**Greenwich Hospital:** application PLPZ 2021 00101, for a Final Site Plan and Special Permit, to the new Smilow Cancer Center, a 54,865 square foot, three (3) story, medical building, with below-grade parking for 118 vehicles, new driveways, outdoor seating areas, landscaping – including trees to be planting in the Town’s right-of-way, reconfigurations to the Lake Avenue / Lafayette Place / William Street / Perryridge Road traffic circle, crosswalks, and related site improvements on a 94.869 sq. ft. of land located at **16-38 Lake Avenue & 54-64 Lafayette Place** in the RMF Zone but proposed to be re-zoned to the H-2 Zone (see application PLPZ 2021 00102).

**Floor Area:**
- Existing: 17,500 sf commercial / 20,491 sf residential
- Proposed: 54,865 sf
- Permitted: 56,937 sf

**FAR:**
- Existing: 0.40
- Proposed: 0.578
- Permitted: 0.6 (in H-2 zone)

**Building Height:**
- 39’ 2&3/8”

**Lot Coverage:**
- Existing: 63.8%
- Proposed: 77.1%
- Permitted: 75% (see text amendment proposing 80%)

**Building Coverage:**
- Proposed: 41.1%
- Permitted: 35% (see text amendment proposing 45%)

**Parking:**
- Proposed: 118 spaces
- Includes some valet

**UPDATE:**

This application was last heard at the May 11, 2021 public hearing and was left open to address the following:

1) **ARC** – The applicant was heard by the ARC at their June 2, 2021 meeting. The Minutes are not yet available although it can be reported the application as well-received and issued a “Do Not Return”.

2) **Provide documentation presented during the pre-application process regarding how the Cancer Center will benefit the residents of Greenwich during the pre-application proceedings (attached)**

3) **Provide documentation on the location and use of hospital facilities throughout town.**

4) **Department comments:**
   a. **DPW** – revised plans are under review and comments are expected by Tuesday
   b. **ZEO** – awaiting comments
c. Traffic – BETA has responded to the responses from the applicant’s traffic engineer. There are still a few questions raised about how the site will function that the applicant will need to address.
d. Sewer – comments are expected by Tuesday.
e. Fire – comments are expected by Tuesday

APPLICATION SUMMARY:

The applicant is requesting a Final Site Plan and Special Permit to construct the Smilow Cancer Center, which is a 54,865 square foot, three (3) story, medical building, with below-grade parking for 118 vehicles, new driveways, outdoor seating areas, landscaping – including trees to be planting in the Town’s right-of-way, reconfigurations to the Lake Avenue / Lafayette Place / William Street / Perryridge Road traffic circle, crosswalks, and related site improvements on a 94,869 sq. ft. of land located at **16-38 Lake Avenue & 54-64 Lafayette Place** in the RMF Zone but proposed to be re-zoned to the H-2 Zone (see application PLPZ 2021 00102).

The building is proposed as two main floors for the expansion of radiation and medical oncology treatments. Structured, underground parking to accommodate 118 spaces will be provided beneath the building and surface parking will be provided on the western end of the site.

The development involves the consolidation of 9 properties at the corner of Lake Avenue and Lafayette Place directly across from the Greenwich Hospital and existing Bendheim Cancer Center.

Demolition is anticipated to begin in the fall of 2021 and project completion by June 2024.

ISSUES TO BE RESOLVED:

It is recommended that the application be left open to address the following:

1) The first issue for the Commission to decide is whether the proposal is in keeping with the purpose statement of the H-2 zone. The applicant presented considerable documentation on how the Cancer Center will benefit the residents of Greenwich during the pre-application proceedings. It is recommended that this documentation be submitted and considered as part of this application. The number of patients from the Greenwich treated by the hospital every year and the number of patients outside of Greenwich should be provided.

2) Department comments:
   a. ARC - The applicant has gone to ARC twice. The project is generally well received although it did receive a “return” at the May 5, 2021 meeting. It is scheduled to be heard again at the May 19, 2021 meeting.
   b. DPW - Resubmit Prior to Final Site Plan Approval – issues with the license agreement, traffic, and drainage
   c. ZEO comments dated 5/3/21 – elevator must count on one level – FAR plans should be revised.
   d. Traffic comments dated May 7, 2021 – issues of parking and traffic are outstanding
   e. Sewer – capacity concerns determined through meetings with the applicant. Written comments have not been provided
   f. Fire – not yet provided.

3) The Smilow Cancer Center will operate Monday through Friday from 8:00 AM to 5:00 PM. Details about how Bendheim will operate versus Smilow should be explained. Will there be a
focus on specific cancers or is this for general care? If specific cancers, the applicant should explain the rationale.

4) DPW is reviewing with the Law Dept., the proposed license agreement for encroachments on town property.

5) The applicant provided a detailed plan for the parking. But the proposed methods of parking management for campus as a whole is still not clear. The applicant should explain how visitors can be informed about available parking areas when they arrive and how they can be directed from parking areas to the building they are visiting (wayfinding signs, attendants, variable signage, parking maps, etc). Since this site was used as overflow parking for Bendheim, how will that be addressed now?

6) Are there operational/management plans to ensure that patients have priority for using the closest parking areas? Please provide additional information.

7) It is recommended that the Commission require one comprehensive table/spreadsheet that shows all properties owned/leased by the hospital and what they are used for, in general terms, and the number of parking spaces and floor area for each use.

8) At one time the hospital was considering a medical helicopter landing pad, which is currently not permitted. Does this proposal contemplate a future request in any way?

9) The existing R-MF parcels are a mixture of apartments, office and commercial uses as well as parking lots. Are these hospital uses or private properties? If used by the hospital, where are those uses going? How many

10) Section 6-113 states: Offices for physicians and surgeons, for no more than five (5%) percent of the gross floor area in all buildings excluding parking garages within the Hospital Zones, H-1 and H-2. The applicant should demonstrate compliance.

11) It is recommended that a consolidation map be filed on the land records if this proposal moves forward.

12) It is recommended that the yards be noted on the plan

DETAILS:
The new Smilow Cancer Center facility is intended to provide oncology services to Greenwich residents in town rather than requiring them to go to other facilities outside of town or to the Smilow Cancer Center in New Haven. Exterior materials were designed to be compatible with and complementary to the existing campus buildings.

The property comprises eight lots with residential, commercial and parking uses on 94,896 square feet. The existing parcels are a mixture of apartments, office and commercial uses as well as parking lots. Existing buildings total 37,991 square feet of floor area. The proposal is for a building 54,865 square feet including the enclosed penthouse area.

Extensive landscaping is provided, and a healing garden is associated with the treatment rooms on the second floor. Outdoor seating areas are also provided for staff. In order to provide more outdoor space for patients during treatment they are proposing an increase in the building coverage and lot coverage limitations.

Over the last several years the Hospital has moved services such as physical therapy and occupational therapy to 500 West Putnam Avenue and has converted all semiprivate rooms to private.
ZONNING:
The proposed Smilow Cancer Center building will be 54,865 square feet including 2,875 square feet of the penthouse mechanical space for a FAR of 0.578. Comments from the ZEO note that the elevator must be included in the floor area at least on one floor. The FAR for the zone is 0.6.

The proposed building will be 39’ 23/8” in height from average grade, conforming with the 40-foot-high limit permitted in the zone and will be two stories with the penthouse rather than the four-stories permitted.

The Hospital proposes to re-zone the property located at 16-38 Lake Avenue and 54-64 Lafayette Place from RMF to H-2 to permit the construction of the new Smilow Cancer Center. In comparing the respective zones, the RMF permits four stories and 40 feet similarly to the H-2 Zone and has the same floor area ratio limitation of 0.6.

Section 6-205 notes that the setbacks in the H-2 zone are 25’ in the front, 25’ in the rear, and 15’ in the side yard.

TRAFFIC:
The applicant has met with the Town Engineer and the Deputy Commissioner of Public Works regarding reconfiguration of the traffic circle at Lake Avenue, Lafayette Place, William Street and Perryridge Road. The proposed plan includes eliminating the crosswalk through the middle of the traffic circle and locating it to the west on Lake Avenue. This reconfiguration will alleviate the need for considering a traffic signal or enlarging the traffic circle. An additional crosswalk with flashing lights will also be installed westerly on Lake Avenue for the facility staff and patients crossing from the hospital campus to the southside of Lake Avenue.

Adler Consulting has prepared a parking and traffic study dated March 2021. The Smilow Cancer Center will operate Monday through Friday from 8:00 AM to 5:00 PM.

DATA COLLECTION:
Traffic volume data were collected for the Weekday Peak AM, Midday, PM and Saturday Highway Hours, at the Lake Avenue/William Street/Lafayette Place/Perryridge Road traffic circle; at the Lake Avenue/Dearfield Road/Glenville Road roundabout; at the West Putnam/Dearfield Road/Field Point Road intersection; at the W Putnam/Lafayette Place/Greenwich Avenue intersection. The data were collected in February 2020, prior to the Covid-19 Stay-at-Home Mandate and were summarized to yield the "Existing" traffic volumes for the four peak hours.

LOS:
An overall Level-of-Service "C" or better operating conditions currently prevail at all of the study intersections for AM, Midday and PM Peak Hours, except West Putnam Avenue/Dearfield Road/Field Point Road during the AM Peak, which operates at LOS “D”.

Analysis of the anticipated Build traffic operating conditions revealed that no changes in overall Levels of Service are expected at the traffic circle at Lake Avenue/William Street/Lafayette Place/Perryridge Road during all three time periods studied. In addition, no overall changes in Levels-of-Service are expected at the West Putnam/Dearfield Road/Field Point Road intersection and the West Putnam/Lafayette Place/Greenwich Avenue intersection during the three peak hours when comparing
the Build traffic operating conditions with the No-Build traffic operations.

There is projected to be an overall LOS drop from No-Build LOS "b" to Build LOS "c" for the PM Peak Hour at the roundabout of Lake Avenue/Dearfield Road/Glenville Road.

TRIP GENERATION:
The proposed development is anticipated to generate a total of 167 trips during the AM Peak Hour, 208 trips during the Midday Peak Hour, and 208 trips during the PM Peak Hour.

PEAK HOURS
The peak hours of traffic activity on the roadway system in the vicinity of the Site are:
Weekday Peak AM Highway Hour 8:00 a.m. to 9:00 a.m.
Weekday Peak Midday Highway Hour 12:00 p.m. to 1:00 p.m.
Weekday Peak PM Highway Hour 4:30 p.m. to 5:30 p.m.

ACCESS:
The primary entrance drive for the facility will be from Lake Avenue and there will be a service drive on Lafayette Place. The main entrance to the center will be on the west side of the building facing the parking lot.

PARKING:
The proposed building will have two levels of below grade parking and additional at grade parking with access to Lake Avenue. There will be a separate entrance located on Lafayette Place to accommodate service or emergency vehicles. The Smilow Cancer Center will provide a total of 118 parking spaces. The hospital currently utilizes valet services on a regular basis and is proposing the same for the Cancer Center.

OVERALL PARKING:
The parking survey indicated that a total of 1,160 parking spaces are presently provided at Greenwich Hospital. This includes a combination of surface lots along Lake Avenue and Lafayette Place, the visitor garages beneath the hospital, the staff garage, and the Bendheim garage. The total parking spaces also account for 176 valet spaces located around campus.

Weekday parking demand counts showed that for a typical day a maximum of 913 vehicles were parked on campus during the day. Staff parking demand counts were conducted during Covid-19 since there was no reduction of staff during that time.

The Smilow Cancer Center will provide 118 parking spaces; however, the construction of the building will demolish surface lots on Lake Avenue and Lafayette Place. Based on the Town of Greenwich zoning requirements, the Cancer Center will demand approximately 164 parking spaces to accommodate for medical professionals, staff, patients and visitors. Bendheim Pavilion will require 81 parking spaces for services that will remain in the existing building. There will be an additional 55 vacant parking spaces in Watson Pavilion in the Build year after all outpatient services relocate from Greenwich Hospital.

Overall, the future parking demand will require 1,011 parking spaces to accommodate Greenwich Hospital functions, and there will be a total of 1,173 available parking spaces, including valet. The yields
a 16 percent surplus of parking spaces in the future.

The conclusion of the parking component of the study is that there would be “sufficient parking provided on Greenwich Hospital’s campus to accommodate the needs of the proposed Smilow Cancer Center.” While that may be true, Table 7 is showing the Smilow Cancer Center garage with demand greater than capacity, while the Bendheim Garage is also essentially at capacity:

Analysis based on ITE parking generation rates indicates demand could be even higher: 108 spaces for the Bendheim Garage and 195 spaces for the Smilow Cancer Center. The Applicant should provide information on the proposed methods of parking management for the Greenwich Hospital campus to explain how visitors can be informed about available parking areas when they arrive and how they can be directed from parking areas to the building they are visiting (wayfinding signs, attendants, variable signage, parking maps, etc). And are there operational/management plans to ensure that patients have priority for using the closest parking areas?

Table 7 shows the future demand for all of the parking facilities at Greenwich Hospital. The future demand exceeds the number of striped parking spaces available on campus by 21 parking spaces. Henceforth, when the staff garage is operating at its full capacity under valet conditions, there will be a surplus of 120 parking spaces. When considering valet operations at all of the applicable parking facilities, the supply of parking spaces exceeds the demand of parking in the future by approximately 16 percent. Chart 4 graphically depicts the demand of future parking versus available parking spaces at Greenwich Hospital.

<table>
<thead>
<tr>
<th>Parking Facility</th>
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<th>Valet</th>
<th>Available Spaces</th>
</tr>
</thead>
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<tr>
<td>Visitor Garages</td>
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**LICENSE AGREEMENT:**
There will be a slight encroachment of the site wall on Lafayette Place and after reviewing the matter with the Town DPW we have drafted a License Agreement for the wall. In addition, a portion of the sidewalk on Lake Avenue is located on the Hospital’s property and we have provided a draft easement to the Town to cover this.
SEWER:
Plans were submitted to the Sewer Division in connection with a new sewer connection for the proposed building. Discussions are ongoing as to the capacity of the sewer main in Lake Avenue and the one along Horseneck Brook.

DRAINAGE:
The applicant provided a drainage summary report prepared by Redniss and Mead dated 3/22/21. It includes a description of the structural and non-structural best management practices that have been proposed to address the increases in impervious surfaces. DPW comments notes that there are some issues that they want resolved before the Commission moves this application forward.

LANDSCAPING AND LIGHTING
Extensive landscape plans have been prepared which include proposed trees within the town right-of-way. Our landscape architect has been in contact with the Town Tree Warden seeking his review and approval. A photometric plan has been prepared showing that the proposed lighting will meet the 0.1-foot candle limitation at all property lines.

Significant landscaping is proposed along both Lafayette Place and Lake Avenue including street trees shrubs bushes and other plant material. Over 30 trees are proposed along the perimeter of the site and all existing street trees but one will be retained.

OTHER APPLICATIONS:
Amendment to H-2 Regulation:
As part of the proposed site plan there are extensive outdoor landscaped treatment areas for patients, which occupy portions of the site resulting in the building being in excess of 35% of the lot area. The proposed building coverage is 41.1% of lot area, therefore the applicant requests an amendment to the building coverage limitation from 35% to 45%. In addition, lot coverage is proposed to be 77.1% of the lot area rather than the permitted 75%. This additional lot coverage allows for fire apparatus access around the entire building and for a separate delivery area for medical equipment and supplies. Therefore, a modification of the lot coverage limitation from 75% to 80% is requested.

BACKGROUND:
The concept for a new cancer center was first presented to the Planning and Zoning Commission on February 25, 2020. As was stated at the hearing, Greenwich Hospital has served the community since its founding in 1903 and has been located on Perryridge Road since 1917. After a series of renovations in the 40s, 50s, and 60s, in 1990 the Commission adopted two hospital zones which led to the renovation and construction of the Helmsley Pavilion in 1999 and the Watson Building in 2006.

DEPT COMMENTS:
DPW – See attached
ZEO – See attached
Health – See attached
Conservation – Awaiting comments
Fire – Awaiting comments
IWWA – green sheet provided
BETA submitted a memo on May 6, 2021 providing a traffic review of the site plan, operational analysis, and parking assessment for the proposed new Smilow Cancer Center. The Applicant has since provided the following additional information relevant to traffic considerations for the site:

- Response to Comments Letter: Greenwich Hospital Smilow Cancer Center; The Chazen Companies; May 11, 2021
- Revised Site Plans, GH Smilow Cancer Center; Redniss & Mead; May 11, 2021

For items where further commentary is provided, BETA’s 5/6/21 comments, Chazen Companies’ responses (dated 5/11/21), and additional remarks are as follows:

**Previous BETA Comment #4b (5/6/21 Memo)** The conclusion of the parking component of the study is that there would be “sufficient parking provided on Greenwich Hospital’s campus to accommodate the needs of the proposed Smilow Cancer Center.” While that may be true, Table 7 is showing the Smilow Cancer Center garage with demand greater than capacity, while the Bendheim Garage is also essentially at capacity:

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**Applicant Response (5/11/21):** The aim of the Smilow Cancer Center arrival process is to be predominantly a drop-off facility. Patients receiving treatment at Smilow will not necessarily be able to accommodate themselves leaving the Site. Accordingly, when drop-offs occur, there will be a parking attendant who will direct drivers where to park. Alternatively, the driver may opt for a valet to park their car on their behalf. Further, there is a guard booth located at the entrance of the visitor parking garage beneath the main hospital building. Parking attendants will be present to
direct the driver where to park or to opt for valet services in the below-grade parking beneath the Watson Pavilion.

**Additional BETA Comment:** Active management of the available parking for this site is important due to the imbalances in parking supply and demand for buildings throughout the site. Will the Applicant provide a more formalized document detailing the information provided above and agree to modify management operations if the future if conditions are not as expected? Additionally, there are no indications on the site plans or architectural plans for where a parking attendant or valet for the Smilow Cancer Center building would be stationed. Is that something that should be planned for?

**Previous BETA Comment #5 (5/6/21 Memo)** There is a site circulation issue for the east drive aisle where two northbound lanes are shown. Eastbound traffic in the north drive aisle would have to exit the site to turn around.

![Image of site plan]

**Applicant Response (5/11/21):** Both aisles of the Smilow parking lot offer two-way traffic. Eastbound traffic in the northbound aisle can turn around within the parking lot, versus exiting and re-entering the parking lot. Additionally, upon entering the parking lot, there will be signage to direct patients to the drop-off area and the parking garage. Implementing signage throughout the parking lot will reduce confusion for drivers as to how to where to find parking.

**Additional BETA Comment:** Referring again to the image above, if a vehicle enters the site’s inbound access drive and proceeds eastbound in the north aisle and then reaches the east drive aisle without finding a parking space, that driver would likely want to turn right to access the parking garage or the other surface parking spaces. It is unlikely that the driver would turn completely around to avoid the short one-way segment that has been created in the pick-up drop-off area or if they do choose to turn around, they would obstruct the exit driveway and/or pick-up drop-off area. This is the potential conflict. Perhaps consider designating the north and south drive aisles one way to promote counterclockwise circulation to avoid that issue and more effectively encourage the desired flow through the site.

**CC:** Patrick LaRow, Town of Greenwich
James Michel, Town of Greenwich
Scott Marucci, Town of Greenwich
Bianca Dygert, Town of Greenwich
May 11, 2021

Katie DeLuca, Planning Director
Town of Greenwich
101 Field Point Road
Greenwich, CT 06830

Re: Greenwich Hospital
Smilow Cancer Center
Greenwich, Connecticut
Chazen Project # 72002.01

Dear Ms. DeLuca:

This letter is in response to the comments raised by the BETA Group Inc, in their memorandum, dated, May 6, 2021 as a part of the Planning and Zoning Commission’s review of the proposed Greenwich Hospital’s Smilow Cancer Center to be located at 16-38 Lake Avenue in the Town of Greenwich, Fairfield County, Connecticut.

Comment 1:
Regarding trip generation, please provide information on and discuss the existing land uses on the sites proposed for redevelopment. Are they currently occupied? What trip volumes and patterns have been observed for those buildings that will be removed with project construction? Although the trip generation provided is conservative, it could be beneficial to give some consideration to those existing trips. Additionally, the narrative states the proposed square footage of the cancer center as 54,865 rather than the 60,000 that was presented in the traffic study.

Response 1:
The parcels on Lake Avenue and Lafayette Place which are used for overflow staff parking during the COVID pandemic and which were counted in December 2020 were vacant. All the parcels were formerly owned and operated by private individuals before bought by the Hospital. In that these parcels are to become part of the footprint of the Smilow Cancer Center and in the interest of providing a conservative analysis, no credit was given to the former occupancy.

The size of the building used in the Traffic and Parking Impact Study was as part of an earlier iteration of the actual building size. In that the size of the building is approximately 5,000 square feet smaller.
than currently proposed, which would in effect yield a smaller number of trips generated, the analysis or the purpose of the traffic impacts was not changed. Further, a 60,000 square foot medical office building generates 14 more vehicle trips during the AM Peak Period, and 18 more vehicle trips during the Midday and PM Peak Hours than a building with 54,865 square foot. Though this analysis is more conservative, it does not affect the overall LOS at the study intersections significantly, LOS levels remain the same when comparing overall No-Build conditions to Build conditions.

Comment 2:
Include the assumed site traffic distribution percentages on Figures 8, 9, and 10 in addition to the site-generated turning movement volumes. There also appear to be incorrect volumes on these figures (i.e. through movement volumes at site access driveways and the unbalanced volumes for the intersection of W. Putnam Ave. at Greenwich Ave.)

Response 2:
Site Generated Volume Figures 8, 9, and 10 were updated with balanced volumes between the intersections of West Putnam Avenue at Lafayette Place and West Putnam Avenue at Greenwich Avenue. The through movement volumes at the site driveway were removed because they are not Site generated. Also, included in the attachments is the Site Traffic Distribution Figure.

Comment 3a:
The intersection of Lake Ave/William St and Lafayette PI/Perryridge Rd does not have a typical layout or use of traffic control devices and was analyzed as an unsignalized intersection with Synchro. The delay/LOS results seem perhaps unrealistically good, with low delays and all approaches operating at LOS "a" for all peak periods analyzed. Do these results correlate to your observations on site? Does the analysis need to be adjusted to resemble existing conditions more accurately?

Response 3a:
The results of the atypical intersection of Lake Avenue and Lafayette Place correlate with observations taken on site. During the critical AM Peak Hour, the traffic flows efficiently throughout the main study intersection.

Comment 3b:
Please confirm/explain why delays for the AM peak hour are considerably less for the build condition during the AM peak hour for the intersection of W Putnam Ave & Dearfield Dr/Field Point Dr.

Response 3b:
The decrease in delay from the Existing conditions to the Build conditions at the intersection of W Putnam Ave and Dearfield Drive/Field Point Drive is due to the signal being actuated coordinated. Although the cycle length does not change from Existing conditions to Build conditions, Synchro Software automatically assigns additional effective green time for the side streets due to the increase
of the volumes during the Build conditions. During the AM Peak Hour, the northbound through/left movement receives 28.7 seconds of effective green time in the Existing conditions. During Build conditions, the northbound through/left movement gains 2.8 seconds of actuated effective green time, now giving it a total of 31.5 seconds. This causes the overall delay on the northbound approach to decrease by approximately 12 seconds from Existing conditions to Build Conditions. This change also occurs in the southbound approach, where the southbound left/through/right movements also gain 2.8 seconds of actuated green time, ultimately reducing the overall southbound approach delay by approximately 20 seconds. Accordingly, assigning additional green time to the side streets of Dearfield Drive and Field Point Drive will reduce actuated green time given to the major approaches. In this case, the West Putnam Avenue westbound left movement lost 3.5 seconds and the westbound through/right movement lost 3.6 seconds. This did not have significant impact to the overall approach LOS, as the westbound approach delay only increased by approximately four (4) seconds. Likewise, removing 2.5 seconds from the eastbound left movement and 2.9 seconds from the eastbound through/right movement only resulted in an overall approach delay increase of approximately four (4) seconds and improved the Level-of-Service.

Comment 3c:
Please confirm/explain for the roundabout at Lake Ave/Glenville Rd & Dearfield Dr why for the AM peak hour delays at for the eastbound approach are higher than the delays for the southbound approach given that volumes are considerably higher on the southbound approach and the geometry does not appear significantly different.

Response 3c:
In roundabout intersections, approaching vehicles must wait for a gap to enter the intersection in that all vehicles within the roundabout have priority over those entering. In this scenario, vehicles on the eastbound approach (Glenville Road) need to wait for access into the roundabout when there are vehicles already in the roundabout. In that there is a significant flow from the southbound direction (Lake Avenue), the Glenville Road entrance to the roundabout must wait for gaps in traffic in order to enter the intersection with the resulting increased delay on the eastbound approach. The southbound through traffic has priority to enter the intersection.

Comment 4a:
Several parking areas for the Greenwich Hospital campus were listed with available supply and observed demand. Please provide a figure that indicates locations for all of the existing and proposed parking areas.

Response 4a:
See the attached Existing Parking Figure and Proposed Parking Figure.
Comment 4b:
The conclusion of the parking component of the study is that there would be "sufficient parking provided on Greenwich Hospital's campus to accommodate the needs of the proposed Smilow Cancer Center." While that may be true, Table 7 is showing the Smilow Cancer Center garage with demand greater than capacity, while the Bendheim Garage is also essentially at capacity. Analysis based on ITE parking generation rates indicates demand could be even higher: 108 spaces for the Bendheim Garage and 195 spaces for the Smilow Cancer Center. The Applicant should provide information on the proposed methods of parking management for the Greenwich Hospital campus to explain how visitors can be informed about available parking areas when they arrive and how they can be directed from parking areas to the building they are visiting (wayfinding signs, attendants, variable signage, parking maps, etc). And are there operational/management plans to ensure that patients have priority for using the closest parking areas? Please provide additional information.

Response 4b:
The aim of the Smilow Cancer Center arrival process is to be predominantly a drop-off facility. Patients receiving treatment at Smilow will not necessarily be able to accommodate themselves leaving the Site. Accordingly, when drop-offs occur, there will be a parking attendant who will direct drivers where to park. Alternatively, the driver may opt for a valet to park their car on their behalf. Further, there is a guard booth located at the entrance of the visitor parking garage beneath the main hospital building. Parking attendants will be present to direct the driver where to park or to opt for valet services in the below-grade parking beneath the Watson Pavilion.

Comment 4c:
The parking surveys for the staff parking garage and "additional lots" were conducted in December 2020. Can the Applicant comment on whether operations at the hospital were representative of pre/post COVID typical conditions (regarding volume of on-site staff, in person patient visits, availability of all services etc.)? It was noted in the study that valet parking was not available due to pandemic operating procedures, so it seems plausible that other conditions could have been impacting parking demand at that time.

Response 4c:
During the time of parking data collection, Greenwich Hospital was fully operational with its typical compliment of employees. In December 2020, only staff parking accumulation counts were conducted. All other parking counts were conducted prior to the COVID pandemic. Those locations included the parking for the Bendheim Center (including lot D) and the parking beneath the main hospital building in the below-grade parking spaces under both the Watson and the Helmsley Pavilions.

It is noted that all the staff for the Smilow Cancer Center will park in the staff garage behind the main hospital building where there is significant excess capacity.
Comment 5:
There is a site circulation issue for the east drive aisle where two northbound lanes are shown. Eastbound traffic in the north drive aisle would have to exit the site to turn around.

Response 5:
Both aisles of the Smilow parking lot offer two-way traffic. Eastbound traffic in the northbound aisle can turn around within the parking lot, versus exiting and re-entering the parking lot. Additionally, upon entering the parking lot, there will be signage to direct patients to the drop-off area and the parking garage. Implementing signage throughout the parking lot will reduce confusion for drivers as to how to where to find parking.

We trust that this information will assist you with your continued work on this project. Should you have any questions or comments, please do not hesitate to contact us.

Respectfully submitted,
The Chazen Companies, A LaBella company

Bernard Adler, P.E.
Senior Director, Transportation Services
Connecticut Professional Engineer 16054
Site Generated AM Peak Hour Volumes
(8:00 am - 9:00 am)

Project # 72002.01

Date: 05/11/2021

Figure 8

Greenwich Hospital
Smilow Cancer Center
Town of Greenwich, Fairfield County, Connecticut

THE Chazen
COMAPANIES
Proud to be Employee Owned

LEGEND

Roundabout
Signalized Intersection
Unsignalized Intersection
Greenwich Hospital
Smilow Cancer Center
Town of Greenwich, Fairfield County, Connecticut

Project # 72002.01
Date: 05/11/2021

Site Generated PM
Peak Hour Volumes
(4:30 pm - 5:30 pm)

Figure 10
Greenwich Hospital
Smilow Cancer Center
Town of Greenwich, Fairfield County, Connecticut

Site Distribution Percentage

Project # 72002.01  Date: 05/11/2021

LEGEND

Roundabout
Signalized Intersection
Unsignalized Intersection
Greenwich Hospital
Smilow Cancer Center
Town of Greenwich, Fairfield County, Connecticut

Existing Parking Areas

Project # 72002.01  Date: 05/11/2021  Figure 15
May 13, 2021

Mr. Scott Marucci  
DPW Engineering  
Town of Greenwich  
101 Field Point Road  
Greenwich, CT 06830

RE: Final Site Plan Application PLPZ202100101, 102, 103/Engineering Project 21-5(24)  
Greenwich Hospital Cancer Center – 10 Lake Avenue, Greenwich, CT

Dear Mr. Marucci,

On behalf of our client, Greenwich Hospital, we are pleased to submit the enclosed revised Site Plans and Drainage Report. The attached has been revised per our recent discussion and your comments dated May 6. As per the Town of Greenwich Drainage Manual, this letter has been prepared to respond to the comments made and to describe any other modifications made to the site plans and drainage report. The following are the responses in the order in which they appear in your comments:

1. To be addressed prior to Zoning/Building Permit Sign-off
2. To be addressed prior to Zoning/Building Permit Sign-off. The Zoning Location Survey (ZLS) prepared by this office and previously included in the Site Plan package contains the location for the sidewalk easement. It is intended that this survey will be the easement map.
4. To be addressed prior to Zoning/Building Permit Sign-off
5. The Zoning Location Survey (ZLS) prepared by this office and previously included in the Site Plan package contains the location for the retaining wall encroachment. It is intended that this survey will be used for the License and Maintenance Agreement.
6. A response from The Chazen Companies will be submitted under separate cover. To address Beta Comment #5, the site plans previously included a one-way sign which will be changed to a diagrammatic “no right turn” sign to limit vehicular traffic from turning right. Additionally, a sign has been added to the site plans in the island by the entrance from Lake Avenue directing all traffic through the parking lot in a counterclockwise direction to the port cochere and/or garage entrance.
7. A revised Form SC-107 is attached
8. Drainage Summary Report:
   a. A meeting was held on May 6, 2021 to review the existing pipe connections on 52 Lafayette Place and the proposed drainage connection within Lake Avenue.
   b. A CCTV inspection was performed and confirmed that the existing pipe leaving 38 Lake Avenue is directly connected into a 12” pipe (no junction structure
observed) located on 52 Lafayette Place. Due to access issues, the CCTV scoping did not proceed further, however we were informed that the pipe was confirmed to travel through 52 Lafayette Place and into Lake Avenue through parking lot on 42/44 Lake Avenue. This was confirmed via a dye test performed by this office that the connection exists. Refer to the attached observation report. Please note, at the time of this writing, copies of the CCTV have not been received and the CCTV inspection may not have been recorded. If we are able to secure a recording, it will be submitted under separate cover.

c. The discharge from the catch basin on 54 Lafayette Place leaves the structure in a southerly direction but shortly after turns west parallel to 56 Lafayette Place and daylights at the top of the slope in the southwest corner of the property. The pipe was inspected was determined to be crushed at the time of inspection. All exhibits previously indicating the 6” discharge leaving south and entering 52 Lafayette Place has been updated to reflect the current conditions.

d. Noted.

e. The time of concentration has been updated. It is noted as being less than 5 minutes, however the HydroCAD model uses a minimum of 5 minutes for the time of concentration so no changes to the model are expected. It is noted that there is no drywell within this drainage basin as noted in the comments.

f. The plans and report reference the elevations correctly. The report does not include crushed stone below the galleries for storage purposes as not all stone will meet the minimum 24” separation required to restrictive layers. To be conservative, the entirety of the stone pad was ignored, and the bottom of gallery elevation was used as the bottom of storage.

g. The inverts have been updated and coordinated between the report and site plans.

h. The conveyance calculations have been revised as noted.

i. All other calculations have been revised as necessary including WQV, Sand Filter Sizing, RRV, GRV and Existing/Proposed HydroCAD reports. Changes to these calculations were updated due to the above comments and also coordination between the rest of the design team and per ARC comments. Refer to a letter dated April 28, 2021 in response to ARC comments for changes. Further changes to the site plan submitted in this package include a revision to the service area to add additional landscaping while reducing impervious coverage. This change was made to address additional ARC comments.

