.36-17.8)	15.2 (10.4-20.7)	16.8 (11.1-23.0)
10-min	3.49 (2.77-4.34)	4.00 (3.17-4.97)	4.88 (3.87-6.09)	5.66 (4.46-7.07)	6.79 (5.23-8.74)	7.72 (5.81-10.00)	8.68 (6.35-11.4)	9.71 (6.85-13.0)	11.1 (7.59-15.2)	12.3 (8.15-16.8)
15-min	2.83 (2.25-3.52)	3.25 (2.58-4.05)	3.97 (3.14-4.95)	4.60 (3.63-5.75)	5.52 (4.25-7.10)	6.27 (4.73-8.13)	7.06 (5.16-9.30)	7.90 (5.57-10.6)	9.06 (6.17-12.4)	9.98 (6.63-13.7)
30-min	2.06 (1.64-2.56)	2.37 (1.88-2.95)	2.89 (2.29-3.61)	3.35 (2.64-4.19)	4.02 (3.10-5.17)	4.57 (3.44-5.91)	5.13 (3.75-6.76)	5.74 (4.04-7.68)	6.57 (4.47-8.96)	7.23 (4.80-9.92)
60-min	1.35 (1.08-1.69)	1.55 (1.24-1.93)	1.90 (1.50-2.37)	2.20 (1.74-2.75)	2.65 (2.04-3.41)	3.01 (2.27-3.90)	3.39 (2.48-4.47)	3.80 (2.68-5.09)	4.37 (2.98-5.96)	4.82 (3.20-6.61)
2-hr	0.839 (0.676-1.03)	0.962 (0.774-1.18)	1.18 (0.942-1.45)	1.36 (1.09-1.69)	1.64 (1.28-2.09)	1.87 (1.43-2.40)	2.11 (1.57-2.75)	2.37 (1.69-3.14)	2.73 (1.89-3.68)	3.01 (2.03-4.08)
3-hr	0.631 (0.511-0.772)	0.721 (0.584-0.882)	0.879 (0.710-1.08)	1.02 (0.819-1.25)	1.23 (0.965-1.55)	1.40 (1.08-1.78)	1.58 (1.18-2.04)	1.77 (1.28-2.33)	2.04 (1.43-2.74)	2.26 (1.54-3.04)
6-hr	0.391 (0.321-0.473)	0.444 (0.364-0.538)	0.537 (0.439-0.651)	0.620 (0.504-0.753)	0.741 (0.591-0.928)	0.842 (0.656-1.06)	0.947 (0.718-1.21)	1.06 (0.777-1.38)	1.22 (0.864-1.61)	1.35 (0.930-1.79)
12-hr	0.240 (0.199-0.287)	0.272 (0.225-0.325)	0.326 (0.270-0.391)	0.374 (0.307-0.449)	0.442 (0.356-0.545)	0.498 (0.393-0.618)	0.556 (0.427-0.701)	0.617 (0.458-0.792)	0.702 (0.505-0.917)	0.769 (0.540-1.01)
24-hr	0.144 (0.121-0.170)	0.165 (0.138-0.195)	0.199 (0.166-0.235)	0.227 (0.189-0.270)	0.268 (0.218-0.325)	0.299 (0.239-0.366)	0.332 (0.258-0.412)	0.365 (0.275-0.461)	0.410 (0.299-0.528)	0.445 (0.318-0.578)
2-day	0.083 (0.071-0.097)	0.096 (0.082-0.112)	0.117 (0.099-0.137)	0.134 (0.113-0.158)	0.159 (0.130-0.190)	0.177 (0.143-0.214)	0.196 (0.154-0.240)	0.215 (0.164-0.268)	0.240 (0.178-0.304)	0.259 (0.188-0.332)
3-day	0.061 (0.052-0.070)	0.069 (0.059-0.080)	0.083 (0.071-0.097)	0.095 (0.081-0.111)	0.113 (0.094-0.134)	0.126 (0.103-0.151)	0.140 (0.111-0.171)	0.154 (0.119-0.191)	0.173 (0.130-0.219)	0.188 (0.138-0.240)
4-day	0.049 (0.042-0.056)	0.055 (0.047-0.064)	0.066 (0.057-0.076)	0.075 (0.064-0.087)	0.089 (0.074-0.105)	0.099 (0.082-0.119)	0.111 (0.089-0.135)	0.123 (0.095-0.152)	0.139 (0.105-0.175)	0.152 (0.112-0.192)
7-day	0.033 (0.028-0.037)	0.037 (0.032-0.042)	0.043 (0.038-0.050)	0.050 (0.043-0.057)	0.059 (0.050-0.069)	0.066 (0.055-0.078)	0.074 (0.060-0.089)	0.082 (0.065-0.101)	0.094 (0.072-0.117)	0.103 (0.077-0.129)
10-day	0.026 (0.023-0.029)	0.029 (0.025-0.033)	0.034 (0.030-0.039)	0.039 (0.034-0.044)	0.046 (0.039-0.054)	0.051 (0.043-0.061)	0.057 (0.047-0.069)	0.064 (0.051-0.078)	0.073 (0.056-0.090)	0.080 (0.061-0.100)
20-day	0.017 (0.015-0.019)	0.019 (0.017-0.022)	0.022 (0.020-0.025)	0.025 (0.022-0.028)	0.029 (0.025-0.033)	0.032 (0.027-0.037)	0.035 (0.029-0.042)	0.039 (0.031-0.047)	0.044 (0.034-0.054)	0.048 (0.037-0.059)
30-day	0.014 (0.013-0.016)	0.016 (0.014-0.017)	0.018 (0.016-0.020)	0.020 (0.018-0.022)	0.023 (0.020-0.026)	0.025 (0.021-0.029)	0.027 (0.023-0.032)	0.030 (0.024-0.035)	0.033 (0.026-0.040)	0.035 (0.027-0.043)
45-day	0.012 (0.011-0.013)	0.013 (0.012-0.014)	0.015 (0.013-0.017)	0.016 (0.015-0.018)	0.019 (0.016-0.021)	0.020 (0.017-0.023)	0.022 (0.018-0.025)	0.023 (0.019-0.027)	0.025 (0.020-0.030)	0.027 (0.021-0.032)
60-day	0.010 (0.009-0.011)	0.012 (0.010-0.013)	0.013 (0.012-0.015)	0.015 (0.013-0.016)	0.016 (0.014-0.018)	0.018 (0.015-0.020)	0.019 (0.016-0.021)	0.020 (0.016-0.023)	0.021 (0.017-0.025)	0.022 (0.018-0.027)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Overall Site conditions, Pre-Development and Post-Development

PRE

*1) Undeveloped Site**

Total Area =	5.407 acres
Pasture =	5.41 acres
Weighted c-factor =	0.30

POST

1) Existing Apartments

Total Area =	2.857 acres
Landscape =	0.6 acres
Impervious =	2.26 acres
Weighted c-factor =	0.88

*2) Proposed Burger King Area + Existing Krystal***

Total Area =	2.444 acres
Landscape =	0.82 acres
Impervious =	1.62 acres
Weighted c-factor =	0.83

3) Bypass Detention

Total Area =	0.106 acres
Landscape =	0.11 acres
Weighted c-factor =	0.60

POST = (1+2 Combined & Routed through Pond) + 3

*Compared to the 1988 report in Appendix A, flow rates have modified slightly due to updated modeling capabilities and current NOAA Atlas data.
**The Post 2 basin is altered with the landscaped area increased by 0.02 acre and the impervious area decreased by 0.02 acres in adjustments for the proposed site.

Results

As shown in the table below, the post-development discharges remain below the pre-development thereby concluding the existing detention pond will be sufficient for the proposed development.

Summary Table of Pre vs Post Development Flows

Event	PRE (CFS)	POST (CFS)
2-Year	8.85	4.33
5-Year	10.79	4.98
10-Year	12.51	5.52
25-Year	15.02	6.12
50-Year	17.01	6.48
100-Year	19.30	7.44

3.0 Water Quality

Summary

The existing conditions of the site do not include any measures for water quality. The existing detention pond may be considered a dry detention basin which can be attributed with up to 60% TSS removal, but the pond is technically off-property. Per the 2016 Edition of the Georgia Stormwater Management Manual Volumes 1 & 2 (GSMM aka "Blue Book"), water quality BMPs must be established to treat water before it leaves a proposed development.

Methods

The "Site Development Review Tool" provided as a supplement to the Blue Book was used to assess water quality objects via runoff reduction or 80% TSS removal. The site topography and intention to continue use of the existing detention pond deemed 80% TSS removal the best means of attaining water quality.

While the detention calculations used the surrounding areas of the site, water quality was bounded to polluted runoff coming from the Burger King project site alone (1+ acre). Due to limited pervious area on the site, a propriety device was selected as an ideal BMP to achieve water quality standards.

Results

The device known as a Contech CDS Inline is to be installed after the last inlet but before the outfall to the detention pond. It has been designed to handle 80% TSS of the 1.2" storm and calculated with the following information provided by Contech Engineered Solutions:

CONTECH®
ENGINEERED SOLUTIONS

Project Name: Douglasville, GA
Date: 4/29/2019 Flow-Based Sizing Per GSWMM
Structure: WQ
Designed By: KMT

SITE CHARACTERISTIC INPUT

Design Storm, P (inches)	1.20	GSWMM Vol 2. Sec. 3.1.7.1
Total Area, A_T (acres)	1.29	
Impervious Area, A_I (acres)	0.86	

WQv & WQq CALCULATIONS

Percent Impervious Cover, I	67%	
Volumetric Runoff Coefficient, Rv	0.65	GSWMM Vol 2. Sec. 3.1.7.1 - Equation 3.1.19
Water Quality Volume, Qwv (in)	0.780	
Water Quality Volume, Wqv (ac-ft)	0.08	GSWMM Vol 2. Sec. 3.1.7.1 - Equation 3.1.20
Water Quality Volume, Wqv (cf)	3,652.51	
Composite Curve Number, CN	95.6	CN = 1000/(10 + 5P +10WQv - 10(WQv^2 + 1.25WQvP)^1/2)
S = 1000/CN -10, (inches)	0.46	
Ia = 0.2S, (inches)	0.09	
*Ia/P =	*0.077*	
*Time of Concentration, tc (min)	5	GSWMM Vol 2. Sec. 3.1.7.2
*Use these numbers to determine qu in GSM Fig. 2.1.5-6		
Unit Peak Discharge, qu (cfs/sqmi/in)	1000	
Water Quality Peak Discharge, WQq (cfs)	1.57	GSWMM Vol 2. Sec. 3.1.7.2 - $Q_{WQ} = q_U * A * Q_{WV}$

See Appendix G for the recommended operations and maintenance guidance.

4.0 Appendices

Please see the attached appendices for further supporting information.

Appendix A: 1988 Drainage Report Prepared by Volunteer Engineering Company of Georgia

Appendix B: Pre-Basin & Post-Basin Exhibits (for detention assessment)

Appendix C: USDA Web Soil Survey

Appendix D: Fema FIRMette, Topo, & Site Maps

Appendix E: GSMM Blue Book – Site Development Tool & Water Quality Exhibit

Appendix F: Contech CDS Inline (CDS2025-5-C) Standard Detail

Appendix G: Maintenance & Operations recommendations

Appendix H: 2019 Georgia CSWCC Checklist

STORMWATER DETENTION ANALYSIS

FOR

SOUTHLODGE, DOUGLASVILLE
AT FAIR FLAGVIEW DRIVE
LAND LOT 53, 1ST DISTRICT 5th SECTION
DOUGLAS COUNTY, GEORGIA

5000-030

Prepared for:

Southlodge, Douglasville

Prepared by:

Volunteer Engineering Company
of Georgia

September 1988

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Appendix

I. INTRODUCTION:

Southlodge, Douglasville is in the process of developing an apartment facility in Douglas County, Georgia. The site is 2.55 acres. It is located on Flagview Mobile Park Access Road (see A-1 for a location map).

The existing site generally slopes from Flagview Access Road westerly across the site. Slopes range from 2 to 8 percent. Two swales on the site collect the runoff into an existing detention pond, located in the northwest corner of the site. The existing detention pond currently serves Krystal's, Shoney's, and Captain D's, all of which are adjacently located to the north of the site. Additional runoff from across Flagview access road enters the site via an 18" corrugated metal pipe. According to a drainage study for Krystal, Shoney's, & Royal Properties, preformed by Willis & Wiley Engineers, the maximum flow thru this pipe is 6.0 cfs.

Development will consist of construction of approximately 70 apartment units in four independent buildings with associated ongrade parking facilities. The existing drainage pattern will be maintained. The parking lot will be graded to low points where drop inlets or catch basins will collect the runoff from the buildings and adjacent parking areas. The runoff collected in

these structures will be piped to a 4' detention pond.

The existing detention facility will be modified to account for increased flow from the developed site. An outflow control structure will regulate the amount of runoff flowing offsite.

II. METHODOLOGY:

In order to verify that the existing detention pond, with modification, could handle the increase runoff from the development by Southlodge, Douglasville, the pond's capacity was checked against the whole basin's development. To determine whether the developed conditions for the entire basin do cause an increase in surface runoff from an original undeveloped basin and to account for this possible increase, the following procedures were used:

A. Calculate peak undeveloped runoff for the entire drainage basin by the Rational Method (Q=(CA)I) by performing:

   1. Time of concentration (Tc) calculations with 5 minute minimum.

   2. Rainfall intensity values corresponding to Tc.

   3. Land coefficient (C) times the area (A) values for drainage areas.

   4. Runoff (Q) calculations for existing conditions.

B. Calculate peak developed runoff for the entire drainage basin by the Rational Method (Q=(CA)I) by perfoming:

   1. Time of concentration (Tc) calculations with a 5 minute minimum.

   2. Rainfall intensity values corresponding to Tc.

   3. Land coefficient (C) times area (A) values for drainage area(s).

   4. Runoff (Q) calculations for developed conditions.

C. Analyze undeveloped and developed runoff. If Q developed is greater than Q undeveloped, modify the existing detention facility to control increased runoff.

1. Calculate runoff (Q) allowable

   Q allowable = Qu - Qb

   Qu: Q undeveloped on-site and off-site.

   Qb: Q developed bypassing detention facility.

2. Calculate runoff (Q) flowing to detention facility.

   Q in = Q developed flowing to detention facility.

3. Determine storage available for detention.

4. Check the outflow control device and route inflow hydrograph through it.

D. Compare Q outflow of detention facility to Q allowable for basin.

A. Existing Peak Flow Analysis

Existing peak flows were determined using the Rational Method. Rain intensities used were referenced from the U.S. Weather Bureau Technical Paper 25 for the Atlanta area (see A-2b). A minimum time of concentration of five minutes was used.

The time of concentration (Tc) for the existing basin was determined using overland flow for a wooded site. The existing basin Tc is 5.00 minutes.

See A-3 for existing basin drainage areas, Tc calculations, rainfall intensity values (I) corresponding to Tc= 5.00 minutes, and peak runoff (Q) for the 2, 5, 10, 25, 50, and 100 year storms, respectively.

B. DEVELOPED PEAK FLOW ANALYSIS

Developed basin peak flows were determined similar to existing peak flows. Runoff coefficients (C) and rainfall intensities (I) were determined in a manner consistent with existing flow calculations.

The time of concentration for the developed basin is Tc = 5.00 minutes.

See A-4 for developed basin drainage areas, Tc calculations, rainfall intensity values (I) corresponding to Tc = 5.00 minutes, and developed peak runoff (Q) for then 2, 5, 10, 25, 50, and 100 year storms respectively.

C. DESIGN OF DETENTION FACILITY

The analysis of existing and developed runoff is shown in Chart 1 below:

CHART 1: COMPARISON OF EXISTING AND DEVELOPED RUNOFF

STORM YEAR	EXISTING RUNOFF(1) (CFS)	DEVELOPED RUNOFF(2) (CFS)
2	10.84	25.79
5	14.52	34.55
10	16.90	40.22
25	19.72	46.93
50	21.68	51.58
100	23.84	56.73

(1) See A-3 for calculations.
(2) See A-4a, A-4b, and A-4c for calculations.

As shown above, the developed basin causes an increase in surface runoff. To compensate for this increase, a detention pond was designed to meet the requirements of the basin. The basin will be graded such that the existing basin flow patterns will be maintained. The size of the pond was determined in the following manner:

1. Calculate the qauntity of runoff that bypasses detention (Q bypass). This is done in a manner consistent with existing and developed runoff calculations. The runoff bypassing is as shown in Chart 2.

CHART 2: RUNOFF BYPASSING DETENTION (DEVELOPED BASIN)

Storm Year	Total Q Bypass (CFS)
2	0.32
5	0.43
10	0.50
25	0.58
50	0.64
100	0.70

2. Determine maximum runoff allowed for the basin.

Q allowable = Qu - Qb

Q allowable = outflow allowed for detention pond.

