LOCATION: 30 Sunset Road  
EXISTING ZONES: R-12 (12,000 sq.ft. minimum lot size) and COZ  
FLOOD ZONE: ZONE AE 13  
PARCEL SIZE: 12,072 sq.ft.  
UTILITIES: Public Water Supply and wants to connect to Town Sewer with this project

<table>
<thead>
<tr>
<th>EXISTING</th>
<th>ALLOWABLE</th>
<th>REQUESTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROSS SQUARE FEET</td>
<td>Not provided by the applicant</td>
<td>3,802.68 sq.ft.</td>
</tr>
<tr>
<td>FLOOR AREA RATIO</td>
<td>Not provided by the applicant</td>
<td>0.315</td>
</tr>
<tr>
<td>GREEN SPACE</td>
<td>Not provided by the applicant</td>
<td>55%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EXISTING</th>
<th>ALLOWABLE</th>
<th>REQUESTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIRST FLOOR ELEVATION (structure is within the AE 13 Flood Zone):</td>
<td>8.0’</td>
<td>14’ (Flood Zone Elevation + 1’)</td>
</tr>
<tr>
<td>DWELLING HEIGHT:</td>
<td>Not provided by the applicant</td>
<td>35’</td>
</tr>
<tr>
<td>DWELLING SETBACKS (Min. Req./Prop.):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Front Yard Setback:</td>
<td>Not provided by the applicant</td>
<td>35’</td>
</tr>
<tr>
<td>• Side Yard Setback:</td>
<td>Not provided by the applicant</td>
<td>side and rear yard setback not less than 25’ *</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Rear Yard Setback:</td>
<td>Not provided by the applicant</td>
<td>11’ *</td>
</tr>
</tbody>
</table>

* A rear yard setback variance of 11 feet from the property line was granted under Appeal No. PLZE 2018 00549 by the ZBA on October 22, 2018 with the condition that the new dwelling be constructed with a combined side and rear yard setback of 25 feet.

APPLICATION SUMMARY:  
The applicant is requesting Final Coastal Site Plan approval under Sections 6-5, 6-13, 6-111, 6-139.1, and 6-205 of the Town of Greenwich Building Zone Regulations (BZR) to demolish an existing single-family dwelling and to construct a new single-family residence and related site improvements on a 12,072 sq. ft. property located at 30 Sunset Road in the R-12 and COZ zones.

ISSUES/RECOMMENDATIONS:
1. **Engineering** issued comments on 5/5/2020 and notes their review can be completed prior to a zoning/building permit once an option is chosen by the Planning and Zoning Commission.
2. **The Inland Wetlands Agency** issued a green sheet signoff dated 12/23/2015 indicating no action is required.

3. **The Zoning Enforcement Officer** issued comments on 5/13/2020 and notes one item for the applicant to address.

4. **Sewer** issued comments on 5/13/2020 and asks the applicant to address an issue during the P&Z phase of the project. The applicant responded with a letter from a licensed plumber stating that none of the sump pumps are connected to the sewer system. The Sewer Division responded and notes their comments still stand in an email dated 5/15/2020.

5. **DEEP** issued comments on 5/13/2020 and offers comments for the Commission’s consideration.

6. **Landscaping Plan.** The limit of the tidal wetland is not noted on the landscaping plan even though it crosses onto the property. The landscaping plan does not call out the groundcover material that is to cover most of the site, and it is unclear if the tidal wetland will have the same material as the other areas of the property. The Commission may ask the applicant to note the tidal wetlands on the landscaping plan and ask what material(s) (and plant species) are selected for the remainder of the site.

**PROPOSAL:**
The applicant is requesting Final Coastal Site Plan approval to demolish an existing single-family dwelling and detached shed, and to then construct a new single-family dwelling, stormwater quality controls and related site grading and landscaping. The basement level will feature a two-car garage and storage space with the necessary flood vents.

The existing dwelling was constructed in 1946 and does not comply with Section 6-139.1(f)(11) of the BZR that states “[n]ew construction or substantial improvement of any residential structure shall have the lowest floor, including basement, elevated at least one (1) foot above the base flood elevation.” The entire property is within the flood hazard overlay zone.

The property is currently improved with a single-family residence, shed, patios, driveway, landscaping, and a stone masonry retaining seawall that extends along the full northwestern side of the property.

**DEPARTMENT COMMENTS:**

- **ZEO** - see attached memo of 5/13/2020
- **ENGINEERING** - see attached memo of 5/5/2020
- **CONSERVATION** - not received
- **SEWER** - see attached memo of 5/13/2020, and follow-up email dated 5/15/2020
- **CT-DEEP** - see attached email from 5/13/2020
- **IWWA** - see attached greensheet from 12/23/2015

**COASTAL RESOURCES AND STRUCTURES:** The site is separated from the Greenwich Cove by a public “driftway” to the northwest, which separates 30 Shore Road from the shoreline (mean high water). The site is within the Coastal Overlay Zone and is therefore subject to all the provisions of Section 6-111 of the BZR. The site is fully within Flood Zones AE 13. A stone masonry retaining seawalls extends along the northwest property line.

The applicant met with DEEP and has since updated the development plan to show the limit of tidal wetlands, and the coastal jurisdiction line. Based on additional topography the grading and site walls were modified to not encroach into the coastal jurisdiction line. After reviewing these changes, DEEP updated their comments on 5/13/2020 offering the Commission to consider the additional information that was submitted to them that clarifies the landward location of the CJL (the state’s regulatory line). DEEP notes in their 5/13/2020 comments that “the revisions, to the extent practicable, appear to minimize stormwater discharges, and therefore potentially adverse impacts, to the tidal wetlands areas.”

**DRAINAGE:** DPW issued comments on 5/5/2020 and notes their review can be completed prior to a zoning/building permit once an option (it is recommended that if Option 1 is selected it be resubmitted
prior to Commission approval) is chosen by the Planning and Zoning Commission for how the project should proceed. After the applicant received these comments, their design team and owner agreed to modify the driveway design in accordance with Option 3, as presented in DPW’s 5/5/2020 comments. The applicant submitted a response letter dated 5/7/2020 noting their intention to proceed with Option 3.

DPW has not revised their comments from 5/5/2020 and continues to urge the Commission to select an option of their choice. DPW wants the Commission to decide which option they feel the project should go forward with.

Currently, the proposed stormwater system includes two Best Management Practices (BMPs): a gravel storage area and a subsurface chamber system. The Drainage Report notes that the modeling of the drainage design may be inaccurate for large storms as a significant portion of the property may be underwater.

SEWER: Based on Sewer Division records, this property was inspected in 2002 and found to have a sump pump discharging to sanitary sewer. This is illegal and needs to be corrected. The applicant/owner must coordinate directly with the Sewer Division to remove this sump pump. We realize the project includes demolishing the dwelling, however approximately 2-years have gone by from our prior 2018 comments and this matter was not resolved, or if it was it was not coordinated with the Sewer Division. The Sewer Division requires written confirmation that the design of the new dwelling will not be discharging any clear water sources (from sump pumps, roof leaders, footing drains, condensate lines, etc. to sanitary sewer).

At this point, the Sewer Division understands the applicant intends to demolish the house and build new. What the Sewer Division needs is written confirmation that the design of the new dwelling will not be discharging any clear water sources (sump pumps, roof leaders, footing drains, condensate lines (whether from a/c or high efficient boilers), etc. to the sanitary sewer system).

The Sewer Division needs confirmation that moving forward someone from the project team is confirming in writing that there will be NO clear water sources as outlined above connected to the sanitary sewer system.

ZONING: On October 22, 2018, the Planning and Zoning Board of Appeals (ZBA) granted a rear yard setback variance to the property owners to locate a new house 11 feet from the property line. The ZBA granted this variance with the condition that the new dwelling be constructed with a combined side and rear yard setback of 25 feet. (Appeal No. PLZE 2018 00549)

The proposed project complies with the remaining zoning criteria for the R-12 zone, including FAR, building height and green area per Section 6-205 of the BZR.

The Zoning Enforcement Officer requests the applicant revise their existing grade plane calculations. The existing grade plan should be calculated without considering the proposed retaining walls as they would not comply with Section 6-134 of the BZR.

BACKGROUND: This is the third application by Stephen and Maria Musante at this property to execute the demolition of the existing house and to then construct a new single-family residence. The first application is PLPZ 201500594 and was withdrawn on 4/21/2016. The second application is PLPZ 201800032 and was withdrawn on 4/19/2018. No other applications were filed through Planning and Zoning for this property.

APPLICABLE ZONING REGULATIONS:
   Section 6-5 – Definitions
   Section 6-13 – Site Plan Approval Required by Planning and Zoning Commission
   Section 6-15 – [Site Plan] Standards
Section 6-111 – Coastal Overlay Zone
Section 6-139.l – Flood Hazard Overlay Zone
Section 6-144 – Accessory Buildings in Residential and Commercial Zones
Section 6-205 – Schedule of Required Open Spaces, Limiting Heights and Bulk of Bdgs.
DEPARTMENT OF PUBLIC WORKS – ENGINEERING DIVISION
SITE DEVELOPMENT REVIEW

Engineering Project No. 19-5(63)  Department Project No. PLPZ201900482
Submittal Received Date: 4/24/2020

Submittal Reviewed For: Planning and Zoning
Traffic Review Requested: No  Review Type: Final Site Plan

PLAN SET INFORMATION

Plan Title: Stephen P. & Maria R. Musante  Project Address: 30 Sunset Road
Engineering Firm: Rocco V. D'Andrea, Inc.  Original Plan Date: 1/8/2018

DRAINAGE SUMMARY REPORT INFORMATION

Engineering Firm: Rocco V. D'Andrea, Inc.  Original Report Date: 1/8/2018
Latest Plan Revision Date: 4/20/2020

Reviews provided by the Engineering Division are for compliance with the Town’s “Roadway Design Manual and Standard Construction Details” and “Drainage Manual” as amended. Reviews are based upon the information and plans provided. Comments pertaining to the Town’s manuals are not all encompassing. Other reviewing entities may provide additional comments regarding consistency with these manuals in accordance with their jurisdictions. Review of sanitary sewer and septic systems are not reviewed by the Engineering Division.

All New Submittals for Commission Meetings must be received by the Engineering Division four weeks before scheduled Commission Meeting.

All Revised Submittals for Commission Meetings must be received by the Engineering Division three weeks before scheduled Commission Meeting.

Reviewed and Approved by: Scott Marucci - Senior Civil Engineer
Date: 5/5/20

1. The Engineering Division can complete the review prior to a zoning/building permit once an option (It is recommended that if Option One is picked it be resubmitted prior to Commission approval) is chosen by the P&Z Commission.
2. Since the proposed design is still not fully compliant (see comment 5) due to the proposed site design and site constraints the Engineering Division needs the P&Z Commission to decide on which option is acceptable to proceed:
   a. Option One – Require modifications to the design to be fully compliant with the standards of the Town of Greenwich Drainage Manual February 2012 as amended. This will require a resubmittal before approval.
   b. Option Two – Remove the driveway from the proposed high point to the rear yard and install lawn to allow the roof discharges to better meet the simple disconnection and install a gravel driveway (GravelPave 2 or equal required – must use No. 57 stone base) from the proposed high point to the road.
   c. Option Three - Install a gravel driveway (GravelPave 2 or equal required – must use No. 57 stone base) for the entire length from the road to the garage. The gravel driveway will allow more runoff to infiltrate over a much larger area to better meet the simple disconnection.
   d. Option Four – No modifications to the proposed design and stormwater BMPs.

See Comments Below
3. A revised Form SC-100 needs to be submitted.
4. A revised Form SC-107 needs to be submitted.
5. Drainage Summary Report comments for P&Z Commission Use:
   a. Even though DEEP is acceptable to the proposed design it still does not fully meet the required standards for a project located in a Critical Area per the standards of the Town of Greenwich Drainage Manual February 2012 as amended.
   b. The design does not include the required treatment BMP (Bioretention/Rain Gardens, Constructed Stormwater Wetlands, Dry Water Quality Swales, Extended Dry Detention Basins, Gravel Wetlands, Proprietary Media Filter (catch basin insert not acceptable), Sand/Organic Filters and Wet Basins).
   c. The proposed gravel under the patio receiving the roof runoff for infiltration does not have a treatment BMP before it and is therefore not fully complaint with the Critical Area Standard but the WQV is being met through infiltration.
   d. The proposed Cultec System receiving the roof runoff for infiltration does not have a treatment BMP before it and is therefore not fully complaint with the Critical Area Standard but the WQV is being met through infiltration.
   e. The proposed simple disconnections as shown in the table below do not fully meet the required standards to meet the Critical Area Standard.

<table>
<thead>
<tr>
<th>Watershed Area Name</th>
<th>Impervious Area for Simple Disconnection</th>
<th>Pervious Area (Required to be twice the impervious area)</th>
<th>Pervious Area Slope (Required Max. 5%)</th>
<th>Travel Length over Pervious Area Provided (Required Min. 40 FT)</th>
<th>Engineering Division Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>A3</td>
<td>840 SF</td>
<td>1,370 SF</td>
<td>0.4%</td>
<td>70 FT</td>
<td>The pervious area is within the R.O.W. and not on the property. The area is not the required 1,680 SF.</td>
</tr>
<tr>
<td>A6 Roof</td>
<td>530 SF</td>
<td>550 SF</td>
<td>1.8%</td>
<td>50 FT</td>
<td>The area is not the required 1,060 SF.</td>
</tr>
<tr>
<td>A6 Roof &amp; Drive</td>
<td>1,340 SF</td>
<td>850 SF</td>
<td>0.4%</td>
<td>45 FT</td>
<td>The area is not the required 2,680 SF.</td>
</tr>
<tr>
<td>A7</td>
<td>280 SF</td>
<td>Overlaps A6</td>
<td>-</td>
<td>-</td>
<td>This area does not qualify since it overlaps A6.</td>
</tr>
</tbody>
</table>

   f. The proposed increase in peak flow for the 10 and 25-year storms to point of concern A1 does not meet the required standard but since the increase is to tidal wetlands it is acceptable.
   g. Because of the proposed location of the garage and driveway in the rear yard the existing ponding area will become smaller and will have a minor increase in ponding elevation from .03 to .05 feet (about ½ inch) during the 1 – 25-years storms. This is minor and should not be an issue.
   h. The conveyance and outlet protection computations must be submitted prior to the zoning/building permit.
6. The construction plan set shall be revised as follows based on the current design:
   a. Site Plan Sheets
      i. The pipe from the junction box to the Cultec System needs to be revised to invert elevation 6.30.
7. The Operations and Maintenance Plan Report shall be revised as needed based on the revised design.

**Standard Conditions for Each Submittal**

1. The Engineering Division will no longer keep any records for the submittals. All records for the submittal shall be obtained from the Town of Greenwich Department/Division that has taken in applications and/or submittals. These documents are maintained within each office (e.g. P&Z, IWWA, and DPW Building and Highway Divisions).
2. All revisions to the reports and plans must follow the requirements in the Town of Greenwich Drainage Manual February 2014 as amended.
3. All revisions must be accompanied by a point-by-point written response to the Engineering Division’s comments.

**Standard Conditions of Approval**

1. The Operations and Maintenance Plan Report must include the following for the Certificate of Occupancy:
   b. The final completed Exhibit A, and B
   c. The Maintenance Declaration needs to be filed on the Town of Greenwich Land Records prior to a Certificate of Occupancy. A review of the documents above must be completed before filing on the Town of Greenwich Land Records.

2. The Town of Greenwich – Standard Construction Notes for Site and Subdivision Plans are conditions that must be met.

3. All requests for a Temporary Certificate of Occupancy (T.C.O.) or a Certificate of Occupancy (C.O.) shall be submitted one month before the T.C.O. or C.O. is required.

4. The submittal for a Temporary or Final Certificate of Occupancy must include the following:
   c. Field Inspection Record (All required photos) – Form SC-106 – Sealed and Signed by a Connecticut Licensed Professional Engineer.
   d. Bioretention Soil Testing Certification Sign-Off (as applicable with the bioretention soil gradation test and the phosphorous test for the mixed soil) – Form SC-104 – Sealed and Signed by a Connecticut Licensed Professional Engineer.
   h. A Letter discussing all the work that remains to be completed (Only for a Temporary Certificate of Occupancy Submittal).
Good morning Jacalyn,

The point of the comment was that this particular property was inspected in 2002 and found to have a sump pump discharging to sanitary sewer which is not allowed. They were notified to coordinate with the Sewer Division to remove it and have follow up inspections to confirm it was removed. That never happened. Then in 2018, we included comment regarding this in a P&Z application in February 2018. No one from that project team ever contacted the Sewer Division to clear this matter up. We then commented about this again in January 2020 and did not hear anything back either.

Our current comment is:

- Based on Sewer Division records, this property was inspected in 2002 and found to have a sump pump discharging to sanitary sewer. This is illegal and needs to be corrected. The applicant/owner must coordinate directly with the Sewer Division to remove this sump pump. We realize the project includes demolishing the dwelling, however approximately 2-years have gone by from our prior 2018 comments and this matter was not resolved, or if it was it was not coordinated with the Sewer Division. The Sewer Division requires written confirmation that the design of the new dwelling will not be discharging any clear water sources (from sump pumps, roof leaders, footing drains, condensate lines, etc. to sanitary sewer).

At this point, we understand that they intend to demolish the house and build new. What we are currently asking is for written confirmation that the design of the new dwelling will not be discharging any clear water sources (sump pumps, roof leaders, footing drains, condensate lines (whether from a/c or high efficient boilers), etc. to the sanitary sewer system).

We appreciate the letter dated May 14, 2020 from the plumber. However, our standard practice is to have photo documentation and perform physical confirmation inspections. We realize during COVID-19, that is not possible at this time. In addition, as the dwelling is proposed to be demolished it is a bit of a moot point now. At this point, we are trying to get confirmation that moving forward someone from the project team is confirming in writing that there will be NO clear water sources as outlined above connected to the sanitary sewer system.

So, I do not see any need to revise the comment, as we are requesting a letter regarding the design of the proposed development. The attached letter does not address that.

If you have any questions or need other info, please let me know.

Thanks,
Rich

Richard C. Feminella, P.E.
Wastewater Division Manager
Town of Greenwich DPW – Sewer Division
101 Field Point Road
Mr. Feminella,

Attached is a letter from a licensed plumber stating that none of the sump pumps are connected to the sewer system. Please let me know if this information is enough for you to revise your comments. The Commission is planning to open this item at the 5/19 meeting. Thank you!

Jacalyn Pruitt, Planner II  
Town of Greenwich Planning & Zoning
Date: May 14, 2020

To: Town of Greenwich – Sewer Department

Re: 30 Sunset Road – Old Greenwich

After evaluating the crawl space at 30 Sunset Road in Old Greenwich we found four (4) sump pumps within the crawl space. They were all separately pumping water out of the building to daylight. We also found that none of the sump pumps are connected to the sewer system.

Regards,

[Signature]

Stephen D. Rozmus
President/Owner

PLM.0204844-P1
HTG.0403710-S3
Date: May 13, 2020

To: Katie Deluca, Director, Planning & Zoning

From: Richard C. Feminella, Wastewater Division Manager

Copy: Chris Mandras, Maintenance Manager - Sewer Division
      Al Romano, Environmental Asset Engineer – Sewer Division

Re: PLPZ201900482: 30 Sunset Road, Musante

We have prepared the following comments and questions regarding the proposed application.

Project Summary:
  • Demolish existing dwelling and construct a new two-story residence.

Sewer Division Comments:
As indicated in the Sewer Division’s prior comments dated January 22, 2020 & February 15, 2018, the following comments still apply and need to be addressed:

Comments to be addressed during P&Z phase:
  • Based on Sewer Division records, this property was inspected in 2002 and found to have a sump pump discharging to sanitary sewer. This is illegal and needs to be corrected. The applicant/owner must coordinate directly with the Sewer Division to remove this sump pump. We realize the project includes demolishing the dwelling, however approximately 2-years have gone by from our prior 2018 comments and this matter was not resolved, or if it was it was not coordinated with the Sewer Division. The Sewer Division requires written confirmation that the design of the new dwelling will not be discharging any clear water sources (from sump pumps, roof leaders, footing drains, condensate lines, etc. to sanitary sewer).

Comments to be addressed during Sewer and Building Permit phase:
  • The applicant/owner will be required to obtain all necessary Sewer Permits. Please coordinate directly with the Sewer Division for permitting.
  • The Sewer Division is in the process of upgrading/rehabilitating the Meadow Pumping Station. Depending upon the applicant’s construction schedule, there may need to be coordination between any proposed construction work on this application and the proposed construction work related to the sewer pumping station. Please have the applicant/owner’s contractor coordinate directly with the Sewer Division.
  • The proposed sanitary sewer connection from 30 Sunset Rd. to the Town sanitary sewer main is required to be made at the same location on the main as the existing sewer lateral. Please coordinate with the Sewer Division for further details.
  • The applicant/owner will be required to perform CCTV inspections of all of the sanitary sewer laterals and private mains (if applicable) that serve the existing buildings to confirm there are no issues with the existing sanitary sewer lateral or its connection to the sewer main. Any televising of sanitary sewer laterals must be performed in the presence of the Environmental Asset Engineer. Please coordinate with Sewer Division – Environmental Asset Engineer (203) 622-
0963 extension 5. Make a DVD of this inspection. Submit a copy of the DVD to the Wastewater Division Manager. Failure to have the Sewer Inspector present during the TVing will result in the Sewer Division not accepting the DVD. Note: VHS format is not accepted. Only DVDs are accepted. Make a copy of the DVD for your records. The Town will not return DVDs. The Town cannot make copies of DVDs. The DVD should be submitted along with a site plan that identifies each investigation run on the DVD.

- Since the proposed development is in a flood zone and includes flood vents, there shall be NO plumbing fixtures installed below the AE and VE elevations. Please provide written confirmation during the Sewer Permitting process that there will not be any proposed plumbing fixtures in the flood (AE or VE) zone elevations for the proposed residence.

- Please note, sanitary sewers are designed for first floor elevations. Therefore, any plumbing fixtures in lower levels (basements) could be subject to sanitary sewer backups/overflows. The property owner is strongly recommended to consider and review this and plan accordingly to protect themselves in those situations. The Town is not responsible for damages as a result of these connections/installations. Please consider this and revise accordingly.

- Please note, in accordance with Town regulations and standard practice, all clear water sources cannot discharge to sanitary sewer. This includes air conditioning and high efficiency heating system condensate lines. Please confirm that the new development will not discharge any clear water sources to sanitary sewer.

