LA CROSSE CENTER STORMWATER REPORT November 15, 2019

REPORT FOR: WISCONSIN DEPARTMENT OF NATURAL RESOURCES FROM: Kris Roppe PE Civil Engineer ISG 201 Main Street, Suite 1020 La Crosse, WI 54601 608.789.2034 kris.roppe@ISGInc.com



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Introduction

This stormwater management report has been prepared to accompany the submitted plans and stormwater calculations for the proposed La Crosse Center Expansion. The property is currently zoned Public – Semi Public. Therefore the project will need to meet the requirements of the City of La Crosse Commercial Design Standards. The project will consist of the construction of a building addition extending west over the existing parking area and Front Street, reconstruction of asphalt pavement, concrete pavement, concrete walk, utilities, erosion control, stormwater management, and landscaping. A project location map is provided on the title sheet of the submitted plan set.

A geotechnical Report was prepared by Chosen Valley Testing. Soil evaluations indicate that the infiltration rate within 5' of the bottom of the bio-infiltration basin is 0.5 inches/hour based on the requirements of Wisconsin DNR Conservation Practice Standard 1002.

The proposed project is adjacent to or slightly within an uncatalogued burial site. A Request to Disturb a Human Burial Site has been submitted to the Wisconsin Historical Society and is included with this submittal for reference.

Design Standards

The disturbed area for the project is 1.65 acres and the project will slightly decrease the onsite impervious area by 0.09 acres. Since the project is over an acre it will require a Wisconsin DNR WPDES permit.

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	Performance Standard	Requirements				
ient ces	Total Suspended Solids NR 151.122	Redevelopment – 40% TSS reduction of load from parking areas and roads.				
sour	Peak Discharge NR 151.123	Exempt per NR 151.123 (2)(b) – Redevelopment site.				
epa Res	Infiltration NR 151.124	Exempt per NR 151.124 (3)(b)3 – Redevelopment site.				
	Protective Areas NR 151.125	N/A – No protective areas within proposed site.				
'isconsin * Natura R 151	Fueling & Vehicle Maintenance NR 151.126	N/A – No proposed fueling or maintenance on site.				
	Location NR 151.127	BMP's will be located on site.				
≤ōz	Timing NR 151.128	BMP's will be installed prior to final stabilization.				

Table 1.1: Design Criteria

Existing Conditions

The existing site is currently paved parking, driveways, street, sidewalk, and landscaped area. The site has been separated into a 10 sub watersheds which drain to existing storm sewer in the parking

area and adjacent streets. A detailed map of the existing drainage conditions including land cover is included with the submittal.

Proposed Conditions

The proposed site has also been separated into 10 sub watersheds and will drain similar to existing conditions. Stormwater management for the site will be a proposed bio-infiltration basin located in the northwest corner of the site to reduce runoff flow and volumes from the proposed sidewalk and parking area as well as provides water quality to meet the City and WDNR requirements for redevelopment. The proposed building addition will also provide water quality improvements for the site as it will cover the existing parking area on the west side of the site as well as a portion of Front Street. A detailed map of the proposed drainage areas and land cover is included with the submittal.

Stormwater Management Summary

Temporary erosion control measures will be implicated for the proposed project prior to the start of construction. Proposed erosion control measures include silt fence, stabilized construction exit, inlet protection, erosion control mat, and a concrete washout area. Locations of the proposed BMPs along with construction activity notes are provided on the erosion control sheets. Approximate construction sequencing for the project is listed below.

- Install temporary erosion control BMPs
- Stripping topsoil, soil corrections, and rough grading
- Footing excavation and construction
- Installation of underground utilities
- Subgrade preparation for parking lot and access drives
- Construction of curb and gutter
- Construction of pavement
- Turf restoration and landscaping
- Stabilization and establishment of turf
- Removal of temporary erosion control BMPs

Proposed stormwater management facilities for the project will include storm a bio-infiltration basin. The infiltration basin has been designed to treat and provide runoff control for the parking area of the site (DA-7).

Calculation summary

Calculations were performed for the existing and proposed drainage conditions. Water quantity calculations were completed using hydraulic models developed by utilizing the design data and the HydroCAD Version 10.00-19 computer modeling system. This was used to provide sizing and analysis for the proposed bio-infiltration basin. Hydrographs for existing and proposed scenarios were generated and routed through these models using the Atlas-14 rainfall distribution. The 2-year, 10-year, 25-year and 100-year 24-hour design storm events were analyzed for this project. The HydroCAD calculations for the existing and proposed conditions are included in the enclosures. The table below summarizes the flow for each design storm and shows the proposed peak runoff for the 2-year, 10-year, and 25-year 24 hour events is reduced when compared to existing conditions. The calculations also show that the proposed bio-infiltration basin safely conveys the 100-year 24 hour design storm event without overtopping meeting the City requirements of La Crosse County Code Section 29.09 (1).

Rainfall	Pre-Development	Proposed
Event	Conditions	Conditions
24-Hour Storm	Peak Flow (CFS)	Peak Flow (CFS)
2-year	17.07	16.94
10-year	25.63	25.51
25-year	32.07	31.99
100-year	43.74	43.73

Table	1.3:	Site	Runoff	Calculatio	ns

Water quality calculations were completed by utilizing the design data and the WinSLAMM Version 10.3.3 computer modeling system. This was used to provide analysis of the reduction in total suspended solids for the bio-infiltration basin. Results show a reduction of 69.33% of the total suspended solids from the proposed site conditions using suitable parameters for the La Crosse area when compared to no controls. The WinSLAMM model shows that the proposed conditions meet the WDNR requirements to reduce total suspended solids by 40% from parking areas and roads. The WinSLAMM Output Report with screenshots of the input parameters can be found in the enclosures.

This project will require a WDNR/WPDES stormwater permit based on the size and scope of the site. This permit, along with all other necessary City of La Crosse stormwater and erosion control permits, will be obtained prior to construction activities on site.

A maintenance agreement with the City will not be required as the property is City owned. A maintenance plan for the proposed stormwater management is included with the submittal.



Design Phase Geotechnical Report:

Proposed La Crosse Center Expansion & Renovation 300 Harborview Plaza La Crosse, Wisconsin

Prepared for:

City of La Crosse C/O: Kevin Bills AIA, LEED AP BD+C Project Architect I&S Group

September 16, 2019 15131.19.WIL



I hereby certify that this report was prepared by me or under my direct supervision, and that I am a duly registered engineer under the laws of the State of Wisconsin.

Cep

Colby T. Verdegan, PE Geotechnical Engineer Registration Number 36326 Date: September 16, 2019

Chosen Valley Testing, Inc.

Geotechnical Engineering & Testing, 1019 2nd Ave. SW, Onalaska, WI 54650, (608) 782-5505 fax (608) 785-2818

September 16, 2019

City of La Crosse C/O: Kevin Bills AIA, LEED AP BD+C Project Architect I&S Group bgries@gries.design

> Re: Design Phase Geotechnical Evaluation Report Proposed La Crosse Center Expansion & Renovation 300 Harborview Plaza La Crosse, Wisconsin CVT Project Number: 15131.19.WIL

Dear Mr. Bills:

As authorized, we have completed the geotechnical exploration for the proposed La Crosse Center Expansion and Renovation in La Crosse, Wisconsin. This letter briefly summarizes the findings in the attached report.

Summary of Boring Results

Three of the CPT borings and two of the supplemental borings were drilled through the concrete pavement within the existing facility. The remaining penetration test borings and CPT boring were drilled through pavements outside of the facility. The borings through concrete encountered about 6 to 9 inches of concrete and those through asphalt met 3 to 4 inches of bituminous over about 4 inches of aggregate base.

The results of the CPT soundings indicated soil behavior that was primarily consistent with sands and silty sands. This is consistent with the expected stratification and generally consistent with the penetration test samples. Possible seams of zones of finer grained soils were indicated.

Beneath the pavements, all of the penetration test borings encountered fill materials to depths of about 4 to 12 feet. The fill consisted primarily of rather clean sands with minimal fines (poorly graded sand and poorly graded sand with silt) or silty sands. Traces of concrete, wood, or brick were noted within the fill at a few locations. At the supplemental borings locations (drilled near existing foundations), the fill appeared to be about 4 to $6\frac{1}{2}$ feet deep.

The natural soils below the fill were dominated by rather clean sands. All of the borings terminated in the sands at the planned depths of around 15 to 101 feet below the surface.

Water was observed in all of the borings at depths of about 7½ to 20 feet below the surface. The depths of the initial borings correspond to elevations of about 636 to 638 feet while the more recent additional borings encountered groundwater near elevation 630 feet. At the time of our initial exploration, water level in the Mississippi were higher than normal. Water levels at the site are expected to fluctuate similar to levels in the nearby Mississippi River, as well as with local weather patterns.

Summary of Analysis and Recommendations

Based on the data, the site conditions consist of fill materials in the upper 4 to 12 feet of the site and clean natural sands at depth. We recommend all removing fill materials from below the structure, along with any other unsuitable materials, and replacing these materials with engineered fill. Based on the data and the planned elevations for the foundations and slabs, it appears that the natural sands will be present at or within a few feet of footing grades at most foundation locations. The borings at the west edge of the facility were

the notable exceptions and found deeper fill.

We noted that some of the fill within the existing building is presumably engineered fill and portions can plausibly be left in place. For planning purposes we recommend assuming that all fill must be removed, but evaluating the exiting fill during construction.

Footings are expected to bear on engineered sand fill or natural sands below the engineered sand fill. As mentioned earlier, the natural sands were loose to dense, but generally medium dense. These are the typical bearing conditions in the area. In their present condition, some of the sands have somewhat low shear strength and moderate settlement potential. Fortunately, clean sands are rather easily improved by surface compaction and this is routinely used in the area to decrease settlement potential and increase shear strength beneath tall and heavy structures in the areas. Succeeding portions of the report provide recommendations for implementation of surface compaction. A key element of that process is geotechnical monitoring of the results of the surface compaction.

As a result of the discussions of the data with the design team, and in consideration of the supplemental information, spread footing foundations appear to be feasible for the vast majority of the foundations. With implementation of our recommendations, we are of the opinion that a design bearing pressure of up to 6,000 psf may be used.

Installation of the foundations and addressing soil corrections is expected to require support of or re-routing of utilities – particularly on the west side of the facility. In one of more locations, the confluence of foundation loads and utilities are expected to require use of helical anchors or similar micro-pile applications. These foundations are normally designed by the design-building foundation installer. In our experience, helical anchors constructed in this area routinely must be drilled much deeper that planned (often twice the expected depth and more) to attain projected capacities. For that reason, we suggest planning on using either lighter than normal foundation reactions loads per anchor and/or budgeting for much deeper anchors than planned.

Remarks

The attached report provides more details of our recommendations for the proposed project. We appreciate the opportunity to serve you. If you have any questions about our report, please feel free to contact us at (608) 782-5505.

Sincerely, Chosen Valley Testing, Inc.

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Frederick Schuster, PE Geotechnical Engineer

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Colby T. Verdegan, PE Sr. Geotechnical/Materials Engineer

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Boring Location Sketch

Log of Boring # 1-10, 15-18

Gradation Curves

Soil Evaluation - Storm

Legend to Soil Description

Design Phase Geotechnical Evaluation Proposed La Crosse Center Expansion & Renovation 300 Harborview Plaza La Crosse, Wisconsin

CVT Project Number: 15131.19.WIL Date: September 16, 2019

A. Introduction

The intent of this report is to present our results to the client in the same logical sequence that led us to arrive at the opinions and recommendations expressed. Since our services must often be completed before the design, assumptions are sometimes needed to prepare a proper evaluation and to analyze the data. A complete and thorough review of this entire document, including the assumptions and the appendices, should be undertaken immediately upon receipt.

A.1. Purpose

This report was prepared for proposed La Crosse Center Expansion and Renovation in La Crosse, Wisconsin. Our services were authorized by the City of La Crosse. Kraus Anderson if the City's Construction Manager for the project. I&S Group is the project design consultant.

A.2. Scope

To obtain data for analysis, we were initially authorized to perform ten standard penetration test borings and four cone penetration test soundings. The borings were drilled to depths of about 15 to 100 feet while the soundings were performed to depths from about 30 feet to equipment refusal depths of about 90 feet.

Upon review of the findings, four additional borings were authorized to explore conditions where new footings are proposed immediately adjacent to existing spread footing foundations. Two of these (B-15 and B-16) were performed inside the existing building, in an area assumed to have been fully "corrected". The other two borings (B-17 and B-18) were drilled just west of the west edge of the existing building, in an area which may also have been corrected but which is occupied by on-grade pavements.

Our preliminary findings were summarized in a preliminary report which were then discussed with other members of the design team. This final report includes the preliminary and supplemental information. The analysis and recommendations in this report are based on refined design information from the discussions with the design team.

A.3. Boring Locations and Elevations

The general initial boring locations were indicated to Chosen Valley Testing on a site plan provided by ISG within the RFP, the additional borings and some locations were minimally offset due to site access and utility

location constraints. The locations of the supplemental borings were selected by CVT based on access constraints. The *Boring Location Sketch* in the Appendix shows the approximate boring locations as drilled.

Ground surface elevations were estimated using a laser level. The rim of the sanitary manhole, just south of the Boring B-6 was used as a benchmark #1, and was understood to be at elevation 646.0 feet. The rim of the storm manhole, in the intersection of Pearl St. and 2nd St. S., was also used as a benchmark and was understood to be at elevation 654.6 feet. The rim of the storm manhole, just east of Boring B-7 was additionally used as a benchmark, and was understood to be at elevation 645.2 feet.

A.4. Geologic Background

A geotechnical report is based on subsurface data collected for the specific structure or problem. Available geologic data from the region can help interpretation of the data and is briefly summarized in this section.

Geologic maps suggest that the natural soils in the area are primarily terrace deposits of sands and gravels. Bedrock is expected to be on the order of 200 feet below the surface. The uppermost bedrock is commonly Cambrian Age sandstone. Some fill was expected on site as a result of the existing site development.

B. Subsurface Data

Methods: The CPT Borings were performed at four locations in accordance with ASTM D3441-12 procedures. A 10 square centimeter cone with a maximum point capacity of 100 MPa was used to perform the soundings. Observed values of point resistance, side friction, pore pressure (U₂ position), and tilt angle were recorded continuously throughout the length of the soundings. Soil stratification from was inferred from the readings and is considered approximate, subject to verification generally from associated Penetration samples.

Most of the borings were performed using penetration test procedures (Method of Test D1586 of the American Society for Testing and Materials). This procedure allows for the extraction of intact soil specimen from deep in the ground. With this method, a hollow-stem auger is drilled to the desired sampling depth. A 2-inch OD sampling tube is then screwed onto the end of a sampling rod, inserted through the hole in the auger's tip, and then driven into the soil with a 140-pound hammer dropped repeatedly from a height of 30 inches above the sampling rod. The sampler is driven 18-inches into the soil, unless the material is too hard. The samples are generally taken at 2½ to 5-foot intervals. The core of soil obtained is classified and logged by the driller and a representative portion is then sealed in a jar and delivered to the soils engineer for review.

B.1. Stratification

Three of the CPT borings and two of the supplemental borings were drilled through the concrete pavement within the existing facility. The remaining penetration test borings and CPT boring were drilled through pavements outside of the facility. The borings through concrete encountered about 6 to 9 inches of concrete and those through asphalt met 3 to 4 inches of bituminous over about 4 inches of aggregate base.

The results of the CPT soundings indicated soil behavior that was primarily consistent with sands and silty sands. This is consistent with the expected stratification and generally consistent with the penetration test samples. Possible seams of zones of finer grained soils were indicated.

Beneath the pavements, all of the penetration test borings encountered fill materials to depths of about 4 to 12

feet. The fill consisted primarily of rather clean sands with minimal fines (poorly graded sand and poorly graded sand with silt) or silty sands. Traces of concrete, wood, or brick were noted within the fill at a few locations. At the supplemental borings locations (drilled near existing foundations), the fill appeared to be about 4 to $6\frac{1}{2}$ feet deep.

The natural soils below the fill were dominated by rather clean sands. All of the borings terminated in the sands at the planned depths of around 15 to 101 feet below the surface.

The boring data have been summarized in the following cross section and shows the apparent depth of fill versus natural sands at all locations. The CPT borings are not able to detect fill versus natural soils and are presumed to have penetrated shallow depths of fill. For more detailed information, please refer to the *Log of Boring* sheets and draft CPT boring sheets in the Appendix.



B.2. Penetration Test Results

The number of blows needed for the hammer to advance the penetration test sampler is an indicator of soil characteristics. The number of blows to advance the sampler 1 foot is called the penetration resistance or "N"-value. The results tend to be more meaningful for natural mineral soils, than for fill soils. In fill soils, compaction tests are more meaningful.

Penetration resistance values (N-values) of 2 to 22 Blows per Foot (BPF) were encountered in the sandy fill materials, indicating they were somewhat variable and possibly at times uncompacted. The natural sands

returned values of 2 to 36 BPF, indicating they were very loose to dense, but generally medium dense.

We note that the lowest values were primarily in the upper part of the site, and also tended to be at or close to the water table. Most of this is the result of unbalanced water pressures, and this affect often dissipates with depth.

The higher penetration test values tended to occur about 50 feet or more below the surface. A handful of lower values were also noted at depth. This is fairly common and likely associated with seams of finer sands or even silt that might be expected to occur in Mississippi River sediments.

A key to the descriptors used to qualify the relative density of soil (such as *soft, stiff, loose,* and *dense*) can be found on the Legend to Soil Description in the Appendix.

B.3. CPT Test Results

The raw CPT data sheets are attached. As also noted in the penetration test borings, the data for the deep CPT borings indicate higher density and resistance beginning about 30 feet below the surface. The reader should note that the scale between the deep borings and the shallow borings is different.

B.4. Onsite PID Testing

A CVT Staff Geologist monitored the completion of the penetration test borings. As previously summarized, the soils encountered during this investigation consisted of generally sands from the ground surface to the final depth of the investigation, which was 20 to 100-feet below ground surface (bgs).

The on-site Staff Geologist evaluated the soil samples that were collected at 2 feet intervals for the Borings B-1 through B-4 and 2½ to 5 feet intervals for the Borings B-5 through B-10 from the surface to the final depth of the investigation at 20 to 100-feet bgs, for petroleum odors or staining. The soil samples were field screened using a photo ionization detector (PID) that detects organic vapors in the parts per million (ppm) range. Results of the PID screening indicated that organic vapors were only present in the approximate 7 feet bgs sample of Boring B-9 of all the soil samples collected from the borings. The PID readings are presented on the Boring logs in the Appendix and are summarized in Table 1 and Table 2 below.

TABLE 1 PID READINGS parts per million (ppm)

Sample Interval	B-1	B-2	B-3	B-4
0'-2'	0.0	0.0	0.0	0.0
2'-4'	0.0	0.0	0.0	0.0
4'-6'	0.0	0.0	0.0	0.0
6'-8'	0.0	0.0	0.0	0.0
8'-10'	0.0	0.0	0.0	0.0
10'-12'	0.0	0.0	0.0	0.0
12'-14'	0.0	0.0	0.0	0.0
14'-16'	0.0	0.0	0.0	0.0
16'-18'	0.0	0.0	0.0	0.0
18'-20'	0.0	0.0	0.0	0.0

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Sample Interval	B-5	B-6	B-7	B-8	B-9	B-10
2'- 31/2'	0.0	0.0	0.0	0.0	0.0	0.0
41/2'- 6'	0.0	0.0	0.0	0.0	0.0	0.0
7'- 81/2'	0.0	0.0	0.0	0.0	10.0	0.0
9½'-11'	0.0	0.0	0.0	0.0	0.0	0.0
12'- 131/2'	0.0	0.0	0.0	0.0	0.0	0.0
141⁄2'- 16'	0.0	0.0	0.0	0.0	0.0	0.0
191⁄2'- 21'	0.0	0.0	0.0	0.0	0.0	0.0
241⁄2'- 26'	0.0	0.0	0.0	0.0	0.0	0.0
291/2'- 31'	0.0	0.0	0.0	0.0	0.0	0.0
341⁄2'- 36'	0.0	0.0				
391/2'- 41'	0.0	0.0				
441⁄2'- 46'	0.0	0.0				
491/2'- 51'	0.0	0.0				
541⁄2'- 56'	0.0	0.0				
59½'- 61'	0.0	0.0				
64½'- 66'	0.0	0.0				
69½'- 71'	0.0	0.0				
74½'- 76'	0.0	0.0				
79½'- 81'	0.0	0.0				
841⁄2'- 86'	0.0	0.0				
89½'- 91'	0.0	0.0				
941⁄2'- 96'	0.0	0.0				
99½'- 101'	0.0	0.0				

TABLE 2 PID READINGS parts per million (ppm)

Notes: organic vapor readings were conducted with a Thermo Electron Corporation

B.5. Groundwater Data

During the drilling operation, the drillers may note the presence of moisture on the sampling instrument, in the cuttings, or within the boreholes. These observations are recorded on the boring logs. The water level may vary with weather; time of year and other factors and the presence or absence of water during the drilling is subject to interpretation and is not always conclusive.

Water was observed in all of the borings at depths of about 7½ to 20 feet below the surface. The depths of the initial borings correspond to elevations of about 636 to 638 feet while the more recent additional borings encountered groundwater near elevation 630 feet. At the time of our initial exploration, water level in the Mississippi were higher than normal. Water levels at the site are expected to fluctuate similar to levels in the nearby Mississippi River, as well as with local weather patterns.

B.6. Laboratory Testing

Fine sieve analyses was performed on representative samples from the stormwater borings to aid in classification. The following table outlines the results of the analyses and the corresponding USDA soil classification. All tests were performed according to ASTM standards.

LA CROSSE CENTER EXPANSION & RENOVATION PROJECT #: 15131.19.WIL

Boring	Depth Below Surface (Feet)	Percent Passing #8 Sieve (%)	Percent Passing #30 Sieve (%)	Percent Passing #70 Sieve (%)	Percent Passing #140 Sieve (%)	Percent Passing #270 Sieve (%)	USDA Soil Classification
B-1	5	99.7	99.1	25.7	4.6	2.4	Sand, S
B-2	7	97.5	92.7	4.3	0.8	0.4	Sand, S
B-3	10	100	99.7	18.3	2.2	1.3	Sand, S
B-4	3	92.5	91.1	26.7	7.4	4.0	Sand, S

C. Design Data

Because each structure has a different loading configuration and intensity, different grades, and different structural or performance tolerances, the results of a geotechnical exploration will mean different things for different facilities. If the design of the facility changes, the soils engineer should be contacted to discuss the possible implications of the changes. Without a chance to review such changes, the recommendations of the soils engineer may no longer be valid or appropriate.

The project consists of the expansion & renovation of the La Crosse Center. Estimated maximum structural loads were provided. Structural design information was provided by the structural engineer, Mr. Adam Wietzki, PE of ISG Group. Maximum axial LRDF vertical column loads are understood to range from 330 to 855 kips (exterior columns) and 80 to 510 kips (interior columns), with maximum moment column loads of 10 to 105 ft-kips (exterior columns) to 1 to 7 ft-kips (interior columns), and maximum shear loads are understood to range from 1-7 kips (exterior columns) to 1 to 6 ft-kips (interior columns). Maximum strip footing loads are assumed be 3,000 pounds per foot (exterior) to 9,000 pounds per foot (interior).

As noted earlier, some of the columns are for new or expanded footings that are close to existing foundations. Those columns within the building were projected to have LRFD vertical columns loads of up to 241 kips. New footings to be cast just west of the west foundation perimeter are projected to have LRFD vertical columns loads of up to 633 kips.

Final grades are assumed to be at or near existing grades – with the center and westerly areas have a slab level at or just about the ground surface at the borings in that area or about elevation $946\frac{1}{2}$ feet. Footings in that area, supporting the columns below the elevated ballroom, are then assumed to bear near elevation 941 feet for exterior unheated foundations and near $644\frac{1}{2}$ feet for heated interior foundations. In the eastern areas, finished floor elevation is assumed to be near or slightly above existing grades or about elevation $656\frac{1}{2}$ feet and are then assumed to bear near $652\frac{1}{2}$ feet

Depending on bearing conditions, foundations options being considered potential include spread footings, piling, helical anchors, or possibly ground improvements with Geopiers to support spread footings.

D. Analysis

Based on the data, the site conditions consist of fill materials in the upper 4 to 12 feet of the site and clean natural sands at depth. We recommend all removing fill materials from below the structure, along with any

other unsuitable materials, and replacing these materials with engineered fill. Based on the data and the planned elevations for the foundations and slabs, it appears that the natural sands will be present at or within a few feet of footing grades at most foundation locations. The borings at the west edge of the facility were the notable exceptions and found deeper fill.

We noted that some of the fill within the existing building is presumably engineered fill and portions can plausibly be left and place. For planning purposes we recommend assuming that all fill must be removed, but evaluating the exiting fill during construction.

Footings are expected to bear on engineered sand fill or natural sands below the engineered sand fill. As mentioned earlier, the natural sands were loose to dense, but generally medium dense. These are the typical bearing conditions in the area. In their present condition, some of the sands have somewhat low shear strength and moderate settlement potential. Fortunately, clean sands are rather easily improved by surface compaction and this is routinely used in the area to decrease settlement potential and increase shear strength beneath tall and heavy structures in the areas. Succeeding portions of the report provide recommendations for implementation of surface compaction. A key element of that process is geotechnical monitoring of the results of the surface compaction.

