



a. Nine Mile Creek Discovery Point
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BOARD OF MANAGERS

Steve Kloiber
Corrine Lynch
Louise Segreto
Jodi Peterson
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April 24, 2017

Karl Keel
City of Bloomington
1800 West Old Shakopee Road
Bloomington, MN 55431

RE: NMCWD Permit 2017-28: Hennepin County South Suburban Court – 1800 West Old Shakopee Road: Bloomington

Dear Mr. Keel:

On Wednesday, April 19, 2017, the Nine Mile Creek Watershed District Board of Managers reviewed and approved the permit application for the construction of the Hennepin County South Suburban Court and associated parking to be located at 1800 West Old Shakopee Road in Bloomington. The NMCWD permit was approved but not valid and issued until compliance with the following conditions:

1. General Conditions.
2. A storm water maintenance agreement prepared and submitted in accordance with Rule 4.3.3.

By accepting the permit, when issued, the applicant agrees to the following stipulations:

1. Per Rule 4.5.6, an as-built drawing of the storm water facilities conforming to the design specifications as approved by the District must be submitted.

The Nine Mile Creek Watershed District will hold the permit until item 2 is received by the District. Please contact me at (952) 835-2078 if you have any questions.

Sincerely,

Randy Anhorn
District Administrator

c: Mandy Backstrom, Anderson-Johnson

Permit #: 2017-28
Project Name: Hennepin County South Suburban Court – 1800 West Old Shakopee Road: Bloomington
Approval Date: April 19, 2017

General Provisions

1. All temporary erosion control measures shown on the erosion and sedimentation control plans must be installed prior to commencement of surface or vegetation alteration and be maintained until completion of construction and vegetation is established as determined by NMCWD.

If silt fence is used, the bottom flap must be buried and the maximum allowable spacing between posts is 4-foot on center. All posts must be either 2-inch x 2-inch pine, hardwood, or steel fence posts. If hay bales are used, all bales must be staked in place and reinforced on the downstream side with snow fence.

2. All areas altered because of construction must be restored with seed and disced mulch, sod, wood fiber blanket, or be hard surfaced within two weeks after completion of land alteration and no later than the end of the permit period.
3. Upon final stabilization, the permit applicant is responsible for the removal of all erosion control measures installed throughout the project site.
4. At the entryway onto the site, a rock filter dike being a minimum of two feet in height and having maximum side slopes of 4:1 must be constructed. This rock filter dike will enable construction traffic to enter the site and also provide an erosion control facility.
5. If dewatering is required and sump pumps are used, all pumped water must be discharged through an erosion control facility prior to leaving the construction site. Proper energy dissipation must be provided at the outlet of the pump system.
6. The NMCWD must be notified a minimum of 48 hours prior to commencement of construction.
7. The NMCWD, its officers, employees and agents review, comment upon, and approve plans and specifications prepared by permit applicants and their consultants for the limited administrative purpose of determining whether there is reasonable assurance that the proposed project will comply with the regulations and criteria of the NMCWD. The determination of the NMCWD that issuance of this permit is appropriate was made in reliance on the information provided by the applicant.
8. The grant of this permit shall not in any way relieve the permittee, its engineer, or other professional consultants of responsibility, nor shall it make the NMCWD responsible for the technical adequacy of the engineer's or consultant's work. The grant of this permit shall not relieve the permittee from complying with all conditions and requirements of the permit which shall be retained by the permittee with the permit.
9. The issue of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state, or local laws or regulations.
10. This permit is permissive only. No liability shall be imposed upon the NMCWD or any of its officers, agents or employees, officially or personally, on account of the granting of this permit or on account of any damage to any person or property resulting from any act or omission of the permittee or any of its agents, employees, or contractors.

11. In all cases where the doing by the permittee of anything authorized by this permit shall involve the taking, using, or damaging of any property, rights or interests of any other person or persons, or of any publicly-owned lands or improvements or interests, the permittee, before proceeding therewith, shall obtain the written consent of all persons, agencies, or authorities concerned, and shall acquire all necessary property, rights, and interest.
12. The permit is transferable only with the approval of the NMCWD (see NMCWD Rule 1.0). The permittee shall make no changes, without written permission previously obtained from the NMCWD, in the dimensions, capacity, or location of any items of work authorized by this permit.
13. The permittee shall grant access to the site at all reasonable times during and after construction to authorized representatives of the NMCWD for inspection of the work authorized by this permit.
14. This permit may be terminated by the NMCWD at any time deemed necessary in the interest of public health and welfare, or for violation of any of the provisions of this permit.
15. Construction work authorized under this permit shall be completed on or before date specified above. The permittee may, in writing, request that the NMCWD extend the time to complete the project in accordance with NMCWD Rule 1.0.

Storm Water Management Report

Hennepin County
South Suburban Courts Relocation

May 23, 2017

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LANDSCAPE ARCHITECTURE • SITE PLANNING • CIVIL ENGINEERING

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Civil Engineer's Certification

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

A handwritten signature in black ink, appearing to read 'David A. Rey', is written over a horizontal line.

David A. Rey, PE

Registration No. 40180

May 23, 2017

DESIGN NARRATIVE

Hennepin County is proposing to construct a building addition to the existing Bloomington Civic Plaza that will house a new courthouse and secure garage for prisoner transfer. The project address is 1800 W Old Shakopee Road in Bloomington. This property is enclosed between Logan Avenue South, West 98th Street, and West Old Shakopee Road. Improvements include a multi-story building addition and drive and parking lot reconstruction.

Within the existing city property, the total area is 15.571 acres. Approximately 9.554 acres consist of impervious surfaces, 5.296 acres consists of pervious surfaces, and 0.721 acres for the existing stormwater pond.

The area of disturbance for the proposed project is approximately 1.913 acres. There is 0.382 acres of additional impervious surface proposed for the site. The total post construction impervious surface amount within the proposed disturbance limits will be approximately 1.670 acres.

As a result, the design includes treatment for all impervious areas within the disturbance limits.

This design narrative will address each of the design aspects related to storm water management as required by Nine Mile Creek Watershed District.

