DRAINAGE REPORT

For

C.R. Klewin, LLC

PROPOSED

"Multi-Family Residential"

19, 29 & 39 Military Highway
Gales Ferry/Ledyard, Connecticut

Prepared by:

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BOHLER

February 19th, 2025
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I. EXECUTIVE SUMMARY

This report examines the changes in drainage that can be expected as the result of the proposed development at 19, 29 & 39 Military Highway, Gales Ferry, CT and provides calculations documenting the design of the proposed stormwater management system illustrated within the accompanying Proposed Site Plan Documents prepared by Bohler.

The stormwater management system for this site has been designed utilizing Best Management Practices (BMPs) to meet or exceed the stormwater management standards in accordance with Connecticut Department of Energy & Environmental Protection (CT DEEP) 2024 Connecticut Stormwater Quality Manual and the Ledyard Zoning Regulations. The proposed project will provide; pollutant reduction by providing via treatment of the water quality volume and water quality flows through stormwater BMPs; peak runoff attenuation through use of stormwater BMPs; and conveyance protection through structural stormwater BMPs. The project will also provide erosion and sedimentation controls in accordance with the Connecticut Guidelines for Soil Erosion and Sediment Control during the demolition and construction periods, as well as long term stabilization of the site.

A summary of the pre- and pos-development conditions peak runoff rates for the 2-, 10-,25- and 100-year storms can be found in **Table 1.1** below.

Table 1.1: Design Point Peak Runoff Rate Summary

Peak Flow Discharge in cubic feet per second (cfs)												
	2-year			10-year			25-year			100-year		
	Pre-	Post-	Delta	Pre-	Post-	Delta	Pre-	Post-	Delta	Pre-	Post-	Delta
DP1	8.48	2.27	-6.21	21.35	7.34	-14.01	30.77	15.76	-15.01	46.17	36.61	-9.56
DP2	3.84	3.58	-0.26	6.89	6.63	-0.26	8.89	8.60	-0.29	11.97	11.67	-0.30

II. EXISTING SITE CONDITIONS

Existing Site Description

The site consists of approximately 18.95 acres of land historically used agriculturally. The site is located on the eastern side of Military Highway and bounded by commercial properties to the east/north, and vacant and residential properties to the south. The site is partially wooded in fair

condition and the majority of the site has been cleared for agricultural purposes. The site is located in a FEMA floodplain Zone AE with an associated flood elevation of 28.1 feet.

On-Site Soil Information

The site includes soils classified by the Natural Resource Conservation Service (NRCS) as Hydrologic Soil Group (HSG) "B", and "D". The "D" type soils are associated with the on-site wetland body located at the southeast corner of the property. Reading of test pits, infiltration tests and permeability sampling were completed by Whitestone Associates, Inc. in June 2022. Refer to **Appendix B** for additional information.

Existing Collection and Conveyance

There is no existing drainage infrastructure on site.

Existing Watersheds and Design Point Information

The entirety of the site drains westerly toward the property line and ultimately drains to Thames River within the Thames River subregional basin – Thames Main Stem Regional Basin - Thames Major Basin. The site has varying slopes ranging from <1% - 60% and elevations ranging from 82 at the road to 26 at the wetland boundary. The site was analyzed at two (2) design points to analyze pre-development condition flow rates. DP-1 is wetland body located at the southeast corner of the site. DP-2 is the portion of the site that drains to the Military Highway. Pre-development land use coverages within the analysis area include areas of Forest, drives & walks, lawns, roofs and impervious area.

Refer to **Table 1.1,** for the calculated pre-development conditions peak rates of runoff. For additional hydrologic information and graphical representation of the existing drainage areas, refer to **Appendix C** and the Drainage Area Maps in the appendices of this report.

III. PROPOSED SITE CONDITIONS

Proposed Development Description

The proposed project consists of the construction of two (2) residential, apartment buildings and includes associated paved parking areas, landscaping, utilities, and stormwater management. The site will be served by public water and subsurface sewage disposal systems. The project will also

provide erosion and sedimentation controls during the demolition and construction periods, as well as long term stabilization of the site. In addition, a Stormwater Operation and Maintenance (O&M) Plan, attached in **Appendix F**, has been developed which includes scheduled maintenance and periodic inspections of stormwater management structures.

Proposed Development Collection and Conveyance

The site has been designed with a conventional drainage system. Catch basins will capture and convey stormwater runoff, via an underground pipe system, to either an underground infiltration system or an infiltration basin. All rooftop runoff will be directed to stormwater system as well. Pretreatment of stormwater runoff will be provided by proposed proprietary treatment devices or a sediment forebay.

Proposed Watersheds and Design Point Information

The project has been designed to maintain existing drainage watersheds to the greatest extent possible, with the same design points described in **Section II** above. The site was subdivided into eight (8) separate sub catchment areas for the post-development conditions. Post-development land use coverages within the analysis area include areas of forest, lawns, roofs and impervious.

Refer to **Table 1.1** for the calculated post-development conditions peak rates of runoff. For additional hydrologic information and graphical representation of the proposed drainage areas, refer to **Appendix D** and the Drainage Area Maps in the appendices of this report.

IV. STORMWATER MANAGEMENT STANDARDS

In accordance with the 2024 Connecticut Stormwater Quality Manual and the Ledyard Zoning Regulations, the following stormwater management standards are provided.

Standard #1: Runoff Volume Pollutant Reduction

The runoff volume and pollutant reduction criterion are designed to preserve pre-development hydrology and pollutant loads to protect water quality and maintain groundwater recharge. This standard is achieved by treating a prescribed water quality volume (WQV) or associated peak flow, referred to as the water quality flow (WQF). The WQV is the volume of stormwater runoff from a given storm event that must be retained and/or treated to remove most of the post-development

stormwater pollutant load on an average annual basis and to help maintain pre-development site hydrology in terms of duration, rate and volume of stormwater flows including groundwater recharge. The water quality volume (WQV) is the amount of stormwater runoff from any given storm that should be captured and treated in order to remove most stormwater pollutants on an average annual basis. The recommended WQV, which results in the capture and treatment of the entire runoff volume for 90 percent of the average annual storm events, is equivalent to the runoff associated with the first 1.3 inches of rainfall. As calculated, the WQV required for this development is 25,591 CF, whereas 30,870 CF of WQV is provided.

- The WQV required for subcatchment area PR-1A and PR-1B that drain to the underground Infiltration System 1A is 14,476 CF, whereas Infiltration System 1A provides 19,283 CF of WQV.
- The WQV required for subcatchment area PR-1C is 2,632 CF, whereas 2,663 CF of WQV is provided in Rain Garden 1C.
- The WQV required for subcatchment area PR-1D and PR-1E that drain to the above ground Infiltration Basin 1E is 8,484 CF, whereas Infiltration Basin 1E provides 8,924 CF of WQV.

Refer to **Appendix E** of this report for calculations documenting required and provided water quality.

Required Retention Volume

The required retention volume (RRV) criterion is intended to maintain pre-development annual groundwater recharge volumes by capturing and infiltrating stormwater runoff. The RRV is equal to 100% or 50% of the site's WQV depending on the type of project or activity (new development, redevelopment, or retrofit) and the existing Directly Connected Impervious Area (DCIA) of the site.

100% of the site's WQV is required to be retained on site for: all new developments, redevelopment or retrofit of sites that are currently developed with existing DCIA of less than 40%, and any new stormwater discharges located within 500 feet of tidal wetlands. The RRV is considered part of the total WQV and therefore, since the WQV is met through infiltration, the RRV is met.

Standard #2: Stormwater Runoff Quantity Control

The objective of the stormwater runoff quantity control criterion is to maintain pre-development peak runoff rates and manage the volume and timing of runoff to prevent downstream flooding, channel erosion, and other adverse impacts. As outlined in **Table 1.1**, the development of the site, and the proposed stormwater management system, have been designed so that post-development peak rates of runoff meet or are below pre-development conditions for the 2-, 10-, 25- and 100-year storm events at all design points.

Peak Runoff Attenuation

Peak runoff attenuation requirements are achieved for site development/redevelopment by the following conditions. Controlling the 2-year, 24-hour post-development peak flow rate to 50% of the 2-year, 24-hour pre-development peak flow rate for each point at which stormwater discharges from a site using structural stormwater BMPs. Control the 10-year, 24-hour post-development peak flow rate to the 10-year, 24-hour pre-development peak flow rate for each point at which stormwater discharges from a site using structural stormwater BMPs.

The pre- and post-development runoff rates discharged from the site were computed using the HydroCAD Software Solutions LLC computer program. HydroCAD is a computer model that utilizes the methodologies set forth in the Technical Release No. 55 (TR-55) manual and Technical Release No. 20 (TR-20) computer model, originally developed by the United States Department of Agriculture – Natural Resources Conservation Service (USDA-NRCS). The computer program forecasts the rate of surface water runoff based upon several factors including land use, hydrologic soil type, contributing watershed area, time of concentration, rainfall data, storage volumes, exfiltration rates, and the hydraulic capacity of structures. The computer model predicts the amount of runoff as a function of time, with the ability to include the attenuation effect due to dams, lakes, large wetlands, floodplains, and stormwater management basins. Land use for the site under pre- and post-development conditions were determined from field survey, town topographic maps, and aerial imagery.

The input data for rainfalls with statistical recurrence frequencies of 2-, 10-, 25- and 100- years are based on NOAA and are listed in **Table 2.1** below. Refer to **Appendix E** for more information.

Table 2.1: NOAA Rainfall Depths

Frequency	2-year	10-year	25-year	100-year
Rainfall* (inches)	3.46	5.12	6.15	7.75

*The rainfall depths were obtained from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14, Volume 10, Precipitation Frequency Data Server (PFDS).

The proposed stormwater management as designed will provide a decrease in peak rates of runoff for the 2-, 10-, 25-, and 100-year design storm events in accordance with the 2024 Connecticut Stormwater Quality Manual and the Ledyard Zoning Regulations. The pre-development versus post-development stormwater discharge comparisons is contained in Table 1.1. Refer to **Appendix C and D** for the Existing and Proposed Hydrologic analysis.

Conveyance Protection

Conveyance protection requirements are achieved for on-line structural BMP's when the conveyance system is designed leading to, from, and through structural stormwater BMPs based on the post-development peak flow rate associated with the 25-year, 24-hour or larger magnitude design storm. Pipes have been designed to safely convey the 25-year storm using the Hydraflow Storm Sewers Extension for Autodesk Civil 3D. This program utilizes the rational method. Final discharge pipes were modeled with 'normal' starting tailwater conditions as determined by Manning's Equation. In situations where the pipe discharges into a stormwater basin, the tail water is set at the water surface elevation of that stormwater basin for the design storm event. In situations where the normal depth is less than the critical depth, Hydraflow Storm Sewers Extension changes the starting tailwater to critical depth (min. specific energy) of the line. A 30% clogging factor was utilized for the area of the catch basin grates in the sag conditions as mentioned in the Ledyard Stormwater Regulations Ordinance #300-017.

The input data for rainfalls, regarding storm conveyance, with statistical precipitation intensities of 25-years are based on NOAA Atlas 14, Volume 10, Version 3 and provided in **Appendix E**. Refer to **Appendix E** for more information and pipe sizing calculations.

Emergency Outlet Sizing

The emergency outlets of stormwater management facilities shall be designed to safely pass the peak discharge rate associated with the 100-year storm. The emergency outlets are sized to pass

the 100-year peak runoff rate, in a controlled manner, without eroding outfalls or downstream conveyances. The peak discharges from the basins are managed via outlet control structures that feed into respective HDPE drainage pipes and empty to a suitably designed outlet protection measure. Refer to **Appendix E** for more information.

Standard #3: Construction Soil Erosion and Sediment Control

The proposed project will provide construction period erosion and sedimentation controls as indicated within the Soil Erosion and Sediment Control (SESC) plan(s) provided for this project in the site plan documents. This includes a proposed construction exit, protection for stormwater inlets, protection around temporary material stockpiles and various other techniques as outlined on the erosion and sediment control sheets.

Standard #4: Post Construction Operation and Maintenance

An Operation and Maintenance (O&M) Plan for this site has been prepared and is included in **Appendix F** of this report. The O&M Plan outlines procedures and timetables for the long-term operation and maintenance of the proposed site stormwater management system, including initial inspections upon completion of construction, and periodic monitoring of the system components, in accordance with established practices and the manufacturer's recommendations. The O&M Plan includes a list of responsible parties.

Standard #5: Stormwater Management Plan

This report and supporting documentation are intended to satisfy the requirements outlined in the 2024 Connecticut Stormwater Quality Manual.

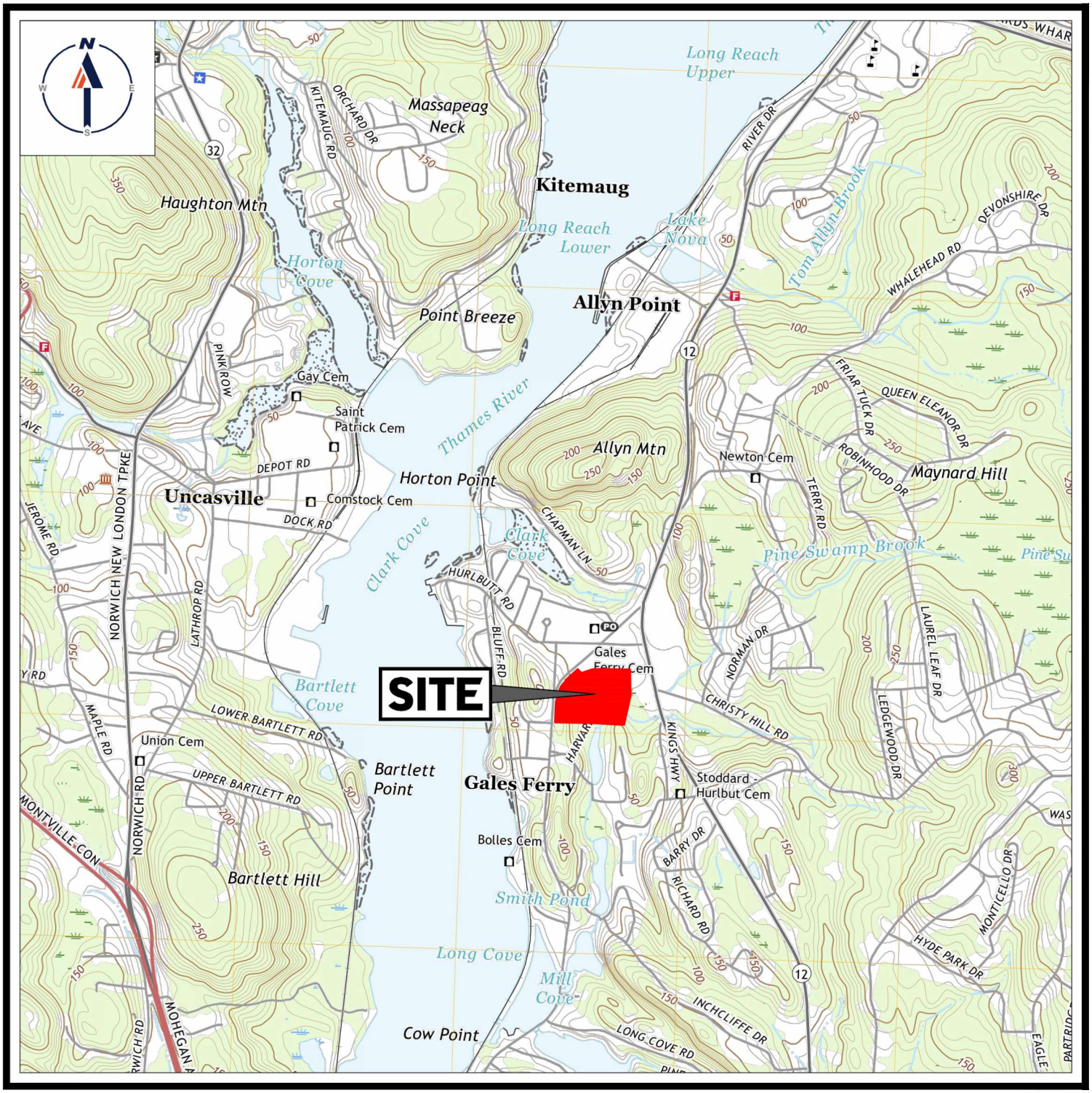
V. SUMMARY

In summary, the proposed stormwater management system illustrated on the drawings prepared by Bohler, meets, or exceeds the standards set forth in the 2024 Connecticut Stormwater Quality Manual and the Ledyard Zoning Regulations. The proposed development results in an improvement from the historic use, improves water quality, and reduces peak rates of stormwater runoff from the subject site when compared to pre-development conditions for the analyzed storm events. The pre-development versus post-development stormwater discharge comparisons is

contained in **Table 1.1** above. Supporting documentation and stormwater-related computations are contained in the appendices of this report.