As a result of the discussions of the data with the design team, and in consideration of the supplemental information, spread footing foundations appear to be feasible for the vast majority of the foundations. With implementation of our recommendations, we are of the opinion that a design bearing pressure of up to 6,000 psf may be used.

Installation of the foundations and addressing soil corrections is expected to require support of or re-routing of utilities – particularly on the west side of the facility. In one of more locations, the confluence of foundation loads and utilities are expected to require use of helical anchors or similar micro-pile applications. These foundations are normally designed by the design-building foundation installer. In our experience, helical anchors constructed in this area routinely must be drilled much deeper that planned (often twice the expected depth and more) to attain projected capacities. For that reason, we suggest planning on using either lighter than normal foundation reactions loads per anchor and/or budgeting for much deeper anchors than planned.

The remainder of the report provides more details of our recommendations.

E. Grading Recommendations

E.1. Groundwater/De-watering

As mentioned, groundwater was encountered at depths of about $7\frac{1}{2}$ to 20 feet below the surface. The depths correspond to elevations of about 636 to 638 feet while the more recent borings found groundwater near elevation 630 feet. Depending upon the level of the nearby Mississippi at the time of construction, the fill removal could extend into the water table in some areas. Soils below the water table typically consisted of

highly permeable sands with some clays and silts. Based on this, dewatering wells may be needed depending on the water levels relative to the improvements.

E.2. Excavation

We recommend removing all paving materials and non-engineered fill from below the structure, along with any existing foundations or otherwise unsuitable soils. The tabulation below show the apparent depth of the fill/unsuitable soils at the locations explored. As noted before, some of the fill soils were presumably "engineered" for the existing facility. For budgeting purposes, we recommend assuming that all fill must be removed from below the footings and slabs.

Boring	Approx. Surface Elevation (feet)	Approx. Depth of Existing pavements/slab and Fill (feet)Approx. Bottom Elevation of Existing pavements/slab and 		Expected Bottom of Footing Elevation (feet)
B-1	644 1/2	5	639 1/2	641
B-2	644 1/2	4 1/2	640	641
B-3	655 1/2	6	649 1/2	652 1/2
B-4	655 1/2	4 1/2	651	652 1/2
B-5	656	6 1/2	649 1/2	652 1/2
B-6	646	11 1/2	634 1/2	641
B-7	646	11 1/2	634 1/2	641
B-8	646 1/2	9	637 1/2	641
B-9	644 1/2	6 1/2	638	641
B-10	656 1/2	6 1/2	650	652 1/2
B-15	646	4	642	644 1/2
B-16	646	4	642	644 1/2
B-17	645 1/2	6 1/2	639	641
B-18	645 1/2	6 1/2	639	641

E.3. Oversizing

The corrective excavations should be oversized at least 1 foot beyond the building areas for each foot of fill needed below footing grade. This over-sizing can be reduced by up to 50% if rather precise staking is present during grading.

E.4. Filling and Compaction

We recommend using clean sands or gravels having less than 10% particles passing the number 200 sieve, as replacement fill, if needed. Most of the natural sands at the site appear capable of meeting this gradation though much of the fill materials would not. For planning purposes we suggest assuming that imported fill will be needed. Portions of the existing fill might be saved and preserved during construction, subject to closer review at that time.

We recommend using clean, free draining sands having less than 5% passing a #200 sieve in the upper 1 foot of all slab areas. This material would likely have to be imported.

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All fill below the foundations should be compacted to a minimum of 100 percent of its maximum standard Proctor density (ASTM D 698). Below slab areas, compaction to 95% it considered adequate.

E.5. Surface Compaction of Soils at Footing Grade

The soils at depth were generally medium dense. To provide more uniform support to the structure, while increasing shear strength and reducing settlement potential, we recommend surface compacting the soils at footing elevation with a large vibratory compactor, or a backhoe with a hoe-ram-type compaction attachment. This is considered applicable to all column footings having vertical LRFD loads of 600 kips or more. For lighter columns, strip footing areas, and columns adjoining existing foundation (which had been at least partially pre-loaded by the existing building), heavy compaction with a turtle type compactor or light compaction with a hoe ram should be adequate.

Tests should be conducted during the compaction operation to evaluate the compaction efforts. Subject to that evaluation, additional compactive effort may be deemed warranted.

F. Building Design

F.1. Foundation Depth

We recommend placing the footings at least 48 inches below the exposed ground surface for frost protection.

F.2. Bearing Capacity and Settlement

With the recommended soil corrections, we are of the opinion that footings may be designed to exert a bearing pressure of up to 6,000 pounds per square foot. This capacity includes a safety factor of at least 3 against shear failure. Total settlements are expected to be 1 inch or less beneath the maximum column loads. Differential settlement between similarly loaded footings is expected to be on the order of ½ inch or less.

F.3. Lateral Support/Resistance

Backfill placed around the structure and above foundation elevation should be compacted to at least 95% of its maximum standard Proctor density (ASTM D 698). Lateral resistance will depend on the materials used. We recommend clean sands or gravels as fill around below-grade walls. The following table includes recommended support values for clean sands. These values do not include a safety factor.

Poorly Graded Sands (SP) 95% standard Proctor density					
Internal Friction Angle (degrees)	34				
Cohesion (psf)	0				
Coefficient of Friction between Concrete and Soil	0.50				
Moist Unit Weight (pcf)	120				
Saturated Unit Weight (pcf)	130				
At-Rest Coefficient (Ko)	0.44				
Active Coefficient (Ka)	0.28				
Passive Coefficient (Kp)	3.54				

The actual loads exerted on the structure will depend on the movement or flexure of the structure. For sand fill, horizontal movement or flexure of about 0.2% of the height of soil retained may be sufficient to mobilize frictional forces from the at-rest state to the active state.

G. Paved Areas

G.1. Stripping and Grading

We recommend stripping any highly organic topsoil, vegetation and rootzone, and existing pavements from below the newly paved areas. The top of any existing soils that may be present within 2 feet of the surface should be scarified and compacted, to encourage uniformity.

We recommend using clean sands or gravels as fill below the pavements. All fill should be compacted to at least 95% of its maximum standard Proctor density. Compaction to 90% is usually sufficient in green areas. The completed pavement subgrade should be able to pass a test roll. Areas not passing the test roll should be reworked and stabilized as needed to pass the test roll.

G.2. Pavement Design

We recommend designing pavements using support values with the following estimated characteristics:

Soil Type	AASHTO Classification	Frost Index	Design Group Index	K-Value	Soil Support Factor	Est. California Bearing Ratio
Silty Sand	A-2-4/A-4	F-3	10	200	4.5	5 – 15
Poorly-Graded Sand	A-3	F-2	6	250	5.0	10 – 20

Again, the proposed parking areas are assumed to experience primarily auto traffic and occasional commercial truck traffic. We recommend a minimum pavement section consisting of at least 3 inches of bituminous and 6 inches of aggregate base in auto traffic areas. In more frequent heavy truck traffic, we recommend increasing the sections to 4 inches of bituminous and 8 inches of aggregate base. These values appear comparable to heavier than the existing pavement sections.

These sections should be considered preliminary, subject to review by the project civil engineering consultant, and subject to their experience with pavement design and performance in the area of the project.

H. Deep Excavations/Utilities

H.1. Dewatering

As mentioned, groundwater was encountered at depths of about $7\frac{1}{2}$ to 20 feet below the surface in the initial borings and these depths correspond to elevations of about 636 to 638 feet. The more recent water levels appear closer to 630 feet. Soils below the water table typically consisted of highly permeable sands with some clays and silts. Based on this, dewatering wells may be needed depending on the water levels relative to the improvements.

M I N N E S O T A

H.2. Trench Sidewalls

The contractor will be required to slope or shore the excavations as needed to meet OSHA requirements for safety. The sands present at the site would classify as Type C materials as defined by OSHA.

H.3. Trench Bottom Stability

The soils encountered at the base of the utility trenches are expected to be natural sands. These materials are expected to provide adequate support for utilities. Care should be taken so that over-size materials such as larger gravels are kept at least ½ foot from utility pipes, to reduce point loads on the pipes.

H.4. Fill Placement and Compaction

Soils placed as backfill in the trenches should be compacted to the densities required of any overlying structures: 95% of standard Proctor density in building and paved areas and 90% in green areas.

I. Stormwater Recommendations

As requested, infiltration rates were estimated for the various materials encountered in the site borings (Boring B-01, B-02, B-03 and B-04). The borings encountered materials ranging from sands or fine sands to loamy sands. Infiltration rates for these materials were estimated to range from 3.60 to 0.50 inches per hour, based on USDA soil classification. The infiltration/permeability values are the recommended design values from the Wisconsin DNR. Please see the *Soil Evaluation – Storm* sheets in the Appendix for more details. Double-ring infiltrometer testing could be performed to provide site specific infiltration values, but was not part of our initial work scope.

J. Construction Recommendations

J.1. Excavation

The stripping can likely be accomplished with a variety of equipment; though rubber tired equipment tends to have difficulty traversing dry sands. For any deep excavations we recommend using a backhoe.

J.2. Cold Weather

If site grading is anticipated during cold weather, we recommend that good winter construction practices be observed. All snow and ice should be removed from cut and fill areas prior to additional grading. No fill should be placed on soils that have frozen or contain frozen material. Frozen soils should not be used as fill.

J.3. Testing and Documentation

Ideally, the foundation improvements should be evaluated and documented by qualified personnel. If the filling proceeds during periods of freezing weather, full-time testing should be considered to help confirm that imported fill is thawed prior to and during compaction, and that all snow has been removed before placement of the fill.

Pockets of deep fill, debris or foundations are often encountered at unexpected locations when working in the downtown area. Geotechnical evaluations and documentation are strongly recommended during grading to help identify conditions, document over-sizing and evaluate options, if necessary.

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All fill should be evaluated for conformance to the project gradation requirements and should be tested for compaction. The surface compaction efforts should be tested after compaction with a Dynamic Cone Penetrometer or similar implement. Subject to that evaluation, additional effort or compaction with alternative compaction equipment maybe deemed warranted.

Although our firm offers testing services relating to structural components of the project (such as concrete testing, reinforcement observations, etc.), specification of such services is beyond our work scope and the designer(s) should be consulted as to such requirements.

I. Level of Care

The services provided for this project have been conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in this area, under similar budget and time constraints. This is our professional responsibility. No other warranty, expressed or implied, is made.

Appendix

Boring Location Sketch Log of Boring # 1-10, 15-18 CPT Draft Date Sheets Legend to Soil Description







PROJECT: 15131.19.WIL BORI									BORING: B-01				
	D	esign Ph	nas T	e Geotechnical Evaluation]	LOCAT	OCATION: See attached sketch						
	30	00 Harbo	Li Drv	view Plaza									
	La	a Crosse	, \	Wisconsin	_	DATE: (/(/0010			10	SCALE: 1" - 5'			
						DATE:	0/	0/20	19	SCALE. $I = J$			
Elev. 644.5	Depth 0.0	USCS Symbo	1	Description of Materials (ASTM D 2487/2488)			I	3PF	WL	Tests and Notes			
- 644.2	0.3/	SM X	.≢ X	$\frac{4'' \text{ ASPHALT}}{4'' \text{ ACCDECATE PASE}}$		/	M	10		Benchmark #1: Rim of the manhole south of B-6			
642.5			X	SILTY SAND trace gravel, fine grained, bro	ov	/	Δ	17		understood elevation 646.0			
-	_	SP SM	X	moist, medium dense.			M	9		feet. PID = 0.0 ppm			
-	_		8	(Fill) POORLY CRADED SAND with SILT fu	ne		\wedge	,		PID = 0.0 ppm			
639.5	5.0		X	grained, brown, moist, very loose to loose.	ne	ŕ	M	5					
-		SP SM		(Fill)		$\frac{1}{m_{0} \text{ of }}$	Δ	5		PID = 0.0 ppm			
-	_	SIVI		silty sand, fine grained, brown, moist to wate	er		M	2					
	0.7			bearing, very loose.			Δ	2	-	PID = 0.0 ppm			
636.0	8.5	SP		\Water bearing below around 7'.		[╢	5					
<u> </u>				POORLY GRADED SAND trace gravel, f	fin	e to	\wedge	5		PID = 0.0 ppm			
-				medium grained, brown, water bearing, loos	se	to	M	7					
+				(Alluvium)			\wedge	/		PID = 0.0 ppm			
-							M	0					
-							\wedge	0		PID = 0.0 ppm			
<u> </u>							M	4					
18/18							\wedge	4		PID = 0.0 ppm			
<u> </u>							M	7					
				Grayish brown below 17'.			\wedge	/		PID = 0.0 ppm			
- CGNN							M	4					
624.5	20.0						Λ	4		PID = 0.0 ppm			
	_			End of boring. Water encountered during drilling below are	ווור	nd 7'							
	_			Boring sealed upon completion.	Jui	iid / .							
	_												
<u>н</u> –													
	_												
19.													
- 1910													
3													



PROJE	ECT: 15	5131.1	9.W	TL	BORING	ORING: B-02				
	D	esign 1	Phas	e Geotechnical Evaluation	LOCATION:					
	P1 3(opose)0 Har	a La bory	view Plaza	See all	acheo	i skeu			
	La	a Cros	se, V	Visconsin						
					DATE:	6/6/2	019	SCALE: 1" = 5'		
Elev. 644.6	Depth 0.0	USC Symł	CS bol	Description of Materials (ASTM D 2487/2488)		BPI	WL	. Tests and Notes		
- 644.3	0.3/	SD		<u>4" ASPHALT</u>	/r	M_{2}		Benchmark #1: Rim of the		
644.0	2.0	SM	\bigotimes	<u>3" AGGREGATE BASE</u> POORLY GRADED SAND with SILT fu	/	M 2.	,	understood elevation 646.0		
-		SP	\bigotimes	grained, brown, moist, medium dense.		Μ 5		feet. $PID = 0.0 \text{ mm}$		
-		SM	\bigotimes	(Fill) POOPL V CPADED SAND with SU T tr		\mathbb{N}^{3}		PID = 0.0 ppm $PID = 0.0 ppm$		
640.1	4.5	SP	\sim	γ gravel, fine grained, brown, moist, loose.	ιcc [Μ,				
_		51		(Fill)		N '		PID = 0.0 ppm		
-				grained, brown, moist to water bearing, loos	n e to	M 8				
-				medium dense.		∆ °	ĮŸ	PID = 0.0 ppm		
-	_			Water bearing below around 7.5'.		Μ 7				
<u> </u>				Trace gravel below 8'.		Δ΄		PID = 0.0 ppm		
-						Ma				
-						Δ΄		PID = 0.0 ppm		
-						Μ,				
-						Δ΄		PID = 0.0 ppm		
<u>_</u>						Mg				
	_					Δ΄		PID = 0.0 ppm		
	_					Mg				
	_			Grayish brown below 17'.		Δ´		PID = 0.0 ppm		
	_					M 10				
624.6	20.0					Δ	,	PID = 0.0 ppm		
	_			End of boring. Water encountered during drilling below arc	und					
				7.5'.						
				Boring sealed upon completion.						
5										
15121 10	WII							D 02 mage 1 - f 1		



PROJE	ECT: 15	5131.1	9.W	TL	BORIN	DRING: B-03				
	D	esign	Phas	se Geotechnical Evaluation	LOCAT	LOCATION:				
	Pi 3(opose)0 Har	d La bory	a Crosse Center Expansion & Renovation	See at	See anacieu skeien				
	L	a Cros	se, V	Wisconsin						
					DATE: 6/6/2019 SCALE: 1			SCALE: 1" = 5'		
Elev. 655.6	Depth 0.0	USC Syml	CS bol	Description of Materials (ASTM D 2487/2488)		B	PF	WL	Tests and Notes	
655.1	0.5	SM	=- XX	<u>6'' CONCRETE</u>	/	M	20		Benchmark #2: Rim of the	
654.1	1.5		\bigotimes	SILTY SAND trace gravel, fine grained, brown of standard trace gravel, fine grained, brown of the second standard trace gravely find trace gravely f	own,	\mathbb{N}	20		intersection of 2nd and	
_		SM	\bigotimes	(Fill)		Μ	10		Pearl Streets, understood	
_			\bigotimes	POORLY GRADED SAND with SILT tra	lense	М	10		PID = 0.0 ppm	
_			\bigotimes	(Fill)	uciise.	Μ	16		PID = 0.0 ppm	
-649.6	6.0		\bigotimes			М	10		PID = 0.0 ppm	
_		SP		POORLY GRADED SAND with SILT fu	ne	M	0			
_		SM		(Alluvium)	se.	Ŵ	9		PID = 0.0 ppm	
_						M	11			
_	_					Ŵ	11		PID = 0.0 ppm	
						M	~			
_	_					Ŵ	2		PID = 0.0 ppm	
_	_					M	0			
_						Ŵ	8		PID = 0.0 ppm	
641.1	14.5	SD		POORLY CRADED SAND trace gravel f	ine to	$\overline{\mathbb{N}}$	0			
		51		medium grained, grayish brown, moist, med	ium	Ŵ	9		PID = 0.0 ppm	
<u>ה</u>				dense.		M	0			
	_			Medium to coarse grained below 16.5'.		Ŵ	9		PID = 0.0 ppm	
637.1	18.5	SD		POORLY GRADED SAND with SILT fu	1e	$\overline{\mathbb{M}}$	10			
s − 635.6	20.0	SM		grained, brown, moist to water bearing, loos	e.	M	13	$\overline{\Delta}$	PID = 0.0 ppm	
				(Alluvium) Fine to medium grained below 19'	[
				Water bearing below around 19.5'.						
				End of boring. Water encountered during drilling balances	und					
				19.5'.	ullu					
				Boring sealed upon completion.						
<u> </u>										
15121 10	WII					L			P 03 page 1 of 1	

15131.19.WIL



PROJEC	CT: 15	5131.1	9.W	IL	BORING: B-04				
	D Pr	esign l	Phas	e Geotechnical Evaluation	LOCATION: See attached sketch				
	30)0 Har	borv	view Plaza					
	La	a Cros	se, V	Visconsin	DATE: 0		19	SCALE: 1" = 5'	
Elev. 655.6	Depth 0.0	USC Symł	CS bol	Description of Materials (ASTM D 2487/2488)		BPF	WL	Tests and Notes	
Elev. 655.6 655.1 655.1 655.1 651.1 - - - - - - - - - - - - - - - - - -	Depth 0.0 	USC Symt		Description of Materials (ASTM D 2487/2488) 6" CONCRETE SILTY SAND moist, medium dense to dense. (Fill) POORLY GRADED SAND with SILT gravel, fine grained, light brown, moist, loos (Alluvium) POORLY GRADED SAND trace gravel, f medium grained, brown, moist to water bear loose to medium dense. (Alluvium) Water bearing below around 19.5'. End of boring. Water encountered during drilling below around 19.5'.	ine to ing,	BPF 25 11 2 2 7 6 9 8 15 9	₩L	Tests and Notes Benchmark #2: Rim of the southern manhole in the intersection of 2nd and Pearl Streets, understood elevation 654.6 feet. PID = 0.0 ppm PID = 0.0 ppm	
				Boring sealed upon completion.					



PROJE	CT: 15	5131.1	9.W	IL	ORING: B-05						
	D	esign	Phas	e Geotechnical Evaluation	LOCAT	LOCATION:					
	30	00 Hai	borv	view Plaza							
	La	a Cros	se, V	Visconsin		6161	010	SCALE: $1'' - 5'$			
					DATE: 0/0/2019			SCALE. 1 = 5			
Elev. 655.8	Depth 0.0	USC Sym	CS bol	Description of Materials (ASTM D 2487/2488)		BP	F WL	. Tests and Notes			
655.3	0.5/	SM	=- XX	<u>6'' CONCRETE</u>	/	-1		Benchmark #2: Rim of the			
	_	5101	\bigotimes	SILTY SAND trace gravel, fine grained, bromoist very loose	own,			intersection of 2nd and			
	_		\bigotimes	(Fill)		$\overline{\mathbb{N}}$		Pearl Streets, understood			
	_		\bigotimes				´	elevation 654.6 feet. PID = 0.0 ppm			
	_		\bigotimes					1 ID 010 ppm			
			\bigotimes	Trace concrete around 5'.		XE		PID = 0.0 ppm			
649.3	6.5	CD	X	DOODLY CDADED CAND with CILT fo	22						
	_	SP		grained, brown, moist, loose.		M s		PID = 0.0 ppm			
	_			(Alluvium)		A '	'	r 1D – 0.0 ppin			
	_										
						X		PID = 0.0 ppm			
	_			Gravich brown below 11.5'		Ĩ					
	_			Grayish brown below 11.5.		M s		PID = 0.0 npm			
	_					A '	'	r 1D – 0.0 ppm			
	_										
9/19						X 9		PID = 0.0 ppm			
	_					T					
<u>5</u> 638.3	17.5	SD		POOPLY CRADED SAND fine to medium	m	-					
CENND	_	51		grained, grayish brown, wet to water bearing	g, loose						
	_			to medium dense.							
				Water bearing below around 20'.		X 7	' ¥	PID = 0.0 ppm			
	_					T					
	_										
						1	D	PID = 0.0 ppm			
						I					
ACHC											
						1	1	PID = 0.0 ppm			
N-91.	_					I					
1913											
	_										
	_										
						1	D	PID = 0.0 ppm			
15131.19.	VIL			/ · · · ·				B-05 page 1 of 3			



PRO	JECT:	15131	.19).W	IL	BORINC	BORING: B-05 (cont.)				
		Desig	n P	has	e Geotechnical Evaluation	LOCATION:					
		Propo 300 H	sed	La	Crosse Center Expansion & Renovation	See attached sketch					
		La Cro	OSS	e. V	Visconsin						
						DATE: 6/6/2019				SCALE:	1" = 5'
Elev	. Depth	US Syr	SCS mbo	S ol	Description of Materials (ASTM D 2487/2488)	BPF WL				Tests and	d Notes
		SP					ł				
618	3.3 37(sontin	nnec	$\frac{d}{d}$	POODLY CDADED SAND with CDAVE	T					
				ġ	medium to coarse grained, grayish brown, w	ater					
				0	bearing, medium dense.		I				
_	-			o	(Alluvium)		14		PID	= 0.0 ppm	
		-		0							
613	.3 42.	5		0							
		_ SP			POORLY GRADED SAND trace gravel, n	nedium	5				
-					loose to medium dense.	mg,					
-		4			(Alluvium)		14		חוק	- 0 0 ppm	
		_								– 0.0 ppm	
_							5				
_					Gray below 47.5'.						
					2						
	_						8		PID	= 0.0 ppm	
3/19		-					Ĩ				
T 9/1		-					ł				
6.GD		-			Fine to medium grained below 52.5'.		1				
NNN -		-									
A G	-	_					25		PID	= 0.0 ppm	
		_								– 0.0 ppm	
).GPJ		_					1				
		_			Grayish brown below 57.5'.		ł				
AOV -		_	- - -		No gravel below 57.5'.		5				
	_		. .								
NOIS							\mathbb{A}^{27}		PID	= 0.0 ppm	
PAN			. .								
L EX							1				
ENTE		1									
I SE C		1					I				
SROS T		-					13		PID	= 0.0 ppm	
		-									
9.WIL		-									
131.1							ſ				
D 15		_					1				
		_							DID	0.0	
STAN		_							PID	= 0.0 ppm	



ſ	PROJE	CT: 1:	5131.1	9.W	IL	BORING: B-05 (cont.)					
		D Pi 30	esign l ropose 00 Har	Phas d La borv	e Geotechnical Evaluation Crosse Center Expansion & Renovation view Plaza	LOCATION: See attached sketch					
		L	a Cros	se, V	Visconsin	DATE: (5/6/20	19	SCALE: 1" = 5'		
	Elev.	Depth	USC Symł	CS bol	Description of Materials (ASTM D 2487/2488)	BPF WL			Tests and Notes		
	_	(ca	SP ontinue	ed)							
-	-					N	12		PID = 0.0 ppm		
		_				Ĺ			1 ID – 0.0 ppm		
	_	_					ł				
-	_				Trace gravel around 80'.		23		PID = 0.0 ppm		
-	-	_				Ĺ	ľ				
	_	_									
	-						22		PID = 0.0 ppm		
19	_	_				<u>v</u>	ľ				
3DT 9/13/	_	_									
GNNN06.C	-						23		PID = 0.0 ppm		
U LOG A	_	_					ľ				
ATION).GF	_	_									
& RENOV,							29		PID = 0.0 ppm		
ANSION	_	_					Į				
NTER EXI	_						ľ				
DSSE CE	- 554.8	101.0					25		PID = 0.0 ppm		
VIL (LA CRI	_	_			End of boring. Water encountered during drilling below aro Boring sealed upon completion.	ound 20'.					
5131.19.W	_	_									
VDARD 1	- 										
CVT STA	_	_									



