9 MILE CREEK WATERSHED DISTRICT

A. Nine Mile Creek Discovery Point
12800 Gerard Dr.
Eden Prairie, MN 55346

P. (952) 204-9690

W. www.ninemilecreek.org

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

ANDERSON - JOHNSON ASSOCIATES, INC.
AJA
LANDSCAPE ARCHITECTURE • SITE PLANNING • CIVIL ENGINEERING

Index

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LANDSCAPE ARCHITECTURE • SITE PLANNING • CIVIL ENGINEERING

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.

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 Event	Inflow Peak Flow (cfs)	Outflow Elevation (ft)	Outflow 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 Event	Inflow Peak Flow (cfs)	Outflow Elevation (ft)	Outflow Peak Flow (cfs)	Design OK?
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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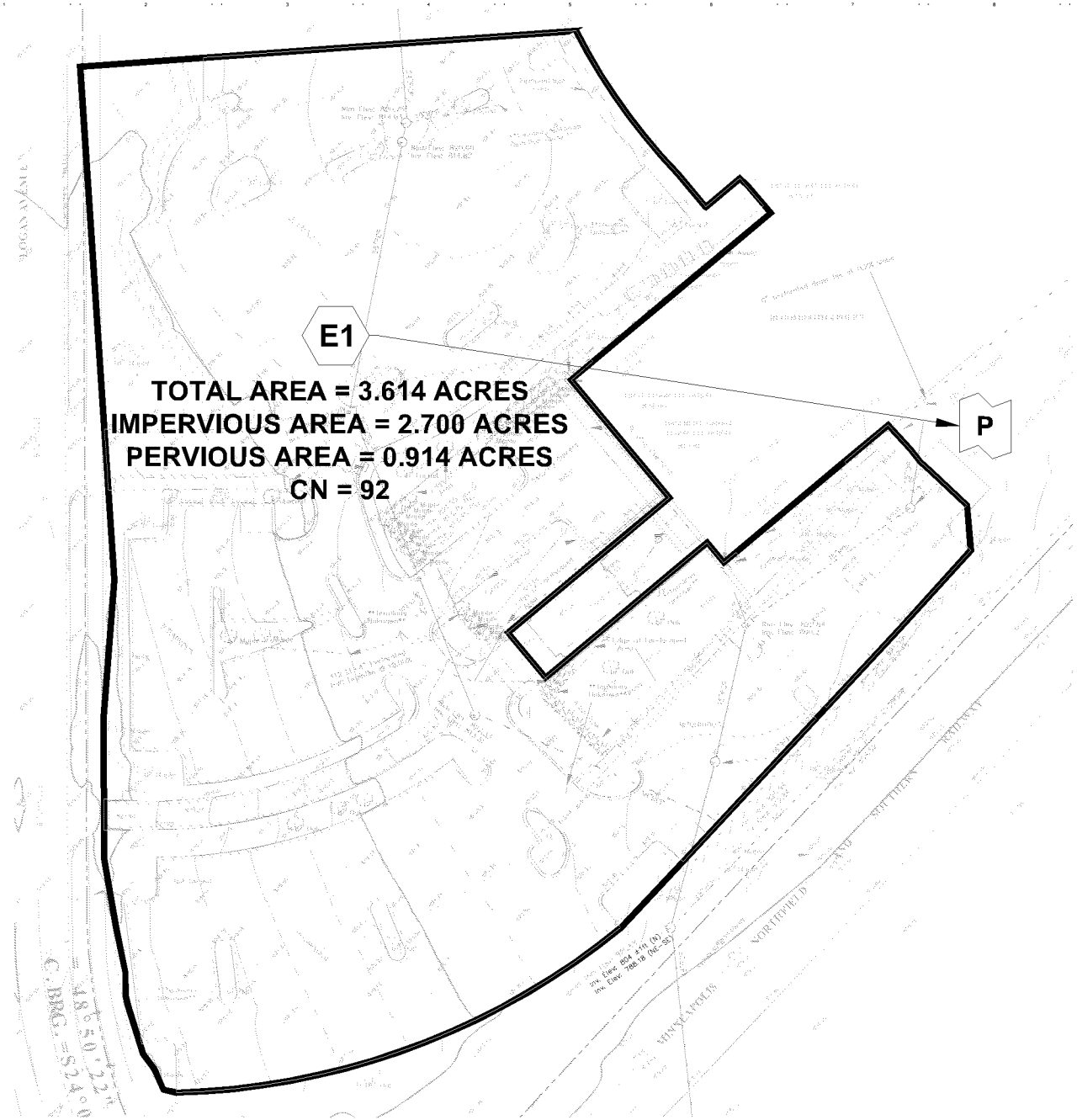
HydroCAD® Calculations

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



WATERSHED SUBMITTAL
NOT FOR CONSTRUCTION

Hennepin County
Minnesota
PROPERTY SERVICES DEPARTMENT

Consultants:

Wold

WOLD ARCHITECTS AND ENGINEERS

AIA

Registration
I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly registered [illegible] under the laws of the State of [illegible]

[illegible] Date: 08/30/17

CAD Data:

Key Plan:

North

No.	Revisions	Date

Project Title:

HENNEPIN COUNTY SOUTH SUBURBAN COURT RELOCATION

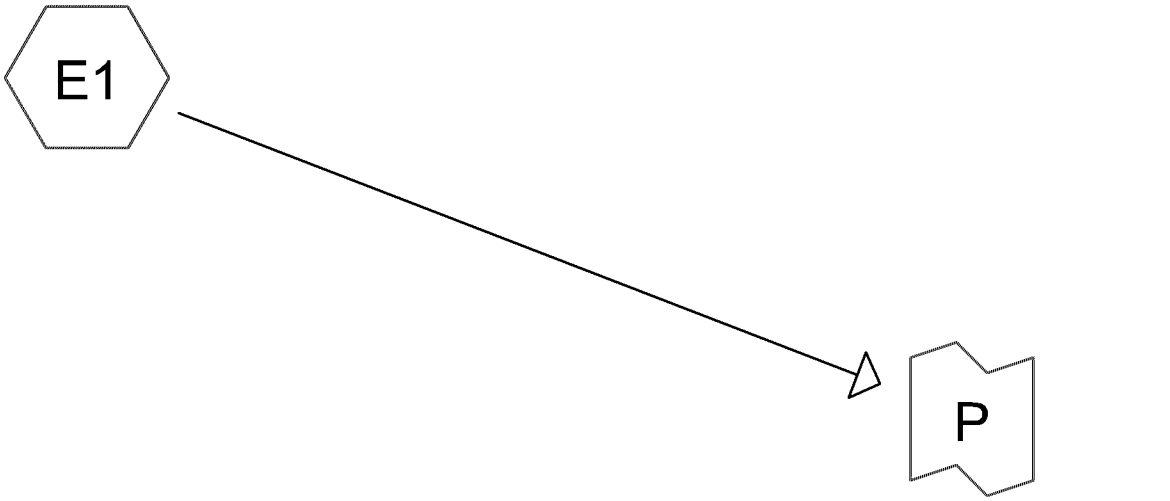
Facility Name (No.) & Address:
BLOOMINGTON CIVIC PLAZA
1800 W. OLD SHAKOPEE RD
BLOOMINGTON, MN 55431

EXISTING DRAINAGE MAP

162150	MLB	DMP

Drawing No.:
DD C0.10

Date: 03/17/17



Subcat Reach Pond Link

Routing Diagram for Existing

Prepared by Anderson Johnson Associates, Inc., Printed 3/16/2017

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,**

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

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,**

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

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,**

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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HydroCAD® Calculations

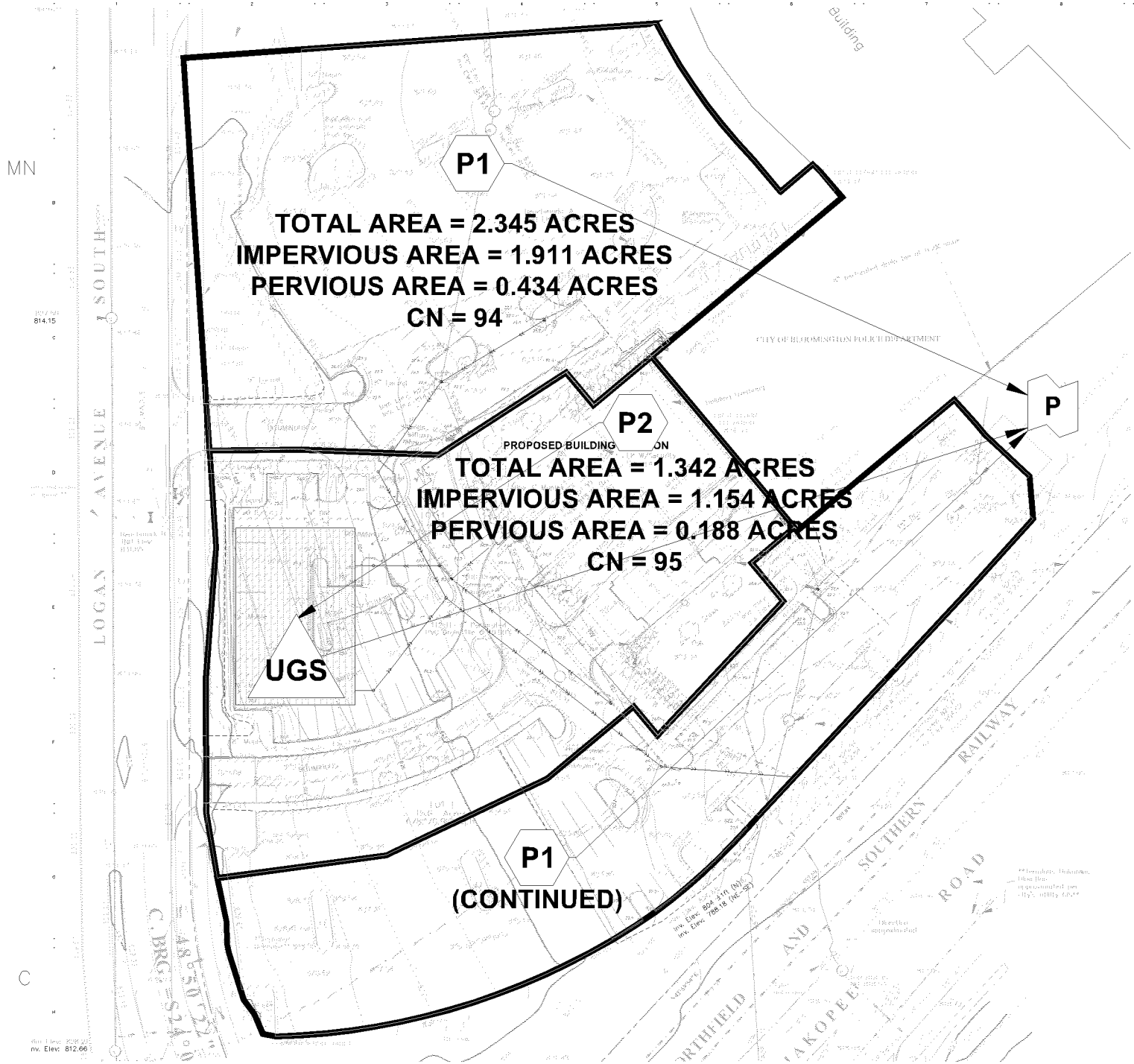
Proposed Conditions

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



AGENCY REVIEW SET
NOT FOR CONSTRUCTION

Hennepin County
Minnesota

PROPERTY SERVICES DEPARTMENT

Consultants:

Wold

WOLD ARCHITECTS AND ENGINEERS

AJA

Registration:

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly registered PROFESSIONAL ENGINEER under the laws of the State of ____.

DAVID A. REY
Registration Number 40180 Date 08/30/17

CAD Data:

Key Plan:

North

No.	Revisions	Date

Project Title:

