September 18, 2024

VIA ELECTRONIC MAIL AND HAND DELIVERY

Melanie Bachman
Executive Director/Staff Attorney
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: Motion to Reopen and Modify Due to Changed Conditions

PETITION NO. 1592 - Santa Fuel, Inc. petition for a declaratory ruling, pursuant to Connecticut General Statutes §4-176 and §16-50k, for the proposed construction, maintenance and operation of a 3.575-megawatt AC solar photovoltaic electric generating facility located at the 159 South Road, Somers, Connecticut, and associated electrical interconnection.

Dear Attorney Bachman:

On behalf of Santa Fuel, Inc., I do hereby submit a Motion to Reopen and Modify the Decision for Petition No. 1592 due to Changed Conditions ("Motion"). Enclosed please find fifteen (15) copies of the Motion, including Attachments A through D. Please note that copies of Attachment A. (the 24"x36" sets of Revised Site Plans) are bound separately.

We respectfully request that the Motion be reviewed and be placed on the next available Site Council agenda for approval. Please do not hesitate to contact me if you have any questions or require further information.

Sincerely,

Timothy A. Coon, P.E.
J.R. Russo & Associates, LLC

Enclosures
Copy to: Kyzer Gardiola, Louth Callan Renewables
Ernst Swikker, Santa Fuel, Inc.
William Ostrander, Santa Fuel, Inc.

STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

Santa Fuel, Inc. petition for a declaratory ruling, pursuant to Connecticut General Statutes §4-176 and §16-50k, for the proposed construction, maintenance and operation of a 3.85-megawatt AC solar photovoltaic electric generating facility located at the 159 South Road, Somers, Connecticut, and associated electrical interconnection.	Petition No. 1592

September 12, 2024

MOTION OF SANTA FUEL, INC.
TO REOPEN AND MODIFY THE DECISION FOR PETITION NO. 1592
DUE TO CHANGED CONDITIONS

I. INTRODUCTION

Pursuant to Connecticut General Statutes ("Conn. Gen. Stat.") §4-181a(b)[1], Santa Fuel, Inc ("SFI" or "Petitioner") hereby moves to reopen the evidentiary record and modify, based on changed conditions, the decision of the Connecticut Site Council (the "Council") not to issue a declaratory ruling in Petition No. 1592.

Based on the changed conditions and new facts discussed herein, including substantial modification to the Project (as that term is defined below), the Petitioner respectfully requests the Council to reopen the Petition No. 1592 proceeding, consider the changed conditions and new information presented, and issue a declaratory ruling that will allow for the construction, maintenance, and operation of the Modified Project (as that term is defined below).

II. BACKGROUND

On September 19, 2023, the Petitioner submitted to the Council a Petition for Declaratory Ruling pursuant to Conn. Gen. Stat.§§ 4-176(a) and 16-50k(a), for the proposed construction, maintenance, and operation of an approximate 3.85 MW AC ground mounted solar

[1] Conn. Gen. Stat. §4-181a(b) provides, in pertinent part that, "[o]n a showing of changed conditions, the agency may reverse or modify the final decision, at any time, at the request of any person or on the agency's own motion."

photovoltaic electric generating facility (the Project) located at 159 South Road in Somers, Connecticut (the "Project Site").

The Project will support state energy policies as set forth in Conn. Gen. Stat. §16a-35k, including the goal to "develop and utilize renewable energy resources, such as solar and wind energy, to the maximum practicable extent." The Project will provide clean, renewable, solar-powered energy to the Connecticut Light and Power Company d/b/a Eversource Energy ("Eversource") and assist the state in meeting its legislatively-mandated obligations. The Project will also assist the state in reducing greenhouse gas emissions and pollutants.

Before filing the Petition with the Council, the Petitioner actively sought input from the Town of Somers land use boards, including meetings with the Somers Conservation Commission and Zoning Commission. After receiving the Petition, the Council completed a thorough information gathering process and granted the Town of Somers request for a public hearing. During the course of the review, the Petitioner responded to 58 interrogatories of the Council. The Council conducted an evidentiary hearing and public hearing on January 11, 2024. At the public hearing session, interested parties were afforded the opportunity to provide oral limited appearance statements. Interested persons were also afforded the opportunity to provide written limited appearance statements at any time up to 30 days after the close of the evidentiary record. No limited appearance statements, oral or written, were provided. At the conclusion of the evidentiary hearing, the Council closed the evidentiary record. Subsequently, at its regular meeting on March 14, 2024, the Council issued Findings of Fact, an Opinion, and a Decision and Order, denying the Petition for a declaratory ruling.

For reasons discussed in Section IV below, the Petitioner respectfully submits that the concerns expressed by the Council during the Petition No. 1592 proceeding and provided in the

Council's Opinion and Decision and Order have now been satisfactorily addressed. The Petitioner therefore requests that the Council grant its motion to reopen on a showing of changed conditions and approve the Petition.

III. STATUTORY AUTHORITY

Pursuant to Conn. Gen. Stat. §4-181a(b), the Council has the authority to reopen and modify the Decision due to changed conditions that have occurred since the Decision was issued. Conn. Gen. Stat. §4-181a(b) provides, in relevant part that, "[o]n a showing of changed conditions, the agency may reverse or modify the final decision, at any time, at the request of any person or on the agency's own motion." Changed conditions may exist when there is "new information or facts, identification of any unknown or unforeseen events or evidence… that were not available at the time of the final decision."

Consistent with this authority, the Council has reopened a number of dockets and petitions involving solar and other electric generating facilities and modified final decisions based on changed conditions and new facts. As the discussion of changed conditions and new facts and evidence below demonstrates, the Petitioner satisfies the applicable standards with respect to reopening this proceeding and modifying the Decision.

IV. CHANGED CONDITIONS AND NEW INFORMATION

The Petitioner listened carefully to the Council's deliberations and the concerns expressed during their review of the Draft Findings of Fact on February 29, 2024 and March 14, 2024. The Petitioner also reviewed the Opinion and Decision and Order prepared by the Council. Taking these and other factors into consideration, the Petitioner has made the decision to modify the Project's size and layout. The Project will now provide approximately 3.575-megawatt AC of energy at the point of interconnection which will now be located on Mountain View Road (The

Modified Project). Details on the Modified Project may be found in the Revised Site Plans attached hereto as **Attachment A**.

A. MODIFIED PROJECT

The following is a summary of changes that were made to the Project:

- The array was shifted to the north;
- 442 panels were eliminated from the southern and southwestern portions of the array;
- Stormwater management basin #2 (southern basin) was relocated further away from South Road;
- The proposed row of evergreen trees between the array and the residence at 187 South Road has been relocated to the edge of the clearing limits and extended around the corner and along the western edge of the fence line between the array and South Road;
- The point of interconnection has been relocated from the South Road frontage to the Mountain View Road frontage. A dead-end access drive with turn-around has been added at this location to provide the required access for maintenance of the utility poles. Due to sight-line limitations at this location, a permanent sight line easement across other land of the Project Site owner will be required to the required sight distance. A Sight Line Demonstration Plan demonstrating the available sight lines and proposed easement are included in the Revised Site Plan set provided as **Attachment A**;
- Equipment pad #2 (northern pad) has been shifted to the north, further away from the eastern property line;
- Sound barrier walls have been added adjacent to the inverters at the two equipment pads to reduce noise levels at the adjacent property line to the east.
- The existing gated access drive at the northern end of the property will now be used as the main access drive to the solar facility; and
- The chain link fence has been replaced with an agricultural style fence.

The Modified Project reflects:

- An increase in the buffer and vegetation between the array and the existing residential property at 187 South Road. The separation distance from perimeter fence to the property line at 187 South Road has been increased from 57 feet to 172 feet.
- An increase in the buffer and vegetation between the array and South Road. The separation distance from perimeter fence to South Road right-of-way has been increased from 123 feet to 178 feet.
- The nearest grading associated with the construction of Stormwater Basin #2 has increased from approximately 34 feet from the edge of South Road to 198 feet.
- The shift and elimination of solar panels in the southwest corner of the array allows for the retention of more of the existing trees and vegetation within the expanded buffer between the solar array and both South Road and the residential property at 187 South Road.

- The elimination of the visual impacts associated with the access drive and utility poles near the residences along South Road.
- The elimination of the utility work necessary to extend a new circuit on the existing poles along South Road.
- An overall reduction in the tree clearing from approximately 3.05 acres to 2.89 acres.
- An overall reduction in clearing within the former orchard area from approximately 5.30 acres to 3.71 acres.
- An overall reduction in the Limit of Disturbance from approximately 22.1 acres to 21.6 acres.
- A reduction in the site grading.
- An increase in the distance from equipment pad #2 to the eastern property line from 80' to 137'.
- The relocation of equipment pad #2 and the addition of sound barriers at the two equipment pads results in a reduction in the noise levels at the eastern property line. All noise levels at the adjacent property lines will now meet both the daytime and night time noise limits. A noise analysis and recommendations for the sound barriers prepared by Acoustical Technologies, Inc. are provided in **Attachment B**.

A revised Drainage Report reflecting the changes to the Modified Project has been prepared to replace the prior submission provided in support of the Petition and is attached hereto as **Attachment C**.

B. NEW INFORMATION

Both during deliberations and in the written Opinion, the Council expressed concerns regarding the proximity of Stormwater Management Basin #1 to the existing ponds at the site, and the potential impacts to the water quality. As detailed in the petition, Stormwater Management Basin #1 is located in the hayfield area to the east of the existing ponds. The intent of the Stormwater Management Basin is to intercept the runoff from the upgradient solar array, infiltrate the majority of the runoff back into the ground, and mete out the overflow during larger storm events to insure no flooding impacts downstream. The runoff collected in the basin will be clean runoff from solar array area.

In response to the Council's concerns, the Petitioner's Certified Soil Scientist, Rick Zulick, conducted a more in depth evaluation of the potential water quality impacts the development could have on the ponds. A copy of his report is attached hereto as **Attachment D**. The report concludes that the pollutant loads entering the ponds from the Stormwater Basin will be inconsequential, and no impacts to amphibian life or any other wildlife supported by the ponds is anticipated.

The revised Drainage Report provided as Attachment B also details how the Modified Project complies with the DEEP's Appendix I of the Stormwater General Permit, including compliance with the required 100' setback to solar panels and minimum required 50' undisturbed buffer to a wetland. Compliance with the DEEP requirements, in combination with the temporary erosion control measures that will be installed and maintained during construction, provide further assurance that the Modified Project will not have an adverse impact on the ponds, their associated wetlands, or any amphibians that the ponds may support.

V. CONCLUSION

For all of the foregoing reasons, the Petitioner respectfully requests that the Council reopen the Petition No. 1592 proceeding, modify its Decision and Order, and issue a Declaratory Ruling for the Modified Project based on the changed conditions and new facts summarize in this Motion.

Respectfully submitted,
Santa Fuel, Inc.

By: _____
William Ostrander
Authorized Signatory

ATTACHMENT A

REVISED SITE PLANS
(BOUND SEPARATELY)

ATTACHMENT B

NOISE ANALYSIS & RECOMMENDATIONS

Prepared For: Santa Fuel, Inc.

Point of Contact: Andrew Kellar

Prepared by: Acoustical Technologies Inc.
50 Myrock Avenue
Waterford, CT 06385-3008

Subject: Somers Solar
Noise Treatment Recommendations
159 South Road
Somers, CT 06071

Author: Carl Cascio

Date: September 15, 2024

Revision: 5

Table of Contents

Summary

This document makes acoustic noise control recommendations that should assist in meeting the acoustic noise concerns during the operation of the inverters and transformers on the 159 South Road site in Somers, CT. An acoustic assessment plan was developed and executed to acquire acoustic information useful in explaining and mitigating the potential airborne noise issues associated with the future operation of fourteen inverters and two transformers at the Somers Solar site. This has been accomplished and the results show that the acoustic impact of operating the fourteen inverters and two transformers will be minimal with the recommended mitigation.

The airborne noise levels expected to be generated by the fourteen inverters and two transformers operating at the Somers Solar site were estimated using data supplied by vendors to Louth Callan Renewables[0]. The individual inverters[1] were expected to produce average overall A-weighted sound pressure levels of 80 dBA reference 20 microPascals at 1 meter at startup and 61 dBA at 1 meter (reference 20 µPa) for the individual transformer[2]. The inverter levels drop to 63.8 dBA after start up[5]. Seven inverters and one transformer are planned for a north and south location on the east side of the site. The airborne noise levels from each equipment location were estimated at the closest property line, east of where the equipment was to be placed. At startup the predicted airborne noise without mitigation indicated the inverters would produce 58 dBA at the north property line and 54 dBA at the property line next to the south site. These airborne noise estimates are near or above the allowed daytime limit in a residential zone[3,4]. The 55 dBA day time limit can be met without treatment since a startup lasting less than 15 minutes qualifies for a temporary 3 dB increase in noise level.

The Somers site is located in a Residential Zone (A-1) on South Road and is surrounded by Residential Zones (A) 225 meters to the West and to the South and 79 meters to the north. Business (B) and Industrial (I) Zones are located at least 500 meters to the north. Based on Noise Tools analysis[7] the airborne noise from the fourteen inverters and two transformers should be below the 45 dBA noise limit at distances greater than about 75 meters. All nearby residential properties at greater distances are expected to be well below the day time and night time Residential Zone noise limits for an emitter in a Residential Zone. The closest property line to the east is only about 41.8 meters from the north group of seven inverters and one transformer so noise mitigation will be required during start up to bring the property line noise level below the night time noise limit of 45 + 3 = 48 dBA for both the north and south inverters. No mitigation is necessary to meet the 55 dBA day time limit with a startup of less than 15 minutes.

Operation during night time hours mean reducing the inverters airborne noise **during start up** at both locations and should be directed at adding a sound barrier treatment to block the inverter's noise from reaching the adjacent residential property. This approach places a transmission loss treatment on a chain link fence next to the inverters. ABBC-EXT-R Sound Curtains can be used to provide the necessary mitigation. The inverters at both sites should be treated as shown in Figure 5 with either an 8-foot (south) or 9-foot (north) noise barriers on the east side of the inverters to limit airborne noise escaping to the east. Predicted startup airborne noise levels as shown in Table 3 are expected to be below 45 + 3 = 48 dBA at the residential property line. This noise control approach should remove any acoustic concerns about siting and operating the fourteen inverters and two transformers at the Somers Solar site.

Introduction

Acoustical Technologies Inc. was tasked with an assessment of potential acoustic noise issues associated with fourteen inverters and two transformers generating airborne noise that may reach the residential properties adjacent to the Somers Solar site near 159 South Road in Somers, CT. Responding to a request from Martin Mija and Andrew Kellar, a task to evaluate the airborne noise issue was issued on August 2, 2024. The task estimates the property line airborne noise to be produced by the fourteen inverters and two transformers in order to identify potential noise issues. If necessary, noise mitigation will be developed to implement a noise control approach that will eliminate any acoustic noise concerns during the equipment's operation.

The purpose of this effort is to utilize the available acoustic information[1,2,5] to mitigate the potential airborne noise issues associated with the operation of fourteen inverters and two transformers at 159 South Road in Somers, CT. The State of Connecticut[3] and the Town of Somers[4] Noise Ordinances have been consulted to assess the impact of the estimated acoustic levels. (The day time airborne noise levels should be kept below 55 dBA reference 20 μPa while the night time noise levels should be kept below 45 dBA.) Noise mitigation may be required and could be appropriate in order to reduce the airborne noise propagated by the fourteen inverters and two transformers to the Northern Connecticut Land Trust, the closest neighbor's property north of Mountain View Road and directly east of the two inverter locations.

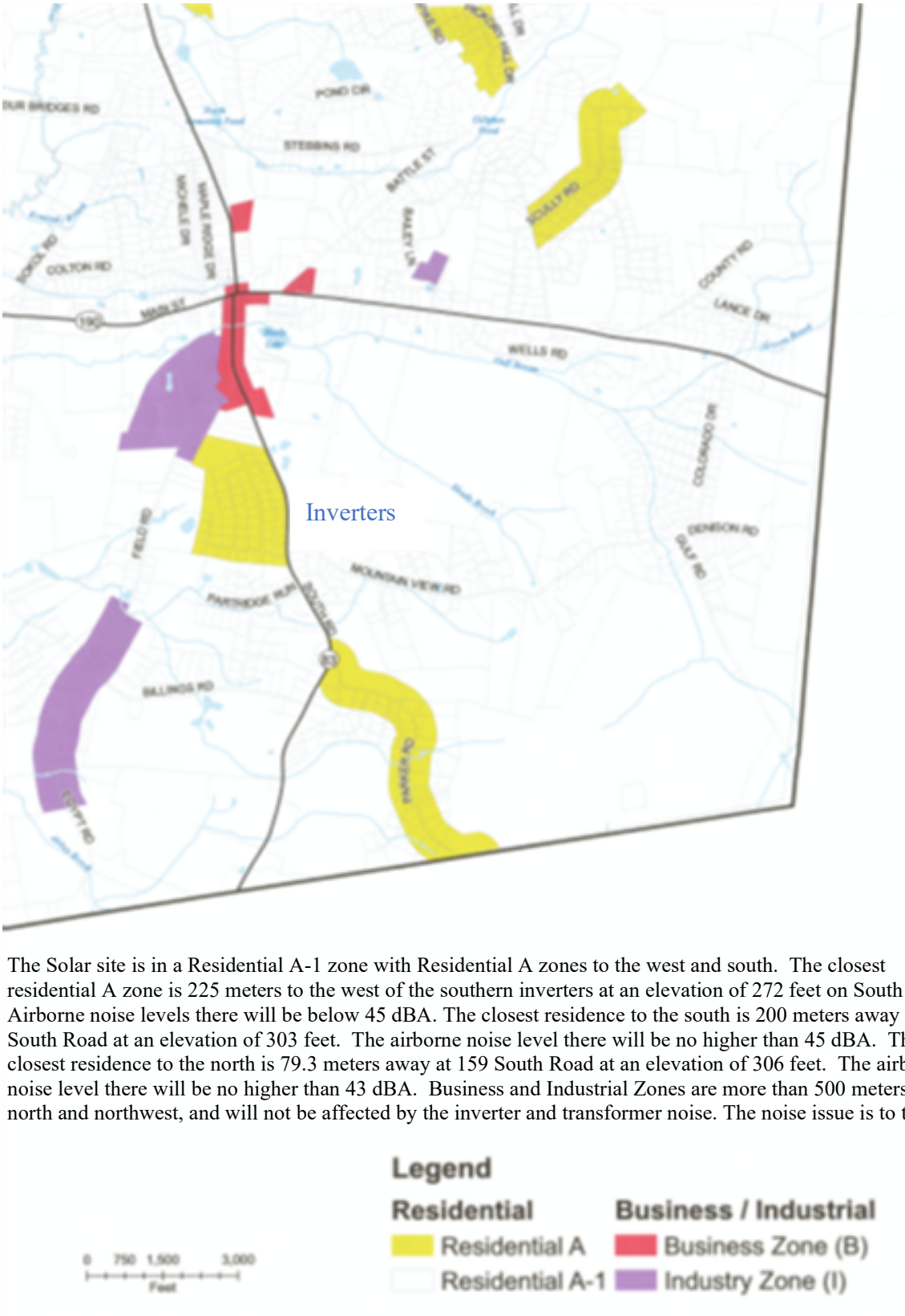
Acoustic Plan

Table 1 provides estimates of the expected sound pressure levels from inverters and transformers in dB reference 20 microPascals (20 μPa) at each of the two closest property line locations. Columns 3 and 7 provides the A-weighted airborne noise estimates while the last two numbers in each column power sum the individual estimates to create the expected property line noise level without noise mitigation. The startup estimate assumes an 80 dBA inverter source level while this level drops to 63.8 dBA after start up. The accuracy of these estimates is plus or minus 1 dB so the north location could require noise mitigation to ensure the 55 dBA limit is met. (Startup lasts less than 15 minutes so a temporary 3 dB increase in noise level is allowed.)

Table 1. Estimated Property Line Noise Levels without Noise Mitigation at Startup

Distance (ft)	Distance (m)	Receive	Type	Distance (ft)	Distance (m)	Receive
South	Location	dBA		**North**	Location	dBA
206.25	62.9	46.1	Inverter	137	41.8	49.8
210.8	64.3	45.9	Inverter	138.2	42.1	49.7
215.3	65.6	45.7	Inverter	139.3	42.5	49.6
219.8	67.0	45.5	Inverter	140.5	42.8	49.6
224.3	68.4	45.3	Inverter	141.7	43.2	49.5
228.9	69.8	45.1	Inverter	142.8	43.5	49.4
233.4	71.2	45	Inverter	144	43.9	49.3
235.3	71.7	25.9	Transformer	146.2	44.6	30.2
Start Up	Level	54.0	Total			58.0
After	Start Up	38.1				42.1

Figure 1. Section of the Somers Zoning Map Near the Solar Site



The Solar site is in a Residential A-1 zone with Residential A zones to the west and south. The closest residential A zone is 225 meters to the west of the southern inverters at an elevation of 272 feet on South Road. Airborne noise levels there will be below 45 dBA. The closest residence to the south is 200 meters away at 187 South Road at an elevation of 303 feet. The airborne noise level there will be no higher than 45 dBA. The closest residence to the north is 79.3 meters away at 159 South Road at an elevation of 306 feet. The airborne noise level there will be no higher than 43 dBA. Business and Industrial Zones are more than 500 meters to the north and northwest, and will not be affected by the inverter and transformer noise. The noise issue is to the east.

Figure 2. Noise Tools Chart for a Single Inverter at 137 Feet from the Property Line

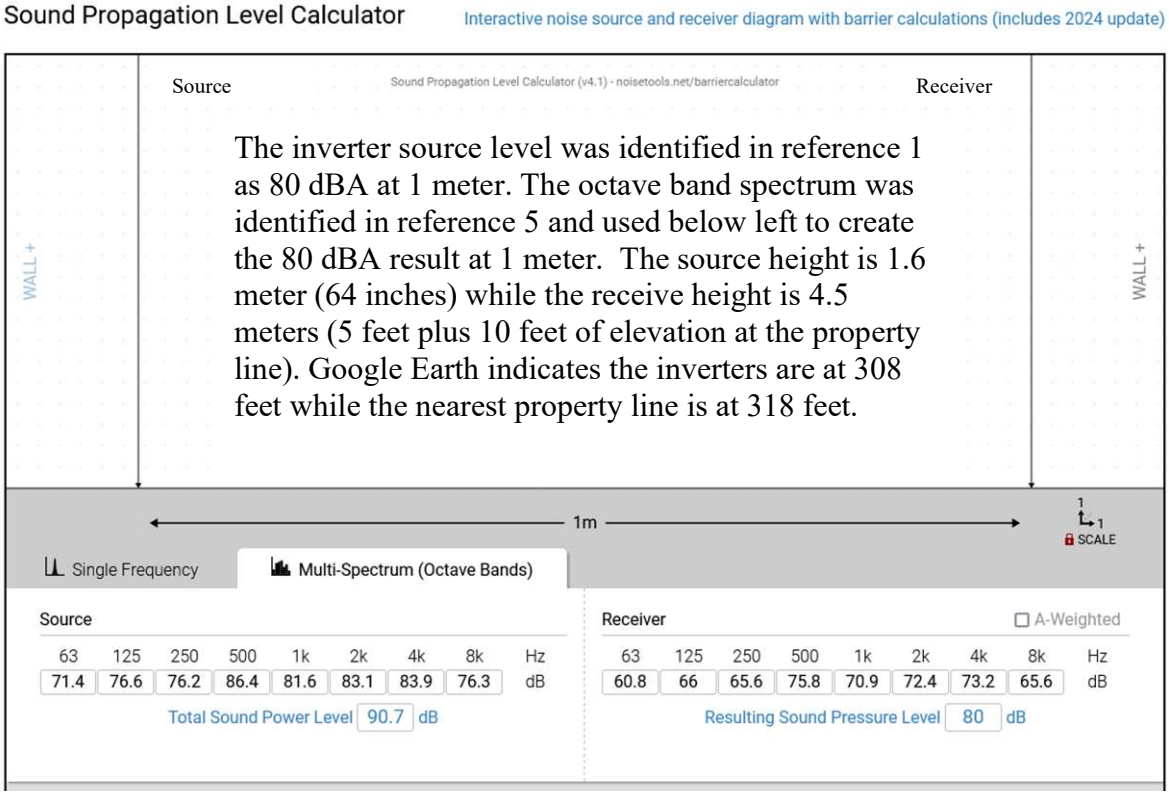
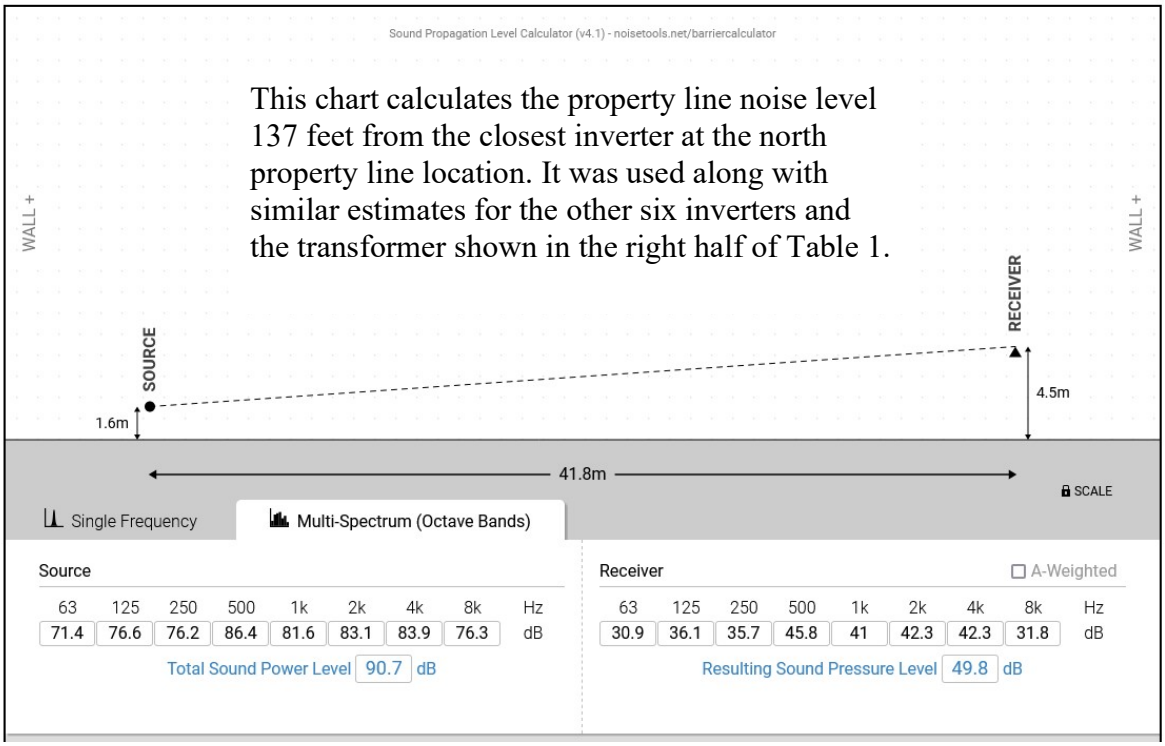


Figure 3. Estimated Property Line Noise Level from One Inverter in dBA re 20 µPa



Efforts to reduce the fourteen inverters and two transformers airborne noise at the South Road location should be directed at adding a sound barrier treatment to block the inverter's noise from reaching the adjacent residential property. The transformers do not need noise mitigation since their source level is 19 dB lower than one inverter (80 dBA). The noise control approach places a transmission loss treatment on a chain link fence next to the inverters. Table 2 calculates the performance of noise barriers of different height at the two inverter locations. In this table the noise barrier is 6 feet from the north inverter and both 3 meters & 6 feet from the south inverter.

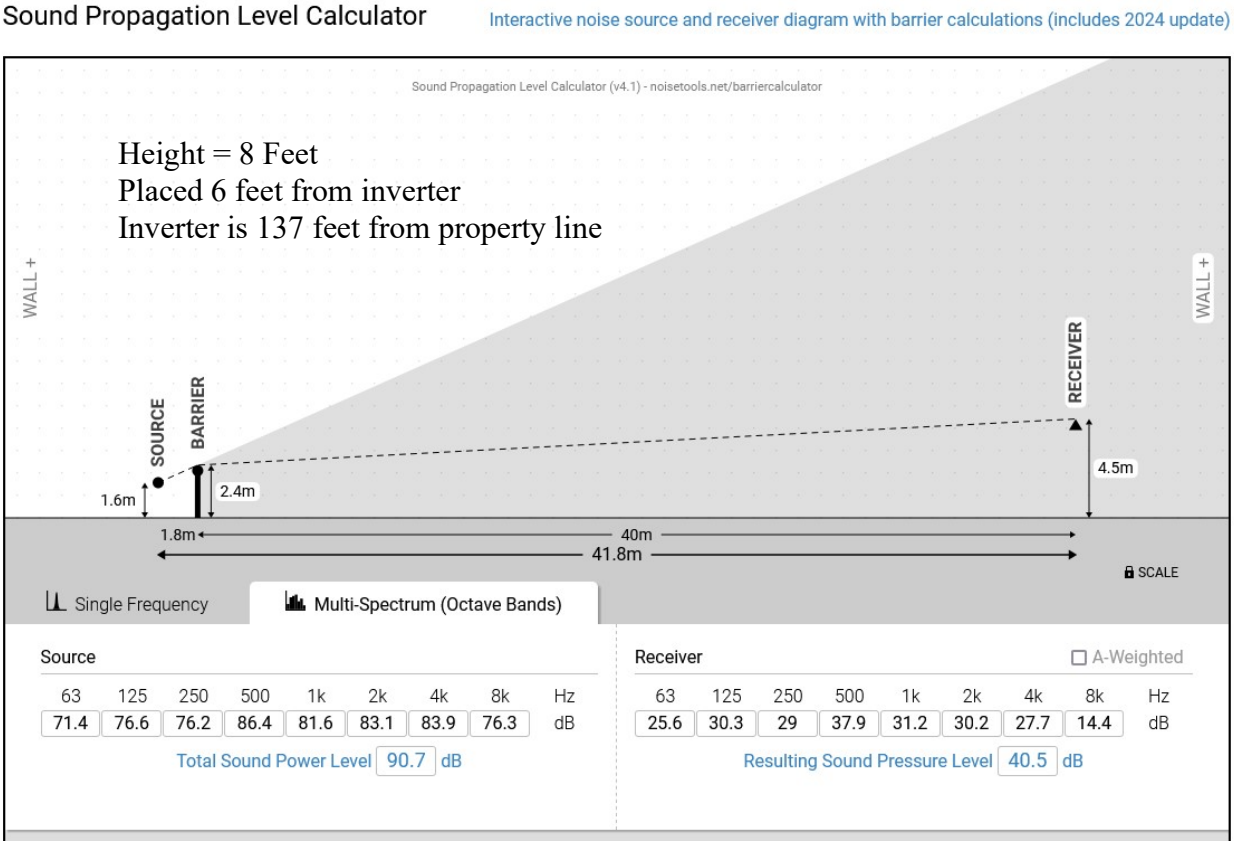
Table 2. Estimated Property Line Noise Levels with Noise Mitigation

Distance in Feet	Distance in Meters	Receive Level 4.5 feet	Receive Level 8 feet	Type Height	Distance in Feet	Distance in Meters	Receive Level 8 feet	Receive Level 9 feet
South	Location	dBA (3m)	dBA (6ft)		**North**	Location	dBA	dBA
206.25	62.9	44.2	36.1	Inverter	137	41.8	40.5	38.6
210.8	64.3	44	35.9	Inverter	138.2	42.1	40.5	38.5
215.3	65.6	43.9	35.8	Inverter	139.3	42.5	40.4	38.4
219.8	67.0	43.7	35.6	Inverter	140.5	42.8	40.3	38.4
224.3	68.4	43.5	35.4	Inverter	141.7	43.2	40.2	38.3
228.9	69.8	43.3	35.2	Inverter	142.8	43.5	40.2	38.2
233.4	71.2	43.1	35.1	Inverter	144	43.9	40.1	38.1
235.3	71.7	25.9	25.9	Xformer	146.2	44.6	30.2	30.2
206.25	Left	29.6	33.9	Left	137	41.8	34.1	34.1
233.4	Right	28.7	32.8	Right	144	43.9	33.8	33.8
	Direct	0.1	0.1			Direct	0.2	0.2
Noise	Total	52.3	44.9		Noise	Total	49.3	47.5

Table 2 calculates three different paths that noise can take to reach the property line. The first seven rows of numbers calculate the noise that diffracts over the top of the barrier from each inverter. The eighth row is the direct path for the transformer which does not need mitigation. The ninth and tenth rows are for diffraction around the left and right edges of the barrier. The eleventh row is for the direct path through the barrier. A typical calculation is shown in Figure 4.

Table 2 provides the noise mitigation results for barriers of height 4.5, 8 and 9 feet. A typical barrier blanket is 4.5 feet by 8 feet. The seven inverters are assumed to occupy about 24 feet in length. If they are spaced further apart, additional 4.5 by 8-foot blankets may be needed. The 4.5-foot column in the table assumes three blankets stretched horizontally while the 9-foot column assumes four blankets wide in a double row. The first 8-foot column assumes 8-foot-tall blankets stacked side by side. One row of five 4.5 by 8-foot blanket material will provide more margin to meet the 55 dBA day time limit at any separation distance from 6 feet to 4 meters at the southern location. For the inverters at the southern location, seven 8-foot pieces allows the night time noise limit of 45 + 3 = 48 dBA to be met. A double row of eight, 9-foot-high blankets, should be sufficient to meet the 45 + 3 = 48 dBA night time limit at the northern location. The inverters are assumed to be on a pad no more than 36 inches off the ground.

Figure 4. Estimated Property Line Noise Level from One Mitigated Inverter in dBA re 20 µPa



Other combinations of barrier spacing and barrier height were modeled and the results are shown in Table 3 below. An 8- or 9-foot-high barrier would be needed to meet the night time requirement. The south location needs at least seven 8-foot-high blankets to meet the temporary 48 dBA night time limit. The north location needs at least eight 4.5 by 8-foot blankets to meet the temporary 48 dBA night time limit. Again, this is for the inverter startup noise. No mitigation is needed after startup as the 80 dBA source drops to 63.8 dBA.

Table 3. Estimated Property Line Noise Levels with Various Noise Mitigation Designs

Location	Barrier	Barrier	SPL	Location	Barrier	Barrier	SPL
South	Height	Separation	dBA	**North**	Height	Separation	dBA
South	5 x 4.5 ft	4 meters	52.3	**North**	5 x 4.5 ft	6 feet	57.1
South	5 x 4.5 ft	3 meters	52.3	**North**	8 x 8 ft	6 feet	49.3
South	5 x 4.5 ft	6 feet	52.4	**North**	8 x 9 ft	6 feet	47.5
South	7 x 4.5 ft	6 feet	52.4	**North**	8 x 10 ft	6 feet	46.2
South	7 x 8 ft	6 feet	44.9	**North**	10 x 10 ft	6 feet	45.9
South	8 x 9 ft	6 feet	43.3	**North**	12 x 10 ft	6 feet	45.9
		^				^	
	Barrier to	Inverter	Distance		Barrier to	Inverter	Distance

Figure 5. Recommended Location for the Noise Barriers

Table 2 provides the estimated total airborne noise level for the fourteen inverters and two transformers at each of the closest locations at the east property line. See Figure 5 above for the approximate noise barrier locations. For the north location the 9-foot-high noise barrier should be parallel to the seven inverters and 6 feet away. For the south location the 8-foot-high noise barrier should be parallel to the seven inverters and 6 feet away. These locations should keep the property line noise level below 45 + 3 = 48 dBA to meet the night time noise requirement. (During part of the year the sun appears before the night time hours are over at 9 am on Sunday.)

Allowable Noise Levels

CT section 22a-69-3.1 (Ref. 4) states that no person shall cause or allow the emission of excessive noise beyond the boundaries of his/her Noise Zone so as to violate any provisions of these Regulations. The Town of Somers and the CT noise ordinances have been used to evaluate the noise generated by the inverter. The day time noise limit is 55 dBA and the night time limit is 45 dBA in both ordinances. One property to the east could see airborne noise levels near or above the 55 dBA day time noise requirement at startup. Noise mitigation is recommended for these two inverter locations in order to meet the night time limit of 45 dBA. The day time limit can be met without treatment because the startup noise lasts less than 15 minutes and the CT Noise Ordinance **Sec. 22a-69-4. Measurement procedures, part (f)** allows a 3 dB noise excursion for temporary events lasting less than 15 minutes.

All the other residential properties at greater distances (more than 79 meters) are expected to be below the day time and night time Residential Zone noise limits for an emitter in a Residential Zone without noise mitigation. The closest commercial and industrial zones to the north and northwest are about 500 meters away. The airborne noise from the fourteen new inverters and two transformers should be well below the 55 dBA noise limit at any of the nearby commercial and industrial properties without noise mitigation.

Noise Treatment Recommendations

The layout of the fourteen inverters and two transformers is shown in Figure 5. Estimates from the Somers Solar reports indicate that the inverter's startup noise contribution may be 3 dB above the day time noise limit at the adjoining property line. Noise treatment of the fourteen inverters and two transformers to reduce its noise by at least 3 dB is not needed since the 3 dB allowance for short term noise events can be used. This assumes a source level of 80 dBA at 1 meter from a single inverter during start up drops to 63.8 dBA after start up. Given this drop in level of 16.2 dB, the total property line noise levels will drop 15.9 dB without any mitigation to noise levels well below 45 dBA after startup.

During start up, the mitigation necessary to meet a 45 dBA night time limit can be obtained by building an acoustic barrier between the inverters and the property line This approach places a transmission loss treatment on a chain link fence near the fourteen inverters as was shown in Figure 5. The transformers do not need mitigation. The following paragraphs describe the analysis used in designing this barrier noise treatment for the startup inverter noise.

The noise control is provided by attaching an acoustic barrier material to a chain link fence. Calculating the acoustic performance of the barrier requires an estimate of the transmission loss through the barrier as well as an estimate of the acoustic leakage over and around the barrier. Typical noise treatments will have at least 20 dB of performance for sound traveling through the treatment as shown in Figure 6 below. This means diffraction over the top and sides of the barrier will be the dominant noise path. The path through the treatment only adds 0.1 to 0.2 dB to the total noise. Table 3 shows the results for various combinations of barrier height and separation. A 4.5-foot-high barrier is not sufficient to meet the night time requirement at the south inverter location while an 8-foot-high barrier is not sufficient at the north location. A 9-foot-high barrier at a 6-foot distance between inverter and barrier is needed at the north location because the property line is closer at 137 feet away. An 8-foot-high barrier at a distance of 6 feet will work at the south location.

Materials such as the ABBC-EXT-R Sound Curtains from Acoustical Solutions (Reference 6) or equivalent should be sufficient to produce the needed 10 dB of sound reduction. One path of noise transmission to consider is the path directly through the barrier. The transmission loss for a one-inch-thick material from Acoustical Solutions called ABBC-EXT-R Sound Curtains[6] is shown in Figure 6. The material has great high frequency performance and the lower frequencies still have 10 dB better performance than the diffraction of sound over the barrier. An example of the noise treatment installation at Mt Sinai Hospital in Hartford, CT is shown in Figure 7. The ABBC-EXT-R Sound Curtains were hung from the front and side of a security fence around a cooling module to mitigate the airborne noise at the site.

Meeting the 45 dBA night time limit is required, so my recommendation is to install an 8-foot and 9-foot acoustic barriers on the east side of the fourteen inverters as shown in Figure 5. These barriers are expected to bring the east property line airborne noise levels below 48 dBA during startup. (The Somers noise ordinance extends night time hours until 9 am on Sundays.) This treatment will allow operation before 9 am on Sundays and before 7 am on other days. For both locations this can be achieved by making the barrier height either 8 or 9 feet. Since propagation

through the barrier material exceeds 20 dB the property line noise level would be at or below the temporary 48 dBA level at startup for these treatment configurations.

Figure 6. The Effect of an Acoustic Barrier on Transmission to Nearby Properties

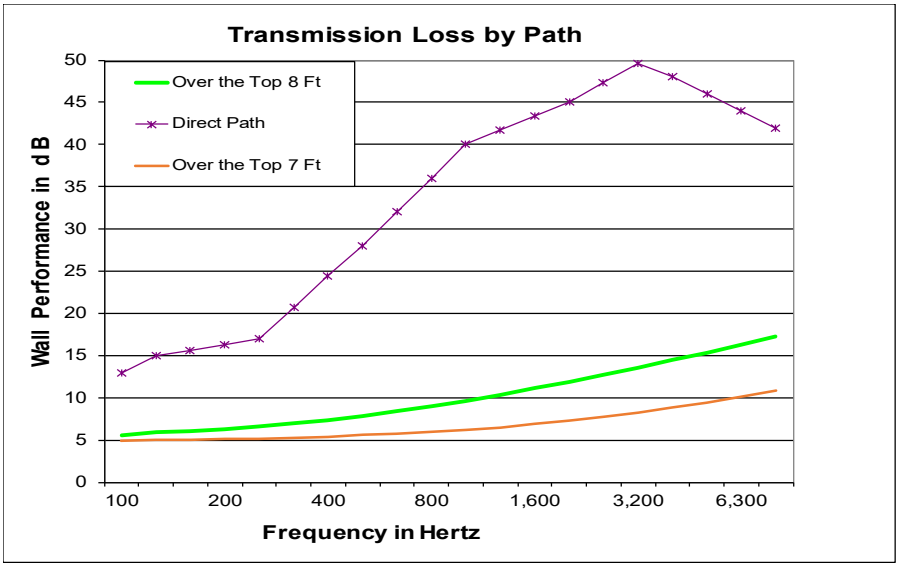


Figure 7. Eight Foot Fence Surrounding a Cooling Module with Noise Treatment

Conclusions

The purpose of this effort has been to evaluate the acoustical environment at the Somers Solar site near 159 South Road in Somers, CT. This has been accomplished and the results show that the acoustic impact to the Northern Connecticut Land Trust, the closest property north of Mountain View Road, needs to be addressed. Since start up lasts less than 15 minutes **no** mitigation is necessary to meet the 55 dBA requirement at the site using the 3 dB temporary increase in noise level. Startup operation of the fourteen inverters and two transformers is estimated to meet all of the state and town noise requirements during day time hours. Eight and nine-foot-high barriers are required to meet the 45 dBA night time requirement during start up. Operation after start up does **not** require noise mitigation for either day or night operation. Airborne noise levels with noise treatment at startup are expected to be below 48 dBA at the property line and near 30 dBA at the property line after startup.

The two acoustic barriers as described in this report should mitigate the noise issue on the east side of the two inverter locations. A 9-foot-high wall on the east side of the northern inverters would be effective for the 45 + 3 = 48 and 55 + 3 = 58 dBA temporary limits for the inverters that are 137 feet or 41.8 meters from the property line assuming a 6-foot separation of the inverters from the barrier. An 8-foot-high wall on the east side of the southern inverters would be effective in meeting the night time 48 dBA limit for the inverters that are 209 feet or 64 meters from the property line. Separation between the inverters and barrier should be 6 feet. The two transformers do not need noise mitigation. This noise control approach should remove any acoustic concerns about siting and operating the fourteen inverters and two transformers at the Somers Solar site.

References

1) Somers Solar Noise Analysis_R0

2) Eaton-Pad-mounted-Transformer-Brochure-EN-US.pdf

3) CT DE&EP *Noise Control Regulation RCSA Section 22a-69*-1 to 22a-69-7.4
http://www.ct.gov/dep/lib/dep/regulations/22a/22a-69-1through7.pdf

4) Somersnoiseordinance.pdf, *https://portal.ct.gov*
>SomersNoiseOrdinancepdf

5) CPS SCH275KTL-DO US-800 Noise test report.pdf

6) https://acousticalsolutions.com/product/abbc-13-ext-audioseal-exterior-sound-blanket/

7) https://noisetools.net/barriercalculator

0) Louth Callan Renewables is a subcontractor to Solar Fuel

ATTACHMENT C

REVISED DRAINAGE REPORT

DRAINAGE REPORT
Louth Callan Renewables, LLC
Somers Solar
159 South Road
Somers, CT

Revised June 11, 2024

Prepared for:

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Owner:

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Project No. 2023-001

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I. INTRODUCTION

A. Project Description

The applicant is proposing to construct a ground mounted solar array at 159 South Road in Somers. The proposed project includes a fenced area of approximately 16.8 acres containing approximately 8,268 solar panel modules. The development will include two stormwater management basins designed to provide groundwater recharge and retention of stormwater to ensure no environmental or flooding impacts downstream. The development and stormwater management system have been designed in accordance with the CT Stormwater Quality Manual and Department of Energy & Environmental Protection's (DEEP's) Stormwater General Permit.

B. Existing Conditions

The project site consists of approximately 21.6 acres of undeveloped land, part of a larger 108.5-acre parcel (the property) located at 159 South Road in Somers, Connecticut. The property is located on the east side of South Road and the north side of Mountain View Road. The northeastern portion of the property was formerly mined for gravel. The gravel mining operation was initiated in 1998 and terminated in 2009. Upon completion of the mining operations, disturbed areas were restored and are currently maintained as hay field. The southeastern portion of the property is undeveloped woodland. The southwestern portion of the property consists of an old orchard that is no longer maintained. An existing single-family home with a couple of barns and a former fruit stand are located adjacent to South Road on the western portion of the Property. Two dug ponds are located in the northwestern portion of the Property. The area around the ponds has become overgrown with brush.

The project site slopes downwards from east to the west. Runoff from the northern portion of the project site flows into the two on-site dug ponds. Runoff from the southern portion of the project site flows into an existing depressed area along Somers Road that conveys water to an existing culvert that crosses under Somers Road to the west.

Based on a review of the USDA Soil Survey, the soils in the drainage area of the proposed development are classified as Manchester gravelly sand, Charlton-Chatfield complex, or Cheshire fine sandy loam (See Soils Map in Appendix 1). The USDA Soil Survey defines groups of soils into Hydrologic Soil Groups (HSG) according to their runoff-producing characteristics. Soils are assigned to four groups (A, B, C, and D Groups). In group A, are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They typically are deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a hardpan or clay layer at or near the surface, have a permanent high-water table, or

are shallow over nearly impervious bedrock or other nearly impervious material. Charlton-Chatfield complex and Cheshire fine sandy loam are classified as HSG B. The HSG classification of Manchester gravelly sand is HSG A.

On April 7, 2023, a series of five test pits were performed in the area of the proposed stormwater management basins to confirm the existing soil conditions. Two additional test pits were performed on June 13, 2023 in the area of the second proposed stormwater management basin. Test pits 1-3 were located in the former gravel pit area in the vicinity of the northern basin (#1) while test pits 4-7 were in the orchard in the vicinity of the southern basin (#2). Test Pits 1-3 were excavated to a depth of 108 inches. Soils encountered included 12-16 inches of topsoil over fine to coarse sand with gravel. Soil mottling indicative of the seasonal high water table was encountered at 48 inches below the ground surface in TP1, 80 inches in TP2, and 60 inches in TP3. Test pits 4 & 5 are farther up the hill to the east of the southern basin. Soils encountered included 10-11 inches of topsoil over light brown sandy loam subsoils to a depth of 24 inches, overlying coarse sand and gravel. No soil mottling was encountered in either test pit, but TP5 hit refusal at 66 inches. TP4 was excavated to a depth of 108 inches. Test pits 6 & 7 are down the hill near the southern basin. They were excavated to depths of 144 and 120 inches. Soils encountered included 8-12 inches of topsoil with some brown loamy sand subsoils in TP6 to a depth of 20 inches, overlying fine to coarse sand with gravel. No soil mottling was encountered in either test pit. Test pit logs are provided on the Site Plans.

Soil samples were subsequently collected in the vicinity of test pits 1, 2, 6 and 7 at depths of 18-24 inches with a post hole digger. These samples were submitted to New England Materials Testing Lab, LLC for permeability testing by ASTM D2434. The permeability calculated for the four samples were 5.7 in/hr, 0.75 in/hr, 1.784 in/hr, and 0.49 in/hr, respectively. Permeability test results are also provided in Appendix 1.

II. STORMWATER RUNOFF ANALYSIS

A. Methodology

Peak runoff flow rates were determined for pre- and post-development conditions using Applied Microcomputer System's HydroCAD™ Stormwater Modeling System. This computer software employs the SCS Technical Release 55 and 20 (TR-55 & TR-20) methodology. The potential stormwater impacts downstream were evaluated for the 2-yr, 25-yr, 50-yr, and 100-yr; 24-hour storm events. The rainfall for these storm events was taken from NOAA Atlas 14 provided in Appendix 2.

Based on the present drainage patterns, two design points were selected for the analysis. Design point #1 (DP1) is the wetland at the edge of the dug ponds located that receives runoff from the northern portion of the development. Design Point #2 (DP2) is the roadside

swale that collects runoff from the southern portion of the project site and conveys it to the culvert south of the site that crosses under Somers Road.

B. Pre-Development Hydrology

The pre-development site was divided into four subcatchments as shown on the pre-development drainage area map in Appendix 3. Subcatchment E1 includes the off-site area that flows through the site to DP1. Subcatchment E2 includes the on-site area that flows to DP1. Subcatchment E3 includes the off-site area that flows through the site to DP2. Subcatchment E4 includes the on-site area that flows to DP2. The pre-development runoff characteristics of the contributing areas are provided on the HydroCAD data sheets in Appendix 4. The pre-development discharge rates from the site during the design storms are summarized in Tables 1-2.

C. Post-Development Hydrology

The Project Site consists of a 16.8-acre fenced area surrounding the array. The proposed solar array will be mostly be installed at existing grade. Some grading will occur in the area of the existing orchard where slopes are in excess of 15%. These slopes will be reduced to less than 15%. Overall, the drainage patterns will be maintained. Soil disturbance will be limited to the construction of the stormwater management basins and access driveways; the stump removal of the southeastern portion of the array; and the re-grading of slopes in excess of 15%. The existing vegetation within the undisturbed portion of the array will be maintained throughout the project to provide stabilization of the underlying soils and prevent erosion and sedimentation. The proposed tracker panel solar arrays will be installed on elevated racks that provide adequate height above the ground to allow for infiltration, and promote the revegetation of the southwest portion and the continued growth of the existing vegetative cover. As a result, post construction, the areas containing the solar arrays can be considered pervious vegetated groundcover.

In accordance with Appendix I of the DEEP's General Permit, the hydrologic analysis is required to account for the compaction of soils that result from extensive machinery traffic over the course of the construction of the array. To account for this, the runoff curve number must be increased by one full HSG category where grading within the array exceeds a 2-foot difference between existing and proposed grades and one half the difference between the on-site HSG and the next higher HSG for the remainder of the array. As discussed above, majority of the proposed array at our site will utilize existing grades. Of the 16.8 acres within the array, only 0.37 acres exceed a 2-foot difference between existing and proposed grades. Thus, to meet this requirement, the post construction runoff curve number was increased by one full HSG category for the 0.37 acres and by one half the difference for the remainder of the array.

The project will include the construction of two stormwater management basins to mitigate the increase in runoff from the development. The northern stormwater management basin (Basin 1) will be equipped with a 30" flared end as a primary outlet and a 20-feet wide earthen berm spillway. The southern stormwater management basin (Basin 2) will be equipped with a 12" pipe as a primary outlet and a 10-feet wide earthen berm spillway. Basin 1's outlet pipe will discharge into a Type 1 preformed scour hole upgradient of the wetland associated with the northern pond. Basin 2's outlet pipe will discharge onto a Type A riprap apron into the roadside swale. Outlet protection for the basins' spillways will consist of 12" thick modified riprap slopes extended 5 feet beyond the toe of the slope. A stone trench will also be installed in the bottom of each basin to facilitate infiltration, especially in the winter months when the ground could freeze.

As discussed above, two soil samples were collected from the soils at the base of each of the proposed stormwater management basins and analyzed for permeability. Samples PH1 and PH2 were collected from the vicinity of test pits TP1 and TP2 in the area of Basin 1. Samples PH6 and PH7 were collected from the vicinity of test pits TP6 and TP7 in the area of Basin 2. The resulting permeabilities were 5.7 in/hr (PH1), 0.75 in/hr (PH2), 1.784 in/hr (PH6) and 0.49 in/hr (PH7). As a conservative measure, the slowest permeability rate in each the basins (0.75 in/hr for Basin 1 and 0.49 in/hr for Basin 2) was used as the basis for the design infiltration rate.

The post-development site was divided into 6 subcatchments as shown on the post-development drainage area map in Appendix 3. Subcatchment S1 includes the off-site area that flows through the site into the northern basin (Basin 1) that will discharge towards the DP1. Subcatchment S2 includes the on-site area that flows into Basin 1. Subcatchment S3 includes the off-site area that flows through the site into the southern basin (Basin 2) that will discharge towards DP2. Subcatchment S4 includes the on-site area that flows into Basin 2. Subcatchment S5 includes the area that bypasses Basin 2 and sheet flows directly to DP2. Subcatchment S6 includes the area that bypasses the Basin 1 and sheet flows directly to DP1. The post development subcatchment characteristics are summarized in the attached HydroCAD data sheets in Appendix 5. The post-development discharge rates from the site during the design storms are summarized in Tables 1-2.

Using the characteristics described above, the Post Development peak flow rates for the site were calculated for the 2, 25, 50, and 100-year 24-hour rainfall design storms. Refer to Appendices 4 and 5 for pre-development and post-development HydroCAD data sheets. Tables 1-2 compares the pre-development peak flows with the post-development peak flows at the design point. As shown, the resulting post-development peak flows are less than the pre-development peak flows.

TABLE 1 – COMPARISON OF PRE- & POST-DEVELOPMENT DISCHARGE RATES (CFS) TO DESIGN POINT 1 (WETLAND)

	2-year	25-year	50-year	100-year
Pre-Development	1.9	24.3	33.6	46.2
Post Development	0.4	16.4	24.4	33.7

TABLE 2 – COMPARISON OF PRE- & POST-DEVELOPMENT DISCHARGE RATES (CFS) TO DESIGN POINT 2 (STREET CULVERT)

	2-year	25-year	50-year	100-year
Pre-Development	0.2	3.6	5.1	7.0
Post Development	0.1	3.6	4.5	5.3

D. Stormwater Treatment

Appendix I of the DEEP Stormwater General Permit requires that all solar panels in the array be considered effective impervious cover for the purposes of calculating Water Quality Volume if the proposed post-construction slopes at a site are 15% or more or if slopes less than 15% do not meet the four listed conditions:

a) The vegetated area receiving runoff between rows of solar panels is equal to or greater than the average width of the row of solar panels draining to the vegetated area;
b) Overall site conditions and solar panel configuration within the array are designed so stormwater runoff remains as sheet flows across the entire site towards the intended stormwater management controls;
c) The following conditions are satisfied regarding the design of the post-construction slope of the site:
    i. Slopes less than or equal to 5%:
        Appropriate vegetation shall be established that will ensure sheet flow conditions and that will provide sufficient ground cover throughout the site.
    ii. Slopes between 5% and 10%:
        Practices such as level spreaders, terraces, or berms shall be used to ensure long term sheet flow conditions.
    iii. Slopes greater than or equal to 10% and less than 15%:
        The plan must include specific engineered stormwater control measures with detailed specifications that are designed to provide permanent stabilization and non-erosive conveyance of runoff downgradient from the site.
    iv. Slopes greater than or equal to 8%:
        Erosion control blankets, stump grindings, erosion control mix mulch, or hydroseed with tackifier shall be applied within 72 hours of final grading, or

when a rainfall of 0.5 inches or greater is predicted within 24 hours of final grading, whichever time period is less.

d) The solar panels shall be designed as to allow the growth of native vegetation beneath and between the panels.

Proposed grading of the existing steep slopes at the site will reduce slopes to less than 15%. Therefore, conditions (a)-(d) are required to be met in order to avoid treating the panels as impervious area. To satisfy condition (a), the proposed row spacing of 11.23' will exceed the 7.40' width of the panels' horizontal projection. To satisfy condition (b), the existing grades and vegetation will be maintained in the northern portion of the array. Where re-grading occurs in the southern portion of the array, berms of coarse woody debris generated from clearing activities will be installed and maintained along the contours at regular intervals throughout the portion of the array that has been cleared to capture and redistribute runoff as sheet flow. For condition (c), where the existing vegetation will be maintained throughout construction, the need for additional erosion control measures to provide stabilization of the slopes are not necessary. Where tree clearing and re-grading woody berms will be installed along the contours at regular intervals to provide additional slope to satisfy condition c. In addition, all disturbed areas will be seeded with a pollinator seed mix and mulched immediately to establish a vegetated cover. Finally, to satisfy condition (d), the proposed fixed panel solar arrays will be installed on elevated racks that provide adequate height above the ground to promote the continued growth of the existing vegetative cover and allow for infiltration.

As a result of satisfying the conditions above, the panels need not be considered as impervious coverage for the calculation of the WQV. Thus, the only proposed surfaces required to be included in the calculation of the WQV are the equipment pads and gravel access drive. However, these areas are small in relation to the overall site and not directly connected to the stormwater collection system. Thus, runoff from these areas will sheet flow over significant distances through the established, dense vegetation which will provide adequate filtering to treat and remove any pollutants that may be generated in these areas.

E. Summary of Results

The proposed design and analysis indicates that the proposed development will not result in negative flooding impacts downstream. In addition, the maintenance of existing grades, vegetation and sheet flow drainage patterns during and after construction will prevent any negative impacts downstream resulting from erosion or sedimentation.

Appendix 1:
SOILS INFORMATION

Custom Soil Resource Report
Soil Map

Map Scale: 1:5,930 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 250 500 1000 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N 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 1:12,000.

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: State of Connecticut
Survey Area Data: Version 22, Sep 12, 2022

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

Date(s) aerial images were photographed: Jun 14, 2022—Oct 6, 2022

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
37C	Manchester gravelly sandy loam, 3 to 15 percent slopes	43.8	44.1%
62C	Canton and Charlton fine sandy loams, 3 to 15 percent slopes, extremely stony	0.7	0.7%
64B	Cheshire fine sandy loam, 3 to 8 percent slopes, very stony	5.8	5.9%
73C	Charlton-Chatfield complex, 0 to 15 percent slopes, very rocky	45.3	45.6%
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	3.6	3.7%
Totals for Area of Interest		**99.3**	**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

State of Connecticut

37C—Manchester gravelly sandy loam, 3 to 15 percent slopes

Map Unit Setting

National map unit symbol: 9ln6
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Manchester and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Manchester

Setting

Landform: Terraces, outwash plains, kames, eskers
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy and gravelly glaciofluvial deposits derived from sandstone and shale and/or basalt

Typical profile

Ap - 0 to 9 inches: gravelly sandy loam
Bw - 9 to 18 inches: gravelly loamy sand
C - 18 to 65 inches: stratified extremely gravelly coarse sand to very gravelly loamy sand

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Minor Components

Hartford

Percent of map unit: 5 percent
Landform: Terraces, outwash plains

Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Penwood

Percent of map unit: 5 percent
Landform: Terraces, outwash plains
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Branford

Percent of map unit: 3 percent
Landform: Terraces, outwash plains
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Ellington

Percent of map unit: 3 percent
Landform: Terraces, outwash plains
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Unnamed, gravelly loamy sand surface

Percent of map unit: 2 percent
Hydric soil rating: No

Unnamed, nongravelly surface

Percent of map unit: 2 percent
Hydric soil rating: No

62C—Canton and Charlton fine sandy loams, 3 to 15 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2wks7
Elevation: 0 to 1,310 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Canton, extremely stony, and similar soils: 50 percent
Charlton, extremely stony, and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton, Extremely Stony

Setting

Landform: Moraines, hills, ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 5 inches: fine sandy loam
Bw1 - 5 to 16 inches: fine sandy loam
Bw2 - 16 to 22 inches: gravelly fine sandy loam
2C - 22 to 67 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 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 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Charlton, Extremely Stony

Setting

Landform: Ridges, ground moraines, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: fine sandy loam
Bw - 4 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 3 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 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: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Chatfield, extremely stony

Percent of map unit: 5 percent
Landform: Ridges, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Leicester, extremely stony

Percent of map unit: 5 percent
Landform: Hills, drainageways, depressions, ground moraines
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: Yes

Sutton, extremely stony

Percent of map unit: 5 percent
Landform: Ground moraines, hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

64B—Cheshire fine sandy loam, 3 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: 9lpz
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

Cheshire and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cheshire

Setting

Landform: Till plains, hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-loamy melt-out till derived from basalt and/or sandstone and shale

Typical profile

Ap - 0 to 8 inches: fine sandy loam
Bw1 - 8 to 16 inches: fine sandy loam
Bw2 - 16 to 26 inches: fine sandy loam
C - 26 to 65 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: F145XY013CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Wilbraham
Percent of map unit: 5 percent
Landform: Drainageways, depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Yalesville
Percent of map unit: 5 percent
Landform: Ridges, hills
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Wethersfield
Percent of map unit: 5 percent
Landform: Hills, drumlins
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Watchaug
Percent of map unit: 3 percent
Landform: Till plains, hills
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Menlo
Percent of map unit: 2 percent
Landform: Drainageways, depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

73C—Charlton-Chatfield complex, 0 to 15 percent slopes, very rocky

Map Unit Setting
National map unit symbol: 2w698
Elevation: 0 to 1,550 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition
Charlton, very stony, and similar soils: 50 percent
Chatfield, very stony, and similar soils: 30 percent

Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton, Very Stony

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest, nose slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: fine sandy loam
Bw - 4 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 3 to 15 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 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: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Chatfield, Very Stony

Setting

Landform: Hills, ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 2 inches: fine sandy loam
Bw - 2 to 30 inches: gravelly fine sandy loam
2R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 3 to 15 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 20 to 41 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 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 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Rock outcrop

Percent of map unit: 5 percent
Hydric soil rating: No

Hollis, very stony

Percent of map unit: 5 percent
Landform: Hills, ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Leicester, very stony

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: Yes

Sutton, very stony

Percent of map unit: 5 percent
Landform: Ground moraines, hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

73E—Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky

Map Unit Setting

National map unit symbol: 9lql
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

Charlton and similar soils: 45 percent
Chatfield and similar soils: 30 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-loamy melt-out till derived from granite and/or schist and/or gneiss

Typical profile

Ap - 0 to 4 inches: fine sandy loam
Bw1 - 4 to 7 inches: fine sandy loam
Bw2 - 7 to 19 inches: fine sandy loam
Bw3 - 19 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 15 to 45 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B

Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Chatfield

Setting

Landform: Ridges, hills
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coarse-loamy melt-out till derived from granite and/or schist and/or gneiss

Typical profile

Oa - 0 to 1 inches: highly decomposed plant material
A - 1 to 6 inches: gravelly fine sandy loam
Bw1 - 6 to 15 inches: gravelly fine sandy loam
Bw2 - 15 to 29 inches: gravelly fine sandy loam
2R - 29 to 80 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 45 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Rock outcrop

Percent of map unit: 10 percent
Hydric soil rating: No

Sutton

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Leicester

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: Yes

Hollis

Percent of map unit: 3 percent
Landform: Ridges, hills
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Unnamed, sandy subsoil

Percent of map unit: 1 percent
Hydric soil rating: No

Unnamed, red parent material

Percent of map unit: 1 percent
Hydric soil rating: No

NEW ENGLAND MATERIALS TESTING LAB, LLC.
NEW ENGLAND REGIONAL OFFICE
72 Bissell Street Manchester, CT 06040 • Tel: 860-783-5830 • Fax: 860-783-5832

Client: JR Russo Surveyors & Engineers
P. O Box 938
East Windsor, CT. 06088

Report #: 001-23

Lab ID: 210-23

Project: Somers Solar
59 South Rd. Somers, CT.

Client ID: PH-1

Technician: Z. A

Date: 09/05/2023

LAB PERMEABILITY TEST

Sample description: 1 ½" minus reddish br. sand.

Location: Onsite (Somers Solar, 159 South Rd. Somers, CT).

Sample depth: 18" to 24"

Method: Permeability by ASTM D2434 (Constant Head Method)

k = QL/ath

Where k = coefficient of permeability,

Q = quantity of water discharged,	Q =	1000 cm^3
L = length of sample in centimeters	L =	15.24 cm
A = cross sectional area of specimen,	A =	43.10 cm^2
t = total time for discharge, in seconds	t =	1440 sec
h = difference in head manometers,	h =	61.5 cm

k = 0.003992731 cm/sec.

k = 5.7 inch/hour

Reported To: JR Russo Surveyors & Engineers

Submitted By: New England Materials Testing Lab, LLC.

Reviewed By: Laboratory Manager

NEW ENGLAND MATERIALS TESTING LAB, LLC.
NEW ENGLAND REGIONAL OFFICE
72 Bissell Street Manchester, CT 06040 • Tel: 860-783-5830 • Fax: 860-783-5832

Client: JR Russo Surveyors & Engineers
P. O Box 938
East Windsor, CT. 06088

Report #: 002-23

Lab ID: 211-23

Project: Somers Solar
59 South Rd. Somers, CT.

Client ID: PH-2

Technician: Z. A

Date: 09/05/2023

LAB PERMEABILITY TEST

Sample description: 1 ½" minus reddish br. sand, little fines.

Location: Onsite (Somers Solar, 159 South Rd. Somers, CT).

Sample depth: 18" to 24"

Method: Permeability by ASTM D2434 (Constant Head Method)

k = QL/ath

Where k = coefficient of permeability,

Q = quantity of water discharged,	Q =	500 cm^3
L = length of sample in centimeters	L =	15.24 cm
A = cross sectional area of specimen,	A =	43.10 cm^2
t = total time for discharge, in seconds	t =	5400 sec
h = difference in head manometers,	h =	61.5 cm

k = 0.000532364 cm/sec.

k = 0.75 inch/hour

Reported To: JR Russo Surveyors & Engineers

Submitted By: New England Materials Testing Lab, LLC.

Reviewed By: Laboratory Manager

NEW ENGLAND MATERIALS TESTING LAB, LLC.
NEW ENGLAND REGIONAL OFFICE
72 Bissell Street Manchester, CT 06040 • Tel: 860-783-5830 • Fax: 860-783-5832

Client: JR Russo Surveyors & Engineers
P. O Box 938
East Windsor, CT. 06088

Report #: 003-23

Lab ID: 212-23

Project: Somers Solar
59 South Rd. Somers, CT.

Client ID: PH-6

Technician: Z. A

Date: 09/05/2023

LAB PERMEABILITY TEST

Sample description: 1 ½" minus reddish br. sand, some fines.

Location: Onsite (Somers Solar, 159 South Rd. Somers, CT).

Sample depth: 18" to 24"

Method: Permeability by ASTM D2434 (Constant Head Method)

k = QL/ath

Where k = coefficient of permeability,

Q = quantity of water discharged,	Q =	1000 cm^3
L = length of sample in centimeters	L =	15.24 cm
A = cross sectional area of specimen,	A =	43.10 cm^2
t = total time for discharge, in seconds	t =	4560 sec
h = difference in head manometers,	h =	61.6 cm

k = 0.0012588157 cm/sec.

k = 1.784 inch/hour

Reported To: JR Russo Surveyors & Engineers

Submitted By: New England Materials Testing Lab, LLC.

Reviewed By: Laboratory Manager

NEW ENGLAND MATERIALS TESTING LAB, LLC.
NEW ENGLAND REGIONAL OFFICE
72 Bissell Street Manchester, CT 06040 • Tel: 860-783-5830 • Fax: 860-783-5832

Client: JR Russo Surveyors & Engineers
P. O Box 938
East Windsor, CT. 06088

Report #: 004-23

Lab ID: 213-23

Project: Somers Solar
59 South Rd. Somers, CT.

Client ID: PH-7

Technician: Z. A

Date: 09/05/2023

LAB PERMEABILITY TEST

Sample description: 1 ½" minus reddish br. silty clayed sand.

Location: Onsite (Somers Solar, 159 South Rd. Somers, CT).

Sample depth: 18" to 24"

Method: Permeability by ASTM D2434 (Constant Head Method)

k = QL/ath

Where k = coefficient of permeability,

Q = quantity of water discharged,	Q =	400 cm^3
L = length of sample in centimeters	L =	15.24 cm
A = cross sectional area of specimen,	A =	43.10 cm^2
t = total time for discharge, in seconds	t =	6600 sec
h = difference in head manometers,	h =	61.5 cm

k = 0.000348457 cm/sec.

k = 0.49 inch/hour

Reported To: JR Russo Surveyors & Engineers

Submitted By: New England Materials Testing Lab, LLC.

Reviewed By: Laboratory Manager

Appendix 2:
RAINFALL DATA

NOAA Atlas 14, Volume 10, Version 3
Location name: Town of Somers, Connecticut, USA*
Latitude: 41.977°, Longitude: -72.4422°
Elevation: m/ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.334** (0.257-0.434)	**0.402** (0.309-0.523)	**0.513** (0.393-0.670)	**0.606** (0.462-0.796)	**0.733** (0.542-1.01)	**0.829** (0.602-1.16)	**0.929** (0.655-1.35)	**1.04** (0.699-1.55)	**1.20** (0.775-1.85)	**1.33** (0.839-2.09)
10-min	**0.473** (0.364-0.614)	**0.569** (0.438-0.741)	**0.727** (0.557-0.949)	**0.858** (0.654-1.13)	**1.04** (0.768-1.43)	**1.17** (0.852-1.65)	**1.32** (0.929-1.92)	**1.47** (0.989-2.20)	**1.70** (1.10-2.63)	**1.88** (1.19-2.97)
15-min	**0.556** (0.428-0.723)	**0.670** (0.515-0.871)	**0.856** (0.655-1.12)	**1.01** (0.769-1.33)	**1.22** (0.903-1.68)	**1.38** (1.00-1.94)	**1.55** (1.09-2.26)	**1.73** (1.16-2.59)	**2.00** (1.29-3.09)	**2.21** (1.40-3.49)
30-min	**0.753** (0.580-0.979)	**0.908** (0.698-1.18)	**1.16** (0.890-1.52)	**1.37** (1.05-1.80)	**1.66** (1.23-2.28)	**1.88** (1.36-2.64)	**2.11** (1.49-3.07)	**2.36** (1.58-3.52)	**2.72** (1.76-4.20)	**3.01** (1.90-4.75)
60-min	**0.950** (0.731-1.24)	**1.15** (0.881-1.49)	**1.47** (1.12-1.92)	**1.73** (1.32-2.28)	**2.10** (1.55-2.88)	**2.37** (1.72-3.33)	**2.66** (1.88-3.88)	**2.98** (2.00-4.45)	**3.44** (2.22-5.32)	**3.80** (2.41-6.01)
2-hr	**1.21** (0.938-1.57)	**1.46** (1.12-1.88)	**1.85** (1.43-2.41)	**2.18** (1.67-2.85)	**2.63** (1.96-3.61)	**2.97** (2.17-4.17)	**3.33** (2.38-4.87)	**3.76** (2.53-5.58)	**4.39** (2.85-6.75)	**4.92** (3.12-7.73)
3-hr	**1.39** (1.08-1.79)	**1.67** (1.30-2.16)	**2.13** (1.64-2.76)	**2.51** (1.93-3.27)	**3.03** (2.27-4.14)	**3.42** (2.51-4.79)	**3.83** (2.75-5.60)	**4.34** (2.93-6.43)	**5.11** (3.32-7.84)	**5.77** (3.67-9.03)
6-hr	**1.75** (1.37-2.25)	**2.12** (1.65-2.72)	**2.72** (2.12-3.51)	**3.22** (2.49-4.17)	**3.91** (2.94-5.33)	**4.41** (3.27-6.17)	**4.97** (3.60-7.27)	**5.66** (3.83-8.34)	**6.74** (4.40-10.3)	**7.69** (4.90-12.0)
12-hr	**2.17** (1.71-2.77)	**2.67** (2.09-3.41)	**3.47** (2.71-4.45)	**4.14** (3.22-5.33)	**5.06** (3.83-6.88)	**5.73** (4.27-7.99)	**6.48** (4.72-9.45)	**7.42** (5.04-10.9)	**8.91** (5.83-13.5)	**10.2** (6.54-15.8)
24-hr	**2.57** (2.03-3.26)	**3.20** (2.52-4.06)	**4.22** (3.31-5.37)	**5.06** (3.95-6.49)	**6.23** (4.74-8.43)	**7.08** (5.30-9.84)	**8.03** (5.89-11.7)	**9.24** (6.29-13.5)	**11.2** (7.34-16.9)	**12.9** (8.28-19.8)
2-day	**2.91** (2.31-3.67)	**3.65** (2.89-4.61)	**4.86** (3.83-6.15)	**5.86** (4.60-7.46)	**7.24** (5.54-9.76)	**8.24** (6.21-11.4)	**9.36** (6.92-13.6)	**10.8** (7.40-15.7)	**13.2** (8.69-19.8)	**15.3** (9.86-23.4)
3-day	**3.17** (2.52-3.98)	**3.97** (3.16-5.00)	**5.29** (4.19-6.68)	**6.38** (5.02-8.10)	**7.88** (6.05-10.6)	**8.97** (6.78-12.4)	**10.2** (7.56-14.8)	**11.8** (8.07-17.0)	**14.4** (9.49-21.5)	**16.7** (10.8-25.5)
4-day	**3.41** (2.71-4.27)	**4.26** (3.39-5.35)	**5.66** (4.49-7.13)	**6.82** (5.38-8.63)	**8.41** (6.47-11.3)	**9.57** (7.24-13.2)	**10.9** (8.07-15.7)	**12.6** (8.62-18.1)	**15.3** (10.1-22.9)	**17.8** (11.5-27.0)
7-day	**4.06** (3.25-5.07)	**5.02** (4.01-6.27)	**6.59** (5.25-8.27)	**7.90** (6.26-9.96)	**9.69** (7.48-12.9)	**11.0** (8.35-15.0)	**12.5** (9.26-17.9)	**14.3** (9.87-20.6)	**17.4** (11.5-25.8)	**20.1** (13.0-30.3)
10-day	**4.71** (3.78-5.87)	**5.73** (4.60-7.15)	**7.40** (5.92-9.26)	**8.79** (6.98-11.1)	**10.7** (8.26-14.2)	**12.1** (9.18-16.4)	**13.6** (10.1-19.4)	**15.6** (10.8-22.3)	**18.7** (12.4-27.6)	**21.4** (13.9-32.2)
20-day	**6.77** (5.46-8.38)	**7.86** (6.34-9.74)	**9.65** (7.75-12.0)	**11.1** (8.89-13.9)	**13.2** (10.2-17.2)	**14.7** (11.1-19.6)	**16.3** (12.0-22.7)	**18.2** (12.6-25.8)	**21.0** (14.0-30.8)	**23.4** (15.2-35.0)
30-day	**8.51** (6.89-10.5)	**9.63** (7.79-11.9)	**11.5** (9.23-14.2)	**13.0** (10.4-16.2)	**15.1** (11.7-19.5)	**16.7** (12.6-22.0)	**18.3** (13.4-25.1)	**20.1** (14.0-28.3)	**22.5** (15.1-32.9)	**24.5** (16.0-36.6)
45-day	**10.7** (8.67-13.1)	**11.8** (9.59-14.5)	**13.7** (11.1-16.9)	**15.3** (12.3-19.0)	**17.4** (13.5-22.4)	**19.1** (14.4-25.0)	**20.7** (15.1-28.0)	**22.4** (15.6-31.4)	**24.5** (16.4-35.6)	**26.1** (17.0-38.8)
60-day	**12.5** (10.2-15.3)	**13.7** (11.1-16.8)	**15.6** (12.6-19.2)	**17.2** (13.8-21.3)	**19.4** (15.1-24.8)	**21.1** (16.0-27.5)	**22.8** (16.6-30.6)	**24.3** (17.1-34.0)	**26.2** (17.6-38.0)	**27.6** (18.0-40.9)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