APPENDIX A: PROJECT LOCATION MAPS

- *USGS MAP*
- *FEMA FIRMETTE*



USGS MAP

SOURCE: USGS UNCASVILLE QUADRANGLE

National Flood Hazard Layer FIRMette

FEMA

72°5'30"W 41°25'49"N

72°4'53"W 41°25'22"N

Feet 1:6,000

0 250 500 1,000 1,500 2,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

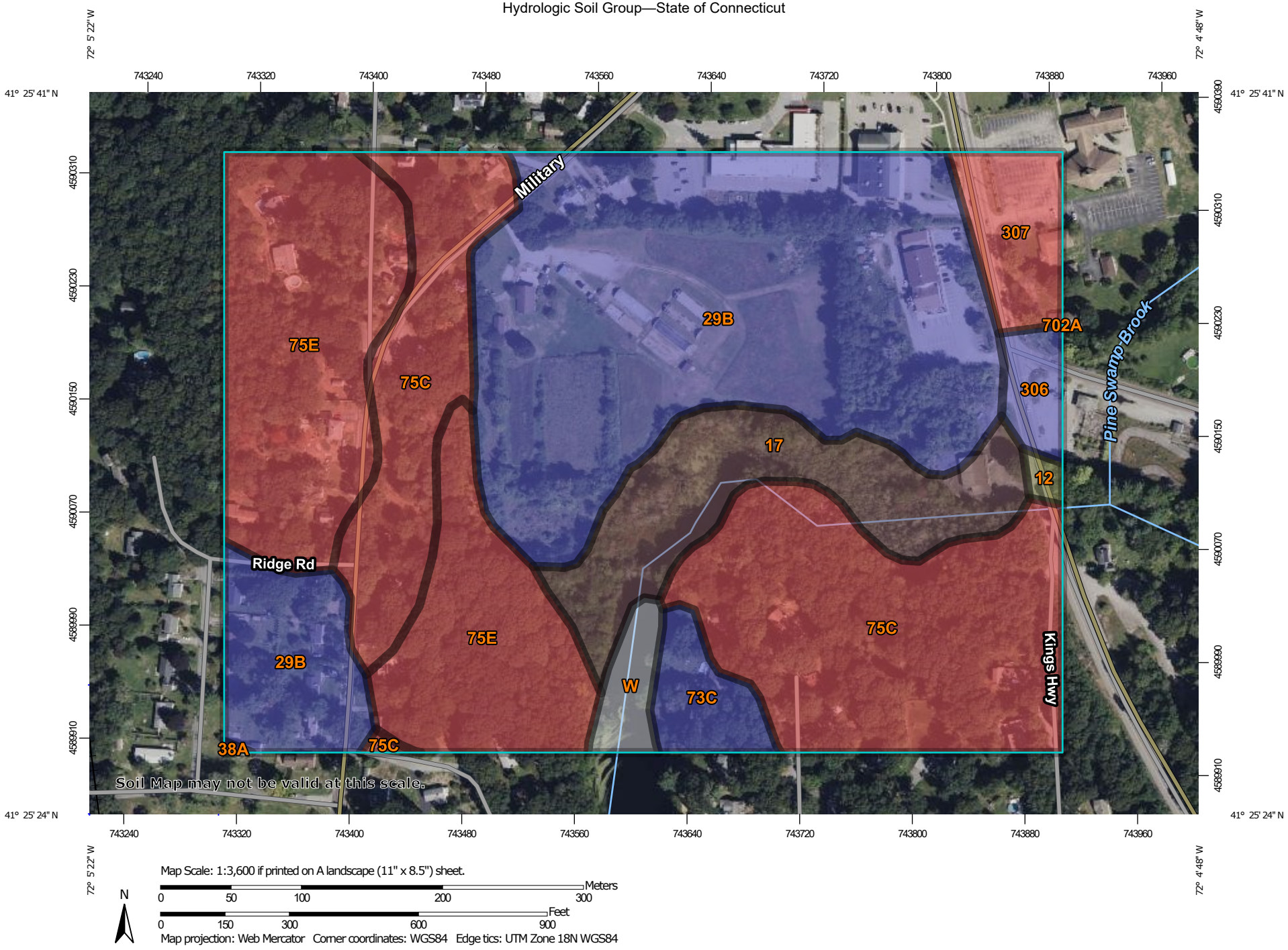
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 4/4/2023 at 4:15 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX B: SOIL AND WETLAND INFORMATION

- *NCRS CUSTOM SOIL RESOURCE REPORT*
- *GEOTECHNICAL REPORT*
- *SOIL TESTING RESULTS*


72° 5' 22" W
72° 4' 48" W
41° 25' 41" N
41° 25' 24" N
743240
743320
743400
743480
743560
743640
743720
743800
743880
743960
4590390
4590310
4590230
4590150
4590070
4589990
4589910
Military
Ridge Rd
Pine Swamp Brook
Kings Hwy
307
29B
702A
306
75E
75C
17
12
75E
75C
29B
W
73C
38A
75C
Soil Map may not be valid at this scale.
Map Scale: 1:3,600 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0 50 100 200 300
Feet
0 150 300 600 900
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

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

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

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

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
12	Raypol silt loam	C/D	0.2	0.3%
17	Timakwa and Natchaug soils, 0 to 2 percent slopes	B/D	5.9	9.3%
29B	Agawam fine sandy loam, 3 to 8 percent slopes	B	22.7	36.2%
38A	Hinckley loamy sand, 0 to 3 percent slopes	A	0.0	0.0%
73C	Charlton-Chatfield complex, 0 to 15 percent slopes, very rocky	B	1.4	2.3%
75C	Hollis-Chatfield-Rock outcrop complex, 3 to 15 percent slopes	D	15.5	24.7%
75E	Hollis-Chatfield-Rock outcrop complex, 15 to 45 percent slopes	D	13.2	21.1%
306	Udorthents-Urban land complex	B	0.9	1.4%
307	Urban land	D	2.0	3.2%
702A	Tisbury silt loam, 0 to 3 percent slopes	C	0.0	0.0%
W	Water		0.9	1.5%
Totals for Area of Interest			**62.8**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

WHITESTONE
An Employee-Owned Company

16 OLD FORGE ROAD
SUITE A
ROCKY HILL, CT 06067
860.726.7889
whitestoneassoc.com

June 28, 2023

via email

C.R. KLEWIN, INC.
Three Johnny Cake Hill Road
Old Lyme, Connecticut 06371

Attention: Mr. Maurice Gawendo
President

Regarding: LIMITED GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
27 - 29 MILITARY HIGHWAY
MAP 91, BLOCK 1590, LOTS 29 & 39
VILLAGE OF GALES FERRY, TOWN OF LEDYARD
NEW LONDON COUNTY, CONNECTICUT
WHITESTONE PROJECT NO.: GM2320566.000

Dear Mr. Gawendo:

Whitestone Associates, Inc. (Whitestone) has completed a limited geotechnical investigation at the above-referenced site. The results of the investigation and preliminary recommendations presented below are based on the soil conditions disclosed from a limited number of soil explorations conducted during Whitestone's field investigation. The purpose of the investigation was to assess subsurface conditions within and adjacent to the proposed development area accessible to a truck-mounted drill rig and tracked excavator. Preliminary recommendations for support of the proposed structures and pavements and anticipated earthwork requirements are included herein. Subsurface conditions vary significantly at the western edge of the site and as such, further structure-specific drilling is recommended.

1.0 PROJECT DESCRIPTION

1.1 Site Location & Existing Conditions

The site is located at 27 - 29 Military Highway in the Village of Gales Ferry, Town of Ledyard, New London County, Connecticut. The 18.8-acre property is further identified as Map 91, Block 1590, Lots 29 and 39. The site is developed with *Sweet Hill Farm*, which has a residence and several light structures for a farm store and weddings/private events. Most of the site slopes down to the south from approximately 40 feet above North American Vertical Datum of 1988 (NAVD) to 30 feet above NAVD. However, the western side slopes down steeply to the east from approximately 70 feet above NAVD to 30 feet above NAVD.

1.2 Site Geology

Based on a review of the *Surficial Materials Map of Connecticut (1992)*, the natural site soils consist of a glaciofluvial deposit (sand over sand and gravel). A Connecticut Department of Transportation (CTDOT) boring in the vicinity of the site indicates 56 feet of sand over 29 feet of sand and gravel. Glacial till is mapped on the western edge of the site. The *Bedrock Geologic Map of Connecticut (1985)* indicates that the subject property is primarily underlain by the Proterozoic Z-age Plainfield Formation, consisting of quartzite with minor schist and gneiss and incidental calc-silicate rock and amphibolite. The western

edge of the site is underlain by Proterozoic Z-age Potter Hill Granite Gneiss, consisting of gneiss. Both are part of the Eastern Uplands; Avalonian (Continental) Terrane; Avalonian Anticlinorium. Bedrock outcrops along the western side of the site.

1.3 Proposed Construction

Based on a March 30, 2023 *Conceptual Layout Plan* prepared by Bohler Engineering MA, LLC of West Hartford, Connecticut, the proposed development includes demolition of the existing structures and construction of four five-story residential buildings (Buildings 1 through 4) with associated paved parking, utilities, and landscaped areas. The location is shown on attached Figure 1 - *Test Location Plan*. Stormwater management and septic system areas are planned south of the structures. Retaining walls will likely be required as part of site grading.

Structural information was not available at the time of this report, however, based on experience with similar facilities, Whitestone anticipates that maximum column, wall, and floor loads will be less than about 250 kips, 3.0 kips per lineal foot, and 150 pounds per square foot, respectively.

2.0 FIELD EXPLORATION & TESTING

2.1 Field Exploration

Field exploration at the project site consisted of advancing nine soil borings (identified as B-1 through B-9) within accessible portions of the site. The explorations subsequently were backfilled to the surface with excavated soils from the investigation. The locations of the borings are shown on the accompanying *Test Location Plan* included as Figure 1. *Records of Subsurface Exploration* for the borings are provided in Appendix A.

Field exploration also consisted of excavating six test pits (identified as TP-1 through TP-6). The test pits were backfilled to the surface with excavated soils. The locations of the test pits are shown on the accompanying *Test Location Plan* included as Figure 1. *Records of Subsurface Exploration* for the test pits are provided in Appendix A.

The subsurface tests were conducted in the presence of a Whitestone engineer, who conducted field tests, recorded visual classifications, and collected samples of the various strata encountered. The tests were located in the field using phone-based GPS. These locations are presumed to be accurate to the degree implied by the method used.

Soil borings and Standard Penetration Tests (SPTs) were conducted in general accordance with ASTM International (ASTM) designation D1586. The SPT resistance value (N) can be used as an indicator of the consistency of fine-grained soils and the relative density of coarse-grained soils. The N-value for various soil types can be correlated with the engineering behavior of earthworks and foundations.

Groundwater level observations, where encountered, were recorded during and immediately after the completion of field operations prior to backfilling the tests. Seasonal variations, temperature effects, man-made effects, and recent rainfall conditions may influence the levels of the groundwater, and the observed levels will depend on the permeability of the soils. Groundwater elevations derived from sources other than seasonally observed groundwater monitor wells may not be representative of true groundwater levels.

2.2 Infiltration Testing

Test pits were completed to evaluate soil conditions prior to infiltration testing. Test pits TP-1, TP-2, TP-3, and TP-6 were advanced to depths of 5.5 feet below ground surface (fbgs) to eight fbgs. Infiltration tests I-1 through I-4 were conducted as falling head tests in cased holes at the locations shown on the *Test Location Plan*. PVC casing, four inches in diameter, was installed depths of 1.5 fbgs or three fbgs. A thin layer of clean sand was placed at the bottom of the casing. The soil was pre-soaked for approximately one hour. Following testing, the casings were removed. The results are tabulated below.

SUMMARY OF INFILTRATION TESTING				
Location	**Approximate Ground Elevation (ft NAVD)**	**Test Depth (fbgs)**	**Approximate Test Elevation (ft NAVD)**	**Infiltration Rate (in/hr)**
I-1 (TP-1)	28	1.5	26.5	>15
I-2 (TP-2)	27	1.5	25.5	>15
I-3 (TP-3)	32	3.0	29	>15
I-4 (TP-6)	32	3.0	29	>15

The infiltration testing was conducted within the glaciofluvial deposit. Typically, a Factor of Safety (FoS) is applied to measured infiltration rates to account for siltation and consolidation of soil below the systems over time. Safety factors used should consider how critical the systems are to the development and the available storage. If the system is critical or storage limited, a higher FoS should be applied. Infiltration rates are variable and dependent on test depth and stratification. Whitestone recommends that the unfactored infiltration rate not exceed eight inches per hour and that a FoS of at least 2.5 be applied to the rate for design purposes.

2.3 Percolation Testing

Test pits were completed to evaluate soil conditions prior to percolation testing. Test pits TP-4 and TP-5 were advanced to depths of six fbgs and 7.5 fbgs, respectively. There were indications of estimated seasonal high groundwater (ESHGW) on the sidewalls of test pit TP-5 at a depth of 5.8 fbgs. There were no indications of ESHGW on the sidewalls of test pit TP-4. Percolation test P-1 adjacent to TP-4 and P-2 adjacent to TP-5 were attempted in the glaciofluvial deposit at depths of four fbgs and 3.5 fbgs, respectively, in hand-dug holes that were approximately 12 inches in diameter and 12 inches deep. The percolation test holes were pre-soaked but could not hold water. Percolation testing was abandoned. Whitestone estimates of percolation rate are tabulated below.

SUMMARY OF PERCOLATION TESTING		
Location	**Percolation Rate (minutes per inch)**	**Approximate Test Elevation (ft NAVD)**
P-1 (TP-4)	< 1 [1]	28
P-2 (TP-5)	< 1 [1]	28.5

Note 1: Percolation rates estimated based on observations during pre-soaking.

2.4 Laboratory Testing

Laboratory testing was conducted to determine additional, pertinent engineering characteristics of representative samples of on-site soils. The laboratory testing was conducted in general accordance with applicable ASTM standard test methods and included physical/textural testing of representative samples.

The results of the laboratory testing are presented in this section in a general manner and qualitatively interpreted. The results are incorporated into the findings and recommendations discussed throughout this report. Quantitative test results are provided in Appendix B.

Physical and Textural Analysis: Representative samples of selected strata were subjected to laboratory testing that included moisture content determination (ASTM D2216) and washed gradation analysis (ASTM D422) in order to conduct supplementary engineering soil classifications in general accordance with ASTM D2487. The soil stratum tested was classified by the Unified Soil Classification System (USCS). The results of the laboratory testing are summarized in the following table:

PHYSICAL/TEXTURAL ANALYSES SUMMARY					
Boring	**Sample**	**Depth (fbgs)**	**Moisture Content (%)**	**Passing No. 200 Sieve (%)**	**USCS Classification**
B-1	S-3	5.0 - 7.0	27.8	8.1	SP-SM
B-3	S-2	2.0 - 4.0	1.8	7.4	SW-SM
B-5	S-3	5.0 - 7.0	26.3	25.7	SM
B-7	S-2	2.0 - 4.0	3.6	2.6	SP

Based on the results of the gradation testing, the United States Department of Agriculture (USDA) textural analysis classifies the glaciofluvial deposit as “sand”.

3.0 SUBSURFACE CONDITIONS

The subsurface soil conditions encountered within the subsurface tests conducted by Whitestone consisted of the following generalized strata in order of increasing depth. *Records of Subsurface Exploration* are provided in Appendix A.

Surface Cover Materials: The explorations, except borings B-5, encountered four inches to 12 inches of topsoil at the ground surface, underlain in places by four inches to 12 inches of subsoil with roots.

Existing Fill (intermittent): Existing fill was encountered in B-3 to a depth of nine fbgs. Although existing fill was not encountered within other borings, considering the wide spacing of the explorations and the existing development at the site fill should be expected, especially around existing structures. In addition, bury holes and other pockets of fill may be encountered during redevelopment.

Glaciofluvial Deposit: Beneath the surface cover materials or at the ground surface, the explorations encountered a glaciofluvial deposit, consisting of brown to gray, loose to medium dense (occasionally

dense), poorly graded sand with silt (USCS: SP-SM) to silty sand (USCS: SM) to well-graded sand with silt (USCS: SW-SM) to poorly graded sand (USCS: SP), occasional gravel and cobbles. The SPT N-values within the glaciofluvial deposit were variable, ranging from four blows per foot (bpf) to 49 bpf. Borings B-3 through B-8 terminated in the glaciofluvial deposit at depths of 22 fbgs to 32 fbgs. The test pits terminated in the glaciofluvial deposit at depths of 5.5 fbgs to eight fbgs.

Glacial Till: Beneath the glaciofluvial deposit, borings B-1, B-2, and B-9 encountered glacial till, consisting of gray-brown to brown, dense to very dense, silty sand with gravel (USCS: SM). The SPT N-values within the glacial till ranged from 31 bpf to 66 bpf. Boring B-1 terminated in the glacial till at a depth of 24 fbgs.

Apparent Bedrock: Borings B-2 and B-9 encountered auger refusal on apparent bedrock at depths of five fbgs and 8.7 fbgs, respectively. Bedrock was not sampled through rock coring efforts, but was inferred by auger refusal. Rock coring techniques would be required to further characterize the nature and extent of the refusal materials. Additional explorations should evaluate the bedrock, the surface of which likely undulates and is relatively close to anticipated excavation depths.

