

Exhibit O

Preliminary Stormwater Report

Circleville Solar



Preliminary Stormwater Report

Prepared for:

Circleville Solar, LLC

700 University Blvd.

Juno Beach, FL 33408

Location: Circleville, OH

December 2, 2021

EVS Project No.: 2021-145.1

Table of Contents

List of Appendices	i
1.0 Introduction.....	1
2.0 Existing Conditions	1
3.0 Proposed Development	1
4.0 Jurisdictional Requirements	2
5.0 Stormwater Design Approach.....	2
6.0 Calculations and Data.....	4
7.0 Federal Emergency Management Agency (FEMA)	5
8.0 Scour & Erosion Potential	5
9.0 High Water Level	6
10.0 Conclusion	6

List of Appendices

Appendix A – Drainage Exhibits

Appendix B – HydroCAD Model

Appendix C – 100-year High-Water Level Depths

1.0 Introduction

The purpose of this report is to describe the proposed stormwater management design for the construction of a solar photovoltaic generation facility and substation (“the project”) and document compliance with State and local stormwater requirements. The project is located in Jackson and Wayne Townships, Pickaway County, Ohio.

The project proposes to convert approximately 756 acres of the property’s 1,636-acres of cultivated agricultural land into a power generation facility and substation. Construction will include elevated solar modules mounted on driven steel piles, concrete transformer pads, aggregate substation pad and aggregate access roads. The goal of the stormwater management design is to meet or exceed the requirements of the Authorities Having Jurisdiction by reducing the rate and volume of runoff generated by the project site and controlling pollutants and sedimentation from leaving the site during construction.

2.0 Existing Conditions

The project is proposed to be constructed within a 1,636-acre set of properties that is generally bounded on the north and east by State Route 56 W, on the west by Lick Run Creek, on the south by the Jackson / Wayne Township Line, and on the southeast by State Route 104. Current land use is agricultural and is composed primarily of straight row crops, but also includes field roads and drainage ditches.

The USDA’s Web Soil Survey (WSS) indicates existing soils on site are generally silt loams and silty clay loams.

The site is generally flat with the majority of slopes under five percent. Intermittent streams, ditches, and drainageways throughout the project have side slopes ranging from 4:1 up to 2:1. Existing drainage for each of the properties within the project area are largely maintained by natural and man-made swales throughout the property.

For the purposes of stormwater analysis, the existing conditions have been modeled as Row Crops with Type C soils, which results in a sitewide curve number of 85.

See Appendix ‘A’ for the Existing Drainage Exhibit.

3.0 Proposed Development

The proposed development consists of 70 MW AC of total solar capacity in addition to a substation to support the distribution of the electrical power to the grid. The project proposes to install solar collection equipment across an area spanning through approximately 756-acre project area and a substation pad with electrical distribution infrastructure. Solar modules are mounted on racking attached to steel piles driven directly into the ground. Racking systems are called tracker-systems, which are oriented in the north/south direction. The tracker-systems rotate east to west during the day to maintain optimal angle with the sun. Supplementary proposed land uses include concrete equipment pads, aggregate access roads, and vegetative buffers. Aggregate surfacing for temporary laydown yards will be removed and replaced with topsoil and seeding at the conclusion of the project.

Site grading is proposed in select locations within the project area. Grading, earthwork and disturbance will be limited to the greatest extent possible and used only to fulfill the purpose of providing positive drainage, accessible roads, temporary sediment basins and a workable surface to install the solar panel tracking system.

Temporary BMP's are also proposed to minimize offsite transport of sediment during construction. These include but are not limited to planting temporary seeding to maintain vegetative coverage during construction, constructing rock construction entrances at site entrances, installing silt fence at the downstream ends of flow patterns from the site, wetting gravel drives and laydown yards to minimize dust, and installation of temporary sediment basins where runoff drains to a concentrated location.

This project also proposes to plant permanent seed mixtures across the entire site prior to conclusion of construction. Doing so will significantly reduce the curve numbers below the existing values associated with the existing row crops. Ground cover below the solar modules will be a low-growing perennial vegetation.

