BORREGO SOLAR

April 1, 2019

Ms. Michelle Buck, AICP
Leicester Town Planner
Town of Leicester Planning Board
3 Washburn Square
Leicester, MA 01524

RE: Site Plan Review (PB File#: SPR2018-01)
Ground Mounted PV Facility
515 Henshaw Street
Leicester, Massachusetts

Dear Ms. Buck:

The following are the outstanding comments provided by Quinn Engineering, dated January 29, 2019. Borrego's response can be found in bolded and italicized text following the comment by Quinn Engineering.

7. **Resolved with Further Comment.** The Engineer indicates that a sign detail is provided on Sheet C-5.0, however, no detail is found on that sheet. (5.14.6.6 and SPRRR II.A.5)
Response: The reference to a sign detail was in error. It is still Borrego's intent to request of a waiver to provide sign details until time of building permit submittal. A sign stating the Owner and Operator's contact and Emergency contact information will be posted on the vehicle gate, however the final Owner and Operator have not been identified, so a sign detail cannot be provided at this time. A photo of the type of sign used on previous projects is attached for review.

15. **Comment Stands.** The narrative provided should identify other permits that are required besides from the Leicester Planning Board (ie. NPDES CGP) and should include information regarding the development schedule, stages and estimated date of completion. Applicant indicates that the Project narrative includes a permit summary, however it is not found. (Ref: II.F)
Response: The narrative has been updated to include the requested information.

17. **Comment Stands.** Information regarding the depth to seasonal high groundwater table and confirmation of the USDA soil mapping should be provided. (Ref. LSR 4.0.A.12, LSR 4.0.A.19, DEP Vol.2, Ch.2, page 51/110 and DEP Vol.3 Ch.1, page 8)
Response: Information obtained from Web Soil Survey has now been included in the updated Stormwater Memo. This information indicates that the seasonal high ground water is greater than 200 cm (78.7 in) from the existing surface.

18. **Comment Stands.** Velocities and capacities in all proposed culverts should be identified. (LSR 4.0.A.17.h) ***Response: Capacities and velocities of the proposed culverts have now been called out. Please refer to Sheet C-4.0 Grading and Erosion Plan.***

55 Technology Drive, Suite 102
Lowell, MA 01851

20. **Comment Stands.** Basins have been designed with outlets which conduct flows, however, the outlets of the culverts should be equipped with rip-rap aprons to control erosion. All outlet structures, grading, and rip-rap aprons and energy dissipaters should be shown on the site plan. Details should be provided for all drainage basin components.
Response: Rip-rap aprons were previously shown; however, a detail was not provided. A detail has now been added. Refer to Sheet C-5.1 Civil Details.

22. **Comment Stands.** The stormwater basins should be classified as "infiltration basins" because the stored water will be recharged. Information related to the estimated seasonal high ground water elevation should be provided at all recharge BMPs in order to verify that there is a 24 inch vertical separation. (LSR 4.0.A.12 and DEP Vol. 2, Ch. 2, page 89)
Response: The Southernly basin has now been reclassified as an infiltration basin within the plan set. This is due to the fact that the primary outlet proposed is half a foot above the proposed bottom of the basin. The Northernly basin remains a detention basin as the primary outlet proposed is at the bottom of the basin. Information on the seasonal high ground water can now be found in the Stormwater memo. This information obtained from Web Soil Survey indicates that the seasonal high ground water is greater than 200 cm (78.7 in) below existing grade.

27. **Comment Stands.** A calculation should be provided to demonstrate that proposed rip rap apron energy dissipaters are adequately sized. (DEP Vol. 3, Ch. 1, page 2***)***
Response: A calculation has been completed and provided within this response package.

28. **Comment Stands.** Comment Stands. Although infiltration is not accounted for in the HydroCAD model, a mounding analysis should be provided at all infiltration BMPs used to attenuate storms larger than the 10-year event and where 48-inch vertical separation is not provided to the seasonal high ground water table. The analysis is required to demonstrate that the stored volume is fully dewatered within 72 hours and that mounding does not interfere. Draw down calculations which show mounding effects and dewatering within 72-hours should be provided. (DEP Vol. 3, Ch. 1, page 28)
Response: Web Soil survey data has been provided in the updated Stormwater Memo, this data indicated that the seasonal high ground water is greater than 200 cm below existing grade. This is at least 78.7 inches. Furthermore, the soil type that is found on the project site is classified in Hydrologic Soil Group A. This is a well-drained soil composed of mostly sand. Due to these points, the area should have no problem draining within 72 hours. Borrego would be happy to be conditioned to providing a mounding analysis prior to receiving the building permit, because of the time of year as well as, the thick ground cover of brush, bushes and trees that exist where the Southernly basin is proposed, a mounding test would be difficult to complete at this time.

34**. Comment Stands.** Rip rap or other stabilization method is recommended where concentrated flow will enter and exit the stormwater basins.
Response: Noted. A detail of the stormwater basin and rip rap apron has been provided. Please refer to Sheet C-5.1 Civil Details.

44. **Additional Comment.** The Southern Infiltration Basin is depicted on plan as 10 feet long and 5 feet wide, however, in the Hydro CAD analysis, is listed as 10 feet x 10 feet. The plans and the hydrologic analysis must agree.
***Response: This has been corrected*.**

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In addition, the following items raised by the Police Department in their review are addressed as follows:

1. Entrance/Exit onto Stafford Street and access road to facility must have rood for two (2) vehicles (Police, Fire or EMS) to pass each other and the gate far enough into the property so delivery vehicles do not back onto Stafford Street.
   Response: The proposed driveway is 16' wide and providing for 2 vehicles to pass. The main gate is over 390 feet from Stafford Street, providing adequate storage of delivery vehicles.
2. Entrance/Exit onto Stafford Street must have adequate clear line of sight (i.e. unobstructed view) looking both east and west on Stafford Street for vehicle(s) entering and exiting the facility.
   Response: The sight distances were checked at the entrance location and meet or exceed Massachusetts Department of Transportation requirements.
3. Post the facility area as "No Trespassing".
   Response: The facility will have all no trespassing, warning and emergency signage required by the National Electric Code.
4. Provide signage on the front gate of who to notify in case of emergency while under construction. Once completed update the signage with long term emergency contact information.
   Response: The site plan has been updated to provide emergency contact information at the main gate. Temporary signage will be provided during construction, which will be updated with permanent contacts once known.

If you have any questions regarding the above, please do not hesitate to call.

Very truly yours,
Borrego Solar Systems

C. Dean Smith, P.E.
Civil Engineer

cc: Quinn Engineering, Inc.

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439 Richardson Avenue
Attleboro, MA 02703
Richardson Solar Generation Site
In case of emergency call
1-508-421-7970
nationalgrid

Town of Leicester Site Plan Review

1.193 MW Solar Energy Generating Facility

Submitted By:

Borrego Solar Systems, Inc.
55 Technology Drive, Suite 102
Lowell, MA 01851

Submitted to:

Town of Leicester
Planning Board
3 Washburn Square
Leicester, MA 01524

January 19, 2018
Revised January 8, 2019

Project Narrative

The project site is located along the east side of Henshaw Street and north side of Stafford Street at Assessor's Map 45 Block A Lot 8. The site is 33.63 acres in size and is zoned BR-1 (Business-Residential-1) and SA (Suburban-Agricultural). The solar project is located within the BR-1 zoned portion of the parcel. Refer to Figure 1-Zoning Map and Figure 2-Aerial Map.

ZONING SUMMARY TABLE

Suburban Agricultural District – SA, and Business Residential BR-1. See note 1.

Use: Large-scale ground-mounted solar photovoltaic installation is an allowed use in the SA and BR-1 zoning districts. Under Section 5.2.02.1.g Large-scale ground-mounted solar photovoltaic installations require Site Plan Review by the Planning Board.

		Required (SA Structure)	Required (BR-1 Structure)	Provided	Notes
Minimum Lot Area	sf	80,000	20,000	>>500,000	
Frontage	feet	200/50*	150/50*	330	Along Strafford Street
Front Yard	feet	40	50	171	to array
Side Yard	feet	40	40	151	to array
Rear Yard	feet	40	40	46	to array
Setback from Residential District (SA,R1,R2)	feet	100	-	156	to array
Max. Height of Buildings	Feet	35	15**	12	To top of array
Maximum building coverage	%	30	30	N/A	

*Minimum frontage in the Zoning Bylaw for Leicester is 50 feet in Section 5.14.5.2.
**Section 5.14 Ground-Mounted Solar Energy Systems 6.2 B

Note 1:

2.3.04 Where a district boundary line divides any lot existing at the time such line is adopted, the regulations for the less restricted portion of such lot may extend not more than thirty (30) feet into the more restricted portion, provided only that such lot has the required minimum frontage on a street in the less restricted portion for the existing or intended use of the premises.

The solar power generating facility is a ground-mounted facility generating approximately 990 kW of electricity (AC rated). The solar system will consist of:

- Approximately 3,060 - 390 watt solar panels
- TerraSmart Terrafarm racking at 25° racking tilt angle. Racking is approx. 14 feet apart and modules placed in a 2 x 9 portrait layout. Refer to Figures 1 and 2 for typical racking installation. However, the racking will be installed with a 6' high leading edge and maximum height will be less than 15'.
- 1 Inverter
- Data Acquisition System (DAS) for remote monitoring
- Transformer and switchgear
- Underground trenching
- Overhead power lines to interconnection point on Stafford Street (determined by NGrid)
- Gravel access driveway
- Perimeter security fence (7' high Chain-link)
    - Total Fenced area = 6.29 acres ±
- Access gates
- Warning signage on security fence (in accordance with NEC)
- Emergency contact signage at main entrance

PERMITS REQUIRED

- Town of Leicester Planning Board approval
- Town of Leicester Conservation Commission Order of Conditions
- Driveway Permit for entrance construction on Stafford Street
- Building Permit
- NPDES Permit for Construction Stormwater Discharges

The general construction timeframes anticipated at this time will be earliest construction mobilization between the Fall of 2019 to late Spring of 2020. The on-site construction period will extend over 4-6 months to reach mechanical completion. It would be expected that utility upgrades and placement in operation to occur within one year of construction mobilization.

Figure 1 - Racking

Figure 2 - Racking

In accordance with Section 5.2.05 Standards for Site Plan Approval as outlined in the Zoning Bylaws for the Town of Leicester as amended through May 2, 2017, we have the following responses to items A-G.