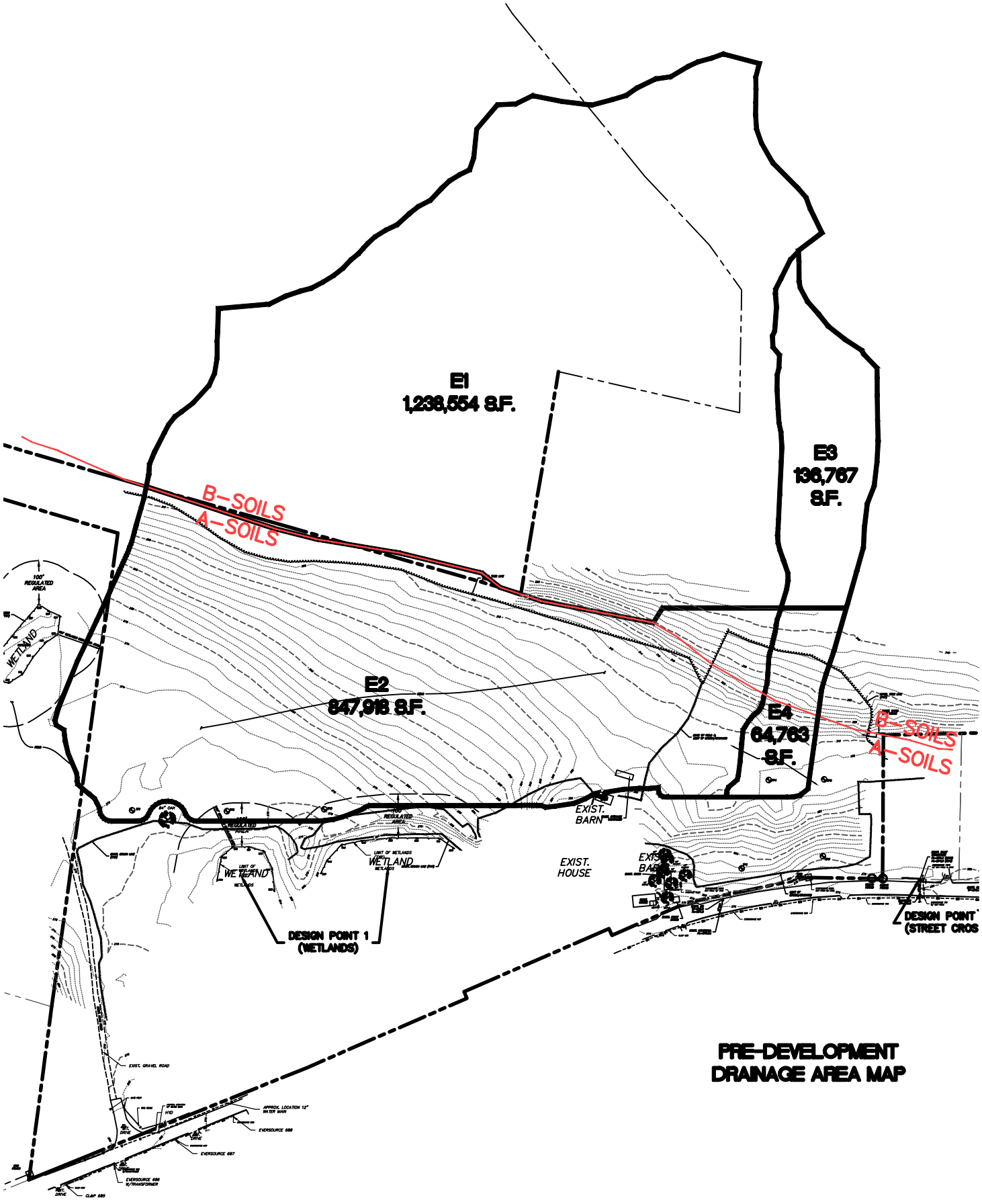
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

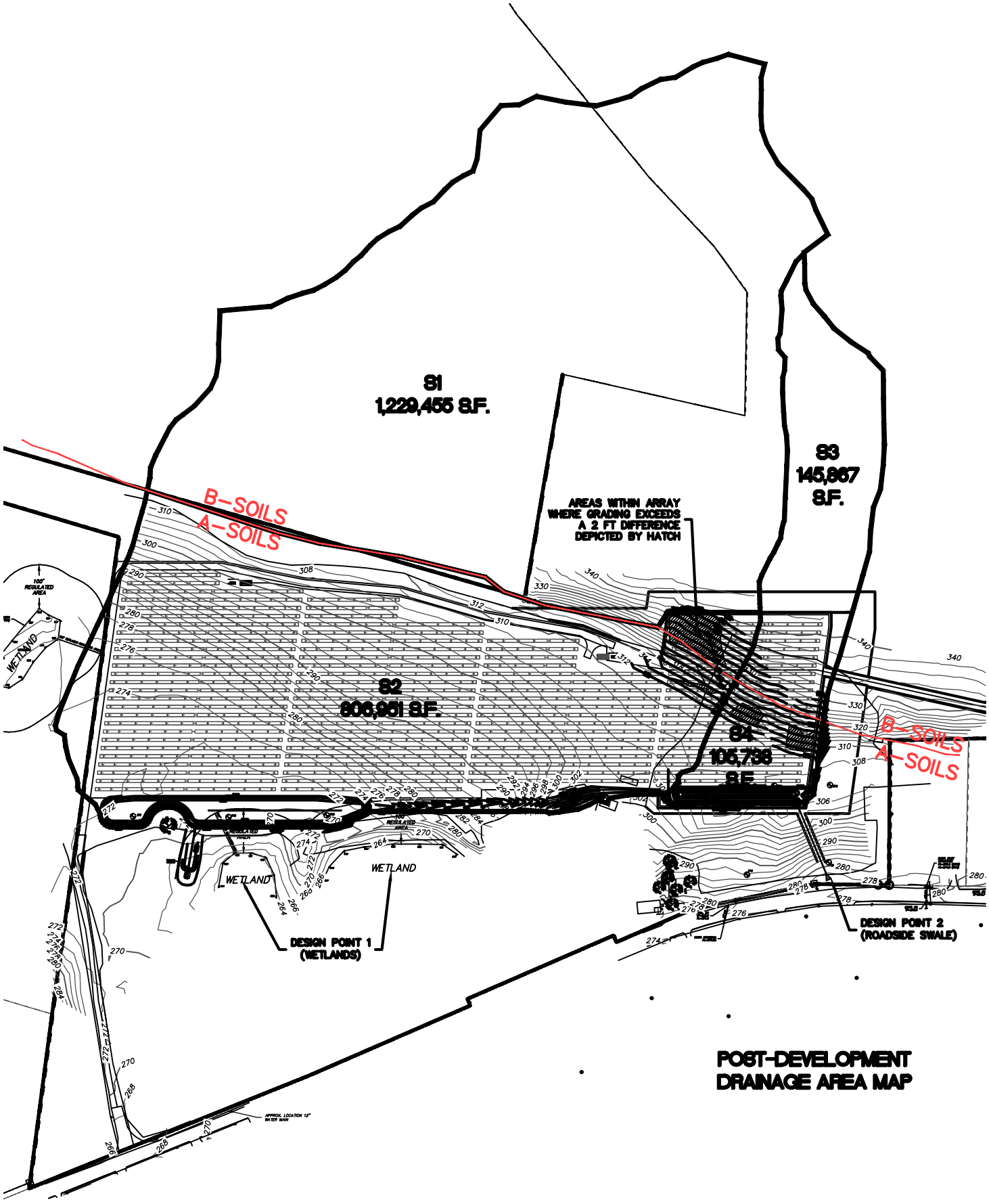
Back to Top

PF graphical

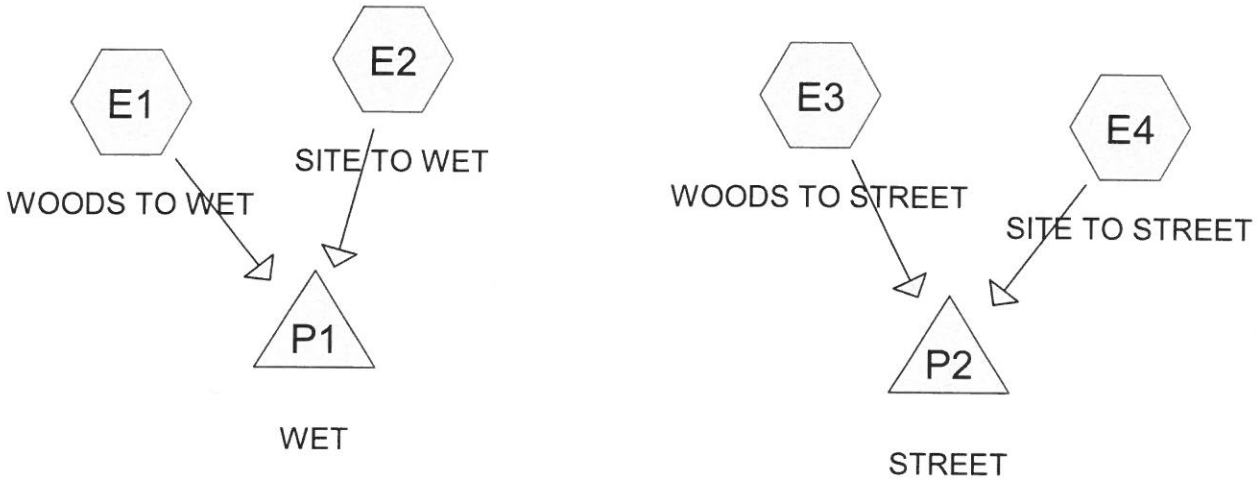
Appendix 3:
DRAINAGE AREA MAPS



PRE-DEVELOPMENT
DRAINAGE AREA MAP


S1
1,229,455 S.F.
S3
145,867
S.F.
S2
806,951 S.F.
S4
106,736
S.F.
B-SOILS
A-SOILS
AREAS WITHIN ARRAY
WHERE GRADING EXCEEDS
A 2 FT DIFFERENCE
DEPICTED BY HATCH
WETLAND
WETLAND
WETLAND
100' REGULATED AREA
DESIGN POINT 1
(WETLANDS)
DESIGN POINT 2
(ROADSIDE SWALE)
POST-DEVELOPMENT
DRAINAGE AREA MAP

Appendix 4:
PRE-DEVELOPMENT ANALYSIS



Subcat Reach Pond Link

Routing Diagram for 2023-001 Revisde Louth Callan - South Rd, Somers
Prepared by JR Russo & Associates, Printed 6/18/2024

Time span=1.00-72.00 hrs, dt=0.01 hrs, 7101 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment E1: WOODS TO WET Runoff Area=1,238,554 sf 0.00% Impervious Runoff Depth=2.80"
Flow Length=2,707' Tc=40.5 min CN=55 Runoff=43.79 cfs 6.645 af

Subcatchment E2: SITE TO WET Runoff Area=846,819 sf 0.00% Impervious Runoff Depth=0.50"
Flow Length=1,037' Tc=25.1 min CN=31 Runoff=2.46 cfs 0.803 af

Subcatchment E3: WOODS TO STREET Runoff Area=136,767 sf 0.00% Impervious Runoff Depth=2.80"
Flow Length=1,759' Tc=29.9 min CN=55 Runoff=5.60 cfs 0.734 af

Subcatchment E4: SITE TO STREET Runoff Area=64,763 sf 0.00% Impervious Runoff Depth=1.65"
Flow Length=930' Tc=28.6 min CN=44 Runoff=1.37 cfs 0.205 af

Pond P1: WET Inflow=46.16 cfs 7.448 af
Primary=46.16 cfs 7.448 af

Pond P2: STREET Inflow=6.97 cfs 0.938 af
Primary=6.97 cfs 0.938 af

Summary for Subcatchment E1: WOODS TO WET

Runoff = 43.79 cfs @ 12.60 hrs, Volume= 6.645 af, Depth= 2.80"
Routed to Pond P1 : WET

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.03"

Area (sf)	CN	Description
1,238,554	55	Woods, Good, HSG B
1,238,554		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	100	0.1600	0.18		**Sheet Flow, W** Woods: Light underbrush n= 0.400 P2= 3.20"
14.6	1,617	0.1369	1.85		**Shallow Concentrated Flow, W** Woodland Kv= 5.0 fps
2.7	357	0.0964	2.17		**Shallow Concentrated Flow, FARM** Short Grass Pasture Kv= 7.0 fps
9.5	401	0.0102	0.71		**Shallow Concentrated Flow, FARM** Short Grass Pasture Kv= 7.0 fps
4.4	232	0.0310	0.88		**Shallow Concentrated Flow, W** Woodland Kv= 5.0 fps
40.5	2,707	Total			

Summary for Subcatchment E2: SITE TO WET

Runoff = 2.46 cfs @ 12.67 hrs, Volume= 0.803 af, Depth= 0.50"
Routed to Pond P1 : WET

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.03"

Area (sf)	CN	Description
21,189	55	Woods, Good, HSG B
11,505	58	Woods/grass comb., Good, HSG B
62,512	30	Woods, Good, HSG A
45,435	32	Woods/grass comb., Good, HSG A
706,178	30	Meadow, non-grazed, HSG A
846,819	31	Weighted Average
846,819		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	20	0.1283	0.12		**Sheet Flow, W** Woods: Light underbrush n= 0.400 P2= 3.20"
5.7	80	0.1263	0.23		**Sheet Flow, FARM** Grass: Dense n= 0.240 P2= 3.20"
2.3	291	0.0919	2.12		**Shallow Concentrated Flow, FARM** Short Grass Pasture Kv= 7.0 fps
9.9	414	0.0099	0.70		**Shallow Concentrated Flow, FARM** Short Grass Pasture Kv= 7.0 fps
4.4	232	0.0310	0.88		**Shallow Concentrated Flow, W** Woodland Kv= 5.0 fps
25.1	1,037	Total			

Summary for Subcatchment E3: WOODS TO STREET

Runoff = 5.60 cfs @ 12.46 hrs, Volume= 0.734 af, Depth= 2.80"
Routed to Pond P2 : STREET

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.03"

Area (sf)	CN	Description
136,767	55	Woods, Good, HSG B
136,767		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.1333	0.17		**Sheet Flow, W** Woods: Light underbrush n= 0.400 P2= 3.20"
7.6	891	0.1539	1.96		**Shallow Concentrated Flow, W** Woodland Kv= 5.0 fps
1.9	202	0.1317	1.81		**Shallow Concentrated Flow, ORCHARD** Woodland Kv= 5.0 fps
2.5	113	0.0228	0.75		**Shallow Concentrated Flow, ORCHARD** Woodland Kv= 5.0 fps
1.8	200	0.1440	1.90		**Shallow Concentrated Flow, ORCHARD** Woodland Kv= 5.0 fps
6.0	253	0.0100	0.70		**Shallow Concentrated Flow, GRASS** Short Grass Pasture Kv= 7.0 fps
29.9	1,759	Total			

Summary for Subcatchment E4: SITE TO STREET

Runoff = 1.37 cfs @ 12.49 hrs, Volume= 0.205 af, Depth= 1.65"
Routed to Pond P2 : STREET

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.03"

Area (sf)	CN	Description
15,525	55	Woods, Good, HSG B
15,594	58	Woods/grass comb., Good, HSG B
33,644	32	Woods/grass comb., Good, HSG A
64,763	44	Weighted Average
64,763		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	92	0.0641	0.12		**Sheet Flow, W** Woods: Light underbrush n= 0.400 P2= 3.20"
1.4	8	0.1258	0.10		**Sheet Flow, ORCHARD** Woods: Light underbrush n= 0.400 P2= 3.20"
1.9	201	0.1258	1.77		**Shallow Concentrated Flow, ORCHARD** Woodland Kv= 5.0 fps
5.1	191	0.0157	0.63		**Shallow Concentrated Flow, ORCHARD** Woodland Kv= 5.0 fps
1.6	185	0.1530	1.96		**Shallow Concentrated Flow, ORCHARD** Woodland Kv= 5.0 fps
6.0	253	0.0100	0.70		**Shallow Concentrated Flow, GRASS** Short Grass Pasture Kv= 7.0 fps
28.6	930	Total			

Summary for Pond P1: WET

Inflow Area = 47.874 ac, 0.00% Impervious, Inflow Depth = 1.87" for 100-year event
Inflow = 46.16 cfs @ 12.60 hrs, Volume= 7.448 af
Primary = 46.16 cfs @ 12.61 hrs, Volume= 7.448 af, Atten= 0%, Lag= 0.6 min

Routing by Sim-Route method, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs

Summary for Pond P2: STREET

Inflow Area = 4.626 ac, 0.00% Impervious, Inflow Depth = 2.43" for 100-year event
Inflow = 6.97 cfs @ 12.46 hrs, Volume= 0.938 af
Primary = 6.97 cfs @ 12.47 hrs, Volume= 0.938 af, Atten= 0%, Lag= 0.6 min

Routing by Sim-Route method, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs

Time span=1.00-72.00 hrs, dt=0.01 hrs, 7101 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment E1: WOODS TO WET Runoff Area=1,238,554 sf 0.00% Impervious Runoff Depth=0.25"
Flow Length=2,707' Tc=40.5 min CN=55 Runoff=1.88 cfs 0.594 af

Subcatchment E2: SITE TO WET Runoff Area=846,819 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,037' Tc=25.1 min CN=31 Runoff=0.00 cfs 0.000 af

Subcatchment E3: WOODS TO STREET Runoff Area=136,767 sf 0.00% Impervious Runoff Depth=0.25"
Flow Length=1,759' Tc=29.9 min CN=55 Runoff=0.24 cfs 0.066 af

Subcatchment E4: SITE TO STREET Runoff Area=64,763 sf 0.00% Impervious Runoff Depth=0.03"
Flow Length=930' Tc=28.6 min CN=44 Runoff=0.01 cfs 0.004 af

Pond P1: WET Inflow=1.88 cfs 0.594 af
Primary=1.88 cfs 0.594 af

Pond P2: STREET Inflow=0.24 cfs 0.070 af
Primary=0.24 cfs 0.070 af

Time span=1.00-72.00 hrs, dt=0.01 hrs, 7101 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment E1: WOODS TO WET Runoff Area=1,238,554 sf 0.00% Impervious Runoff Depth=1.65"
Flow Length=2,707' Tc=40.5 min CN=55 Runoff=24.28 cfs 3.914 af

Subcatchment E2: SITE TO WET Runoff Area=846,819 sf 0.00% Impervious Runoff Depth=0.13"
Flow Length=1,037' Tc=25.1 min CN=31 Runoff=0.34 cfs 0.213 af

Subcatchment E3: WOODS TO STREET Runoff Area=136,767 sf 0.00% Impervious Runoff Depth=1.65"
Flow Length=1,759' Tc=29.9 min CN=55 Runoff=3.10 cfs 0.432 af

Subcatchment E4: SITE TO STREET Runoff Area=64,763 sf 0.00% Impervious Runoff Depth=0.83"
Flow Length=930' Tc=28.6 min CN=44 Runoff=0.55 cfs 0.102 af

Pond P1: WET Inflow=24.28 cfs 4.127 af
Primary=24.28 cfs 4.127 af

Pond P2: STREET Inflow=3.63 cfs 0.535 af
Primary=3.63 cfs 0.535 af

Time span=1.00-72.00 hrs, dt=0.01 hrs, 7101 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment E1: WOODS TO WET Runoff Area=1,238,554 sf 0.00% Impervious Runoff Depth=2.17"
Flow Length=2,707' Tc=40.5 min CN=55 Runoff=33.12 cfs 5.153 af

Subcatchment E2: SITE TO WET Runoff Area=846,819 sf 0.00% Impervious Runoff Depth=0.28"
Flow Length=1,037' Tc=25.1 min CN=31 Runoff=0.78 cfs 0.450 af

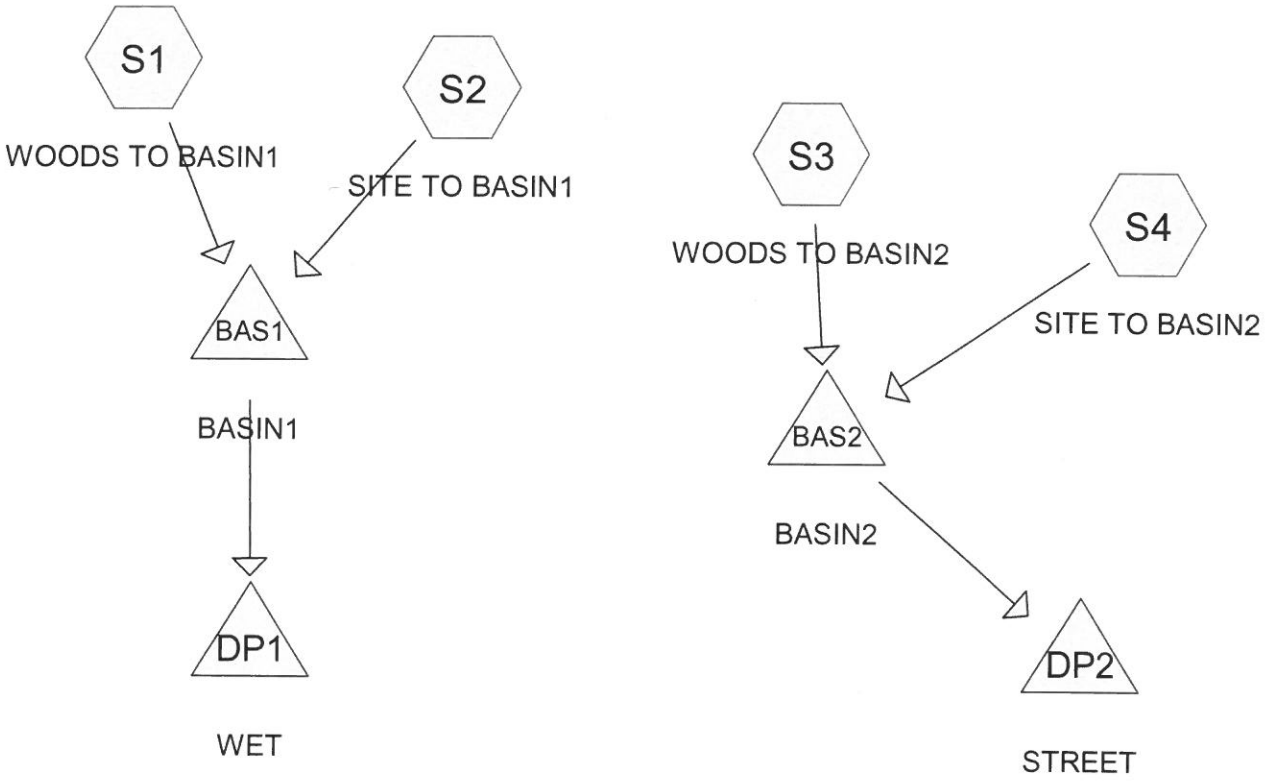
Subcatchment E3: WOODS TO STREET Runoff Area=136,767 sf 0.00% Impervious Runoff Depth=2.17"
Flow Length=1,759' Tc=29.9 min CN=55 Runoff=4.24 cfs 0.569 af

Subcatchment E4: SITE TO STREET Runoff Area=64,763 sf 0.00% Impervious Runoff Depth=1.19"
Flow Length=930' Tc=28.6 min CN=44 Runoff=0.90 cfs 0.148 af

Pond P1: WET Inflow=33.59 cfs 5.603 af
Primary=33.59 cfs 5.603 af

Pond P2: STREET Inflow=5.13 cfs 0.717 af
Primary=5.13 cfs 0.717 af

Appendix 5:
POST-DEVELOPMENT ANALYSIS



Subcat Reach Pond Link

Routing Diagram for 2023-001 Revisde Louth Callan - South Rd, Somers
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Time span=1.00-72.00 hrs, dt=0.01 hrs, 7101 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment S1: WOODS TO BASIN1 Runoff Area=1,229,455 sf 0.00% Impervious Runoff Depth=2.80"
Flow Length=2,404' Tc=34.4 min CN=55 Runoff=47.22 cfs 6.597 af

Subcatchment S2: SITE TO BASIN1 Runoff Area=806,951 sf 1.86% Impervious Runoff Depth=1.45"
Flow Length=733' Tc=19.0 min CN=42 Runoff=16.62 cfs 2.246 af

Subcatchment S3: WOODS TO BASIN2 Runoff Area=145,867 sf 0.00% Impervious Runoff Depth=2.70"
Flow Length=1,285' Tc=18.8 min CN=54 Runoff=6.93 cfs 0.752 af

Subcatchment S4: SITE TO BASIN2 Runoff Area=105,738 sf 0.00% Impervious Runoff Depth=2.37"
Flow Length=423' Tc=12.7 min CN=51 Runoff=5.00 cfs 0.480 af

Pond BAS1: BASIN1 Peak Elev=271.10' Storage=85,726 cf Inflow=61.48 cfs 8.842 af
Discarded=1.97 cfs 1.105 af Primary=33.70 cfs 7.744 af Outflow=35.67 cfs 8.849 af

Pond BAS2: BASIN2 Peak Elev=305.48' Storage=11,669 cf Inflow=11.49 cfs 1.233 af
Discarded=0.08 cfs 0.053 af Primary=5.32 cfs 1.180 af Outflow=5.40 cfs 1.233 af

Pond DP1: WET Inflow=33.70 cfs 7.744 af
Primary=33.70 cfs 7.744 af

Pond DP2: STREET Inflow=5.32 cfs 1.180 af
Primary=5.32 cfs 1.180 af

Summary for Subcatchment S1: WOODS TO BASIN1

Runoff = 47.22 cfs @ 12.50 hrs, Volume= 6.597 af, Depth= 2.80"
Routed to Pond BAS1 : BASIN1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.03"

Area (sf)	CN	Description
1,212,094	55	Woods, Good, HSG B
17,361	48	Brush, Good, HSG B
1,229,455	55	Weighted Average
1,229,455		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	100	0.1600	0.18		**Sheet Flow, W** Woods: Light underbrush n= 0.400 P2= 3.20"
14.6	1,617	0.1369	1.85		**Shallow Concentrated Flow, W** Woodland Kv= 5.0 fps
2.7	357	0.0964	2.17		**Shallow Concentrated Flow, ARRAY** Short Grass Pasture Kv= 7.0 fps
7.8	330	0.0102	0.71		**Shallow Concentrated Flow, ARRAY** Short Grass Pasture Kv= 7.0 fps
34.4	2,404	Total			

Summary for Subcatchment S2: SITE TO BASIN1

Runoff = 16.62 cfs @ 12.33 hrs, Volume= 2.246 af, Depth= 1.45"
Routed to Pond BAS1 : BASIN1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.03"

	Area (sf)	CN	Description
	498	48	Brush, Good, HSG B
	1,265	58	Meadow, non-grazed, HSG B
*	10,045	65	Meadow, non-grazed, HSG B/C
	9,578	71	Meadow, non-grazed, HSG C
	39,631	30	Woods, Good, HSG A
	16,454	30	Brush, Good, HSG A
	171,745	30	Meadow, non-grazed, HSG A
*	541,433	44	Meadow, non-grazed, HSG A/B
	1,307	58	Meadow, non-grazed, HSG B
*	14,836	98	Paved parking, HSG A/B
	159	98	Roofs, HSG A
	806,951	42	Weighted Average
	791,956		98.14% Pervious Area
	14,995		1.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	20	0.1283	0.12		**Sheet Flow, W** Woods: Light underbrush n= 0.400 P2= 3.20"
5.7	80	0.1263	0.23		**Sheet Flow, ARRAY** Grass: Dense n= 0.240 P2= 3.20"
2.3	291	0.0919	2.12		**Shallow Concentrated Flow, ARRAY** Short Grass Pasture Kv= 7.0 fps
8.2	342	0.0099	0.70		**Shallow Concentrated Flow, ARRAY** Short Grass Pasture Kv= 7.0 fps
19.0	733	Total			

Summary for Subcatchment S3: WOODS TO BASIN2

Runoff = 6.93 cfs @ 12.28 hrs, Volume= 0.752 af, Depth= 2.70"
Routed to Pond BAS2 : BASIN2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.03"

Area (sf)	CN	Description
135,277	55	Woods, Good, HSG B
10,590	48	Brush, Good, HSG B
145,867	54	Weighted Average
145,867		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.1900	0.19		**Sheet Flow, W** Woods: Light underbrush n= 0.400 P2= 3.20"
5.3	632	0.1551	1.97		**Shallow Concentrated Flow, W** Woodland Kv= 5.0 fps
0.9	99	0.1311	1.81		**Shallow Concentrated Flow, W** Woodland Kv= 5.0 fps
2.6	388	0.1311	2.53		**Shallow Concentrated Flow, ARRAY** Short Grass Pasture Kv= 7.0 fps
1.3	66	0.0153	0.87		**Shallow Concentrated Flow, ARRAY** Short Grass Pasture Kv= 7.0 fps
18.8	1,285	Total			

Summary for Subcatchment S4: SITE TO BASIN2

Runoff = 5.00 cfs @ 12.19 hrs, Volume= 0.480 af, Depth= 2.37"
Routed to Pond BAS2 : BASIN2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.03"

	Area (sf)	CN	Description
	8,137	48	Brush, Good, HSG B
*	34,290	65	Meadow, non-grazed, HSG B/C
	3,229	30	Brush, Good, HSG A
*	55,050	44	Meadow, non-grazed, HSG A/B
	5,032	58	Meadow, non-grazed, HSG B
	105,738	51	Weighted Average
	105,738		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	100	0.0660	0.19		**Sheet Flow, ARRAY** Grass: Dense n= 0.240 P2= 3.20"
1.5	223	0.1197	2.42		**Shallow Concentrated Flow, ARRAY** Short Grass Pasture Kv= 7.0 fps
2.3	100	0.0109	0.73		**Shallow Concentrated Flow, ARRAY** Short Grass Pasture Kv= 7.0 fps
12.7	423	Total			

Summary for Pond BAS1: BASIN1

Inflow Area = 46.749 ac, 0.74% Impervious, Inflow Depth = 2.27" for 100-year event
Inflow = 61.48 cfs @ 12.49 hrs, Volume= 8.842 af
Outflow = 35.67 cfs @ 12.88 hrs, Volume= 8.849 af, Atten= 42%, Lag= 23.6 min
Discarded = 1.97 cfs @ 12.88 hrs, Volume= 1.105 af
Primary = 33.70 cfs @ 12.88 hrs, Volume= 7.744 af
Routed to Pond DP1 : WET

Routing by Sim-Route method, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 271.10' @ 12.88 hrs Surf.Area= 36,250 sf Storage= 85,726 cf
Flood Elev= 272.00' Surf.Area= 63,880 sf Storage= 130,814 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 52.8 min (943.2 - 890.4)

Volume	Invert	Avail.Storage	Storage Description
#1	268.00'	130,814 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
268.00	21,706	0	0
270.00	29,312	51,018	51,018
271.00	33,200	31,256	82,274
272.00	63,880	48,540	130,814

Device	Routing	Invert	Outlet Devices
#1	Discarded	268.00'	**0.750 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 267.00'
#2	Primary	268.00'	**30.0" Round Culvert** L= 156.0' Ke= 0.500 Inlet / Outlet Invert= 268.00' / 267.00' S= 0.0064 '/' Cc= 0.900

			n= 0.012, Flow Area= 4.91 sf
#3	Primary	271.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.97 cfs @ 12.88 hrs HW=271.10' (Free Discharge)
└**1=Exfiltration** (Controls 1.97 cfs)

Primary OutFlow Max=33.70 cfs @ 12.88 hrs HW=271.10' TW=0.00' (Dynamic Tailwater)
├**2=Culvert** (Inlet Controls 32.14 cfs @ 6.55 fps)
└**3=Broad-Crested Rectangular Weir** (Weir Controls 1.56 cfs @ 0.78 fps)

Summary for Pond BAS2: BASIN2

Inflow Area = 5.776 ac, 0.00% Impervious, Inflow Depth = 2.56" for 100-year event
Inflow = 11.49 cfs @ 12.24 hrs, Volume= 1.233 af
Outflow = 5.40 cfs @ 12.63 hrs, Volume= 1.233 af, Atten= 53%, Lag= 23.4 min
Discarded = 0.08 cfs @ 12.63 hrs, Volume= 0.053 af
Primary = 5.32 cfs @ 12.63 hrs, Volume= 1.180 af
Routed to Pond DP2 : STREET

Routing by Sim-Route method, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 305.48' @ 12.63 hrs Surf.Area= 6,841 sf Storage= 11,669 cf
Flood Elev= 307.00' Surf.Area= 9,566 sf Storage= 24,123 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 29.6 min (902.2 - 872.6)

Volume	Invert	Avail.Storage	Storage Description
#1	303.00'	24,123 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
303.00	2,623	0	0
304.00	4,274	3,449	3,449
306.00	7,745	12,019	15,468
307.00	9,566	8,656	24,123

Device	Routing	Invert	Outlet Devices
#1	Discarded	303.00'	**0.490 in/hr Exfiltration over Surface area**
			Conductivity to Groundwater Elevation = 276.00'
#2	Primary	306.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Primary	303.00'	**12.0" Round Culvert** L= 192.0' Ke= 0.500
			Inlet / Outlet Invert= 303.00' / 278.00' S= 0.1302 '/' Cc= 0.900
			n= 0.012, Flow Area= 0.79 sf

Discarded OutFlow Max=0.08 cfs @ 12.63 hrs HW=305.48' (Free Discharge)
└**1=Exfiltration** (Controls 0.08 cfs)

Primary OutFlow Max=5.32 cfs @ 12.63 hrs HW=305.48' TW=0.00' (Dynamic Tailwater)
├**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└**3=Culvert** (Inlet Controls 5.32 cfs @ 6.77 fps)

Summary for Pond DP1: WET

Inflow Area = 46.749 ac, 0.74% Impervious, Inflow Depth = 1.99" for 100-year event
Inflow = 33.70 cfs @ 12.88 hrs, Volume= 7.744 af
Primary = 33.70 cfs @ 12.89 hrs, Volume= 7.744 af, Atten= 0%, Lag= 0.6 min

Routing by Sim-Route method, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs

Summary for Pond DP2: STREET

Inflow Area = 5.776 ac, 0.00% Impervious, Inflow Depth = 2.45" for 100-year event
Inflow = 5.32 cfs @ 12.63 hrs, Volume= 1.180 af
Primary = 5.32 cfs @ 12.64 hrs, Volume= 1.180 af, Atten= 0%, Lag= 0.6 min

Routing by Sim-Route method, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs

Time span=1.00-72.00 hrs, dt=0.01 hrs, 7101 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment S1: WOODS TO BASIN1 Runoff Area=1,229,455 sf 0.00% Impervious Runoff Depth=0.25"
Flow Length=2,404' Tc=34.4 min CN=55 Runoff=2.00 cfs 0.590 af

Subcatchment S2: SITE TO BASIN1 Runoff Area=806,951 sf 1.86% Impervious Runoff Depth=0.01"
Flow Length=733' Tc=19.0 min CN=42 Runoff=0.03 cfs 0.021 af

Subcatchment S3: WOODS TO BASIN2 Runoff Area=145,867 sf 0.00% Impervious Runoff Depth=0.22"
Flow Length=1,285' Tc=18.8 min CN=54 Runoff=0.24 cfs 0.062 af

Subcatchment S4: SITE TO BASIN2 Runoff Area=105,738 sf 0.00% Impervious Runoff Depth=0.15"
Flow Length=423' Tc=12.7 min CN=51 Runoff=0.08 cfs 0.030 af

Pond BAS1: BASIN1 Peak Elev=268.24' Storage=5,256 cf Inflow=2.00 cfs 0.611 af
Discarded=0.48 cfs 0.476 af Primary=0.35 cfs 0.152 af Outflow=0.83 cfs 0.628 af

Pond BAS2: BASIN2 Peak Elev=303.17' Storage=483 cf Inflow=0.32 cfs 0.093 af
Discarded=0.03 cfs 0.035 af Primary=0.13 cfs 0.058 af Outflow=0.16 cfs 0.093 af

Pond DP1: WET Inflow=0.35 cfs 0.152 af
Primary=0.35 cfs 0.152 af

Pond DP2: STREET Inflow=0.13 cfs 0.058 af
Primary=0.13 cfs 0.058 af

Time span=1.00-72.00 hrs, dt=0.01 hrs, 7101 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment S1: WOODS TO BASIN1 Runoff Area=1,229,455 sf 0.00% Impervious Runoff Depth=1.65"
Flow Length=2,404' Tc=34.4 min CN=55 Runoff=26.14 cfs 3.885 af

Subcatchment S2: SITE TO BASIN1 Runoff Area=806,951 sf 1.86% Impervious Runoff Depth=0.70"
Flow Length=733' Tc=19.0 min CN=42 Runoff=5.88 cfs 1.075 af

Subcatchment S3: WOODS TO BASIN2 Runoff Area=145,867 sf 0.00% Impervious Runoff Depth=1.57"
Flow Length=1,285' Tc=18.8 min CN=54 Runoff=3.75 cfs 0.438 af

Subcatchment S4: SITE TO BASIN2 Runoff Area=105,738 sf 0.00% Impervious Runoff Depth=1.33"
Flow Length=423' Tc=12.7 min CN=51 Runoff=2.51 cfs 0.270 af

Pond BAS1: BASIN1 Peak Elev=269.83' Storage=46,066 cf Inflow=31.80 cfs 4.960 af
Discarded=1.26 cfs 0.889 af Primary=16.44 cfs 4.077 af Outflow=17.70 cfs 4.966 af

Pond BAS2: BASIN2 Peak Elev=304.38' Storage=5,210 cf Inflow=6.05 cfs 0.708 af
Discarded=0.06 cfs 0.045 af Primary=3.55 cfs 0.663 af Outflow=3.61 cfs 0.708 af

Pond DP1: WET Inflow=16.44 cfs 4.077 af
Primary=16.44 cfs 4.077 af

Pond DP2: STREET Inflow=3.55 cfs 0.663 af
Primary=3.55 cfs 0.663 af

Time span=1.00-72.00 hrs, dt=0.01 hrs, 7101 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment S1: WOODS TO BASIN1 Runoff Area=1,229,455 sf 0.00% Impervious Runoff Depth=2.17"
Flow Length=2,404' Tc=34.4 min CN=55 Runoff=35.66 cfs 5.115 af

Subcatchment S2: SITE TO BASIN1 Runoff Area=806,951 sf 1.86% Impervious Runoff Depth=1.03"
Flow Length=733' Tc=19.0 min CN=42 Runoff=10.32 cfs 1.588 af

Subcatchment S3: WOODS TO BASIN2 Runoff Area=145,867 sf 0.00% Impervious Runoff Depth=2.08"
Flow Length=1,285' Tc=18.8 min CN=54 Runoff=5.19 cfs 0.580 af

Subcatchment S4: SITE TO BASIN2 Runoff Area=105,738 sf 0.00% Impervious Runoff Depth=1.80"
Flow Length=423' Tc=12.7 min CN=51 Runoff=3.63 cfs 0.365 af

Pond BAS1: BASIN1 Peak Elev=270.40' Storage=63,013 cf Inflow=45.16 cfs 6.703 af
Discarded=1.55 cfs 0.988 af Primary=24.42 cfs 5.721 af Outflow=25.97 cfs 6.710 af

Pond BAS2: BASIN2 Peak Elev=304.89' Storage=7,920 cf Inflow=8.50 cfs 0.945 af
Discarded=0.07 cfs 0.049 af Primary=4.45 cfs 0.897 af Outflow=4.52 cfs 0.945 af

Pond DP1: WET Inflow=24.42 cfs 5.721 af
Primary=24.42 cfs 5.721 af

Pond DP2: STREET Inflow=4.45 cfs 0.897 af
Primary=4.45 cfs 0.897 af

ATTACHMENT D

WATER QUALITY REPORT

Richard Zulick R.S, S.S
Certified Forester / Soil Scientist
400 Nott Highway
Ashford, CT. 06278

May 28, 2024

Re: Summary Water Quality Report: Somers Solar Project

Dear Commissioners:

This report summarizes potential water quality concerns related to the development of existing hay fields with a solar array on approximately 17 acres. The report only addresses the post-development condition, assuming that erosion controls will be sufficient during the construction phase of the project. More specifically, it addresses water quality in the two existing ponds and their inhabitants which are located westerly of the proposed development.

Pollutant Loads:

Generally, phosphorous is the pollutant of most concern in freshwater ponds, as phosphorous loading can lead to algal blooms, which degrade water quality in several ways, but mainly by reducing dissolved oxygen to levels that cannot support life. Phosphorous typically has a high affinity for sorption onto soil particles, so it is usually not found in high quantities as a dissolved contaminant. Therefore, implementation of a rigorous sediment and erosion control plan that prevents loss of soil into the water column is the most important way to reduce the potential for phosphorus loading of the receiving ponds.

The drainage area discharging into the ponds is currently maintained as grass (hay) and the solar arrays are designed to allow sufficient sunlight to support grasses in the post development condition. Existing fertilizer practices are unknown. However, a post-development plan should be developed to reduce nutrients to the lowest levels possible to support a well vegetated condition. It is recommended to conduct soil testing prior to the first seeding and each spring prior to the application of any fertilizer, with particular attention to phosphorus levels. If phosphorus is not required, a no phosphorus fertilizer is recommended. Soil testing is available at the University of Connecticut Soil nutrient Analysis Laboratory.

Contaminants from pest control are typically not a significant source of water contamination provided that certified pesticide applicators are used for pest control. In addition, pest identification may help reduce unnecessary pesticide applications. Pest identification services are available at the University of Connecticut's Home and Garden Education Center and the Cooperative Extension System. Use of an Integrated Pest Management program is recommended to reduce pesticide applications to a minimum.

Summary of Drainage Report in Relation to Surface Water Pollution:

As discussed above, surface water contaminants can be minimized using Best Management Practices for sediment and erosion control, reduced fertilizer usage, and an Integrated Pest Management Program. Based on the Drainage Report, only 40% of the total drainage area discharging into the 2 ponds/wetland complex will be developed. Sixty percent of the drainage area will remain in its current wooded condition. Therefore, any potential stormwater pollutants discharging into the basin will be diluted by a factor of 1:1 upon entering the basin. Under most precipitation conditions (2-year storm and under) 70% of the water entering the basin will be infiltrated and enter the ponds as "clean" groundwater. The remaining 25% (0.154 acre feet) of water discharging into the ponds will be further polished by traveling through over 75 feet of vegetated area before entering the ponds. Based on the foregoing discussion, pollutant loads entering the ponds will be inconsequential.

While larger storm events will discharge approximately the same amount of stormwater to the ponds (=/- 4 acre feet under the 25 year event) there are minimal sources of stormwater pollutants in the discharge resulting from the proposed use, as ground conditions are virtually identical to the pre-development condition. Any minimal dissolved constituents in the stormwater will travel through 70 feet of thickly vegetated area before reaching the ponds and the ponds themselves, particularly the southern-most pond, has an extensive area of emergent vegetation. Emergent vegetation has a high capacity for nutrient storage.

Based on the discussion above, no negative impacts to amphibian life or any other wildlife supported by the ponds is anticipated.

If you have any questions concerning the wetland function assessment or this report, please feel free to contact me.

Sincerely,

Richard Zulick
Certified Forester and Soil Scientist
Member SSSSNE