4.0 Jurisdictional Requirements

Local jurisdictions for stormwater requirements of this project include Pickaway County and the Ohio Environmental Protection Agency (OEPA).

As the local Authority Having Jurisdiction, Pickaway County is responsible for reviewing BMPs to control sedimentation during construction, i.e. silt fence, sediment basins, temporary stabilization, etc. Pickaway County does not have separate storm water volume reduction or rate control requirements.

The project will be required to comply with the Ohio Environmental Protection Agency's NPDES Construction General Permit, which has the following requirements:

- Implement BMPs to control sedimentation during construction, i.e. silt fence, sediment basins, temporary stabilization, etc.
- Submittal of a Notice of Intent.
- Develop a Storm Water Pollution Prevention Plan (SWPPP).
- Water quality treatment.
- Weekly Inspections.
- Permanent stabilization.
- Filing of Notice of Termination.

5.0 Stormwater Design Approach

The project proposes to replace approximately 13.6 acres of existing cropland with impervious roads (compacted aggregate) and equipment pads. In addition, approximately 609 acres of solar modules will be constructed but will not replace existing vegetation as they are elevated on driven steel piles. The Ohio Environmental Protection Agency (OEPA) does not consider the proposed solar equipment to be impervious. The addition of impervious roads and equipment pads will generate an increase in stormwater runoff rate and volume, which will be mitigated to mimic pre-settlement conditions.

EVS, Inc. has used HydroCAD software to model the proposed stormwater conditions and to determine the peak stormwater runoff rates. Based on the design standards in the Rainwater and Land Development section of the Ohio EPA Standards for Stormwater Management, a proposed buffer strip will be provided on the downstream side of any impervious cover of a width equal to that of the impervious coverage draining to the buffer strip. This is considered acceptable if topsoil that is removed or compacted during the construction of phase of the project is replaced and uncompacted.

Design Assumptions

- The OEPA has determined that solar modules are to be considered pervious.
- The USDA Web Soil Survey indicates soils on site are primarily silt loams and silty clay loams, and designated as HSG Type C.
- The NRCS land cover Curve Number (CN) for HSG Type C soils are as follows:
 - Row Crops CN is 85
 - Meadow grass CN is 71
 - Aggregate road CN is 96
 - Concrete pads CN is 98

Rate Control

To achieve post construction rate control, the approach will be to take advantage of a change in land use from annually rotated cropland to permanently vegetated grass ground cover over much of the site. This vegetated grassland will act as a large filter strip between the impervious access drives and all offsite discharge locations. The existing site condition of straight row crops with approximately 5% woods in Hydric Soil Group C, which has a composite NRCS Curve Number (CN) of 84. When converted to a fully vegetated meadow condition, the same soil has a CN of 71. When the impervious gravel and the concrete equipment pads are added, the combined curve number is 77. The reduction in overall CN from 85 to 77 is shown to reduce the rate of stormwater runoff sufficiently.