Qu = peak undeveloped flow

Qb = peak developed flow bypassing detention.

CHART 3: CALCULATION OF Q ALLOWABLE

Storm Year	A	B	Q allowable (cfs)
	Qu (cfs)	Qb (cfs)	
2	10.84	0.32	10.52
5	14.52	0.43	14.09
10	16.90	0.50	16.40
25	19.72	0.58	19.14
50	21.68	0.64	21.04
100	23.84	0.70	23.14

3. Determine the peak developed runoff flowing to the detention facility.

Q in = runoff flowing to detention facility.

Q dev = peak developed flow.

CHART 4: CALCULATION OF Q IN

Storm Year	A	B	C
	Q (cfs) Dev on site	Qb (cfs) Dev off site	Q in (cfs)
2	10.21	15.26	25.47
5	13.69	20.43	34.12
10	15.93	23.79	39.72
25	18.59	27.76	46.35
50	20.43	30.51	50.94
100	22.47	33.56	56.03

4. A pond was designed to meet the requirements of the site. The amount of storage provided by this pond is as follows:

CHART 5: STAGE VS. STORAGE FOR DETENTION POND

Stage (ft.)	Storage (cu. ft.)
0	0
.5	498.75
1.0	1,995
1.5	4,331.25
2.0	7,350
2.5	10,821.25
3.0	14,515
3.5	18,431.25
4.0	22,570

(See Figure 1 for Stage-Storage Curve)

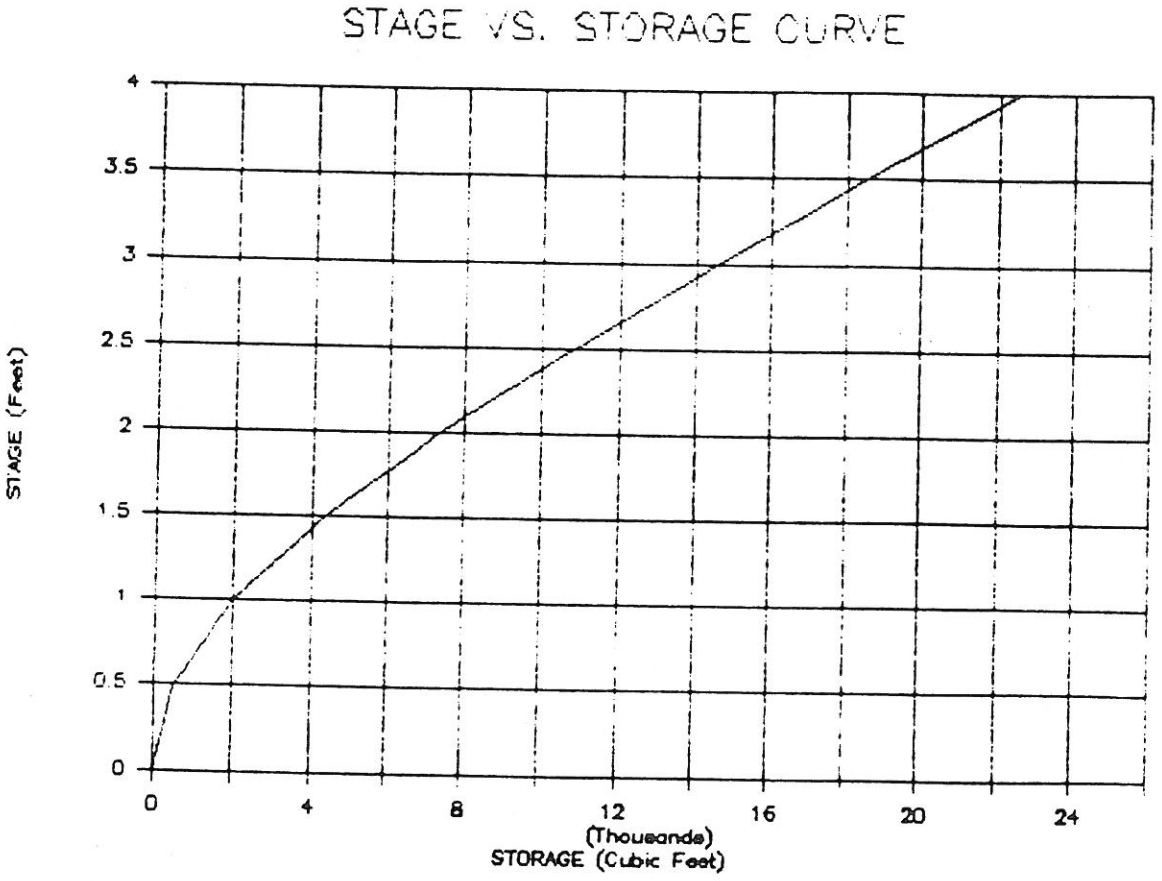


FIGURE 1: STAGE-STORAGE CURVE

5. To discharge less than or equal to the Q allowable for the basin, a control structure was designed. The control structure for this detention pond will be a 4' box with a 17" orifice and a 3'-4" wier at different stages. (See A-5 for control structure detail). The control structure discharges into a 24" reinforced concrete pipe that flows 25' to a headwall that will discharge off-site. The following chart illustrates how the control structure discharges:

CHART 6: DISCHARGE FOR CONTROL STRUCTURE

Stage	(A) 17" Orifice	(B) Q Structure (40" weir)1	A + B	Q 24"	Controling Discharge
.5	5.45	--	5.45	10.87	5.45
1.0	7.71	--	7.71	15.37	7.71
1.5	9.45	--	9.45	18.83	9.45
2.0	10.91	--	10.91	21.74	10.91
2.5	12.19	--	12.19	24.30	12.19
3.0	13.36	--	13.36	26.62	13.36
3.5	14.43	3.92	18.35	28.76	18.35
4.0	15.42	11.1	26.52	30.74	26.52

1 Overflow occurs at Stage = 4.0

(See Fig. 2 for Stage-Discharge Curve)

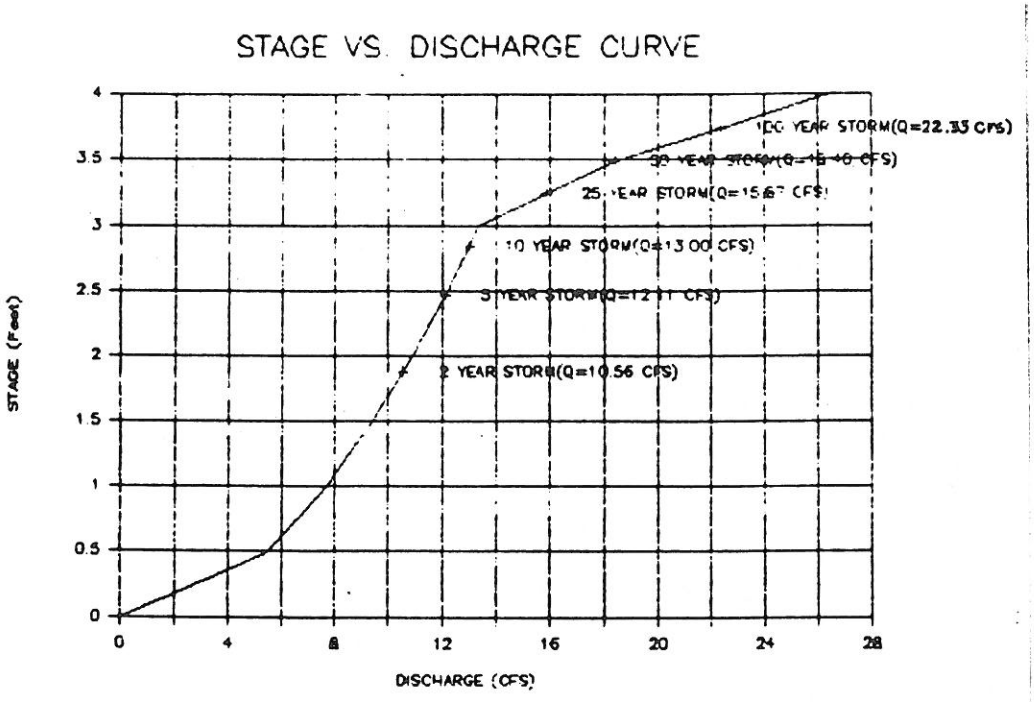


FIGURE 2: STAGE-DISCHARGE CURVE

An inflow hydrograph was developed using a dimensionless hydrograph for the Atlanta area for a time of concentration less than 20 minutes. (See A-6 for Dimensionless Hydrograph.)

The routing method was done by computer analysis to obtain outflows for the detention pond/control structure. (See A-7 through A-13 for Computer Routing Analysis and Routing Curve.)

D. Q Discharged vs. Q Allowable for Site

The use of a detention pond and a control structure to control the amount of runoff discharged off-site, is less in the developed condition than in the existing basin condition. The following chart summarizes these results:

CHART 7: SUMMARY

Storm Year	Q In (cfs)	Q Discharged (cfs)	Q Allowable (cfs)	HW Stage (ft.)	Storage (cu.ft)
2	25.47	10.56	10.52*	1.88	6631.63
5	34.12	12.11	14.00	2.47	10592.21
10	39.72	13.00	16.40	2.84	13369.16
25	46.35	15.87	19.14	3.25	16483.96
50	50.94	18.40	21.04	3.50	18456.17
100	56.03	22.33	23.14	3.74	20447.79

(See A-14 and A-15 for 2 Year and 100 Year Inflow vs. Outflow Graphs, respectively.)

*within 0.1 cfs (allowed .1 cfs/acre)

III. SUMMARY

The pre-developed basin is wooded. A C-Factor of .30 was used in the calculation of existing runoff. The site generally slopes from the Flagview access road westerly.

The post-developed site will be graded such that the existing drainage pattern will be maintained. A detention facility was designed to compensate for the increased runoff due to development. The detention facility consists of a 4' detention pond and a control structure. The detention pond will collect the runoff from four individual sites. The first site is Krystal. The second site is Shoneys. The third site is Captain D's. The fourth site is the apartment complex for Southlodge Douglasville. The parking lot for Southlodge will be graded to low points where drop inlets will collect the runoff. The runoff collected will be piped to the detention pond.

The 17" orifice and 3'-4" wier will regulate the amount of runoff discharged off-site. The outflow from the structure will be piped 25' to a headwall and then discharged off-site. Velocity for this outlet will be 9.5 ft./sec for the 100-year storm. Because of the high velocity the outflow channel will be lined.

The use of this detention facility will allow less runoff to be discharged off the post-developed site than the runoff from the

existing site. Therefore, the outfall for the detention facility is adequate.

IV. GENERAL DEFINITIONS

Rational Method - Method for determning surface runoff in terms of cubic feet per second from a given area. It is based on the direct relationship between rainfall and runoff and is expressed by the formula:

$$Q = C \times I \times A$$

Q = Runoff in cubic feet per second from a given area.

C = Runoff coefficient representing the ratio of runoff to rainfall.

I = Intensity of rainfall in inches per hour for a duration equal to the time of concentration and for a stated frequency.

A = The drainage area in acres.

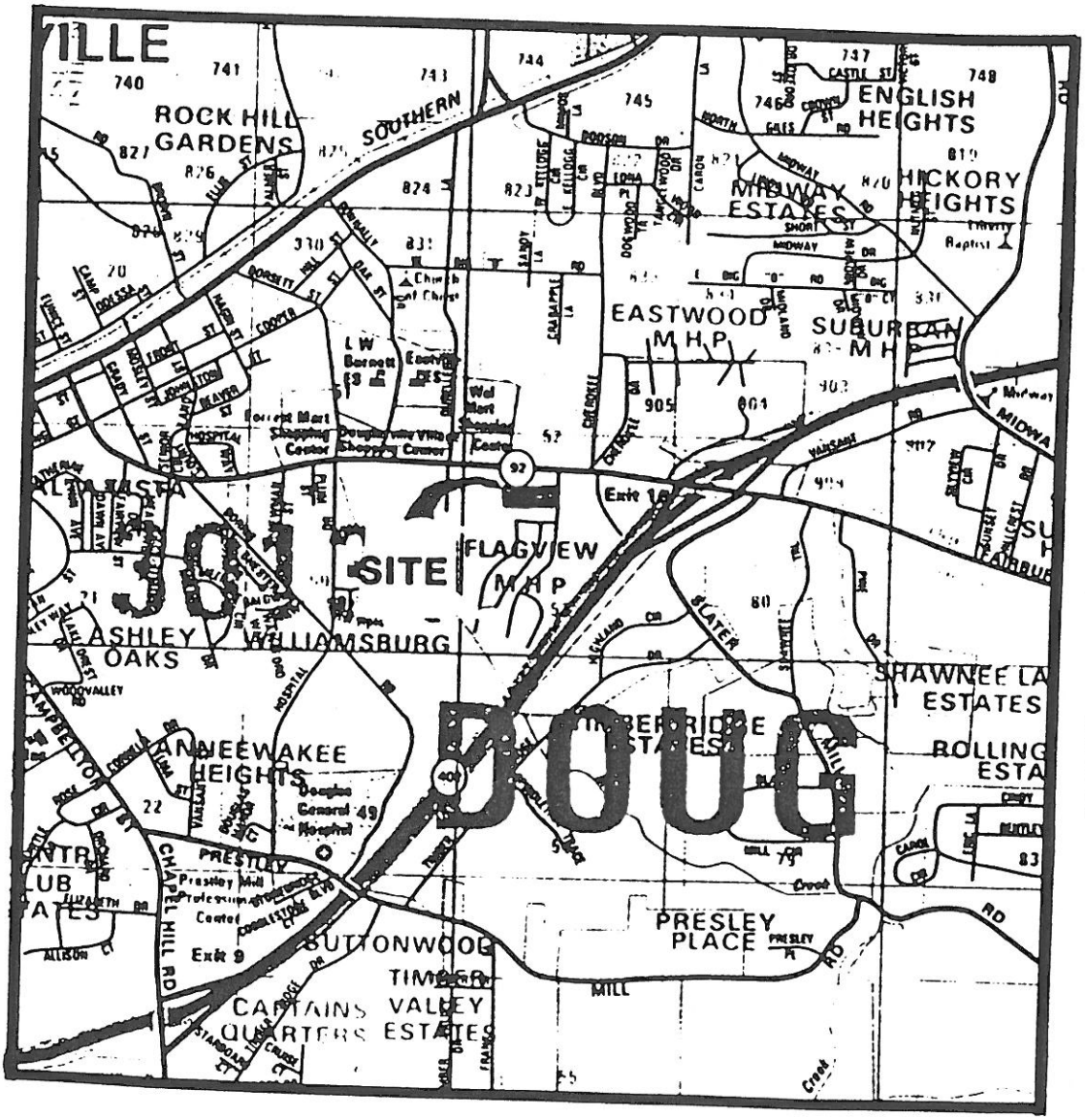
Q 24" - The discharge in cubic feet per second for a 24" pipe.

Q allowable - Runoff in cubic feet per second allowed for the basin.

Q in - Runoff in cubic feet per second flowing to the detention facility.