- Please note, any portion of sanitary sewer lateral that crosses under drainage areas, permeable paver or pervious pavement areas, or within 10-feet of storm drainage systems (such as cultecs) are required to be encased in concrete to the nearest upstream and downstream joints to inhibit infiltration. Please coordinate with the Sewer Division for details.

**Please NOTE:** These comments are intended for P&Z review only. These comments do not take the place of Sewer Permit(s). Any Sewer Permit Applications receive thorough reviews and may result in additional comments/requirements at that time. In addition, please be reminded that in order to receive Building Permits, the applicant must have secured all other necessary permits, including, but not limited to, Sewer Permits **PRIOR** to obtaining their Building Permits.
Bianca,

We have reviewed the above-referenced proposal for consistency with Connecticut Coastal Management Act (CCMA) [CGS Sections 22a-90 through 22a-112, inclusive] policies and offer the following comments for the Planning & Zoning Commission's consideration.

Additional information has been submitted that clarifies the landward location of the CJL (the state's regulatory jurisdiction). The application was then revised to remove all of the initially-proposed structures and fill from within the state's regulatory jurisdiction. Additional information regarding the existence of tidal wetland species on the parcel was also submitted. The revisions, to the extent practicable, appear to minimize stormwater discharges, and therefore potential adverse impacts, to the tidal wetlands areas.

Accordingly, there does not appear to be any areas of the proposal that are inconsistent with the relevant and applicable CCMA policies.

Please let me know if you have any questions or if you need any additional information.

John Gaucher
Environmental Analyst III
Land & Water Resources Division
Bureau of Water Protection and Land Reuse
79 Elm Street
Hartford, CT 06106

Phone 860.424.3660
fax 860.424.4054

CAUTION: This email originated from outside the Town email system. Do not click links or open attachments unless you have verified the sender and know the content is safe.
Ok for Zoning Permit Sign-off with the following revisions:
The existing grade plane should be calculated without considering the proposed retaining walls as they would not comply with section 6-134.

☐ Resubmit the following prior to Site Plan/ Subdivision approval:

☐ The subject site plan/subdivision meets the requirements of the Building Zone Regulations, excluding sections 6-15 and 6-17, and is Ok for Zoning Permit Sign-off.
May 7, 2020

Scott Marucci  
Department of Public Works – Engineering Division  
c/o Planning & Zoning Commission  
101 Field Point Road  
Greenwich CT 06830

Re: 30 Sunset Road, Old Greenwich  
Stephen and Maria Musante - CAM Application

Dear Mr. Marucci,

In response to your follow-up Site Development Review memo to Planning and Zoning dated May 5, 2020, we presented the four suggested driveway design options with the owner/applicant Stephen Musante, the project architect Ed Parker, and the attorney for the project, Thomas Heagney. It was decided that given the design options for consideration, Option Three would best serve the project.

Therefore, assuming the project is approved by the Planning and Zoning Commission, the final design will address all P&Z approval comments and will include a gravel driveway using GravelPave 2 or equal and No. 57 base stone.

We request that you provide an updated response to P&Z removing the other three options and instead simply state that the driveway shall be a gravel drive as stated.

We thank you for your continued review, and should you have any additional questions, please contact us.

Sincerely,

ROCCO V. D’ANDREA, INC.

Leonard C. D’Andrea, PE

LCD:adm  
15LJSM01

cc: Stephen Musante  
Adam Cerini, EIT-RVDI  
Thomas J. Heagney, Esquire  
Patrick LaRow, AICP – Greenwich P&Z
April 23, 2020

Scott Marucci
Department of Public Works – Engineering Division
c/o Planning & Zoning Commission
101 Field Point Road
Greenwich CT 06830

Re: 30 Sunset Road, Old Greenwich
    Stephen and Maria Musante - CAM Application

Dear Mr. Marucci,

In response to your Site Development Review memo to Planning and Zoning dated April 6, 2020, we have made plan revisions, provided a Sight Line plan, and provided responses to your comments. For your further review, we are providing the following:

- Final Site Plan Review Set, revised to April 20, 2020;
- Driveway Profile & Sight Distance Plan, dated April 20, 2020;
- Drainage Summary Report, revised to April 20, 2020; and,
- Drainage Forms (SC-100 & SC-107), revised and re-dated to April 20, 2020.

The following responses are enumerated to your memo:

1. A revised SC-100 form is included.
2. A revised SC-107 form is included.
3. The previously provided stormwater management plan had been prepared and modified through meetings and plan review conducted by the various members of the Connecticut Department of Energy & Environmental Protection, (CTDEEP) Office of Long Island Sound Programs. Several modifications were made to the site design, including grading modifications, driveway modification, stormwater treatment train, elimination of certain landscape walls and the lowering of others. The design previously presented to you and this design
resulted in the acceptance of our site design and drainage management plan such that it meets the policies and goals of the CAM act such that this project will not adversely impact the waters of Long Island Sound. Additionally, we offer the following:

a. The use of simple disconnection as a non-structural LID technique is prioritized. The proposed BMPs are located close to the source, each provides treatment with TSS removal through overall land flow, a technique encouraged by the CTDEEP, and also provides infiltration. Due to space and elevation constraints, the proposed BMPs should be considered acceptable for discharge to a critical area in lieu of a treatment train. The stormwater management plan has been reviewed and approved by CT DEEP.

b. The revised drainage design utilizes the non-structural LID technique of Simple Disconnection. Disconnected areas and their flow paths are depicted on the LID Plan and further described in the Drainage Summary Report. A total of 51 percent of on-site impervious areas will be treated using this technique. The technique was encouraged and approved by the CTDEEP for protecting the waters of Long Island Sound.

c. Through the additional use of simple disconnection, 85% of on-site impervious area under proposed conditions is treated in accordance with the Town Drainage Manual using mainly LID techniques and BMPs.

d. The rear yard serves as a disconnection flow path for a portion of roof and a portion of driveway. To accomplish this, we requested a modification to the dwelling design. The architect responded by designing a recessed garage entrance. The recessed entrance was necessary in order to provide for a sufficient back-out distance. Intuitively, the recessed designed reduced the area of exposed driveway. The reduction in length, and the narrowness of the driveway increased the surface area of the rear lawn dramatically over the original design. The CTDEEP was appreciative of the effort made to decrease the driveway surface and increase the lawn area so that hydraulic flow lengths could be increased. Additionally the CTDEEP encouraged, and we provided, a 55-foot gravel-filled curtain drain along a portion of the southwest property line as a way of encouraging additional infiltration and to abate the erosive nature of the concentrated flow path emanating from the Segal and Clark properties to the south, and Pastula property to the east. A similar technique has been incorporated along the easterly property line to collect and manage the

Rocco V. D’Andrea, Inc.
runoff from the off-site steep slope contiguous with our easterly property that the Town of Greenwich allowed to be constructed, and which has adversely impacted the subject property over the recent years.

e. No response required.
f. No response required.
g. The revised drainage report is included.
h. The shallow ponding in the rear yard is included in the drainage models. Ponding is not expected to occur on the adjacent properties to the south or east because the adjacent yards are higher in elevation, with the easterly property having a steep slope along, and immediately adjacent to, our easterly property line. The limit of ponding is depicted on the watershed maps within the drainage report (Exhibits A & B).
i. The ultimate POC (Greenwich Cove) is divided into two sub-POCs: The tidal wetland in the private, unimproved right-of-way (A1), and the rear property boundary (A2). Neither of the sub-POCs are developable and both immediately discharge to Greenwich Cove. We request exemptions from peak flow and runoff reduction requirements to both POCs since they immediately enter a tidally influenced water body, although the proposed BMPs mitigate the increases. We encourage you to review your GIS resources in order to understand and appreciate the level of off-site treatment that will be provided by this section of an unimproved roadway right-of-way that cannot be further improved or developed because of the existence of tidal wetland vegetation. It should be noted the Town of Greenwich runs a drainage line through this resource that discharges directly into the waters of Long Island Sound, and also runs a sewer line through the ROW to the sewer pump station recently reconstructed on the shoreline at the terminus of Meadow Place.
j. The LID plan has been revised to show all roof areas and all disconnection flow paths. Any areas that do not meet the standard are explained in the report in Appendix A.
k. The grate elevation of Area Drain #1 has been lowered.

4.

a. A cut/fill table was added to the Development Plan.
b. The LID plan was revised.
c. Even though a sight distance and driveway plan and profile are certainly not necessary given that we are re-using the existing driveway and no other driveway is proposed, or can be proposed for the extension of

Rocco V. D’Andrea, Inc.
Sunset Road, west of the intersection with Byron Road, one has been prepared and provided herewith.

d. The building elevation sheet does not require a revision because the building design has not changed.

5. The Operations and Maintenance Plan Report does not require a revision because the proposed BMPs have not changed.

In conclusion, we have worked with the owner, architect, Town of Greenwich, and CTDEEP in developing a viable solution to the redevelopment of the subject property that will result in the replacement of the existing dwelling that is non-conforming relative to the flood prone area, Greenwich Zoning Regulations and FEMA’s minimum design standards, and a drainage management plan that will protect the waters of Long Island Sound as concurred by the CTDEEP. It will reduce the potential for flood damage to both the land and dwelling, and will not adversely impact local drainage patterns, adjacent properties, or the waters of Long Island Sound.

We thank you for your continued review and should you have any additional questions, please contact us.

Sincerely,

ROCCO V. D’ANDREA, INC.

Leonard C. D’Andrea, PE

LCD:adm
Enclosures
15LJ Trans Eng 1

cc:    Stephen Musante
        Adam Cerini, EIT-RVDI
        Thomas J. Heagney, Esquire
        Patrick LaRow, AICP - Greenwich P&Z
March 13, 2020

Ms. Jacalyn Pruitt, Planner 11
Town of Greenwich Planning and Zoning
101 Field Point Road
Greenwich, CT 06830

RE: Musante – 30 Sunset Road
PLPZ 2019 00482

Dear Jacalyn:

After meeting with representatives of the DEEP in Hartford last month, we have prepared a revised Development Plan. The plan has been updated to show the limit of tidal wetlands and the coastal jurisdiction line. Based on additional topography the grading and site walls have been modified to not encroach into the coastal jurisdiction line.

There is no change to the building itself. All modifications have occurred on the north and west sides of the site.

Enclosed are ten full size copies of the revised Development Plan with eight reductions. Also enclosed are five copies of the Drainage Summary Report and ten copies of the Zoning Location Survey and reductions along with five copies of the Engineer’s Certification.

The site plan has been forwarded to John Gaucher at DEEP.

Please let me know if any additional information is required. Thank you for your assistance.

Very truly yours,

Thomas J. Heagney

TJH/mm
Enclosures
SOILS MAPPING & WETLAND/WATERCOURSE DELINEATION REPORT
30 SUNSET ROAD, GREENWICH, CT 06870
Page 1

PROPERTY LOCATION AND DESCRIPTION:

LAND USE: Single Family Residential  ACRES: 0.25±
ADDRESS: 30 Sunset Road Greenwich, CT 06870

REPORT COMPLETED FOR:

NAME: Stephen Musante
MAILING ADDRESS: 30 Sunset Road Greenwich, CT 06870

WETLANDS/WATERCOURSE JURISDICTION
The Inland Wetlands and Watercourses Act (Connecticut General Statutes §22a-38) define inland wetlands as "land, including submerged land, which consists of any soil types designated as poorly drained, very poorly drained, alluvial, and floodplain." Water courses are defined in the act as "rivers, streams, brooks, waterways, lakes, ponds, marshes, swamps, bogs and all other bodies of water, natural or artificial, vernal or intermittent, public or private, which are contained within, flow through or border upon the state or any portion thereof."

MAPPING AND DELINEATION METHODOLOGY
Soils analysis, as described in this report, is intended as an inventory and evaluation of the existing soil characteristics on the subject property. A first order soil survey in accordance with the principles and practices noted in the USDA publication Soil Survey Manual (1993) was completed at the site. Soil units mapped in the field correspond with those in the USDA publication Soil Survey of Fairfield County, Connecticut (1981).

Wetland identification was based on the presence of poorly drained, very poorly drained, alluvial, or floodplain soils and submerged land (e.g. a pond). These and other soil types were identified by observation of soil morphology (soil texture, color, structure, etc.). To observe the morphology of the property's soils, numerous two-foot deep test pits and/or hand borings were completed throughout the site. Transects were located perpendicular to and at representative points along the perceived boundaries of the wetland areas identified on the property. Soil morphologies were observed at soil sampling points along the transects. Sampling began well outside the bounds of the wetland and continued towards it until inland wetland soils were observed. This point on each transect was marked (flagged) with an orange surveyor's tape labeled "Wetland Boundary". The complete boundary of every wetland area is located along the lines that connect these sequentially numbered boundary points.

Intermittent watercourses were delineated by a defined permanent channel and bank and the occurrence of two or more of the following characteristics: A) evidence of scour or deposits of recent alluvium or detritus, B) the presence of standing or flowing water for a duration longer than a particular storm incident, and C) the presence of hydrophytic vegetation. Surveyor's tape, which was labeled "Wetland Boundary" and sequentially numbered, was placed at critical points to demarcate the boundary of each delineated watercourse.

The wetland and watercourse boundaries are subject to change until adopted by local or state regulatory agencies.

DATE AND CONDITIONS AT TIME OF INSPECTION

DATE: February 12, 2020  INSPECTED BY: Jay Fain
WEATHER: Cool, Sunny
SOIL MOISTURE CONDITIONS: DRY X MOIST WET FROST DEPTH: N/A SNOW DEPTH: N/A

CERTIFICATION

JAY FAIN, PRINCIPAL, SOIL SCIENTIST
SOILS MAPPING & WETLAND/WATERCOURSE
DELINEATION REPORT
30 SUNSET ROAD, GREENWICH, CT 06870
Page 2

WETLAND/WATERCOURSE IDENTIFIED

<table>
<thead>
<tr>
<th>FLAG NUMBERS</th>
<th>WETLAND TYPE</th>
<th>SOIL TYPE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>Tidal Wetlands Only</td>
<td>We – Westbrook Mucky Peat</td>
<td>See Addendum I</td>
</tr>
</tbody>
</table>

SOIL MAP UNITS
Each soil map unit that was identified on the property represents a specific area on the landscape and consists of one or more soils for which the unit is named. Other soils (inclusions that are generally too small to be delineated separately) may account for 10 to 15 percent of the map unit. The mapped units are identified in the following table by name and symbol and typical characteristics (parent material, drainage class, high water table, depth to bedrock, and slope) of each unit are provided. These are generally the primary characteristics to be considered in land use planning and management. A narrative that defines each characteristic and describes their land use implications follows the table. Complete descriptions of each soil map unit can be found in the Soil Survey of Fairfield County, Connecticut (1981).

UPLAND SOILS

<table>
<thead>
<tr>
<th>SOIL</th>
<th>PARENT MATERIAL</th>
<th>SLOPE</th>
<th>DRAINAGE CLASS</th>
<th>HIGH WATER TABLE</th>
<th>DEPTH TO BEDROCK</th>
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</thead>
<tbody>
<tr>
<td>Ud</td>
<td>Udorthents</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ud</td>
<td>Udorthents</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Properties and characteristics are variable, as unit consists of soils that have been altered by cutting & filling (>20 inches thick). Additional investigations are required to determine specific characteristics.

WETLAND SOILS

<table>
<thead>
<tr>
<th>SOIL</th>
<th>PARENT MATERIAL</th>
<th>SLOPE</th>
<th>DRAINAGE CLASS</th>
<th>HIGH WATER TABLE</th>
<th>DEPTH TO BEDROCK</th>
</tr>
</thead>
<tbody>
<tr>
<td>We</td>
<td>Westbrook Mucky Peat</td>
<td>0-3</td>
<td>Very Poorly Drained</td>
<td>1.0-0.0</td>
<td>Apparent</td>
</tr>
</tbody>
</table>

* Current NRCS Classification – HTM – Human Transported Material
SOIL CHARACTERISTICS: DEFINITIONS AND LAND USE IMPLICATIONS

PARENT MATERIAL: Parent material is the unconsolidated organic and mineral material in which soil forms. Soil inherits characteristics, such as mineralogy and texture, from its parent material. Glacial till is unsorted, nonstratified glacial drift consisting of clay, silt, sand and boulders transported and deposited by glacial ice. Glacial outwash consists of gravel, sand and silt, which is commonly stratified, deposited by glacial melt water. Alluvium is material such as sand, silt or clay deposited on land by streams. Organic deposits consist of decomposed plant and animal parts.

A soil’s texture affects the ease of digging, filling and compacting and the permeability of a soil. Generally sand and gravel soils, such as outwash soils, have higher permeability rates than most glacial till soils. Soil permeability affects the cost to design and construct subsurface sanitary disposal facilities and, if too slow or too fast, may preclude their use. Outwash soils are generally excellent sources of natural aggregates (sand and gravel) suitable for commercial use, such as construction subbase material. Organic layers in soils can cause movement of structural footings. Compacted glacial till layers make excavating more difficult and may preclude the use of subsurface sanitary disposal systems or increase their design and construction costs if fill material is required.

SLOPE: Generally soils with steeper slopes increase construction costs, increase the potential for erosion and sedimentation impacts, and reduce the feasibility of locating subsurface sanitary disposal facilities.

DRAINAGE CLASS: Drainage class refers to the frequency and duration of periods of soil saturation or partial saturation during soil formation. Seven classes of natural drainage classes exist. They range from excessively drained, where water is removed from the soil very rapidly, to very poorly drained, where water is removed so slowly that free water remains at or near the soil surface during most of the growing season. Soil drainage affects the type and growth of plants found in an area. When landscaping or gardening, drainage class information can be used to assure that proposed plants are adapted to existing drainage conditions or that necessary alterations to drainage conditions (irrigation or drainage systems) are provided to assure plant survival.

HIGH WATER TABLE: High water table is the highest level of a saturated zone in the soil in most years. The water table can affect when shallow excavations can be made; the ease of the excavations, construction, and grading; and the supporting capacity of the soil. Shallow water tables may preclude the use of subsurface sanitary disposal systems or increase design and construction costs if fill material is required.

DEPTH TO BEDROCK: The depth to bedrock refers to the depth to fixed rock. Bedrock depth affects the ease and cost of construction, such as digging, filling, compacting and planting. Shallow depth bedrock may preclude the use of subsurface sanitary disposal systems or increase design and construction costs if fill material is required.
The property located at 30 Sunset Road, Greenwich, CT was investigated on February 12, 2020 for the presence of Tidal Wetlands. In Connecticut tidal wetlands are "those areas which border on or lie beneath tidal waters, such as, but not limited to banks, bogs, salt marshes, swamps, meadows, flats, or other low lands subject to tidal action, including those areas now or formerly connected to tidal waters, and whose surface is at or below an elevation of one foot above local extreme high water; and upon which may grow or be capable of growing some, but not necessarily all, of [a list of specific plant species - see Connecticut General Statutes (CGS) section 22a-29(2)] [CGS section 22a-29, as referenced by CGS section 22a-93(7)(E)]. See Addendum A for list of plant species.

The property is a 12,000 ± sq ft parcel roughly triangularly shaped parcel with frontage on Sunset Road and limited frontage on the Greenwich Cove portion of Long Island Sound. The tidal wetlands in this general vicinity have been historically altered in connection with past development of this and the surrounding parcels. On the 30 Sunset Road parcel this includes the construction of a stone wall along the western property line and backfilling. The subject parcel is occupied by a single-family residence and landscaped grounds - mostly manicured lawn. Grass species include Kentucky bluegrass (Poa spp.) and rye grass (Lolium spp.). Annual weeds include common crabgrass (Digitaria spp.) and goose grass (Eleusine spp.). Although it was not possible to make a positive identification because on the lack of any seed heads, it appears that there may be some isolated individuals of salt grass (Distichlis spicata) within the lawn matrix. This was attributed to the rhizomatous growth habit of this plant which allows it to spread beyond its preferred habitat of salt-water saturated soils. There is no evidence of tidal action in this vicinity which would provide a competitive advantage for these plants and the general topographic elevation is at or above elevation 5.5 NGVD which is elevation of one foot above local extreme high water in this location. Therefore, the presence of few small individuals plants was judged not to be indicative of tidal action.

Tidal wetlands were identified as occurring along the northern and eastern property lines. The dominant vegetation is Phragmites australis, which, is in and of itself, not an indicator of tidal wetlands. However, mixed in with the Phragmites are high tide bush (Iva frutescens), seaside goldenrod (Solidago sempervirens) and most dominantly, salt grass (Distichlis spicata). The tidal wetlands identified exhibit evidence of staining which is indicative of periodic inundation and are a distinctive tidal wetland characteristic.

One item to note. The property does contain an area in which wood chips, arborvitae leaves and sweet gums hulls have accumulated due to alluvial deposition. This area was investigated and was determined to be due to the accumulation of freshwater stormwater runoff draining from the adjacent property to the south. This accumulation is not due to tidal action and is not a wrack line.

Tidal wetlands identified by this investigation were plotted on the property survey by Rocco V. D’Andrea, the project surveyor. Approximate tidal wetland location for the property to the east was also included to indicate the extent and pattern of tidal inundation.
By way of background, I have a BS in Wildlife Ecology and MS in Plant and Forest Ecology from Cornell University. I have over 40 years of experience in field biology and ecology and have performed thousands of wetland delineations in Connecticut. I have worked with Kevin Zawoy of CT DEEP OLISP on multiple occasions to identify tidal wetlands and believe I fully understand the basis and criteria for identifying tidal wetlands in Connecticut.