Groundwater: Groundwater was encountered in the soil explorations during the investigation at depths ranging from 2.7 fbgs to 14 fbgs, though typically from five fbgs to 10 fbgs. The shallower groundwater is likely perched. Indications of ESHGW were observed in test pits TP-1, TP-2, TP-3, and TP-5 at depths of 2.3 fbgs to 5.8 fbgs. Groundwater levels should be expected to fluctuate seasonally and following periods of precipitation.

4.0 CONCLUSIONS & RECOMMENDATIONS

Contingent upon construction phase evaluation, Whitestone's findings indicate that the proposed buildings may be supported on conventional shallow foundations bearing on a layer of compacted structural fill placed over thoroughly compacted glaciofluvial deposit. Shallow foundations may also bear directly on glacial till, which is likely to be encountered within a portion of the footprint of Building 4. Although only encountered in a limited number of explorations, existing fill associated with the buildings to be demolished should be expected during construction. In addition, bury holes and other pockets of fill may be encountered during redevelopment. Any existing fill should be overexcavated beneath footings and replaced with structural fill. Ground-supported floor slabs may derive support from the inspected and approved glaciofluvial deposit (or existing fill if encountered) and/or controlled structural fill materials. Additionally, the site conditions support the use of typical pavement sections using standard CTDOT specified materials. The recommendations for support of the proposed structures and pavements included herein should be considered preliminary until additional structure-specific drilling has been completed.

The following recommendations have been developed on the basis of subsurface conditions encountered within the limited exploration conducted and without a site development plan. Additional borings for each planned structure are recommended. Whitestone should review the preliminary recommendations in this report following completion of this drilling.

4.1 Site Preparation & Earthwork

Surface Cover Stripping and Demolition: Prior to stripping operations, utilities should be identified and secured. The surface cover materials to be stripped should be removed from within and at least five feet beyond the limits of the proposed building, slab, and pavement areas. Given the size of the site and the configuration of the proposed and existing buildings, existing structural elements, such as foundation

walls, and concrete foundations, walls, or slabs encountered during excavations, should be removed entirely. Topsoil, subsoil, vegetation, trees, shrubs, and other organic matter should also be removed from within and at least five feet beyond the limits of the proposed building footprints and other site structures, as well as any other area that will require controlled structural fill placement. Tree/shrub removal should include the removal of stumps and root material. Root structures will require removal in excess of the few inches of topsoil typically encountered at the ground surface. The demolition contractor should be required to conduct earthwork in accordance with the recommendations in this report, including backfilling the basement area and other excavation, etc. with structural fill. Fill or backfill placed within areas requiring structural support, such as the proposed building areas, should be placed as structural fill in accordance with Section 4.2 of this report.

Surface Preparation/Proofrolling: Exposed soils should be compacted to a firm and unyielding surface with several passes in two perpendicular directions of a minimum 10-ton vibratory compactor. The surface should then be proofrolled with a loaded tandem axle truck in the presence of the geotechnical engineer to help identify soft or loose pockets that may require removal and replacement, or further evaluation. Proofrolling should be conducted after a suitable period of dry and non-freezing weather to reduce the likelihood of degrading an otherwise stable subgrade. Should construction be started during the winter months, Whitestone should be contacted for alternate surface preparation procedures. Fill and backfill should be placed and compacted in accordance with Section 4.2.

Ground Improvement - Heavy Compaction: The glaciofluvial deposit varies in relative density, with many loose zones. Whitestone recommends heavy compaction of the glaciofluvial deposit to provide more uniform support for the proposed shallow foundations. The glaciofluvial deposit beneath footings should be overexcavated by up to 24 inches and the exposed subgrade thoroughly compacted. The footing excavations should be made sufficiently wide to allow several passes of a full-size 10-ton (static weight), vibratory roller compactor. The underside of footing level should be re-established by placing and compacting structural fill, which should consist of a well-graded mixture of sand and gravel. To some extent, the groundwater level at each building will govern the amount of overexcavation and the compactive energy that may be applied. In this regard, monitoring wells are proposed to further evaluate site groundwater levels.

Weather Performance Criteria: Because the glaciofluvial deposit is typically well drained, achieving compaction and maintaining surface compaction of this material during dry weather may be difficult. These soils may need to be wetted on a regular basis to achieve compaction and will be easily disturbed at the surface by construction activities. Routine grading, wetting, and proofrolling may be required to maintain exposed subgrades.

Groundwater Control: Groundwater was encountered during the exploration at depths as shallow as 2.7 fbgs. Shallow perched water may be encountered elsewhere on the site during construction above any impermeable material. Construction phase dewatering will likely consist of removing surface water runoff, infiltrating water, or trapped water at this site. Whitestone anticipates that such construction phase dewatering would typically include installing temporary sump pits and filtered pumps within trenches and excavations. Whitestone recommends that foundation construction occur during periods of relatively dry weather. Every effort should be made to maintain drainage of surface water runoff away from construction areas by grading and limiting the exposure of foundation areas to precipitation.

4.2 Structural Fill & Backfill

Imported Fill Material: Any imported material placed as structural fill or backfill to restore design grades should consist of clean, relatively well graded sand or gravel with a maximum particle size of three inches and up to 15 percent of material finer than a #200 sieve. The material should be free of clay

lumps, organics, and deleterious material. Any imported structural fill material should be approved by a qualified geotechnical engineer prior to delivery to the site.

Soil Reuse: Whitestone anticipates that the site soils will be structurally suitable for selective reuse as fill/backfill material, provided that soil moisture contents are controlled within three percent of optimum moisture level, particles larger than three inches in diameter are either removed or crushed, and objectionable portions, such as any organics, are segregated. Reuse of the site soils will be contingent on careful review in the field by visual observation by the owner's geotechnical engineer during construction as recommended herein.

Compaction and Placement Requirements: Fill and backfill should be placed in maximum 12-inch thick loose lifts when compacted using a vibratory drum roller with a minimum weight of one ton, and in maximum eight-inch thick loose lifts when compacted with a plate compactor. Structural fill and backfill should be compacted to at least 95 percent of the maximum dry density within three percent of the optimum moisture content, as determined by ASTM D1557 (Modified Proctor).

4.3 Foundation Design Criteria

Foundations: Contingent upon construction phase evaluation, Whitestone's findings indicate that the proposed buildings may be supported on conventional shallow foundations deriving support from the thoroughly compacted glaciofluvial deposit or from the glacial till. Where the footings will derive support from the glaciofluvial deposit, the footing subgrade should be overexcavated by 24 inches and replaced with compacted structural fill. Prior to placing the structural fill, the exposed subgrade should be compacted with a full size vibratory roller compactor, as discussed in Section 4.1. The amount of overexcavation and degree of compaction will depend on the groundwater level at each building. Monitoring wells are proposed to further evaluate site groundwater levels. Although only encountered in a limited number of explorations, existing fill associated with the buildings to be demolished should be expected during construction. Any existing fill should be overexcavated beneath footings and replaced with structural fill. Foundations bearing within these materials may be designed using a maximum net allowable bearing pressure of 3,000 pounds per square foot.

Foundation subgrades should be reviewed by the geotechnical engineer. Regardless of loading conditions, new foundations should be sized no less than minimum dimensions of 24 inches for continuous wall footings and 36 inches for isolated column footings.

Footings subject to lateral loads and/or overturning should be designed so that the maximum toe pressure due to the combined effect of vertical loads and overturning moment does not exceed the recommended maximum allowable net bearing pressure. In addition, positive contact pressure should be maintained throughout the base of the footings such that no uplift or tension exists between the base of the footings and the supporting soil. Uplift loads should be resisted by the weight of the concrete. Side friction should be neglected when proportioning the footings so that lateral resistance should be provided by friction resistance at the base of the footings. An allowable coefficient of friction against sliding of 0.4 is recommended for use in the design of the foundations bearing within the existing site soils or imported structural fill soils.

Seismic Site Class: Based on a review of the subsurface conditions relevant to the *Connecticut State Building Code*, the subject site has been assigned a Site Class D. Based on the seismic zone and soil profile, liquefaction considerations are not expected to have a substantial impact on design.

Inspection/Overexcavation Criteria: Whitestone recommends that the suitability of the bearing soils at the footing bottoms be reviewed by a geotechnical engineer immediately prior to placing concrete for the

footings. In the event that areas of unsuitable materials are encountered, additional overexcavation and replacement of the materials may be necessary to provide a suitable footing subgrade. Any overexcavation to be restored with structural fill will need to extend at least one foot laterally beyond footing edges for each vertical foot of overexcavation. Lateral overexcavation may be eliminated if grades are restored with lean concrete.

Frost Coverage: Footings subject to frost action should be placed at least 42 inches below adjacent exterior grades, in accordance with the *Connecticut State Building Code*, to provide protection from frost penetration. Interior footings not subject to frost action may be placed at a minimum depth of 18 inches below the floor slab subgrade.

Settlement: Whitestone estimates post construction settlements of proposed foundations of less than one inch, if the recommendations outlined in this report are properly implemented. Differential settlement of spread foundations should be less than one half inch.

4.4 Floor Slabs

Whitestone anticipates that the properly inspected, approved, and improved glaciofluvial deposit (and existing fill if encountered) and/or compacted structural fill will be suitable for support of the proposed floor slabs, provided these materials are properly evaluated, compacted, and proofrolled in accordance with the recommendations of this report during favorable weather conditions. Areas that are, or become, softened or disturbed as a result of wetting and/or repeated exposure to construction traffic should be removed and replaced with compacted structural fill. The properly prepared on-site soils are expected to yield a minimum subgrade modulus (k) of 150 psi/in.

A minimum 12-inch layer of CTDOT *M.05.01 Processed Aggregate Base* (or approved equivalent) should be placed below the floor slabs to provide a uniform granular base. A moisture vapor barrier should also be installed beneath the floor slabs in accordance with flooring manufacturer's recommendations.

4.5 Pavement Design

Whitestone anticipates that the properly inspected, approved, and improved glaciofluvial deposit (and existing fill if encountered) and/or compacted structural fill and/or backfill placed to raise or restore design elevations will be suitable for support of the proposed pavements, provided these materials are properly evaluated, compacted, and proofrolled in accordance with the recommendations in this report during favorable weather conditions.

A California Bearing Ratio value of 8.0 has been assigned to the properly prepared subgrade soils for pavement design purposes. This value was correlated with pertinent soil support values and assumed traffic loads to a prepare flexible pavement design per the AASHTO *Guide for the Design of Pavement Structures*.

Design traffic loads were assumed based on typical volumes for similar facilities and correlated with 18-kip equivalent single axle loads (ESAL) for a 20-year life. Estimated maximum pavement loads of 30,000 ESALs and 75,000 ESALs were used for the standard-duty and heavy-duty pavement areas, respectively. These values assume the pavements primarily will accommodate both automobile and limited heavier truck traffic, with the heavier truck traffic designated to the main drive lanes. Actual loading experienced is anticipated to be less than these values.

Pavement components should meet material specifications from CTDOT *Standard Specifications* specified below. The recommended flexible pavement sections are tabulated below:

FLEXIBLE PAVEMENT SECTION			
Layer	**Material**	**Standard-Duty Thickness (inches)**	**Heavy-Duty Thickness (inches)**
Asphalt Wearing Course	CTDOT HMA S0.375 (Superpave); PG 64S-22	1.5	1.5
Asphalt Binder Course	CTDOT HMA S0.5 (Superpave); PG 64S-22	1.5	2.5
Granular Base	CTDOT M.05.01 Processed Aggregate Base	6.0	6.0
Granular Subbase	CTDOT M.02.02 Subbase; M.02.06 Gradation A	6.0	6.0

Rigid concrete pavement should be used to provide suitable support at areas of high traffic or severe turns, such as at ingress/egress locations and the trash enclosure. The recommended rigid pavement is tabulated below:

RIGID PAVEMENT SECTION		
Layer	**Material**	**Thickness (inches)**
Surface	4,000 psi Air-Entrained Concrete	6.0 [1]
Granular Base	CTDOT M.05.01 Processed Aggregate Base	6.0
Granular Subbase	CTDOT M.02.02 Subbase; M.02.06 Gradation A	6.0

[1] The outer edges of concrete pavements are susceptible to damage as trucks move from rigid pavement to adjacent flexible pavement. Therefore, the thickness at the outer two feet of the rigid concrete pavement should be 12 inches. The concrete should be reinforced with at least one layer of six-inch by six-inch W5.4/W5.4 welded wire fabric (ASTM A185).

The pavement section thickness designs presented in this report are based on the design parameters detailed herein and are contingent on proper construction, inspection, and maintenance. Additional pavement thickness may be required by local code. The designs are contingent on achieving the minimum soil support value in the field. To accomplish this requirement, subgrade soil and supporting fill or backfill should be placed, compacted, and evaluated in accordance with the recommendations of this report. Proper drainage should be provided for the pavement structure, including appropriate grading and surface water control.

The performance of the pavement also will depend on the quality of materials and workmanship. Whitestone recommends that CTDOT standards for materials, workmanship, and maintenance be applied to this site. Project specifications should include verifying that the installed asphaltic concrete material composition is within tolerance for the specified materials and that the percentage of air voids of the installed pavement is within specified ranges for the respective materials. Rigid concrete pavements should be suitably air-entrained, jointed, and reinforced in general accordance with ACI 330R-08 *Guide for the Design and Construction of Concrete Parking Lots*.

4.6 Retaining Walls/Lateral Earth Pressures

The following parameters may be used for design of any retaining walls, below-grade walls, and other structures reliant on granular materials to provide adequate drainage. However, the parameters are not

directly applicable to the design of mechanically stabilized earth (MSE) retaining walls, which require proprietary design methods for the selected earth retention system.

Retaining/below-grade walls should be capable of withstanding active and at-rest earth pressures. With an active earth pressure coefficient (K_a) of 0.33, a level backfill, and an assumed maximum backfill soil unit weight of 140 pounds per cubic foot (pcf), an equivalent fluid pressure of 46 psf per foot of wall height should be used in design of retaining/below-grade walls which are free to rotate.

Retaining/below-grade walls and wall corners that are restrained from lateral movement should be designed using at-rest earth pressures. A coefficient of at-rest earth pressure (K_o) of 0.5, for a level backfill, is recommended for retaining/below-grade walls designed to resist at-rest earth pressures, which assume no lateral movement. With an assumed maximum total unit weight of backfill of approximately 140 pcf, an equivalent fluid pressure of 70 pounds per square foot per foot of wall height should be used in design of restrained retaining/below-grade wall and wall corners. A coefficient of friction of 0.4 against sliding can be used for concrete on the existing site soils. Additional lateral earth pressures from a sloped backfill or any temporary or long-term surcharge loads also should be included in the design. Retaining wall design should include a global stability analysis.

Whitestone recommends that granular soils be used to backfill behind retaining walls. The granular backfill materials should consist of clean, relatively well graded sand or gravel.

Whitestone recommends that backfill directly behind any walls be compacted with light, hand-held compactors. Heavy compactors and grading equipment should not be allowed to operate within a zone of influence measured at a 45-degree angle from the base of the walls during backfilling to avoid developing excessive temporary or long-term lateral soil pressures.

Positive drainage should be provided at the base of the below-grade walls. Where wall drainage is not provided, the wall should be designed to withstand full hydrostatic pressure.

Whitestone should be notified if any other retaining structures or design considerations requiring lateral earth pressure estimations are proposed. Specific recommendations for temporary retaining structures are beyond Whitestone's scope of work.

4.7 Excavations

The site soils encountered during this investigation typically are, at a minimum, consistent with Type C Soil Conditions as defined by 29 CFR Part 1926 (OSHA), which require a maximum unbraced excavation angle of 1.5:1 (horizontal:vertical). Actual conditions encountered during construction should be evaluated by a competent person (as defined by OSHA), so that safe excavation methods and/or shoring and bracing requirements are implemented. Competent bedrock may be excavated at an angle of 1:6 (horizontal:vertical). A steeper temporary excavation angle in the bedrock may be feasible, if the exposed bedrock is reviewed by a professional engineer or geologist.

4.8 Slopes

Whitestone's exploration did not include a detailed analysis of slope stability for any temporary or permanent condition. Based upon common local practice and Whitestone's experience with stable soil slopes, permanent soil slopes no steeper than 3:1 (horizontal:vertical) are recommended. For slopes steeper than 3:1 (horizontal:vertical), riprap covering would likely be required for long-term stability and erosion control.

Temporary slopes should be regularly evaluated for signs of movement or unsafe conditions. The site soils are prone to erosion by precipitation and runoff. Soil slopes should be covered for protection from rain. Surface runoff should be diverted away from the slopes. For erosion protection, a protective cover of grass or other vegetation should be established on permanent soil slopes as soon as possible. Erosion control matting would provide protection until vegetation is fully established.

5.0 SUPPLEMENTAL POST INVESTIGATION SERVICES

Additional Structure-Specific Drilling: Additional borings should be advanced to further evaluate soil conditions for foundation support, including the relative density of the glaciofluvial deposit, the extent of glacial till, and the presence of shallow bedrock within the western portion of the site. Groundwater monitoring wells should be installed in selected borings to allow assessment of proposed overexcavation beneath the footings. The scope of the additional drilling should be reviewed when the site grading plan is available.

