BORREGO SOLAR

December 4, 2018
Revised January 8, 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:

This letter provides updates based on comments received in a letter from the Town of Leicester dated February 27, 2018. The following information, calculations and plans are enclosed for your review:

- Two (2) full size copies of the SITE PLANS, 515 HENSHAW STREET, last revised January 8, 2019.
- Eleven (11) 11x17 copies of the SITE PLANS, 515 HENSHAW STREET, last revised January 8, 2019.
- Three (3) copies of the Stormwater Management Report, last revised January 8, 2019.
- Thirteen (13) copies of Project Narrative, last revised January 8, 2019.
- Thirteen (13) copies of O&M Plan, last revised December 4, 2018.

The following are specific responses to the comments and status update for the each:

1. Tree clearing is proposed to the property line in several locations. This is prohibited by Section 5.14.6.8A, which states in part that "Existing vegetation shall remain in required setback areas except where such vegetation would shade the solar energy system. However, in no event shall clearing of existing vegetation in setbacks exceeds half of the required setback width." At a minimum, all vegetation (including trees) must remain for at least half of the required setback (full setback preferred, and required where vegetation wont shade panels). Also, the residential district (SA) boundary location is not shown on the tree clearing plan (sheet C2.0) so I'm unable to determine conformance in this area.
   Response: The locations in which tree clearing was proposed to the property line were revised to abide by Section 5.14.6.8A. All tree clearing no longer exceeds half the width of the property setback, except in the southern most section of the project site where tree clearing will be necessary to construct the access roadway. The zoning boundaries are now represented on Sheet C-2.0 Tree Clearing Plan. The boundary is visible to the left of the system and makes clear that the system lies in the Business Residential Zone (BR-1).

2. Screening for abutting residential property owners appears insufficient (Section 5.14.6.8.C). Only 36 trees along 400 feet of roadway are proposed, and there is no screening at all proposed in the vicinity of the driveway entrance on Stafford Street. Additional screening methods, such as opaque fencing or additional landscaping should be proposed. The Board may require post-construction view representations (See site Plan Review Regulations II.k.2).
Response: With the new tree clearing plan that is proposed there will be a width of at least 25' of existing trees between Stafford street and the solar system. In addition, 250 feet of opaque fencing is now proposed to negate any possible visibility from the right of way in front of the access road entrance.

3. The locus plan does not show the information required under II.G of the Planning Board's Site Plan Regulations [project sire and its relation to surrounding properties, building and roadways, and zoning district boundaries within on thousand (1,000) feet of the project boundaries]. In particular, abutting residential structures should be clearly identified.
Response: Noted. Sheet C-1.0 Locus Plan now meets the requirements of the Planning Board's Site Plan Regulations.

4. The project narrative should include all information required in II.E and II.K.8.
Response: Noted. The project narrative now includes this information. As the proposed project is unmanned, does not use water or sewer services, generates very little traffic, and has minimal earth disturbance, many of the items are not applicable.

5. The sample decommission bond language is unacceptable as it allows for cancellation at any time with no notice. We will also require that the project be identified on decommission bond by addess and Planning Board permit #. What is the projected lifespan of this facility (to determine bond amount with inflation)?
Response: These comments regarding the bond are noted. None of the requested changes appear to be problematic. Final bond documents can be provided for review to the Planning Board, Town Planner or Town counsel as appropriate. The term of the lease for this facility is twenty (20) years. We respectfully request that agreement on final bond language be a condition to Site Plan Review approval and be provided prior to Building Permit approval.

6. The application packet includes a plan (labeled PV-1, L1 proposal Layout) showing the driveway access to the site on the 515 Henshaw Street parcel (Map 45, Parcel A8). However the site plans show the driveway access on an adjacent parcel (Map 45, Parcel A4). Please provide an explanation of why the driveway crosses onto an adjacent parcel.
Response: The new driveway shown does cross an adjacent parcel. The driveway was realigned to this location in order to take advantage of an existing access/cut road and reduce tree clearing and other earth disturbance required. The adjacent parcel is also owned by Cooper's Hilltop Farm and an easement will be obtained.

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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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BORREGO SOLAR

December 3, 2018
Revised January 8, 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 specific responses to the comments made by Quinn Engineering and status update for each:

1. The applicant should identify the site distance at the proposed driveway entrance and compare that to AASHTO standards in order to identify any potential hazards (Ref. 5.2.05B)
Response: Stafford Street has a posted speed limit of 45 MPH at the project entrance location. This would customarily be the posted speed limit for a 55 MPH design speed roadway. The roadway is relatively straight at this location, with grades between 1 and 3% on the approaches to the proposed entrance. Site distances on either side of the project entrance are in excess of 640 feet. This is adequate stopping distance for an approaching vehicle to stop on a 60 MPH design speed road, as well as adequate sight distance for an exiting vehicle to make a left turn movement from the proposed entrance. It should be noted that the project will have very little traffic once the system is in operation, as it is an unmanned facility. Maintenance visits to the site will be infrequent, usually 2 to 3 times per year.