Jay Fain MS, RPSS, CSPESC, CERP
Jay Fain & Associates, LLC
134 Round Hill Road
Fairfield, CT 06824
203-254-3156
"Wetland" means those areas which border on or lie beneath tidal waters, such as, but not limited to banks, bogs, salt marsh, swamps, meadows, flats, or other low lands subject to tidal action, including those areas now or formerly connected to tidal waters, and whose surface is at or below an elevation of one foot above local extreme high water; and upon which may grow or be capable of growing some, but not necessarily all, of the following: Salt meadow grass (Spartina patens), spike grass (Distichlis spicata), black grass (Juncus gerardi), saltmarsh grass (Spartina alterniflora), saltworts (Salicornia Europaea, and Salicornia bigelovii), sea lavender (Limonium carolinianum), saltmarsh bulrushes (Scirpus robustus and Scirpus paludosus var. atlanticus), sand spurrey (Spergularia marina), switch grass ( Panicum virgatum), tall cordgrass (Spartina pectinata), high-tide bush (Iva frutescens var. oraria), cattails (Typha angustifolia, and Typha latifolia), spike rush (Eleocharis rostellata), chairmaker's rush (Scirpus americana), bent grass (Agrostis palustris), and sweet grass (Hierochloe odorata), royal fern (Osmunda regalis), interrupted fern (Osmunda claytoniana), cinnamon fern (Osmunda cinnamomea), sensitive fern (Onoclea sensibilis), marsh fern (Dryopteris thelypteris), bur-reed family (Sparganium eurycarpum, Sparganium androcladum, Sparganium americanum, Sparganium chlorocarpum, Sparganium angustifolium, Sparganium fluctuans, Sparganium minimum), horned pondweed (Zannichellia palustris), water-plantain (Alisma triviale), arrowhead (Sagittaria subulata, Sagittaria graminea, Sagittaria eatoni, Sagittaria engelmanniana), wild rice (Zizania aquatica), tuckahoe (Peltandra virginica), water-arum (Calla palustris), skunk cabbage (Symplocarpus foetidus), sweet flag (Acorus calamus), pickerelweed (Pontederia cordata), water stargrass (Heteranthera dubia), soft rush (Juncus effusus), false hellebore (Veratrum viride), slender blue flag (Iris prismatica purshr), blue flag (Iris versicolor), yellow iris (Iris pseudacorus), lizard's tail (Saururus cernuus), speckled alder (Alnus rugosa), common alder (Alnus serratula), arrow-leaved tearthumb (Polygonum sagittatum), halberd-leaved tearthumb (Polygonum arifolium), spatter-dock (Nuphar variegatum nuphar advena), marsh marigold (Caltha palustris), swamp rose (Rosa palustris), poison ivy (Rhus radicans), poison sumac (Rhus vernix), red maple (Acer rubrum), jewelweed (Impatiens capensis), marshmallow (Hibiscus palustris), loosestrife (Lythrum alatum, lythrum salicaria), red osier (Cornus stolonifera), red willow
(Cornus amomum), silky dogwood (Cornus obliqua), sweet pepper-bush (Clethra alnifolia), swamp honeysuckle (Rhododendron viscosum), high-bush blueberry (Vaccinium corymbosum), cranberry (Vaccinium macrocarpon), sea lavender (Limonium nashii), climbing hemp-weed (Mikania scandens), joe pye weed (Eupatorium purpureum), joe pye weed (Eupatorium maculatum), thoroughwort (Eupatorium perfoliatum);
Jay J. Fain
8 Elm Street
Fairfield, CT

Jay Fain
Forest Ecologist, Wetland Biologist, Soil Scientist, Ecological Restoration Practitioner

Education:  Master of Science, Forest Ecology, Cornell University, Ithaca, New York
Bachelor of Science, Wildlife Ecology, Cornell University, Ithaca, New York

Certification:  Certified Soil Scientist, Soil Science Society of Southern New England
Certified Professional Erosion and Sediment Control (CPESC)
Certified Ecological Restoration Practitioner #82

Experience:  1988 - Present  Jay Fain & Associates Environmental Consulting Services
Fairfield, CT
Position:  Owner/Principal – Wetland and Soil Scientist, Design Professional

1986 -1988  Stanley Hunts Associates, Southport, CT
Position:  Environmental Scientist/Biologist

1983 -1984  University of Wyoming - Research Technician
Position:  Basic Ecological Research – Lodgepole Pine Ecosystem

1980 -1981  Town of Fairfield Conservation Department
Position:  Site Monitor

Professional Affiliations:
Soil Science Society of America
American Society of Agronomy
Society for Ecological Restoration
Soil Scientist Society for Southern New England
Connecticut Association of Wetland Scientist

RECEIVED
MAR 13 2020
PLANNING & ZONING COMMISSION
## Map Unit Legend

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<th>Map Unit Name</th>
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<td>Hinchley-Urban land complex, 3 to 15 percent slopes</td>
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<td>250B</td>
<td>Sutton-Urban land complex, 0 to 8 percent slopes</td>
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<td>305</td>
<td>Udorthents-Urban land complex</td>
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<td><strong>8.9</strong></td>
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SITE PLAN APPLICATION

☐ PRELIMINARY

Project Name: Musante Residence
Project Address: 30 Sunset Road, Old Greenwich, CT 06870
Property Owner(s): Stephen P. & Maria R. Musante
Tax Account Number(s): 06-2544/S Zone(s): R-12 Lot Area: 12,072 sf

Please select all relevant items below:
☐ Special Permit – Complete special permit application form
☒ Coastal Overlay Zone
☐ Property is within 500 feet of a Municipal Boundary of ___________________________ (for notification)
☐ Amendment to Building Zone Regulations – Section(s) _______________________________
☐ Amendment to Building Zone Map – Zone(s) affected _______________________________________________________________________
☐ Health Department review needed
☐ Sewer Department review needed
☐ Architectural Review Committee Application attached or Review needed
☐ Planning & Zoning Board of Appeals review needed
☐ Inland Wetlands and Watercourses Agency Review / Approval Required

RECEIVED

NOV 16 2019

PLANNING & ZONING COMMISSION

AUTHORIZED AGENT

Name: John Heagney
Firm name: Heagney, Lennon & Slane, LLP
Street Address: 248 Greenwich Avenue
City: Greenwich St: CT Zip: 06830
Phone: (203) 661-8490
Email: JHeagney@HLS248.com
Signature: ____________________________ Date: November 8, 2019

PROPERTY OWNER(S) AUTHORIZATION

Name: Stephen P. & Maria R. Musante
Street Address: 30 Sunset Road
City: Old Greenwich ST: CT Zip: 06870
Phone: ____________________________ Email: ____________________________
Signature: *See Authorization Letter Date: ____________________________

To be completed by P&Z staff only:
Check #: 4437107 Check Amount: $790.00
Application #: PLPL-2019-00482

PZ Site Plan App 2018
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<td>Usable Floor Area</td>
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</tr>
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<td>Parking Spaces</td>
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<td></td>
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<tr>
<td>COMMERCIAL/RETAIL</td>
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<td>Gross Floor Area</td>
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<tr>
<td>Usable Floor Area</td>
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<tr>
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<tr>
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<td>1</td>
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<tr>
<td>Number of Bedrooms</td>
<td>3</td>
<td>4</td>
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<tr>
<td>Gross Floor Area</td>
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<td>Parking Spaces</td>
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<td>TOTAL SQUARE FOOTAGE</td>
<td>2,251 sf</td>
<td>3,789.77 sf</td>
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<td>2.5 stories</td>
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<td>FLOOR AREA RATIO</td>
<td>0.196</td>
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<td>BUILDING COVERAGE</td>
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<td>3,012 sf</td>
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<td>LOT COVERAGE</td>
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<td>GREEN AREA</td>
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<td>61.2% (7,389 sf)</td>
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<tr>
<td>AGE OF STRUCTURE</td>
<td></td>
<td>73 years (built 1946)</td>
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</table>

This Site Plan Involves:

- [ ] ADDITIONS
- [ ] ALTERATIONS
- [ ] DEMOLITION
- [ ] RE-CONSTRUCTION

PZSitePlan App 2018
APPLICATION FOR REVIEW OF COASTAL SITE PLAN

Applicant's Name: Stephen P. & Maria R. Musante
Date: November 8, 2019

Address: 30 Sunset Road, Old Greenwich, CT 06870

Project Address or Locations: 30 Sunset Road, Old Greenwich, CT 06870

The following information must be supplied by the applicant and submitted in addition to, and along with, any application, plans and data required for approval of the proposed project under the zoning and/or subdivision regulations of this municipality. Attach additional sheets if more space is required.

I. PLANS

A. Project Plan(s)
   This application must be accompanied by a plan (or plans) of the entire project indicating 1) project location, 2) design of all existing and proposed buildings, structures, and uses, 3) all proposed site improvements or alterations, and 4) ownership and type of use on adjacent properties.

B. Coastal Resources
   This application must be accompanied by a plan showing the location of all coastal resources (as defined in Section 22a-93(7) of the Connecticut Coastal Management Act) on and contiguous to the site.

II. WRITTEN INFORMATION

A. Description of the Proposed Project
   Describe the entire project including types of buildings and structures, uses, methods and timing of construction, type and extend of development adjacent to the site. This information should supplement and/or clarify plans in I (A) above.

   Applicant proposes to demolish existing dwelling and construct a new two-story residence.
B. Description of Coastal Resources

Identify the coastal resources on and contiguous to the site (as shown on the coastal resources map) and describe their condition. This information should supplement and/or clarify the plan in (b) above.

The property lies approximately 10' from Greenwich Cove.

C. Assessment of the Suitability of the Project for the Proposed Site and the Capability of the Resources to Accommodate the Proposed Use.

(1) Identify any and all coastal use policies (in Section 22a-92(10)(b)(1) of Connecticut Coastal Management Act) applicable to the proposed project.

(2) Identify and all coastal resource policies (in Section 22a-92(10)(b)(2) of Connecticut Coastal Management Act) applicable to the proposed project.

(3) Describe how the proposed project is consistent with all of the coastal policies identified in C (1) and (2) above (i.e. describe the extent to which the project complies or conflicts with each policy, the project should be modified to reduce or eliminate the conflict.

The proposed construction will comply with the flood zone requirements.

D. Evaluation of the Potential Beneficial and Adverse Impacts of the Project and Description of Proposed Methods to Mitigate Adverse Effects.

(1) Identify and describe the potential adverse impacts (as defined in Section 22a-93(15) of Connecticut Coastal Management Act and potential beneficial impacts of the project on coastal resources.

None.

FOR WATERFRONT PROPERTY ONLY:

(2) Is the project a water dependent use as defined in Section 22a-93(16) OF THE CONNECTICUT Coastal management Act? If, so, explain why.

No
FOR WATERFRONT PROPERTY ONLY:

(3) Describe the impacts of effects (either positive or negative) that the project will have on future water dependent uses or development on and adjacent to this site as defined in Section 22a-93(17).

(4) Describe the proposed measures to mitigate (reduce or eliminate) any adverse impacts on coastal resources described in D(1) and, if applicable, on future water dependent development opportunities described in D(3).

E. Demonstration of the Acceptability of Remaining or Unmitigated Adverse Impacts on Coastal Resources and Future Water Dependent Uses and Development.

(1) Describe any adverse impacts that remain after employing all reasonable mitigation measures.

(2) Explain why these remaining adverse impacts were not mitigated.

(3) Explain why the commission reviewing this application should find these remaining adverse impacts to acceptable.
December 23, 2015

Planning and Zoning Commission
Town of Greenwich
101 Field Point Road
Greenwich, CT 06830

RE:  Final Coastal Site Plan – 30 Sunset Road, Old Greenwich

To Whom It May Concern:

I hereby authorize Heagney, Lennon & Slane, LLP to act as my agent to appear before the Town of Greenwich Planning and Zoning Commission in connection with the filing of an application for final coastal site plan approval for the above captioned property.

[Signature]

Stephen Musante
Ms. Jacalyn Pruitt, Planner II  
Planning and Zoning  
Town of Greenwich  
101 Field Point Road  
Greenwich, CT 06830  

RE: 30 Sunset Road, Old Greenwich, CT 06870  

Dear Jackie:  

Enclosed please find the following in connection with the above referenced application:  

1. Site Plan Application Checklist;  
2. Site Plan Application, 8 copies;  
3. Application for Review of Coastal Site Plan, 8 copies;  
4. Authorization Letter;  
5. Affidavit of Notice to abutting property owners;  
6. Narrative, 8 copies;  
7. Topographic and Aerial GIS Map;  
8. Assessor's Field Card;  
9. Architectural Plans, 8 full size and 8 reduced copies;  
10. Site Plan, 15 full size and 8 reduced copies;  
11. Zoning Location Survey, 15 full size and 8 reduced copies;  
12. Elevation Plan with Soil Info, 5 copies;  
13. Grade Plane Plan, 5 copies;  
14. Directly Connected Impervious Area (DCIA) Certification Pre-Construction, 5 copies;  
15. Engineer of Record Certification, 5 copies;  
16. Operations and Maintenance Plan Report, 5 copies;  
17. Drainage Summary Report, 5 copies;  
18. Copy of Planning and Zoning Board of Appeals Approval of Appeal No. PLZE201800549;  
19. Copy of Approved IWYA Green Sheet;  
20. CD of application materials; and  
21. Check representing the filing fee for a final site plan review by the Commission and State fee.  

Please schedule this item for the next available agenda. Thank you for your assistance in this matter.  

Very truly yours,  

John Heagney  

JH/em  
Enclosures
SITE PLAN CHECKLIST

APPLICATION NAME: Musante Residence - 30 Sunset Road

All applications for preliminary and final site plan approval shall be made on the appropriate forms as provided by the Planning Staff. The following items must also be provided with the application. If any of the following items are not filed at the time of application, the application may be returned to the applicant in order that it may be filed in the entirety at an appropriate future date. Required Items: (Sec. 6-14)

CHECK ITEMS SUBMITTED

☐ 1. Fifteen copies of a survey, folded to 9" x 12", showing existing conditions, including:
   □ a. Locations and dimensions of all existing buildings, structures, fences, retaining walls, utility facilities, trees of six (6) inches or more in diameter at breast height, and other similar features.
   □ b. Existing contours at no more than a two-foot vertical interval, unless waived by the commission Staff in circumstances where such contours may not be necessarily pertinent. The survey shall indicate topographic conditions of property immediately adjoining the subject parcel.
   □ c. The location of all existing watercourses, intermittent streams, wetlands as required by IWWA, Flood Hazard Lines as determined by FEMA, springs and rock outcrops or a note indicating that none exist, with the sources of information listed.
   □ d. The zone in which the land to be developed falls and the location of any town and zone boundary lines within or adjoining the tract, and yard dimensions to existing buildings. Lot area, by zone, shall be indicated.
   □ e. The title of the development, date, revision date if any and nature of revision, north arrow, scale, and the name and address of owner and names of owners of adjacent land.
   □ f. Street and property lines, curbs, edges of pavement, sidewalks, easements, right-of-way, covenants, and deed restrictions.
   □ g. Traffic lights and controls, public trees, catch basins, hydrants, and power and telephone lines in adjacent streets.
   □ h. Certification with the signature and seal or registration number of a registered land surveyor licensed in the State of Connecticut that the drawing is substantially correct to A-2 Standards, and that the property is in a designated zone under the zoning regulations.

☐ 2. Fifteen sets of a detailed Site development plan, at a readable scale, folded to 9" x 12", prepared in accordance with all applicable Town standards including the Roadway Design and Drainage Design Manuals, and signed by a professional architect, land surveyor, or engineer licensed in the State of Connecticut, showing:
   □ a. Location, dimension, and elevation of all proposed buildings, structures, walls, fences.
   □ b. Location dimensions and surface treatment of all existing and proposed parking and loading spaces, traffic access and circulation drives, and pedestrian walks. Sidewalks are to be provided as required by the Building Zone Regulations.
   □ c. Approximate location of proposed utility lines, including water, gas, electricity, sewer and the location of any transformers.
   □ d. Note specifying source of water supply and method of sewage disposal.
   □ e. Existing and proposed contours at units of no more than a two foot interval unless waived by the Commission's staff. Cuts and fills and estimates of blasting to be submitted at time of final site plan.
   □ f. Location, size and type of proposed landscaping and buffer planting and the designation of those areas of natural vegetation not to be disturbed.
   □ g. Any other similar information determined by the Commission staff in order to provide for the proper enforcement of the Building Zone Regulations.
   □ h. Zoning statistics including: Gross Floor Area, Floor Area Ratio, Usable Floor Area, Required Parking, Actual Parking Provided, Building Height, Building Footprint, and Area Devoted to Surface parking, Building and Drives.
   □ i. Provisions for compliance with Americans with Disabilities Act (Handicap Access) and State Building Code.
   □ j. Coastal Area Management Application for projects within the Coastal Overlay Zone.

☐ 3. Eight sets of architectural plans, signed and sealed by an architect registered in the State of Connecticut, of all floors, all exterior elevations showing existing and proposed grade conditions. Elevations are to detail architectural elements by labeling materials, color and dimensions. Each architectural elevation shall show the absolute building height as well as building height for zoning purposes. All HVAC facilities are to be shown on architectural elevations.
4. Three copies of Floor Plan Work Sheets with the dimensions and calculated floor areas for each floor prepared in accordance with Sec. 6-3(22). Consult Commission Staff for required format.

5. Three copies of “building coverage” computation sheets.

6. Three copies of “area devoted to surface parking, building, and drives” worksheets.

7. Five copies of sight distance certification reports when required by a preliminary site plan review or when advised by the commission staff pursuant to item 2(g) of this checklist.

8. Three copies of Volume calculations per 6-101.

9. Completed Traffic Impact Evaluation Form if applicable. Submission requirements are defined on the form, available at the Commission office. A traffic report may be required.

10. Ten copies of completed application form signed by applicant or authorized agent, owners and contract purchasers, as applicable.

11. Ten copies of completed Special Permit form, if required by Building Zone Regulations.

12. Fifteen copies of detailed, inclusive narrative description of the proposed project. For those projects involving amendments to the Building Zone Regulations and/or amendments to the Building Zone Regulation Map, the narrative description must provide the section number and text for the proposed amendments(s) to the BZR and an explanation providing justification for the proposal. For map changes, a scaled drawing at 1” to 400’ needs to be provided for affected areas(s).

13. Eight copies of reductions in, 11 x 17 size, or other appropriate size, providing a readable, clear plan of proposed site development and architectural plans.

14. A showing that an adequate source of potable water is available to satisfy the needs of the proposed development as per Sec. 6-15(a) (5), signed by C.A.W.C.

15. An affidavit certifying that all abutting property owners have been notified, as evidenced by the submission of a certificate of mailing or certified or registered mail receipts about said application. A schedule of names, addresses, shown on a GIS map with lot lines indicating the location of the notified property owners. Owners of lots, or portions of lots, which are across a public or private street shall be deemed to be abutting property owners. For projects which require the preliminary review by the Conservation Commission, the notice shall be sent by the applicant to abutting owners two weeks prior to any scheduled hearing date of the Conservation Commission.

16. Authorization for the agent and contract purchasers to act on behalf of the certified property owner(s).

17. A separate schematic plan at a scale no larger than 1”-100” indicating buildings, parking and drives on the site and all adjoining properties, including those across the street, and the nearest cross street.

18. Five copies of a Drainage Summary Report as per Department of Public Works and the Town Drainage Design Manual. The summary report must be prepared in accordance with the following formats: PRELIMINARY: Existing and proposed storm water distribution, existing and proposed runoff rates, capability of off-site drainage facilities to accommodate proposed runoff, capability of off-site soils to accommodate percolation or detention if proposed, and identification of proposed drainage structures. FINAL: Final structure design details, prior approval from IWWA, Engineering Division and Conservation Commission as appropriate, and all information required by the preliminary report or two copies of drainage exemption forms.

19. In accordance with Sec. 6-183.1 to 6-183.10 of the Building Zone regulations, tree protection and sedimentation and erosion control plans shall be submitted with all site plan applications.

20. All applications for final site plans shall be in the form of a survey prepared by a registered Connecticut land surveyor having metes and bounds, dimensions of all buildings, parking and drives, setbacks of all structures from property lines, setbacks between buildings, and certification that building dimensions shown thereon are the same as the approved architectural plans

21. Required fee submitted at time of application (see fee schedule).

22. "It is the belief of the PZC staff that this application is incomplete because of the failure of the applicant to provide the materials referred to above. This application will be reviewed by the PZC and a decision made as to whether it is complete or incomplete at its public meeting to be held in the PZC office."

All applicants must make an appointment to submit this application with the Applications Coordinator, Peter Mangs, who can be reached by (email) Peter_Mangs@greenwichct.org or (phone) 203-622-7894.

NOTE: Any new documentation presented at Planning and Zoning Meetings shall be submitted to staff so that they can be made part of the record. Please ensure all documents can easily be removed from presentation boards.
NARRATIVE

Applicant proposes to demolish the existing dwelling and shed and construct a new 3,789.77 sf single-family home at 30 Sunset Road in Old Greenwich.

The property lies across the unfinished end of Sunset Road from Greenwich Cove adjacent to Town of Greenwich “Driftway”. The tidal wetland limit was delineated in September 2019 by JMM Wetland Consulting Services and it was determined that the parcel contains no tidal wetlands.

The entire property lies within the AE-13 flood zone and the new house will have a F.F.E. of 15.0 and E.A.F.E. of 6.0 to comply with the flood zone standards. The basement level will feature a two-car garage and storage space with the necessary flood vents.

The front yard and part of the side and rear yards will have a new 2.5’ retaining wall to bury the required drainage system and the stone masonry wall abutting the Town “Driftway” will remain. The utilities will be located underground, including a propane tank for the proposed generator.

In October 2018, the Zoning Board of Appeals granted a rear yard setback variance to the property owners to locate a new house 11’ from the property line. The Zoning Board of Appeals granted this variance with the condition that the new dwelling be constructed with a combined side and rear yard setback of 25’.

The proposed project will comply with the remaining zoning criteria for the R-12 zone, including FAR, building height and green area.

Applicant proposes to reconnect the new dwelling to the Sunset Road sanitary sewer line.

The Inland Wetlands and Watercourses staff has issued Green Sheet sign off for the property.

Applicant requests final coastal site plan approval to demolish the existing dwelling and construct a new home.

Respectfully Submitted,
John J. Heagney
Dated: November 14, 2019

RECEIVED
NOV. 15 2019
PLANNING & ZONING COMMISSION
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**Assessment Year:** 2013/2014

**Tax:** 10/01/13 to 09/30/14

**Property Address:**

**City:**

**County:**

**State:**

**Zip Code:**

**Tax:** 10/01/13 to 09/30/14

**Property Address:**

**City:**

**County:**

**State:**

**Zip Code:**
TOWN OF GREENWICH

AFFIDAVIT OF NOTIFICATION OF COASTAL SITE PLAN
APPLICATION TO PLANNING AND ZONING COMMISSION

STATE OF CONNECTICUT  )
COUNTY OF FAIRFIELD  )
ss: Greenwich

I, JOHN J. HEAGNEY, being first duly sworn, do hereby certify that on November 7, 2019, I caused to be mailed, postage prepaid, evidenced by certificate of mailing, to those persons whose names are set forth on Exhibit A attached hereto, a copy of the notice Exhibit B. Said persons are the record owners, as of November 7, 2019, as shown on the Town Tax Assessor’s Office records of property abutting and across the street from the property located at 30 Sunset Road, Old Greenwich, Connecticut for which an application for a coastal site plan has been filed with the Greenwich Planning and Zoning Commission.

Subscribed and sworn to before me this 7th day of November, 2019.