APPENDIX

SITE LOCATION MAP



DOUGLAS COUNTY, GEORGIA

LAND LOT 53

1st DISTRICT

5th SECTION

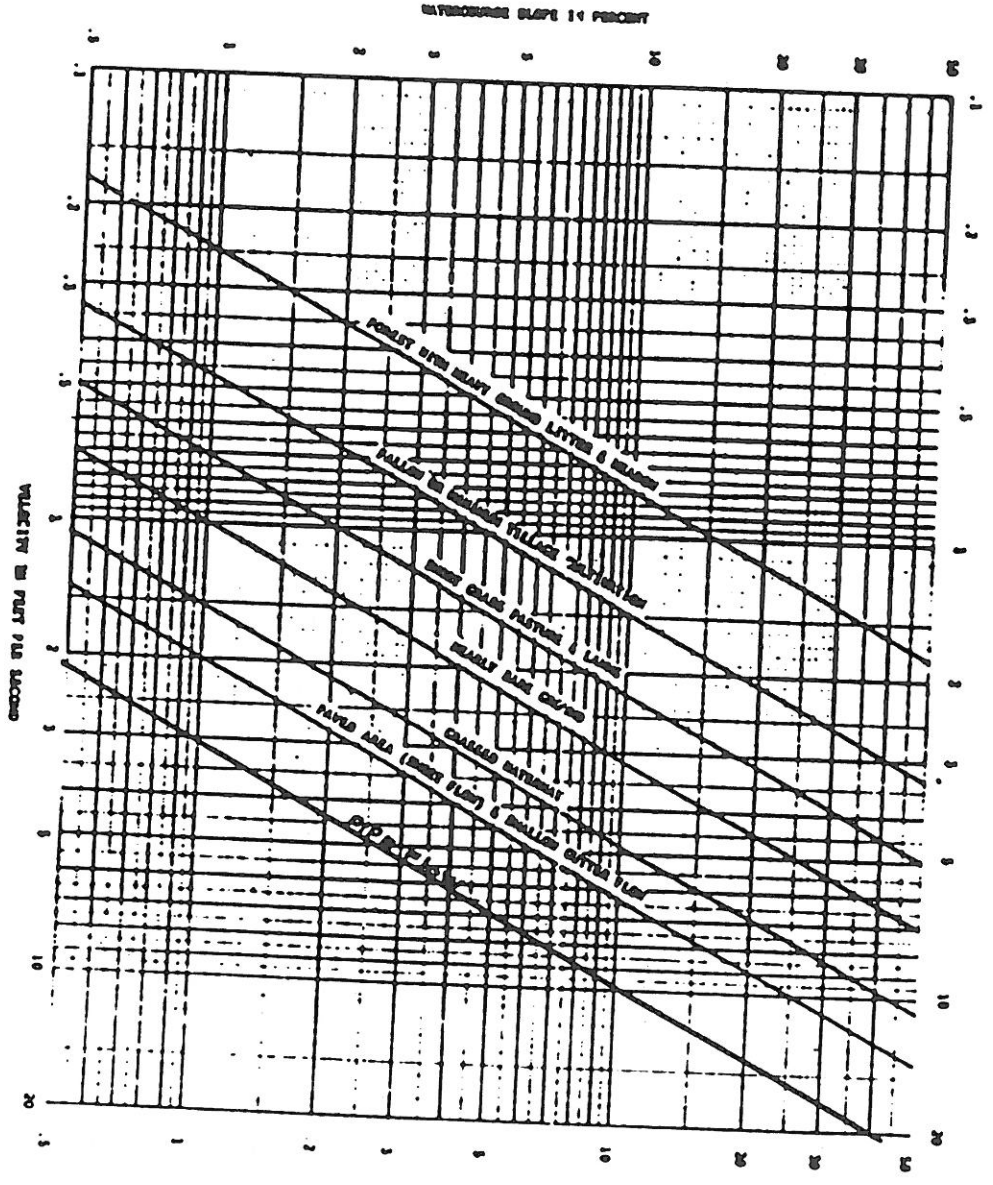
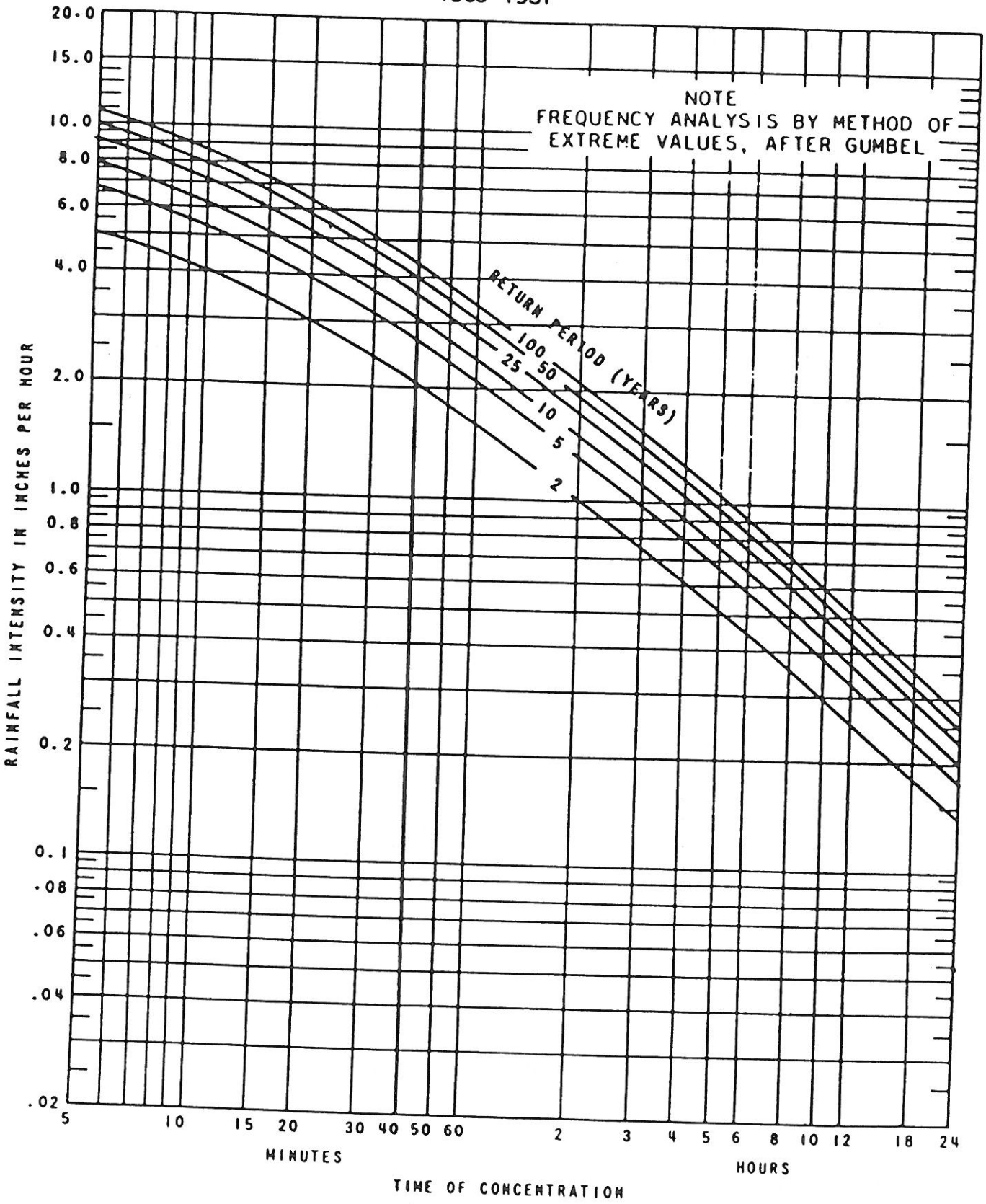


CHART 2.2
Average Velocity of Overland Flow

A-2a

ATLANTA, GEORGIA
1903-1951



WEATHER BUREAU
TECHNICAL PAPER 25

CHART 4 - 3

AREA DRAINAGE COMPUTATIONS

PROJECT: SOUTH LODGE-DOUGLASVILLE
COUNTY: DOUGLAS
SUBAREA #: EXISTING (UNDEVELOPED)
DRAINAGE AREA: 5.407 ACRES

DRAINAGE COEFFICIENT

Land Use	C-factor	Area(ac)	C*Area
PASTURE	0.30	5.41	1.62
	0.00		0.00
	0.00		0.00
	0.00		0.00
	0.00		0.00
	0.00		0.00
	0.00		0.00
	0.00		0.00
	0.00		0.00
	0.00		0.00
TOTAL		5.41	1.62
WEIGHTED-C FACTOR=			0.30

TIME OF CONCENTRATION

TYPE OF FLOW	FROM ELEV	TO ELEV	LENGTH (FT)	SLOPE (%)	VEL (FT/S)	TIME (MIN)
PASTURE	1079.00	1070.00	200.00	4.50	1.50	2.22
WATERWAY	1070.00	1054.00	450.00	3.56	2.88	2.61
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
TOTAL TIME OF CONCENTRATION (5 MIN. MINIMAL) =						5.00

PEAK RATES OF DISCHARGE CA = 1.622

FREQUENCY (YR)	INTENSITY (IN)	DISCHARGE(Q) (CFS)	ACROSS RD. DISCHARGE(Q) (CFS)	TOTAL DISCHARGE(Q) (CFS)
2	5.00	8.11	2.73	10.84
5	6.70	10.87	3.65	14.52
10	7.80	12.65	4.25	16.90
25	9.10	14.76	4.96	19.72
50	10.00	16.22	5.46	21.68
100	11.00	17.84	6.00	23.84

PREPARED BY:
VOLUNTEER ENGINEERING COMPANY OF GEORGIA
PEACHTREE CITY, GA.

AREA DRAINAGE COMPUTATIONS

PROJECT: SOUTH LODGE-DOUGLASVILLE
COUNTY: DOUGLAS
SUBAREA #: PROPOSED-ONSITE (CONTROLLED)
DRAINAGE AREA: 2.444 ACRES

DRAINAGE COEFFICIENT

Land Use	C-factor	Area(ac)	C*Area
LANDSCAPED	0.60	0.80	0.48
PAVED	0.95	1.04	0.99
ROOF	0.95	0.61	0.58
	0.00		0.00
	0.00		0.00
	0.00		0.00
	0.00		0.00
	0.00		0.00
	0.00		0.00
TOTAL		2.44	2.04
WEIGHTED-C FACTOR=			0.84

TIME OF CONCENTRATION

TYPE OF FLOW	FROM ELEV	TO ELEV	LENGTH (FT)	SLOPE (%)	VEL (FT/S)	TIME (MIN)
PASTURE	1072.00	1068.00	100.00	4.00	1.41	1.18
PIPE	1063.00	1061.90	108.00	1.02	3.10	0.58
PIPE	1061.90	1061.50	40.00	1.00	3.10	0.22
PIPE	1061.50	1060.80	70.00	1.00	3.10	0.38
PIPE	1060.80	1058.00	147.00	1.90	4.30	0.57
PIPE	1057.70	1057.50	10.00	2.00	4.40	0.04
WATERWAY	1057.50	1056.00	150.00	1.00	1.52	1.64
TOTAL TIME OF CONCENTRATION (5 MIN. MINIMAL) =						5.00

PEAK RATES OF DISCHARGE CA = 2.043

FREQUENCY (YR)	INTENSITY (IN)	DISCHARGE(Q) (CFS)
2	5.00	10.21
5	6.70	13.69
10	7.80	15.93
25	9.10	18.59
50	10.00	20.43
100	11.00	22.47

PREPARED BY:
VOLUNTEER ENGINEERING COMPANY OF GEORGIA
PEACHTREE CITY, GA

AREA DRAINAGE COMPUTATIONS

PROJECT: SOUTH LODGE-DOUGLASVILLE
COUNTY: DOUGLAS
SUBAREA #: PROPOSED-OFFSITE (CONTROLLED)
DRAINAGE AREA: 2.857 ACRES

DRAINAGE COEFFICIENT

Land Use	C-factor	Area(ac)	C*Area
LANDSCAPED	0.60	0.60	0.36
ROOF	0.95	0.22	0.21
PAVED	0.95	2.04	1.94
	0.00		0.00
	0.00		0.00
	0.00		0.00
	0.00		0.00
	0.00		0.00
	0.00		0.00
TOTAL		2.86	2.51
WEIGHTED-C FACTOR=			0.88

TIME OF CONCENTRATION

TYPE OF FLOW	FROM ELEV	TO ELEV	LENGTH (FT)	SLOPE (%)	VEL (FT/S)	TIME (MIN)
PAVED	1079.00	1072.00	200.00	3.50	3.74	0.89
PIPED	1068.50	1066.60	190.00	1.00	3.10	1.02
PIPED	1058.70	1058.10	58.00	1.03	3.10	0.31
WATERWAY	1058.10	1056.00	95.00	2.21	2.27	0.70
				0.00	0.00	0.00
				0.00	0.00	0.00
TOTAL TIME OF CONCENTRATION (5 MIN. MINIMAL) =						5.00

PEAK RATES OF DISCHARGE CA = 2.505

FREQUENCY (YR)	INTENSITY (IN)	DISCHARGE(Q) (CFS)	ACROSS RD. DISCHARGE(Q) (CFS)	TOTAL DISCHARGE(Q) (CFS)
2	5.00	12.53	2.73	15.26
5	6.70	16.78	3.65	20.43
10	7.80	19.54	4.25	23.79
25	9.10	22.80	4.96	27.76
50	10.00	25.05	5.46	30.51
100	11.00	27.56	6.00	33.56

PREPARED BY:
VOLUNTEER ENGINEERING COMPANY OF GEORGIA
PEACHTREE CITY, GA.

AREA DRAINAGE COMPUTATIONS

PROJECT: SOUTH LODGE-DOUGLASVILLE
COUNTY: DOUGLAS
SUBAREA #: PROPOSED-ONSITE (BYPASSING DETENTION)
DRAINAGE AREA: 0.106 ACRES

DRAINAGE COEFFICIENT

Land Use	C-factor	Area(ac)	C*Area
LANDSCAPED	0.60	0.11	0.06
	0.00		0.00
	0.00		0.00
	0.00		0.00
	0.00		0.00
	0.00		0.00
	0.00		0.00
	0.00		0.00
	0.00		0.00
TOTAL		0.11	0.06
WEIGHTED-C FACTOR=			0.60

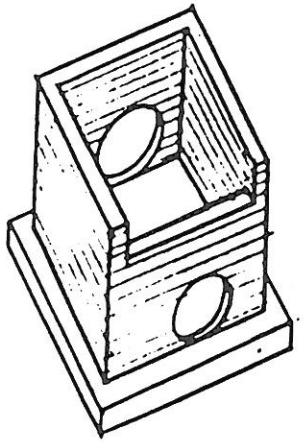
TIME OF CONCENTRATION

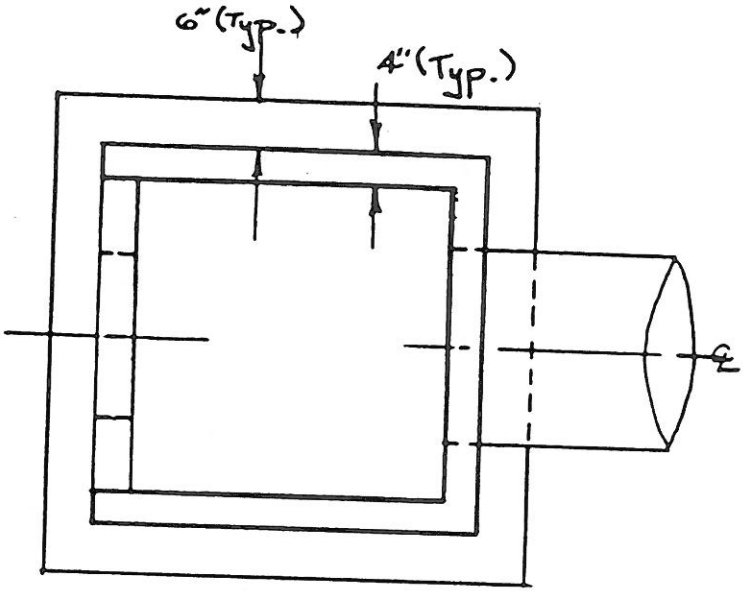
TYPE OF FLOW	FROM ELEV	TO ELEV	LENGTH (FT)	SLOPE (%)	VEL (FT/S)	TIME (MIN)
PASTURE	1065.00	1058.00	150.00	4.67	1.53	1.64
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
TOTAL TIME OF CONCENTRATION (5 MIN. MINIMAL) =						5.00

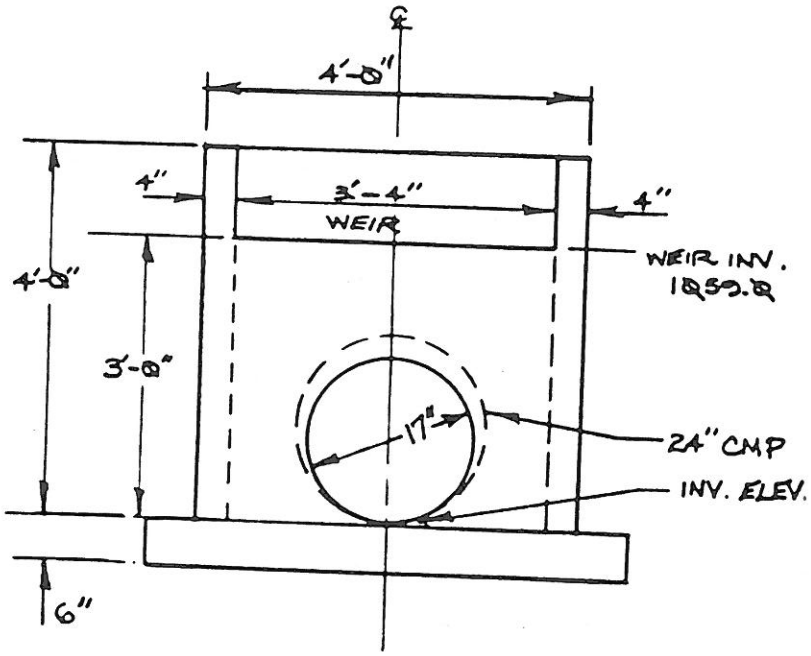
PEAK RATES OF DISCHARGE CA = 0.064

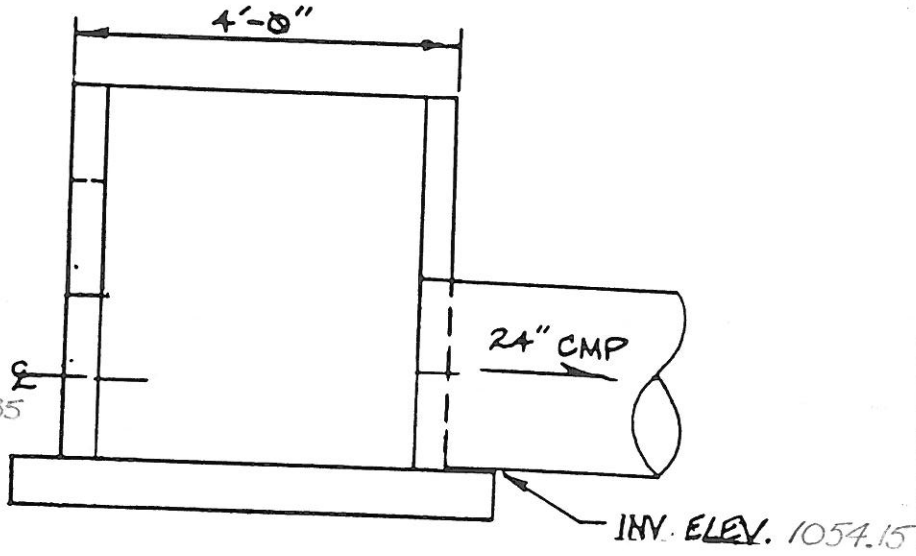
FREQUENCY (YR)	INTENSITY (IN)	DISCHARGE(Q) (CFS)
2	5.00	0.32
5	6.70	0.43
10	7.80	0.50
25	9.10	0.58
50	10.00	0.64
100	11.00	0.70

PREPARED BY:
VOLUNTEER ENGINEERING COMPANY OF GEORGIA
PEACHTREE CITY, GA.



