



PRELIMINARY STORMWATER MANAGEMENT REPORT

Sun Trust Solar Project

Kane County, Illinois

AUGUST 21, 2025

PREPARED FOR:



PREPARED BY:

Westwood

Preliminary Stormwater Management Report

Sun Trust Solar Project

Kane County, Illinois

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Introduction

The purpose of this report is to summarize the proposed stormwater management for the Sun Trust Solar Project (“the project”). This report was prepared to meet the runoff reduction and water quality requirements of Kane County and the state of Illinois. This is a preliminary plan which will need to be updated as the design progresses.

The project site will encompass approximately 23 acres and is located approximately 40 miles northwest of the city of Chicago in Kane County, Illinois, with the nearest town being Gilberts. Gilberts is located 0.75 miles northeast of the project area. The site’s current use is agricultural row crops.

The proposed use of the site will be a solar facility with the area below the solar panels modeled as pervious surface as consistent with industry standard. The proposed site will consist of 22.76 acres of meadow grasses and 0.24 acres of the new impervious surface including gravel access roads, inverters, and other associated solar infrastructure.

FEMA has completed a study to determine flood hazards for the selected location; the project area contains FEMA Zone AE areas. No preliminary or pending FEMA data was located that will affect the project area.

Minimal new impervious area and grading will be proposed on site and existing drainage patterns will be maintained. It is proposed to convert the project area from row crop land cover to meadow grass to meet the runoff reduction and water quality requirements of Kane County and the state of Illinois.

Data Sources

TABLE 1: DATA SOURCES

Task	Format	Source	Use
Elevation	DWG	SunVest Solar	Onsite Elevations
Elevation	1-meter Lidar	USGS	Offsite Elevations
Landcover	Shapefile	USDA 2021 Crop Data Layer	Existing Landcover
Soils	Shapefile	USGS SSURGO Dataset	Curve Numbers
Precipitation	PDF File	ISWS Bulletin 75 State Water Survey	Design Storms
Site Boundary	KMZ	SunVest Solar	Define Model Extents
2014 Aerial Photography	ArcGIS Map Service	USDA FSA	Reference
FEMA Flood Zones	PDF; Shapefile	FEMA	Reference

Site Conditions

Site Location

The project site will encompass approximately 23 acres and is located approximately 40 miles northwest of the city of Chicago in Kane County, Illinois, with the nearest town being Gilberts. Gilberts is located 0.75 miles northeast of the project area. See Exhibit 1 for a map of the project location.

Topography Description

The existing topographic information utilized in the analysis consists of a CAD surface provided by SunVest Solar and USGS National Elevation Set 1m elevation data obtained from The National Map. The provided CAD surface was used for onsite elevations whereas the 1m data was used to determine offsite contributing watersheds. Most of the site is generally flat with slopes of around 0.5%-2%, with slightly steeper slopes in the northeastern section of the site up to around 5%.

Drainage Patterns

Approximately 14 acres of offsite runoff enters the site from the north and northeast. Runoff from the project drains south via sheet flow into Tyler Creek. Tyler Creek is located to the south of the project and drains from northwest to southeast. Onsite and offsite drainage areas and the overall project discharge point are shown in Exhibits 5 & 6.

FEMA Flood Zones

FEMA has completed a study to determine flood hazards for the selected location; the project area is covered by panel 17089C0135H (Appendix F). The southwestern fence line of the project borders a FEMA Zone AE flood hazard area associated with the Tyler Creek floodplain. A FEMA Zone AE flood hazard is a 100-year flood hazard in which base flood elevations are provided. No preliminary or pending FEMA changes are proposed within the project area. See Exhibit 2 for the FEMA Zones within the project area.

Soils

SSURGO soils information was downloaded and reviewed for the analysis.

The site consists primarily of Hydrologic Soil Group (HSG) D soils with some locations of HSG B. Type B soils have moderate runoff potential and infiltration rates. Type D soils have high runoff potential and low infiltration rates. Low infiltration rates can cause localized flooding in low areas for extended periods on site. See Exhibit 3 for the soils distribution throughout the site.

Landcover

A review of aerial photographs and the USDA 2021 Crop Data Layer shows that the site is currently used and has historically been used for agricultural row crops. See Exhibit 4 for a map of the landcover throughout the site.

Requirements

State and County requirements have been reviewed for the project. All requirements determined to be relevant to the project are summarized below.

Post-Construction Stormwater Management Requirements

The following post-construction requirements need to be met for the project.

TABLE 2: STORMWATER MANAGEMENT REQUIREMENTS

Agency	Location of Requirements	New Impervious Area	Requirement
Kane County	Kane County Stormwater Management Ordinance (Rev. 06/01/2019)	5,000 sq.ft. – 24,999 sq.ft.	Provide volume reduction and water quality treatment of one-inch of rainfall over the impervious area

The project also proposes to provide a watershed benefit measure by converting the existing land cover from row crop to a proposed meadow grass cover. See the Stormwater Management Approach section for more information.

Drainage Improvements

Proposed drainage improvements will be sized per Table 3.

TABLE 3: DRAINAGE IMPROVEMENT SIZING REQUIREMENTS

Drainage Improvement	Source	Requirement
Entrance Culverts	Kane County Stormwater Management Ordinance	100-year 24-hour

Methodology

Existing and proposed conditions are modeled in HydroCAD software. HydroCAD is a widely accepted hydrologic and hydraulic modeling package based on National Engineering Handbook (NEH) Part 630. It models stormwater runoff discharge rates and velocities from ponds, culverts, outlet control structures, and stream reaches.

Hydrology

Curve Number Methodology, based on NEH Part 630 Chapter 9, was used in the modeling for predicting direct runoff. Curve numbers were assigned by reviewing the soil and landcover for each drainage area.

Times of concentration were calculated for each drainage area in HydroCAD using methods described in Chapter 15 of NEH Part 630.

Atlas 14 precipitation and distribution data was used for the analysis. See Table 4 and Appendix A for the precipitation values used.

TABLE 4: RAINFALL TABLE

Storm Event	2-year 24-hour	10-year 24-hour	100-year 24-hour
Rainfall (in)	3.34	5.15	8.57

Hydraulics

Culvert sizing was completed using HydroCAD and contributing watershed properties to find runoff rates to the anticipated culvert locations. CulvertMaster was then used to size the culverts assuming 1' allowable headwater and Manning's number of 0.024 for corrugated metal culverts. CulvertMaster uses the methodologies outlined in Hydraulic Design Series Number 5 from the U.S. Federal Highway Administration to calculate capacities and end conditions.

Stormwater Management Approach

A solar project differs greatly from other commercial or residential developments. When constructed, a solar project will include solar panels, at-grade gravel access roads, and other electrical equipment. The panels will be mounted above the ground with a low maintenance perennial meadow grass growing below. Due to the area between and beneath the panels being vegetated, panels are modeled as pervious surface. While solar projects may require grading, the existing terrain is smoothed to accommodate array installation, rather than significant changes to grades or slopes, and the grading is designed to maintain existing drainage patterns. Access roads are installed at grade and allow for runoff to sheet flow through the proposed meadow cover which provides treatment and reduction in runoff. The proposed vegetation slows the runoff and allows for water to filter into the soils for treatment.

Water quality is improved over pre-development conditions due to the land cover's conversion from a higher runoff rate row-crop field to a lower runoff rate meadow grass. Water quality concerns are also minimized due to the low percentage of impervious surfaces and that runoff from these surfaces filters through the meadow grasses on site prior to discharging.