5.2.05 STANDARDS FOR SITE PLAN APPROVAL:

The Planning Board shall approve a site plan when the following standards are met:

A. The use complies with all the provisions of the Leicester Zoning By-Law;

   Response: ***The ground-mounted solar system use is an allowed use in the SA and BR-1 zoning districts and the dimensional regulations have been met.***

B. The use will not materially endanger or constitute a hazard to the public health and safety;

   Response: ***The project does not pose any hazard or endanger the public health and safety. See responses to items C-G below.***

C. The use will not create undue traffic congestion or unduly impair pedestrian safety;

   Response: ***The project does not generate traffic. Approximately 2 times annually, operations and maintenance personnel will mow inside the fence and keep large woody plants from growing in the cleared areas. O & M personnel may also be visiting the site to maintain the equipment.***

   The project is private and un-manned. There will be no pedestrian access allowed. There are no sidewalks or paths along Stafford Street or Henshaw Street.

   We will coordinate with the Leicester DPW regarding a Driveway Permit for access onto Stafford Street.

D. Sufficient off-street parking exists or will be provided to serve the use;

   Response: ***The solar project is un-manned and does not require off-street parking. Adequate space is provided on and alongside the internal gravel access road for O & M personnel.***

E. The use can be adequately served by water, sewer, and other necessary utilities, or if these are unavailable, that they will be brought to the site at the owner's expense; or, the Planning Board is satisfied that the proposed alternatives will comply with all applicable regulations; and,

   Responses: ***See below.***

   Water: The project is un-manned and will not consume any water and will not require connection to any public or private water supply.
   Sewer: The project is un-manned and does not generate any wastewater and will not require connection to any public or private wastewater system.

Other Utilities: The project will not require connections to cable TV, gas mains or telephone lines.

There will be an electrical interconnection to a power pole in Stafford Street. The on-site portion of the interconnection will consist of: 1) customer recloser pole; 2) utility meter pole, 3) customer disconnect pole; 4) a customer recloser pole and 5) existing pole.

Within the fenced area electrical lines will be buried.

F. The use will not result in a substantial increase of volume or rate of surface water runoff to neighboring properties and streets, nor will result in pollution or degradation to surface water or groundwater;

Response: ***The project will not result in an increase in the volume of surface water runoff. The project will not result in any increase in the post-development condition. Refer to the Stormwater Memo dated December 13, 2018. In accordance with the MA DEP Stormwater Regulations, the quality of runoff will not change and the recharge to groundwater will be similar. During construction, silt fences, mulch tubes and other erosion control and sedimentation measures will be employed.***

G. The use will not result in any undue disturbance to adjoining property owners or the Town caused by excessive or unreasonable noise, smoke, vapors, fumes, dust, glare, etc.

Responses: ***See below.***

Noise: The projects central inverter does make minimal noise, only when generating electricity (when the sun is shining). During early morning and evening the system will not make noise. The nearest residence to a string inverter is 530 feet. In a typical quiet rural area the background noise levels during the daylight hours is approximately 45-50 dB. The noise level associated with the central inverter is approximately 72 dB (@1 meter). At 530 feet or 162 meters, the shortest distance to any residence, the noise associated with the central inverter will be com less than ambient noise and therefore will not be heard.

Smoke: Solar photovoltaic systems do not generate emissions or smoke. There are no mechanical devices or equipment and no combustible engines. There are no buildings.

Vapors/fumes: The solar photovoltaic systems do not generate fumes or vapors. There are no emissions or exhausts and there is no condensation associated with the electrical equipment.

Dust: The project will fully vegetated aside from the gravel roads and the electrical equipment area. Dust during construction will be controlled (when necessary) using water trucks.

Glare: Motion-activated lighting (approximately 8 feet high) is proposed at the electrical equipment area. It is necessary for maintenance purposes.

Lighting will be directed downward and towards the equipment. The lighting for system A will be located approximately 520 feet from the nearest residence on Strafford Street. The lighting is also screened by the existing vegetation that will be left around the system, the system fence, and the racking.

Glare from the solar modules is minimized through anti-glare coatings.

Waivers

In accordance with Section IIA of the Town of Leicester Planning Board's Plan Review Rules and Regulations the following waivers are being requested.

Location, height, size and design of signage/lighting: The project will include signage as required by the National Electric Code. They will be mounted on the fence at specific locations as well as on the electrical equipment. There will be a motion-activated light also at the equipment area and it will be directed away from residences.

Location/Description of existing/proposed utilities: The project does not require connections/extensions or improvement to any water, sewer, storm drain, gas or telephone utilities. There are no underground utilities proposed in public or private streets. The project will interconnect to the power grid adjacent to parcel limits.