EMMA A. MUTINO
NOTARY PUBLIC
State of Connecticut
My Commission Expires
April 30, 2020

RECEIVED
PLANNING & ZONING COMMISSION
NOV 15 2019

JOHN J. HEAGNEY
EXHIBIT A

Abutting property owners of 30 Sunset Road:

David Lipschitz & Leora Rajak
2 Meadow Place
Old Greenwich, CT 06870
06-1808/S

Town of Greenwich
C/O Finance Dept.
101 Field Point Road
Greenwich, CT 06830
06-4702

Samtosha Holdings LLC
51 Keofferam Road
Old Greenwich, CT 06870
06-2450/S

26 Sunset Road LLC
26 Sunset Road
Old Greenwich, CT 06870
06-2972/S

Reunion LLC
27 Sunset Road
Old Greenwich, CT 6870
06-2348/S

Dept. of Energy & Environmental Protection
State of Connecticut
79 Elm Street
Hartford, CT 06106
EXHIBIT B

November 7, 2019

To Whom It May Concern:

Notice is hereby given that Stephen P. and Maria R. Musante have filed an application with the Town of Greenwich Planning Commission for a coastal site plan to construct a new home on their property located at 30 Sunset Road in Old Greenwich, Connecticut.

Further information regarding this application may be obtained at the Planning and Zoning Commission or this office.

As an adjoining property owner, you are entitled to this notice. You may appear at the Public Hearing of this appeal or send a representative. You may also write to the Planning and Zoning Commission to express your position on this matter under review if you so choose. The date of the hearing has not yet been determined. Prior to the hearing a legal notice will be published twice in the Greenwich Time newspaper to announce the date and time of the hearing. The appeal and accompanying documents are on file at Greenwich Town Hall. You may review these public records at Town Hall if you wish.

John Heagney

For information contact:
Planning and Zoning Commission
Town Hall, 101 Field Point Road
Greenwich, CT 06830
Tel: 203-622-7894
To Whom It May Concern:

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For information contact:
Planning and Zoning Commission
Town Hall, 101 Field Point Road
Greenwich, CT 06830
Tel: 203-622-7894
October 22, 2018

Thomas J. Heagney
248 Greenwich Avenue
Greenwich, CT 06830

Dear Mr. Heagney:

This will notify you that effective October 22, 2018 the Planning and Zoning Board of Appeals of the Town of Greenwich (Patricia Kirkpatrick, Chairman, Arthur Delmhorst, Secretary, Wayne Sullivan, Ken Rogozinski, John Vecchiolla and Frank Baratta) rendered the following decision.

APPEAL No. PLZE201800549

Appeal of Stephen and Maria Musante, 30 Sunset Road, Old Greenwich for a variance of rear yard setback to permit the construction of a new dwelling located in the R-12 zone.

It was unanimously RESOLVED that said appeal be granted with conditions.

After due consideration, the Board finds there is hardship due to the unique shape of the lot. Therefore, the requested variance of rear yard setback is granted from sections 6-203 and 6-205 with the condition that the new dwelling be constructed with a combined side and rear yard setback of 25 feet.

The Board further finds that this relief can be granted without detriment to the public welfare or impairment to the integrity of the regulations.

Frank Baratta sat for John Vecchiolla for this appeal.

Arthur Delmhorst, Secretary
PROJECT: Street Address 30 Sunset Road

PARCEL ID: 06 25 44

Has there ever been an IWWA application for this site? YES NO

Appl. #

ACTIVITY: (Circle) Addition Demolition Deck Garage Interior renovations New residence Pool Tennis court

Generator Site Work/Landscaping Septic Other (please specify)

Will this activity require an addition to the septic system or Biolo? YES NO

FEE: $30 for in office review, $65 for reviews requiring a site visit or further in office analysis

Owner's full name (please print) Stephen P. & Maria R. Musante Phone ()
Mailing address 30 Sunset Road Town Old Greenwich Zip 06870

Authorized Agent's name (please print) John Heagney Phone (203) 561-8400
Mailing address 248 Greenwich Avenue Town Greenwich Zip 06830

A PLOT PLAN IS REQUIRED SHOWING THE PROPOSED ACTIVITY IN RED.

Staff cannot review your proposal without a plan.

IWWA staff will review this questionnaire to determine if regulated activities are associated with the proposal and whether an IWWA permit is required. Do not apply for a Building Permit until this review is complete.

If your project does not require an IWWA permit, we will sign off on this questionnaire, which you will need if you are obtaining permits from other departments.

If an IWWA permit is required, we will supply you with a permit application packet. You must obtain an IWWA permit prior to the commencement of your project. No work may begin until you receive an IWWA permit. The issuance of a building permit alone does not constitute an authorization to proceed.

If you do not receive notice regarding your questionnaire within two weeks of submission, please contact the IWWA office.

As the property owner ☐ or, authorized agent ☑ (check one) I believe that the information I have submitted is correct.

Signature __________________________ Date 12/23/15

If mailing, return completed form and a $30 check (payable to "Town of Greenwich") to the Greenwich Inland Wetlands & Watercourses Agency.

If a site visit is required, you will be notified and asked to remit an additional $35.

The site visit will not take place until this additional fee is received.

STAFF NOTES

Office Rev Date 12/23/15 Field Inv Date 1/1/15 WET/WC YES NO TIDAL ☑

Action Required? YES NO If yes, DR AA AR SIA Staff ☑☐

Soils Report Date 1/1/15 Author _____________________ Soils _____________________

Comments: _____________________

Fee Received YES NO Comment: _____________________

IWWA Questionnaire Revised 9/16/15
OPERATIONS AND MAINTENANCE PLAN REPORT

For

30 Sunset Road,
Old Greenwich, Connecticut

Prepared For

Stephen P. and Maria R. Musante

November 4, 2019

Leonard C. D’Andrea, PE
CT License No. 14869
Stormwater Management Practices
Maintenance Declaration
Stormwater Management Practices Maintenance Declaration

THIS DECLARATION is made this date, ______________, 20_____, by and between the Town of Greenwich, a municipal corporation with principal offices located at 101 Field Point Road, Greenwich, CT 06830 and

Stephen P. Musante & Maria R. Musante

[Owner(s) Name]

30 Sunset Road, Old Greenwich, CT

[Address]

hereinafter referred to as “Owner(s)” of the “Property” as more fully described in a deed recorded in Book 6590 at Page 339 of the Greenwich Land Records. In accordance with the Town of Greenwich Drainage Manual as Amended, the “Owner(s)” agree to install and maintain stormwater management practice(s) on the subject Property in accordance with approved plans and conditions. The Owner further agrees to the terms stated in this document to ensure that the stormwater management practice(s) continues serving the intended function in perpetuity. This Declaration includes the following exhibits located in the project files of one or all of the following Town of Greenwich Departments:

- Building Division – Permit # ____________________________
- Inland Wetlands and Watercourses Agency – Application # ____________________________
- Planning and Zoning – Application # ____________________________

Exhibit A: Long-term Maintenance Plan that prescribes those activities that must be carried out to maintain compliance with this Declaration. Approved Maintenance Plan dated ______________.

Exhibit B: Improvement Location Survey depicting “As-Built” conditions and showing an accurate location of each stormwater management practice affected by this Declaration. Approved Improvement Location Survey dated ______________.

Note: After construction has been verified and accepted by the Town of Greenwich for the stormwater management practices, this declaration shall be recorded by the Owner on the Greenwich Land Records and copies of the recorded document shall be submitted to all of the following Town of Greenwich Departments involved in the approval:

- Building Division
- Inland Wetlands and Watercourses Agency
- Planning and Zoning

Through this Declaration, the Owner(s) hereby subjects the Property to the following covenants, conditions, and restrictions:

1. The Owner(s), at its expense, shall secure from any affected owners of land all easements and releases of rights-of-way necessary for utilization of the stormwater practices identified in Exhibit B and shall record them with the Town Clerk. These easements and releases of rights-of-way shall
not be altered, amended, vacated, released or abandoned without prior written approval of the Town of Greenwich.

2. The Owner(s) shall be solely responsible for the installation, maintenance and repair of the stormwater management practices, drainage easements and associated landscaping identified in Exhibit B in accordance with the Operation and Maintenance Plan (Exhibit A).

3. No alterations or changes to the stormwater management practice(s) identified in Exhibit B shall be permitted unless they are deemed to comply with this Declaration and are approved in writing by the Town of Greenwich.

4. The Owner(s) shall retain the services of a qualified inspector (as described in Exhibit A) to operate and ensure the maintenance of the stormwater management practice(s) identified in Exhibit B in accordance with the Operation and Maintenance Plan (Exhibit A).

5. The Owners(s) must maintain all records (logs, invoices, reports, data, etc.) and have them readily available for inspection at all times. Inspection Documentation must be maintained as specified required in Exhibit A.

6. The Town of Greenwich or its designee is authorized to access the property as necessary to conduct inspections of the stormwater management practices or drainage easements to ensure compliance with the intent of this Declaration and the activities prescribed in Exhibit A. Upon written notification by the Town of Greenwich or their designee of required maintenance or repairs, the Owner(s) shall complete the specified maintenance or repairs within a reasonable time frame determined by the Town of Greenwich. The Owner(s) shall be liable for the failure to undertake any maintenance or repairs so that the public health, safety, general welfare or the environment shall not be endangered.

7. If the Owner(s) does not keep the stormwater management practice(s) in reasonable order and condition, or complete maintenance activities in accordance with the Operation and Maintenance Plan contained in Exhibit A, or the required maintenance or repairs under 6 above within the specified time frames, the Town of Greenwich is authorized, but not required, to perform the specified inspections, maintenance or repairs in order to preserve the intended functions of the practice(s) and prevent the practice(s) from becoming a threat to public health, safety, general welfare or the environment. In the case of an emergency, as determined by the Town of Greenwich, no notice shall be required prior to the Town of Greenwich performing emergency maintenance or repairs. The Town of Greenwich may levy the costs and expenses of such inspections, maintenance, repairs and appropriate fees against the Owner(s). The Town of Greenwich at the time of entering upon said stormwater management practice for the purpose of maintenance or repair may file a notice of lien upon the property affected by the lien. If said costs and expenses are not paid by the Owner(s), the Town of Greenwich may pursue the collection of same through appropriate court actions.

8. The Owner(s) hereby conveys to the Town of Greenwich an easement over, on and in the Property for the purpose of access to the stormwater management practice(s) for the inspection, maintenance and repair thereof, should the Owner(s) fail to properly inspect, maintain and repair the practice(s). The Town of Greenwich’s execution of any repair or maintenance does not alter the Owner(s) responsibility to maintain in future.
9. The Owner(s) agrees that this Declaration shall be recorded and that the land described in a deed recorded in Book 6590 at Page 339 of the Greenwich Land Records shall be subject to the covenants and obligations contained herein, and this Declaration shall bind all current and future owners of the property.

10. The Owner(s) agrees in the event that the Property is sold, transferred, or leased to provide information to the new owner, operator, or lessee regarding proper inspection, maintenance and repair of the stormwater management practice(s). The information shall accompany the first deed transfer and include Exhibits A and B and this Declaration. The transfer of this information shall also be required with any subsequent sale, transfer or lease of the Property.

11. The Owner(s) agree that the rights, obligations and responsibilities hereunder shall commence upon execution of the Declaration.

12. The parties whose signatures appear below hereby represent and warrant that they have the authority and capacity to sign this declaration and bind the respective parties hereto.

13. The Proprietor, its agents, representatives, successors and assigns shall defend, indemnify and hold the Town of Greenwich harmless from and against any claims, demands, actions, damages, injuries, costs or expenses of any nature whatsoever, hereinafter “Claims”, fixed or contingent, known or unknown, arising out of or in any way connected with the design, construction, use, maintenance, repair or operation (or omissions in such regard) of the storm drainage system referred to in the permit as Exhibit “A” hereto, appurtenances, connections and attachments thereto which are the subject of this Declaration. The Proprietor, its agents, representatives, successors and assigns shall not be required to indemnify the Town, its officers, agents, servants, or employees, against any such damages occasioned solely by acts or omissions of the Town, its officers, agents, servants or employees, other than supervisory acts or omissions of the Town, its officers, agents; servants, or employees, in connection with such Claims or the enforcement of this Declaration.

RECEIVED
NOV 15 2019
PLANNING & ZONING COMMISSION
IN WITNESS WHEREOF, the “Owner(s)” have executed this Declaration on this _____ day of ____________________, 20____.

By: _________________________________
[Owner(s)]

By: _________________________________
[Owner(s)]

STATE OF CONNECTICUT  
)  
COUNTY OF FAIRFIELD  
) ss: Greenwich

The foregoing instrument was acknowledged before me on this___________ day of  
__________________, 20____, by _________________________________, the  
[Owner(s)]

“Owner(s)” of _________________________________.

[Address]

_______________________________
Notary Public

My Commission Expires On:

WHEN RECORDED RETURN COPY TO:  
[All of the following departments involved in approval:  
Building Division, Inland Wetlands & Watercourses Agency, and Planning & Zoning]
Exhibit “A”

Operation and Maintenance Plan with Log
Exhibit A
Operations and Maintenance Plan
30 Sunset Road
Old Greenwich, Connecticut

Scope:

The purpose of the Operations and Maintenance Plan is to ensure that the existing and proposed stormwater components installed at 30 Sunset Road are maintained in operational condition as designed throughout the life of the project. The service procedures associated with this plan shall be performed as required by the parties legally responsible for their maintenance.

Recommended Frequency of Service:

As further defined below, all stormwater components should be checked on a periodic basis and kept in full working order. Ultimately, the required frequency of inspection and service will depend on runoff quantities, pollutant loading, and clogging due to debris. At a minimum, we recommend that all stormwater components be inspected and serviced twice per year, once before winter begins and once during spring cleanup.

Qualified Inspector:

The inspections must be completed by an individual experienced in the construction and maintenance of stormwater drainage systems. Once every five years the inspections must be completed by a professional engineer.

Service Procedures:

1. **Catch Basins & Drainage Inlets:**
   a. Catch basins and drainage inlets shall be completely cleaned of accumulated debris and sediments at the completion of construction.
   b. For the first year, catch basins and drainage inlets shall be inspected on a quarterly basis.
   c. Any accumulated debris within the catch basins/inlets shall be removed and any repairs as required.
   d. From the second year onward, visual inspections shall occur twice per year, once in the spring and once in the fall, after fall cleanup of leaves has occurred.
   e. Accumulated debris within the catch basins/inlets shall be removed and repairs made as required.
   f. Accumulated sediments shall be removed at which time they are within 12 inches of the invert of the outlet pipe.
   g. Any additional maintenance required per the manufacturer’s specifications shall also be completed.

2. **Storm Drainage Piping and Manholes/Junction Boxes:**
   a. All storm drainage piping shall be completely flushed of debris and accumulated sediment at the completion of construction.
   b. Manholes/Junction Boxes shall be inspected and repaired on an annual basis.
   c. Unless system performance indicates degradation of piping, comprehensive video inspection of storm drainage piping shall occur once every ten years.
   d. Any additional maintenance required per the manufacturer’s specifications shall also be completed.
3. **Drywells and Infiltration Systems:**
   a. All drywells/infiltrators shall be completely cleaned of accumulated debris and sediments upon the completion of construction.
   b. For the first year, the drywells/infiltrators shall be inspected on a quarterly basis.
   c. Any accumulated debris within the drywells/infiltrators shall be removed and any repairs made to the units as required.
   d. From the second year onward, visual inspection shall occur twice per year, once in the spring and once in the fall, after fall cleanup of leaves has occurred.
   e. Accumulated debris within the units shall be removed and repairs made as required.
   f. Any additional maintenance required per the manufacturer's specifications shall also be completed.

4. **Roof Gutters:**
   a. Remove accumulated debris and inspect for damage. Any damage should be repaired as required.

**Disposal of Debris and Sediment:**

All debris and sediment removed from the stormwater structures and bioretention/biofiltration basins shall be disposed of legally. There shall be no dumping of silt or debris into or in proximity to any inland or tidal wetlands.

**Maintenance Records:**

The Owners(s) must maintain all records (logs, invoices, reports, data, etc.) and have them readily available for inspection at all times.
Operations and Maintenance Log (Page 1 of 2)
30 Sunset Road
Old Greenwich, Connecticut

Type of Inspection: □ Spring  □ Fall  □ Other

Inspector's Name: ___________________________  Date of Inspection: ____________
Affiliation: ___________________________  Phone #: ___________________________

Catch Basins, Manholes & Drainage Inlets:
• Has Accumulated Debris been removed from grates? □ Yes □ No □ N/A
• Do Any Basins Require Additional Repair? (Identify Below): □ Yes □ No □ N/A
• Have Sumps Been Cleaned of Sediment? □ Yes □ No □ N/A

Notes:

Stormwater Piping:
• Is there any evidence of stormwater piping failure? □ Yes □ No □ N/A
• Have roof drains and gutters been inspected and cleared of debris? □ Yes □ No □ N/A

Notes:

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PLANNING & ZONING COMMISSION

Roof Gutters:
• Has accumulated debris been removed from gutters? □ Yes □ No □ N/A
• Do any gutters require additional repair? (Identify below) □ Yes □ No □ N/A

Notes:
Operations and Maintenance Log (Page 2 of 2)
30 Sunset Road
Old Greenwich, Connecticut

Drywells and Infiltration Systems:
- Have units been cleared of debris/sediments? □ Yes □ No □ N/A
- Do units require additional repair? (identify below): □ Yes □ No □ N/A
- Has draining times of system been verified? □ Yes □ No □ N/A

Notes:

Please make additional notes/observations and particular concerns below. Also record any additional maintenance that has been performed:

Signature of Inspector: ___________________________ Date: ___________________________
Engineer of Record Certification

Project Name: Single-Family Residence

Project Address: 30 Sunset Road, Old Greenwich

Engineer’s Name: Leonard D’Andrea

Engineering Firm’s Name: Rocco V. D’Andrea, Inc.

Street Address: 6 Neil Lane City: Riverside State: CT Zip: 06878

Phone: 203-637-1779 Fax: 203-637-1770 Email: lcd@rvdiv.com

The undersigned Registered Professional Engineer of Record certifies that the Stormwater Management Report and Plans submitted herewith entitled:

> Drainage Summary Report
> Final Site Plan Review Set

Stormwater Management Report Last Revision Date: 4-20-20

Number of Plan Sheets: 4 Last Revision Date: 4-20-20


Engineer’s Signature

Date 4-20-20

Engineer’s Seal
DIRECTLY CONNECTED IMPERVIOUS AREA (DCIA) CERTIFICATION
PRE-CONSTRUCTION

Property Address: 30 Sunset Road, 0, 05. Tax Account No.: 06-254415

Building Permit No.: _______________

PLANS & DRAINAGE SUMMARY REPORT INFORMATION

Engineering Firm: Rocco V. D’Andrea, Inc.

Design Plans Date: 4-20-20 Drainage Report Date: 4-20-20

PROPERTY INFORMATION FOR DIRECTLY CONNECTED IMPERVIOUS AREA (DCIA)

<table>
<thead>
<tr>
<th>Description</th>
<th>Area (SF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Property Area</td>
<td>12,072</td>
</tr>
<tr>
<td>Total Proposed Site Disturbance Area (SF)</td>
<td>11,000 ±</td>
</tr>
<tr>
<td>Total Impervious Area Under Existing Conditions</td>
<td>2,330</td>
</tr>
<tr>
<td>Total Impervious Area Under Proposed Conditions</td>
<td>5,130</td>
</tr>
<tr>
<td>Total Disconnected Impervious Area Under Proposed Conditions (SF)</td>
<td>4,340</td>
</tr>
<tr>
<td>Total Directly Connected Impervious Area Under Proposed Conditions (SF)</td>
<td>790</td>
</tr>
</tbody>
</table>

1 The entire property area (i.e. parcel/lot area) based on property address and tax account number.

2 The entire area being disturbed for the proposed construction activity (foundations, buildings, houses, stormwater systems, septic systems, pools, patios, accessory structures, vegetative soil cover modifications, etc.). The project disturbance area (delineated with construction/silt fence) shall be depicted on the design, construction, and mitigation plans, and shall be installed on-site prior to commencing land disturbance activities.

3 Impervious surfaces include but are not limited to roofs (including green roofs), buildings, houses, walks, patios, walls, tennis/sport courts (all surface types must be counted), landscape ponds, pools, paved streets/drives/parking areas constructed with concrete, asphalt, compacted dirt, gravel, or permeable pavements.

4 All impervious surfaces that are directed to stormwater BMPs that meet the water quality volume (WQV) standard will be considered disconnected impervious cover. Acceptable stormwater BMPs are Bioretention (infiltrating/filtering), Constructed Stormwater Wetlands, Extended Dry Detention Basins (infiltration required), Gravel Wetlands, Constructed Wet Stormwater Ponds, Sand/Organic Filters (sand filters, tree filters, stormwater planters, etc.), Infiltration Systems (drywells, Cultecs, etc.), Permeable Pavement Areas (infiltrating/filtering), Green Roofs, and Disconnected Impervious Area (must meet all the standards under Simple Disconnection on page 44 and 45 of the Drainage Manual).

5 Subtract the Total Disconnected Impervious Area Under Proposed Conditions (SF) from the Total Impervious Area Under Proposed Conditions (SF).

Engineer’s Signature: 

Date: 4-20-20 

Engineer’s Seal

Form SC-107
DRAINAGE SUMMARY REPORT

For

30 Sunset Road
Old Greenwich, Connecticut

Prepared For

Stephen & Maria Musante

REVISED
April 20, 2020

Original
January 8, 2018

Leonard C. D’Andrea, PE
CT License No. 14869
Table of Contents

Introduction
   Project Summary 1
   Watershed Analysis 1
      Existing Conditions 2
      Proposed Conditions 2
   Conclusion 2

Exhibits
   Watershed Map – Existing Conditions Exhibit A
   Watershed Map – Proposed Conditions Exhibit B
   USDA Soil Delineation Map Exhibit C
   Flood Insurance Rate Map (FIRM) by FEMA Exhibit D

Appendices
   Stormwater Management Standards Narrative Appendix A
   Credits for LID BMPs Appendix B
   Stormwater Design Calculations Appendix C
   HydroCAD Analysis – Existing Conditions Appendix D
   HydroCAD Analysis – Proposed Conditions Appendix E
   Soil Results Appendix F
**Project Summary**

Stephen and Maria Musante are proposing to redevelop 30 Sunset Road in Old Greenwich, CT. The 12,072 s.f. property is located at the end of Sunset Road, approximately 80 ft west of the intersection with Bryon Road, and within an R-12 residential zone.