In addition to typical stormwater management BMPs, the recommended approach for solar projects should include the following: limit the amount of impervious surfaces to reduce runoff, minimize the amount of grading to promote sheet flow, and the planting of the meadow grass on the majority of the site to provide both runoff reduction and treatment.

Modeling

The site is modeled in existing and proposed conditions in order to complete the water quantity analysis required.

Existing Conditions

The existing onsite areas consist of row crops. Offsite runoff is included in the analysis to determine overall discharge rates from the site. Curve numbers were assigned based on the landcover and soil types, see Table 5 for a summary of existing conditions.

TABLE 5: EXISTING CONDITIONS COVER

Cover	CN	Area (ac)
Row Crops, HSG B	78	1.25
Row Crops, HSG D	89	21.75
Row Crops, HSG B (Offsite)	78	3.82
Row Crops, HSG D (Offsite)	89	5.76
Wooded/Grass, HSG B (Offsite)	58	4.42
Total	84	37.00

Proposed Conditions

The use of the site will be a solar facility. The solar modules will be located above grade with meadow grass below the proposed array and a small percentage of impervious areas. See Table 6 below for a summary of proposed conditions.

TABLE 6: PROPOSED CONDITIONS COVER

Cover	CN	Area (ac)
Meadow Grass, HSG B	58	1.25
Meadow Grass, HSG D	78	21.51
Impervious	98	0.24
Row Crops, HSG B (Offsite)	78	3.82
Row Crops, HSG D (Offsite)	89	5.76
Wooded/Grass, HSG B (Offsite)	58	4.42
Total	77	37.00

*Panels are considered meadow cover, see Stormwater Management Approach section for details.

Results

The results of the various analyses are described below.

Water Quantity Analysis

Stormwater runoff calculations for the site were prepared using HydroCAD. The proposed site reduces runoff rates and volumes from existing to proposed conditions by converting the area between and below the array from row crop to meadow grass cover. This land cover acts as a filter strip across the entire project area, implementing a watershed benefit measure that improves water quality and reduces stormwater runoff. Tables 7 and 8 show a summary of the runoff rates and volumes for the 2-year, 10-year, and 100-year 24-hour storm events from the project under existing and proposed conditions, including offsite runoff onto the site. Calculations are included in Appendices B & C.

TABLE 7: RUNOFF RATE SUMMARY

Location	2-year Runoff (cfs)		10-year Runoff (cfs)		100-year Runoff (cfs)	
	Existing	Proposed	Existing	Proposed	Existing	Proposed
1	9.81	7.50	17.53	14.85	32.07	29.32

TABLE 8: RUNOFF VOLUME SUMMARY

Location	2-year Runoff (ac-ft)		10-year Runoff (ac-ft)		100-year Runoff (ac-ft)	
	Existing	Proposed	Existing	Proposed	Existing	Proposed
1	5.551	4.048	10.508	8.476	20.485	17.882

Water Quality Analysis

Treatment of the stormwater quality volume for the site will be provided through filter strip BMPs by the conversion from row crop to meadow grass land cover across the site. The filter strip BMP treats and reduces the runoff volume from the one-inch rainfall event over the impervious area. Table 9 shows the required and provided treatment volume for site. The provided treatment volume was calculated by taking the difference between the proposed runoff volume and the existing runoff volume from the site for the 1-inch rainfall event. Calculations can be found in Appendix D.

TABLE 9: WATER QUALITY TREATMENT SUMMARY

Proposed Impervious Area (ac)	Required Treatment Volume (cu ft)	Provided Treatment Volume (cu ft)
0.24	871	13,983

Stormwater Management Practices

Crossing Sizing

An entrance culvert is proposed at the access road entrance of the project. The culvert is sized for the 100-year 24-hour rain event with a 1 foot allowable head. Calculations were performed using HydroCAD and CulvertMaster and are included in Appendix E.

TABLE 10: ENTRANCE CULVERT SUMMARY

Location	Culvert Size	Culvert Material
EC-01	18"	CMP

Conclusion

The proposed site was designed to meet the water quality and runoff reduction requirements of Kane County and the State of Illinois. The proposed vegetative cover below the solar array reduces runoff rates and volumes from existing to proposed conditions while providing water quality treatment of stormwater runoff. Overall existing drainage patterns shall be maintained from existing to proposed conditions and grading should be minimized to the extent possible. This report is preliminary and updates should be made as the design progresses.

References Cited

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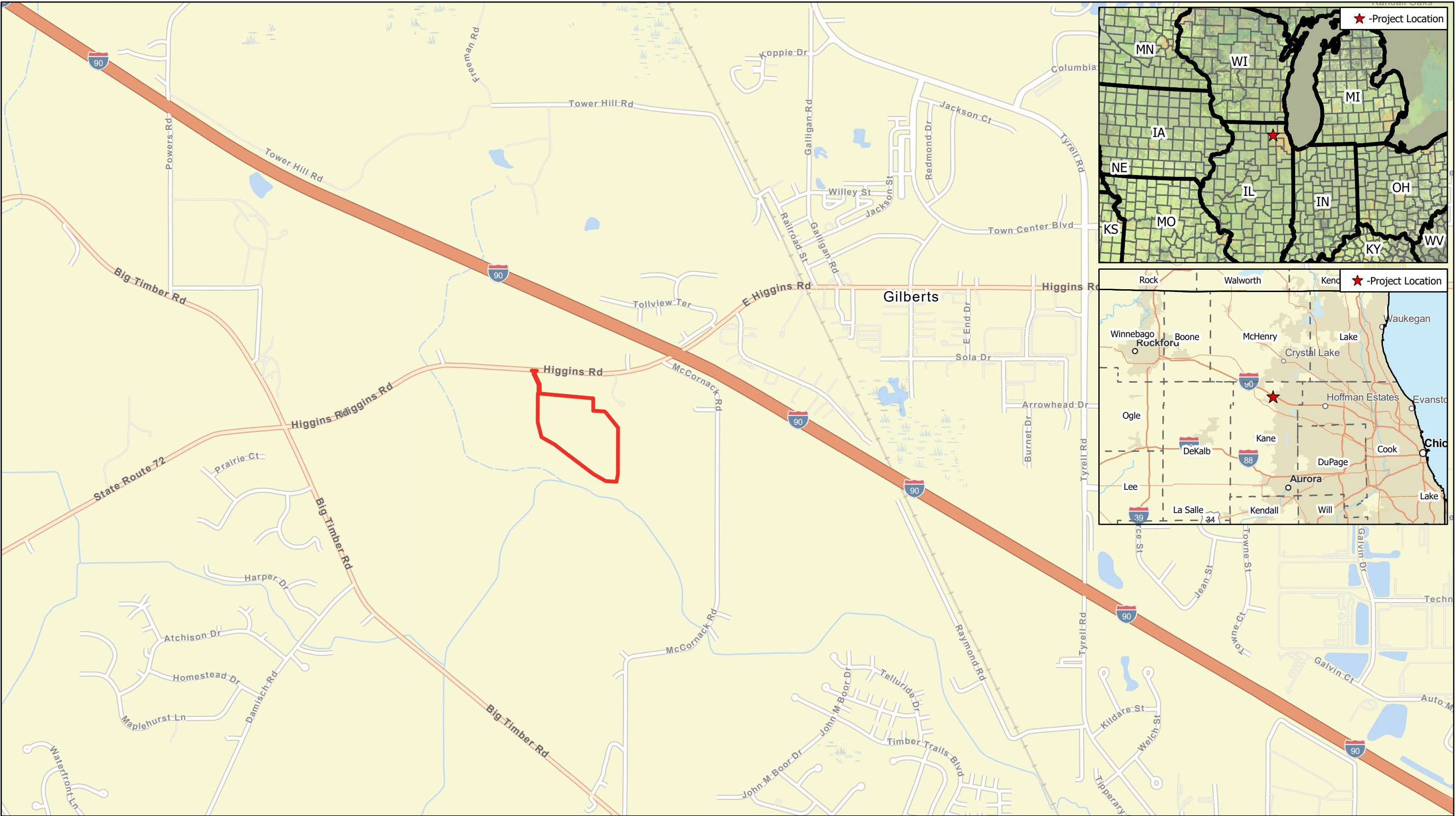
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Exhibits