9. Construction Plan Set:

a. Existing Condition Survey
   i. Refer to response 8b above.
   ii. All documents referencing the connection have been updated to represent the same information.

b. Site Plan Sheets
   i. The connection was discussed on May 6. An alternate connection was requested to be shown which includes a catch basin in front of 42/44
Lake Avenue to collect the existing 12” pipe as well as the overflow from the proposed site and connect into the existing manhole within Lake Avenue. Further discussion will be required with Engineering Division and DPW Highway to formalize this design. Included in the revised drainage is an analysis of what is assumed to be flowing through the 12” pipe from offsite areas. All combined flow through an 18” pipe exceeds its capacity during a 25-year storm event.

ii. All gates have been revised to swing into the property. The western gate located on 38 Lake Avenue has been set back 25’ from the curb line. The other 2 gates were reviewed during a meeting with DPW Highway on May 13 and they accepted the revisions. Final coordination with the Highway Department shall occur prior to Zoning/Building Permit Sign-off.

iii. E&S controls have been added to the Site Demolition Plan on Sheet SE-1.

iv. Notes referencing the LID plan which call out the roof areas has been added to the Utility Plan on Sheet SE-2.

v. A meeting was held on May 13 with DPW Highway and they accept the concept of the imprinted mid-block cross walk. Details will be provided by the DPW Highway staff of the current Town standard to be used.

vi. A meeting was held on May 13 with DPW Highway and they accept the use of the solar powered RRFB. Details will be provided by the DPW Highway staff of the current Town standard to be used.

vii. A meeting with the Deputy Commission of DPW will be requested prior to a Zoning/Building Permit Sign-off.

viii. A request will be submitted to the Parking Authority prior to a Zoning/Building Permit Sign-off.

ix. A note has been added to the Site Plan. A meeting was held on May 13 with DPW Highway and they accept this note. Final determination will be made at the end of construction.

x. All requested notes have been added to the Site Plan (Sheet SE-1) except for Comment 9.b.x.5 which was added to the Site Grading Plan (Sheet SE-2).

1. As discussed, it is the intent of the contractor to close the sidewalks along the entire frontage at the start of construction (post demolition). A draft phasing plan prepared by Gilbane has been previously submitted (and included in this response). A formal plan will be prepared prior to issuance of the Highway Permit.

xi. Dimensions have been added to the Lake Ave Traffic Circle Improvement Plan on Sheet SE-3

xii. Dimensions have been added to the Lake Ave Traffic Circle Improvement Plan on Sheet SE-3. All dimensions are face of curb to face of curb.

xiii. A meeting was held on May 13 with DPW Highway and the final limits of pavement restoration will be determined at the end of construction.
xiv. A chart containing the excavation and fill quantities has been included adjacent to the Site Grading Plan on Sheet SE-2

xv. The preliminary construction phasing prepared by Gilbane has been included on Sheet SE-4

xvi. The retaining wall footing drain network is shown on the Site Utility Plan Sheet SE-2

xvii. All sump elevations have been added to the structure tables on Sheet SE-6

xviii. The elevations of the bottom of other structures have been added to the structure tables on Sheet SE-6

xix. The elevations of the bottom of the control structures have been added to the structure tables on Sheet SE-6

c. Driveway Profile & Sight Distance Sheet
   i. The sight distances have been added
   ii. The width of the driveway at the property line has been added
   iii. The width of the driveway at the edge of the road has been added
   iv. The distance from the driveway to the intersection has been added
   v. The distance between driveways has been added
   vi. The distance from the edge of driveway to parallel property line has been added
   vii. Positive slope is shown on the grading plan on SE-1. The driveway profiles have been updated to reflect that condition.
   viii. Positive slope is shown on the grading plan on SE-1. The driveway profiles have been updated to reflect that condition.
   ix. All vegetation along the property line and within the Right of Way is shown
   x. All structures are shown
   xi. Vegetation to be removed has been indicated

d. Traffic Signage, Pavement Markings and Parking Space Layout Sheet
   i. The width of the drive will be reviewed with the Commission
   ii. The dimensions of the end spaces within the parking garage will be reviewed with the Commission
   iii. The wheel stops have been removed and small bollards are proposed. Final design of the bollards to be coordinated with the Landscape Architect prior to Zoning/Building Permit Sign-off.
   iv. A one-way sign is now proposed and shown on Sheet SE-1
   v. A “No Parking – Loading Zone” sign is now proposed and shown on Sheet SE-1

e. Construction Details Sheets
   i. The pedestrian ramp detail has been updated to use the Town of Greenwich SCD No. 921.44. Refer to Sheet SE-7.
   ii. The revised SCD No. 921.11 has been included. Refer to Sheet SE-7.
iii. The catch basin detail previously indicated in the plans has been updated to reference onsite use only. Town of Greenwich SCD No. 507.10 is also indicated should it be determined a catch basin is required within the Town Right of Way. Refer to Sheet SE-5.

iv. A note has been added to the detail indicating that the soil beneath shall be scarified or tilled to improve infiltration

10. Operation & Maintenance Plan Report


b. Upon consolidation of all affected parcels, the property will be known as 10 Lake Avenue. No modification is required.

We trust that these modifications are acceptable. Should you have any questions or comments, please do not hesitate to contact me.

Sincerely,

David R. Ginter, P.E.

Enclosures

cc (w/ Enc.): Project Team

h:\jobfiles2\6000\6300\6355\documents\engineering\engineering response (2017-12-05).docx
Parking Management Plan

Table of Contents

I. Introduction

II. Employee parking
   a. Narrative
   b. Designated parking facilities
   c. Housing Residents
   d. Policy

III. Patient and Visitor parking
   a. Narrative
   b. Designated Parking Facilities;
      i. 5 Perryridge Visitor Garage
         1. Helmsley
         2. Watson
      ii. 77 Lafayette Place
      iii. Future GH Smilow Cancer Center
   c. Parking Lot wayfinding system

IV. Service personnel
   a. Narrative
   b. Procedures for deliveries
   c. Procedures for contractors and vendors
Introduction

The Greenwich Hospital campus is made up of properties at 5 Perryridge Road (Greenwich Hospital - Helmsley Building & Watson Pavilion), 45 Lake Avenue (Staff Parking Garage), 77 Lafayette Place (Bendheim Cancer Center) and eight (8) properties which are to be combined into 10 Lake Avenue as part of the construction of the new Smilow Cancer Center. All employees are required to park in the multi-level garage at 45 Lake Avenue. This is to ensure that adequate spaces are available at the Hospital, Bendheim Cancer Center and the Smilow Cancer Center for patients and visitors. With the protocols set forth in this Parking Management Plan, the parking is organized to accommodate all activities on the Hospital properties. Valet services will be offered for each garage including the employee garage and an automatic parking guidance system will be implemented for all patient and visitor garages.

Employee Parking

The Employee Parking Facility located at 45 Lake Avenue is designated for all Hospital, Bendheim Cancer Center and Smilow Cancer Center staff. This includes all direct employees, medical staff, contracted employees and volunteers. Parking for staff is complimentary. The facility has 545 striped spaces distributed over three levels. The garage can accommodate an additional 141 vehicles under valet operations. The hospital has contracted with the firm Parking Productions to provide valet service during peak operating hours.

Employees who live in Hospital housing located within walking distance from the Hospital are designated to park their vehicles at their residence. This includes the Prescott House on Lafayette Place along with the Hospital owned houses on William Street and Perryridge Road.

The Hospital established a Parking Policy to provide staff guidance on parking operations. A copy of the policy is included in the appendix here. Employees are required to register their vehicles with Hospital security and display a permit sticker on their front windshield.

Patient and Visitor Parking - Greenwich Hospital

The Main Hospital located at 5 Perryridge Road has a driveway up to the front entrance with a porte-cochere for patient and visitor access to the lobby. A parking attendant is stationed at this entrance to greet patients and provide direction for available parking on site. The Hospital has two subterranean garages for complimentary patient and visitor parking. The garage entrance is located beneath the front driveway at 5 Perryridge Road.
Upon entering the garage patients and visitors are greeted by a parking attendant during peak hours. The attendant provides direction for available parking in either the Helmsley Building or the Watson Pavilion. The Helmsley Building has a capacity of 147 striped parking spaces distributed over two levels and the Watson Pavilion has a capacity for 104 vehicles distributed over three levels. Thirty (30) additional vehicles can be parked under valet operations. When patients and visitors leave their vehicle and enter the elevator lobby they are encouraged to pick up a location ticket. The ticket provides building and floor level information to help them identify where their vehicle is parked.

The hospital is evaluating options to install an automatic parking guidance system similar to the Falcon Vision system made by ECO lighting solutions. This type of system is part of the plan for the Smilow Cancer Center and the Hospital is looking to implement for all remaining garages. Yale New Haven Health recently installed this system at a garage located at 149 Legion Avenue in New Haven with much success. Information on the product is attached here in the appendix.

Patient and Visitor Parking – 77 Lafayette Place, Bendheim Cancer Center

The Bendheim Cancer Center offers complimentary parking in a garage located below the building. Upon entering the site at 77 Lafayette the driveway leads to the pedestrian main entrance. At this point patients and visitors can leave their vehicle with the valet or self-park in one of the 78 striped parking spaces. Valet services will continue to be offered.

Patient and Visitor Parking – Future Smilow Cancer Center

The proposed GH Smilow Cancer Center will be located on the corner of Lake Avenue and Lafayette Place. The site will offer a mixture of surface and below grade parking. The entrance to the site will be off of Lake Avenue where patients and visitors will be directed to a porte-cochere for drop off and pick up. Parking attendants will be available to direct drivers to use either the surface parking lot with 42 striped spaces or the garage with 76 striped spaces distributed over two levels. Based on patient needs, it is anticipated that at peak periods a maximum of 84 patients and visitors will access the building. While more than adequate parking will exist, valet services will also be offered.

Service Personnel - Hospital

To provide access for service personnel, the Hospital has a service road that circles around back of the building. The entrance to the service road can be found between the Emergency Department entrance ramp and Employee Parking Garage, off of Lake Avenue; the service
road terminates at the North end of the site on Perryridge Road. Shipping and receiving along with waste management occur at the Hospital’s loading dock, which is located along the service road. Access to the central power plant, bulk medical gases and emergency fuel supply are provided from the service road, too. There are 20 striped spaces for contractor and vendor parking.

Service Personnel – Bendheim Cancer Center

The Bendheim Cancer Center site has one parking space located in the front of the building designated for deliveries. Delivery vehicles that exceed the size of this parking space will use the hospital loading dock. The Hospital’s couriers will then transport the materials to Bendheim using smaller delivery vans.

Service Personnel – Future Smilow Cancer Center

The future Smilow Cancer Center is proposed with a service road that circles around the back of the building. The service road will begin on Lafayette Place at the south end of the property and terminate at Lake Avenue. The service road will provide access for delivery vehicles and waste management operations. There will be 3 parking spaces sized to accommodate 30-foot box trucks.

Appendix

-GH Parking Policy
-149 Legion Ave, New Haven Parking Guidance System
-ECO Parking System Architecture
FALCON VISION™ Parking Guidance

The ECO FlexTech™ equipped with FALCON VISION™ is your personal assistant...your Concierge!

By integrating the Vision Based Parking Guidance and LED indicator into the FlexTech™ fixture, the need to provide costly control and power wiring has been virtually eliminated. The colored LED indicator directs you to an open parking spot revealing Green or Blue (ADA) for available and Red for occupied. Or, choose your own color to indicate parking by zones (Attributes). The fixture mounted Hi-Definition camera, and Machine Learning, recognizes space status as well as pedestrian and vehicular motion. Because the Falcon Vision™ is integrated into the light fixture, the complete system operates at it's most energy efficient level.

The FALCON VISION™ Parking Guidance system is like no other parking guidance system. It's Wireless and, it's integrated into the Lighting Fixture. Parking Guidance with a Real ROI!

FALCON VISION™ Features

• Parking Guidance
• Hi-Definition Camera
• Dual Camera for single Type II Wide Distribution LED fixture, one down middle of drive lane
• Single Camera for dual Type V Broad Distribution LED fixture, two per drive lane
• Ambient Light and Motion Sensing through Vision for Lighting Control
• Standard occupancy sensing: Green and Blue (ADA) = Available, Red = Occupied
• Through RGB LED indicators custom colors are available for Park by Color™ Attribute Zoning
• Integrated into LED Parking Garage Lighting Fixture
• On-Board controls allows LED fixture to limit output to meet specific lighting levels
• Wireless System
• Expandable Sensor Network
• Edge Computing
• Falcon Vision Dashboard
• Open protocol with integration opportunity into PARCs systems
• Communication with signage
• Features Under Development include: License Plate Recognition, EmergenSEE interface, Find My Car, Parking Scents, Audible Features, and many more...

CONCIERGE LIGHTING....at your service!™
RGB LED with custom colors available for attribute zoning

Single Sensor Installation

Dual Sensor Installation

Integrated lighting controls via motion and ambient light level sensing

Gateway located in secure area
RS-485 connection from gateway to signage
Wireless access points installed for complete coverage (locations garage dependent)

Specifications subject to change without notice

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ECO FlexTech
Parking Garage Luminaire

Product Features: The ECO FlexTech LED parking garage fixture is the most versatile, flexible, up-gradable and energy efficient lighting fixture of its kind. The ECO FlexTech is equipped with a double-refracted lens providing low glare without sacrificing uplighting, while still maintaining tested performance exceeding 120 lumens per watt.

Housing
- Cast aluminum two-piece construction with secure latching and set screw locking device.

Reflector
- Flat one-piece aluminum painted with high gloss, high heat resistant white TGIC polyester powder over 90% reflectance

Driver
- Mean Well electronic, dimming ballast with input voltage of 120-277V

Lens
- Acrylic refractor mounted with stainless steel screws

Mounting
- Standard surface quick mount, pendant mount option available

Warranty
- Five year limited warranty. See warranty terms at www.ecolightingsolutions.com

Finish
- Chip resistant electrostatic TGIC powder polyester coating, electrostatic applied and baked. Standard white color finish. Additional finishes available, contact factory for options.

Listings
- UL/cUL listed for wet location
- DLC (Qualified Models in Table, page 2)
  - See DLC QPL for details (www.designlights.org/QPL)
  - Title 24 compliant with occupancy sensor

Electrical
- Suitable for operation with line voltage of 120 to 277V +/- 10% VAC.
- High brightness LED module, available in cool white (5000K) or neutral white (4000K)
- Optional Wattstopper for both occupancy and daylight harvesting controls.
- Falcon Vision™ - Integrated, wireless enterprise secured, Guidance, Controls & More

LED Module
- Cree LED Modules available in High Efficiency XPG or Ultra Efficiency XPL installations.

Ordering Information: Model Numbers

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<th>Color Temp.</th>
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<td>45M or 45P=45 watt</td>
<td>U= Universal 120/277V</td>
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Note: Additional customizations available, contact factory for details.
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*Luminaire data measured for 5000K color temperature

### Zonal Lumen Summary

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### DLC Qualified Items Include:

- FT-GL-60M-U-50-24G-D, -X
- FT-GL-60M-U-50-24L-D, -W, -X
- FT-GL-80M-U-*0-32L-D, -F, -W, -X
- FT-GL-100M-U-50-24L-D, -W, -X
- FT-GL-100M-U-*0-32L-D, -F, -W, -X

* = 4 or 5

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I. POLICY
To enhance quality patient services, improve accessibility, and ensure the safety of our patients, visitors, volunteers, medical staff, and employees at Greenwich Hospital, all hospital employees, medical staff, contractors and volunteers must park in the Employee Parking Facility and their designated areas at all times while on duty.

II. SCOPE
All employees, medical staff, contractors and volunteers.

III. PROCEDURE
The Employee Parking Facility is designated for all employees (including employees of the Cohen Pavilion), medical staff, contractors and volunteers. If all other parking spaces are occupied, Security may designate alternate parking arrangements. Employees may not designate their own alternate parking arrangements. Greenwich Hospital assumes no liability for damage or theft to vehicles parked on/within its parking facilities. Vehicles parked or operated are the sole responsibility of the owner/ operator.

- The Director of Safety & Security will be responsible for the assignment of parking on all Greenwich Hospital campuses.
- Employees who live in Hospital housing (i.e. Prescott, Pickwick, etc.) located within “walking distance” from the Hospital are designated to park their vehicles at their residence.
- All employees, medical staff, long term contractors and volunteers are required to display their GH parking permit sticker in the lower right hand corner (passenger side) of their front windshield.
- GH parking permit stickers may be obtained at the Security Office, first floor Helmsley 1-467. Parking permit stickers are granted to employees for a secondary/new vehicle or replacement windshield at no cost. In order to enter and exit the Employee Parking Facility and gain access to the staff entrance, employees need their hospital employee ID badges.
- Employee ID badges may be obtained at the Security Office, first floor Helmsley 1-467. One (1) badge is given to each employee at the time of hire.
- Lost badges must be reported to Security immediately. Broken or mangled cards must be turned in to Security.
In case of an emergency or absence of employee badge, employees may call Security via the intercom located at all access card readers in the garage, to gain entry or exit.

- Handicap spaces can be utilized by vehicles that have a state issued permit.
- Employees who park in non-designated areas will have parking violation tickets or stickers applied to their driver side window as a warning of violation.
- The violation decals are intended to serve as a warning of violation of the parking policies. Disciplinary actions will be consistent with the Human Resources policy, Employee Conduct and Corrective Action. The first violation will be a documented verbal warning, second violation will be a written and so forth.

Parking tickets or warning stickers may be issued for, but not limited to any of the following violations. Once issued, the parking tickets will be distributed to the employee's manager and Human Resources Department to begin the disciplinary process in accordance with HR policy, Employee Conduct and Corrective Action.

1. No parking permit displayed
2. Failure to register vehicle with security
3. Taking two spaces when parking
4. Parking in prohibited / restricted areas / no parking zones
5. Parking beyond the end of a row
6. Parking in an unmarked space
7. Parking in a handicapped space without state permit
8. Parking in reserved spaces
9. Parking in a fire lane
10. Blocking driveway / entrance / exit / loading zone
11. Parking for more than 24 hours without prior authorization from Security Director
12. Traveling wrong way or in opposing lane
13. Snow emergency / not obeying temporary parking rules
14. Unauthorized parking in quality award winner spaces
For the three parking violations listed below, warning stickers will be placed on vehicles windshields and the parking violation will be considered a final written warning at minimum.

1. Parking in any hospital visitor parking, unless as a patient or with a patient while not working.
2. Parking at 49 Lake Avenue, unless as a patient or with a patient while not working.
3. Causing damage to another vehicle or property and not reporting the incident to Security immediately.

Respect and courtesy toward others in the parking facilities, shall be shown at all times. Please see HR policy Employee Conduct and Corrective Action.
THE ORIGINAL OF THIS DRAWING IS 36" X 48". IF THIS COPY IS ANY OTHER SIZE, IT HAS EITHER BEEN REDUCED OR ENLARGED. TAKE APPROPRIATE PRECAUTIONS ACCORDINGLY.

DRAWING INFORMATION

C SHEPLEY BULFINCH
2 Seaport Lane
Boston, MA 02210
T:617.423.1700 | F:800.934.9691
shepleybulfinch.com

ARCHITECT
OWNER
CONSULTANTS

STAMP

PROJECT INFORMATION

ISSUANCES

DATE

DESCRIPTION

2/2/2021 5:50:34 PM
C:\Revit Locals\5196_GHC SMILOW CC REDUCED STUDY_CENTRAL_v19_NOnabanjoEEXDV.rvt
GH SMILOW CANCER CENTER
Greenwich, CT
JOB NO: 5196
Greenwich, CT
Yale New Haven Health System - Greenwich Hospital
REDNIS & MEAD
22 1st St, Stamford, CT 06905
TOWERS GOLDE
85 Willow Steet #26, New Haven CT 06511
SGH
715 Boylston St, Boston, MA 02116
JB&B
80 Pine Street, New York, NY 10005

COVER SHEET

DRAWING TITLE

NUMBER

SE-1

SE-2

SE-3

SE-4

SE-5

SE-6

SE-7

SE-8

SE-9

SE-10

SECTIONS-

LID-1

ISSUED FOR:

FINAL SITE PLAN APPROVAL - PLANNING AND ZONING SUBMISSION

ISSUED FOR:

SITE GRADING & DRAINAGE PLAN & UTILITY PLAN

LOW IMPACT DEVELOPMENT PLAN

SIGHT DISTANCE PLAN & DRIVEWAY PROFILES

TURNING MOVEMENT PLANS

SEDIMENT & EROSION CONTROLS PLAN

ZLS ZONING LOCATION SURVEY

PROPERTY & TOPOGRAPHIC SURVEY

SITE DEMOLITION PLAN & SITE DEVELOPMENT PLAN

SITE MODERN & DESIGNER PLAN & UTILIZATION

PLOTS & SITE GRADING SURVEY & ELECTRICAL

INTERNATIONAL

REVISED

DATE

DAVID R. GINTER CT. P.E. 27177

May 11, 2021

IS 1/4"=100' 

This document and copies thereof are valid only if they bear the signature and embossed seal of the designated licensed professional. Unauthorized alterations render any declaration hereon null & void.
These drawings are intended only to depict the design of site grading, drainage, sediment & erosion control.

It shall be the responsibility of the contractor to provide any excavation safeguards, necessary barricades, and fencing as indicated on the drawings.

The work shall be done in conformance with the contract documents/plans unless changes have been approved by the owner or architect.

The Contractor shall engage a qualified independent testing agency to perform field inspections and tests as specified in the contract documents.

All pavement striping and replacement shall conform to the Town of Greenwich standards and the latest edition of AASHTO Highway Design Manual.

Disturbed areas shall be topsoiled, seeded with grass and mulched in a manner conforming to the requirements of the Connecticut Department of Environmental Protection.

Sediment Control, OSHA, and CT DOT Form 818 (latest edition).

Refer to drawings by Towers Golde for information regarding surface treatment and landscaping.

Sanitary Sewer Testing: The sanitary sewer line shall be Low Pressure Air Tested, at the expense of the contractor; Testing to be in accordance with recommended procedure in "Unibell’s" "Recommended Practice for Low Pressure Air Testing of Installed Sewer Pipe" UNI B-6. The minimum starting pressure shall be 30 psig.

Flow in existing sewer system must not be interrupted. Any temporary routing of this sewer flow must be done in a manner satisfactory to the owner and in compliance with applicable Codes.

After compacting, the fill shall be 4" below the required grade as shown on the plan.

Sieve (5 lbs/ac.) and not more than 15% clay. pH range shall be 6.0-7.5 and soluble salts shall not exceed 500ppm.

Spill protection and support of these facilities and repair any damage caused by the work in a manner satisfactory to the owner.

After compacting, the fill shall be 4" below the required grade as shown on the plan.

Sanitary Sewers.

Temporary inlet sediment control devices shall be installed to prevent spills, hydraulic leaks, and any other construction damage for the remainder of construction until Owner’s representative who shall determine if the facilities shall be replaced. Replacement of the facilities shall be done in a manner satisfactory to the owner and in compliance with applicable Codes.

Drainage flows shall be channelled through ditches to French drains for disposal.

Signage shall be designed to comply with all applicable Codes and standards.

Temporary Inlet Sediment Control Devices:

- Fabric & Post Siltation Control
- Silt Fence for When on Truck
- Tarpaulin & Post Siltation
- Temporary Entrance
- Tree Protection
- Metal Sign Post
- Handicapped Parking Sign Detail
- No Parking Sign Detail
2. MINIMUM CONCRETE STRENGTH OF 4,000 PSI IS RECOMMENDED. CONCRETE SHOULD BE VIBRATED TO ELIMINATE AIR POCKETS.

PIPE SIZE:

CAMPBELL FOUNDRY NO. 2565

ENGINEERING ADVICE MAY BE REQUIRED.

8" [200mm] STANDARD TOWN OF MIN.

TRENCH DRAIN (ACO K200)

ALL CATCH BASIN COMPONENTS TO BE PRE-CAST REINFORCED CONCRETE, ABLE TO EXPANSION JOINT TO CATCH BASIN SHALL CONFORM TO ASTM C478. ALL CRUSHED STONE SHALL BE GRADATION NO. 4 AS PER CT D.O.T. FORM 818, NOTES:

1. ALL CATCH BASIN COMPONENTS TO BE PRE-CAST REINFORCED CONCRETE, ABLE TO

NOTES:

2. ALL JOINTS TO BE MORTARED.

4. ALL CRUSHED STONE SHALL BE GRADATION NO. 4 AS PER CT D.O.T. FORM 818, NOTES:

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GHz Smilow Cancer Center

C:\Revit Locals\5196_GHC SMILOWCC REDUCED STUDY_CENTRAL_v19_NOnabanjoEEXDV.rvt

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N.T.S.

Control Box Detail

Activated, both shall flash

Solar Powered

Job No: 5196

Greenwich, CT

Cancer Center

Inlaid Thermoplastics Pavement Markings

Guideline Rail Detail

Control Box Detail

Rectangular Rapid-Flash Beacon Detail (RPBF)

Lake Avenue Traffic Circle Improvements

Pedestrian Ramp Detail

TOWN OF GREENWICH STANDARD DETAIL

Painted Stripes

Alternating 16"

Pedestrian Ramp

Retaining Wall Detail

Curb or Ramp

N.T.S.

White (Typ) Coloring:

Town of Greenwich Standard Detail

Pavement Markings

Service Drives

6"-Residential Drives

8"-Commercial and

Ramped Section

Warp Section

Warp Section

Curb

�팀 GRAVEBA

Compacted Gravel

3"

Asphalt Pavement Detail

Concrete Sidewalk

Concrete Trench Repair

Asphalt Trench Repair

Stopping Bar Stripping

Handicapped Parking

Handicapped Van Parking

Handicapped Sign

Stop Bar Stripping

Handicapped Parking Shall Be Graded No Greater Than 2% In Any Direction.

NOTE:

N.T.S.

White 4" Painted

45°

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VERTICAL SCALE: 1" = 10'

130

HORIZONTAL SCALE: 1" = 20'

51LF 18" PVC Pipe @ 0.013 FPF

115LF 8" PVC Pipe @ 0.006 FPF

140 150 160

140LF 12" PVC Pipe @ 0.026 FPF

3.1%

2.6%

LAKE AVENUE

4.2%

BACK OF SIDEWALK

PROPERTY LINE

EXISTING BUILDING

Unauthorized alterations render any declaration hereon null & void.

signature and embossed seal of the designated licensed professional.

May 11, 2021

NO. DATE DESCRIPTION

PZC SUBMISSION 3/22/2021

PER ENGINEERING COMMENTS 5/11/2021

103LF 12" PVC Pipe @ 0.064 FPF

-4.7%

-2.3%

PROPERTY LINE

CURB LINE

PROPERTY LINE

CURB LINE

157.2

80 Pine Street, New York, NY 10005

TC 149.7

BC 143.8

TC 142.8

TC 143.0

TC 142.8

BC 144.7

TC 164.3

TC 166.6

BW 160.6

BC 168.6

G

148.5

G

146

BC 142.7

TC 143.6

G

TC 143.1

BC 142.9

166.2

G

170

BC 168.5

G

147.8

TC 146.9

TRW 152.2

BC 159.0

FFG 162.6

2+00

1+50

1+00

0+75

2+25

2+75

173

TRW 150.0

BRW 148.8

145

R26.5'
LOW IMPACT CANCER CENTER

signature and embossed seal of the designated licensed professional.

Upon completion, the proponent shall certify that the project is in accordance with approved plans and if the system is found to be inadequate to operational failure, even though built according to the approved plans, corrective action shall be required and a Stop Work order.

GREENWICH LID NOTES:

THE TOWN OF GREENWICH

SUBSURFACE SOIL INVESTIGATION INDICATES THE SOILS IN THE AREA OF THE PROJECT SCHOOL ZONE OF INFLUENCE (TYP.) GROUP B, URBAN LAND, AS PER USDA SURVEY FOUND IN APPENDIX #4 OF THE PROJECT SCHOOL ZONE REPORT. MOST OF ON-SITE GROUP B, URBAN LAND COMPLEX, AS PER USDA NRCS WEB SOIL SURVEY REPORT.

1. SOILS ARE CLASSIFIED AS HYDROLOGIC SOIL GROUP D, URBAN LAND, AS PER USDA SURVEY FOUND IN APPENDIX #4 OF THE PROJECT SCHOOL ZONE REPORT.
2. SITE COMPARED TO DRAINAGE OR STORMWATER CONVEYANCE STRUCTURES; AND A FINAL INSPECTION BEFORE THE SURETY IS RELEASED. THE

3. SURFACE SOIL INVESTIGATION SHOWS THE ROLE IN THE AREA OF THE INFILTRATION SYSTEM FOR HYDROLOGIC GROUP.
4. SITE IS OUTSIDE OF THE 500 S.F. SATURATED ZONE AND WILL BE MANAGED BY HARVESTING THE TOWN OF GREENWICH.

5. OTHER DIRECTED BY THE HIGHWAY POSSIBLE SHALL BE INSTALLED, UNLESS

6. THE LEDGE TO BE SHAPED. A RETAINING WALL OTHERWIS DETERMINED THAT ALL WORK WAS COMPLETED IN CONFORMANCE WITH THE APPROVED PLANS. CORRECTIVE ACTION SHALL BE REQUIRED AND A STOP WORK ORDER

7. DAVID R. GINTER CT. P.E. 27177

8. See note 5

9. LG=157.0(N)

10. BC=170.30

11. 8.06\%
DRAINAGE SUMMARY REPORT
For
Greenwich Hospital Cancer Center

Prepared For
Greenwich Hospital
10 Lake Avenue Greenwich, CT
Formerly:
16, 22, 28, 32 & 38 Lake Avenue and
54, 56, 60 & 64 Lafayette Place Greenwich, CT

Prepared by
Redniss & Mead, Inc.
22 First Street
Stamford, CT
(203) 327-0500

Issued on
March 22, 2021

Reissued on
May 11, 2021

David R. Ginter, P.E.
CT #27177
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**DIRECTLY CONNECTED IMPERVIOUS AREA (DCIA) CERTIFICATION**

**PRE-CONSTRUCTION**

Property Address: 10 Lake Avenue

Building Permit No.: 

Tax Account No.: 

**PLANS & DRAINAGE SUMMARY REPORT INFORMATION**

Engineering Firm: Redniss & Mead

Design Plans Date: 5/11/2021

Drainage Report Date: 5/11/2021

**PROPERTY INFORMATION FOR DIRECTLY CONNECTED IMPERVIOUS AREA (DCIA)**

<table>
<thead>
<tr>
<th>Description</th>
<th>Under Existing Conditions (SF)</th>
<th>Under Proposed Conditions (SF)</th>
<th>Under Proposed Conditions (SF)</th>
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<tbody>
<tr>
<td>Total Impervious Area</td>
<td>60,950.00</td>
<td>71,385.00</td>
<td>70,608.00</td>
<td>777.00</td>
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</tbody>
</table>

1 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.

2 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, andDisconnected Impervious Area (must meet all the standards under Simple Disconnection on page 44 and 45 of the Drainage Manual).

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

Engineer's Signature: David Ginter, P.E.  
Date: 5/11/2021
General Project Description

Greenwich Hospital, owners of 16, 22, 28, 32 & 38 Lake Avenue and 54, 56, 60 & 64 Lafayette Place Greenwich, CT, in conjunction with Smilow Cancer Center are proposing to construct a 2-story cancer center with a penthouse level and 1 story of parking below grade, surface parking and drives as well as walks and various landscape areas.

Site

The project Site is comprised of several properties at the southwest corner of the Lake Avenue and Lafayette Place intersection. The site is bordered by Lake Avenue to the north, Lafayette Place to the east, Fairfield House condominium to the south and Bethel AME Church to the west. Upon consolidation of all the parcels, the project site will be 2.22 acres.

The project Site is currently developed with several commercial and residential buildings, paved parking, and landscaped areas. The existing buildings will be demolished to construct the proposed cancer center. Existing grades slope up from west to east and vary from about elevation 142 in the western portion of the site to elevation 173 in the southeastern area of the site along Lafayette Place. The property is served by public water and sewer. There are no wetlands within the project site.

Non-Structural BMPs

Various non-structural BMP’s are incorporated into the site design and include the use of disconnected impervious coverage (eastern portion of the site and rooftop garden), filtering through sand and crushed stone reservoirs, and swales. Runoff from the proposed parking lot, driveway and a portion of the building roof will be conveyed to a sand filter for treatment. There will also be some green roof systems installed on the roof of the first floor of the building designed for outdoor garden space for patients receiving care.

A small portion of the proposed driveway along Lake Avenue will be allowed to sheet flow to a catch basin within the street. Given the existing grades along the property line, a formal BMP is not feasible.

The storm water management measures incorporated are intended to promote Low Impact Development principles described in Section 4.4 of the Greenwich LID Manual\(^1\). The proposed development has been designed to minimize the overall impact on the site.

---

\(^1\) Town of Greenwich Drainage Manual Low Impact Development and Stormwater Management February 2014, Effective March 1, 2014
Structural BMPs

Structural BMPs include the use of a sand filter and an infiltration system under the parking lot, which will provide WQV, RRV, GRV and peak flow attenuation. Further infiltration practices are limited due to the elevation of bedrock, groundwater and the cuts and fills required.

There are multiple discharge locations for the proposed stormwater runoff. The majority of the site drains towards the stormwater conveyance system in Lake Avenue. The planted area south of the parking lot outlets through a swale to an existing pipe and conveyance network through the Fairfield House condominium property before ultimately connecting into the stormwater conveyance system in Lake Avenue. The planted area south and west of the service driveway sheet flows onto the Fairfield House property before being collected by their onsite conveyance network and discharging into the stormwater conveyance system in Lake Avenue.

Compliance with Stormwater Management Standards

Standard 1. Low Impact Development

Low impact development and site planning techniques were used to the maximum extent practicable given the depth of bedrock and groundwater and the grading required as part of the development. LID techniques are used by providing green roofs and vegetated buffers in the northern and eastern portion of the development, minimizing driveway widths where allowed by the Fire Marshal and Zoning regulations, and providing some of the required parking within the building footprint.

Under proposed conditions the sites natural flow paths are maintained as much as practical given the existing grade conditions and grading requirements for the proposed driveway. Storm water quality is enhanced by utilizing a LID-BMP to treat the new impervious surfaces.

Standard 2. Protection of Natural Hydrology

A. Total site disturbance for this project is approximately 2.22 acres. Temporary site disturbance that will impact soil compaction will be minimized throughout construction and limited to areas that will be developed with impervious surfaces. Surrounding vegetation and mature trees will be protected throughout the construction process and remain in place after it is completed to the maximum extent possible. The limit of disturbance is noted on the site plans and will be delineated in the field by silt and/or construction fence.