This report summarizes the effects of the development on downstream locations, and outlines the proposed stormwater management plan designed to provide water quality improvements and runoff attenuation before discharging excess runoff offsite.

The applicant is proposing to remove the existing dwelling and construct a new single-family dwelling. Also included will be the installation of a new driveway, underground utilities, a stormwater management system, and miscellaneous site improvements.

The proposed development will increase the impervious cover of the site from 2,330 sq ft to 5,130 sq ft, for an increase of 2,800 sq ft (+120%). Therefore, the volume and peak rate of runoff generated during a storm event would increase as well. A stormwater management plan was developed that would route runoff from much of the proposed impervious surfaces to a retention system before discharging offsite. This plan mitigates the increase in flows to the maximum extent practical. In addition, the proposed BMPs would provide treatment of runoff from some of the new impervious surfaces.

For a depiction of the site and the proposed development, refer to a set of plans prepared by Rocco V. D’Andrea, Inc. entitled “Final Site Plan Review Set” revised April 20, 2020.

**Watershed Analysis**

Drainage patterns for the site were analyzed using HydroCAD version 10, with runoff data generated for the 1, 2, 5, 10, 25, 50 and 100-year storm frequency events.

In this analysis, the site was divided into various drainage areas discharging to one “point of concern” (POC) and two sub-POCs. Referring to the watershed maps in Exhibits A & B, POC A is designated as Greenwich Cove, sub-POC A1 is the tidal wetland in the private right of way, and sub-POC A2 is the rear property boundary. Offsite area from adjacent properties to the east and south discharges onto the subject property, but the flow will bypass the proposed BMPs and is not modeled.

According to the USDA soil delineation map included in Exhibit C, the property lies within a mapped area of HSG-B soils. On-site soil test pit results, as presented in Appendix F, show the presence of sandy and silty soils as well as shallow groundwater. Infiltration is possible only in areas of fill.
Existing Conditions

Under existing conditions, the site supports a single-family dwelling, driveway, shed, patio, and other miscellaneous hardscapes. Existing stormwater infrastructure is absent on the property except for roof leaders. A storm drain runs under Sunset Road and discharges to Greenwich Cove at the end of the street. A public “driftway” to the northwest is all that stands been the subject property and the shoreline (mean high water). A small amount of ponding occurs near the south corner of the property around the existing shed, with the overflow discharging along the southerly property line to the driftway. As depicted on the watershed maps (Exhibits A & B), ponding is very shallow and restricted to the subject property only.

The existing site was modeled using several drainage areas which flow to each sub-POC. Existing condition drainage areas are depicted on the Watershed Map in Exhibit A. Refer to Appendix D for inputs and results of the HydroCAD model.

Proposed Conditions

Under proposed conditions, the site will support a new single-family dwelling, driveway, and other miscellaneous hardscapes.

The non-structural LID technique of Simple Disconnection is used to treat runoff from impervious surfaces such as the roof and driveway. Disconnection areas and flowpaths are depicted on the Low Impact Development Plan within the site plan set. One roof leader in particular does not meet the standards for Simple Disconnection, but this should be considered acceptable because it is a small roof area (280 s.f.). One of the disconnection flowpaths is within the private right of way, but this should also be considered acceptable because the receiving area is tidal wetland, which is protected from development by CT DEEP regulations.

The proposed stormwater system includes two BMPs: a gravel storage area and a subsurface chamber system. The gravel area is located beneath the elevated porch and provides some retention storage. An overflow catch basin conveys excess water to POC A. The chamber system consists of a series of plastic chambers in a gravel bed under lawn. When the system is full, excess flow is released by pop-up emitters. Each system is designed to provide treatment for less than 1,000 s.f. of roof area and should be considered LID BMPs.

Proposed condition drainage areas are depicted on the Watershed Map in Exhibit B. Refer to Appendix E for inputs and results of the HydroCAD model.
Conclusion

The following table shows that peak flow rates and volumes to each POC increase for most modeled storm events. We request exemption from peak flow and RRV requirements since POC A is a tidally-influenced water body and the sub-POCs represent undevelopable areas. Satisfaction of WQV, GRV, drawdown, and TSS removal requirements are shown in Appendix C.

During a storm surge, a significant portion of the property may be underwater. Therefore, the results of this model may be inaccurate for large storms. By placing the proposed BMPs in areas of fill, a minor flood will not compromise their function.

The proposed drainage design provides treatment of runoff from new impervious surfaces and mitigates the increase in runoff volume and peak flow rates to the maximum extent practicable. Therefore, the design will not cause any adverse impacts to the site or surrounding area.

<table>
<thead>
<tr>
<th>Point of Concern</th>
<th>Storm Frequency</th>
<th>Existing</th>
<th>Proposed</th>
<th>Δ</th>
<th>Δ %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 year</td>
<td>0.08</td>
<td>0.07</td>
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<tr>
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<td>0.06</td>
<td>13%</td>
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<tr>
<td></td>
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<td>0.69</td>
<td>0.06</td>
<td>10%</td>
</tr>
<tr>
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<tr>
<td>A2</td>
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<td>0.05</td>
<td>0.04</td>
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<td>0.09</td>
<td>0.00</td>
<td>0%</td>
</tr>
<tr>
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<td>34%</td>
</tr>
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<td>Point of Concern</td>
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<td>Proposed</td>
<td>Δ</td>
<td>Δ %</td>
</tr>
<tr>
<td>------------------</td>
<td>----------------</td>
<td>----------</td>
<td>----------</td>
<td>---</td>
<td>-----</td>
</tr>
<tr>
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<td>346</td>
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<td>2,866</td>
<td>688</td>
<td>32%</td>
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<td>1 year</td>
<td>468</td>
<td>662</td>
<td>194</td>
<td>41%</td>
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<td>5,759</td>
<td>680</td>
<td>13%</td>
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</tbody>
</table>
Exhibits “A” & “B”

Watershed Maps
Existing & Proposed Conditions
NOTES:
1. The site's soils are labeled as "Ninigret-Urban Land Complex" and "Udorthents-Urban Land Complex" (HSG B).

2. Areas with no flowpath shown assumed to have Tc = 5 minutes.

3. Property lies entirely within FEMA Flood Hazard Zone AE (EL 13) as depicted on Flood Insurance Rate Map No. 09001C0514G dated July 8, 2013.
NOTES:
1. The site's soils are labeled as "Ninigret-Urban Land Complex" and "Udorthents-Urban Land Complex" (HSG B).
2. Areas with no flowpath shown assumed to have Tc = 5 minutes.
3. Property lies entirely within FEMA Flood Hazard Zone AE (EL 13) as depicted on Flood Insurance Rate Map No. 09001C0514G dated July 8, 2013.
Exhibit “C”

USDA Soil Delineation Map
## Hydrologic Soil Group

<table>
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<tr>
<th>Map unit symbol</th>
<th>Map unit name</th>
<th>Rating</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
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</thead>
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<td>Ninigret-Urban land complex, 0 to 5 percent slopes</td>
<td>B</td>
<td>5.4</td>
<td>56.5%</td>
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<tr>
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<td>Sutton-Urban land complex, 0 to 8 percent slopes</td>
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<tr>
<td>306</td>
<td>Udorthents-Urban land complex</td>
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<tr>
<td>W</td>
<td>Water</td>
<td></td>
<td>1.8</td>
<td>18.8%</td>
</tr>
<tr>
<td><strong>Totals for Area of Interest</strong></td>
<td></td>
<td></td>
<td><strong>9.6</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>
Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition
Component Percent Cutoff: None Specified
Tie-break Rule: Higher
Exhibit “D”

Flood Insurance Rate Map (FIRM) by FEMA
Appendix “A”

Stormwater Management Standards Narrative
Standard 1: Low Impact Development

One non-structural LID technique is used: Simple disconnection. There are three disconnection flowpaths. One serves roof area and is located in the rear of the property. A second is also located in the rear and serves both roof area and driveway. The third serves the driveway and is located in the tidal wetlands in the right of way. A total of 2,710 s.f. (51%) of onsite impervious area is treated by simple disconnection.

One roof leader in particular does not meet the standards for Simple Disconnection, but this should be considered acceptable because it is a small roof area (280 s.f.). One of the disconnection flowpaths is within the private right of way, but this should also be considered acceptable because the receiving area is tidal wetland, which is protected from development by CT DEEP regulations.

The two proposed BMPs may be considered LID since they each treat less than 1,000 s.f. of roof area. Together, they treat 1,630 s.f. (32%) of onsite impervious area. Therefore, a total of 4,340 s.f. (85%) of onsite impervious area is treated by any method.

Standard 2: Protection of Natural Hydrology

A. Site Disturbance
Due to the scope of the proposal, a majority of the site will be disturbed. Temporary sedimentation and erosion control measures will be installed to minimize the impact to the surrounding areas during construction. The portion of onsite tidal wetlands will not be disturbed.

B. Soil Compaction
Due to the “tight” nature of the site design, it is not practical or feasible to protect all areas from soil compaction.

C. Time of Concentration
The proposed development’s time of concentration will be similar to existing site conditions. Vegetation and avoidance of steep slopes will prevent erosive runoff velocities.

D. Grading Plan
See Development Plan.

E. Compost Amended Soils
Compost amended soils are not proposed.

F. Ground Disturbance
No disturbed ground is to be left as exposed bare soil at project completion. All disturbed areas shall be covered with topsoil and stabilized with grass or vegetation.

G. Surface Water Systems
There will be no disturbance to the onsite and adjacent tidal wetland.
H. Roadway and Driveway Crossings (Surface Waters)
Sub-standard is not applicable to this project.

I. Roadway and Driveway Crossings (Streams)
Sub-standard is not applicable to this project.

**Standard 3: Stormwater Best Management Practices**

Two structural BMPs are proposed: One gravel bed and one chamber system. They are described in the report summary.

A. Hydrologic and Geologic Conditions
The site lies within a mapped area of HSG-B soils. Soil test pits were dug, including at least one near the proposed location of each BMP. Test pit results, shown in Appendix F and the development plan, describe the soil in more detail and show the depth of the restrictive layer. Both BMPs are located in areas of fill so that infiltration can occur.

B. Design Calculations
Design calculations are provided in Appendix C.

C. Shutdown & Containment
The BMPs can’t be taken offline without the use of pumps.

D. Pumping of Stormwater
No stormwater will be pumped.

E. Pumping of Uncontaminated Groundwater
No foundation sump pump is necessary and no other groundwater will be pumped.

**Standard 4: Runoff Volume Reduction and Groundwater Recharge**

A. Runoff Volume Reduction
This standard is met to the maximum extent practicable. We request exemption for the full requirement since POC A is a tidally influenced water body and the sub-POCs represent undevelopable areas. Refer to Appendix “C” for calculations.

B. Groundwater Recharge
The proposed drainage design is compliant with the groundwater recharge standard. Refer to Appendix “C” for calculations.

C. Runoff Capture
Since the proposed BMPs are sized to retain the water quality volume of runoff from new impervious surfaces, the design is compliant with the Runoff Capture Volume standard.
Standard 5: Peak Flow Control

A. Stream Channel Protection
Sub-standard is not applicable to this project.

B. Conveyance Protection
The proposed drainage design is compliant with the Conveyance Protection standard. Refer to Appendices “D” and “E” for additional information.

C. Peak Runoff Attenuation
The proposed drainage system mitigates the increase in peak flows to the maximum extent practicable. We request exemption for the full requirement since POC A is a tidally influenced water body and the sub-POCs represent undevelopable areas. Refer to Appendices “D” and “E” for additional information.

D. Emergency Outlet Sizing
Outlets designed for runoff volume reduction and peak flow attenuation also safely pass water for large storms.

Standard 6: Pollutant Reduction

A. TSS Removal
The proposed drainage system will provide removal of at least 80% of the average post-construction load of Total Suspended Solids (TSS) from the contributing impervious areas. Refer to Appendix “C” for calculations.

Standard 7: High Load Areas
This site is not classified as being in a High Load Area. Therefore, standard 7 is not applicable.

Standard 8: Critical Area
This project is located near a Critical Area (Greenwich Cove). The use of simple disconnection as a non-structural LID technique is prioritized. The proposed BMPs are located close to the source, provide treatment with TSS removal, and also provide infiltration. Due to space and elevation constraints, the proposed BMPs should be considered acceptable for discharge to a critical area in lieu of a treatment train.

Standard 9: Redevelopment

A. Redevelopment Definition
This project is considered a redevelopment.

B. Meet the Standards
As outlined in this report, the proposed project meets the standards to the maximum extent possible, including the evaluation of LID site planning and the inclusion of stormwater BMPs. Waivers are requested for runoff reduction and peak flow attenuation, although the proposed BMPs mitigate the increase of both.
C. **Undeveloped Portions of the Property**
Due to the scope of the proposal, a majority of the site will be disturbed. Temporary sedimentation and erosion control measures will be installed to minimize the impact to the surrounding areas during construction.

D. **Stormwater Controls**
The proposed structural stormwater BMP has been designed to reduce pollutant loads and provide filtration of stormwater runoff prior to discharging off-site.

E. **Infiltration through Hazardous Substances**
This standard is not applicable to this project.

**Standard 10: Construction Erosion and Sediment Control**

A. **Sedimentation and Erosion Control Plan**
Refer to the Final Site Plan Review Set, for a depiction of the proposed sedimentation and erosion control measures.

B. **Sedimentation and Erosion Control Measures Installation and Removal**
The proposed site design instructs the contractor to install all sedimentation and erosion control measures prior to commencing construction and to appropriately remove these measures at the completion of construction.

**Standard 11: Construction Inspections**

A. **Surety**
If requested by the approving authority, the proponent will post a bond, cash, or other acceptable surety in an amount deemed sufficient to ensure the work will be completed in accordance with the approved plans.

B. **Notification of Work**
The proponent will be instructed to notify the approving authority before starting land-disturbing activity and before construction of the key components of the stormwater management system.

C. **Stormwater Management System Inspections**
The project engineer will complete and report periodic inspections of the stormwater management system.

D. **Site Inspections**
The project engineer will complete site inspections in accordance with this sub-standard and the Field Inspection Record form (SC-106).

The project engineer will inspect the stormwater management system during a storm event if possible.
E. Failing Stormwater Management System
The approving authority will be notified if the system is found to be inadequate due to operational failure, regardless of its compliance with the approved plans. The design of the system shall then be corrected before final approval is granted by the approving authority.

F. Project Completion
Upon project completion, the project’s compliance with the approved plans will be certified and all required inspection certifications will be provided to the approving authority.

Standard 12: Operation and Maintenance

A. Operation and Maintenance Plan
Refer to the Operations and Maintenance Plan Report prepared for the project outlining maintenance measures to ensure functionality of the proposed stormwater management system.

B. O&M Plan Components
The Operations and Maintenance Plan will identify all applicable items in Section 5 and Section 7 of the Town of Greenwich Drainage Manual.

C. O&M Plan Implementation
The Operation and Maintenance Plan Report will identify the parties legally responsible for implementing the O&M Plan.

D. O&M Plan Records
The appropriate parties will be instructed to complete and retain documents relating to installation, maintenance and repairs to the stormwater management system.

E. Proof of O&M Plan Records
The appropriate parties will be instructed to provide records of maintenance and repairs to the approving authority during inspections and/or upon request.

F. Failure to Implement O&M Plan
The appropriate parties will be informed that failure to implement the O&M Plan can result in the municipality assuming responsibility for their implementation and securing reimbursement for associated expenses.


The drainage design depicted on the Development Plans for the site is congruent with the stormwater management plan outlined in this report.

Standard 14: Illicit Discharges

Illicit discharges do not currently exist on the site. The proposed site design does not depict any illicit discharges to be installed.
Appendix “B”

Credits for
LID BMPs
Checklist
### Credits for Low Impact Development (LID) Best Management Practices (BMPs)

<table>
<thead>
<tr>
<th>LID Technique</th>
<th>Compliance Requirements</th>
<th>Credit</th>
<th>LID Used</th>
<th>Credit Taken</th>
</tr>
</thead>
</table>
| Minimizing Soil Compaction (Section 4.4.1) | - The “no disturbance” areas are protected by having the limits of disturbance and access clearly shown on the Stormwater Management Plan, all construction drawings, and delineated/flagged/fenced in the field.  
  - “No disturbance” areas are not to be stripped of existing topsoil.  
  - “No disturbance” areas are not to be stripped of existing vegetation.  
  - Vehicle movement, storage, or equipment/material lay-down is not to be permitted in “no disturbance” areas.  
  - Use of soil amendments and additional topsoil is permitted in other areas being disturbed. Grading may be performed using low ground pressure equipment (less than 3 pounds per square inch) to reduce the potential for soil compaction.  
  - Lawn and turf grass are acceptable uses. Planted meadow is an encouraged use.                                                                                                                                                                                                                                                                                                                                                                                        | Areas that comply (i.e., “no disturbance areas”) can use the forested cover and open space site cover runoff coefficient (R) when calculating the required Water Quality Volume. See Section 5.6.3 and Table 5-5, Site Cover Runoff Coefficients.                                                                 |          |              |
| Minimizing Site Disturbance (Section 4.4.2) | Site disturbance including earthwork and clearing of vegetation should be limited to 40 feet beyond the building perimeter, 10 feet beyond the primary roadway curbs, walkways, and main utility branch trenches, and 25 feet beyond areas of proposed infiltration in order to limit compaction in the proposed infiltration area. This guidance is not intended to limit lawn areas.                                                                                                                                                                                                                                                                  | Areas that comply can use the forested cover and open space site cover runoff coefficient (R) when calculating the required Water Quality Volume. See Section 5.6.3 and Table 5-5, Site Cover Runoff Coefficients.                                                                                                                                                                                                                                                 |          |              |
| Protecting Sensitive Natural Areas (Section 4.4.3) | Sensitive natural areas should be conserved at development sites, thereby preserving predevelopment hydrologic and water quality characteristics. The area must be permanently protected under a conservation easement.                                                                                                                                                                                                                                                                                                                                                      | The project proponent can subtract the conservation area from the total area in the Water Quality Volume calculation.                                                                                                                                                                                                                                                                                                                                                              |          |              |
| Protecting Riparian Buffers (Section 4.4.4) | Effective treatment of stormwater runoff is achieved when pervious and impervious area runoff is discharged to a grass or forested buffer via overland flow. The use of a filter strip is recommended to treat overland flow in the green space of a development site.  
  - The minimum stream buffer width (i.e., perpendicular to the stream flow path) shall be 50 feet as measured from the top bank elevation of a stream or the boundary of a wetland.  
  - The maximum contributing path shall be 150 feet for pervious surfaces and 75 feet for impervious surfaces.  
  - The average contributing overland slope to and across the buffer shall be less than or equal to 5%.  
  - Runoff shall enter the buffer as sheet flow. A level spreader shall be utilized where local site conditions prevent sheet flow from being maintained.  
  - The stream buffer remains unmanaged other than routine debris removal.  
  - The buffer is protected by an acceptable conservation easement or other enforceable instrument that provides perpetual protection of the area. The easement must clearly specify how the natural area vegetation shall be maintained.                                                                                                                                                                                                                                   | The area draining by sheet flow to a buffer can be subtracted from the total area in the Water Quality Volume calculation, and the impervious area draining to the buffer by sheet flow can be subtracted from the impervious area in the Groundwater Recharge Volume calculation and post-development impervious area in the Runoff Reduction Volume calculation.                                                                 |          |              |
## Credits for Low Impact Development (LID) Best Management Practices (BMPs)

<table>
<thead>
<tr>
<th>LID Technique</th>
<th>Compliance Requirements</th>
<th>Credit</th>
<th>LID Used</th>
<th>Credit Taken</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Avoiding Disturbance of Steep Slopes (Section 4.4.5)</strong></td>
<td>Development on steep slope areas shall be avoided. Unnecessary grading should be avoided on all slopes, as should the flattening of hills and ridges. Development shall follow the natural contours of the landscape.</td>
<td>Undisturbed steep slope areas can use the forested cover and open space site cover runoff coefficient (R) when calculating the required Water Quality Volume. See Section 5.6.3 and Table 5-5, Site Cover Runoff Coefficients.</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td><strong>Siting on Permeable and Erodible Soils (Section 4.4.6)</strong></td>
<td>Whenever possible, highly erodible soils should be left undisturbed and protected from disturbance during site construction. Gravel soils tend to be the least erodible. Also as clay and organic matter increase erodibility tends to decrease. Infiltration practices should be located on those portions of the site with the most permeable soils.</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td><strong>Protecting Natural Flow Pathways (Section 4.4.7)</strong></td>
<td>Site designs should use and/or improve natural drainage pathways whenever possible to reduce or eliminate the need for stormwater pipe networks. Natural drainage pathways should be protected from significantly increased runoff volumes and rates due to development. The design should prevent the erosion and degradation of natural drainage pathways through the use of upstream volume and rate control BMPs, if necessary. Level spreaders, erosion control matting, revegetation, outlet stabilization, and check dams can also be used to protect natural drainage features.</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td><strong>Reducing Impervious Surfaces (Section 4.4.8)</strong></td>
<td>By reducing the amount of paved surfaces, stormwater runoff is decreased while infiltration and evapotranspiration opportunities are increased.</td>
<td>Reducing impervious surfaces reduces the Water Quality Volume, Runoff Reduction Volume, Groundwater Recharge Volume, and Peak Flow/Runoff Attenuation requirements.</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td><strong>Stormwater Disconnection (Section 4.4.9)</strong></td>
<td>Disconnecting roof leaders and routing road and driveway runoff from conventional stormwater conveyance systems allows runoff to be collected and managed onsite. Runoff can be directed to vegetated areas designed for onsite storage, treatment, and volume control. All design criteria from section 4.4.9 must be met in order to obtain the credits shown.</td>
<td>Methods to compute the resultant runoff volumes and peak runoff rates from disconnected impervious areas are discussed in Section 4.6 of this manual and the design references cited therein. For simple disconnection, subtract 100% of the disconnected area from the total area in the Water Quality Volume calculation if the receiving pervious area is HSG A or B soils or 50% of the</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
# Credits for Low Impact Development (LID) Best Management Practices (BMPs)

<table>
<thead>
<tr>
<th>LID Technique</th>
<th>Compliance Requirements</th>
<th>Credit</th>
<th>LID Used</th>
<th>Credit Taken</th>
</tr>
</thead>
</table>
| Compost-Amended Soils             | **Restore the original properties and porosity of the soil by deep till and amendment with compost to reduce the generation of runoff and enhance the runoff reduction performance of infiltration BMPs.**  
  - Soil must be tilled to 12 to 16 inches and amended with small amounts of organic material.  
  - For mechanical aeration of lawns/turf to be effective:  
    - Utilize a soil aerator that has a mechanical action that not only penetrates the soil surface but also shatters the soil matrix, causing the soil to decompact and crack, thus creating void space and increasing infiltration. (Passive-type aerators which simply poke a hole into the soil, whether it removes a plug or simply spikes a hole, can create a hardpan effect at the depth of penetration.)  
    - Shatter-type aerators include vertidrain, soil reliever, agrivator, and groundbreaker. Shatter-type aerators should penetrate the soil at depths of 8 to 18 inches.  
    - The depth to water table or bedrock must be greater than 18 inches.  
    - Existing soils may not be saturated or seasonal wet.  
    - Slopes may not exceed 10%.  
    - Existing tree root systems shall be avoided, no deep till or amendment under the tree drip lines. | Disconnect a pervious area if the receiving area is HSG C or D soils.  
For disconnection to LID BMPs, subtract 100% of the disconnected area from the total area in the Water Quality Volume calculation.  
Subtract 50% of any restored areas (100% of any restored and reforested areas) from the total post development site area and re-calculate the Runoff Reduction Volume. |         |              |
| Rainwater Harvesting (Rain Barrels) | **Rain barrels should hold a minimum of 50 gallons.**  
Rain barrels can be connected in series to provide larger storage volumes.  
Equip rain barrels with a drain spigot near the bottom of the barrel with garden hose threading to allow easy hook up and use for watering.  
Provide an overflow pipe or hose near the top of the rain barrel.  
Provide removable, child-resistant covers.  
Provide mosquito screening on water entry holes to prevent mosquito breeding in standing water. | Subtract 25% of the contributing drainage area from the total area in the Water Quality Volume calculation. |         |              |
### Credits for Low Impact Development (LID) Best Management Practices (BMPs)

<table>
<thead>
<tr>
<th>LID Technique</th>
<th>Compliance Requirements</th>
<th>Credit</th>
<th>LID Used</th>
<th>Credit Taken</th>
</tr>
</thead>
</table>
| Rainwater Harvesting     | The rooftop runoff must be captured and either (1) used on site for irrigation of lawns and gardens, wash water and other non-potable uses, or (2) treated and released, or (3) infiltrated.  
The cistern must be sized to treat the design rainfall from the roof area directed to the water harvesting system. If all of the design volume captured cannot be used, then a scaled reduction in credit will be given. The remaining volume must be treated by a properly designed BMP.  
A minimum factor of safety equal to 1.2 must be applied to the calculated cistern volume required.  
All stormwater collected must have a dedicated, year-round, use to assure no overflow of the system during a design rainfall. A water balance calculation must be used to establish the dedicated use volumes and rates. The water balance calculation must demonstrate that the design volume can: (1) be drawn down (used) within 3 days to allow for available volume in the system for the next rain event to be captured and stored, or (2) have an overflow of no more than 14 percent of the annual average historic rainfall, or (3) be drawn down within 3 days and discharged to a properly designed BMP. On a case-by-case basis, reduced credit may be given if the design volume cannot be reliably drawn down within 3 days, or if a year-round reuse is not available. The dedicated water use system must be automated to ensure that the water will be used at the rate and volume designed.  
The overflow shall discharge flows in excess of the design volume to a vegetated or natural area, or to another properly designed BMP (e.g., rain garden). This discharge shall be non-erosive flow for the 10-yr rainfall event. It shall not discharge directly to impervious surfaces. The elevation of the overflow pipe from the cistern shall be at or above the design volume elevation. If a first flush diverter is used, the bypassed water must discharge to a properly designed BMP. The first flush can be directed to a relatively small BMP next to the water harvesting system, or it can be directed to and accounted for in other BMPs on the site.  
At a minimum, a 1 mm or smaller screen at the entrance to the cistern from the gutter system shall be provided to filter out debris and to keep mosquitoes out of the cistern.  
If the water reuse system is designed to accommodate basement sump/foundation drain water and roof runoff, the design must allow for adequate storage for the full volume of roof runoff for the next design storm and basement sump/foundation drain water. | Subtract 100% of the contributing drainage area from the total area in the Water Quality Volume calculation.                                                                                     |          |              |
<table>
<thead>
<tr>
<th>LID Technique</th>
<th>Compliance Requirements</th>
<th>Credit</th>
<th>LID Used</th>
<th>Credit Taken</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A properly designed footing for the cistern must be designed if the load of the cistern at full capacity is greater than the soils will support. If it is buried, buoyancy calculations must be provided to show the cistern will not float when empty. Buoyancy calculations and flotation constraints must be provided if any part of the buried cistern is below the seasonal high water table, or if the area is subject to flooding. An appropriate pump shall be selected to provide adequate pressure for its designated uses. Above ground cisterns shall be made of a material or color that prevents light from entering the cistern, which helps prevent algae growth within the cistern. Irrigation water from a cistern shall be applied so that the water infiltrates into the ground. If for any reason the designed dedicated end use becomes unavailable because of some change, it will be required that an approved alternative end use or a properly designed BMP treatment system be installed on site to manage the roof runoff. The harvesting system shall be labeled and identified as non-potable water. The harvesting system shall meet all local and state building and plumbing codes.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix "C"

Runoff Volume & Retention System Design Calculations
Water Quality Volume

\[ WQV = \frac{1}{12} \left( R_I A_I + R_T A_T \right) \]

Where:
- WQV = Water quality volume
- \( R_I \) = Runoff coefficient for impervious = 0.95
- \( R_T \) = Runoff coefficient for turf = 0.20 (HSG-B)
- \( A_I \) = Area of impervious
- \( A_T \) = Area of turf

<table>
<thead>
<tr>
<th>Watershed Basin</th>
<th>Treated By</th>
<th>Impervious Area (sf)</th>
<th>Lawn Area (sf)</th>
<th>WQV (cf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A3</td>
<td>Disconnection</td>
<td>1,040</td>
<td>3,730</td>
<td>145</td>
</tr>
<tr>
<td>A4</td>
<td>Gravel</td>
<td>850</td>
<td>0</td>
<td>67</td>
</tr>
<tr>
<td>A5</td>
<td>Chambers</td>
<td>780</td>
<td>0</td>
<td>62</td>
</tr>
<tr>
<td>A6</td>
<td>Disconnection</td>
<td>2,120</td>
<td>2,370</td>
<td>207</td>
</tr>
<tr>
<td>A7</td>
<td>Curtain Drain*</td>
<td>340</td>
<td>840</td>
<td>41</td>
</tr>
</tbody>
</table>

*Does not meet TSS removal requirements

Groundwater Recharge Volume

\[ GRV = F \times (I_p - I_e) \]

Where:
- GRV = Groundwater recharge volume
- \( F \) = Target depth factor = 0.35 in (HSG-B)
- \( I_p \) = Proposed impervious area = 5,130 ft\(^2\)
- \( I_e \) = Existing impervious area = 2,330 ft\(^2\)

\[ GRV = \frac{0.35 \text{ in}}{12 \text{ in/ft}} (5,130 - 2,330) \]

GRV = 82 ft\(^3\)

Runoff Reduction Volume

\[ RRV = V_{POST} - V_{PRE} \]

Where:
\[ V_{\text{PRE}} = \text{1-year pre-development runoff volume} \]
\[ V_{\text{POST}} = \text{1-year post-development runoff volume without BMPs} \]

\[ RRV = 1,087 \text{ cf} - 589 \text{ cf} = 498 \text{ cf} \]

**Proposed BMPs**

<table>
<thead>
<tr>
<th>Proposed BMP</th>
<th>To POC</th>
<th>WQV (cf)</th>
<th>Retained Volume (cf)</th>
<th>1-Year Retained (cf)</th>
<th>Treatment Volume (cf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gravel under Porch</td>
<td>A</td>
<td>67</td>
<td>156 @ el=8.7</td>
<td>same</td>
<td>174</td>
</tr>
<tr>
<td>Chambers</td>
<td>A</td>
<td>62</td>
<td>263</td>
<td>173</td>
<td>263</td>
</tr>
</tbody>
</table>

GRV = 82 cf  
RRV = 498 cf  
Total Retained during 1-Year Storm = 362 cf

Due to the low elevation of the site, retention is provided to the maximum extent practicable.

**BMP Drawdown Calculations**

\[ t_{\text{drawdown}} = \frac{DV}{kA} \]

Where:
\[ DV = \text{Design Volume} \]
\[ k = \text{Infiltration (Rawl’s) Rate} = 1.02 \text{ (sandy loam)} \]
\[ A = \text{Infiltration (bottom) Area} \]

<table>
<thead>
<tr>
<th>Proposed BMP</th>
<th>Design Volume (cf)</th>
<th>Bottom Area (sf)</th>
<th>Drawdown Time (hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gravel under Porch</td>
<td>156</td>
<td>230</td>
<td>8</td>
</tr>
<tr>
<td>Chambers</td>
<td>263</td>
<td>142</td>
<td>22</td>
</tr>
</tbody>
</table>

**Total Suspended Solids Removal**

**Gravel under Porch:**
\[ TSS_{\text{Removal}} = 90\% + (100\% - 0\%)(0\%) = 90\% \]

**Chambers:**
\[ TSS_{\text{Removal}} = 90\% + (100\% - 0\%)(0\%) = 90\% \]
Appendix "D"

HydroCAD Analysis –
Existing Conditions
<table>
<thead>
<tr>
<th>Area (sq-ft)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>9,740</td>
<td>61.0</td>
<td>&gt;75% Grass cover, Good, HSG B (A1, A3, A4)</td>
</tr>
<tr>
<td>571</td>
<td>98.0</td>
<td>Driveway (A1)</td>
</tr>
<tr>
<td>16</td>
<td>98.0</td>
<td>Driveway Flagstone (A1)</td>
</tr>
<tr>
<td>1,378</td>
<td>98.0</td>
<td>Dwelling (A1, A3)</td>
</tr>
<tr>
<td>24</td>
<td>98.0</td>
<td>Front Flagstone (A1)</td>
</tr>
<tr>
<td>142</td>
<td>98.0</td>
<td>Shed (A3)</td>
</tr>
<tr>
<td>201</td>
<td>98.0</td>
<td>Side Flagstone (A1)</td>
</tr>
<tr>
<td><strong>12,072</strong></td>
<td><strong>68.1</strong></td>
<td><strong>TOTAL AREA</strong></td>
</tr>
</tbody>
</table>
Time span = 0.00-24.00 hrs, dt = 0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH = SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1: To Front
- Runoff Area = 6,490 sf
- 23.13% Impervious
- Runoff Depth > 0.64"
- Tc = 9.6 min
- CN = 69.6
- Runoff = 0.08 cfs
- 346 cf

Flow Length = 75'
- Slope = 0.0110 '/'

Subcatchment A3: To Ponding
- Runoff Area = 4,474 sf
- 18.57% Impervious
- Runoff Depth > 0.57"
- Tc = 5.0 min
- CN = 67.9
- Runoff = 0.06 cfs
- 213 cf

Subcatchment A4: To Rear
- Runoff Area = 1,108 sf
- 0.00% Impervious
- Runoff Depth > 0.33"
- Tc = 5.0 min
- CN = 61.0
- Runoff = 0.01 cfs
- 30 cf

Pond PO: South Ponding
- Peak Elev = 5.32'
- Storage = 131 cf
- Inflow = 0.06 cfs
- 213 cf
- Outflow = 0.00 cfs
- 91 cf

Link A: POC A
- Inflow = 0.09 cfs
- 468 cf
- Primary = 0.09 cfs
- 468 cf

Link A2: Rear
- Inflow = 0.01 cfs
- 122 cf
- Primary = 0.01 cfs
- 122 cf

Total Runoff Area = 12,072 sf
Runoff Volume = 589 cf
Average Runoff Depth = 0.59"
80.68% Pervious = 9,740 sf
19.32% Impervious = 2,332 sf
Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1: To Front
Runoff Area=6,490 sf  23.13% Impervious  Runoff Depth>0.92"
Flow Length=75'  Slope=0.0110 '/'  Tc=9.6 min  CN=69.6  Runoff=0.13 cfs  499 cf

Subcatchment A3: To Ponding
Runoff Area=4,474 sf  18.57% Impervious  Runoff Depth>0.84"
Tc=5.0 min  CN=67.9  Runoff=0.09 cfs  312 cf

Subcatchment A4: To Rear
Runoff Area=1,108 sf  0.00% Impervious  Runoff Depth>0.53"
Tc=5.0 min  CN=61.0  Runoff=0.01 cfs  49 cf

Pond PO: South Ponding
Peak Elev=5.33'  Storage=145 cf  Inflow=0.09 cfs  312 cf
Outflow=0.01 cfs  188 cf

Link A: POC A
Inflow=0.14 cfs  737 cf
Primary=0.14 cfs  737 cf

Link A2: Rear
Inflow=0.01 cfs  237 cf
Primary=0.01 cfs  237 cf

Total Runoff Area = 12,072 sf  Runoff Volume = 860 cf  Average Runoff Depth = 0.86"
80.68% Pervious = 9,740 sf  19.32% Impervious = 2,332 sf
Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1: To Front
Runoff Area=6,490 sf  23.13% Impervious  Runoff Depth>1.50"
Flow Length=75'  Slope=0.0110 '/'  Tc=9.6 min  CN=69.6  Runoff=0.22 cfs  813 cf

Subcatchment A3: To Ponding
Runoff Area=4,474 sf  18.57% Impervious  Runoff Depth>1.39"
Tc=5.0 min  CN=67.9  Runoff=0.16 cfs  518 cf

Subcatchment A4: To Rear
Runoff Area=1,108 sf  0.00% Impervious  Runoff Depth>0.97"
Tc=5.0 min  CN=61.0  Runoff=0.03 cfs  89 cf

Pond PO: South Ponding
Peak Elev=5.35'  Storage=187 cf  Inflow=0.16 cfs  518 cf
Outflow=0.04 cfs  391 cf

Link A: POC A
Inflow=0.25 cfs  1,293 cf
Primary=0.25 cfs  1,293 cf

Link A2: Rear
Inflow=0.05 cfs  480 cf
Primary=0.05 cfs  480 cf

Total Runoff Area = 12,072 sf  Runoff Volume = 1,421 cf  Average Runoff Depth = 1.41"
80.68% Pervious = 9,740 sf  19.32% Impervious = 2,332 sf
Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1: To Front
Runoff Area=6,490 sf  23.13% Impervious  Runoff Depth>2.07" 
Flow Length=75'  Slope=0.1110 '/'  Tc=9.6 min  CN=69.6  Runoff=0.31 cfs  1,122 cf

Subcatchment A3: To Ponding
Runoff Area=4,474 sf  18.57% Impervious  Runoff Depth>1.94" 
Tc=5.0 min  CN=67.9  Runoff=0.24 cfs  724 cf

Subcatchment A4: To Rear
Runoff Area=1,108 sf  0.00% Impervious  Runoff Depth>1.43" 
Tc=5.0 min  CN=61.0  Runoff=0.04 cfs  132 cf

Pond PO: South Ponding
Peak Elev=5.37'  Storage=223 cf  Inflow=0.24 cfs  724 cf  Outflow=0.10 cfs  593 cf

Link A: POC A
Inflow=0.40 cfs  1,847 cf  Primary=0.40 cfs  1,847 cf

Link A2: Rear
Inflow=0.12 cfs  725 cf  Primary=0.12 cfs  725 cf

Total Runoff Area = 12,072 sf  Runoff Volume = 1,977 cf  Average Runoff Depth = 1.97"
80.68% Pervious = 9,740 sf  19.32% Impervious = 2,332 sf
Type III 24-hr 25-Year Rainfall = 6.40"

Time span = 0.00-24.00 hrs, dt = 0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH = SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1: To Front
Runoff Area = 6,490 sf  23.13% Impervious  Runoff Depth > 3.08"
Flow Length = 75'  Slope = 0.0110'  Tc = 9.6 min  CN = 69.6  Runoff = 0.47 cfs  1,666 cf

Subcatchment A3: To Ponding
Runoff Area = 4,474 sf  18.57% Impervious  Runoff Depth > 2.92"
Tc = 5.0 min  CN = 67.9  Runoff = 0.36 cfs  1,088 cf

Subcatchment A4: To Rear
Runoff Area = 1,108 sf  0.00% Impervious  Runoff Depth > 2.28"
Tc = 5.0 min  CN = 61.0  Runoff = 0.07 cfs  210 cf

Pond PO: South Ponding
Peak Elev = 5.40'  Storage = 279 cf  Inflow = 0.36 cfs  1,088 cf
Outflow = 0.23 cfs  954 cf

Link A: POC A
Inflow = 0.75 cfs  2,830 cf
Primary = 0.75 cfs  2,830 cf

Link A2: Rear
Inflow = 0.28 cfs  1,164 cf
Primary = 0.28 cfs  1,164 cf

Total Runoff Area = 12,072 sf  Runoff Volume = 2,964 cf  Average Runoff Depth = 2.95"
80.68% Pervious = 9,740 sf  19.32% Impervious = 2,332 sf
Time span = 0.00-24.00 hrs, dt = 0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH = SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment A1: To Front**
- Runoff Area = 6,490 sf
- 23.13% Impervious
- Runoff Depth = 4.07"
- Flow Length = 75'
- Slope = 0.0110 '/'
- Tc = 9.6 min
- CN = 69.6
- Runoff = 0.63 cfs
- 2,201 cf

**Subcatchment A3: To Ponding**
- Runoff Area = 4,474 sf
- 18.57% Impervious
- Runoff Depth = 3.89"
- Tc = 5.0 min
- CN = 67.9
- Runoff = 0.49 cfs
- 1,449 cf

**Subcatchment A4: To Rear**
- Runoff Area = 1,108 sf
- 0.00% Impervious
- Runoff Depth = 3.14"
- Tc = 5.0 min
- CN = 61.0
- Runoff = 0.10 cfs
- 290 cf

**Pond PO: South Ponding**
- Peak Elev = 5.43'
- Storage = 321 cf
- Inflow = 0.49 cfs
- 1,449 cf
- Outflow = 0.37 cfs
- 1,311 cf

**Link A: POC A**
- Inflow = 1.07 cfs
- 3,803 cf
- Primary = 1.07 cfs
- 3,803 cf

**Link A2: Rear**
- Inflow = 0.44 cfs
- 1,601 cf
- Primary = 0.44 cfs
- 1,601 cf

**Total Runoff Area = 12,072 sf**
- Runoff Volume = 3,940 cf
- Average Runoff Depth = 3.92"
- 80.68% Pervious = 9,740 sf
- 19.32% Impervious = 2,332 sf
Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1: To Front
Runoff Area=6,490 sf  23.13% Impervious  Runoff Depth>5.36"
Flow Length=75'  Slope=0.0110'  Tc=9.6 min  CN=69.6  Runoff=0.83 cfs  2,901 cf

Subcatchment A3: To Ponding
Runoff Area=4,474 sf  18.57% Impervious  Runoff Depth>5.16"
Tc=5.0 min  CN=67.9  Runoff=0.64 cfs  1,923 cf

Subcatchment A4: To Rear
Runoff Area=1,108 sf  0.00% Impervious  Runoff Depth>4.30"
Tc=5.0 min  CN=61.0  Runoff=0.13 cfs  397 cf

Pond PO: South Ponding
Peak Elev=5.44'  Storage=361 cf  Inflow=0.64 cfs  1,923 cf  Outflow=0.52 cfs  1,781 cf

Link A: POC A
Inflow=1.46 cfs  5,079 cf
Primary=1.46 cfs  5,079 cf

Link A2: Rear
Inflow=0.63 cfs  2,178 cf
Primary=0.63 cfs  2,178 cf

Total Runoff Area = 12,072 sf  Runoff Volume = 5,220 cf  Average Runoff Depth = 5.19"
80.68% Pervious = 9,740 sf  19.32% Impervious = 2,332 sf
Summary for Subcatchment A1: To Front

Runoff = 0.47 cfs @ 12.14 hrs, Volume = 1,666 cf, Depth > 3.08" 

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span = 0.00-24.00 hrs, dt = 0.01 hrs 
Type III 24-hr 25-Year Rainfall = 6.40"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>* 571</td>
<td>98.0</td>
<td>Driveway</td>
</tr>
<tr>
<td>* 689</td>
<td>98.0</td>
<td>Dwelling</td>
</tr>
<tr>
<td>* 24</td>
<td>98.0</td>
<td>Front Flagstone</td>
</tr>
<tr>
<td>* 16</td>
<td>98.0</td>
<td>Driveway Flagstone</td>
</tr>
<tr>
<td>* 201</td>
<td>98.0</td>
<td>Side Flagstone</td>
</tr>
<tr>
<td>4,989</td>
<td>61.0</td>
<td>&gt;75% Grass cover, Good, HSG B</td>
</tr>
<tr>
<td>6,490</td>
<td>69.6</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>4,989</td>
<td></td>
<td>76.87% Pervious Area</td>
</tr>
<tr>
<td>1,501</td>
<td></td>
<td>23.13% Impervious Area</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tc (min)</th>
<th>Length (feet)</th>
<th>Slope (ft/ft)</th>
<th>Velocity (ft/sec)</th>
<th>Capacity (cfs)</th>
<th>Description</th>
</tr>
</thead>
</table>
| 9.6      | 75            | 0.0110        | 0.13              |                | Sheet Flow, Grass: Short n = 0.150 P2 = 3.40"

Subcatchment A1: To Front

Hydrograph

Type III 24-hr
25-Year Rainfall = 6.40"
Runoff Area = 6,490 sf
Runoff Volume = 1,666 cf
Runoff Depth > 3.08"
Flow Length = 75'
Slope = 0.0110 '/'
Tc = 9.6 min
CN = 69.6
Summary for Subcatchment A3: To Ponding

Runoff = 0.36 cfs @ 12.08 hrs, Volume= 1,088 cf, Depth> 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.40"

<table>
<thead>
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<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>689</td>
<td>98.0</td>
<td>Dwelling</td>
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<tr>
<td>142</td>
<td>98.0</td>
<td>Shed</td>
</tr>
<tr>
<td>3,643</td>
<td>61.0</td>
<td>&gt;75% Grass cover, Good, HSG B</td>
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<tr>
<td>4,474</td>
<td>67.9</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>3,643</td>
<td>81.43% Pervious Area</td>
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<tr>
<td>831</td>
<td>18.57% Impervious Area</td>
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</table>

<table>
<thead>
<tr>
<th>Tc (min)</th>
<th>Length (feet)</th>
<th>Slope (ft/ft)</th>
<th>Velocity (ft/sec)</th>
<th>Capacity (cfs)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.0</td>
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<td></td>
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<td></td>
<td>Direct Entry, minimum</td>
</tr>
</tbody>
</table>

Subcatchment A3: To Ponding

Hydrograph

Type III 24-hr
25-Year Rainfall=6.40"
Runoff Area=4,474 sf
Runoff Volume=1,088 cf
Runoff Depth>2.92"
Tc=5.0 min
CN=67.9
Summary for Subcatchment A4: To Rear

Runoff = 0.07 cfs @ 12.08 hrs, Volume = 210 cf, Depth > 2.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span = 0.00-24.00 hrs, dt = 0.01 hrs
Type III 24-hr 25-Year Rainfall = 6.40"

<table>
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<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
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<tbody>
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<td>&gt;75% Grass cover, Good, HSG B</td>
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<td>1,108</td>
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<td>100.00% Pervious Area</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Tc (min)</th>
<th>Length (feet)</th>
<th>Slope (ft/ft)</th>
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<th>Capacity (cfs)</th>
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</thead>
<tbody>
<tr>
<td>5.0</td>
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<td></td>
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<td></td>
<td>Direct Entry, minimum</td>
</tr>
</tbody>
</table>

Subcatchment A4: To Rear

Type III 24-hr
25-Year Rainfall = 6.40"
Runoff Area = 1,108 sf
Runoff Volume = 210 cf
Runoff Depth > 2.28"
Tc = 5.0 min
CN = 61.0
Summary for Pond PO: South Ponding

Inflow Area = 4,474 sf, 18.57% Impervious, Inflow Depth > 2.92" for 25-Year event
Inflow = 0.36 cfs @ 12.08 hrs, Volume= 1,088 cf
Outflow = 0.23 cfs @ 12.17 hrs, Volume= 954 cf, Atten= 37%, Lag= 5.5 min
Primary = 0.23 cfs @ 12.17 hrs, Volume= 954 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 5.40' @ 12.17 hrs Surf.Area= 1,943 sf Storage= 279 cf

Plug-Flow detention time= 95.0 min calculated for 954 cf (88% of inflow)
Center-of-Mass det. time= 38.0 min ( 876.4 - 838.3 )

<table>
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<tr>
<th>Volume</th>
<th>Invert</th>
<th>Avail.Storage</th>
<th>Storage Description</th>
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<tbody>
<tr>
<td>#1</td>
<td>5.10'</td>
<td>486 cf</td>
<td>Custom Stage Data (Conic) Listed below (Recalc)</td>
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</table>

<table>
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<td>5.50</td>
<td>2,400</td>
<td>386</td>
<td>486</td>
<td>2,401</td>
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</table>

Device Routing Invert Outlet Devices
#1 Primary 5.30' Custom Weir/Orifice, Cv= 2.62 (C= 3.28)
Head (feet) 0.00 0.20
Width (feet) 0.00 10.00

Primary OutFlow Max=0.23 cfs @ 12.17 hrs HW=5.40' TW=0.00' (Dynamic Tailwater)
1=Custom Weir/Orifice (Weir Controls 0.23 cfs @ 0.85 fps)
Pond PO: South Ponding

Inflow Area=4,474 sf
Peak Elev=5.40'
Storage=279 cf
<table>
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<th>Surface (sq-ft)</th>
<th>Storage (cubic-ft)</th>
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<td>5.48</td>
<td>2,301</td>
<td>439</td>
</tr>
<tr>
<td>5.49</td>
<td>2,350</td>
<td>463</td>
</tr>
<tr>
<td>5.50</td>
<td><strong>2,400</strong></td>
<td><strong>486</strong></td>
</tr>
</tbody>
</table>
Summary for Link A: POC A

Inflow Area = 12,072 sf, 19.32% Impervious, Inflow Depth > 2.81" for 25-Year event
Inflow = 0.75 cfs @ 12.14 hrs, Volume= 2,830 cf
Primary = 0.75 cfs @ 12.14 hrs, Volume= 2,830 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link A: POC A

Inflow Area=12,072 sf

Hydrograph
Summary for Link A2: Rear

Inflow Area = 5,582 sf, 14.89% Impervious, Inflow Depth > 2.50" for 25-Year event
Inflow = 0.28 cfs @ 12.15 hrs, Volume = 1,164 cf
Primary = 0.28 cfs @ 12.15 hrs, Volume = 1,164 cf, Atten = 0%, Lag = 0.0 min

Primary outflow = Inflow, Time Span = 0.00-24.00 hrs, dt = 0.01 hrs

Link A2: Rear

Hydrograph

Inflow Area = 5,582 sf
Appendix "E"

HydroCAD Analysis –
Proposed Conditions
Routing Diagram for 15LJ_PR_2
Prepared by RVDI, Printed 4/22/2020
HydroCAD® 10.00-25 s/n 08137 © 2019 HydroCAD Software Solutions LLC
<table>
<thead>
<tr>
<th>Area (sq-ft)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6,940</td>
<td>61.0</td>
<td>&gt;75% Grass cover, Good, HSG B (A3, A6, A7)</td>
</tr>
<tr>
<td>1,530</td>
<td>98.0</td>
<td>Drive (A3, A6)</td>
</tr>
<tr>
<td>3,090</td>
<td>98.0</td>
<td>Roof (A4, A5, A6, A7)</td>
</tr>
<tr>
<td>510</td>
<td>98.0</td>
<td>Walk (A3, A6, A7)</td>
</tr>
<tr>
<td>12,070</td>
<td>76.7</td>
<td>TOTAL AREA</td>
</tr>
</tbody>
</table>
Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A3: Front Yard
Runoff Area=4,770 sf  21.80% Impervious  Runoff Depth>0.62" 
   Tc=5.0 min  CN=69.1  Runoff=0.07 cfs 246 cf

Subcatchment A4: To Gravel
Runoff Area=850 sf  100.00% Impervious  Runoff Depth>2.67" 
   Tc=5.0 min  CN=98.0  Runoff=0.06 cfs 189 cf

Subcatchment A5: To Chambers
Runoff Area=780 sf  100.00% Impervious  Runoff Depth>2.67" 
   Tc=5.0 min  CN=98.0  Runoff=0.05 cfs 173 cf

Subcatchment A6: To Ponding
Runoff Area=4,490 sf  47.22% Impervious  Runoff Depth>1.09" 
   Tc=5.0 min  CN=78.5  Runoff=0.13 cfs 406 cf

Subcatchment A7: To Curtain Drain
Runoff Area=1,180 sf  28.81% Impervious  Runoff Depth>0.73" 
   Tc=5.0 min  CN=71.7  Runoff=0.02 cfs 72 cf

Pond CH: Chambers
Peak Elev=7.63' Storage=173 cf  Inflow=0.05 cfs 173 cf  Outflow=0.00 cfs 0 cf

Pond GR: Gravel under Porch
Peak Elev=8.70' Storage=157 cf  Inflow=0.06 cfs 189 cf  Outflow=0.00 cfs 32 cf

Pond PO: South Ponding
Peak Elev=5.35' Storage=143 cf  Inflow=0.13 cfs 406 cf  Outflow=0.04 cfs 311 cf

Link A: POC A
Inflow=0.09 cfs 662 cf  Primary=0.09 cfs 662 cf

Link A1: To Front
Inflow=0.07 cfs 279 cf  Primary=0.07 cfs 279 cf

Link A2: To Rear
Inflow=0.05 cfs 383 cf  Primary=0.05 cfs 383 cf

Total Runoff Area = 12,070 sf  Runoff Volume = 1,087 cf  Average Runoff Depth = 1.08"
57.50% Pervious = 6,940 sf  42.50% Impervious = 5,130 sf
Subcatchment A3: Front Yard
Runoff Area = 4,770 sf 21.80% Impervious  Runoff Depth > 0.90"  
Tc = 5.0 min  CN = 69.1  Runoff = 0.11 cfs 357 cf

Subcatchment A4: To Gravel
Runoff Area = 850 sf 100.00% Impervious  Runoff Depth > 3.16"  
Tc = 5.0 min  CN = 98.0  Runoff = 0.07 cfs 224 cf

Subcatchment A5: To Chambers
Runoff Area = 780 sf 100.00% Impervious  Runoff Depth > 3.16"  
Tc = 5.0 min  CN = 98.0  Runoff = 0.06 cfs 206 cf

Subcatchment A6: To Ponding
Runoff Area = 4,490 sf 47.22% Impervious  Runoff Depth > 1.45"  
Tc = 5.0 min  CN = 78.5  Runoff = 0.18 cfs 544 cf

Subcatchment A7: To Curtain Drain
Runoff Area = 1,180 sf 28.81% Impervious  Runoff Depth > 1.04"  
Tc = 5.0 min  CN = 71.7  Runoff = 0.03 cfs 102 cf

Pond CH: Chambers
Peak Elev = 8.00' Storage = 206 cf Inflow = 0.06 cfs 206 cf  
Outflow = 0.00 cfs 0 cf

Pond GR: Gravel under Porch
Peak Elev = 8.70' Storage = 157 cf Inflow = 0.07 cfs 224 cf  
Outflow = 0.01 cfs 68 cf

Pond PO: South Ponding
Peak Elev = 5.37' Storage = 165 cf Inflow = 0.18 cfs 544 cf  
Outflow = 0.09 cfs 447 cf

Link A: POC A
Inflow = 0.18 cfs 974 cf  
Primary = 0.18 cfs 974 cf

Link A1: To Front
Inflow = 0.11 cfs 425 cf  
Primary = 0.11 cfs 425 cf

Link A2: To Rear
Inflow = 0.10 cfs 549 cf  
Primary = 0.10 cfs 549 cf

Total Runoff Area = 12,070 sf  Runoff Volume = 1,433 cf  
Average Runoff Depth = 1.42"  
57.50% Pervious = 6,940 sf  42.50% Impervious = 5,130 sf
Subcatchment A3: Front Yard
Runoff Area = 4,770 sf  21.80% Impervious  Runoff Depth > 1.47"  
Tc = 5.0 min  CN = 69.1  Runoff = 0.19 cfs  585 cf

Subcatchment A4: To Gravel
Runoff Area = 850 sf  100.00% Impervious  Runoff Depth > 4.06"  
Tc = 5.0 min  CN = 98.0  Runoff = 0.08 cfs  288 cf

Subcatchment A5: To Chambers
Runoff Area = 780 sf  100.00% Impervious  Runoff Depth > 4.06"  
Tc = 5.0 min  CN = 98.0  Runoff = 0.08 cfs  264 cf

Subcatchment A6: To Ponding
Runoff Area = 4,490 sf  47.22% Impervious  Runoff Depth > 2.17"  
Tc = 5.0 min  CN = 78.5  Runoff = 0.27 cfs  811 cf

Subcatchment A7: To Curtain Drain
Runoff Area = 1,180 sf  28.81% Impervious  Runoff Depth > 1.65"  
Tc = 5.0 min  CN = 71.7  Runoff = 0.05 cfs  162 cf

Pond CH: Chambers
Peak Elev = 10.41'  Storage = 262 cf  Inflow = 0.08 cfs  264 cf  
Outflow = 0.00 cfs  2 cf

Pond GR: Gravel under Porch
Peak Elev = 8.72'  Storage = 158 cf  Inflow = 0.08 cfs  288 cf  
Outflow = 0.05 cfs  131 cf

Pond PO: South Ponding
Peak Elev = 5.40'  Storage = 203 cf  Inflow = 0.27 cfs  811 cf  
Outflow = 0.19 cfs  711 cf

Link A: POC A
Inflow = 0.40 cfs  1,591 cf  
Primary = 0.40 cfs  1,591 cf

Link A1: To Front
Inflow = 0.19 cfs  717 cf  
Primary = 0.19 cfs  717 cf

Link A2: To Rear
Inflow = 0.23 cfs  873 cf  
Primary = 0.23 cfs  873 cf

Total Runoff Area = 12,070 sf  Runoff Volume = 2,109 cf  Average Runoff Depth = 2.10"
57.50% Pervious = 6,940 sf  42.50% Impervious = 5,130 sf
Subcatchment A3: Front Yard
Runoff Area=4,770 sf  21.80% Impervious  Runoff Depth=2.04"
Tc=5.0 min  CN=69.1  Runoff=0.27 cfs  809 cf

Subcatchment A4: To Gravel
Runoff Area=850 sf  100.00% Impervious  Runoff Depth=4.86"
Tc=5.0 min  CN=98.0  Runoff=0.10 cfs  344 cf

Subcatchment A5: To Chambers
Runoff Area=780 sf  100.00% Impervious  Runoff Depth=4.86"
Tc=5.0 min  CN=98.0  Runoff=0.09 cfs  316 cf

Subcatchment A6: To Ponding
Runoff Area=4,490 sf  47.22% Impervious  Runoff Depth=2.84"
Tc=5.0 min  CN=78.5  Runoff=0.36 cfs  1,062 cf

Subcatchment A7: To Curtain Drain
Runoff Area=1,180 sf  28.81% Impervious  Runoff Depth=2.25"
Tc=5.0 min  CN=71.7  Runoff=0.07 cfs  221 cf

Pond CH: Chambers
Peak Elev=10.43'  Storage=263 cf  Inflow=0.09 cfs  316 cf
Outflow=0.00 cfs  53 cf

Pond GR: Gravel under Porch
Peak Elev=8.73'  Storage=159 cf  Inflow=0.10 cfs  344 cf
Outflow=0.10 cfs  188 cf

Pond PO: South Ponding
Peak Elev=5.41'  Storage=228 cf  Inflow=0.36 cfs  1,062 cf
Outflow=0.28 cfs  961 cf

Link A: POC A
Inflow=0.69 cfs  2,232 cf
Primary=0.69 cfs  2,232 cf

Link A1: To Front
Inflow=0.37 cfs  1,050 cf
Primary=0.37 cfs  1,050 cf

Link A2: To Rear
Inflow=0.34 cfs  1,182 cf
Primary=0.34 cfs  1,182 cf

Total Runoff Area = 12,070 sf  Runoff Volume = 2,753 cf  Average Runoff Depth = 2.74"
57.50% Pervious = 6,940 sf  42.50% Impervious = 5,130 sf
Time span = 0.00 - 24.00 hrs, dt = 0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH = SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

<table>
<thead>
<tr>
<th>Subcatchment A3: Front Yard</th>
<th>Runoff Area = 4,770 sf</th>
<th>21.80% Impervious</th>
<th>Runoff Depth &gt; 3.03&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tc = 5.0 min</td>
<td>CN = 69.1</td>
<td>Runoff = 0.40 cfs</td>
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<td></td>
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<td>1,206 cf</td>
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<table>
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<tr>
<th>Subcatchment A4: To Gravel</th>
<th>Runoff Area = 850 sf</th>
<th>100.00% Impervious</th>
<th>Runoff Depth &gt; 6.16&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tc = 5.0 min</td>
<td>CN = 98.0</td>
<td>Runoff = 0.13 cfs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>436 cf</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subcatchment A5: To Chambers</th>
<th>Runoff Area = 780 sf</th>
<th>100.00% Impervious</th>
<th>Runoff Depth &gt; 6.16&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tc = 5.0 min</td>
<td>CN = 98.0</td>
<td>Runoff = 0.12 cfs</td>
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<tr>
<td></td>
<td></td>
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<td>400 cf</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subcatchment A6: To Ponding</th>
<th>Runoff Area = 4,490 sf</th>
<th>47.22% Impervious</th>
<th>Runoff Depth &gt; 3.98&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tc = 5.0 min</td>
<td>CN = 78.5</td>
<td>Runoff = 0.50 cfs</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>1,490 cf</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Subcatchment A7: To Curtain Drain</th>
<th>Runoff Area = 1,180 sf</th>
<th>28.81% Impervious</th>
<th>Runoff Depth &gt; 3.29&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tc = 5.0 min</td>
<td>CN = 71.7</td>
<td>Runoff = 0.11 cfs</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>324 cf</td>
</tr>
</tbody>
</table>

| Pond CH: Chambers | Peak Elev = 10.48' | Storage = 263 cf | Inflow = 0.12 cfs    |
|                  |                     |                  | Outflow = 0.03 cfs   |
|                  |                     |                  | 138 cf               |

| Pond GR: Gravel under Porch | Peak Elev = 8.73' | Storage = 160 cf | Inflow = 0.13 cfs    |
|                            |                     |                  | Outflow = 0.13 cfs   |
|                            |                     |                  | 280 cf               |

| Pond PO: South Ponding | Peak Elev = 5.43' | Storage = 258 cf | Inflow = 0.50 cfs    |
|                       |                     |                  | Outflow = 0.42 cfs   |
|                       |                     |                  | 1,490 cf             |
|                       |                     |                  | 1,386 cf             |

| Link A: POC A | Inflow = 1.02 cfs | Primary = 1.02 cfs |
|               | 3,333 sf          | 3,333 sf          |

| Link A1: To Front | Inflow = 0.53 cfs | Primary = 0.53 cfs |
|                   | 1,624 cf          | 1,624 cf          |

| Link A2: To Rear | Inflow = 0.52 cfs | Primary = 0.52 cfs |
|                 | 1,709 cf          | 1,709 cf          |

Total Runoff Area = 12,070 sf  Runoff Volume = 3,857 cf  Average Runoff Depth = 3.83"
57.50% Pervious = 6,940 sf  42.50% Impervious = 5,130 sf
Subcatchment A3: Front Yard
Runoff Area = 4,770 sf  21.80% Impervious  Runoff Depth > 4.02"
Tc = 5.0 min  CN = 69.1  Runoff = 0.54 cfs  1,598 cf

Subcatchment A4: To Gravel
Runoff Area = 850 sf  100.00% Impervious  Runoff Depth > 7.36"
Tc = 5.0 min  CN = 98.0  Runoff = 0.15 cfs  521 cf

Subcatchment A5: To Chambers
Runoff Area = 780 sf  100.00% Impervious  Runoff Depth > 7.36"
Tc = 5.0 min  CN = 98.0  Runoff = 0.14 cfs  478 cf

Subcatchment A6: To Ponding
Runoff Area = 4,490 sf  47.22% Impervious  Runoff Depth > 5.08"
Tc = 5.0 min  CN = 78.5  Runoff = 0.63 cfs  1,899 cf

Subcatchment A7: To Curtain Drain
Runoff Area = 1,180 sf  28.81% Impervious  Runoff Depth > 4.31"
Tc = 5.0 min  CN = 71.7  Runoff = 0.14 cfs  424 cf

Pond CH: Chambers
Peak Elev = 10.56'  Storage = 263 cf  Inflow = 0.14 cfs  478 cf
Outflow = 0.14 cfs  216 cf

Pond GR: Gravel under Porch
Peak Elev = 8.74'  Storage = 160 cf  Inflow = 0.15 cfs  521 cf
Outflow = 0.15 cfs  364 cf

Pond PO: South Ponding
Peak Elev = 5.45'  Storage = 282 cf  Inflow = 0.63 cfs  1,899 cf
Outflow = 0.55 cfs  1,792 cf

Link A: POC A
Inflow = 1.33 cfs  4,393 cf
Primary = 1.33 cfs  4,393 cf

Link A1: To Front
Inflow = 0.69 cfs  2,178 cf
Primary = 0.69 cfs  2,178 cf

Link A2: To Rear
Inflow = 0.67 cfs  2,216 cf
Primary = 0.67 cfs  2,216 cf

Total Runoff Area = 12,070 sf  Runoff Volume = 4,919 cf  Average Runoff Depth = 4.89"
57.50% Pervious = 6,940 sf  42.50% Impervious = 5,130 sf
Subcatchment A3: Front Yard
- Runoff Area: 4,770 sf
- 21.80% Impervious
- Runoff Depth: 5.31"
- Tc: 5.0 min
- CN: 69.1
- Runoff: 0.71 cfs
- 2,109 cf

Subcatchment A4: To Gravel
- Runoff Area: 850 sf
- 100.00% Impervious
- Runoff Depth: 8.85"
- Tc: 5.0 min
- CN: 98.0
- Runoff: 0.18 cfs
- 627 cf

Subcatchment A5: To Chambers
- Runoff Area: 780 sf
- 100.00% Impervious
- Runoff Depth: 8.85"
- Tc: 5.0 min
- CN: 98.0
- Runoff: 0.17 cfs
- 576 cf

Subcatchment A6: To Ponding
- Runoff Area: 4,490 sf
- 47.22% Impervious
- Runoff Depth: 6.47"
- Tc: 5.0 min
- CN: 78.5
- Runoff: 0.80 cfs
- 2,422 cf

Subcatchment A7: To Curtain Drain
- Runoff Area: 1,180 sf
- 28.81% Impervious
- Runoff Depth: 5.63"
- Tc: 5.0 min
- CN: 71.7
- Runoff: 0.18 cfs
- 554 cf

Pond CH: Chambers
- Peak Elev: 10.64'
- Storage: 263 cf
- Inflow: 0.17 cfs
- Outflow: 0.22 cfs
- 313 cf

Pond GR: Gravel under Porch
- Peak Elev: 8.74'
- Storage: 160 cf
- Inflow: 0.18 cfs
- Outflow: 0.18 cfs
- 471 cf

Pond PO: South Ponding
- Peak Elev: 5.46'
- Storage: 309 cf
- Inflow: 0.80 cfs
- Outflow: 0.71 cfs
- 2,313 cf

Link A: POC A
- Inflow: 1.95 cfs
- Primary: 1.95 cfs

Link A1: To Front
- Inflow: 1.11 cfs
- Primary: 1.11 cfs

Link A2: To Rear
- Inflow: 0.88 cfs
- Primary: 0.88 cfs

Total Runoff Area = 12,070 sf
Runoff Volume = 6,287 cf
Average Runoff Depth = 6.25"
57.50% Pervious = 6,940 sf
42.50% Impervious = 5,130 sf
Summary for Subcatchment A3: Front Yard

Runoff = 0.40 cfs @ 12.08 hrs, Volume=1,206 cf, Depth> 3.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.40"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>* 840</td>
<td>98.0</td>
<td>Drive</td>
</tr>
<tr>
<td>* 200</td>
<td>98.0</td>
<td>Walk</td>
</tr>
<tr>
<td>3,730</td>
<td>61.0</td>
<td>&gt;75% Grass cover, Good, HSG B</td>
</tr>
<tr>
<td>4,770</td>
<td>69.1</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>3,730</td>
<td>78.20%</td>
<td>Pervious Area</td>
</tr>
<tr>
<td>1,040</td>
<td>21.80%</td>
<td>Impervious Area</td>
</tr>
</tbody>
</table>

Tc Length Slope Velocity Capacity Description
(min)  (feet) (ft/ft) (ft/sec) (cfs)
5.0 80 1 0.1 0.40 cfs @ 12.08 hrs

Direct Entry,

Subcatchment A3: Front Yard

Type III 24-hr
25-Year Rainfall=6.40"
Runoff Area=4,770 sf
Runoff Volume=1,206 cf
Runoff Depth>3.03"
Tc=5.0 min
CN=69.1
Summary for Subcatchment A4: To Gravel

Runoff = 0.13 cfs @ 12.07 hrs, Volume = 436 cf, Depth > 6.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span = 0.00-24.00 hrs, dt = 0.01 hrs
Type III 24-hr 25-Year Rainfall = 6.40"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>850</td>
<td>98.0</td>
<td>Roof</td>
</tr>
<tr>
<td>850</td>
<td>100.00% Impervious Area</td>
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</tr>
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</table>

Tc  Length  Slope  Velocity  Capacity  Description
(min) (feet) (ft/ft) (ft/sec) (cfs)            
5.0     

Direct Entry,

Subcatchment A4: To Gravel

Hydrograph

Type III 24-hr
25-Year Rainfall = 6.40"
Runoff Area = 850 sf
Runoff Volume = 436 cf
Runoff Depth > 6.16"
Tc = 5.0 min
CN = 98.0
Summary for Subcatchment A5: To Chambers

Runoff = 0.12 cfs @ 12.07 hrs, Volume = 400 cf, Depth > 6.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.40"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>780</td>
<td>98.0</td>
<td>Roof</td>
</tr>
<tr>
<td>780</td>
<td></td>
<td>100.00% Impervious Area</td>
</tr>
</tbody>
</table>

Direct Entry,

Subcatchment A5: To Chambers

Hydrograph

Type III 24-hr
25-Year Rainfall=6.40"
Runoff Area=780 sf
Runoff Volume=400 cf
Runoff Depth>6.16"
Tc=5.0 min
CN=98.0
Summary for Subcatchment A6: To Ponding

Runoff = 0.50 cfs @ 12.07 hrs, Volume = 1,490 cf, Depth > 3.98"

Runoff by SCS TR-20 method, UH = SCS, Weighted-CN, Time Span = 0.00-24.00 hrs, dt = 0.01 hrs
Type III 24-hr 25-Year Rainfall = 6.40"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,180</td>
<td>98.0</td>
<td>Roof</td>
</tr>
<tr>
<td>690</td>
<td>98.0</td>
<td>Drive</td>
</tr>
<tr>
<td>250</td>
<td>98.0</td>
<td>Walk</td>
</tr>
<tr>
<td>2,370</td>
<td>61.0</td>
<td>&gt;75% Grass cover, Good, HSG B</td>
</tr>
<tr>
<td>4,490</td>
<td>78.5</td>
<td>Weighted Average</td>
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<tr>
<td>2,370</td>
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<td>52.78% Pervious Area</td>
</tr>
<tr>
<td>2,120</td>
<td></td>
<td>47.22% Impervious Area</td>
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</tbody>
</table>

Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description
---------|---------------|---------------|-------------------|----------------|-----------------|
5.0      |               |               |                   |                | Direct Entry,   |

Subcatchment A6: To Ponding

Type III 24-hr
25-Year Rainfall = 6.40"
Runoff Area = 4,490 sf
Runoff Volume = 1,490 cf
Runoff Depth > 3.98"
Tc = 5.0 min
CN = 78.5
Summary for Subcatchment A7: To Curtain Drain

Runoff = 0.11 cfs @ 12.08 hrs, Volume= 324 cf, Depth> 3.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.40"

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<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
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<tr>
<td>* 280</td>
<td>98.0</td>
<td>Roof</td>
</tr>
<tr>
<td>* 60</td>
<td>98.0</td>
<td>Walk</td>
</tr>
<tr>
<td>840</td>
<td>61.0</td>
<td>&gt;75% Grass cover, Good, HSG B</td>
</tr>
<tr>
<td>1,180</td>
<td>71.7</td>
<td>Weighted Average</td>
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<tr>
<td>340</td>
<td>28.81% Impervious Area</td>
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</tr>
<tr>
<td>840</td>
<td>71.19% Pervious Area</td>
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</table>

Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description
---------|---------------|---------------|-------------------|----------------|-----------------|
5.0      |               |               |                   |                | Direct Entry,

Subcatchment A7: To Curtain Drain

Hydrograph

Type III 24-hr
25-Year Rainfall=6.40"
Runoff Area=1,180 sf
Runoff Volume=324 cf
Runoff Depth>3.29"
Tc=5.0 min
CN=71.7
Summary for Pond CH: Chambers

Inflow Area = 780 sf, 100.00% Impervious, Inflow Depth > 6.16" for 25-Year event
Inflow = 0.12 cfs @ 12.07 hrs, Volume= 400 cf
Outflow = 0.03 cfs @ 12.42 hrs, Volume= 138 cf, Attenuation= 72%, Lag= 21.2 min
Primary = 0.03 cfs @ 12.42 hrs, Volume= 138 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 10.48' @ 12.42 hrs Surf.Area= 152 sf Storage= 263 cf

Plug-Flow detention time= 376.6 min calculated for 138 cf (34% of inflow)
Center-of-Mass det. time= 196.1 min (938.9 - 742.8)

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<td>5.70'</td>
<td>129 cf</td>
<td>5.92'W x 24.00'L x 3.21'H Field A</td>
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<td>456 cf Overall - 134 cf Embedded = 322 cf x 40.0% Voids</td>
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<tr>
<td>#2A</td>
<td>6.20'</td>
<td>134 cf</td>
<td>Cultec R-280HD x 3 Inside #1</td>
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<tr>
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<td></td>
<td>Effective Size= 46.9&quot;W x 26.0&quot;H =&gt; 6.07 sf x 7.00'L = 42.5 cf</td>
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<tr>
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<td>Overall Size= 47.0&quot;W x 26.5&quot;H x 8.00'L with 1.00' Overlap</td>
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<td>Row Length Adjustment= +1.00' x 6.07 sf x 1 rows</td>
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<tr>
<td>#3</td>
<td>10.40'</td>
<td>1 cf</td>
<td>1.00'W x 1.00'L x 0.10'H Dummy (for oscillations) x 10</td>
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<td>263 cf Total Available Storage</td>
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Storage Group A created with Chamber Wizard

Device Routing Invert Outlet Devices
#1 Primary 10.40' 4.0" Vert. Pop-up Emitters X 2.00 C= 0.600

Primary OutFlow Max=0.03 cfs @ 12.42 hrs HW=10.48' TW=0.00' (Dynamic Tailwater)
↑-1=Pop-up Emitters (Orifice Controls 0.03 cfs @ 0.96 fps)
Pond CH: Chambers - Chamber Wizard Field A

Chamber Model = Cultec R-280HD (Cultec Recharger® 280HD)
Effective Size = 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf
Overall Size = 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap
Row Length Adjustment = +1.00' x 6.07 sf x 1 rows

3 Chambers/Row x 7.00' Long +1.00' Row Adjustment = 22.00' Row Length +12.0'' End Stone x 2 = 24.00' Base Length
1 Rows x 47.0'' Wide + 12.0'' Side Stone x 2 = 5.92' Base Width
6.0'' Base + 26.5'' Chamber Height + 6.0'' Cover = 3.21' Field Height

3 Chambers x 42.5 cf +1.00' Row Adjustment x 6.07 sf x 1 Rows = 133.6 cf Chamber Storage

455.6 cf Field - 133.6 cf Chambers = 322.0 cf Stone x 40.0% Voids = 128.8 cf Stone Storage

Chamber Storage + Stone Storage = 262.4 cf = 0.006 af
Overall Storage Efficiency = 57.6%
Overall System Size = 24.00' x 5.92' x 3.21'

3 Chambers
16.9 cy Field
11.9 cy Stone
Inflow Area=780 sf
Peak Elev=10.48'
Storage=263 cf
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</table>
Summary for Pond GR: Gravel under Porch

Inflow Area = 850 sf, 100.00% Impervious, Inflow Depth > 6.16" for 25-Year event
Inflow = 0.13 cfs @ 12.07 hrs, Volume = 436 cf
Outflow = 0.13 cfs @ 12.07 hrs, Volume = 280 cf, Atten= 0%, Lag= 0.3 min
Primary = 0.13 cfs @ 12.07 hrs, Volume = 280 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 8.73' @ 12.07 hrs Surf.Area= 230 sf Storage= 160 cf

Plug-Flow detention time= 203.0 min calculated for 280 cf (64% of inflow)
Center-of-Mass det. time= 98.3 min (841.1 - 742.8 )

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<td>230.00'W x 1.00'L x 2.00'H Gravel</td>
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<td>460 cf Overall x 40.0% Voids</td>
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<td>Inlet / Outlet Invert= 7.00' / 6.00' S= 0.0909 '/ Cc= 0.900</td>
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<td>n= 0.011 PVC, smooth interior, Flow Area= 0.09 sf</td>
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<td>#2</td>
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<td>Limited to weir flow at low heads</td>
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Primary OutFlow Max=0.13 cfs @ 12.07 hrs HW=8.73' TW=0.00' (Dynamic Tailwater)

↑1=Culvert (Passes 0.13 cfs of 0.53 cfs potential flow)
↑2=Orifice/Grate (Weir Controls 0.13 cfs @ 0.61 fps)
Pond GR: Gravel under Porch

Hydrograph

Inflow Area=850 sf
Peak Elev=8.73'
Storage=160 cf

0.13 cfs @ 12.07 hrs
### Stage-Area-Storage for Pond GR: Gravel under Porch

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<td>8.02</td>
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</table>
Summary for Pond PO: South Ponding

Inflow Area = 4,490 sf, 47.22% Impervious, Inflow Depth > 3.98" for 25-Year event
Inflow = 0.50 cfs @ 12.07 hrs, Volume= 1,490 cf
Outflow = 0.42 cfs @ 12.12 hrs, Volume= 1,386 cf, Atten= 16%, Lag= 2.9 min
Primary = 0.42 cfs @ 12.12 hrs, Volume= 1,386 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 5.43' @ 12.12 hrs  Surf.Area= 1,596 sf  Storage= 258 cf

Plug-Flow detention time= 63.7 min calculated for 1,385 cf (93% of inflow)
Center-of-Mass det. time= 27.3 min ( 841.0 - 813.7 )

<table>
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<tr>
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<th>Invert</th>
<th>Avail.Storage</th>
<th>Storage Description</th>
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<tr>
<td>#1</td>
<td>5.10'</td>
<td>374 cf</td>
<td>Custom Stage Data (Conic) Listed below (Recalc)</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
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<tr>
<td>5.50</td>
<td>1,850</td>
<td>297</td>
<td>374</td>
<td>1,851</td>
</tr>
</tbody>
</table>

Device | Routing | Invert | Outlet Devices
#1     | Primary  | 5.30'  | Custom Weir/Orifice, Cv= 2.62 (C= 3.28)
|       |         |       | Head (feet) 0.00 0.20
|       |         |       | Width (feet) 0.00 10.00

Primary OutFlow Max=0.42 cfs @ 12.12 hrs  HW=5.43'  TW=0.00' (Dynamic Tailwater)
↑1=Custom Weir/Orifice (Weir Controls 0.42 cfs @ 0.95 fps)
Pond PO: South Ponding

Hydrograph

Inflow Area = 4,490 sf
Peak Elev = 5.43'
Storage = 258 cf
### Stage-Area-Storage for Pond PO: South Ponding

<table>
<thead>
<tr>
<th>Elevation (feet)</th>
<th>Surface (sq-ft)</th>
<th>Storage (cubic-feet)</th>
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<tr>
<td>5.50</td>
<td>1,850</td>
<td>374</td>
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</table>
Summary for Link A: POC A

Inflow Area = 12,070 sf, 42.50% Impervious, Inflow Depth > 3.31" for 25-Year event
Inflow = 1.02 cfs @ 12.09 hrs, Volume = 3,333 cf
Primary = 1.02 cfs @ 12.09 hrs, Volume = 3,333 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link A: POC A

Hydrograph

Inflow Area=12,070 sf
Summary for Link A1: To Front

Inflow Area = 6,400 sf, 41.72% Impervious, Inflow Depth > 3.04" for 25-Year event
Inflow = 0.53 cfs @ 12.08 hrs, Volume= 1,624 cf
Primary = 0.53 cfs @ 12.08 hrs, Volume= 1,624 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link A1: To Front

Hydrograph
Summary for Link A2: To Rear

Inflow Area = 5,670 sf, 43.39% Impervious, Inflow Depth > 3.62" for 25-Year event
Inflow = 0.52 cfs @ 12.11 hrs, Volume= 1,709 cf
Primary = 0.52 cfs @ 12.11 hrs, Volume= 1,709 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link A2: To Rear

Hydrograph

Inflow Area=5,670 sf
Appendix “F”

Soil Results Form
SOIL EVALUATION TEST RESULTS

Project Name: Single-Family Residence
Project Address: 30 Sunset Road

Engineering Firm's Name: Rocco V. D'Andrea, Inc.
Engineer's Name: Leonard C. D'Andrea

Test Pit or Soil Boring #: 1

<table>
<thead>
<tr>
<th>Elevation</th>
<th>Soil Texture (Percent Sand, Silt and Clay)</th>
<th>Depth Range in Inches</th>
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</thead>
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<td>5.2</td>
<td>Topsoil</td>
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</tr>
<tr>
<td>4.7</td>
<td>Orange-Brown Gravely Sand</td>
<td>6</td>
</tr>
<tr>
<td>3.7</td>
<td>Brown-Orange Silty Sand</td>
<td>18</td>
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<tr>
<td>2.2</td>
<td>Brown Sandy Silt</td>
<td>36</td>
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<td>1.2</td>
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Elevation

<table>
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<tr>
<th>Mottling (Seasonally High Groundwater)</th>
<th>Depth in Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2</td>
<td>36</td>
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<td>2.2</td>
<td>36</td>
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<tr>
<td>N/A</td>
<td>N/A</td>
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Saturated Hydraulic Conductivity Test Location #:

Ground Elevation:
Top Elevation of Proposed Infiltration System:
Bottom Elevation of Proposed Infiltration System:
Elevation of Test*:
Test Method (check one of the following acceptable methods**):
  Borehole infiltration test (NHDES, 2008)
  Guelph permeameter - ASTM D5126-90 Method
  Falling head permeameter - ASTM D5126-90 Method
  Double ring permeameter or infiltrometer - ASTM D3385-03, D5093-02, D5126-90 Methods
  Amoozeme or Amoozegar (constant head) permeameter – Amoozegar 1992

Attach field data forms for the respective infiltration test method.
Calculated Saturated Hydraulic Conductivity Rate:

**A percolation test, performed in accordance with the guidelines of the Connecticut State Health Code or otherwise, is not an acceptable test for saturated hydraulic conductivity. Percolation tests overestimate the saturated hydraulic conductivity rate.

* All test pits or soil borings shall be excavated to an elevation four feet below the proposed bottom elevation of the infiltration system.

* All field infiltration tests must be conducted in the actual location and soil layer where stormwater infiltration is proposed.

TEST CERTIFICATION
I HEREBY CERTIFY THAT THE INFORMATION CONTAINED IN THIS REPORT IS TRUE AND CORRECT.

Chris Gagnon
Name of Test Conductor

Signature of Test Conductor

Date 2/29/16
**SOIL EVALUATION TEST RESULTS**

**Project Name:** Single-Family Residence  
**Project Address:** 30 Sunset Road

**Engineering Firm's Name:** Rocco V. D'Andrea, Inc.  
**Engineer's Name:** Leonard C. D'Andrea

<table>
<thead>
<tr>
<th>Test Pit or Soil Boring #:</th>
<th>Ground Elevation: 5.1</th>
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</thead>
<tbody>
<tr>
<td>Elevation</td>
<td>Soil Texture (Percent Sand, Silt and Clay)</td>
</tr>
<tr>
<td>5.1</td>
<td>Topsoil</td>
</tr>
<tr>
<td>4.6</td>
<td>Brown Sandy Silt (Stoney)</td>
</tr>
<tr>
<td>3.1</td>
<td></td>
</tr>
</tbody>
</table>

**Saturated Hydraulic Conductivity Test Location #:**

- **Ground Elevation:**
- **Top Elevation of Proposed Infiltration System:**
- **Bottom Elevation of Proposed Infiltration System:**
- **Elevation of Test:**

**Test Method (check one of the following acceptable methods**):  
- Borehole infiltration test (NHDES, 2008)  
- Guelph permeameter - ASTM D5126-90 Method  
- Falling head permeameter – ASTM D5126-90 Method  
- Double ring permeameter or infiltrometer - ASTM D3385-03, D5093-02, D5126-90 Methods  
- Amoozement or Amoozegar (constant head) permeameter – Amoozegar 1992

Attach field data forms for the respective infiltration test method.

**Calculated Saturated Hydraulic Conductivity Rate:**

**Mottling (Seasonally High Groundwater)**

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<th>Depth in Inches</th>
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</table>

**Ledge**

- **N/A**

* All test pits or soil borings shall be excavated to an elevation four feet below the proposed bottom elevation of the infiltration system.

**TEST CERTIFICATION**

I HEREBY CERTIFY THAT THE INFORMATION CONTAINED IN THIS REPORT IS TRUE AND CORRECT.

**Name of Test Conductor:**  
**Signature of Test Conductor:**  
**Date:** 2/29/16

---

February 2012

---

FF0000Form SC-101
Town of Greenwich  
Department of Public Works - Engineering Division  
Town Hall - 101 Field Point Road, Greenwich, CT 06830  
Phone 203-622-7767 - Fax 203-622-7747

Project Name: Single-Family Residence  
Project Address: 30 Sunset Road

<table>
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<td>Topsoil</td>
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<td>Brown Sandy Silt (Stoney)</td>
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<td>3.3</td>
<td>Gray Silt</td>
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<td>1.8</td>
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<table>
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<tr>
<th>Elevation</th>
<th>Depth in Inches</th>
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</thead>
<tbody>
<tr>
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<td>Mortling (Seasonally High Groundwater)</td>
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<tr>
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<td>Groundwater</td>
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<tr>
<td>N/A</td>
<td>Ledge</td>
</tr>
</tbody>
</table>

Saturated Hydraulic Conductivity Test Location #:

Ground Elevation:  
Top Elevation of Proposed Infiltration System:  
Bottom Elevation of Proposed Infiltration System:  
Elevation of Test*:

Test Method (check one of the following acceptable methods**):
- Borehole infiltration test (NHDES, 2008)
- Guelph permeameter - ASTM D5126-90 Method
- Falling head permeameter - ASTM D5126-90 Method
- Double ring permeameter or infiltrometer - ASTM D3385-03, D5093-02, D5126-90 Methods
- Amoozegar or Amoozegar (constant head) permeameter - Amoozegar 1992

Attach field data forms for the respective infiltration test method.

Calculated Saturated Hydraulic Conductivity Rate:  

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* All field infiltration tests must be conducted in the actual location and soil layer where stormwater infiltration is proposed.

TEST CERTIFICATION

I HEREBY CERTIFY THAT THE INFORMATION CONTAINED IN THIS REPORT IS TRUE AND CORRECT.

Chris Gagnon  
Name of Test Conductor  
Signature of Test Conductor  
2/29/16  
Date
NOTES:
1. The site's soils are labeled as "Ninigret-Urban Land Complex" and "Udorthents-Urban Land Complex" (HSG B).
2. Areas with no flowpath shown assumed to have Tc = 5 minutes.
3. Property lies entirely within FEMA Flood Hazard Zone AE (EL 13) as depicted on Flood Insurance Rate Map No. 09001C0514G dated July 8, 2013.
NOTES:
1. The site's soils are labeled as "Ninigret—Urban Land Complex" and "Udorthents—Urban Land Complex" (HSG B).

2. Areas with no flowpath shown assumed to have Tc = 5 minutes.

3. Property lies entirely within FEMA Flood Hazard Zone AE (EL 13) as depicted on Flood Insurance Rate Map No. 09001C0514G dated July 8, 2013.
# FINAL SITE PLAN REVIEW SET

OF

RESIDENTIAL DEVELOPMENT

LOCATED AT

30 SUNSET ROAD

GREENWICH, CONNECTICUT

PREPARED FOR

STEPHEN P. MUSANTE

MARIA R. MUSANTE

## SHEET INDEX

<table>
<thead>
<tr>
<th>SHEET</th>
<th>TITLE</th>
<th>REVISION</th>
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<td>TOPOGRAPHIC SURVEY</td>
<td>4</td>
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<tr>
<td>2</td>
<td>DEVELOPMENT PLAN</td>
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<td>3</td>
<td>SEDIMENTATION &amp; EROSION CONTROL PLAN</td>
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<td>LOW IMPACT DEVELOPMENT PLAN</td>
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<td>5</td>
<td>NOTES &amp; DETAILS</td>
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REFER TO BOOK 805 PAGE 574 G.L.R.
AREA = 12,072 SQ. FT.
LAND LIES IN "R-12" ZONE
NOTES:

1. Soil tests were conducted by Rocco V. D'Andrea, Inc. on February 28, 2016. Refer to the Development Plan of the Final Site Plan Review Set for test pit locations and results.

2. Refer to architectural plans prepared by Allaberg Parker Architects LLC.

3. No ledge was observed near the location of the proposed building.

RECEIVED
NOV 15 2018

1 INCH = 10 FEET

LEONARD C. D'ANDREA, CT PE No. 14869

ONLY COPIES OF THIS MAP, BEARING AN ORIGINAL IMPRINT OF THE ENGINEER’S EMBOSSED SEAL, SHALL BE CONSIDERED TO BE TRUE, VALID COPIES.

ROCCO V. D'ANDREA, INC.
• LAND PLANNERS
• ENGINEERS
• SURVEYORS
P.O. BOX 549
RIVERSIDE, CT 06878
TEL. 637-1779

SINGLE-FAMILY RESIDENCE

PREPARED FOR
STEPHEN P. MUSANTE
MARIA R. MUSANTE

LOCATION
30 SUNSET ROAD
GREENWICH, CONNECTICUT

ELEVATION WITH SOIL INFO

1 OF 1
NOTES:
1. ALL ROOF BREATHERS TO BE PLACED IN THE FIELD WITH THE ARCHITECT.
2. CP-2 ROOF AT ROOF N.T.
3. COPPER CIRCUM.
4. COPPER CIRCUM.
5. ROOF DRAIN.
6. ROOF DRAIN.
7. ROOF DRAIN.
8. ROOF DRAIN.
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