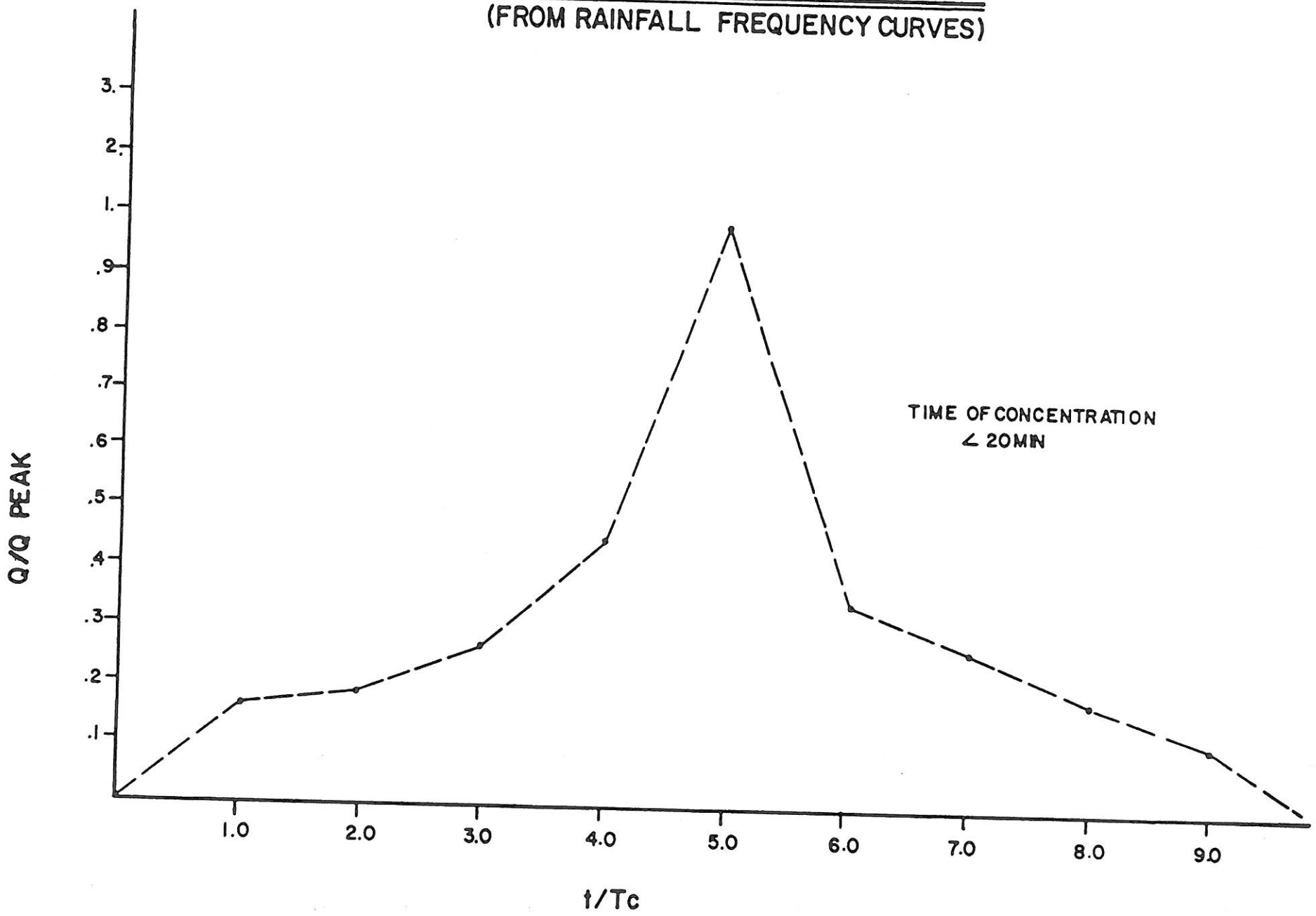






C-1 CONTROL STRUCTURE (M)

DIMENSIONLESS HYDROGRAPH
(FROM RAINFALL FREQUENCY CURVES)



STAGE	STORAGE	2*S/T	OUTFLOW	2*S/T+O
0.50	498.75	06.65	05.45	12.10
01.00	1995.00	26.60	07.71	34.31
01.50	4331.25	57.75	09.45	67.20
02.00	7350.00	98.00	10.91	108.91
02.50	10821.25	144.28	12.19	156.48
03.00	14515.00	193.53	13.36	206.89
03.50	18431.25	245.75	18.35	264.10
04.00	22570.00	300.93	26.52	327.45

TIME	I1	I2	2*S1/T	O1	2*S2/T+O2	O2	2*S2/T
2.50	0.00	2.04	0.00	0.00	2.04	0.92	1.12
5.00	2.04	4.08	1.12	0.92	6.31	2.85	3.47
7.50	4.08	4.46	3.47	2.85	9.16	4.13	5.03
10.00	4.46	4.84	5.03	4.13	10.20	4.60	5.61
12.50	4.84	5.86	5.61	4.60	11.71	5.27	6.43
15.00	5.86	6.88	6.43	5.27	13.89	5.64	8.26
17.50	6.88	9.17	8.26	5.64	18.67	6.12	12.55
20.00	9.17	11.46	12.55	6.12	27.06	6.97	20.08
22.50	11.46	18.47	20.08	6.97	43.03	8.17	34.86
25.00	18.47	25.47	34.86	8.17	70.63	9.57	61.06
27.50	25.47	17.06	61.06	9.57	94.03	10.39	83.64
30.00	17.06	8.66	83.64	10.39	98.98	10.56	88.42
32.50	8.66	7.77	88.42	10.56	94.29	10.40	83.90
35.00	7.77	6.88	83.90	10.40	88.15	10.18	77.97
37.50	6.88	5.86	77.97	10.18	80.52	9.91	70.61
40.00	5.86	4.84	70.61	9.91	71.39	9.59	61.80
42.50	4.84	3.95	61.80	9.59	60.99	9.12	51.88
45.00	3.95	3.06	51.88	9.12	49.76	8.53	41.23
47.50	3.06	1.53	41.23	8.53	37.29	7.87	29.42
50.00	1.53	0.00	29.42	7.87	23.08	6.57	16.51
52.50	0.00	0.00	16.51	6.57	9.94	4.48	5.46
55.00	0.00	0.00	5.46	4.48	0.98	0.44	0.54
57.50	0.00	0.00	0.54	0.44	0.10	0.04	0.05
60.00	0.00	0.00	0.05	0.04	0.01	0.00	0.01
62.50	0.00	0.00	0.01	0.00	0.00	0.00	0.00
65.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
67.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
70.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
72.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
75.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUMMARY: SOUTH LODGE - 2 YEAR DESIGN

TIME OF CONCENTRATION = 05.00

Q-IN = 25.47

MAX Q-OUT = 10.56

STORAGE = 6631.63

STAGE = 01.88

COMPUTER ROUTING ANALYSIS

STAGE	STORAGE	2*S/T	OUTFLOW	2*S/T+O
0.50	498.75	06.65	05.45	12.10
01.00	1995.00	26.60	07.71	34.31
01.50	4331.25	57.75	09.45	67.20
02.00	7350.00	98.00	10.91	108.91
02.50	10821.25	144.28	12.19	156.48
03.00	14515.00	193.53	13.36	206.89
03.50	18431.25	245.75	18.35	264.10
04.00	22570.00	300.93	26.52	327.45

TIME	I1	I2	2*S1/T	O1	2*S2/T+O2	O2	2*S2/T
2.50	0.00	2.73	0.00	0.00	2.73	1.23	1.50
5.00	2.73	5.46	1.50	1.23	8.46	3.81	4.65
7.50	5.46	5.97	4.65	3.81	12.27	5.47	6.80
10.00	5.97	6.48	6.80	5.47	13.78	5.62	8.16
12.50	6.48	7.85	8.16	5.62	16.86	5.94	10.92
15.00	7.85	9.21	10.92	5.94	22.05	6.46	15.58
17.50	9.21	12.28	15.58	6.46	30.61	7.34	23.28
20.00	12.28	15.35	23.28	7.34	43.58	8.20	35.38
22.50	15.35	24.74	35.38	8.20	67.27	9.45	57.82
25.00	24.74	34.12	57.82	9.45	107.23	10.85	96.38
27.50	34.12	22.86	96.38	10.85	142.51	11.82	130.69
30.00	22.86	11.60	130.69	11.82	153.34	12.11	141.23
32.50	11.60	10.41	141.23	12.11	151.13	12.05	139.08
35.00	10.41	9.21	139.08	12.05	146.65	11.93	134.72
37.50	9.21	7.85	134.72	11.93	139.85	11.74	128.11
40.00	7.85	6.48	128.11	11.74	130.69	11.50	119.19
42.50	6.48	5.29	119.19	11.50	119.47	11.19	108.28
45.00	5.29	4.09	108.28	11.19	106.47	10.82	95.64
47.50	4.09	2.05	95.64	10.82	90.96	10.28	80.69
50.00	2.05	0.00	80.69	10.28	72.45	9.63	62.82
52.50	0.00	0.00	62.82	9.63	53.19	8.71	44.49
55.00	0.00	0.00	44.49	8.71	35.78	7.79	27.99
57.50	0.00	0.00	27.99	7.79	20.20	6.28	13.92
60.00	0.00	0.00	13.92	6.28	7.65	3.44	4.20
62.50	0.00	0.00	4.20	3.44	0.76	0.34	0.42
65.00	0.00	0.00	0.42	0.34	0.07	0.03	0.04
67.50	0.00	0.00	0.04	0.03	0.01	0.00	0.00
70.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
72.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
75.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUMMARY: SOUTH LODGE - 5 YEAR DESIGN

TIME OF CONCENTRATION = 05.00

Q-IN = 34.12

MAX Q-OUT = 12.11

STORAGE = 10592.21

STAGE = 02.47

COMPUTER ROUTING ANALYSIS

STAGE	STORAGE	2*S/T	OUTFLOW	2*S/T+O
0.50	498.75	06.65	05.45	12.10
01.00	1995.00	26.60	07.71	34.31
01.50	4331.25	57.75	09.45	67.20
02.00	7350.00	98.00	10.91	108.91
02.50	10821.25	144.28	12.19	156.48
03.00	14515.00	193.53	13.36	206.89
03.50	18431.25	245.75	18.35	264.10
04.00	22570.00	300.93	26.52	327.45

TIME	I1	I2	2*S1/T	O1	2*S2/T+O2	O2	2*S2/T
2.50	0.00	3.18	0.00	0.00	3.18	1.43	1.75
5.00	3.18	6.36	1.75	1.43	9.85	4.44	5.41
7.50	6.36	6.95	5.41	4.44	14.28	5.67	8.60
10.00	6.95	7.55	8.60	5.67	17.43	6.00	11.43
12.50	7.55	9.14	11.43	6.00	22.12	6.47	15.65
15.00	9.14	10.72	15.65	6.47	29.04	7.18	21.86
17.50	10.72	14.30	21.86	7.18	39.71	8.00	31.71
20.00	14.30	17.87	31.71	8.00	55.89	8.85	47.04
22.50	17.87	28.80	47.04	8.85	84.86	10.06	74.79
25.00	28.80	39.72	74.79	10.06	133.25	11.57	121.68
27.50	39.72	26.61	121.68	11.57	176.45	12.66	163.79
30.00	26.61	13.50	163.79	12.66	191.25	13.00	178.26
32.50	13.50	12.11	178.26	13.00	190.88	12.99	177.89
35.00	12.11	10.72	177.89	12.99	187.74	12.92	174.82
37.50	10.72	9.14	174.82	12.92	181.77	12.78	168.99
40.00	9.14	7.55	168.99	12.78	172.89	12.57	160.32
42.50	7.55	6.16	160.32	12.57	161.45	12.31	149.14
45.00	6.16	4.77	149.14	12.31	147.75	11.96	135.79
47.50	4.77	2.38	135.79	11.96	130.99	11.50	119.48
50.00	2.38	0.00	119.48	11.50	110.36	10.95	99.41
52.50	0.00	0.00	99.41	10.95	88.47	10.19	78.28
55.00	0.00	0.00	78.28	10.19	68.08	9.48	58.61
57.50	0.00	0.00	58.61	9.48	49.13	8.49	40.64
60.00	0.00	0.00	40.64	8.49	32.14	7.49	24.65
62.50	0.00	0.00	24.65	7.49	17.16	5.97	11.19
65.00	0.00	0.00	11.19	5.97	5.22	2.35	2.87
67.50	0.00	0.00	2.87	2.35	0.52	0.23	0.28
70.00	0.00	0.00	0.28	0.23	0.05	0.02	0.03
72.50	0.00	0.00	0.03	0.02	0.01	0.00	0.00
75.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUMMARY: SOUTH LODGE - 10 YEAR DESIGN

TIME OF CONCENTRATION = 05.00

Q-IN = 39.72

MAX Q-OUT = 13.00

STORAGE = 13369.16

STAGE = 02.84

COMPUTER ROUTING ANALYSIS

STAGE	STORAGE	2*S/T	OUTFLOW	2*S/T+O
0.50	498.75	06.65	05.45	12.10
01.00	1995.00	26.60	07.71	34.31
01.50	4331.25	57.75	09.45	67.20
02.00	7350.00	98.00	10.91	108.91
02.50	10821.25	144.28	12.19	156.48
03.00	14515.00	193.53	13.36	206.89
03.50	18431.25	245.75	18.35	264.10
04.00	22570.00	300.93	26.52	327.45