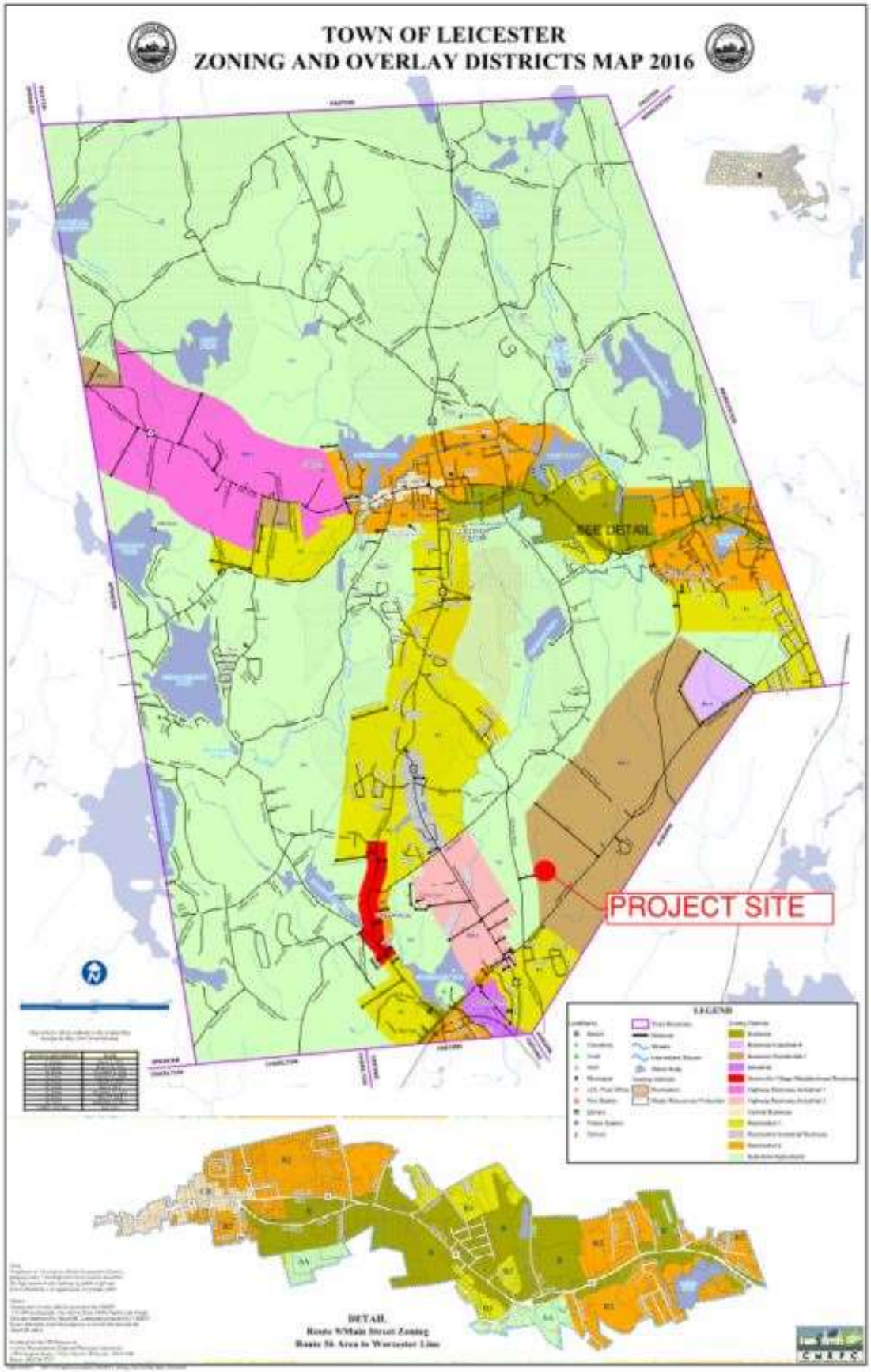


Figure 1-Zoning Map

Figure 2 - Aerial Map

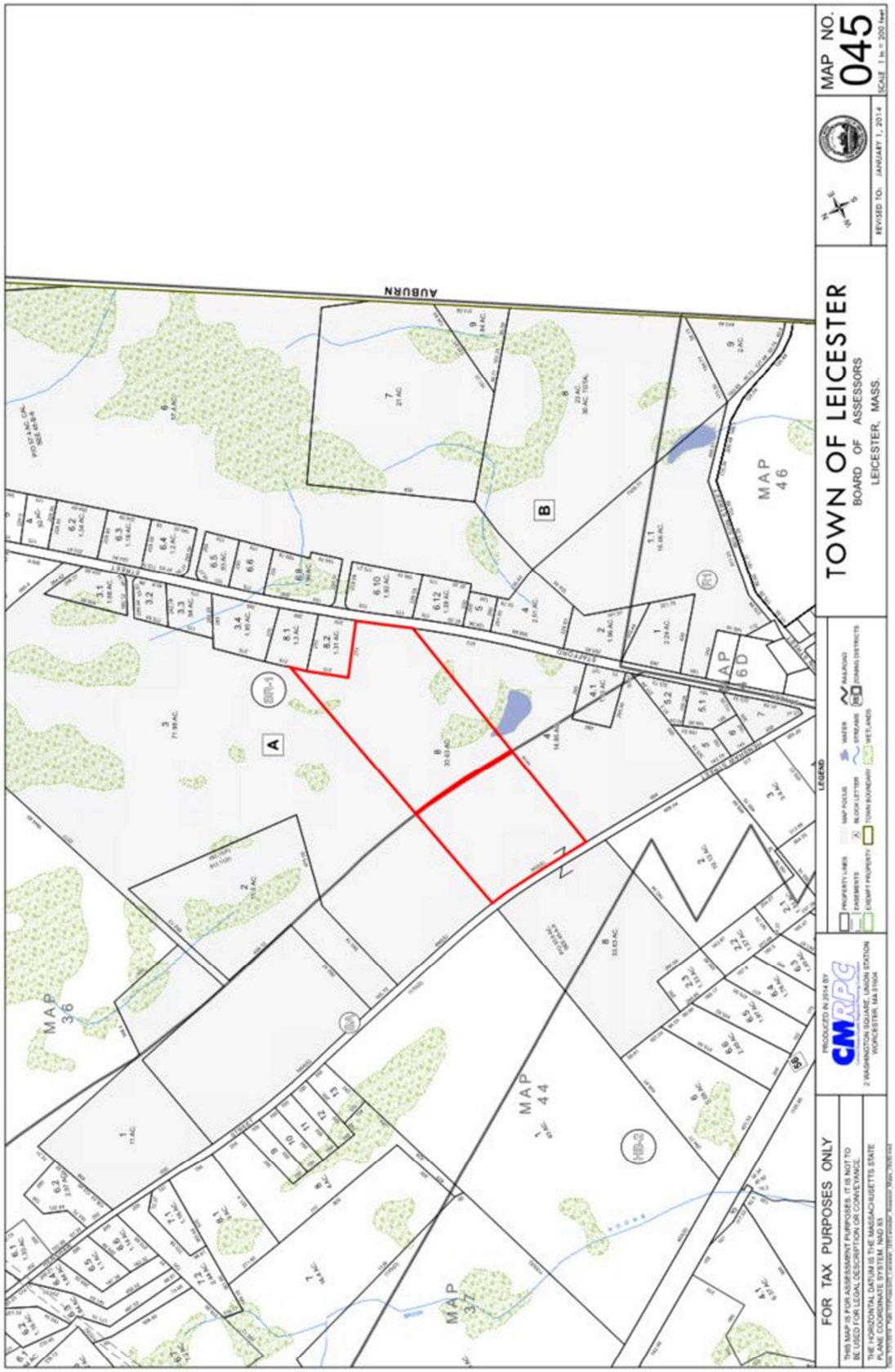


Figure 3 - Assessors Map

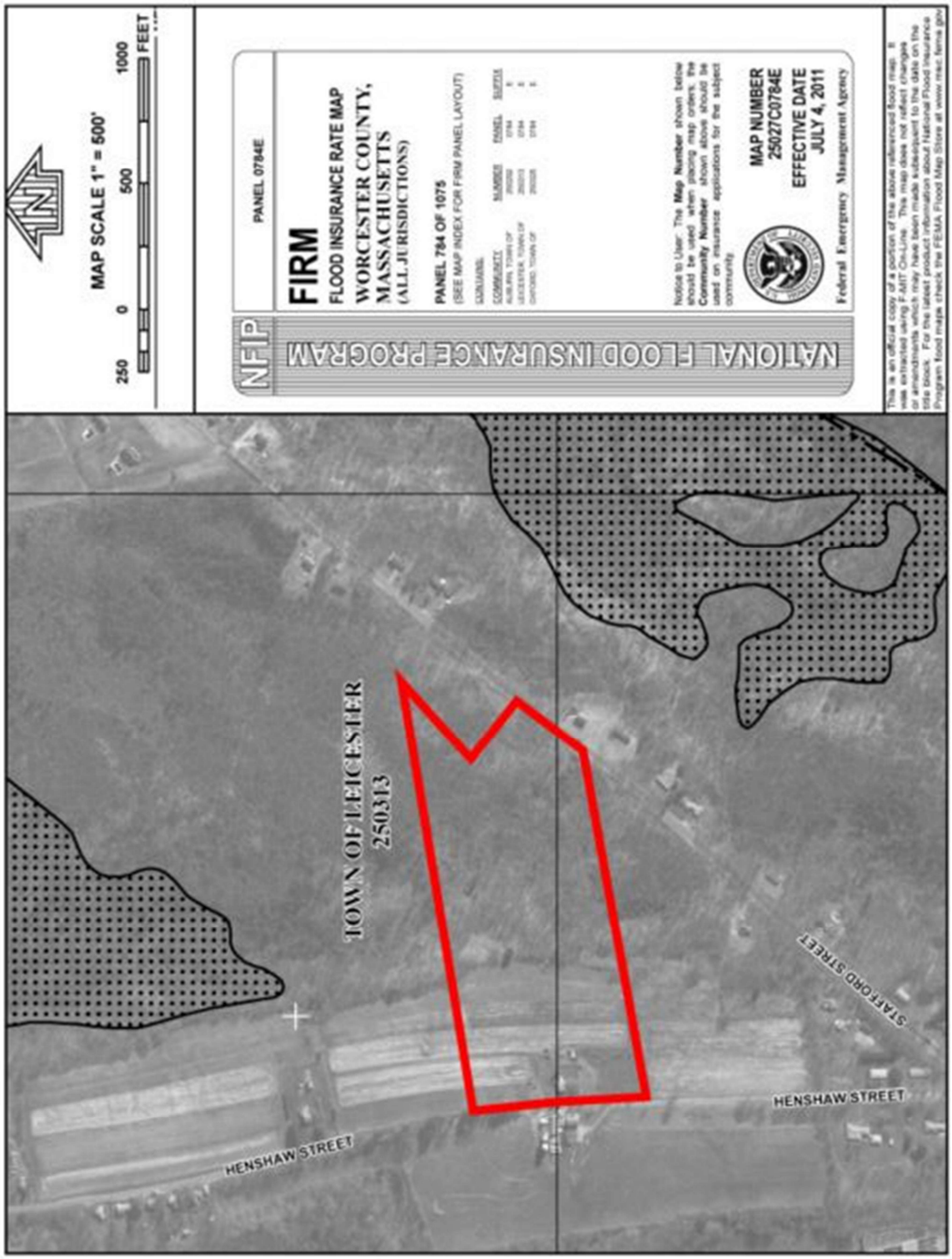


Figure 4a – FEMA Map

Stormwater Memo

1.0 Introduction

The proposal is to construct a 1,193.40-kW ground mount solar energy generating system on a forested portion of a Suburban Agricultural & Business Residential-1 parcel. The solar project is located within the Business Residential-1 portion of the parcel. This document presents existing and proposed construction as well as hydrologic conditions pre- and post-development.

2.0 Existing Conditions

As shown on sheet C-1.1 Existing Conditions Plan, the majority of the 33.63 acre parcel is forested. Three wetland resource areas have been delineated, one at the north of the site, one to the east, and one to the south. The site also contains some clearings along with a small system of hiking trails.

3.0 Proposed Construction

On the attached sheet C-3.1 Layout and Materials Plan the solar system is laid out in the east portion (Business Residential-1) of the parcel. Grading, which is associated with preparing an area for the electrical equipment pad and the gravel road, is included on sheet C-4.0 Grading and Materials Plan. The following is some information about the system characteristics.

Solar System Characteristics	
Parcel Area:	33.63 acres (45-A8-0)
System Area (Fenced Area):	6.29 acres
Number of Modules/String Inverters:	3,060 390-watt modules / 1
Height of Fence:	7-foot
Proposed Impervious area:	503 ±sf (concrete pads) 138 ±sf (screw foundations)
Proposed gravel roads:	0.24 acres
Total area of disturbance:	7.4± acres (includes trees cleared only)

4.0 Stormwater

The Massachusetts Department of Environmental Protection (MA DEP) issued stormwater standards in 2008. The following section describes how each of these standards will be achieved by incorporating Best Management Practices into the design.

Standard No. 1 No new stormwater conveyances may discharge untreated directly to or cause erosion in wetlands or waters of the Commonwealth.

The only impervious area introduced is a negligible area of 641 square feet, or 0.015 acres, of concrete equipment pads /screw rack foundation. The existing and proposed stormwater runoff from this site discharges towards the south towards wetland A and Strafford Street. There is no need for treatment and therefore Standard 1 is satisfied.

Standard No. 2 Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.

In order to determine the peak rate of discharge for existing and proposed conditions, runoff hydrographs were generated for the 1-, 2-, 10- and 100-year, 24-hour storm events using the Soil

Conservation Service (SCS) Technical Release 20 Method and Type III rainfall distribution.

As shown in Table 1 below, overall post-development peak stormwater runoff rates for the project are less than or equal to the pre-development peak stormwater runoff rates in the modeled design storms. The three (3) design points are part of a larger tributary area associated with the un-named stream along the easterly edge of site. The proposed project will not increase the rate of runoff.

The comparison of peak rates of runoff is shown in Table 1 below.

Table 1 Peak Stormwater Runoff Rates

Point of Analysis	Area		2-Year			10-Year			100-Year		
	Pre	Post	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
POA-1	8.481	8.481	0.0	0.0	NC	0.02	0.01	(-0.01)	1.77	1.29	(-0.48)
POA-2	1.490	1.661	0.0	0.0	NC	0.0	0.0	NC	0.12	0.12	NC
POA-3	0.417	0.246	0.0	0.0	NC	0.0	0.0	NC	0.06	0.06	NC
	13.188	13.188									

*Summation of DP-1 through DP-3
NC=No Change

Standard No. 3 Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operations and maintenance. At a minimum, the annual recharge from pre-development site shall approximate the annual recharge from pre-development conditions based on soil type. This standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

There is only a minor increase (641 square feet) of impervious cover proposed as part of this project. Annual recharge to groundwater will continue to occur due to the fact that the solar panels are installed on supports and are elevated above the existing ground. Any precipitation that falls on the solar panels will shed directly onto the ground not affecting annual groundwater recharge. Each solar panel rack is installed with space between each of the solar panels that allow precipitation to fall through.

Recharge Calculations:
The required recharge volume equals a depth of runoff corresponding to the soil type times the impervious areas covering that soil type at the post-development site. The soils are defined by the Soil Conservation Services (SCS) Soil Survey of Worcester County (North) as A, C and D types.

Table 3 Soils Based on the Hydrologic Soil Group

HSG	Soil Texture	Target Depth (inches)	Area (acres)
A	Sand	0.60	13.188
B	Loam	0.35	0.00
C	Silty Loam	0.25	0.00
D	Clay	0.10	0.00

Based on the different soils types on site the cumulative target depth is 0.60 inches.

Recharge Volumes Required. Based on the impervious surfaces.

- Concrete Equipment Pads = 503 sf
- Screw anchors = 138 sf

The total impervious area = 641 sf

Table 4 Required Recharge Volume Calculations

Description of Area	Area (sf)	Target Depth (inches)	Volume Required (cubic feet)
Equipment Pads + Foundation Screws	641	0.60	32.05

Recharge Volumes Provided:
The equipment area less the concrete padding. This area is equal to the 2011 sf minus the concrete padding is approximately 1508 sf.

Table 5 Provided Recharge Volume Calculations

Description of Area	Area (sf)	Target Depth (inches)	Volume Provided (cubic feet)
Equipment Areas	1,508	0.60	75.40

Recharge Required = 32.05 cubic feet
Recharge Provided = 75.40 cubic feet "MEETS RECHARGE STANDARD #3"

Standard No. 4 Stormwater Management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS).