Data Source(s): Westwood (2025); Esri WMS
Basemap Imagery (Accessed 2025); USGS
(2025); FEMA (2025); USDA (2025)

Westwood

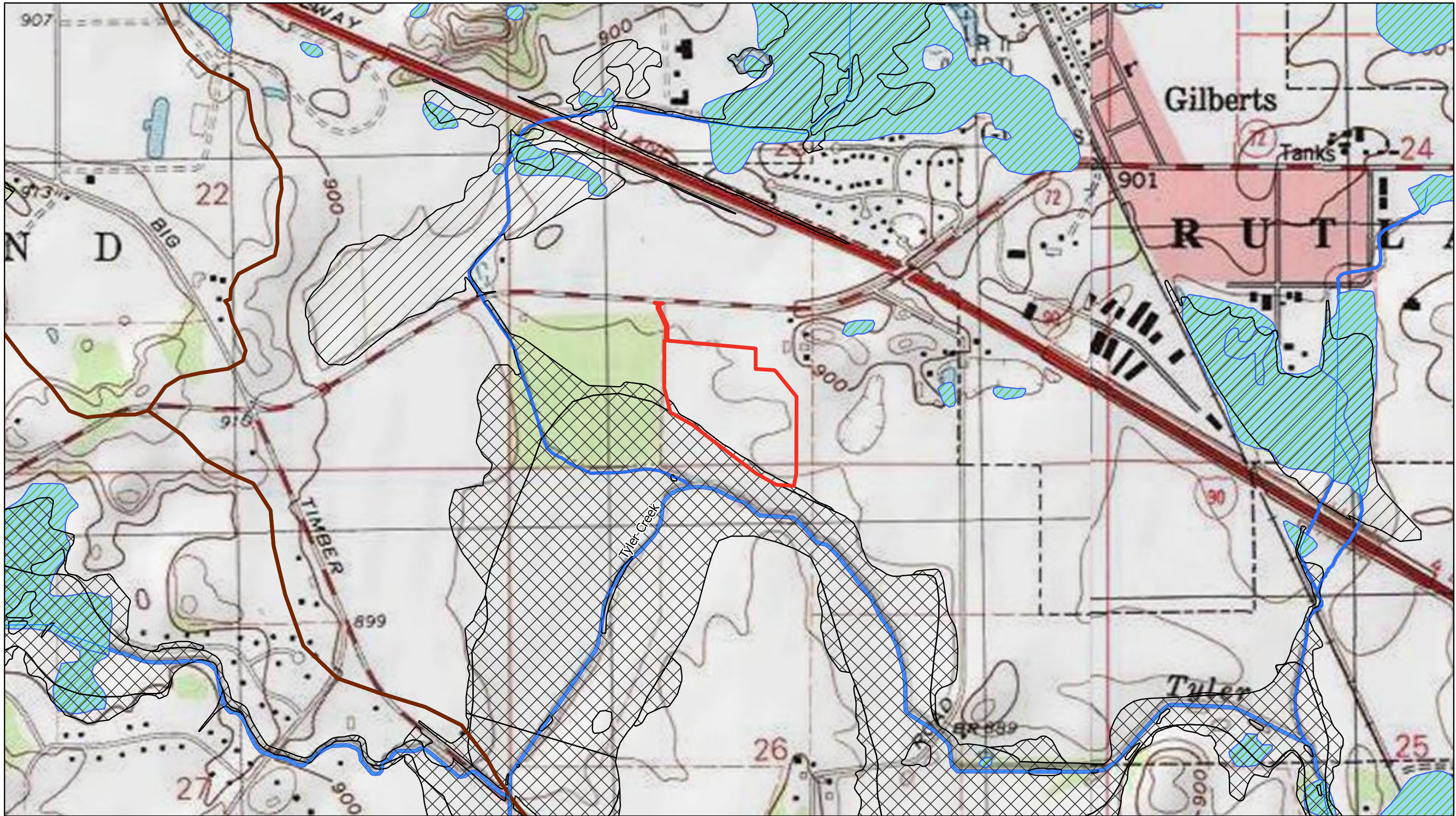
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Legend

-  Project Area
-  County Boundary

Sun Trust Solar Project
Kane County, Illinois











Data Source(s): Westwood (2025); Esri WMS
Basemap Imagery (Accessed 2025); USGS
(2025); FEMA (2025); USDA (2025)

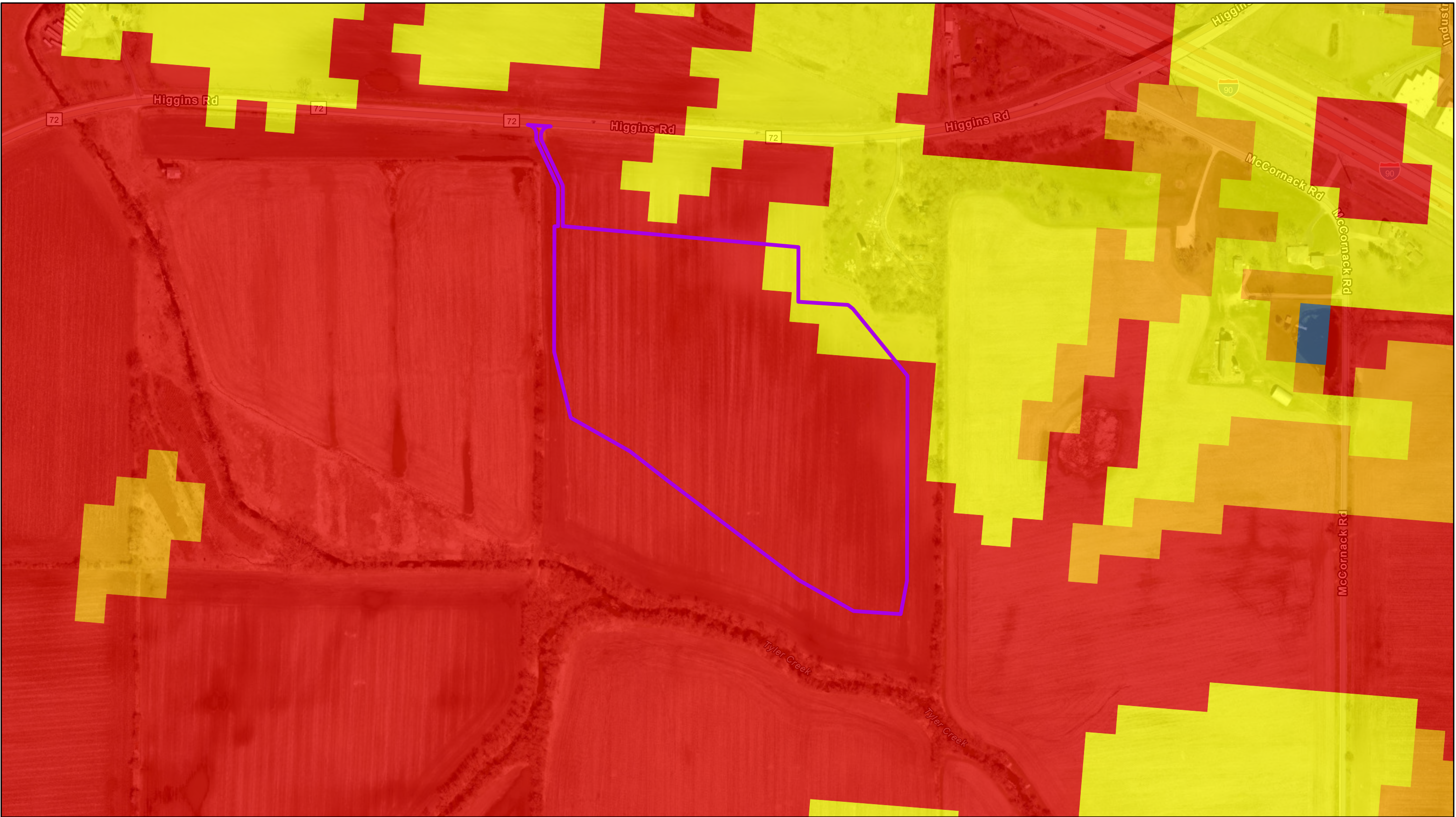
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Legend