B. Soil compaction and disturbance will be minimized by using the smallest equipment necessary to complete the development. Areas for infiltration will be protected during construction through the use of construction fencing and/or steel plates.

C. Existing on site drainage patterns are retained as much as is practicable. The time of concentration under pre-development conditions is similar to that under post-development conditions.
D. Grades on the property naturally slopes up from west to east and the grades are generally matched in the proposed development. Due to the significant grade change from the middle of the development site to the eastern portion, the building has been designed to have a walk out on the first floor (western face of the building) with a walk out on the second floor (southeastern corner). All retaining walls have been designed to meet the Building Zone Regulations.

E. No compost amended soils are proposed as a part of this project. Areas of disturbance surrounding the development will be planted through a detailed planting plan that will include topsoil placement and scarification before planting.

F. At the completion of the project, no soil shall be left bare. All areas of exposed soil shall be sufficiently seeded, planted, or mulched so as to sufficiently stabilize the ground.

G. The existing drainage patterns are maintained as are some of the existing conveyance systems leaving the property. There are no wetlands, natural swales, low-lying areas within the subject parcels.

H. No roadways are proposed to cross any surface waters as a result of this project.

I. No roadways are proposed to cross any surface waters as a result of this project.


A. Stormwater best management practices have been designed to integrate with the site specific hydrologic and geologic conditions. The site will continue to function hydraulically as the existing site currently does. The runoff from the new impervious surfaces will be treated by a sand filter and infiltration practices and will ultimately discharge into the storm sewer in Lake Avenue.

B. The proposed stormwater best management practices generally comply with the Groundwater Recharge Volumes (GRV), Runoff Reduction Volume (RRV), Water Quality Volume (WQV) and peak flow requirements of the Greenwich LID Manual. A summary of existing and proposed flows is provided in Table 1 and Table 2 and in Appendix 5. Runoff Reduction Volumes, Groundwater Recharge Volumes and Water Quality Volumes are summarized in Appendix 2.

C. N/A

D. This project does not propose any stormwater to be pumped.

E. This project does not propose any groundwater to be pumped.

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

A. Runoff Reduction Volume (RRV) for the property is achieved, when the volume from potential groundwater flows are excluded, through the use of the infiltration system. Refer to Appendix 2 & 5 for the runoff reduction volume calculations & HydroCAD model. Refer to Table 1 for a summary of runoff volumes.

B. Groundwater Recharge Volume requirements for this project are met through the use of the infiltration system.
C. This item does not apply to this site as there are no tidal wetlands in the vicinity.

Standard 5. Peak Flow Control
A. As all runoff from the property is tributary to the conveyance network within Lake Avenue, Stream Channel Protection was analyzed, and is achieved, at its connection within Lake Avenue. Refer to the chart below and Appendix 5 for further information.
B. All proposed stormwater management facilities are adequately sized to pass appropriate flows. The facilities upstream of the infiltration practices are designed to pass the 25-year storm event while the facilities downstream of these practices are designed to pass the 100-year storm event. Further, the stone lined swale to the north of the proposed building has been sized to convey the 10-year storm event. Refer to Appendix 2d and 5 for further information and calculations.
C. Peak flow rates for design storms up to and including the 100-year storm will be kept at or below current levels for all POI’s. Refer to Table 1, 2 & 3 and Appendix 5 for further information.
D. All conveyance outlets from the sand filter and infiltration system have been sized to safely pass the emergency storm event (100-year storm). Refer to Appendix 5 for further information.

Standard 6. Pollutant Reduction
A. Stormwater management systems meet the Greenwich LID Manual requirement to reduce 80% of the annual TSS by treating stormwater runoff from affected areas. Refer to Appendix 3 for further information on TSS removal. Refer to Appendix 2a for a summary of the required water quality volumes and provided storage.

Standard 7. High Load Areas
A. This site does not, and Greenwich Hospital is not proposing to have any areas defined as “High Load Areas” defined in the Greenwich LID Manual.

Standard 8. Critical Areas
A. No stormwater discharge is proposed within or near any critical areas as defined by the Greenwich LID Manual.
B. Infiltration from “High Load Areas” are not proposed because there are no “High Load Areas” on site.

Standard 9. Redevelopment
A. This project is considered to be a redevelopment project as defined by the Greenwich LID Manual. The manual defines redevelopment as, “…construction, alteration, or improvement that disturbs the ground surface or increases the impervious area on previously developed sites.”
Standard 10. Construction Erosion and Sediment Control

A. Plans (Sheet SE-3) to control construction related impacts have been created specifically for this site and project and are included in the drawing set revised May 11, 2021.

B. Sediment and erosion controls such as silt fence, hay bales around catch basins, and tree protection will be put in place at the beginning of the project. Controls related to improvements not yet constructed are proposed to be put in place as soon as construction allows.

Standard 11. Construction Inspections

A. No surety is proposed.

B. Refer to Greenwich LID Notes on site plan sheet SE-4.

Standard 12. Operation and Maintenance

A. A long-term operation and maintenance plan, developed to ensure proper function of the stormwater management system, can be found as a separate attachment submitted concurrently with this report.

B. The operation and maintenance plan takes into consideration applicable items outlined in Sections 5 and 7 of the Greenwich LID Manual.

C. These items will be addressed by way of the “Stormwater Management Practices Maintenance Declaration” (Appendix H of the Greenwich LID Manual) at the time a Certificate of Occupancy is requested.


This document shall serve as the “Stormwater Management Report”.

Standard 14. Illicit Discharges

There are no “illicit discharges” found onsite.

Site Inventory and Evaluation

The project Site is currently developed with several commercial and residential buildings, paved parking and driveways, and landscaped areas. Existing grades slope up from west to east and vary from about El. 142 feet in the western portion of the site to El. 173 feet in the southeastern portion of the site along Lafayette Place.

Runoff from the proposed development area generally flows east to west with all runoff eventually connecting into the Lake Avenue conveyance system. Under existing conditions, the western portion of the site (38 & 32 Lake Avenue) drains to a pipe that flows onto the Fairfield House condominium property (52 Lafayette Place) then through the Bethel AME church property (44 Lake Avenue) before connecting into the stormwater conveyance system within Lake Avenue. This connection was verified with a dye test and partial CCTV inspection. Refer to Appendix 7 for an observation report regrading this connection. The remaining properties fronting Lake Avenue
discharge directly into the stormwater conveyance system within Lake Avenue via one of the catch basins in the gutter line of Lake Avenue. The southeastern portion of the site drains to either an on-site drain or dry well that overflow onto the Fairfield House property where it is collected within their conveyance system and ultimately discharges into the storm sewer in Lake Avenue via the pipe referenced above. Refer to Appendix 1 for the existing drainage basin map.

The NRCS information indicates the soils in the area of the proposed development are primarily in the D Hydrologic Soil Group, with a small area of the site along Lafayette Place within the B Hydrologic Soil Group. Based on the field observation and test pits, we have assumed the property functions as Hydrologic Soil Group C. A total of four (4) test pits have been performed to date in the area of the infiltration system and generally indicate a mix of fill, silty loam and sandy loam. Mottling was observed in the majority of the test pits. Four (4) hydraulic conductivity tests have been performed in the area of the infiltration system yielding applicable rates between 6± and 159± in/hr.

**Development Envelope**

The proposed improvement construction envelope is confined to a total of 2.22± acres plus some offsite improvements including sidewalk replacement and the expansion of the existing traffic island at the Lake Avenue and Lafayette Place intersection. Areas outside the proposed development or construction activities will be delineated with the use of silt or construction fence. No stockpiling will occur outside the limit of disturbance.

Silt fence will be installed around the perimeter of the project where runoff can flow onto Town owned or neighboring properties. Haybale or coir log backing may be required. A tracking pad shall be installed at all construction entrances. All proposed onsite drainage inlets shall be surrounded by haybales and shall have a silt sack installed internal to the drain once installed. It may be necessary to protect existing inlet structures in the surrounding roads with silt sacks. Any temporary dewatering will be connected into existing conveyance systems surrounding the property via underground connections. No dewatering will be allowed to sheet flow overland off the property. All dewatering waters will need to leave the property clear. Stockpiles will be required to have silt fence or haybales installed on the downhill side of them and shall be seeded if they are to remain onsite for longer than 30 days. Construction fencing shall be installed around any infiltration practice to protect from any construction activity over compacting the subgrade soils.

**Proposed Conditions**

The proposed structure will consist of two above-grade levels, a penthouse level, and one below-grade level (parking). The above-grade levels have planned footprints of up to about 36,000 square feet (SF). The remainder of the Site will consist of at grade paved parking, driveways, retaining walls, landscaping and a small water feature. These improvements increase impervious coverage by approximately 0.24 acres. To be conservative and in keeping with past Town of Greenwich practices, the water feature was assumed to be fully impervious as a liner is proposed.
All sub-basins are ultimately tributary to the 18-inch storm sewer in Lake Avenue which is the POI analyzed for all calculations. As the proposed improvements are classified as a redevelopment, both the Runoff Reduction Volume (RRV) and Water Quality Volume (WQV) for the property were calculated (Appendix 2).

The proposed stormwater management system will consist of standard catch basins with 4-foot-deep sumps and bell traps, area drains with 2-foot deep sumps and bell traps or PVC elbows, a trench drain, a gravel swale and manholes to convey roof and surface runoff to the below grade treatment systems. Water quality treatment will be provided through the use of a box sand filter and infiltration system.

Runoff from the Penthouse level roof, the main parking lot in the central and western portions of the site and from the driveway in the southeastern portion of the site will be directed into the sand filter. It is noted that in response to neighbor concerns and ARC comments, the roof of the mechanical penthouse will have a green roof. No credit for the green roof is taken in any of the calculations.

The sand filter consists of twenty-eight (28) total units, fourteen (14) forebay units and fourteen (14) units containing the sand filter media. The overall height of the system is 5.5 feet with 18” of sand within the 2-foot-tall sand units. Each half of the system will be wrapped in a pond liner and an additional pond liner will wrap the entire system to ensure water tightness. A 4” perforated pipe will be installed at the bottom of each of the sand filled rows and act as a low flow outlet while two separate four (4) foot wide weirs act as the high overflows. Two metering manholes will allow runoff to be directed in two separate directions, north towards Lake Avenue and south into the existing connection onto the property of the Fairfield House condominium.

Per a discussion with and at the request of the Engineering Division, the connection into the Lake Avenue conveyance system has been adjusted to eliminate the number of drainage structures. The onsite conveyance system will connect into an existing catch basin located in front of 38 Lake Avenue. An 18-inch pipe will exit the west side of the catch basin towards a new junction structure, currently proposed as a catch basin, located in front of the driveway for 42 & 44 Lake Avenue (Bethel AME Church property). This structure will serve as a junction point for the existing 12” line coming from Fairfield House. An 18” pipe will connect this new junction structure and the existing manhole within Lake Avenue. As noted during the discussion with the Engineering Division, there is a capacity concern with the 18” pipe when combining all proposed development flow with existing offsite flow. Further discussions will be required with Engineering Division and Highway Department to determine final connection into Lake Avenue. Please refer to Appendix 7 for further information.

An infiltration system consisting of fourteen (14) 2.5 foot tall Retain-It concrete chambers are proposed to provide groundwater recharge, additional water quality treatment and stormwater retention. A four (4) foot wide weir will ensure the system will fill before overflowing into the conveyance network through the site. The majority of the building’s roof, as well as the landscape areas east and north of the building will be directed to this system. The system will have a
minimum of 6” of crushed stone below and 12” of crushed stone between the units around its perimeter.

All permanent footing drains around the building, and to the extent able-retaining walls, will be connected into the stormwater conveyance system via gravity lines and will bypass the sand filter and infiltration systems. A base flow of 0.22 cfs (100 gpm) was included in the design based on the geotechnical report by GZA. Per Engineering Department comments made on May 6, all retaining walls around the perimeter of the site will have footing drains connecting into the stormwater conveyance network. Retaining walls internal to the property may have weep holes thereby not requiring a hard pipe connection.

The following table illustrates the required and provided WQV and RRV in these systems:

<table>
<thead>
<tr>
<th>Water Quality Volume</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>POI</td>
<td>Required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WQV</td>
</tr>
<tr>
<td>Lake Ave</td>
<td>5,757</td>
<td>527</td>
</tr>
</tbody>
</table>

Note: WQV includes all storage within the sand filter and the infiltration system below the high overflow weirs while the RRV includes only the storage provided in the infiltration system.

To compare existing and proposed peak rates of runoff & volume, a storm water routing model was prepared utilizing the HydroCAD software. The following tables depict the results of the HydroCAD model for all Points of Interest (can also be found in Appendix #5).

**Table 1 – Lake Avenue**

<table>
<thead>
<tr>
<th>Peak Flow (cfs)</th>
<th>Runoff Volume (cf)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Return Period (yrs)</td>
</tr>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

*Note: Proposed volume excludes 19,016 cf of volume from potential groundwater flow (100 gpm)*
**Table 2 – 12” Pipe to Fairfield House**

<table>
<thead>
<tr>
<th>Return Period (yrs)</th>
<th>Peak Flow (cfs)</th>
<th>Runoff Volume (cf)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lake Ave</td>
<td>Lake Ave</td>
</tr>
<tr>
<td></td>
<td>Ex Pr Change % Change</td>
<td>Ex Pr Change % Change</td>
</tr>
<tr>
<td>1</td>
<td>2.90 0.14 -2.76 -95.2%</td>
<td>4,136 541 -3,595 -86.9%</td>
</tr>
<tr>
<td>2</td>
<td>3.40 0.69 -2.71 -79.7%</td>
<td>5,208 1,330 -3,878 -74.5%</td>
</tr>
<tr>
<td>5</td>
<td>4.30 2.01 -2.29 -53.3%</td>
<td>7,195 2,907 -4,288 -59.6%</td>
</tr>
<tr>
<td>10</td>
<td>5.10 3.27 -1.83 -35.9%</td>
<td>9,002 4,445 -4,557 -50.6%</td>
</tr>
<tr>
<td>25</td>
<td>6.40 4.46 -1.94 -30.3%</td>
<td>11,986 7,150 -4,836 -40.3%</td>
</tr>
<tr>
<td>50</td>
<td>7.60 5.42 -2.18 -28.7%</td>
<td>14,775 9,787 -4,988 -33.8%</td>
</tr>
<tr>
<td>100</td>
<td>9.10 6.61 -2.49 -27.4%</td>
<td>18,287 13,207 -5,080 -27.8%</td>
</tr>
</tbody>
</table>

**Table 3 – Total to Fairfield House**

<table>
<thead>
<tr>
<th>Return Period (yrs)</th>
<th>Peak Flow (cfs)</th>
<th>Runoff Volume (cf)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lake Ave</td>
<td>Lake Ave</td>
</tr>
<tr>
<td></td>
<td>Ex Pr Change % Change</td>
<td>Ex Pr Change % Change</td>
</tr>
<tr>
<td>1</td>
<td>3.58 0.24 -3.34 -93.3%</td>
<td>10,909 854 -10,055 -92.2%</td>
</tr>
<tr>
<td>2</td>
<td>4.41 0.75 -3.66 -83.0%</td>
<td>13,498 1,757 -11,741 -87.0%</td>
</tr>
<tr>
<td>5</td>
<td>5.89 2.17 -3.72 -63.2%</td>
<td>18,252 3,558 -14,694 -80.5%</td>
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<tr>
<td>10</td>
<td>7.20 3.55 -3.65 -50.7%</td>
<td>22,545 5,309 -17,236 -76.5%</td>
</tr>
<tr>
<td>25</td>
<td>9.32 4.87 -4.45 -47.7%</td>
<td>29,599 8,381 -21,218 -71.7%</td>
</tr>
<tr>
<td>50</td>
<td>11.27 5.94 -5.33 -47.3%</td>
<td>36,163 11,370 -24,793 -68.6%</td>
</tr>
<tr>
<td>100</td>
<td>13.69 7.28 -6.41 -46.8%</td>
<td>44,412 15,244 -29,168 -65.7%</td>
</tr>
</tbody>
</table>

It is our opinion that this project is in conformance with all applicable standards set forth in the Greenwich LID Drainage Manual. This project, if built and constructed according to the design plans, will have no significant impact to the onsite wetlands, or adverse impact to onsite or downstream hydrology.
Appendix 1
Drainage Basin Maps
<table>
<thead>
<tr>
<th>PR BASIN</th>
<th>Total Area (SF)</th>
<th>Impervious Area (SF)</th>
<th>Pervious Area (SF)</th>
<th>Weighted CN</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB-PR-LAKE QLD</td>
<td>1,517</td>
<td>777</td>
<td>741</td>
<td>86</td>
</tr>
<tr>
<td>DB-PR-SAND FILTER</td>
<td>56,103</td>
<td>50,097</td>
<td>6,006</td>
<td>96</td>
</tr>
<tr>
<td>DB-PR-INFIL</td>
<td>29,370</td>
<td>19,908</td>
<td>9,462</td>
<td>90</td>
</tr>
<tr>
<td>DB-PR-12&quot; PIPE</td>
<td>5,772</td>
<td>300</td>
<td>5,472</td>
<td>75</td>
</tr>
<tr>
<td>DB-PR-FH OVERLAND</td>
<td>3,965</td>
<td>304</td>
<td>3,661</td>
<td>76</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>96,727</strong></td>
<td><strong>71,385</strong></td>
<td><strong>25,343</strong></td>
<td></td>
</tr>
</tbody>
</table>

PROPOSED DRAINAGE BASIN EXHIBIT
GREENWICH HOSPITAL CANCER CENTER
GREENWICH, CT
Appendix 2a
Site Calculations
WQV, SAND FILTER SYSTEM SIZING
### Water Quality Volume Calculations

**Project:** Greenwich Hospital Cancer Center  
**Location:** 10 Lake Avenue, Greenwich, CT  
**Project #:** 6355  
**Date:** 5/11/2021  
**By:** EWM  
**Checked:** DRG

#### Proposed Conditions

#### WQV Calculations

<table>
<thead>
<tr>
<th>Drainage Area ID</th>
<th>Description</th>
<th>Total Area (SF)</th>
<th>Total Area (AC)</th>
<th>Impervious Area</th>
<th>Pervious Area</th>
<th>% of Total Impervious</th>
<th>Runoff Coefficient R</th>
<th>WQV (Acre-ft)</th>
<th>WQV (CF)</th>
<th>Storage Volume Provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DB-PR-LAKE</td>
<td>1,517</td>
<td>0.035</td>
<td>777</td>
<td>740</td>
<td>1.1%</td>
<td>0.594</td>
<td>0.002</td>
<td>75.1</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>DB-PR-SAND FILTER</td>
<td>56,103</td>
<td>1.288</td>
<td>50,097</td>
<td>6,006</td>
<td>70.2%</td>
<td>0.872</td>
<td>0.094</td>
<td>4,076.1</td>
<td>4,120</td>
</tr>
<tr>
<td>3</td>
<td>DB-PR-INFIL</td>
<td>29,370</td>
<td>0.674</td>
<td>19,908</td>
<td>9,462</td>
<td>27.9%</td>
<td>0.715</td>
<td>0.040</td>
<td>1,749.5</td>
<td>1,944</td>
</tr>
<tr>
<td>4</td>
<td>DB-PR-12&quot; PIPE</td>
<td>5,772</td>
<td>0.132</td>
<td>300</td>
<td>5,472</td>
<td>0.0%</td>
<td>0.258</td>
<td>0.003</td>
<td>124.1</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>DB-PR-OVERLAND</td>
<td>3,965</td>
<td>0.091</td>
<td>304</td>
<td>3,661</td>
<td>0.0%</td>
<td>0.276</td>
<td>0.002</td>
<td>91.2</td>
<td>0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>96,727</strong></td>
<td><strong>2.221</strong></td>
<td><strong>71,386</strong></td>
<td><strong>25,341</strong></td>
<td><strong>0.71</strong></td>
<td><strong>0.132</strong></td>
<td></td>
<td></td>
<td><strong>6,064</strong></td>
</tr>
</tbody>
</table>

**Hydrologic Soil Group C**

Impervious Cover including pools, ponds and stormwater wet ponds per Table 5-5  
R=Site Cover Runoff Coefficient = (RvI*%I)+(RvT*%T)+(RvF*%F); Equation taken from February 2014 Town of Greenwich Drainage Manual section 5.6.3  
WQV=Water Quality Volume=(1"xRxA)/12; Equation taken from February 2014 Town of Greenwich Drainage Manual section 5.6.3  

**NOTE:** The minimum required area of treatment using LID technique is 60% of the new impervious area, or 42,913 sf. The impervious area treated within the disturbed area using LID techniques is 50,218 sf within the sand filter.

Storage provided is equal to volume provided below low outlet.
## Retain-It Sand Filter Sizing

### Project: Greenwich Hospital Cancer Center | Project #: 6355 | Date: 5/11/2021
Location: 10 Lake Avenue, Greenwich, CT | By: EWM | Checked: DRG

### Sand Filter (Page 1 of 2)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_QS</td>
<td>Water Quality Volume to Treat (cf)</td>
<td>4,076</td>
</tr>
<tr>
<td>H_S</td>
<td>Height of System (ft)</td>
<td>5.5</td>
</tr>
<tr>
<td>H_OF</td>
<td>Height above High Overflow/Freeboard (ft)</td>
<td>0.83</td>
</tr>
<tr>
<td>T_HS</td>
<td>Sand Bed Thickness</td>
<td>1.5</td>
</tr>
<tr>
<td>k</td>
<td>Sand Bed Permeability (ft/day)</td>
<td>16</td>
</tr>
<tr>
<td>n</td>
<td>Sand Bed Porosity</td>
<td>0.3</td>
</tr>
<tr>
<td>T_D</td>
<td>Required Water Quality Volume</td>
<td>1.5</td>
</tr>
</tbody>
</table>

### Volume in Sand =

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>D_FT</td>
<td>Volume above Sand Bed</td>
<td>2.67</td>
</tr>
<tr>
<td>D_ST</td>
<td>Volume above Permanent Pool</td>
<td>2.67</td>
</tr>
<tr>
<td>V_ST</td>
<td>Volume above High Overflow</td>
<td>2038</td>
</tr>
<tr>
<td>V_FT</td>
<td>Temporary Forebay Volume Excluding Permanent Pool Volume (cf)</td>
<td>2038</td>
</tr>
<tr>
<td>A_F</td>
<td>Minimum Forebay Surface Area (sf)</td>
<td>763</td>
</tr>
<tr>
<td>A_S</td>
<td>Minimum Sand Bed Surface Area (sf)</td>
<td>653</td>
</tr>
<tr>
<td>FB</td>
<td>Minimum Number of Retain-It Forebay Structures</td>
<td>14</td>
</tr>
<tr>
<td>SB</td>
<td>Minimum Number of Retain-It Sand Bed Structures</td>
<td>12</td>
</tr>
</tbody>
</table>

---

a WQV=Water Quality Volume=(1"xRxA)/12; Equation taken from February 2014 Town of Greenwich Drainage Manual section 5.6.3

b Internal height of the entire Sand Filter
c Distance from the high overflow invert to the top of structure (Volume in this range is excluded)
dd Sand bed permeability based on an assumed conductivity rate of 8 inches per hour
e \[ D_{FT} = D_{ST} = H_S - H_{OF} - 2 \]

f \[ V_{ST} = V_{FT} = 0.5 \times V_{QS} \]
g \[ A_F = \left(\frac{V_{FT}}{D_{FT}}\right) \]
h \[ A_S = \frac{V_{ST}}{(D_{ST}) + (TH_S \times n)} \]
i Retain-It numbers are calculated by dividing the minimum surface area for either the forebay or sand bed by the per unit surface area (55 sf) per the HydroCAD report. The calculated value is rounded up.
### Sand Filter Volume Calculations

**Project:** Greenwich Hospital Cancer Center  
**Project #:** 6355  
**Date:** 5/11/2021  
**Location:** 10 Lake Avenue, Greenwich, CT  
**By:** EWM  
**Checked:** DRG

#### Proposed Sand Filter (Page 2 of 2)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottom of Sand</td>
<td>135.0</td>
</tr>
<tr>
<td>Top of Sand</td>
<td>137.0</td>
</tr>
<tr>
<td>Top of System</td>
<td>140.5</td>
</tr>
<tr>
<td>High Overflow set at Elev</td>
<td>139.67</td>
</tr>
<tr>
<td>Required Water Quality Volume</td>
<td>4,076 cf</td>
</tr>
<tr>
<td>Volume in Sand</td>
<td>347 cf</td>
</tr>
<tr>
<td>Volume above Sand Bed</td>
<td>2,060 cf</td>
</tr>
<tr>
<td>Volume above Permanent Pool</td>
<td>2,060 cf</td>
</tr>
<tr>
<td>Volume above High Overflow</td>
<td>1,281 cf</td>
</tr>
<tr>
<td><strong>Water Quality Volume Provided</strong></td>
<td>4,120 cf</td>
</tr>
</tbody>
</table>

*WQV Provided = Volume above sand and below high overflow*

Retain-It numbers are calculated by dividing the minimum surf
**Exfiltration Calculations**

<table>
<thead>
<tr>
<th>Project: Greenwich Hospital Cancer Center</th>
<th>Project #: 6355</th>
<th>Date: 3/22/2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location: 10 Lake Avenue, Greenwich, CT</td>
<td>By: EWM</td>
<td>Checked: DRG</td>
</tr>
</tbody>
</table>

### User Defined Elevation Flow Table

<table>
<thead>
<tr>
<th>Sand Filter</th>
<th>Area of Sand (sf)</th>
<th>Elevation during 1 year storm</th>
<th>Elevation top of sand</th>
<th>h</th>
<th>Ds</th>
<th>Effective Percolation Rate (ft/hr)</th>
<th>Calculated Flow (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>770</td>
<td>139.73</td>
<td>137.00</td>
<td>2.73</td>
<td>1.50</td>
<td>0.67</td>
<td>0.2608</td>
</tr>
</tbody>
</table>

1. Area taken from HydroCAD; 2700 CF ÷ 3.5 FT = 770 ± SF
2. Assumed Percolation Rate = 8" per hour
3. Calculated Flow = Area (sf) x Effective Percolation Rate (ft/hr) x 1 hr / 3600 s

Note: This process is iterative to determine exfiltration through sand matches water surface elevation in HydroCAD model. The below are other exfiltration rates analyzed to determine the above calculated exfiltration rate.

### Trial 1

- **A** = 770
- **h** = 2.72 peak elev. In 1 year storm 139.72 (from Hydrocad Model)
- **Ds** = 1.5 el top of sand 137
- **k** = 0.67
- **q** = 0.2599 cfs

### Trial 2

- **A** = 770
- **h** = 2.73 peak elev. In 1 year storm 139.73 (from Hydrocad Model)
- **Ds** = 1.5 el top of sand 137
- **k** = 0.67
- **q** = 0.2608 cfs
Appendix 2b
Site Calculations
RRV
<table>
<thead>
<tr>
<th>POI - Lake Ave</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runoff Volumes taken from HydroCAD Report in Appendix 5.</td>
</tr>
<tr>
<td>( V_{pre} ) = Runoff volume_1-year_Pre Development(^1) = 16,030 ft(^3)</td>
</tr>
<tr>
<td>( V_{post} ) = Runoff volume 1-year Post Development (No BMPs)(^2) = 16,557</td>
</tr>
<tr>
<td>( RVR ) = Runoff volume Reduction ( (V_{post} - V_{pre}) ) = 527</td>
</tr>
<tr>
<td>( RSV ) = Proposed Storage Volume(^3) = 1,994</td>
</tr>
<tr>
<td>( V_{post_BMP} ) = Runoff volume_1-year_Post Development with BMPs(^4) = 14,597</td>
</tr>
<tr>
<td>( V_{post_BMP} ) = ( V_{post} - RSV ) = 14,563</td>
</tr>
<tr>
<td>( V_{post_BMP} ) &lt; ( V_{pre} ) Runoff Volume Reduction Standard met</td>
</tr>
</tbody>
</table>

\(^1\) Runoff volume taken from Link EX-Lake

\(^2\) Runoff volume is sum of all proposed subcatchments and excludes volume associated with groundwater flow.

\(^3\) Volume provided in Infiltration system below the overflow

\(^4\) Runoff volume taken from Link PR-Lake Ave excluding 19,016 CF of potential groundwater volume.
Appendix 2c
Site Calculations
GRV
# Groundwater Recharge Volume Calculation

**Project:**  Greenwich Hospital Cancer Center  
**Project #:**  6355  
**Date:**  5/11/2021  
**Location:**  10 Lake Avenue, Greenwich, CT  
**By:**  EWM  
**Checked:**  DRG

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Increase In Impervious Area (I) =</td>
<td>0.240 acres</td>
</tr>
<tr>
<td>NRCS Hydrologic Soil Group =</td>
<td>C&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Design Rainfall =</td>
<td>1.0 inches</td>
</tr>
<tr>
<td>Groundwater Recharge Depth (F) =</td>
<td>0.250&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

**Groundwater Recharge Volume (GRV)=**  0.005 ac. ft.<sup>c</sup>  
  
217.80 ft.<sup>3</sup>

---

<sup>a</sup> From Natural Resources Conservation Service  
<sup>b</sup> Table 5-2 from the 2014 Town of Greenwich Drainage Manual Section 5.6.1  
<sup>c</sup> GRV = F x I from the 2014 Town of Greenwich Drainage Manual Section 5.6.1
Appendix 2d
Site Calculations
Conveyance: Pipe and Swale
## HYDRAULIC DATA FOR RATIONAL METHOD

### Project: Greenwich Hospital Cancer Center
- **Project #: 6355**
- **Date: 5/11/2021**

### Location: 10 Lake Avenue, Greenwich, CT
- **By: EWM**

```
Pipe Flow Analysis - To Lake Ave
```

<table>
<thead>
<tr>
<th>Basin Description</th>
<th>Drainage Path</th>
<th>Time (min)</th>
<th>Rainfall Intensity (in/hr)</th>
<th>Q = ACI (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MMH#3 TO MMH#1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acres</td>
<td>C</td>
<td>Description</td>
<td>AC</td>
<td>Length (ft)</td>
</tr>
<tr>
<td>0.00</td>
<td>0.95</td>
<td>Impervious</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>0.00</td>
<td>0.30</td>
<td>Pervious</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>0.00</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q in system (cfs)</th>
<th>Pipe Size (in)</th>
<th>Pipe Length (ft)</th>
<th>Roughness coefficient</th>
<th>Material</th>
<th>Slope (ft/ft)</th>
<th>Qfull (cfs)</th>
<th>Qsystem / Qfull (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.98</td>
<td>15</td>
<td>84</td>
<td>0.011</td>
<td>PVC</td>
<td>0.011</td>
<td>8.03</td>
<td>74.5%</td>
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</tbody>
</table>

100-Year Storm Event from Hydrocad Model

<table>
<thead>
<tr>
<th><strong>MMH#1 TO MH#103</strong></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Acres</td>
<td>C</td>
<td>Description</td>
<td>AC</td>
<td>Length (ft)</td>
</tr>
<tr>
<td>0.00</td>
<td>0.95</td>
<td>Impervious</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>0.00</td>
<td>0.30</td>
<td>Pervious</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>0.00</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q in system (cfs)</th>
<th>Pipe Size (in)</th>
<th>Pipe Length (ft)</th>
<th>Roughness coefficient</th>
<th>Material</th>
<th>Slope (ft/ft)</th>
<th>Qfull (cfs)</th>
<th>Qsystem / Qfull (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.08</td>
<td>18</td>
<td>57</td>
<td>0.011</td>
<td>PVC</td>
<td>0.012</td>
<td>13.64</td>
<td>88.6%</td>
</tr>
</tbody>
</table>

100-Year Storm Event from Hydrocad Model

<table>
<thead>
<tr>
<th><strong>MH#103 TO EXCB</strong></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Acres</td>
<td>C</td>
<td>Description</td>
<td>AC</td>
<td>Length (ft)</td>
</tr>
<tr>
<td>0.00</td>
<td>0.95</td>
<td>Impervious</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>0.00</td>
<td>0.30</td>
<td>Pervious</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>0.00</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q in system (cfs)</th>
<th>Pipe Size (in)</th>
<th>Pipe Length (ft)</th>
<th>Roughness coefficient</th>
<th>Material</th>
<th>Slope (ft/ft)</th>
<th>Qfull (cfs)</th>
<th>Qsystem / Qfull (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.08</td>
<td>18</td>
<td>15</td>
<td>0.011</td>
<td>PVC</td>
<td>0.010</td>
<td>12.45</td>
<td>97.0%</td>
</tr>
</tbody>
</table>

100-Year Storm Event from Hydrocad Model

---

---
## HYDRAULIC DATA FOR RATIONAL METHOD

### Project: Greenwich Hospital Cancer Center
#### Project #: 6355
#### Date: 5/11/2021
#### Location: 10 Lake Avenue, Greenwich, CT
#### By: EWM
#### Checked: DRG

**Pipe Flow Analysis - To FFLD House**

<table>
<thead>
<tr>
<th>Basin Description</th>
<th>Drainage Path</th>
<th>Time (min)</th>
<th>25yr. Rainfall Intensity (in/hr)</th>
<th>Q = AC1 (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MMH#2 TO MH#201</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acres</td>
<td>C</td>
<td>Description</td>
<td>AC</td>
<td>Length (ft)</td>
</tr>
<tr>
<td>0.00</td>
<td>0.95</td>
<td>Impervious</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>0.00</td>
<td>0.30</td>
<td>Pervious</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>0.00</td>
<td></td>
<td>Total</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Q in system</td>
<td></td>
<td></td>
<td>5.66</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>System</td>
<td>5.82</td>
<td>97.3%</td>
</tr>
</tbody>
</table>