TIME	I1	I2	2*S1/T	O1	2*S2/T+O2	O2	2*S2/T
2.50	0.00	3.71	0.00	0.00	3.71	1.67	2.04
5.00	3.71	7.42	2.04	1.67	11.49	5.18	6.31
7.50	7.42	8.11	6.31	5.18	16.66	5.92	10.75
10.00	8.11	8.81	10.75	5.92	21.75	6.43	15.31
12.50	8.81	10.66	15.31	6.43	28.34	7.11	21.24
15.00	10.66	12.51	21.24	7.11	37.31	7.87	29.44
17.50	12.51	16.69	29.44	7.87	50.77	8.58	42.19
20.00	16.69	20.86	42.19	8.58	71.15	9.58	61.57
22.50	20.86	33.60	61.57	9.58	106.44	10.82	95.62
25.00	33.60	46.35	95.62	10.82	164.76	12.39	152.37
27.50	46.35	31.05	152.37	12.39	217.39	14.27	203.12
30.00	31.05	15.76	203.12	14.27	235.65	15.87	219.79
32.50	15.76	14.14	219.79	15.87	233.81	15.71	218.11
35.00	14.14	12.51	218.11	15.71	229.05	15.29	213.76
37.50	12.51	10.66	213.76	15.29	221.64	14.65	207.00
40.00	10.66	8.81	207.00	14.65	211.82	13.79	198.03
42.50	8.81	7.18	198.03	13.79	200.23	13.20	187.03
45.00	7.18	5.56	187.03	13.20	186.57	12.89	173.68
47.50	5.56	2.78	173.68	12.89	169.13	12.49	156.65
50.00	2.78	0.00	156.65	12.49	146.94	11.94	135.00
52.50	0.00	0.00	135.00	11.94	123.07	11.29	111.78
55.00	0.00	0.00	111.78	11.29	100.49	10.61	89.88
57.50	0.00	0.00	89.88	10.61	79.26	9.87	69.39
60.00	0.00	0.00	69.39	9.87	59.53	9.04	50.48
62.50	0.00	0.00	50.48	9.04	41.44	8.09	33.35
65.00	0.00	0.00	33.35	8.09	25.27	6.79	18.47
67.50	0.00	0.00	18.47	6.79	11.68	5.26	6.42
70.00	0.00	0.00	6.42	5.26	1.15	0.52	0.63
72.50	0.00	0.00	0.63	0.52	0.11	0.05	0.06
75.00	0.00	0.00	0.06	0.05	0.01	0.01	0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUMMARY: SOUTH LODGE - 25 YEAR DESIGN

TIME OF CONCENTRATION = 05.00

Q-IN = 46.35

MAX Q-OUT = 15.87

STORAGE = 16483.96

STAGE = 03.25

COMPUTER ROUTING ANALYSIS

STAGE	STORAGE	2*S/T	OUTFLOW	2*S/T+O
0.50	498.75	06.65	05.45	12.10
01.00	1995.00	26.60	07.71	34.31
01.50	4331.25	57.75	09.45	67.20
02.00	7350.00	98.00	10.91	108.91
02.50	10821.25	144.28	12.19	156.48
03.00	14515.00	193.53	13.36	206.89
03.50	18431.25	245.75	18.35	264.10
04.00	22570.00	300.93	26.52	327.45

TIME	I1	I2	2*S1/T	O1	2*S2/T+O2	O2	2*S2/T
2.50	0.00	4.08	0.00	0.00	4.08	1.84	2.24
5.00	4.08	8.15	2.24	1.84	12.63	5.51	7.12
7.50	8.15	8.91	7.12	5.51	18.68	6.12	12.56
10.00	8.91	9.68	12.56	6.12	25.03	6.77	18.26
12.50	9.68	11.72	18.26	6.77	32.89	7.57	25.32
15.00	11.72	13.75	25.32	7.57	43.22	8.18	35.04
17.50	13.75	18.34	35.04	8.18	58.95	9.01	49.94
20.00	18.34	22.92	49.94	9.01	82.19	9.97	72.22
22.50	22.92	36.93	72.22	9.97	122.10	11.26	110.84
25.00	36.93	50.94	110.84	11.26	187.44	12.91	174.53
27.50	50.94	34.13	174.53	12.91	246.69	16.83	229.86
30.00	34.13	17.32	229.86	16.83	264.48	18.40	246.08
32.50	17.32	15.54	246.08	18.40	260.54	18.04	242.50
35.00	15.54	13.75	242.50	18.04	253.75	17.45	236.30
37.50	13.75	11.72	236.30	17.45	244.33	16.62	227.70
40.00	11.72	9.68	227.70	16.62	232.47	15.59	216.88
42.50	9.68	7.90	216.88	15.59	218.87	14.40	204.46
45.00	7.90	6.11	204.46	14.40	204.07	13.29	190.77
47.50	6.11	3.06	190.77	13.29	186.65	12.89	173.76
50.00	3.06	0.00	173.76	12.89	163.92	12.37	151.56
52.50	0.00	0.00	151.56	12.37	139.19	11.73	127.47
55.00	0.00	0.00	127.47	11.73	115.74	11.09	104.65
57.50	0.00	0.00	104.65	11.09	93.55	10.37	83.19
60.00	0.00	0.00	83.19	10.37	72.82	9.64	63.17
62.50	0.00	0.00	63.17	9.64	53.53	8.73	44.80
65.00	0.00	0.00	44.80	8.73	36.08	7.81	28.27
67.50	0.00	0.00	28.27	7.81	20.47	6.30	14.16
70.00	0.00	0.00	14.16	6.30	7.86	3.54	4.32
72.50	0.00	0.00	4.32	3.54	0.78	0.35	0.43
75.00	0.00	0.00	0.43	0.35	0.08	0.03	0.04
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUMMARY: SOUTH LODGE - 50 YEAR DESIGN

TIME OF CONCENTRATION = 05.00

Q-IN = 50.94

MAX Q-OUT = 18.40

STORAGE = 18456.17

STAGE = 03.50

COMPUTER ROUTING ANALYSIS

STAGE	STORAGE	2*S/T	OUTFLOW	2*S/T+O
0.50	498.75	06.65	05.45	12.10
01.00	1995.00	26.60	07.71	34.31
01.50	4331.25	57.75	09.45	67.20
02.00	7350.00	98.00	10.91	108.91
02.50	10821.25	144.28	12.19	156.48
03.00	14515.00	193.53	13.36	206.89
03.50	18431.25	245.75	18.35	264.10
04.00	22570.00	300.93	26.52	327.45

TIME	I1	I2	2*S1/T	O1	2*S2/T+O2	O2	2*S2/T
2.50	0.00	4.48	0.00	0.00	4.48	2.02	2.46
5.00	4.48	8.96	2.46	2.02	13.89	5.64	8.25
7.50	8.96	9.81	8.25	5.64	21.39	6.40	14.99
10.00	9.81	10.65	14.99	6.40	29.04	7.18	21.87
12.50	10.65	12.89	21.87	7.18	38.22	7.92	30.31
15.00	12.89	15.13	30.31	7.92	50.40	8.56	41.84
17.50	15.13	20.17	41.84	8.56	68.58	9.49	59.08
20.00	20.17	25.21	59.08	9.49	94.97	10.42	84.56
22.50	25.21	40.62	84.56	10.42	139.97	11.75	128.22
25.00	40.62	56.03	128.22	11.75	213.13	13.90	199.23
27.50	56.03	37.54	199.23	13.90	278.89	20.26	258.64
30.00	37.54	19.05	258.64	20.26	294.97	22.33	272.64
32.50	19.05	17.09	272.64	22.33	286.45	21.23	265.21
35.00	17.09	15.13	265.21	21.23	276.20	19.91	256.29
37.50	15.13	12.89	256.29	19.91	264.39	18.39	246.01
40.00	12.89	10.65	246.01	18.39	251.15	17.22	233.93
42.50	10.65	8.68	233.93	17.22	236.04	15.90	220.14
45.00	8.68	6.72	220.14	15.90	219.65	14.47	205.17
47.50	6.72	3.36	205.17	14.47	200.79	13.22	187.57
50.00	3.36	0.00	187.57	13.22	177.72	12.68	165.03
52.50	0.00	0.00	165.03	12.68	152.35	12.08	140.26
55.00	0.00	0.00	140.26	12.08	128.18	11.43	116.75
57.50	0.00	0.00	116.75	11.43	105.32	10.78	94.54
60.00	0.00	0.00	94.54	10.78	83.76	10.03	73.73
62.50	0.00	0.00	73.73	10.03	63.71	9.26	54.45
65.00	0.00	0.00	54.45	9.26	45.18	8.29	36.90
67.50	0.00	0.00	36.90	8.29	28.61	7.13	21.48
70.00	0.00	0.00	21.48	7.13	14.35	5.68	8.67
72.50	0.00	0.00	8.67	5.68	2.98	1.34	1.64
75.00	0.00	0.00	1.64	1.34	0.29	0.13	0.16
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SUMMARY: SOUTH LODGE - 100 YEAR DESIGN