Demolition and Construction Inspection and Monitoring: The owner's geotechnical engineer with specific knowledge of the site subsurface conditions and design intent should conduct inspection, testing, and consultation during construction as described in previous sections of this report. Monitoring and testing should also be conducted to confirm that the existing structures are properly demolished, any encountered underground structures, such as the existing building foundations, are properly backfilled, the existing surface cover materials are properly removed, and suitable materials, used for controlled fill, are properly placed and compacted over suitable subgrade soils. The proofrolling of all subgrades prior to foundation, floor slab, and pavement support should be witnessed and documented by the owner's geotechnical engineer.

6.0 CLOSING

Whitestone's Geotechnical Division appreciates the opportunity to be of service to C.R. Klewin, Inc. Please note that Whitestone has the capability to conduct the additional geotechnical engineering services recommended herein. Please contact us with any questions regarding this report.

Sincerely,

WHITESTONE ASSOCIATES, INC.

Richard W.M. McLaren, P.E.
Senior Consultant

Ryan R. Roy, P.E.
Vice President

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Enclosures

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FIGURE 1
Test Location Plan

LEGEND

B-1	BORING LOCATION
TP-1	TEST PIT LOCATION
	SUBJECT PROPERTY BOUNDARY

NOTE: ALL LOCATIONS ARE APPROXIMATE.

REFERENCE

THIS PLAN IS BASED ON A 3/30/23 CONCEPTUAL LAYOUT PLAN PREPARED BY BOHLER.

WHITESTONE
An Employee-Owned Company
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860.726.7889 WHITESTONEASSOC.COM

DRAWING TITLE: **TEST LOCATION PLAN**

CLIENT: **C.R. KLEWIN LLC**

PROJECT: **PROPOSED RESIDENTIAL DEVELOPMENT**
27 - 29 MILITARY HIGHWAY
GALES FERRY, NEW LONDON COUNTY, CONNECTICUT

PROJECT #: GM2320566.000	
DESIGNED BY: MR	PROJ. MGR.: RR
DATE: 6/19/23	FIGURE: 1
SCALE: 1" = 100'	

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APPENDIX A
Records of Subsurface Exploration

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RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-1

Page 1 of 1

Project:	Proposed Residential Development	**WAI Project No.:**	GM2320566.000
Location:	27 - 29 Military Highway, Gales Ferry, New London County, Connecticut	**Client:**	C.R. Klewin LLC

				Water Depth | Elevation (feet bgs) | (ft NAVD88)	Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)
Surface Elevation:	± 30.0 feet Above NAVD88	**Date Started:**	5/24/2023		
Termination Depth:	22.0 feet bgs	**Date Completed:**	5/24/2023		
Proposed Location:	Building 4	**Logged By:**	OR	**During:** 5.0 | 25.0	
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	MS	**At Completion:** -- | --	**At Completion:** -- | --
		Equipment:	Mobile B-53	**24 Hours:** -- | --	**24 Hours:** -- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
0 - 2	S-1	X	2 - 3 - 3 - 3	14	6		TS		12" Topsoil	
2 - 4	S-2	X	4 - 4 - 3 - 4	16	7				Brown, Loose, Poorly Graded Sand with Silt (SP-SM)	
						5.0			As Above (SP-SM)	
5 - 7	S-3	X	2 - 3 - 4 - 5	15	7					
7 - 9	S-4	X	5 - 5 - 5 - 6	22	10				As Above, Loose to Medium Dense (SP-SM)	
						10.0	GLACIO-FLUVIAL DEPOSIT			
10 - 12	S-5	X	2 - 3 - 4 - 4	18	7				As Above, Loose (SP-SM)	
						15.0				
15 -17	S-6	X	1 - 1 - 4 - 5	22	5				As Above (SP-SM)	
						20.0				
20 - 22	S-7	X	7 - 12 - 24 - 25	22	36		GLACIAL TILL		Gray-Brown, Dense, Silty Sand with Gravel (SM)	
						25.0			Boring Log B-1 Terminated at Depth of 22 feet below ground surface.	

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-2

Page 1 of 1

Project:	Proposed Residential Development	**WAI Project No.:**	GM2320566.000
Location:	27 - 29 Military Highway, Gales Ferry, New London County, Connecticut	**Client:**	C.R. Klewin LLC

				Water Depth | Elevation (feet bgs) | (ft NAVD88)	Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)
Surface Elevation:	± 35.0 feet Above NAVD88	**Date Started:**	5/24/2023		
Termination Depth:	5.0 feet bgs	**Date Completed:**	5/24/2023		
Proposed Location:	Building 4	**Logged By:**	OR	**During:** -- | --	
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	MS	**At Completion:** -- | --	**At Completion:** -- | --
		Equipment:	Mobile B-53	**24 Hours:** -- | --	**24 Hours:** -- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
0 - 2	S-1	X	3 - 2 - 1 - 2	12	3		TS		9" Topsoil	
							GLACIO-FLUVIAL DEPOSIT		Brown, Very Loose, Silty Sand (SM)	
						2.5			As Above, Loose (SM)	
2 - 4	S-2	X	4 - 10 - 21 - 62	16	31		GLACIAL TILL		Gray-Brown, Dense, Silty Sand with Gravel (SM)	
						5.0				Auger Grinding 4 to 5 fbgs
									Boring Log B-1 Terminated upon Auger Refusal at Depth of 5 fbgs.	
						10.0				
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-3

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Project:	Proposed Residential Development	**WAI Project No.:**	GM2320566.000
Location:	27 - 29 Military Highway, Gales Ferry, New London County, Connecticut	**Client:**	C.R. Klewin LLC

				Water Depth | Elevation (feet bgs) | (ft NAVD88)	Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)
Surface Elevation:	± 39.0 feet Above NAVD88	**Date Started:**	5/24/2023		
Termination Depth:	22.0 feet bgs	**Date Completed:**	5/24/2023		
Proposed Location:	Building 3	**Logged By:**	OR	**During:** 14.0 | 25.0	
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	MS	**At Completion:** -- | --	**At Completion:** -- | --
		Equipment:	Mobile B-53	**24 Hours:** -- | --	**24 Hours:** -- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TS		6" Topsoil	
0 - 2	S-1	X	9 - 16 - 13 - 23	10	29		EXISTING FILL		Gray-Brown, Medium Dense, Well-Graded Sand with Silt and Gravel (FILL)	Cobbles
2 - 4	S-2	X	23 - 29 - 20 - 15	11	49				As Above, Dense (FILL)	
						5.0				
5 - 7	S-3	X	23 - 24 - 22 - 13	6	46				As Above, Brown (FILL)	Cobbles
7 - 9	S-4	X	14 - 12 - 13 - 11	4	25				Gray-Brown, Medium Dense, Poorly Graded Sand with Silt and Gravel (FILL)	
						10.0				
10 - 12	S-5	X	5 - 6 - 6 - 9	15	12				As Above, Brown (SP-SM)	
						15.0				
15 -17	S-6	X	6 - 8 - 5 - 5	12	13		GLACIO-FLUVIAL DEPOSIT		As Above (SP-SM)	
						20.0				
20 - 22	S-7	X	6 - 5 - 7 - 14	11	12				As Above (SP-SM)	
									Boring Log B-3 Terminated at Depth of 22 feet below ground surface.	
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-4

Project:	Proposed Residential Development	**WAI Project No.:**	GM2320566.000
Location:	27 - 29 Military Highway, Gales Ferry, New London County, Connecticut	**Client:**	C.R. Klewin LLC

				Water Depth | Elevation (feet bgs) | (ft NAVD88)	Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)
Surface Elevation:	± 36.0 feet Above NAVD88	**Date Started:**	5/24/2023		
Termination Depth:	22.0 feet bgs	**Date Completed:**	5/24/2023		
Proposed Location:	Building 3	**Logged By:**	OR	**During:** 10.0 | 26.0	
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	MS	**At Completion:** -- | --	**At Completion:** -- | --
		Equipment:	Mobile B-53	**24 Hours:** -- | --	**24 Hours:** -- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
0 - 2	S-1	X	7 - 7 - 7 - 11	5	14		TS		12" Topsoil	
									Brown, Medium Dense, Poorly Graded Sand with Silt and Gravel (SP-SM)	
2 - 4	S-2	X	10 - 11 - 12 - 14	16	23				As Above (SP-SM)	
						5.0				
5 - 7	S-3	X	33 - 19 - 14 - 13	13	33				As Above, Dense (SP-SM)	Cobbles
7 - 9	S-4	X	8 - 12 - 12 - 12	22	24				As Above, Medium Dense (SP-SM)	Cobbles
						10.0 ▼				
10 - 12	S-5	X	10 - 9 - 9 - 9	17	18		GLACIO-FLUVIAL DEPOSIT		Brown, Medium Dense, Poorly Graded Sand with Silt (SP-SM)	
						15.0				
15 -17	S-6	X	7 - 7 - 4 - 6	16	11				As Above (SP-SM)	
						20.0				
20 - 22	S-7	X	9 - 11 - 14 - 24	16	25				Brown, Medium Dense, Poorly Graded Sand with Silt and Gravel (SP-SM)	
						25.0			Boring Log B-4 Terminated at Depth of 22 feet below ground surface.	

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-5

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Project:	Proposed Residential Development	**WAI Project No.:**	GM2320566.000
Location:	27 - 29 Military Highway, Gales Ferry, New London County, Connecticut	**Client:**	C.R. Klewin LLC

				Water Depth | Elevation (feet bgs) | (ft NAVD88)	Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)
Surface Elevation:	± 33.0 feet Above NAVD88	**Date Started:**	5/23/2023		
Termination Depth:	22.0 feet bgs	**Date Completed:**	5/23/2023		
Proposed Location:	Building 2	**Logged By:**	OR	**During:** 6.0 | 27.0	
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	MS	**At Completion:** -- | --	**At Completion:** -- | --
		Equipment:	Mobile B-53	**24 Hours:** -- | --	**24 Hours:** -- | --

SAMPLE INFORMATION						DEPTH	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)			
						0.0			
0 - 2	S-1	X	3 - 5 - 5 - 6	10	10			Brown, Loose to Medium Dense, Poorly Graded Sand with Silt (SP-SM)	
2 - 4	S-2	X	7 - 10 - 10 - 9	12	20			Gray-Brown, Medium Dense, Silty Sand (SM)	
						5.0			
5 - 7	S-3	X	3 - 4 - 6 - 6	16	10			As Above, Loose to Medium Dense (SM)	
7 - 9	S-4	X	4 - 3 - 4 - 6	15	7			As Above, Loose (SM)	
						10.0			
10 - 12	S-5	X	2 - 4 - 5 - 6	18	9		GLACIO-FLUVIAL DEPOSIT	As Above (SM)	
						15.0			
15 -17	S-6	X	2 - 2 - 2 - 3	20	4			As Above, Very Loose to Loose (SM)	
						20.0			
20 - 22	S-7	X	7 - 7 - 9 - 12	18	16			As Above, Medium Dense (SM)	
						25.0		Boring Log B-5 Terminated at Depth of 22 feet below ground surface.	

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-6

Project:	Proposed Residential Development	**WAI Project No.:**	GM2320566.000
Location:	27 - 29 Military Highway, Gales Ferry, New London County, Connecticut	**Client:**	C.R. Klewin LLC

				Water Depth | Elevation (feet bgs) | (ft NAVD88)	Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)
Surface Elevation:	± 34.0 feet Above NAVD88	**Date Started:**	5/23/2023		
Termination Depth:	32.0 feet bgs	**Date Completed:**	5/23/2023		
Proposed Location:	Building 2	**Logged By:**	OR	**During:** 7.0 | 27.0	
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	MS	**At Completion:** -- | --	**At Completion:** -- | --
		Equipment:	Mobile B-53	**24 Hours:** -- | --	**24 Hours:** -- | --

SAMPLE INFORMATION						DEPTH	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)			
						0.0			
							TS	4" Topsoil	
0 - 2	S-1	X	3 - 6 - 9 - 8	16	15			Brown, Medium Dense, Poorly Graded Sand with Silt (SP-SM)	
2 - 4	S-2	X	7 - 11 - 10 - 8	15	21			As Above, Gray-Brown (SP-SM)	
						5.0			
5 - 7	S-3	X	3 - 4 - 4 - 6	14	8			As Above, Loose (SP-SM)	
7 - 9	S-4	X	5 - 6 - 6 - 6	10	12			As Above, Medium Dense (SP-SM0	
						10.0			
10 - 12	S-5	X	2 - 3 - 3 - 6	20	6		GLACIO-FLUVIAL DEPOSIT	As Above, Loose (SP-SM)	
						15.0			
15 -17	S-6	X	4 - 4 - 5 - 5	16	9			As Above (SP-SM)	
						20.0			
20 - 22	S-7	X	4 - 5 - 5 - 7	18	10			Brown, Loose to Medium Dense, Silty Sand (SM)	
						25.0			

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-6

Project:	Proposed Residential Development	**WAI Project No.:**	GM2320566.000
Location:	27 - 29 Military Highway, Gales Ferry, New London County, Connecticut	**Client:**	C.R. Klewin LLC

				Water Depth | Elevation (feet bgs) | (ft NAVD88)	Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)
Surface Elevation:	± 34.0 feet Above NAVD88	**Date Started:**	5/23/2023		
Termination Depth:	32.0 feet bgs	**Date Completed:**	5/23/2023		
Proposed Location:	Building 2	**Logged By:**	OR	**During:** 7.0 | 27.0	
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	MS	**At Completion:** -- | --	**At Completion:** -- | --
		Equipment:	Mobile B-53	**24 Hours:** -- | --	**24 Hours:** -- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						25.0				
25 - 27	S-8	X	3 - 5 - 8 - 10	18	13				Gray-Brown, Medium Dense, Poorly Graded Sand with Silt (SP-SM)	
							GLACIO-FLUVIAL DEPOSIT			
						30.0				
30 -32	S-9	X	9 - 9 - 13 - 15	20	22				As Above, Brown (SP-SM)	
									Boring Log B-6 Terminated at Depth of 32 feet below ground surface.	
						35.0				
						40.0				
						45.0				
						50.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-7

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Project:	Proposed Residential Development	**WAI Project No.:**	GM2320566.000
Location:	27 - 29 Military Highway, Gales Ferry, New London County, Connecticut	**Client:**	C.R. Klewin LLC

				Water Depth | Elevation (feet bgs) | (ft NAVD88)	Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)
Surface Elevation:	± 34.0 feet Above NAVD88	**Date Started:**	5/23/2023		
Termination Depth:	22.0 feet bgs	**Date Completed:**	5/23/2023		
Proposed Location:	Building 1	**Logged By:**	OR	**During:** 8.0 | 26.0	
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	MS	**At Completion:** -- | --	**At Completion:** -- | --
		Equipment:	Mobile B-53	**24 Hours:** -- | --	**24 Hours:** -- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TS		4" Topsoil	
0 - 2	S-1	X	3 - 7 - 7 - 5	15	14				Brown, Medium Dense, Poorly Graded Sand (SP)	
2 - 4	S-2	X	3 - 5 - 8 - 7	16	13				As Above, Gray-Brown (SP)	
						5.0				
5 - 7	S-3	X	6 - 4 - 3 - 6	14	7				As Above, Loose, Brown (SP)	
7 - 9	S-4	X	4 - 4 - 5 - 4	14	9				As Above (SP)	
						10.0				
10 - 12	S-5	X	3 - 3 - 3 - 3	13	6		GLACIO-FLUVIAL DEPOSIT		As Above (SP)	
						15.0				
15 -17	S-6	X	6 - 7 - 6 - 6	14	13				As Above, Medium Dense (SP)	
						20.0				
20 - 22	S-7	X	2 - 2 - 3 - 4	11	5				As Above, Loose (SP)	
						25.0			Boring Log B-7 Terminated at Depth of 22 feet below ground surface.	