HENNEPIN COUNTY SOUTH SUBURBAN COURT RELOCATION

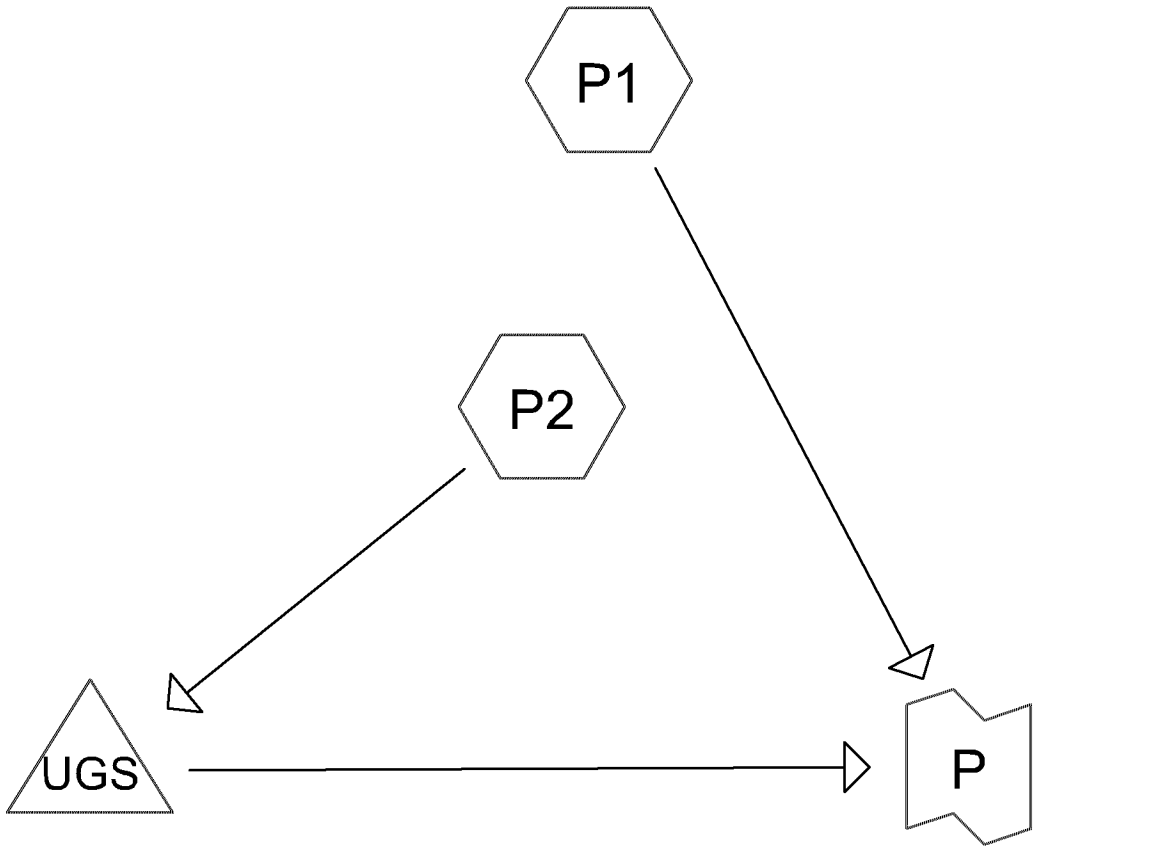
Facility Name (No.) & Address:
BLOOMINGTON CIVIC PLAZA
1800 W. OLD SHAKOPEE RD
BLOOMINGTON, MN 55431

PROPOSED DRAINAGE MAP

162150	MLB	DAR
	1" = 20'	

DD
Date 03/17/17

Drawing No.: **C0.20**



Subcat Reach Pond Link

Routing Diagram for Proposed
Prepared by Anderson Johnson Associates, Inc., Printed 5/23/2017

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)

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

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)

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

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)

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

P8-V3.X Hennepin County South Suburban Courts.p8c

							Directly Connected UnSwept Areas--->				Directly Connected Swept Areas--->				Street Sweeping Parameters			
	Total			Pervious	Indirect	Pervious		Depress		Imperv		Depress		Imperv	Start	Stop		Sweep
Watershed	Area	Outflow	Percol	Curve	Imperv	Load	Imperv	Storage	Runoff	Load	Imperv	Storage	Runoff	Load	Date	Date	Sweep	Freq
Label	acres	Device	Device	Number	Fraction	Factor	Fraction	inches	Coef	Factor	Fraction	inches	Coef	Factor	MMDD	MMDD	Effic	1/week
P2	1.267	Infiltration Area	Aquifer - Out	74	0.000	1	0.861	0.02	0.95	1	0	0.02	1	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	Type:	AQUIFER
	Infilt from watershed		P2
Device:	Infiltration Area	Type:	INF_BASIN
	Discharges spillway to		Pipe Out
	Runoff from watershed		P2
Device:	Pipe Out	Type:	PIPE

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

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				perm p			total p		
	total	imperv	imperv	runoff	area	volume	depth	area	volume	depth
	acres	acres	%	in/yr	acres	ac-ft	ft	acres	ac-ft	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)

		imperv		total		flood p		hydraulic	tss
		ap/wi	vp/wi	ap/wt	vp/wt	at/wt	vt/wt	load	removal
device	type	%	inches	%	inches	%	inches	ft/yr	%
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

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

Mass Balances by Device and Variable

Device: OVERALL Type: NONE Variable: TSS

Mass Balance Term	Flow_acft	Flow_cfs	Load_lbs	Load_lbs/yr	Conc_ppm
01 watershed inflows	2.98	0.00	721.9	734.3	89.03
03 infiltrate	2.55	0.00	121.1	123.2	17.50
04 exfiltrate	2.55	0.00	0.0	0.0	0.00
05 filtered	0.00	0.00	121.1	123.2	
06 normal outlet	0.44	0.00	0.0	0.0	0.00
08 sedimen + decay	0.00	0.00	600.2	610.5	
09 total inflow	2.98	0.00	721.9	734.3	89.03
10 surface outflow	0.44	0.00	0.0	0.0	0.00
11 groundw outflow	2.55	0.00	0.0	0.0	0.00
12 total outflow	2.98	0.00	0.0	0.0	0.00
13 total trapped	0.00	0.00	721.3	733.6	
14 storage increase	0.00	0.00	0.0	0.0	
15 mass balance check	0.00	0.00	0.7	0.7	
Reduction (%)	0.00	0.00	99.9	99.9	

Device: OVERALL Type: NONE Variable: TP

Mass Balance Term	Flow_acft	Flow_cfs	Load_lbs	Load_lbs/yr	Conc_ppm
01 watershed inflows	2.98	0.00	2.4	2.4	0.29
03 infiltrate	2.55	0.00	1.1	1.2	0.17
04 exfiltrate	2.55	0.00	0.1	0.1	0.01
05 filtered	0.00	0.00	1.1	1.1	
06 normal outlet	0.44	0.00	0.0	0.0	0.01
08 sedimen + decay	0.00	0.00	1.2	1.2	
09 total inflow	2.98	0.00	2.4	2.4	0.29
10 surface outflow	0.44	0.00	0.0	0.0	0.01
11 groundw outflow	2.55	0.00	0.1	0.1	0.01
12 total outflow	2.98	0.00	0.1	0.1	0.01
13 total trapped	0.00	0.00	2.3	2.3	
14 storage increase	0.00	0.00	0.0	0.0	
15 mass balance check	0.00	0.00	0.0	0.0	
Reduction (%)	0.00	0.00	96.5	96.5	

Device: Infiltration Area Type: INF_BASIN Variable: TSS

Mass Balance Term	Flow_acft	Flow_cfs	Load_lbs	Load_lbs/yr	Conc_ppm
01 watershed inflows	2.55	0.00	721.9	734.3	104.35
03 infiltrate	2.55	0.00	121.1	123.2	17.50
04 exfiltrate	2.55	0.00	0.0	0.0	0.00
05 filtered	0.00	0.00	121.1	123.2	
08 sedimen + decay	0.00	0.00	600.2	610.5	
09 total inflow	2.55	0.00	721.9	734.3	104.35
11 groundw outflow	2.55	0.00	0.0	0.0	0.00
12 total outflow	2.55	0.00	0.0	0.0	0.00
13 total trapped	0.00	0.00	721.3	733.6	
14 storage increase	0.00	0.00	0.0	0.0	
15 mass balance check	0.00	0.00	0.7	0.7	

Reduction (%)	0.00	0.00	99.9	99.9	

Device: Infiltration Area Type: INF_BASIN Variable: TP

Mass Balance Term	Flow_acft	Flow_cfs	Load_lbs	Load_lbs/yr	Conc_ppm
01 watershed inflows	2.55	0.00	2.4	2.4	0.34
03 infiltrate	2.55	0.00	1.1	1.2	0.17
04 exfiltrate	2.55	0.00	0.1	0.1	0.01
05 filtered	0.00	0.00	1.1	1.1	
08 sedimen + decay	0.00	0.00	1.2	1.2	
09 total inflow	2.55	0.00	2.4	2.4	0.34
11 groundw outflow	2.55	0.00	0.1	0.1	0.01
12 total outflow	2.55	0.00	0.1	0.1	0.01
13 total trapped	0.00	0.00	2.3	2.3	
14 storage increase	0.00	0.00	0.0	0.0	
15 mass balance check	0.00	0.00	0.0	0.0	
Reduction (%)	0.00	0.00	97.0	97.0	

Device: Pipe Out Type: PIPE Variable: TSS

Mass Balance Term	Flow_acft	Flow_cfs	Load_lbs	Load_lbs/yr	Conc_ppm
Reduction (%)	0.00	0.00	0.0	0.0	

Device: Pipe Out Type: PIPE Variable: TP

Mass Balance Term	Flow_acft	Flow_cfs	Load_lbs	Load_lbs/yr	Conc_ppm
Reduction (%)	0.00	0.00	0.0	0.0	

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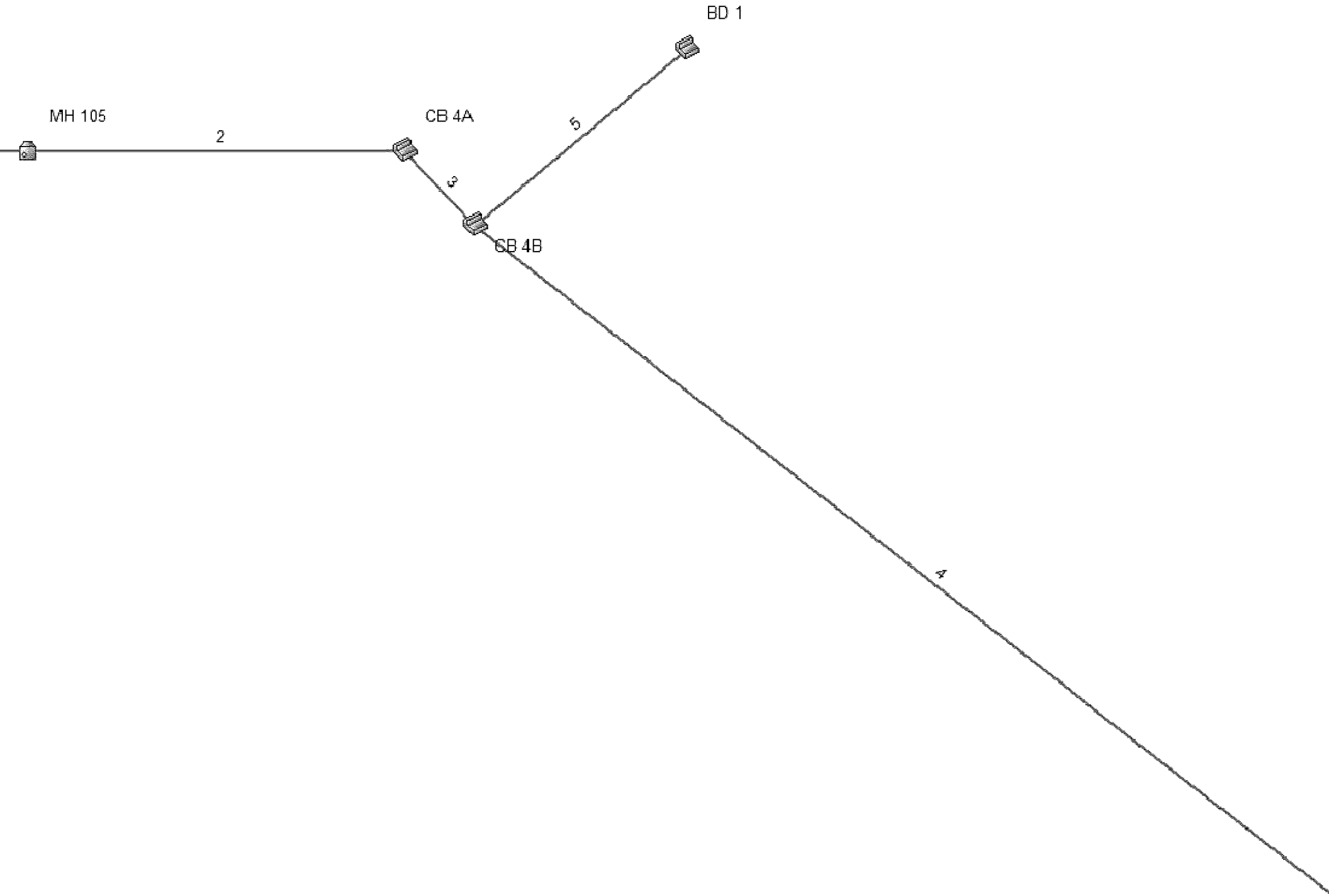
Storm Sewer Piping Calculations


BD 1
MH 105
CB 4A
2
5
3
CB 4B
4

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	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	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(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