TIME OF CONCENTRATION = 05.00

Q-IN = 56.03

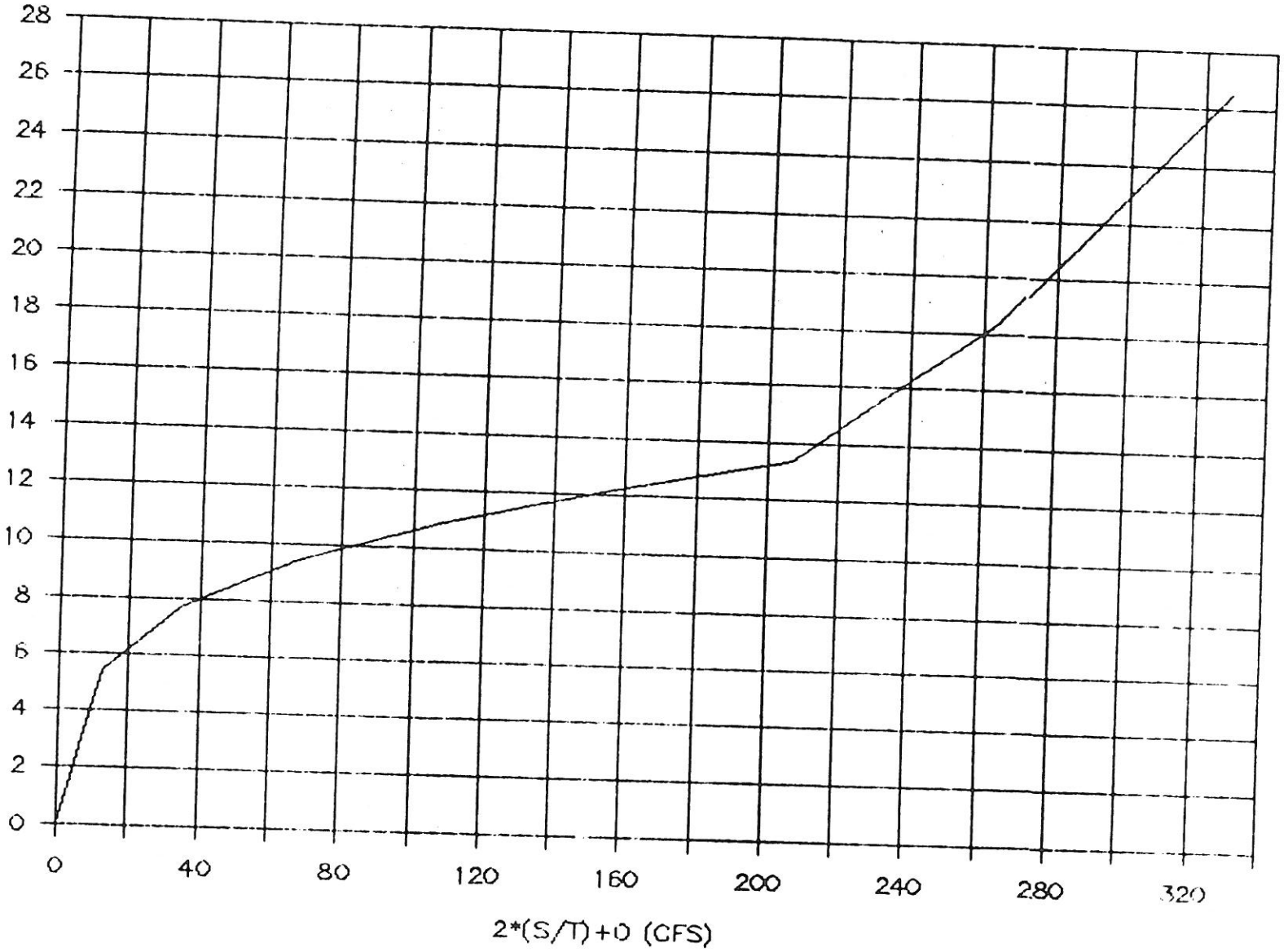
MAX Q-OUT = 22.33

STORAGE = 20447.79

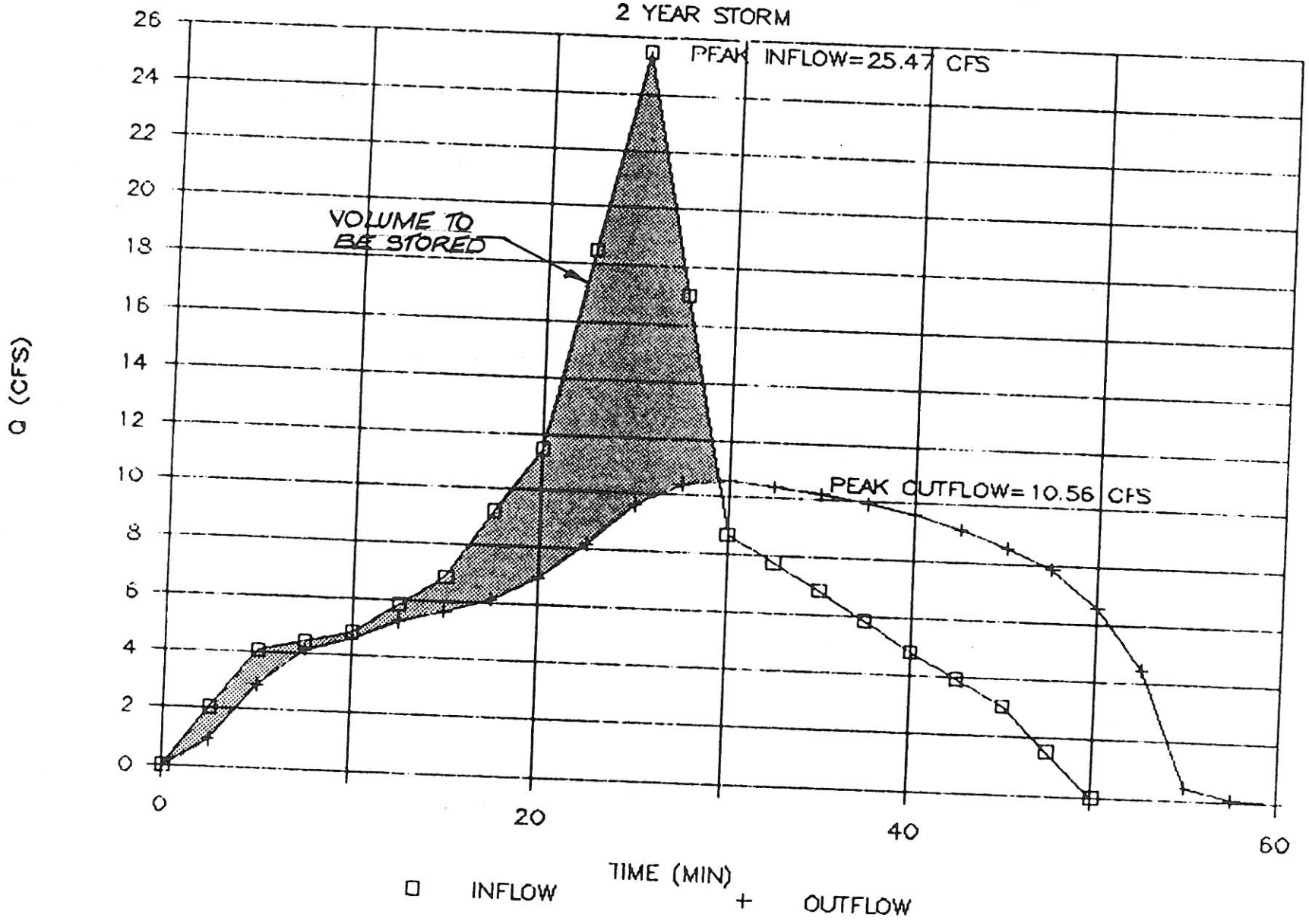
STAGE = 03.74

COMPUTER ROUTING ANALYSIS

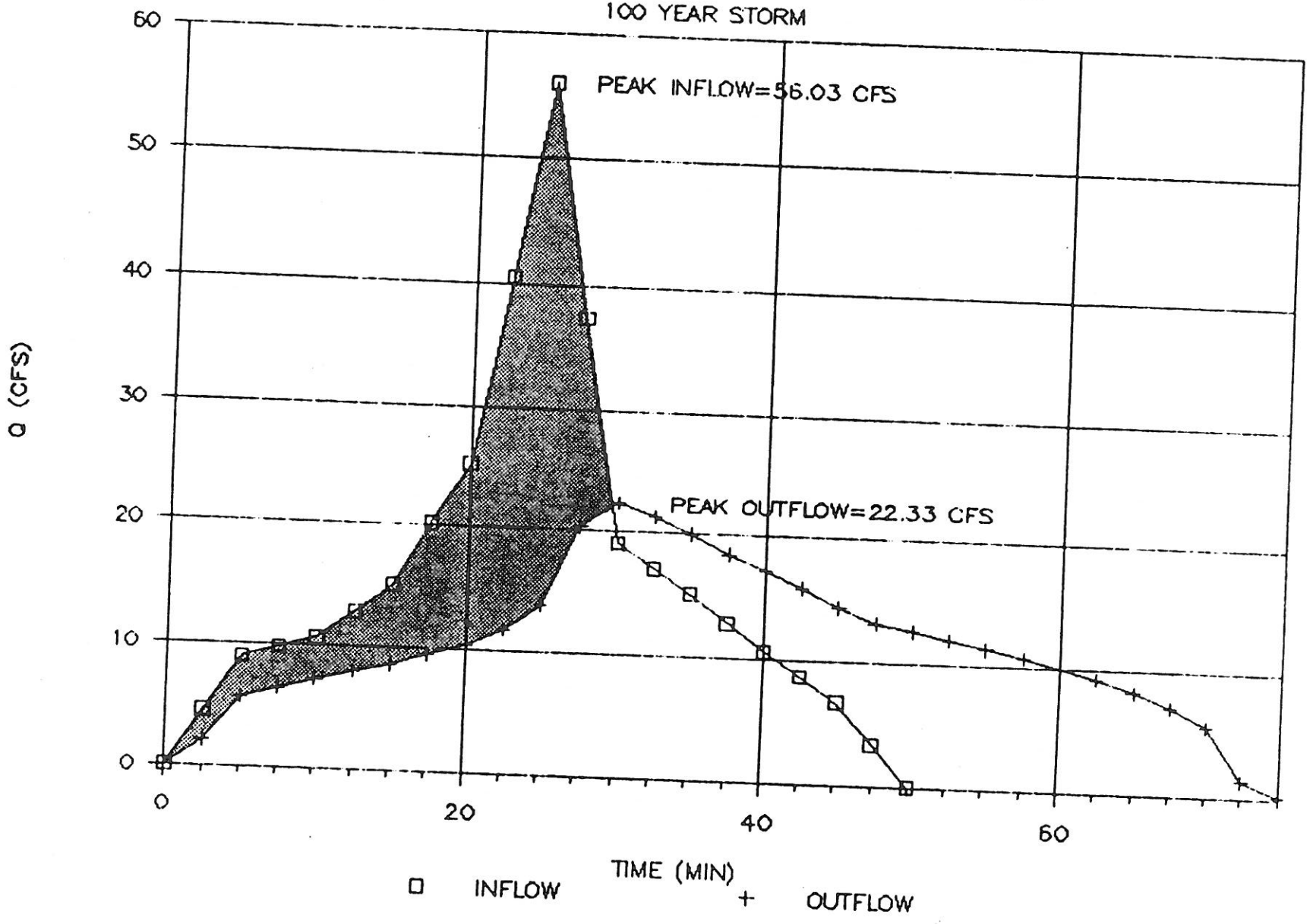
ROUTING CURVE



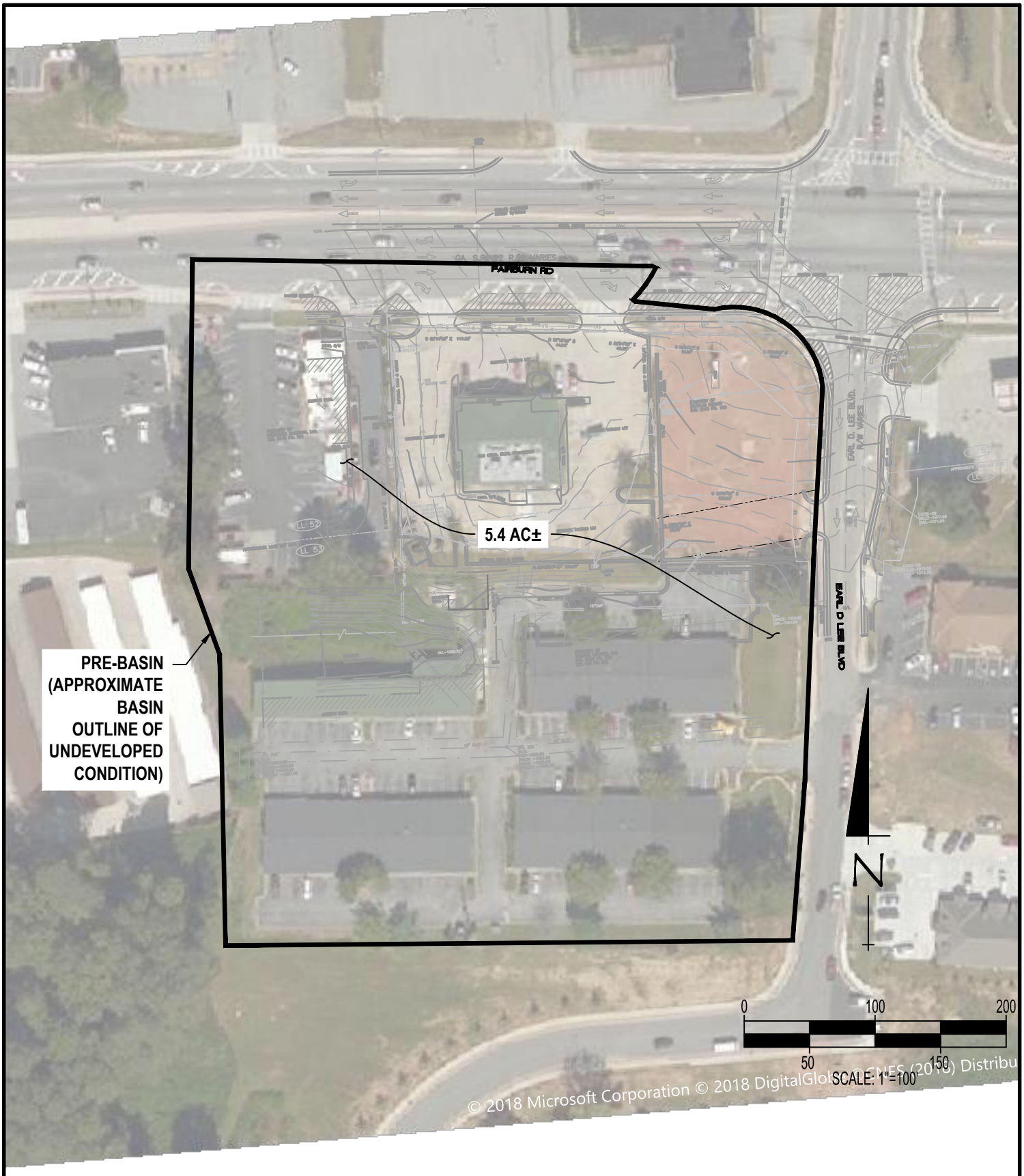
INFLOW VS. OUTFLOW CURVE



INFLOW VS. OUTFLOW CURVE



Appendix B
Pre-Basin & Post-Basin Exhibits (for detention assessment)

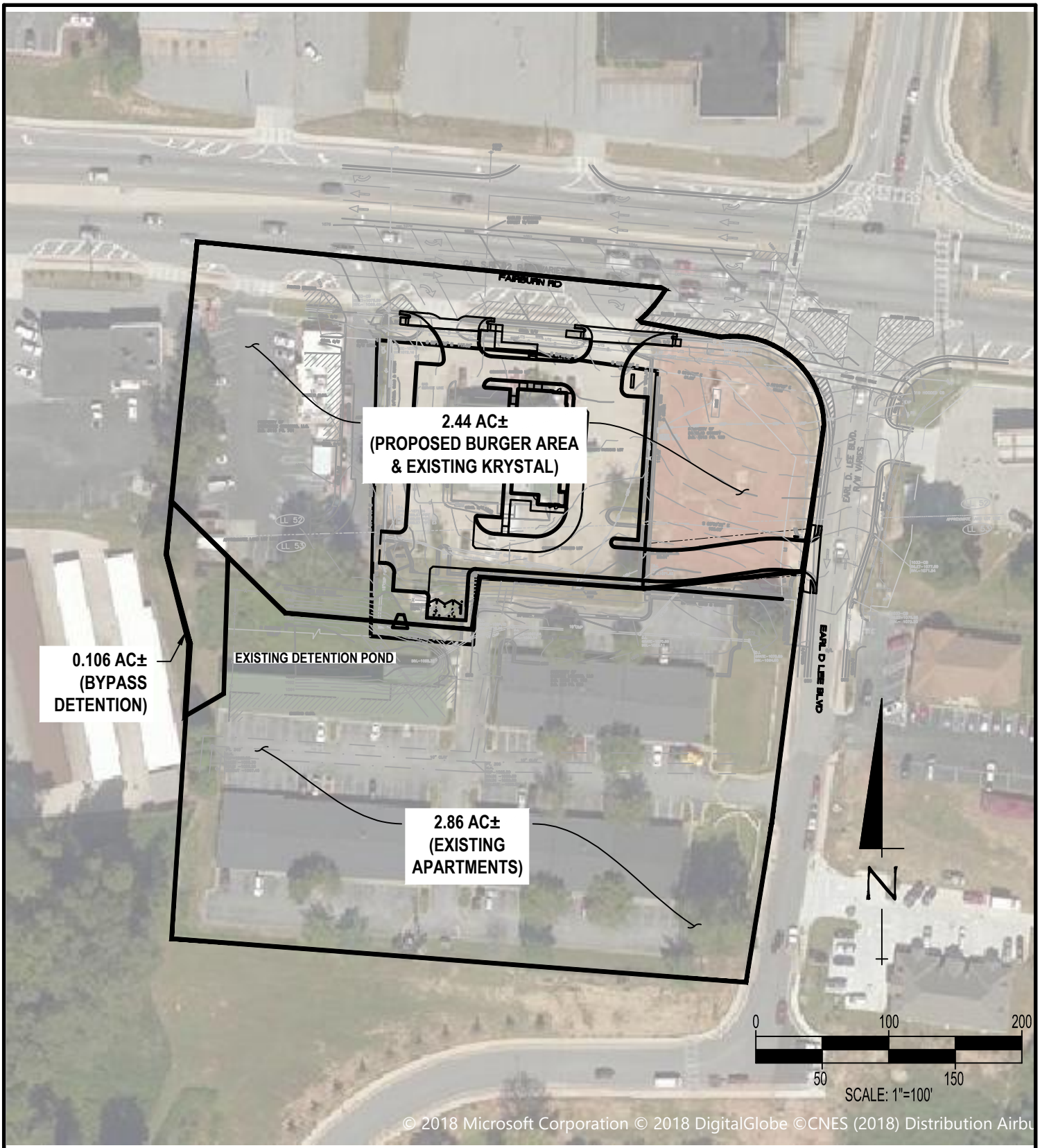


LBYD ENGINEERS

Project	Project No.	Date
BURGER KING - 5700 FAIRBURN RD	102-18-156.008	05-01-19

Drawing Title	Drawing No.
PRE BASIN EXHIBIT	

880 Montclair Road, Suite 600 ▲ Birmingham, Alabama 35213
Phone (205) 251-4500 ▲ Structural Fax (205) 324-4181 ▲ Civil Fax (205) 488-0226 ▲ www.lbyd.com



LBYD ENGINEERS

Project	Project No.	Date
BURGER KING - 5700 FAIRBURN RD	102-18-156.008	05-01-19
Drawing Title		**Drawing No.**
POST BASIN EXHIBIT		

880 Montclair Road, Suite 600 ▲ Birmingham, Alabama 35213
Phone (205) 251-4500 ▲ Structural Fax (205) 324-4181 ▲ Civil Fax (205) 488-0226 ▲ www.lbyd.com

Appendix C
USDA Web Soil Survey

Map Scale: 1:777 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 10 20 40 60

Feet
0 35 70 140 210

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Douglas County, Georgia
Survey Area Data: Version 10, Sep 14, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 4, 2014—Oct 25, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AmB2	Appling sandy loam, 2 to 6 percent slopes, moderately eroded	B	0.1	3.9%
AmC2	Appling sandy loam, 6 to 10 percent slopes, moderately eroded	B	2.3	94.2%
AnC3	Appling sandy clay loam, 6 to 10 percent slopes, severely eroded	B	0.0	1.9%
Totals for Area of Interest			**2.4**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix D
Fema FIRMette, Topo, & Site Maps

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Georgia State Plane West Zone (FIPS zone 1002). The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American [illegible] Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was provided in digital format by the Douglas County Geographic Information Systems (GIS) Department. This information was photogrammetrically compiled at a scale of 1"= 100' from aerial photography dated 2007 or later.

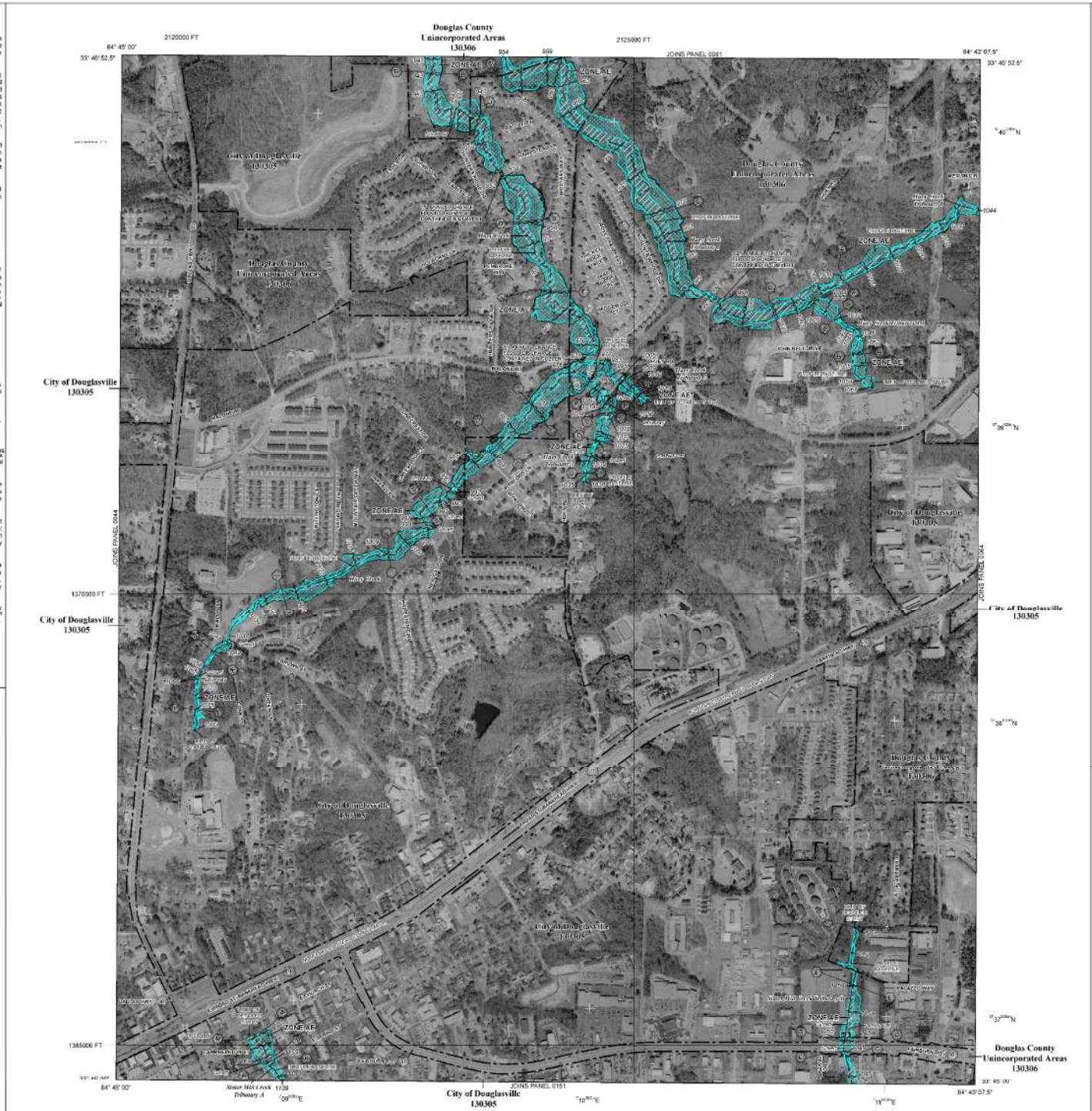
The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map**, how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A — No Base Flood Elevations determined.

ZONE AE — Base Flood Elevations determined.

ZONE AH — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR — Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 — Area to be protected from 1% annual chance flood by a federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V — Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE — Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% Annual Chance Floodplain Boundary

0.2% Annual Chance Floodplain Boundary

Floodway Boundary

Zone D Boundary

CBRS and OPA Boundary

Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.