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-8

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Project:	Proposed Residential Development	**WAI Project No.:**	GM2320566.000
Location:	27 - 29 Military Highway, Gales Ferry, New London County, Connecticut	**Client:**	C.R. Klewin LLC
Surface Elevation:	± 38.0 feet Above NAVD88	**Date Started:**	5/23/2023
Termination Depth:	22.0 feet bgs	**Date Completed:**	5/23/2023
Proposed Location:	Building 1	**Logged By:**	OR
Drill / Test Method:	HSA / SPT	**Contractor:**	MS
	(No Auto Hammer)	**Equipment:**	Mobile B-53

Water Depth | Elevation (feet bgs) | (ft NAVD88)		Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)	
During:	10.0 | 28.0		
At Completion:	-- | --	**At Completion:**	-- | --
24 Hours:	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TS		6" Topsoil	
0 - 2	S-1	X	3 - 3 - 5 - 7	14	8				Brown, Loose, Poorly Graded Sand (SP)	
2 - 4	S-2	X	9 - 11 - 12 - 11	12	23				As Above, Medium Dense (SP)	
						5.0				
5 - 7	S-3	X	7 - 7 - 7 - 8	12	14				As Above (SP)	
7 - 9	S-4	X	10 - 8 - 8 - 8	18	16				As Above, Gray-Brown (SP)	
						10.0 ▼				
10 - 12	S-5	X	7 - 9 - 10 - 10	13	9		GLACIO-FLUVIAL DEPOSIT		As Above, Loose (SP)	
						15.0				
15 -17	S-6	X	4 - 5 - 5 - 5	11	10				As Above, Loose to Medium Dense (SP)	
						20.0				
20 - 22	S-7	X	5 - 4 - 5 - 7	11	9				As Above, Loose (SP)	
									Boring Log B-8 Terminated at Depth of 22 feet below ground surface.	
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-9

Project:	Proposed Residential Development	**WAI Project No.:**	GM2320566.000
Location:	27 - 29 Military Highway, Gales Ferry, New London County, Connecticut	**Client:**	C.R. Klewin LLC

Surface Elevation:	± 34.0 feet Above NAVD88	**Date Started:**	5/24/2023		**Water Depth | Elevation** (feet bgs) | (ft NAVD88)		**Cave-In Depth | Elevation** (feet bgs) | (ft NAVD88)
Termination Depth:	8.7 feet bgs	**Date Completed:**	5/24/2023				
Proposed Location:	Building 4	**Logged By:**	OR	**During:**	7.0 | 27.0		
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	MS	**At Completion:**	-- | --	**At Completion:**	-- | --
		Equipment:	Mobile B-53	**24 Hours:**	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TS		4" Topsoil	
0 - 2	S-1	X	4 - 5 - 6 - 5	7	11		GLACIO-FLUVIAL DEPOSIT		Brown, Medium Dense, Poorly Graded Sand with Silt (SP-SM)	
						2.0				
2 - 4	S-2	X	7 - 10 - 23 - 26	13	33				Brown, Dense, Silty Sand with Gravel (SM)	
										Auger Grinding 4 to 5 fbgs
						5.0				
5 - 7	S-3	X	25 - 22 - 24 - 25	16	46		GLACIAL TILL		As Above (SM)	
7 - 8.7	S-4	X	41 - 31 - 35 - 40/2"	18	66				As Above, Very Dense (SM)	
										Cobbles
									Boring Log B-9 Terminated upon Auger Refusal at Depth of 8.7 fbgs	
						10.0				
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-9

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Project:	Proposed Residential Development	**WAI Project No.:**	GM2320566.000
Location:	27 - 29 Military Highway, Gales Ferry, New London County, Connecticut	**Client:**	C.R. Klewin LLC

Surface Elevation:	± 34.0 feet Above NAVD88	**Date Started:**	5/24/2023	**Water Depth | Elevation** (feet bgs) | (ft NAVD88)		**Cave-In Depth | Elevation** (feet bgs) | (ft NAVD88)	
Termination Depth:	8.7 feet bgs	**Date Completed:**	5/24/2023				
Proposed Location:	Building 4	**Logged By:**	OR	**During:**	7.0 | 27.0		
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	MS	**At Completion:**	-- | --	**At Completion:**	-- | --
		Equipment:	Mobile B-53	**24 Hours:**	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
0 - 2	S-1		4 - 5 - 6 - 5	7	11		TS		4" Topsoil	
							GLACIO-FLUVIAL DEPOSIT		Brown, Medium Dense, Poorly Graded Sand with Silt (SP-SM)	
						2.0				
2 - 4	S-2		7 - 10 - 23 - 26	13	33				Brown, Dense, Silty Sand with Gravel (SM)	
						5.0				Auger Grinding 4 to 5 fbgs
5 - 7	S-3		25 - 22 - 24 - 25	16	46		GLACIAL TILL		As Above (SM)	
7 - 8.7	S-4		41 - 31 - 35 - 40/2"	18	66				As Above, Very Dense (SM)	Cobbles
									Boring Log B-9 Terminated upon Auger Refusal at Depth of 8.7 fbgs	
						10.0				
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-1

Page 1 of 1

Project:	Proposed Residential Development	**WAI Project No.:**	GM2320566.000
Location:	27 - 29 Military Highway, Gales Ferry, New London County, Connecticut	**Client:**	C.R. Klewin LLC

				Water Depth (feet bgs) | Elevation (ft NAVD88)	Cave-In Depth (feet bgs) | Elevation (ft NAVD88)
Surface Elevation:	± 28.0 feet NAVD88	**Date Started:**	5/22/2023		
Termination Depth:	7.0 feet bgs	**Date Completed:**	5/22/2023		
Proposed Location:	SWM Area	**Logged By:**	RK	**During:** 3.7 | 24.3	
Excavating Method:	Compact Excavator	**Contractor:**	MM	**At Completion:** -- | --	**At Completion:** -- | --
Test Method:	Visual Observation	**Rig Type:**	Takeuchi TB290	**24 Hours:** -- | --	

SAMPLE INFORMATION			DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (ft.)	Number	Type	(feet)				
			0.0				
				TOPSOIL		5" Topsoil	
				SUBSOIL		4" Subsoil, Roots	
				GLACIO-FLUVIAL DEPOSIT		Brown, Poorly Graded Sand with Silt (SP-SM)	Infiltration Test @ 1.5 fbgs ESHGW 2.3 fbgs
			5.0				
			10.0			Test Pit TP-1 Terminated at Depth of 7 Feet Below Ground Surface.	
			15.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-2

Project:	Proposed Residential Development	**WAI Project No.:**	GM2320566.000
Location:	27 - 29 Military Highway, Gales Ferry, New London County, Connecticut	**Client:**	C.R. Klewin LLC

				Water Depth (feet bgs)	Elevation (ft NAVD88)	Cave-In Depth (feet bgs)	Elevation (ft NAVD88)
Surface Elevation:	± 27.0 feet NAVD88	**Date Started:**	5/22/2023				
Termination Depth:	5.5 feet bgs	**Date Completed:**	5/22/2023				
Proposed Location:	SWM Area	**Logged By:**	RK	**During:**	2.7 | 24.3		
Excavating Method:	Compact Excavator	**Contractor:**	MM	**At Completion:**	-- | --	**At Completion:**	-- | --
Test Method:	Visual Observation	**Rig Type:**	Takeuchi TB290	**24 Hours:**	-- | --		

SAMPLE INFORMATION			DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (ft.)	Number	Type	(feet)				
			0.0				
				TOPSOIL		6" Topsoil	
				SUBSOIL		14" Subsoil, Roots	Infiltration Test @ 1.5 fbgs
				GLACIO-FLUVIAL DEPOSIT		Brown, Poorly Graded Sand with Silt (SP-SM)	ESHGW 2.3 fbgs
			5.0				
						Test Pit TP-2 Terminated at Depth of 5.5 Feet Below Ground Surface.	
			10.0				
			15.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-3

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Project:	Proposed Residential Development	**WAI Project No.:**	GM2320566.000
Location:	27 - 29 Military Highway, Gales Ferry, New London County, Connecticut	**Client:**	C.R. Klewin LLC

				Water Depth (feet bgs)	Elevation (ft NAVD88)	Cave-In Depth (feet bgs)	Elevation (ft NAVD88)
Surface Elevation:	± 32.0 feet NAVD88	**Date Started:**	5/22/2023				
Termination Depth:	7.5 feet bgs	**Date Completed:**	5/22/2023				
Proposed Location:	SWM Area	**Logged By:**	RK	**During:**	6.0 / 26.0		
Excavating Method:	Compact Excavator	**Contractor:**	MM	**At Completion:**	-- / --	**At Completion:**	-- / --
Test Method:	Visual Observation	**Rig Type:**	Takeuchi TB290	**24 Hours:**	-- / --		

SAMPLE INFORMATION			DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (ft.)	Number	Type	(feet)				
			0.0				
				TOPSOIL		9" Topsoil	
				GLACIO-FLUVIAL DEPOSIT		Brown to Gray, Poorly Graded Sand with Silt (SP-SM)	Infiltration Test @ 3 fbgs
			5.0				ESHGW 5.5 fbgs
						Gray, Silty Sand (SM)	
						Test Pit TP-3 Terminated at Depth of 7.5 Feet Below Ground Surface.	
			10.0				
			15.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-4

Page 1 of 1

Project:	Proposed Residential Development	**WAI Project No.:**	GM2320566.000
Location:	27 - 29 Military Highway, Gales Ferry, New London County, Connecticut	**Client:**	C.R. Klewin LLC

Surface Elevation:	± 32.0 feet NAVD88	**Date Started:**	5/22/2023		**Water Depth (feet bgs) | Elevation (ft NAVD88)**	**Cave-In Depth (feet bgs) | Elevation (ft NAVD88)**	
Termination Depth:	6.0 feet bgs	**Date Completed:**	5/22/2023				
Proposed Location:	SWM Area	**Logged By:**	RK	**During:**	-- | --		
Excavating Method:	Compact Excavator	**Contractor:**	MM	**At Completion:**	-- | --	**At Completion:**	-- | --
Test Method:	Visual Observation	**Rig Type:**	Takeuchi TB290	**24 Hours:**	-- | --		

SAMPLE INFORMATION			DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (ft.)	Number	Type	(feet)				
			0.0				
				TOPSOIL		5" Topsoil	No indications of ESHGW
				SUBSOIL		12" Subsoil, Roots	
				GLACIO- FLUVIAL DEPOSIT		Brown, Poorly Graded Sand (SP)	5" Silty Sand layer @ 3.4 fbgs Percolation Test @ 4 fbgs
			5.0				
			10.0			Test Pit TP-4 Terminated at Depth of 6 Feet Below Ground Surface.	
			15.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-5

Page 1 of 1

Project:	Proposed Residential Development	**WAI Project No.:**	GM2320566.000
Location:	27 - 29 Military Highway, Gales Ferry, New London County, Connecticut	**Client:**	C.R. Klewin LLC

				Water Depth (feet bgs)	Elevation (ft NAVD88)	Cave-In Depth (feet bgs)	Elevation (ft NAVD88)
Surface Elevation:	± 32.0 feet NAVD88	**Date Started:**	5/22/2023				
Termination Depth:	7.5 feet bgs	**Date Completed:**	5/22/2023				
Proposed Location:	SWM Area	**Logged By:**	RK	**During:**	7.0 | 25.0		
Excavating Method:	Compact Excavator	**Contractor:**	MM	**At Completion:**	-- | --	**At Completion:**	-- | --
Test Method:	Visual Observation	**Rig Type:**	Takeuchi TB290	**24 Hours:**	-- | --		

SAMPLE INFORMATION			DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (ft.)	Number	Type	(feet)				
			0.0				
				TOPSOIL		4" Topsoil	
				SUBSOIL		12" Subsoil, Roots	
				GLACIO-FLUVIAL DEPOSIT		Brown, Poorly Graded Sand with Silt (SP-SM)	Percolation Test @ 3.5 fbgs
			5.0				ESHGW 5.8 fbgs
						Test Pit TP-5 Terminated at Depth of 7.5 Feet Below Ground Surface.	
			10.0				
			15.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-6

Page 1 of 1

Project:	Proposed Residential Development	**WAI Project No.:**	GM2320566.000
Location:	27 - 29 Military Highway, Gales Ferry, New London County, Connecticut	**Client:**	C.R. Klewin LLC

				Water Depth (feet bgs)	Elevation (ft NAVD88)	Cave-In Depth (feet bgs)	Elevation (ft NAVD88)
Surface Elevation:	± 32.0 feet NAVD88	**Date Started:**	5/22/2023				
Termination Depth:	8.0 feet bgs	**Date Completed:**	5/22/2023				
Proposed Location:	SWM Area	**Logged By:**	RK	**During:**	7.1 / 24.9		
Excavating Method:	Compact Excavator	**Contractor:**	MM	**At Completion:**	-- / --	**At Completion:**	-- / --
Test Method:	Visual Observation	**Rig Type:**	Takeuchi TB290	**24 Hours:**	-- / --		

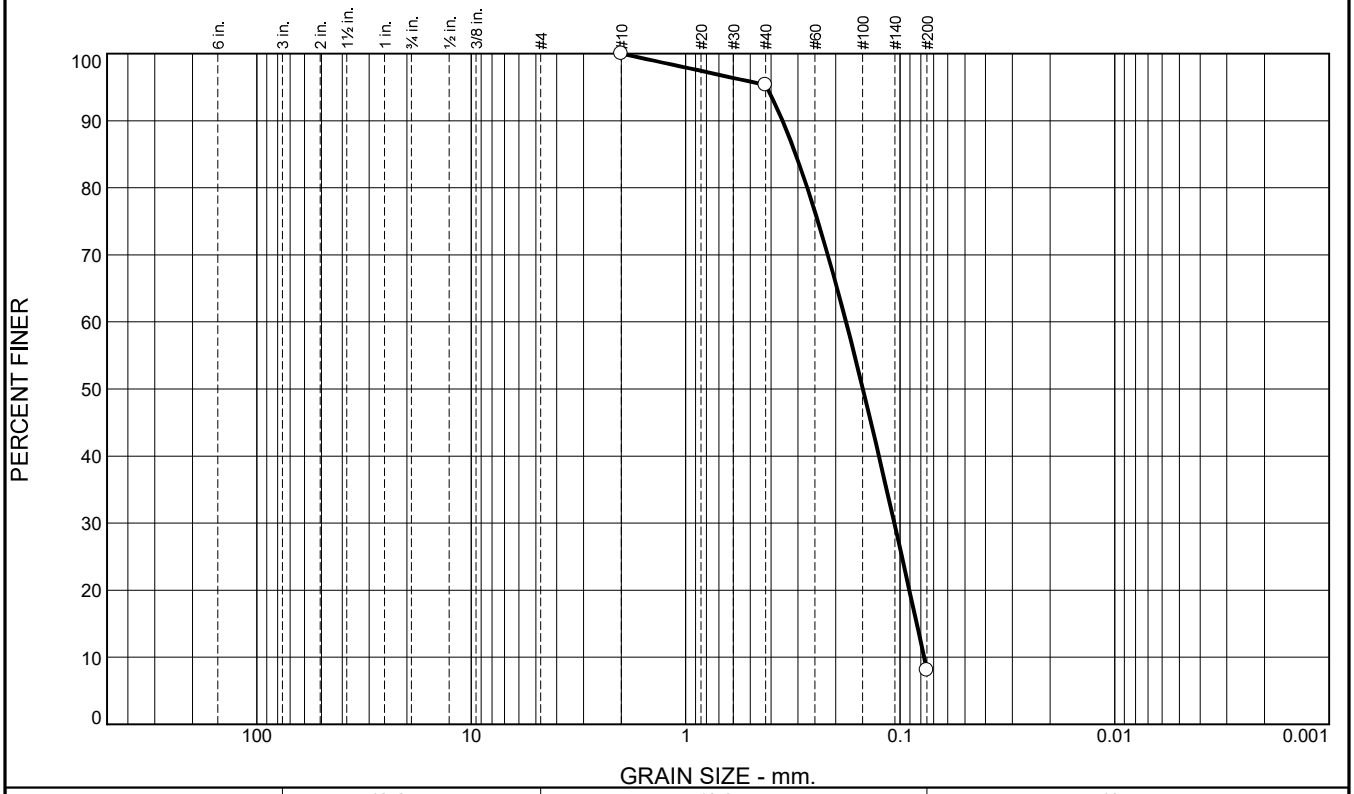
SAMPLE INFORMATION			DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (ft.)	Number	Type	(feet)				
			0.0				
				TOPSOIL		4" Topsoil	No indications of ESHGW
				SUBSOIL		11" Subsoil, Roots	
						Brown to Gray, Silty Sand (SM)	
						Brown, Poorly Graded Sand with Silt and Gravel (SP-SM)	Infiltration Test @ 3 fbgs
				GLACIO- FLUVIAL DEPOSIT			
			5.0			Brown, Poorly Graded Sand (SP)	
						Test Pit TP-6 Terminated at Depth of 8 Feet Below Ground Surface.	
			10.0				
			15.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

APPENDIX B
Laboratory Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	4.7	87.2	8.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	95.3		
#200	8.1		

* (no specification provided)

Material Description

Poorly Graded Sand with Silt

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.3539 D_{85}= 0.3074 D_{60}= 0.1791
D_{50}= 0.1494 D_{30}= 0.1067 D_{15}= 0.0838
D_{10}= 0.0773 C_u= 2.32 C_c= 0.82