- | | | |
|---|--|---|
|  Project Area |  FEMA Zone A |  NWI Wetlands |
|  HUC-12 Boundary |  FEMA Zone AE |  NHD Flowlines |

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Kane County, Illinois





Exhibit 2: Base Hydrologic Map
August 21, 2025



Data Source(s): Westwood (2025); Esri WMS
Basemap Imagery (Accessed 2025); USGS
(2025); FEMA (2025); USDA (2025)

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Legend

- | | |
|--|---|
|  Project Area |  C |
| Hydrologic Soil Group |  D |
|  B |  Water |



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Kane County, Illinois











Exhibit 3: Soils Map
August 21, 2025



Data Source(s): Westwood (2025); Esri WMS Basemap Imagery (Accessed 2025); USGS (2025); FEMA (2025); USDA (2025)

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Legend

- | | | | |
|--|--|---|---|
|  Project Area |  Cultivated |  Woods |  Water |
| Landcover |  Developed |  Pastureland |  Wetland |
|  Barren |  Fallow |  Shrubland | |



Sun Trust Solar Project
Kane County, Illinois

Exhibit 4: Landcover Map
August 21, 2025



- LEGEND:**
- EX. STREAM CHANNEL
 - FEMA FLOOD ZONE
 - NWI WETLAND
 - EX. ONSITE DRAINAGE AREA BOUNDARY
 - EX. OFFSITE DRAINAGE AREA BOUNDARY
 - EX. TIME OF CONCENTRATION LINE
 - EX. OFFSITE TIME OF CONCENTRATION LINE
 - DISCHARGE LOCATION
 - ONSITE DRAINAGE AREA LABEL
 - DISCHARGE AREA LABEL
 - OFFSITE DRAINAGE AREA LABEL

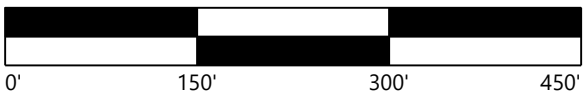
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Kane County, Illinois

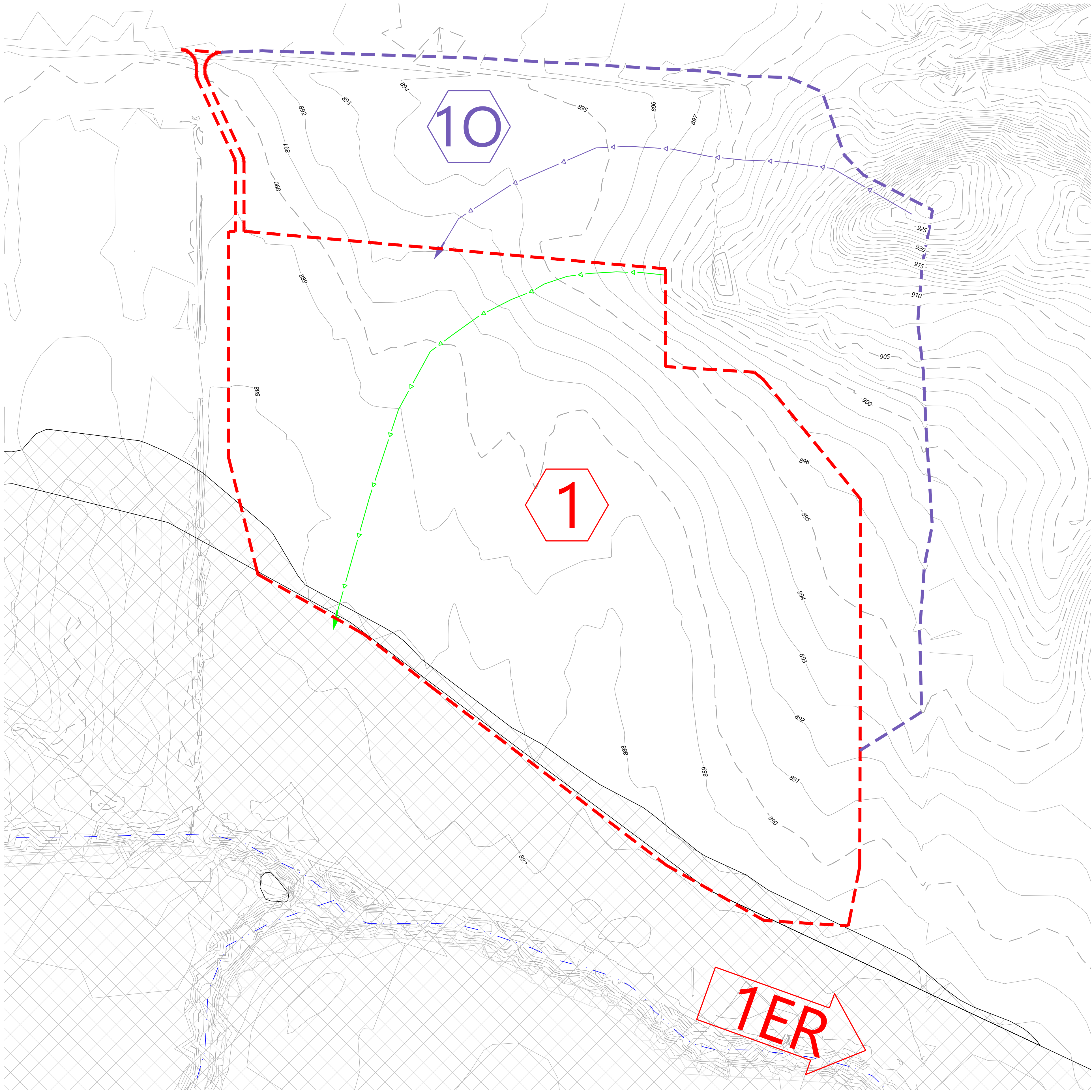
Overall Existing
Drainage Map

DATE: 08/21/2025

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- LEGEND:**
- EX. INDEX CONTOUR
 - EX. INTERVAL CONTOUR
 - EX. STREAM CHANNEL
 - FEMA FLOOD ZONE
 - NWI WETLAND
 - EX. ONSITE DRAINAGE AREA BOUNDARY
 - EX. OFFSITE DRAINAGE AREA BOUNDARY
 - EX. TIME OF CONCENTRATION LINE
 - EX. OFFSITE TIME OF CONCENTRATION LINE
 - DISCHARGE LOCATION
 - 1 ONSITE DRAINAGE AREA LABEL
 - 1ER DISCHARGE AREA LABEL
 - 1 OFFSITE DRAINAGE AREA LABEL