Narrative for Proposed Design Features

The requirements for storm water management are found in Rule 04 which are summarized as follows:

1. Rule 4.2.1, Regulation - Storm water management features have been designed for all impervious areas on site.
2. Rule 4.3.1a, Onsite retention of one inch of runoff from the new impervious surfaces.
3. Rule 4.3.1b, Limit peak runoff rates for the 2, 10, and 100 year storm events to existing conditions.
4. Rule 4.3.1c, Provide 60% removal of phosphorous, and 90% removal of suspended solids.

RULE 4.2.1, REGULATION

The project will disturb more than 50 cubic yards of earth. The project will disturb more 5,000 square feet of surface area. Therefore, watershed district rules apply to this project and the enclosed calculations are based on all impervious surfaces within the limits of construction.

RULE 4.3.1A, ONSITE RETENTION

Existing soils vary across the site. In general, however, the soils consist mainly of SP or SP-SM sands. There are areas of the site where clay soils and fill soils exist. Soil boring logs and map are included at the end of this report.

The existing site has one primary drainage area. There is currently a 36" RCP storm sewer that runs along the west side of the building which captures the runoff from the proposed disturbance area. This pipe also collects runoff from the majority of the parking lots on the west and south sides of the property, and then routes northeast to discharge into an existing stormwater pond on the property. In the proposed project area, the grades slope away from Logan Ave South and towards the existing building.

Once existing site conditions were analyzed, the concept of using the existing pond on the property for treatment was discussed. Upon discovering that the existing pond is lined, it was decided that the existing pond would not meet the necessary water quality requirements for the proposed project.

As there is little room for a surface feature on this part of the property, it was decided that an underground storage system would be the optimum solution. A raised outlet at the underground storage area will allow for water retention and subsequent infiltration. The existing soils in the location where the underground storage system is proposed consist of SP sands and will provide true infiltration to meet the water quality requirements.

Infiltration rates used for the calculations are taken from the Minnesota Stormwater Manual. For the native SP sands on the site, 0.80 in/hour has been used. In-situ infiltration tests have not been performed. Based on this infiltration rate, the area has been designed to drain within 48 hours.

RULE 4.3.1B, LIMIT PEAK RUNOFF RATES

Peak runoff rates have been limited to the existing conditions model for the 2, 10, and 100-year storm events. The underground retention and infiltration facilities provide for rate control. As the existing surface soils consist primarily of various fills and clays, a classification of C type soils was used for the rate control calculations.

RULE 4.3.1C, PROVIDE 60% REMOVAL OF PHOSPHOROUS, AND 90% REMOVAL OF SUSPENDED SOLIDS

Phosphorous (TP) and total suspended solids (TSS) removal was analyzed using P8.

TP removal exceeds watershed district minimum requirement of 60%. TSS removal for this site is in excess of 90%.

DRAINAGE SUMMARY

Existing

Inflow		Outflow	
Event	Peak Flow (cfs)	Elevation (ft)	Peak Flow (cfs)
2 Yr	9.14	N/A	9.14
10 Yr	14.81	N/A	14.81
100 Yr	27.85	N/A	27.85

Proposed

Inflow		Outflow		Design OK?
Event	Peak Flow (cfs)	Elevation (ft)	Peak Flow (cfs)	
2 Yr	6.36	N/A	6.36	YES
10 Yr	10.01	N/A	10.01	YES
100 Yr	23.14	N/A	23.14	YES

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HydroCAD[®] Calculations

Existing Conditions

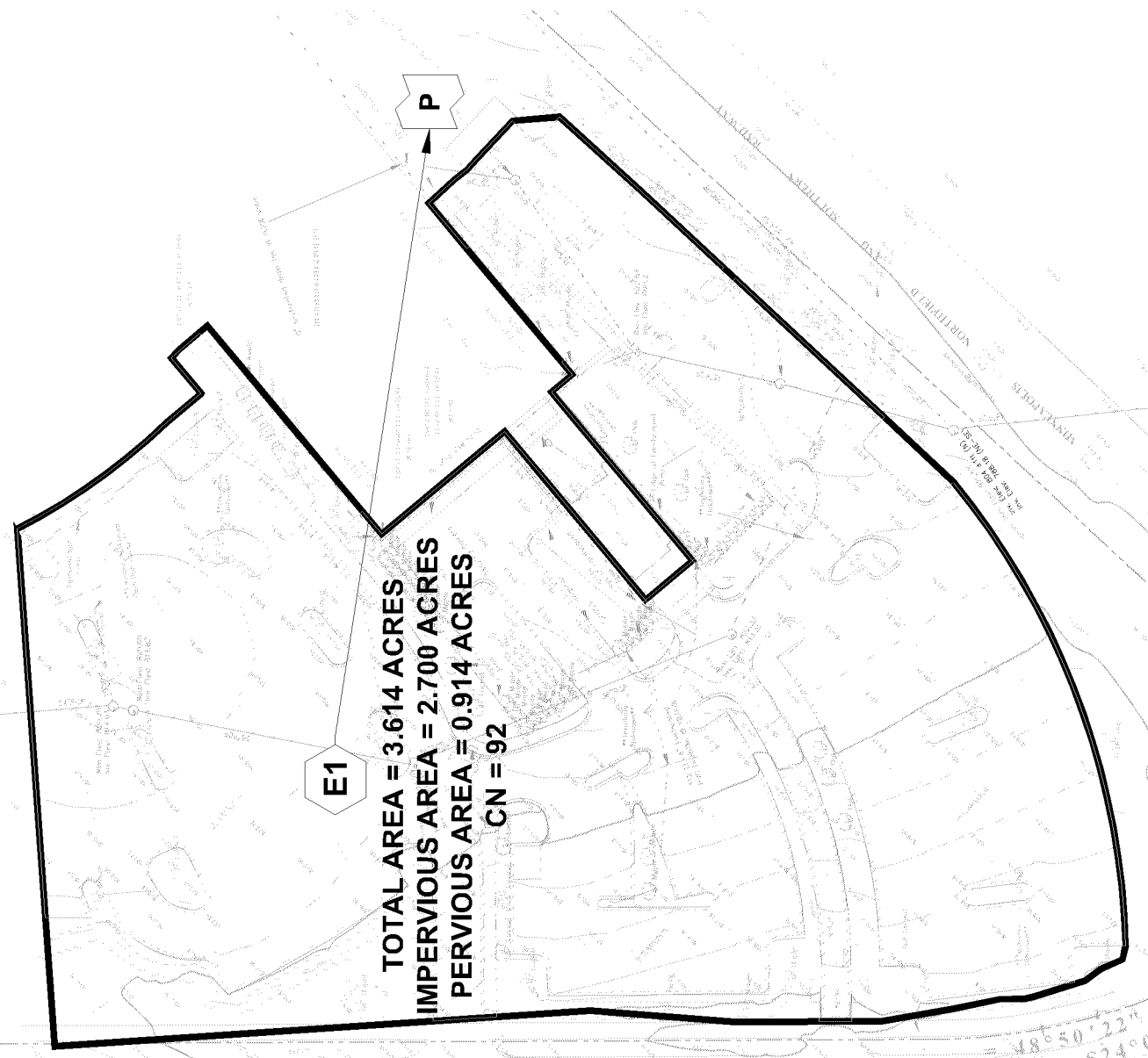
HC SOUTH SUBURBAN COURTS

EXISTING CONDITIONS - DRAINAGE AREAS

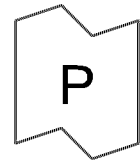
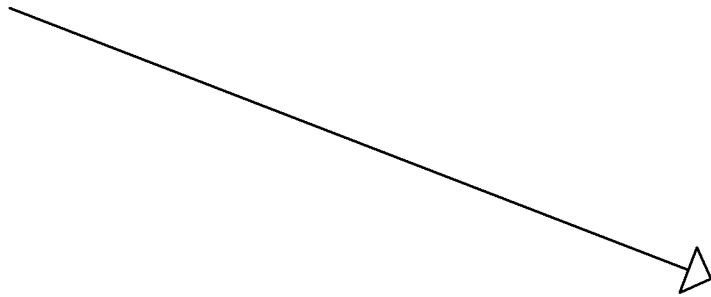
AREA	PERVIOUS	IMPERVIOUS	TOTAL
E1	0.914 acres	2.700 acres	3.613 acres
TOTAL	0.914 acres	2.700 acres	3.613 acres



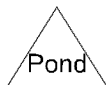
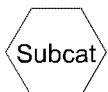
No.	Revisions	Date



WATERSHED SUBMITTAL
 NOT FOR CONSTRUCTION



TO EXISTING POND



Existing

Type II 24-hr 2 YR Atlas 14 Rainfall=2.84"

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Summary for Subcatchment E1:

Runoff = 9.14 cfs @ 12.07 hrs, Volume= 0.605 af, Depth= 2.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 2 YR Atlas 14 Rainfall=2.84"

Area (ac)	CN	Description
0.914	74	>75% Grass cover, Good, HSG C
2.700	98	Paved parking, HSG C
3.614	92	Weighted Average
0.914		25.29% Pervious Area
2.700		74.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry,

Existing

Type II 24-hr 2 YR Atlas 14 Rainfall=2.84"

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Summary for Link P: TO EXISTING POND

Inflow Area = 3.614 ac, 74.71% Impervious, Inflow Depth = 2.01" for 2 YR Atlas 14 event
Inflow = 9.14 cfs @ 12.07 hrs, Volume= 0.605 af
Primary = 9.14 cfs @ 12.07 hrs, Volume= 0.605 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs

Existing

Type II 24-hr 10 YR Atlas 14 Rainfall=4.23"

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Summary for Subcatchment E1:

Runoff = 14.81 cfs @ 12.06 hrs, Volume= 1.006 af, Depth= 3.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 YR Atlas 14 Rainfall=4.23"

Area (ac)	CN	Description
0.914	74	>75% Grass cover, Good, HSG C
2.700	98	Paved parking, HSG C
3.614	92	Weighted Average
0.914		25.29% Pervious Area
2.700		74.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry,

Existing

Type II 24-hr 10 YR Atlas 14 Rainfall=4.23"

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Summary for Link P: TO EXISTING POND

Inflow Area = 3.614 ac, 74.71% Impervious, Inflow Depth = 3.34" for 10 YR Atlas 14 event
Inflow = 14.81 cfs @ 12.06 hrs, Volume= 1.006 af
Primary = 14.81 cfs @ 12.06 hrs, Volume= 1.006 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs

Existing

Type II 24-hr 100 YR Atlas 14 Rainfall=7.47"

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Summary for Subcatchment E1:

Runoff = 27.85 cfs @ 12.06 hrs, Volume= 1.963 af, Depth= 6.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 100 YR Atlas 14 Rainfall=7.47"

Area (ac)	CN	Description
0.914	74	>75% Grass cover, Good, HSG C
2.700	98	Paved parking, HSG C
3.614	92	Weighted Average
0.914		25.29% Pervious Area
2.700		74.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry,

Existing

Type II 24-hr 100 YR Atlas 14 Rainfall=7.47"

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Summary for Link P: TO EXISTING POND

Inflow Area = 3.614 ac, 74.71% Impervious, Inflow Depth = 6.52" for 100 YR Atlas 14 event
Inflow = 27.85 cfs @ 12.06 hrs, Volume= 1.963 af
Primary = 27.85 cfs @ 12.06 hrs, Volume= 1.963 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs

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Proposed Conditions

HC SOUTH SUBURBAN COURTS

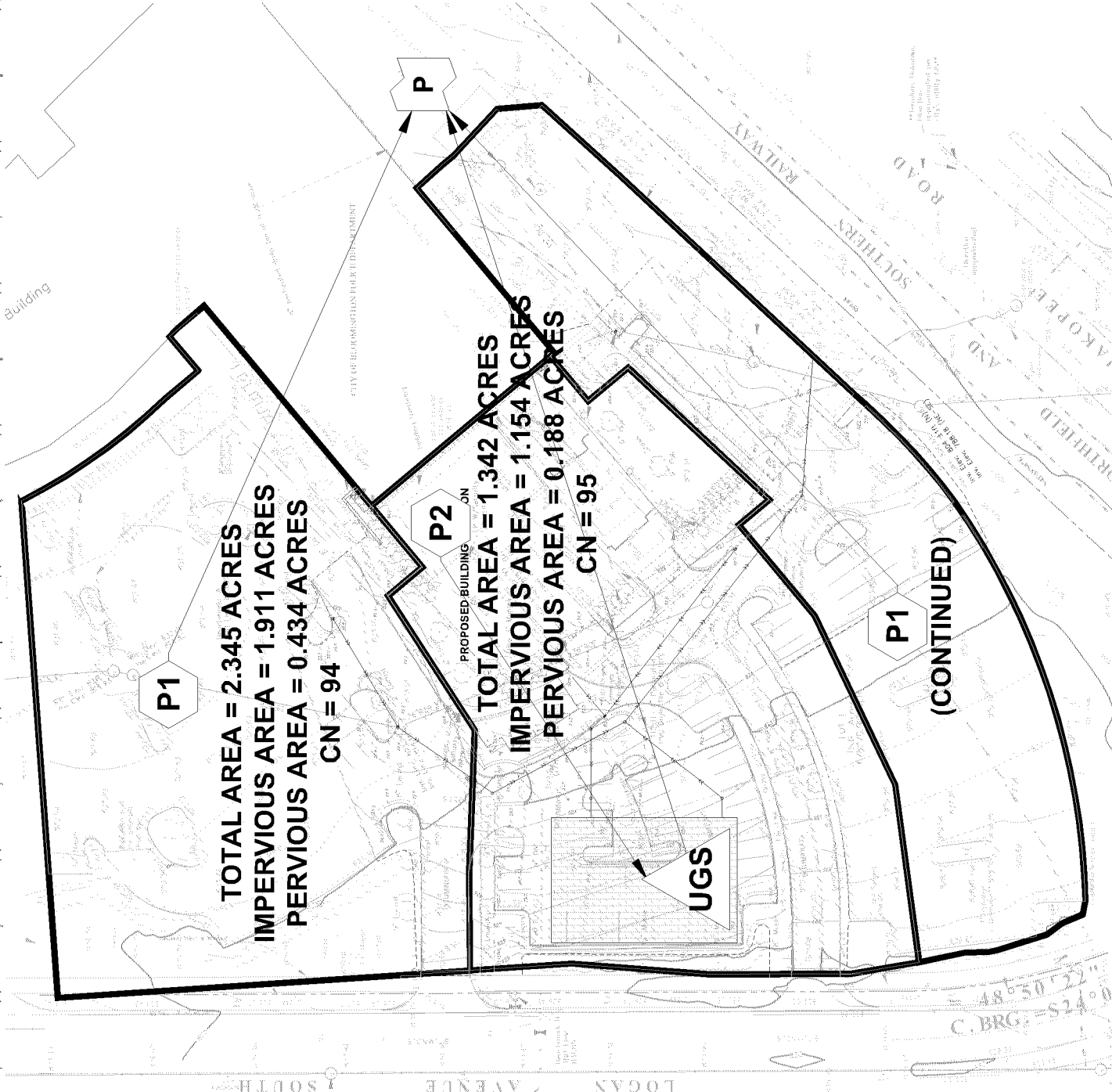
PROPOSED CONDITIONS - DRAINAGE AREAS

AREA	PERVIOUS	IMPERVIOUS	TOTAL
P1	0.434 acres	1.911 acres	2.345 acres
P2	0.188 acres	1.154 acres	1.342 acres
TOTAL	0.434 acres	3.065 acres	3.687 acres

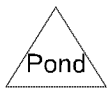
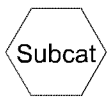
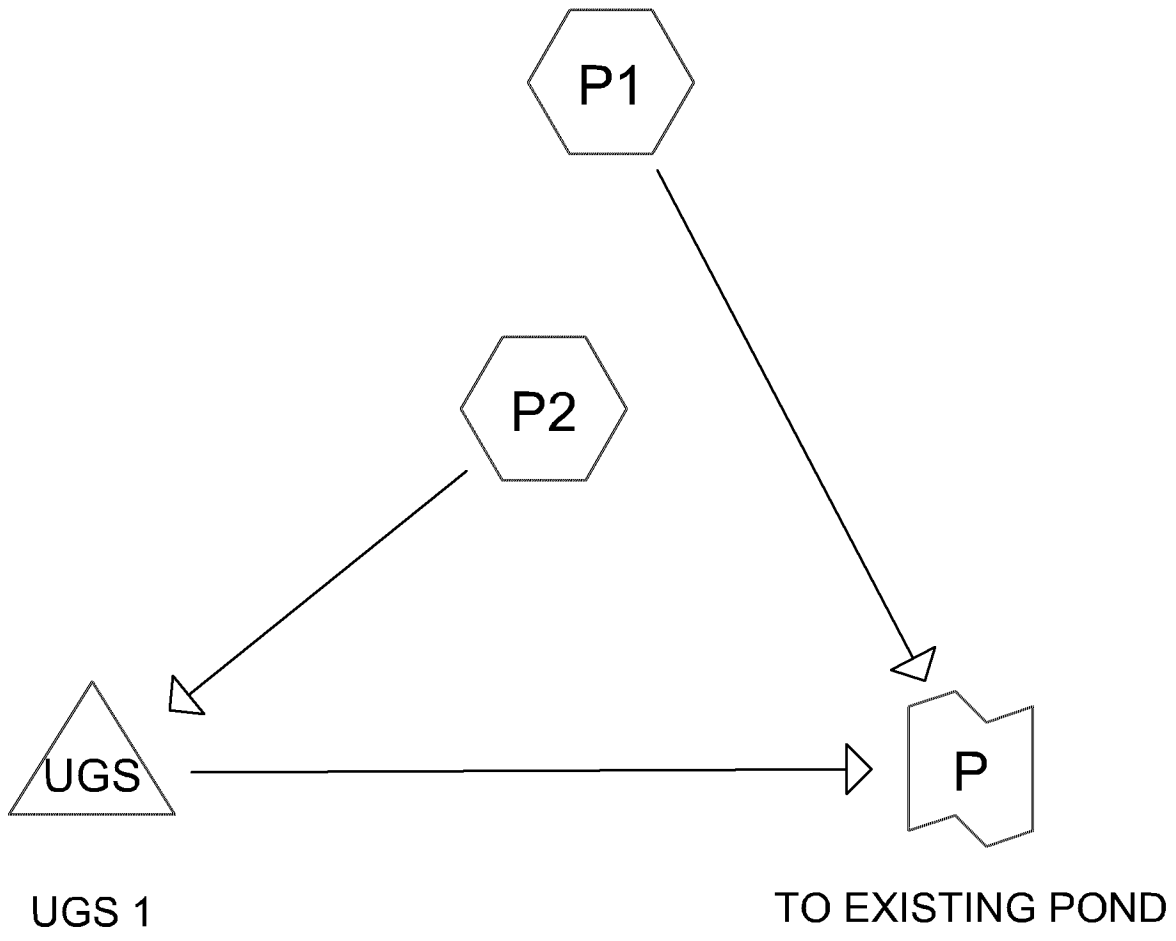
DIFFERENCE	-0.480 acres	0.366 acres	0.074 acres
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No.	Revisions	Date



AGENCY REVIEW SET
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Routing Diagram for Proposed
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Proposed

Type II 24-hr 2 YR Atlas 14 Rainfall=2.84"

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Summary for Subcatchment P1:

Runoff = 6.36 cfs @ 12.06 hrs, Volume= 0.429 af, Depth= 2.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 2 YR Atlas 14 Rainfall=2.84"

Area (ac)	CN	Description
0.434	74	>75% Grass cover, Good, HSG C
1.911	98	Paved parking, HSG C
2.345	94	Weighted Average
0.434		18.51% Pervious Area
1.911		81.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry,

Summary for Subcatchment P2:

Runoff = 3.75 cfs @ 12.06 hrs, Volume= 0.256 af, Depth= 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 2 YR Atlas 14 Rainfall=2.84"

Area (ac)	CN	Description
0.188	74	>75% Grass cover, Good, HSG C
1.154	98	Paved parking, HSG C
1.342	95	Weighted Average
0.188		14.01% Pervious Area
1.154		85.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry,

Summary for Pond UGS: UGS 1

Inflow Area = 1.342 ac, 85.99% Impervious, Inflow Depth = 2.29" for 2 YR Atlas 14 event
 Inflow = 3.75 cfs @ 12.06 hrs, Volume= 0.256 af
 Outflow = 0.12 cfs @ 15.03 hrs, Volume= 0.257 af, Atten= 97%, Lag= 178.0 min
 Discarded = 0.11 cfs @ 11.15 hrs, Volume= 0.256 af
 Primary = 0.01 cfs @ 15.03 hrs, Volume= 0.001 af

Routing by Dyn-Stor-Ind method, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 817.58' @ 15.03 hrs Surf.Area= 5,954 sf Storage= 6,328 cf
 Flood Elev= 822.00' Surf.Area= 5,954 sf Storage= 18,100 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 528.2 min (1,318.0 - 789.8)

Proposed

Type II 24-hr 2 YR Atlas 14 Rainfall=2.84"

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Volume	Invert	Avail.Storage	Storage Description
#1A	815.80'	6,277 cf	94.42'W x 63.06'L x 5.50'H Field A 32,747 cf Overall - 11,822 cf Embedded = 20,924 cf x 30.0% Voids
#2A	816.55'	11,822 cf	ADS_StormTech MC-3500 d +Cap x 104 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 13 Rows of 8 Chambers Cap Storage= +14.9 cf x 2 x 13 rows = 387.4 cf
		18,100 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	817.55'	24.0" Round Pipe Out L= 10.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 817.55' / 817.40' S= 0.0150 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Discarded	815.80'	0.800 in/hr Filtration through sand media over Surface area

Discarded OutFlow Max=0.11 cfs @ 11.15 hrs HW=815.87' (Free Discharge)↑**2=**Filtration through sand media (Exfiltration Controls 0.11 cfs)**Primary OutFlow** Max=0.01 cfs @ 15.03 hrs HW=817.58' TW=0.00' (Dynamic Tailwater)↑**1=**Pipe Out (Barrel Controls 0.01 cfs @ 0.87 fps)**Summary for Link P: TO EXISTING POND**

Inflow Area = 3.687 ac, 83.13% Impervious, Inflow Depth = 1.40" for 2 YR Atlas 14 event
 Inflow = 6.36 cfs @ 12.06 hrs, Volume= 0.430 af
 Primary = 6.36 cfs @ 12.06 hrs, Volume= 0.430 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs

Proposed

Type II 24-hr 10 YR Atlas 14 Rainfall=4.23"

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Summary for Subcatchment P1:

Runoff = 10.01 cfs @ 12.06 hrs, Volume= 0.694 af, Depth= 3.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 YR Atlas 14 Rainfall=4.23"

Area (ac)	CN	Description
0.434	74	>75% Grass cover, Good, HSG C
1.911	98	Paved parking, HSG C
2.345	94	Weighted Average
0.434		18.51% Pervious Area
1.911		81.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry,

Summary for Subcatchment P2:

Runoff = 5.83 cfs @ 12.06 hrs, Volume= 0.409 af, Depth= 3.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 YR Atlas 14 Rainfall=4.23"

Area (ac)	CN	Description
0.188	74	>75% Grass cover, Good, HSG C
1.154	98	Paved parking, HSG C
1.342	95	Weighted Average
0.188		14.01% Pervious Area
1.154		85.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry,

Summary for Pond UGS: UGS 1

Inflow Area = 1.342 ac, 85.99% Impervious, Inflow Depth = 3.66" for 10 YR Atlas 14 event
 Inflow = 5.83 cfs @ 12.06 hrs, Volume= 0.409 af
 Outflow = 1.19 cfs @ 12.41 hrs, Volume= 0.409 af, Atten= 80%, Lag= 21.2 min
 Discarded = 0.11 cfs @ 10.00 hrs, Volume= 0.293 af
 Primary = 1.08 cfs @ 12.41 hrs, Volume= 0.116 af

Routing by Dyn-Stor-Ind method, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 818.01' @ 12.41 hrs Surf.Area= 5,954 sf Storage= 8,287 cf
 Flood Elev= 822.00' Surf.Area= 5,954 sf Storage= 18,100 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 405.9 min (1,183.5 - 777.6)

Proposed

Type II 24-hr 10 YR Atlas 14 Rainfall=4.23"

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Volume	Invert	Avail.Storage	Storage Description
#1A	815.80'	6,277 cf	94.42'W x 63.06'L x 5.50'H Field A 32,747 cf Overall - 11,822 cf Embedded = 20,924 cf x 30.0% Voids
#2A	816.55'	11,822 cf	ADS_StormTech MC-3500 d +Cap x 104 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 13 Rows of 8 Chambers Cap Storage= +14.9 cf x 2 x 13 rows = 387.4 cf
		18,100 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	817.55'	24.0" Round Pipe Out L= 10.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 817.55' / 817.40' S= 0.0150 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Discarded	815.80'	0.800 in/hr Filtration through sand media over Surface area

Discarded OutFlow Max=0.11 cfs @ 10.00 hrs HW=815.87' (Free Discharge)

↑ **2= Filtration through sand media** (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=1.08 cfs @ 12.41 hrs HW=818.01' TW=0.00' (Dynamic Tailwater)

↑ **1= Pipe Out** (Barrel Controls 1.08 cfs @ 3.00 fps)

Summary for Link P: TO EXISTING POND

Inflow Area = 3.687 ac, 83.13% Impervious, Inflow Depth = 2.63" for 10 YR Atlas 14 event
 Inflow = 10.01 cfs @ 12.06 hrs, Volume= 0.810 af
 Primary = 10.01 cfs @ 12.06 hrs, Volume= 0.810 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs

Proposed

Type II 24-hr 100 YR Atlas 14 Rainfall=7.47"

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Summary for Subcatchment P1:

Runoff = 18.38 cfs @ 12.06 hrs, Volume= 1.320 af, Depth= 6.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 100 YR Atlas 14 Rainfall=7.47"

Area (ac)	CN	Description
0.434	74	>75% Grass cover, Good, HSG C
1.911	98	Paved parking, HSG C
2.345	94	Weighted Average
0.434		18.51% Pervious Area
1.911		81.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry,

Summary for Subcatchment P2:

Runoff = 10.59 cfs @ 12.06 hrs, Volume= 0.769 af, Depth= 6.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 100 YR Atlas 14 Rainfall=7.47"

Area (ac)	CN	Description
0.188	74	>75% Grass cover, Good, HSG C
1.154	98	Paved parking, HSG C
1.342	95	Weighted Average
0.188		14.01% Pervious Area
1.154		85.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry,

Summary for Pond UGS: UGS 1

Inflow Area = 1.342 ac, 85.99% Impervious, Inflow Depth = 6.87" for 100 YR Atlas 14 event
 Inflow = 10.59 cfs @ 12.06 hrs, Volume= 0.769 af
 Outflow = 6.94 cfs @ 12.19 hrs, Volume= 0.769 af, Atten= 34%, Lag= 7.5 min
 Discarded = 0.11 cfs @ 6.90 hrs, Volume= 0.336 af
 Primary = 6.83 cfs @ 12.19 hrs, Volume= 0.433 af

Routing by Dyn-Stor-Ind method, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 818.88' @ 12.19 hrs Surf.Area= 5,954 sf Storage= 11,996 cf
 Flood Elev= 822.00' Surf.Area= 5,954 sf Storage= 18,100 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 261.1 min (1,024.2 - 763.0)

Proposed

Type II 24-hr 100 YR Atlas 14 Rainfall=7.47"

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Volume	Invert	Avail.Storage	Storage Description
#1A	815.80'	6,277 cf	94.42'W x 63.06'L x 5.50'H Field A 32,747 cf Overall - 11,822 cf Embedded = 20,924 cf x 30.0% Voids
#2A	816.55'	11,822 cf	ADS_StormTech MC-3500 d +Cap x 104 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 13 Rows of 8 Chambers Cap Storage= +14.9 cf x 2 x 13 rows = 387.4 cf
		18,100 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	817.55'	24.0" Round Pipe Out L= 10.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 817.55' / 817.40' S= 0.0150 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Discarded	815.80'	0.800 in/hr Filtration through sand media over Surface area

Discarded OutFlow Max=0.11 cfs @ 6.90 hrs HW=815.86' (Free Discharge)↑**2=**Filtration through sand media (Exfiltration Controls 0.11 cfs)**Primary OutFlow** Max=6.77 cfs @ 12.19 hrs HW=818.87' TW=0.00' (Dynamic Tailwater)↑**1=**Pipe Out (Barrel Controls 6.77 cfs @ 4.36 fps)**Summary for Link P: TO EXISTING POND**

Inflow Area = 3.687 ac, 83.13% Impervious, Inflow Depth = 5.70" for 100 YR Atlas 14 event

Inflow = 23.14 cfs @ 12.09 hrs, Volume= 1.753 af

Primary = 23.14 cfs @ 12.09 hrs, Volume= 1.753 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs

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Storm Water Quality Calculations

HENNEPIN COUNTY SOUTH SUBURBAN COURTS RELOCATION

Infiltration Area UGS 1 Calculations

Criteria:

1.00 inch of runoff from the NEW AND DISTURBED IMPERVIOUS areas must be infiltrated
48 hour infiltration period

Required Volume

NEW AND DISTURBED Impervious Areas	1.620 acres
Runoff Factor	1.0
Depth	1.00 inch
Required Volume to Infiltrate	5890 cubic feet

Volume provided below outlet elevation

Infiltration Area properties

Surface Area Provided = 5954 sq. ft.
Volume Provided = 6127 cubic feet (elevation 817.54)
(from HydroCAD)

For portion of the infiltration area that lies over sand soils **100%**

Infiltration rate for soil = 0.800 in/hr

Area required to infiltrate required volume over 48 hours based on assumed infiltration rate

Area = Required Volume x 12 inches / foot / 48 hours / infiltration rate = 1841 sq. ft.

Area at basin bottom = 5954 sq. ft.

Potential Volume Infiltrated = Surface Area / 12 inches / foot * 48 hours * infiltration rate =

Volume Infiltrated = 19053 cubic feet

Actual Volume infiltrated (=volume provided or sum of potential infiltrated, whichever is less) **6127 cubic feet**

Design Checks

Total Volume required to be infiltrated:	5890 cubic feet	
Potential Volume infiltrated, based on rate	19053 cubic feet	OK
Total Volume provided	6127 cubic feet	OK

P8 Urban Catchment Model, Version 3.5

Run Date 03/16/17

Case	Hennepin County South Suburban Courts.p8c	FirstDate	10/01/78	Precip(in)	29.5
Title	Hennepin County South Suburban Courts	LastDate	09/30/79	Rain(in)	23.22
PrecFile	MSP_4908.pcp	Events	64	Snow(in)	6.29
PartFile	nurp50.p8p	TotalHrs	8618	TotalYrs	0.98

File Directory P:\1project\wold\Hennepin County South Suburban Courts\Stormwater Related\p8\

Case Title Hennepin County South Suburban Courts

Case File Hennepin County South Suburban Courts.p8c

Particle File nurp50.p8p

Temperature File MSP_4808.tmp

Storm File MSP_4908.pcp

Precip Scale Factor 1

Watersheds 1

Devices 3

Particles 5

WQ Components 7

Start Date 09/05/78

Keep Date 10/01/78

Stop Date 09/30/79

Storm Count 64

Total Hours 8618

Wet Hours 909

Precip (in) 30

Rain (in) 23

Snowfall (in) 6

Snowmelt (in) 6

EvapoTran(in) 21

Overall TSS Removal(%) 1

Water Balance Error(%) 0

TSS Mass Balance Error (%) 0

Watershed Label	Total Area acres	Infiltration Area	Percol Device	Aquifer - Out	Previous Curve Number	Imirect	Pervious	Directly Connected UnSwept Areas-->			Directly Connected Swept Areas-->			Street Sweeping Parameters				
								Imperv Fraction	Depress Storage inches	Runoff Coef	Imperv Load Factor	Imperv Fraction	Depress Storage inches	Runoff Coef	Start Date MM/DD	Stop Date MM/DD	Sweep Freq 1/week	
	1.257				74	0.000		0.861	0.02	0.95	1	0	0.02	1	101	1231	1	0

P8 Urban Catchment Model, Version 3.5

Run Date 03/16/17

Case	Hennepin County South Suburban Courts.p8c	FirstDate	10/01/78	Precip(in)	29.5
Title	Hennepin County South Suburban Courts	LastDate	09/30/79	Rain(in)	23.22
PrecFile	MSP_4908.pcp	Events	64	Snow(in)	6.29
PartFile	nurp50.p8p	TotalHrs	8618	TotalYrs	0.98

Devices Listed in Downstream Order

Device:	Aquifer - Out Infil from watershed	Type:	AQUIFER P2
Device:	Infiltration Area Discharges spillway to Runoff from watershed	Type:	INF_BASIN Pipe Out P2
Device:	Pipe Out	Type:	PIPE

P8 Urban Catchment Model, Version 3.5

		FirstDate	10/01/78	Run Date	03/16/17
Case	Hennepin County South Suburban Courts.p8c	LastDate	09/30/79	Precip(in)	29.5
Title	Hennepin County South Suburban Courts	Events	64	Rain(in)	23.22
PrecFile	MSP_4908.pcp	TotalHrs	8618	Snow(in)	6.29
PartFile	nurp50.p8p			TotalYrs	0.98

Hydraulics

Sedimentation rates assume bulk density of 1 ton per cubic yard of wet sediment.

Variable	Units	Infiltration Area	Pipe Out
Total Inflow	ac-ft	2.55	0.00
Total Outflow	ac-ft	0.00	0.00
Mean Inflow	cfs	0.00	0.00
Mean Outflow	cfs	0.00	0.00
Max Inflow	cfs	1.37	0.00
Max Outflow	cfs	0.00	0.00
Min Elev	ft	815.81	0.00
Max Elev	ft	816.79	0.00
Max Velocity	ft/sec	0.00	0.00
Wet Period	%	1.06	0.00
WtrBal Error	ac-ft	0.00	0.00
WtrBal Error%	%	0.00	0.00
Max Area	acres	0.14	0.00
Mean Hyd Load	in/day	0.61	0.00
Max Hyd Load	in/hr	9.71	0.00
Sed Rate Mass	tons/ac-yr	2.62	0.00
Sed Rate Vol	yd3/yr	0.37	0.00
Sed Rate Depth	in/yr	0.02	0.00
Max Volume	ac-ft	0.14	0.00
Direct Watershed	acres	1.27	0.00
Unit Runoff	inches/yr	24.52	0.00

P8 Urban Catchment Model, Version 3.5

Run Date 03/16/17

Case	Hennepin County South Suburban Courts.	FirstDate	10/01/78	Precip(in)	29.5
Title	Hennepin County South Suburban Courts	LastDate	09/30/79	Rain(in)	23.22
PrecFile	MSP_4908.pcp	Events	64	Snow(in)	6.29
PartFile	nurp50.p8p	TotalHrs	8618	TotalYrs	0.98

Watershed areas contributing surface runoff to each device

	wtrshd		imperv %	runoff in/yr	perm p		depth ft	total p		depth ft
	total acres	imperv acres			area acres	volume ac-ft		area acres	volume ac-ft	
Infiltration Area	1.27	1.09	86.10	24.52	0.14	0.42	2.97	0.14	0.42	2.97
TOTAL	1.27	1.09	86.10	24.52	0.14	0.42	2.97	0.14	0.42	2.97

Normalized device areas & volumes vs. performance (tss removal)

- wi = impervious watershed area draining directly into device (acres)
- wt = total watershed area draining directly into device(acres)
- ap = permanent pool area (acres)
- vp = permanent pool volume (ac-ft)
- at = total device area (acres)
- vt = total device volume (ac-ft)

device	type	imperv		total		flood p		hydraulic	tss
		ap/wi %	vp/wi inches	ap/wt %	vp/wt inches	at/wt %	vt/wt inches	load ft/yr	removal %
Infiltration Area	INF_BASIN	12.83	4.58	11.05	3.94	11.05	3.94	18.49	99.91
TOTAL	NONE	12.83	4.58	11.05	3.94	11.05	3.94	18.49	99.91

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Storm Sewer Piping Calculations

BD 1



5

CB 4A



3

CB 4B

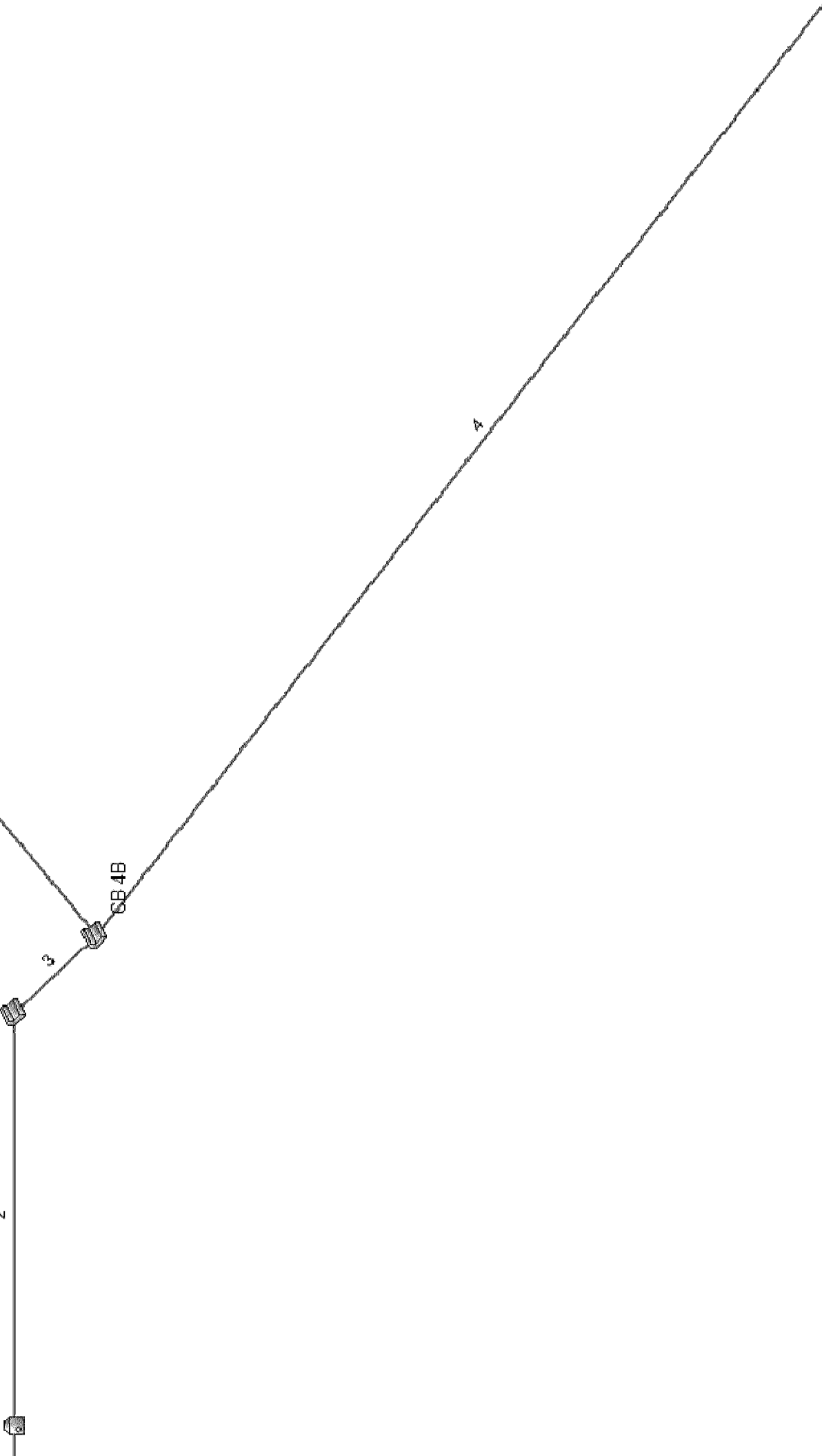


4

MH 105



2



Storm Sewer Tabulation

Station Line	To Line	Len (ft)	Drng Area		Rhoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
			Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	10	0.00	1.35	0.00	0.00	1.15	0.0	15.3	5.6	6.52	7.47	4.76	18	0.51	816.55	816.60	817.63	817.69	824.10	824.40	UGS 1 - MH 105
2	1	35	0.23	1.35	0.78	0.18	1.15	10.0	15.2	5.7	6.55	7.91	3.81	18	0.57	816.60	816.80	818.06	818.16	824.40	822.80	MH 105 - CB 4A
3	2	10	0.23	1.12	0.78	0.18	0.97	10.0	15.1	5.7	5.54	6.41	4.56	15	0.99	817.20	817.30	818.43	818.48	822.80	823.00	CB 4A - CB 4B
4	3	109	0.39	0.39	0.82	0.32	0.32	10.0	10.0	6.7	2.15	2.41	3.03	12	0.46	817.80	818.30	818.74	819.09	823.00	822.00	CB 4B - CB 5
5	3	26	0.50	0.50	0.95	0.48	0.48	15.0	15.0	5.7	2.71	3.16	4.52	12	0.79	818.90	819.10	819.61	819.82	823.00	824.00	CB 4B - BD 1
Project File: storm.stm														Number of lines: 5				Run Date: 05-23-2017				

NOTES: Intensity = 77.01 / (Inlet time + 11.60) ^ 0.79; Return period = 25 Yrs. ; c = cir e = ellip b = box

Hydraulic Grade Line Computations

Line	Size (in)	Q (cfs)	Downstream								Len (ft)	Upstream								Check		JL coeff (K)	Minor loss (ft)
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Energy loss (ft)		
1	18	6.52	816.55	817.63	1.08	1.37	4.76	0.35	817.99	n/a	10	816.60	817.69	1.09	1.37	4.76	0.35	818.04i	n/a	n/a	-0.301	0.15	n/a
2	18	6.55	816.60	818.06	1.46	1.75	3.73	0.22	818.28	0.344	35	816.80	818.16	1.36	1.68	3.89	0.23	818.40	0.340	0.342	0.121	1.15	0.27
3	15	5.54	817.20	818.43	1.23	1.22	4.53	0.32	818.75	n/a	10	817.30	818.48	1.19	1.21	4.59	0.33	818.81i	n/a	n/a	-0.266	1.50	n/a
4	12	2.15	817.80	818.74	0.94	0.77	2.81	0.12	818.87	n/a	109	818.30	819.09	0.79	0.66	3.24	0.16	819.25i	n/a	n/a	0.221	1.00	n/a
5	12	2.71	818.90	819.61	0.71*	0.60	4.52	0.32	819.93	n/a	26	819.10	819.82	0.71	0.60	4.52	0.32	820.13i	n/a	n/a	-0.114	1.00	n/a

Project File: storm.stm

Number of lines: 5

Run Date: 05-23-2017

Notes: * Normal depth assumed. ; c = cir e = ellip b = box