Classification

USCS= SP-SM AASHTO= A-3

Remarks

Moisture Content: 27.8%

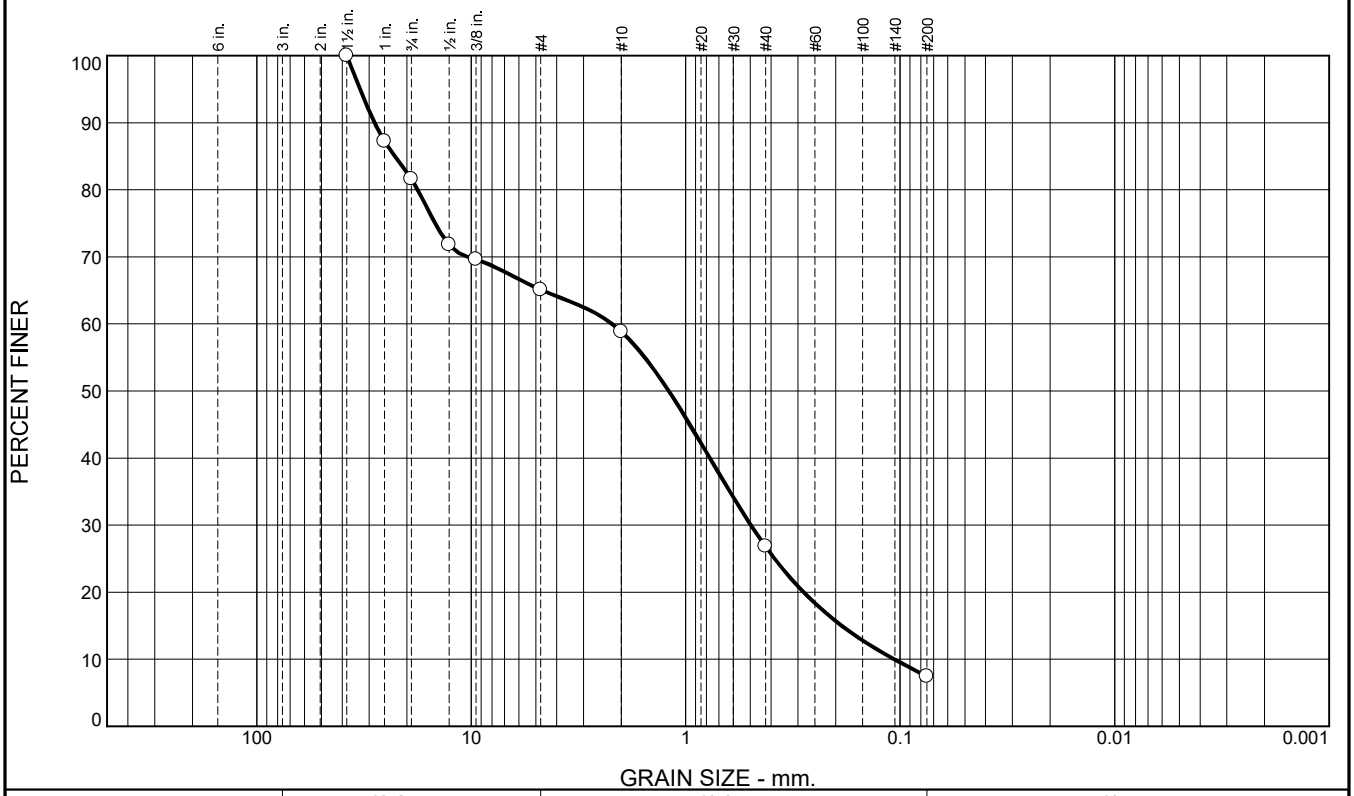
Location: B-1
Sample Number: S-3 **Depth:** 5' - 7' **Date:** 5/31/23

WHITESTONE

Client: C.R. Klewin, LLC
Project: Proposed Residential Development
27-29 Military Highway, Gales Ferry, New London County, CT
Project No: GM2320566.000 **Figure** S-1

Tested By: MM **Checked By:** RWM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	18.4	16.5	6.3	32.0	19.4	7.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100.0		
1"	87.2		
3/4"	81.6		
1/2"	71.8		
3/8"	69.6		
#4	65.1		
#10	58.8		
#40	26.8		
#200	7.4		

* (no specification provided)

Material Description

Well-Graded Sand with Silt and Gravel

Atterberg Limits

PL= NP LL= NV PI= NV

Coefficients

D_{90}= 28.2689 D_{85}= 22.7486 D_{60}= 2.2112
D_{50}= 1.2020 D_{30}= 0.4972 D_{15}= 0.1876
D_{10}= 0.1067 C_u= 20.72 C_c= 1.05

Classification

USCS= SW-SM AASHTO= A-1-b

Remarks

Moisture Content: 1.8%

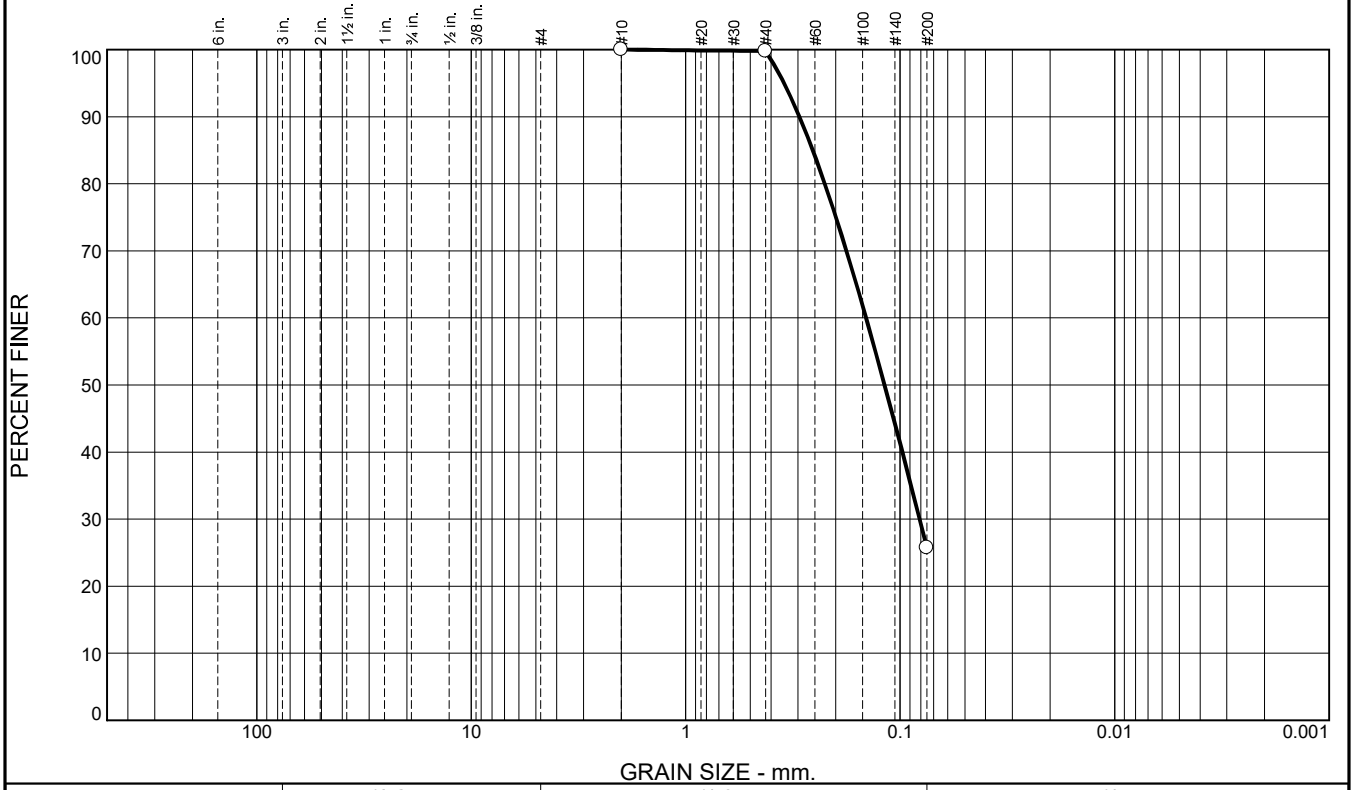
Location: B-3
Sample Number: S-2 **Depth:** 2' - 4' **Date:** 5/31/23

WHITESTONE

Client: C.R. Klewin, LLC
Project: Proposed Residential Development
27-29 Military Highway, Gales Ferry, New London County, CT
Project No: GM2320566.000 **Figure** S-2

Tested By: MM **Checked By:** RWM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.2	74.1	25.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	99.8		
#200	25.7		

* (no specification provided)

Material Description

Silty Sand

Atterberg Limits

PL= NP LL= NV PI= NV

Coefficients

D_{90}= 0.2952 D_{85}= 0.2559 D_{60}= 0.1444
D_{50}= 0.1184 D_{30}= 0.0812 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Moisture Content: 26.3%

Location: B-5
Sample Number: S-3 **Depth:** 5' - 7' **Date:** 5/31/23

WHITESTONE

Client: C.R. Klewin, LLC
Project: Proposed Residential Development
27-29 Military Highway, Gales Ferry, New London County, CT
Project No: GM2320566.000 **Figure** S-3

Tested By: MM **Checked By:** RWM

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	10.1	87.3	2.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	89.9		
#200	2.6		

* (no specification provided)

Material Description

Poorly Graded Sand

Atterberg Limits

PL= NP LL= NV PI= NV

Coefficients

D_{90}= 0.4307 D_{85}= 0.3614 D_{60}= 0.2012
D_{50}= 0.1664 D_{30}= 0.1174 D_{15}= 0.0917
D_{10}= 0.0845 C_u= 2.38 C_c= 0.81

Classification

USCS= SP AASHTO= A-3

Remarks

Moisture Content: 3.6%

Location: B-7
Sample Number: S-2 **Depth:** 2' - 4' **Date:** 5/31/23

WHITESTONE

Client: C.R. Klewin, LLC
Project: Proposed Residential Development
27-29 Military Highway, Gales Ferry, New London County, CT
Project No: GM2320566.000 **Figure** S-4

Tested By: MM **Checked By:** RWM

WHITESTONE

APPENDIX C
Supplemental Information (USCS, Terms & Symbols)

WHITESTONE
An Employee-Owned Company

16 Old Forge Road
Suite A
Rocky Hill, CT 06067
860.726.7889
whitestoneassoc.com

UNIFIED SOIL CLASSIFICATION SYSTEM

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMITS LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMITS GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS FOR SAMPLES WITH 5% TO 12% FINES

GRADATION*

% FINER BY WEIGHT

TRACE..... 1% TO 10%
LITTLE..... 10% TO 20%
SOME..... 20% TO 35%
AND..... 35% TO 50%

COMPACTNESS*
Sand and/or Gravel

RELATIVE DENSITY

LOOSE. ..... 0% TO 40%
MEDIUM DENSE.... 40% TO 70%
DENSE..... 70% TO 90%
VERY DENSE..... 90% TO 100%

CONSISTENCY*
Clay and/or Silt

RANGE OF SHEARING STRENGTH IN POUNDS PER SQUARE FOOT

VERY SOFT..... LESS THAN 250
SOFT..... ..... 250 TO 500
MEDIUM..... 500 TO 1000
STIFF..... 1000 TO 2000
VERY STIFF..... 2000 TO 4000
HARD..... GREATER THAN 4000

** VALUES ARE FROM LABORATORY OR FIELD TEST DATA, WHERE APPLICABLE. WHEN NO TESTING WAS PERFORMED, VALUES ARE ESTIMATED.*

L:\Geotechnical Forms and References\Reports\USCSTRMSSYM CT.docx

WHITESTONE
An Employee-Owned Company

16 OLD FORGE ROAD
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860.726.7889
whitestoneassoc.com

GEOTECHNICAL TERMS AND SYMBOLS

SAMPLE IDENTIFICATION

The Unified Soil Classification System is used to identify the soil unless otherwise noted.

SOIL PROPERTY SYMBOLS

N: Standard Penetration Value: Blows per ft. of a 140 lb. hammer falling 30" on a 2" O.D. split-spoon.
Qu: Unconfined compressive strength, TSF.
Qp: Penetrometer value, unconfined compressive strength, TSF.
Mc: Moisture content, %.
LL: Liquid limit, %.
PI: Plasticity index, %.
δd: Natural dry density, PCF.
▼: Apparent groundwater level at time noted after completion of boring.

DRILLING AND SAMPLING SYMBOLS

NE: Not Encountered (Groundwater was not encountered).
SS: Split-Spoon - 1 ⅜" I.D., 2" O.D., except where noted.
ST: Shelby Tube - 3" O.D., except where noted.
AU: Auger Sample.
OB: Diamond Bit.
CB: Carbide Bit
WS: Washed Sample.

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

Term (Non-Cohesive Soils)	Standard Penetration Resistance
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

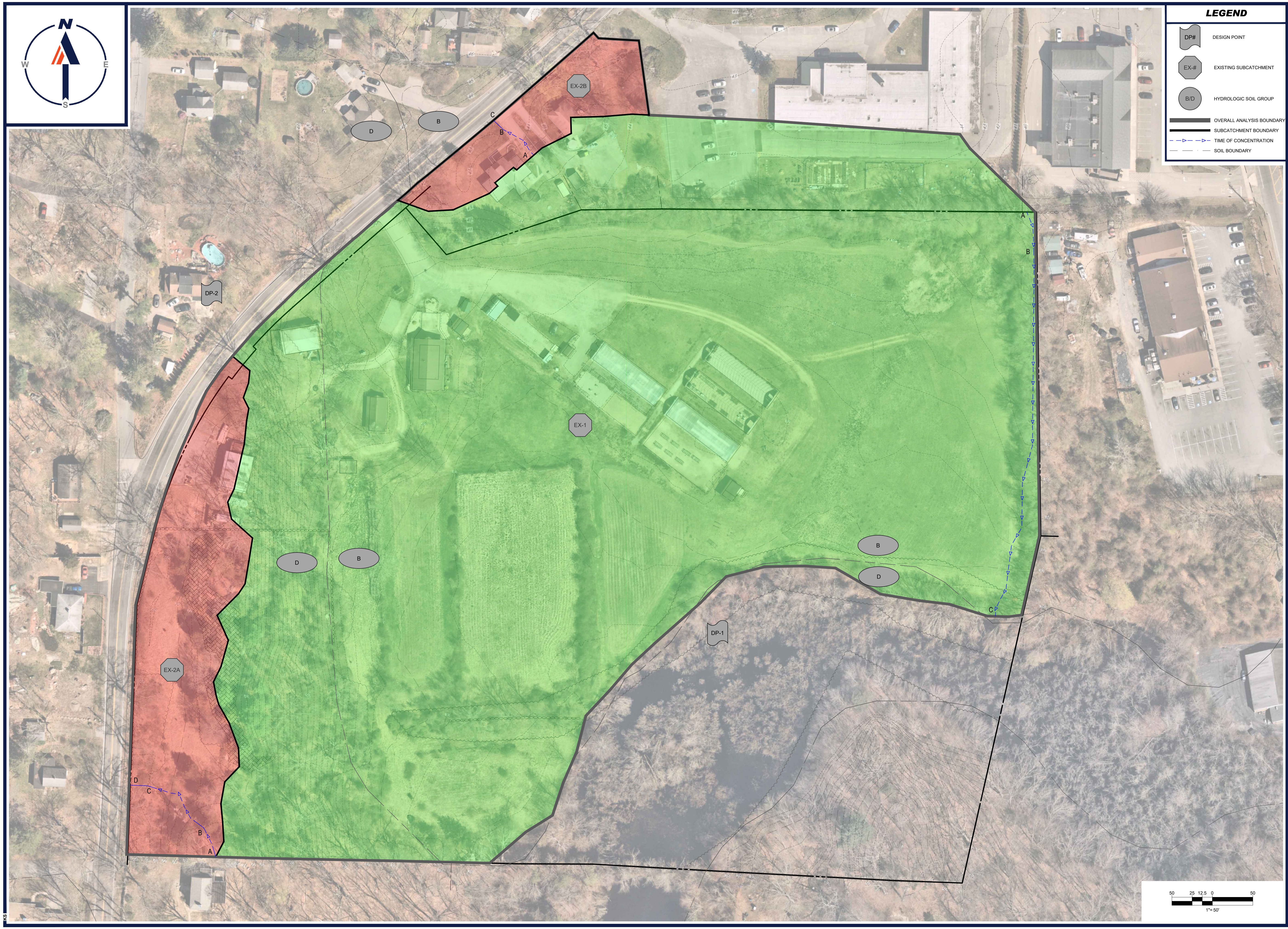
Term (Cohesive Soils)	Qu (TSF)
Very Soft	0 - 0.25
Soft	0.25 - 0.50
Firm (Medium)	0.50 - 1.00
Stiff	1.00 - 2.00
Very Stiff	2.00 - 4.00
Hard	4.00+

PARTICLE SIZE

Boulders	8 in.+	Coarse Sand	5mm-0.6mm	Silt	0.074mm-0.005mm
Cobbles	8 in.-3 in.	Medium Sand	0.6mm-0.2mm	Clay	-0.005mm
Gravel	3 in.-5mm	Fine Sand	0.2mm-0.074mm		

APPENDIX C: EXISTING CONDITIONS HYDROLOGIC ANALYSIS

- *EXISTING CONDITIONS DRAINAGE MAP*
- *EXISTING CONDITIONS HYDROCAD COMPUTATIONS*



BOHLER//

SITE CIVIL AND CONSULTING ENGINEERING
LAND SURVEYING
PROGRAM MANAGEMENT
LANDSCAPE ARCHITECTURE
SUSTAINABLE DESIGN
PERMITTING SERVICES
TRANSPORTATION SERVICES

REVISIONS

REV	DATE	COMMENT	DRAWN BY / CHECKED BY

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PERMIT SET

THIS DRAWING IS INTENDED FOR MUNICIPAL AND/OR AGENCY REVIEW AND APPROVAL. IT IS NOT INTENDED AS A CONSTRUCTION DOCUMENT UNLESS INDICATED OTHERWISE.