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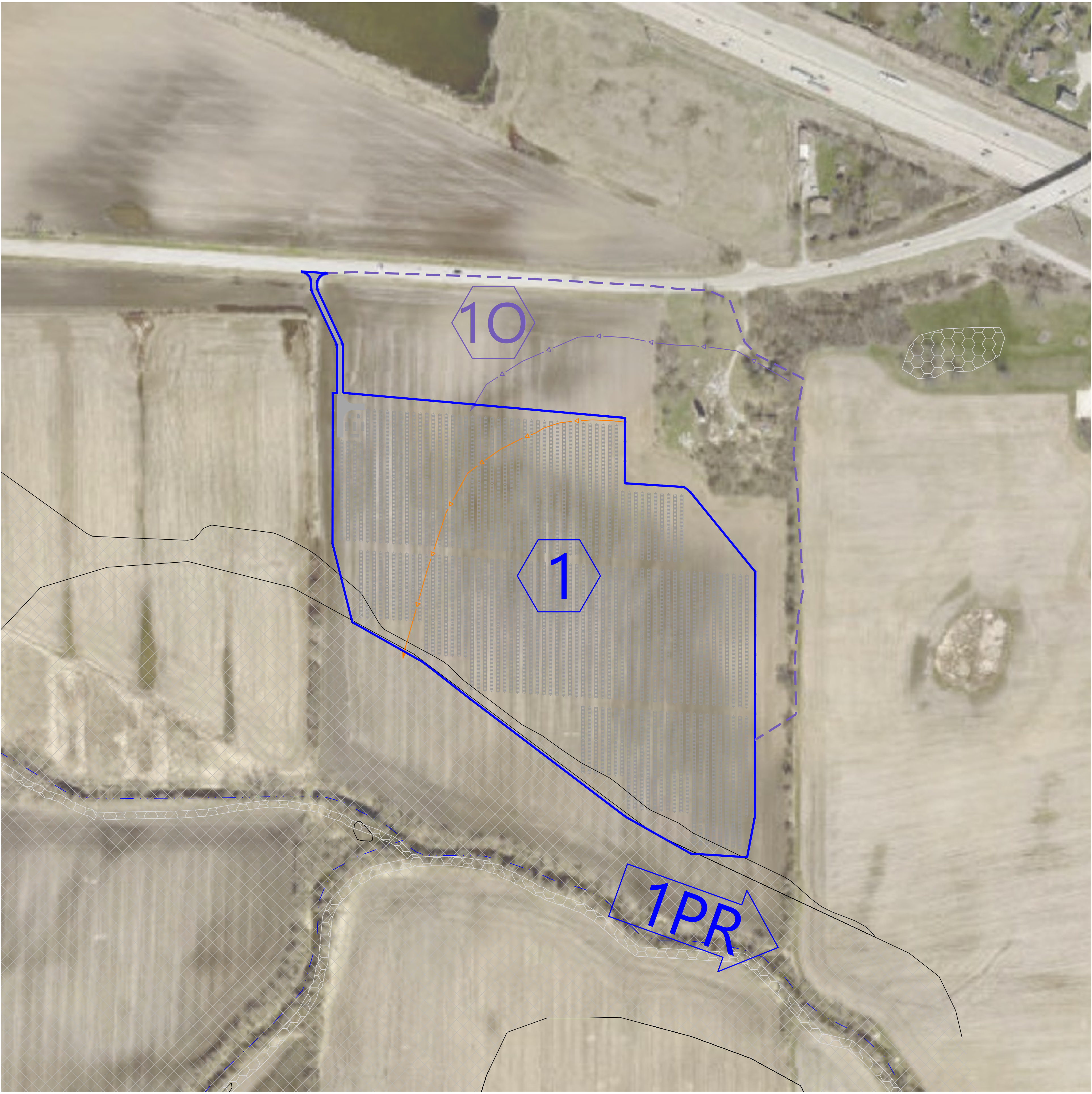
Kane County, Illinois

Existing Drainage Map

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- LEGEND:
- EX. STREAM CHANNEL
 - FEMA FLOOD ZONE
 - NWI WETLAND
 - SOLAR ARRAY
 - EX. ONSITE DRAINAGE AREA BOUNDARY
 - EX. OFFSITE DRAINAGE AREA BOUNDARY
 - EX. TIME OF CONCENTRATION LINE
 - EX. OFFSITE TIME OF CONCENTRATION LINE
 - DISCHARGE LOCATION
 - 1 ONSITE DRAINAGE AREA LABEL
 - 1PR DISCHARGE AREA LABEL
 - 1 OFFSITE DRAINAGE AREA LABEL

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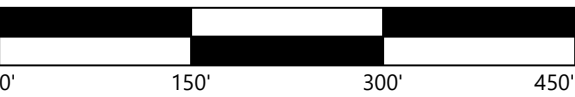
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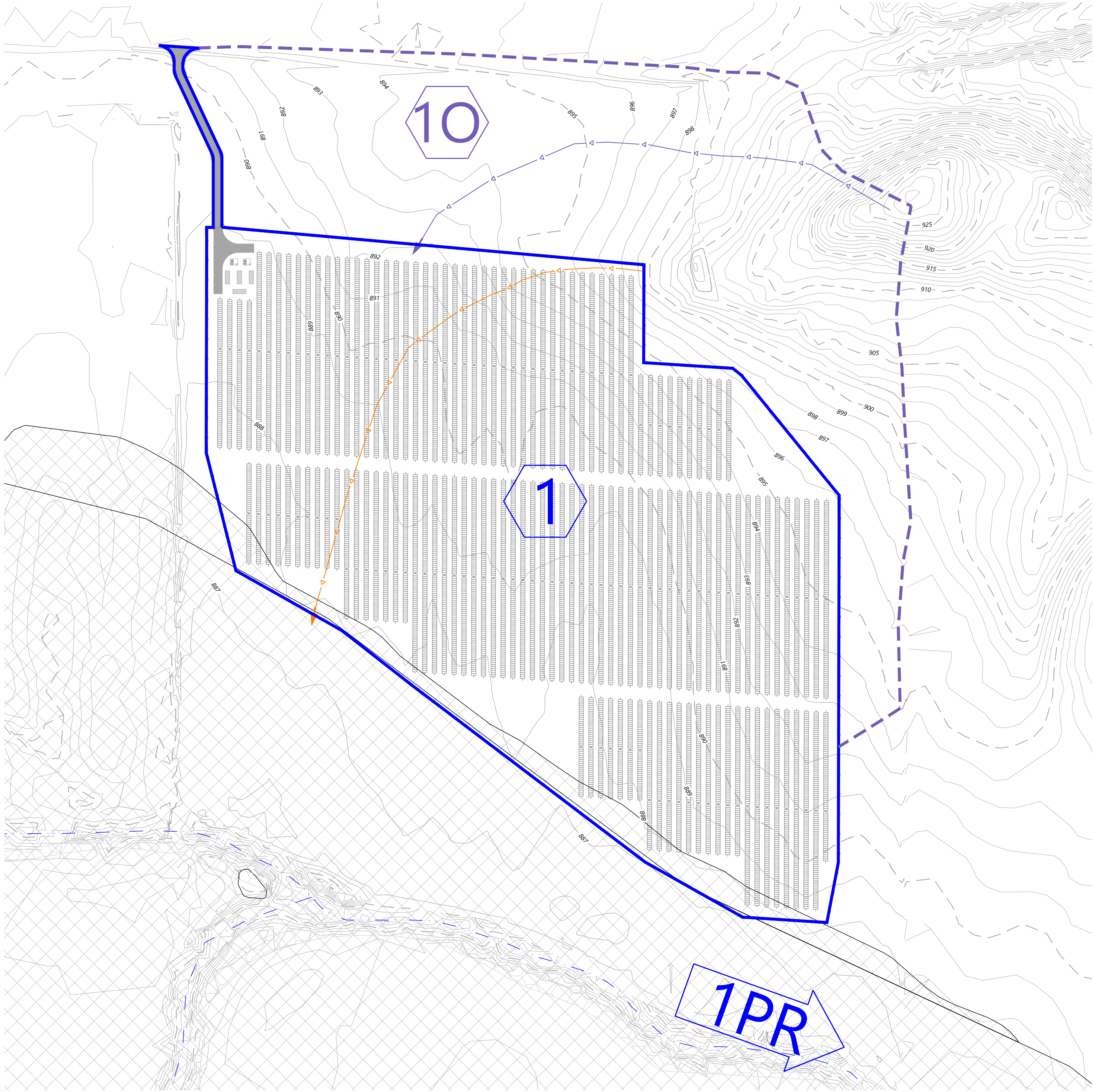
Overall Proposed
Drainage Map

DATE: 08/21/2025

REV:

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- LEGEND:
- EX. INDEX CONTOUR
 - EX. INTERVAL CONTOUR
 - EX. STREAM CHANNEL
 - FEMA FLOOD ZONE
 - NWI WETLAND
 - SOLAR ARRAY
 - EX. ONSITE DRAINAGE AREA BOUNDARY
 - EX. OFFSITE DRAINAGE AREA BOUNDARY
 - EX. TIME OF CONCENTRATION LINE
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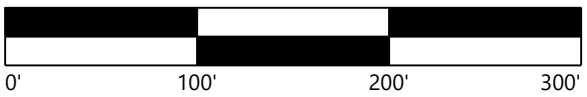
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Kane County, Illinois

Proposed Drainage Map

DATE: 08/21/2025

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The background of the entire page is a dark red topographic map. It features intricate, wavy contour lines in a lighter red shade. A dashed red line runs diagonally from the top left towards the bottom center. Along this line, there is a solid red dot in the lower half and a red 'x' mark in the upper half. The text is centered in the upper portion of the image.

Appendix A

Precipitation Frequency Study for Illinois

Table 7. Rainfall (inches) for Given Recurrence Interval for Section 2 (Northeast)

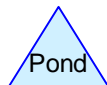
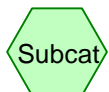
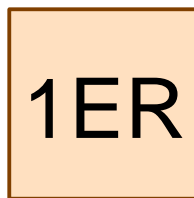
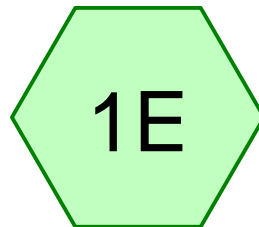
Storm Duration	2-month	3-month	4-month	6-month	9-month	1-year	2-year	5-year	10-year	25-year	50-year	100-year	500-year
5 minutes	0.19	0.22	0.24	0.27	0.31	0.33	0.40	0.52	0.62	0.77	0.90	1.03	1.35
10 minutes	0.33	0.38	0.41	0.47	0.53	0.58	0.70	0.90	1.08	1.35	1.58	1.80	2.36
15 minutes	0.42	0.49	0.53	0.61	0.69	0.75	0.90	1.16	1.39	1.74	2.03	2.32	3.04
30 minutes	0.58	0.66	0.73	0.83	0.94	1.03	1.24	1.59	1.91	2.39	2.78	3.17	4.16
1 hour	0.74	0.84	0.93	1.05	1.20	1.30	1.57	2.02	2.42	3.03	3.53	4.03	5.28
2 hours	0.91	1.04	1.14	1.30	1.48	1.61	1.94	2.49	2.99	3.74	4.35	4.97	6.52
3 hours	1.00	1.15	1.26	1.44	1.63	1.77	2.14	2.75	3.30	4.13	4.80	5.49	7.20
6 hours	1.18	1.35	1.48	1.68	1.91	2.08	2.51	3.23	3.86	4.84	5.63	6.43	8.43
12 hours	1.37	1.56	1.71	1.95	2.21	2.41	2.91	3.74	4.48	5.61	6.53	7.46	9.78
18 hours	1.48	1.69	1.85	2.11	2.39	2.61	3.14	4.04	4.84	6.06	7.05	8.06	10.57
24 hours	1.57	1.80	1.97	2.24	2.55	2.77	3.34	4.30	5.15	6.45	7.50	8.57	11.24
48 hours	1.72	1.97	2.16	2.46	2.79	3.04	3.66	4.71	5.62	6.99	8.13	9.28	12.10
72 hours	1.87	2.14	2.34	2.67	3.03	3.30	3.97	5.08	6.05	7.49	8.64	9.85	12.81
120 hours	2.08	2.38	2.61	2.97	3.37	3.67	4.42	5.63	6.68	8.16	9.39	10.66	13.81
240 hours	2.63	3.01	3.30	3.76	4.27	4.65	5.60	7.09	8.25	9.90	11.26	12.65	16.00



Appendix B

Existing HydroCAD Results

Existing Conditions



Summary for Subcatchment 1E:

Runoff = 9.81 cfs @ 15.96 hrs, Volume= 5.551 af, Depth= 1.80"
 Routed to Reach 1ER :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Huff 0-10sm 3Q scaled to 24.00 hrs 2yr Rainfall=3.34"

Area (ac)	CN	Description
21.750	89	Row crops, straight row, Good, HSG D
1.250	78	Row crops, straight row, Good, HSG B
4.420	58	Woods/grass comb., Good, HSG B
3.820	78	Row crops, straight row, Good, HSG B
5.760	89	Row crops, straight row, Good, HSG D
37.000	84	Weighted Average
37.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	100	0.1300	0.37		Sheet Flow, Grass: Short n= 0.150 P2= 3.34"
21.1	1,570	0.0190	1.24		Shallow Concentrated Flow, Cultivated Straight Rows Kv= 9.0 fps
25.6	1,670	Total			

Summary for Reach 1ER:

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

Inflow Area = 37.000 ac, 0.00% Impervious, Inflow Depth = 1.80" for 2yr event
 Inflow = 9.81 cfs @ 15.96 hrs, Volume= 5.551 af
 Outflow = 9.81 cfs @ 15.96 hrs, Volume= 5.551 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Subcatchment 1E:

Runoff = 17.53 cfs @ 15.90 hrs, Volume= 10.508 af, Depth= 3.41"
 Routed to Reach 1ER :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Huff 0-10sm 3Q scaled to 24.00 hrs 10yr Rainfall=5.15"

Area (ac)	CN	Description
21.750	89	Row crops, straight row, Good, HSG D
1.250	78	Row crops, straight row, Good, HSG B
4.420	58	Woods/grass comb., Good, HSG B
3.820	78	Row crops, straight row, Good, HSG B
5.760	89	Row crops, straight row, Good, HSG D
37.000	84	Weighted Average
37.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	100	0.1300	0.37		Sheet Flow, Grass: Short n= 0.150 P2= 3.34"
21.1	1,570	0.0190	1.24		Shallow Concentrated Flow, Cultivated Straight Rows Kv= 9.0 fps
25.6	1,670	Total			

Summary for Reach 1ER:

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

Inflow Area = 37.000 ac, 0.00% Impervious, Inflow Depth = 3.41" for 10yr event
 Inflow = 17.53 cfs @ 15.90 hrs, Volume= 10.508 af
 Outflow = 17.53 cfs @ 15.90 hrs, Volume= 10.508 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Subcatchment 1E:

Runoff = 32.07 cfs @ 15.90 hrs, Volume= 20.485 af, Depth= 6.64"
 Routed to Reach 1ER :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Huff 0-10sm 3Q scaled to 24.00 hrs 100yr Rainfall=8.57"

Area (ac)	CN	Description
21.750	89	Row crops, straight row, Good, HSG D
1.250	78	Row crops, straight row, Good, HSG B
4.420	58	Woods/grass comb., Good, HSG B
3.820	78	Row crops, straight row, Good, HSG B
5.760	89	Row crops, straight row, Good, HSG D
37.000	84	Weighted Average
37.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	100	0.1300	0.37		Sheet Flow, Grass: Short n= 0.150 P2= 3.34"
21.1	1,570	0.0190	1.24		Shallow Concentrated Flow, Cultivated Straight Rows Kv= 9.0 fps
25.6	1,670	Total			

Summary for Reach 1ER:

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

Inflow Area = 37.000 ac, 0.00% Impervious, Inflow Depth = 6.64" for 100yr event
 Inflow = 32.07 cfs @ 15.90 hrs, Volume= 20.485 af
 Outflow = 32.07 cfs @ 15.90 hrs, Volume= 20.485 af, Atten= 0%, Lag= 0.0 min

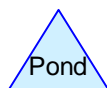
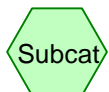
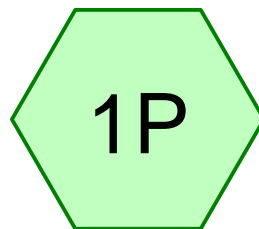
Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

The background of the page is a dark red topographic map. It features numerous thin, light red contour lines that form irregular, concentric shapes across the entire surface. A dashed red line runs diagonally from the top center towards the bottom left. Along this dashed line, there is a solid red dot located in the lower-left quadrant and a red 'X' mark located slightly above and to the right of the dot.

Appendix C

Proposed HydroCAD Results

Proposed Conditions



Summary for Subcatchment 1P:

Runoff = 7.50 cfs @ 16.21 hrs, Volume= 4.048 af, Depth= 1.31"
 Routed to Reach 1PR :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Huff 0-10sm 3Q scaled to 24.00 hrs 2yr Rainfall=3.34"

Area (ac)	CN	Description
21.510	78	Meadow, non-grazed, HSG D
* 0.240	98	Impervious
1.250	58	Meadow, non-grazed, HSG B
4.420	58	Woods/grass comb., Good, HSG B
3.820	78	Row crops, straight row, Good, HSG B
5.760	89	Row crops, straight row, Good, HSG D
37.000	77	Weighted Average
36.760		99.35% Pervious Area
0.240		0.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	100	0.1300	0.37		Sheet Flow, Grass: Short n= 0.150 P2= 3.34"
9.4	850	0.0280	1.51		Shallow Concentrated Flow, Cultivated Straight Rows Kv= 9.0 fps
24.2	720	0.0050	0.49		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
38.1	1,670	Total			

Summary for Reach 1PR:

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

Inflow Area = 37.000 ac, 0.65% Impervious, Inflow Depth = 1.31" for 2yr event
 Inflow = 7.50 cfs @ 16.21 hrs, Volume= 4.048 af
 Outflow = 7.50 cfs @ 16.21 hrs, Volume= 4.048 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Subcatchment 1P:

Runoff = 14.85 cfs @ 16.13 hrs, Volume= 8.476 af, Depth= 2.75"
 Routed to Reach 1PR :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Huff 0-10sm 3Q scaled to 24.00 hrs 10yr Rainfall=5.15"

Area (ac)	CN	Description
21.510	78	Meadow, non-grazed, HSG D
* 0.240	98	Impervious
1.250	58	Meadow, non-grazed, HSG B
4.420	58	Woods/grass comb., Good, HSG B
3.820	78	Row crops, straight row, Good, HSG B
5.760	89	Row crops, straight row, Good, HSG D
37.000	77	Weighted Average
36.760		99.35% Pervious Area
0.240		0.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	100	0.1300	0.37		Sheet Flow, Grass: Short n= 0.150 P2= 3.34"
9.4	850	0.0280	1.51		Shallow Concentrated Flow, Cultivated Straight Rows Kv= 9.0 fps
24.2	720	0.0050	0.49		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
38.1	1,670	Total			

Summary for Reach 1PR:

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

Inflow Area = 37.000 ac, 0.65% Impervious, Inflow Depth = 2.75" for 10yr event
 Inflow = 14.85 cfs @ 16.13 hrs, Volume= 8.476 af
 Outflow = 14.85 cfs @ 16.13 hrs, Volume= 8.476 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Subcatchment 1P:

Runoff = 29.32 cfs @ 16.04 hrs, Volume= 17.882 af, Depth= 5.80"
 Routed to Reach 1PR :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Huff 0-10sm 3Q scaled to 24.00 hrs 100yr Rainfall=8.57"

Area (ac)	CN	Description
21.510	78	Meadow, non-grazed, HSG D
* 0.240	98	Impervious
1.250	58	Meadow, non-grazed, HSG B
4.420	58	Woods/grass comb., Good, HSG B
3.820	78	Row crops, straight row, Good, HSG B
5.760	89	Row crops, straight row, Good, HSG D
37.000	77	Weighted Average
36.760		99.35% Pervious Area
0.240		0.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	100	0.1300	0.37		Sheet Flow, Grass: Short n= 0.150 P2= 3.34"
9.4	850	0.0280	1.51		Shallow Concentrated Flow, Cultivated Straight Rows Kv= 9.0 fps
24.2	720	0.0050	0.49		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
38.1	1,670	Total			

Summary for Reach 1PR:

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

Inflow Area = 37.000 ac, 0.65% Impervious, Inflow Depth = 5.80" for 100yr event
 Inflow = 29.32 cfs @ 16.04 hrs, Volume= 17.882 af
 Outflow = 29.32 cfs @ 16.04 hrs, Volume= 17.882 af, Atten= 0%, Lag= 0.0 min

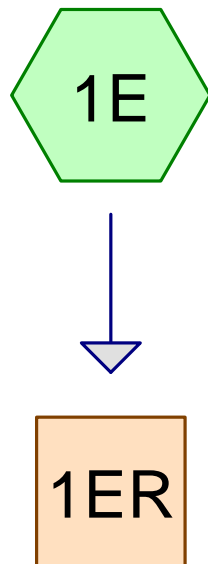
Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs



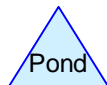
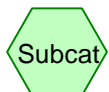
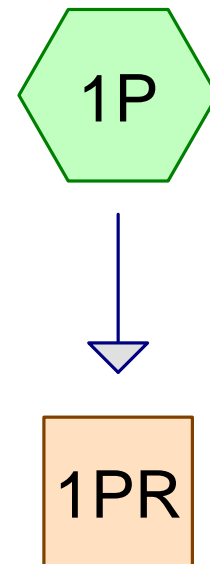
Appendix D

Water Quality Calculations

Existing Conditions



Proposed Conditions



Summary for Subcatchment 1E:

Runoff = 0.94 cfs @ 16.36 hrs, Volume= 0.468 af, Depth= 0.15"
 Routed to Reach 1ER :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Huff 0-10sm 3Q scaled to 24.00 hrs WQ Rainfall=1.00"

Area (ac)	CN	Description
21.750	89	Row crops, straight row, Good, HSG D
1.250	78	Row crops, straight row, Good, HSG B
4.420	58	Woods/grass comb., Good, HSG B
3.820	78	Row crops, straight row, Good, HSG B
5.760	89	Row crops, straight row, Good, HSG D
37.000	84	Weighted Average
37.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	100	0.1300	0.37		Sheet Flow, Grass: Short n= 0.150 P2= 3.34"
21.1	1,570	0.0190	1.24		Shallow Concentrated Flow, Cultivated Straight Rows Kv= 9.0 fps
25.6	1,670	Total			

Summary for Subcatchment 1P:

Runoff = 0.29 cfs @ 17.82 hrs, Volume= 0.147 af, Depth= 0.05"
 Routed to Reach 1PR :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Huff 0-10sm 3Q scaled to 24.00 hrs WQ Rainfall=1.00"

Area (ac)	CN	Description
21.510	78	Meadow, non-grazed, HSG D
* 0.240	98	Impervious
1.250	58	Meadow, non-grazed, HSG B
4.420	58	Woods/grass comb., Good, HSG B
3.820	78	Row crops, straight row, Good, HSG B
5.760	89	Row crops, straight row, Good, HSG D
37.000	77	Weighted Average
36.760		99.35% Pervious Area
0.240		0.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	100	0.1300	0.37		Sheet Flow, Grass: Short n= 0.150 P2= 3.34"
9.4	850	0.0280	1.51		Shallow Concentrated Flow, Cultivated Straight Rows Kv= 9.0 fps
24.2	720	0.0050	0.49		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
38.1	1,670	Total			

Summary for Reach 1ER:

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

Inflow Area = 37.000 ac, 0.00% Impervious, Inflow Depth = 0.15" for WQ event
 Inflow = 0.94 cfs @ 16.36 hrs, Volume= 0.468 af
 Outflow = 0.94 cfs @ 16.36 hrs, Volume= 0.468 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Reach 1PR:

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

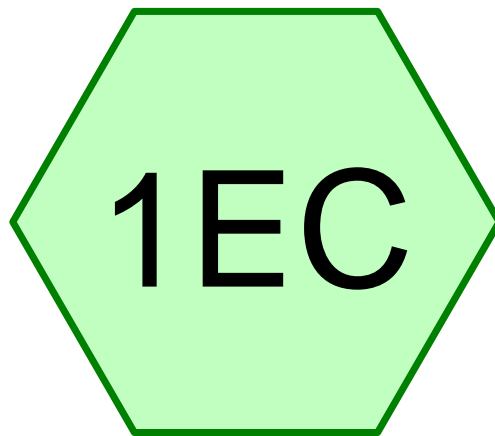
Inflow Area = 37.000 ac, 0.65% Impervious, Inflow Depth = 0.05" for WQ event
 Inflow = 0.29 cfs @ 17.82 hrs, Volume= 0.147 af
 Outflow = 0.29 cfs @ 17.82 hrs, Volume= 0.147 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

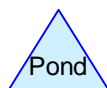
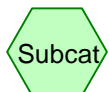
The background of the page is a dark red color with a complex pattern of lighter red, wavy contour lines, resembling a topographic map. A dashed red line runs diagonally from the top left towards the bottom center. On this line, there is a solid red dot in the lower half and a red 'X' mark in the upper half.

Appendix E

Crossing Sizing Calculations



Entrance Culvert



Routing Diagram for 2025_08_20 Sun Trust Culvert Sizing
Prepared by Westwood Professional Services, Printed 8/20/2025
HydroCAD® 10.20-6a s/n 02351 © 2024 HydroCAD Software Solutions LLC

Summary for Subcatchment 1EC: Entrance Culvert

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 1.14 cfs @ 15.72 hrs, Volume= 0.701 af, Depth= 6.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, $dt=0.10$ hrs
 Huff 0-10sm 3Q scaled to 24.00 hrs 100yr Rainfall=8.57"

Area (ac)	CN	Description
0.270	89	Row crops, straight row, Good, HSG D
0.180	98	Paved parking, HSG D
0.280	98	Paved parking, HSG B
0.140	78	Row crops, straight row, Good, HSG B
0.470	61	Pasture/grassland/range, Good, HSG B
1.340	81	Weighted Average
0.880		65.67% Pervious Area
0.460		34.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	100	0.1340	0.42		Sheet Flow, Range $n=0.130$ $P2=3.34"$
1.7	300	0.0320	2.88		Shallow Concentrated Flow, Unpaved $K_v=16.1$ fps
6.1	900	0.0072	2.44	10.24	Channel Flow, Area= 4.2 sf Perim= 9.5' $r=0.44'$ $n=0.030$ Short grass
11.8	1,300	Total			

Culvert Design Report

Entrance Culvert

Peak Discharge Method: User-Specified				
Design Discharge	1.14	cfs	Check Discharge	0.00 cfs
Grades Model: Inverts				
Invert Upstream	891.60	ft	Invert Downstream	891.40 ft
Length	40.00	ft	Slope	0.005000 ft/ft
Drop	0.20	ft		
Headwater Model: Unspecified				
Tailwater Conditions: Constant Tailwater				
Tailwater Elevation	N/A	ft		
Name	Description	Discharge	HW Elev.	Velocity
x Trial-1	1-18 inch Circular	1.14 cfs	892.26 ft	3.03 ft/s

Culvert Design Report

Entrance Culvert

Design: Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	N/A ft	Storm Event	Design
Computed Headwater Elevation	892.26 ft	Discharge	1.14 cfs
Headwater Depth/Height	0.44	Tailwater Elevation	N/A ft
Inlet Control HW Elev.	892.16 ft	Control Type	Outlet Control
Outlet Control HW Elev.	892.26 ft		
Grades			
Upstream Invert	891.60 ft	Downstream Invert	891.40 ft
Length	40.00 ft	Constructed Slope	0.005000 ft/ft
Hydraulic Profile			
Profile	M2	Depth, Downstream	0.40 ft
Slope Type	Mild	Normal Depth	0.55 ft
Flow Regime	Subcritical	Critical Depth	0.40 ft
Velocity Downstream	3.03 ft/s	Critical Slope	0.016768 ft/ft
Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	1.50 ft
Section Size	18 inch	Rise	1.50 ft
Number Sections	1		
Outlet Control Properties			
Outlet Control HW Elev.	892.26 ft	Upstream Velocity Head	0.06 ft
Ke	0.90	Entrance Loss	0.05 ft
Inlet Control Properties			
Inlet Control HW Elev.	892.16 ft	Flow Control	Unsubmerged
Inlet Type	Projecting	Area Full	1.8 ft²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		



Appendix F

FEMA FIRM Panel