100-Year Storm Event from Hydrocad Model

<table>
<thead>
<tr>
<th>MH#201 TO EX 12&quot; PIPE</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Acres</td>
<td>C</td>
<td>Description</td>
<td>AC</td>
<td>Length (ft)</td>
</tr>
<tr>
<td>0.00</td>
<td>0.95</td>
<td>Impervious</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>0.00</td>
<td>0.30</td>
<td>Pervious</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>0.00</td>
<td></td>
<td>Total</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Q in system</td>
<td></td>
<td></td>
<td>6.61</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>System</td>
<td>12.31</td>
<td>53.7%</td>
</tr>
</tbody>
</table>

100-Year Storm Event from Hydrocad Model
| Line ID | Length (ft) | Drng Area (ac) | Rational | C x A | Tc | Intensity | Total Q (cfs) | Capacity (cfs) | Velocity (ft/s) | Line Size (in) | Line Slope (%) | Invert Elev (ft) | HGL Elev (ft) | Surface Elev (ft) | Line No |
|---------|-------------|----------------|----------|------|----|------------|---------------|---------------|----------------|----------------|----------------|----------------|---------------|---------------|---------------|-----------|
| Pipe - (21) (1) | 52.15 | 0.000 | 0.163 | 0.00 | 0.00 | 0.07 | 0.0 | 5.00 | 8.62 | 0.57 | 5.07 | 1.68 | 12 | 1.73 | 145.00 | 144.10 | 145.32 | 145.10 | 151.55 | 150.01 | 1 |
| Pipe - (21) | 35.22 | 0.000 | 0.163 | 0.00 | 0.00 | 0.07 | 0.0 | 5.00 | 8.62 | 0.57 | 5.81 | 2.63 | 12 | 2.27 | 145.90 | 145.10 | 146.22 | 145.42 | 152.66 | 151.55 | 2 |
| Pipe - (20) (2) | 63.57 | 0.042 | 0.163 | 0.30 | 0.01 | 0.07 | 5.0 | 5.00 | 8.62 | 0.57 | 5.52 | 2.63 | 12 | 2.04 | 147.30 | 146.00 | 147.62 | 146.32 | 153.43 | 152.66 | 3 |
| Pipe - (19) | 144.28 | 0.112 | 0.121 | 0.40 | 0.04 | 0.05 | 5.0 | 5.00 | 8.62 | 0.46 | 13.20 | 2.46 | 12 | 11.71 | 164.30 | 147.40 | 164.59 | 147.69 | 170.76 | 153.43 | 4 |
| Pipe - (78) | 18.02 | 0.009 | 0.009 | 0.95 | 0.01 | 0.01 | 5.0 | 5.00 | 8.62 | 0.07 | 14.08 | 1.47 | 12 | 13.32 | 167.50 | 165.10 | 167.62 | 165.22 | 173.48 | 170.76 | 5 |
| Pipe - (89) | 114.91 | 0.000 | 0.000 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 | 8.62 | 0.25 | 0.95 | 2.26 | 8 | 0.52 | 135.60 | 135.00 | 135.84 | 135.24 | 150.70 | 145.85 | 6 |
| Pipe - (48) | 72.58 | 0.000 | 0.000 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 | 8.62 | 0.25 | 1.19 | 2.27 | 8 | 0.83 | 136.30 | 135.70 | 136.54 | 135.94 | 152.43 | 150.70 | 7 |
| Pipe - (47) | 11.19 | 0.000 | 0.000 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 | 8.62 | 0.25 | 1.24 | 2.26 | 8 | 0.89 | 136.50 | 136.40 | 136.74 | 136.64 | 152.43 | 152.43 | 8 |

Notes: IDF File = SampleDF.idf, Return Period = 25-yr. Pipe travel time suppressed.
<table>
<thead>
<tr>
<th>Line ID</th>
<th>Length (ft)</th>
<th>Drng Area (ac)</th>
<th>Rational C x A</th>
<th>Tc (min)</th>
<th>Inlet (in/hr)</th>
<th>Syst (in/hr)</th>
<th>Intensity (in/hr)</th>
<th>Total Q (cfs)</th>
<th>Capacity (cfs)</th>
<th>Velocity (ft/s)</th>
<th>Line Size (in)</th>
<th>Slope (%)</th>
<th>Invert Elev (ft)</th>
<th>HGL Elev (ft)</th>
<th>Surface Elev (ft)</th>
<th>Line No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe - (55)</td>
<td>35.55</td>
<td>0.000</td>
<td>0.436</td>
<td>0.00</td>
<td>0.0</td>
<td>0.41</td>
<td>0.0</td>
<td>5.0</td>
<td>8.62</td>
<td>3.57</td>
<td>11.75</td>
<td>4.92</td>
<td>12</td>
<td>9.28</td>
<td>142.80</td>
<td>139.50</td>
</tr>
<tr>
<td>Pipe - (16)</td>
<td>140.00</td>
<td>0.000</td>
<td>0.291</td>
<td>0.00</td>
<td>0.0</td>
<td>0.28</td>
<td>0.0</td>
<td>5.0</td>
<td>8.62</td>
<td>2.38</td>
<td>6.10</td>
<td>4.36</td>
<td>12</td>
<td>2.50</td>
<td>146.70</td>
<td>143.20</td>
</tr>
<tr>
<td>Pipe - (15)</td>
<td>30.77</td>
<td>0.000</td>
<td>0.291</td>
<td>0.00</td>
<td>0.0</td>
<td>0.28</td>
<td>0.0</td>
<td>5.0</td>
<td>8.62</td>
<td>2.38</td>
<td>5.82</td>
<td>4.28</td>
<td>12</td>
<td>2.28</td>
<td>147.50</td>
<td>146.80</td>
</tr>
<tr>
<td>Pipe - (14)</td>
<td>102.63</td>
<td>0.000</td>
<td>0.193</td>
<td>0.00</td>
<td>0.0</td>
<td>0.18</td>
<td>0.0</td>
<td>5.0</td>
<td>8.62</td>
<td>1.58</td>
<td>9.78</td>
<td>3.11</td>
<td>12</td>
<td>6.43</td>
<td>154.20</td>
<td>147.60</td>
</tr>
<tr>
<td>Pipe - (45)</td>
<td>129.86</td>
<td>0.000</td>
<td>0.143</td>
<td>0.00</td>
<td>0.0</td>
<td>0.14</td>
<td>0.0</td>
<td>5.0</td>
<td>8.62</td>
<td>1.17</td>
<td>12.16</td>
<td>3.22</td>
<td>12</td>
<td>9.93</td>
<td>167.20</td>
<td>154.30</td>
</tr>
<tr>
<td>Pipe - (80)</td>
<td>8.49</td>
<td>0.046</td>
<td>0.046</td>
<td>0.95</td>
<td>0.04</td>
<td>0.04</td>
<td>5.0</td>
<td>5.0</td>
<td>8.62</td>
<td>0.38</td>
<td>5.92</td>
<td>2.32</td>
<td>12</td>
<td>2.36</td>
<td>168.30</td>
<td>168.10</td>
</tr>
<tr>
<td>Pipe - (44)</td>
<td>52.46</td>
<td>0.097</td>
<td>0.097</td>
<td>0.95</td>
<td>0.09</td>
<td>0.09</td>
<td>5.0</td>
<td>5.0</td>
<td>8.62</td>
<td>0.79</td>
<td>1.13</td>
<td>4.31</td>
<td>6</td>
<td>3.45</td>
<td>169.11</td>
<td>167.30</td>
</tr>
<tr>
<td>Pipe - (13)</td>
<td>10.67</td>
<td>0.050</td>
<td>0.050</td>
<td>0.95</td>
<td>0.05</td>
<td>0.05</td>
<td>5.0</td>
<td>5.0</td>
<td>8.62</td>
<td>0.41</td>
<td>5.28</td>
<td>1.03</td>
<td>12</td>
<td>1.88</td>
<td>154.50</td>
<td>154.30</td>
</tr>
<tr>
<td>Pipe - (23)</td>
<td>9.26</td>
<td>0.098</td>
<td>0.098</td>
<td>0.95</td>
<td>0.09</td>
<td>0.09</td>
<td>5.0</td>
<td>5.0</td>
<td>8.62</td>
<td>0.80</td>
<td>5.67</td>
<td>2.25</td>
<td>12</td>
<td>2.16</td>
<td>148.00</td>
<td>147.80</td>
</tr>
<tr>
<td>Pipe - (62)</td>
<td>8.59</td>
<td>0.145</td>
<td>0.145</td>
<td>0.95</td>
<td>0.14</td>
<td>0.14</td>
<td>5.0</td>
<td>5.0</td>
<td>8.62</td>
<td>1.19</td>
<td>3.84</td>
<td>1.51</td>
<td>12</td>
<td>1.16</td>
<td>143.00</td>
<td>142.90</td>
</tr>
</tbody>
</table>

Notes: IDF File = SampleIDF.idf, Return Period = 25-yrs. Pipe travel time suppressed.
### Grass Swale Capacity Calculations

**Project:** Greenwich Hospital Cancer Center  
**Project #:** 6355  
**Date:** 3/22/2021  
**Location:** 10 Lake Avenue, Greenwich, CT  
**By:** EWM  
**Checked:** DRG

#### Gravel Swale Water Feature

**Swale #1**

Calculate the capacity of the swale.

<table>
<thead>
<tr>
<th>Manning's n Value</th>
<th>0.023</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel Depth</td>
<td>0.500 ft</td>
</tr>
<tr>
<td>Bottom Width</td>
<td>1.5 ft</td>
</tr>
<tr>
<td>Side Slope</td>
<td>3 (H:V)</td>
</tr>
<tr>
<td>Area, A</td>
<td>1.50 ft²</td>
</tr>
<tr>
<td>Wetted perimeter, P</td>
<td>4.66 ft</td>
</tr>
<tr>
<td>Hydraulic radius, $R_h$</td>
<td>0.32 ft</td>
</tr>
<tr>
<td>Slope, S</td>
<td>0.113 ft/ft</td>
</tr>
</tbody>
</table>

\[
R_h = \frac{A}{P}
\]

\[
Q = \frac{1.486}{n} AR_h^{2/3} S^{1/2}
\]

**Q, Capacity** 15.34 cfs

**Proposed 10-yr Flow, $Q_p^*$** 0.41 cfs

\[Q > Q_p\quad \text{Therefore, the channel size is adequate.}\]

*$This assumes that all area drains upstream of the swale are either not installed or not functioning, allowing the swale to convey all anticipated flow.
Appendix 3
TSS Removal
Drawdown Calculations
### Project Information
- **Project:** Greenwich Hospital Cancer Center
- **Project #:** 6355
- **Date:** 3/22/2021
- **Location:** 10 Lake Avenue, Greenwich, CT
- **By:** EWM
- **Checked:** DRG

### Sand Filter - South System

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BMP&lt;sup&gt;a&lt;/sup&gt;</td>
<td>TSS removal Rate&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Starting TSS Load&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Amount Removed (B x C)</td>
</tr>
<tr>
<td>1</td>
<td>Deep Sump Catch Basins</td>
<td>25.0%</td>
<td>100.0%</td>
<td>25.0%</td>
</tr>
<tr>
<td>2</td>
<td>Sand/Organic Filters</td>
<td>85.0%</td>
<td>75.0%</td>
<td>63.8%</td>
</tr>
</tbody>
</table>

### Sand Filter - North System<sup>c</sup>

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BMP&lt;sup&gt;a&lt;/sup&gt;</td>
<td>TSS removal Rate&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Starting TSS Load&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Amount Removed (B x C)</td>
</tr>
<tr>
<td>1</td>
<td>Sand/Organic Filters</td>
<td>85.0%</td>
<td>100.0%</td>
<td>85.0%</td>
</tr>
</tbody>
</table>

---

<sup>a</sup> Refer to Table 5-6 from February 2012 Town of Greenwich Drainage Manual section 5.6.3

<sup>b</sup> Equal to the remaining load from the previous BMP

<sup>c</sup> The north system is interconnected catch basins (CB#101, CB#102 & CB#103) and therefore excluded from calculation.
# Total Suspended Solids Removal (TSS)

**Project:** Greenwich Hospital Cancer Center  
**Location:** 10 Lake Avenue, Greenwich, CT  
**Project #:** 6355  
**Date:** 3/22/2021  
**By:** EWM  
**Checked:** DRG

## Infiltration System

### Infil #1

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>BMP&lt;sup&gt;a&lt;/sup&gt;</td>
<td>TSS removal Rate&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Starting TSS Load&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Amount Removed</td>
<td>Remaining Load</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Deep Sump Catch Basins</td>
<td>25.0%</td>
<td>100.0%</td>
<td>25.0%</td>
<td>75.0%</td>
</tr>
<tr>
<td>2</td>
<td>Sand/Organic Filters</td>
<td>85.0%</td>
<td>75.0%</td>
<td>63.8%</td>
<td>11.3%</td>
</tr>
</tbody>
</table>

---

<sup>a</sup> Refer to Table 5-6 from February 2012 Town of Greenwich Drainage Manual section 5.6.3

<sup>b</sup> Equal to the remaining load from the previous BMP
### Infiltration System

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface Area of Infiltration System (SA)</td>
<td>1,102 ft²</td>
</tr>
<tr>
<td>Volume of Storage of Infiltration System (VS)</td>
<td>1,944 ft³</td>
</tr>
<tr>
<td>Infiltration Rate (IR)</td>
<td>0.27 in/hr³</td>
</tr>
<tr>
<td>Infiltration Rate (IR)</td>
<td>3.00 in/hr⁴</td>
</tr>
<tr>
<td>Theoretical Water Column Height</td>
<td>21.17 in²</td>
</tr>
<tr>
<td>Time of Draw Down</td>
<td>78.40 hr³</td>
</tr>
<tr>
<td>Time of Draw Down (HCT#101)</td>
<td>7.06 hr³</td>
</tr>
</tbody>
</table>

---

a Theoretical Water Column Height (WCH) = VS/SA*12
b Time of Draw Down = WCH/IR
c Infiltration Rate (IR) Taken From the
  Greenwich Drainage Manual for C class
d Infiltration Rate (IR) taken from HCT#101.
Appendix 4a
NRCS Soils Report
Town of Greenwich Soil Testing Logs
Preface

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

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

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

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

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

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

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How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and
identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.
Soil Map

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

**Area of Interest (AOI)**
- Area of Interest (AOI)

**Soils**
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

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

**Water Features**
- Streams and Canals

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

**Background**
- Aerial Photography

**Spoil Area**
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

**Special Line Features**

### MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

**Source of Map:** Natural Resources Conservation Service

**Web Soil Survey URL:**

**Coordinate System:** Web Mercator (EPSG:3857)

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

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

**Soil Survey Area:** State of Connecticut

**Survey Area Data:** Version 20, Jun 9, 2020

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

**Date(s) aerial images were photographed:** Jul 21, 2014—Aug 27, 2014

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

<table>
<thead>
<tr>
<th>Map Unit Symbol</th>
<th>Map Unit Name</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>306</td>
<td>Udorthents-Urban land complex</td>
<td>0.4</td>
<td>12.8%</td>
</tr>
<tr>
<td>307</td>
<td>Urban land</td>
<td>2.7</td>
<td>87.2%</td>
</tr>
<tr>
<td><strong>Totals for Area of Interest</strong></td>
<td></td>
<td><strong>3.1</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

Map Unit Descriptions

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

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

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

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,
onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

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

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

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

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

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

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

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

306—Udorthents-Urban land complex

Map Unit Setting
- **National map unit symbol:** 9lmg
- **Elevation:** 0 to 2,000 feet
- **Mean annual precipitation:** 43 to 56 inches
- **Mean annual air temperature:** 45 to 55 degrees F
- **Frost-free period:** 120 to 185 days
- **Farmland classification:** Not prime farmland

Map Unit Composition
- **Udorthents and similar soils:** 50 percent
- **Urban land:** 35 percent
- **Minor components:** 15 percent
- Estimates are based on observations, descriptions, and transects of the map unit.

Description of Udorthents

Setting
- **Down-slope shape:** Convex
- **Across-slope shape:** Linear
- **Parent material:** Drift

Typical profile
- **A - 0 to 5 inches:** loam
- **C1 - 5 to 21 inches:** gravelly loam
- **C2 - 21 to 80 inches:** very gravelly sandy loam

Properties and qualities
- **Slope:** 0 to 25 percent
- **Depth to restrictive feature:** More than 80 inches
- **Drainage class:** Well drained
- **Runoff class:** Medium
- **Capacity of the most limiting layer to transmit water (Ksat):** Very low to high (0.00 to 1.98 in/hr)
- **Depth to water table:** About 54 to 72 inches
- **Frequency of flooding:** None
- **Frequency of ponding:** None
- **Available water capacity:** Moderate (about 6.8 inches)

Interpretive groups
- **Land capability classification (irrigated):** None specified
- **Land capability classification (nonirrigated):** 3e
- **Hydrologic Soil Group:** B
- **Hydric soil rating:** No

Description of Urban Land

Typical profile
- **H - 0 to 6 inches:** material

Interpretive groups
- **Land capability classification (irrigated):** None specified
- **Land capability classification (nonirrigated):** 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Unnamed, undisturbed soils
Percent of map unit: 8 percent
Hydric soil rating: No

Udorthents, wet substratum
Percent of map unit: 5 percent
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

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

307—Urban land

Map Unit Setting
National map unit symbol: 9lmh
Elevation: 0 to 2,000 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 120 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition
Urban land: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Typical profile
H - 0 to 6 inches: material

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Unnamed, undisturbed soils
Percent of map unit: 10 percent
Hydric soil rating: No
Udorthents, wet substratum

Percent of map unit: 10 percent
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No
References


Custom Soil Resource Report


### SOIL EVALUATION TEST RESULTS

**Project Name:** Greenwich Hospital  
**Project Address:** 10 Lake Avenue  
**Engineering Firm's Name:** Redniss & Mead  
**Engineer's Name:** David R. Ginter

<table>
<thead>
<tr>
<th>Test Pit or Soil Boring #:</th>
<th>101</th>
<th>Ground Elevation:</th>
<th>150.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elevation</td>
<td></td>
<td>Soil Texture (Percent Sand, Silt and Clay)</td>
<td>Depth Range in Inches</td>
</tr>
<tr>
<td>146.50</td>
<td>Fill</td>
<td>0&quot;-48&quot;</td>
<td></td>
</tr>
<tr>
<td>143.50</td>
<td>Brown sandy loam</td>
<td>48&quot;-84&quot;</td>
<td></td>
</tr>
</tbody>
</table>

---

**Saturated Hydraulic Conductivity Test Location #:** 101

- **Ground Elevation:** 150.4
- **Top Elevation of Proposed Infiltration System:** 150.4
- **Bottom Elevation of Proposed Infiltration System:** 145.2
- **Test Method (check one of the following acceptable methods**):  
  - X 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  
  - Amoozemeter or Amoozegar (constant head) permeameter – Amoozegar 1992

*Attach field data forms for the respective infiltration test method.*

**Calculated Saturated Hydraulic Conductivity Rate:** 6 in/hr

---

**Mottling (Seasonally High Groundwater):** N/A  
**Groundwater:** N/A  
**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.

**David R. Ginter, P.E.**  
Name of Test Conductor  
**October 11, 2017**  
Signature of Test Conductor  
Date

---

**Form SC-101 February 2012**

---

**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 field infiltration tests must be conducted in the actual location and soil layer where stormwater infiltration is proposed.*
SOIL EVALUATION TEST RESULTS

Project Name: Greenwich Hospital
Project Address: 10 Lake Avenue
Engineering Firm's Name: Redniss & Mead
Engineer's Name: David R. Ginter

<table>
<thead>
<tr>
<th>Test Pit or Soil Boring #:</th>
<th>102</th>
<th>Ground Elevation:</th>
<th>149.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elevation</td>
<td>Soil Texture (Percent Sand, Silt and Clay)</td>
<td>Depth Range in Inches</td>
<td></td>
</tr>
<tr>
<td>147.18</td>
<td>Fill</td>
<td>0&quot;-23&quot;</td>
<td></td>
</tr>
<tr>
<td>142.93</td>
<td>Orange brown silty loam</td>
<td>23&quot;-74&quot;</td>
<td></td>
</tr>
</tbody>
</table>

Saturated Hydraulic Conductivity Test Location #: 102

Ground Elevation: 149.1
Top Elevation of Proposed Infiltration System:
Bottom Elevation of Proposed Infiltration System:
Elevation of Test*: 144.1

Test Method (check one of the following acceptable methods**):
- X 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
- Amoozemeter or Amoozegar (constant head) permeameter – Amoozegar 1992

Attach field data forms for the respective infiltration test method.

Calculated Saturated Hydraulic Conductivity Rate: 10.5 in/hr

**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.

David R. Ginter, P.E.
Name of Test Conductor

Signature of Test Conductor

October 11, 2017
Date
### SOIL EVALUATION TEST RESULTS

**Project Name:** Greenwich Hospital  
**Project Address:** 10 Lake Avenue  
**Engineering Firm's Name:** Redniss & Mead  
**Engineer's Name:** David R. Ginter  

<table>
<thead>
<tr>
<th>Test Pit or Soil Boring #:</th>
<th>103</th>
<th>Ground Elevation:</th>
<th>149.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elevation</td>
<td>Depth Range in Inches</td>
<td></td>
<td></td>
</tr>
<tr>
<td>145.20 Fill</td>
<td>0&quot;-48&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>141.95 Orange brown silty loam</td>
<td>48&quot;-87&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Saturated Hydraulic Conductivity Test Location #:** 103

- **Ground Elevation:** 149.2
- **Top Elevation of Proposed Infiltration System:**
- **Bottom Elevation of Proposed Infiltration System:**
- **Elevation of Test:** 144.25

**Test Method (check one of the following acceptable methods**):
- X 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
- Amoozemeter or Amoozegar (constant head) permeameter – Amoozegar 1992

**Attach field data forms for the respective infiltration test method.**

**Calculated Saturated Hydraulic Conductivity Rate:** 159 in/hr

**Elevation** | **Depth in Inches**  
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>143.7 Mottling (Seasonally High Groundwater)</td>
<td>66&quot;</td>
</tr>
<tr>
<td>- Groundwater</td>
<td>N/A</td>
</tr>
<tr>
<td>- Ledge</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Notes:**
- **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 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.**

David R. Ginter, P.E.  
Name of Test Conductor  
David R. Ginter  
Signature of Test Conductor  
October 11, 2017  
Date
**SOIL EVALUATION TEST RESULTS**

<table>
<thead>
<tr>
<th>Test Pit or Soil Boring #:</th>
<th>104</th>
<th>Ground Elevation:</th>
<th>146.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elevation</td>
<td>138.58</td>
<td>Soil Texture (Percent Sand, Silt and Clay)</td>
<td>Fill</td>
</tr>
<tr>
<td>Depth Range in Inches</td>
<td>0&quot;-95&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>Elevation</th>
<th>Depth in Inches</th>
<th>Mottling (Seasonally High Groundwater)</th>
<th>82&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>Groundwater</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>-</td>
<td>Ledge</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

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

**Saturated Hydraulic Conductivity Test Location #: 104**

- Ground Elevation: 145.5
- Top Elevation of Proposed Infiltration System: 147.92
- Bottom Elevation of Proposed Infiltration System: 143.25
- Elevation of Test*: 142.92

- Test Method (check one of the following acceptable methods**):
  - **X** 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
  - Amoozemeter or Amoozegar (constant head) permeameter – Amoozegar 1992

- Attach field data forms for the respective infiltration test method.

**Calculated Saturated Hydraulic Conductivity Rate:** 58 in/hr

**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 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.**

David R. Ginter, P.E.  
Name of Test Conductor

[Signature]

October 11, 2017  
Date
Appendix 4b
Geotechnical Reports
MEMORANDUM

To: Anthony Carratelli - Greenwich Hospital
From: David Barstow, P.E., James Davis, P.E., Lawrence Johnsen, P.E. - GZA
Date: March 19, 2021
GZA File No.: 05.0046603.01

Re: Greenwich Hospital Smilow Cancer Center
Lake Avenue, Greenwich, Connecticut
Underslab Drain Flow Estimate

GZA prepared this Memorandum to present the monitoring well logs recently completed and to provide an underslab drain flow estimate for the proposed Greenwich Hospital Smilow Cancer Center (GHSCC). This Memorandum is subject to the Limitations included in Appendix A.

The proposed GHSCC will consist of an approximate 35,500-square foot (sf) building with two above-ground levels and about 24,500-sf of at-grade parking. The GHSCC will also include an approximate 23,500-sf level of below-grade parking. The below-grade parking will have a slab that varies from El. 139 to 148 feet (NAVD88). The below-grade level will incorporate an under-slab drainage system consisting of a network of perforated pipes that transport groundwater outside of the building footprint. The Schematic Design under-slab drain plan is attached as Appendix B.

Subsurface Exploration Program

GZA completed an exploration program for the proposed GHSCC in January 2020. The exploration program consisted of four test borings (GZ-5, GZ-5A, GZ-6, GZ-6A) in proposed at-grade parking areas and five test borings (GZ-1 through GZ-4, GZ-2A) in the proposed GHSCC building footprint. Two of the building test borings, GZ-1 and GZ-3, were completed as observation wells. The previously completed test boring logs are attached as Appendix C and the approximate locations are presented on Figure 1-Exploration Location Plan. Refer to GZA’s February 14, 2020 Geotechnical Engineering Report for additional information.

Two additional observation wells, GZ-101 and GZ-102, were installed at the Site on January 27, 2021 by SoilTesting, Inc. The approximate locations of the two observation wells are presented on Figure 1-Exploration Location Plan. The observation wells were installed to depths of about 30 and 35 feet. The wells were constructed with a 10-foot screened section and solid PVC above the screened section. The test boring logs, including details of the well installation, are included in Appendix C.
Subsurface Conditions

The test borings located within the proposed building encountered, in descending order, the following:

- 0.3 to 1 foot of topsoil/asphalt;
- 0 to more than 5 feet of fill;
- 0 to 3.2 feet of subsoil;
- 2.2 to 11.5 feet of glacial till;
- 6.3 to 33 feet of decomposed bedrock; and
- Bedrock.

Descriptions of the strata are included in the February 2020 Geotechnical Engineering Report. On February 24, 2021, groundwater was measured in the observation wells (GZ-1 OW, GZ-102 OW, and GZ-3 OW) at elevations ranging from about El. 148.1 to 153.1 feet. GZA observed that the well at GZ-101 OW was silted in when a groundwater measurement was attempted. The measured groundwater levels are up to about 14 feet higher than the proposed below-grade slab elevation. Fluctuations in groundwater levels will vary due to seasonal variations in rainfall, temperature, and other factors different than those prevailing at the time the readings were taken. The measured groundwater levels are shown on the exploration logs in Appendix C.

Laboratory Testing Program

Three samples from GZ-1 OW and GZ-3 OW were sent to a geotechnical laboratory for grain size and hydrometer analysis. The results of the testing are attached as Appendix D and summarized below.

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Sample Stratum</th>
<th>Sample Elevation (feet)</th>
<th>Percent Passing No. 200 Sieve</th>
<th>Estimated Permeability Using Hazen Formula (cm/sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GZ-1, SS-7</td>
<td>Decomposed Bedrock</td>
<td>149 to 151</td>
<td>20%</td>
<td>$1.1 \times 10^3$</td>
</tr>
<tr>
<td>GZ-1, SS-11</td>
<td>Decomposed Bedrock</td>
<td>130 to 131</td>
<td>24%</td>
<td>$3.2 \times 10^6$</td>
</tr>
<tr>
<td>GZ-3, SS-5</td>
<td>Glacial Till</td>
<td>152.5 to 154</td>
<td>24%</td>
<td>$1.8 \times 10^3$</td>
</tr>
</tbody>
</table>

Field Hydraulic Conductivity Testing

On January 28, 2021, GZA performed a pumping test at observation wells GZ-1 OW and GZ-3 OW and also performed a slug test at GZ-3 OW. At the time of field testing, GZ-101 OW was silted in and could not be tested and there was only about 1 foot of water within GZ-102 OW, which also could not be tested. The pumping test consisted of using a peristaltic pump to constantly pump water from the well and measuring the flow needed to lower the groundwater to a constant level for a 10-minute period. The pumping rate was varied a total of 3 times per test. The slug test consisted of installing a pressure transducer at the bottom of the observation well, installing a “slug” (PVC pipe filled with sand) into the well to raise the water level, and measuring the time it takes for the groundwater to return to previous levels. The same procedure except in reverse was performed when the slug was removed from the well.

Recommended Underdrain Flow Rates

Based on the field testing and laboratory test results, GZA estimated a flow rate from the underslab drain below the proposed below-grade parking level to be about 50 gallons per minute (gpm).
The estimated flow rate is based on widely spaced borings and field testing. During construction, the excavation for the proposed building will advance through decomposed bedrock and bedrock. The degree of decomposition, fracturing, and general competency of the decomposed bedrock and bedrock will vary with depth and short horizontal distances. The amount of flow through the decomposed bedrock and bedrock will depend on these factors and is anticipated to be variable such that more flow could be encountered in some areas and less flow in others. Additionally, water bearing fractures in the decomposed bedrock and bedrock may be encountered.

Due to the anticipated variable subsurface conditions and flows, we recommend oversizing the underdrain pipes downstream of the building to allow a flow on the order of 100 gpm. The installation of larger diameter pipes during construction will be less expensive than installation after construction when actual underslab drain flows are known.

Attachments:  
Figure 1- Exploration location Plan  
Appendix A- Limitations  
Appendix B- Schematic Design Underdrain Plan  
Appendix C- Test Boring Logs  
Appendix D- Laboratory Test Results
FIGURE 1
EXPLORATION LOCATION PLAN
GENERAL NOTES

1. BASE MAP DEVELOPED FROM ELECTRONIC PDF FILE "SITE REMOVALS PLAN & SITE PLAN", SHEET NO. SE-1, ORIGINAL SCALE 1"=20', DATED FEBRUARY 23, 2021, REVISION 2, 100% SCHEMATIC DESIGN.

2. LOCATION OF EXPLORATIONS WERE DETERMINED BY TAPE MEASURING FROM EXISTING SITE FEATURES.

3. THE PURPOSE OF THIS DRAWING IS TO LOCATE, DESCRIBE, AND REPRESENT THE POSITIONS OF EXPLORATIONS AND MONITORING WELLS IN RELATION TO THE SUBJECT SITE. THIS DRAWING IS NOT CONSIDERED A LAND SURVEY. THE LOCATIONS SHOWN SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.

4. VERTICAL DATUM (NAVD 1988)

LEGEND

GZ-1 INDICATES TEST BORINGS PERFORMED BY SOIL TESTING INC BETWEEN JANUARY 8 AND JANUARY 13, 2020 AND OBSERVED BY GZA PERSONNEL. (OW) INDICATES OBSERVATION WELL INSTALLED IN BORING.

GZ-101 (OW) INDICATES TEST BORING PERFORMED BY SOIL TESTING INC ON JANUARY 27, 2021 AND OBSERVED BY GZA PERSONNEL. (OW) INDICATES OBSERVATION WELL INSTALLED IN BORING.
APPENDIX A

LIMITATIONS
USE OF REPORT

1. GZA GeoEnvironmental, Inc. (GZA) prepared this report on behalf of, and for the exclusive use of our Client for the stated purpose(s) and location(s) identified in the Proposal for Services and/or Report. Use of this report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s). Further, reliance by any party not expressly identified in the agreement, for any use, without our prior written permission, shall be at that party’s sole risk, and without any liability to GZA.

STANDARD OF CARE

2. GZA’s findings and conclusions are based on the work conducted as part of the Scope of Services set forth in the Proposal for Services and/or Report and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered during the course of our work. Conditions other than described in this report may be found at the subject location(s).

3. GZA’s services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services, at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made. Specifically, GZA does not and cannot represent that the Site contains no hazardous material, oil, or other latent condition beyond that observed by GZA during its study. Additionally, GZA makes no warranty that any response action or recommended action will achieve all of its objectives or that the findings of this study will be upheld by a local, state or federal agency.

4. In conducting our work, GZA relied upon certain information made available by public agencies, Client and/or others. GZA did not attempt to independently verify the accuracy or completeness of that information. Inconsistencies in this information which we have noted, if any, are discussed in the Report.

SUBSURFACE CONDITIONS

5. The generalized soil profile(s) provided in our Report are based on widely-spaced subsurface explorations and are intended only to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, and were based on our assessment of subsurface conditions. The composition of strata, and the transitions between strata, may be more variable and more complex than indicated. For more specific information on soil conditions at a specific location refer to the exploration logs. The nature and extent of variations between these explorations may not become evident until further exploration or construction. If variations or other latent conditions then become evident, it will be necessary to reevaluate the conclusions and recommendations of this report.

6. Water level readings have been made, as described in this Report, in and monitoring wells at the specified times and under the stated conditions. These data have been reviewed and interpretations have been made in this report. Fluctuations in the level of the groundwater however occur due to temporal or spatial variations in areal recharge rates, soil heterogeneities, the presence of subsurface utilities, and/or natural or artificially induced perturbations. The observed water table may be other than indicated in the Report.

COMPLIANCE WITH CODES AND REGULATIONS

7. We used reasonable care in identifying and interpreting applicable codes and regulations necessary to execute our scope of work. These codes and regulations are subject to various, and possibly contradictory, interpretations. Interpretations and compliance with codes and regulations by other parties is beyond our control.
INTERPRETATION OF DATA

8. Our opinions are based on available information as described in the Report, and on our professional judgment. Additional observations made over time, and/or space, may not support the opinions provided in the Report.

ADDITIONAL INFORMATION

9. In the event that the Client or others authorized to use this report obtain additional information on environmental or hazardous waste issues at the Site not contained in this report, such information shall be brought to GZA's attention forthwith. GZA will evaluate such information and, on the basis of this evaluation, may modify the conclusions stated in this report.