PROJECT No.:	CTA220061.00
DRAWN BY:	TJN/KMB
CHECKED BY:	JGB
DATE:	02/19/2025
CAD I.D.:	CTA220061.00-EDAM-5A

PROJECT:

PROPOSED SITE PLAN DOCUMENTS

FOR

C.R. KLEWIN LLC

PROPOSED
RESIDENTIAL DEVELOPMENT

19, 29 & 39 MILITARY HIGHWAY,
GALES FERRY,
LEDYARD,
NEW LONDON COUNTY,
CONNECTICUT

BOHLER//
65 LaSALLE ROAD, SUITE 401
WEST HARTFORD, CT 06107
Phone: (860) 333-8900
www.BohlerEngineering.com

STATE OF CONNECTICUT
JEFFREY G. BORD
No. 30414
LICENSED
PROFESSIONAL ENGINEER

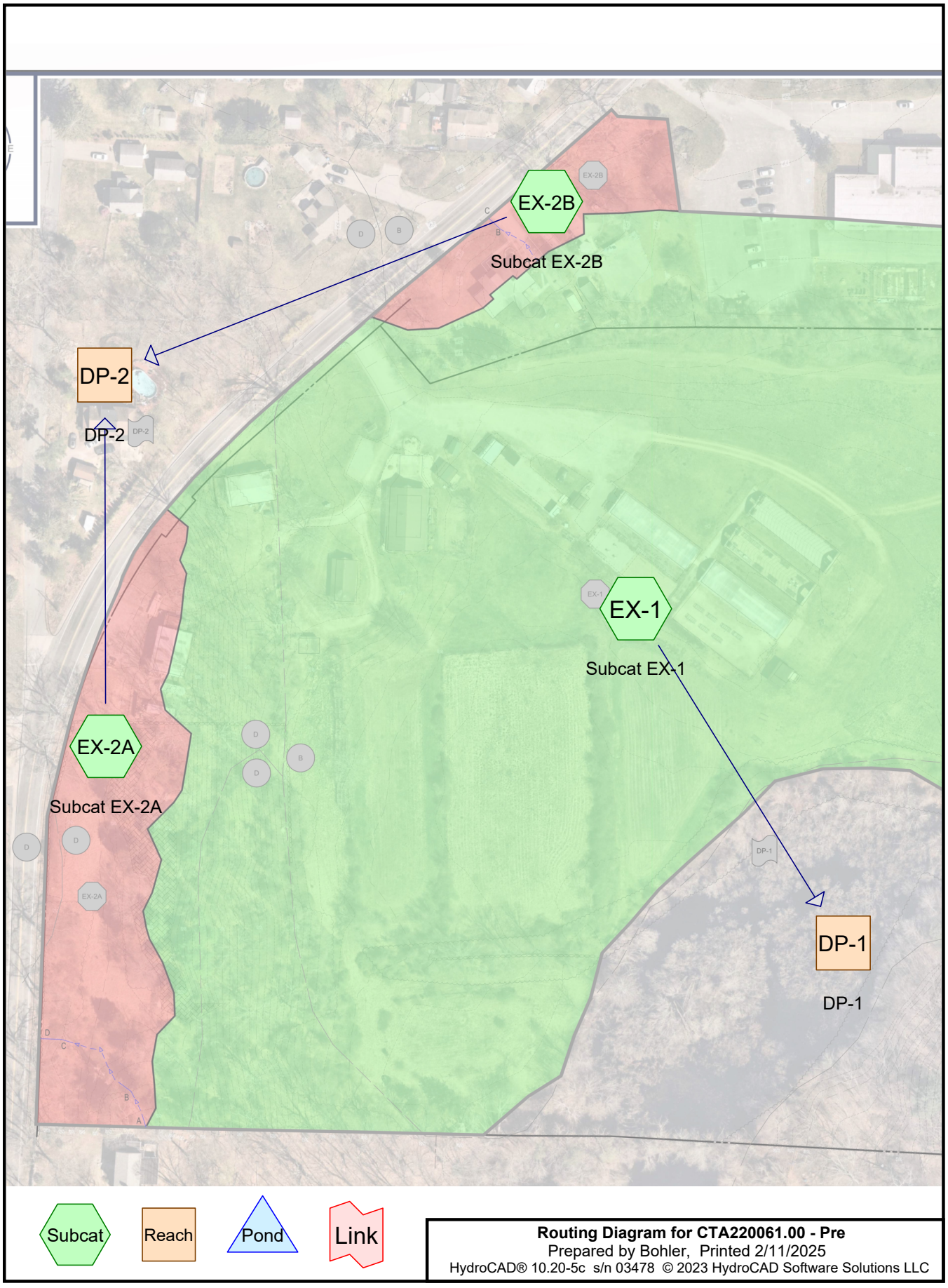
SHEET TITLE:

EXISTING CONDITIONS DRAINAGE AREA MAP

SHEET NUMBER:

EXDAM

ORG. DATE - 02/19/2025



Routing Diagram for CTA220061.00 - Pre
Prepared by Bohler, Printed 2/11/2025

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

Subcatchment EX-1: Subcat EX-1 Runoff Area=663,406 sf 7.88% Impervious Runoff Depth>0.82"
Flow Length=510' Tc=20.8 min CN=67 Runoff=8.48 cfs 1.044 af

Subcatchment EX-2A: Subcat EX-2A Runoff Area=1.423 ac 18.97% Impervious Runoff Depth>1.98"
Flow Length=154' Tc=7.7 min CN=85 Runoff=3.12 cfs 0.235 af

Subcatchment EX-2B: Subcat EX-2B Runoff Area=0.536 ac 16.24% Impervious Runoff Depth>1.21"
Tc=6.0 min CN=74 Runoff=0.73 cfs 0.054 af

Reach DP-1: DP-1 Inflow=8.48 cfs 1.044 af
Outflow=8.48 cfs 1.044 af

Reach DP-2: DP-2 Inflow=3.84 cfs 0.289 af
Outflow=3.84 cfs 0.289 af

Total Runoff Area = 17.188 ac Runoff Volume = 1.332 af Average Runoff Depth = 0.93"
90.94% Pervious = 15.632 ac 9.06% Impervious = 1.557 ac

Summary for Subcatchment EX-1: Subcat EX-1

Runoff = 8.48 cfs @ 12.32 hrs, Volume= 1.044 af, Depth> 0.82"
Routed to Reach DP-1 : DP-1

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 2-YR Rainfall=3.46"

Area (sf)	CN	Description
49,280	69	50-75% Grass cover, Fair, HSG B
13,934	84	50-75% Grass cover, Fair, HSG D
28,608	96	Gravel surface, HSG B
195	96	Gravel surface, HSG D
371,259	58	Meadow, non-grazed, HSG B
27,517	98	Paved parking, HSG B
4,464	98	Paved parking, HSG D
17,957	98	Roofs, HSG B
2,318	98	Roofs, HSG D
72,594	60	Woods, Fair, HSG B
75,280	79	Woods, Fair, HSG D
663,406	67	Weighted Average
611,150		92.12% Pervious Area
52,256		7.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0184	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.46"
8.5	460	0.0328	0.91		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
20.8	510	Total			

Summary for Subcatchment EX-2A: Subcat EX-2A

Runoff = 3.12 cfs @ 12.11 hrs, Volume= 0.235 af, Depth> 1.98"
Routed to Reach DP-2 : DP-2

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 2-YR Rainfall=3.46"

Area (ac)	CN	Description
0.648	84	50-75% Grass cover, Fair, HSG D
0.250	98	Paved parking, HSG D
0.020	98	Roofs, HSG D
0.505	79	Woods, Fair, HSG D
1.423	85	Weighted Average
1.153		81.03% Pervious Area
0.270		18.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	45	0.0682	0.11		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.46"
0.7	85	0.0852	2.04		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.3	24	0.0681	1.30		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
7.7	154	Total			

Summary for Subcatchment EX-2B: Subcat EX-2B

Runoff = 0.73 cfs @ 12.09 hrs, Volume= 0.054 af, Depth> 1.21"
Routed to Reach DP-2 : DP-2

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 2-YR Rainfall=3.46"

Area (ac)	CN	Description
0.448	69	50-75% Grass cover, Fair, HSG B
0.001	84	50-75% Grass cover, Fair, HSG D
0.043	98	Paved parking, HSG B
0.000	98	Paved parking, HSG D
0.044	98	Roofs, HSG B
0.536	74	Weighted Average
0.449		83.76% Pervious Area
0.087		16.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Reach DP-1: DP-1

Inflow Area = 15.230 ac, 7.88% Impervious, Inflow Depth > 0.82" for 2-YR event
Inflow = 8.48 cfs @ 12.32 hrs, Volume= 1.044 af
Outflow = 8.48 cfs @ 12.32 hrs, Volume= 1.044 af, Atten= 0%, Lag= 0.0 min

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

Summary for Reach DP-2: DP-2

Inflow Area = 1.959 ac, 18.23% Impervious, Inflow Depth > 1.77" for 2-YR event
Inflow = 3.84 cfs @ 12.11 hrs, Volume= 0.289 af
Outflow = 3.84 cfs @ 12.11 hrs, Volume= 0.289 af, Atten= 0%, Lag= 0.0 min

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

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

Subcatchment EX-1: Subcat EX-1 Runoff Area=663,406 sf 7.88% Impervious Runoff Depth>1.86"
Flow Length=510' Tc=20.8 min CN=67 Runoff=21.35 cfs 2.365 af

Subcatchment EX-2A: Subcat EX-2A Runoff Area=1.423 ac 18.97% Impervious Runoff Depth>3.46"
Flow Length=154' Tc=7.7 min CN=85 Runoff=5.39 cfs 0.410 af

Subcatchment EX-2B: Subcat EX-2B Runoff Area=0.536 ac 16.24% Impervious Runoff Depth>2.44"
Tc=6.0 min CN=74 Runoff=1.53 cfs 0.109 af

Reach DP-1: DP-1 Inflow=21.35 cfs 2.365 af
Outflow=21.35 cfs 2.365 af

Reach DP-2: DP-2 Inflow=6.89 cfs 0.519 af
Outflow=6.89 cfs 0.519 af

Total Runoff Area = 17.188 ac Runoff Volume = 2.883 af Average Runoff Depth = 2.01"
90.94% Pervious = 15.632 ac 9.06% Impervious = 1.557 ac

Summary for Subcatchment EX-1: Subcat EX-1

Runoff = 21.35 cfs @ 12.31 hrs, Volume= 2.365 af, Depth> 1.86"
Routed to Reach DP-1 : DP-1

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 10-YR Rainfall=5.10"

Area (sf)	CN	Description
49,280	69	50-75% Grass cover, Fair, HSG B
13,934	84	50-75% Grass cover, Fair, HSG D
28,608	96	Gravel surface, HSG B
195	96	Gravel surface, HSG D
371,259	58	Meadow, non-grazed, HSG B
27,517	98	Paved parking, HSG B
4,464	98	Paved parking, HSG D
17,957	98	Roofs, HSG B
2,318	98	Roofs, HSG D
72,594	60	Woods, Fair, HSG B
75,280	79	Woods, Fair, HSG D
663,406	67	Weighted Average
611,150		92.12% Pervious Area
52,256		7.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0184	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.46"
8.5	460	0.0328	0.91		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
20.8	510	Total			

Summary for Subcatchment EX-2A: Subcat EX-2A

Runoff = 5.39 cfs @ 12.11 hrs, Volume= 0.410 af, Depth> 3.46"
Routed to Reach DP-2 : DP-2

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 10-YR Rainfall=5.10"

Area (ac)	CN	Description
0.648	84	50-75% Grass cover, Fair, HSG D
0.250	98	Paved parking, HSG D
0.020	98	Roofs, HSG D
0.505	79	Woods, Fair, HSG D
1.423	85	Weighted Average
1.153		81.03% Pervious Area
0.270		18.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	45	0.0682	0.11		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.46"
0.7	85	0.0852	2.04		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.3	24	0.0681	1.30		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
7.7	154	Total			

Summary for Subcatchment EX-2B: Subcat EX-2B

Runoff = 1.53 cfs @ 12.09 hrs, Volume= 0.109 af, Depth> 2.44"
Routed to Reach DP-2 : DP-2

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 10-YR Rainfall=5.10"

Area (ac)	CN	Description
0.448	69	50-75% Grass cover, Fair, HSG B
0.001	84	50-75% Grass cover, Fair, HSG D
0.043	98	Paved parking, HSG B
0.000	98	Paved parking, HSG D
0.044	98	Roofs, HSG B
0.536	74	Weighted Average
0.449		83.76% Pervious Area
0.087		16.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Reach DP-1: DP-1

Inflow Area = 15.230 ac, 7.88% Impervious, Inflow Depth > 1.86" for 10-YR event
Inflow = 21.35 cfs @ 12.31 hrs, Volume= 2.365 af
Outflow = 21.35 cfs @ 12.31 hrs, Volume= 2.365 af, Atten= 0%, Lag= 0.0 min

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

Summary for Reach DP-2: DP-2

Inflow Area = 1.959 ac, 18.23% Impervious, Inflow Depth > 3.18" for 10-YR event
Inflow = 6.89 cfs @ 12.10 hrs, Volume= 0.519 af
Outflow = 6.89 cfs @ 12.10 hrs, Volume= 0.519 af, Atten= 0%, Lag= 0.0 min

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

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

Subcatchment EX-1: Subcat EX-1 Runoff Area=663,406 sf 7.88% Impervious Runoff Depth>2.63"
Flow Length=510' Tc=20.8 min CN=67 Runoff=30.77 cfs 3.339 af

Subcatchment EX-2A: Subcat EX-2A Runoff Area=1.423 ac 18.97% Impervious Runoff Depth>4.44"
Flow Length=154' Tc=7.7 min CN=85 Runoff=6.85 cfs 0.526 af

Subcatchment EX-2B: Subcat EX-2B Runoff Area=0.536 ac 16.24% Impervious Runoff Depth>3.31"
Tc=6.0 min CN=74 Runoff=2.08 cfs 0.148 af

Reach DP-1: DP-1 Inflow=30.77 cfs 3.339 af
Outflow=30.77 cfs 3.339 af

Reach DP-2: DP-2 Inflow=8.89 cfs 0.674 af
Outflow=8.89 cfs 0.674 af

Total Runoff Area = 17.188 ac Runoff Volume = 4.013 af Average Runoff Depth = 2.80"
90.94% Pervious = 15.632 ac 9.06% Impervious = 1.557 ac

Summary for Subcatchment EX-1: Subcat EX-1

Runoff = 30.77 cfs @ 12.30 hrs, Volume= 3.339 af, Depth> 2.63"
Routed to Reach DP-1 : DP-1

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-YR Rainfall=6.15"

Area (sf)	CN	Description
49,280	69	50-75% Grass cover, Fair, HSG B
13,934	84	50-75% Grass cover, Fair, HSG D
28,608	96	Gravel surface, HSG B
195	96	Gravel surface, HSG D
371,259	58	Meadow, non-grazed, HSG B
27,517	98	Paved parking, HSG B
4,464	98	Paved parking, HSG D
17,957	98	Roofs, HSG B
2,318	98	Roofs, HSG D
72,594	60	Woods, Fair, HSG B
75,280	79	Woods, Fair, HSG D
663,406	67	Weighted Average
611,150		92.12% Pervious Area
52,256		7.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0184	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.46"
8.5	460	0.0328	0.91		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
20.8	510	Total			

Summary for Subcatchment EX-2A: Subcat EX-2A

Runoff = 6.85 cfs @ 12.11 hrs, Volume= 0.526 af, Depth> 4.44"
Routed to Reach DP-2 : DP-2

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-YR Rainfall=6.15"

Area (ac)	CN	Description
0.648	84	50-75% Grass cover, Fair, HSG D
0.250	98	Paved parking, HSG D
0.020	98	Roofs, HSG D
0.505	79	Woods, Fair, HSG D
1.423	85	Weighted Average
1.153		81.03% Pervious Area
0.270		18.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	45	0.0682	0.11		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.46"
0.7	85	0.0852	2.04		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.3	24	0.0681	1.30		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
7.7	154	Total			

Summary for Subcatchment EX-2B: Subcat EX-2B

Runoff = 2.08 cfs @ 12.09 hrs, Volume= 0.148 af, Depth> 3.31"
Routed to Reach DP-2 : DP-2

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-YR Rainfall=6.15"

Area (ac)	CN	Description
0.448	69	50-75% Grass cover, Fair, HSG B
0.001	84	50-75% Grass cover, Fair, HSG D
0.043	98	Paved parking, HSG B
0.000	98	Paved parking, HSG D
0.044	98	Roofs, HSG B
0.536	74	Weighted Average
0.449		83.76% Pervious Area
0.087		16.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Reach DP-1: DP-1

Inflow Area = 15.230 ac, 7.88% Impervious, Inflow Depth > 2.63" for 25-YR event
Inflow = 30.77 cfs @ 12.30 hrs, Volume= 3.339 af
Outflow = 30.77 cfs @ 12.30 hrs, Volume= 3.339 af, Atten= 0%, Lag= 0.0 min

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

Summary for Reach DP-2: DP-2

Inflow Area = 1.959 ac, 18.23% Impervious, Inflow Depth > 4.13" for 25-YR event
Inflow = 8.89 cfs @ 12.10 hrs, Volume= 0.674 af
Outflow = 8.89 cfs @ 12.10 hrs, Volume= 0.674 af, Atten= 0%, Lag= 0.0 min