PROJE	CT: 15	5131.1	9.W	ΤL	BORING	BORING: B-06				
	D D	esign l	Phas	e Geotechnical Evaluation	LOCATI	LOCATION: See attached sketch				
	30)0 Har	borv	view Plaza		See analog sketch				
	La	a Cros	se, V	Wisconsin	DATE:	5/7/20	19	SCALE: <u>1" = 5'</u>		
Elev. 645.8	Depth 0.0	USC Symł	CS bol	Description of Materials (ASTM D 2487/2488)		BPF	WL	Tests and Notes		
645.0	0.8		= _=	<u>9'' CONCRETE</u>		ł		Benchmark #1: Rim of the		
_		SP SM	\bigotimes	POORLY GRADED SAND with SILT tra gravel trace brick fine grained brown mois	nce st	[understood elevation 646.0		
_		5101	\bigotimes	medium dense.	<i>,</i>	16		feet.		
_			\bigotimes	(Fill)				PID = 0.0 ppm		
_			\bigotimes							
	<i>.</i>		\bigotimes			21		PID = 0.0 ppm		
<u> </u>	6.5	SP	\bigotimes	POORLY GRADED SAND with SILT se	am of	l				
_	_	SM	\bigotimes	lean clay, fine to medium grained, brown, we	et to	4	$\overline{\Sigma}$	PID = 0.0 ppm		
- 636.8	9.0		\bigotimes	water bearing, loose. (Fill)						
_		SM	\bigotimes	Water bearing below around 8'.	/					
-(24.2	11.5		\bigotimes	<u>SILTY SAND</u> trace gravel, fine grained, browater bearing, loose.	own,	Ň 2		PID = 0.0 ppm		
- 034.3		SP		(Fill)	/	Į				
_	_	SM		POORLY GRADED SAND with SILT fir	ie loose	8		PID = 0.0 ppm		
_	_			(Alluvium)	10050.					
13/15/	_					3		PID = 0.0 ppm		
628.2	17 5					{				
020.3	- 17.5	SP		POORLY GRADED SAND trace gravel, fr	ine to	ł				
	_			medium grained, brown, water bearing, loose	e to	[
- 20				(Alluvium)		N 11		DID = 0.0 mm		
	_							PID = 0.0 ppIII		
	_					ł				
	_			Gray below 22.5'.		ł				
Ϋ «	_					ł				
				No gravel around 25'		9		PID = 0.0 ppm		
EXPA	_							ppm		
	_					ł				
3 	_			Medium to coarse grained below 27.5'.		f				
	_					ł				
						12		PID = 0.0 ppm		
	_							···· rr		
	_					ł				
≓⊢ ⊋	_					f				
	_					ł				
						12		PID = 0.0 ppm		
3 - 15121103	VII.					/ \		PP		



ſ	PROJE	CT: 15	5131.1	9.W	IL	BORING: B-06 (cont.)				
		D Pi	esign i ropose	Phas d La	e Geotechnical Evaluation Crosse Center Expansion & Renovation	LOCATI See att	ON: ached	sketa	ch	
		30	00 Har	bory	view Plaza					
		L	a Cros	se, v	visconsin	DATE:	6/7/20	19	SCALE: 1" = 5'	
	Elev.	Depth	USC Syml	CS bol	Description of Materials (ASTM D 2487/2488)	BPF WL			Tests and Notes	
F	-	(0	SP ontinue	ed)			ł			
╞	-						ł			
	-									
	_						14		PID = 0.0 ppm	
-	603 3	42 5					ł			
F	-		SP	0	POORLY GRADED SAND with GRAVE	<u>L</u> fine	ł			
╞	-	_		0	(Alluvium)	50.				
	-			0			36		PID = 0.0 ppm	
	500 2			0			Ī			
F	- 598.3	47.5	SP		POORLY GRADED SAND trace gravel, f	ine to	ł			
┢	-	_			nedium grained, grayish brown, water bearing loose to dense.	ng, very				
ŀ	-				(Alluvium)		25		PID = 0.0 ppm	
13/19	_	_					ł			
DT 9/	-						ł			
0.90NN		-					j –			
A GN	-						3		PID = 0.0 ppm	
51 LO	-	_								
ON).GF	-	_					j.			
VOVATI	-						ł			
I & REN	-						12		PID = 0.0 ppm	
ANSION	—	_							т — 0.0 ррш	
R EXP/	-	_					ł			
CENTE.	-	_					ł			
OSSE (-									
(LA CR		_					6		PID = 0.0 ppm	
9.WIL	-	_					ł			
15131.1	-	_					ł			
ARD	-	_								
STAND	_						14		PID = 0.0 ppm	
2 Z	-									



	PROJE	CT: 1	5131.1	9.W	IL	BORING	B-06 (cont.)			
		D P	esign ropose	Phas d La	e Geotechnical Evaluation Crosse Center Expansion & Renovation	LOCATI See atta	ON: ached	sketa	ch	
		30 L	00 Har a Cros	borv se. V	view Plaza Visconsin					
						DATE:	5/7/20	19	SCALE: 1" = 5'	
	Elev.	Depth	USC Syml	CS bol	Description of Materials (ASTM D 2487/2488)	BPF WL			Tests and Notes	
	_	(ca	SP ontinue	ed)	No gravel below 72.5'.		ł			
	_									
		_	-				26		PID = 0.0 ppm	
	-	_	-				ł			
	_	_					ł			
	-		-		Trace gravel around 80'		¶ 28		PID = 0.0 nmm	
		_	-		Trace graver around so.				PID = 0.0 ppin	
	_	_	-				ł			
	_	_					}			
	-		-				26		PID = 0.0 ppm	
		-	-							
/13/19	_	_					j			
GDT 9	-	_	-				j			
NNN06	-		-				29		PID = 0.0 ppm	
OG A G	_	_	-				ł			
GPJ L	_	_					ł			
ATION)	-	_	-							
RENOV	_						26		PID = 0.0 ppm	
SION &	_	_					Ī			
EXPAN	-	_	-]			
ENTER	-	_	-				ł			
DSSE CI	- 544.8	101.0					35		PID = 0.0 ppm	
(LA CRC	-	_			End of boring. Water encountered during drilling below aro	ound 8'.				
19.WIL	_	_	-		Boring sealed upon completion.					
15131.	_									
VDARD			-							
/T STA	-	_	-							
Ú	_		<u> </u>							



PROJ	ECT: 1:	5131.1	9.W	IL	BORING: B-07				
	D	esign I	Phas	e Geotechnical Evaluation	LOCATI See atta	ON: ached :	sketa	۰h	
	30	00 Har	borv	view Plaza	See all	aenea	Shere		
	L	a Cross	se, V	Visconsin	DATE: 6		19	SCALE: 1" = 5'	
Elev. 646.1	Depth 0.0	USC Symb	CS bol	Description of Materials (ASTM D 2487/2488)		BPF	WL	Tests and Notes	
Elev. 646.1 645.4 - - - - - - - -	Depth 0.0 0.7 - - - - 5 6.5 - - - - 5 11.5 - - - - - - - - - - - - - - - - - - -	Symbolic Symbolic Symbolic Symbolic Symbolic Symbolic SP SSM SP SSM SP		Beschpuon of Materials (ASTM D 2487/2488) 8.5" CONCRETE POORLY GRADED SAND with SILT traplastic, fine grained, brown, moist, loose. (Fill) SILTY SAND fine grained, brown, wet to we bearing, loose. (Fill) Trace concrete around 7.5'. Water encountered below around 8.5'. Trace wood around 10'. POORLY GRADED SAND with SILT tragravel, fine grained, brown, water bearing, velose to loose. (Alluvium) POORLY GRADED SAND trace gravel, fmedium grained, gray, water bearing, loose to medium dense. (Alluvium)	vater nce ery ine to to	BPF 9 6 4 2 6 11 11	WL	Tests and Notes Benchmark #1: Rim of the manhole south of B-6, understood elevation 646.0 feet. PID = 0.0 ppm PID = 0.0 ppm	
						14		PID = 0.0 ppm	
	-			End of boring. Water encountered during drilling below aro 8.5'. Boring sealed upon completion.	und				

15131.19.WIL


PROJ	PROJECT: 15131.19.WIL Design Phase Geotechnical Evaluation			IL	BORING: B-08				
	D D	esign l	Phas	e Geotechnical Evaluation	LOCATI	ON:	sket		
	30	00 Har	u La borv	riew Plaza	See all		SKCU	511	
	L	a Cros	se, V	Visconsin	DATE:	6/6/20	19	SCALE: 1" = 5'	
Elev. 646.3	Depth 0.0	USC Symł	CS bol	Description of Materials (ASTM D 2487/2488)	BPF V			Tests and Notes	
645.	5 0.8	GM	=_ _= 	<u>9" CONCRETE</u>		ł		Benchmark #1: Rim of the	
	_	SM	\bigotimes	SILTY SAND trace gravel, fine grained, bromoist, loose to medium dense.	own,	ł		understood elevation 646.0	
	_		\bigotimes	(Fill)		8		teet. PID = 0.0 ppm	
	_		\bigotimes			Ī			
-			\bigotimes			10		PID = 0.0 ppm	
639.3	8 6.5	an	\bigotimes						
_		SP SM	\bigotimes	<u>POORLY GRADED SAND with SIL1</u> tra gravel, fine to medium grained, brown, mois	ace at to wet,	5		PID = 0.0 npm	
637.	3 9.0		\bigotimes	loose. (Fill)				1 m = 0.0 ppm	
-		SP SM		POORLY GRADED SAND with SILT fir	ne		_		
	_	5101		grained, brown, water bearing loose. (Alluvium)		Å ′		PID = 0.0 ppm	
	_								
_	_					8		PID = 0.0 ppm	
_						l			
<u></u>	3 15.5	CD				11		PID = 0.0 ppm	
- 	_	SP		<u>POOKLY GRADED SAND</u> trace gravel, in medium grained, brown, water bearing, loose	e to	T			
				(Alluvium)		1			
				(i mu rum)		ł			
1.0	_							PID = 0.0 ppm	
	_					ł			
	_					ſ			
	_					ł			
						6		PID = 0.0 ppm	
ан						ł			
	_					ł			
	_					ſ			
						12		PID = 0.0 ppm	
<u> </u>	3 31.0			End of boring.		Δ 12		110 – 0.0 ppm	
0131.1	-			Water encountered during drilling below aro	ound 9'.				
	-			Bornig scaled upon completion.					
15131.19	WIL							B-08 page 1 of 1	



PROJECT: 15131.19.WIL Design Phase Geotechnical Evaluation					BORING: B-09			
	D	esign	Phas	e Geotechnical Evaluation	LOCAT	ON:	alrate	h
	P1 3(ropose)0 Hai	α La bory	Crosse Center Expansion & Renovation	See attached sketch			cn
	L	a Cros	se, V	Visconsin				
					DATE:	6/6/20	19	SCALE: $1'' = 5'$
Elev. 644.3	Depth 0.0	USC Sym	CS bol	Description of Materials (ASTM D 2487/2488)		BPF	WL	Tests and Notes
644.0	0.3	CD	≢ .≢ XX	$\frac{4'' \text{ ASPHALT}}{4'' \text{ ACCDECATE DAGE}}$	/_	ł		Benchmark #1: Rim of the
<u> </u>	0.7	SP SM		<u>4" AGGREGATE BASE</u> POORLY GRADED SAND with SILT fit	/	1		understood elevation 646.0
-				grained, light brown, moist, loose.		5		feet.
-			\boxtimes	(Fill)				PID = 0.0 ppm
<u> </u>			\bigotimes					
-) 9		PID = 0.0 ppm
- 637.8	6.5	CD	\bowtie	POOPLV CPADED SAND trace gravel f	ina ta	T		
-	_	SP		medium grained, brown, wet to water bearin	g, loose.	М 6	$\overline{\Sigma}$	PID = 10.0 nmm
-	_			(Alluvium)				PID = 10.0 ppin
<u> </u>	_			Water bearing below around 7.5'.				
-				6		5		PID = 0.0 ppm
_	_							
-	_							0.0
_	_					Å ⁸		PID = 0.0 ppm
	_					ł		
<u>n</u>						M 4		PID = 0.0 ppm
<u> </u>	_							ing on ppm
	_					ł		
	_			Grayish brown below 17.5'.		ł		
	_					ł		
						n V		DID = 0.0 nmm
5	_							$r_{\rm ID} = 0.0 \rm ppm$
	_					1		
	_					ł		
	_					1		
						7		
	_					∆ ′		PID = 0.0 ppm
616.0	<u>יז ד</u>					1		
		SP	·0 ·	POORLY GRADED SAND with GRAVE	EL	ł		
	_		0	medium to coarse grained, gray, water bearin	ng,	f		
				(Alluvium)				
613.3	31.0		0 .0			∆ 31		PID = 0.0 ppm
				End of boring. Water encountered during drilling below are	und			
				7.5'.	unu			
				Boring sealed upon completion.				
15131.19.	WIL							B-09 page 1 of 1



PROJE	CT: 15	5131.1	9.W	IL	BORING: B-10				
	D	esign	Phas	e Geotechnical Evaluation	LOCAT	ON:	alect	h	
	P1 3(opose)0 Hai	≿d La ∙bory	view Plaza	See au	ached	skett	n	
	L	a Cros	se, V	Visconsin		()()00	10		
					DATE:	6/6/20	19	SCALE: $1^{\circ} = 5^{\circ}$	
Elev. 656.3	Depth 0.0	USC Sym	CS bol	Description of Materials (ASTM D 2487/2488)		BPF	WL	Tests and Notes	
655.8	0.5	SM	= <u>-</u>	<u>6" CONCRETE</u>	doul:	ł		Benchmark #2: Rim of the	
	_	5111		SILTY SAND trace concrete, fine grained, a brown, moist, medium dense.	dark	1		intersection of 2nd and	
-	_			(Fill)		18		Pearl Streets, understood	
652.3	4.0		\bigotimes					PID = 0.0 ppm	
-		SM		SILTY SAND fine grained, brown, moist, n	nedium				
-			\bigotimes	(Fill)		16		PID = 0.0 ppm	
649.8	6.5	SP		POORLY GRADED SAND with SILT fin	ne	ſ			
-	_	SM		grained, brown, moist, medium dense.		10		PID = 0.0 ppm	
-	_			(Alluvium)					
-									
-	_							PID = 0.0 ppm	
	_								
-	_					10		PID = 0.0 ppm	
-	_								
_									
13/12/	_					12		PID = 0.0 ppm	
	17.5					I			
- 030.0	- 17.3	SP		POORLY GRADED SAND trace gravel, f	ine to	ł			
	_			medium grained, brown, wet to water bearin	g, loose	I			
				(Alluvium)			₽		
- -	_			Water bearing below around 20'.				PID = 0.0 ppm	
	_					1			
	_			Grayish brown below 22.5'.		ł			
× 7	_					1			
								DID = 0.0 npm	
	_							$r_{ID} = 0.0 \text{ ppin}$	
ц Т	_					1			
	_								
Cossi	_					1			
						10		PID = 0.0 nnm	
625.3	31.0			End of boring				1 m – 0.0 hhin	
131.15	_			Water encountered during drilling below aro	ound 20'.				
	_			Boring sealed upon completion.					
NDAH	_								
3 15131.19.V	VIL							B-10 page 1 of 1	



PROJE	ECT: 15	5131.19.W	П	BORING	b:		B-15
	D	esign Phas	se Geotechnical Evaluation	LOCATI	ON:	.1 .4	.1
	P1 3(oposed La	a Crosse Center Expansion & Renovation	See att	ached	sket	ch
	L	a Crosse. V	Wisconsin				
	1			DATE:	9/9/20	19	SCALE: 1" = 5'
Elev. 645.8	Depth	USCS Symbol	Description of Materials (ASTM D 2487/2488)		BPF	WL	Tests and Notes
645.3	0.5	5M XX	<u>6'' CONCRETE</u>		ł		Benchmark #3: Rim of the
644.3	1.5		SILTY SAND trace gravel, fine grained, brown of the second	own,	X		storm manhole, east of Boring B-7, understood
		SM 🕅	(Fill)		30		elevation 645.2 feet.
641.8	4.0		POORLY GRADED SAND with SILT tra	ice			
_		SP Š	moist, dense.	wii,			
		SM	(Fill)		6		
639.3	6.5	SD	POORLY GRADED SAND with SILT fin	ne Г	T		
	_	51	(Alluvium)		Ā 8		
			<u>POORLY GRADED SAND</u> trace gravel, f medium grained light brown moist to water	ine to			
			bearing, loose.				
			(Alluvium) Seam of silty sand around 7 5'		8		
			Sound of Shify Sund around 715 1		Ī		
					6		
629.8	16.0		Water bearing below 15'.		6	-	
			End of boring. Water encountered during drilling below are	und 15'			
			Boring sealed upon completion.	uliu 13.			
	_						
	_						
3 15131.19	WIL						B-15 page 1 of 1



PROJECT: 15131.19.WIL Design Phase Geotechnical Evaluation			IL	BORING: B-16				
	D	esign	Phas	e Geotechnical Evaluation	LOCAT	FION:	altat	
	P1 3(ropose)0 Hai	∞d La •borv	iew Plaza	See a	uached	skeu	cn
	L	a Cros	se, V	Visconsin				
					DATE	: 9/9/20	19	SCALE: 1" = 5'
Elev. 645.8	Depth 0.0	USC Sym	CS bol	Description of Materials (ASTM D 2487/2488)		BPF	WL	Tests and Notes
645.3	0.5	CD	=-	<u>_6'' CONCRETE</u>				Benchmark #3: Rim of the
	_	SP	\bigotimes	POORLY GRADED SAND with SILT fin	ne	16		storm manhole, east of Boring B-7 understood
			\bigotimes	(Fill)		1 25		elevation 645.2 feet.
641.8	4 0		\bigotimes	Trace brick encountered around 1.5'.				
		SP		POORLY GRADED SAND fine grained, l	ight	┤┨		
_				brown, moist to water bearing, loose.		X 4		
	_							
F	-			Fine to medium grained below 6.5°.				
	-					0		
F	-			Trace gravel below 9'.		I		
_				Medium to coarse grained below 9'.		7		
	_							
—	_					<u>ہ</u>		
_	_					Δ°		
_	_					I	$ $ ∇	
	16.0			Water bearing below 14.5'.		4		
₩ <u>029.8</u>	10.0			End of boring.		+		
00.00 	_			Water encountered during drilling below arc	ound			
	_			Boring sealed upon completion.				
0 2 2 2	_							
- LO								
N).GI	_							
	-							
	-							
N N N	-							
ANSI								
R EXI								
	-							
SSE C	-							
CHOC								
L (LA								
19.WI	-							
5131.	-							
	-							
	-							
o <u>⊢</u> 15131.19.	WIL						1	B-16 page 1 of 1



PROJ	ECT: 1:	5131.1	IL	BORING: B-17						
	D	esign	Phas	e Geotechnical Evaluation	LOCATI	[ON:	:			
	P	ropose	d La	Crosse Center Expansion & Renovation	See att	ache	ed ske	etch		
	30	JU Hai	borv	View Plaza					_	
			se, v	WISCONSIII	DATE:	9/9/2	2019		SCALE:	1'' = 5'
Elev.	Depth	USC Sym	CS bol	Description of Materials (ASTM D 2487/2488)		BP	PF W	L	Tests and	Notes
645.2	2/ 0.3/			<u>_4'' ASPHALT</u>				Be	enchmark #3:	Rim of the
644.7	0.8	SM		6" RECYCLED ASPHALT		2	2	sto	orm manhole,	east of
-644.3		SM	\bigotimes	4" AGGREGATE BASE	hroun		.	ele	evation 645.2	feet.
642.5	5/ 3.07	SP	\bigotimes	moist.	, biown,	Ň '	4			
	_	SM	\bigotimes	(Fill)		ł				
			\bigotimes	SILTY SAND fine grained, brown, moist, lo	oose.	$\overline{\mathbb{N}}$:	2			
639.0	6.5		\bigotimes	POORLY GRADED SAND with SILT fir	ne					
	-	SP		grained, light brown, moist, very loose to loo	ose.					
_	_			(Fill) Fina to modium grained below 4'		X	9			
-	_			Seam of silty clay around 5'.						
-				Trace glass around 5'.						
				POORLY GRADED SAND fine grained, 1	ight	∦ 1	0			
-				(Alluvium)		ł				
-	_			Fine to medium grained below 9'.		Ā 1	0			
_	_			Trace gravel below 9'.						
_	_			Medium to coarse grained below 14'.				7		
629 5	16.0			Water bearing below 15'.) 1	1	-		
	10.0			End of boring.		\square				
	_			Water encountered during drilling below aro	und 15'.					
	_			Boring seared upon completion.						
	_									
LD.()	_									
	_									
	_									
	_									
	_									
	_									
	_									
	-									
	-									
	-									
3 15131.19	.WIL								В	-17 page 1 of 1



PROJE	PROJECT: 15131.19.WIL Design Phase Geotechnical Evaluation				BORING: B-18							
	D	esign P	has	e Geotechnical Evaluation		LOCAT	ΊΟ	N:	.1 .4	1		
	P1 3(oposed 00 Harb	La	view Plaza		See at	tac	cned	skeu	n		
	L	a Crosse	e, V	Visconsin								
						DATE:	9/	9/20	19	SCALE: 1" = 5'		
Elev. 645.3	Depth 0.0	USCS Symbo	5 51	Description of Materials (ASTM D 2487/2488)	Materials 37/2488)			3PF	WL	Tests and Notes		
645.0	0.3/		= #	<u>3'' ASPHALT</u>		/[Benchmark #3: Rim of the		
-644.8	0.5	SM	\otimes	3.5" ASPHALT		/	1)	18		storm manhole, east of Boring B-7, understood		
_	.		\otimes	SILTY SAND trace gravel, fine grained, bro	ov	vn,	\square	7		elevation 645.2 feet.		
641.3	4.0	Ě	\bigotimes	moist, loose to medium dense.			\square					
_		SP	Ŵ	POORLY GRADED SAND with SILT tra	ac	e brick.						
<u> </u>		SM	\otimes	trace concrete, fine grained, brown, moist, lo	00	se.	Ň	6				
- 638.8	6.5	SD .	X	(Fill)		[-[
-		51		POORLY GRADED SAND fine grained, 1	lig	,ht	Ň	9				
-	_			brown, moist to water bearing, loose to medi	liu	m	\square					
-				(Alluvium)								
<u> </u>				Trace gravel below 9'.			Ň	6				
-				Aedium to coarse grained below 11.5'.								
-				We during the course granical below 11.5.				11				
-												
-												
629.3	16.0			Water bearing below 15'.			Ň	6				
<u> </u>				End of boring. Water encountered during drilling below are	201	nd 15'						
				Boring sealed upon completion.	Ju	iiu 1 <i>3</i> .						
	_											
	_											
	_											
	_											
	_											
	_											
	_											
	_											
	_											
	_											
₽ ₽	_											
	_											
5 15131.19.V	WIL									B-18 page 1 of 1		



Attachment 2:

1002-CPS-23 Division of Industry Services P. O. Box 2658 Madison, Wisconsin 53701 Scott Walker, Governor

SOIL AND SITE EVALUATION – STORM

In accordance with SPS 382.365, 385, Wis. Adm. Code, and WDNR Standard 1002

		Page <u>1</u> of <u>2</u>			
Attach a complete site plan on paper not less than 8 ½ x 11	inches in size.	County			
Plan must include, but not limited to: vertical and harizontal	reference point	La Crosse			
(BM), direction and percent of slope, scale or dimensions, n	orth arrow, and	Parcel I.D.			
BM referenced to nearest road		Reviewed by:			
Please print all information		Date:			
Personal information you provide may be used for secondary purposes [Privacy Law,	s. 15.04(1)(m)]				
Property Owner	Property Location				
La Crosse Center	Govt. Lot SW1/4 SE1/4	S 31 ⊺ 16 N R7 X(or)			
Property Owner' Mail Address	Lot # Block # Sul	bd. Name or CSM #			
300 Harborview Plaza					
City State Zip Code Phone Number	City Village	Town Nearest Road			
La Crosse WI 54601 608-789-7400	La Crosse	Harborview Plaza			
Drainage area 🔲 sq .ft 🛛 acres	Hydraulic Application Tes Method	t Soil Moisture Date of soil borings: <u>6/6/2019</u>			
Test site suitable for (check all that apply):	Morphologica				
☐ Bioretention; ☐ Subsurface Dispersal System;	Double Ring	⊠Normal = 2;			
Reuse; Irrigation; Other	Wet =				

	4
IK-	

#OBS. ☐ Pit ⊠ Boring Ground surface elevation. <u>644.5</u> ft. Elevation of limiting factor <u>637.5</u> ft.