513 (EL 987) — Base Flood Elevation line and value; elevation in feet*

Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — Cross section line

23 — Transect line

Culvert

Bridge

33° 22' 08", 83° 32' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere

3100000 FT — 5000-foot ticks: Georgia State Plane West Zone (FIPS Zone 1002), Transverse Mercator projection

1000-meter Universal Transverse Mercator grid values, zone 16

DX5310 — Bench mark (see explanation in Notes to Users section of this FIRM panel)

M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
March 4, 2013 - to update corporate limits, to add Base Flood Elevations, to change Special Flood Hazard Areas, to reflect updated topographic information and to change floodway.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

PANEL 0063D

FIRM

FLOOD INSURANCE RATE MAP

DOUGLAS COUNTY, GEORGIA AND INCORPORATED AREAS

PANEL 63 OF 251

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

COMMUNITY	NUMBER	PANEL	SUFFIX
DOUGLAS COUNTY	130306	0063	D
DOUGLASVILLE, CITY OF	130305	0063	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
13097C0063D
MAP REVISED
MARCH 4, 2013

Federal Emergency Management Agency

TOPOGRAPHIC MAP

SCALE: 1" = 1000'

= FLOW ARROW

FROM USGS QUADRANGLE MAP

0 1000 2000

500 1500

SCALE: 1"=1000'


SITE
AmC2
AmB2
N
Soil Map may not be valid at this scale.

Appendix E
GSMM Blue Book – Site Development Tool

Georgia Stormwater Management Manual
Stormwater Quality Site Development Review Tool
Version 2.2

General Information

Name of Developer:	GPS Hospitality	**Date Submitted:**	5/1/2019
Development Name:	Burger King	**Permit Number:**	
Site Location / Address:	5700 Fairburn Road	**Developer Contact:**	Ted Brennen
	Douglasville, GA 30134	**Phone Number:**	(770) 712-3000
		Name of Engineer(s):	David Coley, P.E.
Development Type:	Commercial/Retail	**Maintenance Responsibility:**	GPS Hospitality

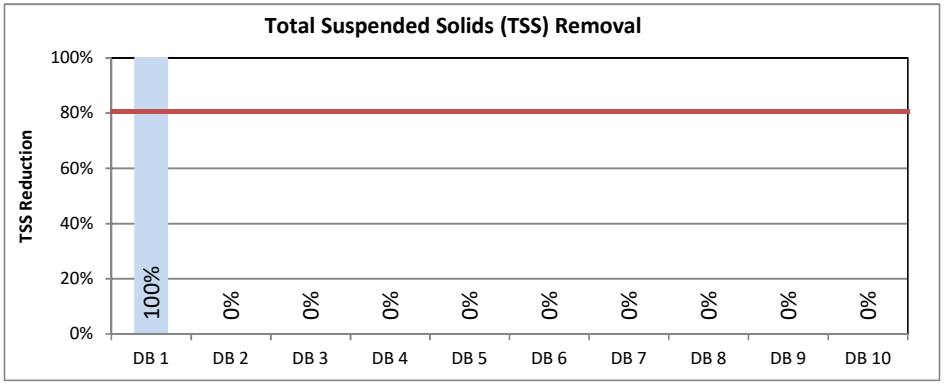
Site Summary

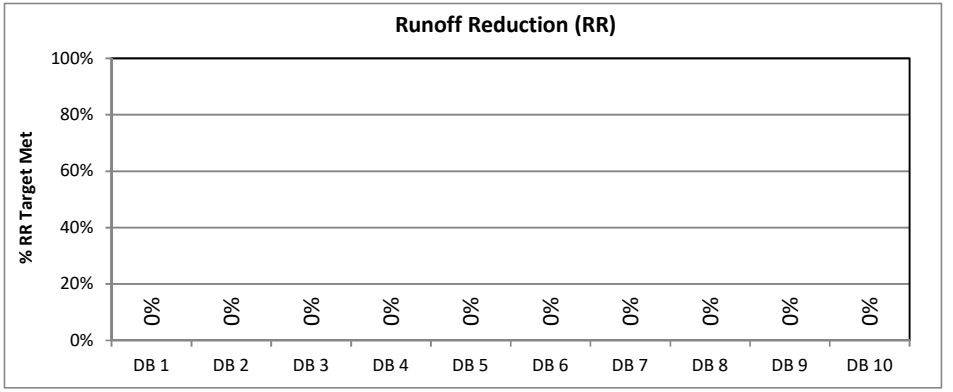
Total Pre-Development Area (ac):	**1.29**
Total Post-Development Area (ac):	**1.29**
Total Treated Area (ac):	**2.26**
Total Untreated Area (ac):	**-0.97**

		I (ac)	P (ac)	CA (ac)
1	DB 1	0.85	0.44	0.00
Drainage Basin 2	DB 2	0.00	0.00	0.00
Drainage Basin 3	DB 3	0.00	0.00	0.00
Drainage Basin 4	DB 4	0.00	0.00	0.00
Drainage Basin 5	DB 5	0.00	0.00	0.00
Drainage Basin 6	DB 6	0.00	0.00	0.00
Drainage Basin 7	DB 7	0.00	0.00	0.00
Drainage Basin 8	DB 8	0.00	0.00	0.00
Drainage Basin 9	DB 9	0.00	0.00	0.00
Drainage Basin 10	DB 10	0.00	0.00	0.00
	TOTAL	**0.85**	**0.44**	**0.00**

I = Impervious Area, P = Pervious Area, CA = Conservation Area

Target Runoff Reduction Volume Achieved?	**No**
Target TSS Removal Achieved?	**Yes**
Total Target Runoff Reduction Volume (cf)	3,011
Runoff Reduction Volume Achieved (cf)	0
Total Target Water Quality Volume (cf)	3,613
% TSS Removal Achieved	100%





Official Use Only

Tracking #:		**Conditions of Approval:**	
Reviewed By:			
Date Approved:			

Georgia Stormwater Management Manual
Stormwater Quality Site Development Review Tool, v2.2
Runoff Reduction and TSS Removal Efficiencies

data input cells constant values

	Runoff Reduction %	Effective TSS Removal %	Runoff Reduction Method	Drainage Area Restrictions	Units	Min/Max
Bioretention Basin (w/ underdrain)	50%	85%	Storage	5	acres	Max
Bioretention Basin (w/ upturned underdrain)	75%	85%	Storage	5	acres	Max
Bioretention Basin (w/o underdrain)	100%	100%	Storage	5	acres	Max
Bioslope (A & B hydrologic soils)	50%	85%	Storage	--	--	--
Bioslope (C & D hydrologic soils)	25%	85%	Storage	--	--	--
Downspout Disconnect (A & B hydrologic soils)	50%	80%	Convey	2500	ft^2	Max
Downspout Disconnect (C & D hydrologic soils)	25%	80%	Convey	2500	ft^2	Max
Dry Detention Basin	0%	60%	Storage	75	acres	Max
Dry Extended Detention Basin	0%	60%	Storage	--	--	--
Dry Well	100%	100%	Storage	2500	ft^2	Max
Enhanced Dry Swale (w/ underdrain)	50%	80%	Storage	5	acres	Max
Enhanced Dry Swale (w/o underdrain)	100%	100%	Storage	5	acres	Max
Enhanced Wet Swale	0%	80%	Storage	5	acres	Max
Grass Channel (A & B hydrologic soils)	25%	50%	Convey	5	acres	Max
Grass Channel (C & D hydrologic soils)	10%	50%	Convey	5	acres	Max
Gravity (oil-grit) Separator	0%	40%	Convey	5	acres	Max
Green Roof	60%	80%	Storage	--	--	--
Infiltration Trench	100%	100%	Storage	5	acres	Max
Multi-Purpose Detention Basin	0%		Storage	--	--	--
Organic Filter	0%	80%	Storage	10	acres	Max
Permeable Paver System (w/ underdrain)	50%	80%	Storage	--	--	--
Permeable Paver System (w/ upturned underdrain)	75%	80%	Storage	--	--	--
Permeable Paver System (w/o underdrain)	100%	100%	Storage			
Pervious Concrete (w/ underdrain)	50%	80%	Storage	--	--	--
Pervious Concrete (w/ upturned underdrain)	75%	80%	Storage			
Pervious Concrete (w/o underdrain)	100%	100%	Storage	--	--	--
Porous Asphalt (w/ underdrain)	50%	50%	Storage	--	--	--
Porous Asphalt (w/ upturned underdrain)	75%	50%	Storage			
Porous Asphalt (w/o underdrain)	100%	100%	Storage	--	--	--
Porous Asphalt (OGFC, PEM)	0%	50%	Convey	--	--	--
Proprietary System	0%	80%	Convey	2	acres	max
Rainwater Harvesting			Storage			
Regenerative Stormwater Conveyance	0%	80%	Storage	50	acres	Max
Sand Filter	0%	80%	Storage	10	acres	Max
Site Reforestation/Revegetation	0%	0%	Convey	--	--	--
Soil Restoration (can be used to remediate C & D soils)	0%	0%	Convey	--	--	--
Stormwater Planter / Tree Box	50%	80%	Storage	2500	ft^2	Max
Stormwater Pond	0%	80%	Storage	10-25	acres	Min
Stormwater Wetlands – Level 1	0%	80%	Convey	5	acres	Min
Stormwater Wetlands – Level 2	0%	85%	Convey	5	acres	Min
Submerged Gravel Wetlands	0%	80%	Convey	5	acres	Min
Underground Detention	0%	0%	Convey	--	--	--
Vegetated Filter Strip (A & B hydrologic soils)	50%	60%	Convey	--	--	--
Vegetated Filter Strip (C & D hydrologic soils)	25%	60%	Convey	--	--	--
[User Input 1]						
[User Input 2]						
[User Input 3]						

Georgia Stormwater Management Manual
Stormwater Quality Site Development Review Tool, v2.2

Development Name: Burger King
Drainage Basin Name: 1

data input cells
calculation cells
constant values

Site Data

Indicate Pre-Development Land Cover and Runoff Curve Numbers in the Site's Disturbed Area

Cover Type	HSG* A (acres)	CN	HSG B (acres)	CN	HSG C (acres)	CN	HSG D (acres)	CN	Total	% Cover
Open space - Good condition (grass cover > 75%)		39	0.42	61		74		80	0.42	33%
Impervious		98	0.87	98		98		98	0.87	67%
Select a land cover type…		0		0		0		0	0.00	0%
Select a land cover type…		0		0		0		0	0.00	0%
Select a land cover type…		0		0		0		0	0.00	0%
Local Jurisdiction Input									0.00	0%
Other									0.00	0%
Total	0.00		1.29		0.00		0.00		1.29	100%

*HSG = hydrologic soil group

Impervious (ac)	0.87
Weighted CN	86
Potential Max Soil Retention, S_{pre} (in)	1.63

Indicate Post-Development Land Cover and Runoff Curve Numbers in the Site's Disturbed Area

Cover Type	HSG A (acres)	CN	HSG B (acres)	CN	HSG C (acres)	CN	HSG D (acres)	CN	Total	% Cover
Impervious		98	0.85	98		98		98	0.85	66%
Open space - Good condition (grass cover > 75%)		39	0.44	61		74		80	0.44	34%
Select a land cover type…		0		0		0		0	0.00	0%
Select a land cover type…		0		0		0		0	0.00	0%
Select a land cover type…		0		0		0		0	0.00	0%
Local Jurisdiction Input									0.00	0%
Other									0.00	0%
Total	0.00		1.29		0.00		0.00		1.29	100%

Impervious (ac)	0.85
Rv	0.64
Weighted CN	85
Potential Max Soil Retention, S_{post} (in)	1.71

Conservation Area Credits

Scenario 1: Natural Conservation Area **See the GSMM Volume 2, Section 2.3.3.3 for more information.*

☐ Check the box if a portion of the post-developed area is protected by a conservation easement or equivalent form of protection.

Area (ac) of development protected by a conservation easement or equivalent form of protection.

Note: The green cell will unlock if the Scenario 1 box above is checked

Scenario 2: Site Reforestation/Revegetation **See the GSMM Volume 2, Section 4.22 for more information.*

☐ Check the box if a portion of the post-developed area employs site reforestation/revegetation and is protected by a conservation easement or equivalent form of protection.

Area (ac) of development reforested/revegetated and protected by a conservation easement or equivalent form of protection.

Note: The green cell will unlock if the Scenario 2 box above is checked

Scenario 3: Soil Restoration **See the GSMM Volume 2, Section 4.23 for more information.*

☐ Check the box if a portion of the post-developed area employs soil restoration and is protected by a conservation easement or equivalent form of protection.

Area (ac) of development with restored soils and protected by a conservation easement or equivalent form of protection.

Note: The green cell will unlock if the Scenario 3 box above is checked

Scenario 4: Site Reforestation/Revegetation & Soil Restoration **See the GSMM Volume 2, Section 4.22 and 4.23 for more information.*

☐ Check the box if the same portion of the post-developed area employs site reforestation/revegetation and soil restoration, and is protected by a conservation easement or equivalent form of protection.

Area (ac) with restored soils in a reforested & revegetated area and protected by a conservation easement or equivalent form of protection.

Note: The green cell will unlock if the Scenario 4 box above is checked

Total Conservation Area Credit (acres) 0.00

Georgia Stormwater Management Manual
Stormwater Quality Site Development Review Tool, v2.2

Development Name: Burger King
Drainage Basin Name: 1

data input cells
calculation cells
constant values

Water Quality Goals

Target Runoff Reduction Storm (in): 1.00

Total Site Area for Water Quality Volume (acres): 1.29
Target Runoff Reduction Volume (cf): 3,011
Target Water Quality Volume (cf): 3,613

Select BMPs for Runoff Reduction and Water Quality

		Area Draining to Each BMP			Storage Volume Provided by BMP (cf)	RR Conveyance Volume Provided by BMP (cf)	Down-stream BMP	Runoff Reduction Calculations						WQ Calculations	
		On-site Pervious Area (acres)	On-site Impervious Area (acres)	Offsite Area (acres)				RR Volume from Direct Drainage (cf)	RR Volume from Upstream Practices (cf)	Total RR Volume Received by BMP (cf)	Runoff Reduction %	RR Achieved (cf)	Remaining RR Volume (cf)	WQ_v from Direct Drainage (cf)	Effective TSS Removal %
BMP 1	Proprietary System	0.28	0.85	0.00		2,982	BMP 2	2,982	0	2,982	0%	0	2,982	3,578	80%
BMP 2	Dry Detention Basin	0.28	0.85	0.00	22,570			2,982	2,982	5,964	0%	0	5,964	3,578	60%
BMP 3	Select a BMP…							0	0	0	N/A	0	0	0	N/A
BMP 4	Select a BMP…							0	0	0	N/A	0	0	0	N/A
BMP 5	Select a BMP…							0	0	0	N/A	0	0	0	N/A
BMP 6	Select a BMP…							0	0	0	N/A	0	0	0	N/A
BMP 7	Select a BMP…							0	0	0	N/A	0	0	0	N/A
BMP 8	Select a BMP…							0	0	0	N/A	0	0	0	N/A
BMP 9	Select a BMP…							0	0	0	N/A	0	0	0	N/A
BMP 10	Select a BMP…							0	0	0	N/A	0	0	0	N/A
	TOTAL	0.56	1.70	0.00				5,964				0		7,157	
	UNTREATED AREA (acres)	0.00	0.00												

Target Runoff Reduction Volume (cf)	3,011
Target Achieved?	No
Remaining Runoff Reduction Volume (cf)	3,011

Target Water Quality Volume (cf)	3,613
% TSS Removal Achieved	100%
Target Achieved?	Yes!
Remaining TSS Removal %	0%

Georgia Stormwater Management Manual
Stormwater Quality Site Development Review Tool, v2.2

Development Name: Burger King
Drainage Basin Name: 1

data input cells
calculation cells
constant values

Channel and Flood Protection Calculations

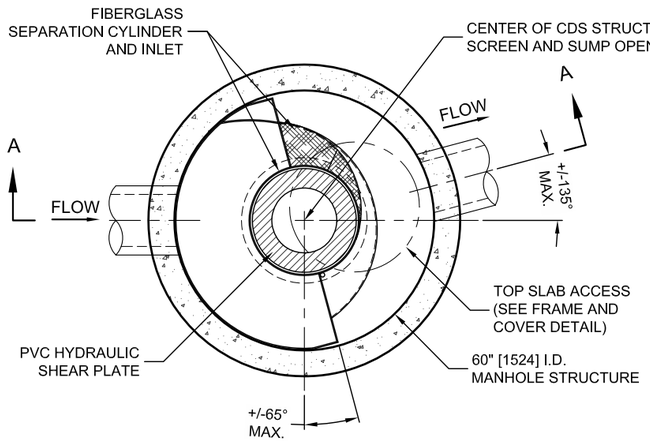
	1-yr, 24-hr storm	2-yr, 24-hr storm	25-yr, 24-hr storm	100-yr, 24-hr storm
Target Rainfall Event (in)	3.46	3.95	6.42	7.96