The minimal amount of impervious cover proposed as part of this project are not for vehicular access. Therefore there are no generators (impervious surfaces) of TSS as part of the proposed project. Furthermore, all such areas are surrounded by gravel surfaces which will capture and infiltration runoff from these small areas of impervious coverage. Any access to the project will be via the existing bituminous road and the proposed 16 feet wide gravel drive. From this gravel road, stormwater runoff will be allowed to directly recharge into the ground. Such areas will also be surrounded by grassed pervious surfaces, which will encourage further infiltration. Standard 4 has been met.

Standard No. 5 For land uses with higher pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable.

The proposed project is not classified as a "Land Use with Higher Pollutant Loads". This standard does not apply to the project. Standard 5 has been met.

Standard No. 6 Stormwater discharges with the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook.

We have reviewed the Massachusetts Geographical Information System (GIS) and the site is not located within Zone II, Interim Wellhead Protection Areas, or Outstanding Resource Watersheds and therefore this standard has been met. See Figure 2.

Standard No. 7 A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5 and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

To the maximum extent practicable and where appropriate we have met the requirements of Standard 7.

Standard No. 8 A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period pollution prevention plan) shall be developed and implemented.

A Stormwater Pollution Prevention Plan (SWPPP) will be implemented to control erosion and sedimentation associated with the construction/installation of the project. Erosion and sedimentation controls will be in place prior to construction-related land disturbance on the site. A NPDES (National Pollutant Discharge Elimination System) Notice of Intent (NOI) will be filed with the US EPA a minimum of 14 days prior to the commencement of construction.

Standard No. 9 A long-term Operation and Maintenance Plan shall be developed and implemented to ensure that stormwater management systems function as designed.

An Operations and Maintenance Plan (O & M) has been developed and is included in Appendix B – Operating and Maintenance Plan. The O & M Plan will be implemented to ensure that the site stormwater management systems function as designed. The owner of the system will be responsible for contracting with a solar system operations and maintenance company to implement the attached O & M Plan.

Standard No. 10 All illicit discharges to the stormwater management system are prohibited.

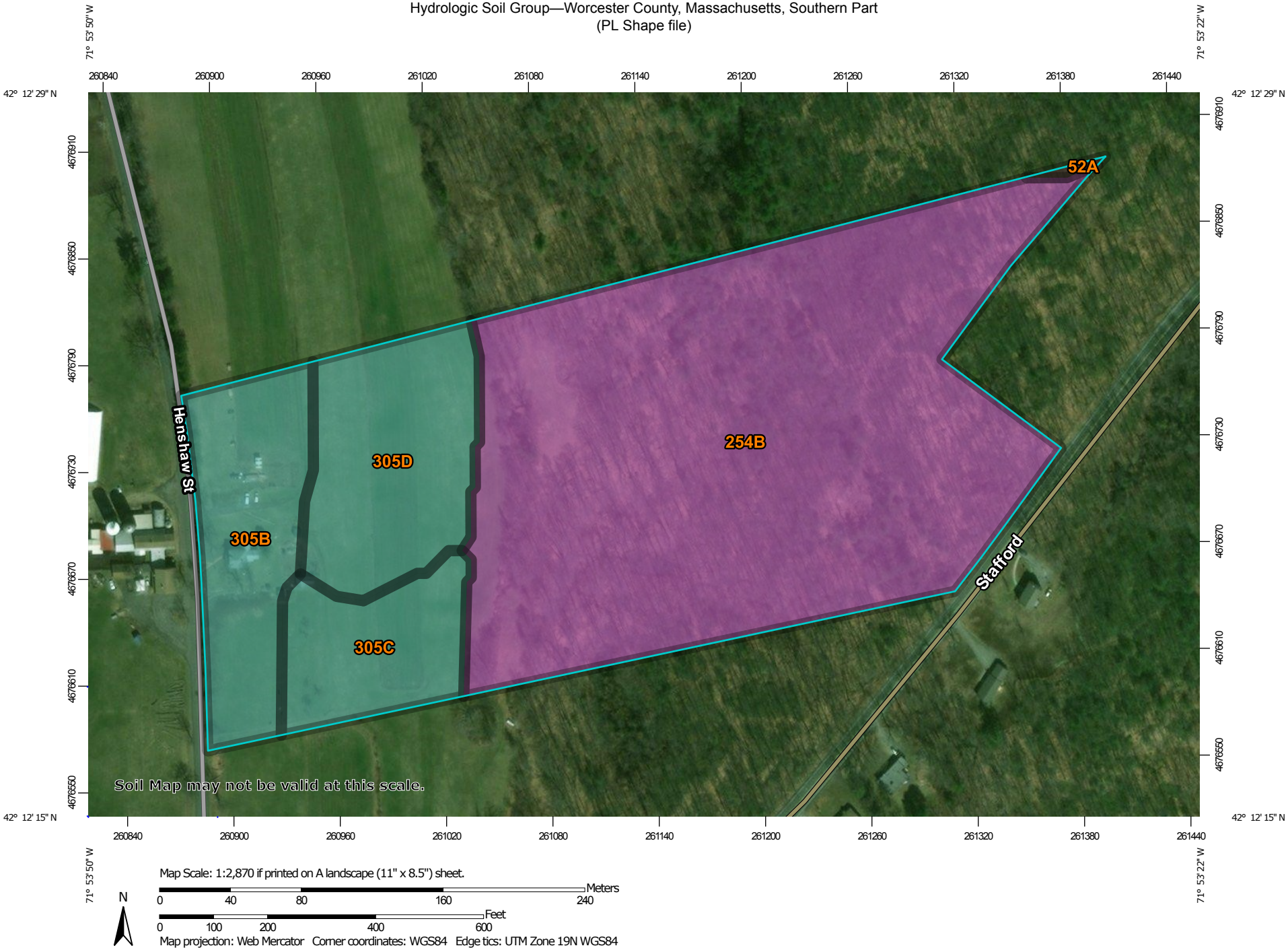
An Illicit Discharge Compliance Statement confirming that no illicit discharges exist on site is included in Appendix E – Supporting Documentation of the Notice of Intent.

If you have any questions regarding the above, please do not hesitate to call.

Very truly yours,
Borrego Solar Systems

C. Dean Smith, P.E.
Senior Civil Engineer

Hydrologic Soil Group—Worcester County, Massachusetts, Southern Part
(PL Shape file)



Map Scale: 1:2,870 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 40 80 160 240

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Worcester County, Massachusetts, Southern Part
Survey Area Data: Version 11, Sep 11, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

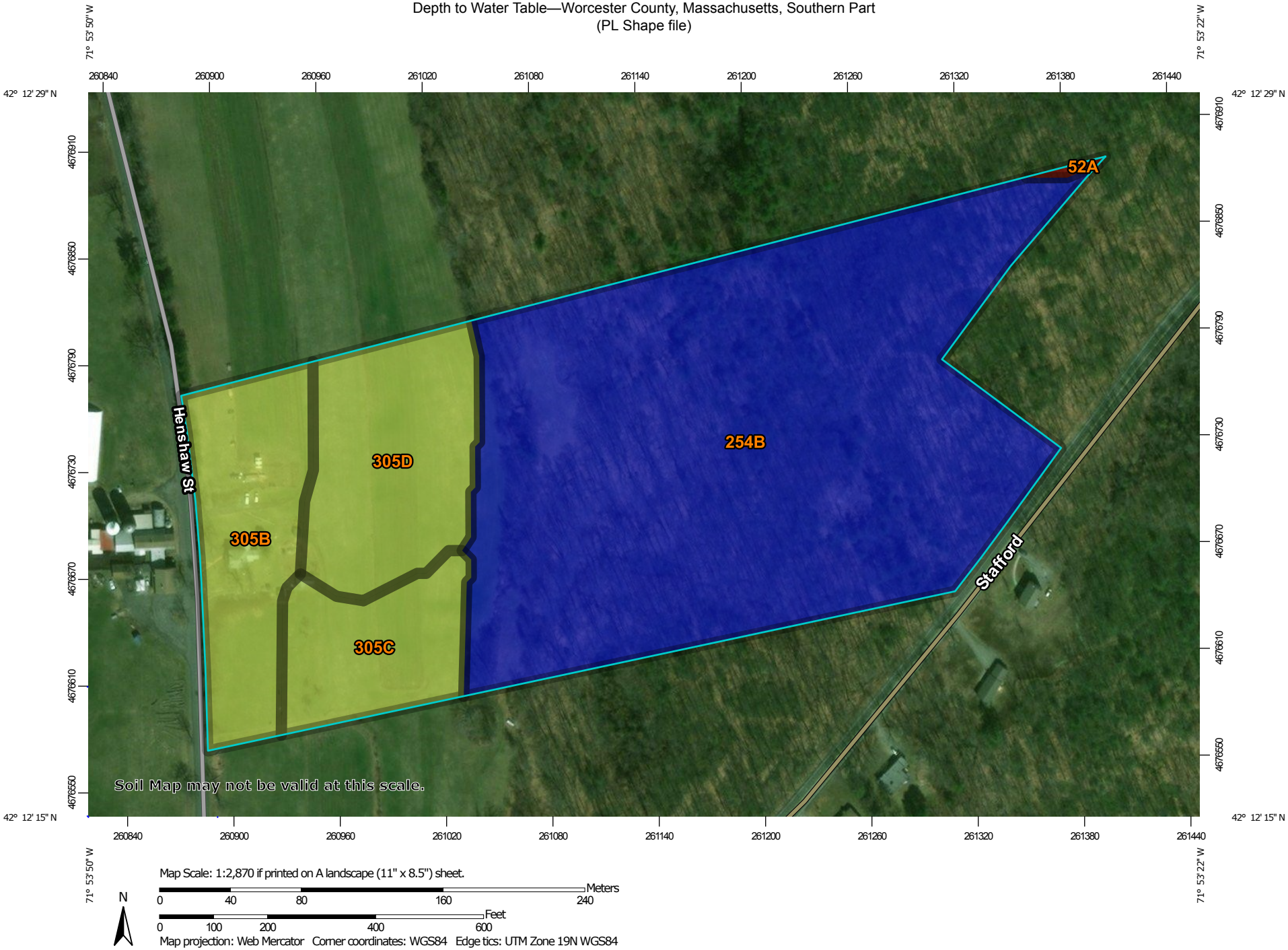
Date(s) aerial images were photographed: Apr 14, 2011—Aug 27, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
52A	Freetown muck, 0 to 1 percent slopes	B/D	0.0	0.2%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	A	16.3	67.3%
305B	Paxton fine sandy loam, 3 to 8 percent slopes	C	2.8	11.7%
305C	Paxton fine sandy loam, 8 to 15 percent slopes	C	1.9	8.0%
305D	Paxton fine sandy loam, 15 to 25 percent slopes	C	3.1	12.8%
Totals for Area of Interest			**24.3**	**100.0%**

Depth to Water Table—Worcester County, Massachusetts, Southern Part
(PL Shape file)



Map Scale: 1:2,870 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 40 80 160 240

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- 0 - 25
- 25 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- > 200
- Not rated or not available

Soil Rating Lines

- 0 - 25
- 25 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- > 200
- Not rated or not available

Soil Rating Points

- 0 - 25
- 25 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- > 200
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Worcester County, Massachusetts, Southern Part
Survey Area Data: Version 11, Sep 11, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 14, 2011—Aug 27, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Depth to Water Table

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
52A	Freetown muck, 0 to 1 percent slopes	0	0.0	0.2%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	>200	16.3	67.3%
305B	Paxton fine sandy loam, 3 to 8 percent slopes	61	2.8	11.7%
305C	Paxton fine sandy loam, 8 to 15 percent slopes	61	1.9	8.0%
305D	Paxton fine sandy loam, 15 to 25 percent slopes	61	3.1	12.8%
Totals for Area of Interest			**24.3**	**100.0%**

Description

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Rating Options

Units of Measure: centimeters

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Interpret Nulls as Zero: No

Beginning Month: January

Ending Month: December

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

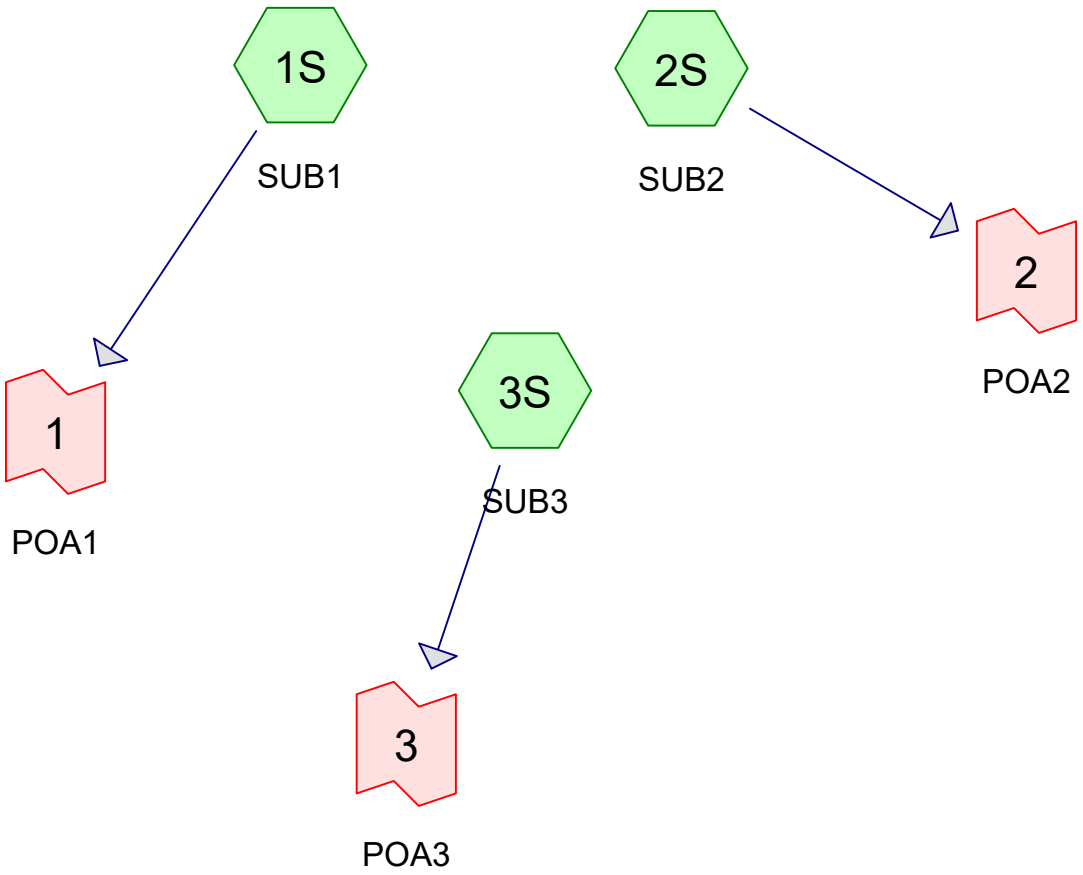
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix A
HydroCAD Reports



Subcat Reach Pond Link

Routing Diagram for 515 Henshaw Rd MA_Pre-hydrocad_092518_WS_F
Prepared by {enter your company name here}, Printed 12/13/2018
HydroCAD® 10.00-22 s/n 10491 © 2018 HydroCAD Software Solutions LLC

Summary for Subcatchment 1S: SUB1

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.13"

Area (sf)	CN	Description
1,043	72	Dirt roads, HSG A
5,445	72	Dirt roads, HSG A
592	72	Dirt roads, HSG A
1,524	72	Dirt roads, HSG A
574	89	Urban commercial, 85% imp, HSG A
336	89	Urban commercial, 85% imp, HSG A
1,239	89	Urban commercial, 85% imp, HSG A
588	72	Dirt roads, HSG A
23,723	30	Meadow, non-grazed, HSG A
2,631	30	Meadow, non-grazed, HSG A
21,723	30	Woods, Good, HSG A
310,010	32	Woods/grass comb., Good, HSG A
369,428	33	Weighted Average
367,601		99.51% Pervious Area
1,827		0.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0620	0.11		**Sheet Flow, Woods: Light Underbrush** Woods: Light underbrush n= 0.400 P2= 3.13"
1.7	136	0.0705	1.33		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
2.0	111	0.0333	0.91		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
0.0	11	0.0606	3.96		**Shallow Concentrated Flow, Unpaved** Unpaved Kv= 16.1 fps
0.4	38	0.0810	1.42		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
0.3	74	0.0690	4.23		**Shallow Concentrated Flow, Unpaved** Unpaved Kv= 16.1 fps
3.5	246	0.0541	1.16		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
15.8	666	Total			

Summary for Subcatchment 2S: SUB2

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.13"

Area (sf)	CN	Description
6,307	30	Meadow, non-grazed, HSG A
58,603	30	Woods, Good, HSG A
64,910	30	Weighted Average
64,910		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	50	0.0480	0.09		**Sheet Flow, Woods: Light Underbrush** Woods: Light underbrush n= 0.400 P2= 3.13"
0.7	40	0.0200	0.99		**Shallow Concentrated Flow, Short Grass Pasture** Short Grass Pasture Kv= 7.0 fps
1.9	106	0.0330	0.91		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
0.5	66	0.1803	2.12		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
2.4	93	0.0161	0.63		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
14.3	355	Total			

Summary for Subcatchment 3S: SUB3

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.13"

Area (sf)	CN	Description
942	72	Dirt roads, HSG A
17,227	30	Woods, Good, HSG A
18,169	32	Weighted Average
18,169		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.2	50	0.0060	0.04		**Sheet Flow, Woods: Light Underbrush** Woods: Light underbrush n= 0.400 P2= 3.13"
1.4	138	0.1065	1.63		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
0.1	17	0.0235	2.47		**Shallow Concentrated Flow, Unpaved** Unpaved Kv= 16.1 fps
0.7	69	0.1058	1.63		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
22.4	274	Total			

Summary for Link 1: POA1

Inflow Area = 8.481 ac, 0.49% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 2: POA2

Inflow Area = 1.490 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 3: POA3

Inflow Area = 0.417 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 1S: SUB1

Runoff = 0.02 cfs @ 20.00 hrs, Volume= 0.003 af, Depth> 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.68"

Area (sf)	CN	Description
1,043	72	Dirt roads, HSG A
5,445	72	Dirt roads, HSG A
592	72	Dirt roads, HSG A
1,524	72	Dirt roads, HSG A
574	89	Urban commercial, 85% imp, HSG A
336	89	Urban commercial, 85% imp, HSG A
1,239	89	Urban commercial, 85% imp, HSG A
588	72	Dirt roads, HSG A
23,723	30	Meadow, non-grazed, HSG A
2,631	30	Meadow, non-grazed, HSG A
21,723	30	Woods, Good, HSG A
310,010	32	Woods/grass comb., Good, HSG A
369,428	33	Weighted Average
367,601		99.51% Pervious Area
1,827		0.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0620	0.11		**Sheet Flow, Woods: Light Underbrush** Woods: Light underbrush n= 0.400 P2= 3.13"
1.7	136	0.0705	1.33		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
2.0	111	0.0333	0.91		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
0.0	11	0.0606	3.96		**Shallow Concentrated Flow, Unpaved** Unpaved Kv= 16.1 fps
0.4	38	0.0810	1.42		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
0.3	74	0.0690	4.23		**Shallow Concentrated Flow, Unpaved** Unpaved Kv= 16.1 fps
3.5	246	0.0541	1.16		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
15.8	666	Total			

Summary for Subcatchment 2S: SUB2

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.68"

Area (sf)	CN	Description
6,307	30	Meadow, non-grazed, HSG A
58,603	30	Woods, Good, HSG A
64,910	30	Weighted Average
64,910		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	50	0.0480	0.09		**Sheet Flow, Woods: Light Underbrush** Woods: Light underbrush n= 0.400 P2= 3.13"
0.7	40	0.0200	0.99		**Shallow Concentrated Flow, Short Grass Pasture** Short Grass Pasture Kv= 7.0 fps
1.9	106	0.0330	0.91		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
0.5	66	0.1803	2.12		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
2.4	93	0.0161	0.63		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
14.3	355	Total			

Summary for Subcatchment 3S: SUB3

Runoff = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af, Depth> 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.68"

Area (sf)	CN	Description
942	72	Dirt roads, HSG A
17,227	30	Woods, Good, HSG A
18,169	32	Weighted Average
18,169		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.2	50	0.0060	0.04		**Sheet Flow, Woods: Light Underbrush** Woods: Light underbrush n= 0.400 P2= 3.13"
1.4	138	0.1065	1.63		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
0.1	17	0.0235	2.47		**Shallow Concentrated Flow, Unpaved** Unpaved Kv= 16.1 fps
0.7	69	0.1058	1.63		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
22.4	274	Total			

Summary for Link 1: POA1

Inflow Area = 8.481 ac, 0.49% Impervious, Inflow Depth > 0.00" for 10-Year event
Inflow = 0.02 cfs @ 20.00 hrs, Volume= 0.003 af
Primary = 0.02 cfs @ 20.00 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 2: POA2

Inflow Area = 1.490 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 3: POA3

Inflow Area = 0.417 ac, 0.00% Impervious, Inflow Depth > 0.00" for 10-Year event
Inflow = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 1S: SUB1

Runoff = 1.77 cfs @ 12.37 hrs, Volume= 0.405 af, Depth> 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.34"

Area (sf)	CN	Description
1,043	72	Dirt roads, HSG A
5,445	72	Dirt roads, HSG A
592	72	Dirt roads, HSG A
1,524	72	Dirt roads, HSG A
574	89	Urban commercial, 85% imp, HSG A
336	89	Urban commercial, 85% imp, HSG A
1,239	89	Urban commercial, 85% imp, HSG A
588	72	Dirt roads, HSG A
23,723	30	Meadow, non-grazed, HSG A
2,631	30	Meadow, non-grazed, HSG A
21,723	30	Woods, Good, HSG A
310,010	32	Woods/grass comb., Good, HSG A
369,428	33	Weighted Average
367,601		99.51% Pervious Area
1,827		0.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0620	0.11		**Sheet Flow, Woods: Light Underbrush** Woods: Light underbrush n= 0.400 P2= 3.13"
1.7	136	0.0705	1.33		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
2.0	111	0.0333	0.91		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
0.0	11	0.0606	3.96		**Shallow Concentrated Flow, Unpaved** Unpaved Kv= 16.1 fps
0.4	38	0.0810	1.42		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
0.3	74	0.0690	4.23		**Shallow Concentrated Flow, Unpaved** Unpaved Kv= 16.1 fps
3.5	246	0.0541	1.16		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
15.8	666	Total			

Summary for Subcatchment 2S: SUB2

Runoff = 0.12 cfs @ 12.64 hrs, Volume= 0.045 af, Depth> 0.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.34"

Area (sf)	CN	Description
6,307	30	Meadow, non-grazed, HSG A
58,603	30	Woods, Good, HSG A
64,910	30	Weighted Average
64,910		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	50	0.0480	0.09		**Sheet Flow, Woods: Light Underbrush** Woods: Light underbrush n= 0.400 P2= 3.13"
0.7	40	0.0200	0.99		**Shallow Concentrated Flow, Short Grass Pasture** Short Grass Pasture Kv= 7.0 fps
1.9	106	0.0330	0.91		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
0.5	66	0.1803	2.12		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
2.4	93	0.0161	0.63		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
14.3	355	Total			

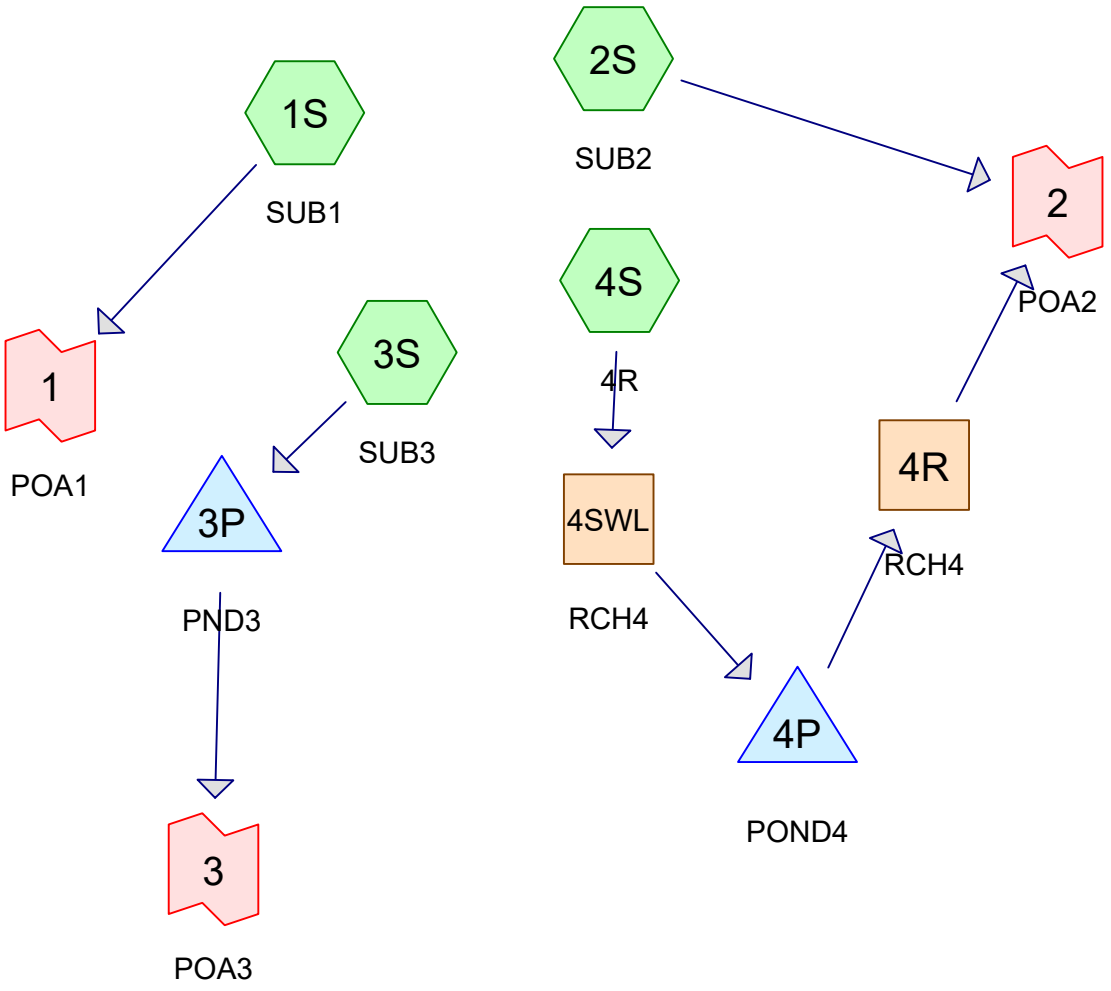
Summary for Subcatchment 3S: SUB3

Runoff = 0.06 cfs @ 12.57 hrs, Volume= 0.017 af, Depth> 0.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.34"

Area (sf)	CN	Description
942	72	Dirt roads, HSG A
17,227	30	Woods, Good, HSG A
18,169	32	Weighted Average
18,169		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.2	50	0.0060	0.04		**Sheet Flow, Woods: Light Underbrush** Woods: Light underbrush n= 0.400 P2= 3.13"
1.4	138	0.1065	1.63		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
0.1	17	0.0235	2.47		**Shallow Concentrated Flow, Unpaved** Unpaved Kv= 16.1 fps
0.7	69	0.1058	1.63		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
22.4	274	Total			



Subcat Reach Pond Link

Routing Diagram for 515 Henshaw Rd MA_Post-hydrocad_020419_WS
Prepared by {enter your company name here}, Printed 2/7/2019
HydroCAD® 10.00-24 s/n 10491 © 2018 HydroCAD Software Solutions LLC

Summary for Subcatchment 1S: SUB1

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.13"

Area (sf)	CN	Description
52,191	30	Woods, Good, HSG A
13,188	30	Woods, Good, HSG A
18,810	30	Woods, Good, HSG A
1,347	30	Woods, Good, HSG A
4,865	30	Woods, Good, HSG A
1,043	72	Dirt roads, HSG A
588	72	Dirt roads, HSG A
1,336	72	Dirt roads, HSG A
574	89	Urban commercial, 85% imp, HSG A
5,868	30	Brush, Good, HSG A
32,077	30	Brush, Good, HSG A
8,962	96	Gravel surface, HSG A
1,502	96	Gravel surface, HSG A
503	98	Paved parking, HSG A
226,574	30	Meadow, non-grazed, HSG A
369,428	32	Weighted Average
368,437		99.73% Pervious Area
991		0.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0620	0.11		**Sheet Flow, Woods: Light Underbrush** Woods: Light underbrush n= 0.400 P2= 3.13"
2.0	162	0.0705	1.33		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
1.1	85	0.0333	1.28		**Shallow Concentrated Flow, Short Grass Pasture** Short Grass Pasture Kv= 7.0 fps
0.1	11	0.0606	1.72		**Shallow Concentrated Flow, Short Grass Pasture** Short Grass Pasture Kv= 7.0 fps
0.3	38	0.0810	1.99		**Shallow Concentrated Flow, Short Grass Pasture** Short Grass Pasture Kv= 7.0 fps
0.7	74	0.0690	1.84		**Shallow Concentrated Flow, Short Grass Pasture** Short Grass Pasture Kv= 7.0 fps
3.2	224	0.0541	1.16		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
0.2	22	0.1050	1.62		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
15.5	666	Total			

Summary for Subcatchment 2S: SUB2

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.13"

Area (sf)	CN	Description
18,277	30	Woods, Good, HSG A
1,520	30	Brush, Good, HSG A
2,755	30	Brush, Good, HSG A
13,795	30	Meadow, non-grazed, HSG A
36,347	30	Weighted Average
36,347		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	50	0.0480	0.14		**Sheet Flow, Grass Dense** Grass: Dense n= 0.240 P2= 3.13"
0.7	40	0.0200	0.99		**Shallow Concentrated Flow, Short Grass Pasture** Short Grass Pasture Kv= 7.0 fps
1.9	106	0.0330	0.91		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
0.2	41	0.1781	2.95		**Shallow Concentrated Flow, Short Grass Pastrue** Short Grass Pasture Kv= 7.0 fps
0.2	25	0.1803	2.12		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
2.8	150	0.0310	0.88		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
11.6	412	Total			

Summary for Subcatchment 3S: SUB3

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.13"

Area (sf)	CN	Description
798	30	Woods, Good, HSG A
4,573	30	Woods, Good, HSG A
1,583	96	Gravel surface, HSG A
3,774	30	Brush, Good, HSG A
10,728	40	Weighted Average
10,728		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		**Sheet Flow, Woods: Light Underbrush** Woods: Light underbrush n= 0.400 P2= 3.13"
0.2	19	0.0789	1.40		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
0.1	23	0.0739	5.52		**Shallow Concentrated Flow, Paved** Paved Kv= 20.3 fps
0.6	57	0.1000	1.58		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
8.1	149	Total			

Summary for Subcatchment 4S: 4R

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.13"

Area (sf)	CN	Description
8,343	30	Brush, Good, HSG A
27,645	30	Meadow, non-grazed, HSG A
35,988	30	Weighted Average
35,988		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	50	0.0640	0.16		**Sheet Flow, Grass Dense** Grass: Dense n= 0.240 P2= 3.13"
2.0	141	0.0284	1.18		**Shallow Concentrated Flow, Short Grass Pature** Short Grass Pasture Kv= 7.0 fps
0.2	36	0.1750	2.93		**Shallow Concentrated Flow, Shor Grs** Short Grass Pasture Kv= 7.0 fps
7.4	227	Total			

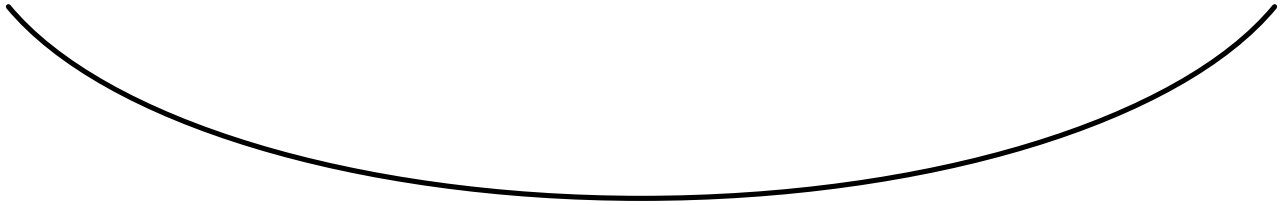
Summary for Reach 4R: RCH4

Inflow Area = 0.826 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 5.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00' Flow Area= 66.7 sf, Capacity= 194.83 cfs

100.00' x 1.00' deep Parabolic Channel, n= 0.080 Earth, long dense weeds
Length= 127.0' Slope= 0.0425 '/'
Inlet Invert= 807.00', Outlet Invert= 801.60'



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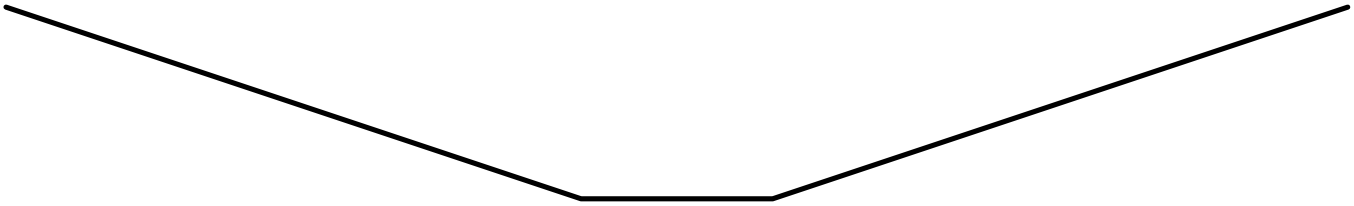
Summary for Reach 4SWL: RCH4

Inflow Area = 0.826 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 5.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 11.37 cfs

1.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 7.00'
Length= 122.0' Slope= 0.0074 '/'
Inlet Invert= 808.70', Outlet Invert= 807.80'



Summary for Pond 3P: PND3

Inflow Area = 0.246 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 798.00' @ 5.00 hrs Surf.Area= 0.002 ac Storage= 0.000 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	798.00'	0.089 af	**5.00'W x 20.00'L x 5.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	799.25'	**4.0" Round Culvert** L= 10.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 799.25' / 799.00' S= 0.0250 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.09 sf

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=798.00' (Free Discharge)
1=Culvert (Controls 0.00 cfs)

Summary for Pond 4P: POND4

Inflow Area = 0.826 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 807.50' @ 5.00 hrs Surf.Area= 0.009 ac Storage= 0.000 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	807.50'	0.180 af	**8.00'W x 50.00'L x 5.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	807.50'	**6.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 807.50' / 807.00' S= 0.0250 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=807.50' (Free Discharge)
1=Culvert (Controls 0.00 cfs)

Summary for Link 1: POA1

Inflow Area = 8.481 ac, 0.27% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 2: POA2

Inflow Area = 1.661 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 3: POA3

Inflow Area = 0.246 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 1S: SUB1

Runoff = 0.01 cfs @ 20.00 hrs, Volume= 0.000 af, Depth> 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.68"

Area (sf)	CN	Description
52,191	30	Woods, Good, HSG A
13,188	30	Woods, Good, HSG A
18,810	30	Woods, Good, HSG A
1,347	30	Woods, Good, HSG A
4,865	30	Woods, Good, HSG A
1,043	72	Dirt roads, HSG A
588	72	Dirt roads, HSG A
1,336	72	Dirt roads, HSG A
574	89	Urban commercial, 85% imp, HSG A
5,868	30	Brush, Good, HSG A
32,077	30	Brush, Good, HSG A
8,962	96	Gravel surface, HSG A
1,502	96	Gravel surface, HSG A
503	98	Paved parking, HSG A
226,574	30	Meadow, non-grazed, HSG A
369,428	32	Weighted Average
368,437		99.73% Pervious Area
991		0.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0620	0.11		**Sheet Flow, Woods: Light Underbrush** Woods: Light underbrush n= 0.400 P2= 3.13"
2.0	162	0.0705	1.33		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
1.1	85	0.0333	1.28		**Shallow Concentrated Flow, Short Grass Pasture** Short Grass Pasture Kv= 7.0 fps
0.1	11	0.0606	1.72		**Shallow Concentrated Flow, Short Grass Pasture** Short Grass Pasture Kv= 7.0 fps
0.3	38	0.0810	1.99		**Shallow Concentrated Flow, Short Grass Pasture** Short Grass Pasture Kv= 7.0 fps
0.7	74	0.0690	1.84		**Shallow Concentrated Flow, Short Grass Pasture** Short Grass Pasture Kv= 7.0 fps
3.2	224	0.0541	1.16		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
0.2	22	0.1050	1.62		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
15.5	666	Total			

Summary for Subcatchment 2S: SUB2

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.68"

Area (sf)	CN	Description
18,277	30	Woods, Good, HSG A
1,520	30	Brush, Good, HSG A
2,755	30	Brush, Good, HSG A
13,795	30	Meadow, non-grazed, HSG A
36,347	30	Weighted Average
36,347		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	50	0.0480	0.14		**Sheet Flow, Grass Dense** Grass: Dense n= 0.240 P2= 3.13"
0.7	40	0.0200	0.99		**Shallow Concentrated Flow, Short Grass Pasture** Short Grass Pasture Kv= 7.0 fps
1.9	106	0.0330	0.91		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
0.2	41	0.1781	2.95		**Shallow Concentrated Flow, Short Grass Pastrue** Short Grass Pasture Kv= 7.0 fps
0.2	25	0.1803	2.12		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
2.8	150	0.0310	0.88		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
11.6	412	Total			

Summary for Subcatchment 3S: SUB3

Runoff = 0.00 cfs @ 13.36 hrs, Volume= 0.002 af, Depth> 0.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.68"

Area (sf)	CN	Description
798	30	Woods, Good, HSG A
4,573	30	Woods, Good, HSG A
1,583	96	Gravel surface, HSG A
3,774	30	Brush, Good, HSG A
10,728	40	Weighted Average
10,728		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		**Sheet Flow, Woods: Light Underbrush** Woods: Light underbrush n= 0.400 P2= 3.13"
0.2	19	0.0789	1.40		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
0.1	23	0.0739	5.52		**Shallow Concentrated Flow, Paved** Paved Kv= 20.3 fps
0.6	57	0.1000	1.58		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
8.1	149	Total			

Summary for Subcatchment 4S: 4R

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.68"

Area (sf)	CN	Description
8,343	30	Brush, Good, HSG A
27,645	30	Meadow, non-grazed, HSG A
35,988	30	Weighted Average
35,988		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	50	0.0640	0.16		**Sheet Flow, Grass Dense** Grass: Dense n= 0.240 P2= 3.13"
2.0	141	0.0284	1.18		**Shallow Concentrated Flow, Short Grass Pature** Short Grass Pasture Kv= 7.0 fps
0.2	36	0.1750	2.93		**Shallow Concentrated Flow, Shor Grs** Short Grass Pasture Kv= 7.0 fps
7.4	227	Total			

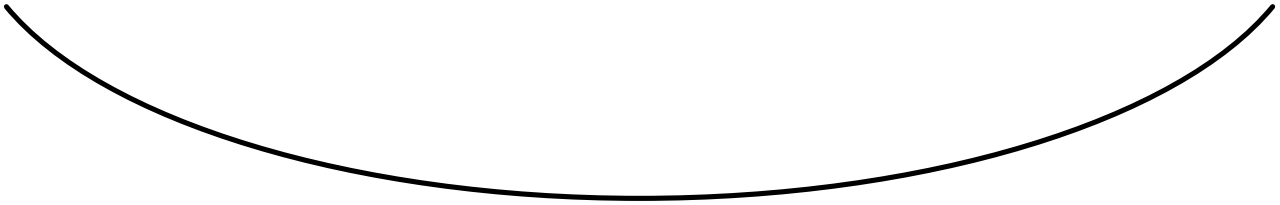
Summary for Reach 4R: RCH4

Inflow Area = 0.826 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 5.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00' Flow Area= 66.7 sf, Capacity= 194.83 cfs

100.00' x 1.00' deep Parabolic Channel, n= 0.080 Earth, long dense weeds
Length= 127.0' Slope= 0.0425 '/'
Inlet Invert= 807.00', Outlet Invert= 801.60'



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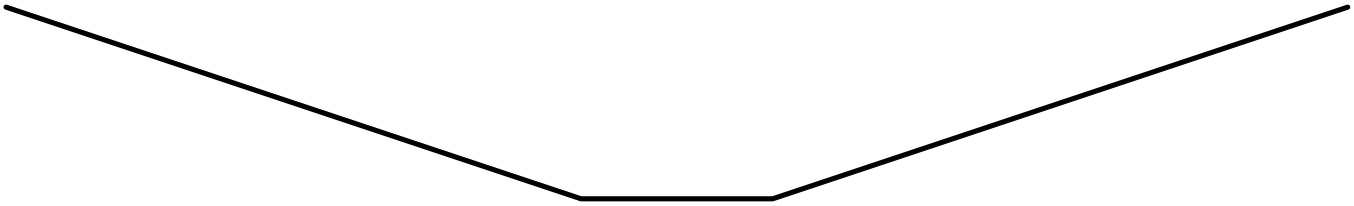
Summary for Reach 4SWL: RCH4

Inflow Area = 0.826 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 5.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 11.37 cfs

1.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 7.00'
Length= 122.0' Slope= 0.0074 '/'
Inlet Invert= 808.70', Outlet Invert= 807.80'



Summary for Pond 3P: PND3

Inflow Area = 0.246 ac, 0.00% Impervious, Inflow Depth > 0.11" for 10-Year event
Inflow = 0.00 cfs @ 13.36 hrs, Volume= 0.002 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 798.66' @ 20.00 hrs Surf.Area= 0.005 ac Storage= 0.002 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	798.00'	0.089 af	**5.00'W x 20.00'L x 5.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	799.25'	**4.0" Round Culvert** L= 10.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 799.25' / 799.00' S= 0.0250 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.09 sf

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=798.00' (Free Discharge)
1=Culvert (Controls 0.00 cfs)

Summary for Pond 4P: POND4

Inflow Area = 0.826 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 807.50' @ 5.00 hrs Surf.Area= 0.009 ac Storage= 0.000 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	807.50'	0.180 af	**8.00'W x 50.00'L x 5.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	807.50'	**6.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 807.50' / 807.00' S= 0.0250 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=807.50' (Free Discharge)
1=Culvert (Controls 0.00 cfs)

Summary for Link 1: POA1

Inflow Area = 8.481 ac, 0.27% Impervious, Inflow Depth > 0.00" for 10-Year event
Inflow = 0.01 cfs @ 20.00 hrs, Volume= 0.000 af
Primary = 0.01 cfs @ 20.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 2: POA2

Inflow Area = 1.661 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 3: POA3

Inflow Area = 0.246 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 1S: SUB1

Runoff = 1.29 cfs @ 12.41 hrs, Volume= 0.353 af, Depth> 0.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.34"

Area (sf)	CN	Description
52,191	30	Woods, Good, HSG A
13,188	30	Woods, Good, HSG A
18,810	30	Woods, Good, HSG A
1,347	30	Woods, Good, HSG A
4,865	30	Woods, Good, HSG A
1,043	72	Dirt roads, HSG A
588	72	Dirt roads, HSG A
1,336	72	Dirt roads, HSG A
574	89	Urban commercial, 85% imp, HSG A
5,868	30	Brush, Good, HSG A
32,077	30	Brush, Good, HSG A
8,962	96	Gravel surface, HSG A
1,502	96	Gravel surface, HSG A
503	98	Paved parking, HSG A
226,574	30	Meadow, non-grazed, HSG A
369,428	32	Weighted Average
368,437		99.73% Pervious Area
991		0.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0620	0.11		**Sheet Flow, Woods: Light Underbrush** Woods: Light underbrush n= 0.400 P2= 3.13"
2.0	162	0.0705	1.33		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
1.1	85	0.0333	1.28		**Shallow Concentrated Flow, Short Grass Pasture** Short Grass Pasture Kv= 7.0 fps
0.1	11	0.0606	1.72		**Shallow Concentrated Flow, Short Grass Pasture** Short Grass Pasture Kv= 7.0 fps
0.3	38	0.0810	1.99		**Shallow Concentrated Flow, Short Grass Pasture** Short Grass Pasture Kv= 7.0 fps
0.7	74	0.0690	1.84		**Shallow Concentrated Flow, Short Grass Pasture** Short Grass Pasture Kv= 7.0 fps
3.2	224	0.0541	1.16		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
0.2	22	0.1050	1.62		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
15.5	666	Total			

Summary for Subcatchment 2S: SUB2

Runoff = 0.07 cfs @ 12.59 hrs, Volume= 0.025 af, Depth> 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.34"

Area (sf)	CN	Description
18,277	30	Woods, Good, HSG A
1,520	30	Brush, Good, HSG A
2,755	30	Brush, Good, HSG A
13,795	30	Meadow, non-grazed, HSG A
36,347	30	Weighted Average
36,347		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	50	0.0480	0.14		**Sheet Flow, Grass Dense** Grass: Dense n= 0.240 P2= 3.13"
0.7	40	0.0200	0.99		**Shallow Concentrated Flow, Short Grass Pasture** Short Grass Pasture Kv= 7.0 fps
1.9	106	0.0330	0.91		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
0.2	41	0.1781	2.95		**Shallow Concentrated Flow, Short Grass Pastrue** Short Grass Pasture Kv= 7.0 fps
0.2	25	0.1803	2.12		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
2.8	150	0.0310	0.88		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
11.6	412	Total			

Summary for Subcatchment 3S: SUB3

Runoff = 0.27 cfs @ 12.17 hrs, Volume= 0.024 af, Depth> 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.34"

Area (sf)	CN	Description
798	30	Woods, Good, HSG A
4,573	30	Woods, Good, HSG A
1,583	96	Gravel surface, HSG A
3,774	30	Brush, Good, HSG A
10,728	40	Weighted Average
10,728		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		**Sheet Flow, Woods: Light Underbrush** Woods: Light underbrush n= 0.400 P2= 3.13"
0.2	19	0.0789	1.40		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
0.1	23	0.0739	5.52		**Shallow Concentrated Flow, Paved** Paved Kv= 20.3 fps
0.6	57	0.1000	1.58		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
8.1	149	Total			

Summary for Subcatchment 4S: 4R

Runoff = 0.07 cfs @ 12.55 hrs, Volume= 0.025 af, Depth> 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.34"

Area (sf)	CN	Description
8,343	30	Brush, Good, HSG A
27,645	30	Meadow, non-grazed, HSG A
35,988	30	Weighted Average
35,988		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	50	0.0640	0.16		**Sheet Flow, Grass Dense** Grass: Dense n= 0.240 P2= 3.13"
2.0	141	0.0284	1.18		**Shallow Concentrated Flow, Short Grass Pature** Short Grass Pasture Kv= 7.0 fps
0.2	36	0.1750	2.93		**Shallow Concentrated Flow, Shor Grs** Short Grass Pasture Kv= 7.0 fps
7.4	227	Total			

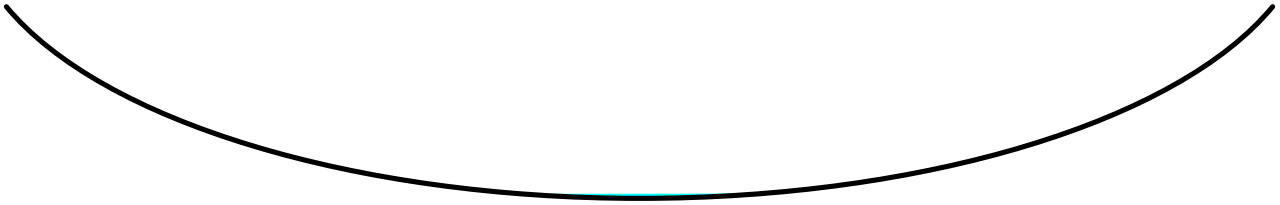
Summary for Reach 4R: RCH4

Inflow Area = 0.826 ac, 0.00% Impervious, Inflow Depth > 0.35" for 100-Year event
Inflow = 0.06 cfs @ 13.12 hrs, Volume= 0.024 af
Outflow = 0.06 cfs @ 13.37 hrs, Volume= 0.023 af, Atten= 1%, Lag= 15.5 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.25 fps, Min. Travel Time= 8.5 min
Avg. Velocity = 0.21 fps, Avg. Travel Time= 10.0 min

Peak Storage= 31 cf @ 13.23 hrs
Average Depth at Peak Storage= 0.02'
Bank-Full Depth= 1.00' Flow Area= 66.7 sf, Capacity= 194.83 cfs

100.00' x 1.00' deep Parabolic Channel, n= 0.080 Earth, long dense weeds
Length= 127.0' Slope= 0.0425 '/'
Inlet Invert= 807.00', Outlet Invert= 801.60'



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Summary for Reach 4SWL: RCH4

Inflow Area = 0.826 ac, 0.00% Impervious, Inflow Depth > 0.37" for 100-Year event
Inflow = 0.07 cfs @ 12.55 hrs, Volume= 0.025 af
Outflow = 0.07 cfs @ 12.62 hrs, Volume= 0.025 af, Atten= 2%, Lag= 4.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.69 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 0.56 fps, Avg. Travel Time= 3.6 min

Peak Storage= 12 cf @ 12.57 hrs
Average Depth at Peak Storage= 0.08'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 11.37 cfs

1.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 7.00'
Length= 122.0' Slope= 0.0074 '/'
Inlet Invert= 808.70', Outlet Invert= 807.80'

Summary for Pond 3P: PND3

Inflow Area = 0.246 ac, 0.00% Impervious, Inflow Depth > 1.16" for 100-Year event
Inflow = 0.27 cfs @ 12.17 hrs, Volume= 0.024 af
Outflow = 0.06 cfs @ 12.95 hrs, Volume= 0.017 af, Atten= 78%, Lag= 46.9 min
Primary = 0.06 cfs @ 12.95 hrs, Volume= 0.017 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 799.42' @ 12.95 hrs Surf.Area= 0.009 ac Storage= 0.008 af

Plug-Flow detention time= 137.4 min calculated for 0.017 af (71% of inflow)
Center-of-Mass det. time= 59.6 min (927.0 - 867.3)

Volume	Invert	Avail.Storage	Storage Description
#1	798.00'	0.089 af	**5.00'W x 20.00'L x 5.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	799.25'	**4.0" Round Culvert** L= 10.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 799.25' / 799.00' S= 0.0250 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.09 sf

Primary OutFlow Max=0.06 cfs @ 12.95 hrs HW=799.42' (Free Discharge)
1=Culvert (Inlet Controls 0.06 cfs @ 1.25 fps)

Summary for Pond 4P: POND4

Inflow Area = 0.826 ac, 0.00% Impervious, Inflow Depth > 0.36" for 100-Year event
Inflow = 0.07 cfs @ 12.62 hrs, Volume= 0.025 af
Outflow = 0.06 cfs @ 13.12 hrs, Volume= 0.024 af, Atten= 11%, Lag= 29.7 min
Primary = 0.06 cfs @ 13.12 hrs, Volume= 0.024 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 807.66' @ 13.12 hrs Surf.Area= 0.011 ac Storage= 0.002 af

Plug-Flow detention time= 22.6 min calculated for 0.024 af (96% of inflow)
Center-of-Mass det. time= 11.6 min (946.2 - 934.6)

Volume	Invert	Avail.Storage	Storage Description
#1	807.50'	0.180 af	**8.00'W x 50.00'L x 5.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	807.50'	**6.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 807.50' / 807.00' S= 0.0250 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.06 cfs @ 13.12 hrs HW=807.66' (Free Discharge)
1=Culvert (Inlet Controls 0.06 cfs @ 1.08 fps)

Summary for Link 1: POA1

Inflow Area = 8.481 ac, 0.27% Impervious, Inflow Depth > 0.50" for 100-Year event
Inflow = 1.29 cfs @ 12.41 hrs, Volume= 0.353 af
Primary = 1.29 cfs @ 12.41 hrs, Volume= 0.353 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 2: POA2

Inflow Area = 1.661 ac, 0.00% Impervious, Inflow Depth > 0.35" for 100-Year event
Inflow = 0.12 cfs @ 13.25 hrs, Volume= 0.049 af
Primary = 0.12 cfs @ 13.25 hrs, Volume= 0.049 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 3: POA3

Inflow Area = 0.246 ac, 0.00% Impervious, Inflow Depth > 0.83" for 100-Year event
Inflow = 0.06 cfs @ 12.95 hrs, Volume= 0.017 af
Primary = 0.06 cfs @ 12.95 hrs, Volume= 0.017 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs