Stormwater Report

Duluth Trading Company
2320 Bluemound Road
Waukesha, WI

Issue/Revision Date
January 24, 2017

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Duluth Trading Company (Home Depot Outlot), 2320 Bluemound Road, Waukesha, WI

Existing Conditions

The original stormwater management design for the overall Home Depot development provides stormwater detention for the runoff generated during the 10- and 100-year rainfall events within a detention pond located behind the Home Depot building. Water quality treatment and TSS removal is provided for in an existing pond located north of and adjacent to the detention pond, which was constructed for the overall Home Depot development.

As defined in the *Storm Water Management Plan* for the Home Depot-Waukesha dated 01/18/99 and prepared by R.A. Smith & Associates, Inc., the carve-out outlot to be developed for Duluth Trading Company, which includes 15,536 sf building, parking and landscape areas, is located within Drainage Basin A. Based on the Technical Release 55 Curve Number and Time of Concentration worksheet contained within Appendix B of the *Storm Water Management Plan*, the Developed (Existing) condition provides 11.11 acres (483,952 SF) of impervious area based on 7.73 acres pavement and 3.48 acres building and sidewalk (see Appendix 1).

Proposed Conditions

Based on the ATLA/NSPS Land Title Survey with Topographic Data dated 01/06/17 and prepared by R.A. Smith National, Inc., 10.37 acres (451,916 SF) of impervious area is the as-built condition within Basin A, which is 32,036 SF less of impervious surface constructed than included in the Proposed Conditions hydrologic/hydraulic analysis. The proposed site plan for the Duluth Trading Company will create an increase in impervious surface of 29,418 SF, which is 2,618 SF less than calculated in the Proposed Conditions hydrologic/hydraulic analysis. Therefore, developing the Duluth Trading Company at the Home Depot site will not adversely impact or increase stormwater runoff to the existing detention pond.

The City of Waukesha's Stormwater requirements – Section 32.06(B)2 apply to "land development activity that may ultimately result in the addition of 0.50 acres or greater of impervious surfaces." Since the proposed impervious area is less than the total impervious area included in the Proposed Conditions hydrologic/hydraulic analysis, the City of Waukesha will not require a post-construction stormwater management plan for the project.

Stormwater runoff from the proposed building, landscape areas and parking will be collected and conveyed by proposed storm sewer to the existing Catchbasin 8 and existing 18-inch dia. RCP @ 0.46% (design slope 0.42%), which has a full-flow capacity of 8.44 CFS. This storm sewer system ultimately discharges to the existing detention pond located behind the Home Depot building. Under Existing Conditions, 6.45 CFS of runoff drains toward the existing 18-inch dia. pipe (refer to calculations contained in Appendix 2). Under proposed conditions, 7.86 CFS of runoff will drain towards the existing 18-inch dia. pipe (see Appendix 2). 7.86 CFS is less than the full-flow capacity of 8.44 CFS for the existing 18-inch dia. RCP, therefore pipe capacity is sufficient.

Stormwater runoff from landscape areas and parking will sheet flow towards Catchbasin 1 and existing 12-inch dia. RCP @ 0.65% (design slope 0.52%), which has a full-flow capacity of 3.41 CFS. This storm sewer system ultimately discharges to the existing detention pond. Under Existing Conditions, 1.92 CFS of runoff drains to this pipe (see Appendix 2). Under proposed conditions 2.61 CFS of runoff will drain towards this pipe (see Appendix 2). 2.61 CFS is less than the full-flow capacity of 3.41 CFS for the existing 12-inch dia. RCP, therefore pipe capacity is sufficient.

Appendix 1

Storm Water Management Plan for the Home Depot – Waukesha dated 01/18/99 and prepared by R.A. Smith & Associates, Inc.

R.A.SMITH
& ASSOCIATES, INC.

KS9-1

STORM WATER MANAGEMENT PLAN

for the

The Home Depot - Waukesha

City of Waukesha
Waukesha County, Wisconsin

Project Number: 1970034

January 18, 1999

The Home Depot - Waukesha
City of Waukesha, Waukesha County, Wisconsin
Storm Water Management Plan (SWMP)

Introduction

R.A. Smith & Assoc., Inc. was retained by The Home Depot, USA to perform a Storm Water Management Plan (SWMP) for the future Home Depot in the City of Waukesha, Waukesha County, WI. This site is located at the northwest corner of Bluemound Road (CTH JJ) and Kossow Road. The site consists of soils classified as predominately Hochheim Loam and St Charles Silt Loam, Type B soils. The existing storm water drains from south to north and leaves the site through an existing drainage ditch (see the Existing Drainage Plan located in Appendix D).

The design intent of the storm water drainage for this site is to collect and direct the proposed on site runoff to a detention basin located the north of the proposed building. The detention basin will temporarily detain the runoff and release the storm water volume generated at a controlled rate. The City's SWM ordinance requires that there be no net increase in the peak discharge from a post-developed condition in comparison to a pre-developed condition for a 10- and 100-year storm event. For the purpose of the SWMP, the storm events evaluated for both the existing and proposed conditions were the 10- and 100-year storms.

Hydrologic Analysis

A hydrologic analysis was required to determine peak storm water runoff from the subject property under existing and proposed conditions. The analysis was performed using the INTELISOLVE Hydroflow hydrologic simulation computer model. The discharges were generated using the SCS Dimensionless Unit Hydrograph Method for a 24-hour duration storm. Model parameters include drainage area, SCS runoff curve number, average basin slope, hydraulic length, 24-hour precipitation and time of concentration.

The runoff curve number is determined by the soils, vegetation cover, amount of impervious area, and surface storage to convert the mass of rainfall into the mass runoff in the SCS Method. Higher curve numbers mean more potential runoff. Composite curve numbers were determined from the existing and proposed condition land use.

The hydraulic length is the distance from the most hydrologically remote point in the drainage area to the outlet of that area. This parameter is used in computing the basin lag and the unit hydrograph.

The time of concentration is the time required for water to flow from the most remote part of the drainage area to the point of design. The water moves through the watershed or subbasin as sheet flow, shallow concentrated flow, open channel flow, gutter flow, storm sewer flow, culvert flow or a combination of these.

Existing Condition

The existing condition drainage basin for the site was delineated by RAS using the topographic survey map developed by National Survey and Engineering (See appendix D). The total drainage area of the parcel is approximately 16.96 acres. The current drainage pattern for this parcel flows off the northern portion of the site. The site contains a drainage channel that runs from the southwest portion of the site and exits the parcel on the north. This channel conveys water from under Bluemound Road through an existing 54"X84" storm sewer pipe. The existing site was modeled as one existing drainage basin due to the uniform drainage pattern and is approximately 16.96 acres in size.

The information provided in Table 1 summarizes the parameters and peak flows generated for a 10- and 100-year storm event under existing conditions(pre-developed conditions).

Table 1

Existing On-Site Parameters and Peak Discharges

Description	Area	CN	Tc	10-Year peak discharge(cfs)
Existing Basin	16.96 ac.	77	19 min.	33.8

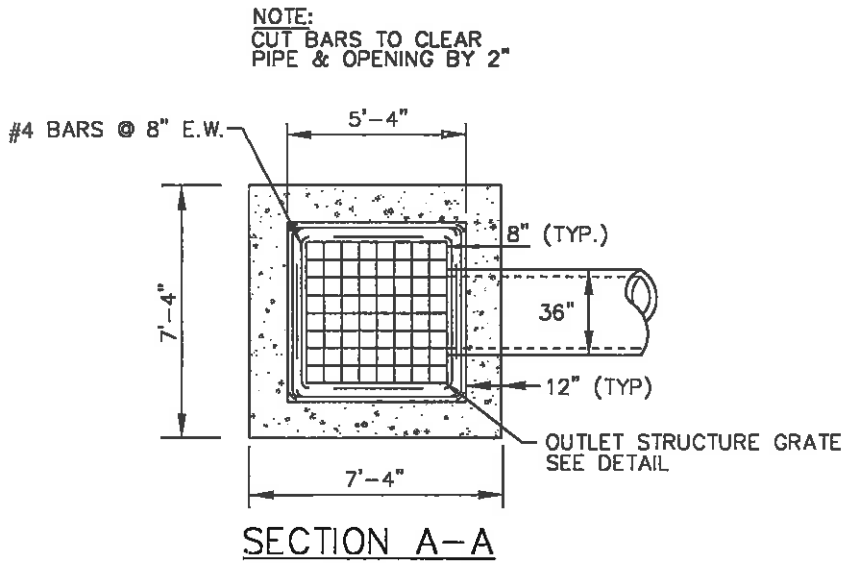
Description	Area	CN	Tc	100-Year peak discharge(cfs)
Existing Basin"	16.96 ac.	77	19 min.	61.7