	1-yr, 24-hr storm	2-yr, 24-hr storm	25-yr, 24-hr storm	100-yr, 24-hr storm
Pre-Development Runoff Volume (in)	2.06	2.50	4.80	6.29
Post Development Runoff Volume (in) with no BMPs	2.01	2.45	4.74	6.22
Post-Development Runoff Volume (in) with BMPs	2.01	2.45	4.74	6.22
Adjusted CN	**85**	**85**	**85**	**85**

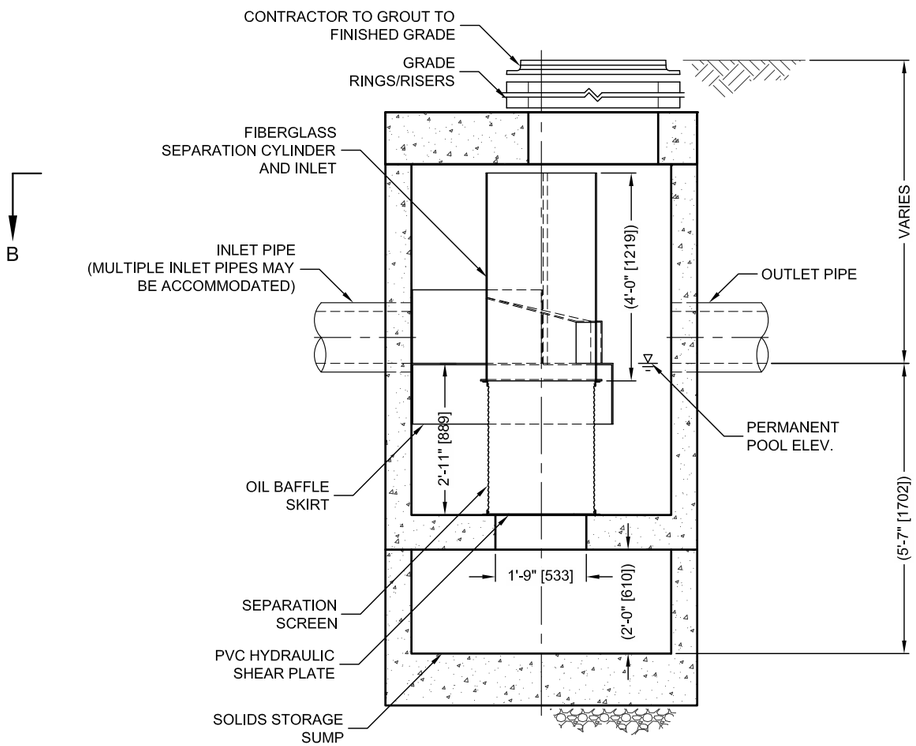
*See Stormwater Management Standards to Determine Detention Requirements.

Comments

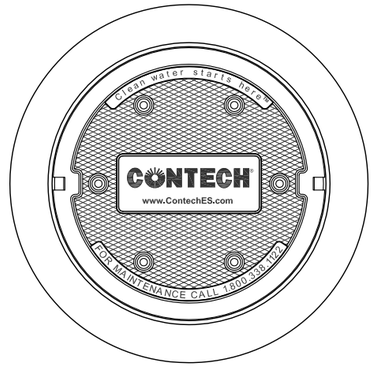
Appendix F
Contech CDS Inline (CDS2025-5-C) Standard Detail



PLAN VIEW B-B
N.T.S.



ELEVATION A-A
N.T.S.



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

CDS2025-5-C DESIGN NOTES

THE STANDARD CDS2025-5-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
SEPARATE OIL BAFFLE (SINGLE INLET PIPE REQUIRED FOR THIS CONFIGURATION)
SEDIMENT WEIR FOR NJDEP / NJCAT CONFORMING UNITS

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (CFS OR L/s)	*
PEAK FLOW RATE (CFS OR L/s)	*
RETURN PERIOD OF PEAK FLOW (YRS)	*
SCREEN APERTURE (2400 OR 4700)	*

PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*

RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CDS2025-5-C
INLINE CDS
STANDARD DETAIL

Appendix G
Maintenance & Operations Recommendations

Proprietary Systems

Proprietary systems are control systems available from commercial vendors designed to treat stormwater runoff and/or provide water quantity control. Typically these systems are underground and installed at inlet structures. There are many types of proprietary stormwater structural controls to provide water quality treatment and quantity control. These systems come in different shapes and sizes ranging from small systems that use a swirling vortex to a large system that has multiple chambers to separate sediment, floatables, and oil/grease from the stormwater runoff.

There are some common problems to be aware of when maintaining propriety systems. They include, but are not limited to, the following:

- Sediment and oil/grease build-up
- Clogging in the inlet and outlet structure
- Inability to remove dissolved pollutants
- Must be maintained routinely so that system does not become a potential source of pollutants

Routine inspection and maintenance should be performed on the proprietary systems to ensure that the structure is functioning properly. Typical maintenance will include removing accumulated sediment and pressure washing the system to remove blockage. It is important that the accumulated sediment and water from cleaning the proprietary system be collected and disposed of properly. This is important to keep the ground surrounding the system clean to avoid clogging.

Additional maintenance may be necessary if a spill occurs upstream of the system and drains into the practice. The contributing drainage area should be maintained to limit the amount of trash and debris that enters the practice.

Proprietary systems should be inspected after a large rainstorm. It may be necessary to make repairs to the inlets, outlets, and other structural components. Check the manufacturer's guidelines for recommended maintenance on the system. In addition, it is required that a maintenance plan is developed and implemented.

The table below shows a schedule for when different maintenance activities should be performed on proprietary systems.

Proprietary Systems Typical Routine Maintenance Activities and Schedule

Activity	Schedule
• Check to make sure practice is draining properly.	After a large rain storm event or as needed
• Keep contributing drainage area free of trash, chunks of sediment, and debris. • Cleanout if spill occurs and enters the system. • Repair structural components.	As needed

Activity	Schedule
• Check maintenance plan and/or manufacturer's guidelines for additional maintenance needs. • Check system to make sure no blockage or significant sediment accumulation is occurring in the system.	Quarterly
• Cleanout system with vacuum or boom trucks. • Remove sediment and oil from chambers	Annually

Proprietary System					
Maintenance Item	Condition				Comment
	Good	Marginal	Poor	N/A*	
General Inspection					
Access to the site is adequately maintained for inspection and maintenance.					
Contributing drainage area is clean (trash, debris, grass clippings, etc. removed).					
Inlet and outlet pipes are clean; stormwater can enter and exit the practice without being blocked.					
Overflow structure is in good condition and clean.					
Maintenance is being performed according to manufacturer's guidelines.					
Maintenance is being performed according to the maintenance plan.					
Water is going through structure (i.e. no evidence of water going around the structure).					
Structure seems to be working properly. No settling around the structure. Comment on overall condition of structure.					
Results					
Overall condition of Proprietary System:					
Additional Comments					
Notes: * If a specific maintenance item was not checked, please check N/A and explain why in the appropriate comment box.					

Appendix H
2019 Georgia CSWCC

EROSION, SEDIMENTATION & POLLUTION CONTROL PLAN CHECKLIST
STAND ALONE CONSTRUCTION PROJECTS

SWCD:_____

Project Name: Burger King **Address:** 5700 Fairburn Road

City/County: Douglasville, GA 30134 **Date on Plans:** 05/01/2019

Name & email of person filling out checklist: Cori Austell - caustell@lbyd.com

Plan Page #	Included Y/N		TO BE SHOWN ON ES&PC PLAN
C600	Y	1	The applicable Erosion, Sedimentation and Pollution Control Plan Checklist established by the Commission as of January 1 of the year in which the land-disturbing activity was permitted. (The completed Checklist must be submitted with the ES&PC Plan or the Plan will not be reviewed)
ALL	Y	2	Level II certification number issued by the Commission, signature and seal of the certified design professional. (Signature, seal and Level II number must be on each sheet pertaining to ES&PC plan or the Plan will not be reviewed)
C600	Y	3	Limits of disturbance shall be no greater than 50 acres at any one time without prior written authorization from the EPD District Office. If EPD approves the request to disturb 50 acres or more at any one time, the Plan must include at least 4 of the BMPs listed in Appendix 1 of this checklist.* (A copy of the written approval by EPD must be attached to the plan for the Plan to be reviewed.)
ALL	Y	4	The name and phone number of the 24-hour local contact responsible for erosion, sedimentation and pollution controls.
C600	Y	5	Provide the name, address, email address, and phone number of primary permittee.
C600	Y	6	Note total and disturbed acreage of the project or phase under construction.
C600	Y	7	Provide the GPS location of the construction exit for the site. Give the Latitude and Longitude in decimal degrees.
C600	Y	8	Initial date of the Plan and the dates of any revisions made to the Plan including the entity who requested the revisions.
C600	Y	9	Description of the nature of construction activity.
C600	Y	10	Provide vicinity map showing site's relation to surrounding areas. Include designation of specific phase, if necessary.
C600	Y	11	Identify the project receiving waters and describe all sensitive adjacent areas including streams, lakes, residential areas, wetlands, marshlands, etc. which may be affected.
C600	Y	12	Design professional's certification statement and signature that the site was visited prior to development of the ES&PC Plan as stated on Part IV page 19 of the permit.
C600	Y	13	Design professional's certification statement and signature that the permittee's ES&PC Plan provides for an appropriate and comprehensive system of BMPs and sampling to meet permit requirements as stated on Part IV page 19 of the permit.*
C600	Y	14	Clearly note the statement that "The design professional who prepared the ES&PC Plan is to inspect the installation of the initial sediment storage requirements and perimeter control BMPs within 7 days after installation." in accordance with Part IV.A.5 page 25 of the permit.*
C602	Y	15	Clearly note the statement that "Non-exempt activities shall not be conducted within the 25 or 50-foot undisturbed stream buffers as measured from the point of wrested vegetation or within 25-feet of the coastal marshland buffer as measured from the Jurisdictional Determination Line without first acquiring the necessary variances and permits."
C602	Y	16	Provide a description of any buffer encroachments and indicate whether a buffer variance is required.
C602	Y	17	Clearly note the statement that "Amendments/revisions to the ES&PC Plan which have a significant effect on BMPs with a hydraulic component must be certified by the design professional."*

C602	Y	18	Clearly note the statement that "Waste materials shall not be discharged to waters of the State, except as authorized by a Section 404 permit."*
C602	Y	19	Clearly note statement that "The escape of sediment from the site shall be prevented by the installation of erosion and sediment control measures and practices prior to land disturbing activities."
C602	Y	20	Clearly note statement that "Erosion control measures will be maintained at all times. If full implementation of the approved Plan does not provide for effective erosion control, additional erosion and sediment control measures shall be implemented to control or treat the sediment source."
C602	Y	21	Clearly note the statement "Any disturbed area left exposed for a period greater than 14 days shall be stabilized with mulch or temporary seeding."
C602	N/A	22	Any construction activity which discharges storm water into an Impaired Stream Segment, or within 1 linear mile upstream of and within the same watershed as, any portion of an Biota Impaired Stream Segment must comply with Part III. C. of the permit. Include the completed Appendix 1 listing all the BMPs that will be used for those areas of the site which discharge to the Impaired Stream Segment.*
N/A	N/A	23	If a TMDL Implementation Plan for sediment has been finalized for the Impaired Stream Segment (identified in Item 22 above) at least six months prior to submittal of NOI, the ES&PC Plan must address any site-specific conditions or requirements included in the TMDL Implementation Plan.*
C603-C604			
C608	Y	24	BMPs for concrete washdown of tools, concrete mixer chutes, hoppers and the rear of the vehicles. Washout of the drum at the construction site is prohibited.*
C602	Y	25	Provide BMPs for the remediation of all petroleum spills and leaks.
C602	Y	26	Description of the measures that will be installed during the construction process to control pollutants in storm water that will occur after construction operations have been completed.*
C602	Y	27	Description of practices to provide cover for building materials and building products on site.*
C602	Y	28	Description of the practices that will be used to reduce the pollutants in storm water discharges.*
C602	Y	29	Description and chart or timeline of the intended sequence of major activities which disturb soils for the major portions of the site (i.e., initial perimeter and sediment storage BMPs, clearing and grubbing activities, excavation activities, utility activities, temporary and final stabilization).
C602	Y	30	Provide complete requirements of inspections and record keeping by the primary permittee.*
C602	Y	31	Provide complete requirements of sampling frequency and reporting of sampling results.*
C602	Y	32	Provide complete details for retention of records as per Part IV.F. of the permit.*
C601	Y	33	Description of analytical methods to be used to collect and analyze the samples from each location.*
C601	Y	34	Appendix B rationale for NTU values at all outfall sampling points where applicable.*
C601	Y	35	Delineate all sampling locations, perennial and intermittent streams and other water bodies into which storm water is discharged.*
C603-C605			
C603	Y	36	A description of appropriate controls and measures that will be implemented at the construction site including: (1) initial sediment storage requirements and perimeter control BMPs, (2) intermediate grading and drainage BMPs, and (3) final BMPs. For construction sites where there will be no mass grading and the initial perimeter control BMPs, intermediate grading and drainage BMPs, and final BMPs are the same, the Plan may combine all of the BMPs into a single phase.*
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C605			

ALL	Y	37 Graphic scale and North arrow.
C601	Y	38 Existing and proposed contour lines with contour lines drawn at an interval in accordance with the following:

C603-C605

Map Scale	Ground Slope	Contour Intervals, ft.
1 inch = 100ft or larger scale	Flat 0 - 2%	0.5 or 1
	Rolling 2 - 8%	1 or 2
	Steep 8% +	2,5 or 10

C602	Y	39 Use of alternative BMPs whose performance has been documented to be equivalent to or superior to conventional BMPs as certified by a Design Professional (unless disapproved by EPD or the Georgia Soil and Water Conservation Commission). Please refer to the Alternative BMP Guidance Document found at www.gaswcc.org.
C602	Y	40 Use of alternative BMP for application to the Equivalent BMP List. Please refer to Appendix A-2 of the Manual for Erosion & Sediment Control in Georgia 2016 Edition.*
C602	N/A	41 Delineation of the applicable 25-foot or 50-foot undisturbed buffers adjacent to state waters and any additional buffers required by the Local Issuing Authority. Clearly note and delineate all areas of impact.
C602	N/A	42 Delineation of on-site wetlands and all state waters located on and within 200 feet of the project site.
C601	Y	43 Delineation and acreage of contributing drainage basins on the project site.
C601	Y	44 Provide hydrology study and maps of drainage basins for both the pre- and post-developed conditions.*
C601	Y	45 An estimate of the runoff coefficient or peak discharge flow of the site prior to and after construction activities are completed.

C604-C605

	Y	46 Storm-drain pipe and weir velocities with appropriate outlet protection to accommodate discharges without erosion. Identify/Delineate all storm water discharge points.
C601	Y	47 Soil series for the project site and their delineation.
C603-C605	Y	48 The limits of disturbance for each phase of construction.
C606	Y	49 Provide a minimum of 67 cubic yards of sediment storage per acre drained using a temporary sediment basin, retrofitted detention pond, and/or excavated inlet sediment traps for each common drainage location. Sediment storage volume must be in place prior to and during all land disturbance activities until final stabilization of the site has been achieved. A written justification explaining the decision to use equivalent controls when a sediment basin is not attainable must be included in the Plan for each common drainage location in which a sediment basin is not provided. A written justification as to why 67 cubic yards of storage is not attainable must also be given. Worksheets from the Manual included for structural BMPs and all calculations used by the storage design professional to obtain the required sediment when using equivalent controls. When discharging from sediment basins and impoundments, permittees are required to utilize outlet structures that withdraw water from the surface, unless infeasible. If outlet structures that withdraw water from the surface are not feasible, a written justification explaining this decision must be included in the Plan.

C603-

C605	Y	50 Location of Best Management Practices that are consistent with and no less stringent than the Manual for Erosion and Sediment Control in Georgia. Use uniform coding symbols from the Manual, Chapter 6, with legend.

C606-

C608	Y	51 Provide detailed drawings for all structural practices. Specifications must, at a minimum, meet the guidelines set forth in the Manual for Erosion and Sediment Control in Georgia.
C608	Y	52 Provide vegetative plan, noting all temporary and permanent vegetative practices. Include species, planting dates and seeding, fertilizer, lime and mulching rates. Vegetative plan shall be site specific for appropriate time of the year that seeding will take place and for the appropriate geographic region of Georgia.

*If using this checklist for a project that is less than 1 acre and not part of a common development but within 200 ft of a perennial stream the * checklist items would be N/A.

Effective January 1, 2019