2. The applicant should provide information regarding uses on adjacent properties in order to determine if glare will affect those properties and if screening is warranted.
Response: The topography of the site rises from Stafford Street to a somewhat flat area in the central portion. The site has been placed at the top of this rise and back from the top of slope. There is not expected to be any visibility of the solar modules from the south. In addition, the site layout has been revised to preserve additional existing vegetation along the Stafford Street frontage. These factors will eliminate the possibility for glare to passing vehicles or nearby residences.

3. The property frontage should be identified in the Site Plan set. (Ref. 5.14.6.2)
Response: Noted. The property frontage is now identified, please refer to Sheet C-1.1 Existing Conditions Plan.

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4. No information appears in the plan set related to property line determination, and no property line data is included for the property lines that have been shown. The applicant must provide assurance to the Board that the property boundaries depicted are accurate and that setback requirements have been met. (Ref. 5.14.6.2 and SPRRR I.A.I)
Response: Noted. The full survey completed by Northeast Survey Consultants, please refer to Sheet C-1.1 Limited ALTA/NPPS Land Title Survey.

5. Evidence of utility notification has been provided. (5.14.6.3)
Response: Noted.

6. The Applicant has requested a waiver to provide site lighting information. (5.14.6.6 and SPRRR II.A.5)
Response: Pole mounted lighting fixtures will be provided at the equipment pad area per the detail shown on C-5.1. The LED fixture will be mounted on a 7-9 foot pole. It will be down-shielded and motion activated. It will illuminate only the area directly around the equipment pads.

7. The Applicant has requested a waiver to provide sign details. (5.14.6.6 and SPRRRR II.A.5)
Response: Signs will be placed at a constant interval along the perimeter fence in accordance with national electric code. Those details will be provided at the time of building Permit application, when detailed system design is complete. Owner and emergency contact information will also be posted on the vehicle gate at the access road. Please refer to Sheet C-5.0 Civil Details.

8. Submission of the project summary, electrical schematic and site plan to local emergency services is required. The Board may wish to solicit comments from the Fire Department and Police Department regarding the adequacy of the proposed access within the facility. (5.14.6.7)
Response: Noted.

9. Land clearing is to be minimized. The Board may request that the Applicant justify the proposed limit of clearing, particularly areas beyond the proposed array field. (Ref. 5.14.6.8)
Response: The extent of land clearing has been revised.

10. Information regarding financial surety had been submitted in the application package, however, due to numerous redactions, it is unclear whether the information submitted pertains to this project. (Ref. 5.14.6.10.C and SPRRR II.G.7)
Response: The surety provided was meant to be an example of the standard bond document that Borrego uses, and was not specific to this project. It is standard performance bond format. The final form of this document is generally provided to the Town for review with the Building Permit submittal. We would respectfully request the Board's review of the estimated amounts for that surety and condition any approval to require provision of the final surety at the time of Building Permit issuance.

11. No portion of the existing property boundary data has been identified on the plans. (Ref. II.A.1)
Response: Please refer to Sheets: C-1.0 Locus Plan, C-1.1 Limited ALTA/NPPS Land Title Survey, and C-1.2 Existing Conditions Plan, for property boundary data and details.

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12. Site ownership information should be added to the Project Directory on the Site Plans. (Ref. II.A.1 and LSR 4.0.A.1)
Response: Noted. Site ownership information has been added to the Project Directory.

13. The volume of earth moving should be provided. (Ref. II.A.9)
Response: The revised plans show a limited amount of proposed grading. The total volume of earth work will be approximately 574.6 Cu. Yd. This is comprised of 358.8 Cu. Yd. of cut and 143.8 Cu. Yd. of Fill. The net earthwork will be 143.0 Cu. Yd. of cut.

14. The locus plan provided does not meet the requirements of Section II.B (Ref. II.B)
Response: Noted. Please refer to Sheets: C-1.0 Locus Plan.

15. The narrative provided should in 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. (II.F)
Response: This permit summary has been added to the revised project narrative enclosed for review.

16. The proposed Solar O&M Service Maintenance should identify (II.G5):
    a. The party responsible for inspection and maintenance
    b. Access road maintenance requirements
    c. Mowing requirements
    d. Procedures for remedying erosion
    e. That items found to be deficient during the outlined visual inspections should be remedied.

Response: A revised Operation and Maintenance Plan is enclosed for review.

17. Information regarding the depth to seasonal high groundwater table and confirmation of the USDA soil mapping should be provided. (Ref. LSRT 4.0.A.12, LSR 4.0.A.19, DEP Vol.2, Ch.2, pages 51/110 and DEP Vol.3 Ch.1, page 8)
Response: Noted. Please refer to the figures attached to the Stormwater Memo.

18. Velocities and capacities in all proposed culverts should be identified.
Response: Noted. Please refer to Sheet C-4.0 Grading and Erosion Plan. Southern Culvert is 10' long with a 4" diameter. The Eastern Culvert is 20 feet long with a diameter of 6". Both are round plastic pipes.

19. Access to the detention basins should be provided in accordance with DEP standard (Ref. DEP Vol2, Ch 2, page 111)
Response: Noted.

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20. It is recommended that the outlets from stormwater basins be reconfigured to eliminate flows over emergency spillways. Spill ways are indicated in the stormwater report but not shown in the plan set. 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: All basins have been revised, refer to Sheets C-3.0 Layout and Materials Plan and C-4.0 Grading and Erosion Plan.

21. Basins should be designed in accordance with MA DEP Stormwater Handbook requirements. A minimum of 12" of freeboard is recommended at all stormwater basins. Basins 1 and 2 do not provide adequate freeboard.
Response: All basins have been revised, refer to Sheets C-3.0 Layout and Materials Plan and C-4.0 Grading and Erosion Plan.

22. 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.)
Response: According to Web Soil Survey, the seasonal high ground water is greater than 200 centimeters (78.74 inches) throughout the project site. This, of course, includes the areas of the detention basin.

23. Watershed maps have not been included in the Drainage Analysis and should identify catchments, cover, hydraulic length and location of all "ponds" and "reaches" used in the HydroCAD model. Stormwater modeling methodology is unclear without delineation of design features. (4.0.A.15)
Response: Noted. Please refer to Sheets W-1.0 Pre-Development Watershed Plan and W-2.0 Post Development Watershed Plan.

24. An Operation and Maintenance Plan for the proposed drain system should be provided. The maintenance activities and frequency specified in the drainage Analysis for the stormwater Handbook. (LSR 4.0.B and DEP Vol. 2, Ch. 2, pages 3, 4, 87, 92, 109 and 111)
Response: A revised Operation and Maintenance Plan is enclosed for review.

25. The Applicant should clarify how the total recharge volume is met. (LSR 5.0.E and DEP Vol. 3, Ch.1, page 15)
Response: Please refer to the Stormwater Memo for the recharge volume calculations.

26. It is unclear if any runoff from the impervious areas in the post-development is not expected to discharge to the proposed infiltration BMPs. A capture area adjustment calculation should be provided to demonstrate the recharge requirement is met if all impervious areas are draining to infiltrating structure. (LSR 5.0.E and DEP Vol. 3, Ch. 1, page 2)
Response: All impervious, which are the concrete equipment pads, are surrounded by gravel which allows for recharge. The water that sheds off of these pads will be recharged within the surrounding gravel.

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27. A calculation should be provided to demonstrate that proposed rip rap apron energy dissipaters area adequately sized. (DEP Vol. 3, Ch. 1, page 2)
Response: Revised Stormwater memo is enclosed for review.

28. 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: Revised Stormwater memo is enclosed for review.

29. The Applicant should confirm that the panels will be post mounted and not mounted on concrete ballast blocks. Runoff rate and infiltration requirements will be impacted if concrete ballast blocks are used because the impervious surface area below the panels will be increased.
Response: The panel racking system foundation will consist of ground screws. Please refer to the detail on sheet C-5.0. There is very little earth disturbance created with this foundation system. The system will not be ballasted.

30. Property line and contour data provided lacks information of origin. A surveyor of record is not listed in the project directory.
Response: Please refer to Sheets, C-1.0, C-1.1, C-1.2.

31. Finished contour grade lines should be shown on the site plan for the proposed solar array field, the proposed gravel access driveway, and the adjacent stormwater swale to assure adequate placement of erosion controls. Finished grades for basin berms, spillways, and discharge points should be added to the site plans.
Response: Noted. Please refer to Sheet C-4.0 Grading and Erosion Plan.

32. Finish grade elevations and culvert invert information should be provided at the driveway cross culverts.
Response: The culverts previously proposed to be under the road are no longer proposed. Current site design requires less water management facilities than the previously submitted plans. Invert elevations as well as the length of the culverts proposed in the stormwater basins has been shown. Please refer to Sheets C-3.0 Layout and Materials Plan and C-4.0 Grading and Erosion Plan, and the revised Stormwater memo.

33. As no finish grading has been provided for the access drive, there appears to be potential for erosion along the western edge of the driveway leading to wetland resource areas. A swale with check dames or other type of conveyance or a cross pitch is recommended to maintain runoff off the driveway and reduce potential erosion.
Response: Grading has been added for the roadway. The entrance road will be constructed largely at grade. The slopes of the roadway are mainly 1 to 4%. There is a short section that is approximately 7.5%. If there is still a concern regarding erosion, we are happy to discuss further measures with the reviewing engineer.

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34. Rip rap or other stabilization method is recommended where concentrated flow will enter and exit the stormwater basins.
Response: Please refer to Sheet C-5.0 Civil Details.

35. The applicant should indicate if the proposed gate will have a lock. If so, the Fire Department or other suitable emergency responder should be provided with a key.
Response: They vehicle and man gates will be locked. The necessary access information will be provided to the appropriate emergency responders. Borrego generally provides knox boxes for access by emergency services.

36. Other solar projects reviewed by this office have proposed to set the surrounding fence 6 inches to 8 inches above the ground to allow for passage of small wildlife. The applicant and board may want to consider this option.
Response: It is now Borrego's standard include a 6-inch wildlife gap in its fencing. Refer to Sheet C-5.0 Civil Details.

37. Stafford Street is misspelled throughout the plan set.
Response: This has been corrected.

38. The location of the barrier gate should be shown on the plan set.
Response: Refer to Sheet C-3.0 Layout and Materials Plan.

39. It is recommended that the stormwater basins be located within fenced areas such that access to the basins is restricted.
Response: Noted.

40. A 16' wide gravel drive does not meet NFPA minimum access width requirements. The Board may wish to confirm with the Fire Department and Police Department regarding adequate width of the access road.
Response: Noted. Fire and Police Department concurrence will be obtained.

41. Site access is provided via an easement on the adjacent property (though in common ownership). Information related to the Board. The Board should determine if abutters have been adequately notified, if portions of site work are to include parcels not identified as subject parcels.
Response: Abutters to the adjacent parcel where the entrance drive is located have been notified.

42. Utilities and stormwater facilities also partially fall on the adjacent property (though in common ownership). The Board should confirm that the installation of solar facility (stormwater basin and electric poles/OHW) appurtenances on abutting properties is acceptable to the Board. Easements should be put in place for such installation and easement legal terms, definition, and evidence of recording should be provided to the Board. The Board should determine if abutters have been adequately notified, if portions of site work are to include parcels not identified as subject parcels.
Response: Noted.

43. Existing utilities have not been shown on the plan set, and the Applicant has requested a waver to not provide those items as no water and sewer are to be connected to the site.
Response: There are no known existing utilities in the project area to be shown.

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Very truly yours,
Borrego Solar Systems

C. Dean Smith, P.E.
Civil Engineer

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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.

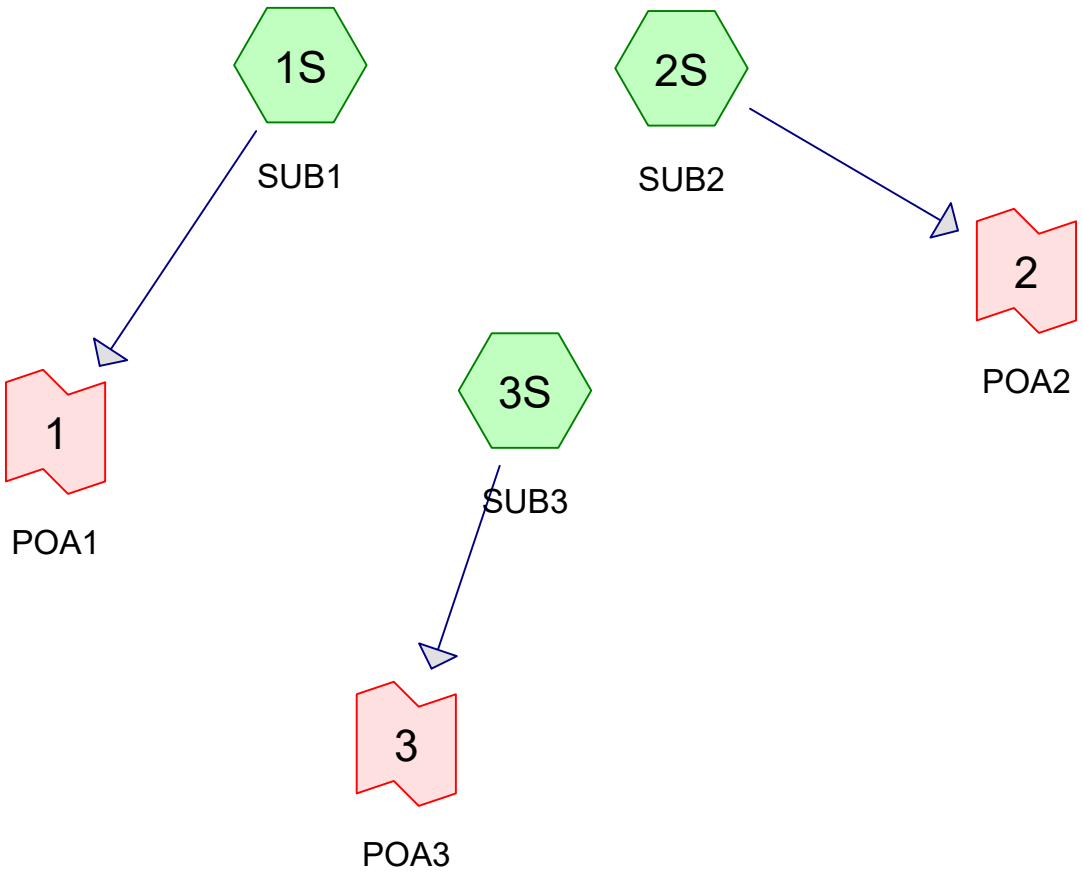
An Illicit Discharge Compliance Statement confirming that no illicit discharges exist on site is included in Appendix E – Supporting Documentation of the Notice of Intent.

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

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			

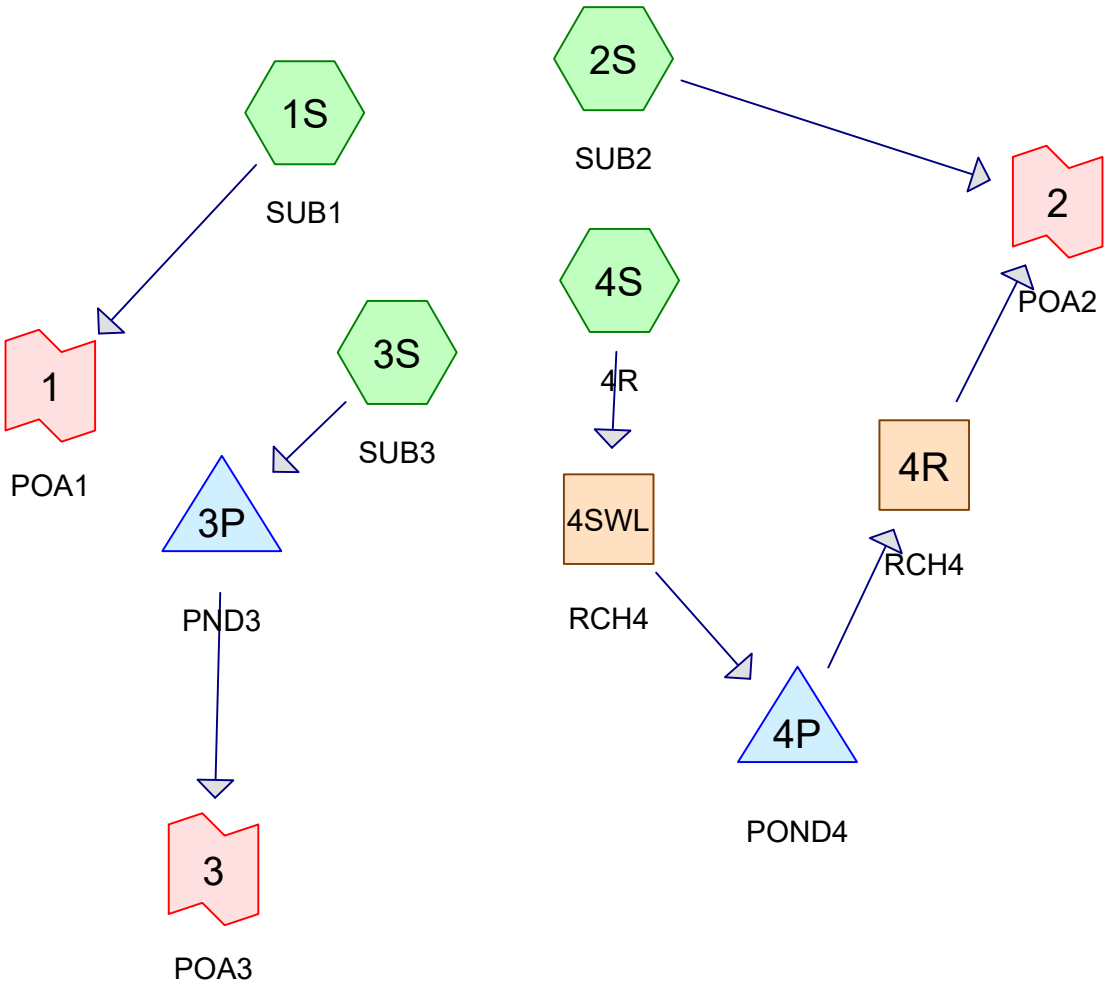
Summary for Subcatchment 3S: SUB3

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_092518_WS_BASIN2_F

Prepared by {enter your company name here}, Printed 12/13/2018

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			

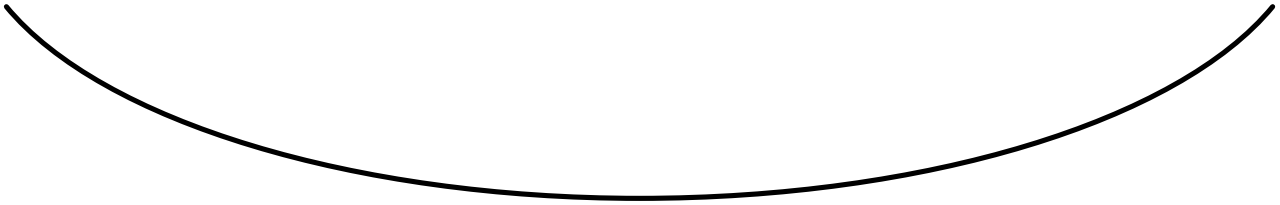
Summary for Reach 4R: RCH4

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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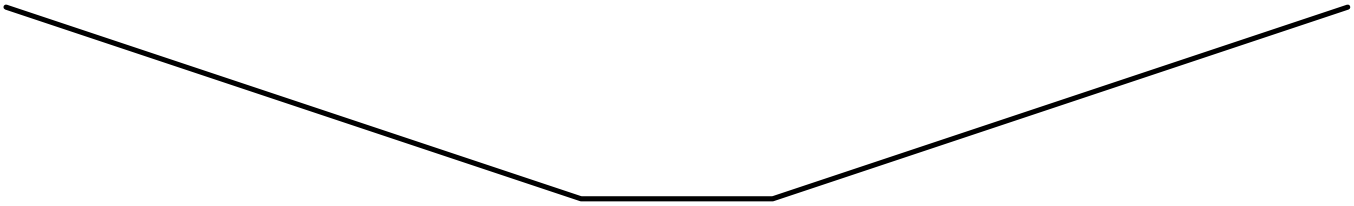
Summary for Reach 4SWL: RCH4

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'	0.080 af	**10.00'W x 10.00'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			

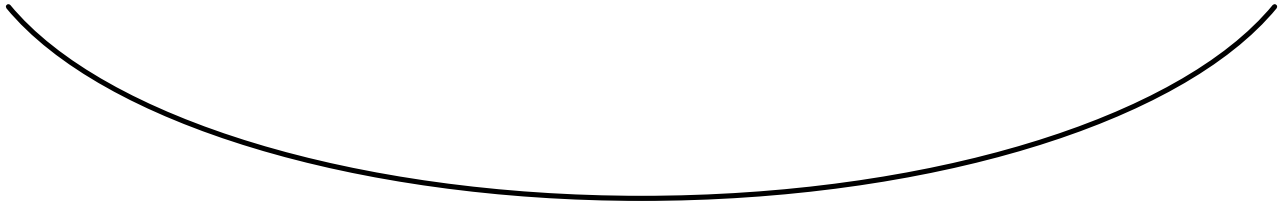
Summary for Reach 4R: RCH4

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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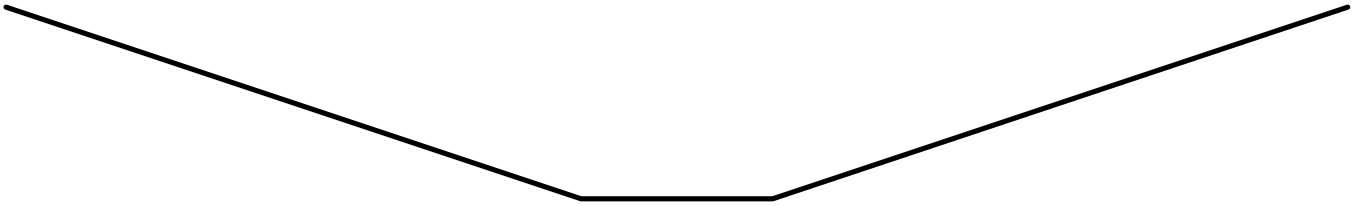
Summary for Reach 4SWL: RCH4

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= 798.69' @ 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'	0.080 af	**10.00'W x 10.00'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			

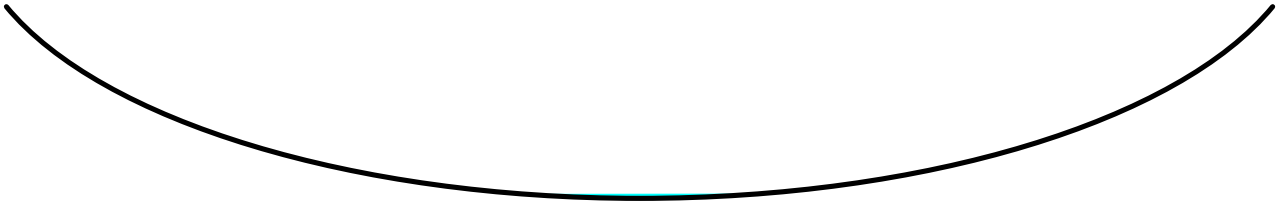
Summary for Reach 4R: RCH4

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 @ 12.78 hrs, Volume= 0.018 af, Atten= 76%, Lag= 36.8 min
Primary = 0.06 cfs @ 12.78 hrs, Volume= 0.018 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 799.43' @ 12.78 hrs Surf.Area= 0.008 ac Storage= 0.007 af

Plug-Flow detention time= 125.2 min calculated for 0.018 af (74% of inflow)
Center-of-Mass det. time= 53.1 min (920.4 - 867.3)

Volume	Invert	Avail.Storage	Storage Description
#1	798.00'	0.080 af	**10.00'W x 10.00'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 @ 12.78 hrs HW=799.43' (Free Discharge)
1=Culvert (Inlet Controls 0.06 cfs @ 1.29 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 > 0.86" for 100-Year event
Inflow = 0.06 cfs @ 12.78 hrs, Volume= 0.018 af
Primary = 0.06 cfs @ 12.78 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min

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

Site Inspection Protocol

Operation & Maintenance Department

SERVICES

During the Term, Contractor shall perform the following services on each System:

Each System will be installed with an Internet-based Data Acquisition System (DAS). The DAS will have the capability to send alarms identifying communication and power generation issues.

Description of Work	Frequency of Inspection
On-Call System Service Technician	Per request
Full System Electrical Inspection & Maintenance	One time per year
Module Washing	Optional (maximum once per year)
Vegetation Management	Minimum of once per year
Landscaping	Minimum of once per year
Gravel Access Road	Minimum of once per year
Sediment Forebay and Infiltration Trench	Minimum of four times per year

In the event that the Town finds the facility owner failing to properly maintain the facility in working order, the town may issue a notice of violation. If after notice by the Permit Granting Authority to correct a violation requiring maintenance work, satisfactory corrections are not made by the owner(s) within thirty days, the Town may perform all necessary work to place the facility in proper working condition and place a municipal lien on the affected property as security for all of the costs assumed by the town to perform the work. The owner(s) of the facility shall be assessed the cost of the work and any penalties.

Scope of Work

1. On-call Service Technician:

In response to an automated DAS alarm or request by Customer, a Service Technician will be required to visit the site within three (3) business days of notification to trouble shoot and resolve the issue. Emergency situations may require faster response.

2. System Electrical Inspection & Maintenance:

a. Electrical Maintenance
   The technician will:
   i. Perform a visual inspection of PV modules and array wiring, strain relief, mounting system, trackers, inverters, switchgear, transformers, combiner boxes, wireways and conduit, data acquisition system, weather sensors and outdoor lighting. ii. Check pyranometers and reference cells.
   iii. Record operational data from inverters and meters.
   iv. IR Thermography may be used as part of the visual inspection process.

b. Inspect External and/or Internal DC Disconnects and Combiner Boxes During the inspection, the technician will:

i. Ensure that Imp testing is performed on all DC strings, and values are logged on the Borrego provided form.
ii. Spot check torque values and tighten loose electrical connections.

c. Inverter and Transformer The technician will:
   i. Clean out all electrical enclosures
   ii. Clean inverter air filters
   iii. Perform Preventive Maintenance per manufacturer protocol as required to maintain inverter manufacturer's warranty.
d. AC Disconnects
   i. The technician will check for proper operation.
e. DAS
   i. Verify with Borrego O&M representative before leaving site that the DAS system is functioning properly.
f. Fencing, Gates, Civil
   i. Annual visit will include a visual inspection of any fences, gates, equipment pads, etc. Facility improvements installed by Borrego Solar such as gravel access roads, etc. shall be inspected on a periodic basis per Borrego Solar.
g. Service Report
   i. A report must be filed with Borrego noting results of the annual inspection.

3. Module Washing. At a maximum, modules might be washed once per year. Only clean water will be used. No chemical additives or cleaners will be used. Additional washings may be requested by Borrego based upon system performance objectives and site-specific environmental conditions.

4. Vegetation Management. The site shall be inspected for evidence of erosion and rilling in any slopes. Any such conditions shall be noted in the annual report for re-vegetating.

   Growth of trees or other vegetation that is having a shade impact on the arrays should be noted in the annual report. Vegetation growth (saplings, bush, large weeds, etc.) within any array fences or inverter enclosures shall be removed. The site shall be mowed a minimum of twice per year.

5. Gravel Access Road. The road and roadside swales shall be inspected for evidence of erosion, rilling and clogging. These conditions shall be noted and supported with photographs and locations as part of the annual report.

6. Water Treatment Basins and Swales. The swales and detention basins shall be inspected for evidence of erosion, rilling and clogging. These conditions shall be noted and supported with photographs and locations as part of the inspection report.

Borrego Solar System, Inc.
Joe Thorpe, Director of Operations & Maintenance

_____ _____

Signature Date

Long Term Pollution Prevention Plan

Hours of Operation

The hours of operation on site during construction will be as follows:

7AM – 5PM Monday – Friday
8AM – 12PM Saturday (No heavy equipment work or other significant noise generating activities permitted on Saturday)

Following construction completion, work on site will be infrequent. Maintenance activities will be conducted during the above specified hours, except in the case of emergency.

Good Housekeeping Practices

The Owner/Operator shall employ the use of good housekeeping practices by adhering to the maintenance schedules and procedures described in Appendix B - Operations and Maintenance Plan of this report.

Provisions for storing materials/waste products

The storing of hazardous materials and waste is not anticipated with this project. Materials Safety Data Sheets (MSDS) are not required since no materials or substances will be permanently stored on site.

Vehicle Washing

On site washing of vehicles is not anticipated with this project. Vehicles will be washed off site. Only clean vehicles are permitted on site. A concrete wash-out will be provided during construction for washing vehicles on entrance and exit from project, if necessary. Wash-out area to be reclaimed following construction.

Solar Panel Washing

The washing of panels is not typically required in the Northeast, as the average monthly rainfall amounts are sufficient to clean the panels. If it is determined that local conditions warrant cleaning of the panels, only clean water will be used.

Requirements for routine inspections and maintenance of stormwater BMP's

The Operator shall adhere to the maintenance schedules and procedures described in Appendix B - Operations and Maintenance Plan of this report.

Spill Prevention and Response Plans

There is a minimal risk of a large spill requiring action on this project. Hazardous materials (such as, pesticides, petroleum products, fertilizers, detergents, acids, paints, cleaning solvents, etc.) will not be stored on-site.

In the event of a spill of hazardous substances or oil, the following procedures must be followed:

- All measures must be taken to contain and abate the spill and to prevent the discharge of hazardous substances or oil to storm water or off-site
- For spills less than five (5) gallons of material, proceed with source control and containment, cleanup with absorbent materials or other applicable means unless and imminent hazard or other circumstances dictate that the spill should be treated by a professional emergency response contractor.
- For spills greater than five (5) gallons of material, immediately contact the MassDEP Emergency Response Program at (1-888-304-1133) and an approved emergency response contractor. Provide information to emergency response contractor (or coordinator) on the type of material that spilled, the location, the estimated quantity and the time of the spill.

If there is a Reportable Quantity (RQ) release, notify the National Response Center immediately at (800) 424-8802. Within 14 days a report must be submitted to the EPA Regional Office describing the release, the date and circumstances of the release and the steps taken to prevent another release. This Long Term Pollution Prevention Plan must be updated to reflect any changes or steps taken to prevent the same for reoccurring.

Provisions for maintenance of landscaped areas.

Ground cover shall be mowed a minimum of once per year. Additional mowing may be necessary.

Provisions for solid waste management

A solid waste management program during construction (including dumpster, trash receptacles) shall be implemented, inspected and maintained in accordance with local and state requirements. During construction a properly sized dumpster will be on-site. No permanent dumpsters are proposed.

Emergency Contacts

Borrego Solar

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MassDEP Western Regional Office

(413) 784-1100

United States Environmental Protection Agency

(800) 424-8802