*See Appendix A for computer generated information

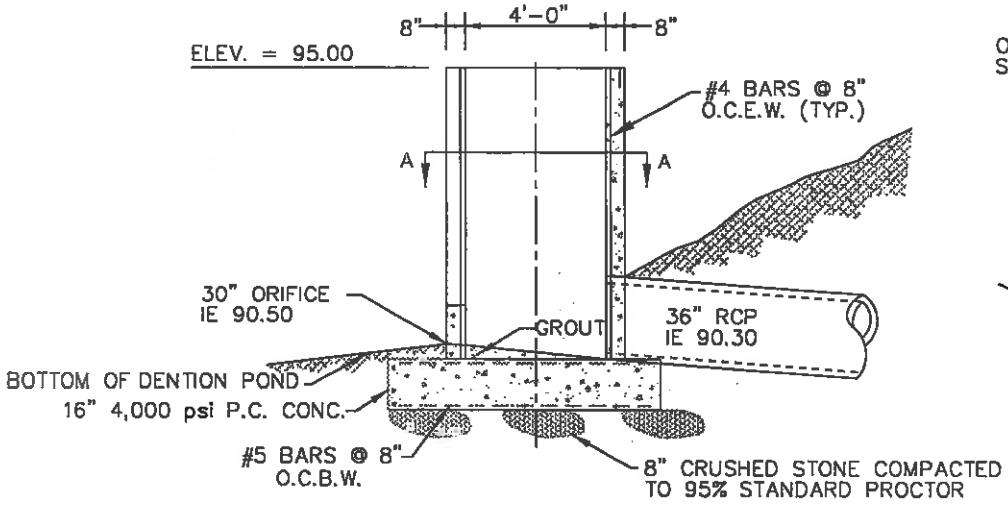
Proposed Condition

Runoff from the proposed site was broken into two separate basins (See appendix E). Basin A includes the majority of the site and was designed to drain to the detention basin located to the north of the proposed building. The drainage area for Basin A was calculated to be approximately 14.17 acres. The time of concentration was assumed to be 10 min. to the first inlet and an additional 5 min. travel time in the storm sewer (average 5 ft/sec velocity). The proposed detention basin has an outlet structure that will release through a 36 inch reinforced concrete pipe (See figure 1). Basin B contains the remainder of the site estimated at approximately 2.86 acres. This area was determined to be not feasible to drain into the proposed detention basin because of design impracticality, the low volumes produced by this basin and the intent to use this area as compensatory storage in the event of a 100- year storm. The existing 54"X84" storm sewer pipe will be rerouted through the site via a 66" (equivalent sized) storm sewer system and will ultimately exit at the northwest corner of the site into the existing drainage channel. See Table 2 for the parameters and resulting peak discharges.

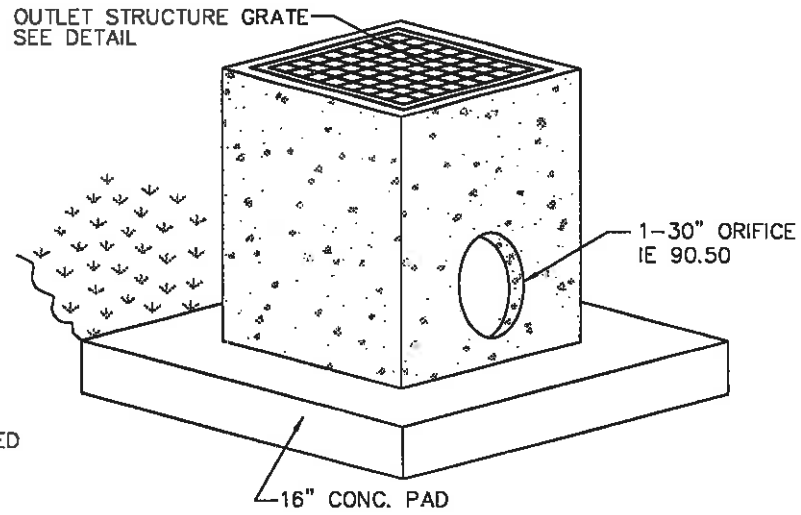
FIGURE 1



SECTION A-A



ELEVATION



ISOMETRIC VIEW

DETENTION BASIN – OUTFALL STRUCTURE

NTS

Table 2
Proposed Drainage areas, Curve Numbers, & Tc

Description	Area	CN	Tc	**10**-Year peak discharge(cfs)
Basin "A"	14.17	91	15	50.7
Basin "B"	2.86	63	35	1.6

Description	Area	CN	Tc	**100**-Year peak discharge(cfs)
Basin "A"	14.17	91	15	77.4
Basin "B"	2.86	63	35	4.1

*See appendix B for computer generated information.

Wet Detention Basin Analysis

Due to the change in land use, the resulting proposed discharges for the drainage basin are greater than the existing conditions thus requiring a detention basin to regulate the peak discharges. Runoff will enter the detention basin primarily through the storm sewer. The bottom of the detention pond will be at an elevation of 90.5. The detention basin has a principal outlet structure consisting of a 36" outlet pipe with an invert of 90.3 and a 30" orifice with an invert elevation of 90.5 that will be used to control peak discharge rates. The basin will have a top of berm elevation of 98.0 and an emergency spillway set at an elevation of 96.5. In a 10-year storm event this basin will reach a maximum water elevation of 94.82 and discharge at a peak rate of 29.7 cfs and in a 100-year storm event the basin will reach a maximum water elevation of 95.72, and discharge at a peak rate of 57.2 cfs.

The detention basin analysis results are shown in Table 3 with the applicable computer generated information located in Appendix C.

Table 3
Wet Detention Basin Results

Storm Event	Discharge	Maximum Elevation	Maximum Storage
10-Year Storm	29.7 cfs	94.82	34,186 cu. ft.
100-Year Storm	57.2 cfs	95.72	47,986 cu. ft.

Compensatory Storage

Based on the Stormwater Management Plan for the Town of Brookfield, September 1998 prepared by R.A. Smith & Associates, Inc in conjunction with Hey and Associates, Inc, it was calculated that the 100- year water surface elevation at the 48" culvert pipe, that runs under I-94, was 94.65 (875.20 USGS). In using this result, we have provided sufficient compensatory storage on site to match or exceed the volume of water which is presently available on site (See Appendix F).

Summary

The purpose of this report was to present the results of the storm water management plan for the proposed Home Depot Facility. In summary, it was determined that the design for the SWMP is in accordance with the requirements of the City of Waukesha.

The results show that the detention basin does not overtop for any of the storm events evaluated. The maximum water elevation in the detention basin for the 10- and 100- year events was calculated to be 94.82 and 95.72 respectively. The overflow spillway for the detention basin is proposed at an elevation of 96.00. In addition, the peak discharge rates for the proposed site for both the 10- and 100- year events will not exceed the peak discharge rates of the existing site for there equivalent storm events due to the detention basin and the outlet structure.

Table 4 shows a summary of the peak discharges for the existing and proposed sites as calculated for the relevant events.

Table 4
Peak Discharge Summary

		Proposed Site Discharge		
Storm Event	Existing Site Discharge	Basin A	Basin B	Detention Basin Discharge
10-year	33.8 cfs	50.7 cfs	1.6 cfs	29.7 cfs
100-year	61.7 cfs	77.4 cfs	4.1 cfs	57.2 cfs

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Return period (yrs)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	33.8	2	724	106,763	10	----	------	------	Existing Site
2	SCS Runoff	61.7	2	724	192,840	100	----	------	------	Existing Site
3	SCS Runoff	50.7	2	722	146,526	10	----	------	------	Basin A
4	SCS Runoff	1.6	2	738	8,866	10	----	------	------	Basin B
5	Reservoir	29.7	2	730	146,526	10	3	94.82	34,186	Pond Outlet
6	SCS Runoff	77.4	2	722	229,002	100	----	------	------	Basin A
7	SCS Runoff	4.1	2	736	19,518	100	----	------	------	Basin B
8	Reservoir	57.2	2	728	229,002	100	6	95.72	47,986	Pond Outlet

Proj. file: Swmp4.GPW	IDF file: Sample.IDF	Run date: 01-18-1999

Appendix B

Technical Release 55 (TR-55)

Runoff Curve Number and Time of Concentration

Subbasin Name	Project Name	Prepared By	Date
Basin A	Home Depot - Waukesha	MPK	
Project Location (County)	Project Number	Checked By	Date
Waukesha	1970034		

Land Use Condition (Existing / Developed)
Developed

sumed minimum time of concentration (min.) =
umed minimum strom sewer inlet time (min.) = 10
Assumed storm sewer flow velocity (ft/sec) = 5

CN :	91
Tc (min.):	15.0
Lag Time (hr.):	0.150
Average Slope (%):	0.33
Total Hydraulic lengh (ft):	1300
TR-55 Duration:	2

RUNOFF CURVE NUMBER

Soil Name and Hydrologic Soil Group	Ground Cover description	Curve # CN	Area	Product of CN x area
Type B	Detention Pond	98	0.5	49.00
Type B	Grass	61	2.56	156.16
Type B	Pavement	98	7.63	747.74
Type B	Building & Sidewalk	98	3.48	341.04
		Total:	14.17	1293.94

CN (weighted) = Total product / Total area = 91.32 Use: 91.00

TIME OF CONCENTRATION

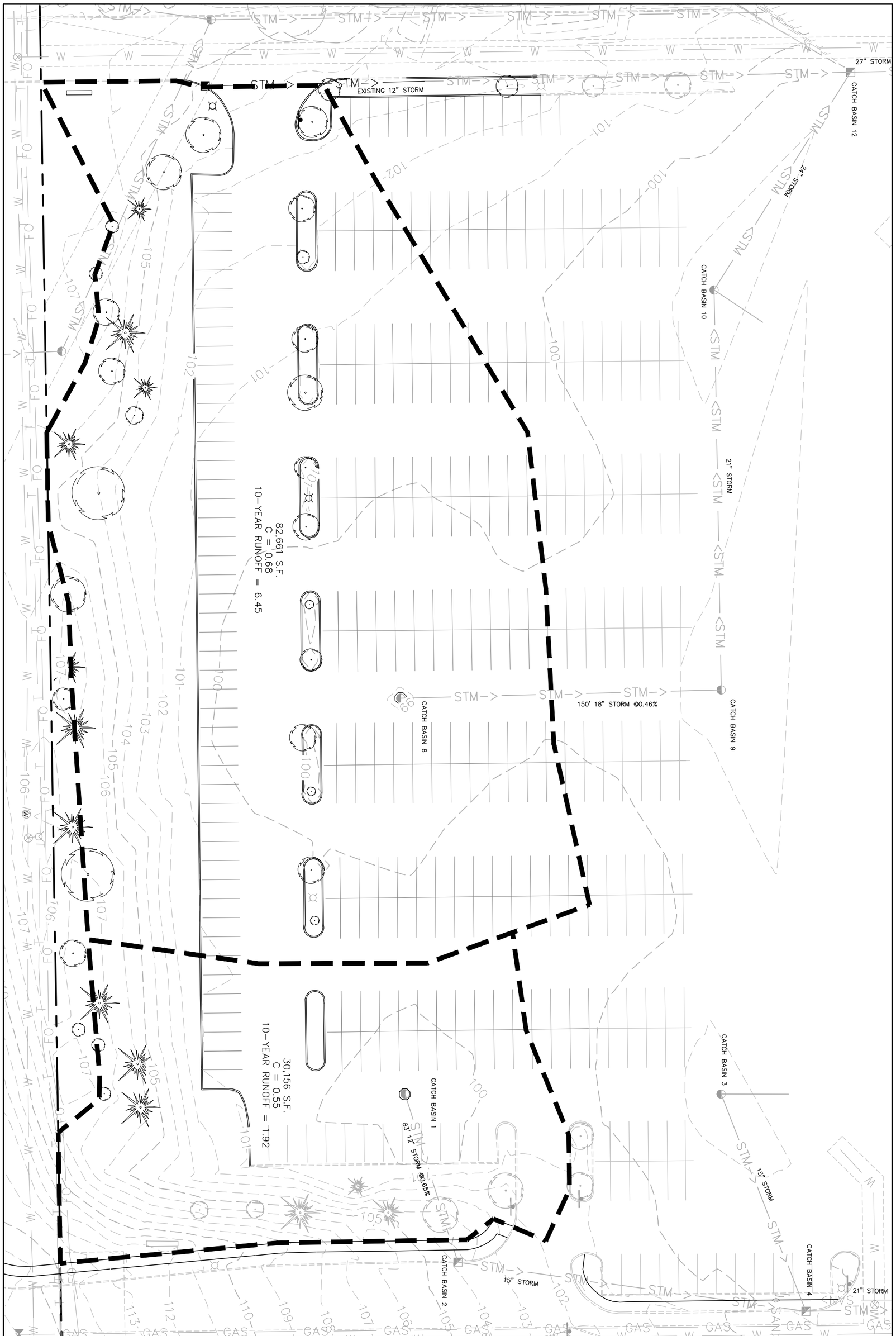
Sheet flow	Segment ID				
1. Surface description (table 3-1)					
2. Manning's roughness coeff., n (table 3-1)					
3. Flow length, Total L<300	ft				
4. Two-year 24-hour rainfall	in				
5. Land slope, s	ft/ft				
6. Travel Time, Tt	hr				