ADDITIONAL SERVICES

10. GZA recommends that we be retained to provide services during any future investigations, design, implementation activities, construction, and/or property development/redevelopment at the Site. This will allow us the opportunity to: i) observe conditions and compliance with our design concepts and opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design; and iv) assess the consequences of changes in technologies and/or regulations.
APPENDIX B

SCHEMATIC DESIGN UNDERDRAIN PLAN
NOTES

1. BASE MAP DEVELOPED FROM AN ELECTRONIC PLAN ENTITLED, "PARKING LEVEL PLAN", PROGRESS PRINT DATED JANUARY 22, 2021 BY SHEPLEY BULFINCH, SHEET A101P.

2. 6-INCH DIAMETER PVC PIPE FOR THE UNDERSLAB DRAIN AND FOUNDATION DRAIN SHALL BE SLOTTED SDR 35 WITH RUBBER GASKETED JOINTS AND MEET THE REQUIREMENTS OF ASTM D3034 AND D3212.


4. GEOTEXTILE FABRIC SHALL BE MIRAFI 140N OR EQUIVALENT.

5. WHERE ELEVATION CONFLICT OCCURS WITH OTHER UTILITIES, UNDERSLAB DRAIN PIPES SHALL BE INSTALLED BELOW OTHER UTILITIES.

6. GZA SHALL MONITOR THE INSTALLATION OF THE UNDERDRAINAGE SYSTEM.

7. CAP ALL OPEN PIPE ENDS.

LEGEND

UNDERSLAB DRAIN
CLEANOUT
FLOW DIRECTION
FOOTING DRAIN
SOLID PIPE FOR FOOTING AND UNDERSLAB DRAIN
SLOPE UNDERDRAIN PIPE SAME AS RAMP

THE ORIGINAL OF THIS DRAWING IS 36" X 48". IF THIS COPY IS ANY OTHER SIZE, IT HAS EITHER BEEN REDUCED OR ENLARGED. TAKE APPROPRIATE PRECAUTIONS ACCORDINGLY.
APPENDIX C

TEST BORING LOGS
# TEST BORING LOG

**GZA GeoEnvironmental, Inc.**

**Proposed Greenwich Hospital Cancer Center**
Lake Avenue & Lafayette Place
Greenwich, Connecticut

**EXPLORATION NO.: GZ-1 (OW)**

**Sheet:** 1 of 2  
**Project No:** 05.0046603.00  
**Reviewed by:** J. Davis

**Logged by:** B. Carias  
**Drilling Co.:** Soiltesting, Inc.  
**Foreman:** J. Knepple

**Type of Rig:** Truck  
**Rig Model:** Diedrich D-120  
**Drilling Method:** HSA

**Boring Location:** See Plan  
**Ground Surface Elev. (ft.):** 166.1  
**Final Boring Depth (ft.):** 45.4  
**Date Start - Finish:** 1/9/2020 - 1/10/2020

**H. Datum:** Project NAVD 88

**Hammer Type:** Safety  
**Hammer Weight (lb.):** 140  
**Hammer Fall (in.):** 30  
**Auger or Casing O.D./I.D Dia (in.):** 4.25

**Sampler Type:** SS  
**Sampler O.D. (in.):** 2.0  
**Sampler Length (in.):** 24  
**Rock Core Size:** N/A

## Groundwater Depth (ft.)

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Water Depth</th>
<th>Stab. Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/10/2020</td>
<td>0900</td>
<td>15</td>
<td>5 min</td>
</tr>
<tr>
<td>1/13/2020</td>
<td>0750</td>
<td>17.5</td>
<td>70 hrs</td>
</tr>
<tr>
<td>1/13/2020</td>
<td>1515</td>
<td>17.5</td>
<td>77.25 hrs</td>
</tr>
</tbody>
</table>

**Casing Blows/Core Rate**

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>No.</th>
<th>Casing Blows/ Core Rate</th>
<th>Blows per 6&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5-2.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5-4.5</td>
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<td></td>
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</tr>
<tr>
<td>5-7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.5-10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-20</td>
<td></td>
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<tr>
<td>20-25</td>
<td></td>
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<tr>
<td>30-35</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Depth (ft.)**

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Blows per 6&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5-2.5</td>
<td>5</td>
</tr>
<tr>
<td>2.5-4.5</td>
<td>3</td>
</tr>
<tr>
<td>5-7</td>
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<tr>
<td>7.5-10</td>
<td>15</td>
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<td>12</td>
</tr>
<tr>
<td>15-20</td>
<td>5</td>
</tr>
<tr>
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<td>100/5&quot;</td>
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<tr>
<td>25-30</td>
<td>100/1&quot;</td>
</tr>
<tr>
<td>30-35</td>
<td>100/1&quot;</td>
</tr>
</tbody>
</table>

## Sample Description

- **SS-1**: Top 4", Tan, fine SAND and fine to coarse GRAVEL, trace Silt, trace Asphalt
- **SS-2**: Bottom 8", Brown, orange, SILT, some fine to coarse GRAVEL, trace Asphalt
- **SS-3**: Medium dense, tan, light brown, fine to coarse SAND, trace Silt
- **SS-4**: Medium dense, tan, fine to coarse SAND, little fine to coarse GRAVEL trace Silt
- **SS-5**: Top 7", Tan, fine to coarse SAND, some fine to coarse GRAVEL
- **SS-6**: Bottom 8", Light brown, fine to coarse SAND and GRAVEL, little Silt (Stratification)
- **SS-7**: Top 5", Orange, brown, fine to medium SAND, trace Silt
- **SS-8**: Grey and black, fine SAND, trace Silt (Petroleum Odor)
- **SS-9**: Very dense, grey, light brown, fine to coarse SAND and GRAVEL, little Silt
- **SS-10**: No Recovery

**Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.**

- **1**: Grinding from 7 to 12.4 ft; grinding from 20 to 35 ft.
- **2**: Oil sheen observed on rods when extracting SS-8. Petroleum odor observed within samples SS-5, SS-6 and SS-7

**Exploration No.: GZ-1 (OW)**
<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Casing Blows/Core Rate</th>
<th>Sample No.</th>
<th>Depth (ft)</th>
<th>Pen. (in)</th>
<th>Rec. (in)</th>
<th>Blows per 6&quot;</th>
<th>SPT Value</th>
<th>Sample Description</th>
<th>Modified Burmister</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-30.2</td>
<td>3</td>
<td>SS-10</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>100/3&quot;</td>
<td>R</td>
<td>SS-10 : No Recovery</td>
<td></td>
</tr>
<tr>
<td>35-36.1</td>
<td>13</td>
<td>SS-11</td>
<td>13</td>
<td>13</td>
<td>42</td>
<td>80</td>
<td>50/1&quot;</td>
<td>SS-11 : Grey, fine to coarse GRAVEL and GRAVEL, some Silt (DECOMPOSED BEDROCK)</td>
<td></td>
</tr>
<tr>
<td>40-40.4</td>
<td>5</td>
<td>SS-12</td>
<td>5</td>
<td>5</td>
<td>100/5&quot;</td>
<td>R</td>
<td>SS-12 : Grey, light grey, fine to coarse GRAVEL, little Silt, trace fine Sand (DECOMPOSED BEDROCK)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45-45.4</td>
<td>5</td>
<td>SS-13</td>
<td>5</td>
<td>5</td>
<td>100/5&quot;</td>
<td>R</td>
<td>SS-13 : Grey, light grey, fine to coarse GRAVEL, little Silt, trace fine Sand (DECOMPOSED BEDROCK)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

End of exploration at 45.4 feet.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

3 - Auger refusal at 45.4 ft. below ground surface
4 - Monitoring well installed at 44 feet. 10 feet of 2" PVC well screen set at approximately 44 feet below grade. Filter sand place in annulus around well from 32.5 feet to 44 feet. Bentonite seal from 30.5 feet to 32.5 feet below grade. Auger spoils (or filter sand) from 0 feet to 30.5 feet below grade. Road box installed at ground surface.

Exploration No.: GZ-1 (OW)
## TEST BORING LOG

**EXPLORATION NO.:** GZ-2  
**PROJECT NO.:** 05.0046603.00  
**REVIEWED BY:** J. Davis

**Logged By:** B. Carias  
**Drilling Co.:** Soiltesting, Inc.  
**Foreman:** J. Knepple

**Type of Rig:** Truck  
**Rig Model:** Diedrich D-120  
**Drilling Method:** HSA  
**Boring Location:** See Plan  
**Ground Surface Elev. (ft.):** 171.4  
**Final Boring Depth (ft.):** 6.2  
**Date Start - Finish:** 1/8/2020 - 1/8/2020  
**H. Datum:** Project  
**V. Datum:** NAVD 88

**Hammer Type:** Safety  
**Hammer Weight (lb.):** 140  
**Hammer Fall (in.):** 30  
**Auger or Casing O.D./I.D Dia (in.):** 4.25

**Sample Description and Identification** (Modified Burmister Procedure)

<table>
<thead>
<tr>
<th>Casing Blows/Core Rate</th>
<th>Depth (ft.)</th>
<th>Sample</th>
<th>SPT Value</th>
<th>Sample Description and Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS-1</td>
<td>0-2</td>
<td>24</td>
<td>12</td>
<td>SS-1: TOPSOIL</td>
</tr>
<tr>
<td></td>
<td>6-9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SS-2</td>
<td>2-2</td>
<td>0</td>
<td>0</td>
<td>SS-2: No Recovery; Gravel in tip</td>
</tr>
<tr>
<td></td>
<td>50/0&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SS-3</td>
<td>5-6.2</td>
<td>14</td>
<td>6</td>
<td>SS-3: Olive, fine SAND, trace Silt, trace fine Gravel</td>
</tr>
<tr>
<td></td>
<td>17 28</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>50/2&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>End of exploration at 6.2 feet below grade.</td>
</tr>
</tbody>
</table>

**Groundwater Depth (ft.)**

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Water Depth</th>
<th>Stab. Time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Dry</td>
<td>5 min</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Depth (ft.)</th>
<th>Casing Blows/Core Rate</th>
<th>No.</th>
<th>Depth (ft.)</th>
<th>Pen. (in.)</th>
<th>Rec. (in.)</th>
<th>Blows (per 6 in.)</th>
<th>SPT Value</th>
<th>Sample Description and Identification</th>
<th>STRATUM Description</th>
<th>Field Test Data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>6.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>End of exploration at 6.2 feet below grade.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Drilling Method:** Diedrich D-120

**Hammer Fall (in.):** 30

**Hammer Weight (lb.):** 140

**Casing Blows/Core Rate:**

1. Grinding and hard augering from 1 to 5 ft. below ground surface, possible boulders
2. Auger refusal at 6.2 ft. below ground surface; offset boring performed 4 ft. southwest

**Remarks:**

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

**Exploration No.:** GZ-2
<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Casing Blows/ Core Rate</th>
<th>Sample</th>
<th>Blows (per 6 in.)</th>
<th>SPT Value</th>
<th>Sample Description and Identification (Modified Burmister Procedure)</th>
<th>Remark</th>
<th>Field Test Data</th>
<th>STRATUM Description</th>
<th>Elev. (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>: See GZ-2 for soil descriptions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7-8.8</td>
<td>SS-1</td>
<td>22</td>
<td>16</td>
<td>28</td>
<td>41 98</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SS-1: Top 6&quot;: Light brown, fine SAND, some fine to coarse</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gravel, trace Silt</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Bottom 10&quot;: Olive, fine SAND, little fine to coarse</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gravel, trace Silt (small stratification)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-10.4</td>
<td>SS-2</td>
<td>10</td>
<td>5</td>
<td>0</td>
<td>0/5&quot; R</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SS-2: No Recovery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12-14</td>
<td>SS-3</td>
<td>24</td>
<td>20</td>
<td>23</td>
<td>20 49</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SS-3: Dense, grey, fine SAND, trace fine to coarse</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>gravel, trace Silt (Petroleum Odor)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-15.7</td>
<td>SS-4</td>
<td>24</td>
<td>13</td>
<td>13</td>
<td>10 30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SS-4: Medium dense, grey, fine SAND, some fine to coarse</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gravel, little Silt (Petroleum Odor)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-20.7</td>
<td>SS-5</td>
<td>9</td>
<td>9</td>
<td>37</td>
<td>100/3&quot; R</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SS-5: Grey, light grey, some fine to coarse GRAVEL, some</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>fine to coarse Sand, little Silt (DECOMPOSED BEDROCK)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(Petroleum Odor) (Wet)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25-25.7</td>
<td>SS-6</td>
<td>9</td>
<td>9</td>
<td>39</td>
<td>50/3&quot; R</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SS-6: Grey, light grey, fine to coarse SAND, little fine</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>to coarse Gravel, little Silt (DECOMPOSED BEDROCK)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**REMARKS**

1 - Hard augering from 7 ft. to 11 ft. below ground surface
2 - Grinding from 11 ft. to 12 ft.
3 - Grinding from 15 ft. to 17 ft.
4 - Groundwater encountered at 20 ft.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

**Exploration No.:**

GZ-2A
**TEST BORING LOG**

**Extraction:**
- **Extraction Method:**
  - **Type of Rig:** Truck
  - **Rig Model:** Diedrich D-120
  - **Drilling Method:** HSA
  - **Ground Surface Elev. (ft.):** 171
  - **Final Boring Depth (ft.):** 35.5
  - **Date Start - Finish:** 1/8/2020 - 1/9/2020

- **Boring Location:** See Plan
- **H. Datum:** NAVD 88

### Sample Description and Identification
**Modified Burmister Procedure**

<table>
<thead>
<tr>
<th>Depth (ft.)</th>
<th>Blows/Core Rate</th>
<th>Sample Description and Identification</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>4:04</td>
<td>SS-7: Olive, fine SAND and SILT (DECOMPOSED BEDROCK)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3:05</td>
<td>C-1: Soft, moderate weathering, extremely fractured, fine to coarse grained, grey, SCHIST</td>
<td>RAW</td>
</tr>
<tr>
<td></td>
<td>2:45</td>
<td>REC=72% RQD=25%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2:15</td>
<td>End of exploration at 35.5 feet below grade.</td>
<td>5</td>
</tr>
</tbody>
</table>

**Remarks:**
- **5:** Rock coring performed with NX-sized, double-tube core barrel. Core rate in units of min/ft. RQD=Rock Quality Designation.
- **Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.**
- **Hammer Type:** Safety
- **Hammer Fall (in.):** 140
- **Hammer Fall (in.):** 30
- **Auger or Casing O.D./I.D Dia (in.):** 4.25
- **Casing/Blow Core Rate:**
  - SS-7  C-1: 30 - 35 ft, 1 blow per 6 in.
  - 100/1 R

**Groundwater Depth (ft.)**
- **Date:** 1/9/2020
- **Time:** 1030
- **Water Depth:** 20
- **Stab. Time:** 5 min

**Drilling Method:**
- **Diedrich D-120**
- **Hammer Weight (lb.):** 4.25

**Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.**

---

**EXPLORATION NO.:** GZ-2A
**GZA GeoEnvironmental, Inc.**
**Engineers and Scientists**

**Logged By:** B. Carias
**Drilling Co.:** Solttesting, Inc.
**Foreman:** J. Knepple

**Proposed Greenwich Hospital Cancer Center**
Lake Avenue & Lafayette Place
Greenwich, Connecticut

**EXPLORATION NO.:** GZ-2A
**SHEET:** 2 of 2
**PROJECT NO:** 05.0046603.00
**REVIEWED BY:** J. Davis

**Logged By:** B. Carias
**Drilling Co.:** Solttesting, Inc.
**Foreman:** J. Knepple

**Type of Rig:** Truck
**Rig Model:** Diedrich D-120
**Drilling Method:** HSA

**Boring Location:** See Plan
**Ground Surface Elev. (ft.):** 171
**Final Boring Depth (ft.):** 35.5
**Date Start - Finish:** 1/8/2020 - 1/9/2020

**H. Datum:** NAVD 88

**Hammer Type:** Safety
**Hammer Fall (in.):** 140
**Hammer Fall (in.):** 30
**Auger or Casing O.D./I.D Dia (in.):** 4.25

**Casing/Blow Core Rate:**
- SS-7  C-1: 30 - 35 ft, 1 blow per 6 in.
- 100/1 R

**Sample Description and Identification (Modified Burmister Procedure)**
- SS-7: Olive, fine SAND and SILT (DECOMPOSED BEDROCK)
- C-1: Soft, moderate weathering, extremely fractured, fine to coarse grained, grey, SCHIST
- REC=72% RQD=25%

**End of exploration at 35.5 feet below grade.**

**Remarks:**
- **5:** Rock coring performed with NX-sized, double-tube core barrel. Core rate in units of min/ft. RQD=Rock Quality Designation.
## TEST BORING LOG

**GZA GeoEnvironmental, Inc.**

**Proposed Greenwich Hospital Cancer Center**
Lake Avenue & Lafayette Place
Greenwich, Connecticut

**EXPLORATION NO.:** GZ-3 (OW)

**SHEET:** 1 of 1

**PROJECT NO:** 05.0046603.00

**REVIEWED BY:** J. Davis

---

**Logged By:** B. Carias  
**Drilling Co.:** Soiltesting, Inc.  
**Foreman:** J. Knepple

**Type of Rig:** Truck  
**Rig Model:** Diedrich D-120  
**Drilling Method:** HSA

**Boring Location:** See Plan  
**Ground Surface Elev. (ft.):** 164.2  
**Final Boring Depth (ft.):** 23.5  
**Date Start - Finish:** 1/8/2020 - 1/8/2020

**H. Datum:** Project V. Datum: NAVD 88

---

**Hammer Type:** Safety  
**Hammer Weight (lb):** 140  
**Hammer Fall (in):** 30  
**Auger or Casing O.D./I.D Dia (in):** 4.25

**Sampler Type:** SS  
**Sampler O.D. (in):** 2.0  
**Sampler Length (in):** 24  
**Rock Core Size:** N/A

---

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Casing Blows/Core Rate</th>
<th>Sample</th>
<th>SPT Value</th>
<th>Sample Description Modified Burmister</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3</td>
<td>24 24 3 3 5 5 8</td>
<td>SS-1</td>
<td>10</td>
<td>SS-1: Medium dense, brown, orange, SILT and fine to coarse SAND, trace fine Gravel</td>
</tr>
<tr>
<td>3-4.5</td>
<td>19 0 9 36 62 50/1&quot;</td>
<td>SS-2</td>
<td>98</td>
<td>SS-2: No Recovery (Gravel in tip)</td>
</tr>
<tr>
<td>5-5.9</td>
<td>11 11 28 50/5&quot;</td>
<td>SS-3</td>
<td>R</td>
<td>SS-3: Brown, tan, fine to coarse SAND, some fine to coarse Gravel, trace Silt</td>
</tr>
<tr>
<td>7-8.4</td>
<td>17 12 42 65 50/5&quot;</td>
<td>SS-4</td>
<td>R</td>
<td>SS-4: Olive, fine SAND, little fine to coarse Gravel, trace Silt (Stratified)</td>
</tr>
<tr>
<td>10-11.6</td>
<td>20 12 43 50 66 50/2&quot;</td>
<td>SS-5</td>
<td>116</td>
<td>SS-5: Very dense, olive, light brown, fine to medium SAND, some fine to coarse Gravel, little Silt</td>
</tr>
<tr>
<td>15-15.4</td>
<td>5 5 100/5&quot;</td>
<td>SS-6</td>
<td>R</td>
<td>SS-6: Grey, light grey, fine to coarse SAND and GRAVEL, trace Silt (DECOMPOSED BEDROCK)</td>
</tr>
<tr>
<td>20-20.1</td>
<td>1 1 100/1&quot;</td>
<td>SS-7</td>
<td>R</td>
<td>SS-7: Grey, fine to coarse SAND, little fine Gravel, trace Silt (DECOMPOSED BEDROCK)</td>
</tr>
<tr>
<td>22-22.1</td>
<td>1 1 100/1&quot;</td>
<td>SS-8</td>
<td>R</td>
<td>SS-8: Grey, fine to medium SAND, some Silt (DECOMPOSED BEDROCK)</td>
</tr>
<tr>
<td>23.5-23.5</td>
<td>0 0 50/0&quot;</td>
<td>SS-9</td>
<td>R</td>
<td>SS-9: No Penetration End of exploration at 23.5 feet.</td>
</tr>
</tbody>
</table>

---

**Groundwater Depth (ft.):**

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Water Depth</th>
<th>Stab. Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8/2020</td>
<td>1230</td>
<td>22</td>
<td>5 min</td>
</tr>
<tr>
<td>1/10/2020</td>
<td>0815</td>
<td>10</td>
<td>43.75 hrs</td>
</tr>
<tr>
<td>1/13/2020</td>
<td>0741</td>
<td>10.7</td>
<td>115.5 hrs</td>
</tr>
<tr>
<td>1/13/2020</td>
<td>1530</td>
<td>11</td>
<td>123.25 hrs</td>
</tr>
</tbody>
</table>

---

**Exploration No.:** 

**REMARKS**

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.
### TEST BORING LOG

**Logged By:** B. Carias  
**Drilling Co.:** Soiltesting, Inc.  
**Foreman:** J. Kneple

**Type of Rig:** Truck  
**Rig Model:** Diedrich D-120  
**Drilling Method:** HSA

**Boring Location:** See Plan  
**Ground Surface Elev. (ft.):** 160.5  
**Final Boring Depth (ft.):** 25.9  
**Date Start - Finish:** 1/10/2020 - 1/13/2020

**H. Datum: Project**  
**V. Datum: NAVD 88**

| SS-1 | Top 3": Tan, fine SAND, some fine to coarse Gravel, little Silt, trace Asphalt |
| SS-2 | Bottom 10": Orange, brown, SILT, some fine to coarse SAND, little fine to coarse Gravel |
| SS-3 | Light brown, grey, fine to medium SAND and fine to coarse GRAVEL, trace Silt |
| SS-4 | No Recovery |
| SS-5 | Very dense, light brown, orange, fine to coarse GRAVEL, little fine to coarse Sand, trace Silt |
| SS-6 | Very dense, grey, brown, fine to coarse GRAVEL and SAND, trace Silt |
| SS-7 | Grey, brown, fine to medium SAND, little Silt, trace fine Gravel |
| SS-8 | Grey, light grey, fine to coarse GRAVEL and SAND, trace Silt |

**End of exploration at 25.9 feet below grade.**

---

### Sample Description and Identification

**Type of Rig:** Truck  
**Rig Model:** Diedrich D-120  
**Drilling Method:** HSA

**Sample Description and Identification (Modified Burmister Procedure):**

<table>
<thead>
<tr>
<th>No.</th>
<th>Depth (ft.)</th>
<th>Blows/Core Rate</th>
<th>Sample Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS-1</td>
<td>1-3</td>
<td>24 13 6 5</td>
<td>SS-1: Top 3&quot;: Tan, fine SAND, some fine to coarse Gravel, little Silt, trace Asphalt</td>
</tr>
<tr>
<td>SS-2</td>
<td>3-4.25</td>
<td>15 9 8 14</td>
<td>SS-2: Bottom 10&quot;: Orange, brown, SILT, some fine to coarse SAND, little fine to coarse Gravel</td>
</tr>
<tr>
<td>SS-3</td>
<td>5-5.7</td>
<td>8 8 12 50/2&quot;</td>
<td>SS-3: Light brown, grey, fine to medium SAND and fine to coarse GRAVEL, trace Silt</td>
</tr>
<tr>
<td>SS-4</td>
<td>10-12</td>
<td>24 0 4 14</td>
<td>SS-4: No Recovery</td>
</tr>
<tr>
<td>SS-5</td>
<td>12-14</td>
<td>24 16 25 38</td>
<td>SS-5: Very dense, light brown, orange, fine to coarse GRAVEL, little fine to coarse Sand, trace Silt</td>
</tr>
<tr>
<td>SS-6</td>
<td>15-16.7</td>
<td>20 14 18 29</td>
<td>SS-6: Very dense, grey, brown, fine to coarse GRAVEL and SAND, trace Silt</td>
</tr>
<tr>
<td>SS-7</td>
<td>20-21.3</td>
<td>15 15 34 83</td>
<td>SS-7: Grey, brown, fine to medium SAND, little Silt, trace fine Gravel</td>
</tr>
<tr>
<td>SS-8</td>
<td>25-25.9</td>
<td>11 11 43 100/5&quot;</td>
<td>SS-8: Grey, light grey, fine to coarse GRAVEL and SAND, trace Silt</td>
</tr>
</tbody>
</table>

---

**Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.**

**Exploration No.:** GZ-4

---

**Remarks:**

1 - Grinding/hard augering from 6 ft. to 10 ft. below ground surface  
2 - Grinding from 14 ft. to 15 ft.
## TEST BORING LOG

**Logged By:** B. Carias
**Drilling Co.:** Soiltesting, Inc.
**Foreman:** S. Deangelis

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Casing Blow/ Core Rate</th>
<th>Sample</th>
<th>Blows (per 6 in.)</th>
<th>SPT Value</th>
<th>Sample Description and Identification (Modified Burmister Procedure)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2</td>
<td>SS-1</td>
<td>24</td>
<td>14 16 12 13</td>
<td>28</td>
<td>SS-1: Medium dense, light brown, black, tan, ASPHALT, little fine to coarse Sand, little Silt, trace fine Gravel</td>
</tr>
<tr>
<td>2-4</td>
<td>SS-2</td>
<td>24</td>
<td>12 10 16 14</td>
<td>26</td>
<td>SS-2: No Recovery; Gravel in tip</td>
</tr>
</tbody>
</table>

- End of exploration at 4 feet below grade.

### Remarks

1 - Auger refusal 4 ft. below ground surface; offset boring performed 5 ft. south

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

**Exploration No.:** GZ-5
**TEST BORING LOG**

**Proposed Greenwich Hospital Cancer Center**
Lake Avenue & Lafayette Place
Greenwich, Connecticut

**Logged By:** B. Carias
**Drilling Co.:** Soiltesting, Inc.
**Foreman:** S. Deangelis
**Type of Rig:** Truck
**Rig Model:** Diedrich D-120
**Drilling Method:** HSA

**Boring Location:** See Plan
**Ground Surface Elev. (ft.):** 148.1
**Final Boring Depth (ft.):** 19.5
**Date Start - Finish:** 1/13/2020 - 1/13/2020

**Hammer Type:** Safety
**Hammer Weight (lb.):** 140
**Hammer Fall (in.):** 10
**Auger or Casing O.D./I.D Dia (in.):** 4.25

**Sample Description and Identification**
(Modified Burmister Procedure)

<table>
<thead>
<tr>
<th>Depth (ft.)</th>
<th>Casing Blow Rate</th>
<th>Sample</th>
<th>Depth (ft.)</th>
<th>Pen. (in.)</th>
<th>Rec. (in.)</th>
<th>Blows (per 6 in.)</th>
<th>SPT Value</th>
<th>STRATUM</th>
<th>Description and Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-0</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>: See soil descriptions on GZ-5</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>SS-1</td>
<td>5-7</td>
<td>24</td>
<td>9</td>
<td>17</td>
<td>10</td>
<td>14</td>
<td>SS-1: Medium dense, light brown, black, SILT, some fine to medium Sand, little fine Gravel, trace Roots</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>SS-2</td>
<td>7-9</td>
<td>24</td>
<td>19</td>
<td>4</td>
<td>4</td>
<td>11</td>
<td>SS-2: Top 7&quot;: Light brown, black, SILT, some fine Sand, little fine Gravel, trace Aspalth Bottom 12&quot;: Light brown, tan, SILT, little fine Sand, trace Gravel</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>SS-3</td>
<td>12-13.75</td>
<td>24</td>
<td>17</td>
<td>15</td>
<td>22</td>
<td>40</td>
<td>SS-3: Olive, light grey, SILT, little fine Sand, trace fine to coarse Gravel (Mottled)</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td>SS-4</td>
<td>15-16.7</td>
<td>20</td>
<td>14</td>
<td>26</td>
<td>69</td>
<td>R</td>
<td>SS-4: Top 6&quot;: Olive, light grey, SILT, little fine Sand, trace fine to coarse Gravel (Mottled) Bottom 11&quot;: Light brown, fine SAND, little Silt (DECOMPOSED BEDROCK)</td>
</tr>
<tr>
<td>25</td>
<td></td>
<td>SS-5</td>
<td>19.5-19.5</td>
<td>0</td>
<td>100/0</td>
<td></td>
<td></td>
<td>R</td>
<td>SS-5: Very dense, light brown, grey, orange, fine SAND, little Silt (DECOMPOSED ROCK)</td>
</tr>
<tr>
<td>30</td>
<td></td>
<td>SS-6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SS-6: No Recovery; split spoon refusal End of exploration at 19.5 feet below grade.</td>
</tr>
</tbody>
</table>

**Remarks:**
- 1 - Grinding from 4 to 5 feet
- 2 - Grinding from 19 ft. to 19.5 ft. below ground surface
- 3 - Auger and split spoon refusal at 19.5 ft. below ground surface

**Exploration No.:** GZ-5A
## TEST BORING LOG

**EXPLORATION NO.:** GZ-6  
**PROJECT NO:** 05.0046603.00

**EXPLORATION NO.:** GZ-6  
**PROJECT NO:** 05.0046603.00

<table>
<thead>
<tr>
<th>Explor A LLo.</th>
<th>GZA GeoEnvironmental, Inc.</th>
<th>Proposed Greenwich Hospital Cancer Center Lake Avenue &amp; Lafayette Place Greenwich, Connecticut</th>
<th>REVIEWED BY: J. Davis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logged By:</td>
<td>B. Carias</td>
<td>Drilling Co.: Soiltesting, Inc. Foreman: S. Deangelis</td>
<td></td>
</tr>
<tr>
<td>Type of Rig:</td>
<td>Truck</td>
<td>Boring Location: See Plan Ground Surface Elev. (ft.): 142.4 Final Boring Depth (ft.): 5.4</td>
<td></td>
</tr>
<tr>
<td>Rig Model:</td>
<td>Diedrich D-120</td>
<td>Date Start - Finish: 1/13/2020 - 1/13/2020</td>
<td></td>
</tr>
<tr>
<td>Drilling Method:</td>
<td>HSA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groundwater Depth (ft.)</td>
<td>Date</td>
<td>Time</td>
<td>Water Depth</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----</td>
<td>-----</td>
<td>-------------</td>
</tr>
<tr>
<td>1/13/2020</td>
<td>1430</td>
<td>3</td>
<td>0 min</td>
</tr>
</tbody>
</table>

**Hammer Type:** Safety  
**Hammer Fall (in.):** 30  
**Hammer Weight (lb.):** 140  
**Auger or Casing O.D./ID Dia (in.):** 4.25

### Sample Description and Identification (Modified Burmister Procedure)

<table>
<thead>
<tr>
<th>Depth (ft.)</th>
<th>Casing Blows/ Core Rate</th>
<th>Sample</th>
<th>SPT Value</th>
<th>Sample Description and Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2</td>
<td>9</td>
<td>SS-1</td>
<td>5</td>
<td>SS-1: Top 4*: TOPSOIL</td>
</tr>
<tr>
<td>2-4</td>
<td>11</td>
<td>SS-2</td>
<td>9</td>
<td>SS-2: Medium dense, black, dark brown, SILT, trace fine Sand, little fine Gravel, trace Roots</td>
</tr>
<tr>
<td>5-5.4</td>
<td>5</td>
<td>SS-3</td>
<td>50/5&quot;</td>
<td>SS-3: Top 3*: Black, brown, SILT, trace fine Sand, trace Roots</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Bottom 2&quot;: Tan, light brown, SILT, little fine Sand</td>
</tr>
<tr>
<td>END</td>
<td></td>
<td></td>
<td></td>
<td>End of exploration at 5.4 feet below ground.</td>
</tr>
</tbody>
</table>

- **Groundwater Depth (ft.)**
- **Groundwater Depth (ft.)**
- **Groundwater Depth (ft.)**
- **Groundwater Depth (ft.)**
- **Groundwater Depth (ft.)**

**Groundwater Depth (ft.)**

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Water Depth</th>
<th>Stab. Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/13/2020</td>
<td>1430</td>
<td>3</td>
<td>0 min</td>
</tr>
</tbody>
</table>

**Remarks:**

1 - Groundwater encountered at 3 ft. below ground surface  
2 - Auger and split spoon refusal at 5.4 ft. below ground surface  
3 - Offset boring 5 ft. north performed

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

**Exploration No.:** GZ-6
## Test Boring Log

**Proposal Greenland Hospital Cancer Center**
Lake Avenue & Lafayette Place
Greenwich, Connecticut

<table>
<thead>
<tr>
<th>EXPLORATION NO.:</th>
<th>GZ-6A</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHEET:</td>
<td>1 of 1</td>
</tr>
<tr>
<td>PROJECT NO.:</td>
<td>05.0046603.00</td>
</tr>
<tr>
<td>REVIEWED BY:</td>
<td>J. Davis</td>
</tr>
</tbody>
</table>

### Logged By:
- B. Carias
- S. Deangelis

### Type of Rig:
- Truck

### Rig Model:
- Diedrich D-120

### Drilling Method:
- HSA

### Boring Location:
- See Plan

### Ground Surface Elev. (ft.):
- 142.6

### Final Boring Depth (ft.):
- 12.5

### Date Start - Finish:
- 1/13/2020 - 1/13/2020

### H. Datum:
- Project

### V. Datum:
- NAVD 88

#### Stratification Lines:
- Represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

### Remarks:
- 1 - Groundwater encountered at 3 ft. below ground surface
- 2 - Rock coring performed with NX-sized, double-tube core barrel. Core rate in units of min/ft. RQD=Rock Quality Designation

### Hammer Type:
- Safety

### Hammer Weight (lb.):
- 140

### Hammer Fall (in.):
- 30

### Auger or Casing O.D./L.D Dia (in.):
- 4.25

### Sample Description and Identification:

<table>
<thead>
<tr>
<th>Depth (ft.)</th>
<th>Sample</th>
<th>Casing Blows/ Core Rate</th>
<th>Sample Description and Identification (Modified Burmister Procedure)</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-0</td>
<td></td>
<td></td>
<td>: See soil description in GZ-11</td>
<td>1</td>
</tr>
<tr>
<td>5-10</td>
<td>SS-1</td>
<td></td>
<td>: Top 4&quot;: Brown, black, SILT, little fine Sand, trace Roots, trace Wood pieces Bottom 4&quot;: Light brown, grey, fine to coarse SAND, trace Silt (DECOMPOSED BEDROCK) C-1: Hard, very slight weathering, slightly fractured, fine to coarse grained, grey, SCHIST</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>C-1</td>
<td></td>
<td>End of exploration at 12.5 feet below grade.</td>
<td></td>
</tr>
<tr>
<td>15-20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-25</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>25-30</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

### Groundwater Depth (ft.)

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Water Depth</th>
<th>Stab. Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/13/2020</td>
<td>1445</td>
<td>3</td>
<td>0 min</td>
</tr>
</tbody>
</table>

### Field Test Data

- Hammer Weight (lb.): 4.25
- Hammer Fall (in.): 140
- Hammer Type: Diedrich D-120
- Rig Model: NX
- Rig Model: 120
- Core Barrel Size: NX
- Sampler O.D. (in.): 2.0
- Sampler Length (in.): 24
- Core Barrel Size: NX
- Sample O.D. (in.): 2.0
- Sample Length (in.): 24
- Sample O.D. (in.): 2.0
- Sample Length (in.): 24
- Groundwater Depth (ft.): 3
- Water Depth (ft.): 12.5
- Stab. Time (min): 0

### Final Boring Depth (ft.):
- 12.5

### Date Start - Finish:
- 1/13/2020 - 1/13/2020
APPENDIX D

LABORATORY TEST RESULTS
### Particle Size Analysis - ASTM D6913/D7928

<table>
<thead>
<tr>
<th>Grain Size (mm)</th>
<th>Percent Finer</th>
<th>Spec. Percent</th>
<th>Complies</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.75 in</td>
<td>19.00</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>0.5 in</td>
<td>12.50</td>
<td>93</td>
<td></td>
</tr>
<tr>
<td>0.375 in</td>
<td>9.30</td>
<td>93</td>
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</tr>
<tr>
<td>#4</td>
<td>4.75</td>
<td>86</td>
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</tr>
<tr>
<td>#10</td>
<td>2.00</td>
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</tr>
<tr>
<td>#20</td>
<td>0.85</td>
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<tr>
<td>#40</td>
<td>0.42</td>
<td>45</td>
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<td>#80</td>
<td>0.25</td>
<td>24</td>
<td></td>
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<tr>
<td>#100</td>
<td>0.15</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>#140</td>
<td>0.11</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>#200</td>
<td>0.075</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Hydrometer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>0.0326</td>
<td>16</td>
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<tr>
<td>---</td>
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<tr>
<td>---</td>
<td>0.0014</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

### Visual Description
- Moist, olive brown silty sand

### Sample Comment
- ---

### Coefficients
- $D_{85} = 4.3341$ mm
- $D_{10} = 0.1914$ mm
- $D_{50} = 0.8298$ mm
- $D_{15} = 0.0255$ mm
- $D_{50} = 0.5265$ mm
- $D_{10} = 0.0107$ mm
- $C_v = 77.551$
- $C_c = 4.126$

### Classification
- ASTM: N/A
- AASHTO: Stone Fragments, Gravel and Sand (A-1-b (0))

### Sample/Test Description
- Sand/Gravel Particle Shape: ANGULAR
- Sand/Gravel Hardness: HARD
- Dispersion Device: Apparatus A - Mech Mixer
- Dispersion Period: 1 minute
- Est. Specific Gravity: 2.65
- Separation of Sample: #200 Sieve
### Particle Size Analysis - ASTM D6913/D7928

#### Visual Description
Moist, yellowish brown silty sand

#### Test Comment
---

#### Sample Comment
---

#### Particle Size Analysis

<table>
<thead>
<tr>
<th>Sieve Name</th>
<th>Sieve Size (mm)</th>
<th>Percent Finer</th>
<th>Spec. Percent</th>
<th>Complies</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 in</td>
<td>12.50</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.375 in</td>
<td>9.50</td>
<td>96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#4</td>
<td>4.75</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>#10</td>
<td>2.00</td>
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<tr>
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<td>#100</td>
<td>0.15</td>
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<tr>
<td>#140</td>
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<td>#200</td>
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</table>

<table>
<thead>
<tr>
<th>Hydrometer</th>
<th>Particle Size (mm)</th>
<th>Percent Finer</th>
<th>Spec. Percent</th>
<th>Complies</th>
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</tr>
<tr>
<td></td>
<td>0.094</td>
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<tr>
<td></td>
<td>0.067</td>
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<td>0.047</td>
<td>9</td>
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</tr>
<tr>
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<td>0.014</td>
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<tr>
<td></td>
<td>0.004</td>
<td>3</td>
<td></td>
<td></td>
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</tbody>
</table>

#### Coefficients

- $D_{85} = 1.4906$ mm
- $D_{50} = 0.1248$ mm
- $D_{30} = 0.4387$ mm
- $D_{15} = 0.0119$ mm
- $D_{10} = 0.3092$ mm
- $D_{10} = 0.0057$ mm
- $C_b = 76.965$
- $C_c = 6.229$

#### ASTM
N/A

#### AASHTO
Silty Gravel and Sand (A-2-4 (0))

#### Classification

- Sand/Gravel Particle Shape: ANGULAR
- Sand/Gravel Hardness: HARD
- Dispersion Device: Apparatus A - Mech Mixer
- Dispersion Period: 1 minute
- Est. Specific Gravity: 2.65
- Separation of Sample: #200 Sieve
Particle Size Analysis - ASTM D6913/D7928

<table>
<thead>
<tr>
<th>Sieve Name</th>
<th>Sieve Size, mm</th>
<th>Percent Finer</th>
<th>Spec. Percent</th>
<th>Complies</th>
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<tbody>
<tr>
<td>0.75 in</td>
<td>19.00</td>
<td>100</td>
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<tr>
<td>0.5 in</td>
<td>12.50</td>
<td>78</td>
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<td>0.375 in</td>
<td>9.50</td>
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<tr>
<td>#4</td>
<td>4.75</td>
<td>72</td>
<td></td>
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<td>#10</td>
<td>2.00</td>
<td>69</td>
<td></td>
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<tr>
<td>#20</td>
<td>0.85</td>
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<td>#40</td>
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<tr>
<td>#60</td>
<td>0.25</td>
<td>45</td>
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<tr>
<td>#100</td>
<td>0.15</td>
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<td>#140</td>
<td>0.11</td>
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<td>#200</td>
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</table>

Hydrometer

<table>
<thead>
<tr>
<th>Particle Size (mm)</th>
<th>Percent Finer</th>
<th>Spec. Percent</th>
<th>Complies</th>
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</thead>
<tbody>
<tr>
<td>0.0327</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0210</td>
<td>12</td>
<td></td>
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</tr>
<tr>
<td>0.0134</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0092</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0068</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0048</td>
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</tr>
<tr>
<td>0.0034</td>
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</tr>
<tr>
<td>0.0015</td>
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</table>

**Coefficients**

| D_85 = 14.2857 mm | D_10 = 0.1060 mm |
| D_60 = 0.6272 mm  | D_15 = 0.0260 mm |
| D_50 = 0.2887 mm  | D_10 = 0.0134 mm |
| C_u = 46.806      | C_C = 1.337     |

**Classification**

<table>
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<tbody>
<tr>
<td>AASHTO</td>
<td>Silty Gravel and Sand (A-2-4 (0))</td>
</tr>
</tbody>
</table>

**Sample/Test Description**

- Sand/Gravel Particle Shape: ANGULAR
- Sand/Gravel Hardness: HARD
- Dispersion Device: Apparatus A - Mech Mixer
- Dispersion Period: 1 minute
- Est. Specific Gravity: 2.65
- Separation of Sample: #200 Sieve
Appendix 5a
Existing Conditions HydroCAD Report
## Rainfall Events Listing

<table>
<thead>
<tr>
<th>Event#</th>
<th>Event Name</th>
<th>Storm Type</th>
<th>Curve</th>
<th>Mode</th>
<th>Duration (hours)</th>
<th>B/B</th>
<th>Depth (inches)</th>
<th>AMC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 Year</td>
<td>Type III 24-hr</td>
<td>Default</td>
<td>24.00</td>
<td>1</td>
<td>2.90</td>
<td>2</td>
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</tr>
<tr>
<td>2</td>
<td>2 Year</td>
<td>Type III 24-hr</td>
<td>Default</td>
<td>24.00</td>
<td>1</td>
<td>3.40</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>5 Year</td>
<td>Type III 24-hr</td>
<td>Default</td>
<td>24.00</td>
<td>1</td>
<td>4.30</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>10 Year</td>
<td>Type III 24-hr</td>
<td>Default</td>
<td>24.00</td>
<td>1</td>
<td>5.10</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>25 Year</td>
<td>Type III 24-hr</td>
<td>Default</td>
<td>24.00</td>
<td>1</td>
<td>6.40</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>50 Year</td>
<td>Type III 24-hr</td>
<td>Default</td>
<td>24.00</td>
<td>1</td>
<td>7.60</td>
<td>2</td>
<td></td>
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<tr>
<td>7</td>
<td>100 Year</td>
<td>Type III 24-hr</td>
<td>Default</td>
<td>24.00</td>
<td>1</td>
<td>9.10</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>wqv</td>
<td>Type III 24-hr</td>
<td>Default</td>
<td>24.00</td>
<td>1</td>
<td>1.00</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
## Area Listing (all nodes)

<table>
<thead>
<tr>
<th>Area (sq-ft)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>35,776</td>
<td>79</td>
<td>50-75% Grass cover, Fair, HSG C (1S, 2S, 3S, 4S)</td>
</tr>
<tr>
<td>60,950</td>
<td>98</td>
<td>Paved parking, HSG C (1S, 2S, 3S, 4S)</td>
</tr>
<tr>
<td><strong>96,726</strong></td>
<td>91</td>
<td><strong>TOTAL AREA</strong></td>
</tr>
</tbody>
</table>
Subcatchment 1S: Ex Lake Ave
- Runoff Area = 29,754 sf
- 66.36% Impervious
- Runoff Depth > 2.07"
- Flow Length = 228'
- Tc = 5.0 min
- CN = 92
- Runoff = 1.68 cfs
- 5,120 cf

Subcatchment 2S: Ex. Drywell
- Runoff Area = 11,947 sf
- 89.37% Impervious
- Runoff Depth > 2.45"
- Tc = 5.0 min
- CN = 96
- Runoff = 0.77 cfs
- 2,441 cf

Subcatchment 3S: Ex. 12" Pipe
- Runoff Area = 28,721 sf
- 47.66% Impervious
- Runoff Depth > 1.73"
- Tc = 5.0 min
- CN = 88
- Runoff = 1.38 cfs
- 4,136 cf

Subcatchment 4S: Ex. FH Overland
- Runoff Area = 26,304 sf
- 64.02% Impervious
- Runoff Depth > 1.98"
- Tc = 5.0 min
- CN = 91
- Runoff = 1.43 cfs
- 4,333 cf

Pond 8P: Ex. Drywell
- Inflow = 0.77 cfs
- Primary = 0.77 cfs
- 2,441 cf

Link 6L: Ex Lake Ave
- Inflow = 5.27 cfs
- Primary = 5.27 cfs
- 16,030 cf

Link 7L: Ex. Fairfield House
- Inflow = 3.58 cfs
- Primary = 3.58 cfs
- 10,909 cf

Total Runoff Area = 96,726 sf
Runoff Volume = 16,030 cf
Average Runoff Depth = 1.99"
36.99% Pervious = 35,776 sf
63.01% Impervious = 60,950 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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: Ex Lake Ave**
- Runoff Area=29,754 sf 66.36% Impervious Runoff Depth>2.54"
- Flow Length=228’ Tc=5.0 min CN=92 Runoff=2.05 cfs 6,296 cf

**Subcatchment 2S: Ex. Drywell**
- Runoff Area=11,947 sf 89.37% Impervious Runoff Depth>2.94"
- Tc=5.0 min CN=96 Runoff=0.91 cfs 2,931 cf

**Subcatchment 3S: Ex. 12" Pipe**
- Runoff Area=28,721 sf 47.66% Impervious Runoff Depth>2.18"
- Tc=5.0 min CN=88 Runoff=1.74 cfs 5,208 cf

**Subcatchment 4S: Ex. FH Overland**
- Runoff Area=26,304 sf 64.02% Impervious Runoff Depth>2.44"
- Tc=5.0 min CN=91 Runoff=1.76 cfs 5,359 cf

**Pond 8P: Ex. Drywell**
- Inflow=0.91 cfs 2,931 cf
- Primary=0.91 cfs 2,931 cf

**Link 6L: Ex Lake Ave**
- Inflow=6.46 cfs 19,793 cf
- Primary=6.46 cfs 19,793 cf

**Link 7L: Ex. Fairfield House**
- Inflow=4.41 cfs 13,498 cf
- Primary=4.41 cfs 13,498 cf

**Total Runoff Area = 96,726 sf**  **Runoff Volume = 19,793 cf**  **Average Runoff Depth = 2.46"**
**36.99% Pervious = 35,776 sf**  **63.01% Impervious = 60,950 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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

<table>
<thead>
<tr>
<th>Subcatchment</th>
<th>Type</th>
<th>Impervious</th>
<th>Runoff</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1S: Ex Lake Ave</td>
<td>Runoff Area=29,754 sf</td>
<td>66.36%</td>
<td>Runoff Depth&gt;3.41&quot;</td>
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<tr>
<td>2S: Ex. Drywell</td>
<td>Runoff Area=11,947 sf</td>
<td>89.37%</td>
<td>Runoff Depth&gt;3.83&quot;</td>
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<tr>
<td>3S: Ex. 12&quot; Pipe</td>
<td>Runoff Area=28,721 sf</td>
<td>47.66%</td>
<td>Runoff Depth&gt;3.01&quot;</td>
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</tr>
<tr>
<td>4S: Ex. FH Overland</td>
<td>Runoff Area=26,304 sf</td>
<td>64.02%</td>
<td>Runoff Depth&gt;3.30&quot;</td>
<td></td>
</tr>
</tbody>
</table>

Pond 8P: Ex. Drywell
Inflow=1.17 cfs 3,818 cf
Primary=1.17 cfs 3,818 cf

Link 6L: Ex Lake Ave
Inflow=8.60 cfs 26,696 cf
Primary=8.60 cfs 26,696 cf

Link 7L: Ex. Fairfield House
Inflow=5.89 cfs 18,252 cf
Primary=5.89 cfs 18,252 cf

Total Runoff Area = 96,726 sf  Runoff Volume = 26,696 cf  Average Runoff Depth = 3.31"
36.99% Pervious = 35,776 sf  63.01% Impervious = 60,950 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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: Ex Lake Ave**
- Runoff Area=29,754 sf 66.36% Impervious  Runoff Depth>4.18"
- Flow Length=228’  Tc=5.0 min  CN=92  Runoff=3.29 cfs 10,374 cf

**Subcatchment 2S: Ex. Drywell**
- Runoff Area=11,947 sf 89.37% Impervious  Runoff Depth>4.63"
  - Tc=5.0 min  CN=96  Runoff=1.40 cfs 4,608 cf

**Subcatchment 3S: Ex. 12" Pipe**
- Runoff Area=28,721 sf 47.66% Impervious  Runoff Depth>3.76"
  - Tc=5.0 min  CN=88  Runoff=2.94 cfs 9,002 cf

**Subcatchment 4S: Ex. FH Overland**
- Runoff Area=26,304 sf 64.02% Impervious  Runoff Depth>4.08"
  - Tc=5.0 min  CN=91  Runoff=2.86 cfs 8,935 cf

**Pond 8P: Ex. Drywell**
- Inflow=1.40 cfs 4,608 cf
- Primary=1.40 cfs 4,608 cf

**Link 6L: Ex Lake Ave**
- Inflow=10.49 cfs 32,919 cf
- Primary=10.49 cfs 32,919 cf

**Link 7L: Ex. Fairfield House**
- Inflow=7.20 cfs 22,545 cf
- Primary=7.20 cfs 22,545 cf

**Total Runoff Area = 96,726 sf  Runoff Volume = 32,919 cf  Average Runoff Depth = 4.08"**
**36.99% Pervious = 35,776 sf  63.01% Impervious = 60,950 sf**
**Type III 24-hr 25 Year Rainfall=6.40”**

**6355 Drainage Model Revised 2021-05 - EX**

- **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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

### Subcatchment 1S: Ex Lake Ave
- **Runoff Area=29,754 sf** 66.36% Impervious  Runoff Depth>5.46”
  - Flow Length=228’  Tc=5.0 min  CN=92  Runoff=4.23 cfs  13,536 cf

### Subcatchment 2S: Ex. Drywell
- **Runoff Area=11,947 sf** 89.37% Impervious  Runoff Depth>5.92”
  - Tc=5.0 min  CN=96  Runoff=1.76 cfs  5,896 cf

### Subcatchment 3S: Ex. 12” Pipe
- **Runoff Area=28,721 sf** 47.66% Impervious  Runoff Depth>5.01”
  - Tc=5.0 min  CN=88  Runoff=3.86 cfs  11,986 cf

### Subcatchment 4S: Ex. FH Overland
- **Runoff Area=26,304 sf** 64.02% Impervious  Runoff Depth>5.35”
  - Tc=5.0 min  CN=91  Runoff=3.69 cfs  11,717 cf

### Pond 8P: Ex. Drywell
- **Inflow=1.76 cfs**  5,896 cf  
  - **Primary=1.76 cfs**  5,896 cf

### Link 6L: Ex Lake Ave
- **Inflow=13.55 cfs**  43,135 cf  
  - **Primary=13.55 cfs**  43,135 cf

### Link 7L: Ex. Fairfield House
- **Inflow=9.32 cfs**  29,599 cf  
  - **Primary=9.32 cfs**  29,599 cf

**Total Runoff Area = 96,726 sf**  Runoff Volume = 43,135 cf  Average Runoff Depth = 5.35”

- 36.99% Pervious = 35,776 sf  63.01% Impervious = 60,950 sf
Summary for Subcatchment 1S: Ex Lake Ave

Runoff = 4.23 cfs @ 12.07 hrs, Volume= 13,536 cf, Depth > 5.46"

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>
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<td>19,744</td>
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<td>Paved parking, HSG C</td>
</tr>
<tr>
<td>10,010</td>
<td>79</td>
<td>50-75% Grass cover, Fair, HSG C</td>
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<tr>
<td>29,754</td>
<td>92</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>10,010</td>
<td>33.64%</td>
<td>Pervious Area</td>
</tr>
<tr>
<td>19,744</td>
<td>66.36%</td>
<td>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>
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</thead>
<tbody>
<tr>
<td>3.5</td>
<td>126</td>
<td>0.0440</td>
<td>0.60</td>
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<td>Sheet Flow,</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td>Fallow n = 0.050 P2 = 3.36&quot;</td>
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<tr>
<td>0.6</td>
<td>102</td>
<td>0.0300</td>
<td>2.79</td>
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<td>Shallow Concentrated Flow,</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Unpaved Kv = 16.1 fps</td>
</tr>
</tbody>
</table>

4.1 228 Total, Increased to minimum Tc = 5.0 min

Subcatchment 1S: Ex Lake Ave

Type III 24-hr
25 Year Rainfall=6.40"
Runoff Area=29,754 sf
Runoff Volume=13,536 cf
Runoff Depth > 5.46"
Flow Length=228'
Tc=5.0 min
CN=92
### Summary for Subcatchment 2S: Ex. Drywell

Runoff = 1.76 cfs @ 12.07 hrs, Volume= 5,896 cf, Depth> 5.92"

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>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
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<tbody>
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<td>Paved parking, HSG C</td>
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<tr>
<td>1,270</td>
<td>79</td>
<td>50-75% Grass cover, Fair, HSG C</td>
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<tr>
<td>11,947</td>
<td>96</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>1,270</td>
<td>106.3% Pervious Area</td>
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</tr>
<tr>
<td>10,677</td>
<td>89.37% 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>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Direct Entry,</td>
</tr>
</tbody>
</table>

### Subcatchment 2S: Ex. Drywell

Type III 24-hr
25 Year Rainfall=6.40"
Runoff Area=11,947 sf
Runoff Volume=5,896 cf
Runoff Depth>5.92"
Tc=5.0 min
CN=96

![Hydrograph](image-url)
Summary for Subcatchment 3S: Ex. 12" Pipe

Runoff = 3.86 cfs @ 12.07 hrs, Volume= 11,986 cf, Depth> 5.01"

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>13,688</td>
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<td>Paved parking, HSG C</td>
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<tr>
<td>15,033</td>
<td>79</td>
<td>50-75% Grass cover, Fair, HSG C</td>
</tr>
<tr>
<td>28,721</td>
<td>88</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>15,033</td>
<td>52.34% Pervious Area</td>
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</tr>
<tr>
<td>13,688</td>
<td>47.66% Impervious Area</td>
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</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>
<tbody>
<tr>
<td>5.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Direct Entry,</td>
</tr>
</tbody>
</table>

Subcatchment 3S: Ex. 12" Pipe

Hydrograph

Type III 24-hr
25 Year Rainfall=6.40"
Runoff Area=28,721 sf
Runoff Volume=11,986 cf
Runoff Depth>5.01"
Tc=5.0 min
CN=88
Summary for Subcatchment 4S: Ex. FH Overland

Runoff = 3.69 cfs @ 12.07 hrs, Volume= 11,717 cf, Depth> 5.35"

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>16,841</td>
<td>98</td>
<td>Paved parking, HSG C</td>
</tr>
<tr>
<td>9,463</td>
<td>79</td>
<td>50-75% Grass cover, Fair, HSG C</td>
</tr>
<tr>
<td>26,304</td>
<td>91</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>9,463</td>
<td>35.98%</td>
<td>Pervious Area</td>
</tr>
<tr>
<td>16,841</td>
<td>64.02%</td>
<td>Impervious Area</td>
</tr>
</tbody>
</table>

Tc = 5.0 min

Subcatchment 4S: Ex. FH Overland

Type III 24-hr
25 Year Rainfall=6.40"
Runoff Area=26,304 sf
Runoff Volume=11,717 cf
Runoff Depth>5.35"
Tc=5.0 min
CN=91

Hydrograph
Summary for Pond 8P: Ex. Drywell

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 11,947 sf, 89.37% Impervious, Inflow Depth > 5.92" for 25 Year event
Inflow = 1.76 cfs @ 12.07 hrs, Volume= 5,896 cf
Primary = 1.76 cfs @ 12.07 hrs, Volume= 5,896 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Pond 8P: Ex. Drywell

Inflow Area=11,947 sf
Summary for Link 6L: Ex Lake Ave

Inflow Area = 96,726 sf, 63.01% Impervious, Inflow Depth > 5.35" for 25 Year event
Inflow = 13.55 cfs @ 12.07 hrs, Volume = 43,135 cf
Primary = 13.55 cfs @ 12.07 hrs, Volume = 43,135 cf, Atten = 0%, Lag = 0.0 min

Primary outflow = Inflow, Time Span = 0.00-24.00 hrs, dt = 0.01 hrs
Summary for Link 7L: Ex. Fairfield House

Inflow Area = 66,972 sf, 61.53% Impervious, Inflow Depth > 5.30" for 25 Year event
Inflow = 9.32 cfs @ 12.07 hrs, Volume= 29,599 cf
Primary = 9.32 cfs @ 12.07 hrs, Volume= 29,599 cf, Attenuation= 0%, Lag= 0.0 min

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

Link 7L: Ex. Fairfield House

Hydrograph
6355 Drainage Model Revised 2021-05 - EX

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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Ex Lake Ave
  Runoff Area=29,754 sf   66.36% Impervious   Runoff Depth>6.64"
  Flow Length=228'   Tc=5.0 min   CN=92   Runoff=5.09 cfs  16,471 cf

Subcatchment 2S: Ex. Drywell
  Runoff Area=11,947 sf   89.37% Impervious   Runoff Depth>7.12"
  Tc=5.0 min   CN=96   Runoff=2.10 cfs  7,086 cf

Subcatchment 3S: Ex. 12" Pipe
  Runoff Area=28,721 sf   47.66% Impervious   Runoff Depth>6.17"
  Tc=5.0 min   CN=88   Runoff=4.71 cfs  14,775 cf

Subcatchment 4S: Ex. FH Overland
  Runoff Area=26,304 sf   64.02% Impervious   Runoff Depth>6.53"
  Tc=5.0 min   CN=91   Runoff=4.46 cfs  14,303 cf

Pond 8P: Ex. Drywell
  Inflow=2.10 cfs  7,086 cf
  Primary=2.10 cfs  7,086 cf

Link 6L: Ex Lake Ave
  Inflow=16.36 cfs  52,635 cf
  Primary=16.36 cfs  52,635 cf

Link 7L: Ex. Fairfield House
  Inflow=11.27 cfs  36,163 cf
  Primary=11.27 cfs  36,163 cf

Total Runoff Area = 96,726 sf  Runoff Volume = 52,635 cf  Average Runoff Depth = 6.53"
  36.99% Pervious = 35,776 sf  63.01% Impervious = 60,950 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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Ex Lake Ave
- Runoff Area=29,754 sf  66.36% Impervious  Runoff Depth>8.13"
- Flow Length=228’  Tc=5.0 min  CN=92  Runoff=6.16 cfs  20,154 cf

Subcatchment 2S: Ex. Drywell
- Runoff Area=11,947 sf  89.37% Impervious  Runoff Depth>8.61"
- Tc=5.0 min  CN=96  Runoff=2.53 cfs  8,575 cf

Subcatchment 3S: Ex. 12" Pipe
- Runoff Area=28,721 sf  47.66% Impervious  Runoff Depth>7.64"
- Tc=5.0 min  CN=88  Runoff=5.75 cfs  18,287 cf

Subcatchment 4S: Ex. FH Overland
- Runoff Area=26,304 sf  64.02% Impervious  Runoff Depth>8.01"
- Tc=5.0 min  CN=91  Runoff=5.41 cfs  17,550 cf

Pond 8P: Ex. Drywell
- Inflow=2.53 cfs  8,575 cf
- Primary=2.53 cfs  8,575 cf

Link 6L: Ex Lake Ave
- Inflow=19.85 cfs  64,566 cf
- Primary=19.85 cfs  64,566 cf

Link 7L: Ex. Fairfield House
- Inflow=13.69 cfs  44,412 cf
- Primary=13.69 cfs  44,412 cf

Total Runoff Area = 96,726 sf  Runoff Volume = 64,566 cf  Average Runoff Depth = 8.01"
36.99% Pervious = 35,776 sf  63.01% Impervious = 60,950 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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Ex Lake Ave
Runoff Area=29,754 sf  66.36% Impervious  Runoff Depth>0.40" 
Flow Length=228’  Tc=5.0 min  CN=92  Runoff=0.33 cfs  997 cf

Subcatchment 2S: Ex. Drywell
Runoff Area=11,947 sf  89.37% Impervious  Runoff Depth>0.63" 
Tc=5.0 min  CN=96  Runoff=0.21 cfs  627 cf

Subcatchment 3S: Ex. 12" Pipe
Runoff Area=28,721 sf  47.66% Impervious  Runoff Depth>0.25" 
Tc=5.0 min  CN=88  Runoff=0.18 cfs  605 cf

Subcatchment 4S: Ex. FH Overland
Runoff Area=26,304 sf  64.02% Impervious  Runoff Depth>0.36" 
Tc=5.0 min  CN=91  Runoff=0.25 cfs  787 cf

Pond 8P: Ex. Drywell
Inflow=0.21 cfs  627 cf  Primary=0.21 cfs  627 cf

Link 6L: Ex Lake Ave
Inflow=0.97 cfs  3,015 cf  Primary=0.97 cfs  3,015 cf

Link 7L: Ex. Fairfield House
Inflow=0.64 cfs  2,018 cf  Primary=0.64 cfs  2,018 cf

Total Runoff Area = 96,726 sf  Runoff Volume = 3,015 cf  Average Runoff Depth = 0.37"
36.99% Pervious = 35,776 sf  63.01% Impervious = 60,950 sf
Appendix 5b
Proposed Conditions HydroCAD Report
## Rainfall Events Listing

<table>
<thead>
<tr>
<th>Event#</th>
<th>Event Name</th>
<th>Storm Type</th>
<th>Curve</th>
<th>Mode</th>
<th>Duration (hours)</th>
<th>B/B</th>
<th>Depth (inches)</th>
<th>AMC</th>
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<tbody>
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<td>1 Year</td>
<td>Type III 24-hr</td>
<td>Default</td>
<td>24.00</td>
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<td>2.90</td>
<td>2</td>
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<tr>
<td>2</td>
<td>2 Year</td>
<td>Type III 24-hr</td>
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<td>1</td>
<td>3.40</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>5 Year</td>
<td>Type III 24-hr</td>
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<td>4.30</td>
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<td>10 Year</td>
<td>Type III 24-hr</td>
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<td>5.10</td>
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<td>5</td>
<td>25 Year</td>
<td>Type III 24-hr</td>
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<td>6.40</td>
<td>2</td>
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<td>50 Year</td>
<td>Type III 24-hr</td>
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<td>7</td>
<td>100 Year</td>
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<td>8</td>
<td>wqv</td>
<td>Type III 24-hr</td>
<td>Default</td>
<td>24.00</td>
<td>1</td>
<td>1.00</td>
<td>2</td>
<td></td>
</tr>
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</table>
## Area Listing (all nodes)

<table>
<thead>
<tr>
<th>Area (sq-ft)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>25,342</td>
<td>74</td>
<td>&gt;75% Grass cover, Good, HSG C (10S, 13S, 14S, 16S, 23S)</td>
</tr>
<tr>
<td>71,386</td>
<td>98</td>
<td>Paved parking, HSG C (10S, 13S, 14S, 16S, 23S)</td>
</tr>
<tr>
<td>96,728</td>
<td>92</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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 10S: Pr Lake Ave
Runoff Area=1,518 sf  51.19% Impervious  Runoff Depth>1.58"
Tc=5.0 min  CN=86  Runoff=0.07 cfs  199 cf

Subcatchment 13S: Pr FH Overland
Runoff Area=3,965 sf  7.67% Impervious  Runoff Depth>0.95"
Tc=5.0 min  CN=76  Runoff=0.10 cfs  313 cf

Subcatchment 14S: Pr 12" Pipe
Runoff Area=5,772 sf  5.20% Impervious  Runoff Depth>0.89"
Tc=5.0 min  CN=75  Runoff=0.14 cfs  430 cf

Subcatchment 16S: Pr Sand Filter
Runoff Area=56,103 sf  89.29% Impervious  Runoff Depth>2.35"
Tc=5.0 min  CN=95  Runoff=3.50 cfs 10,987 cf

Subcatchment 23S: Pr Infil
Runoff Area=29,370 sf  67.78% Impervious  Runoff Depth>1.89"
Tc=5.0 min  CN=90  Runoff=1.54 cfs  4,628 cf

Peak Elev=147.14'  Storage=2,062 cf  Inflow=1.54 cfs  4,628 cf
Outflow=0.68 cfs  2,675 cf

Pond 18P: Sand Filter
Peak Elev=139.70'  Storage=4,168 cf  Inflow=3.50 cfs  10,987 cf
Primary=0.34 cfs  10,869 cf  Secondary=0.08 cfs  110 cf  Outflow=0.42 cfs  10,979 cf

Pond 20P: Groundwater
Peak Elev=136.57'  Inflow=0.22 cfs  19,016 cf
8.0" Round Culvert  n=0.011  L=193.0'  S=0.0062 '/'  Outflow=0.22 cfs  19,016 cf

Link 11L: Pr Lake Ave
Inflow=1.32 cfs  33,613 cf
Primary=1.32 cfs  33,613 cf

Link 12L: Pr Fairfield House
Inflow=0.24 cfs  854 cf
Primary=0.24 cfs  854 cf

Link 22L: MH#101
Inflow=1.16 cfs  32,560 cf
Primary=1.16 cfs  32,560 cf

Link 23L: FH 12" Pipe PR
Inflow=0.14 cfs  541 cf
Primary=0.14 cfs  541 cf

Total Runoff Area = 96,728 sf  Runoff Volume = 16,558 cf  Average Runoff Depth = 2.05"
26.20% Pervious = 25,342 sf  73.80% Impervious = 71,386 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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 10S: Pr Lake Ave
Runoff Area=1,518 sf  51.19% Impervious  Runoff Depth>2.01"  
Tc=5.0 min  CN=86  Runoff=0.09 cfs  254 cf

Subcatchment 13S: Pr FH Overland
Runoff Area=3,965 sf  7.67% Impervious  Runoff Depth>1.29"  
Tc=5.0 min  CN=76  Runoff=0.14 cfs  427 cf

Subcatchment 14S: Pr 12" Pipe
Runoff Area=5,772 sf  5.20% Impervious  Runoff Depth>1.23"  
Tc=5.0 min  CN=75  Runoff=0.19 cfs  592 cf

Subcatchment 16S: Pr Sand Filter
Runoff Area=56,103 sf  89.29% Impervious  Runoff Depth>2.84"  
Tc=5.0 min  CN=95  Runoff=4.19 cfs  13,272 cf

Subcatchment 23S: Pr Infil
Runoff Area=29,370 sf  67.78% Impervious  Runoff Depth>2.35"  
Tc=5.0 min  CN=90  Runoff=1.90 cfs  5,758 cf

Pond 17P: Pr Infil
Peak Elev=147.28'  Storage=2,119 cf  Inflow=1.90 cfs  5,758 cf  
Outflow=1.88 cfs  3,806 cf

Pond 18P: Sand Filter
Peak Elev=139.80'  Storage=4,319 cf  Inflow=4.19 cfs  13,272 cf  
Primary=0.87 cfs  12,525 cf  Secondary=0.60 cfs  738 cf  Outflow=1.47 cfs  13,263 cf

Pond 20P: Groundwater
Peak Elev=136.57'  Inflow=0.22 cfs  19,016 cf  
8.0" Round Culvert  n=0.011  L=193.0'  S=0.0062 '/'  Outflow=0.22 cfs  19,016 cf

Link 11L: Pr Lake Ave
Inflow=2.76 cfs  37,357 cf  
Primary=2.76 cfs  37,357 cf

Link 12L: Pr Fairfield House
Inflow=0.75 cfs  1,757 cf  
Primary=0.75 cfs  1,757 cf

Link 22L: MH#101
Inflow=2.36 cfs  35,347 cf  
Primary=2.36 cfs  35,347 cf

Link 23L: FH 12" Pipe PR
Inflow=0.69 cfs  1,330 cf  
Primary=0.69 cfs  1,330 cf

Total Runoff Area = 96,728 sf  Runoff Volume = 20,303 cf  Average Runoff Depth = 2.52"  
26.20% Pervious = 25,342 sf  73.80% Impervious = 71,386 sf
Subcatchment 10S: Pr Lake Ave
Runoff Area=1,518 sf  51.19% Impervious  Runoff Depth>2.82"
Tc=5.0 min   CN=86   Runoff=0.12 cfs  356 cf

Subcatchment 13S: Pr FH Overland
Runoff Area=3,965 sf  7.67% Impervious  Runoff Depth>1.97"
Tc=5.0 min   CN=76   Runoff=0.22 cfs  651 cf

Subcatchment 14S: Pr 12" Pipe
Runoff Area=5,772 sf  5.20% Impervious  Runoff Depth>1.89"
Tc=5.0 min   CN=75   Runoff=0.30 cfs  910 cf

Subcatchment 16S: Pr Sand Filter
Runoff Area=56,103 sf  89.29% Impervious  Runoff Depth>3.72"
Tc=5.0 min   CN=95   Runoff=5.41 cfs  17,413 cf

Subcatchment 23S: Pr Infil
Runoff Area=29,370 sf  67.78% Impervious  Runoff Depth>3.20"
Tc=5.0 min   CN=90   Runoff=2.56 cfs  7,837 cf

Pond 17P: Pr Infil
Peak Elev=147.34'  Storage=2,124 cf  Inflow=2.56 cfs  7,837 cf
Outflow=2.55 cfs  5,882 cf

Pond 18P: Sand Filter
Peak Elev=139.94'  Storage=4,531 cf  Inflow=5.41 cfs  17,413 cf
Primary=2.04 cfs  15,404 cf  Secondary=1.78 cfs  1,997 cf  Outflow=3.82 cfs  17,401 cf

Pond 20P: Groundwater
Peak Elev=136.57'  Inflow=0.22 cfs  19,016 cf
8.0" Round Culvert n=0.011  L=193.0'  S=0.0062 '/'  Outflow=0.22 cfs  19,016 cf

Link 11L: Pr Lake Ave
Inflow=6.47 cfs  44,217 cf
Primary=6.47 cfs  44,217 cf

Link 12L: Pr Fairfield House
Inflow=2.17 cfs  3,558 cf
Primary=2.17 cfs  3,558 cf

Link 22L: MH#101
Inflow=4.23 cfs  40,303 cf
Primary=4.23 cfs  40,303 cf

Link 23L: FH 12" Pipe PR
Inflow=2.01 cfs  2,907 cf
Primary=2.01 cfs  2,907 cf

Total Runoff Area = 96,728 sf  Runoff Volume = 27,167 cf  Average Runoff Depth = 3.37"
26.20% Pervious = 25,342 sf  73.80% Impervious = 71,386 sf
Subcatchment 10S: Pr Lake Ave
Runoff Area=1,518 sf   51.19% Impervious   Runoff Depth>3.56"
Tc=5.0 min   CN=86   Runoff=0.15 cfs  450 cf

Subcatchment 13S: Pr FH Overland
Runoff Area=3,965 sf   7.67% Impervious   Runoff Depth>2.62"
Tc=5.0 min   CN=76   Runoff=0.29 cfs  864 cf

Subcatchment 14S: Pr 12" Pipe
Runoff Area=5,772 sf   5.20% Impervious   Runoff Depth>2.53"
Tc=5.0 min   CN=75   Runoff=0.41 cfs  1,216 cf

Subcatchment 16S: Pr Sand Filter
Runoff Area=56,103 sf   89.29% Impervious   Runoff Depth>4.52"
Tc=5.0 min   CN=95   Runoff=6.48 cfs  21,111 cf

Subcatchment 23S: Pr Infil
Runoff Area=29,370 sf   67.78% Impervious   Runoff Depth>3.97"
Tc=5.0 min   CN=90   Runoff=3.14 cfs  9,716 cf

Pond 17P: Pr Infil
Peak Elev=147.39'  Storage=2,128 cf   Inflow=3.14 cfs  9,716 cf
Outflow=3.13 cfs  7,759 cf

Pond 18P: Sand Filter
Peak Elev=140.04'  Storage=4,690 cf   Inflow=6.48 cfs  21,111 cf
Primary=3.14 cfs  17,868 cf   Secondary=2.88 cfs  3,229 cf   Outflow=6.02 cfs  21,097 cf

Pond 20P: Groundwater
Peak Elev=136.57'  Inflow=0.22 cfs  19,016 cf
8.0" Round Culvert  n=0.011  L=193.0'  S=0.0062 '/"  Outflow=0.22 cfs  19,016 cf

Link 11L: Pr Lake Ave
Inflow=10.05 cfs  50,402 cf
Primary=10.05 cfs  50,402 cf

Link 12L: Pr Fairfield House
Inflow=3.55 cfs  5,309 cf
Primary=3.55 cfs  5,309 cf

Link 22L: MH#101
Inflow=6.37 cfs  44,642 cf
Primary=6.37 cfs  44,642 cf

Link 23L: FH 12" Pipe PR
Inflow=3.27 cfs  4,445 cf
Primary=3.27 cfs  4,445 cf

Total Runoff Area = 96,728 sf   Runoff Volume = 33,357 cf   Average Runoff Depth = 4.14"
26.20% Pervious = 25,342 sf   73.80% Impervious = 71,386 sf
**Subcatchment 10S: Pr Lake Ave**

Runoff Area = 1,518 sf  
51.19% Impervious  
Runoff Depth > 4.79”  
Tc = 5.0 min  
CN = 86  
Runoff = 0.20 cfs  
606 cf

**Subcatchment 13S: Pr FH Overland**

Runoff Area = 3,965 sf  
7.67% Impervious  
Runoff Depth > 3.72”  
Tc = 5.0 min  
CN = 76  
Runoff = 0.41 cfs  
1,231 cf

**Subcatchment 14S: Pr 12” Pipe**

Runoff Area = 5,772 sf  
5.20% Impervious  
Runoff Depth > 3.62”  
Tc = 5.0 min  
CN = 75  
Runoff = 0.58 cfs  
1,742 cf

**Subcatchment 16S: Pr Sand Filter**

Runoff Area = 56,103 sf  
89.29% Impervious  
Runoff Depth > 5.81”  
Tc = 5.0 min  
CN = 95  
Runoff = 8.22 cfs  
27,140 cf

**Subcatchment 17P: Pr Infil**

Peak Elev = 147.47’  
Storage = 2,135 cf  
Inflow = 4.07 cfs  
12,806 cf  
Outflow = 4.06 cfs  
10,847 cf

**Pond 18P: Sand Filter**

Peak Elev = 140.12’  
Storage = 4,817 cf  
Inflow = 8.22 cfs  
27,140 cf  
Primary = 4.14 cfs  
21,701 cf  
Secondary = 3.88 cfs  
5,408 cf  
Outflow = 8.02 cfs  
27,109 cf

**Pond 20P: Groundwater**

Peak Elev = 136.57’  
Inflow = 0.22 cfs  
19,016 cf  
8.0” Round Culvert  
n = 0.011  
L = 193.0’  
S = 0.0062 '/'  
Outflow = 0.22 cfs  
19,016 cf

**Link 11L: Pr Lake Ave**

Inflow = 13.44 cfs  
60,550 cf  
Primary = 13.44 cfs  
60,550 cf

**Link 12L: Pr Fairfield House**

Inflow = 4.87 cfs  
8,381 cf  
Primary = 4.87 cfs  
8,381 cf

**Link 22L: MH#101**

Inflow = 8.39 cfs  
51,564 cf  
Primary = 8.39 cfs  
51,564 cf

**Link 23L: FH 12” Pipe PR**

Inflow = 4.46 cfs  
7,150 cf  
Primary = 4.46 cfs  
7,150 cf

**Total Runoff Area** = 96,728 sf  
**Runoff Volume** = 43,524 cf  
**Average Runoff Depth** = 5.40”

26.20% Pervious = 25,342 sf  
73.80% Impervious = 71,386 sf
Summary for Subcatchment 10S: Pr Lake Ave

Runoff = 0.20 cfs @ 12.07 hrs, Volume= 606 cf, Depth> 4.79"

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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<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
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<tbody>
<tr>
<td>777</td>
<td>98</td>
<td>Paved parking, HSG C</td>
</tr>
<tr>
<td>741</td>
<td>74</td>
<td>&gt;75% Grass cover, Good, HSG C</td>
</tr>
<tr>
<td>1,518</td>
<td>86</td>
<td>Weighted Average</td>
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<tr>
<td>741</td>
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<td>48.81% Pervious Area</td>
</tr>
<tr>
<td>777</td>
<td></td>
<td>51.19% Impervious Area</td>
</tr>
</tbody>
</table>

Tc Length Slope Velocity Capacity Description

5.0 Direct Entry,

Subcatchment 10S: Pr Lake Ave

Type III 24-hr  25 Year Rainfall=6.40"
Runoff Area=1,518 sf
Runoff Volume=606 cf
Runoff Depth>4.79"
Tc=5.0 min
CN=86
Summary for Subcatchment 13S: Pr FH Overland

Runoff $\quad = \quad 0.41 \text{ cfs} \quad @ \quad 12.07 \text{ hrs}, \quad \text{Volume=} \quad 1,231 \text{ cf}, \quad \text{Depth> 3.72"}$

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>
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<tr>
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<td>74</td>
<td>&gt;75% Grass cover, Good, HSG C</td>
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<td>3,965</td>
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<tr>
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<td>92.33% Pervious Area</td>
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<td>7.67% Impervious Area</td>
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<tr>
<th>Tc (min)</th>
<th>Length (feet)</th>
<th>Slope (ft/ft)</th>
<th>Velocity (ft/sec)</th>
<th>Capacity (cfs)</th>
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Subcatchment 13S: Pr FH Overland

Type III 24-hr
25 Year Rainfall=6.40"
Runoff Area=3,965 sf
Runoff Volume=1,231 cf
Runoff Depth>3.72"
Tc=5.0 min
CN=76
Summary for Subcatchment 14S: Pr 12" Pipe

Runoff = 0.58 cfs @ 12.07 hrs, Volume= 1,742 cf, Depth> 3.62"

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

5.0

Direct Entry,

Subcatchment 14S: Pr 12" Pipe

Type III 24-hr 25 Year Rainfall=6.40"
Runoff Area=5,772 sf
Runoff Volume=1,742 cf
Runoff Depth>3.62"
Tc=5.0 min
CN=75
Summary for Subcatchment 16S: Pr Sand Filter

Runoff = 8.22 cfs @ 12.07 hrs, Volume = 27,140 cf, Depth > 5.81"

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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<td>6,006</td>
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Tc Length Slope Velocity Capacity Description
(min) (feet) (ft/ft) (ft/sec) (cfs)
5.0

Direct Entry,

Subcatchment 16S: Pr Sand Filter

Type III 24-hr
25 Year Rainfall=6.40"
Runoff Area=56,103 sf
Runoff Volume=27,140 cf
Runoff Depth>5.81"
Tc=5.0 min
CN=95

Hydrograph
Summary for Subcatchment 23S: Pr Infil

Runoff = 4.07 cfs @ 12.07 hrs, Volume = 12,806 cf, Depth > 5.23"

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>
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<tr>
<td>19,908</td>
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Tc | Length | Slope | Velocity | Capacity | Description
---|--------|-------|----------|----------|-----------------|
5.0 | (min)  | (feet) | (ft/ft)  | (ft/sec) | (cfs)            |

Direct Entry,

Subcatchment 23S: Pr Infil

Type III 24-hr 25 Year Rainfall = 6.40"
Runoff Area = 29,370 sf
Runoff Volume = 12,806 cf
Runoff Depth > 5.23"
Tc = 5.0 min
CN = 90
Summary for Pond 17P: Pr Infil

Inflow Area = 29,370 sf, 67.78% Impervious, Inflow Depth > 5.23” for 25 Year event
Inflow = 4.07 cfs @ 12.07 hrs, Volume= 12,806 cf
Outflow = 4.06 cfs @ 12.07 hrs, Volume= 10,847 cf, Atten= 0%, Lag= 0.1 min
Primary = 4.06 cfs @ 12.07 hrs, Volume= 10,847 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 147.47’ @ 12.07 hrs Surf.Area= 1,102 sf Storage= 2,135 cf
Plug-Flow detention time= 105.9 min calculated for 10,842 cf (85% of inflow)
Center-of-Mass det. time= 41.9 min ( 823.2 - 781.2 )

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<th>Invert</th>
<th>Avail.Storage</th>
<th>Storage Description</th>
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<tr>
<td>#1A</td>
<td>144.70’</td>
<td>261 cf</td>
<td><strong>19.00’W x 58.00’L x 3.17’H Field A</strong></td>
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<tr>
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<td></td>
<td>3,490 cf Overall - 2,837 cf Embedded = 652 cf x 40.0% Voids</td>
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<tr>
<td>#2A</td>
<td>144.70’</td>
<td>1,907 cf</td>
<td><strong>retain_it retain_it 2.5’ x 14 Inside #1</strong></td>
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<tr>
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<td></td>
<td>Inside= 84.0&quot;W x 30.0&quot;H =&gt; 17.56 sf x 8.00’L = 140.4 cf</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Outside= 96.0&quot;W x 38.0&quot;H =&gt; 25.33 sf x 8.00’L = 202.7 cf</td>
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<td>2 Rows adjusted for 59.4 cf perimeter wall</td>
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<td>2,168 cf Total Available Storage</td>
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Storage Group A created with Chamber Wizard

Device Routing Invert Outlet Devices
#1 Primary 147.00’ **4.0’ long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

**Primary OutFlow** Max=4.06 cfs @ 12.07 hrs HW=147.47’ (Free Discharge)
**↑** 1=Sharp-Crested Rectangular Weir (Weir Controls 4.06 cfs @ 2.23 fps)
Pond 17P: Pr Infil - Chamber Wizard Field A

Chamber Model = retain_it retain_it 2.5' (retain-it®)
Inside= 84.0"W x 30.0"H => 17.56 sf x 8.00'L = 140.4 cf
Outside= 96.0"W x 38.0"H => 25.33 sf x 8.00'L = 202.7 cf
2 Rows adjusted for 59.4 cf perimeter wall

96.0" Wide + 12.0" Spacing = 108.0" C-C Row Spacing

7 Chambers/Row x 8.00' Long = 56.00' Row Length +12.0" End Stone x 2 = 58.00' Base Length
2 Rows x 96.0" Wide + 12.0" Spacing x 1 + 12.0" Side Stone x 2 = 19.00' Base Width
38.0" Chamber Height = 3.17' Field Height

3.3 cf Sidewall x 7 x 2 + 3.3 cf Endwall x 2 x 2 = 59.4 cf Perimeter Wall
14 Chambers x 140.4 cf - 59.4 cf Perimeter wall = 1,906.8 cf Chamber Storage
14 Chambers x 202.7 cf = 2,837.3 cf Displacement

3,489.7 cf Field - 2,837.3 cf Chambers = 652.3 cf Stone x 40.0% Voids = 260.9 cf Stone Storage

Chamber Storage + Stone Storage = 2,167.7 cf = 0.050 af
Overall Storage Efficiency = 62.1%
Overall System Size = 58.00' x 19.00' x 3.17'

14 Chambers
129.2 cy Field
24.2 cy Stone
Pond 17P: Pr Infil

Inflow Area=29,370 sf
Peak Elev=147.47'
Storage=2,135 cf
## Stage-Area-Storage for Pond 17P: Pr Infil

<table>
<thead>
<tr>
<th>Elevation (feet)</th>
<th>Storage (cubic-feet)</th>
<th>Elevation (feet)</th>
<th>Storage (cubic-feet)</th>
<th>Elevation (feet)</th>
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## Stage-Area-Storage for Pond 17P: Pr Infil (continued)

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<th>Storage (cubic-feet)</th>
<th>Elevation (feet)</th>
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<th>Elevation (feet)</th>
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### Stage-Area-Storage for Pond 17P: Pr Infil (continued)

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### Summary for Pond 18P: Sand Filter

Storage within Sand Filter (Sand and Forebay Units) taken from top of sand to top of storage. Actual system will consist of 5.5 foot tall Retain-It units.

| Inflow Area | 56,103 sf, 89.29% Impervious, Inflow Depth > 5.81" for 25 Year event |
| Inflow      | 8.22 cfs @ 12.07 hrs, Volume= 27,140 cf |
| Outflow     | 8.02 cfs @ 12.09 hrs, Volume= 27,109 cf, Atten= 2%, Lag= 1.0 min |
| Primary     | 4.14 cfs @ 12.09 hrs, Volume= 21,701 cf |
| Secondary   | 3.88 cfs @ 12.09 hrs, Volume= 5,408 cf |

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Peak Elev= 140.12' @ 12.09 hrs  
Surf.Area= 1,792 sf  
Storage= 4,817 cf

Plug-Flow detention time= 85.3 min calculated for 27,109 cf (100% of inflow)  
Center-of-Mass det. time= 84.6 min (845.2 - 760.7)

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<th>Storage Description</th>
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| #1A    | 137.00' | 0 cf          | 16.00'W x 56.00'L x 4.17'H Sand Units  
3,733 cf Overall - 3,733 cf Embedded = 0 cf x 40.0% Voids |
| #2A    | 137.00' | 2,700 cf      | retain_it retain_it 3.5' x 14 Inside #1  
Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf  
Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf  
2 Rows adjusted for 110.5 cf perimeter wall |
| #3B    | 137.00' | 0 cf          | 16.00'W x 56.00'L x 4.17'H Forebay Units  
3,733 cf Overall - 3,733 cf Embedded = 0 cf x 40.0% Voids |
| #4B    | 137.00' | 2,700 cf      | retain_it retain_it 3.5' x 14 Inside #3  
Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf  
Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf  
2 Rows adjusted for 110.5 cf perimeter wall |

5,401 cf  
Total Available Storage

Storage Group A created with Chamber Wizard  
Storage Group B created with Chamber Wizard

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<th>Outlet Devices</th>
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| #1     | Primary | 135.00' | 4.0" Round Culvert X 2.00 L= 3.0' Ke= 0.500  
Inlet / Outlet Invert= 135.00' / 134.95' S= 0.0167 '/' Cc= 0.900  
n= 0.011, Flow Area= 0.09 sf |
| #2     | Device 1| 137.00' | 0.26 cfs Exfiltration at all elevations |
| #3     | Secondary| 139.67'| 4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) |
| #4     | Primary | 139.67'| 4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) |
| #5     | Device 4| 137.20'| 18.0" Round Culvert  
L= 5.0' Ke= 0.500  
Inlet / Outlet Invert= 137.00' / 137.20' S= -0.0400 '/' Cc= 0.900  
n= 0.011, Flow Area= 1.77 sf |
| #6     | Device 3| 137.20'| 18.0" Round Culvert  
L= 5.0' Ke= 0.500  
Inlet / Outlet Invert= 137.00' / 137.20' S= -0.0400 '/' Cc= 0.900  
n= 0.011, Flow Area= 1.77 sf |
Primary Outflow: Max=4.13 cfs @ 12.09 hrs HW=140.12’ (Free Discharge)
1=Culvert (Passes 0.26 cfs of 1.87 cfs potential flow)
2=Exfiltration (Exfiltration Controls 0.26 cfs)
4=Sharp-Crested Rectangular Weir (Weir Controls 3.87 cfs @ 2.20 fps)
5=Culvert (Passes 3.87 cfs of 5.71 cfs potential flow)

Secondary Outflow: Max=3.87 cfs @ 12.09 hrs HW=140.12’ (Free Discharge)
3=Sharp-Crested Rectangular Weir (Weir Controls 3.87 cfs @ 2.20 fps)
6=Culvert (Passes 3.87 cfs of 5.71 cfs potential flow)
Pond 18P: Sand Filter - Chamber Wizard Sand Units

**Chamber Model = retain_it retain_it 3.5' (retain-it®)**
Inside = 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf
Outside = 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf
2 Rows adjusted for 110.5 cf perimeter wall

7 Chambers/Row x 8.00' Long = 56.00' Row Length
2 Rows x 96.0" Wide = 16.00' Base Width
50.0" Chamber Height = 4.17' Field Height

6.1 cf Sidewall x 7 x 2 + 6.1 cf Endwall x 2 x 2 = 110.5 cf Perimeter Wall
14 Chambers x 200.8 cf - 110.5 cf Perimeter wall = 2,700.4 cf Chamber Storage
14 Chambers x 266.7 cf = 3,733.3 cf Displacement

Chamber Storage = 2,700.4 cf = 0.062 af
Overall Storage Efficiency = 72.3%
Overall System Size = 56.00' x 16.00' x 4.17'

14 Chambers
138.3 cy Field
Pond 18P: Sand Filter - Chamber Wizard Forebay Units

Chamber Model = retain_it retain_it 3.5' (retain-it®)
Inside = 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf
Outside = 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf
2 Rows adjusted for 110.5 cf perimeter wall

7 Chambers/Row x 8.00' Long = 56.00' Row Length
2 Rows x 96.0" Wide = 16.00' Base Width
50.0" Chamber Height = 4.17' Field Height

6.1 cf Sidewall x 7 x 2 + 6.1 cf Endwall x 2 x 2 = 110.5 cf Perimeter Wall
14 Chambers x 200.8 cf - 110.5 cf Perimeter wall = 2,700.4 cf Chamber Storage
14 Chambers x 266.7 cf = 3,733.3 cf Displacement

Chamber Storage = 2,700.4 cf = 0.062 af
Overall Storage Efficiency = 72.3%
Overall System Size = 56.00’ x 16.00’ x 4.17’

14 Chambers
138.3 cy Field

Diagram of Chamber Layout
Pond 18P: Sand Filter

Inflow Area = 56,103 sf
Peak Elev = 140.12'
Storage = 4,817 cf
### Stage-Area-Storage for Pond 18P: Sand Filter

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Summary for Pond 20P: Groundwater

Groundwater flow assumed to be 100 gpm per GZA report dated March 16, 2021.

[57] Hint: Peaked at 136.57' (Flood elevation advised)

<table>
<thead>
<tr>
<th>Device</th>
<th>Routing</th>
<th>Invert</th>
<th>Outlet Devices</th>
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<td>136.30'</td>
<td>8.0&quot; Round Culvert</td>
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<td>L=193.0' Ke=0.500</td>
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<td>Inlet / Outlet Invert=136.30'/135.10' S=0.0062 '/'</td>
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<td>Cc=0.900</td>
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<td>n=0.011, Flow Area=0.35 sf</td>
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</table>

Primary OutFlow Max=0.22 cfs @ 0.00 hrs HW=136.57' (Free Discharge)

8.0" Round Culvert (Barrel Controls 0.22 cfs @ 2.44 fps)
### Stage-Area-Storage for Pond 20P: Groundwater

<table>
<thead>
<tr>
<th>Elevation (feet)</th>
<th>Storage (cubic-feet)</th>
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Summary for Link 11L: Pr Lake Ave

Inflow Area = 96,728 sf, 73.80% Impervious, Inflow Depth > 7.51" for 25 Year event

Inflow = 13.44 cfs @ 12.08 hrs, Volume = 60,550 cf
Primary = 13.44 cfs @ 12.08 hrs, Volume = 60,550 cf, Attenu = 0%, Lag = 0.0 min

Primary outflow = Inflow, Time Span = 0.00-24.00 hrs, dt = 0.01 hrs
Summary for Link 12L: Pr Fairfield House

Inflow Area = 9,737 sf, 6.20% Impervious, Inflow Depth > 10.33" for 25 Year event

Inflow = 4.87 cfs @ 12.08 hrs, Volume = 8,381 cf
Primary = 4.87 cfs @ 12.08 hrs, Volume = 8,381 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Summary for Link 22L: MH#101

Inflow Area = 85,473 sf, 81.90% Impervious, Inflow Depth > 7.24" for 25 Year event
Inflow = 8.39 cfs @ 12.08 hrs, Volume= 51,564 cf
Primary = 8.39 cfs @ 12.08 hrs, Volume= 51,564 cf, Atten= 0%, Lag= 0.0 min

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

Link 22L: MH#101

Hydrograph

Inflow Area=85,473 sf
Summary for Link 23L: FH 12" Pipe PR

Inflow Area = 5,772 sf, 5.20% Impervious, Inflow Depth > 14.87" for 25 Year event
Inflow = 4.46 cfs @ 12.09 hrs, Volume= 7,150 cf
Primary = 4.46 cfs @ 12.09 hrs, Volume= 7,150 cf, Atten= 0%, Lag= 0.0 min

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

Link 23L: FH 12" Pipe PR

![Hydrograph](image_url)
### Subcatchment 10S: Pr Lake Ave
- Runoff Area: 1,518 sf
- Impervious: 51.19%
- Runoff Depth: >5.94" (Tc=5.0 min, CN=86)
- Runoff: 0.24 cfs, 751 cf

### Subcatchment 13S: Pr FH Overland
- Runoff Area: 3,965 sf
- Impervious: 7.67%
- Runoff Depth: >4.79" (Tc=5.0 min, CN=76)
- Runoff: 0.53 cfs, 1,583 cf

### Subcatchment 14S: Pr 12" Pipe
- Runoff Area: 5,772 sf
- Impervious: 5.20%
- Runoff Depth: >4.68" (Tc=5.0 min, CN=75)
- Runoff: 0.75 cfs, 2,250 cf

### Subcatchment 16S: Pr Sand Filter
- Runoff Area: 56,103 sf
- Impervious: 89.29%
- Runoff Depth: >7.00" (Tc=5.0 min, CN=95)
- Runoff: 9.82 cfs, 32,719 cf

### Subcatchment 23S: Pr Infil
- Runoff Area: 29,370 sf
- Impervious: 67.78%
- Runoff Depth: >6.41" (Tc=5.0 min, CN=90)
- Runoff: 4.93 cfs, 15,682 cf

### Pond 17P: Pr Infil
- Peak Elev: 147.53'
- Inflow: 4.93 cfs
- Outflow: 4.92 cfs
- Storage: 2,140 cf
- Total: 15,682 cf

### Pond 18P: Sand Filter
- Peak Elev: 140.18'
- Inflow: 9.82 cfs
- Primary: 4.93 cfs, 24,495 cf
- Secondary: 4.67 cfs, 7,537 cf
- Outflow: 9.61 cfs, 32,031 cf

### Pond 20P: Groundwater
- Peak Elev: 136.57'
- Inflow: 0.22 cfs
- 8.0" Round Culvert
- L=193.0', S=0.0062 '/'
- Outflow: 0.22 cfs

### Link 11L: Pr Lake Ave
- Inflow: 16.21 cfs
- Primary: 16.21 cfs

### Link 12L: Pr Fairfield House
- Inflow: 5.94 cfs
- Primary: 5.94 cfs

### Link 22L: MH#101
- Inflow: 10.03 cfs
- Primary: 10.03 cfs

### Link 23L: FH 12" Pipe PR
- Inflow: 5.42 cfs
- Primary: 5.42 cfs

Total Runoff Area: 96,728 sf
Runoff Volume: 52,986 cf
Average Runoff Depth: 6.57"
26.20% Pervious: 25,342 sf
73.80% Impervious: 71,386 sf
<table>
<thead>
<tr>
<th>Subcatchment</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subcatchment 10S: Pr Lake Ave</td>
<td>Runoff Area=1,518 sf   51.19% Impervious   Runoff Depth&gt;7.40&quot;   Tc=5.0 min   CN=86   Runoff=0.30 cfs 936 cf</td>
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<td>Runoff Area=3,965 sf   7.67% Impervious   Runoff Depth&gt;6.16&quot;   Tc=5.0 min   CN=76   Runoff=0.67 cfs 2,036 cf</td>
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<td>Subcatchment 16S: Pr Sand Filter</td>
<td>Runoff Area=56,103 sf   89.29% Impervious   Runoff Depth&gt;8.49&quot;   Tc=5.0 min   CN=95   Runoff=11.81 cfs 39,702 cf</td>
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<tr>
<td>Subcatchment 23S: Pr Infil</td>
<td>Runoff Area=29,370 sf   67.78% Impervious   Runoff Depth&gt;7.88&quot;   Tc=5.0 min   CN=90   Runoff=5.99 cfs 19,298 cf</td>
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Pond 17P: Pr Infil
- Peak Elev=147.61'   Storage=2,146 cf   Inflow=5.99 cfs 19,298 cf   Outflow=5.98 cfs 17,335 cf

Pond 18P: Sand Filter
- Peak Elev=140.25'   Storage=5,020 cf   Inflow=11.81 cfs 39,702 cf   Primary=5.92 cfs 27,977 cf   Secondary=5.66 cfs 10,302 cf   Outflow=11.58 cfs 38,280 cf

Pond 20P: Groundwater
- Peak Elev=136.57'   Inflow=0.22 cfs 19,016 cf   8.0" Round Culvert   n=0.011   L=193.0'   S=0.0062 '/'   Outflow=0.22 cfs 19,016 cf

Link 11L: Pr Lake Ave
- Inflow=19.65 cfs 80,507 cf   Primary=19.65 cfs 80,507 cf

Link 12L: Pr Fairfield House
- Inflow=7.28 cfs 15,244 cf   Primary=7.28 cfs 15,244 cf

Link 22L: MH#101
- Inflow=12.08 cfs 64,328 cf   Primary=12.08 cfs 64,328 cf

Link 23L: FH 12" Pipe PR
- Inflow=6.61 cfs 13,207 cf   Primary=6.61 cfs 13,207 cf

**Total Runoff Area = 96,728 sf   Runoff Volume = 64,876 cf   Average Runoff Depth = 8.05"**

**26.20% Pervious = 25,342 sf   73.80% Impervious = 71,386 sf**
Subcatchment 10S: Pr Lake Ave  
Runoff Area=1,518 sf  51.19% Impervious  Runoff Depth>0.20"  
Tc=5.0 min  CN=86  Runoff=0.01 cfs  25 cf

Subcatchment 13S: Pr FH Overland  
Runoff Area=3,965 sf  7.67% Impervious  Runoff Depth>0.04"  
Tc=5.0 min  CN=76  Runoff=0.00 cfs  13 cf

Subcatchment 14S: Pr 12" Pipe  
Runoff Area=5,772 sf  5.20% Impervious  Runoff Depth>0.03"  
Tc=5.0 min  CN=75  Runoff=0.00 cfs  15 cf

Subcatchment 16S: Pr Sand Filter  
Runoff Area=56,103 sf  89.29% Impervious  Runoff Depth>0.56"  
Tc=5.0 min  CN=95  Runoff=0.88 cfs  2,631 cf

Subcatchment 23S: Pr Infil  
Runoff Area=29,370 sf  67.78% Impervious  Runoff Depth>0.32"  
Tc=5.0 min  CN=90  Runoff=0.25 cfs  783 cf

Pond 17P: Pr Infil  
Peak Elev=145.63'  Storage=783 cf  Inflow=0.25 cfs  783 cf  
Outflow=0.00 cfs  0 cf

Pond 18P: Sand Filter  
Peak Elev=137.32'  Storage=497 cf  Inflow=0.88 cfs  2,631 cf  
Primary=0.26 cfs  2,629 cf  Secondary=0.00 cfs  0 cf  Outflow=0.26 cfs  2,629 cf

Pond 20P: Groundwater  
Peak Elev=136.57'  Inflow=0.22 cfs  19,016 cf  8.0" Round Culvert  n=0.011  L=193.0'  S=0.0062 '/'  Outflow=0.22 cfs  19,016 cf

Link 11L: Pr Lake Ave  
Inflow=0.49 cfs  21,697 cf  
Primary=0.49 cfs  21,697 cf

Link 12L: Pr Fairfield House  
Inflow=0.00 cfs  27 cf  
Primary=0.00 cfs  27 cf

Link 22L: MH#101  
Inflow=0.48 cfs  21,645 cf  
Primary=0.48 cfs  21,645 cf

Link 23L: FH 12" Pipe PR  
Inflow=0.00 cfs  15 cf  
Primary=0.00 cfs  15 cf

Total Runoff Area = 96,728 sf  Runoff Volume = 3,466 cf  Average Runoff Depth = 0.43"  
26.20% Pervious = 25,342 sf  73.80% Impervious = 71,386 sf
Appendix 6
DCIA Certification, L.I.D Best Management Credits, Draft Drainage Maintenance Agreement
DIRECTLY CONNECTED IMPERVIOUS AREA (DCIA) CERTIFICATION
PRE-CONSTRUCTION

Property Address: 10 Lake Avenue - GH Smilow Cancer Center  Tax Account No.: Varies
Building Permit No.: N/A

PLANS & DRAINAGE SUMMARY REPORT INFORMATION

Engineering Firm: Redniss & Mead, Inc.
Design Plans Date: 3/22/2021  Drainage Report Date: 3/22/2021

PROPERTY INFORMATION FOR DIRECTLY CONNECTED IMPERVIOUS AREA (DCIA)

<table>
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<tr>
<th>Description</th>
<th>Existing Conditions</th>
<th>Proposed Conditions</th>
<th>Disconnected</th>
<th>Directly Connected</th>
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<tr>
<td>Total Impervious Area</td>
<td>60,950.00</td>
<td>71,523.00</td>
<td>70,165.00</td>
<td>1,358.00</td>
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</tbody>
</table>

1 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.

2 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, andDisconnected Impervious Area (must meet all the standards under Simple Disconnection on page 44 and 45 of the Drainage Manual).

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

Engineer’s Signature [Signature]  Date 3/22/2021

Engineer’s Seal
### 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. | X | □ |
| **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. | X | □ |
| **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 | 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>
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<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>
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</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>
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<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>
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</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>
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</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>
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</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. | 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 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>
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<th>LID Used</th>
<th>Credit Taken</th>
</tr>
</thead>
</table>
| Rainwater Harvesting (Cisterns) | 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. | ☐        | ☐            |
## 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></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.</td>
<td></td>
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<tr>
<td></td>
<td>An appropriate pump shall be selected to provide adequate pressure for its designated uses.</td>
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<tr>
<td></td>
<td>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.</td>
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<tr>
<td></td>
<td>Irrigation water from a cistern shall be applied so that the water infiltrates into the ground.</td>
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<tr>
<td></td>
<td>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.</td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>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>
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</tbody>
</table>
Stormwater Management Practices Maintenance Declaration

THIS DECLARATION is made this date, ________________, 2021, by and between the Town of Greenwich, a municipal corporation with principal offices located at 101 Field Point Road, Greenwich, CT 06830 and

Greenwich Hospital

[Owner(s) Name]

10 Lake Avenue

[Address]

hereinafter referred to as “Owner(s)” of the “Property” as more fully described in a deed recorded in Book TBD at Page TBD 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 # PLPZ 2021 00101

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 March 22, 2021.

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 TBD.

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 frequently as 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 ascertain 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 TBD at Page TBD 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.
IN WITNESS WHEREOF, the “Owner(s)” have executed this Declaration on this _______ day of ________________, 20____.

By: ________________________________
   [Owner(s)]

By: ________________________________
   [Owner(s)]

STATE OF CONNECTICUT )
   ) ss: Greenwich
COUNTY OF FAIRFIELD )

The foregoing instrument was acknowledged before me on this___________ day of ________________, 20____, by ________________________________, the “Owner(s)” of ____________________________________________.

[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
Operations and Maintenance Plan
10 Lake Avenue, Greenwich, CT
March 22, 2021

Scope:

The purpose of the Operations and Maintenance Plan is to ensure that the existing and proposed stormwater components installed at 10 Lake Avenue, Greenwich, CT are maintained in operational condition 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. **Stormwater Control Structures:**

   a. All control structures (orifice, weir, etc.) shall be completely cleaned of accumulated debris and sediments at the completion of construction. Any repairs shall be performed.
   
   b. For the first year, control structures (orifice, weir, etc.) shall be inspected on a quarterly basis.
   
   c. Any accumulated debris shall be removed and any repairs made to the control structures (orifice, weir, etc.) 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 shall be removed and repairs made as required.
   
   f. Any additional maintenance required per the manufacturer’s specifications shall also be completed.

4. **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.

5. **Retain-it Sand Filter Systems:**

   a. Sand Filter system shall be cleaned of debris and sediments upon the completion of construction. Any filter media impacted by the construction activities shall be removed and replaced at this time.
   
   b. Clear accumulated debris and trash from the sand filter every 6 months or as necessary to keep the filter clean.
   
   c. The sand filter shall be inspected on a quarterly basis after the first six months of successful operation and after all storm events to ensure it is working as intended. One inspection shall occur immediately following the completion of winter sanding and subsequent sweeping operations, and one shall occur just prior to the winter season. Any accumulated debris and sediments shall be removed.
   
   d. Check and record dewatering times for all sand filters to determine if corrective maintenance measures are warranted. Sand filters tend to experience clogging after 3-5 years of operation. Corrective maintenance of the filtration chamber shall be performed as necessary upon inspection. This includes removal and replacement of the top layers of sand, gravel and/or filter fabric that has become clogged. Ensure removed media is disposed of in accordance with all governing regulations.
e. Brief annual inspection reports shall be kept on site in a log available upon request. These reports shall include a record of the dewatering times for all sand filters to help determine if maintenance is necessary.

6. **Vegetative Roof:**

   a. Vegetative roof shall be cleaned of debris and sediments upon the completion of construction. Any filter media impacted by the construction activities shall be removed and replaced at this time.
   
   b. The roof shall be visually inspected on a bi-weekly basis for the first 6 months. Any erosion or displacement of the filter media shall be promptly repaired and the cause of the problem shall be identified and corrected. During these inspections weeds shall be pulled and removed. Monthly inspections shall continue until successful operation of the system is confirmed.
   
   c. The surface of these structures shall be inspected on a quarterly basis after the first six months of successful operation and after heavy runoff events (e.g. >3.0” in a 24-hour period). One inspection shall occur immediately following the winter months after snow has melted. Any accumulated debris and sediments shall be removed.
   
   d. Check draining time of vegetative roof annually. Check within 72 hours after a minimum one inch rain event. If there is no standing water, infiltration is acceptable. If draining time is excessive, quantitatively determine infiltration rate. Use a double ring infiltrometer or monitor drop in water level after a significant storm. If infiltration rate <0.5 in. /hour, remedial action shall be taken.
   
   e. Perform a soil test for nutrients and ph every spring and amend the growing media as recommend by the testing agency.
   
   f. During the spring and summer months bi-weekly weeding shall be performed and weeds shall be removed.
   
   g. During extreme durations of heat and drought watering may be necessary.
   
   h. Any additional maintenance required per the manufacturer’s specifications shall also be completed.

**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.
Type of Inspection: ☐ Spring ☐ Fall ☐ Other

Inspector’s Name: ___________________________ Date of Inspection: ________________
Affiliation: ___________________________ Phone #: __________________

Catch Basins & 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:

Storm Drainage Piping and Manholes/Junction Boxes:
- Has accumulated debris been removed? ☐ Yes ☐ No ☐ N/A
- Do any manholes require additional repair? (identify below): ☐ Yes ☐ No ☐ N/A
- Is there any evidence of stormwater piping failure? ☐ Yes ☐ No ☐ N/A
- Has a comprehensive video inspection been completed? ☐ Yes ☐ No ☐ N/A

Notes:

Stormwater Control Structures:
- Has accumulated debris been removed? ☐ Yes ☐ No ☐ N/A
- Are any repairs required? (identify below): ☐ Yes ☐ No ☐ N/A
- Have orifices and weirs been cleaned of debris? ☐ Yes ☐ No ☐ N/A

Notes:
**Operations and Maintenance Log (Page 2 of 3)**

*10 Lake Avenue, Greenwich, CT*  
*March 22, 2021*

### 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:**

### Retain-it Sand Filter 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:**

### Vegetative Roof:
- **Have trays been cleared of debris/sediments?**
  - [ ] Yes  
  - [ ] No  
  - [ ] N/A  
- **Have draining times of trays been verified?**
  - [ ] Yes  
  - [ ] No  
  - [ ] N/A  
- **Has vegetation been weeded (bi-weekly)**
  - [ ] Yes  
  - [ ] No  
  - [ ] N/A  
- **Have roof drains been inspected and cleared of debris**
  - [ ] 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:
Appendix 7
Analysis of 12” Pipe on Fairfield House Property
Site Observation Report
Greenwich Hospital Cancer Center

Redniss & Mead made several site visits to the project site and adjacent properties to assess the existing drainage patterns and verify the discharge points. Several drainage structures within the Fairfield House Condo property and Church property were opened. Refer to Exhibit 1 for the pipes observed within the structures opened. As a part of the investigation drainage pipes were traced and dye tested. The following summarizes the findings:

38 Lake Avenue:

Highland sewer traced the pipe discharging from the existing drain in the parking lot of 38 Lake Avenue. The 12” pipe discharged to an existing pipe on the Fairfield House Condo property via a direct pipe connection.

A dye test was performed to verify the existing pipe from the Fairfield House Condo property discharges to the existing manhole within the Church driveway. Dye was put into the area drain and observed within the manhole on the Church property.
54 Lafayette Place

Highland sewer traced the pipe in the existing drain within the parking lot of 54 Lafayette. The pipe was found to run west below the concrete walkway. The pipe was crushed so they were not able to trace the pipe to its outlet. The pipe appears to be in line with a pipe that daylights onto the Fairfield House Condo property at the south east corner of the property. We believe that this is the same drainage line.

Conclusion:

The properties fronting Lake Avenue either directly connect to the stormwater conveyance system in Lake Avenue or outlet to an existing pipe on the Fairfield House condominium property before ultimately connecting into the stormwater conveyance system in Lake Avenue.

The properties fronting Lafayette Place ultimately sheet flow onto the Fairfield House property before being collected by their onsite conveyance network and discharging into the stormwater conveyance system in Lake Avenue.
OFFSITE DRAINAGE BASINS
GREENWICH HOSPITAL CANCER CENTER
GREENWICH, CT
## HYDRAULIC DATA FOR RATIONAL METHOD

**Project:** Greenwich Hospital Cancer Center  
**Project #:** 6355  
**Date:** 5/11/2021  
**Location:** 10 Lake Avenue, Greenwich, CT  
**By:** EWM  
**Checked:** DRG

### Pipe Flow Analysis - Within Lake Avenue

<table>
<thead>
<tr>
<th>Basin Description</th>
<th>Drainage Path</th>
<th>25yr. Rainfall Intensity (in/hr)</th>
<th>Q = ACI (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EX CB TO CB#100</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acres</td>
<td>C</td>
<td>Description</td>
<td>AC</td>
</tr>
<tr>
<td>0.16</td>
<td>0.95</td>
<td>Impervious</td>
<td>0.15</td>
</tr>
<tr>
<td>0.02</td>
<td>0.30</td>
<td>Pervious</td>
<td>0.01</td>
</tr>
<tr>
<td>0.18</td>
<td></td>
<td>Total</td>
<td>0.16</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q in system (cfs)</th>
<th>Pipe Size (in)</th>
<th>Pipe Length (ft)</th>
<th>Roughness coefficient</th>
<th>Material</th>
<th>Slope (ft/ft)</th>
<th>Qfull (cfs)</th>
<th>Qsystem / Qfull (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.94</td>
<td>18</td>
<td>67</td>
<td>0.011</td>
<td>PVC</td>
<td>0.011</td>
<td>13.06</td>
<td>76.1%</td>
</tr>
</tbody>
</table>

Overland flow into EX CB plus 25-Year Storm Event from HydroCAD model

| **CB#100 TO EX MH** | | | |
|-------------------| | | |
| Acres | C | Description | AC | Length (ft) | ΔH | Slope (%) | Description | Time (min) | |
| 0.16 | 0.95 | Impervious | 0.15 | | | | | |
| 0.02 | 0.30 | Pervious | 0.01 | | | | | |
| 0.18 | | Total | 0.16 | | | | | 5 | 8.4 | 1.35 |

<table>
<thead>
<tr>
<th>Q in system (cfs)</th>
<th>Pipe Size (in)</th>
<th>Pipe Length (ft)</th>
<th>Roughness coefficient</th>
<th>Material</th>
<th>Slope (ft/ft)</th>
<th>Qfull (cfs)</th>
<th>Qsystem / Qfull (%)</th>
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</thead>
<tbody>
<tr>
<td>24.88</td>
<td>18</td>
<td>6</td>
<td>0.011</td>
<td>PVC</td>
<td>0.017</td>
<td>16.09</td>
<td>154.6%</td>
</tr>
</tbody>
</table>

Overland flow into EX CB plus 25-Year Storm Event from HydroCAD model
Proposed Conditions
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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 10S: Pr Lake Ave**
Runoff Area=1,518 sf, 51.19% Impervious
Runoff Depth>4.79"
Tc=5.0 min, CN=86, Runoff=0.20 cfs 606 cf

**Subcatchment 13S: Pr FH Overland**
Runoff Area=3,965 sf, 7.67% Impervious
Runoff Depth>3.72"
Tc=5.0 min, CN=76, Runoff=0.41 cfs 1,231 cf

**Subcatchment 14S: Pr 12" Pipe**
Runoff Area=5,772 sf, 5.20% Impervious
Runoff Depth>3.62"
Tc=5.0 min, CN=75, Runoff=0.58 cfs 1,742 cf

**Subcatchment 16S: Pr Sand Filter**
Runoff Area=56,103 sf, 89.29% Impervious
Runoff Depth>5.81"
Tc=5.0 min, CN=95, Runoff=8.22 cfs 27,140 cf

**Subcatchment 22S: EX Offsite**
Runoff Area=90,390 sf, 66.35% Impervious
Runoff Depth>5.24"
Tc=0.0 min, CN=90, Runoff=14.77 cfs 39,440 cf

**Subcatchment 23S: Pr Infil**
Runoff Area=29,370 sf, 67.78% Impervious
Runoff Depth>5.23"
Tc=5.0 min, CN=90, Runoff=4.07 cfs 12,806 cf

**Subcatchment 24S: Ex. Offsite to Pr CB**
Runoff Area=2,625 sf, 17.60% Impervious
Runoff Depth>4.36"
Tc=0.0 min, CN=82, Runoff=0.37 cfs 953 cf

**Pond 17P: Pr Infil**
Peak Elev=147.47’ Storage=2,135 cf Inflow=4.07 cfs 12,806 cf
Outflow=4.06 cfs 10,847 cf

**Pond 18P: Sand Filter**
Peak Elev=140.12’ Storage=4,817 cf Inflow=8.22 cfs 27,140 cf
Primary=4.14 cfs 21,701 cf Secondary=3.88 cfs 5,408 cf Outflow=8.02 cfs 27,109 cf

**Pond 20P: Groundwater**
Peak Elev=136.57’ Inflow=0.22 cfs 19,016 cf
8.0” Round Culvert n=0.011 L=193.0’ S=0.0062 '/' Outflow=0.22 cfs 19,016 cf

**Link 11L: Pr Lake Ave**
Inflow=23.62 cfs 100,943 cf Primary=23.53 cfs 100,943 cf

**Link 12L: Pr Fairfield House**
Inflow=17.62 cfs 47,821 cf Primary=17.62 cfs 47,821 cf

**Link 22L: MH#101**
Inflow=8.39 cfs 51,564 cf Primary=8.39 cfs 51,564 cf

**Link 23L: FH 12” Pipe PR**
Inflow=4.46 cfs 7,150 cf Primary=4.46 cfs 7,150 cf

Total Runoff Area = 189,743 sf  Runoff Volume = 83,918 cf  Average Runoff Depth = 5.31"
30.53% Pervious = 57,923 sf  69.47% Impervious = 131,820 sf
Summary for Subcatchment 10S: Pr Lake Ave

Runoff = 0.20 cfs @ 12.07 hrs, Volume= 606 cf, Depth> 4.79"

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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<td>Paved parking, HSG C</td>
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<tr>
<td>741</td>
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<td>1,518</td>
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<tr>
<td>741</td>
<td>48.81%</td>
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<tr>
<td>777</td>
<td>51.19%</td>
<td>Impervious Area</td>
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Tc = 5.0 min

Subcatchment 10S: Pr Lake Ave

Type III 24-hr
25 Year Rainfall=6.40"
Runoff Area=1,518 sf
Runoff Volume=606 cf
Runoff Depth>4.79"
Tc=5.0 min
CN=86

![Hydrograph](image)
Summary for Subcatchment 13S: Pr FH Overland

Runoff = 0.41 cfs @ 12.07 hrs, Volume = 1,231 cf, Depth > 3.72"

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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<td>Paved parking, HSG C</td>
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<td>&gt;75% Grass cover, Good, HSG C</td>
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<tr>
<td>3,965</td>
<td>76</td>
<td>Weighted Average</td>
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<tr>
<td>3,661</td>
<td>92.33% Pervious Area</td>
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<tr>
<td>304</td>
<td>7.67% Impervious Area</td>
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Tc Length Slope Velocity Capacity Description
(min) (feet) (ft/ft) (ft/sec) (cfs)
5.0

Subcatchment 13S: Pr FH Overland

Hydrograph

Type III 24-hr 25 Year Rainfall=6.40"
Runoff Area = 3,965 sf
Runoff Volume = 1,231 cf
Runoff Depth > 3.72"
Tc = 5.0 min
CN = 76
Summary for Subcatchment 14S: Pr 12" Pipe

Runoff = 0.58 cfs @ 12.07 hrs, Volume= 1,742 cf, Depth> 3.62"

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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<td>Paved parking, HSG C</td>
</tr>
<tr>
<td>5,472</td>
<td>74</td>
<td>&gt;75% Grass cover, Good, HSG C</td>
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<tr>
<td>5,772</td>
<td>75</td>
<td>Weighted Average</td>
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<tr>
<td>5,472</td>
<td></td>
<td>94.80% Pervious Area</td>
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<tr>
<td>300</td>
<td></td>
<td>5.20% Impervious Area</td>
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<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>
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<tr>
<td>5.0</td>
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<td>Direct Entry,</td>
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Subcatchment 14S: Pr 12" Pipe

Type III 24-hr
25 Year Rainfall=6.40"
Runoff Area=5,772 sf
Runoff Volume=1,742 cf
Runoff Depth>3.62"
Tc=5.0 min
CN=75
Summary for Subcatchment 16S: Pr Sand Filter

Runoff = 8.22 cfs @ 12.07 hrs, Volume = 27,140 cf, Depth > 5.81"

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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<tbody>
<tr>
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<td>98</td>
<td>Paved parking, HSG C</td>
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<tr>
<td>6,006</td>
<td>74</td>
<td>&gt;75% Grass cover, Good, HSG C</td>
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<tr>
<td>56,103</td>
<td>95</td>
<td>Weighted Average</td>
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<tr>
<td>6,006</td>
<td>10.71% Pervious Area</td>
<td></td>
</tr>
<tr>
<td>50,097</td>
<td>89.29% Impervious Area</td>
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</table>

Tc=5.0 min

Subcatchment 16S: Pr Sand Filter

Type III 24-hr
25 Year Rainfall = 6.40"
Runoff Area = 56,103 sf
Runoff Volume = 27,140 cf
Runoff Depth > 5.81"
Tc=5.0 min
CN=95
Summary for Subcatchment 22S: EX Offsite

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 14.77 cfs @ 12.00 hrs, Volume= 39,440 cf, Depth> 5.24"

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>
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<th>Description</th>
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<tbody>
<tr>
<td>59,972</td>
<td>98</td>
<td>Water Surface, HSG C</td>
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<tr>
<td>30,418</td>
<td>74</td>
<td>&gt;75% Grass cover, Good, HSG C</td>
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<tr>
<td>90,390</td>
<td>90</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>30,418</td>
<td>33.65% Pervious Area</td>
<td></td>
</tr>
<tr>
<td>59,972</td>
<td>66.35% Impervious Area</td>
<td></td>
</tr>
</tbody>
</table>

Subcatchment 22S: EX Offsite

Type III 24-hr
25 Year Rainfall=6.40"
Runoff Area=90,390 sf
Runoff Volume=39,440 cf
Runoff Depth>5.24"
Tc=0.0 min
CN=90
Summary for Subcatchment 23S: Pr Infil

Runoff = 4.07 cfs @ 12.07 hrs, Volume= 12,806 cf, Depth> 5.23"

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>
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<tbody>
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<td>19,908</td>
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<td>Paved parking, HSG C</td>
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<tr>
<td>9,462</td>
<td>74</td>
<td>&gt;75% Grass cover, Good, HSG C</td>
</tr>
<tr>
<td>29,370</td>
<td>90</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>9,462</td>
<td>32.22% Pervious Area</td>
<td></td>
</tr>
<tr>
<td>19,908</td>
<td>67.78% Impervious Area</td>
<td></td>
</tr>
</tbody>
</table>

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

Direct Entry,

Subcatchment 23S: Pr Infil

Type III 24-hr
25 Year Rainfall=6.40"
Runoff Area=29,370 sf
Runoff Volume=12,806 cf
Runoff Depth>5.23"
Tc=5.0 min
CN=90
Summary for Subcatchment 24S: Ex. Offsite to Pr CB

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.37 cfs @ 12.00 hrs, Volume= 953 cf, Depth> 4.36"

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>462</td>
<td>98</td>
<td>Paved parking, HSG C</td>
</tr>
<tr>
<td>2,163</td>
<td>79</td>
<td>50-75% Grass cover, Fair, HSG C</td>
</tr>
<tr>
<td>2,625</td>
<td>82</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>2,163</td>
<td>82.40% Pervious Area</td>
<td></td>
</tr>
<tr>
<td>462</td>
<td>17.60% Impervious Area</td>
<td></td>
</tr>
</tbody>
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Subcatchment 24S: Ex. Offsite to Pr CB

Type III 24-hr
25 Year Rainfall=6.40"
Runoff Area=2,625 sf
Runoff Volume=953 cf
Runoff Depth>4.36"
Tc=0.0 min
CN=82
Summary for Pond 17P: Pr Infil

Inflow Area = 29,370 sf, 67.78% Impervious, Inflow Depth > 5.23" for 25 Year event
Inflow = 4.07 cfs @ 12.07 hrs, Volume= 12,806 cf
Outflow = 4.06 cfs @ 12.07 hrs, Volume= 10,847 cf, Atten= 0%, Lag= 0.1 min
Primary = 4.06 cfs @ 12.07 hrs, Volume= 10,847 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 147.47' @ 12.07 hrs Surf.Area= 1,102 sf Storage= 2,135 cf

Plug-Flow detention time= 105.9 min calculated for 10,842 cf (85% of inflow)
Center-of-Mass det. time= 41.9 min (823.2 - 781.2)

<table>
<thead>
<tr>
<th>Volume</th>
<th>Invert</th>
<th>Avail.Storage</th>
<th>Storage Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1A</td>
<td>144.70'</td>
<td>261 cf</td>
<td>19.00'W x 58.00'L x 3.17'H Field A 3,490 cf Overall - 2,837 cf Embedded = 652 cf x 40.0% Voids Inside= 84.0&quot;W x 30.0&quot;H =&gt; 17.56 sf x 8.00'L = 140.4 cf Outside= 96.0&quot;W x 38.0&quot;H =&gt; 25.33 sf x 8.00'L = 202.7 cf 2 Rows adjusted for 59.4 cf perimeter wall</td>
</tr>
<tr>
<td>#2A</td>
<td>144.70'</td>
<td>1,907 cf</td>
<td>retain_it retain_it 2.5' x 14 Inside #1 Inside= 84.0&quot;W x 30.0&quot;H =&gt; 17.56 sf x 8.00'L = 140.4 cf Outside= 96.0&quot;W x 38.0&quot;H =&gt; 25.33 sf x 8.00'L = 202.7 cf</td>
</tr>
</tbody>
</table>

2,168 cf Total Available Storage

Storage Group A created with Chamber Wizard

<table>
<thead>
<tr>
<th>Device</th>
<th>Routing</th>
<th>Invert</th>
<th>Outlet Devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>Primary</td>
<td>147.00'</td>
<td>4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)</td>
</tr>
</tbody>
</table>

Primary OutFlow Max=4.06 cfs @ 12.07 hrs HW=147.47' (Free Discharge)
=1=Sharp-Crested Rectangular Weir (Weir Controls 4.06 cfs @ 2.23 fps)
Pond 17P: Pr Infil - Chamber Wizard Field A

Chamber Model = retain_it retain_it 2.5' (retain-it®)
Inside= 84.0"W x 30.0"H => 17.56 sf x 8.00'L = 140.4 cf
Outside= 96.0"W x 38.0"H => 25.33 sf x 8.00'L = 202.7 cf
2 Rows adjusted for 59.4 cf perimeter wall

96.0" Wide + 12.0" Spacing = 108.0" C-C Row Spacing

7 Chambers/Row x 8.00' Long = 56.00' Row Length +12.0" End Stone x 2 = 58.00' Base Length
2 Rows x 96.0" Wide + 12.0" Spacing x 1 + 12.0" Side Stone x 2 = 19.00' Base Width
38.0" Chamber Height = 3.17' Field Height

3.3 cf Sidewall x 7 x 2 + 3.3 cf Endwall x 2 x 2 = 59.4 cf Perimeter Wall
14 Chambers x 140.4 cf - 59.4 cf Perimeter wall = 1,906.8 cf Chamber Storage
14 Chambers x 202.7 cf = 2,837.3 cf Displacement

3,489.7 cf Field - 2,837.3 cf Chambers = 652.3 cf Stone x 40.0% Voids = 260.9 cf Stone Storage

Chamber Storage + Stone Storage = 2,167.7 cf = 0.050 af
Overall Storage Efficiency = 62.1%
Overall System Size = 58.00' x 19.00' x 3.17'

14 Chambers
129.2 cy Field
24.2 cy Stone
Pond 17P: Pr Infil

Inflow Area=29,310 sf
Peak Elev=147.47'
Storage=2,135 cf
<table>
<thead>
<tr>
<th>Elevation (feet)</th>
<th>Storage (cubic-feet)</th>
<th>Elevation (feet)</th>
<th>Storage (cubic-feet)</th>
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### Stage-Area-Storage for Pond 17P: Pr Infil (continued)

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Summary for Pond 18P: Sand Filter

Storage within Sand Filter (Sand and Forebay Units) taken from top of sand to top of storage. Actual system will consist of 5.5 foot tall Retain-It units.

Inflow Area = 56,103 sf, 89.29% Impervious, Inflow Depth > 5.81” for 25 Year event
Inflow = 8.22 cfs @ 12.07 hrs, Volume= 27,140 cf
Outflow = 8.02 cfs @ 12.09 hrs, Volume= 27,109 cf, Atten= 2%, Lag= 1.0 min
Primary = 4.14 cfs @ 12.09 hrs, Volume= 21,701 cf
Secondary = 3.88 cfs @ 12.09 hrs, Volume= 5,408 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 140.12’ @ 12.09 hrs  Surf.Area= 1,792 sf  Storage= 4,817 cf

Plug-Flow detention time= 85.3 min calculated for 27,109 cf (100% of inflow)
Center-of-Mass det. time= 84.6 min (845.2 - 760.7)

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<td>#2A 137.00’</td>
<td>2,700 cf</td>
<td><strong>retain_it retain_it 3.5’ x 14 In Inside #1</strong></td>
<td>Inside= 84.0”W x 42.0”H =&gt; 25.10 sf x 8.00’L = 200.8 cf</td>
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<td>#3B 137.00’</td>
<td>0 cf</td>
<td><strong>16.00’W x 56.00’L x 4.17’H Forebay Units</strong></td>
<td>3,733 cf Overall - 3,733 cf Embedded = 0 cf x 40.0% Voids</td>
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<td>Inside= 84.0”W x 42.0”H =&gt; 25.10 sf x 8.00’L = 200.8 cf</td>
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5,401 cf Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard

Device Routing Invert Outlet Devices
#1 Primary 135.00’ **4.0’ Round Culvert X 2.00** L= 3.0’ Ke= 0.500
Inlet / Outlet Invert= 135.00’ / 134.95’ S= 0.0167 '/' Cc= 0.900
n= 0.011, Flow Area= 0.09 sf

#2 Device 1 137.00’ **0.26 cfs Exfiltration at all elevations**

#3 Secondary 139.67’ **4.0’ long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

#4 Primary 139.67’ **4.0’ long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

#5 Device 4 137.20’ **18.0’ Round Culvert** L= 5.0’ Ke= 0.500
Inlet / Outlet Invert= 137.00’ / 137.20’ S= -0.0400 '/' Cc= 0.900
n= 0.011, Flow Area= 1.77 sf

#6 Device 3 137.20’ **18.0’ Round Culvert** L= 5.0’ Ke= 0.500
Inlet / Outlet Invert= 137.00’ / 137.20’ S= -0.0400 '/' Cc= 0.900
n= 0.011, Flow Area= 1.77 sf
Primary OutFlow  Max=4.13 cfs @ 12.09 hrs  HW=140.12' (Free Discharge)  
1=Culvert  (Passes 0.26 cfs of 1.87 cfs potential flow)  
2=Exfiltration  (Exfiltration Controls 0.26 cfs)  
4=Sharp-Crested Rectangular Weir  (Weir Controls 3.87 cfs @ 2.20 fps)  
5=Culvert  (Passes 3.87 cfs of 5.71 cfs potential flow)  

Secondary OutFlow  Max=3.87 cfs @ 12.09 hrs  HW=140.12' (Free Discharge)  
3=Sharp-Crested Rectangular Weir  (Weir Controls 3.87 cfs @ 2.20 fps)  
6=Culvert  (Passes 3.87 cfs of 5.71 cfs potential flow)
Pond 18P: Sand Filter - Chamber Wizard Sand Units

Chamber Model = retain_it retain_it 3.5' (retain-it®)
- Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf
- Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf
- 2 Rows adjusted for 110.5 cf perimeter wall

7 Chambers/Row x 8.00' Long = 56.00' Row Length
- 2 Rows x 96.0" Wide = 16.00' Base Width
- 50.0" Chamber Height = 4.17' Field Height

6.1 cf Sidewall x 7 x 2 + 6.1 cf Endwall x 2 x 2 = 110.5 cf Perimeter Wall
- 14 Chambers x 200.8 cf - 110.5 cf Perimeter wall = 2,700.4 cf Chamber Storage
- 14 Chambers x 266.7 cf = 3,733.3 cf Displacement

Chamber Storage = 2,700.4 cf = 0.062 af
- Overall Storage Efficiency = 72.3%
- Overall System Size = 56.00’ x 16.00’ x 4.17’

14 Chambers
- 138.3 cy Field
Pond 18P: Sand Filter - Chamber Wizard Forebay Units

**Chamber Model = retain_it retain_it 3.5' (retain-it®)**

Inside: 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf
Outside: 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf
2 Rows adjusted for 110.5 cf perimeter wall

7 Chambers/Row x 8.00' Long = 56.00' Row Length
2 Rows x 96.0" Wide = 16.00' Base Width
50.0" Chamber Height = 4.17' Field Height

6.1 cf Sidewall x 7 x 2 + 6.1 cf Endwall x 2 x 2 = 110.5 cf Perimeter Wall
14 Chambers x 200.8 cf - 110.5 cf Perimeter wall = 2,700.4 cf Chamber Storage
14 Chambers x 266.7 cf = 3,733.3 cf Displacement

Chamber Storage = 2,700.4 cf = 0.062 af
Overall Storage Efficiency = 72.3%
Overall System Size = 56.00' x 16.00' x 4.17'

14 Chambers
138.3 cy Field
Pond 18P: Sand Filter

Inflow Area = 56,103 sf
Peak Elev = 140.12'
Storage = 4,817 cf
### Stage-Area-Storage for Pond 18P: Sand Filter

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Summary for Pond 20P: Groundwater

Groundwater flow assumed to be 100 gpm per GZA report dated March 16, 2021.

[57] Hint: Peaked at 136.57' (Flood elevation advised)

Inflow = 0.22 cfs @ 0.00 hrs, Volume= 19,016 cf, Incl. 0.22 cfs Base Flow
Outflow = 0.22 cfs @ 0.00 hrs, Volume= 19,016 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.22 cfs @ 0.00 hrs, Volume= 19,016 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 136.57' @ 0.00 hrs

Device Routing Invert Outlet Devices
#1 Primary 136.30' **8.0" Round Culvert** L= 193.0' Ke = 0.500
Inlet / Outlet Invert= 136.30' / 135.10' S= 0.0062 '/' Cc= 0.900
n= 0.011, Flow Area= 0.35 sf

Primary OutFlow Max=0.22 cfs @ 0.00 hrs HW=136.57' (Free Discharge)
1=Culvert (Barrel Controls 0.22 cfs @ 2.44 fps)
## Stage-Area-Storage for Pond 20P: Groundwater

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Summary for Link 11L: Pr Lake Ave

Inflow Area = 189,743 sf, 69.47% Impervious, Inflow Depth > 6.38" for 25 Year event
Inflow = 23.53 cfs @ 12.01 hrs, Volume = 100,943 cf
Primary = 23.53 cfs @ 12.01 hrs, Volume = 100,943 cf, Atten = 0%, Lag = 0.0 min

Primary outflow = Inflow, Time Span = 0.00-24.00 hrs, dt = 0.01 hrs
Summary for Link 12L: Pr Fairfield House

Inflow Area = 100,127 sf, 60.50% Impervious, Inflow Depth > 5.73" for 25 Year event

Inflow = 17.62 cfs @ 12.00 hrs, Volume= 47,821 cf
Primary = 17.62 cfs @ 12.00 hrs, Volume= 47,821 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Summary for Link 22L: MH#101

Inflow Area = 85,473 sf, 81.90% Impervious, Inflow Depth > 7.24" for 25 Year event
Inflow = 8.39 cfs @ 12.08 hrs, Volume= 51,564 cf
Primary = 8.39 cfs @ 12.08 hrs, Volume= 51,564 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Summary for Link 23L: FH 12" Pipe PR

Inflow Area = 5,772 sf, 5.20% Impervious, Inflow Depth > 14.87" for 25 Year event
Inflow = 4.46 cfs @ 12.09 hrs, Volume = 7,150 cf
Primary = 4.46 cfs @ 12.09 hrs, Volume = 7,150 cf, Atten = 0%, Lag = 0.0 min

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

Inflow Area = 5,772 sf

4.46 cfs

4.46 cfs

Link 23L: FH 12" Pipe PR

Hydrograph