Horizon	Depth in.	Dominant Color Munsell	Qu. Sz. Cont. Color	lexture	Gr. Sz. Sh.	Consistence	Boundary	% ROCK Frags.	% FINes	Rate Inches/Hr	
4" Aspł	4" Asphalt										
4" Aggregate Base											
1	8-24	10 yr 3/3		LS	0sg	ml	as	<10	15-25	1.63	
2	24-102	10 yr 4/3	Water encountered below 7'	fS	0sg	ml	gw	<10	5-15	0.50	
3	102-204	10 yr 4/3		s	0sg	ml	gw	<10	<10	3.60	
4	204-240	10 yr 4/2		s	0sg	ml		<10	<10	3.60	
Comme	Comments:										

B-2	#OBS	5. 🗌 Pit	Boring Ground	surface elevation. 644	1.6 _ft.	Elevation of lim	iting factor <u>63</u>	5 7.1 ft.				
Н	orizon	Depth	Dominant Color	Redox Description	Texture	Structure	Consistence	Boundary	% Rock	% Fines	Hydraulic App	
		in.	Munsell	Qu. Sz. Cont. Color		Gr. Sz. Sh.			Frags.		Rate Inches/Hr	
4"	Asph	alt										
4"	Aggre	egate B	ase									
1		7-24	10 yr 4/4		fS	0sg	ml	as	<10	5-15	0.50	
2		24-204	10 yr 4/4		s	0sg	ml	gw	<10	<15	3.60	
3		204-240	10 yr 4/2	Water encountered below 7.5'	s	0sg	ml		<10	<10	3.60	
С	ommen	ts:										
Ν	ame (Pl	ease Print	i)		Signa	ture		Credential Number				
	Frede	rick Schi	uster, PE						CS	<u>F 1356930</u>) / PE 46610	
A	ddress	and Avia	SW Opalaaka WI	54650		Date Evaluation Conducted				Telephone Number		
	10192	nu Ave.		54050		6/24/2019				608-782-5505		

SBD-10793 (R01/17)

WDNR September 2017

3-3 #OB	3S. 🗌 Pit	Boring Ground	surface elevation65	<u>5.6_</u> ft.	Elevation of lim	niting factor <u>63</u>	<u>6.1</u> ft.		Page	_2_of_2_
Horizon	Depth in	Dominant Color	Redox Description	Texture	Structure	Consistence	Boundary	% Rock	% Fines	Hydraulic App Rate Inches/Hr
6" Con		Morisei	Q0. 32. COM. COO		01, 52, 511,			riugs.		Kule inches/fil
1	6-18	10 yr 3/4		LS	0sg	ml	as	<10	15-25	1.63
2	18-174	10 yr 4/4		s	060	ml	0w	<10	5-15	3.60
3	174 240	10 yr 4/3	Water encountered below 19.5	s	0.00	ml	gw	<10	<10	3.60
0	174-240			0	USY			10	10	3.00
Comme	ents:									
	29 🗆 Dit	M Boring Ground	surface elevation 655	6 #	Elevation of lim	aiting factor 636	1 ft			
Horizon	Depth	Dominant Color	Redox Description	Texture	Structure	Consistence	Boundary	% Rock	% Fines	Hydraulic App
	in.	Munsell	Qu. Sz. Cont. Color		Gr. Sz. Sh.		,	Frags.		Rate Inches/Hr
6" Con	crete	I	I				1	1	1	1
1	6-54	10 yr 4/4		LS	0 f sg	ml	as	<10	15-25	1.63
2	54-102	10 yr 3/6		S	0 f sg	ml	gw	<10	5-15	3.60
3	102-174	10 yr 4/4	Water encountered below 19.5'	S	0 f sg	ml	gw	<10	5-15	3.60
4	174-240	10 yr 4/3		S	0 f sg	ml		<10	<10	3.60
Comme	ents:									
#OE	BS. 🗌 Pit	Boring Ground	surface elevation.	ft.	Elevation of lim	niting factor	ft.			
Horizon	Depth	Dominant Color	Redox Description	Texture	Structure	Consistence	Boundary	% Rock	% Fines	Hydraulic App
	in.	MUnsell	QU. SZ. CONT. COIOR		Gr. sz. sn.			Frags.		Rate Inches/Hr
Comme	ents:									
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#OE	3S. 🗌 Pit	Boring Ground	surface elevation.	ft.	Elevation of lim	niting factor	ft.		~ ~	I
Horizon	Depth in.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	lexture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frags.	% Fines	Hydraulic App Rate Inches/Hr
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Overall Site Comments:

SBD-10793 (R 7/17)

WDNR September 2017

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EXISTING DRAINAGE MAP

ARCHITECTURE + ENGINEERING + ENVIRONMENTAL + PLANNING www.ISGInc.com

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LA CROSSE CENTER LA CROSSE, WISCONSIN 10/10/2019 ISG Project No. 16-19990

Watershed	Surface Cover	Area (SF)	Area (AC)	Percent Impervious
	Impervious	20844	0.479	100%
DA-1	Pervious	0	0.000	
	Total	20844	0.479	
	Impervious	23150	0.531	100%
DA-2	Pervious	0	0.000	
	Total	23150	0.531	
	Impervious	3208	0.074	100%
DA-3	Pervious	0	0.000	
	Total	3208	0.074	
	Impervious	590	0.014	100%
DA-4	Pervious	0	0.000	
	Total	590	0.014	
	Impervious	3639	0.084	100%
DA-5	Pervious	0	0.000	
	Total	3639	0.084	
	Impervious	2614	0.060	92%
DA-6	Pervious	232	0.005	
	Total	2846	0.065	
	Impervious	16549	0.380	90%
DA-7	Pervious	1861	0.043	
	Total	18410	0.423	
	Impervious	5752	0.132	76%
DA-8	Pervious	1815	0.042	
	Total	7567	0.174	
	Impervious	13787	0.317	95%
DA-9	Pervious	786	0.018	
	Total	14573	0.335	
	Impervious	115310	2.647	100%
DA-10	Pervious	0	0.000	
	Total	115310	2.647	
	TOTAL IMPERV	lous	4.718	98%
	TOTAL PERVI	OUS	0.108	
	TOTAL ARE	Α	4.826	



REFERENCE SCALE 1 INCH = 50 FEET

100





19990 Existing Watersheds Prepared by ISG HydroCAD® 10.00-19 s/n 02403 © 2016 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area	CN	Description
(acres)		(subcatchment-numbers)
0.108	61	>75% Grass cover, Good, HSG B (6S, 7S, 8S, 9S)
0.172	98	Paved parking, HSG A (3S, 4S, 5S)
1.899	98	Paved roads w/curbs & sewers, HSG A (1S, 2S, 6S, 7S, 8S, 9S)
2.646	98	Roofs, HSG A (10S)
4.825	97	TOTAL AREA

Soil Listing (all nodes)

Area	Soil	Subcatchment
(acres)	Group	Numbers
4.717	HSG A	1S, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S, 10S
0.108	HSG B	6S, 7S, 8S, 9S
0.000	HSG C	
0.000	HSG D	
0.000	Other	
4.825		TOTAL AREA

19990 Existing Watersheds	
Prepared by ISG	Printed 11/14/2019
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			Ground C		loues		
HSG-A	HSG-B	HSG-C	HSG-D	Other	Total	Ground	Subcatchment
 (acres)	(acres)	(acres)	(acres)	(acres)	(acres)	Cover	Numbers
0.000	0.108	0.000	0.000	0.000	0.108	>75% Grass cover, Good	6S,
							7S,
							8S,
							9S
0.172	0.000	0.000	0.000	0.000	0.172	Paved parking	3S,
							4S,
							5S
1.899	0.000	0.000	0.000	0.000	1.899	Paved roads w/curbs & sewers	1S,
							2S,
							6S,
							7S,
							85
							9S
2.646	0.000	0.000	0.000	0.000	2.646	Roofs	10
	0.000	0.000		0.000			S
4.717	0.108	0.000	0.000	0.000	4.825	TOTAL AREA	

Ground Covers (all nodes)

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points Runoff by SCS TR-20 method, UH=SCS, Weighted-Q Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Page 5

Subcatchment 1S: DA-1	Flow Length=781'	Runoff Area=0.4 Slope=0.0030 '/'	79 ac 1 Tc=11.7	100.009 7 min	% Imperv CN=98	rious Runol	Runoff D ff=1.45 c	epth>2.38 fs_0.095 a
Subcatchment 2S: DA-2	Flow Length=781'	Runoff Area=0.53 Slope=0.0026 '/'	31 ac 1 Tc=12.6	100.009 6 min	% Imperv CN=98	rious Runol	Runoff D ff=1.57 c)epth>2.38 fs_0.105 a
Subcatchment 3S: DA-3		Runoff Area=0.03	74 ac 1 Tc=5.0	100.009 0 min	% Imperv CN=98	rious Runot	Runoff D ff=0.27 c	epth>2.38 fs_0.015 a
Subcatchment 4S: DA-4		Runoff Area=0.07	14 ac 1 Tc=5.0	100.009 0 min	% Imperv CN=98	rious Runoi	Runoff D ff=0.05 c)epth>2.38 fs_0.003 a
Subcatchment 5S: DA-5		Runoff Area=0.08	84 ac 1 Tc=5.0	100.009 0 min	% Imperv CN=98	rious Runot	Runoff D ff=0.31 c	epth>2.38 fs_0.017 a
Subcatchment 6S: DA-6		Runoff Area=0.0	065 ac Tc=5.0	92.319 min C	% Imperv CN=WQ	rious Runot	Runoff D ff=0.22 c)epth>2.21 fs_0.012 a
Subcatchment 7S: DA-7		Runoff Area=0.4	423 ac Tc=5.0	89.839 min C	% Imperv CN=WQ	rious Runoi	Runoff E ff=1.42 c	0epth>2.16 fs_0.076 a
Subcatchment 8S: DA-8		Runoff Area=0.	174 ac Tc=5.0	75.86° min C	% Imperv CN=WQ	rious Runoi	Runoff D ff=0.50 c	0epth>1.86 fs_0.027 a
Subcatchment 9S: DA-9		Runoff Area=0.3	335 ac Tc=5.0	94.639 min C	% Imperv CN=WQ	rious Runot	Runoff D ff=1.18 c)epth>2.26 fs_0.063 a
Subcatchment 10S: DA-1	0	Runoff Area=2.64	46 ac 1 Tc=10.0	100.009 0 min	% Imperv CN=98	rious Runot	Runoff D ff=8.44 c	epth>2.38 fs_0.524 a
Reach 1R: Existing Runo	ff				С	Inflow outflow	=14.67 c =14.67 c	fs 0.936 a fs 0.936 a
Total Run	off Area = 4.825	ac Runoff Volu	me = 0.9	936 af	Avera	ge Ru	noff De	oth = 2.33

2.24% Pervious = 0.108 ac 97.76% Impervious = 4.717 ac

Summary for Subcatchment 1S: DA-1

Runoff = 1.45 cfs @ 12.03 hrs, Volume= 0.095 af, Depth> 2.38"



Summary for Subcatchment 2S: DA-2

Runoff = 1.57 cfs @ 12.04 hrs, Volume= 0.105 af, Depth> 2.38"



Summary for Subcatchment 3S: DA-3

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.27 cfs @ 11.95 hrs, Volume= 0.015 af, Depth> 2.38"



Summary for Subcatchment 4S: DA-4

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.05 cfs @ 11.95 hrs, Volume= 0.003 af, Depth> 2.38"



19990 Exis Prepared by <u>HydroCAD® 1</u>	ting V / ISG 10.00-19	Vatershed	S © 2016 Hyd	IroCAD Software	Solutions LLC	Type II 24-hr	1-yr Rair Printed	1 fall=2.61 " 11/14/2019 Page 10
		5	Summary	for Subcatch	ment 5S: D	DA-5		
[49] Hint: Tc∢	<2dt ma	ay require sr	naller dt					
Runoff =		0.31 cfs @	11.95 hrs,	Volume=	0.017 af,	Depth> 2.38"		
Runoff by SC Type II 24-hr	CS TR-2	20 method, l ainfall=2.61	UH=SCS, V "	Veighted-Q, Time	e Span= 0.00	0-24.00 hrs, dt=	= 0.05 hrs	
Area (ac)	CN	Descriptio	on					
0.084	98	Paved pa	rking, HSG	А				
0.084		100.00%	Impervious	Area				



Subcatchment 5S: DA-5



Summary for Subcatchment 6S: DA-6

[49] Hint: Tc<2dt may require smaller dt

Runoff 0.22 cfs @ 11.95 hrs, Volume= 0.012 af, Depth> 2.21" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 1-yr Rainfall=2.61"

_	Area (ac)	CN	Desc	ription		
	0.060	98	Pave	d roads w	/curbs & se	ewers, HSG A
	0.005	61	>75%	6 Grass co	over, Good,	I, HSG B
	0.065		Weig	hted Aver	age	
	0.005		7.699	% Perviou	s Ārea	
	0.060		92.31	I% Imperv	vious Area	
	Tc Leng (min) (fe	jth S et)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
	FO					Direct Entry



Direct Entry,

Subcatchment 6S: DA-6



Summary for Subcatchment 7S: DA-7

[49] Hint: Tc<2dt may require smaller dt

0-

0 1 2

3

4 5 6 7 8

9 10

Runoff = 1.42 cfs @ 11.95 hrs, Volume= 0.076 af, Depth> 2.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 1-yr Rainfall=2.61"

Area (ac) C	CN Des	cription								
0.380	98 Pav	ed roads w	/curbs & se	wers,	HSG A					
0.043	61 >75	% Grass co	over, Good	HSG	В					
0.423	Wei	ghted Aver	age							
0.043	10.1	7% Pervio	us Area							
0.380	89.8	3% Imperv	∕ious Area							
			- ·	_						
Tc Length	Slope	Velocity	Capacity	Desc	ription					
(min) (feet)	(ft/ft)	(ft/sec)	(cts)							
5.0				Direc	t Entry,					
			0							
			Subcate	cnme	nt 75: I	JA-1				
			Hydro	graph						
				42 cfs						
-							Tvi	oe II	24-hr	
							·)	_		
-						1-yr	Rain	tall=	-2.61	
					Ru	inoff	Area	=0.4	23 ac	
1-					Rund	off Vo	olume	e=0.0	076 af	
(s)						.	£6 D			
						Runo	DTT De	ptn>	2.16	
NOL I							T	c=5.	0 min	
								U	vvv	

11 12 13 14 15 16 17 18 19 20 21 22 23 24 Time (hours)

Summary for Subcatchment 8S: DA-8

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.50 cfs @ 11.95 hrs, Volume= 0.027 af, Depth> 1.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 1-yr Rainfall=2.61"

Area	(ac)	CN	Desc	ription							
0.	132	98	Pave	Paved roads w/curbs & sewers, HSG A							
0.	042	61	>75%	6 Grass co	over, Good,	, HSG B					
0.	174		Weig	hted Aver	age						
0.	042		24.14	4% Pervio	us Area						
0.	132		75.86	5% Imperv	vious Area						
-					A						
IC	Lengt	h S	Slope	Velocity	Capacity	Description					
(min)	(fee	t)	(ft/ft)	(ft/sec)	(cfs)						
5.0						Direct Entry,					

Subcatchment 8S: DA-8



Summary for Subcatchment 9S: DA-9

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.18 cfs @ 11.95 hrs, Volume= 0.063 af, Depth> 2.26"

Area (ac)	CN	Descr	ription				
0.317	98	Paveo	d roads w	/curbs & se	ewers, HSG A		
0.018	61	>75%	Grass co	over, Good	, HSG B		
0.335		Weigł	hted Aver	age			
0.018		5.37%	6 Perviou	s Ārea			
0.317		94.63	% Imperv	vious Area			
Tc Leng (min) (fe	gth et)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description		
5.0					Direct Entry,		
				Subcate	chment 9S: D	DA-9	
				Hyaro	grapn		
					1.18 cfs	Type II 24-hr	Runoff



Summary for Subcatchment 10S: DA-10

Runoff = 8.44 cfs @ 12.01 hrs, Volume= 0.524 af, Depth> 2.38"

Area (ac) CN Description	
2.646 98 Roofs, HSG A	
2.646 100.00% Impervious Area	
Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs)	
10.0 Direct Entry,	
Subcatchment 10S: DA-10	
Hydrograph	
9 Type II 24-hr 1-yr Rainfall=2.61" Runoff Area=2.646 ac Runoff Volume=0.524 af 6 6 7 6 7 6 7	Runoff
0 ⁻¹ 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 Time (hours)	

Summary for Reach 1R: Existing Runoff

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	a =	4.825 ac, 9	7.76% Imp	ervious,	Inflow Dep	th > 2.3	33" for	1-yr event
Inflow	=	14.67 cfs @	11.99 hrs,	Volume	= 0	.936 af		
Outflow	=	14.67 cfs @	11.99 hrs,	Volume	= 0	.936 af,	Atten= 0	%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs



Reach 1R: Existing Runoff

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points Runoff by SCS TR-20 method, UH=SCS, Weighted-Q Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: DA-1	Flow Length=781'	Runoff Area=0.4 Slope=0.0030 '/'	79 ac Tc=11	100.00 .7 min	% Imperv CN=98	/ious Runo ⁻	Runoff E ff=1.68 c)epth>2.78" fs_0.111 af
Subcatchment 2S: DA-2	Flow Length=781'	Runoff Area=0.5 Slope=0.0026 '/'	31 ac Tc=12	100.00 2.6 min	% Imper\ CN=98	/ious Runo ⁻	Runoff E ff=1.82 c)epth>2.78" fs_0.123 af
Subcatchment 3S: DA-3		Runoff Area=0.0	74 ac Tc=5	100.00 5.0 min	% Imper\ CN=98	/ious Runo	Runoff E ff=0.32 c)epth>2.79" :fs_0.017 af
Subcatchment 4S: DA-4		Runoff Area=0.0	14 ac Tc=5	100.00 5.0 min	% Imper\ CN=98	/ious Runo	Runoff E ff=0.06 c)epth>2.79" fs_0.003 af
Subcatchment 5S: DA-5		Runoff Area=0.0	84 ac Tc=5	100.00 5.0 min	% Imper\ CN=98	/ious Runo	Runoff E ff=0.36 c)epth>2.79" fs_0.020 af
Subcatchment 6S: DA-6		Runoff Area=0.	.065 ac Tc=5.(92.31) min (% Imper\ CN=WQ	/ious Runo	Runoff E ff=0.26 c)epth>2.60" fs_0.014 af
Subcatchment 7S: DA-7		Runoff Area=0.	423 ac Tc=5.0	89.83) min (% Imper\ CN=WQ	/ious Runo	Runoff E ff=1.66 c)epth>2.54" sfs_0.090 af
Subcatchment 8S: DA-8		Runoff Area=0.	174 ac Tc=5.0	75.86) min (% Imper\ CN=WQ	/ious Runo	Runoff E ff=0.59 c)epth>2.20" fs_0.032 af
Subcatchment 9S: DA-9		Runoff Area=0.	.335 ac Tc=5.(94.63) min (% Imper\ CN=WQ	/ious Runo	Runoff E ff=1.37 c)epth>2.66" ;fs_0.074 af
Subcatchment 10S: DA-1	0	Runoff Area=2.6	46 ac Tc=10	100.00).0 min	% Imper\ CN=98	/ious Runo ⁻	Runoff E ff=9.80 c)epth>2.78" ;fs_0.614 af
Reach 1R: Existing Runo	ff				С	Inflow)utflow	=17.07 c =17.07 c	fs 1.098 af fs 1.098 af
Total Rur	off Area = 4.825	ac Runoff Volu	me = 1	. 09 8 at	f Avera	ge Ru	noff De	pth = 2.73"

2.24% Pervious = 0.108 ac 97.76% Impervious = 4.717 ac

Summary for Subcatchment 1S: DA-1

Runoff = 1.68 cfs @ 12.03 hrs, Volume= 0.111 af, Depth> 2.78"



Summary for Subcatchment 2S: DA-2

Runoff = 1.82 cfs @ 12.04 hrs, Volume= 0.123 af, Depth> 2.78"



Summary for Subcatchment 3S: DA-3

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.32 cfs @ 11.95 hrs, Volume= 0.017 af, Depth> 2.79"



Summary for Subcatchment 4S: DA-4

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.06 cfs @ 11.95 hrs, Volume= 0.003 af, Depth> 2.79"



[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.36 cfs @ 11.95 hrs, Volume= 0.020 af, Depth> 2.79"


Summary for Subcatchment 6S: DA-6

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.26 cfs @ 11.95 hrs, Volume= 0.014 af, Depth> 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 2-yr Rainfall=3.02"

Area (a	ac)	CN	Desc	ription		
0.0	60	98	Pave	d roads w	/curbs & se	ewers, HSG A
0.0	05	61	>75%	6 Grass co	over, Good,	, HSG B
0.0	65		Weig	hted Aver	age	
0.0	05		7.69	% Perviou	s Ārea	
0.0	60		92.31	I% Imperv	vious Area	
Tc (min)	Length (feet)	n S) (lope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0						Direct Entry,

Subcatchment 6S: DA-6



Summary for Subcatchment 7S: DA-7

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.66 cfs @ 11.95 hrs, Volume= 0.090 af, Depth> 2.54"

0.380 98 Paved roads w/curbs & sewers, HSG A 0.043 61 >75% Grass cover, Good, HSG B 0.423 Weighted Average 0.423 Weighted Average 0.423 Weighted Average 0.423 Weighted Average 0.423 Weighted Average 0.423 Using the environment of the	Ar	ea (a	ac)	CN	De	escr	iption															
0.043 61 >75% Grass cover, Good, HSG B 0.423 Weighted Average 0.043 10.17% Pervious Area 0.380 89.83% Impervious Area Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs) 5.0 Direct Entry, Subcatchment 7S: DA-7 Hydrograph Type II 24-hr 2-yr Rainfall=3.02" Runoff Area=0.423 ac Runoff Volume=0.090 af Runoff Depth>2.54" Tc=5.0 min CN=WQ 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24		0.3	80	98	Pa	aved	road	s w	/curb	os & s	sewer	s, H	SG	А								
0.423 Weighted Average 0.043 10.17% Pervious Area 0.380 89.83% Impervious Area Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs) 5.0 Direct Entry, Subcatchment 7S: DA-7 Hydrograph Type II 24-hr 2-yr Rainfall=3.02" Runoff Area=0.423 ac Runoff Volume=0.090 af Runoff Depth>2.54" Tc=5.0 min CN=WQ 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24		0.0	43	61	>7	75%	Grass	s co	over,	Goo	d, HS	ŚВ										
0.043 10.17% Pervious Area 0.380 89.83% Impervious Area Tc Length Slope Velocity Capacity Description (min) (feet) (ft/fsec) (cfs) 5.0 Direct Entry, Subcatchment 7S: DA-7 Hydrograph Type II 24-hr 2-yr Rainfall=3.02" Runoff Area=0.423 ac Runoff Volume=0.090 af Runoff Depth>2.54" Tc=5.0 min CN=WQ		0.4	23		W	eigh	nted A	ver	age													
0.380 89.83% Impervious Area <u>Tc Length</u> Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs) 5.0 Direct Entry, Subcatchment 7S: DA-7 Hydrograph Type II 24-hr 2-yr Rainfall=3.02" Runoff Area=0.423 ac Runoff Volume=0.090 af Runoff Depth>2.54" Tc=5.0 min CN=WQ		0.0	43		10).17º	% Per	viou	us A	rea												
Tc Length (feet) Slope (th/ft) Velocity (th/sec) Description (cfs) 5.0 Direct Entry, Subcatchment 7S: DA-7 Hydrograph Type II 24-hr Of the second of the se		0.3	80		89	9.839	% Imp	erv	ious	Area	1											
Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs) 5.0 Direct Entry, Subcatchment 7S: DA-7 Hydrograph Type II 24-hr 2-yr Rainfall=3.02" Runoff Area=0.423 ac Runoff Volume=0.090 af Runoff Depth>2.54" Tc=5.0 min CN=WQ																						
(min) (feet) (ft/ft) (ft/sec) (cfs) 5.0 Direct Entry, Subcatchment 7S: DA-7 Hydrograph Type II 24-hr 2-yr Rainfall=3.02" Runoff Area=0.423 ac Runoff Volume=0.090 af Runoff Depth>2.54" Tc=5.0 min CN=WQ	-	Tc	Leng	th	Slop	e '	Veloci	ity	Cap	pacity	/ Des	scrip	otio	n								
5.0 Direct Entry, Subcatchment 7S: DA-7 Hydrograph Type II 24-hr 2-yr Rainfall=3.02'' Runoff Area=0.423 ac Runoff Volume=0.090 af Runoff Depth>2.54'' Tc=5.0 min CN=WQ	(mi	n)	(fee	et)	(ft/f	t)	(ft/se	c)		(cfs)											
Purpose of the second s	5	5.0									Dir	ect	Ent	t ry ,								
Subcatchment 7S: DA-7 Hydrograph Type II 24-hr 2-yr Rainfall=3.02" Runoff Area=0.423 ac Runoff Volume=0.090 af Runoff Depth>2.54" Tc=5.0 min CN=WQ									-							_						
Wydrograph Wydrograph Type II 24-hr 2-yr Rainfall=3.02" Runoff Area=0.423 ac Runoff Volume=0.090 af Runoff Depth>2.54" Tc=5.0 min CN=WQ									Su	ibca	tchm	ent	t 79	S: [DA-	7						
Type II 24-hr 2-yr Rainfall=3.02" Runoff Area=0.423 ac Runoff Volume=0.090 af Runoff Depth>2.54" Tc=5.0 min CN=WQ										Hyd	rograph	۱										
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Image: Second		-										_				, , ,						
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0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 Time (hours)																						
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		0	1 2	23	4	5	67	8	9	10 1 Ti	1 12 me (hou	13 ⁻ I rs)	14	15	16	17	18	19 2	0 21	22	23 24	

Summary for Subcatchment 8S: DA-8

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.59 cfs @ 11.95 hrs, Volume= 0.032 af, Depth> 2.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 2-yr Rainfall=3.02"

Area (a	ic) (CN	Desc	ription		
0.13	32	98	Pave	ed roads w	/curbs & se	ewers, HSG A
0.04	42	61	>75%	6 Grass co	over, Good,	, HSG B
0.17	74		Weig	hted Aver	age	
0.04	42		24.14	4% Pervio	us Area	
0.13	32		75.86	5% Imperv	vious Area	
Tc L (min)	_ength (feet)	Sl (1	ope ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0						Direct Entry,

Subcatchment 8S: DA-8



Summary for Subcatchment 9S: DA-9

[49] Hint: Tc<2dt may require smaller dt

Flow (cfs)

0-

0 1 2

3

4 5 6 7 8

9 10

Runoff = 1.37 cfs @ 11.95 hrs, Volume= 0.074 af, Depth> 2.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 2-yr Rainfall=3.02"

<u></u>	CN D	escription						
0.317	98 P	aved roads w	/curbs & se	ewers, HS <mark>G</mark> /	۹			
0.018	61 >	75% Grass c	over, Good	, HSG B				
0.335	V	/eighted Ave	rage					
0.018	5	.37% Perviou	s Area					
0.317	9	4.63% Imperv	∕ious Area					
To leng	ith Sloi	ne Velocity	Canacity	Description				
(min) (fee	et) (ft/	ft) (ft/sec)	(cfs)	Decemption				
5.0		, , ,		Direct Entr	у,			
			Subcate	chmont QS	• חΔ_9			
			Hydro	graph	. DA-3			
			Hydro	graph	2-yr	Type II Rainfall=	24-hr =3.02"	Runoff
			Hydro	graph	2-yr Runoff	Type II Rainfall= Area=0.3	24-hr =3.02" 335 ac	Runoff

Runoff Depth>2.66"

11 12 13 14 15 16 17 18 19 20 21 22 23 24 Time (hours)

Tc=5.0 min

CN=WQ

Summary for Subcatchment 10S: DA-10

Runoff = 9.80 cfs @ 12.01 hrs, Volume= 0.614 af, Depth> 2.78"

Area (a	c) CN Description	
2.6	6 98 Roofs, HSG A	
2.6	6 100.00% Impervious Area	
Tc (min)	ength Slope Velocity Capacity Description (feet) (ft/ft) (ft/sec) (cfs)	
10.0	Direct Entry,	
	Subcatchment 10S: DA-10	
	Hydrograph	
1		off
10	Type II 24-hr	
9	2-vr Rainfall=3.02"	
8	Runoff Area=2.646 ac	
7	Runoff Volume=0.614 af	
(cts)	Runoff Depth>2.78"	
Elow	Tc=10.0 min	
4	CN=98	
3		
2		
1		
Ó	2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 Time (hours)	

Summary for Reach 1R: Existing Runoff

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	a =	4.825 ac, 9	7.76% Imp	ervious,	Inflow Dep	oth > 2.	73" for	2-yr	event
Inflow	=	17.07 cfs @	11.99 hrs,	Volume	= '	1.098 af			
Outflow	=	17.07 cfs @	11.99 hrs,	Volume	= '	1.098 af,	Atten=	0%,	Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs



Reach 1R: Existing Runoff

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points Runoff by SCS TR-20 method, UH=SCS, Weighted-Q Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: DA-1	Flow Length=781'	Runoff Area=0.4 Slope=0.0030 '/'	79 ac Tc=11	100.00 .7 min	0% Imperv CN=98	/ious Runo	Runoff E ff=2.52 c)epth>4.24 fs_0.169 ≀	4" af
Subcatchment 2S: DA-2	Flow Length=781'	Runoff Area=0.5 Slope=0.0026 '/'	31 ac Tc=12	100.00 2.6 min	0% Imperv CN=98	/ious Runo	Runoff E ff=2.72 c)epth>4.24 fs 0.187 a	4" af
Subcatchment 3S: DA-3		Runoff Area=0.0)74 ac Tc=5	100.00 5.0 min	0% Imperv CN=98	/ious Runo	Runoff E ff=0.48 c)epth>4.24 ;fs_0.026 a	4" af
Subcatchment 4S: DA-4		Runoff Area=0.0	14 ac Tc=5	100.00 5.0 min	0% Imperv CN=98	/ious Runo	Runoff E ff=0.09 c)epth>4.24 ;fs_0.005 ;	4" af
Subcatchment 5S: DA-5		Runoff Area=0.0	084 ac Tc=5	100.00 5.0 min	0% Imperv CN=98	/ious Runo	Runoff E ff=0.54 c)epth>4.24 ;fs_0.030 a	4" af
Subcatchment 6S: DA-6		Runoff Area=0	.065 ac Tc=5.0	92.31) min	% Imperv CN=WQ	/ious Runo	Runoff [ff=0.40 c)epth>4.00 ;fs_0.022)" af
Subcatchment 7S: DA-7		Runoff Area=0	.423 ac Tc=5.(89.83) min	% Imperv CN=WQ	/ious Runo	Runoff [ff=2.52 c)epth>3.92 ;fs_0.138 ;	<u>2</u> " af
Subcatchment 8S: DA-8		Runoff Area=0	.174 ac Tc=5.(75.86) min	6% Imperv CN=WQ	/ious Runo	Runoff E ff=0.92 c)epth>3.48 ;fs 0.050 a	3" af
Subcatchment 9S: DA-9		Runoff Area=0	.335 ac Tc=5.(94.63) min	% Imperv CN=WQ	/ious Runo	Runoff E ff=2.07 c)epth>4.07 ;fs_0.114 ;	7" af
Subcatchment 10S: DA-1	10	Runoff Area=2.6	646 ac Tc=10.0	100.00 0 min	0% Imperv CN=98	/ious Runoff	Runoff [=14.65 c)epth>4.24 ;fs_0.934 ;	4" af
Reach 1R: Existing Runc	off				C	Inflow Dutflow	/=25.63 c /=25.63 c	;fs 1.676 a ;fs 1.676 a	af af
Total Ru	ooff Area = 4.825	ac Runoff Volu	ıme = 1	676 a	f Avera	ae Ru	noff De	oth = 4.17	7"

Total Runoff Area = 4.825 ac Runoff Volume = 1.676 af Average Runoff Depth = 4.17" 2.24% Pervious = 0.108 ac 97.76% Impervious = 4.717 ac

Summary for Subcatchment 1S: DA-1

Runoff = 2.52 cfs @ 12.03 hrs, Volume= 0.169 af, Depth> 4.24"



Summary for Subcatchment 2S: DA-2

Runoff = 2.72 cfs @ 12.04 hrs, Volume= 0.187 af, Depth> 4.24"



19990 Existing Watersheds Prepared by ISG HydroCAD® 10.00-19_s/n 02403_© 2016 HydroCAD Software Solu	Type II 24-hr 10-yr Rainfall=4.48' Printed 11/14/2019 utions LLC Page 32												
Summary for Subcatchment 3S: DA-3													
[49] Hint: Tc<2dt may require smaller dt													
Runoff = 0.48 cfs @ 11.95 hrs, Volume= 0	0.026 af, Depth> 4.24"												



Runoff = 0.09 cfs @ 11.95 hrs, Volume= 0.005 af, Depth> 4.24"



19990 Existing Watersheds	Type II 24-hr 10-yr Rainfall=4.48" Printed 11/14/2019
HydroCAD® 10.00-19 s/n 02403 © 2016 HydroCAD Software Solutions LI	<u>.C Page 34</u>
Summary for Subcatchment 5S:	DA-5
[49] Hint: Tc<2dt may require smaller dt	
Runoff = 0.54 cfs @ 11.95 hrs, Volume= 0.030 af	Depth> 4.24"
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0. Type II 24-hr 10-yr Rainfall=4.48"	00-24.00 hrs, dt= 0.05 hrs
Area (ac) CN Description	
0.084 98 Paved parking, HSG A	
0.084 100.00% Impervious Area	
Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs)	
5.0 Direct Entry,	
Subcatchment 5S: DA-5	
Hydrograph	
0.6	Runoff
0.55	Type II 24-hr
0.5-10_vr	Painfall=4 48"
0.45	
	Area=0.084 ac
Runoff Ve	olume=0.030 af
الله الله الله الله الله الله الله الله	ff Depth>4.24"
	Tc=5.0 min

CN=98

10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 Time (hours)

0.25

0.2-0.15 0.1-0.05 0-0

2

3

1

4 5

7

8 9

6

Summary for Subcatchment 6S: DA-6

[49] Hint: Tc<2dt may require smaller dt

0.40 cfs @ 11.95 hrs, Volume= 0.022 af, Depth> 4.00" Runoff =

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 10-yr Rainfall=4.48"

Area (ac)	CN	Desc	ription				
0.060	98	Pave	d roads w	/curbs & se	wers, HSG A		
0.005	61	>75%	Grass co	over, Good,	HSG B		
0.065		Weig	hted Aver	age			
0.005		7.69%	6 Pervious	s Ārea			
0.060		92.31	% Imperv	ious Area			
Tc Lenç (min) (fe	gth S	Slope	Velocity	Capacity	Description		
<u> (IIIII) (IE</u>	01	(1011)	(10360)	(013)	Direct Entry		—



Direct Entry,

Subcatchment 6S: DA-6



Summary for Subcatchment 7S: DA-7

[49] Hint: Tc<2dt may require smaller dt

Runoff = 2.52 cfs @ 11.95 hrs, Volume= 0.138 af, Depth> 3.92"

Ar	ea (a	ac)	CN	I D)esc	ripti	on																
	0.3	80	98	3 P	ave	d ro	ads	w/ci	urbs	& se	wer	s⊢	ISC	iΑ									
	0.0	43	61	, . >	75%	6 Gr	225	COV	er G	and	HS	G B											
	0.0	-0 -02	0	 	Voia	ubtor	4 0.00	oroc		000,	, 110		, 										
	0.4	23 49		V A		70/ r		erag	je Ara	_													
	0.0	43		1	0.1	/%) h	Pervi	ous	Are	а													
	0.3	80		8	9.8	3% I	mpe	rvio	us A	rea													
	_										_												
-	TC	Leng	th	Slo	pe	Vel	locity	/ C	Capa	city	De	scri	ptic	n									
(mi	n)	(fee	et)	(ft/	′ft)	(ft	/sec)	(0	cfs)													
5	5.0										Dir	ect	En	try,									
								ę	Sub	cato	chm	nen	t 7	S: I		-7							
									F	lydro	grap	h											
	/									-													
	-																						Runoff
	-									2	2.52 cfs							_					
																		l y	pe	II 24	4-h	r	
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	0	1	2 3	8 4	5	6	7	8 9	9 10	11 Time	12 e (hoi	13 u rs)	14	15	16	17	18	19 2	20 2	1 22	23	24	
											•												

Summary for Subcatchment 8S: DA-8

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.92 cfs @ 11.95 hrs, Volume= 0.050 af, Depth> 3.48"

Area (ac)		V Des	scriptio	on										
0.132	98	8 Pav	ved roa	ads w	/curbs 8	sewers.	HSC	λA						
0.042	6	1 >75	5% Gra	ass co	over. Go	od. HSG	В							
0 174		We	ighted	Aver	ade	, -								
0.042		24	14% F	Pervio	us Area									
0.012		75	86% Ir	mperv	vious Are	a								
0.102		10.	00/01	nport	10007410									
Tc Le	nath	Slope	e Velo	ocitv	Capaci	tv Desc	riptic	n						
(min) (1	feet)	(ft/ft)) (ft/	sec)	(cf	s)								
50		(1211)	((4	/	(Dire	t En	trv						
0.0								,						
					Subc	atchme	nt 8	S: D	A-8					
					Ну	drograph								
1-														Runoff
						0.92 cfs				-		. 11 2	1	
											ype		4-111	
								1	0-vi	' Ra	infa	ll=4	.48"	
								D						
								RU	ΠΟΠ		ea=u	J.174	4 ac	
							Rı	ino	ffV	olur	ne=	0.05	i0 af	
(s														
(ct								К	unc)tt L)ept	:n>3	.48"	
Ň											Tr=	=5 0	min	
ш.											10	0.0		
-												CN=	:WQ	
					hand		TT	m						
0														
0 1	2 3	3 4 5	5 6	7 8	9 10	11 12 13 Time (hours	14	15 1	6 17	18 19	9 20	21 22	23 24	
						(nouis	1							

Summary for Subcatchment 9S: DA-9

[49] Hint: Tc<2dt may require smaller dt

Runoff = 2.07 cfs @ 11.95 hrs, Volume= 0.114 af, Depth> 4.07"

Area (ac) CN Description	
0.317 98 Paved roads w/curbs & sewers. HSG A	
0.018 61 >75% Grass cover, Good, HSG B	
0.335 Weighted Average	
0.018 5.37% Pervious Area	
0.317 94.63% Impervious Area	
Tc Length Slope Velocity Capacity Description	
(min) (feet) (ft/ft) (ft/sec) (cfs)	
5.0 Direct Entry,	
Subcatchment 9S: DA-9	
Hydrograph	
	Runoff
10-yr Rainfall=4.48"	
Runoff Area=0.335 ac	
Runon volume=0.114 ai	
෪ Runoff Depth>4.07"	
[§] . Tc=5.0 min	
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24	
Time (hours)	

Summary for Subcatchment 10S: DA-10

Page 39

Runoff 14.65 cfs @ 12.01 hrs, Volume= 0.934 af, Depth> 4.24" =

Area (ac) CN Description	
2.646 98 Roofs, HSG A	
2.646 100.00% Impervious Area	
Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs)	
10.0 Direct Entry,	
Subcatchment 10S: DA-10	
Hydrograph	
16-1	Runoff
14 Type II 24-hr	
13 10-yr Rainfall=4.48"	
¹² Runoff Area=2 646 ac	
$\frac{11}{11} = \frac{11}{11}$	
້ອ Aunoff Deptn>4.24"	
ê [*] ₇ Tc=10.0 min	
6 CN=98	
5	
4	
3	
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 Time (hours)	

Summary for Reach 1R: Existing Runoff

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	a =	4.825 ac, 9	7.76% Imp	ervious,	Inflow Depth >	4.1	7" for 10-	-yr event
Inflow	=	25.63 cfs @	11.99 hrs,	Volume	= 1.676	af		
Outflow	=	25.63 cfs @	11.99 hrs,	Volume	= 1.676	af,	Atten= 0%,	Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs



Reach 1R: Existing Runoff

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points Runoff by SCS TR-20 method, UH=SCS, Weighted-Q Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: DA-1	Flow Length=781'	Runoff Area=0.4 Slope=0.0030 '/'	79 ac Tc=11	100.00 .7 min	% Imperv CN=98	/ious Runo	Runoff [ff=4.27 c)epth>7.: ;fs_0.292	32" 2 af
Subcatchment 2S: DA-2	Flow Length=781'	Runoff Area=0.5 Slope=0.0026 '/'	31 ac Tc=12	100.00 2.6 min	% Imperv CN=98	/ious Runo	Runoff [ff=4.62 c)epth>7.3 sfs 0.324	32" 4 af
Subcatchment 3S: DA-3		Runoff Area=0.0)74 ac Tc=5	100.00 5.0 min	% Imperv CN=98	/ious Runo	Runoff [ff=0.81 d)epth>7.: sfs 0.045	33" 5 af
Subcatchment 4S: DA-4		Runoff Area=0.0	014 ac Tc=5	100.00 5.0 min	% Imperv CN=98	/ious Runo	Runoff [ff=0.15 c)epth>7.3 sfs_0.009	33" 9 af
Subcatchment 5S: DA-5		Runoff Area=0.0	084 ac Tc=5	100.00 5.0 min	% Imper\ CN=98	/ious Runo	Runoff [ff=0.92 d)epth>7.: ;fs_0.051	33" 1 af
Subcatchment 6S: DA-6		Runoff Area=0	.065 ac Tc=5.0	92.31) min	% Imper\ CN=WQ	/ious Runo	Runoff [ff=0.68 d)epth>7.0 sfs_0.038	00" 8 af
Subcatchment 7S: DA-7		Runoff Area=0	.423 ac Tc=5.(89.83) min	% Imper\ CN=WQ	/ious Runo	Runoff [ff=4.39 d)epth>6.9 sfs_0.243	90" 3 af
Subcatchment 8S: DA-8		Runoff Area=0	.174 ac Tc=5.(75.86) min	i% Imper∖ CN=WQ	/ious Runo	Runoff [ff=1.68 d)epth>6.3 sfs_0.091	31" 1 af
Subcatchment 9S: DA-9		Runoff Area=0	.335 ac Tc=5.(94.63) min	% Imper\ CN=WQ	/ious Runo	Runoff [ff=3.56 d)epth>7. sfs_0.198	10" 8 af
Subcatchment 10S: DA-1	10	Runoff Area=2.6	646 ac Tc=10.0	100.00 0 min	% Imper\ CN=98	/ious Runoff	Runoff [=24.87 ()epth>7.: sfs 1.614	32" 4 af
Reach 1R: Existing Runc	off				C	Inflow Dutflow	=43.74 (=43.74 (fs 2.906 fs 2.906	3 af 6 af
Total Ru	ooff Aroa = 4.825	ac Runoff Volu	mo = 2	906 a	f Avora	ao Ru	noff Do	nth = 7	23"

Total Runoff Area = 4.825 ac Runoff Volume = 2.906 af Average Runoff Depth = 7.23" 2.24% Pervious = 0.108 ac 97.76% Impervious = 4.717 ac

Summary for Subcatchment 1S: DA-1

Runoff = 4.27 cfs @ 12.03 hrs, Volume= 0.292 af, Depth> 7.32"



Summary for Subcatchment 2S: DA-2

Runoff = 4.62 cfs @ 12.04 hrs, Volume= 0.324 af, Depth> 7.32"



Summary for Subcatchment 3S: DA-3

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.81 cfs @ 11.95 hrs, Volume= 0.045 af, Depth> 7.33"



Summary for Subcatchment 4S: DA-4

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.15 cfs @ 11.95 hrs, Volume= 0.009 af, Depth> 7.33"





11 12 13

Time (hours)

14 15 16 17 18 19 20 21 22 23 24

1 2 3 4 5 6 Ż 8 ġ 10

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Printed 11/14/2019

Summary for Subcatchment 6S: DA-6

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.68 cfs @ 11.95 hrs, Volume= 0.038 af, Depth> 7.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 100-yr Rainfall=7.57"

_	Area (ac)	CN	Desci	ription						
	0.060	98	Pave	d roads w	/curbs & se	wers, HSG A				
_	0.005	61	>75%	Grass co	over, Good,	, HSG B				
	0.065		Weig	hted Aver	age					
	0.005	0.005 7.69% Pervious Area								
	0.060		92.31	% Imperv	ious Area					
	Tc Leng (min) (fe	gth S et)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description				
	F 0									



Direct Entry,

Subcatchment 6S: DA-6



Summary for Subcatchment 7S: DA-7

[49] Hint: Tc<2dt may require smaller dt

Runoff = 4.39 cfs @ 11.95 hrs, Volume= 0.243 af, Depth> 6.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 100-yr Rainfall=7.57"

Area	(ac)	CN	Desc	ription							
0.	380	98	Pave	d roads w	/curbs & se	ewers, HSG A					
0.	043	61	>75%	75% Grass cover, Good, HSG B							
0.	423		Weig	hted Aver	age						
0.	043		10.17	7% Pervio	us Area						
0.	0.380 89.83% Impervious Area				vious Area						
Тс	l enat	h 🤇	Slone	Velocity	Canacity	Description					
(min)	(fee	t)	(ft/ft)	(ft/sec)	(cfs)	Description					
5.0	`	,	· /	//		Direct Entry,					

Subcatchment 7S: DA-7



Summary for Subcatchment 8S: DA-8

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.68 cfs @ 11.95 hrs, Volume= 0.091 af, Depth> 6.31"

Area (ac)	CN	Descr	ription					
0.132	98	Paveo	d roads w	/curbs & se	ewers, HSG A			
0.042	61	>75%	Grass co	over, Good,	HSG B			
0.174		Weigł	hted Aver	age				
0.042		24.14	% Pervio	us Area				
0.132	0.132 75.86% Impervious Area							
Tc Leng (min) (fee	gth S et)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description			
5.0					Direct Entry,			
Subcatchment 8S: DA-8								



Tc=5.0 min

11 12 13 14 15 16 17 18 19 20 21 22 23 24 Time (hours)

CN=WQ

Summary for Subcatchment 9S: DA-9

[49] Hint: Tc<2dt may require smaller dt

Flow

0-

0 1 2 3

4 5 6 7 8

9 10

Runoff = 3.56 cfs @ 11.95 hrs, Volume= 0.198 af, Depth> 7.10"

Area (ac) CN	Description	
0.317 98	Paved roads w/curbs & sewers, HSG A	
0.018 61	>75% Grass cover, Good, HSG B	
0.335	Weighted Average	
0.018	5.37% Pervious Area	
0.317	94.63% Impervious Area	
Tc Length ((min) (feet)	Slope Velocity Capacity Description (ft/ft) (ft/sec) (cfs)	
5.0	Direct Entry,	
	Subcatchment 9S: DA-9 Hydrograph Type II 24-hr 100-yr Rainfall=7.57" Runoff Area=0.335 ac Runoff Volume=0.198 af Bunoff Depth>7.10"	Runoff

Summary for Subcatchment 10S: DA-10

Runoff = 24.87 cfs @ 12.01 hrs, Volume= 1.614 af, Depth> 7.32"

0

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1 2 3 4 5 6 7 8 9 10

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 100-yr Rainfall=7.57"

2.646 98 Roofs, HSG A 2.646 100.00% Impervious Area Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs) 10.0 Direct Entry, Subcatchment 10S: DA-10 Hydrograph 26 Type II 24-hr 100-yr Rainfall=7.57" 20 Runoff Area=2.646 ac Image: state of the second sec	Area (ac) CN Description	
2.646 100.00% Impervious Area <u>Tc Length Slope Velocity Capacity Description</u> (min) (feet) (ft/ft) (ft/sec) (cfs) 10.0 Direct Entry, Subcatchment 10S: DA-10 Hydrograph <u>Type II 24-hr</u> 100-yr Rainfall=7.57" Runoff Area=2.646 ac	2.646 98 Roofs, HSG A	
Tc Length (feet) Slope (ft/ft) (ft/sec) Capacity (cfs) Description 10.0 Direct Entry, Subcatchment 10S: DA-10 Hydrograph 0 Type II 24-hr 0 <t< td=""><td>2.646 100.00% Impervious Area</td><td>а</td></t<>	2.646 100.00% Impervious Area	а
10.0 Direct Entry, Subcatchment 10S: DA-10 Hydrograph Type II 24-hr 100-yr Rainfall=7.57" Runoff Area=2.646 ac	Tc Length Slope Velocity Capacity (min) (feet) (ft/ft) (ft/sec) (cfs)	Description
Subcatchment 10S: DA-10 Hydrograph	10.0	Direct Entry,
Hydrograph	Subcatc	hment 10S: DA-10
26 24.87 cfs Image: Constraint of the second s	Hydro	ograph
18 Runoff Volume=1.614 af Ind Runoff Depth>7.32" Ind Ind Ind Ind <t< td=""><td>26 24 22 20 100-yr Rainfall=7.57" 20 100-yr Rainfall=7.57" 20 20 20 20 20 20 20 20 20 20</td><td>24.87 cfs 24.87 cfs 1 1</td></t<>	26 24 22 20 100-yr Rainfall=7.57" 20 100-yr Rainfall=7.57" 20 20 20 20 20 20 20 20 20 20	24.87 cfs 24.87 cfs 1 1
6	6	

11 12 13

Time (hours)

14 15 16 17 18 19 20 21 22 23 24

Summary for Reach 1R: Existing Runoff

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	a =	4.825 ac, 9	7.76% Imp	ervious,	Inflow De	epth > 7.	23" for	100-yr event
Inflow	=	43.74 cfs @	11.99 hrs,	Volume	=	2.906 af		
Outflow	=	43.74 cfs @	11.99 hrs,	Volume	=	2.906 af,	Atten= 0	0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs



Reach 1R: Existing Runoff



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LA CROSSE CENTER LA CROSSE, WISCONSIN 10/10/2019 ISG Project No. 16-19990

Watershed	Surface Cover	Area (SF)	Area (AC)	Percent Impervious
	Impervious	13454	0.309	94%
DA-1	Pervious	790	0.018	
	Total	14244	0.327	
	Impervious	14884	0.342	95%
DA-2	Pervious	766	0.017	
	Total	15650	0.359	
	Impervious	2850	0.065	100%
DA-3	Pervious	0	0.000	
	Total	2850	0.065	
	Impervious	536	0.012	100%
DA-4	Pervious	0	0.000	
	Total	536	0.012	
	Impervious	592	0.014	36%
DA-5	Pervious	1118	0.025	
	Total	1710	0.039	
DA-6	Impervious	29950	0.688	100%
	Pervious		0.000	
	Total	29950	0.688	
	Impervious	6385	0.147	82%
DA-7	Pervious	1415	0.032	
	Total	7800	0.179	
	Impervious	7379	0.169	68%
DA-8	Pervious	3450	0.080	
	Total	10829	0.249	
	Impervious	11968	0.275	91%
DA-9	Pervious	1177	0.027	
	Total	13145	0.302	
	Impervious	113509	2.606	100%
DA-10	Pervious		0.000	
	Total	113509	2.606	
	TOTAL IMPERV	IOUS	4.627	96%
	TOTAL PERVIO	OUS	0.199	
	TOTAL ARE	Α	4.826	







19990 Proposed Watersheds

Prepared by ISG HydroCAD® 10.00-19 s/n 02403 © 2016 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area	CN	Description
(acres)		(subcatchment-numbers)
0.199	61	>75% Grass cover, Good, HSG B (1S, 2S, 5S, 7S, 8S, 9S)
0.091	98	Paved parking, HSG A (3S, 4S, 5S)
1.242	98	Paved roads w/curbs & sewers, HSG A (1S, 2S, 7S, 8S, 9S)
3.294	98	Roofs, HSG A (6S, 10S)
4.826	96	TOTAL AREA

19990 Proposed Watersheds

Prepared by ISG HydroCAD® 10.00-19 s/n 02403 © 2016 HydroCAD Software Solutions LLC

Soil Listing (all nodes)

Area	Soil	Subcatchment
(acres)	Group	Numbers
4.627	HSG A	1S, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S, 10S
0.199	HSG B	1S, 2S, 5S, 7S, 8S, 9S
0.000	HSG C	
0.000	HSG D	
0.000	Other	
4.826		TOTAL AREA

Prepared by ISG HydroCAD® 10.00-19 s/n 02403 © 2016 HydroCAD Software Solutions LLC						Printed 11/1	Printed 11/14/2019 Page 4	
			Ground C	overs (all	nodes)			
HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers	
0.000	0.199	0.000	0.000	0.000	0.199	>75% Grass cover, Good	1S,	
							2S,	
							5S,	
							7S,	
							8S, 9S	

0.000

0.000

0.000

0.000

0.091

1.242

3.294

4.826

Roofs

TOTAL AREA

Paved parking

Paved roads w/curbs & sewers 1S,

3S,

4S, 5S

2S,

7S,

8S, 9S

6S,

10 S

19990 Proposed Watersheds

0.091

1.242

3.294

4.627

0.000

0.000

0.000

0.199

0.000

0.000

0.000

0.000

0.000

0.000

0.000

0.000

19990 Proposed Watersheds	Type II 24-hr	1-yr Rainfall=2.61"
Prepared by ISG		Printed 11/14/2019
HydroCAD® 10.00-19 s/n 02403 © 2016 HydroCAD Software Solutions LLC)	Page 5

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points Runoff by SCS TR-20 method, UH=SCS, Weighted-Q Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: DA-1 Flow Length=781'	Runoff Area=0.327 ac 94.50% Impervious Runoff Depth>2.26" Slope=0.0030 '/' Tc=11.7 min CN=WQ Runoff=0.94 cfs 0.062 af
Subcatchment 2S: DA-2 Flow Length=781'	Runoff Area=0.359 ac 95.26% Impervious Runoff Depth>2.27" Slope=0.0026 '/' Tc=12.6 min CN=WQ Runoff=1.01 cfs 0.068 af
Subcatchment 3S: DA-3	Runoff Area=0.065 ac 100.00% Impervious Runoff Depth>2.38" Tc=5.0 min CN=98 Runoff=0.24 cfs 0.013 af
Subcatchment 4S: DA-4	Runoff Area=0.012 ac 100.00% Impervious Runoff Depth>2.38" Tc=5.0 min CN=98 Runoff=0.04 cfs 0.002 af
Subcatchment 5S: DA-5	Runoff Area=0.039 ac 35.90% Impervious Runoff Depth>1.00" Tc=5.0 min CN=WQ Runoff=0.06 cfs 0.003 af
Subcatchment 6S: DA-6	Runoff Area=0.688 ac 100.00% Impervious Runoff Depth>2.38" Tc=10.0 min CN=98 Runoff=2.19 cfs 0.136 af
Subcatchment 7S: DA-7	Runoff Area=0.179 ac 82.12% Impervious Runoff Depth>1.99" Tc=5.0 min CN=WQ Runoff=0.55 cfs 0.030 af
Subcatchment 8S: DA-8	Runoff Area=0.249 ac 67.87% Impervious Runoff Depth>1.69" Tc=5.0 min CN=WQ Runoff=0.64 cfs 0.035 af
Subcatchment 9S: DA-9	Runoff Area=0.302 ac 91.06% Impervious Runoff Depth>2.19" Tc=5.0 min CN=WQ Runoff=1.02 cfs 0.055 af
Subcatchment 10S: DA-10	Runoff Area=2.606 ac 100.00% Impervious Runoff Depth>2.38" Tc=10.0 min CN=98 Runoff=8.31 cfs 0.516 af
Reach 1R: Proposed Runoff	Inflow=14.54 cfs 0.912 af Outflow=14.54 cfs 0.912 af
Pond 4P: Bio-Infiltration Basin Discarded=0.00	Peak Elev=644.64' Storage=147 cf Inflow=0.55 cfs 0.030 af cfs 0.005 af Primary=0.52 cfs 0.022 af Outflow=0.53 cfs 0.027 af

Total Runoff Area = 4.826 acRunoff Volume = 0.920 afAverage Runoff Depth = 2.29"4.12% Pervious = 0.199 ac95.88% Impervious = 4.627 ac
Summary for Subcatchment 1S: DA-1

Runoff = 0.94 cfs @ 12.03 hrs, Volume= 0.062 af, Depth> 2.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 1-yr Rainfall=2.61"

_ Area (ac) CN Description	
0.309 98 Paved roads w/curbs & sewers, HSG A	
0.018 61 >75% Grass cover, Good, HSG B	
0.327 Weighted Average	
0.018 5.50% Pervious Area	
0.309 94.50% Impervious Area	
IC Length Slope Velocity Capacity Description	
11.7 781 0.0030 1.11 Shallow Concentrated Flow	
Paved Ky= 20.3 fps	
Subcatchment 1S: DA-1	
Hydrograph	
	off
Type II 24-hr	
1-yr Rainfail=2.61	
Runoff Area=0.327 ac	
Runoff Volume=0 062 af	
ε Runoπ Deptn>2.26"	
출 Flow Length=781'	
$S_{1000} = 0.0030 $ '/'	
Tc≠11.7 min	
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 Time (hours)	

Summary for Subcatchment 2S: DA-2

Runoff = 1.01 cfs @ 12.04 hrs, Volume= 0.068 af, Depth> 2.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 1-yr Rainfall=2.61"

Area (a	CN Description	
0.34	98 Paved roads w/curbs & sewers, HSG A	
0.01	61 >75% Grass cover, Good, HSG B	
0.35	Weighted Average	
0.01	4.74% Pervious Area	
0.34	95.26% Impervious Area	
Tc L	ngth Slope Velocity Capacity Description	
(min)	reet) (ft/ft) (ft/sec) (cfs)	
12.6	7810.00261.04Shallow Concentrated Flow,	
	Paved Kv= 20.3 fps	
	Subatalment 25: DA 2	
	Subcatchinent 25. DA-2	
7	Hydrograph	
		Runoff
		. turiori
1-	Type II 24-hr	
	1.vr Painfall=2.61"	
-	Runoff Area=0.359 ac	
	Runoff Volume=0 068 af	
(s		
ct (Runoff Depth>2.27	
No	Flow Length=781'	
	Slope=0.0026 7	
	Tc=12.6 min	
-		
0-		
0	2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24	

Prepare HydroCA	08 10.00-	<u>19 s/n 02</u>	2403 © 20	16 HydroCA	D Software	Solutions L	LC	Printed	Page 8
			Sum	mary for S	Subcatch	ment 3S:	DA-3		
[49] Hint	:: Tc<2dt r	nay requ	ire smaller	dt					
Runoff	=	0.24 cfs	s@ 11.9	5 hrs, Volu	ime=	0.013 af	, Depth>	2.38"	
Runoff b Type II 2	y SCS TF 24-hr 1-yr	R-20 meth Rainfall=	nod, UH=S =2.61"	SCS, Weigh	ited-Q, Tim	e Span= 0	.00-24.00	hrs, dt= 0.05 h	rs
Area	(ac) Cl	N Dese	cription						
0	.065 9	8 Pave	ed parking	, HSG A					
0	.065	100.	00% Impe	rvious Area	1				
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Descriptio	n			
5.0				· · ·	Direct En	try,			
0.26 0.24 0.22 0.18 0.16 0.14 0.12 0.1 0.08 0.06 0.04					chment 3 graph	S: DA-3 1-yı Runoff Inoff Vo Runc	Type Rainfa Area= olume= off Dep Tc:	e II 24-hr all=2.61" 0.065 ac 0.013 af th>2.38" =5.0 min CN=98	Runoff
0.02					XIII				

3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 Time (hours)

0 1 2

19990 Proposed Watersheds Prepared by ISG	Type II 24-hr	1-yr Rainfall=2.61 Printed 11/14/2019		
Summary for Subcatchment 4S:	<u> </u>	<u> </u>		
[49] Hint: Tc<2dt may require smaller dt				
Runoff = 0.04 cfs @ 11.95 hrs, Volume= 0.002 af,	Depth> 2.38"			
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.0 Type II 24-hr 1-yr Rainfall=2.61")0-24.00 hrs, dt=	[:] 0.05 hrs		
Area (ac) CN Description				
0.012 98 Paved parking, HSG A				
0.012 100.00% Impervious Area				
Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs)				
5.0 Direct Entry,				
Subcatchment 4S: DA-4				
Hydrograph				
0.048 0.046 0.044 0.042 0.042 0.04 cfs	Type II 24	Lange Runoff		



Summary for Subcatchment 5S: DA-5

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.06 cfs @ 11.96 hrs, Volume= 0.003 af, Depth> 1.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 1-yr Rainfall=2.61"

Area ((ac)	CN	Desc	cription		
0.0	014	98	Pave	d parking,	, HSG A	
0.0	025	61	>75%	6 Grass co	over, Good,	, HSG B
0.0	039		Weig	ghted Aver	age	
0.0	025		64.10	0% Pervio	us Area	
0.0	014		35.90	0% Imperv	vious Area	
Tc (min)	Lengt (fee	t)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0						Direct Entry,
					0	





Summary for Subcatchment 6S: DA-6

Page 11

Runoff 2.19 cfs @ 12.01 hrs, Volume= 0.136 af, Depth> 2.38" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 1-yr Rainfall=2.61"



Summary for Subcatchment 7S: DA-7

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.55 cfs @ 11.95 hrs, Volume= 0.030 af, Depth> 1.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 1-yr Rainfall=2.61"

 Area (ac)	CN	Desc	ription		
0.147	98	Pave	d roads w	/curbs & se	ewers, HSG A
 0.032	61	>75%	6 Grass co	over, Good,	I, HSG B
0.179		Weig	hted Aver	age	
0.032		17.88	3% Pervio	us Area	
0.147		82.12	2% Imperv	vious Area	
Talana	wth C	Slope	Volocity	Conosity	Description
(min) (fee	et)	(ft/ft)	(ft/sec)	(cfs)	Description
 5.0					Direct Entry,

Subcatchment 7S: DA-7



Summary for Subcatchment 8S: DA-8

[49] Hint: Tc<2dt may require smaller dt

0.64 cfs @ 11.95 hrs, Volume= Runoff 0.035 af, Depth> 1.69" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 1-yr Rainfall=2.61"

Area (ac)	CN	Descr	ription			
0.169	98	Paveo	d roads w	/curbs & se	wers, HSG A	
0.080	61	>75%	Grass co	over, Good,	HSG B	
0.249		Weigh	nted Aver	age		
0.080		32.13	% Pervio	us Area		
0.169		67.87	% Imperv	ious Area		
Tc Ler (min) (fe	ngth s eet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description	
5.0					Direct Entry,	



Subcatchment 8S: DA-8



Summary for Subcatchment 9S: DA-9

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.02 cfs @ 11.95 hrs, Volume= 0.055 af, Depth> 2.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 1-yr Rainfall=2.61"

Are	a (a	c)	С	N	D	esc	ripti	on																			
	0.27	75	ç	98	P	ave	d rc	ads	; w/	curt	os 8	ι se	wers	s, F	ISG	βA											
	0.02	27	6	51	>	75%	6 Gr	ass	со	ver,	Go	od,	HS	GE	3												
	0.30)2			W	/eig	hte	d Av	/era	age																	
	0.02	27			8.	94%	6 P	ervi	ous	Are	ea																
	0.2	/5			9	1.06	5% I	mpe	ervi	ous	Are	ea															
Т	ъ I	en	ath	9	Slor)e	Ve	locit	v	Car	haci	tv	Des	scri	intic	n											
(min)	(fe	et)		(ft/	ft)	(ft	/sec	.y ;)	ou	(cf	s)	000		pue	,,,,											
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	\langle																										
												1	02 cfs													Runoff	ł
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Time (hours)

Summary for Subcatchment 10S: DA-10

Runoff = 8.31 cfs @ 12.01 hrs, Volume= 0.516 af, Depth> 2.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 1-yr Rainfall=2.61"



Summary for Reach 1R: Proposed Runoff

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	a =	4.826 ac, 9	95.88% Impe	ervious,	Inflow D)epth >	2.27"	for 1-y	r event
Inflow	=	14.54 cfs @	12.00 hrs,	Volume	=	0.912 a	af		
Outflow	=	14.54 cfs @	12.00 hrs,	Volume	=	0.912 a	af, Att	en= 0%,	Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs



Reach 1R: Proposed Runoff

Summary for Pond 4P: Bio-Infiltration Basin

Inflow Area	a =	0.179 ac, 8	2.12% Impe	ervious, Inflow	Depth > 1.9	9" for 1-yı	^r event
Inflow	=	0.55 cfs @	11.95 hrs,	Volume=	0.030 af		
Outflow	=	0.53 cfs @	11.97 hrs,	Volume=	0.027 af,	Atten= 4%,	Lag= 1.1 min
Discarded	=	0.00 cfs @	11.97 hrs,	Volume=	0.005 af		•
Primary	=	0.52 cfs @	11.97 hrs,	Volume=	0.022 af		

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Peak Elev= 644.64' @ 11.97 hrs Surf.Area= 348 sf Storage= 147 cf

Plug-Flow detention time= 70.3 min calculated for 0.027 af (92% of inflow) Center-of-Mass det. time= 26.8 min (786.5 - 759.6)

Volume	Invert	Avail.Stor	rage S	Storage [Description	
#1	644.00'	29	98 cf (Custom	Stage Data (Pr	ismatic) Listed below (Recalc)
Elevation (feet)	Sur	f.Area (sq-ft)	Inc.S (cubic-t	Store feet)	Cum.Store (cubic-feet)	
644.00 645.00		115 480		0 298	0 298	
Device Ro	outing	Invert	Outlet	Devices	5	
#1 Di #2 Pr	iscarded rimary	644.00' 644.50'	0.500 12.0'' Limite	in/hr Ex Horiz. O d to weir	filtration over \$ rifice/Grate 6 flow at low hea	Surface area C= 0.600 in 12.0" Grate (100% open area) ads

Discarded OutFlow Max=0.00 cfs @ 11.97 hrs HW=644.63' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.51 cfs @ 11.97 hrs HW=644.63' (Free Discharge) **2=Orifice/Grate** (Weir Controls 0.51 cfs @ 1.20 fps)



Pond 4P: Bio-Infiltration Basin

19990 Proposed Watersheds	Type II 24-hr	2-yr Rainfa	//=3.02"
Prepared by ISG		Printed 11/	14/2019
HydroCAD® 10.00-19 s/n 02403 © 2016 HydroCAD Software Solutions LLC	;		<u>Page 19</u>

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points Runoff by SCS TR-20 method, UH=SCS, Weighted-Q Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: DA-1 Flow Length=781'	Runoff Area=0.327 ac 94.50% Impervious Runoff Depth>2.65" Slope=0.0030 '/' Tc=11.7 min CN=WQ Runoff=1.09 cfs 0.072 af
Subcatchment 2S: DA-2 Flow Length=781'	Runoff Area=0.359 ac 95.26% Impervious Runoff Depth>2.67" Slope=0.0026 '/' Tc=12.6 min CN=WQ Runoff=1.18 cfs 0.080 af
Subcatchment 3S: DA-3	Runoff Area=0.065 ac 100.00% Impervious Runoff Depth>2.79" Tc=5.0 min CN=98 Runoff=0.28 cfs 0.015 af
Subcatchment 4S: DA-4	Runoff Area=0.012 ac 100.00% Impervious Runoff Depth>2.79" Tc=5.0 min CN=98 Runoff=0.05 cfs 0.003 af
Subcatchment 5S: DA-5	Runoff Area=0.039 ac 35.90% Impervious Runoff Depth>1.24" Tc=5.0 min CN=WQ Runoff=0.07 cfs 0.004 af
Subcatchment 6S: DA-6	Runoff Area=0.688 ac 100.00% Impervious Runoff Depth>2.78" Tc=10.0 min CN=98 Runoff=2.55 cfs 0.160 af
Subcatchment 7S: DA-7	Runoff Area=0.179 ac 82.12% Impervious Runoff Depth>2.35" Tc=5.0 min CN=WQ Runoff=0.65 cfs 0.035 af
Subcatchment 8S: DA-8	Runoff Area=0.249 ac 67.87% Impervious Runoff Depth>2.01" Tc=5.0 min CN=WQ Runoff=0.76 cfs 0.042 af
Subcatchment 9S: DA-9	Runoff Area=0.302 ac 91.06% Impervious Runoff Depth>2.57" Tc=5.0 min CN=WQ Runoff=1.20 cfs 0.065 af
Subcatchment 10S: DA-10	Runoff Area=2.606 ac 100.00% Impervious Runoff Depth>2.78" Tc=10.0 min CN=98 Runoff=9.66 cfs 0.605 af
Reach 1R: Proposed Runoff	Inflow=16.94 cfs 1.072 af Outflow=16.94 cfs 1.072 af
Pond 4P: Bio-Infiltration Basin Discarded=0.00	Peak Elev=644.65' Storage=153 cf Inflow=0.65 cfs 0.035 af cfs 0.006 af Primary=0.62 cfs 0.027 af Outflow=0.62 cfs 0.033 af

Total Runoff Area = 4.826 acRunoff Volume = 1.080 afAverage Runoff Depth = 2.68"4.12% Pervious = 0.199 ac95.88% Impervious = 4.627 ac

Summary for Subcatchment 1S: DA-1

Runoff = 1.09 cfs @ 12.03 hrs, Volume= 0.072 af, Depth> 2.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 2-yr Rainfall=3.02"

Area (ac) CN Description	
0.309 98 Paved roads w/curbs & se	ewers, HSG A
0.018 61 >75% Grass cover, Good,	, HSG B
0.327 Weighted Average	
0.018 5.50% Pervious Area	
0.309 94.50% Impervious Area	
Tc Length Slope Velocity Capacity	Description
(min) (feet) (ft/ft) (ft/sec) (cfs)	
11.7 781 0.0030 1.11	Shallow Concentrated Flow,
	Paved Kv= 20.3 fps
0 1	
Subcato	chment 15: DA-1
Hydro	graph
Type II 24-hr	
2-yr Rainfall=3.02	
Runoff Area=0.327 ac	
Bunoff Volume-0.072 at	
్ Runoff Depth>2.65"	
⁸ Flow Length=781'	
Slope=0.0030 '/'	
Tc=11 7 min	
0	
0 1 2 3 4 5 6 7 6 9 10 11 Time	e (hours)

Summary for Subcatchment 2S: DA-2

Runoff = 1.18 cfs @ 12.04 hrs, Volume= 0.080 af, Depth> 2.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 2-yr Rainfall=3.02"

Area (a	c) CN Des	cription									
0.34	l2 98 Pav	ed roads w	/curbs & s	ewers, H	ISG A						
0.01	7 61 >75	% Grass c	over, Good	I, HSG E	3						
0.35	59 We	ighted Ave	rage								
0.01	4.74	4% Perviou	is Area								
0.34	12 95.2	26% Imper	vious Area								
				_							
TC L	ength Slope	Velocity	Capacity	Descr	iption						
(min)	(feet) (ft/ft)	(ft/sec)	(CfS)								
12.6	781 0.0026	1.04		Shallo	ow Con	icentra	ated Fl	ow,			
				Paved	KV=	20.3 tp	DS				
			Subcat	chmen	t 2S:	DA-2					
			Hydro	ograph							
1											٦
Í											Runoff
-	T			1.18 cfs							
	i ype ii 24	I-nr									
_	2-vr Rain	fall=3.0	2"								NERREN
1-	Dunoff A		FO o o								
	Runon A	rea-u.3	59 ac								
-	Runoff V	olume=	0.080 a	f							
(sis)	Runoff D	onth>2	67"								
<u> </u>		epui>z	.07	1							
- Flo	Flow Len	gth=78	1'								
	Slope=0	0026 '/'									
	Tc=12.6 r	nin									
	CN=WQ										
-											
				/ 📎	The						
						UIII,	//////		1/////		>
0	1 2 3 4 5	6 7 8	9 10 11	12 13	14 15	16 17	18 19	20 2	21 22	23 24	
			Tim	ie (nours)							

19990 Proposed Watersheds Prepared by ISG HydroCAD® 10.00-19 s/n 02403 © 2016 HydroCAD Software Solutions LL	Type II 24-hr 2-yr Rainfall=3.02" Printed 11/14/2019 C Page 22
Summary for Subcatchment 3S:	DA-3
[49] Hint: Tc<2dt may require smaller dt	
Runoff = 0.28 cfs @ 11.95 hrs, Volume= 0.015 af,	Depth> 2.79"
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0. Type II 24-hr 2-yr Rainfall=3.02"	00-24.00 hrs, dt= 0.05 hrs
Area (ac) CN Description	
0.065 98 Paved parking, HSG A	
0.065 100.00% Impervious Area	
Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs)	
5.0 Direct Entry,	
Subcatchment 3S: DA-3 Hydrograph	Runoff
0.3 0.28 cfs	
0.26	i ype ii 24-nr
0.24- 2-yr	Rainfall=3.02"
0.22 Runoff	Area=0.065 ac
	lume=0.015 af
ê ^{0.18} Runo	ff Denth>2 79"
0.12	CN=98
0.08	
0.06	
0.04	
0.02	

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 Time (hours)

0 0

19990 Proposed Wa	atersheds	Type II 24-hr 2-yr Rainfall=3.02"
HydroCAD® 10.00-19 s/	/n 02403 © 2016 HydroCAD Software	e Solutions LLC Printed 11/14/2019
	Summary for Subcate	hment 4S: DA-4
[49] Hint: Tc<2dt may r	equire smaller dt	
Runoff = 0.09	5 cfs @ 11.95 hrs, Volume=	0.003 af, Depth> 2.79"
Runoff by SCS TR-20 r Type II 24-hr 2-yr Rain	nethod, UH=SCS, Weighted-Q, Tir ıfall=3.02"	me Span= 0.00-24.00 hrs, dt= 0.05 hrs
Area (ac) CN [Description	
0.012 98 F	Paved parking, HSG A	
0.012 1	100.00% Impervious Area	
Tc Length Slo	pe Velocity Capacity Descript	ion
(min) (feet) (ft	:/ft) (ft/sec) (cfs)	
5.0	Direct E	ntry,
	Subcatchment	4S: DA-4
	Hydrograph	
0.055	0.05 cfs	
0.05		i ype ii 24-nr
0.045		2-yr Rainfall=3.02"
0.04		Runoff Area=0.012 ac
0.035	R	unoff Volume=0.003 af
(g)		Runoff Depth>2.79"
B 0.025		Tc=5.0 min
0.020		

0.02-0.015-0.01-0.005-

0-

0 1

2 3

4 5

7

8 9 10

6

CN=98

11 12 13 14 15 16 17 18 19 20 21 22 23 24 Time (hours)

Summary for Subcatchment 5S: DA-5

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.07 cfs @ 11.96 hrs, Volume= 0.004 af, Depth> 1.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 2-yr Rainfall=3.02"

_	Area (a	ac)	CN	Desc	ription		
	0.0	14	98	Pave	d parking,	HSG A	
	0.0	25	61	>75%	6 Grass co	over, Good,	, HSG B
	0.0	39		Weig	hted Aver	age	
	0.0	25		64.10	% Pervio	us Area	
	0.0	14		35.90)% Imperv	ious Area	
	Tc (min)	Lengtl (feet	n S) (lope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
	5.0						Direct Entry,

Subcatchment 5S: DA-5



Summary for Subcatchment 6S: DA-6

2.55 cfs @ 12.01 hrs, Volume= Runoff 0.160 af, Depth> 2.78" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 2-yr Rainfall=3.02"



Summary for Subcatchment 7S: DA-7

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.65 cfs @ 11.95 hrs, Volume= 0.035 af, Depth> 2.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 2-yr Rainfall=3.02"

Area (ac)) CN	Description			
0.147	⁷ 98	Paved roads	w/curbs & se	ewers, HSG A	
0.032	. 61	>75% Grass	cover, Good	I, HSG B	
0.179)	Weighted Av	erage		
0.032	2	17.88% Perv	ious Area		
0.147	,	82.12% Impe	ervious Area		
Tc Le (min) (1	ngth feet)	Slope Velocit (ft/ft) (ft/sec	y Capacity) (cfs)	Description	
5.0				Direct Entry,	