Shallow concentrated flow	Segment ID				
7. Surface description (paved or unpaved)					
8. Flow length, L	ft				
9. Watercourse slope, s	ft/ft				
10. Average velocity, V	ft/s				
11. Travel Time, Tt	hr				

Channel flow	Segment ID				
12. Cross sectional flow area	ft²	na			
13. Wetted perimeter, Pw	ft	na			
14. Hydraulic radius, r=a/Pw	ft	na			
15. Channel slope, s	ft/ft	0.010			
16. Manning's roughness coeff., n		0.013			
17. V=1.49*r^(2/3)s^(1/2)/n	ft/s	5.000			
18. Flow length, L	ft	1300			
19. Travel Time, Tt	hr	0.072			
20. Watershed or subbasin Tc in steps 6, 11, and 19					0.07
				Tc (hr)	0.07
				Tc (min.)	4.33
				Use (min.)	15

Appendix 2

Storm Sewer Pipe Calculations



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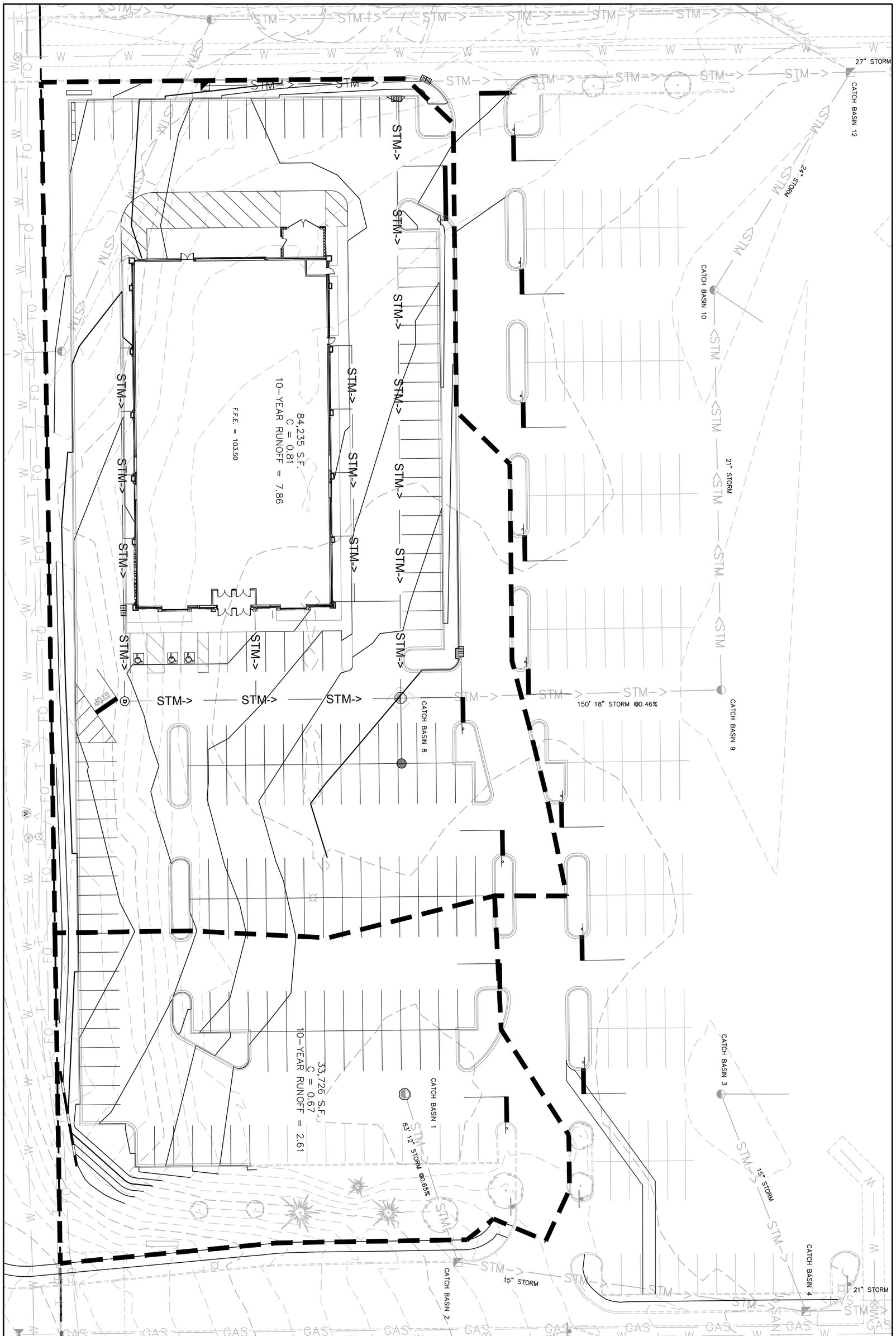
DULUTH TRADING

2320 WEST BLUEMOUND ROAD
WAUKESHA, WI

SHEET NUMBER:
EXISTING
1 OF 1
DATE:01-24-2017



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DULUTH TRADING

2320 WEST BLUEMOUND ROAD
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SHEET NUMBER:
PROPOSED
1 OF 1
DATE:01-24-2017

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1-20-17
Job # 20161393.0

100-YEAR STORM SEWER SIZING

i= 5.00 in/hr (10-YEAR, 10 MIN)

n= 0.011 RCP

From Structure	To Structure	Area (ac)	Pervious (sf)	Impervious (sf)	C-value[3]	Q (cfs)	Qsum (cfs)	Slope (%)	Length (ft)	Dia. (in.)	Full-Flow Velocity[1] (fps)	Full-Flow Capacity[2] (cfs)	
EXISTING CONDITIONS													
Catchbasin 8	Catchbasin 9	1.90	26025	56636	0.68	6.45	6.45	0.46%	150	18	4.78	8.44	O.K
Catchbasin 1	Catchbasin 2	0.69	14937	15219	0.55	1.92	1.92	0.65%	83	12	4.34	3.41	O.K
PROPOSED CONDITIONS													
Catchbasin 8	Catchbasin 9	1.93	10500	73735	0.81	7.86	7.86	0.46%	150	18	4.78	8.44	O.K
Catchbasin 1	Catchbasin 2	0.77	10848	22878	0.67	2.61	2.61	0.65%	83	12	4.34	3.41	O.K