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

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

Subcatchment EX-1: Subcat EX-1 Runoff Area=663,406 sf 7.88% Impervious Runoff Depth>3.90"
Flow Length=510' Tc=20.8 min CN=67 Runoff=46.17 cfs 4.946 af

Subcatchment EX-2A: Subcat EX-2A Runoff Area=1.423 ac 18.97% Impervious Runoff Depth>5.96"
Flow Length=154' Tc=7.7 min CN=85 Runoff=9.08 cfs 0.707 af

Subcatchment EX-2B: Subcat EX-2B Runoff Area=0.536 ac 16.24% Impervious Runoff Depth>4.70"
Tc=6.0 min CN=74 Runoff=2.95 cfs 0.210 af

Reach DP-1: DP-1 Inflow=46.17 cfs 4.946 af
Outflow=46.17 cfs 4.946 af

Reach DP-2: DP-2 Inflow=11.97 cfs 0.917 af
Outflow=11.97 cfs 0.917 af

Total Runoff Area = 17.188 ac Runoff Volume = 5.863 af Average Runoff Depth = 4.09"
90.94% Pervious = 15.632 ac 9.06% Impervious = 1.557 ac

Summary for Subcatchment EX-1: Subcat EX-1

Runoff = 46.17 cfs @ 12.29 hrs, Volume= 4.946 af, Depth> 3.90"
Routed to Reach DP-1 : DP-1

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 100-YR Rainfall=7.75"

Area (sf)	CN	Description
49,280	69	50-75% Grass cover, Fair, HSG B
13,934	84	50-75% Grass cover, Fair, HSG D
28,608	96	Gravel surface, HSG B
195	96	Gravel surface, HSG D
371,259	58	Meadow, non-grazed, HSG B
27,517	98	Paved parking, HSG B
4,464	98	Paved parking, HSG D
17,957	98	Roofs, HSG B
2,318	98	Roofs, HSG D
72,594	60	Woods, Fair, HSG B
75,280	79	Woods, Fair, HSG D
663,406	67	Weighted Average
611,150		92.12% Pervious Area
52,256		7.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0184	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.46"
8.5	460	0.0328	0.91		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
20.8	510	Total			

Summary for Subcatchment EX-2A: Subcat EX-2A

Runoff = 9.08 cfs @ 12.11 hrs, Volume= 0.707 af, Depth> 5.96"
Routed to Reach DP-2 : DP-2

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 100-YR Rainfall=7.75"

Area (ac)	CN	Description
0.648	84	50-75% Grass cover, Fair, HSG D
0.250	98	Paved parking, HSG D
0.020	98	Roofs, HSG D
0.505	79	Woods, Fair, HSG D
1.423	85	Weighted Average
1.153		81.03% Pervious Area
0.270		18.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	45	0.0682	0.11		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.46"
0.7	85	0.0852	2.04		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.3	24	0.0681	1.30		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
7.7	154	Total			

Summary for Subcatchment EX-2B: Subcat EX-2B

Runoff = 2.95 cfs @ 12.09 hrs, Volume= 0.210 af, Depth> 4.70"
Routed to Reach DP-2 : DP-2

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 100-YR Rainfall=7.75"

Area (ac)	CN	Description
0.448	69	50-75% Grass cover, Fair, HSG B
0.001	84	50-75% Grass cover, Fair, HSG D
0.043	98	Paved parking, HSG B
0.000	98	Paved parking, HSG D
0.044	98	Roofs, HSG B
0.536	74	Weighted Average
0.449		83.76% Pervious Area
0.087		16.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Reach DP-1: DP-1

Inflow Area = 15.230 ac, 7.88% Impervious, Inflow Depth > 3.90" for 100-YR event
Inflow = 46.17 cfs @ 12.29 hrs, Volume= 4.946 af
Outflow = 46.17 cfs @ 12.29 hrs, Volume= 4.946 af, Atten= 0%, Lag= 0.0 min

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

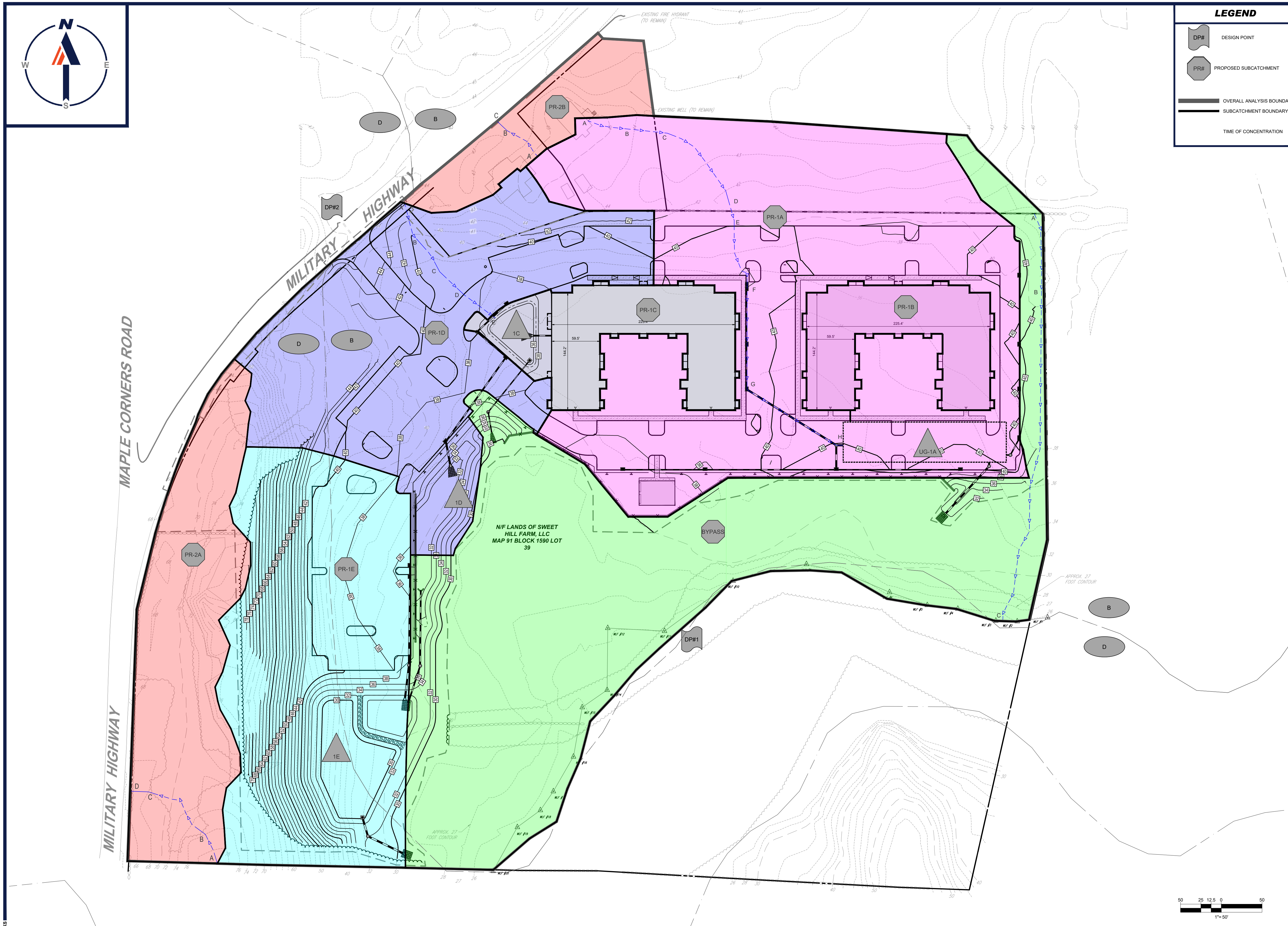
Summary for Reach DP-2: DP-2

Inflow Area = 1.959 ac, 18.23% Impervious, Inflow Depth > 5.62" for 100-YR event
Inflow = 11.97 cfs @ 12.10 hrs, Volume= 0.917 af
Outflow = 11.97 cfs @ 12.10 hrs, Volume= 0.917 af, Atten= 0%, Lag= 0.0 min

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

APPENDIX D: PROPOSED CONDITIONS HYDROLOGIC ANALYSIS

- *PROPOSED CONDITIONS DRAINAGE MAP*
- *PROPOSED CONDITIONS HYDROCAD CALCULATIONS*



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DRAWN BY:	TJN/KMB
CHECKED BY:	JGB
DATE:	02/19/2025
CAD I.D.:	CTA220061.00-PDAM-5A

PROJECT:

PROPOSED SITE PLAN DOCUMENTS

FOR

C.R. KLEWIN LLC

PROPOSED RESIDENTIAL DEVELOPMENT

19, 29 & 39 MILITARY HIGHWAY, GALES FERRY, LEDYARD, NEW LONDON COUNTY, CONNECTICUT

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SHEET TITLE:

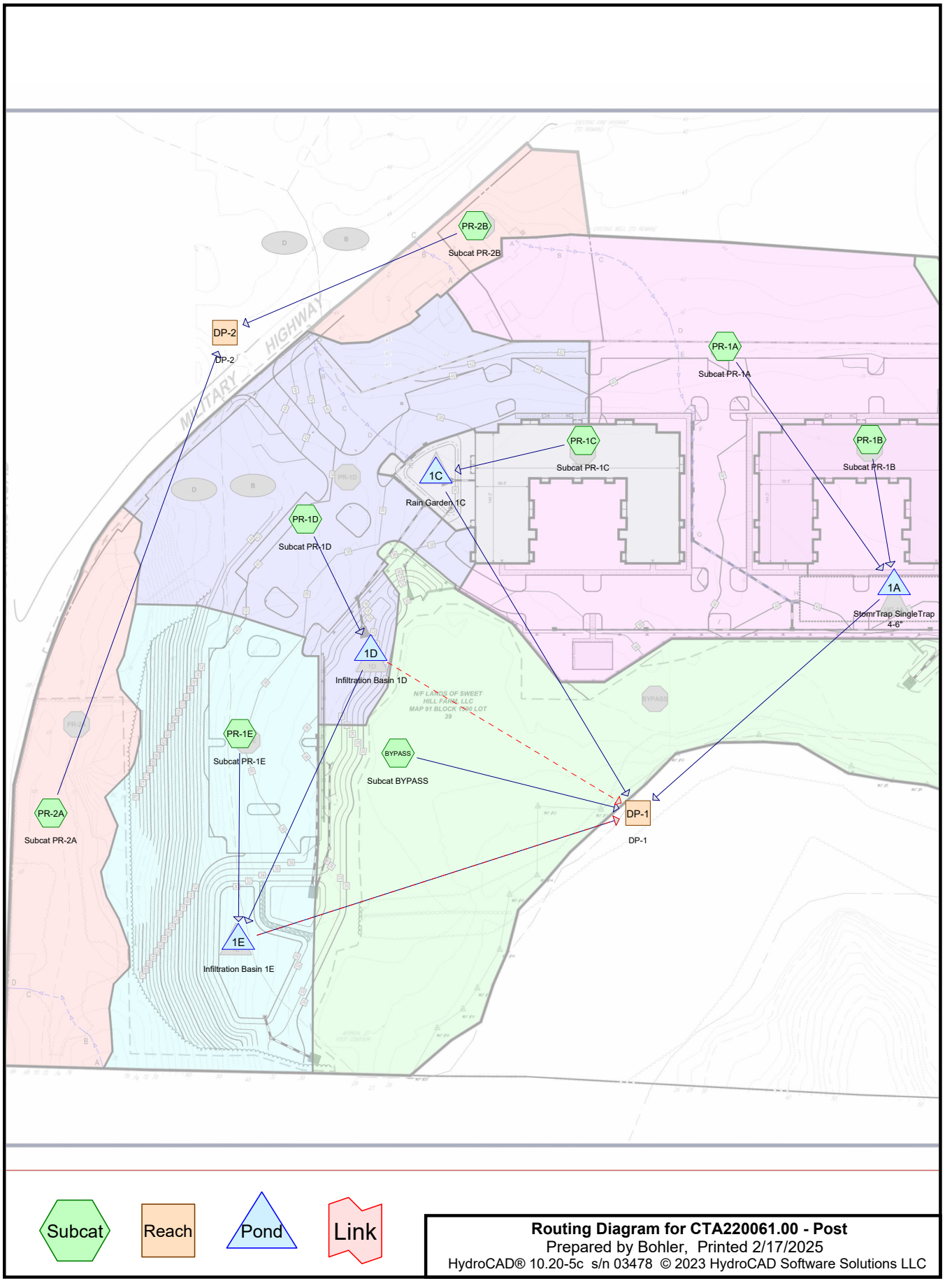
PROPOSED CONDITIONS DRAINAGE AREA MAP

SHEET NUMBER:

PRDAM

50 25 12.5 0 50
1"= 50'

ORG. DATE - 02/19/2025



Routing Diagram for CTA220061.00 - Post
Prepared by Bohler, Printed 2/17/2025

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment BYPASS: Subcat BYPASS Runoff Area=4.622 ac 0.50% Impervious Runoff Depth=0.55"
Flow Length=510' Tc=20.8 min CN=61 Runoff=1.43 cfs 0.214 af

Subcatchment PR-1A: Subcat PR-1A Runoff Area=4.251 ac 60.23% Impervious Runoff Depth=2.06"
Flow Length=584' Tc=8.9 min CN=86 Runoff=9.30 cfs 0.731 af

Subcatchment PR-1B: Subcat PR-1B Runoff Area=25,241 sf 100.00% Impervious Runoff Depth=3.23"
Tc=6.0 min CN=98 Runoff=1.95 cfs 0.156 af

Subcatchment PR-1C: Subcat PR-1C Runoff Area=0.732 ac 79.20% Impervious Runoff Depth=2.60"
Tc=6.0 min CN=92 Runoff=2.17 cfs 0.158 af

Subcatchment PR-1D: Subcat PR-1D Runoff Area=2.563 ac 38.85% Impervious Runoff Depth=1.75"
Tc=6.0 min CN=82 Runoff=5.25 cfs 0.374 af

Subcatchment PR-1E: Subcat PR-1E Runoff Area=108,287 sf 28.99% Impervious Runoff Depth=2.06"
Tc=6.0 min CN=86 Runoff=6.01 cfs 0.427 af

Subcatchment PR-2A: Subcat PR-2A Runoff Area=1.419 ac 7.91% Impervious Runoff Depth=1.82"
Flow Length=154' Tc=7.7 min CN=83 Runoff=2.86 cfs 0.216 af

Subcatchment PR-2B: Subcat PR-2B Runoff Area=0.536 ac 16.24% Impervious Runoff Depth=1.21"
Tc=6.0 min CN=74 Runoff=0.73 cfs 0.054 af

Reach DP-1: DP-1 Inflow=2.27 cfs 0.270 af
Outflow=2.27 cfs 0.270 af

Reach DP-2: DP-2 Inflow=3.58 cfs 0.270 af
Outflow=3.58 cfs 0.270 af

Pond 1A: StomrTrap SingleTrap 4-6" Peak Elev=31.62' Storage=13,482 cf Inflow=11.06 cfs 0.887 af
Discarded=1.51 cfs 0.887 af Primary=0.00 cfs 0.000 af Outflow=1.51 cfs 0.887 af

Pond 1C: Rain Garden 1C Peak Elev=35.88' Storage=2,871 cf Inflow=2.17 cfs 0.158 af
Discarded=0.04 cfs 0.097 af Primary=0.97 cfs 0.056 af Outflow=1.01 cfs 0.154 af

Pond 1D: Infiltration Basin 1D Peak Elev=31.79' Storage=2,560 cf Inflow=5.25 cfs 0.374 af
Discarded=0.42 cfs 0.207 af Primary=2.88 cfs 0.167 af Secondary=0.00 cfs 0.000 af Outflow=3.30 cfs 0.374 af

Pond 1E: Infiltration Basin 1E Peak Elev=30.96' Storage=10,792 cf Inflow=8.16 cfs 0.594 af
Discarded=1.18 cfs 0.594 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=1.18 cfs 0.594 af

Total Runoff Area = 17.188 ac Runoff Volume = 2.330 af Average Runoff Depth = 1.63"
67.08% Pervious = 11.530 ac 32.92% Impervious = 5.658 ac

Summary for Subcatchment BYPASS: Subcat BYPASS

Runoff = 1.43 cfs @ 12.38 hrs, Volume= 0.214 af, Depth= 0.55"
Routed to Reach DP-1 : DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.46"

Area (ac)	CN	Description
0.680	69	50-75% Grass cover, Fair, HSG B
3.108	58	Meadow, non-grazed, HSG B
0.025	78	Meadow, non-grazed, HSG D
0.023	98	Paved parking, HSG B
0.654	60	Woods, Fair, HSG B
0.133	79	Woods, Fair, HSG D
4.622	61	Weighted Average
4.599		99.50% Pervious Area
0.023		0.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0184	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.46"
8.5	460	0.0328	0.91		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
20.8	510	Total			

Summary for Subcatchment PR-1A: Subcat PR-1A

Runoff = 9.30 cfs @ 12.13 hrs, