ALLEN SOLAR POWER, LLC

ROOSEVELT TRAIL, RAYMOND, MAINE

STORMWATER MANAGEMENT PLAN

Submitted by:

MAINELY SOLAR
143 HIGHLAND SHORES ROAD
CASCO, MAINE 04015

Prepared by:

Acheron Engineering, LLC

153 Main Street
Newport, Maine 04953
(207) 368-5700

113 Winter East
Williamsburg, VA 23188
(207) 341-2590

DATE:

SEPTEMBER, 2023

This Stormwater Management Plan addresses each applicable criterion set forth in the of Maine, Department of Environmental Protection, Chapter 500, Stormwater management and Town of Raymond, Land Use Ordinance §350-6.11, §300-9.24.C and §300-10.4 (3)(n).

1.0 Development Description

Location: Allen Solar Power, LLC proposes to develop a 1 +/- megawatt community scale solar facility that will occupy approximately 6.8 acres and is in the Town of Raymond, Maine. The project parcels total approximately 29 acres in size. Parcels are identified by the Town as Map 4, Lots 68 and 68A. Please refer to the Appendix G for survey plan of the parcels Appendix A for the site location map.

Land Cover & General Topography: The parcel topography is consider rolling with slopes in the north, south, east, and west directions. Land cover within the parcel boundary is predominately forested, with two residential structures, located on the south end of lot 68A. A boat storage area with a crushed stone surface and paved driveway currently exists on lot 68. The project area proposed is considered undeveloped and forested. Trees within the proposed project area and parcel have recently been selectively harvested. The project area topography includes grades in the 4 to 15% range in the northwest direction.

Soils: Soils within the parcel boundaries and project area were obtained from the United States Agriculture and Natural Resource Conservation Service (NRC) web soil survey. Soil types names and description are list in the table below, boundaries are delineated on site plans attached, and a NRCS custom soils report and BMP test pit report can be found in Appendix D

Soils Map Unit Symbol	Map Unit Name	HSG
HhB	Hermon sandy loam 0-8% percent slopes, very stoney	A
HhC	Hermon sandy loam 8-15% percent slopes, very stoney	A
WsB	Woodbridge very stoney fine sandy loam, 0-8%	C

Surface Waters: Surface waters within the parcel includes; scrub-shrub, isolated forested, wetlands, and vernal pools, two of which have been classified as significant. Please see the Protected Natural Resource report prepared by Watershed Resource Consultants for specific details and classifications.

Downstream Ponds or Lakes and Flooding: The project area is within the watershed of Thomas Pond which is listed as a waterbody most at risk of development in Chapter 502. The project area is not within an identified flood zone per Flood Insurance Rate Map (FIRM), Town of Raymond, Maine, community-panel number 230205 0015 B, panel 15 of 20. The referenced FIRM map is attached as Appendix E.

Alterations to Land Cover: Proposed alterations to landcover include, clearing and grubbing the project area. Construction of a gravel access driveway to the project area that includes, grading approximately to support solar panel installation, construction of a solar equipment pad, and construction of two underdrained soil filters for stormwater treatment. The specific proposed and existing alterations since November, 2005 are presented below.

Land Alteration Table

Alteration Identifier	Description	Existing or Proposed	Impervious Area (sf)	Landscaped Area (sf)	Developed Area (sf)
A	Paved driveway to east abutter	Existing	2,556	0	2,556
B*	Boat storage - crushed stone surface	Existing	9,900	0	9,900
C	Solar field gravel access driveway	Proposed	17,657	39,338	56,995
D	Solar equipment pad	Proposed	160	0	160
E	Solar panel racking support posts	Proposed	10	0	10
		Total	30,283	39,338	69,621
* Considered impervious area for the purpose of determining jurisdictional thresholds					

Assumptions:

1. Impervious area associated with solar panel rack support post are self-buffering. The solar field will be maintained as a meadow by limiting the mowing to no more than two times per year.
2. The existing crushed stone surface of the boat storage area is considered landscaped/developed area. The crushed stone is permeable and the hydraulic soil gradient (HSG) is classified as HSG A and "somewhat excessively drained."

2.0 Basic Standard Submission

Based on the land alteration table the project the Basic Standard of Chapter 500 apply to the project. Erosion and sedimentation control plan details and notes can be found on the design plans located in Appendix G. See Appendix B for the Erosion & Sedimentation Control Inspection and Maintenance Plan.

3.0 General Standards Submission

The proposed and existing impervious area will total more than 20,000 square feet of impervious area but less than 3 acres of impervious and less than 5 acres of developed within a watershed most at risk of development. As a result, the General Standards apply to the project. The General Standards require that the project must provide stormwater treatment of no less than 95% of the impervious area and 80% of the developed area. To meet the standard two underdrained soil filters are proposed. The design of the filters is based Chapter 7.1 – Grassed Underdrained Soil Filters of the Maine Stormwater Management Design Manual, Volume I, dated March, 2016. As proposed the project will provide stormwater treatment for 100% of the proposed and existing impervious area and 86% of the existing and proposed developed area. Please refer to the Water Quality Treatment Table below and the stormwater quality calculations in Appendix C for specific details.

Water Quality Treatment Table

Area Description	Impervious Area (SF)	Developed Area (SF)	Impervious Area Treated (SF)	Developed Area Treated (SF)	BMP
Project Access Drive, STA 0+00 to 6+40	10,240	39,466	10,240	39,466	SFA
Project Access Drive, STA 6+40 to 9+80	7,417	17,529	7,417	17,529	SFB
Concrete Equipment Pad	160	160	160	160	SFB
Solar Panel Racking Support Posts	10	10	10	10	Self Buffering
Boat Storage Area	0	9,900	0	0	N/A
Residential Paved Driveway to East	2,556	2,556	2556	2556	N/A
Total	20,383	69,621	20,383	59,721	
		Percent Treated	**100%**	**86%**	

4.0 Flooding Standards Submission:

As proposed the project does not include 3 acres or more of impervious area or 20 acres or more of developed area and is not required to meet the flooding standard in Chapter 500. However, the Town of Raymond Land use Ordinance includes the requirement that a project shall be designed so that the post-development stormwater peak runoff does not exceed the pre-development stormwater peak runoff for the 2yr, 10yr and 25yr, 24-hr storm events.

The hydrology model for the proposed project was completed using HydroCad. Runoff curve numbers were determined by SCS published charts (contained within the HydroCad program) and the proposed site development soil types determined by NRCS. Time of concentration flow values were determined from site topography maps and the type of ground cover. Please refer to the attached HydroCad reports in Appendix F for additional information on specific assumptions utilized in the model.

The 24-hr storm type and rain fall values used for modeling were acquired form Appendix H of Chapter 500 for Cumberland County SE (North Windham Area) and listed in the table below.

24-hour Duration Rain Fall Amounts		
Storm Type	**Return Period**	**Storm Depth (in)**
III	2-yr	3.1
III	10-yr	4.6
III	25-yr	5.8

Modeling was performed for the areas where proposed land alterations are proposed. Results of the runoff analysis are presented in the table below.

Peak Stormwater Runoff Rate Table			
Point of Analysis	**Storm Frequency (yr)**	**Existing Conditions Runoff (cfs)**	**Proposed Conditions Runoff (cfs)**
1L	2	0.1	0.04
	10	1.91	0.91
	25	5.46	4.81
2L	2	0.00	0.00
	10	0.06	0.02
	25	0.34	0.14

Model results predict that the peak storm runoff from the fully developed solar project will be the same or less than the existing condition for the 2-yr, 10-yr and 25-yr storm events. Detailed HydroCAD model reports can be found in Appendix F of this plan and details of model inputs and results can be found on the stormwater management plans in Appendix G.

5.0 Plan Summary:

Below is a summary of how the project meets the State and Local stormwater standards as designed:

Basic Standard: As submitted, construction activity associated with the project, will not impede or otherwise alter drainageways so as to have an unreasonable adverse impact on a wetland or waterbody, or an adjacent downslope parcel. Project plans includes details and specifications for erosion control measures. Including temporary stabilization, mulch, buffers, stormwater channels and winter construction. The attached, Erosion and Sedimentation Control, Inspection and Maintenance Plan, provides detail inspection, maintenance, and housekeeping procedures.

General Standards: As designed, the project provides stormwater treatment for 100% of the proposed impervious area and 86% of the developed area. BMPs designed to achieve the treatment level are two grassed underdrained soil filters (SFA & SFB).

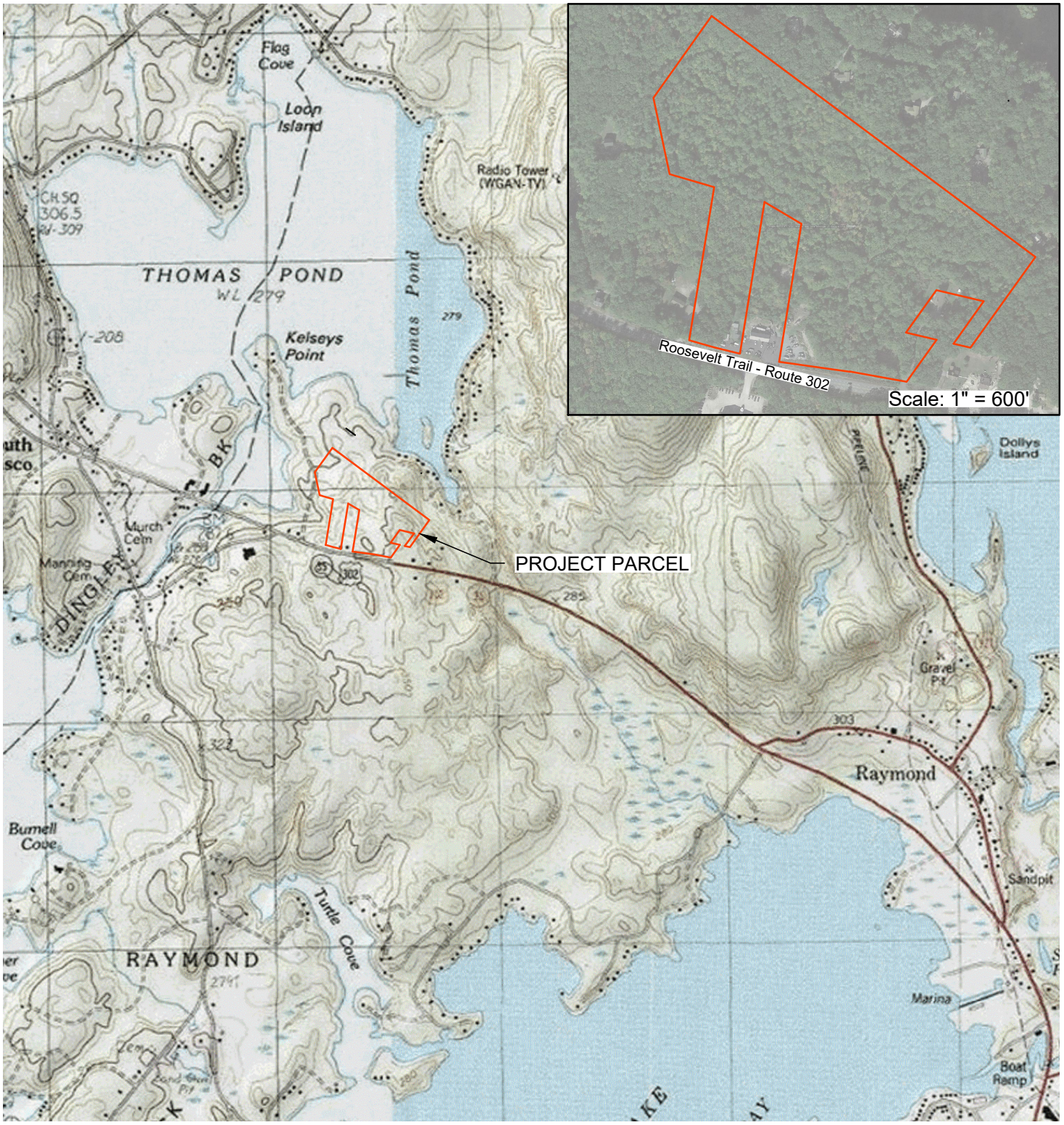
Flooding Standard: Peak stormwater runoff from the proposed project will equal or be less than the existing peak runoff rates for the 2-yr, 10-yr and the 25-yr storm events.

Prepared By:

Acheron Engineering, LLC

Kirk Ball, ME PE #11681

Appendix A
Site Location Plan & Photos



0 2000' 4000' 6000'

Scale: 1" = 2,000'

Do Not Use for Construction
For Regulatory Review Only

Site Location Map

Mainely Solar, LLC.
143 Highland Shores Road
Casco, Maine

Job No.: MS001	Scale: As Noted
Date: 8/24/2023	Sheet: 1

Facility Name:	Site Location:
Allen Solar	Raymond, Maine

Phot No.	Date:
1	`2023

Photo Description:

Solar Facility Project area.

Facility Name:	Site Location:
Allen Solar	Raymond, Maine

Phot No.	Date:
2	`2023

Photo Description:

Solar Facility Project area.

Facility Name:	Site Location:
Allen Solar	Raymond, Maine

Phot No.	Date:
3	`2023

Photo Description:

Drone Image

Facility Name:	Site Location:
Ellsworth Demo Disposal	Raymond, Maine

Phot No.	Date:
4	`2023

Photo Description:

Drone Image

Facility Name:	Site Location:
Allen Solar	Raymond, Maine

Phot No.	Date:
5	2023

Photo Description:

Existing Driveway

Facility Name:	Site Location:
Allen Solar	Raymond, Maine

Phot No.	Date:
6	`2023

Photo Description:

Existing boat storage area.

Appendix B
Erosion, Sedimentation Control Inspection & Maintenance Plan

EROSION AND SEDIMENTATION CONTROL
INSPECTION AND MAINTENANCE PLAN

ALLEN SOLAR
ROOSEVELT TRAIL, RAYMOND, MAINE

Prepared by:

Acheron Engineering, LLC
153 Main Street
Newport, Maine 04953
207- 341-2590

DATE:

AUGUST, 2023

1.0 Introduction

The purpose of this plan is to establish an inspection and maintenance process to employ during construction of the project and is intended to meet the requirements set forth in Chapter 500, Section 4(B) of the Stormwater Management Rules. The following section includes:

- A description of the project.
- Responsible parties for implementing the plan.
- Inspection and maintenance procedures during construction.
- Inspection and maintenance procedures after construction

This plan was prepared by or under the supervision of, Kirk Ball, P.E., Acheron Engineering, 153 Main Street Newport, Maine 04953.

2.0 Project Description

The Allen Solar project the construction of a small solar power generation facility that will occupy approximately 8.4 acres of land.

The scope of work includes but not limited to:

1. Clearing approximately 8.4 acres of forested area.
2. The construction of a 980 foot gravel access drive with hammerhead turnaround.
3. Installation of solar panels and racking system.
4. Installation of connection power lines below grade.

Erosion and Sedimentation Control BMPs include:

- Construction Entrance,
- Soil Filters used as sediment basin during construction of access drive,
- Sediment barriers (silt fence or erosion control mix berms),
- and stone check dams.

The stormwater management BMPs includes two grassed underdrained soil filters (SFA & SFB). Please Refer to design plans by Acheron Engineering for specific locations of the BMPs.

3.0 Responsible Parties

During construction General Contractor retained by Allen Solar will be responsible to ensure that the inspections are performed as described in the following sections. Following Construction, Allen Solar will be responsible for overseeing or conducting the inspections and record keeping as described in Section 5. Recertification requirement, within three months of the expiration of each five-year interval from the date of issuance of the permit, the permittee shall certify the following to the Department:

1. All areas of the project site have been inspected for areas of erosion, and appropriate steps have been taken to permanently stabilize these areas.
2. All aspects of the stormwater control system are operating as approved, have been inspected for damage, wear, and malfunction, and appropriate steps have been taken to repair or replace the system, or portions of the system, as necessary.
3. The stormwater maintenance plan for the site is being implemented as approved by the Department, and the maintenance log is being maintained.

Owner Contact Information:

David Fowler
Allen Solar Power, LLC
143 Highland Shores Road
Casco, Maine
Tel. 207-461-0666

General Contractor:
TBD

4.0 Inspection and Maintenance During Construction

This plan applies to all temporary and permanent erosion control features/structures. During construction all erosion control structures that remain in place and stormwater features shall be inspected weekly, or after each rainstorm producing 1" or greater rainfall, whichever is more frequent. All inspections shall be conducted performed by an individual with knowledge of erosion and stormwater control practices and the conditions of the stormwater management permit issued by the Maine Department of Environmental Protection. All erosion and sedimentation controls structures shall be inspected and maintained for but not limited to the following:

A. Sediment Barriers
    1. Inspect weekly, before and after a storm.
    2. Verify that barriers are installed prior to any soil disturbance.
    3. Verify if silt fence is keyed properly and tight.
    4. Repair and/or replace barriers as needed.
    5. Verify barriers are removed when the site is stabilized. Silt fence should be cut at the ground surface.
    6. Water that is flowing under the silt-fence without treatment requires resetting the silt fence so the bottom of the fabric is buried into or covered with soil or stone.
    7. Sediments that have built up behind silt fence should be removed and the section of the silt fence reset (with new fabric and posts if signs of damage are evident).

8. Rips or holes in fabric require replacement of the section of silt fence with new fabric from post to post. Examine area for cause of problem and remove the threat.
9. Water that is flowing under the silt-fence without treatment requires resetting the silt fence so the bottom of the fabric is buried into or covered with soil or stone.
10. Sediments that have built up behind silt fence should be removed and the section of the silt fence reset (with new fabric and posts if signs of damage are evident).
11. Rips or holes in fabric require replacement of the section of silt fence with new fabric from post to post. Examine area for cause of problem and remove the threat.

B. Temporary Stabilization

1. Inspect disturbed areas weekly, before and after a storm.
2. Verify that areas that are idle for more than 14 days has been stabilized.
3. Verify that disturbed areas within 100 feet of a natural resource is stabilized each day.

C. Mulch

1. Inspect disturbed areas weekly, before and after a storm.
2. Verify that areas are seeded and mulched within 7 days of obtaining final grade.
3. Verify that erosion control mix is 4-6 inches thick.
4. Verify that erosion control blankets or hay mulch are anchored.

D. Stormwater Channels

1. Inspect disturbed areas weekly, before and after a storm.
2. Verify that ditches and swales are clear of obstruction, accumulated sediments or debris.
3. Verify that ditch lining/bottoms are free of erosion.

E. Buffers

1. Inspect before and after a storm.
2. Verify that areas that buffers are free of erosion and concentrated flows.
3. Verify that area downgradient of level spreaders is stable.
4. Inspect and remove any sediment accumulation within the level spreaders.

F. Winter Construction (Nov 1st to April 15th)

1. Inspect erosion control measure daily.
    i. Ensure final graded areas are mulched twice the normal rate with and anchored.
    ii. Ensure that newly constructed ditches are lined with riprap.
    iii.

G. Soil Filter Basin

1. The basin area may be excavated for underdrain installation and can be used as a sediment trap during construction. After excavation of the basin, the outlet structure and piping system may be installed if protected with a sediment barrier.

If any corrective correction actions based on inspections, shall be started by the end of the following work day and completed within seven days or prior to the next rain event. Document the corrective actions and maintain with inspection forms. Inspection forms and corrective action document shall be maintained for three years after permanent stabilization is achieved.

(See Appendix B for Inspection and Maintenance Log)

5.0 Inspection and Maintenance After Construction

After construction is finished inspections must take place once per quarter, or after each rainstorm producing at least 1 inch of rainfall, whichever is more frequent. Such inspection is necessary to ensure the buffers are functioning properly and is necessary as part of the 5-year recertification process for long-term maintenance of stormwater systems. If any buffers are not functioning, take corrective action. All inspections shall be conducted performed by an individual with knowledge of erosion and stormwater control practices and the conditions of the stormwater management permit issued by the Maine Department of Environmental Protection. All buffers shall be inspected and maintained for but not limited to the following:

A. Grassed underdrained soil filter

- Sediment Removal: Sediment and plant debris should be removed from the pretreatment structure at least annually.
- Mowing: If mowing is desired, only hand-held string trimmers or push-mowers are allowed on the filter (no tractor) and the grass bed should be mowed no more than 2 times per growing season to maintain grass heights of no less than 6 inches.
- Fertilization: Fertilization of the underdrained filter area should be avoided unless absolutely necessary to establish vegetation.
- Harvesting and Weeding: Harvesting and pruning of excessive growth should be done occasionally. Weeding to control unwanted or invasive plants may also be necessary.
- Grass cover: Maintaining a healthy cover of grass will minimize clogging with fine sediments. If ponding exceeds 48 hours, the top of the filter bed should be rototilled to reestablish the soil's filtration capacity.
- Soil Filter Replacement: The top several inches of the filter can be replaced with fresh material if water is ponding for more than 72 hours, or the basin can be rototilled, seeded and mulched.

Once the filter is mature, adding new material (a 1-inch to 2-inch cover of mature compost) can compensate for subsidence.

Complete an inspection form for each buffer. Document the corrective actions and maintain with inspection forms. Inspection forms and corrective action document shall be maintained for five years after permanent stabilization is achieved.

(See Appendix B for Inspection and Maintenance Log)

6.0 Housekeeping

A. Spill Prevention & Response

Controls must be used to prevent pollutants from construction and waste materials stored on site to enter stormwater, which includes storage practices to minimize exposure of the materials to stormwater. The site contractor or operator must develop, and implement as necessary, appropriate spill prevention, containment, and response planning measures.

NOTE: Any spill or release of toxic or hazardous substances must be reported to the Maine Department of Environmental Protection. For oil spills, call 1-800-482-0777 which is available 24 hours a day. For spills of toxic or hazardous material, call 1-800-452-4664 which is available 24 hours a day. For more information, visit the Department's website at: http://www.maine.gov/dep/spills/emergspillresp/

Clean-up assistance:

Clean Harbors Environmental: 207-772-2201

B. Groundwater protection

During construction, liquid petroleum products and other hazardous materials with the potential to contaminate groundwater may not be stored or handled in areas of the site draining to an infiltration area. An "infiltration area" is any area of the site that by design or as a result of soils, topography and other relevant factors accumulates runoff that infiltrates into the soil. Dikes, berms, sumps, and other forms of secondary containment that prevent discharge to groundwater may be used to isolate portions of the site for the purposes of storage and handling of these materials. Any project proposing infiltration of stormwater must provide adequate pre-treatment of stormwater prior to discharge of stormwater to the infiltration area, or provide for treatment within the infiltration area, in order to prevent the accumulation of fines, reduction in infiltration rate, and consequent flooding and destabilization. During dry months all access roads should be wet down weekly or as needed.

C. Fugitive Sediment and Dust

Actions must be taken to ensure that activities do not result in noticeable erosion of soils or fugitive dust emissions during or after construction. Oil may not be used for dust control, but other water

additives may be considered as needed. A stabilized construction entrance (SCE) should be included to minimize tracking of mud and sediment. If off-site tracking occurs, public roads should be swept immediately and no less than once a week and prior to significant storm events. Operations during dry months, that experience fugitive dust problems, should wet down unpaved access roads once a week or more frequently as needed with a water additive to suppress fugitive sediment and dust.

D. Debris and Other Materials

Minimize the exposure of construction debris, building and landscaping materials, trash, fertilizers, pesticides, herbicides, detergents, sanitary waste and other materials to precipitation and stormwater runoff. These materials must be prevented from becoming a pollutant source.

E. Excavation Dewatering

Excavation de-watering is the removal of water from trenches, foundations, coffer dams, ponds, and other areas within the construction area that retain water after excavation. In most cases the collected water is heavily silted and hinders correct and safe construction practices. The collected water removed from the ponded area, either through gravity or pumping, must be spread through natural wooded buffers or removed to areas that are specifically designed to collect the maximum amount of sediment possible, like a cofferdam sedimentation basin. Avoid allowing the water to flow over disturbed areas of the site. Equivalent measures may be taken if approved by the Department of Environmental Protection.

F. Authorized Non-stormwater Discharges

Identify and prevent contamination by non-stormwater discharges. Where allowed non-stormwater discharges exist, they must be identified and steps should be taken to ensure the implementation of appropriate pollution prevention measures for the non-stormwater component(s) of the discharge. Authorized non-stormwater discharges are:

1. Discharges from firefighting activity;
2. Fire hydrant flushings;
3. Vehicle wash water if detergents are not used and washing is limited to the exterior of vehicles (engine, undercarriage and transmission washing is prohibited);
4. Dust control runoff in accordance with permit conditions;
5. Routine external building wash down, not including surface paint removal, that does not involve detergents;
6. Pavement wash water (where spills/leaks of toxic or hazardous materials have not occurred, unless all spilled material had been removed) if detergents are not used;
7. Uncontaminated air conditioning or compressor condensate;

8. Uncontaminated groundwater or spring water;
9. Foundation or footer drain-water where flows are not contaminated;
10. Uncontaminated excavation dewatering;
11. Potable water sources including waterline flushings; and
12. Landscape irrigation

G. **Unauthorized Non-stormwater Discharges**

The Department of Environmental Protections' approval does not authorize a discharge that is mixed with a source of non stormwater, other than those discharges in compliance with Department regulations. Specifically, the Department's approval does not authorize discharges of the following:

1. Wastewater from the washout or cleanout of concrete, stucco, paint, form release oils, curing compounds or other construction materials;
2. Fuels, oils or other pollutants used in vehicle and equipment operation and maintenance;
3. Soaps, solvents, or detergents used in vehicle and equipment washing; and
4. Toxic or hazardous substances from a spill or other release.

APPENDIX A

INSPECTION LOGS

EROSION AND SEDIMENT CONTROL MEASURES AND ACTIVITY	INSPECTION FREQUENCY		
	Weekly	Before and After a Storm	After Construction
SEDIMENT BARRIERS			
Sediment barriers are installed prior to soil disturbances	X	X	
Silt fences are keyed in and tight	X	X	
Barriers are repaired and replaced as necessary	X	X	
Barriers are removed when the site is stabilized - Silt fence should be cut at the ground surface			X
TEMPORARY STABILIZATION			
Areas are stabilized if idle for 14 days or more	X	X	
Daily stabilization within 100 ft of a natural resource	X	X	
MULCH			
Seed and mulch within 7 days of final grading. Ground is not visible	X	X	
Erosion control mix is 4-6 inch thick	X	X	
Erosion control blankets or hay mulch are anchored	X	X	
VEGETATION			
Vegetation provides 90% soil cover	X		X
Loam or soil amendment were provided	X		X
New seeded areas are mulched and protected from vehicle, foot traffic and runoff	X	X	X
Areas that will remain unworked for more than 1 year are vegetated with grass	X		
SLOPES AND EMBANKMENTS			
Final graded slopes and embankments are stabilized	X	X	X
Diversions are provided for areas with rill erosion	X	X	X
Areas steeper than 2:1 are riprapped	X		
Stones are angular, durable and various in size	X		
Riprap is underlain with a gravel layer or filter fabric	X		
STORMWATER CHANNELS AND CULVERTS			
Ditches and swales are permanently stabilized–channels that will be riprapped have been over-excavated	X	X	X
Ditches are clear of obstructions, accumulated sediments or debris	X	X	X
Ditch lining/bottoms are free of erosion	X	X	X
Check dams are spaced correctly to slow flow velocity	X		
Underlying filter fabric or gravel is not visible	X	X	X
Culvert aprons and plunge pools are sized for expected flows volume and velocity	X		
Stones are angular, durable and various in size	X		
Culverts are sized to avoid upgradient flooding	X	X	
Culvert protection extends to the maximum flow elevation within the ditch	X	X	X
Culvert is embedded, not hanging	X	X	X

CATCH BASIN SYSTEMS			
Catch basins are built properly	X		
Accumulated sediments and debris are removed from sump, grate and collection area		X	X
Floating debris and floating oils are removed from trap			X
ROADWAYS AND PARKING SURFACES			
The gravel pad at the construction entrance is clear from sediments	X	X	
Roads are crowned		X	X
Cross drainage (culvert) is provided	X		
False ditches (from winter sand) are graded		X	X
BUFFERS			
Buffers are free of erosion or concentrated flows		X	X
The downgradient of spreaders and turnouts is stable		X	X
Level spreaders are on the contour			X
The number of spreaders and ditch turnouts is adequate for flow distribution		X	X
Any sediment accumulation is removed from within spreader or turnouts		X	X
STORMWATER BASINS AND TRAPS			
Embankments are free of settlement, slope erosion, internal piping, and downstream swamping		X	X
All flow control structure or orifices are operational and clear of debris or sediments		X	X
Any pre-treatment structure that collects sediment or hydrocarbons is clean or maintained		X	X
Vegetated filters and infiltration basins have adequate grass growth			X
Any impoundment or forebay is free of sediment		X	X
WINTER CONSTRUCTION (November 1st-April15th)			
Final graded areas are mulched daily at twice the normal rate with hay, and anchor (not on snow)	Daily		
A double row of sediment barrier is provided for all areas within 100 ft of a sensitive resource (use erosion control mix on frozen ground)	Daily		
Newly constructed ditches are riprapped	Daily		
Slopes greater than 8% are covered with an erosion control blanket or a 4-inch layer of erosion control mix	Daily		
HOUSEKEEPING PUNCH LIST			
All disturbed areas are permanently stabilized, and plantings are established (grass seeds have germinated with 90% vegetative cover)			X
All trash, sediments, debris or any solid waste have been removed from stormwater channels, catch basins, detention structures, discharge points, etc.			X
All ESC devices have been removed: (silt fence and posts, diversions and sediment structures, etc.)			X
All deliverables (certifications, survey information, as-built plans, reports, notice of termination (NOT), etc.) in accordance with all permit requirements have been submitted to town, Maine DEP, association, owner, etc.			X

EROSION AND SEDIMENT CONTROL MEASURES AND ACTIVITY	INSPECTION FREQUENCY		
	Weekly	Before and After a Storm	After Construction
SEDIMENT BARRIERS			
Sediment barriers are installed prior to soil disturbances	X	X	
Silt fences are keyed in and tight	X	X	
Barriers are repaired and replaced as necessary	X	X	
Barriers are removed when the site is stabilized - Silt fence should be cut at the ground surface			X
TEMPORARY STABILIZATION			
Areas are stabilized if idle for 14 days or more	X	X	
Daily stabilization within 100 ft of a natural resource	X	X	
MULCH			
Seed and mulch within 7 days of final grading. Ground is not visible	X	X	
Erosion control mix is 4-6 inch thick	X	X	
Erosion control blankets or hay mulch are anchored	X	X	
VEGETATION			
Vegetation provides 90% soil cover	X		X
Loam or soil amendment were provided	X		X
New seeded areas are mulched and protected from vehicle, foot traffic and runoff	X	X	X
Areas that will remain unworked for more than 1 year are vegetated with grass	X		
SLOPES AND EMBANKMENTS			
Final graded slopes and embankments are stabilized	X	X	X
Diversions are provided for areas with rill erosion	X	X	X
Areas steeper than 2:1 are riprapped	X		
Stones are angular, durable and various in size	X		
Riprap is underlain with a gravel layer or filter fabric	X		
STORMWATER CHANNELS AND CULVERTS			
Ditches and swales are permanently stabilized–channels that will be riprapped have been over-excavated	X	X	X
Ditches are clear of obstructions, accumulated sediments or debris	X	X	X
Ditch lining/bottoms are free of erosion	X	X	X
Check dams are spaced correctly to slow flow velocity	X		
Underlying filter fabric or gravel is not visible	X	X	X
Culvert aprons and plunge pools are sized for expected flows volume and velocity	X		
Stones are angular, durable and various in size	X		
Culverts are sized to avoid upgradient flooding	X	X	
Culvert protection extends to the maximum flow elevation within the ditch	X	X	X
Culvert is embedded, not hanging	X	X	X

CATCH BASIN SYSTEMS			
Catch basins are built properly	X		
Accumulated sediments and debris are removed from sump, grate and collection area		X	X
Floating debris and floating oils are removed from trap			X
ROADWAYS AND PARKING SURFACES			
The gravel pad at the construction entrance is clear from sediments	X	X	
Roads are crowned		X	X
Cross drainage (culvert) is provided	X		
False ditches (from winter sand) are graded		X	X
BUFFERS			
Buffers are free of erosion or concentrated flows		X	X
The downgradient of spreaders and turnouts is stable		X	X
Level spreaders are on the contour			X
The number of spreaders and ditch turnouts is adequate for flow distribution		X	X
Any sediment accumulation is removed from within spreader or turnouts		X	X
STORMWATER BASINS AND TRAPS			
Embankments are free of settlement, slope erosion, internal piping, and downstream swamping		X	X
All flow control structure or orifices are operational and clear of debris or sediments		X	X
Any pre-treatment structure that collects sediment or hydrocarbons is clean or maintained		X	X
Vegetated filters and infiltration basins have adequate grass growth			X
Any impoundment or forebay is free of sediment		X	X
WINTER CONSTRUCTION (November 1st-April15th)			
Final graded areas are mulched daily at twice the normal rate with hay, and anchor (not on snow)	Daily		
A double row of sediment barrier is provided for all areas within 100 ft of a sensitive resource (use erosion control mix on frozen ground)	Daily		
Newly constructed ditches are riprapped	Daily		
Slopes greater than 8% are covered with an erosion control blanket or a 4-inch layer of erosion control mix	Daily		
HOUSEKEEPING PUNCH LIST			
All disturbed areas are permanently stabilized, and plantings are established (grass seeds have germinated with 90% vegetative cover)			X
All trash, sediments, debris or any solid waste have been removed from stormwater channels, catch basins, detention structures, discharge points, etc.			X
All ESC devices have been removed: (silt fence and posts, diversions and sediment structures, etc.)			X
All deliverables (certifications, survey information, as-built plans, reports, notice of termination (NOT), etc.) in accordance with all permit requirements have been submitted to town, Maine DEP, association, owner, etc.			X

Appendix C
SFA & SFB Design Calculations

Under drained soil filter sizing calculations

SFA:

Size filter to include existing and proposed impervious and landscaped area within subcatchment.

Description	Area Impervious (sf)	Area Landscaped (sf)	Existing or Proposed
Project Access Drive, STA 0+00 to 6+40 & Ditch (west)	10,240	29,226	Proposed
Residential Paved Driveway to East	4,359		Existing
House & Garage Roof	895		Existing
Crushed Stone Boat Storage		1,197	Existing
Ditch to East		19,005	Proposed
Vegetated Boat Storage		13,837	Existing
Total	15,494	63,264	

Channel Protection Volume (cf)	3,400	
Impoundment Depth (ft)	1.40	
Filter Area Required (sf)	2,429	
Filter Area Designed (sf)	2,434	2,434 sf > 2,429 sf required meets BMP standard
Check Filter Area Sum of 5% Imperv & 2% Landscaped (sf)	2,040	2,434 sf > 2,040 sf required meets BMP standard

SFB:

Description	Area Impervious (sf)	Area Landscaped (sf)	Existing or Proposed
Project Access Drive, STA 6+40 to 9+80 & Ditch	7,417	10,112	Proposed
Equipment Pad	160		Proposed
Total	7,577	10,112	

Channel Protection Volume (cf)	968	
Impoundment Depth (ft)	1.00	
Filter Area Required (sf)	968	
Filter Area Designed (sf)	1,064	1,064 sf > 968 required meets BMP standard
Check Filter Area Sum of 5% Imperv & 2% Landscaped (sf)	581	1,064 sf > 581 required meets BMP standard

Appendix D
NRCS Custom Soils Report & Soil Test Pit Report

WATERSHED RESOURCE CONSULTANTS, LLC
NATURAL RESOURCE AND SOIL SCIENCE CONSULTING

22207
August 30, 2023

Kirk Ball, PE
Acheron Engineering, LLC

David Fowler
Mainely Solar, LLC
143 Highland Shore Road
Casco, ME 04015
via email: *kball@acheronengineering.com, dfowler@nextphaseenergyservices.com*

RE: Project # 22207: Allen Solar Project Roosevelt Trail, Raymond, Maine
Soil Assessments for Stormwater Treatment Areas

Dear Kirk and David,

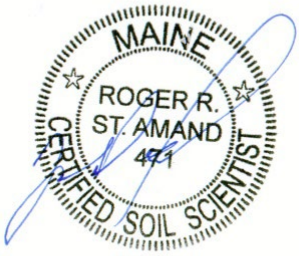
As requested, Watershed Resource Consultants, LLC (WRC) completed soil test pit explorations for a proposed solar development at 1565 Roosevelt Trail (Route 302) in Raymond, Maine (i.e., the "Site"). The purpose of the soil investigation was to assess the soils within areas proposed for stormwater treatment. A Maine Certified Soil Scientist from WRC visited the site in July of 2023 to document and classify soils in the vicinity of the proposed stormwater areas based on preliminary plans provided by your office. Four test pits were excavated with an excavator provided by Cam Hill to approximately 6 to 8 feet below the ground surface (BGS) and located by submeter GPS.

The approximately 30-acre Site shown as Tax Map 4, Lots 68 and 68A on the municipal tax maps is located at 1565 Roosevelt Trail in Raymond, Maine behind Raymond Marine. The property is wooded with a network of logging trails and was selectively harvested in the last year or two. The topography is steeply to moderately sloping with rolling hills. Vegetation onsite consisting of mature second growth hardwood and mixed wood outside of the developed area along Route 302.

The soils observed consist of moderately well drained gravelly and cobbly sandy loam to loamy sand glacial tills. The surface is stony to bouldery. A seasonal high water table observed at 26" to 30" from a perched water table due to a dense layer in the subsoil horizon. These soils would be classified as Skerry Soil Series and would be in Hydrological Soil Group (HSG) C.

Overall, the test pits observed indicated the site is dominated by suitable soils with average depths to a seasonal high-water table of 26-30". Please see the attached test pit logs and site sketch and contact us if you have any questions or require further information.

Sincerely,



Roger St. Amand, Maine Certified Soil Scientist CSS #471

Principal | Watershed Resource Consultants, LLC
rstamand@wrcmaine.com

PAGE 1 OF 1

FORM F (deep) Rev. 7/21

SOIL PROFILE / CLASSIFICATION INFORMATION

DETAILED DESCRIPTION OF SUBSURFACE CONDITIONS AT PROJECT SITES

Project Name:	Applicant Name:	Project Location (municipality):
ALLEN SOLAR	MAINELY SOLAR	RAYMOND

Exploration Symbol # TP23A ☒ Test Pit ☐ Boring ☐ Probe

3 " Organic horizon thickness Ground surface elev. _____

72 " Depth: ☐ of exploration, or ☒ to refusal

Depth below mineral soil surface (inches)

	Texture	Consistence	Color	Redox Features
0–10 A	LOAM	FRIABLE Granular	10yr 3/3	
10–18 Bw	FINE SANDY LOAM		10yr 5/6	NONE
18–26" BW2	LOAM		10yr 5/4	
26"–30 BC	SANDY LOAM	F.I.P	5y 5/3	FEW DISTINCT
30–40 cd	COBBLY COARSE SANDY LOAM	FIRM SUBANG. BLOCKY	5y 5/2	COMMON FAINT & FEW PROMINENT
40–50				
50–60	VERY COBBLY COARSE SANDY LOAM	VERY FIRM	5y 5/2	
60–70				
70–80	//	//	//	//
	REFUSAL - BOULDERS			
80–90	RESTRICTIVE @ 26"			
90–100	SATURATED @ 52"			
100–110	REFUSAL @ 72"			
110–120				
120–130				
130–140				
140–150				

Soil Details by: S.E. ▸▸ S.S. ▸▸

Soil Classification	Slope	Limiting Factor	
Profile / Condition	6 Percent	26" Depth	☒ Groundwater ☒ Restrictive Layer ☐ Bedrock

Soil Series/Phase Name: SKERRY FINE SANDY LOAM ☐ Hydric ☒ Non-hydric

Hydrologic: C (Soil Group)

Exploration Symbol # TP23B ☒ Test Pit ☐ Boring ☐ Probe

3 " Organic horizon thickness Ground surface elev. _____

99 " Depth: ☒ of exploration, or ☐ to refusal

Depth below mineral soil surface (inches)

	Texture	Consistence	Color	Redox Features
0–10 A/E	FINE SANDY LOAM	FRIABLE GRAN.	10yr 2/2	
10–20 Bs1			7.5yr 5/4	NONE
Bs2	SANDY LOAM		10yr 4/6	
20–30 BC			2.5y 5/3	FEW FAINT
30–40 cd	GRAVELLY COARSE SANDY LOAM	FIRM	5y 5/2	COMMON DISTINCT
40–50				COMMON PROMINENT
50–60	COARSE LOAMY SAND			&
60–70	COARSE SANDY LOAM			COMMON FAINT
70–80				
80–90				
90–100				
100–110	NO SAT WATER TABLE OBS			
110–120	RESTRICTIVE @ 26".			
120–130	SAT @	26–32"		
130–140				
140–150				

Soil Details by: S.E. ▸▸ S.S. ▸▸

Soil Classification	Slope	Limiting Factor	
Profile / Condition	8 Percent	26" Depth	☒ Groundwater ☒ Restrictive Layer ☐ Bedrock

Soil Series/Phase Name: SKERRY SANDY LOAM ☐ Hydric ☒ Non-hydric

Hydrologic: C (Soil Group)

INVESTIGATOR INFORMATION AND SIGNATURE

Signature

Roger St.Amand
Name Printed

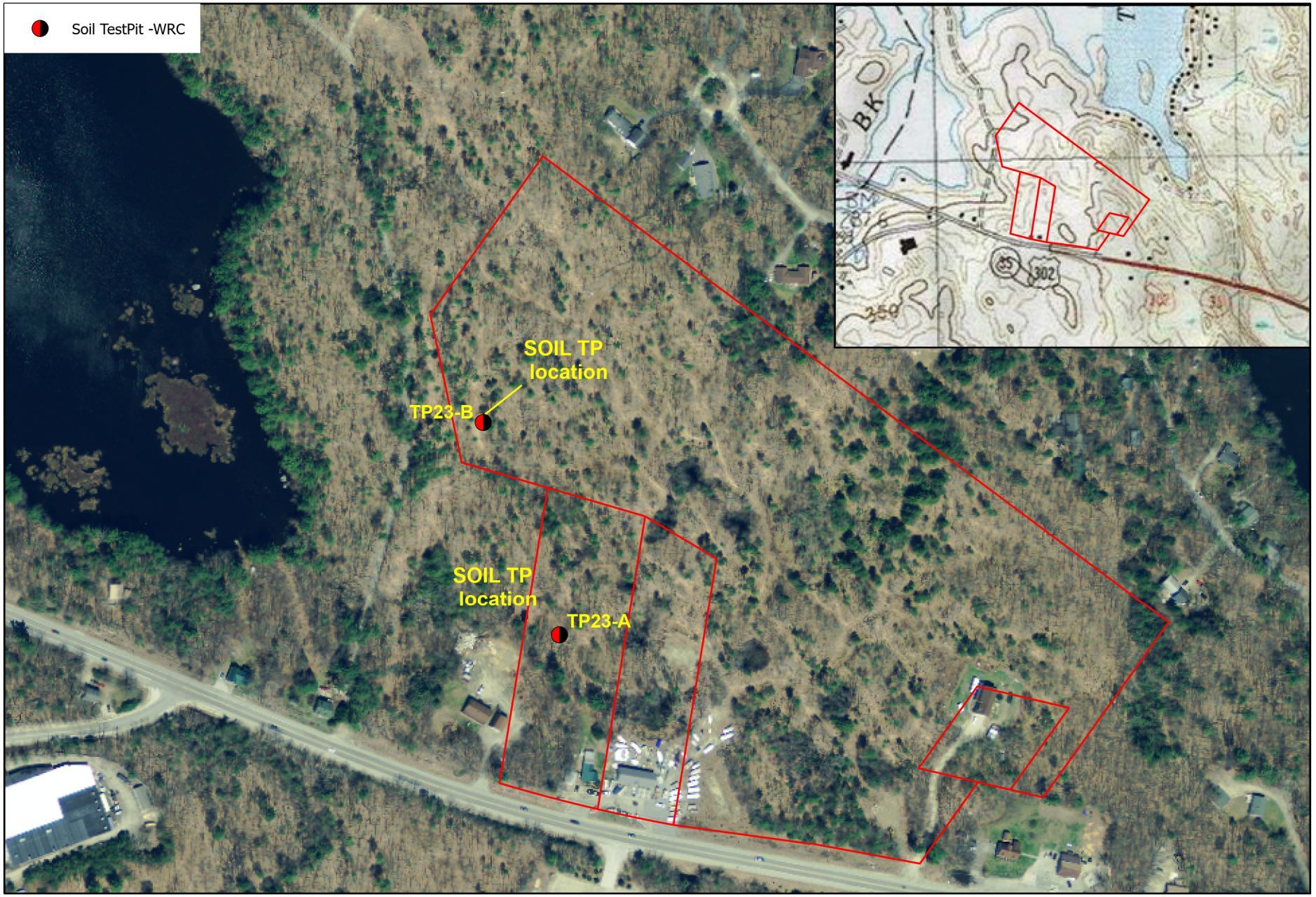
☐ Site Evaluator
☒ Soil Scientist
☐ Geologist
☐ Professional Engineer

7-31-2023
Date

SS# 471
License No.

MAINE ROGER R. ST. AMAND 471 CERTIFIED SOIL SCIENTIST

aff. 21



ALLEN SOLAR
SOIL TEST PIT MAP
RTE 302, RAYMOND, ME

WRC #2207

SITE PHOTOGRAPHS: ALLEN SOLAR, RAYMOND, ME
TAKEN 7-31-2023

Photo 1: TP23-A Existing site conditions.

Photo 2: : TP23-A Soil Test Pit.

SITE PHOTOGRAPHS: ALLEN SOLAR, RAYMOND, ME
TAKEN 7-31-2023

Photo 3: TP23-B typical site conditions.

Photo 4: Looking into test pit TP-23-B soil profile.

LOCATION SKERRY NH+MA ME NY VT

Established Series
Rev. JFH-SALP-SHG-GWS
06/2016

SKERRY SERIES

The Skerry series consists of very deep, moderately well drained soils that formed in a loamy mantle overlying dense, sandy till on drumlins and glaciated uplands. They are moderately deep to a densic contact. Saturated hydraulic conductivity is moderately high or high in the mineral solum and moderately low or moderately high in the dense substratum. Slope ranges from 0 to 25 percent. Mean annual precipitation is about 1175 mm, and mean annual temperature is about 5 degrees C.

TAXONOMIC CLASS: Coarse-loamy, isotic, frigid Aquic Haplorthods

TYPICAL PEDON: Skerry fine sandy loam, on an 11 percent slope in a stony, forested area. The soil is covered by a 3 cm layer of fresh leaf and pine needle litter. (Colors are for moist soil.)

Oa -- 0 to 5 cm; sapric material consisting of partially and well decomposed leaf and pine needle litter. (0 to 15 cm thick.)

E -- 5 to 10 cm; gray (10YR 6/1) fine sandy loam; weak fine granular structure; friable; common fine and medium roots; 10 percent gravel, cobbles, and stones; strongly acid; abrupt broken boundary. (0 to 8 cm thick.)

Bhs -- 10 to 15 cm; dark reddish brown (5YR 3/3) fine sandy loam; weak fine granular structure; friable; common fine and medium roots; 10 percent gravel, cobbles, and stones; strongly acid; abrupt broken boundary. (0 to 10 cm thick.)

Bs1 -- 15 to 51 cm; reddish brown (5YR 4/4) and dark reddish brown (5YR 3/4) gravelly fine sandy loam; moderate medium granular structure; 60 percent friable, 40 percent weakly cemented (ortstein); few fine roots; 10 percent gravel, 5 percent cobbles and stones; strongly acid; clear wavy boundary.

Bs2 -- 51 to 64 cm; yellowish brown (10YR 5/4) gravelly fine sandy loam; massive; 80 percent friable, 20 percent weakly cemented (ortstein); common fine prominent strong brown (7.5YR 5/6) masses of iron accumulation and common fine distinct grayish brown (10YR 5/2) and common fine faint brown (10YR 5/3) areas of iron depletion; 15 percent gravel, 5 percent cobbles and stones; strongly acid; clear smooth boundary. (Combined thickness of the Bs horizons is 15 to 76 cm.)

Cd1 -- 64 to 86 cm; brown (10YR 5/3) gravelly fine sandy loam layers with lenses of light olive brown (2.5Y 5/4) sand; composite texture is gravelly loamy sand; massive and firm (fine sandy loam), and single grain and loose (sand); common fine prominent strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) masses of iron accumulation; 20 percent gravel, 5 percent cobbles and stones; sand lenses up to 5 cm thick are in a horizontal orientation alternatively with fine sandy loam layers; strongly acid; gradual smooth boundary.

Cd2 -- 86 to 165 cm; light olive brown (2.5Y 5/4) sand lenses with layers of grayish brown (2.5Y 5/2) gravelly fine sandy loam; composite texture is gravelly loamy sand; massive and firm (fine sandy loam), and single grain and loose (sand); 20 percent gravel, 5 percent cobbles and stones; sand lenses up to 5 cm thick are in a horizontal orientation alternatively with fine sandy loam layers; strongly acid.

TYPE LOCATION: Carroll County, New Hampshire; Town of Conway, 0.50 mile north of Greely Road on Potter Road, and 85 feet east of Potter Road. USGS Ossipee Lake, NH 15 minute quadrangle; Latitude 43 degrees, 56 minutes, 28 seconds N. and Longitude 71 degrees, 3 minutes, 5 seconds W., NAD 1983.

RANGE IN CHARACTERISTICS: Mineral solum thickness and depth to densic materials ranges from 51 to 96 cm. Rock fragments range from 5 to 30 percent in the solum and from 5 to 40 percent in the substratum. Unless limed, reaction ranges from extremely acid to slightly acid in the solum and very strongly acid to neutral in the substratum. Weak cementation (ortstein) ranges from 0 to 50 percent in the spodic horizon.

The O horizon is neutral or has hue of 2.5YR to 10YR, value of 2 to 4, and chroma of 0 to 4.

Some pedons have an A horizon up to 10 cm thick that has hue of 10YR to 5YR, value of 2 to 3, and chroma of 1 or 2, or an Ap horizon that has hue of 10YR, value of 3 or 4, and chroma of 2 to 4. Texture is fine sandy loam, sandy loam, or loam or their gravelly analogues.

The E horizon has hue of 5YR to 10YR, value of 4 to 7, and chroma of 1 or 2. Texture is fine sandy loam, sandy loam, or loamy sand, or their gravelly analogues.

The Bhs horizon has hue of 2.5YR to 7.5YR, value of 2 to 4, and chroma of 1 to 4. Texture is dominantly fine sandy loam, but includes sandy loam or their gravelly analogues. Combined thickness of the Bhs horizon is 0 to 15 cm.

The Bs horizon has hue of 2.5YR to 10YR, value of 2 to 6, and chroma of 3 to 8. Texture is fine sandy loam or sandy loam, or their gravelly analogues.

The BC horizon, where present, has hue of 10YR to 5Y, value of 3 to 6, and chroma of 2 to 6. Texture is fine sandy loam, sandy loam, coarse sandy loam, loamy fine sand, loamy sand, or their gravelly or cobbly analogues.

Some pedons have an E' horizon below the B horizon 2 inches thick or less. It has hue of 10YR to 5Y, value of 4 to 6, and chroma of 2 or 3. Texture range is the same as the lower part of the B, but typically it is coarser textured than the overlying horizon.

The Cd layer has hue of 10YR to 5Y, value of 4 to 7, and chroma of 2 to 6. It is loamy sand or loamy fine sand, or it comprised of loamy layers and sandy lenses with a composite texture of loamy sand, loamy fine sand, loamy coarse sand, fine sandy loam, sandy loam, coarse sandy loam, or their gravelly or cobbly analogues. The lenses range from loamy fine sand to coarse sand and are 3 to 51 mm thick. They constitute more than 20 percent of the layer. The Cd layer has weak or moderate, thin to thick plates or it is massive. Consistence is firm or very firm except in individual lenses where it is friable to loose.

Some pedons have a friable C horizon above the Cd 20 cm thick or less.

COMPETING SERIES: These are the Chesuncook, Crary, Dixfield, Dixmont, Howland, Peru, Ragmuff, Sunapee, and Worden series. Chesuncook soils have more clay in the particle-size control section. Crary and Dixmont soils have more silt and very fine sand in the solum. Dixfield, Howland, and Peru soils have less than 20 percent sand lenses in the C horizon. Ragmuff soils have bedrock within 102 cm. Sunapee soils have friable substrata. Worden soils have Bh that is more than 10 cm thick.

GEOGRAPHIC SETTING: The nearly level to moderately steep Skerry soils are on drumlins and glaciated uplands. Slope ranges from 0 to 25 percent. The soils formed in stony till of Wisconsin age derived from granitic, schistose, and gneissic rocks. Mean annual temperature ranges from -3 to 9 degrees C, and mean annual precipitation ranges from 790 to 2420 mm. The frost-free growing season ranges from 90 to 160 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Adirondack, Becket, Hermon, Marlow, Monadnock, Moosilauke, Peru, Pillsbury, Sabattis, Success, Tunbridge, and Waumbek soils. The well drained

Becket, somewhat poorly drained Adirondack, and very poorly drained Sabattis soils are in a drainage sequence with Skerry soils. The well drained Marlow soils, the moderately well drained Peru soils, and the somewhat poorly drained and poorly drained Pillsbury soils have densic materials with less than 20 percent sand lenses. The somewhat excessively drained Hermon and Success soils, well drained Monadnock soils, moderately well drained Waumbek soils, and somewhat poorly drained and poorly drained Moosilauke soils have friable substrata. The well drained Tunbridge soils are on bedrock controlled landforms and have bedrock within 102 cm of the mineral surface.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Moderately well drained. Estimated saturated hydraulic conductivity is moderately high or high in the mineral solum and moderately low or moderately high in the dense substratum.

USE AND VEGETATION: Most of these soils are forested. Principle species include sugar maple, yellow birch, paper birch, eastern white pine, eastern hemlock, balsam fir, white spruce, and red spruce. Areas cleared of trees and stones are used primarily for hay and pasture.

DISTRIBUTION AND EXTENT: Maine, Massachusetts, New Hampshire, New York, and Vermont. MLRAs 142, 143, and 144B. The series is of large extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Amherst, Massachusetts

SERIES ESTABLISHED: Franklin County, New York, 1950s.

REMARKS: Diagnostic horizons and features recognized in this pedon are:
a. Albic horizon - the zone from 5 to 10 cm (E horizon).
b. Spodic horizon - the zone from 10 to 51 cm (Bhs and Bs1 horizons).
c. Aquic feature - redoximorphic features in the zone from 51 to 64 cm (Bs2 horizon).
d. Densic contact at 64 cm.
e. Densic materials - The zone from 64 to 165 cm. (Cd1 and Cd2 horizons).

National Cooperative Soil Survey
U.S.A.

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Cumberland County and Part of Oxford County, Maine

June 1, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:3,780 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

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 Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

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 1:24,000.

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: Cumberland County and Part of Oxford County, Maine
Survey Area Data: Version 19, Aug 30, 2022

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

Date(s) aerial images were photographed: Jun 19, 2020—Sep 20, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
HhB	Hermon sandy loam, 0 to 8 percent slopes, very stony	8.8	19.9%
HhC	Hermon sandy loam, 8 to 15 percent slopes, very stony	34.7	79.0%
WsB	Woodbridge very stony fine sandy loam, 0 to 8 percent slopes	0.5	1.1%
Totals for Area of Interest		**44.0**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Cumberland County and Part of Oxford County, Maine

HhB—Hermon sandy loam, 0 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2w9rc
Elevation: 0 to 980 feet
Mean annual precipitation: 31 to 65 inches
Mean annual air temperature: 36 to 52 degrees F
Frost-free period: 90 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Hermon, very stony, and similar soils: 90 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hermon, Very Stony

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Mountainbase, interfluve, base slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy and gravelly supraglacial meltout till derived from granite and gneiss

Typical profile

Oa - 0 to 2 inches: highly decomposed plant material
E - 2 to 3 inches: sandy loam
Bhs - 3 to 9 inches: sandy loam
Bs1 - 9 to 16 inches: very gravelly sandy loam
Bs2 - 16 to 32 inches: extremely gravelly loamy sand
C - 32 to 65 inches: very gravelly coarse sand

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (1.42 to 14.03 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: F144BY601ME - Dry Sand
Hydric soil rating: No

HhC—Hermon sandy loam, 8 to 15 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2w9rd
Elevation: 0 to 1,080 feet
Mean annual precipitation: 31 to 65 inches
Mean annual air temperature: 36 to 52 degrees F
Frost-free period: 90 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Hermon, very stony, and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hermon, Very Stony

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Mountainflank, mountainbase, interfluve, nose slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy and gravelly supraglacial meltout till derived from granite and gneiss

Typical profile

Oa - 0 to 2 inches: highly decomposed plant material
E - 2 to 3 inches: sandy loam
Bhs - 3 to 9 inches: sandy loam
Bs1 - 9 to 16 inches: very gravelly sandy loam
Bs2 - 16 to 32 inches: extremely gravelly loamy sand
C - 32 to 65 inches: very gravelly coarse sand

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 1.1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (1.42 to 14.03 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A

Ecological site: F144BY601ME - Dry Sand
Hydric soil rating: No

WsB—Woodbridge very stony fine sandy loam, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: blkh
Elevation: 20 to 920 feet
Mean annual precipitation: 49 to 49 inches
Mean annual air temperature: 45 degrees F
Frost-free period: 145 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Woodbridge and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Woodbridge

Setting

Landform: Till plains
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-loamy lodgment till derived from mica schist

Typical profile

Oa - 0 to 2 inches: highly decomposed plant material
H1 - 2 to 5 inches: fine sandy loam
H2 - 5 to 22 inches: fine sandy loam
H3 - 22 to 65 inches: fine sandy loam

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 16 to 36 inches to densic material
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Ecological site: F144BY501ME - Loamy Slope (Northern Hardwoods)
Hydric soil rating: No

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Appendix E
FEMA Map

ntact your insurance agent, or call the National Flood Insurance
ogram at (800) 638-6620, or (800) 424-8872.

APPROXIMATE SCALE

800 0 800 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

TOWN OF
RAYMOND,
MAINE
CUMBERLAND COUNTY

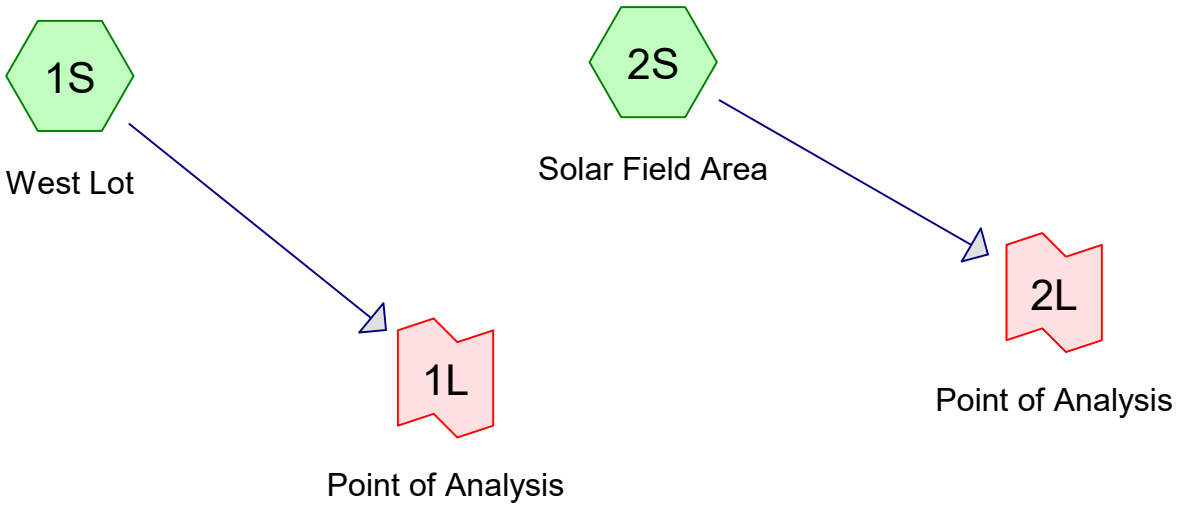
PANEL 15 OF 20
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
230205 0015 B

EFFECTIVE DATE:
MAY 5, 1981

federal emergency management agency
federal insurance administration

Appendix F
HydroCAD Model Reports



Subcat Reach Pond Link

Routing Diagram for 2023-07-11 Allen Solar Existing Conditions_BG
Prepared by {enter your company name here}, Printed 8/12/2023

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.039	49	50-75% Grass cover, Fair, HSG A Lawn Abutter to East (1S)
0.338	68	<50% Grass cover, Poor, HSG A Temp Boat Storage (1S)
0.632	35	Brush, Fair, HSG A (1S)
0.027	96	Gravel surface, HSG A Gravel Boat Storage (1S)
0.129	96	Gravel surface, HSG A Gravel Driveway Abutter West (1S)
0.100	98	Paved parking, HSG A Driveway to Abutter to East (1S)
0.023	98	Roofs, HSG A (1S)
0.021	98	Roofs, HSG A Garage & House (1S)
1.374	98	Wetlands/Vernal Pools HSG A (1S)
15.010	36	Woods, Fair, HSG A (1S, 2S)
17.693	**42**	**TOTAL AREA**

Time span=1.00-30.00 hrs, dt=0.05 hrs, 581 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: West Lot Runoff Area=428,997 sf 15.41% Impervious Runoff Depth=0.07"
Flow Length=1,454' Tc=15.2 min CN=48 Runoff=0.10 cfs 0.061 af

Subcatchment 2S: Solar Field Area Runoff Area=341,707 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=724' Tc=18.2 min CN=36 Runoff=0.00 cfs 0.000 af

Link 1L: Point of Analysis Inflow=0.10 cfs 0.061 af
Primary=0.10 cfs 0.061 af

Link 2L: Point of Analysis Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 17.693 ac Runoff Volume = 0.061 af Average Runoff Depth = 0.04"
91.42% Pervious = 16.176 ac 8.58% Impervious = 1.517 ac

Summary for Subcatchment 1S: West Lot

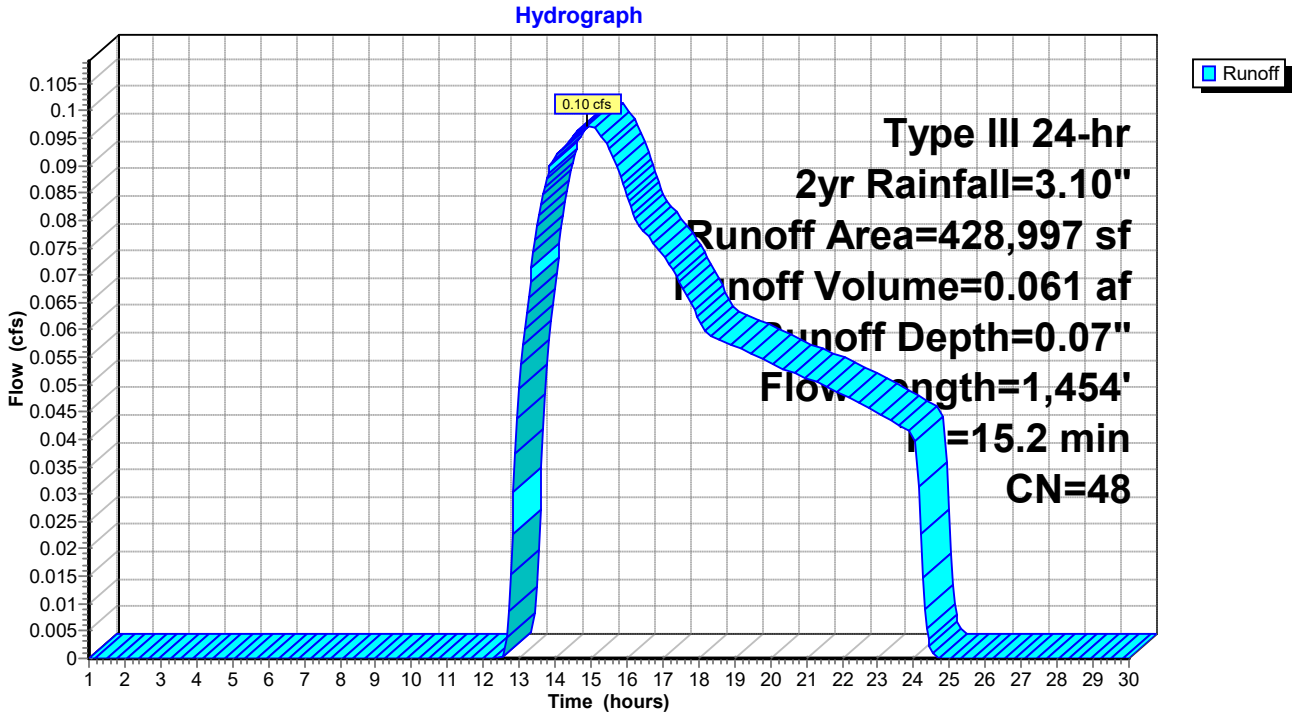
Runoff = 0.10 cfs @ 14.89 hrs, Volume= 0.061 af, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2yr Rainfall=3.10"

	Area (sf)	CN	Description
*	4,359	98	Paved parking, HSG A Driveway to Abutter to East
*	59,855	98	Wetlands/Vernal Pools HSG A
*	895	98	Roofs, HSG A Garage & House
*	14,738	68	<50% Grass cover, Poor, HSG A Temp Boat Storage
*	1,700	49	50-75% Grass cover, Fair, HSG A Lawn Abutter to East
*	5,618	96	Gravel surface, HSG A Gravel Driveway Abutter West
*	1,197	96	Gravel surface, HSG A Gravel Boat Storage
	982	98	Roofs, HSG A
	27,542	35	Brush, Fair, HSG A
	312,111	36	Woods, Fair, HSG A
	428,997	48	Weighted Average
	362,906		84.59% Pervious Area
	66,091		15.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	19	0.0392	1.25		**Sheet Flow, Driveway** Smooth surfaces n= 0.011 P2= 3.00"
0.3	42	0.0833	2.02		**Shallow Concentrated Flow, Lawn** Short Grass Pasture Kv= 7.0 fps
0.6	72	0.1676	2.05		**Shallow Concentrated Flow, Wooded Area** Woodland Kv= 5.0 fps
1.1	62	0.0325	0.90		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
0.1	19	0.3106	2.79		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
4.8	488	0.0125	1.68		**Shallow Concentrated Flow, Wetland** Grassed Waterway Kv= 15.0 fps
0.7	55	0.0723	1.34		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
5.2	445	0.0090	1.42		**Shallow Concentrated Flow, Wetland** Grassed Waterway Kv= 15.0 fps
0.8	72	0.0897	1.50		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
1.0	106	0.0142	1.79		**Shallow Concentrated Flow, Wetland** Grassed Waterway Kv= 15.0 fps
0.3	74	0.1078	4.92		**Shallow Concentrated Flow, Wetland** Grassed Waterway Kv= 15.0 fps
15.2	1,454	Total			

Subcatchment 1S: West Lot



Summary for Subcatchment 2S: Solar Field Area

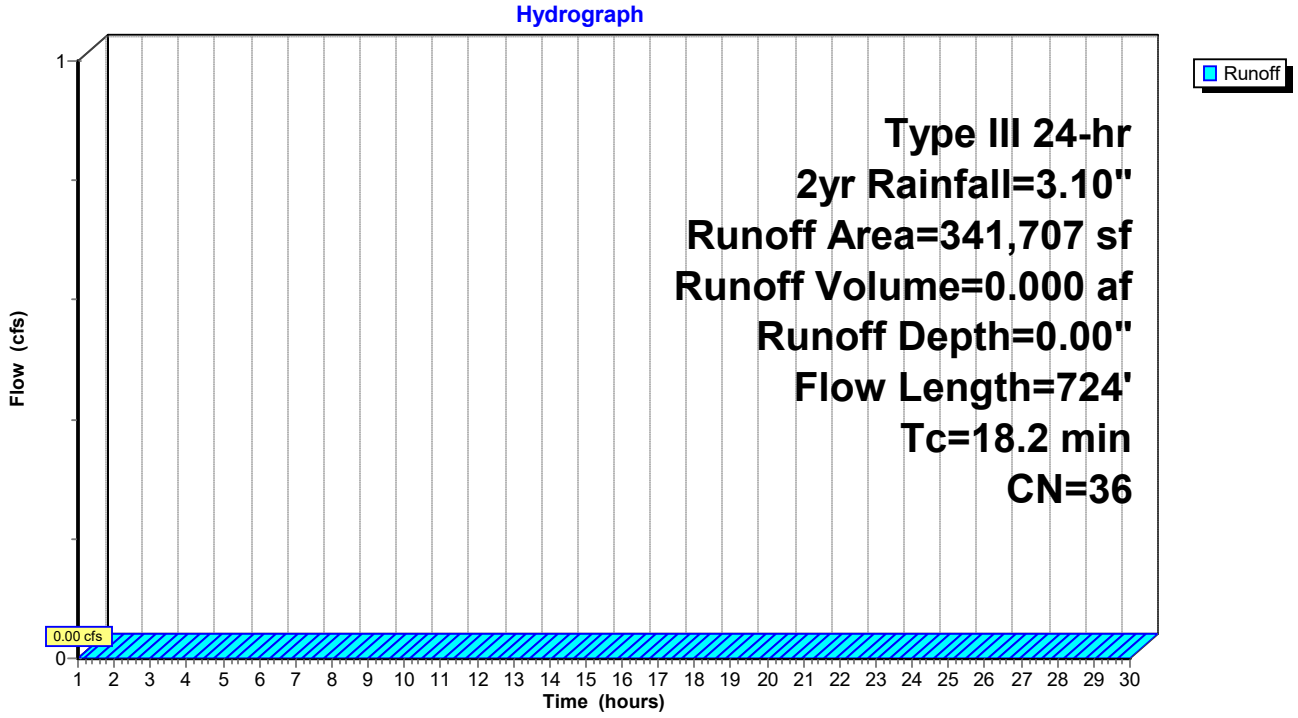
Runoff = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2yr Rainfall=3.10"

Area (sf)	CN	Description
341,707	36	Woods, Fair, HSG A
341,707		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	39	0.0638	0.10		**Sheet Flow, Wooded** Woods: Light underbrush n= 0.400 P2= 3.00"
2.0	89	0.0211	0.73		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
9.6	596	0.0428	1.03		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
18.2	724	Total			

Subcatchment 2S: Solar Field Area

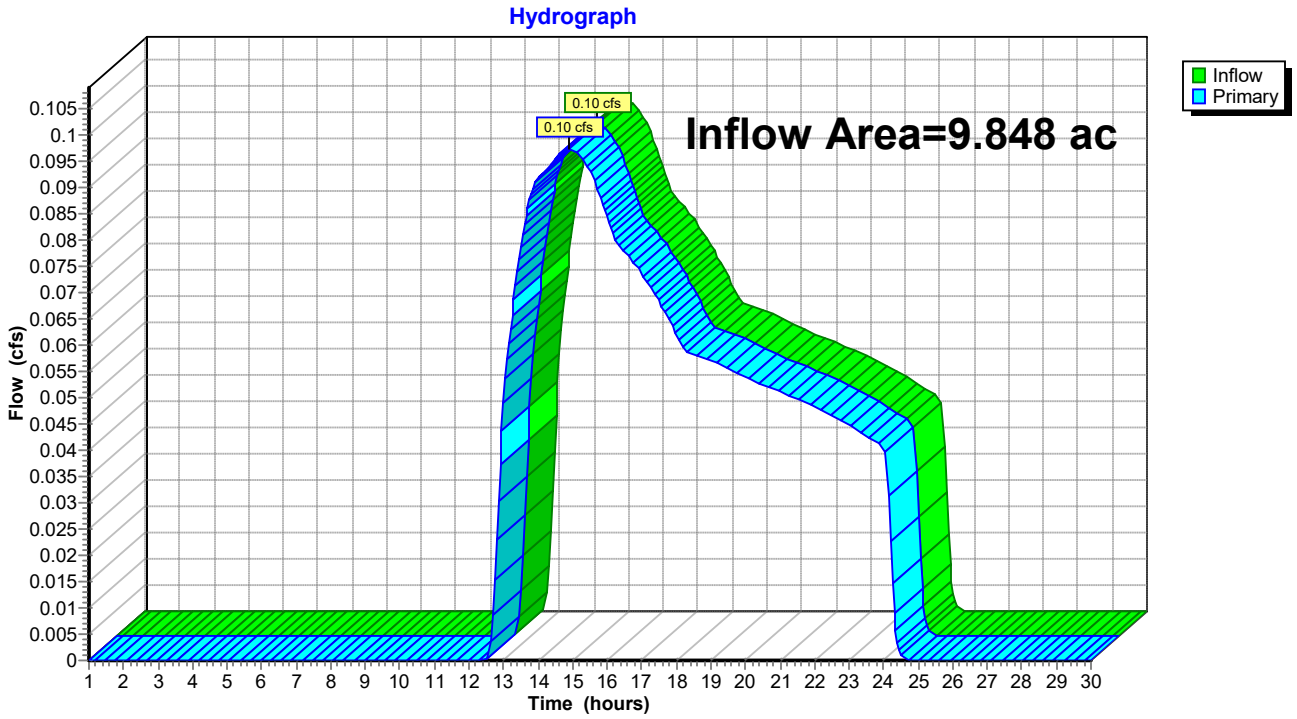


Summary for Link 1L: Point of Analysis

Inflow Area = 9.848 ac, 15.41% Impervious, Inflow Depth = 0.07" for 2yr event
Inflow = 0.10 cfs @ 14.89 hrs, Volume= 0.061 af
Primary = 0.10 cfs @ 14.89 hrs, Volume= 0.061 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-30.00 hrs, dt= 0.05 hrs

Link 1L: Point of Analysis

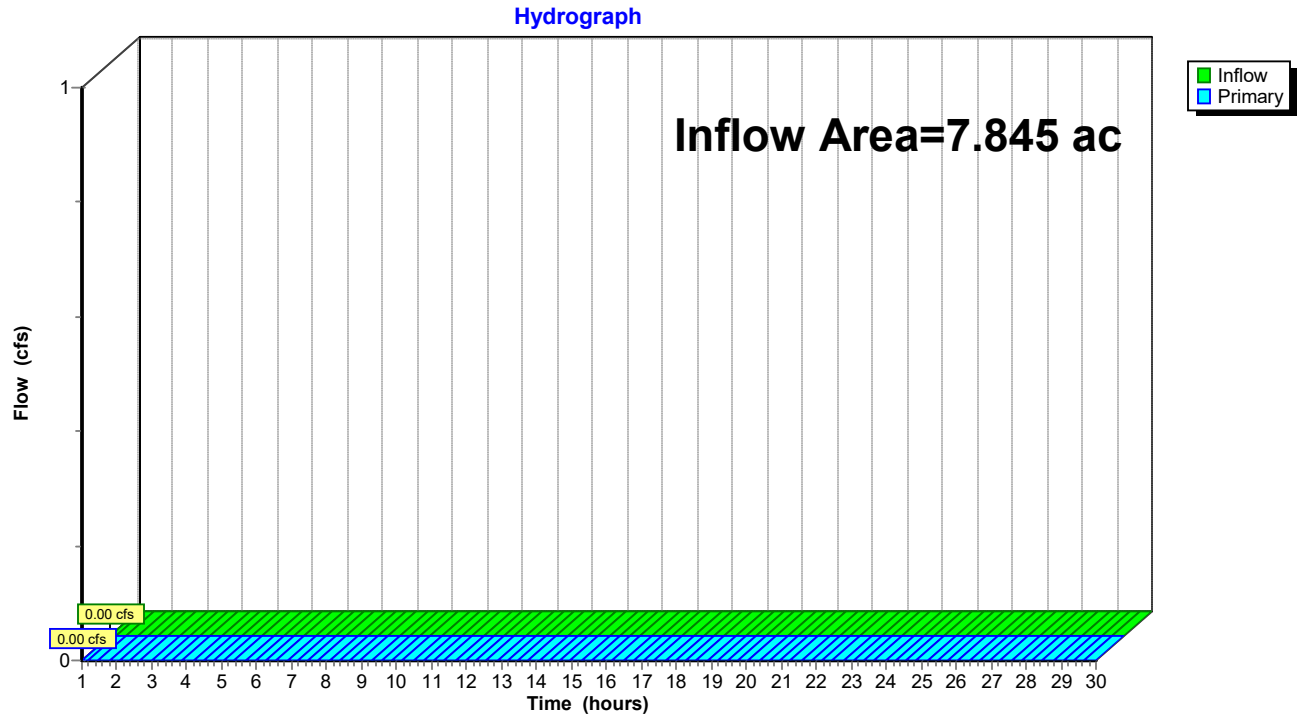


Summary for Link 2L: Point of Analysis

Inflow Area = 7.845 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2yr event
Inflow = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-30.00 hrs, dt= 0.05 hrs

Link 2L: Point of Analysis



Time span=1.00-30.00 hrs, dt=0.05 hrs, 581 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: West Lot Runoff Area=428,997 sf 15.41% Impervious Runoff Depth=0.45"
Flow Length=1,454' Tc=15.2 min CN=48 Runoff=1.91 cfs 0.366 af

Subcatchment 2S: Solar Field Area Runoff Area=341,707 sf 0.00% Impervious Runoff Depth=0.06"
Flow Length=724' Tc=18.2 min CN=36 Runoff=0.06 cfs 0.038 af

Link 1L: Point of Analysis Inflow=1.91 cfs 0.366 af
Primary=1.91 cfs 0.366 af

Link 2L: Point of Analysis Inflow=0.06 cfs 0.038 af
Primary=0.06 cfs 0.038 af

Total Runoff Area = 17.693 ac Runoff Volume = 0.404 af Average Runoff Depth = 0.27"
91.42% Pervious = 16.176 ac 8.58% Impervious = 1.517 ac

Summary for Subcatchment 1S: West Lot

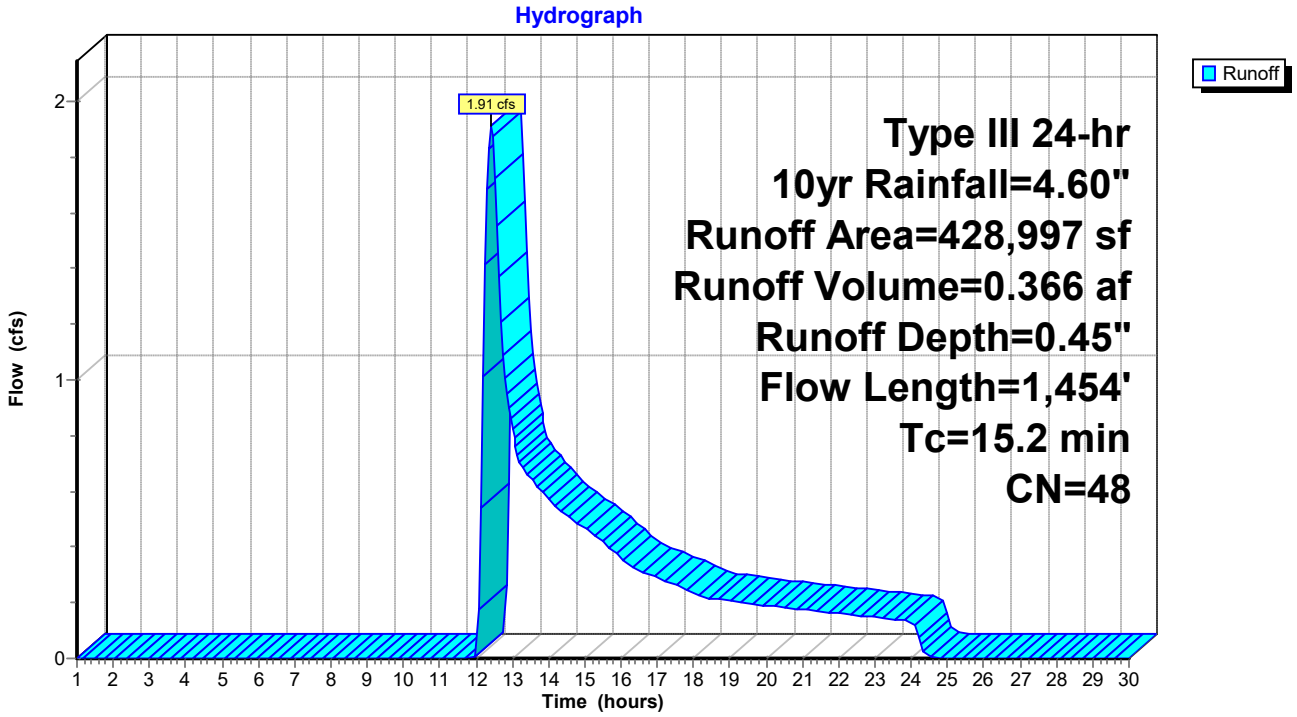
Runoff = 1.91 cfs @ 12.43 hrs, Volume= 0.366 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10yr Rainfall=4.60"

	Area (sf)	CN	Description
*	4,359	98	Paved parking, HSG A Driveway to Abutter to East
*	59,855	98	Wetlands/Vernal Pools HSG A
*	895	98	Roofs, HSG A Garage & House
*	14,738	68	<50% Grass cover, Poor, HSG A Temp Boat Storage
*	1,700	49	50-75% Grass cover, Fair, HSG A Lawn Abutter to East
*	5,618	96	Gravel surface, HSG A Gravel Driveway Abutter West
*	1,197	96	Gravel surface, HSG A Gravel Boat Storage
	982	98	Roofs, HSG A
	27,542	35	Brush, Fair, HSG A
	312,111	36	Woods, Fair, HSG A
	428,997	48	Weighted Average
	362,906		84.59% Pervious Area
	66,091		15.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	19	0.0392	1.25		**Sheet Flow, Driveway** Smooth surfaces n= 0.011 P2= 3.00"
0.3	42	0.0833	2.02		**Shallow Concentrated Flow, Lawn** Short Grass Pasture Kv= 7.0 fps
0.6	72	0.1676	2.05		**Shallow Concentrated Flow, Wooded Area** Woodland Kv= 5.0 fps
1.1	62	0.0325	0.90		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
0.1	19	0.3106	2.79		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
4.8	488	0.0125	1.68		**Shallow Concentrated Flow, Wetland** Grassed Waterway Kv= 15.0 fps
0.7	55	0.0723	1.34		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
5.2	445	0.0090	1.42		**Shallow Concentrated Flow, Wetland** Grassed Waterway Kv= 15.0 fps
0.8	72	0.0897	1.50		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
1.0	106	0.0142	1.79		**Shallow Concentrated Flow, Wetland** Grassed Waterway Kv= 15.0 fps
0.3	74	0.1078	4.92		**Shallow Concentrated Flow, Wetland** Grassed Waterway Kv= 15.0 fps
15.2	1,454	Total			

Subcatchment 1S: West Lot



Summary for Subcatchment 2S: Solar Field Area

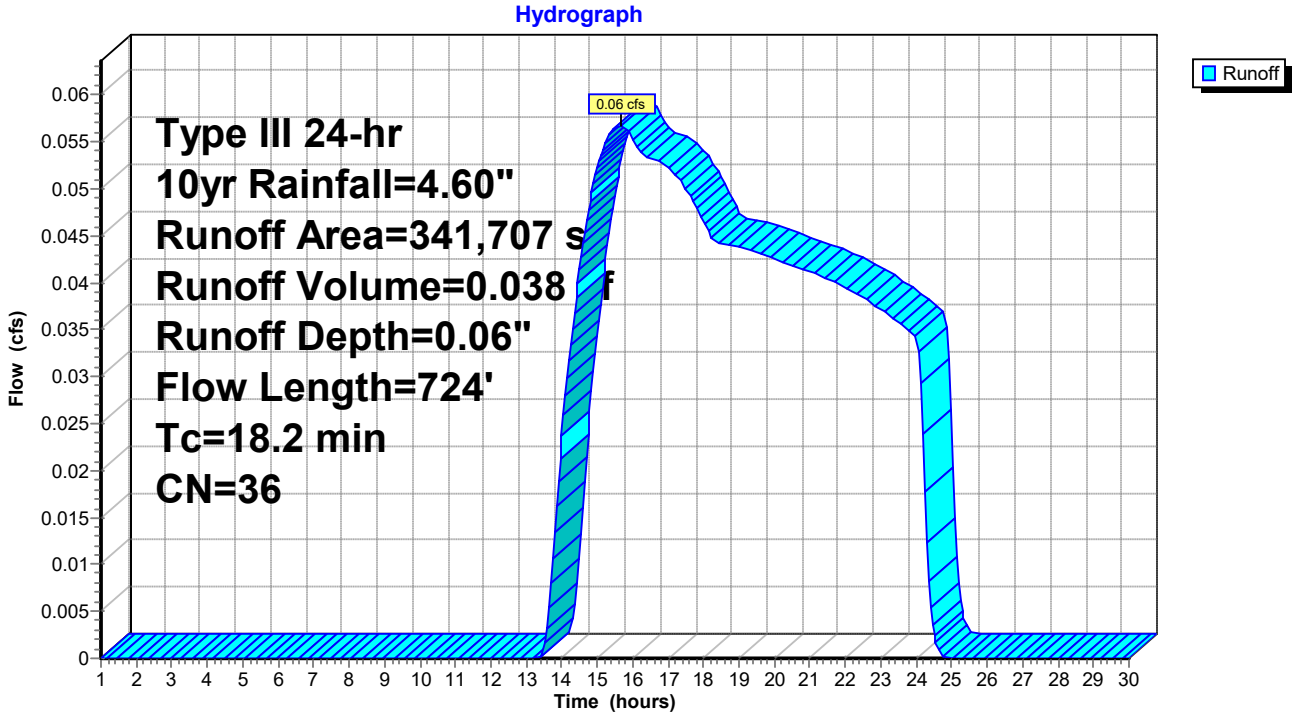
Runoff = 0.06 cfs @ 15.64 hrs, Volume= 0.038 af, Depth= 0.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10yr Rainfall=4.60"

Area (sf)	CN	Description
341,707	36	Woods, Fair, HSG A
341,707		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	39	0.0638	0.10		**Sheet Flow, Wooded** Woods: Light underbrush n= 0.400 P2= 3.00"
2.0	89	0.0211	0.73		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
9.6	596	0.0428	1.03		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
18.2	724	Total			

Subcatchment 2S: Solar Field Area

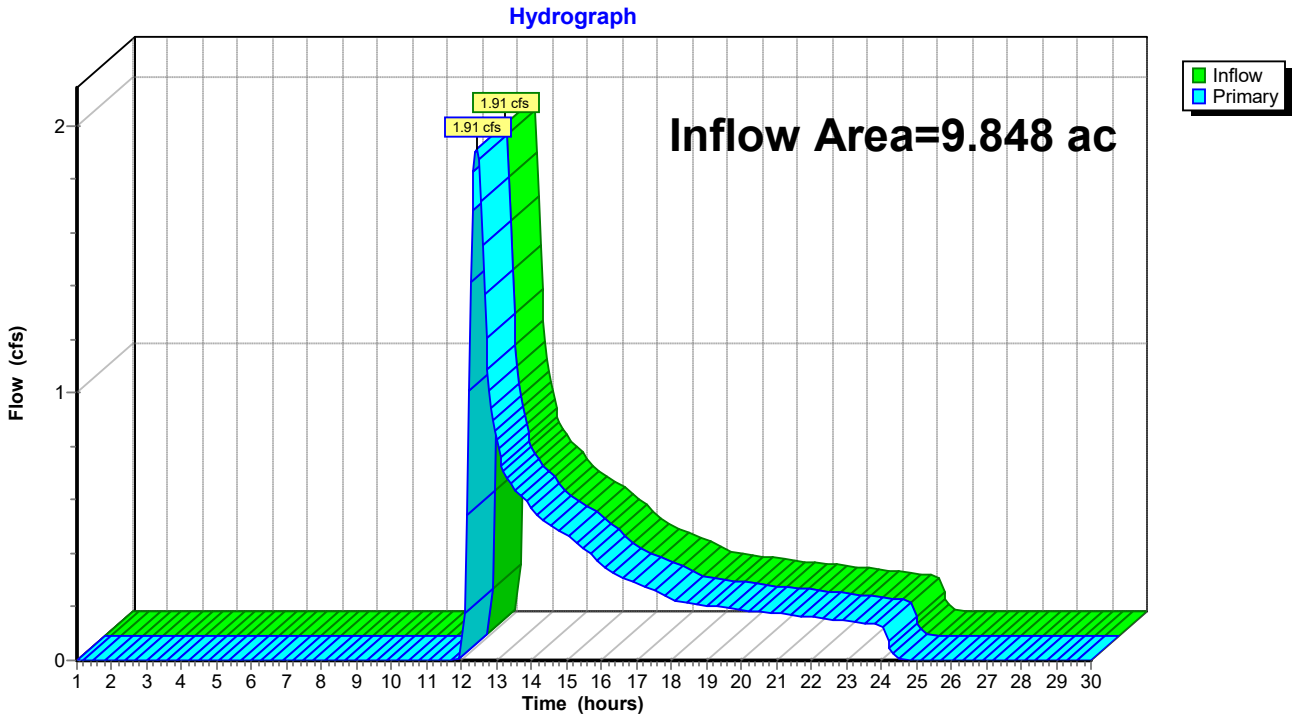


Summary for Link 1L: Point of Analysis

Inflow Area = 9.848 ac, 15.41% Impervious, Inflow Depth = 0.45" for 10yr event
Inflow = 1.91 cfs @ 12.43 hrs, Volume= 0.366 af
Primary = 1.91 cfs @ 12.43 hrs, Volume= 0.366 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-30.00 hrs, dt= 0.05 hrs

Link 1L: Point of Analysis

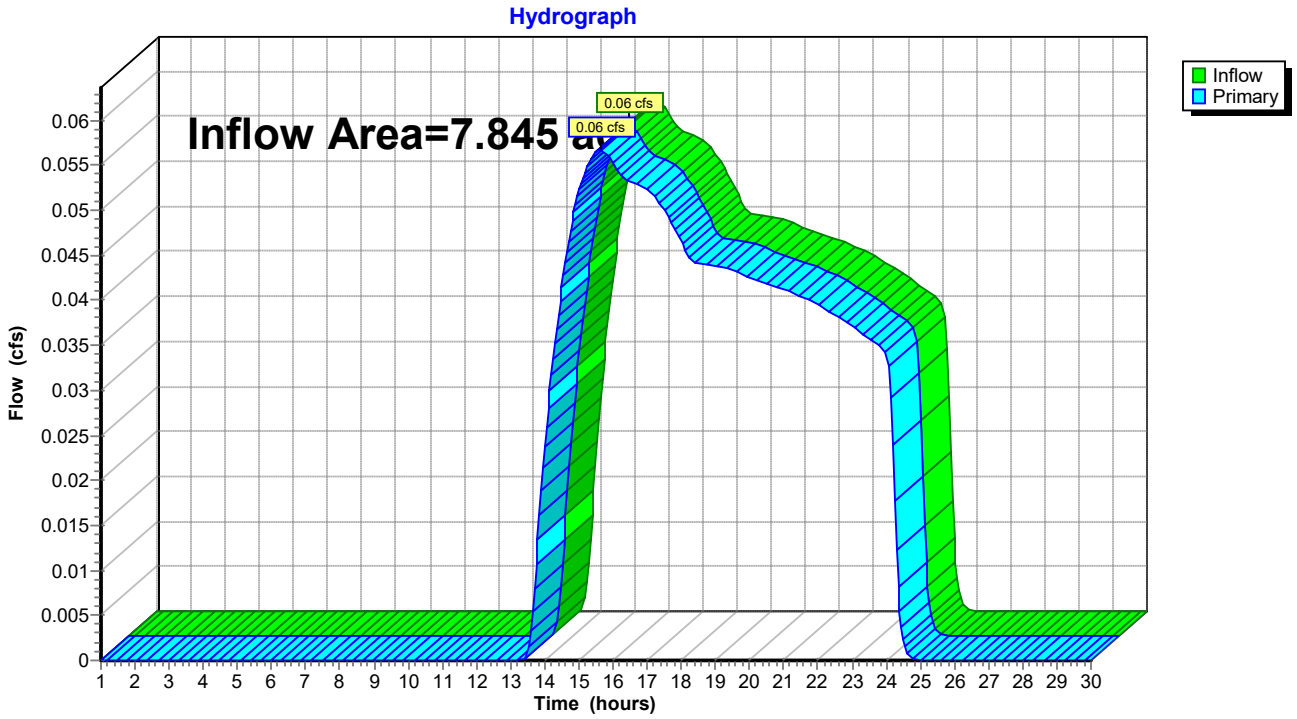


Summary for Link 2L: Point of Analysis

Inflow Area = 7.845 ac, 0.00% Impervious, Inflow Depth = 0.06" for 10yr event
Inflow = 0.06 cfs @ 15.64 hrs, Volume= 0.038 af
Primary = 0.06 cfs @ 15.64 hrs, Volume= 0.038 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-30.00 hrs, dt= 0.05 hrs

Link 2L: Point of Analysis



Time span=1.00-30.00 hrs, dt=0.05 hrs, 581 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: West Lot Runoff Area=428,997 sf 15.41% Impervious Runoff Depth=0.91"
Flow Length=1,454' Tc=15.2 min CN=48 Runoff=5.46 cfs 0.749 af

Subcatchment 2S: Solar Field Area Runoff Area=341,707 sf 0.00% Impervious Runoff Depth=0.25"
Flow Length=724' Tc=18.2 min CN=36 Runoff=0.34 cfs 0.164 af

Link 1L: Point of Analysis Inflow=5.46 cfs 0.749 af
Primary=5.46 cfs 0.749 af

Link 2L: Point of Analysis Inflow=0.34 cfs 0.164 af
Primary=0.34 cfs 0.164 af

Total Runoff Area = 17.693 ac Runoff Volume = 0.913 af Average Runoff Depth = 0.62"
91.42% Pervious = 16.176 ac 8.58% Impervious = 1.517 ac

Summary for Subcatchment 1S: West Lot

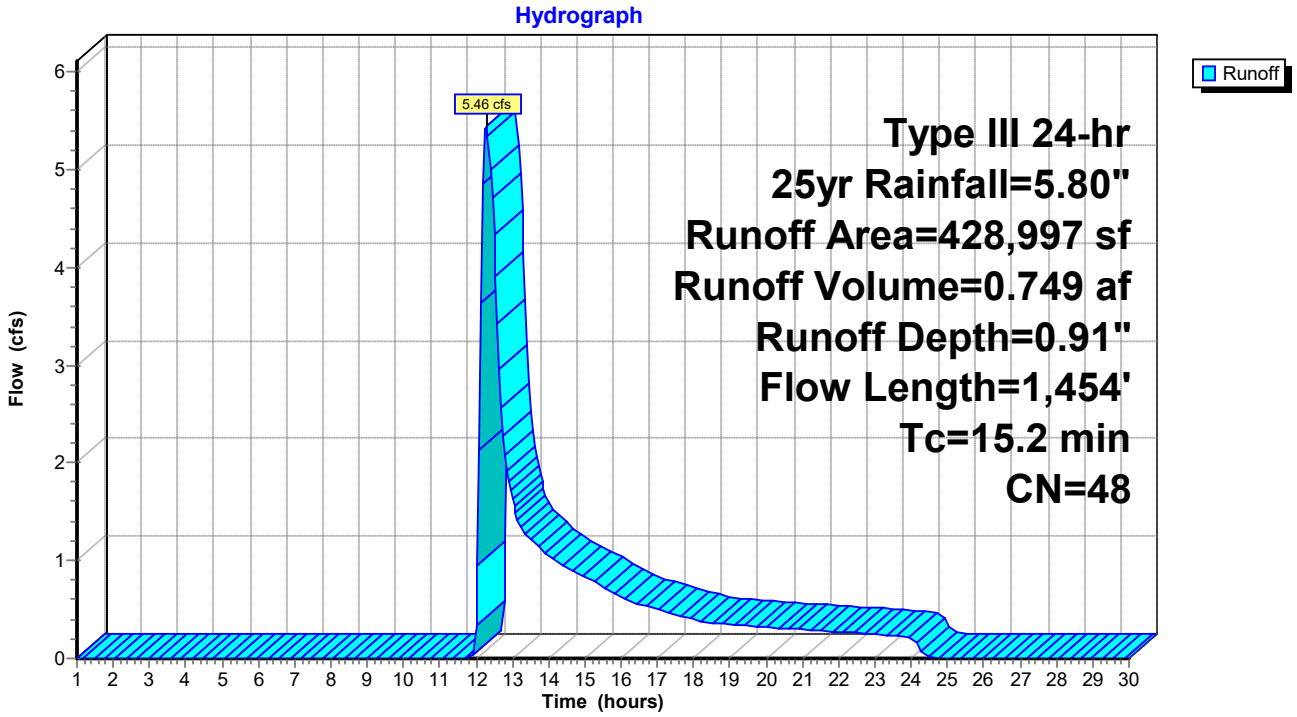
Runoff = 5.46 cfs @ 12.28 hrs, Volume= 0.749 af, Depth= 0.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=5.80"

	Area (sf)	CN	Description
*	4,359	98	Paved parking, HSG A Driveway to Abutter to East
*	59,855	98	Wetlands/Vernal Pools HSG A
*	895	98	Roofs, HSG A Garage & House
*	14,738	68	<50% Grass cover, Poor, HSG A Temp Boat Storage
*	1,700	49	50-75% Grass cover, Fair, HSG A Lawn Abutter to East
*	5,618	96	Gravel surface, HSG A Gravel Driveway Abutter West
*	1,197	96	Gravel surface, HSG A Gravel Boat Storage
	982	98	Roofs, HSG A
	27,542	35	Brush, Fair, HSG A
	312,111	36	Woods, Fair, HSG A
	428,997	48	Weighted Average
	362,906		84.59% Pervious Area
	66,091		15.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	19	0.0392	1.25		**Sheet Flow, Driveway** Smooth surfaces n= 0.011 P2= 3.00"
0.3	42	0.0833	2.02		**Shallow Concentrated Flow, Lawn** Short Grass Pasture Kv= 7.0 fps
0.6	72	0.1676	2.05		**Shallow Concentrated Flow, Wooded Area** Woodland Kv= 5.0 fps
1.1	62	0.0325	0.90		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
0.1	19	0.3106	2.79		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
4.8	488	0.0125	1.68		**Shallow Concentrated Flow, Wetland** Grassed Waterway Kv= 15.0 fps
0.7	55	0.0723	1.34		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
5.2	445	0.0090	1.42		**Shallow Concentrated Flow, Wetland** Grassed Waterway Kv= 15.0 fps
0.8	72	0.0897	1.50		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
1.0	106	0.0142	1.79		**Shallow Concentrated Flow, Wetland** Grassed Waterway Kv= 15.0 fps
0.3	74	0.1078	4.92		**Shallow Concentrated Flow, Wetland** Grassed Waterway Kv= 15.0 fps
15.2	1,454	Total			

Subcatchment 1S: West Lot



Summary for Subcatchment 2S: Solar Field Area

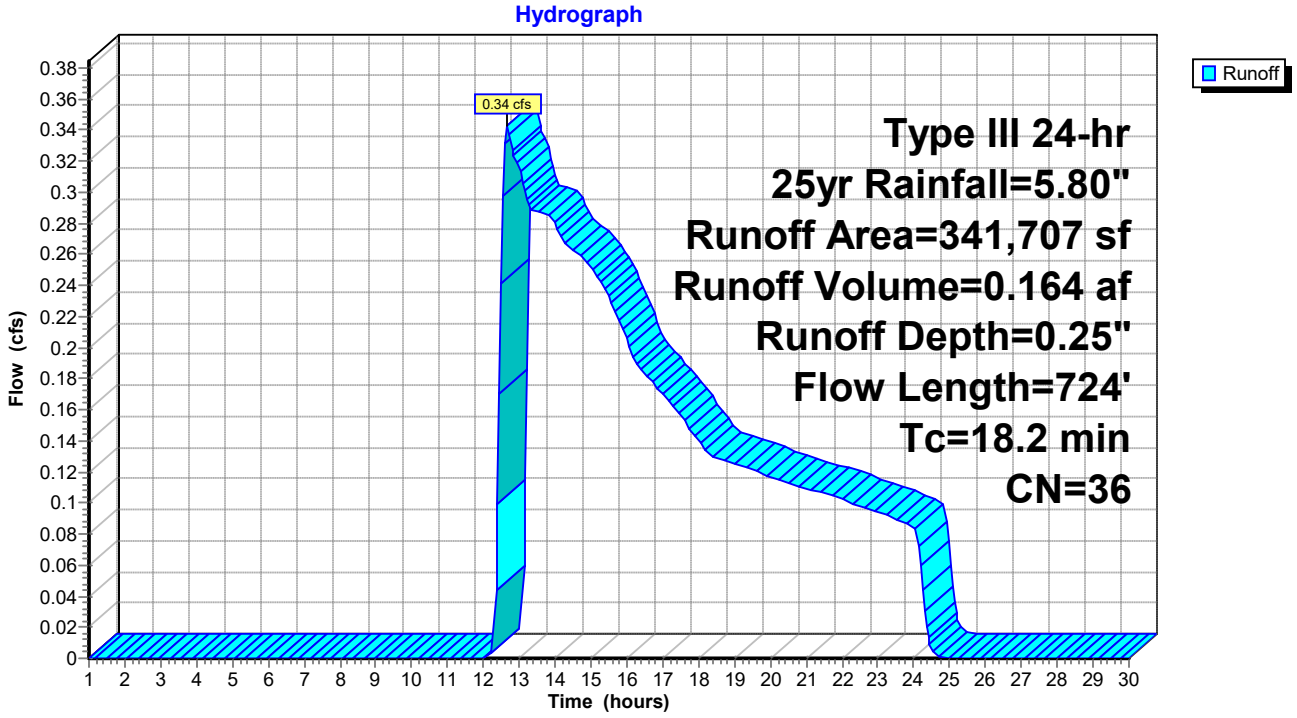
Runoff = 0.34 cfs @ 12.67 hrs, Volume= 0.164 af, Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=5.80"

Area (sf)	CN	Description
341,707	36	Woods, Fair, HSG A
341,707		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	39	0.0638	0.10		**Sheet Flow, Wooded** Woods: Light underbrush n= 0.400 P2= 3.00"
2.0	89	0.0211	0.73		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
9.6	596	0.0428	1.03		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
18.2	724	Total			

Subcatchment 2S: Solar Field Area

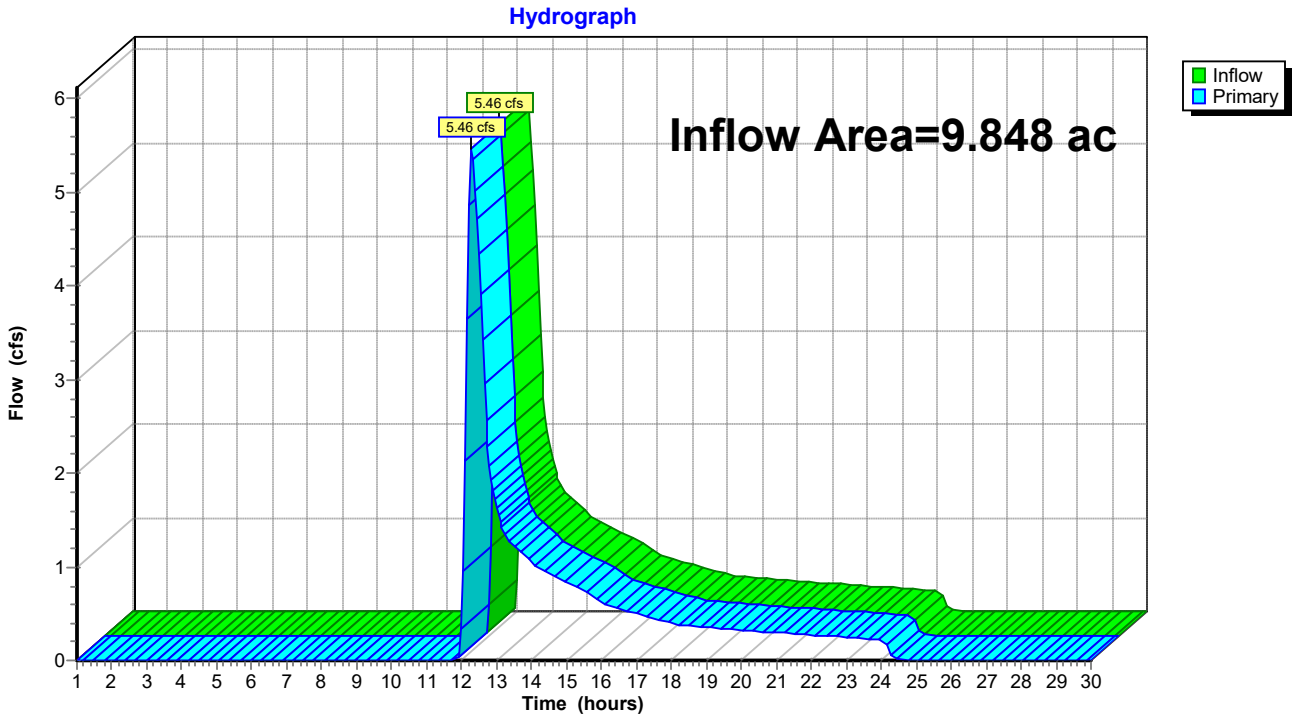


Summary for Link 1L: Point of Analysis

Inflow Area = 9.848 ac, 15.41% Impervious, Inflow Depth = 0.91" for 25yr event
Inflow = 5.46 cfs @ 12.28 hrs, Volume= 0.749 af
Primary = 5.46 cfs @ 12.28 hrs, Volume= 0.749 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-30.00 hrs, dt= 0.05 hrs

Link 1L: Point of Analysis

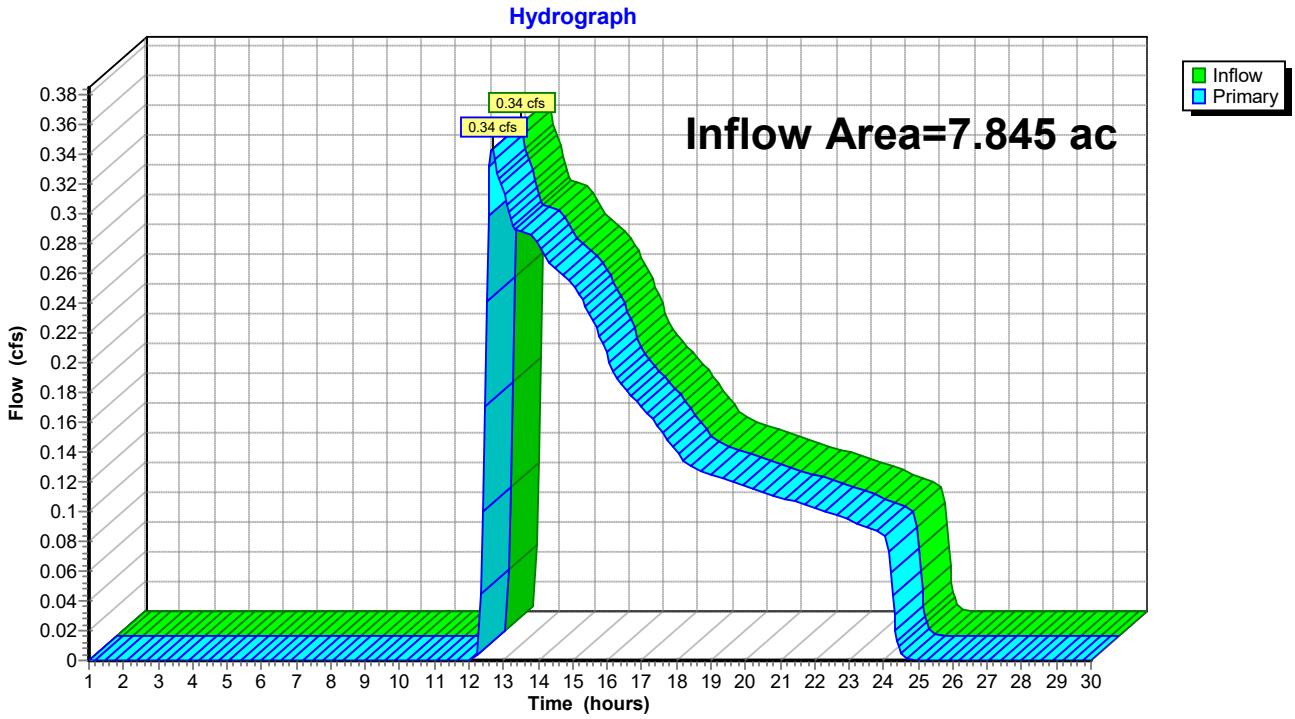


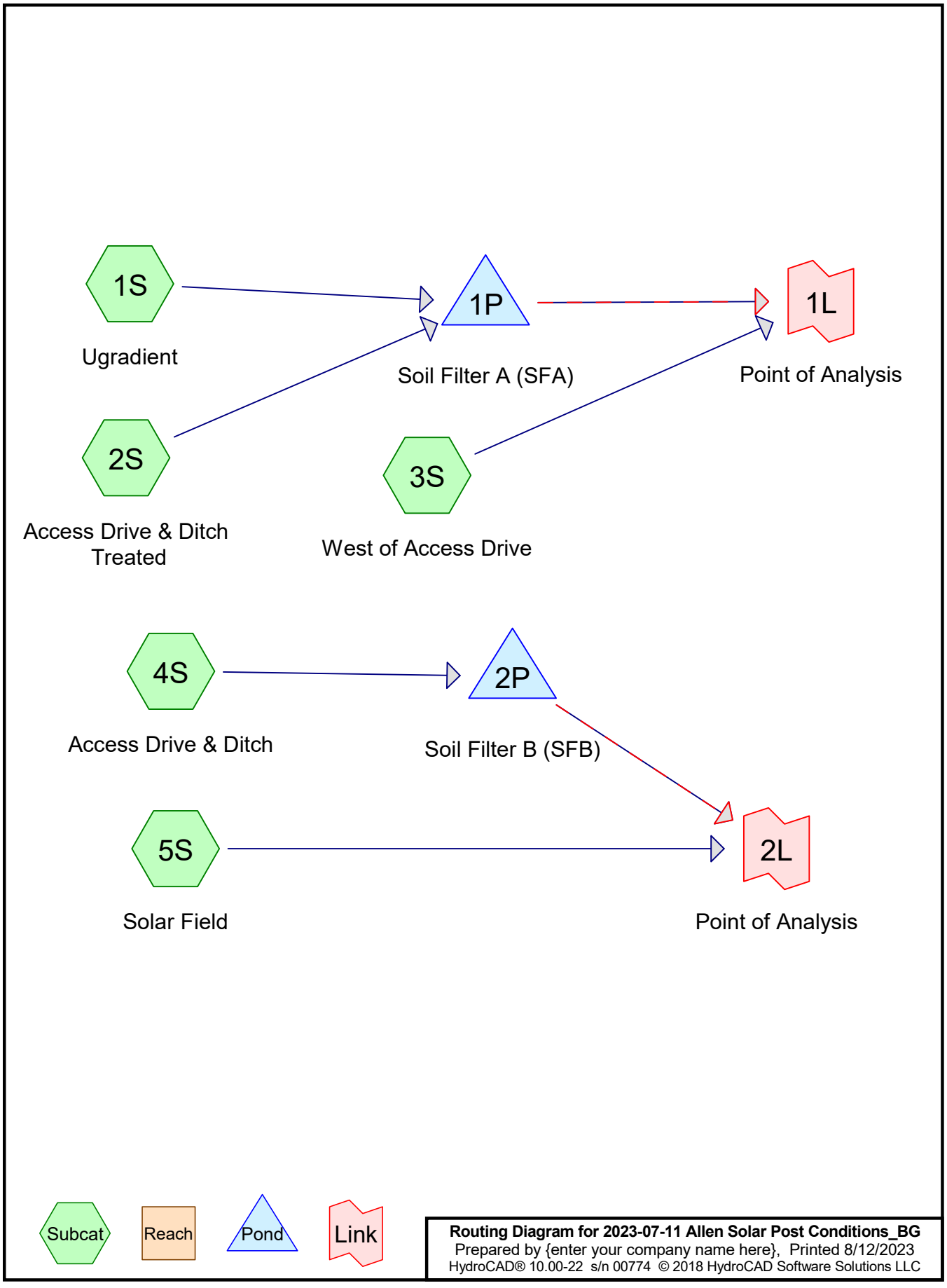
Summary for Link 2L: Point of Analysis

Inflow Area = 7.845 ac, 0.00% Impervious, Inflow Depth = 0.25" for 25yr event
Inflow = 0.34 cfs @ 12.67 hrs, Volume= 0.164 af
Primary = 0.34 cfs @ 12.67 hrs, Volume= 0.164 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-30.00 hrs, dt= 0.05 hrs

Link 2L: Point of Analysis





Routing Diagram for 2023-07-11 Allen Solar Post Conditions_BG
Prepared by {enter your company name here}, Printed 8/12/2023

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.039	49	50-75% Grass cover, Fair, HSG A Lawn Abutter to East (1S)
0.318	68	<50% Grass cover, Poor, HSG A Temp Boat Storage (1S)
0.351	39	>75% Grass cover, Good, HSG A (2S, 3S)
0.232	39	>75% Grass cover, Good, HSG A Ditch (4S)
0.436	39	>75% Grass cover, Good, HSG B Ditch (1S)
0.632	35	Brush, Fair, HSG A (1S)
0.027	96	Gravel HSG A Boat Storage (1S)
0.235	96	Gravel surface, HSG A (2S)
0.170	96	Gravel surface, HSG A, Access Driveway & Equipment Pad (4S)
0.129	96	Gravel surface, HSG A, Gravel Drive off sute West (3S)
0.067	98	HSG A, Wetland (3S)
6.225	30	Meadow, non-grazed, HSG A (3S, 4S, 5S)
0.100	98	Paved parking, HSG A Driveway to Abutter to East (1S)
0.021	98	Roofs, HSG A Garage & House (1S)
0.023	98	Roofs, HSG A, abutter to the West (3S)
0.004	98	Unconnected pavement, HSG A (4S)
1.299	98	Wetlands/Vernal Pools HSG A (1S)
6.114	36	Woods, Fair, HSG A (1S, 3S)
0.990	36	Woods, Fair, HSG A, Northern Abutter (5S)
0.335	36	Woods, Fair, HSG A, West Abutter (4S)
17.749	**42**	**TOTAL AREA**

Summary for Subcatchment 1S: Ugradient

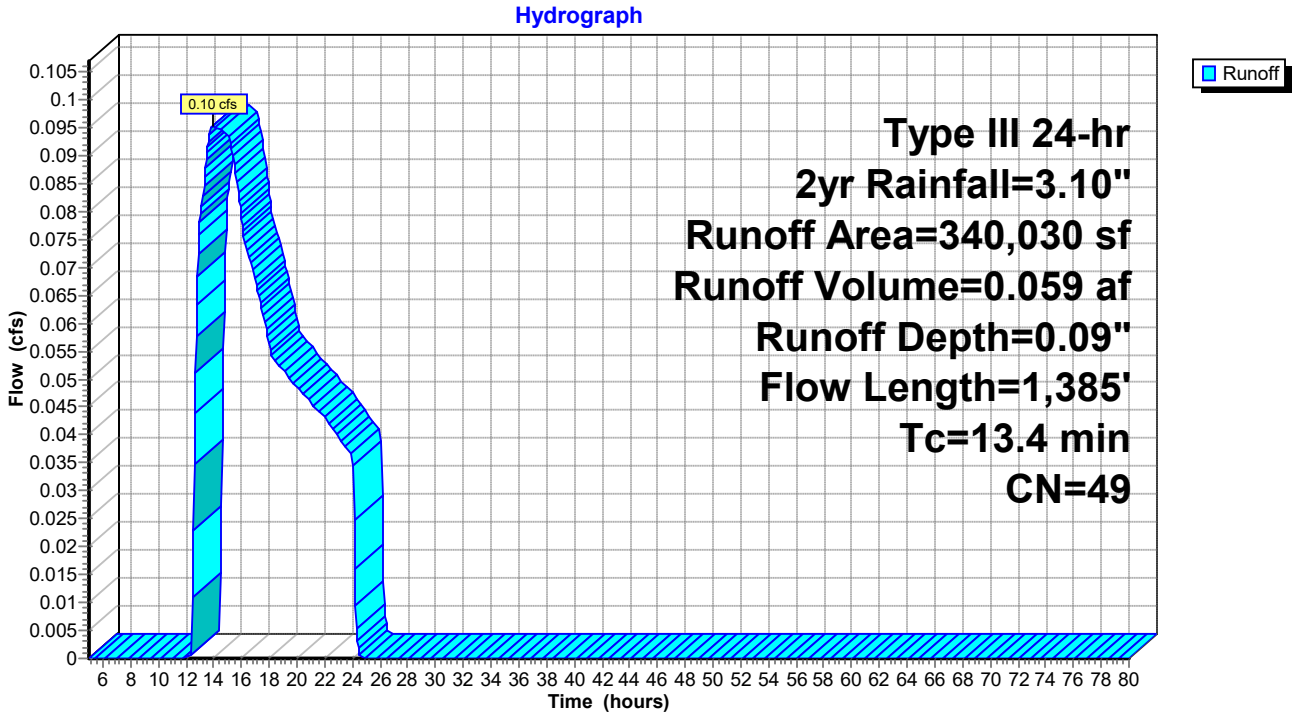
Runoff = 0.10 cfs @ 13.91 hrs, Volume= 0.059 af, Depth= 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2yr Rainfall=3.10"

	Area (sf)	CN	Description
*	4,359	98	Paved parking, HSG A Driveway to Abutter to East
*	56,595	98	Wetlands/Vernal Pools HSG A
*	895	98	Roofs, HSG A Garage & House
*	1,197	96	Gravel HSG A Boat Storage
*	13,837	68	<50% Grass cover, Poor, HSG A Temp Boat Storage
*	1,700	49	50-75% Grass cover, Fair, HSG A Lawn Abutter to East
*	19,005	39	>75% Grass cover, Good, HSG B Ditch
	27,542	35	Brush, Fair, HSG A
	214,900	36	Woods, Fair, HSG A
	340,030	49	Weighted Average
	278,181		81.81% Pervious Area
	61,849		18.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	19	0.0392	1.25		**Sheet Flow, Driveway** Smooth surfaces n= 0.011 P2= 3.00"
0.3	42	0.0833	2.02		**Shallow Concentrated Flow, Lawn** Short Grass Pasture Kv= 7.0 fps
0.6	72	0.1676	2.05		**Shallow Concentrated Flow, Wooded Area** Woodland Kv= 5.0 fps
1.1	62	0.0325	0.90		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
0.1	19	0.3106	2.79		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
4.8	488	0.0125	1.68		**Shallow Concentrated Flow, Wetland** Grassed Waterway Kv= 15.0 fps
0.7	55	0.0723	1.34		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
4.9	427	0.0094	1.45		**Shallow Concentrated Flow, Wetland** Grassed Waterway Kv= 15.0 fps
0.0	9	0.5005	10.61		**Shallow Concentrated Flow, Wetland** Grassed Waterway Kv= 15.0 fps
0.6	192	0.0066	5.45	144.50	**Channel Flow, East Ditch** Area= 26.5 sf Perim= 16.8' r= 1.58' n= 0.030 Earth, grassed & winding
13.4	1,385	Total			

Subcatchment 1S: Ugradient



Summary for Subcatchment 2S: Access Drive & Ditch Treated

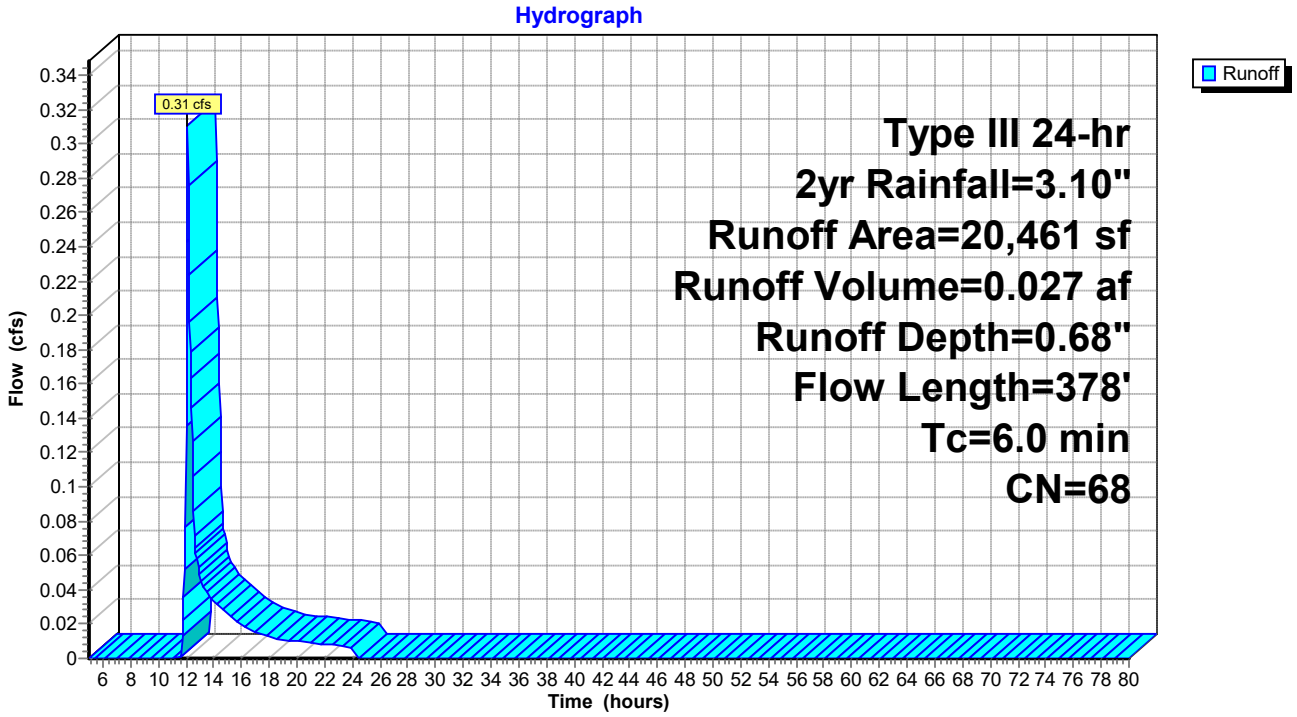
Runoff = 0.31 cfs @ 12.11 hrs, Volume= 0.027 af, Depth= 0.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2yr Rainfall=3.10"

Area (sf)	CN	Description
10,240	96	Gravel surface, HSG A
10,221	39	>75% Grass cover, Good, HSG A
20,461	68	Weighted Average
20,461		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	26	0.0208	1.03		**Sheet Flow, Access Drive** Smooth surfaces n= 0.011 P2= 3.00"
0.1	10	0.1934	3.08		**Shallow Concentrated Flow, Ditch Side Slope** Short Grass Pasture Kv= 7.0 fps
0.1	58	0.0345	12.47	330.38	**Channel Flow, Ditch to STA 0+45** Area= 26.5 sf Perim= 16.8' r= 1.58' n= 0.030 Earth, grassed & winding
0.2	185	0.0649	17.10	453.13	**Channel Flow, Ditch to STA 2+30** Area= 26.5 sf Perim= 16.8' r= 1.58' n= 0.030 Earth, grassed & winding
0.2	99	0.0101	6.75	178.76	**Channel Flow, Ditch to STA 3+30** Area= 26.5 sf Perim= 16.8' r= 1.58' n= 0.030 Earth, grassed & winding
1.0	378	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: Access Drive & Ditch Treated



Summary for Subcatchment 3S: West of Access Drive

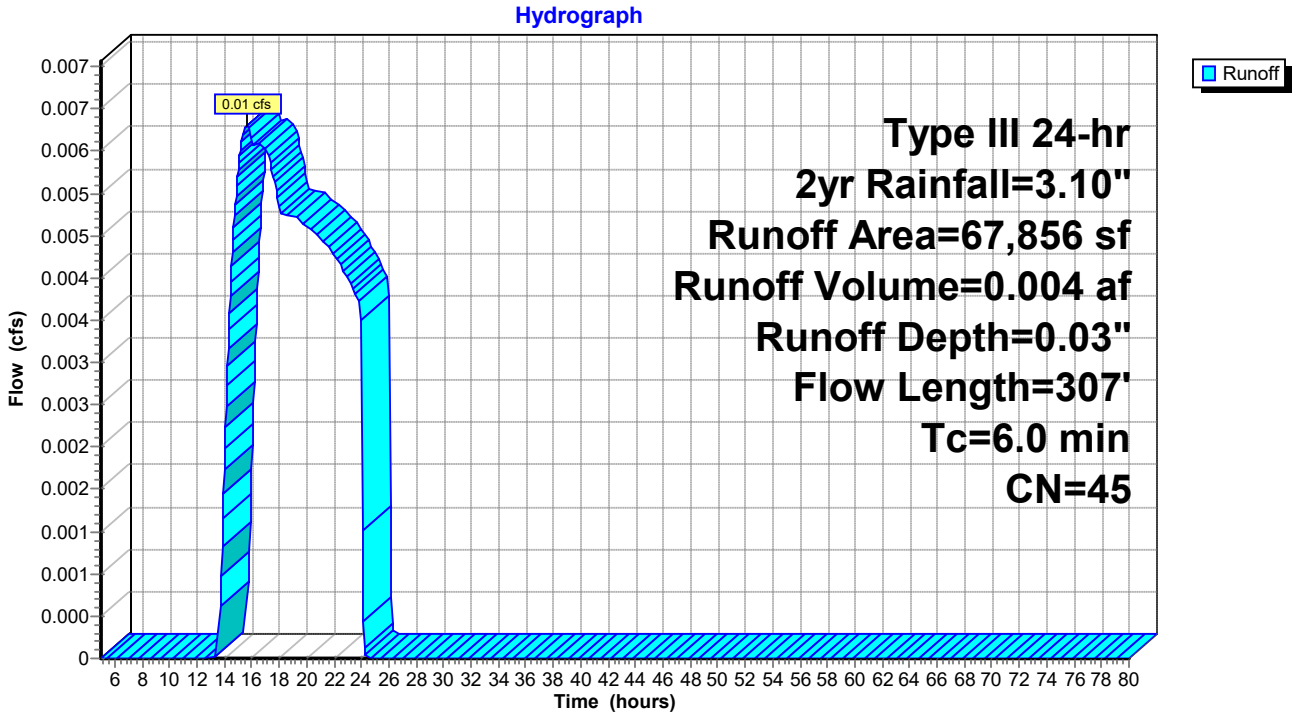
Runoff = 0.01 cfs @ 15.61 hrs, Volume= 0.004 af, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2yr Rainfall=3.10"

	Area (sf)	CN	Description
*	2,935	98	HSG A, Wetland
*	5,618	96	Gravel surface, HSG A, Gravel Drive off sute West
*	982	98	Roofs, HSG A, abutter to the West
	5,089	39	>75% Grass cover, Good, HSG A
	1,800	30	Meadow, non-grazed, HSG A
	51,432	36	Woods, Fair, HSG A
	67,856	45	Weighted Average
	63,939		94.23% Pervious Area
	3,917		5.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	29	0.0696	0.21		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 3.00"
0.1	27	0.2222	3.30		**Shallow Concentrated Flow, West of Access** Short Grass Pasture Kv= 7.0 fps
0.1	127	0.0941	18.70	377.66	**Channel Flow, channel from tie in slopes** Area= 20.2 sf Perim= 14.8' r= 1.36' n= 0.030 Earth, grassed & winding
1.9	124	0.0464	1.08		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
4.4	307	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3S: West of Access Drive



Summary for Subcatchment 4S: Access Drive & Ditch

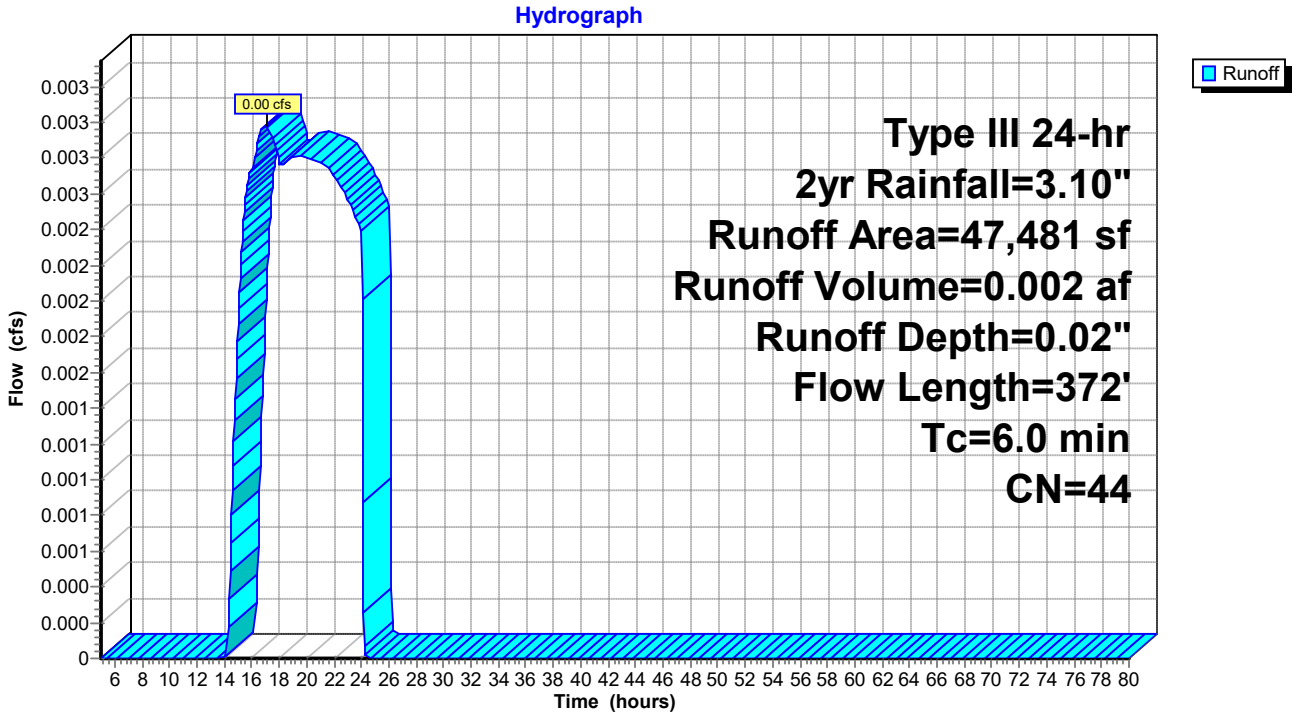
Runoff = 0.00 cfs @ 17.04 hrs, Volume= 0.002 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2yr Rainfall=3.10"

	Area (sf)	CN	Description
	160	98	Unconnected pavement, HSG A
*	7,417	96	Gravel surface, HSG A, Access Driveway & Equipment Pad
*	14,608	36	Woods, Fair, HSG A, West Abutter
*	10,112	39	>75% Grass cover, Good, HSG A Ditch
	15,184	30	Meadow, non-grazed, HSG A
	47,481	44	Weighted Average
	47,321		99.66% Pervious Area
	160		0.34% Impervious Area
	160		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	19	0.0208	0.97		**Sheet Flow, Sheet** Smooth surfaces n= 0.011 P2= 3.00"
0.0	9	0.1121	5.02		**Shallow Concentrated Flow, Grassed Ditch Side Slope** Grassed Waterway Kv= 15.0 fps
0.4	344	0.0479	14.69	389.29	**Channel Flow, Grassed Ditch - West STA 6+40 +/-** Area= 26.5 sf Perim= 16.8' r= 1.58' n= 0.030
0.7	372	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 4S: Access Drive & Ditch



Summary for Subcatchment 5S: Solar Field

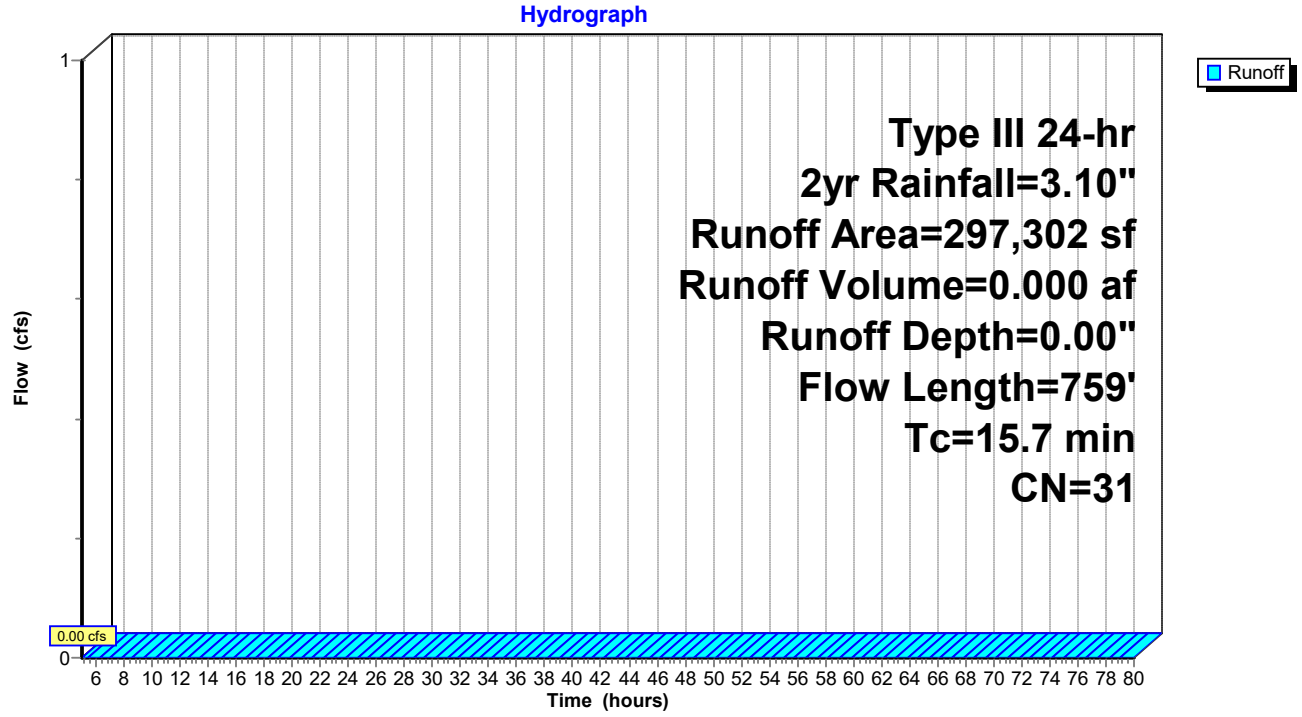
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2yr Rainfall=3.10"

	Area (sf)	CN	Description
*	43,118	36	Woods, Fair, HSG A, Northern Abutter
	254,184	30	Meadow, non-grazed, HSG A
	297,302	31	Weighted Average
	297,302		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	46	0.0329	2.72		**Shallow Concentrated Flow, upper ditch** Grassed Waterway Kv= 15.0 fps
0.1	141	0.0849	19.56	518.27	**Channel Flow, Ditch** Area= 26.5 sf Perim= 16.8' r= 1.58' n= 0.030 Earth, grassed & winding
9.3	98	0.0615	0.18		**Sheet Flow, Solar Field - Level Spreader** Grass: Dense n= 0.240 P2= 3.00"
6.0	474	0.0359	1.33		**Shallow Concentrated Flow, Solar Field** Short Grass Pasture Kv= 7.0 fps
15.7	759	Total			

Subcatchment 5S: Solar Field



Summary for Pond 1P: Soil Filter A (SFA)

Inflow Area = 8.276 ac, 17.16% Impervious, Inflow Depth = 0.12" for 2yr event
Inflow = 0.31 cfs @ 12.11 hrs, Volume= 0.086 af
Outflow = 0.04 cfs @ 24.08 hrs, Volume= 0.086 af, Atten= 88%, Lag= 718.1 min
Primary = 0.04 cfs @ 24.08 hrs, Volume= 0.086 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 326.32' @ 24.08 hrs Surf.Area= 0.065 ac Storage= 0.049 af

Plug-Flow detention time= 589.7 min calculated for 0.086 af (100% of inflow)
Center-of-Mass det. time= 590.1 min (1,585.6 - 995.5)

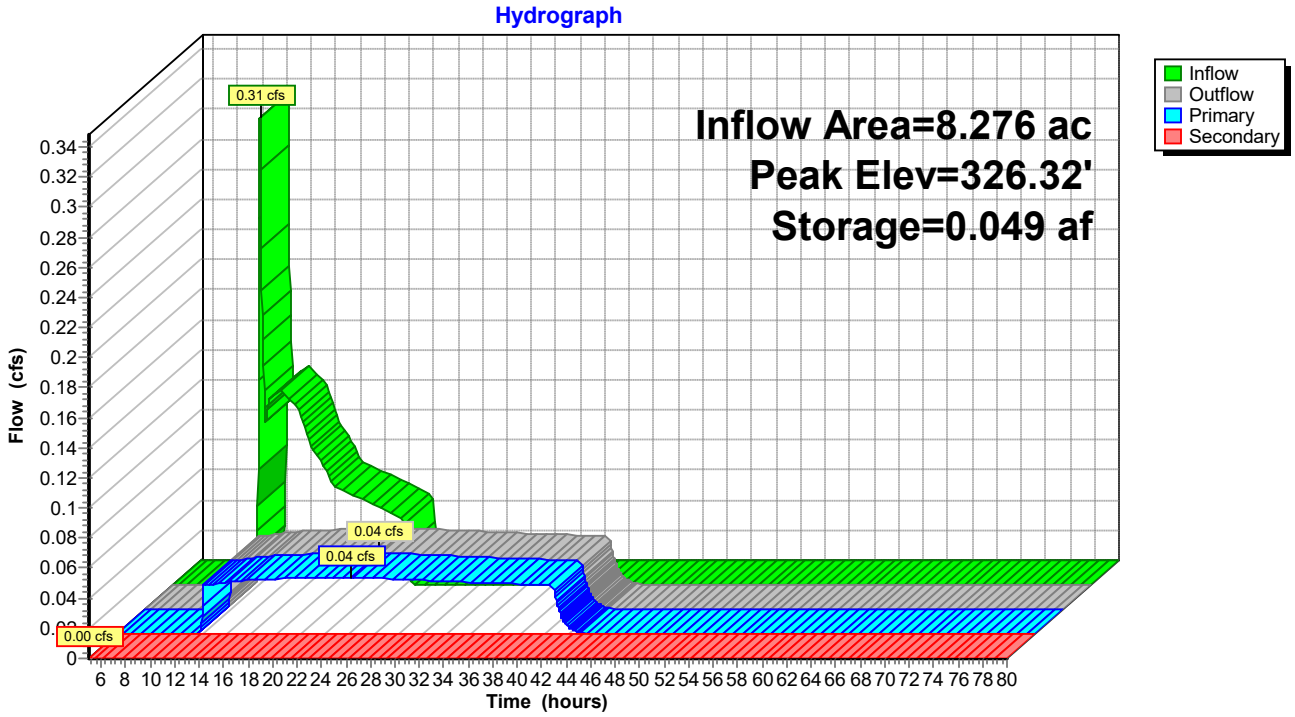
Volume	Invert	Avail.Storage	Storage Description
#1	325.50'	0.222 af	**40.00'W x 60.00'L x 3.00'H Prismatoid Z=2.5**

Device	Routing	Invert	Outlet Devices
#1	Primary	325.50'	**0.575 in/hr Exfiltration over Surface area**
#2	Secondary	326.90'	**4.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.04 cfs @ 24.08 hrs HW=326.32' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=325.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: Soil Filter A (SFA)



Summary for Pond 2P: Soil Filter B (SFB)

Inflow Area = 1.090 ac, 0.34% Impervious, Inflow Depth = 0.02" for 2yr event
Inflow = 0.00 cfs @ 17.04 hrs, Volume= 0.002 af
Outflow = 0.00 cfs @ 17.68 hrs, Volume= 0.002 af, Atten= 3%, Lag= 38.2 min
Primary = 0.00 cfs @ 17.68 hrs, Volume= 0.002 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-80.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 313.51' @ 17.68 hrs Surf.Area= 1,002 sf Storage= 6 cf

Plug-Flow detention time= 37.3 min calculated for 0.002 af (100% of inflow)
Center-of-Mass det. time= 37.4 min (1,199.4 - 1,162.1)

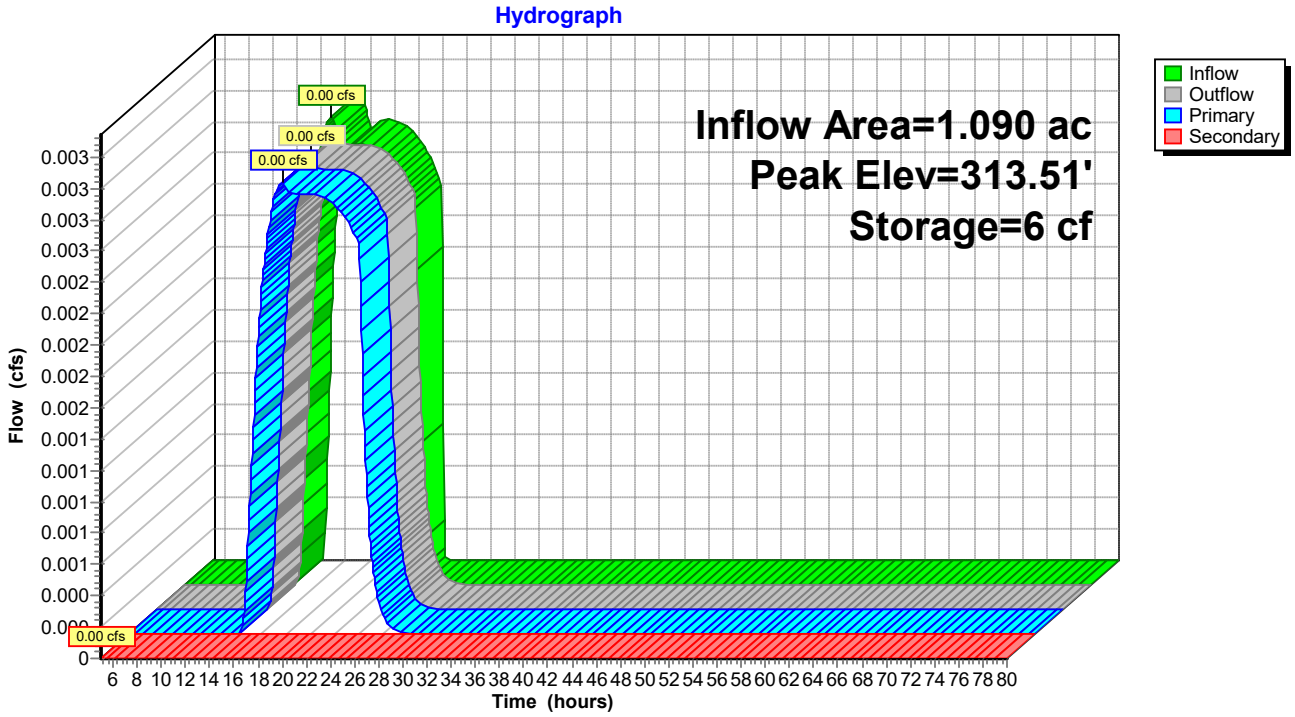
Volume	Invert	Avail.Storage	Storage Description
#1	313.50'	4,688 cf	**25.00'W x 40.00'L x 3.00'H Prismatoid Z=2.5**

Device	Routing	Invert	Outlet Devices
#1	Primary	313.50'	**0.575 in/hr Exfiltration over Surface area**
#2	Secondary	314.00'	**4.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.01 cfs @ 17.68 hrs HW=313.51' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=313.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Soil Filter B (SFB)

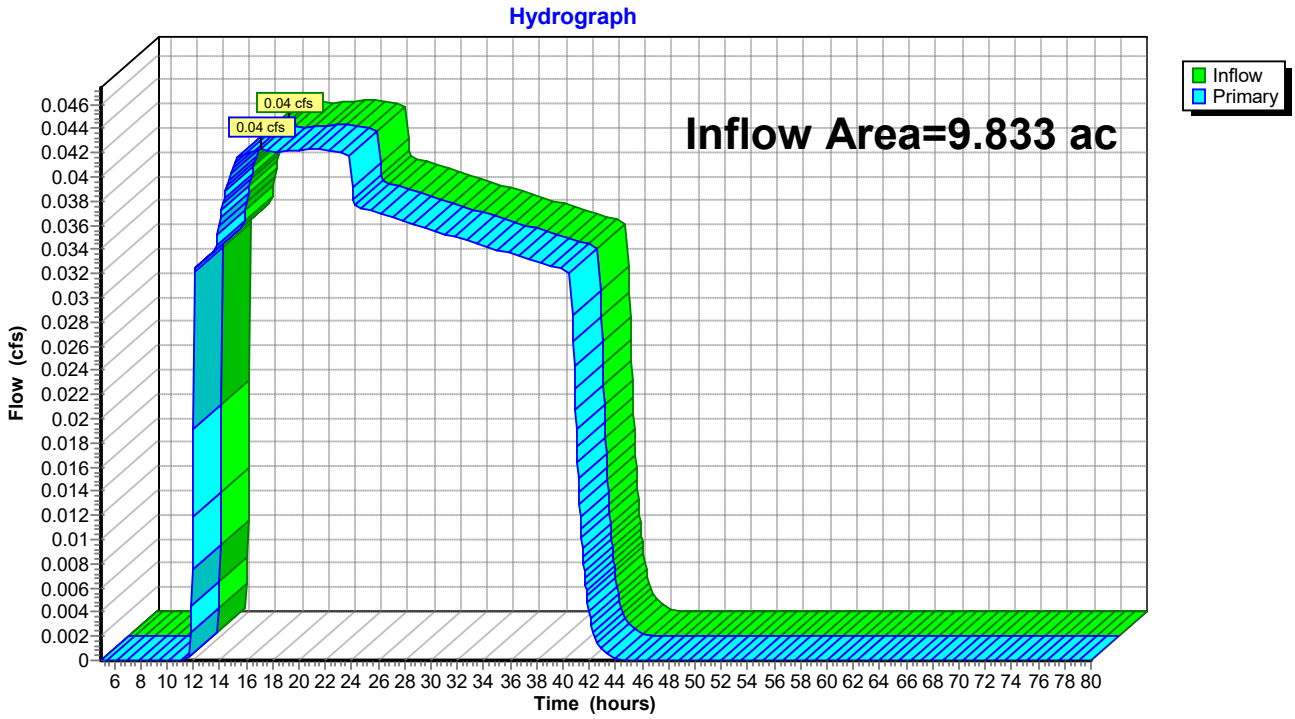


Summary for Link 1L: Point of Analysis

Inflow Area = 9.833 ac, 15.35% Impervious, Inflow Depth = 0.11" for 2yr event
Inflow = 0.04 cfs @ 17.08 hrs, Volume= 0.090 af
Primary = 0.04 cfs @ 17.08 hrs, Volume= 0.090 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-80.00 hrs, dt= 0.05 hrs

Link 1L: Point of Analysis

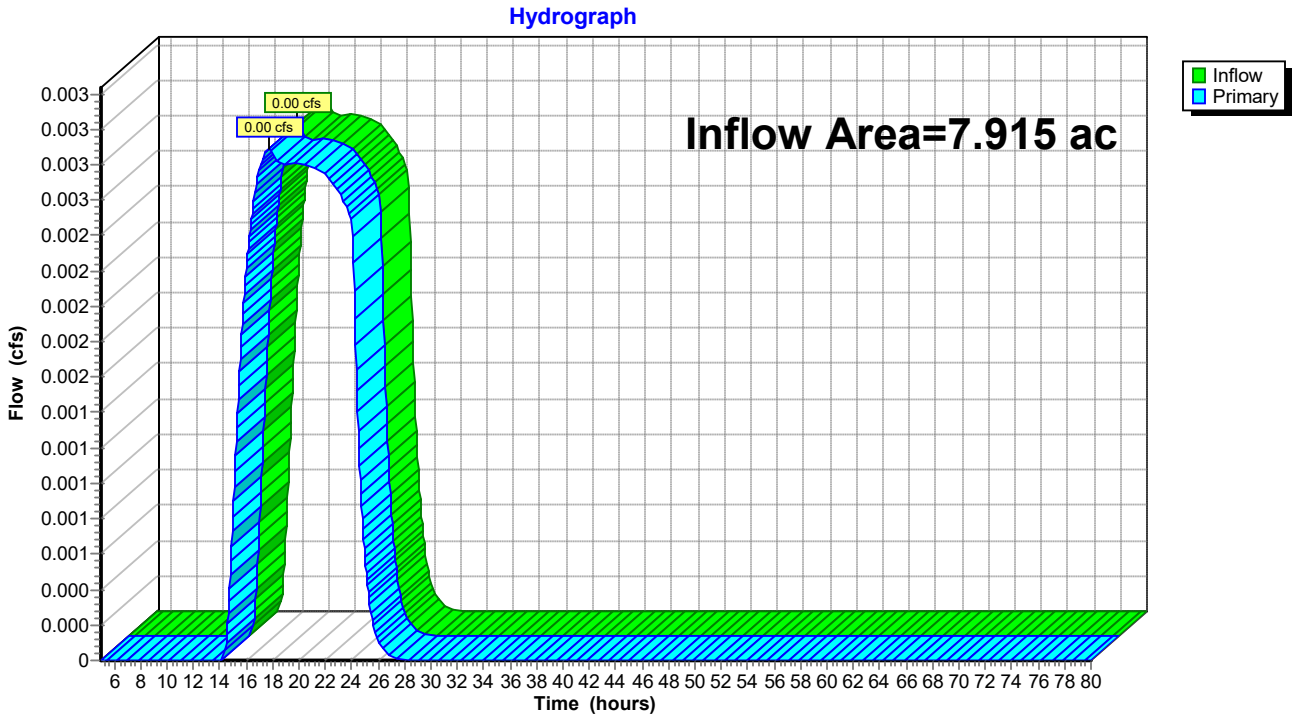


Summary for Link 2L: Point of Analysis

Inflow Area = 7.915 ac, 0.05% Impervious, Inflow Depth = 0.00" for 2yr event
Inflow = 0.00 cfs @ 17.68 hrs, Volume= 0.002 af
Primary = 0.00 cfs @ 17.68 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-80.00 hrs, dt= 0.05 hrs

Link 2L: Point of Analysis



Summary for Subcatchment 1S: Ugradient

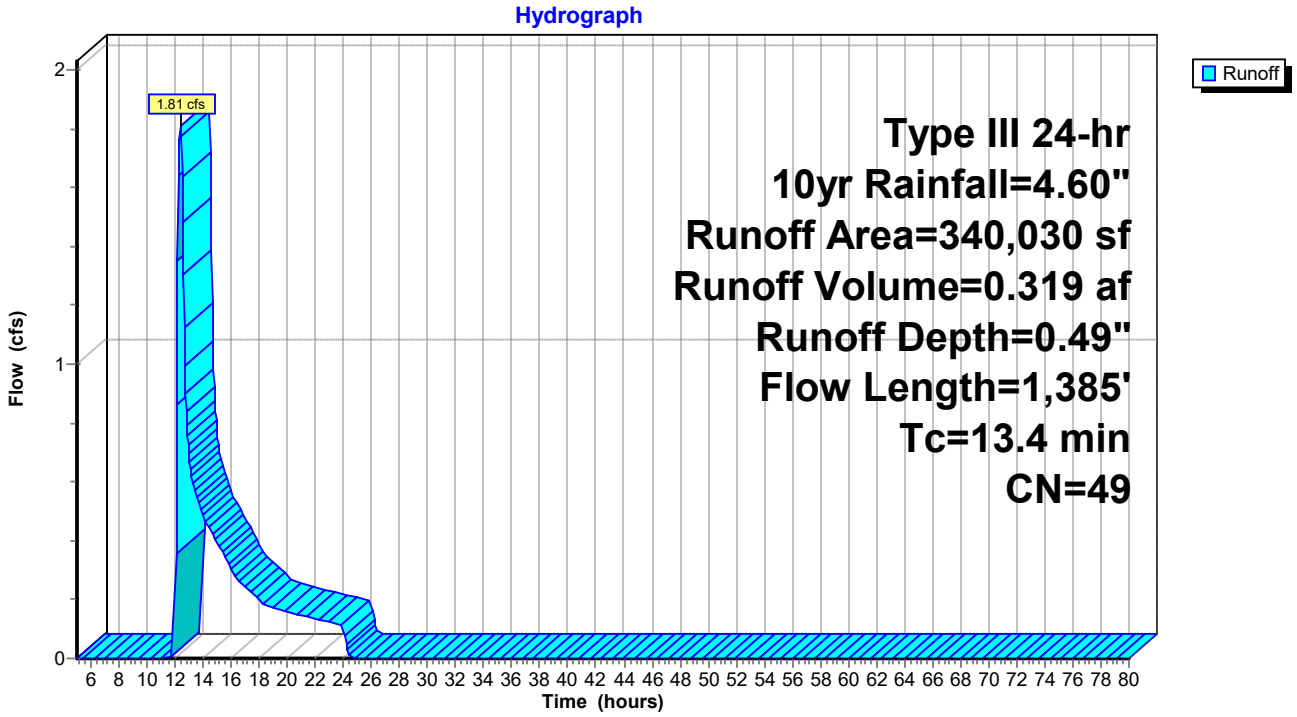
Runoff = 1.81 cfs @ 12.37 hrs, Volume= 0.319 af, Depth= 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10yr Rainfall=4.60"

	Area (sf)	CN	Description
*	4,359	98	Paved parking, HSG A Driveway to Abutter to East
*	56,595	98	Wetlands/Vernal Pools HSG A
*	895	98	Roofs, HSG A Garage & House
*	1,197	96	Gravel HSG A Boat Storage
*	13,837	68	<50% Grass cover, Poor, HSG A Temp Boat Storage
*	1,700	49	50-75% Grass cover, Fair, HSG A Lawn Abutter to East
*	19,005	39	>75% Grass cover, Good, HSG B Ditch
	27,542	35	Brush, Fair, HSG A
	214,900	36	Woods, Fair, HSG A
	340,030	49	Weighted Average
	278,181		81.81% Pervious Area
	61,849		18.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	19	0.0392	1.25		**Sheet Flow, Driveway** Smooth surfaces n= 0.011 P2= 3.00"
0.3	42	0.0833	2.02		**Shallow Concentrated Flow, Lawn** Short Grass Pasture Kv= 7.0 fps
0.6	72	0.1676	2.05		**Shallow Concentrated Flow, Wooded Area** Woodland Kv= 5.0 fps
1.1	62	0.0325	0.90		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
0.1	19	0.3106	2.79		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
4.8	488	0.0125	1.68		**Shallow Concentrated Flow, Wetland** Grassed Waterway Kv= 15.0 fps
0.7	55	0.0723	1.34		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
4.9	427	0.0094	1.45		**Shallow Concentrated Flow, Wetland** Grassed Waterway Kv= 15.0 fps
0.0	9	0.5005	10.61		**Shallow Concentrated Flow, Wetland** Grassed Waterway Kv= 15.0 fps
0.6	192	0.0066	5.45	144.50	**Channel Flow, East Ditch** Area= 26.5 sf Perim= 16.8' r= 1.58' n= 0.030 Earth, grassed & winding
13.4	1,385	Total			

Subcatchment 1S: Ugradient



Summary for Subcatchment 2S: Access Drive & Ditch Treated

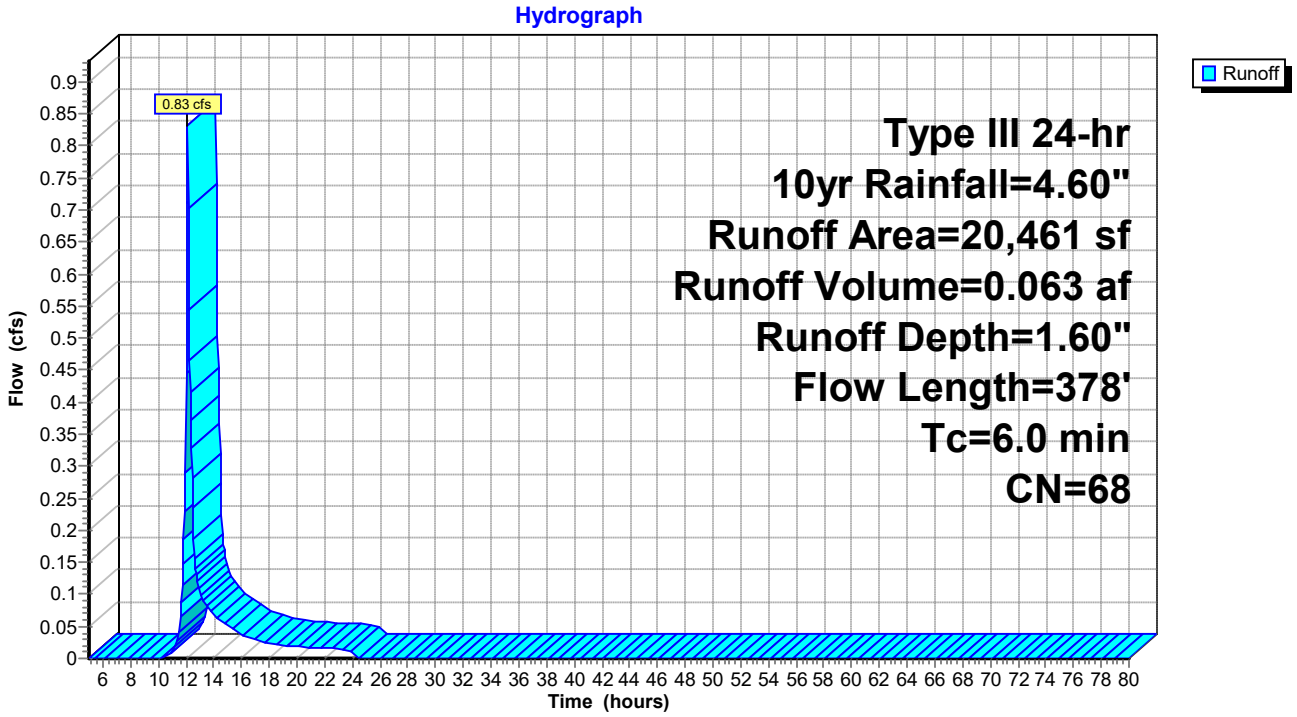
Runoff = 0.83 cfs @ 12.10 hrs, Volume= 0.063 af, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10yr Rainfall=4.60"

Area (sf)	CN	Description
10,240	96	Gravel surface, HSG A
10,221	39	>75% Grass cover, Good, HSG A
20,461	68	Weighted Average
20,461		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	26	0.0208	1.03		**Sheet Flow, Access Drive** Smooth surfaces n= 0.011 P2= 3.00"
0.1	10	0.1934	3.08		**Shallow Concentrated Flow, Ditch Side Slope** Short Grass Pasture Kv= 7.0 fps
0.1	58	0.0345	12.47	330.38	**Channel Flow, Ditch to STA 0+45** Area= 26.5 sf Perim= 16.8' r= 1.58' n= 0.030 Earth, grassed & winding
0.2	185	0.0649	17.10	453.13	**Channel Flow, Ditch to STA 2+30** Area= 26.5 sf Perim= 16.8' r= 1.58' n= 0.030 Earth, grassed & winding
0.2	99	0.0101	6.75	178.76	**Channel Flow, Ditch to STA 3+30** Area= 26.5 sf Perim= 16.8' r= 1.58' n= 0.030 Earth, grassed & winding
1.0	378	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: Access Drive & Ditch Treated



Summary for Subcatchment 3S: West of Access Drive

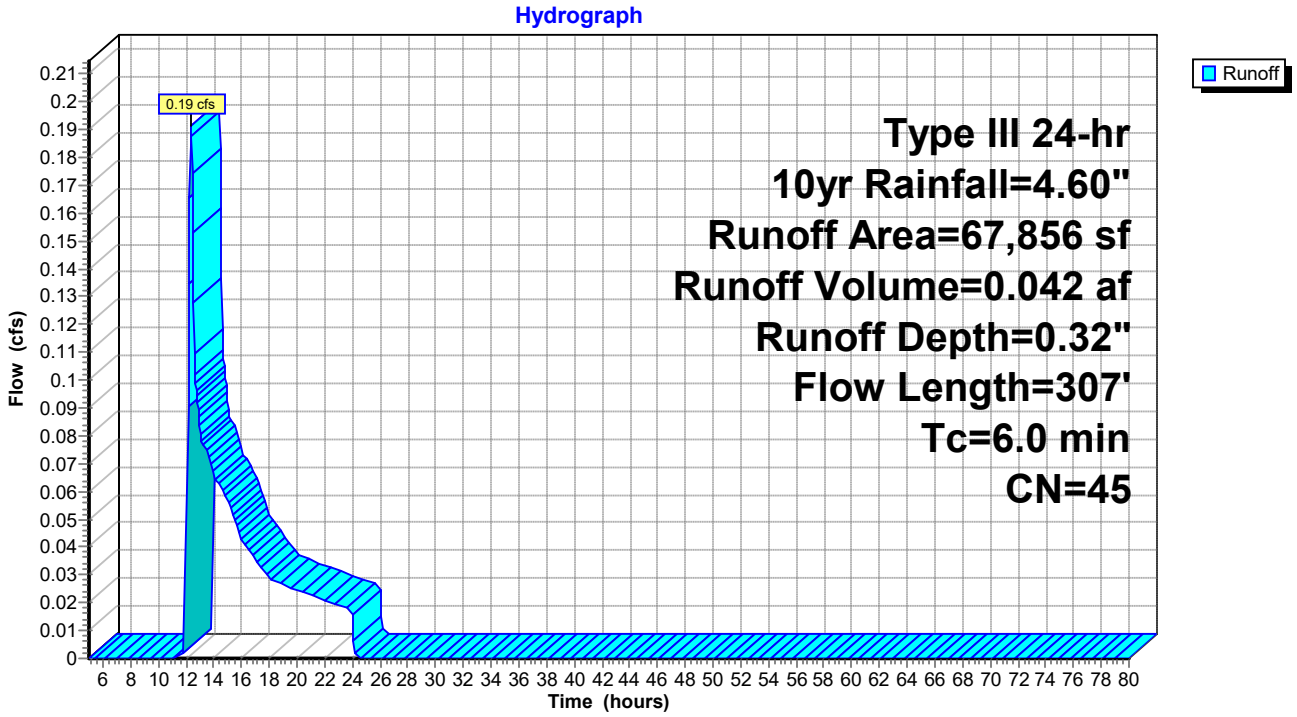
Runoff = 0.19 cfs @ 12.36 hrs, Volume= 0.042 af, Depth= 0.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10yr Rainfall=4.60"

	Area (sf)	CN	Description
*	2,935	98	HSG A, Wetland
*	5,618	96	Gravel surface, HSG A, Gravel Drive off sute West
*	982	98	Roofs, HSG A, abutter to the West
	5,089	39	>75% Grass cover, Good, HSG A
	1,800	30	Meadow, non-grazed, HSG A
	51,432	36	Woods, Fair, HSG A
	67,856	45	Weighted Average
	63,939		94.23% Pervious Area
	3,917		5.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	29	0.0696	0.21		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 3.00"
0.1	27	0.2222	3.30		**Shallow Concentrated Flow, West of Access** Short Grass Pasture Kv= 7.0 fps
0.1	127	0.0941	18.70	377.66	**Channel Flow, channel from tie in slopes** Area= 20.2 sf Perim= 14.8' r= 1.36' n= 0.030 Earth, grassed & winding
1.9	124	0.0464	1.08		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
4.4	307	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3S: West of Access Drive



Summary for Subcatchment 4S: Access Drive & Ditch

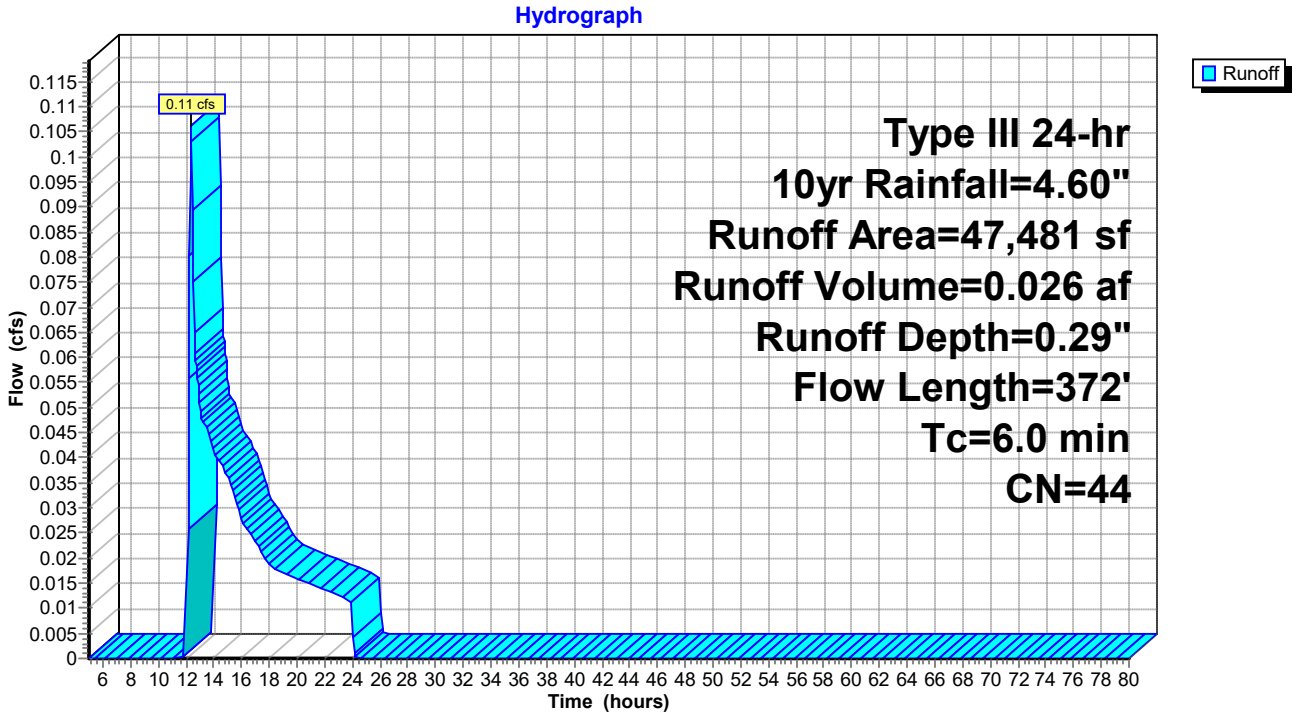
Runoff = 0.11 cfs @ 12.38 hrs, Volume= 0.026 af, Depth= 0.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10yr Rainfall=4.60"

	Area (sf)	CN	Description
	160	98	Unconnected pavement, HSG A
*	7,417	96	Gravel surface, HSG A, Access Driveway & Equipment Pad
*	14,608	36	Woods, Fair, HSG A, West Abutter
*	10,112	39	>75% Grass cover, Good, HSG A Ditch
	15,184	30	Meadow, non-grazed, HSG A
	47,481	44	Weighted Average
	47,321		99.66% Pervious Area
	160		0.34% Impervious Area
	160		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	19	0.0208	0.97		**Sheet Flow, Sheet** Smooth surfaces n= 0.011 P2= 3.00"
0.0	9	0.1121	5.02		**Shallow Concentrated Flow, Grassed Ditch Side Slope** Grassed Waterway Kv= 15.0 fps
0.4	344	0.0479	14.69	389.29	**Channel Flow, Grassed Ditch - West STA 6+40 +/-** Area= 26.5 sf Perim= 16.8' r= 1.58' n= 0.030
0.7	372	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 4S: Access Drive & Ditch



Summary for Subcatchment 5S: Solar Field

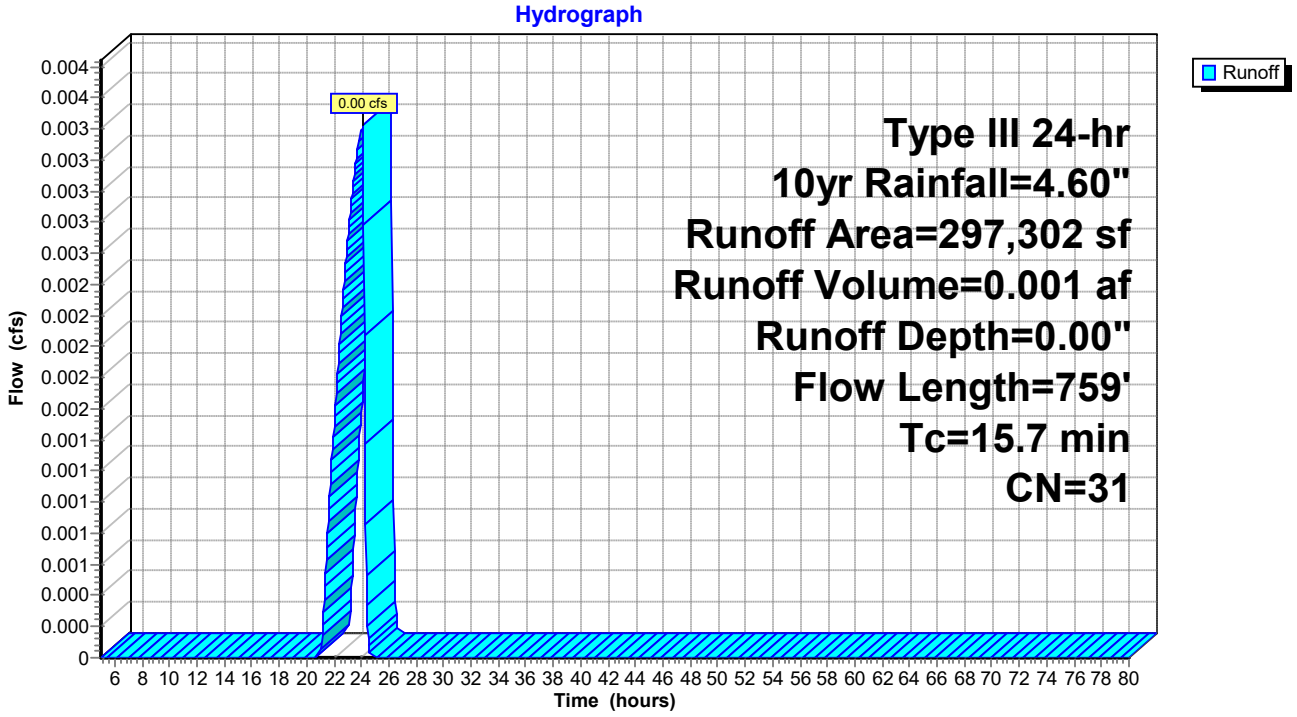
Runoff = 0.00 cfs @ 24.05 hrs, Volume= 0.001 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10yr Rainfall=4.60"

	Area (sf)	CN	Description
*	43,118	36	Woods, Fair, HSG A, Northern Abutter
	254,184	30	Meadow, non-grazed, HSG A
	297,302	31	Weighted Average
	297,302		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	46	0.0329	2.72		**Shallow Concentrated Flow, upper ditch** Grassed Waterway Kv= 15.0 fps
0.1	141	0.0849	19.56	518.27	**Channel Flow, Ditch** Area= 26.5 sf Perim= 16.8' r= 1.58' n= 0.030 Earth, grassed & winding
9.3	98	0.0615	0.18		**Sheet Flow, Solar Field - Level Spreader** Grass: Dense n= 0.240 P2= 3.00"
6.0	474	0.0359	1.33		**Shallow Concentrated Flow, Solar Field** Short Grass Pasture Kv= 7.0 fps
15.7	759	Total			

Subcatchment 5S: Solar Field



Summary for Pond 1P: Soil Filter A (SFA)

Inflow Area = 8.276 ac, 17.16% Impervious, Inflow Depth = 0.55" for 10yr event
Inflow = 2.19 cfs @ 12.33 hrs, Volume= 0.382 af
Outflow = 0.83 cfs @ 12.96 hrs, Volume= 0.382 af, Atten= 62%, Lag= 38.1 min
Primary = 0.04 cfs @ 12.96 hrs, Volume= 0.135 af
Secondary = 0.79 cfs @ 12.96 hrs, Volume= 0.247 af

Routing by Stor-Ind method, Time Span= 5.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 327.08' @ 12.96 hrs Surf.Area= 0.075 ac Storage= 0.102 af

Plug-Flow detention time= 379.8 min calculated for 0.382 af (100% of inflow)
Center-of-Mass det. time= 379.5 min (1,305.7 - 926.2)

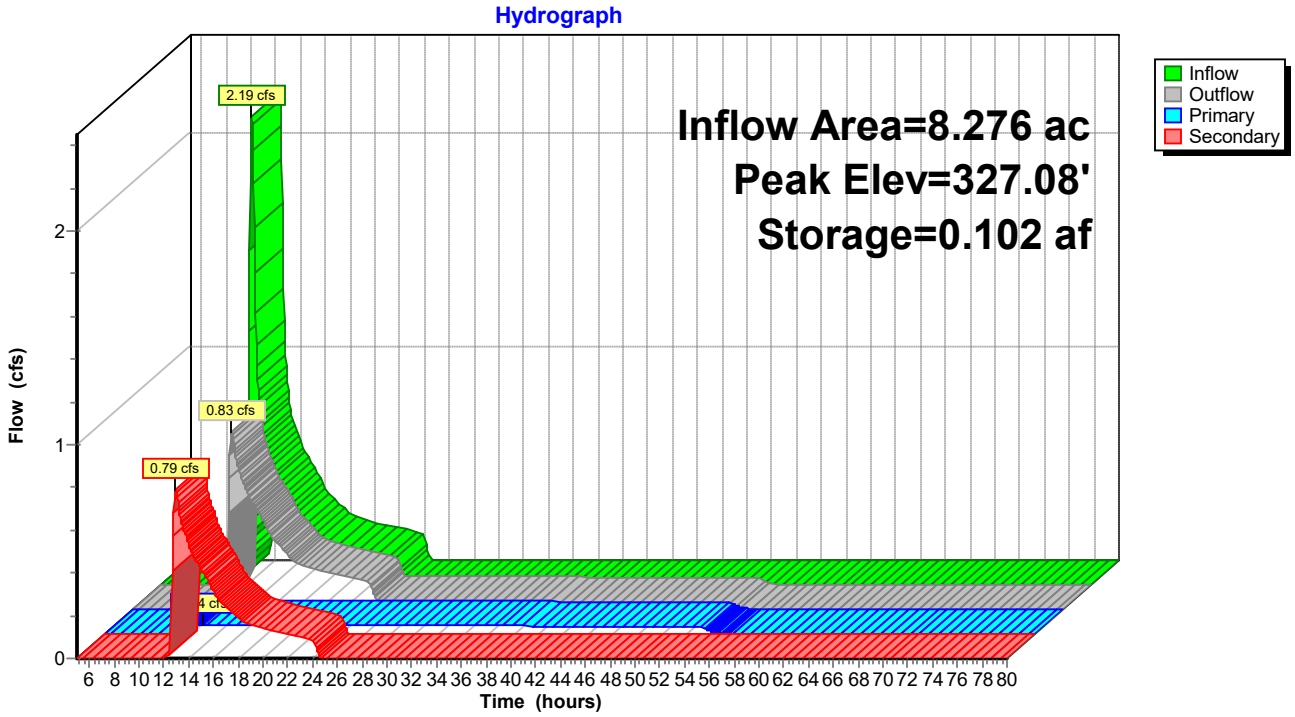
Volume	Invert	Avail.Storage	Storage Description
#1	325.50'	0.222 af	**40.00'W x 60.00'L x 3.00'H Prismatoid Z=2.5**

Device	Routing	Invert	Outlet Devices
#1	Primary	325.50'	**0.575 in/hr Exfiltration over Surface area**
#2	Secondary	326.90'	**4.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.04 cfs @ 12.96 hrs HW=327.08' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Secondary OutFlow Max=0.78 cfs @ 12.96 hrs HW=327.08' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.78 cfs @ 1.08 fps)

Pond 1P: Soil Filter A (SFA)



Summary for Pond 2P: Soil Filter B (SFB)

Inflow Area = 1.090 ac, 0.34% Impervious, Inflow Depth = 0.29" for 10yr event
Inflow = 0.11 cfs @ 12.38 hrs, Volume= 0.026 af
Outflow = 0.02 cfs @ 20.34 hrs, Volume= 0.026 af, Atten= 85%, Lag= 477.3 min
Primary = 0.02 cfs @ 20.34 hrs, Volume= 0.026 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-80.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 313.97' @ 20.34 hrs Surf.Area= 1,160 sf Storage= 512 cf

Plug-Flow detention time= 390.2 min calculated for 0.026 af (100% of inflow)
Center-of-Mass det. time= 389.9 min (1,363.5 - 973.6)

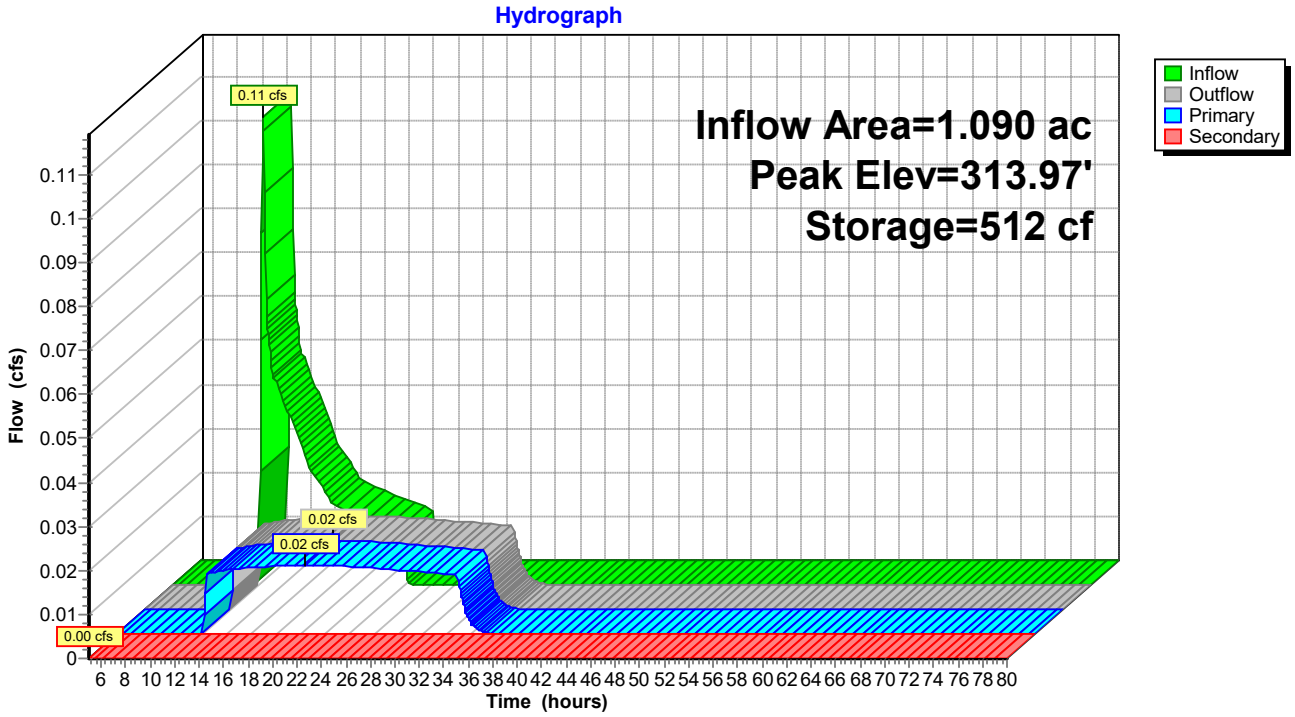
Volume	Invert	Avail.Storage	Storage Description
#1	313.50'	4,688 cf	**25.00'W x 40.00'L x 3.00'H Prismatoid Z=2.5**

Device	Routing	Invert	Outlet Devices
#1	Primary	313.50'	**0.575 in/hr Exfiltration over Surface area**
#2	Secondary	314.00'	**4.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.02 cfs @ 20.34 hrs HW=313.97' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=313.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Soil Filter B (SFB)

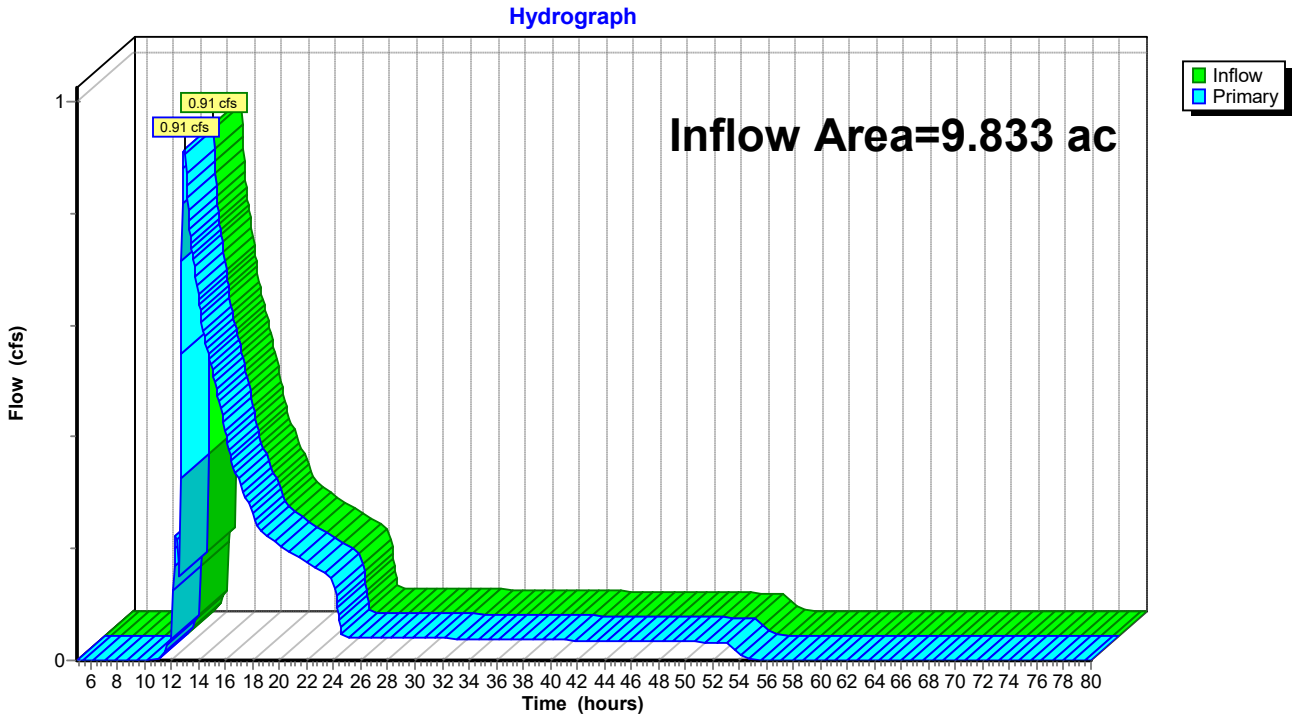


Summary for Link 1L: Point of Analysis

Inflow Area = 9.833 ac, 15.35% Impervious, Inflow Depth = 0.52" for 10yr event
Inflow = 0.91 cfs @ 12.95 hrs, Volume= 0.424 af
Primary = 0.91 cfs @ 12.95 hrs, Volume= 0.424 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-80.00 hrs, dt= 0.05 hrs

Link 1L: Point of Analysis

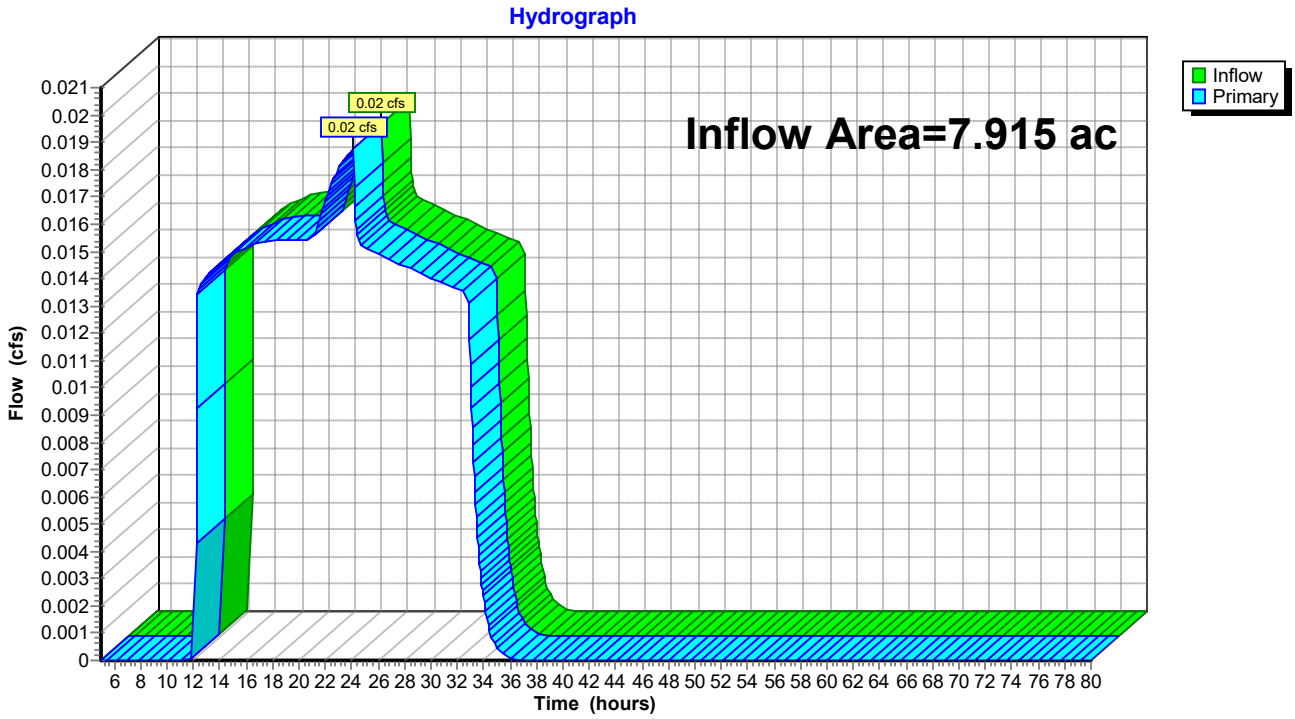


Summary for Link 2L: Point of Analysis

Inflow Area = 7.915 ac, 0.05% Impervious, Inflow Depth = 0.04" for 10yr event
Inflow = 0.02 cfs @ 24.02 hrs, Volume= 0.026 af
Primary = 0.02 cfs @ 24.02 hrs, Volume= 0.026 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-80.00 hrs, dt= 0.05 hrs

Link 2L: Point of Analysis



Summary for Subcatchment 1S: Ugradient

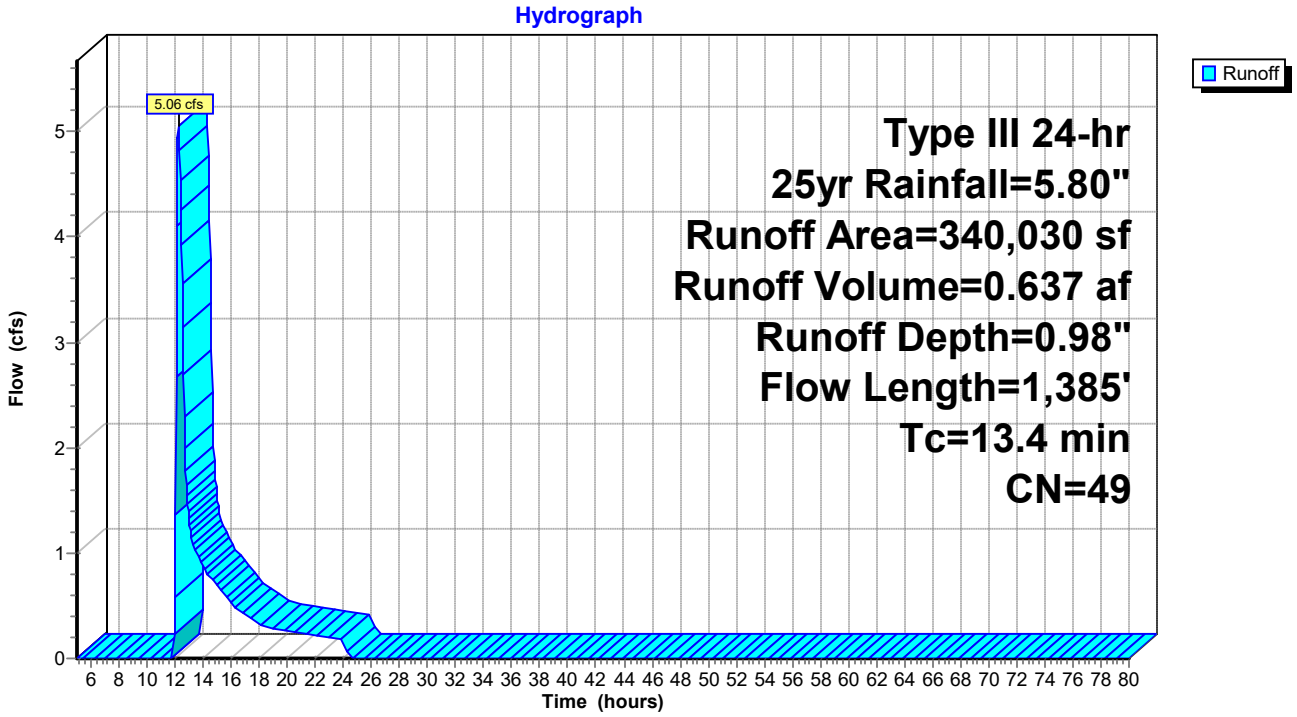
Runoff = 5.06 cfs @ 12.24 hrs, Volume= 0.637 af, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=5.80"

	Area (sf)	CN	Description
*	4,359	98	Paved parking, HSG A Driveway to Abutter to East
*	56,595	98	Wetlands/Vernal Pools HSG A
*	895	98	Roofs, HSG A Garage & House
*	1,197	96	Gravel HSG A Boat Storage
*	13,837	68	<50% Grass cover, Poor, HSG A Temp Boat Storage
*	1,700	49	50-75% Grass cover, Fair, HSG A Lawn Abutter to East
*	19,005	39	>75% Grass cover, Good, HSG B Ditch
	27,542	35	Brush, Fair, HSG A
	214,900	36	Woods, Fair, HSG A
	340,030	49	Weighted Average
	278,181		81.81% Pervious Area
	61,849		18.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	19	0.0392	1.25		**Sheet Flow, Driveway** Smooth surfaces n= 0.011 P2= 3.00"
0.3	42	0.0833	2.02		**Shallow Concentrated Flow, Lawn** Short Grass Pasture Kv= 7.0 fps
0.6	72	0.1676	2.05		**Shallow Concentrated Flow, Wooded Area** Woodland Kv= 5.0 fps
1.1	62	0.0325	0.90		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
0.1	19	0.3106	2.79		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
4.8	488	0.0125	1.68		**Shallow Concentrated Flow, Wetland** Grassed Waterway Kv= 15.0 fps
0.7	55	0.0723	1.34		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
4.9	427	0.0094	1.45		**Shallow Concentrated Flow, Wetland** Grassed Waterway Kv= 15.0 fps
0.0	9	0.5005	10.61		**Shallow Concentrated Flow, Wetland** Grassed Waterway Kv= 15.0 fps
0.6	192	0.0066	5.45	144.50	**Channel Flow, East Ditch** Area= 26.5 sf Perim= 16.8' r= 1.58' n= 0.030 Earth, grassed & winding
13.4	1,385	Total			

Subcatchment 1S: Ugradient



Summary for Subcatchment 2S: Access Drive & Ditch Treated

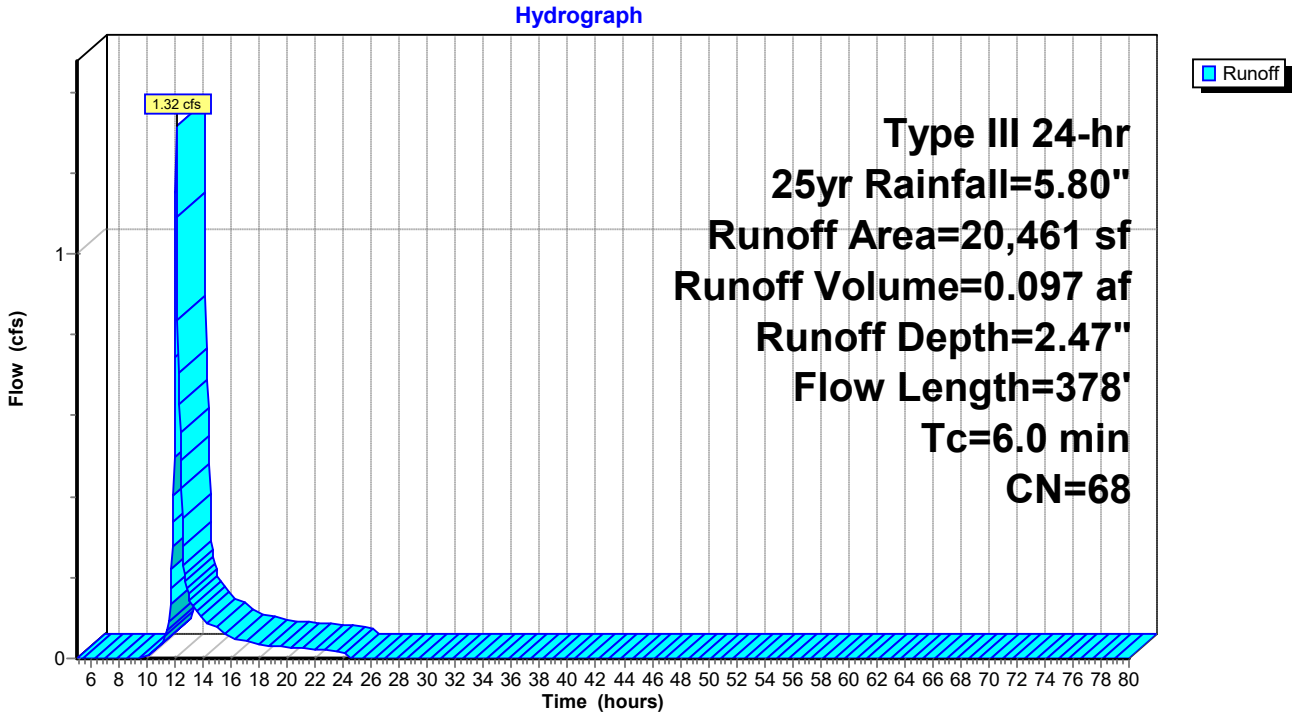
Runoff = 1.32 cfs @ 12.10 hrs, Volume= 0.097 af, Depth= 2.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=5.80"

Area (sf)	CN	Description
10,240	96	Gravel surface, HSG A
10,221	39	>75% Grass cover, Good, HSG A
20,461	68	Weighted Average
20,461		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	26	0.0208	1.03		**Sheet Flow, Access Drive** Smooth surfaces n= 0.011 P2= 3.00"
0.1	10	0.1934	3.08		**Shallow Concentrated Flow, Ditch Side Slope** Short Grass Pasture Kv= 7.0 fps
0.1	58	0.0345	12.47	330.38	**Channel Flow, Ditch to STA 0+45** Area= 26.5 sf Perim= 16.8' r= 1.58' n= 0.030 Earth, grassed & winding
0.2	185	0.0649	17.10	453.13	**Channel Flow, Ditch to STA 2+30** Area= 26.5 sf Perim= 16.8' r= 1.58' n= 0.030 Earth, grassed & winding
0.2	99	0.0101	6.75	178.76	**Channel Flow, Ditch to STA 3+30** Area= 26.5 sf Perim= 16.8' r= 1.58' n= 0.030 Earth, grassed & winding
1.0	378	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: Access Drive & Ditch Treated



Summary for Subcatchment 3S: West of Access Drive

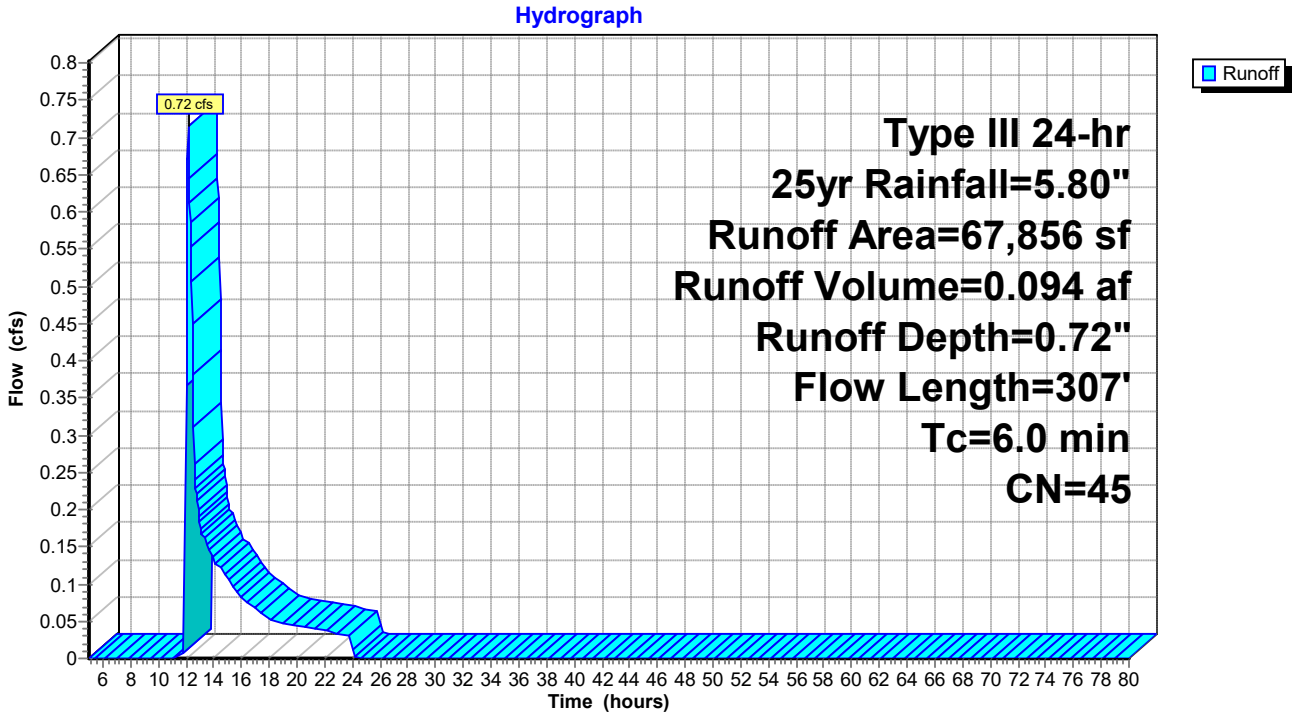
Runoff = 0.72 cfs @ 12.14 hrs, Volume= 0.094 af, Depth= 0.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=5.80"

	Area (sf)	CN	Description
*	2,935	98	HSG A, Wetland
*	5,618	96	Gravel surface, HSG A, Gravel Drive off sute West
*	982	98	Roofs, HSG A, abutter to the West
	5,089	39	>75% Grass cover, Good, HSG A
	1,800	30	Meadow, non-grazed, HSG A
	51,432	36	Woods, Fair, HSG A
	67,856	45	Weighted Average
	63,939		94.23% Pervious Area
	3,917		5.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	29	0.0696	0.21		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 3.00"
0.1	27	0.2222	3.30		**Shallow Concentrated Flow, West of Access** Short Grass Pasture Kv= 7.0 fps
0.1	127	0.0941	18.70	377.66	**Channel Flow, channel from tie in slopes** Area= 20.2 sf Perim= 14.8' r= 1.36' n= 0.030 Earth, grassed & winding
1.9	124	0.0464	1.08		**Shallow Concentrated Flow, Wooded** Woodland Kv= 5.0 fps
4.4	307	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3S: West of Access Drive



Summary for Subcatchment 4S: Access Drive & Ditch

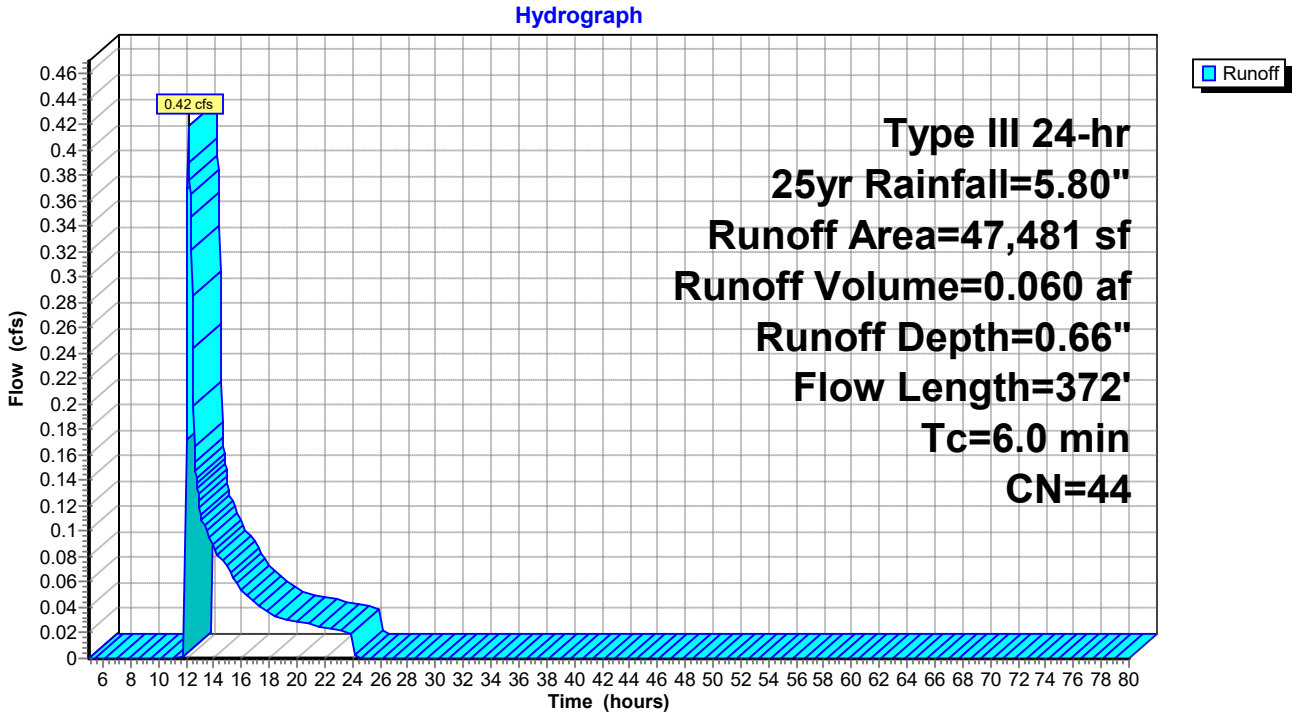
Runoff = 0.42 cfs @ 12.16 hrs, Volume= 0.060 af, Depth= 0.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=5.80"

	Area (sf)	CN	Description
	160	98	Unconnected pavement, HSG A
*	7,417	96	Gravel surface, HSG A, Access Driveway & Equipment Pad
*	14,608	36	Woods, Fair, HSG A, West Abutter
*	10,112	39	>75% Grass cover, Good, HSG A Ditch
	15,184	30	Meadow, non-grazed, HSG A
	47,481	44	Weighted Average
	47,321		99.66% Pervious Area
	160		0.34% Impervious Area
	160		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	19	0.0208	0.97		**Sheet Flow, Sheet** Smooth surfaces n= 0.011 P2= 3.00"
0.0	9	0.1121	5.02		**Shallow Concentrated Flow, Grassed Ditch Side Slope** Grassed Waterway Kv= 15.0 fps
0.4	344	0.0479	14.69	389.29	**Channel Flow, Grassed Ditch - West STA 6+40 +/-** Area= 26.5 sf Perim= 16.8' r= 1.58' n= 0.030
0.7	372	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 4S: Access Drive & Ditch



Summary for Subcatchment 5S: Solar Field

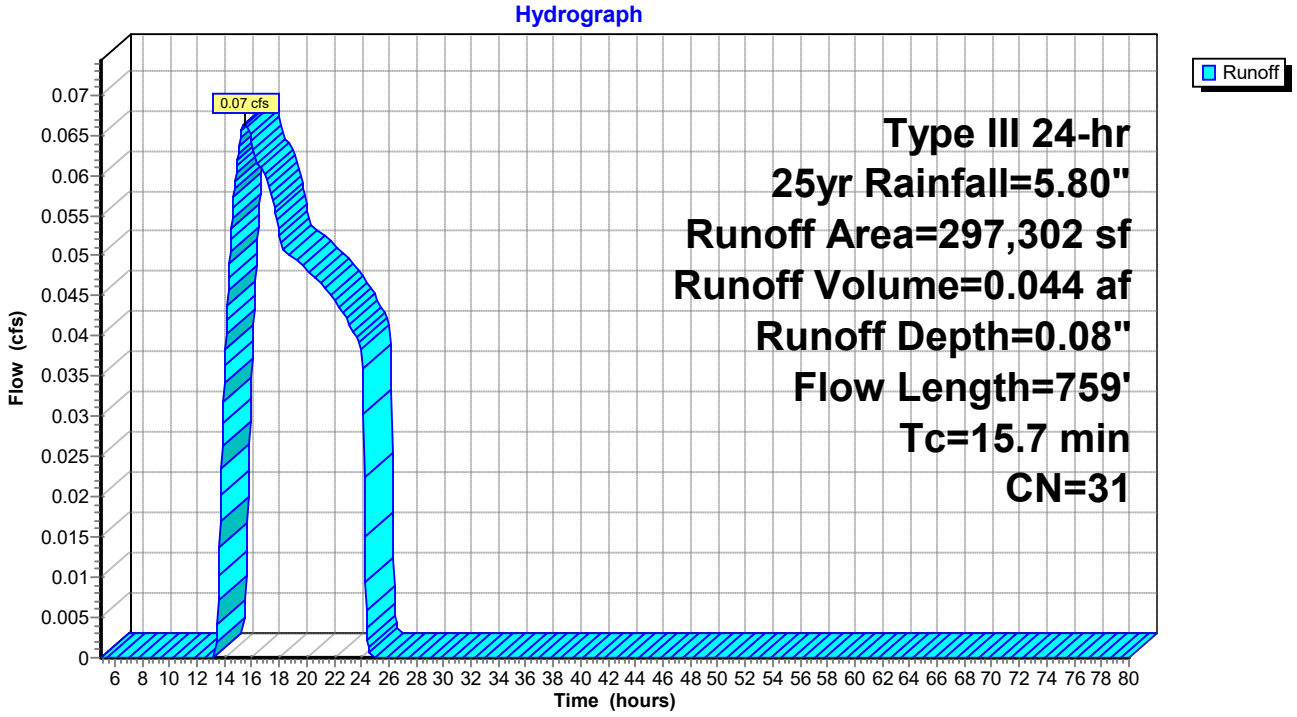
Runoff = 0.07 cfs @ 15.54 hrs, Volume= 0.044 af, Depth= 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=5.80"

	Area (sf)	CN	Description
*	43,118	36	Woods, Fair, HSG A, Northern Abutter
	254,184	30	Meadow, non-grazed, HSG A
	297,302	31	Weighted Average
	297,302		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	46	0.0329	2.72		**Shallow Concentrated Flow, upper ditch** Grassed Waterway Kv= 15.0 fps
0.1	141	0.0849	19.56	518.27	**Channel Flow, Ditch** Area= 26.5 sf Perim= 16.8' r= 1.58' n= 0.030 Earth, grassed & winding
9.3	98	0.0615	0.18		**Sheet Flow, Solar Field - Level Spreader** Grass: Dense n= 0.240 P2= 3.00"
6.0	474	0.0359	1.33		**Shallow Concentrated Flow, Solar Field** Short Grass Pasture Kv= 7.0 fps
15.7	759	Total			

Subcatchment 5S: Solar Field



Summary for Pond 1P: Soil Filter A (SFA)

Inflow Area = 8.276 ac, 17.16% Impervious, Inflow Depth = 1.06" for 25yr event
Inflow = 5.84 cfs @ 12.22 hrs, Volume= 0.733 af
Outflow = 4.36 cfs @ 12.45 hrs, Volume= 0.733 af, Atten= 25%, Lag= 13.9 min
Primary = 0.05 cfs @ 12.46 hrs, Volume= 0.138 af
Secondary = 4.31 cfs @ 12.45 hrs, Volume= 0.596 af

Routing by Stor-Ind method, Time Span= 5.00-80.00 hrs, dt= 0.05 hrs
Peak Elev= 327.45' @ 12.46 hrs Surf.Area= 0.080 ac Storage= 0.131 af

Plug-Flow detention time= 204.7 min calculated for 0.733 af (100% of inflow)
Center-of-Mass det. time= 204.4 min (1,104.9 - 900.5)

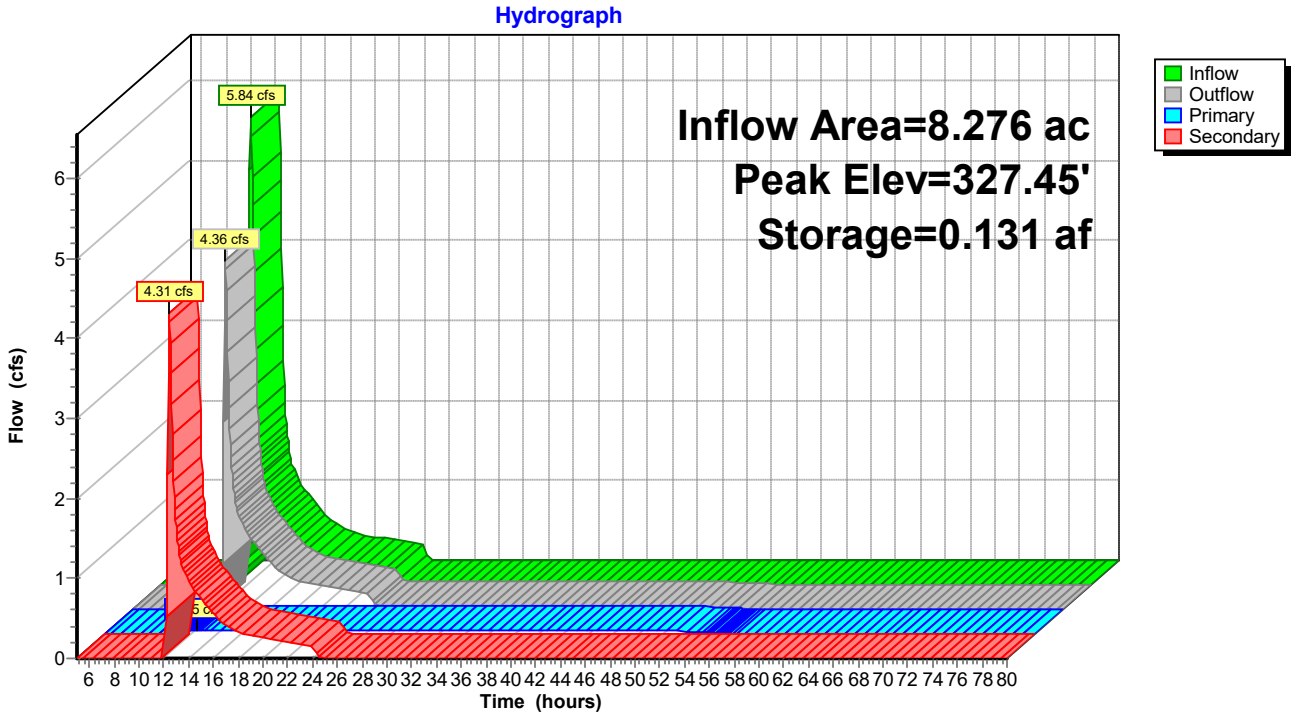
Volume	Invert	Avail.Storage	Storage Description
#1	325.50'	0.222 af	**40.00'W x 60.00'L x 3.00'H Prismatoid Z=2.5**

Device	Routing	Invert	Outlet Devices
#1	Primary	325.50'	**0.575 in/hr Exfiltration over Surface area**
#2	Secondary	326.90'	**4.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.05 cfs @ 12.46 hrs HW=327.45' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Secondary OutFlow Max=4.30 cfs @ 12.45 hrs HW=327.45' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 4.30 cfs @ 1.94 fps)

Pond 1P: Soil Filter A (SFA)



Summary for Pond 2P: Soil Filter B (SFB)

Inflow Area = 1.090 ac, 0.34% Impervious, Inflow Depth = 0.66" for 25yr event
Inflow = 0.42 cfs @ 12.16 hrs, Volume= 0.060 af
Outflow = 0.14 cfs @ 12.75 hrs, Volume= 0.060 af, Atten= 66%, Lag= 35.6 min
Primary = 0.02 cfs @ 12.75 hrs, Volume= 0.028 af
Secondary = 0.13 cfs @ 12.75 hrs, Volume= 0.032 af

Routing by Stor-Ind method, Time Span= 5.00-80.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 314.05' @ 12.75 hrs Surf.Area= 1,187 sf Storage= 604 cf

Plug-Flow detention time= 216.9 min calculated for 0.060 af (100% of inflow)
Center-of-Mass det. time= 217.1 min (1,145.1 - 927.9)

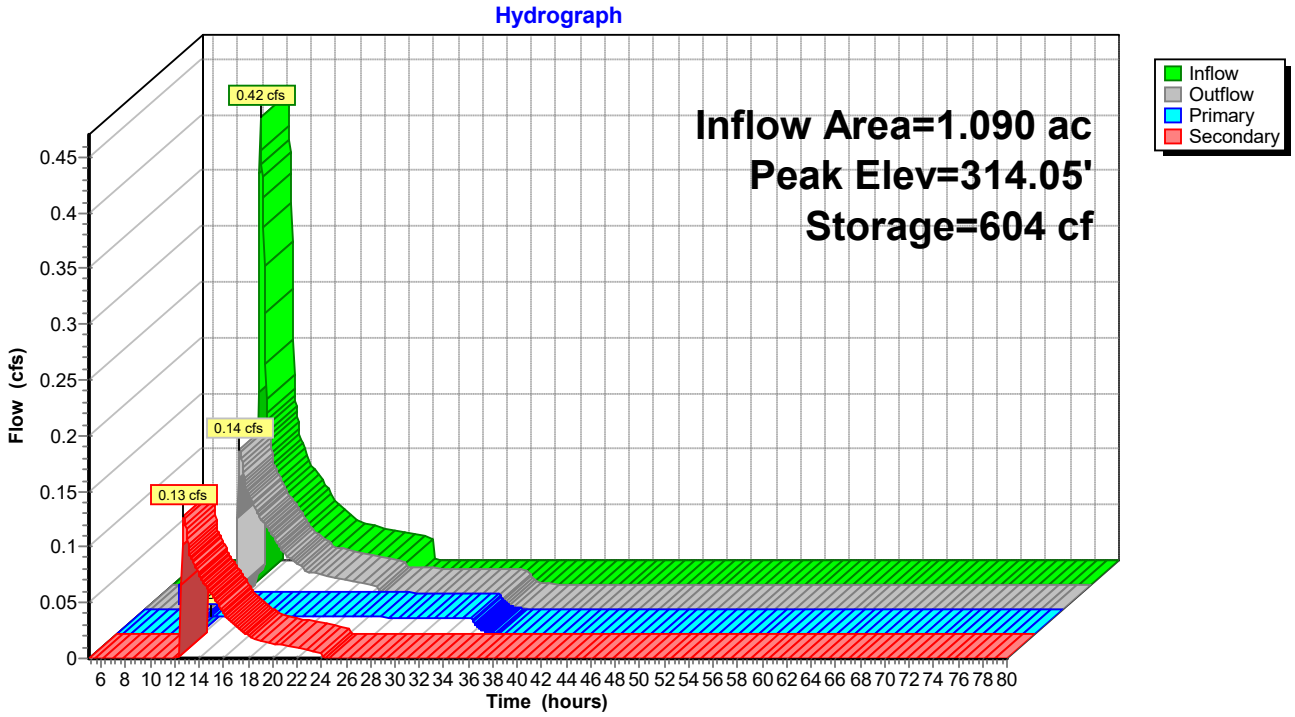
Volume	Invert	Avail.Storage	Storage Description
#1	313.50'	4,688 cf	**25.00'W x 40.00'L x 3.00'H Prismatoid Z=2.5**

Device	Routing	Invert	Outlet Devices
#1	Primary	313.50'	**0.575 in/hr Exfiltration over Surface area**
#2	Secondary	314.00'	**4.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.02 cfs @ 12.75 hrs HW=314.05' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Secondary OutFlow Max=0.12 cfs @ 12.75 hrs HW=314.05' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.12 cfs @ 0.58 fps)

Pond 2P: Soil Filter B (SFB)

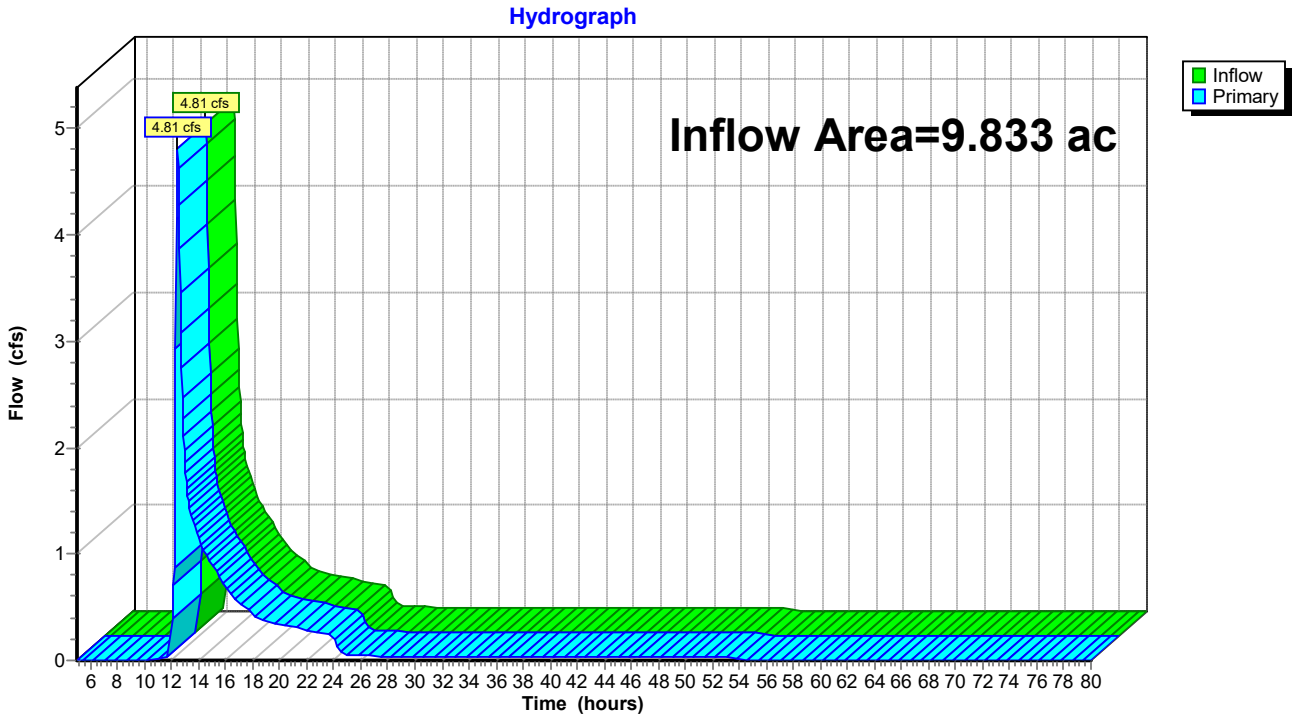


Summary for Link 1L: Point of Analysis

Inflow Area = 9.833 ac, 15.35% Impervious, Inflow Depth = 1.01" for 25yr event
Inflow = 4.81 cfs @ 12.44 hrs, Volume= 0.827 af
Primary = 4.81 cfs @ 12.44 hrs, Volume= 0.827 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-80.00 hrs, dt= 0.05 hrs

Link 1L: Point of Analysis



Summary for Link 2L: Point of Analysis

Inflow Area = 7.915 ac, 0.05% Impervious, Inflow Depth = 0.16" for 25yr event
Inflow = 0.14 cfs @ 12.75 hrs, Volume= 0.104 af
Primary = 0.14 cfs @ 12.75 hrs, Volume= 0.104 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-80.00 hrs, dt= 0.05 hrs

Link 2L: Point of Analysis

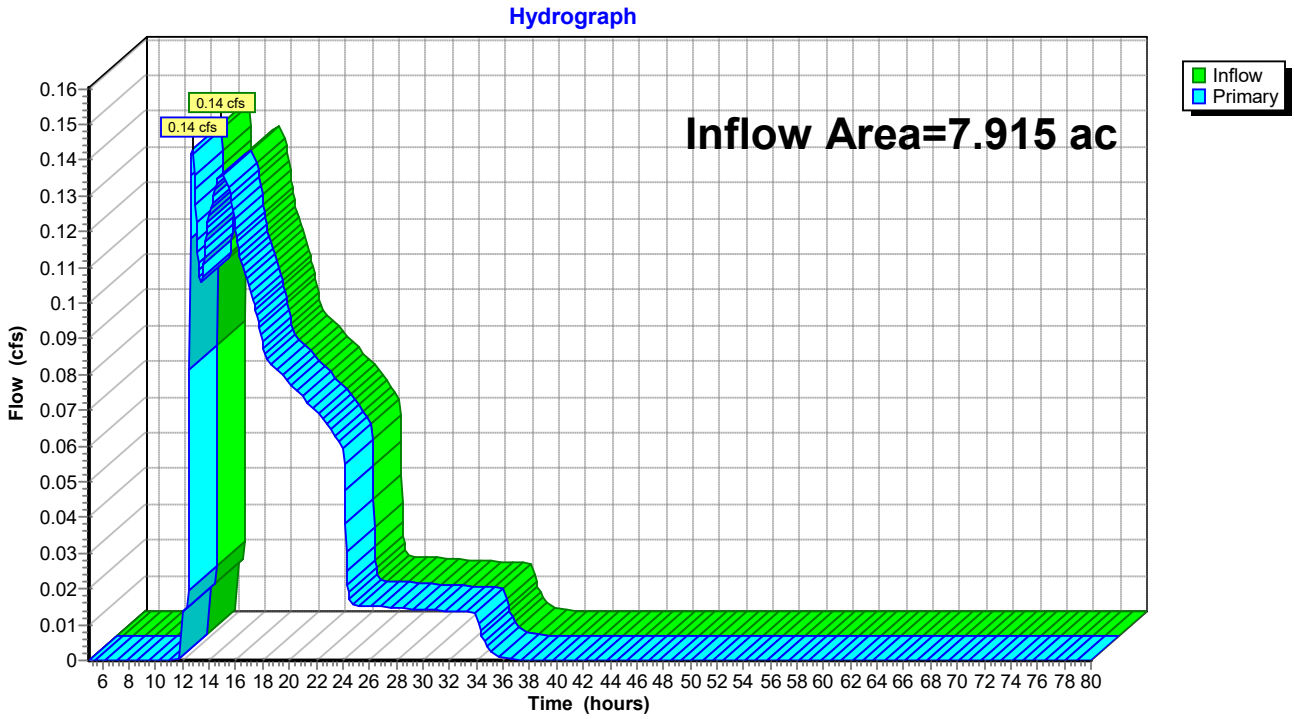


Exhibit F
Decommissioning Plan

Decommissioning Plan

for

Allen Solar

Proposed 996 kWac Ground-Mounted Solar Facility at Roosevelt Trail, Raymond, Maine

22 August 2023

By:
Allen Solar, LLC

1. Introduction

Allen Solar, LLC proposes to build a 996 kWac photovoltaic (PV) solar facility ("**Solar Facility**") under the State of Maine's Renewable Energy New Metering Program. The Solar Facility is planned to have a nameplate capacity of approximately 996 kilowatts (kW) alternating current (AC) and be built on approximately 6.8 acre parcel of private land.

This Decommissioning Plan ("**Plan**") provides an overview of activities that will occur during the decommissioning phase of the Solar Facility, including activities related to the restoration of land, the management of materials and waste, projected costs, and a decommissioning funding requirements overview.

The Solar Facility will have a maturity date of twenty (20) to thirty (30) years; however, the Solar Facility and many of its components including grid infrastructure has an estimated useful lifetime of over 30 years. This Plan assumes that the Solar Facility will be dismantled, and the Solar Facility site restored to a state similar to its pre-construction condition at the end of its useful life.

This decommissioning plan is based on current best management practices and procedures. This Plan may be subject to revision based on new standards and emergent best management practices at the time of decommissioning. Permits will be obtained as required and notification will be given to stakeholders prior to decommissioning as per Town requirements and regulations.

2. Decommissioning Process Description:

Decommissioning and restoration activities will adhere to the requirements of appropriate governing authorities, and will be in accordance with applicable federal, state, and local permits. The decommissioning and restoration process comprises removal of above-ground structures; grading, to the extent necessary; restoration of topsoil (if needed) and seeding. The process of removing structures involves evaluating

and categorizing all components and materials into categories of recondition and reuse, salvage, recycling and disposal. The Project consists of numerous materials that can be recycled, including steel, aluminum, glass, copper, and plastics. The components and material will be transported to the appropriate facilities for reconditioning, salvage, recycling, or disposal. Aboveground structures include the panels, racks, inverters, pads and any interconnection facilities located on the property.

2.1 Project Component Removal

Control cabinets, electronic components, and internal cables will be removed. The panels, racks and inverters will be lowered to the ground where they may be transported whole for reconditioning and reuse or disassembled/cut into more easily transportable sections for salvageable, recyclable, or disposable components.

2.2 PV Module Removal

Solar photovoltaic modules used in the project are manufactured within regulatory requirements for toxicity based on Toxicity Characteristic Leaching Procedure (TCLP). The solar panels are not considered hazardous waste. The panels used in the Project will contain silicon, glass, and aluminum which have value for recycling. Modules will be dismantled and packaged per manufacturer or approved recyclers specifications and shipped back to the manufacturer or to an approved off-site approved recycler.

2.3 Equipment Pad Removal

Only one small concrete pad of approximately 160 sq ft will be required for installing transformers and other electrical equipment. This concrete pad will be excavated to a depth sufficient to remove all anchor bolts, rebar, conduits, cable, and concrete to a depth of 24 inches below grade. The remaining excavation will be filled with clear subgrade material of quality comparable to the immediate surrounding area. The sub-grade material will be compacted to a density similar to surrounding subgrade material. All unexcavated areas compacted by equipment used in decommissioning shall be de-compacted in a manner to adequately restore the topsoil and sub-grade material to the proper density consistent and compatible with the surrounding area.

2.4 Electric Wire Removal

Electric wire made from copper or aluminum has value for recycling. DC wiring can be removed manually from the panels to the inverter. Underground wire to the interconnection pole will be pulled and removed from the ground. Overhead cabling for the interconnection will be removed from poles. All wire will be sent to an approved recycling facility.

2.5 Racking and Fencing removal

All racking and fencing material will be broken down into manageable units and removed from the facility and sent to an approved recycler. All racking posts driven into the ground will be pulled and removed.

2.6 Site Restoration Process Description

Following decommissioning activities, the sub-grade material and topsoil from affected areas will be de-compacted and restored to a density and depth consistent with the surrounding areas. The affected areas will be inspected, thoroughly cleaned, and all construction-related debris removed. Disturbed areas will be reseeded to promote re-vegetation of the area unless the area is to be immediately redeveloped. In all areas restoration shall include, as reasonably required, leveling, terracing, mulching, and other necessary steps to prevent soil erosion, to ensure establishment of suitable grasses and forbs, and to control noxious weeds and pests.

3. Decommissioning Terms

The project shall be decommissioned within 180 days of the end of the project's operational life. Areas disturbed during the decommissioning phase will be seeded with a drought-tolerant grass seed mix appropriate for the area, unless such areas are being immediately redeveloped for other uses. The gravel access road will remain intact.

4. Costs of Decommissioning

Though it is hard to accurately determine the cost after 20 or 25 years, below is an educated attempt to estimate the costs involved based on guidance from NYSERDA and estimates from a more mature Massachusetts solar market.

Task	**Costs**
Remove panels	1,225
Remove rack wiring	1,230
Dismantle racks	6,175
Remove and load electrical equipment	925
Break up concrete pads	750
Remove Racks	3,900
Remove cables	3,250
Remove ground screws and power poles	6,925
Remove fence	2,475
Grading	2,000
Seed disturbed areas	1,040
Transportation to recycling centers	1,125
Current Total	**$31,020**

Given the cost of components today, and the salvage value associated with such components today (structural steel, transformer, copper cables, aluminum frames etc), the cost of decommissioning the solar arrays could be largely offset by the salvage value of the Solar Facility components. However, salvage value is excluded from the Decommissioning Cost estimate.

5. Decommissioning Fund Commitment

Prior to starting any construction work, Allen Solar, LLC commits to providing the Town with a performance bond or a bank Letter of Credit or any other financial security in a format acceptable to the Town in the amount of $32,000 towards the decommissioning activities of the Project.

Contact information for the project proponent is as follows:

Full Name of Company: Allen Solar, LLC

Contact: Lucy Fowler

Address: 143 Highland Shores Rd, Casco, ME 04015

Telephone: (207) 615-6850

Email: lucyfowler@nextphaseenergyservices.com

Exhibit G
Maine Historic Preservation Commission
Request for Comment

22207
August 7, 2023

Maine Historic Preservation Commission
Attention: Kirk F. Mohney, Director
55 Capitol Street, 65 State House Station
Augusta, Maine, 04333-0065

Subject: Historic Review
Proposed Solar Project
Roosevelt Trail, Raymond, Maine

Dear Mr. Mohney,

Watershed Resource Consultants, LLC is conducting permitting assistance services for a proposed solar project on Roosevelt Trail in Raymond, Maine. This letter is to request Maine Historic Preservation Commission (MHPC) review of the project. We understand that MHPC will review the site for known or potential historic and pre-historic resources.

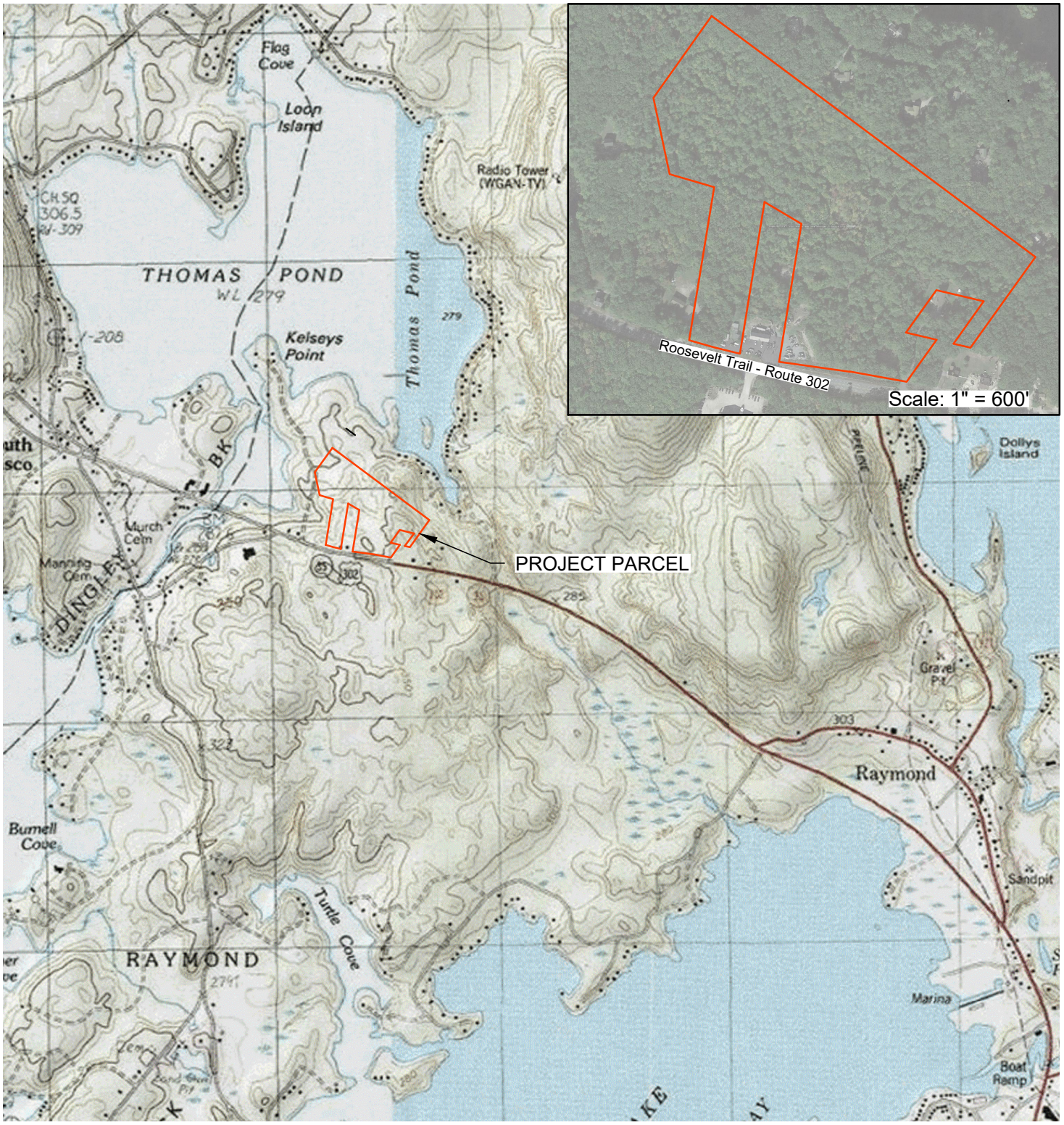
Attached to this letter are a Site Location Map, a plan showing the proposed project, and a tax map referencing each abutting lot and photograph sheets referenced to the tax maps. Only parcels directly abutting the project parcel with structures is included on the tax maps and photograph sheets.

Thank you for your review, if you have any questions, please contact us.

Sincerely,

Watershed Resource Consultants, LLC

Jeanna Leclerc
Project Scientist | ***Watershed Resource Consultants, LLC***
jleclerc@wrcmaine.com
207-610-2623



0 2000' 4000' 6000'

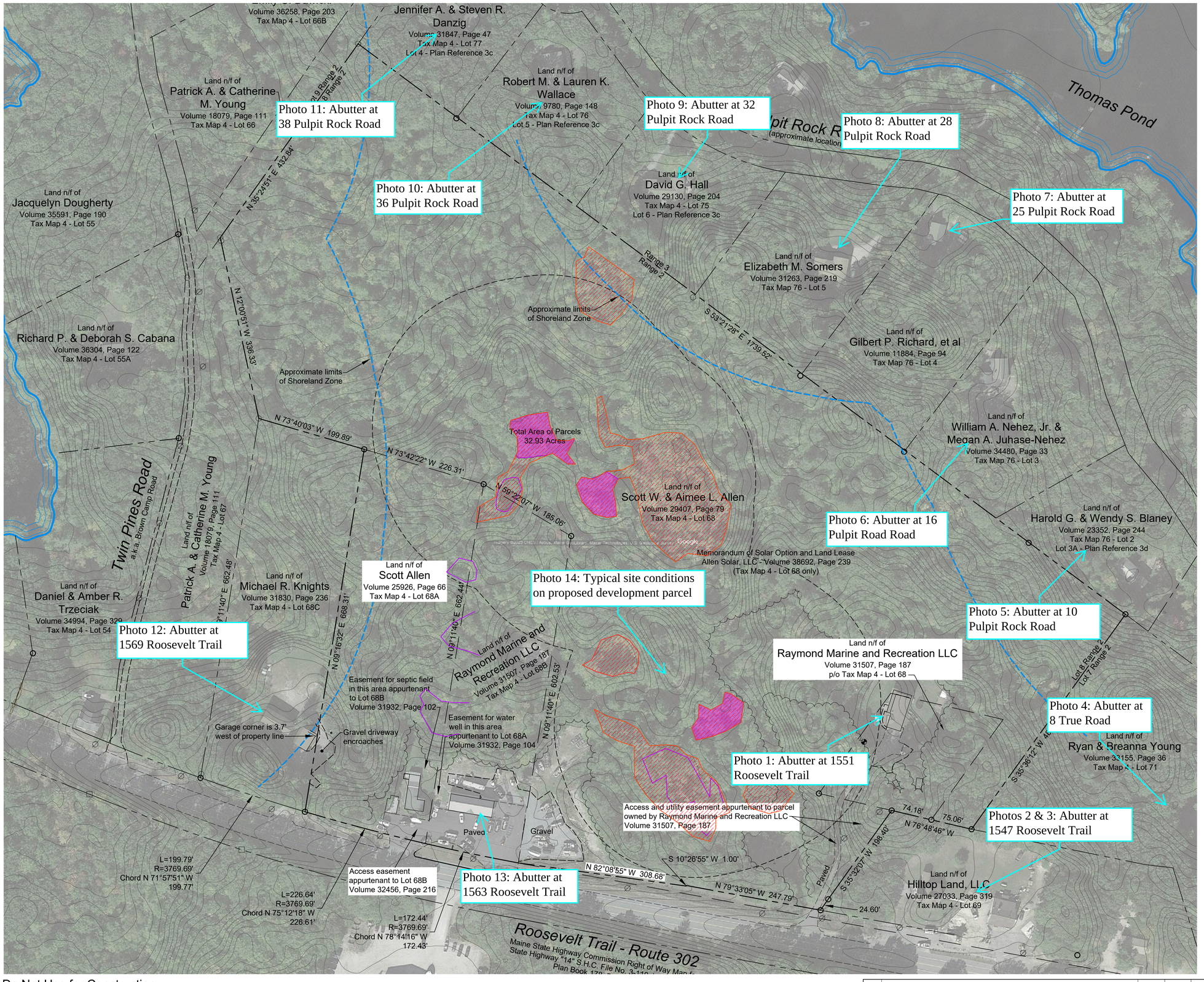
Scale: 1" = 2,000'

Do Not Use for Construction
For Regulatory Review Only

Site Location Map

Mainely Solar, LLC.
143 Highland Shores Road
Casco, Maine

Job No.: MS001	Scale: As Noted
Date: 8/24/2023	Sheet: 1



MHPC Photo Key

Watershed Resource Consultants, LLC.

1366 State Hwy 102
#6 Bar Harbor, ME 04609
(207) 944-7288
rstamand@wrcmaine.com

PO Box 145
Orrington, ME 825-4050
(207) 825-4050
lburman@wrcmaine.com

Preliminary Worksheet

Allen Solar
Route 302
Raymond, Maine

Job No.: 22207	Scale: 1" = 80'
Date: 5/16/2023	Sheet:

No.	Revision Description	Drwn.	Chk'd	Date
—	—	—	—	—
—	—	—	—	—

Do Not Use for Construction
For Regulatory Review Only

0 80' 160' 240'

Photo 1: Abutter at 1551 Roosevelt Trail, Map 4 Lot 68.

Photo 2: Abutter at 1547 Roosevelt Trail, Map 4 Lot 69, building 1.

Photo 3: Abutter at 1547 Roosevelt Trail, Map 4, Lot 69, building 2.

Photo 4: Abutter at 8 True Road, Map 4 Lot 71.

Photo 5: Abutter at 10 Pulpit Rock Road, Map 76 Lot 2.

Photo 6: Abutter at 16 Pulpit Rock Road Map 76 Lot 3.

Photo 7: Abutter at 25 Pulpit Rock Road, Map 76 Lot 4.

Photo 8: Abutter at 28 Pulpit Rock Road, Map 76 Lot 5.

Photo 9: Abutter at 32 Pulpit Rock Road, Map 4 Lot 75.

Photo 10: Abutter at 36 Pulpit Rock Road, Map 4, Lot 76.

Photo 11: Abutter at 38 Pulpit Rock Road, Map 4, Lot 77.

Photo 12: Abutter at 1569 Roosevelt Trail, Map 4, Lot 68C.

Photo 13: Abutter at 1563 Roosevelt Trail, Map 4, Lot 68B.

Photo 14: Typical site conditions at Map 4, Lot 68, proposed development parcel.

Exhibit H
Solar Equipment Manufacturer Specifications

powered by Q.ANTUM DUO Z

Q.PEAK DUO XL-G11.3

570-590

ENDURING HIGH PERFORMANCE

ntv GERMANY'S MOST POPULAR PROVIDER Life & Living Award 2021 1st Place Solar Technology Customer rating from 11 brands www.ntv.de DEUTSCHES INSTITUT FÜR SERVICE-QUALITÄT GmbH & Co. KG

EUPD RESEARCH TOP BRAND PV MODULES EUROPE 2021

Q CELLS Yield Security

BREAKING THE 21% EFFICIENCY BARRIER
Q.ANTUM DUO Z Technology with zero gap cell layout boosts module efficiency up to 21.7%.

LOW ELECTRICITY GENERATION COSTS
Higher yield per surface area, lower BOS costs and up to 175 watts more module power than standard 144 half-cell modules.

ENDURING HIGH PERFORMANCE
Long-term yield security with Anti LID Technology, Anti PID Technology[1], Hot-Spot Protect and Traceable Quality Tra.Q™.

EXTREME WEATHER RATING
High-tech aluminium alloy frame, certified for high snow (5400 Pa) and wind loads (2400 Pa).

A RELIABLE INVESTMENT
Inclusive 12-year product warranty and 25-year linear performance warranty[2].

STATE OF THE ART MODULE TECHNOLOGY
Q.ANTUM DUO combines cutting edge cell separation and innovative 12-busbar design with Q.ANTUM Technology.

[1] APT test conditions according to IEC / TS 62804-1:2015, method A (–1500 V, 96 h)
[2] See data sheet on rear for further information.

THE IDEAL SOLUTION FOR:

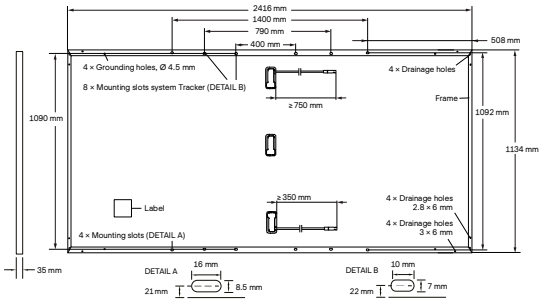
Ground-mounted solar power plants

Engineered in Germany

Q CELLS

MECHANICAL SPECIFICATION

Format	2416 mm × 1134 mm × 35 mm (including frame)
Weight	30.7 kg
Front Cover	3.2 mm thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Anodised aluminium
Cell	6 × 26 monocrystalline Q.ANTUM solar half cells
Junction box	53-101 mm × 32-60 mm × 15-18 mm Protection class IP67, with bypass diodes
Cable	4 mm² Solar cable; (+) ≥ 750 mm, (–) ≥ 350 mm
Connector	Stäubli MC4-Evo2, Hanwha Q CELLS HQC4; IP68



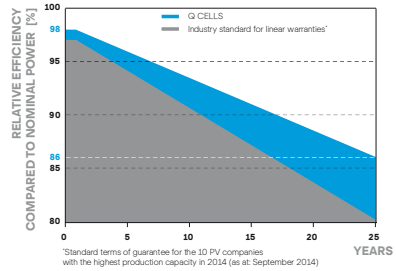
Drawing not to scale

ELECTRICAL CHARACTERISTICS

POWER CLASS				570	575	580	585	590
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC[1] (POWER TOLERANCE +5 W / –0 W)								
Minimum	Power at MPP[1]	P_{MPP}	[W]	570	575	580	585	590
	Short Circuit Current[1]	I_{SC}	[A]	13.49	13.51	13.54	13.57	13.59
	Open Circuit Voltage[1]	V_{OC}	[V]	53.59	53.62	53.64	53.67	53.70
	Current at MPP	I_{MPP}	[A]	12.82	12.87	12.92	12.97	13.01
	Voltage at MPP	V_{MPP}	[V]	44.46	44.68	44.90	45.12	45.33
	Efficiency[1]	η	[%]	≥20.8	≥21.0	≥21.2	≥21.4	≥21.5
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT[2]								
Minimum	Power at MPP	P_{MPP}	[W]	427.6	431.4	435.1	438.9	442.6
	Short Circuit Current	I_{SC}	[A]	10.87	10.89	10.91	10.93	10.95
	Open Circuit Voltage	V_{OC}	[V]	50.54	50.56	50.59	50.62	50.64
	Current at MPP	I_{MPP}	[A]	10.09	10.13	10.17	10.22	10.26
	Voltage at MPP	V_{MPP}	[V]	42.39	42.58	42.77	42.96	43.14

[1]Measurement tolerances P_{MPP} ±3%; I_{SC}; V_{OC} ±5% at STC: 1000 W/m², 25±2°C, AM 1.5 according to IEC 60904-3 • [2]800 W/m², NMOT, spectrum AM 1.5

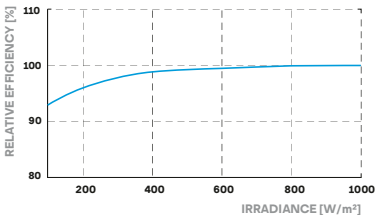
Q CELLS PERFORMANCE WARRANTY



At least 98% of nominal power during first year. Thereafter max. 0.5% degradation per year. At least 93.5% of nominal power up to 10 years. At least 86% of nominal power up to 25 years.

All data within measurement tolerances. Full warranties in accordance with the warranty terms of the Q CELLS sales organisation of your respective country.

PERFORMANCE AT LOW IRRADIANCE



Typical module performance under low irradiance conditions in comparison to STC conditions (25 °C, 1000 W/m²).

TEMPERATURE COEFFICIENTS							
Temperature Coefficient of I_{SC}	α	[%/K]	+0.04	Temperature Coefficient of V_{OC}	β	[%/K]	–0.27
Temperature Coefficient of P_{MPP}	γ	[%/K]	–0.34	Nominal Module Operating Temperature	NMOT	[°C]	43±3

PROPERTIES FOR SYSTEM DESIGN

Maximum System Voltage	V_{SYS}	[V]	1500	PV module classification	Class II
Maximum Reverse Current	I_R	[A]	25	Fire Rating	C
Max. Design Load, Push / Pull		[Pa]	3600 / 1600	Permitted Module Temperature on Continuous Duty	–40 °C - +85 °C
Max. Test Load, Push / Pull		[Pa]	5400 / 2400		

QUALIFICATIONS AND CERTIFICATES

IEC 61215:2016, IEC 61730:2016.
This data sheet complies with DIN EN 50380.

TÜVRheinland CERTIFIED
www.tuv.com
ID 1111220277

CE

PACKAGING INFORMATION

Vertical packaging	2458 mm	1134 mm	1270 mm	1000 kg	20 pallets	16 pallets	31 modules

Note: Installation instructions must be followed. See the installation and operating manual or contact our technical service department for further information on approved installation and use of this product.

Hanwha Q CELLS GmbH
Sonnenallee 17-21, 06766 Bitterfeld-Wolfen, Germany | **TEL** +49 (0)3494 66 99-23444 | **FAX** +49 (0)3494 66 99-23000 | **EMAIL** sales@q-cells.com | **WEB** www.q-cells.com

Engineered in Germany

Q CELLS

TerraTrak

The first and only single axis tracker that allows you to turn unusable land into valuable assets. Built tough for reliable performance, TerraTrak will maximize energy output and returns conquering the most challenging sites. Employ PV where you never thought possible through durable mechanics and intelligent control technology.

Durable Mechanics

- Adaptable frame can accommodate frost susceptible soils, 20% N-S slopes, unlimited E-W eliminating 100% refusal risks
- Durable a-frame, torque tube, gear box, and self-locking hardware increase strength and ensure reliable performance in extreme weather
- Structurally optimized tracker rows and reduced part count simplify installation making it easy and affordable to employ PV anywhere
- Comprehensive wind tunnel analysis and patent pending self-locking hardware which increases stability during weather events
- Proprietary torque tube shape significantly reduces pounds per foot and loading in max capacity to yield in lower material cost and increased strength
- Field ready, lubricant-free with high durable plastics creates a simplistic, functional bushing housing to support the torque tube

terrasmart™

Intelligent Controls

- Proprietary and advanced performance monitoring and controls engineered with bi-directional communications provides real-time performance monitoring data to boost visibility and maximize energy production
- Reduce downtime with predictive analytics and machine learning which tells us when a row isn't tracking on its normal path
- Onsite weather stations monitor wind and snow conditions and automatically stow the site when thresholds are crossed. TerraTrak is also integrated with a weather API which allows us to forecast bad weather and proactively stow your sites before bad weather approaches
- Zone controls allow you to perform routine maintenance like mowing and washing on a portion of the site while the rest of your site continues tracking for optimum power generation
- The persistent cellular connection allows us to troubleshoot each site remotely without rolling a truck
- Row box, weather station, and network controller have been tested to U.S. military standards to ensure reliable operation in the most relenting environmental conditions

Specifications

Module orientation	2 high in portrait
Tracking	120°
Range of motion	± 60°
Weather monitoring	Wind speed, snow depth, and flood height
Corrosion	ISO 9223 C2, C3
Max slope grade	20% N/S, Unlimited E/W
Modules per row	Up to 93 standard framed modules (-2m x 1m)
Drive system	Independent row design / 12 VDC motorized slew drive / Zero grid power consumption
Bushings	High impact polymer / Lubricant-free, Dry bushings
Bearing housings	Hard stop at each foundation / Integrated torque tube translation mitigation
Fasteners	Standard sizes / Self-locking / No special tools required
Material coating	HDG, Inline, Pre-galvanization, Powder coating

Adjustable foundations	Flexibility installation allows marketing leading adjustability
DC capacity per tow	33.49kW, assuming 385W x 87 mods/row
Grounding	Self-grounding racking
Electrical subsystem	Highly advanced BMS hardware & software
Typical dimensions	Horizontal (93 module row @ 60°) Height: 2.95m / 9.67ft Width: 3.96m / 13ft Length: 47.8m / 156.8ft
GCR	No minimum, typical 28% to 50%
Foundations	Ground screw, Driven piles
Max wind speed	Configurable up to 135mph
Flood clearance	66.6 inches (Grade = top of screw)
Leading edge	24.5 inches (Grade = top of screw)
Warranty	10 year structural, 5 year on drive and control system, 20 years on screw foundations, extended terms available
Certifications	UL3703, UL2703, & IEC 62817

Three-phase pad-mounted compartmental type transformer

General

At Eaton, we are constantly striving to introduce new innovations to the transformer industry, bringing you the highest quality, most reliable transformers. Eaton's Cooper Power series Transformer Products are ISO 9001 compliant, emphasizing process improvement in all phases of design, manufacture, and testing. In order to drive this innovation, we have invested both time and money in the Thomas A. Edison Technical Center, our premier research facility in Franksville, Wisconsin. Such revolutionary products as distribution-class UltraSIL™ Polymer-Housed Evolution™ surge arresters and Envirotemp™ FR3™ fluid have been developed at our Franksville lab.

With transformer sizes ranging from 45 kVA to 12 MVA and high voltages ranging from 2400 V to 46 kV, Eaton has you covered. From fabrication of the tanks and cabinets to winding of the cores and coils, to production of arresters, switches, tap changers, expulsion fuses, current limit fuses, bushings (live and dead) and molded rubber goods, Eaton does it all. Eaton's Cooper Power series transformers are available with electrical grade mineral oil or Envirotemp™ FR3™ fluid, a less-flammable and bio-degradable fluid. Electrical codes recognize the advantages of using Envirotemp™ FR3™ fluid both indoors and outdoors for fire sensitive applications. The bio-based fluid meets Occupational Safety and Health Administration (OSHA) and Section 450.23 NEC Requirements.

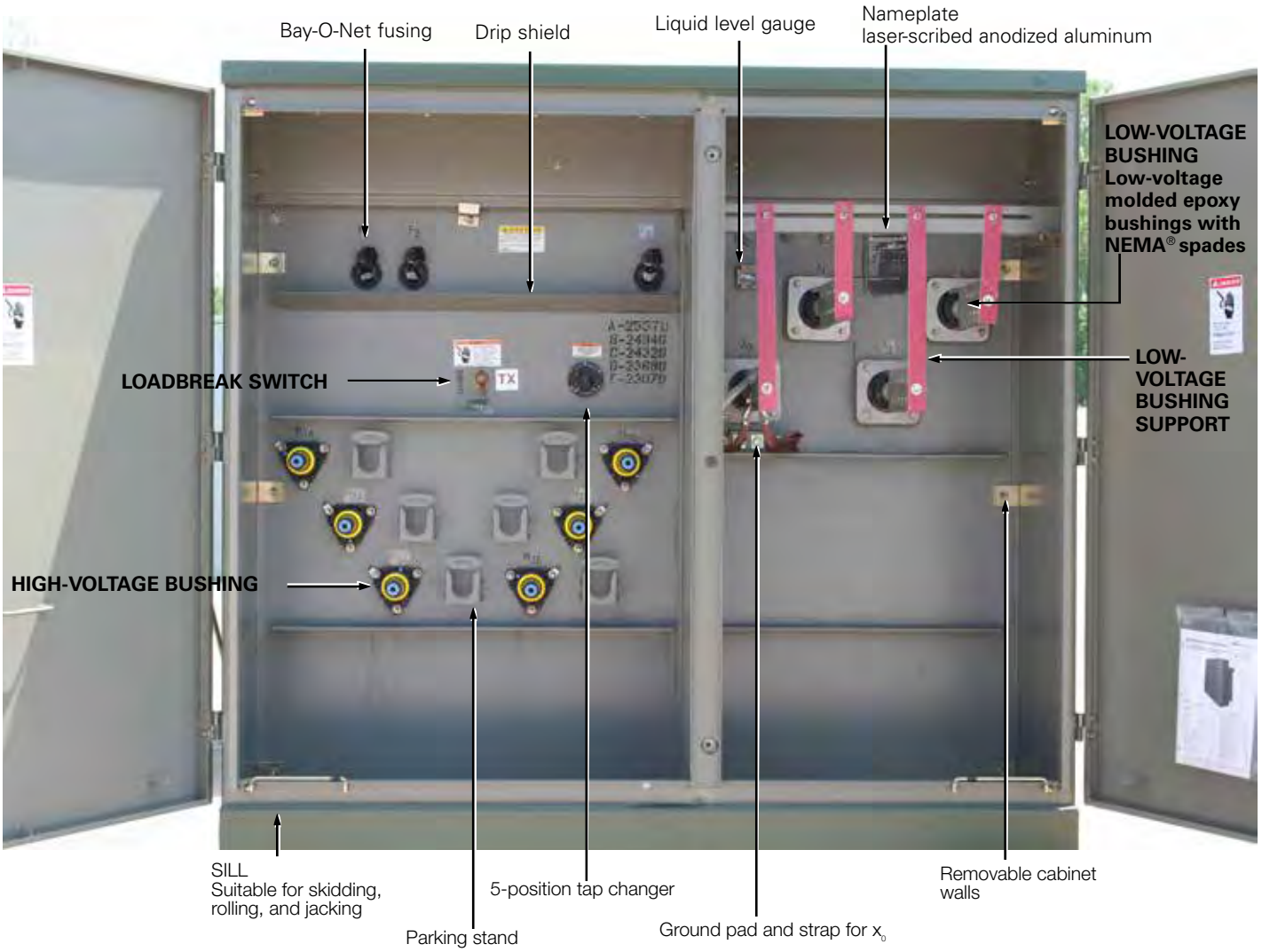


Figure 1. Three-phase pad-mounted compartmental type transformer.

Table 1. Product Scope

Type	Three Phase, 50 or 60 Hz, 65 °C Rise (55 °C, 55/65 °C), 65/75 °C, 75 °C
Fluid Type	Mineral oil or Envirotemp™ FR3™ fluid
Coil Configuration	2-winding or 4-winding or 3-winding (Low-High-Low), 3-winding (Low-Low-High)
Size	45 – 10,000 kVA
Primary Voltage	2,400 – 46,000 V
Secondary Voltage	208Y/120 V to 14,400 V
Specialty Designs	Inverter/Rectifier Bridge
	K-Factor (up to K-19)
	Vacuum Fault Interrupter (VFI)
	UL® Listed & Labeled and Classified
	Factory Mutual (FM) Approved®
	Solar/Wind Designs
	Differential Protection
	Seismic Applications (including OSHPD)
	Hardened Data Center

Table 2. Three-Phase Ratings

Three-Phase 50 or 60 Hz
kVA Available[1]:
45, 75, 112.5, 150, 225, 300, 500, 750, 1000, 1500, 2000, 2500, 3000, 3750, 5000, 7500, 10000

[1]Transformers are available in the standard ratings and configurations shown or can be customized to meet specific needs.

Table 3. Impedance Voltage

	Low-voltage rating		
Rating (kVA)	**≤ 600 V**	**2400 Δ through 4800 Δ**	**6900 Δ through 13800GY/7970 or 13800 Δ**
45-75	2.70-5.75	2.70-5.75	2.70-5.75
112.5-300	3.10-5.75	3.10-5.75	3.10-5.75
500	4.35-5.75	4.35-5.75	4.35-5.75
750-2500	5.75	5.75	5.75
3750	5.75	5.75	6.00
5000		6.00	6.50

Note: The standard tolerance is ± 7.5%

Table 4. Audible Sound Levels

	NEMA® TR-1 Average
Self-Cooled, Two Winding kVA Rating	**Decibels (dB)**
45-500	56
501-700	57
701-1000	58
1001-1500	60
1501-2000	61
2001-2500	62
2501-3000	63
3001-4000	64
4001-5000	65
5001-6000	66
6001-7500	67
7501-10000	68

Table 5. Insulation Test Levels

KV Class	Induced Test 180 or 400 Hz 7200 Cycle	kV BIL Distribution	Applied Test 60 Hz (kV)
1.2	Twice Rated Voltage	30	10
2.5		45	15
5		60	19
8.7		75	26
15		95	34
25		125	40
34.5		150	50

Table 6. Temperature Rise Ratings 0-3300 Feet (0-1000 meters)

	Standard	Optional
Unit Rating (Temperature Rise Winding)	65 °C	55 °C, 55/65 °C, 75 °C
Ambient Temperature Max	40 °C	50 °C
Ambient Temperature 24 Hour Average	30 °C	40 °C
Temperature Rise Hotspot	80 °C	65 °C

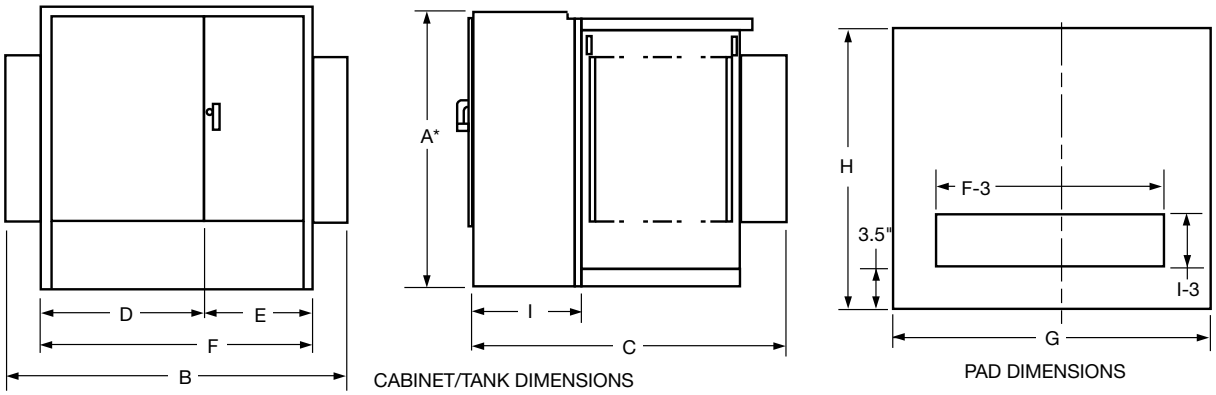


Figure 2. Transformer and pad dimensions.

* Add 9" for Bay-O-Net fusing.

Table 7. Fluid-filled—aluminum windings 55/65 °C Rise[1]

65° Rise	DEAD-FRONT—LOOP OR RADIAL FEED—BAY-O-NET FUSING OIL FILLED—ALUMINUM WINDINGS										
	OUTLINE DIMENSIONS (in.)									Gallons of Fluid	Approx. Total Weight (lbs.)
kVA Rating	A*	B	C	D	E	F	G	H	I		
45	50	68	39	42	26	68	72	43	20	110	2,100
75	50	68	39	42	26	68	72	43	20	115	2,250
112.5	50	68	49	42	26	68	72	53	20	120	2,350
150	50	68	49	42	26	68	72	53	20	125	2,700
225	50	72	51	42	30	72	76	55	20	140	3,150
300	50	72	51	42	30	72	76	55	20	160	3,650
500	50	89	53	42	30	72	93	57	20	190	4,650
750	64	89	57	42	30	72	93	61	20	270	6,500
1000	64	89	59	42	30	72	93	63	20	350	8,200
1500	73	89	86	42	30	72	93	90	24	410	10,300
2000	73	72	87	42	30	72	76	91	24	490	12,500
2500	73	72	99	42	30	72	76	103	24	530	14,500
3000	73	84	99	46	37	84	88	103	24	620	16,700
3750	84	85	108	47	38	85	88	112	24	660	19,300
5000	84	96	108	48	48	96	100	112	24	930	25,000
7500	94	102	122	54	48	102	100	126	24	1,580	41,900

1 Weights, gallons of fluid, and dimensions are for reference only and not for construction. Please contact Eaton for exact dimensions.

* Add 9" for Bay-O-Net fusing.

Table 8. Fluid-Filled—Copper Windings 55/65 °C Rise[1]

65° Rise	DEAD-FRONT—LOOP OR RADIAL FEED—BAY-O-NET FUSING OIL FILLED—COPPER WINDINGS										
	OUTLINE DIMENSIONS (in.)									Gallons of Fluid	Approx. Total Weight (lbs.)
kVA Rating	A*	B	C	D	E	F	G	H	I		
45	50	64	39	34	30	64	69	43	20	110	2,100
75	50	64	39	34	30	64	69	43	20	115	2,350
112.5	50	64	49	34	30	64	69	53	20	115	2,500
150	50	64	49	34	30	64	69	53	20	120	2,700
225	50	64	51	34	30	64	73	55	20	140	3,250
300	50	64	51	34	30	64	75	55	20	160	3,800
500	50	81	53	34	30	64	85	57	20	200	4,800
750	64	89	57	42	30	72	93	61	20	255	6,500
1000	64	89	59	42	30	72	93	63	20	300	7,800
1500	73	89	86	42	30	72	93	90	24	410	10,300
2000	73	72	87	42	30	72	76	91	24	420	11,600
2500	73	72	99	42	30	72	76	103	24	500	14,000
3000	73	84	99	46	37	84	88	103	24	720	18,700
3750	84	85	108	47	38	85	88	112	24	800	20,500
5000	84	96	108	48	48	96	100	112	24	850	25,000
7500	94	102	122	54	48	102	100	126	24	1,620	46,900

[1] Weights, gallons of fluid, and dimensions are for reference only and not for construction. Please contact Eaton for exact dimensions.

* Add 9" for Bay-O-Net fusing.

Standard features

Connections and neutral configurations

- Delta - Wye: Low voltage neutral shall be a fully insulated X0 bushing with removable ground strap.
- Grounded Wye-Wye: High voltage neutral shall be internally tied to the low voltage neutral and brought out as the H0X0 bushing in the secondary compartment with a removable ground strap.
- Delta-Delta: Transformer shall be provided without a neutral bushing.
- Wye-Wye: High voltage neutral shall be brought out as the H0 bushing in the primary compartment and the low voltage neutral shall be brought as the X0- bushing in the secondary compartment.
- Wye-Delta: High voltage neutral shall be brought out as the H0 bushing in the primary compartment. No ground strap shall be provided (line to line rated fusing is required).

High and low voltage bushings

- 200 A bushing wells (15, 25, and 35 kV)
- 200 A, 35 kV Large Interface
- 600 A (15, 25, and 35 kV) Integral bushings (dead-front)
- Electrical-grade wet-process porcelain bushings (live-front)

Tank/cabinet features

- Bolted cover for tank access (45-2500 kVA)
- Welded cover with hand hole (>2500 kVA)
- Three-point latching door for security
- Removable sill for easy installation
- Lifting lugs (4)
- Stainless steel cabinet hinges and mounting studs
- Steel divider between HV and LV compartment
- 20" Deep cabinet (45-1000 kVA)
- 24" Deep cabinet (1500-7500 kVA)
- 30" Deep cabinet (34.5/19.92 kV)
- Pentahead captive bolt
- Stainless steel 1-hole ground pads (45-500 kVA)
- Stainless steel 2-hole ground pads (750-10,000 kVA)
- Parking Stands (dead-front)

Valves/plugs

- One-inch upper filling plug
- One-inch drain plug (45-500 kVA)
- One-inch combination drain valve with sampling device in low voltage compartment (750-10,000 kVA)
- Automatic pressure relief valve

Nameplate

- Laser-scribed anodized aluminum nameplate

Figure 3. Drain valve with sampler.

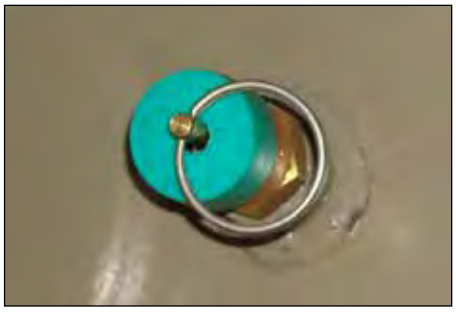


Figure 4. Automatic Pressure relief valve.

Figure 5. Liquid level gauge.

Figure 6. External Gauges.

Figure 7. External visible break with gauges.

Optional features

High and low voltage bushings

- 200 A (15, 25 kV) bushing inserts
- 200 A (15, 25 kV) feed thru inserts
- 200 A (15, 25 kV) (HTN) bushing wells with removable studs
- High-voltage 600 A (15, 25, 35 kV) deadbreak one-piece bushings
- Low voltage 6-, 8-holes spade
- Low voltage 12-, 16-, 20-holes spade (750-2500 kVA)
- Low voltage bushing supports

Tank/cabinet features

- Stainless steel tank base and cabinet
- Stainless steel tank base, cabinet sides and sill
- 100% stainless steel unit
- Service entrance (2 inch) in sill or cabinet side
- Touch-up paint (domestic)
- Copper ground bus bar
- Kirk-Key provisions
- Nitrogen blanket
- Bus duct cutout

Special designs

- Factory Mutual (FM)
- UL® Classified
- Triplex
- High altitude
- K-Factors
- Step-up
- Critical application
- Modulation transformers
- Seismic applications (including OSHPD)

Switches

- One, two, or three On/Off loadbreak switches
- 4-position loadbreak V-blade switch or T-blade switch
- Delta-wye switch
- 3-position V-Blade selector switch
- 100 A, 150 A, 300 A tap changers
- Dual voltage switch
- Visible break with VFI interrupter interlock
- External visible break (15, 25, and 35 kV, up to 3 MVA)
- External visible break with gauges (15, 25, and 35 kV, up to 3 MVA)

Gauges and devices

- Liquid level gauge (optional contacts)
- Pressure vacuum gauge (optional contacts and bleeder)
- Dial-type thermometer (optional alarm contacts)
- Cover mounted pressure relief device (optional alarm contacts)
- Ground connectors
- Hexhead captive bolt
- Molded case circuit breaker mounting provisions
- External gauges in padlockable box

Overcurrent protection

- Bay-O-Net fusing (Current sensing, dual sensing, dual element, high amperage overload)
- Bay-O-Net expulsion fuse in series with a partial range under-oil ELSP current limiting fuse (below 23 kV)
- Cartridge fusing in series with a partial range under-oil ELSP current limiting fuse (above 23 kV)
- MagneX™ interrupter with ELSP current-limiting fuse
- Vacuum Fault Interrupter (VFI)
- Visible break window
- Fuse/switch interlock

Valves/plugs

- Drain/sampling valve in high-voltage compartment
- Globe type upper fill valve

Overvoltage protection

- Distribution-, intermediate-, or station-class surge arresters
- Elbow arresters (for dead-front connections)

Metering/fan/control

- Full metering package
- Current Transformers (CTs)
- Metering Socket
- NEMA® 4 control box (optional stainless steel)
- NEMA® 7 control box (explosion proof)
- Fan Packages

Testing

- Customer test witness
- Customer final inspection
- Zero Sequence Impedance Test
- Heat Run Test
- ANSI® Impulse Test
- Audible Sound Level Test
- RIV (Corona) Test
- Dissolved Gas Analysis (DGA) Test
- 8- or 24-Hour Leak Test

Coatings (paint)

- ANSI® Bell Green
- ANSI® #61 Light Gray
- ANSI® #70 Sky Gray
- Special paint available per request

Nameplate

- Stainless steel nameplate

Decals and labels

- High voltage warning signs
- Mr. Ouch
- Bi-lingual warning
- DOE compliant
- Customer stock code
- Customer stenciling
- Shock and arc flash warning decal
- Non-PCB decal

Construction

Core

The three-legged, step-lap mitered core construction is manufactured using a high-quality cutting machine. For maximum efficiency, cores are precisely stacked, virtually eliminating gaps in the corner joints.

Five-legged wound core or shell-type triplex designs are used for wye-wye connected transformers, and other special transformer designs.

Cores are manufactured with precision cut, burr-free, grain-oriented silicon steel. Many grades of core steel are available for optimizing core loss efficiency.

Coils

Pad-mounted transformers feature a rectangular coil configuration with wire-wound, high-voltage primaries and sheet-wound secondaries. The design minimizes axial stress developed by short circuits and provides for magnetic balancing of tap connections.

Coils are wound using the highest quality winding machines providing exacting tension control and conductor placement for superior short-circuit strength and maximum efficiency.

Extra mechanical strength is provided by diamond pattern, epoxy-coated paper insulation, used throughout the coil, with additional epoxy at heavy stress points. The diamond pattern distribution of the epoxy and carefully arranged ducts, provide a network of passages through which cooling fluid can freely circulate.

Coil assemblies are heat-cured under calculated hydraulic pressure to ensure performance against short-circuit forces.

Core and coil assemblies

Pad-mounted transformer core and coil assemblies are braced with heavy steel ends to prevent the rectangular coil from distorting under short-circuit conditions. Plates are clamped in place using presses, and welded or bolted to form a solid core and coil assembly. Core and coil assemblies exceed ANSI® and IEEE® requirements for short-circuit performance. Due to the rigidity of the design, impedance shift after short-circuit is comparable to that of circular wound assemblies.

Tanks

Transformer tanks are designed for high strength and ease of handling, installation, and maintenance. Tanks are welded using precision-cut, hot rolled, pickled and oiled steel. They are sealed to protect the insulating fluid and other internal components.

Transformer tanks are pressure-tested to withstand 7 psig without permanent distortion and 15 psig without rupture.

Tank finish

An advanced multi-stage finishing process exceeds IEEE Std C57.12.28™-2014 standards. The eight-stage pre-treatment process assures coating adhesion and retards corrosion. It converts tank surfaces to a nonmetallic, water insoluble iron phosphate coating.

The paint method consists of two distinct layers of paint. The first is an epoxy primer (E-coat) layer which provides a barrier against moisture, salt and corrosives. The two-component urethane final coat seals and adds ultraviolet protection.

Vacuum processing

Transformers are dried and filled with filtered insulating fluid under vacuum, while secondary windings are energized. Coils are heated to drive out moisture, ensuring maximum penetration of fluid into the coil insulation system.

Insulating fluid

Eaton's Cooper Power series transformers are available with electrical-grade mineral insulating oil or Envirotemp™ FR3™ fluid. The highly refined fluids are tested and degassed to assure a chemically inert product with minimal acid ions. Special additives minimize oxygen absorption and inhibit oxidation. To ensure high dielectric strength, the fluid is re-tested for dryness and dielectric strength, refiltered, heated, dried, and stored under vacuum before being added to the completed transformer.

Eaton's Cooper Power series transformers filled with Envirotemp™ FR3™ fluid enjoy unique fire safety, environmental, electrical, and chemical advantages, including insulation life extending properties.

A bio-based, sustainable, natural ester dielectric coolant, Envirotemp™ FR3™ fluid quickly and thoroughly biodegrades in the environment and is non-toxic per acute aquatic and oral toxicity tests.

Building for Environmental and Economic Sustainability (BEES) total life cycle assessment software, utilized by the US Dept. of Commerce, reports its overall environmental performance impact score at 1/4th that reported for mineral oil. Envirotemp™ FR3™ fluid has also earned the EPA Environmental Technology Verification of transformer materials.

With a fire point of 360 °C, Envirotemp™ FR3™ fluid is FM Approved® and Underwriters Laboratories (UL®) Classified "Less-Flammable" per NEC® Article 450-23, fitting the definition of a Listed Product per NEC®.

Figure 8. VFI transformer with visible break.

Pad-mounted VFI transformer

Eaton's Cooper Power series VFI transformer combines a conventional distribution transformer with the proven Vacuum Fault Interrupter (VFI). This combination provides both voltage transformation and transformer over current protection in one space saving and money saving package. The pad-mounted VFI transformer protects the transformer and provides proper coordination with upstream protective devices. When a transformer fault or overload condition occurs, the VFI breaker trips and isolates the transformer.

The three-phase VFI breaker has independent single-phase initiation, but is three-phase mechanically gang-tripped. A trip signal on any phase will open all three phases. This feature eliminates single-phasing of three phase loads. It also enables the VFI breaker to be used as a three-phase load break switch.

Due to the resettable characteristics of the VFI breaker, restoring three-phase service is faster and easier.

The sealed visible break window and switch is an option that can be installed to provide visible break contact. This feature provides enhanced safety and allows an operator to see if the loadbreak switch contacts are in an open or closed position before performing maintenance.

Envirotran™ FM Approved special protection transformer

Eaton's Cooper Power series Envirotran™ transformer is FM Approved and suitable for indoor locations. Factory Mutual Research Corporation's (FMRC) approval of the Envirotran transformer line makes it easy to comply with and verify compliance with Section 450.23, 2008 NEC, Less-Flammable Liquid-Filled Transformer Requirements for both indoor and outdoor locations.

Envirotran FM Approved transformers offer the user the benefit of a transformer that can be easily specified to comply with NEC, and makes FM Safety Data Sheet compliance simpler, while also providing maximum safety and flexibility for both indoor and outdoor installations.

Because the "FM Approved" logo is readily visible on the transformer and its nameplate, NEC compliance is now easily verifiable by the inspector.

Envirotran FM Approved transformers are manufactured under strict compliance with FMRC Standard 3990 and are filled with FM Approved Envirotemp™ FR3™ fluid, a fire-resistant dielectric coolant.

FM
APPROVED

Special application transformers

Data Center transformer

With focus rapidly shifting from simply maximizing uptime and supporting demand to improving energy utilization, the data center industry is continually looking for methods to increase its energy efficiency and reliability. Utilizing cutting edge technology, Eaton's Cooper Power series Hardened Data Center (HDC) transformers are the solution. Designed with special attention given to surge protection, HDC liquid-filled transformers provide superior performance under the harshest electrical environments. Contrary to traditional dry-type units, HDC transformers provide unsurpassed reliability, overloadability, operational life, efficiency, thermal loading and installed footprint. These units have reliably served more than 100 MW of critical data center capacity for a total of more than 6,000,000 hours without any reported downtime caused by a thermal or short-circuit coil failure.

The top priority in data center operations is uninterrupted service. Envirotran HDC transformers from Eaton, having substantially higher levels of insulation, are less susceptible to voltage surges. Eaton has experienced zero failures due to switching transients. The ANSI® and IEEE® standard impulse withstand ratings are higher for liquid-filled transformers, making them less susceptible to insulation failure. The Envirotran HDC transformer provides ultimate protection by increasing the BIL rating one level higher than standard liquid-filled transformer ratings. The cooling system of liquid-filled transformers provides better protection from severe overloads—overloads that can lead to significant loss of life or failure.

Data center design typically includes multiple layers of redundancy, ensuring maximum uptime for the critical IT load. When best in class transformer manufacturing lead times are typically weeks, not days, an unexpected transformer failure will adversely affect the facility's reliability and profitability. Therefore, the ability to determine the electrical and mechanical health of a transformer can reduce the probability of costly, unplanned downtime. Routine diagnostic tests, including key fluid properties and dissolved gas analysis (DGA), can help determine the health of a liquid-filled transformer. Although sampling is not required for safe operation, it will provide the user with valuable information, leading to scheduled repair or replacement, and minimizing the duration and expense of an outage. With a dry-type transformer, there is no reliable way to measure the health or likelihood of an impending failure.

Solar transformer

As a result of the increasing number of states that are adopting aggressive Renewable & Alternative Energy Portfolio Standards, the solar energy market is growing—nearly doubling year over year. Eaton, a key innovator and supplier in this expanding market, is proud to offer its Cooper Power series Envirotran transformers specifically designed for Solar Photovoltaic medium-voltage applications. Eaton is working with top solar photovoltaic developers, integrators and inverter manufacturers to evolve the industry and change the way we distribute power.

In accordance with this progressive stance, every Envirotran Solar transformer is filled with non-toxic, biodegradable Envirotemp™ FR3™ dielectric fluid, made from renewable seed oils. On top of its biodegradability, Envirotemp™ FR3™ fluid substantially extends the life of the transformer insulation, saving valuable resources. What better way to distribute green power than to use a green transformer. In fact, delaying conversion to Envirotran transformers places the burden of today's environmental issues onto tomorrow's generations. Eaton can help you create a customized transformer, based on site specific characteristics including: temperature profile, site altitude, solar profile and required system life. Some of the benefits gained from this custom rating include:

- Reduction in core losses
- Improved payback on investment
- Reduction in footprint
- Improved fire safety
- Reduced environmental impact

For the solar photovoltaic industry, Eaton is offering standard step up transformers and dual secondary designs, including 4-winding, 3-winding (Low-High-Low) and 3-winding (Low-Low-High) designs.

Wind transformer

Eaton is offering custom designs for renewable energy power generation. Eaton manufactures its Cooper Power series Generator Step-Up (GSU) transformers for installation at the base of every wind turbine. Additionally, grounding transformers are available for wind power generation.

DOE efficiency

The United States Department of Energy (DOE) has mandated efficiency values for most liquid type, medium voltage transformers. As a result, all applicable Eaton's Cooper Power series transformers 2500 kVA and below conform to efficiency levels as specified in the DOE ruling "10 CFR Part 431 Energy Conservation Program".

Underwriters Laboratories® (UL®) Listed and Labeled/ Classified

The Envirotran transformer from Eaton can be specified as UL® Listed & Labeled, and/or UL® Classified. Underwriters Laboratories (UL®) listing is a verification of the design and construction of the transformer to the ANSI® and IEEE® standards. UL® listing generally is the most efficient, cost-effective solution for complying with relevant state and local electrical codes. UL® Combination Classification/Listing is another way in which to comply with Section 450.23, 2008 NEC® requirements. This combines the UL® listed transformer with a UL® Classified Less-Flammable Liquid and complies with the use restrictions found within the liquid Classification.

c UL US
LISTED

K-Factor transformer

With a drastic increase in the use of ferromagnetic devices, arcing devices, and electric power converters, higher frequency loads have increased significantly. This harmonic loading has the potential to generate higher heat levels within a transformer's windings and leads by as much as 300%. Harmonic loading has the potential to induce premature failure in standard-design distribution transformers.

In addition to standard UL® "K-Factor" ratings, transformers can be designed to customer-provided specifications detailing precise loading scenarios. Onsite measurements of magnitude and frequency, alongside harmonic analysis of the connected load can be performed by Eaton engineers or a third party consultant. These field measurements are used to determine exact customer needs and outline the transformer specifications.

Eaton will design harmonic-resistant transformers that will be subjected to the unique harmonic loads. These units are designed to maintain normal temperature rise under harmonic, full-load conditions. Standard UL® "K-Factor" designs can result in unnecessary costs when the "next-highest" K-Factor must be selected for a calculated design factor. To save the customer these unnecessary costs, Eaton can design the transformer to the specific harmonic spectrum used in the application. Eaton's Cooper Power series K-factor transformers are filled with mineral oil or Envirotemp™ FR3™ fluid and enjoy the added benefits of dielectric cooling such as higher efficiencies than dry-type transformers.

Modulation transformer

Bundled with an Outboard Modulation Unit (OMU) and a Control and Receiving Unit (CRU), a Modulation Transformer Unit (MTU) is designed to remotely achieve two way communication.

The use of an MTU reduces travel time and expense versus traditional meter reading performed by high voltage electricians. Additionally, with MTU it is possible to manage and evaluate energy consumption data, providing reduced metering costs and fewer tenant complaints.

An MTU utilizes existing utility infrastructure, therefore eliminating the need to engineer and construct a dedicated communication network.

Figure 9. Modular transformer.

Inverter/rectifier bridge

Eaton complements its range of applications for transformers by offering dual winding designs. These designs are intended for connection to 12-pulse rectifier bridges.

Product attributes

To set us apart from other transformer manufactures, Eaton includes the following guarantees with every three-phase pad-mounted transformer.

Engineered to order (ETO)

Providing the customer with a well developed, cost-effective solution is the number one priority at Eaton. Using customer specifications, Eaton will work with the customer from the beginning to the end to develop a solution to fit their needs. Whether it is application specific, site specific, or a uniquely specified unit, Eaton will provide transformers with the best in class value and performance, saving the customer time and money.

Made in the U.S.A.

Eaton's three-phase pad-mounted transformers are produced right here in the United States of America. Our manufacturing facilities are positioned strategically for rapid shipment of products. Furthermore, should the need arise, Eaton has a broad network of authorized service repair shops throughout the United States.

Superior paint performance

Protecting transformers from nature's elements worldwide, Eaton's E-coat system provides unrivaled transformer paint life, and exceeds IEEE Std C57.12.28™-2014 and IEEE Std C57.12.29™-2005 standards. In addition to the outside of the unit, each transformer receives a gray E-coat covering in the interior of the tank and cabinet, providing superior rust resistance and greater visibility during service.

If the wide range of standard paint selections does not suit the customer's needs, Eaton will customize the paint color to meet their requirements.

Rectangular coil design

Eaton utilizes a rectangular coil design. This winding technique results in a smaller overall unit footprint as well as reducing the transformer weight. The smaller unit size does not hinder the transformer performance in the least. Units have proven short circuit withstand capabilities up to 10 MVA.

Testing

Eaton performs routing testing on each transformer manufactured including the following tests:

- Insulation Power Factor: This test verifies that vacuum processing has thoroughly dried the insulation system to required limits.
- Ratio, Polarity, and Phase Relation: Assures correct winding ratios and tap voltages; checks insulation of HV and LV circuits. Checks entire insulation system to verify all live-to-ground clearances.
- Resistance: This test verifies the integrity of internal high-voltage and low-voltage connections; provides data for loss upgrade calculations.
- Routine Impulse Tests: The most severe test, simulating a lightning surge. Applies one reduced wave and one full wave to verify the BIL rating.
- Applied Potential: Applied to both high-voltage and low-voltage windings, this test stresses the entire insulation system to verify all live-to-ground clearances.
- Induced Potential: 3.46 times normal plus 1000 volts for reduced neutral designs.
- Loss Test: These design verification tests are conducted to assure that guaranteed loss values are met and that test values are

within design tolerances. Tests include no-load loss and excitation current along with impedance voltage and load loss.

- Leak Test: Pressurizing the tank to 7 psig assures a complete seal, with no weld or gasket leaks, to eliminate the possibility of moisture infiltration or fluid oxidation.

Design performance tests

The design performance tests include the following:

- Temperature Rise: Our automated heat run facility ensures that any design changes meet ANSI® and IEEE® temperature rise criteria.
- Audible Sound Level: Ensures compliance with NEMA® requirements.
- Lightning Impulse: To assure superior dielectric performance, this test consists of one reduced wave, two chopped waves and one full wave in sequence, precisely simulating the harshest conditions.

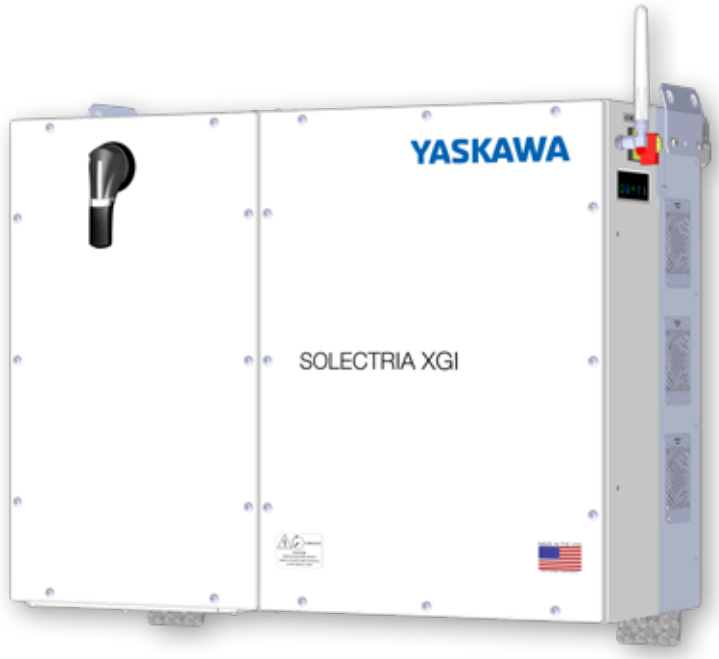
Thomas A Edison Research and Test Facility

We are constantly striving to introduce new innovations to the transformer industry, bringing you the highest quality transformer for the lowest cost. Eaton's Cooper Power series Transformer Products are ISO 9001 compliant, emphasizing process improvement in all phases of design, manufacture, and testing. We have invested millions of dollars in the Thomas A. Edison Technical Center, our premier research facility in Franksville, Wisconsin affirming our dedication to introducing new innovations and technologies to the transformer industry. This research facility is fully available for use by our customers to utilize our advanced electrical and chemical testing labs.

YASKAWA

SOLECTRIA XGI™ 1500

Premium 3-Phase Transformerless Utility-Scale Inverters



Features

- Made in the USA with global components
- Buy American Act (BAA) compliant
- Four models: 125kW/125kVA, 125kW/150kVA, 150kW/166kVA, 166kW/166kVA
- 99.0% peak efficiency
- Flexible solution for distributed and centralized system architecture
- Advanced grid-support functionality Rule 21/UL1741SA
- Robust, dependable and built to last
- Lowest O&M and installation costs
- Access all inverters on site via WiFi from one location
- Remote diagnostics and firmware upgrades
- SunSpec Modbus Certified

Options

- String combiners for distributed and centralized systems
- Web-based monitoring
- Extended warranty

MADE IN THE USA

With U.S. and Global Components

Yaskawa Solectria Solar's XGI 1500 utility-scale string inverters are designed for high reliability and built of the highest quality components that were selected, tested and proven to last beyond their warranty. The XGI 1500 inverters provide advanced grid-support functionality and meet the latest IEEE 1547 and UL 1741 standards for safety. The XGI 1500 inverters are the most powerful 1500VDC string inverters in the PV market and have been engineered for both distributed and centralized system architecture. Designed and engineered in Lawrence, MA, the new SOLECTRIA XGI inverters are assembled and tested at Yaskawa America's facilities in Buffalo Grove, IL. The XGI 1500 inverters are Made in the USA with global components and are compliant with the Buy American Act.

SOLECTRIA SOLAR

SOLECTRIA XGI 1500

Specifications

	XGI 1500-125/125	XGI 1500-125/150	XGI 1500-150/166	XGI 1500-166/166
DC Input				
Absolute Maximum Input Voltage	1500 VDC	1500 VDC	1500 VDC	1500 VDC
Maximum Power Input Voltage Range (MPPT)	860-1250 VDC	860-1250 VDC	860-1250 VDC	860-1250 VDC
Operating Voltage Range (MPPT)	860-1450 VDC	860-1450 VDC	860-1450 VDC	860-1450 VDC
Number of MPP Trackers	1 MPPT	1 MPPT	1 MPPT	1 MPPT
Maximum Operating Input Current	148.3 A	148.3 A	178.0 A	197.7 A
Maximum Operating PV Power	128 kW	128 kW	153 kW	170 kW
Maximum DC/AC Ratio | Max Rated PV Power	2.0 | 250 kW	2.0 | 250 kW	1.66 | 250 kW	1.5 | 250 kW
Max Rated PV Short-Circuit Current (∑Isc x 1.25)	320 A	320 A	320 A	320 A
AC Output				
Nominal Output Voltage	600 VAC, 3-Ph	600 VAC, 3-Ph	600 VAC, 3-Ph	600 VAC, 3-Ph
AC Voltage Range	-12% to +10%	-12% to +10%	-12% to +10%	-12% to +10%
Continuous Real Output Power	125 kW	125 kW	150 kW	166 kW
Continuous Apparent Output Power	125 kVA	150 kVA	166 kVA	166 kVA
Maximum Output Current	120 A	144 A	160 A	160 A
Nominal Output Frequency	60 Hz	60 Hz	60 Hz	60 Hz
Power Factor (Unity default)	+/- 0.85 Adjustable	+/- 0.85 Adjustable	+/- 0.85 Adjustable	+/- 0.85 Adjustable
Total Harmonic Distortion (THD) @ Rated Load	<3%	<3%	<3%	<3%
Grid Connection Type	3-Ph + N/GND	3-Ph + N/GND	3-Ph + N/GND	3-Ph + N/GND
Fault Current Contribution (1 cycle RMS)	144 A	173 A	192 A	192 A
Efficiency				
Peak Efficiency	98.9%	98.9%	99.0%	99.0%
CEC Average Efficiency	98.5%	98.5%	98.5%	98.5%
Tare Loss	<1 W	<1 W	<1 W	<1 W
Temperature				
Ambient Temperature Range	-40°F to 140°F (-40C to 60C)		-40°F to 140°F (-40C to 60C)	
De-Rating Temperature	122°F (50C)		113°F (45C)	
Storage Temperature Range	-40°F to 167°F (-40C to 75C)		-40°F to 167°F (-40C to 75C)	
Relative Humidity (non-condensing)	0 - 95%		0 - 95%	
Operating Altitude	9,840 ft (3 km)		9,840 ft (3 km)	
Communications				
Advanced Graphical User Interface	WiFi			
Communication Interface	Ethernet			
Third-Party Monitoring Protocol	SunSpec Modbus TCP/IP			
Web-Based Monitoring	Optional			
Firmware Updates	Remote and Local			
Testing & Certifications				
Safety Listings & Certifications	UL 1741, IEEE 1547, UL 1998			
Advanced Grid Support Functionality	Rule 21, UL 1741SA			
Testing Agency	ETL			
FCC Compliance	FCC Part 15, Class A			
Warranty				
Standard and Options	5 Years Standard; Option for 10 Years			
Enclosure				
Acoustic Noise Rating	56 dBA @ 3 m			
DC Disconnect	Integrated 2-Pole 250 A DC Disconnect			
Mounting Angle	Vertical only			
Dimensions	Height: 29.5 in. (750 mm) | Width: 39.4 in. (1000 mm) | Depth: 15.1 in. (380 mm)			Specifications subject to change.
Weight	270 lbs (122 kg)			
Enclosure Rating and Finish	Type 4X, Polyester Powder-Coated Aluminum			

SOLECTRIA SOLAR

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Lawrence, MA 01843
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1-978-683-9700
Email: inverters@solectria.com

Document FL.XGI1500.01
9/30/2019

YASKAWA

GEOPAK SERIES SIZE 1 LED

Architectural Wallpack

TRP1/RDI1/QSP1

NEW

Cat.#

Job

Type

HUBBELL Outdoor Lighting

Approvals

SPECIFICATIONS

APPLICATIONS

- Small sized architectural wallpacks in three stylish shapes with molded contours to accentuate building architecture. Provides excellent illumination in energy-saving LED systems.
- Back box accessory available for surface conduit application.

Construction:

- Housing is made from die-cast aluminum with a hinged back-plate for ease of installation and maintenance.
- The LED bezel and trim-plate are made of stainless steel.
- Five powder coat standard finishes, plus custom color options.
- Wet Location Listed to UL924 and UL1598 Standard.

LED:

- 12 high power LEDs delivering up to 3,000 lumens.
- Up to 118 lumens per watt
- Type II, III and IV distributions for a wide variety of applications.
- Zero uplight (UO), dark sky, neighbor friendly

Electrical:

- 120-277 operation, 50/60Hz
- 0-10V dimming driver standard
- 10kA surge protector
- Photocell and occupancy sensor options available for complete on/off and dimming control

Battery Backup:

- Intergral Battery Backup provides emergency lighting for the required 90 minute path of egress.
- Includes a long-life Lithium Iron Phosphate battery with optional battery heater for cold temperature application.
- Utilizes 4 LEDs in emergency mode with 657 lumens. Each of the 4 LEDs in emergency are designed to function independently in the unlikely event of a single LED malfunction
- Spectron® self-testing/self-diagnostic electronics are included standard.

Installation:

- Universal plate for mounting to standard 3 1/2" and 4" square electrical boxes. All connections are made from connections at the rear of the unit.
- Optional back-box accessory available for surface conduit application. See BB-Geo accessories.

Listings:

- UL 1598 listed for use in wet locations
- Drivers IP66 and RoHS compliant
- DesignLights Consortium® (DLC) qualified. Please refer to the DLC website for specific product qualifications at www.designlights.org

Warranty:

- For more information visit:

http://www.hubbelloutdoor.com/resources/warranty/

PRODUCT IMAGE(S)

GEOPAK™

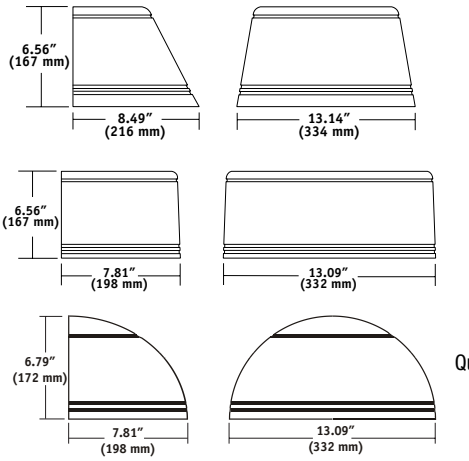
Trapezoid

Round

Quartersphere

Powered by DUALITE

DIMENSIONS



SHIPPING INFORMATION

Catalog Number	Weight (lbs)	Carton Dimensions		
		Length Inch (cm)	Width Inch (cm)	Height Inch (cm)
TRP1	11.5	17.0	9.9	10.0
RDI1	11.5	18.0	11.0	9.25
QSP1	10.5	17.0	9.6	10.5

CERTIFICATIONS/LISTINGS

C SA US

*3000K and warmer CCTs only

DLC QPL LISTED

ORDERING INFORMATION

ORDERING EXAMPLE: TRP-12L-20-4K-3-1-BL-SCP-EH

[ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ]

HOUSING	VERSION	WATTAGE	CCT/CRI	DISTRIBUTION	VOLTAGE	FINISH	CONTROL OPTIONS	OPTIONS
TRP1 Trapezoid	12L 12 LEDS	15 15 watts	3K7 3000K, 70CRI	2 Type II	U 120-277	BL Black	PCU Button Photocell	F[4] Fusing (only available with STD fixture configuration, 120-277V only)
RDI1 Radius		20 20 watts	4K7 4000K, 70CRI	3 Type III	1 120	DB Bronze	SCP[2,3] Programmable Motion Sensor	E[1] Battery Pack (0˚C)
QSP1 Quartersphere		30 30 watts	5K7 5000K, 70CRI	4 Type IV	2 208	GR Gray	SPECIFY SCP HEIGHT: 8F Up to 8ft mount height; 20F Up to 20ft mount height	EH[1] Battery Pack (-30˚C) with heater
					3 240	PS Platinum		
					4 277	WH White		
						CC Custom		

[1] Voltage specific (120 or 277V only)
[2] Must order minimum of one remote control to program dimming settings, 0-10V fully adjustable dimming with automatic daylight calibration and different time delay settings, 120-277V only
[3] PCU option not applicable, included in sensor
[4] Must specify input voltage (120, 208, 240 or 277)

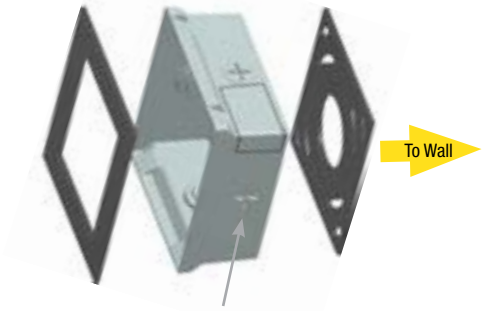
ACCESSORIES - Order separately

Catalog Number	Description
SCP-REMOTE[2]	Remote control for SCP option. Order at least one per project to program and control.
BB-GEO-XX	Back box with 4 - 1/2" threaded conduit holes, specify finish by replacing "XX" with finish selection, eg. Dark Bronze "DB"

[2] Must order minimum of one remote control to program dimming settings, 0-10V fully adjustable dimming with automatic daylight calibration and different time delay settings, 120V-277V only

BB-GEO-XX – Mounted to luminaire

BB-GEO-XX



PERFORMANCE DATA (AC/Standard Configurations)

				5K (5000K nominal, 70 CRI)					4K (4000K nominal, 70 CRI)					3K (3000K nominal, 70 CRI)				
# OF LEDS	DRIVE CURRENT	SYSTEM WATTS	DIST. TYPE	LUMENS	LPW[1]	B	U	G	LUMENS	LPW[1]	B	U	G	LUMENS	LPW[1]	B	U	G
12	350mA	13.9	2	1635	118	1	1	1	1577	113	1	1	1	1497	108	1	1	1
			3	1613	116	1	0	1	1556	112	1	0	1	1477	106	1	0	1
			4	1607	116	0	0	1	1550	111	0	0	1	1471	106	0	0	1
	500mA	19.9	2	2268	114	1	1	1	2176	109	1	1	1	2077	104	1	1	1
			3	2245	113	1	0	1	2140	108	1	0	1	2049	103	1	0	1
			4	2229	112	0	0	1	2150	108	0	0	1	2041	103	0	0	1
	700mA	28.2	2	2942	104	1	1	1	2885	102	1	1	2	2721	96	1	1	1
			3	2912	103	1	0	1	2836	101	1	0	1	2685	95	1	0	1
			4	2892	103	1	0	1	2789	99	1	0	1	2674	95	1	0	1

Electrical Data

Input Power Consumption

Drive Current (mA)	Input Voltage (V)	System Power (w)	Current (Amps)
350mA	120	13.9	0.12
	277		0.05
500mA	120	19.9	0.17
	277		0.07
700mA	120	28.2	0.24
	277		0.10

Battery backup units consume additional power during charging (maximum 32.2 watts for E, 50.7 watts for EH)

Projected Lumen Maintenance

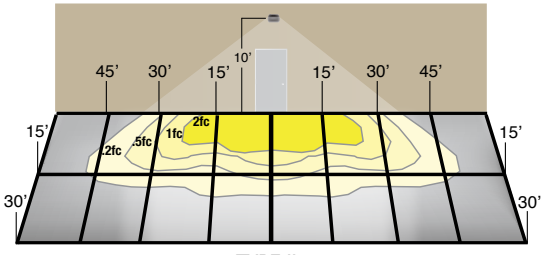
Ambient Temp.	Operating Hours 0	25,000	50,000	TM-21-11[1] 60,000	100,000	L70 (hours)
25°C/77°F	1.00	0.98	0.97	0.95	0.91	>345,000
40°C/104°F	1.00	0.96	0.95	0.92	0.87	>268,000

LUMINAIRE AMBIENT TEMPERATURE FACTOR (LATF)

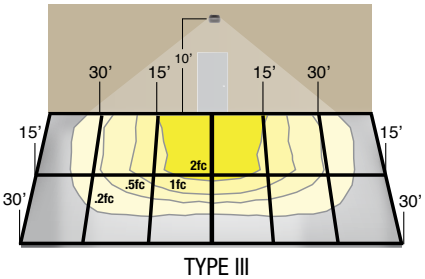
AMBIENT TEMPERATURE		LUMEN MULTIPLIER
0° C	32° F	1.02
10° C	50° F	1.01
20° C	68° F	1.00
25° C	77° F	1.00
30° C	86° F	1.00
40° C	104° F	0.99
50° C	122° F	0.98

Use these factors to determine relative lumen output for average ambient temperatures from 0-40°C (32-104°F).

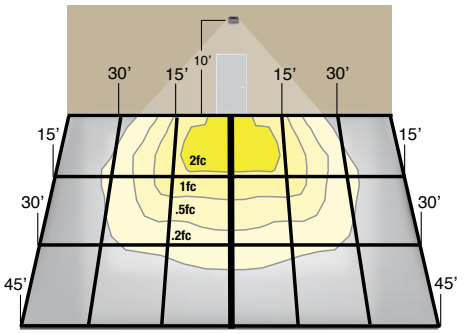
PHOTOMETRIC REPORTS



TYPE II



TYPE III



TYPE IV (Forward throw)