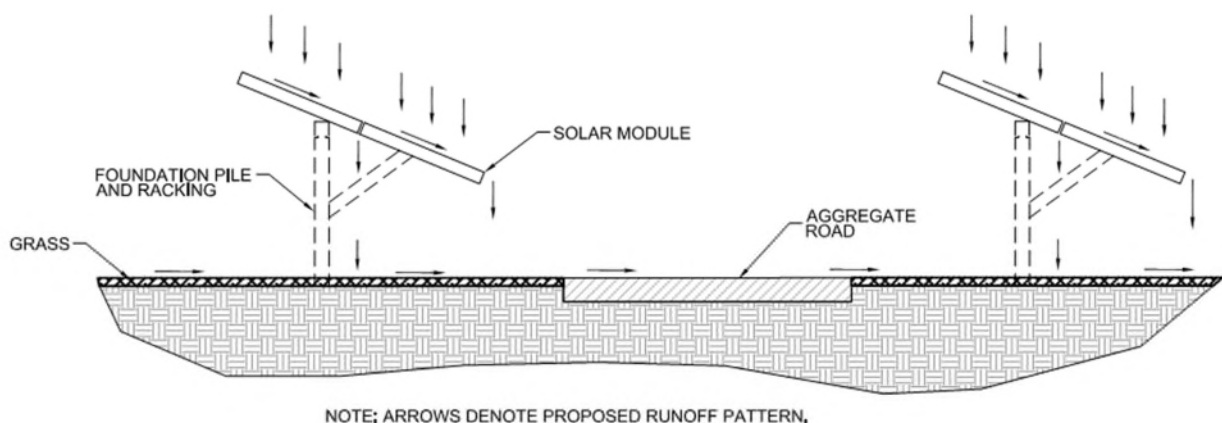


Figure 1 – Runoff Pattern

Water Quality

To achieve the required post construction water quality volume requirement, a buffer strip of the same width as the impervious surface will be installed on the downstream side of the impervious surface.

Water quality will also be provided by changing the land use of the project area from cultivated agricultural land to nearly 100% vegetated ground cover. The runoff from the impervious aggregate roads contains the heaviest concentration of pollutants. Stormwater runoff from solar modules travels over a significant length of vegetation prior to leaving the site. Runoff from the access roads, solar modules, and concrete pads will pass through the vegetative cover prior to entering the existing drainage ditches and leaving the project area. These large filter strips between all access drives and all offsite discharge locations will provide both rate control and water quality improvements over the existing conditions and will help meet all OEPA requirements.

Substation Stormwater Design

The stormwater design for the substation site will consist of a permanent stormwater BMP that will provide the required rate control and water quality in accordance with OEPA regulations.

6.0 Calculations and Data

Volume Reduction Calculations

Table 1 – Impervious Area Tabulation

IMPERVIOUS AREA		
PV ARRAY IMPERVIOUS		
Area of Gravel Roads	12.3	ac
Area of Equipment Pads	1.3	ac
TOTAL Impervious Area	13.6	ac

*Piles are driven directly into the ground with no concrete embedment. The end area of the steel pile is small and would have a negligible effect on the Water Quality Volume. Therefore, it is not included in the calculations.

** The OEPA considers solar panel module area to be pervious as stormwater will run off the panels and onto grass/meadow below.

Rate Control Calculations

The existing and proposed HydroCAD output reports from the model of this system are attached in Appendix B. HydroCAD directly implements some of the key features of TR-55, such as curve-number lookup and procedures for calculating time-of-concentration. Runoff routing method SCS TR-20 is used for this model.

The peak rates provided in the table below represent the flows from the site to adjacent unnamed ditches. Stormwater runoff that travels offsite to the adjacent sites to the southeast of the proposed development have both been reduced. This has been achieved by taking advantage in the change in ground cover from row crops to predominantly meadow grass.

Table 2 - Runoff Rate – Solar Array Area			
Rainfall Event (Type II 24-hr)	Pre-development (cfs)	Proposed (cfs)	% Reduction
2-year	1,050.9	621.1	41%
10-year	1,969.7	1,379.2	30%
100-year	2,936.0	2,228.5	24%

Rainfall Depths

Climate and Precipitation

- Rainfall Frequencies per NOAA Atlas-14

Table 3 - Rainfall Events	
Recurrence Interval (yrs)	24-hour Rainfall Depth (in)
2-year	2.60
10-year	3.80
100-year	5.00

7.0 Federal Emergency Management Agency (FEMA)

The project site is located within Zone X, an area of minimal flood hazard, on FEMA FIRM panel 39129C0300J, effective date 7/21/2010. Several minor flow paths drain through the project site. Big Darby Creek is east of the proposed site and the project site avoids the river's floodplain.

8.0 Scour & Erosion Potential

Site grading is done such that runoff conditions at all pile locations will be sheet flow. No piles are located in ditches, swales, channels, etc. where concentrated flow would create a potential scour condition. Erosion potential is to be mitigated by establishing vegetation throughout the site. No new concentrated flow drainage features are proposed for this project.

9.0 High Water Level

The 100-year high-water level of the project area was analyzed using HEC-RAS and is shown on the High Water Level Exhibit in Appendix C.