Subcatchment 7S: DA-7



Summary for Subcatchment 8S: DA-8

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.76 cfs @ 11.95 hrs, Volume= 0.042 af, Depth> 2.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 2-yr Rainfall=3.02"

Area	(ac)	CN	Desc	ription		
0.	169	98	Pave	d roads w	/curbs & se	ewers, HSG A
0.	080	61	>75%	6 Grass co	over, Good,	I, HSG B
0.	249		Weig	hted Aver	age	
0.	080		32.13	3% Pervio	us Area	
0.	169		67.87	7% Imperv	vious Area	
Та	اممط	h (Clana	Valaaitu	Consoitu	Description
IC (maim)	Lengi	ר ו. אי	Siope		Capacity	Description
(min)	(lee	()	(11/11)	(It/sec)	(CIS)	
5.0						Direct Entry,

Subcatchment 8S: DA-8



Summary for Subcatchment 9S: DA-9

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.20 cfs @ 11.95 hrs, Volume= 0.065 af, Depth> 2.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 2-yr Rainfall=3.02"

Area (ac)	CN	Description							
0.275	98	Paved roads	w/curbs & se	ewers, HSG	A				
0.027	61	>75% Grass	cover, Good	, HSG B					
0.302		Weighted Ave	erage						
0.027		8.94% Pervio	us Area						
0.275		91.06% Impe	rvious Area						
Tc Leng (min) (fee	gth s et)	Slope Velocity (ft/ft) (ft/sec)	Capacity (cfs)	Descriptio	ı				
5.0				Direct Ent	ry,				
			• • •						
			Subcate	chment 98	5: DA-9				
			Hydro	graph					
			E	1.20 cfs		T	vpe II	24-hr	Runoff
					2-vr	Rai	nfall:	=3 02"	
1-					2-yı			0.02	
					Runoff	Are	a=0.3	302 ac	



Summary for Subcatchment 10S: DA-10

Runoff = 9.66 cfs @ 12.01 hrs, Volume= 0.605 af, Depth> 2.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 2-yr Rainfall=3.02"

Area (ac) CN Description	
2.606 98 Roofs, HSG A	
2.606 100.00% Impervious Area	
Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs)	
10.0 Direct Entry,	
Subcatchment 10S: DA-10	
Hydrograph	
	Runoff
2-yr Rainfall=3.02"	
[*] Runoff Area=2.606 ac	
⁷ Runoff Volume=0.605 af	
€ 6 Runoff Depth>2.78"	
≗ 5 Tc=10.0 min	
4 CN=98	
3	
2	
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 Time (hours)	

Summary for Reach 1R: Proposed Runoff

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	a =	4.826 ac, 9	5.88% Impe	ervious,	Inflow De	epth > 2	2.66" f	or 2-y	r event	
Inflow	=	16.94 cfs @	12.00 hrs,	Volume	=	1.072 a	f			
Outflow	=	16.94 cfs @	12.00 hrs,	Volume	=	1.072 a	f, Atten	= 0%,	Lag= 0.0	min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs



Reach 1R: Proposed Runoff

Summary for Pond 4P: Bio-Infiltration Basin

Inflow Area	=	0.179 ac, 8	2.12% Imp	ervious, Ir	Iflow Depth >	2.35"	for 2-yr	r event
Inflow	=	0.65 cfs @	11.95 hrs,	Volume=	0.035	af		
Outflow	=	0.62 cfs @	11.97 hrs,	Volume=	0.033	af, Atte	en= 4%,	Lag= 1.0 min
Discarded	=	0.00 cfs @	11.97 hrs,	Volume=	0.006	af		-
Primary	=	0.62 cfs @	11.97 hrs,	Volume=	0.027	af		

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Peak Elev= 644.65' @ 11.97 hrs Surf.Area= 354 sf Storage= 153 cf

Plug-Flow detention time= 64.7 min calculated for 0.033 af (93% of inflow) Center-of-Mass det. time= 25.9 min (783.0 - 757.1)

Volume	Invert	Avail.Stor	rage Storage	e Description	
#1	644.00'	29	98 cf Custon	n Stage Data (Pr	ismatic) Listed below (Recalc)
Elevation (feet)	Sur	f.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	
644.00 645.00		115 480	0 298	0 298	
Device R	outing	Invert	Outlet Device	es	
#1 D #2 P	viscarded rimary	644.00' 644.50'	0.500 in/hr E 12.0" Horiz. Limited to we	xfiltration over Orifice/Grate eir flow at low hea	Surface area C= 0.600 in 12.0" Grate (100% open area) ads

Discarded OutFlow Max=0.00 cfs @ 11.97 hrs HW=644.65' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.60 cfs @ 11.97 hrs HW=644.65' (Free Discharge) **2=Orifice/Grate** (Weir Controls 0.60 cfs @ 1.27 fps)



Pond 4P: Bio-Infiltration Basin

19990 Proposed Watersheds	Type II 24-hr	10-yr Rainfall=4.48"
Prepared by ISG		Printed 11/14/2019
HydroCAD® 10.00-19 s/n 02403 © 2016 HydroCAD Software Solutions L	LC	Page 33

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points Runoff by SCS TR-20 method, UH=SCS, Weighted-Q Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: DA-1 Flow Length=781'	Runoff Area=0.327 ac 94.50% Impervious Runoff Depth>4.06" Slope=0.0030 '/' Tc=11.7 min CN=WQ Runoff=1.65 cfs 0.111 af
Subcatchment 2S: DA-2 Flow Length=781'	Runoff Area=0.359 ac 95.26% Impervious Runoff Depth>4.09" Slope=0.0026 '/' Tc=12.6 min CN=WQ Runoff=1.78 cfs 0.122 af
Subcatchment 3S: DA-3	Runoff Area=0.065 ac 100.00% Impervious Runoff Depth>4.24" Tc=5.0 min CN=98 Runoff=0.42 cfs 0.023 af
Subcatchment 4S: DA-4	Runoff Area=0.012 ac 100.00% Impervious Runoff Depth>4.24" Tc=5.0 min CN=98 Runoff=0.08 cfs 0.004 af
Subcatchment 5S: DA-5	Runoff Area=0.039 ac 35.90% Impervious Runoff Depth>2.21" Tc=5.0 min CN=WQ Runoff=0.13 cfs 0.007 af
Subcatchment 6S: DA-6	Runoff Area=0.688 ac 100.00% Impervious Runoff Depth>4.24" Tc=10.0 min CN=98 Runoff=3.81 cfs 0.243 af
Subcatchment 7S: DA-7	Runoff Area=0.179 ac 82.12% Impervious Runoff Depth>3.67" Tc=5.0 min CN=WQ Runoff=1.00 cfs 0.055 af
Subcatchment 8S: DA-8	Runoff Area=0.249 ac 67.87% Impervious Runoff Depth>3.22" Tc=5.0 min CN=WQ Runoff=1.23 cfs 0.067 af
Subcatchment 9S: DA-9	Runoff Area=0.302 ac 91.06% Impervious Runoff Depth>3.96" Tc=5.0 min CN=WQ Runoff=1.82 cfs 0.100 af
Subcatchment 10S: DA-10	Runoff Area=2.606 ac 100.00% Impervious Runoff Depth>4.24" Tc=10.0 min CN=98 Runoff=14.43 cfs 0.920 af
Reach 1R: Proposed Runoff	Inflow=25.51 cfs 1.643 af Outflow=25.51 cfs 1.643 af
Pond 4P: Bio-Infiltration Basin Discarded=0.00	Peak Elev=644.71' Storage=172 cf Inflow=1.00 cfs 0.055 af cfs 0.006 af Primary=0.96 cfs 0.046 af Outflow=0.97 cfs 0.052 af

Total Runoff Area = 4.826 acRunoff Volume = 1.652 afAverage Runoff Depth = 4.11"4.12% Pervious = 0.199 ac95.88% Impervious = 4.627 ac

Summary for Subcatchment 1S: DA-1

Runoff = 1.65 cfs @ 12.03 hrs, Volume= 0.111 af, Depth> 4.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 10-yr Rainfall=4.48"

Area (ad	c) CN Descr	iption							
0.30	9 98 Paved	l roads w/curbs	& sewers	HSG A					
0.01	8 61 >75%	Grass cover, C	Good, HSG	В					
0.32	7 Weigł	nted Average							
0.01	8 5.50%	Pervious Area	1						
0.30	9 94.50	% Impervious A	Area						
Tc L	ength Slope	Velocity Capa	acity Des	cription					
(min)	(feet) (ft/ft)	(ft/sec) (cts)						
11.7	781 0.0030	1.11	Sha	low Conc	entrated	l Flow,			
			Pave	ed Kv=20).3 fps				
		Suk	aatahma	nt 10, D	A 4				
		Sui		int 13. D	A-1				
~			Hydrograph						
									Runoff
			1.65 cfs						
	Type II 24-	hr							
	10 vr Doin								
-	то-уг каш	iaii-4.40							
	Runoff Are	ea=0.327 a	С 🚺						
-	Runoff Vol	ume=0 11	1 af						
(s			1 41						
J ⊃) ¹ −′	Runoff De	ptn>4.06"							
NO	Flow Leng	th=781'							
ш									
	Slope=0.00	J30 7							
	Tc=11.7 m	in							
-									
-									
0-14-14-	1 2 3 4 5	6 7 8 9 1	0 11 12 1	3 14 15 1	6 17 18	19 20	21 22	23 2	4
5	0 . 0		Time (hour	s)	• 11 10	10 20	_,	20 2	•

Summary for Subcatchment 2S: DA-2

Runoff = 1.78 cfs @ 12.04 hrs, Volume= 0.122 af, Depth> 4.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 10-yr Rainfall=4.48"

Area (ac) CN Description	
0.342 98 Paved roads w/curbs & se	ewers. HSG A
0.017 61 >75% Grass cover, Good,	HSG B
0.359 Weighted Average	
0.017 4.74% Pervious Area	
0.342 95.26% Impervious Area	
Tc Length Slope Velocity Capacity	Description
(min) (feet) (ft/ft) (ft/sec) (cfs)	·
12.6 781 0.0026 1.04	Shallow Concentrated Flow.
	Paved Kv= 20.3 fps
Subcato	chment 2S: DA-2
Hydrog	graph
i ype ii 24-iii	
10-yr Rainfall=4.48"	
Bunoff Area-0 250 ac	
Runon Area-0.559 ac	
Runoff Volume=0.122 at	
$\widehat{\mathfrak{g}}$ D up off D opth>4.00"	
Flow Length=781'	
Siope=0.0026 7	
Tc=12 6 min	
0	
0 1 2 3 4 5 6 7 8 9 10 11	12 13 14 15 16 17 18 19 20 21 22 23 24
Time	e (hours)

19990 Pr Prepared	oposed	Water	-	Type II 24-h	r 10-yr Ra Printed	<i>infall=4.48"</i> 11/14/2019				
HydroCAD	<u> </u>) s/n 024	tions LLC)	- Thirda	Page 36				
			Sumr	nary for S	Subcat	tchme	nt 3S: [DA-3		
[49] Hint: T	⁻ c<2dt ma	ıy requir	e smaller	dt						
Runoff	= ().42 cfs	@ 11.9	ō hrs, Volu	me=	0	.023 af,	Depth> 4.24	4"	
Runoff by S Type II 24-	SCS TR-2 hr 10-yr l	20 metho Rainfall:	od, UH=S =4.48"	CS, Weigh	ited-Q, ⁻	Time Sp	oan= 0.0	0-24.00 hrs,	dt= 0.05 hr	S
Area (a	<u>c) CN</u>	Desci	ription							
0.06	<u>5 98</u>	Pave	d parking,	HSG A						
0.06	5	100.0	0% Impe	rvious Area	l					
Tc L	ength	Slope	Velocity	Capacity	Descri	iption				
5.0	(1001)	(1011)	(10300)	(013)	Direct	Entry,				
				Subcate	chmen	nt 3S: [DA-3			
				Hydro	graph					
0.46										Runoff
0.44					0.42 cfs			Type II	24-hr	
0.4 0.38								Doinfoll=		
0.36	/						IU-yi		-4.40	
0.34						Rı	inoff /	Area=0.0	65 ac	
0.3 0.28						Runc	off Vo	ume=0.0)23 af	
(sj 0.26							Runof	f Depth>	4.24"	
0.24 0.22	1							Tc=5.	0 min	
- 0.2 -										

0.18 0.16 0.14 0.12 0.1 0.08 0.06 0.04 0.02

0 1

2

3 4 5 6

7

8 9

CN=98

10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 Time (hours)

19990 Prepare HydroCA	Propose ed by ISG AD® 10.00-	d Waters 19 s/n 0240	Type II 24-h	r <i>10-yr Ra</i> Printed	<i>infall=4.48"</i> 11/14/2019 Page 37					
			Sumr	nary for	Subca	atchme	nt 4S:	DA-4		
[49] Hin	t: Tc<2dt r	nay require	smaller	dt						
Runoff	=	0.08 cfs @	11.95	ō hrs, Volu	ıme=	0	.004 af,	Depth> 4.24	1"	
Runoff b Type II 2	oy SCS TF 24-hr 10-y	R-20 methoo r Rainfall=4	d, UH=S 1.48"	CS, Weigł	nted-Q,	, Time S	pan= 0.0	00-24.00 hrs,	dt= 0.05 hr	'S
Area	(ac) Cl	N Descrip	otion							
0	.012 9	8 Paved	parking,	HSG A						
0	.012	100.00	% Imper	vious Area	à					
Tc (min)	Length (feet)	Slope V (ft/ft) (/elocity (ft/sec)	Capacity (cfs)	Desc	ription				
5.0	, <i>i</i>	, <i>i</i>			Direc	ct Entry,				
				Suboot	ohmo	nt 1 Cu				
				Subcat		ni 43.	DA-4			
				nyuru	graph					
80.0	35									Runoff
0.0	08-1 75-1				0.08 cfs			Type II	24-hr	
0.07	07						10	Painfall-	<u>л</u> ло"	
0.06	65						10-yi	Raiman-	4.40	
0.0	06					RI	unoff	Area=0.0	12 ac	
0.05	55-1					Rune	off Vo	olume=0.0)04 af	
(sj) 0.04	15-1 15-1						Runo	ff Depth>	4.24"	
<u>0</u> 0.0)4							Tc=5.	0 min	
0.03	35				<u> </u>				NI-09	
0.0	03								N-30	
0.02	2)2									

11 12 13 14 15 16 17 18 19 20 21 22 23 24 Time (hours)

0.015 0.01-0.005 0-

Ó 1 2 3 4 5 6 7

8 9 10 Type II 24-hr 10-yr Rainfall=4.48"

Summary for Subcatchment 5S: DA-5

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.13 cfs @ 11.96 hrs, Volume= 0.007 af, Depth> 2.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 10-yr Rainfall=4.48"

Area (ac)	CN	Desc	ription		
0.014	98	Pave	d parking,	HSG A	
0.025	61	>75%	6 Grass co	over, Good,	, HSG B
0.039		Weig	hted Aver	age	
0.025		64.10	0% Pervio	us Area	
0.014		35.90	0% Imperv	vious Area	
Tc Ler (min) (f	ngth S eet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0			· · ·	\$ 1	Direct Entry,

Subcatchment 5S: DA-5



Summary for Subcatchment 6S: DA-6

Runoff = 3.81 cfs @ 12.01 hrs, Volume= 0.243 af, Depth> 4.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 10-yr Rainfall=4.48"



Summary for Subcatchment 7S: DA-7

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.00 cfs @ 11.95 hrs, Volume= 0.055 af, Depth> 3.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 10-yr Rainfall=4.48"

Area (ac) CN Description	
0.147 98 Paved roads w/curbs 0.032 61 >75% Grass cover. 0	s & sewers, HSG A Good, HSG B
0.179Weighted Average0.03217.88% Pervious Are0.14782.12% Impervious A	ea Area
Tc Length Slope Velocity Capa (min) (feet) (ft/ft) (ft/sec) (acity Description (cfs)
5.0	Direct Entry,
Sub	bcatchment 7S: DA-7
	Hydrograph
Elow (cts)	Type II 24-hr 10-yr Rainfall=4.48" Runoff Area=0.179 ac Runoff Volume=0.055 af Runoff Depth>3.67" Tc=5.0 min CN=WQ
	10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 Time (hours)

Summary for Subcatchment 8S: DA-8

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.23 cfs @ 11.95 hrs, Volume= 0.067 af, Depth> 3.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 10-yr Rainfall=4.48"

Are	a (ao	C)	CN	D	esc	ripti	on															
-	0.16	9	98	Pa	ave	d ro	ads	w/cı	ırbs	& se	wers.	HSC	λA									
	0.08	80	61	>	75%	Gr	ass	COVe	er. G	ood.	HSG	В										
	0.24	9		W	/ein	hter		Prad	e	,												
	0.24	ŝ		32	2 1.3	11000 19% F	Pervi	nus	Area	a												
	0.00	9		67	7 87	% I	mne	rvin		rea												
	0.10	.0		01	.07	<i>/</i> 01	mpo	1 110		ou												
Т	. 1	enatl	h	Slor	e.	Vel	ocity		ana	city	Desc	rintio	n									
(min)	(feet	.)	(ft/f	it)	(ft	/sec`) Ŭ	مەتھە. (ر	ofs)	2000	npac										
5 (/)	(1001	-)	(14)	<u>.</u>	(14			(-	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	Direc	t En	trv									
0.0	,										Direc		y ,									
								ę	Sub	cato	hme	nt 8	S:	DA	-8							
									н	ydrog	graph											
	\bigwedge																					
																						Runoff
										1	.23 cfs						- .					
																	IУ	pe	11 2	4-n	r	
														10	-yr	R	air	nfal	=4	.48	••	
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	0	1 2	3	4	5	6	7	8 9	10	11 Time	12 13 (hours)	14)	15	16	17	18	19	20 2	1 22	23	24	
Summary for Subcatchment 9S: DA-9

[49] Hint: Tc<2dt may require smaller dt

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11 12 13 Time (hours) 14 15 16 17 18 19 20 21 22 23 24

Runoff = 1.82 cfs @ 11.95 hrs, Volume= 0.100 af, Depth> 3.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 10-yr Rainfall=4.48"

Area (ac) CN Description								
0.275 98 Paved roads w/curbs & sewers, HSG A								
0.027 61 >75% Grass 0	cover, Good	, HSG B						
0.302 Weighted Ave	0.302 Weighted Average							
0.027 8.94% Pervious Area								
0.275 91.06% Impe	vious Area							
Tc Length Slope Velocity	Capacity	Description						
(min) (feet) (ft/ft) (ft/sec)	(cfs)							
5.0		Direct Entry,						
	Subcate	chment 9S: DA-9						
	Hydro	ograph						
2- I I I I I I I I I I I I I		Type II 24-hr 10-yr Rainfall=4.48" Runoff Area=0.302 ac Runoff Volume=0.100 af Runoff Depth>3.96" Tc=5.0 min CN=WQ	Runoff					

Summary for Subcatchment 10S: DA-10

Runoff = 14.43 cfs @ 12.01 hrs, Volume= 0.920 af, Depth> 4.24"

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1 2 3 4 5 6 7 8 9 10

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CN=98

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 10-yr Rainfall=4.48"

Area (ac) CN Description	
2.606 98 Roofs, HSG A	
2.606 100.00% Impervious Area	à
Tc Length Slope Velocity Capacity (min) (feet) (ft/ft) (ft/sec) (cfs)	Description
10.0	Direct Entry,
Subcatc Hydro	hment 10S: DA-10 ^{graph}
	14.43 cfs
14 Type II 24-hr	
¹³ 10-vr Rainfall=4.48 "	
Runoff Area=2.606 ac	
10 Runoff Volume=0.920 at	
ີຢູ່ Runoff Depth>4.24"	
≜ 7 Tc=10.0 min	

11 12 13

Time (hours)

14 15 16 17 18 19 20 21 22 23 24

Summary for Reach 1R: Proposed Runoff

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	a =	4.826 ac, 9	95.88% Impe	ervious,	Inflow Depth 3	> 4.0)9" for	10-yr event	
Inflow	=	25.51 cfs @	12.00 hrs,	Volume	= 1.64	l3 af			
Outflow	=	25.51 cfs @	12.00 hrs,	Volume	= 1.64	l3 af,	Atten= 0	%, Lag= 0.0 m	nin

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs



Reach 1R: Proposed Runoff

Summary for Pond 4P: Bio-Infiltration Basin

Inflow Area	ı =	0.179 ac, 8	2.12% Impe	ervious, Inflo	ow Depth > 3.6	7" for 10-	yr event
Inflow	=	1.00 cfs @	11.95 hrs,	Volume=	0.055 af		
Outflow	=	0.97 cfs @	11.97 hrs,	Volume=	0.052 af,	Atten= 4%,	Lag= 0.9 min
Discarded	=	0.00 cfs @	11.97 hrs,	Volume=	0.006 af		-
Primary	=	0.96 cfs @	11.97 hrs,	Volume=	0.046 af		

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Peak Elev= 644.71' @ 11.97 hrs Surf.Area= 373 sf Storage= 172 cf

Plug-Flow detention time= 48.6 min calculated for 0.052 af (95% of inflow) Center-of-Mass det. time= 21.9 min (773.2 - 751.3)

Volume	Invert	Avail.Stor	rage Storage I	Description	
#1	644.00'	29	98 cf Custom	Stage Data (Pri	smatic) Listed below (Recalc)
Elevatio (fee	on Su et)	urf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	
644.0	00	115	0	0	
645.0	00	480	298	298	
Device	Routing	Invert	Outlet Devices	6	
#1	Discarded	644.00'	0.500 in/hr Ex	filtration over S	Surface area
#2	Primary	644.50'	12.0" Horiz. O Limited to weir	rifice/Grate C flow at low hea	C= 0.600 in 12.0" Grate (100% open area) ads

Discarded OutFlow Max=0.00 cfs @ 11.97 hrs HW=644.70' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.94 cfs @ 11.97 hrs HW=644.70' (Free Discharge) ←2=Orifice/Grate (Weir Controls 0.94 cfs @ 1.47 fps)



Pond 4P: Bio-Infiltration Basin

19990 Proposed Watersheds	Type II 24-hr	100-yr Ra	infall=7.57"
Prepared by ISG		Printed	11/14/2019
HydroCAD® 10.00-19 s/n 02403 © 2016 HydroCAD Software Solutions I	LC		Page 47
			-

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points Runoff by SCS TR-20 method, UH=SCS, Weighted-Q Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: DA-1 Flow Length=781'	Runoff Area=0.327 ac 94.50% Impervious Runoff Depth>7.09" Slope=0.0030 '/' Tc=11.7 min CN=WQ Runoff=2.84 cfs 0.193 af
Subcatchment 2S: DA-2 Flow Length=781'	Runoff Area=0.359 ac 95.26% Impervious Runoff Depth>7.12" Slope=0.0026 '/' Tc=12.6 min CN=WQ Runoff=3.05 cfs 0.213 af
Subcatchment 3S: DA-3	Runoff Area=0.065 ac 100.00% Impervious Runoff Depth>7.33" Tc=5.0 min CN=98 Runoff=0.71 cfs 0.040 af
Subcatchment 4S: DA-4	Runoff Area=0.012 ac 100.00% Impervious Runoff Depth>7.33" Tc=5.0 min CN=98 Runoff=0.13 cfs 0.007 af
Subcatchment 5S: DA-5	Runoff Area=0.039 ac 35.90% Impervious Runoff Depth>4.63" Tc=5.0 min CN=WQ Runoff=0.29 cfs 0.015 af
Subcatchment 6S: DA-6	Runoff Area=0.688 ac 100.00% Impervious Runoff Depth>7.32" Tc=10.0 min CN=98 Runoff=6.47 cfs 0.420 af
Subcatchment 7S: DA-7	Runoff Area=0.179 ac 82.12% Impervious Runoff Depth>6.57" Tc=5.0 min CN=WQ Runoff=1.78 cfs 0.098 af
Subcatchment 8S: DA-8	Runoff Area=0.249 ac 67.87% Impervious Runoff Depth>5.97" Tc=5.0 min CN=WQ Runoff=2.29 cfs 0.124 af
Subcatchment 9S: DA-9	Runoff Area=0.302 ac 91.06% Impervious Runoff Depth>6.95" Tc=5.0 min CN=WQ Runoff=3.15 cfs 0.175 af
Subcatchment 10S: DA-10	Runoff Area=2.606 ac 100.00% Impervious Runoff Depth>7.32" Tc=10.0 min CN=98 Runoff=24.50 cfs 1.590 af
Reach 1R: Proposed Runoff	Inflow=43.73 cfs 2.865 af Outflow=43.73 cfs 2.865 af
Pond 4P: Bio-Infiltration Basin Discarded=0.00	Peak Elev=644.80' Storage=211 cf Inflow=1.78 cfs 0.098 af cfs 0.006 af Primary=1.72 cfs 0.089 af Outflow=1.73 cfs 0.096 af

Total Runoff Area = 4.826 acRunoff Volume = 2.874 afAverage Runoff Depth = 7.15"4.12% Pervious = 0.199 ac95.88% Impervious = 4.627 ac

Summary for Subcatchment 1S: DA-1

Runoff = 2.84 cfs @ 12.03 hrs, Volume= 0.193 af, Depth> 7.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 100-yr Rainfall=7.57"

 Area (ac)	CN	Desc	cription		
0.3	309	98	Pave	ed roads w	/curbs & se	ewers, HSG A
 0.0)18	61	>75%	% Grass co	over, Good,	, HSG B
 0.3	327		Weig	ghted Aver	age	
0.0)18		5.50	% Perviou	s Ārea	
0.3	309		94.50	0% Imperv	vious Area	
Tc	l enath	ı S	Slone	Velocity	Canacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	Description
11.7	78´	1 0.0	0030	1.11		Shallow Concentrated Flow,
						Paved Kv= 20.3 fps





Summary for Subcatchment 2S: DA-2

Runoff = 3.05 cfs @ 12.04 hrs, Volume= 0.213 af, Depth> 7.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 100-yr Rainfall=7.57"

Area (ac) CN Description							
0.342 98 Paved roads w/curbs & sewers, HSG A							
0.017 61 >75% Grass cover, Good, HSG B							
0.359 Weighted Average							
0.017 4.74% Pervious Area							
0.342 95.26% Impervious Area							
Tc Length Slope Velocity Capacity Description							
(min) (feet) (ft/ft) (ft/sec) (cfs)							
12.6 781 0.0026 1.04 Shallow Concentrated Flow,							
Paved KV= 20.3 tps							
Subastahmant 28: DA 2							
Subcatchinem 25. DA-2							
Hydrograph							
	Runoff						
- 3.05 cfs							
³ Type II 24-hr							
100_vr Painfall=7 57"							
Runoff Area=0.359 ac							
Runoff Volume=0.213 af							
$\widehat{\mathscr{P}}^{2}$							
Flow Length=781'							
= 1							
¹ Tc=12.6 min							
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24							
Time (hours)							

19990 Proposed Watersheds Prepared by ISG	<i>Type II 24-hr 100-yr Rainfall=7.57"</i> Printed 11/14/2019
HydroCAD® 10.00-19 s/n 02403 © 2016 HydroCAD Software Solutions LI	<u>_C Page 50</u>
Summary for Subcatchment 3S:	DA-3
[49] Hint: Tc<2dt may require smaller dt	
Runoff = 0.71 cfs @ 11.95 hrs, Volume= 0.040 af	, Depth> 7.33"
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0. Type II 24-hr 100-yr Rainfall=7.57"	00-24.00 hrs, dt= 0.05 hrs
Area (ac) CN Description	
0.065 98 Paved parking, HSG A	
0.065 100.00% Impervious Area	
Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs)	
5.0Direct Entry,	
Subcatchment 3S: DA-3	
Hydrograph	
0.75	
0.71 cfs	Type II 24-hr
0.65 100-yr	Rainfall=7.57"
0.6 0.55 Runoff	Area=0.065 ac
0.5 Runoff Vo	olume=0.040 af
	ff Depth>7.33"
	Tc=5.0 min
0.3	CN=98
0.25	

11 12 13 14 15 16 17 18 19 20 21 22 23 24 Time (hours)

0.15 0.1 0.05-07 0

 Type II 24-hr 100-yr Rainfall=7.57"

19990 Proposed Watersheds Prepared by ISG HydroCAD® 10.00-19 s/n 02403 © 2016 HydroCAD Software Sol	Type II 24-hr 100-yr Rainfall=7.57" Printed 11/14/2019 lutions LLC Page 51
Summary for Subcatchme	ent 4S: DA-4
[49] Hint: Tc<2dt may require smaller dt	
Runoff = $0.13 \text{ cfs} @ 11.95 \text{ hrs}$, Volume= (0.007 af, Depth> 7.33"
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time S Type II 24-hr 100-yr Rainfall=7.57"	Span= 0.00-24.00 hrs, dt= 0.05 hrs
Area (ac) CN Description	



Summary for Subcatchment 5S: DA-5

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.29 cfs @ 11.96 hrs, Volume= 0.015 af, Depth> 4.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 100-yr Rainfall=7.57"

Area (ac)	CN	Desc	ription						
0.0	014	98	Pave	d parking,	HSG A					
0.0)25	61	>75%	>75% Grass cover, Good, HSG B						
0.0	039		Weig	hted Aver	age					
0.0)25		64.10	0% Pervio	us Area					
0.0	014		35.90	0% Imperv	vious Area					
Tc (min)	Lengtl (feet	n S	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description				
5.0						Direct Entry,				

Subcatchment 5S: DA-5



Summary for Subcatchment 6S: DA-6

Runoff = 6.47 cfs @ 12.01 hrs, Volume= 0.420 af, Depth> 7.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 100-yr Rainfall=7.57"



11 12 13 14 15 16 17 18 19 20 21 22 23 24 Time (hours)

CN=WQ

Summary for Subcatchment 7S: DA-7

[49] Hint: Tc<2dt may require smaller dt

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1.78 cfs @ 11.95 hrs, Volume= 0.098 af, Depth> 6.57" Runoff =

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 100-yr Rainfall=7.57"

<u> </u>	Description								
0.147 98	Paved roads w/curbs & se	sewers, HSG A							
0.032 61	>75% Grass cover, Good	d, HSG B							
0.179	Weighted Average								
0.032	17.88% Pervious Area								
0.147	82.12% Impervious Area								
Tc Length SI (min) (feet) (⁻	lope Velocity Capacity ft/ft) (ft/sec) (cfs)	Description							
5.0		Direct Entry,							
Subcatchment 7S: DA-7 Hydrograph									
Flow (cfs)		Type II 24-hr 100-yr Rainfall=7.57" Runoff Area=0.179 ac Runoff Volume=0.098 af Runoff Depth>6.57" Tc=5.0 min	Runoff						

Summary for Subcatchment 8S: DA-8

[49] Hint: Tc<2dt may require smaller dt

Runoff = 2.29 cfs @ 11.95 hrs, Volume= 0.124 af, Depth> 5.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 100-yr Rainfall=7.57"

Area	(ac)	CN	Desc	ription							
0.	169	98	Pave	Paved roads w/curbs & sewers, HSG A							
0.	.080	61	>75%	6 Grass co	over, Good,	, HSG B					
0.	249		Weig	hted Aver	age						
0.	.080		32.13	3% Pervio	us Area						
0.	169		67.87	7% Imperv	vious Area						
Tc (min)	Leng (fee	th S et)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description					
5.0						Direct Entry,					

Subcatchment 8S: DA-8



Summary for Subcatchment 9S: DA-9

[49] Hint: Tc<2dt may require smaller dt

Runoff = 3.15 cfs @ 11.95 hrs, Volume= 0.175 af, Depth> 6.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 100-yr Rainfall=7.57"

	Area (ac)	CN	Desc	cription							
	0.275	98	Pave	Paved roads w/curbs & sewers, HSG A							
	0.027	61	>75%	% Grass co	over, Good,	I, HSG B					
	0.302		Weig	ghted Aver	age						
	0.027 8.94% Pervious Área										
0.275 91.06% Impervious Area				6% Imperv	vious Area						
(Tc Le min) (t	ngth feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description					
	5.0					Direct Entry,					

Subcatchment 9S: DA-9



Runoff Volume=1.590 af

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11 12 13

Time (hours)

14 15 16 17 18 19 20 21 22 23 24

Runoff Depth>7.32"

Tc=10.0 min

CN=98

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14-

12-

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Flow (cfs)

Summary for Subcatchment 10S: DA-10

Runoff = 24.50 cfs @ 12.01 hrs, Volume= 1.590 af, Depth> 7.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Type II 24-hr 100-yr Rainfall=7.57"

Area (ac) CN Description									
2.606 98 Roofs, HSG A									
2.606 100.00% Impervious Area									
Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs)									
10.0 Direct Entry,									
Subcatchment 10S: DA-10									
	Runoff								
²² 100-yr Rainfall=7.57"									
²⁰ Runoff Area=2.606 ac									

Summary for Reach 1R: Proposed Runoff

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	a =	4.826 ac, 9	95.88% Impe	ervious,	Inflow De	epth > 7	.12" for	100-yr ev	/ent
Inflow	=	43.73 cfs @	12.00 hrs,	Volume	=	2.865 af			
Outflow	=	43.73 cfs @	12.00 hrs,	Volume	=	2.865 af	, Atten=	0%, Lag=	0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs



Reach 1R: Proposed Runoff

Summary for Pond 4P: Bio-Infiltration Basin

Inflow Area	ı =	0.179 ac, 8	2.12% Impe	ervious,	Inflow De	epth >	6.57	" for	100-	yr event	
Inflow	=	1.78 cfs @	11.95 hrs,	Volume	=	0.098	af				
Outflow	=	1.73 cfs @	11.96 hrs,	Volume	=	0.096	af, A	Atten= 3	%, I	Lag= 0.8	min
Discarded	=	0.00 cfs @	11.97 hrs,	Volume	=	0.006	af			-	
Primary	=	1.72 cfs @	11.96 hrs,	Volume	=	0.089	af				

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs Peak Elev= 644.80' @ 11.97 hrs Surf.Area= 409 sf Storage= 211 cf

Plug-Flow detention time= 31.4 min calculated for 0.095 af (97% of inflow) Center-of-Mass det. time= 15.4 min (760.7 - 745.3)

Volume	Invert	Avail.Stor	rage S	Storage [Description	
#1	644.00'	29	98 cf (Custom	Stage Data (Pr	ismatic) Listed below (Recalc)
Elevation (feet)	Sur	f.Area (sq-ft)	Inc.S (cubic-t	Store feet)	Cum.Store (cubic-feet)	
644.00 645.00		115 480		0 298	0 298	
Device Ro	outing	Invert	Outlet	Devices	5	
#1 Di #2 Pr	iscarded rimary	644.00' 644.50'	0.500 12.0'' Limite	in/hr Ex Horiz. O d to weir	filtration over \$ rifice/Grate 6 flow at low hea	Surface area C= 0.600 in 12.0" Grate (100% open area) ads

Discarded OutFlow Max=0.00 cfs @ 11.97 hrs HW=644.80' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=1.68 cfs @ 11.96 hrs HW=644.80' (Free Discharge) ←2=Orifice/Grate (Weir Controls 1.68 cfs @ 1.79 fps)



Pond 4P: Bio-Infiltration Basin



3 - PROPOSED BIO-INFILTRATION BASIN

Data file name: S:\Projects\19000 PROJ\19900-19999\19990 La Crosse Center Expansion-La Crosse WI\19990 Civil-Survey\Civil Calcs\Hydrology\Proposed Model.md WinSLAMM Version 10.4.1 Rain file name: C:\WinSLAMM Files\Rain Files\MN Minneapolis 59.RAN Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI AVG01.pscx Runoff Coefficient file name: C:\WinSLAMM Files\WI SL06 Dec06.rsvx Residential Street Delivery file name: C:\WinSLAMM Files\WI Com Inst Indust Dec06.std Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std Industrial Street Delivery file name: C:\WinSLAMM Files\WI Com Inst Indust Dec06.std Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std Freeway Street Delivery file name: C:\WinSLAMM Files\WI Com Inst Indust Dec06.std Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI GEO03.ppdx Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv Cost Data file name: If Other Device Pollutant Load Reduction Values = 1, Off-site Pollutant Loads are Removed from Pollutant Load % Reduction calculations Seed for random number generator: -42 Study period starting date: 01/02/59 Study period ending date: 12/28/59 Date: 10-21-2019 Time: 08:16:03 Site information: LU# 1 - Commercial: DA-7 Total area (ac): 0.179 13 - Paved Parking 1: 0.092 ac. Connected PSD File: C:\WinSLAMM Files\NURP.cpz 31 - Sidewalks 1: 0.055 ac. Connected PSD File: C:\WinSLAMM Files\NURP.cpz 51 - Small Landscaped Areas 1: 0.032 ac. Moderately Compacted Sandy PSD File: C:\WinSLAMM Files\NURP.cpz Control Practice 1: Biofilter CP# 1 (DS) - DS Biofilters # 1 Top area (square feet) = 4801. 2. Bottom aea (square feet) = 115 Depth (ft): 3.5 3. 4. Biofilter width (ft) - for Cost Purposes Only: 10 Infiltration rate (in/hr) = 0.55. Random infiltration rate generation? No 6. Infiltration rate fraction (side): 0.01 7. 8. Infiltration rate fraction (bottom): 1 9. Depth of biofilter that is rock filled (ft) 0.5 10. Porosity of rock filled volume = 0.411. Engineered soil infiltration rate: 13 12. Engineered soil depth (ft) = 2 13. Engineered soil porosity = 0.51 14. Percent solids reduction due to flow through engineered soil = 0 15. Biofilter peak to average flow ratio = 3.8 16. Number of biofiltration control devices = 1 17. Particle size distribution file: Not needed - calculated by program 18. Initial water surface elevation (ft): 0 Soil Type Fraction in Eng. Soil Soil Data Sands 0.600 Peat as Amendment 0.200 Compost as Amendment 0.200 Saturation water content percent (Porosity) = 0 Field capacity (%) = 0 Permanent Wilting Point (%) = 0 Infiltration rate (in/hr) = 13Biofilter Outlet/Discharge Characteristics: Outlet type: Broad Crested Weir 1. Weir crest length (ft): 5 2. Weir crest width (ft): 5 3. Height of datum to bottom of weir opening: 3.4 Outlet type: Vertical Stand Pipe 1. Stand pipe diameter (ft): 1

2. Stand pipe height above datum (ft): 3

Data file name: S:\Projects\19000 PROJ\19900-19999\19990 La Crosse Center Expansion-La Crosse WI\19990 Civil-Survey\Civil Calcs\Hydrology\Proposed Model.md WinSLAMM Version 10.4.1

Rain file name: C:\WinSLAMM Files\Rain Files\MN Minneapolis 59.RAN Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI GEO03.ppdx Residential Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std Institutional Street Delivery file name: C:\WinSLAMM Files\WI Com Inst Indust Dec06.std Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std Freeway Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv Cost Data file name: If Other Device Pollutant Load Reduction Values = 1, Off-site Pollutant Loads are Removed from Pollutant Load % Reduction calculations Seed for random number generator: -42 Study period starting date: 01/02/59 Study period ending date: 12/28/59 Model Run Start Date: 01/02/59 Model Run End Date: 12/28/59 Date of run: 10-21-2019 Time of run: 08:49:32 Total Area Modeled (acres): 0.179 Years in Model Run: 0.99 Runoff Percent Particulate Particulate Percent Volume Runoff Solids Solids Particulate (cu ft) Volume Conc. Yield Solids

	(00.11)	Reduction	(mg/L)	(lbs)	Reduction
Total of all Land Uses without Controls:	11441	-	125.2	89.43	-
Outfall Total with Controls:	3570	68.80%	123.1	27.43	69.33%
Annualized Total After Outfall Controls:	3620			27.81	

Post-Construction Stormwater Management Maintenance Plan

La Crosse Center – La Crosse, Wisconsin

The stormwater management facilities for this project will be owned and maintained by the City of La Crosse. This document will provide direction for performing an inspection and any necessary maintenance of stormwater management practices. It is the responsibility of the property owner to perform the inspections of the stormwater management practices and to perform maintenance as needed.

The Inspection Process

Below are the inspection checklists to be completed on a scheduled interval stated on each checklist by the property owner or an assigned subcontractor. Refer to the site plans for item identification. Additionally, inspections shall be performed any time standing water is observed in the bio-infiltration basins 48 hours after a rainfall event.

Perform Necessary Maintenance

After performing the inspection process, any required maintenance must be performed by the property owner or an assigned subcontractor within 30 calendar days.

If standing water in bio-infiltration basin remains 2 days (48 hours) after a rainfall event, the system may have become clogged with sediment and the existing sand bottom shall be tilled. If the problem of standing water (for the period in excess of 2 days) occurs two times within a 12 month period, the existing sand bottom shall be removed and replaced. Outlet structures and pipes shall be cleaned annually (at a minimum) and as needed to remove trash/debris and sediment to provide proper conveyance from the rain garden. All removed material shall be properly disposed in a landfill in accordance with state and local laws.

All removed sediment must be disposed of according to applicable regulations.

It is assumed that maintenance will consist of a combination of labor and equipment use to accomplish tasks ranging from sediment removal to trash cleanup.

Record Keeping

It is the responsibility of the property owner to maintain accurate inspection and maintenance records.



Stormwater Maintenance Schedule and Inspection List

Facility ID	La Crosse Center							
Location	La Crosse, WI							
GPS Coordinates								
Inspector(s)								
Date								
Time								
Party/Department Responsible for Maintenance:								
<u> </u>								
Contact(s):								
Phone Number(s):								
Email:								
Mailing Address:								

BMP Inspection Schedule and Checklist



A. Inlets

1 = Good Condition

2 = Acceptable, Item on Watch

3 = Item Requires Maintenance Within the Year

4 = Failed Item, Requires Immediate Maintenance

- 1. Inlets provide stable conveyance into facility
- 2. Excessive trash/debris/sediment accumulation at inlet
- 3. Evidence of erosion at/around inlet

Note: All items associated with Pretreatment shall be inspected twice a year.

Once in early Spring and once in late Fall.



BMP Inspection Schedule and Checklist



B. Bio-Infiltration Basin

1 = Good Condition

- 2 = Acceptable, Item on Watch
- 3 = Item Requires Maintenance Within the Year
- 4 = Failed Item, Requires Immediate Maintenance
- 1. Maintenance access to facility
- 2. Excessive sediment accumulation
- 3. Standing water observed in basin over 3 days after rainfall
- 4. Is there evidence of pollution entering pond? Y/N. Where?
- 5. Outlets
 - a. Maintenance access to outlet
 - b. Outlet condition
 - d. Trash/debris accumulation (Remove as quickly as possible)

B. Bio-Infiltration Basin

- 1 = Good Condition
- 2 = Acceptable, Item on Watch
- 3 = Item Requires Maintenance Within the Year
- 4 = Failed Item, Requires Immediate Maintenance
- 1. Maintenance access to facility
- 2. Excessive sediment accumulation
- 3. Standing water observed in basin over 3 days after rainfall
- 4. Is there evidence of pollution entering pond? Y/N. Where?
- 5. Outlets
 - a. Maintenance access to outlet
 - b. Outlet condition
 - d. Trash/debris accumulation (Remove as quickly as possible)





Note: All items associated with the Facility shall be inspected quarterly or as otherwise noted.



BMP Inspection Schedule and Checklist



C. Outlets

- 1 = Good Condition
- 2 = Acceptable, Item on Watch
- 3 = Item Requires Maintenance Within the Year
- 4 = Failed Item, Requires Immediate Maintenance
- 1. Outlets provide stable conveyance from facility
- 2. Excessive trash/debris/sediment accumulation at outlet
- 3. Evidence of erosion at/around outlet



D. Miscellaneous

- 1 = Good Condition
- 2 = Acceptable, Item on Watch
- 3 = Item Requires Maintenance Within the Year
- 4 = Failed Item, Requires Immediate Maintenance

Note: All miscellaneous items shall be inspected annually or as otherwise noted.

Note: All items associated with Outlets shall be inspected twice a year.

Once in the early Spring and once in late Fall.

2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039

- 1. Complaints from local residents
- 2. Pest problems
- 4. Adequate safety signage



Inspector's Summary	



Photographs		
Photo ID	Description	
1.		
2.		
3.		
4.		
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18.		
19.		
20.		



Stetch of Facility			
	Sketch of Facility		

State of Wisconsin DEPARTMENT OF NATURAL RESOURCES Black River Falls Service Center 910 Hwy 54 E Black River Falls, WI 54615

Tony Evers, Governor Preston D. Cole, Secretary Telephone (715) 284-1400 Toll Free 1-888-936-7463 TTY Access via relay - 711



December 2, 2019

Art Fahey La Crosse Center Site 300 Harborview Plaza La Crosse WI 54601 Via email: afahey@lacrossecenter.com

SUBJECT:

Coverage Under WPDES General Permit No. WI-S067831-05: Construction Site Storm Water Runoff

Permittee Name:La Crosse Center SiteSite Name:La Crosse Center Expansion & RenovationFIN:69331

Dear Permittee:

The Wisconsin Department of Natural Resources received your Water Resources Application for Project Permits or Notice of Intent, on November 15, 2019, for the La Crosse Center Expansion & Renovation site and has evaluated the information provided regarding storm water discharges from your construction site. We have determined that your construction site activities will be regulated under ch. 283, Wis. Stats., ch. NR 216, Wis. Adm. Code, and in accordance with Wisconsin Pollutant Discharge Elimination System (WPDES) General Permit No. WI-S067831-05, Construction Site Storm Water Runoff. All erosion control and storm water management activities undertaken at the site must be done in accordance with the terms and conditions of the general permit.

The **Start Date** of permit coverage for this site is December 02, 2019. The maximum period of permit coverage for this site is limited to 3 years from the **Start Date**. Therefore, permit coverage automatically expires and terminates 3 years from the Start Date and storm water discharges are no longer authorized unless another Notice of Intent and application fee to retain coverage under this permit or a reissued version of this permit is submitted to the Department 14 working days prior to expiration.

A copy of the general permit along with extensive storm water information including technical standards, forms, guidance and other documents is accessible on the Department's storm water program Internet site. To obtain a copy of the general permit, please download it and the associated documents listed below from the following Department Internet site: http://dnr.wi.gov/topic/stormwater/construction/forms.html

- Construction Site Storm Water Runoff WPDES general permit No. WI-S067831-05
- Construction site inspection report form
- Notice of Termination form

If, for any reason, you are unable to access these documents over the Internet, please contact me and I will send them to you.

To ensure compliance with the general permit, please read it carefully and be sure you understand its contents. Please take special note of the following requirements (This is not a complete list of the terms and conditions of the general permit.):

1. The Construction Site Erosion Control Plan and Storm Water Management Plan that you completed prior to submitting your permit application must be implemented and maintained throughout construction. Failure to do so may result in enforcement action by the Department.



2. The general permit requires that erosion and sediment controls be routinely inspected at least every 7 days, and within 24 hours after a rainfall event of 0.5 inches or greater. Weekly written reports of all inspections must be maintained. The reports must contain the following information:

a. Date, time, and exact place of inspection;

- b. Name(s) of individual(s) performing inspection;
- c. An assessment of the condition of erosion and sediment controls;
- d. A description of any erosion and sediment control implementation and maintenance performed;
- e. A description of the site's present phase of construction.

3. A Certificate of Permit Coverage must be posted in a conspicuous place on the construction site. The Certificate of Permit Coverage (WDNR Publication # WT-813) is enclosed for your use.

4. When construction activities have ceased and the site has undergone final stabilization, a Notice of Termination (NOT) of coverage under the general permit must be submitted to the Department.

It is important that you read and understand the terms and conditions of the general permit because they have the force of law and apply to you. Your project may lose its permit coverage if you do not comply with its terms and conditions. The Department may also withdraw your project from coverage under the general permit and require that you obtain an individual WPDES permit instead, based on the Department's own motion, upon the filing of a written petition by any person, or upon your request.

If you believe that you have a right to challenge this decision to grant permit coverage, you should know that the Wisconsin statutes and administrative rules establish time periods within which requests to review Department decisions must be filed. For judicial review of a decision pursuant to ss. 227.52 and 227.53, Wis. Stats., you have 30 days after the decision is mailed, or otherwise served by the Department, to file your petition with the appropriate circuit court and serve the petition on the Department. Such a petition for judicial review must name the Department of Natural Resources as the respondent.

To request a contested case hearing pursuant to s. 227.42, Wis. Stats., you have 30 days after the decision is mailed, or otherwise served by the Department, to serve a petition for hearing on the Secretary of the Department of Natural Resources. All requests for contested case hearings must be made in accordance with s. NR 2.05(5), Wis. Adm. Code, and served on the Secretary in accordance with s. NR 2.03, Wis. Adm. Code. The filing of a request for a contested case hearing is not a prerequisite for judicial review and does not extend the 30-day period for filing a petition for judicial review.

Thank you for your cooperation with the Construction Site Storm Water Discharge Permit Program. If you have any questions concerning the contents of this letter or the general permit, please contact Jason Gazdecki at (715) 284-1456.

Sincerely,

Jason Gazdecki West Central Region Storm Water Management Specialist

ENCLOSURE: Certificate of Permit Coverage



CERTIFICATE OF PERMIT COVERAGE

WPDES CONSTRUCTION SITE STORM WATER RUNOFF PERMIT Permit No. WI-S067831-05 **UNDER THE**

has been granted WDNR storm water permit coverage. The landowner must implement and maintain erosion control practices to limit sediment-contaminated runoff to waters of the state in accordance with the permit. required to post this certificate in a conspicuous place at the construction site. This certifies that the site Under s. NR 216.455(2), Wis. Adm. Code, landowners of construction sites with storm water discharges regulated by the Wisconsin Department of Natural Resources (WDNR) Storm Water Permit Program are

EROSION CONTROL COMPLAINTS

1-800-TIP-WDNR (1-800-847-9367)

Please provide the following information to the Tip Line: WDNR Site No. (FIN): 69331

Site Name: La Crosse Center Expansion & Renovation

Address/Location: 300 Harborview Plaza City of LA CROSSE

Additional Information:

Landowner: La Crosse Center Site

Landowner's Contact Person: Art Fahey

Contact Telephone Number: (608) 789-7413

Permit Start Date: December 02, 2019

WDNR Publication # WT-813 (10/11)