10.0 Conclusion

Stormwater management requirements can be separated into two categories: construction phase requirements and post-construction phase requirements. Construction phase stormwater requirements of this project are met by obtaining the NPDES permit required by the OEPA. Post construction phase stormwater requirements are met by constructing the proposed stormwater basin and changing the land use of the project area from cultivated agricultural land to nearly 100% vegetated ground cover acting as a filter strip. This land use change contributes to a reduction in rate of runoff and controls the water quality leaving the project area. The grassed filter strips also contribute to a reduction in volume of runoff.

Stormwater Report

Appendix A

Drainage Exhibit



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CLIENT

PROJECT
CIRCLEVILLE SOLAR

LOCATION
**PICKAWAY COUNTY
CIRCLEVILLE, OH**
SUBMITTAL
**OHIO POWER SITING
BOARD REVIEW**

SCALE



0 500 1000 FT
1 2 IN
DRAWING SCALE APPLIES TO 24" X 36" SHEETS

DATE DESCRIPTION

PROFESSIONAL CERTIFICATION

PRELIMINARY NOT FOR
CONSTRUCTION OR PROCUREMENT

DRAWN BY

KEIMB

CHECKED BY

DB

DATE

2021.11.12

PROJECT #

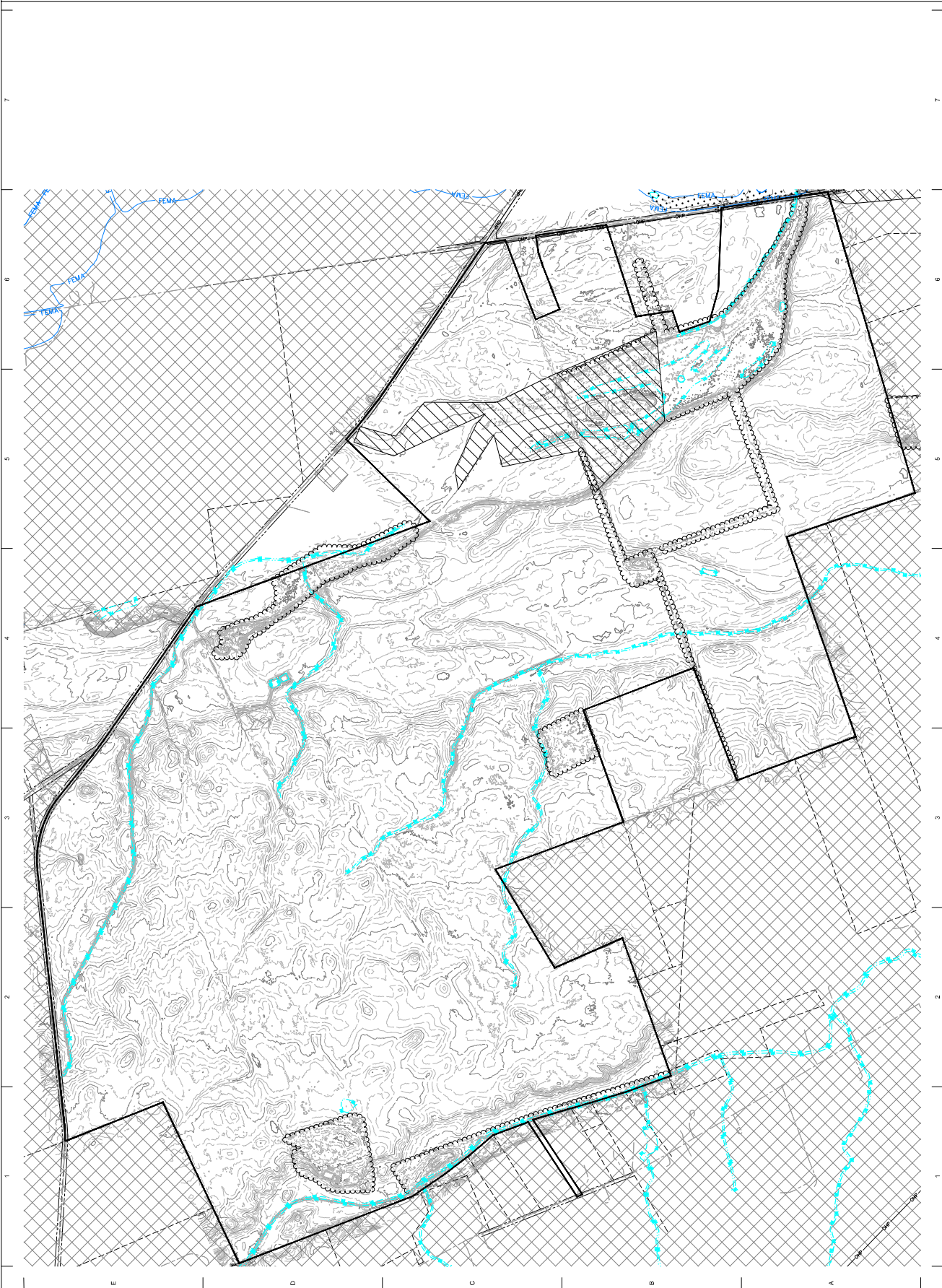
2021-145.1

SHEET NAME

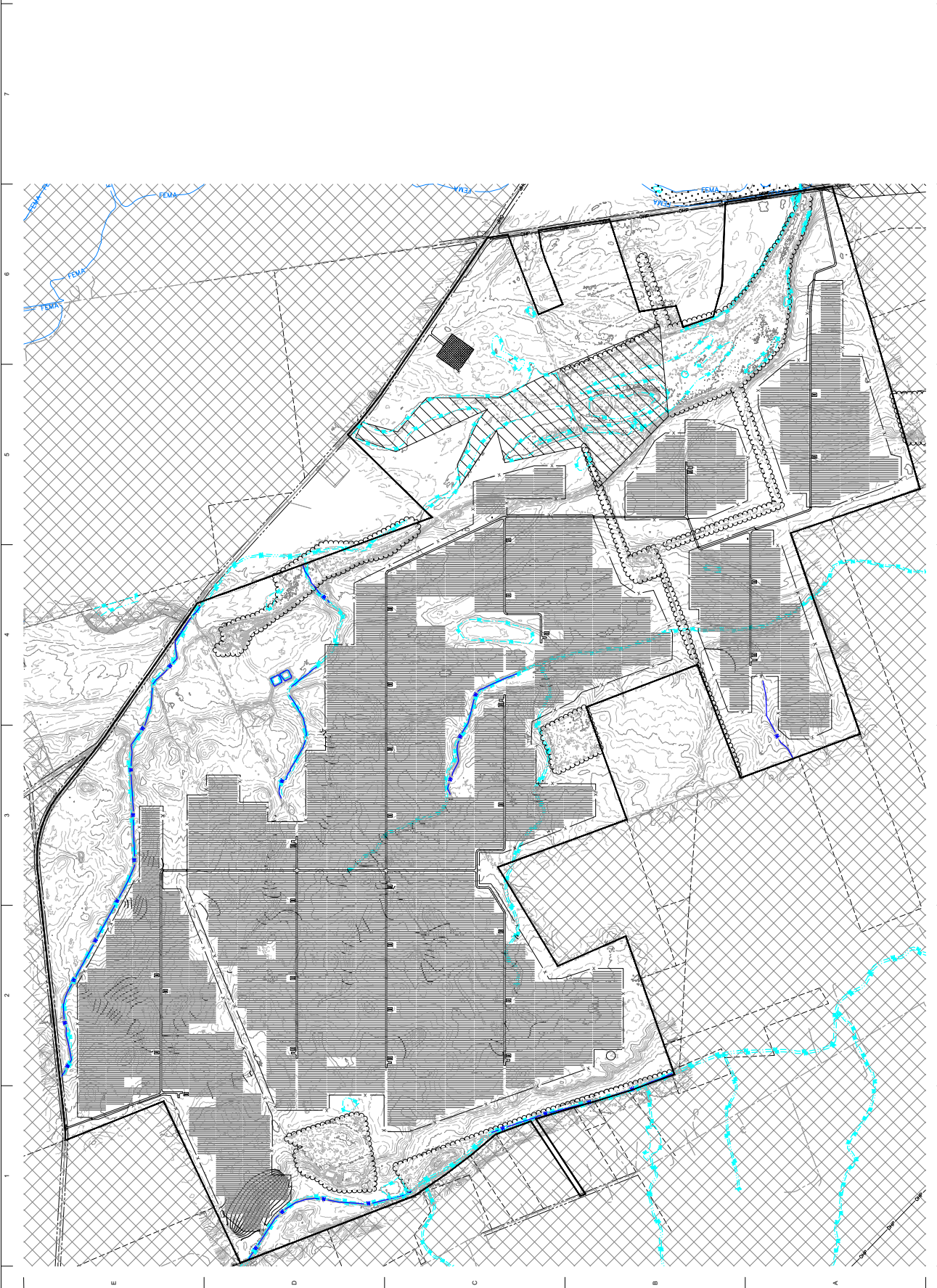
EXISTING DRAINAGE EXHIBIT

SHEET NUMBER

EXHIBIT 1



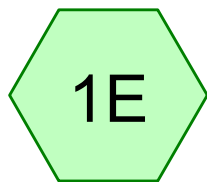
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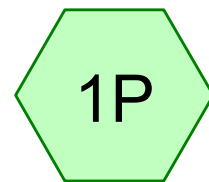
Stormwater Report

Appendix B

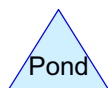
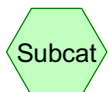
HydroCAD Model



EXISTING



PROPOSED



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Page 2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.251	98	Equipment pad, HSG C (1P)
0.798	96	Gravel around pads, HSG C (1P)
11.901	96	Gravel road, HSG C (1P)
739.080	71	Meadow, non-grazed, HSG C (1P)
1,976.589	85	Row crops, straight row, Good, HSG C (1E, 1P)
139.980	73	Woods, Fair, HSG C (1E, 1P)
2,869.600	81	TOTAL AREA

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Type II 24-hr 2-Year Rainfall=2.60"

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Page 3

Time span=5.00-72.00 hrs, dt=0.05 hrs, 1341 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1E: EXISTING

Runoff Area=64,024,278 sf 0.00% Impervious Runoff Depth=1.19"

Tc=50.0 min CN=84 Runoff=1,050.89 cfs 146.255 af

Subcatchment 1P: PROPOSED

Runoff Area=60,975,503 sf 0.09% Impervious Runoff Depth=0.80"

Tc=50.0 min CN=77 Runoff=621.09 cfs 93.758 af

Total Runoff Area = 2,869.600 ac Runoff Volume = 240.013 af Average Runoff Depth = 1.00"
99.96% Pervious = 2,868.349 ac 0.04% Impervious = 1.251 ac

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Type II 24-hr 2-Year Rainfall=2.60"

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Page 4

Summary for Subcatchment 1E: EXISTING

Runoff = 1,050.89 cfs @ 12.51 hrs, Volume= 146.255 af, Depth= 1.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=2.60"

Area (sf)	CN	Description
60,975,503	85	Row crops, straight row, Good, HSG C
3,048,775	73	Woods, Fair, HSG C
64,024,278	84	Weighted Average
64,024,278		100.00% Pervious Area

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

Summary for Subcatchment 1P: PROPOSED

Runoff = 621.09 cfs @ 12.53 hrs, Volume= 93.758 af, Depth= 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=2.60"

Area (sf)	CN	Description
* 518,409	96	Gravel road, HSG C
* 34,771	96	Gravel around pads, HSG C
* 54,491	98	Equipment pad, HSG C
25,124,724	85	Row crops, straight row, Good, HSG C
32,194,333	71	Meadow, non-grazed, HSG C
3,048,775	73	Woods, Fair, HSG C
60,975,503	77	Weighted Average
60,921,012		99.91% Pervious Area
54,491		0.09% Impervious Area

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

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Type II 24-hr 10-Year Rainfall=3.80"

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Page 5

Time span=5.00-72.00 hrs, dt=0.05 hrs, 1341 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1E: EXISTING

Runoff Area=64,024,278 sf 0.00% Impervious Runoff Depth=2.20"

Tc=50.0 min CN=84 Runoff=1,969.73 cfs 268.945 af

Subcatchment 1P: PROPOSED

Runoff Area=60,975,503 sf 0.09% Impervious Runoff Depth=1.66"

Tc=50.0 min CN=77 Runoff=1,379.22 cfs 193.298 af

Total Runoff Area = 2,869.600 ac Runoff Volume = 462.243 af Average Runoff Depth = 1.93"
99.96% Pervious = 2,868.349 ac 0.04% Impervious = 1.251 ac

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Type II 24-hr 10-Year Rainfall=3.80"

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Page 6

Summary for Subcatchment 1E: EXISTING

Runoff = 1,969.73 cfs @ 12.50 hrs, Volume= 268.945 af, Depth= 2.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.80"

Area (sf)	CN	Description
60,975,503	85	Row crops, straight row, Good, HSG C
3,048,775	73	Woods, Fair, HSG C
64,024,278	84	Weighted Average
64,024,278		100.00% Pervious Area

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

Summary for Subcatchment 1P: PROPOSED

Runoff = 1,379.22 cfs @ 12.51 hrs, Volume= 193.298 af, Depth= 1.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.80"

Area (sf)	CN	Description
* 518,409	96	Gravel road, HSG C
* 34,771	96	Gravel around pads, HSG C
* 54,491	98	Equipment pad, HSG C
25,124,724	85	Row crops, straight row, Good, HSG C
32,194,333	71	Meadow, non-grazed, HSG C
3,048,775	73	Woods, Fair, HSG C
60,975,503	77	Weighted Average
60,921,012		99.91% Pervious Area
54,491		0.09% Impervious Area

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

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Type II 24-hr 100-Year Rainfall=5.00"

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Page 7

Time span=5.00-72.00 hrs, dt=0.05 hrs, 1341 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1E: EXISTING

Runoff Area=64,024,278 sf 0.00% Impervious Runoff Depth=3.27"

Tc=50.0 min CN=84 Runoff=2,935.94 cfs 400.571 af

Subcatchment 1P: PROPOSED

Runoff Area=60,975,503 sf 0.09% Impervious Runoff Depth=2.62"

Tc=50.0 min CN=77 Runoff=2,228.49 cfs 305.973 af

Total Runoff Area = 2,869.600 ac Runoff Volume = 706.543 af Average Runoff Depth = 2.95"
99.96% Pervious = 2,868.349 ac 0.04% Impervious = 1.251 ac

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Type II 24-hr 100-Year Rainfall=5.00"

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Page 8

Summary for Subcatchment 1E: EXISTING

Runoff = 2,935.94 cfs @ 12.49 hrs, Volume= 400.571 af, Depth= 3.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=5.00"

Area (sf)	CN	Description
60,975,503	85	Row crops, straight row, Good, HSG C
3,048,775	73	Woods, Fair, HSG C
64,024,278	84	Weighted Average
64,024,278		100.00% Pervious Area

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

Summary for Subcatchment 1P: PROPOSED

Runoff = 2,228.49 cfs @ 12.50 hrs, Volume= 305.973 af, Depth= 2.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=5.00"

Area (sf)	CN	Description
* 518,409	96	Gravel road, HSG C
* 34,771	96	Gravel around pads, HSG C
* 54,491	98	Equipment pad, HSG C
25,124,724	85	Row crops, straight row, Good, HSG C
32,194,333	71	Meadow, non-grazed, HSG C
3,048,775	73	Woods, Fair, HSG C
60,975,503	77	Weighted Average
60,921,012		99.91% Pervious Area
54,491		0.09% Impervious Area

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

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Multi-Event Tables

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Page 9

Events for Subcatchment 1E: EXISTING

Event	Rainfall (inches)	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
2-Year	2.60	1,050.89	146.255	1.19
10-Year	3.80	1,969.73	268.945	2.20
100-Year	5.00	2,935.94	400.571	3.27

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Multi-Event Tables

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Page 10

Events for Subcatchment 1P: PROPOSED

Event	Rainfall (inches)	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
2-Year	2.60	621.09	93.758	0.80
10-Year	3.80	1,379.22	193.298	1.66
100-Year	5.00	2,228.49	305.973	2.62

Stormwater Report

Appendix C

100-Year High Water Level Depths

**This foregoing document was electronically filed with the Public Utilities
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in

Case No(s). 21-1090-EL-BGN

Summary: Application Exhibit O – Preliminary Stormwater Report electronically
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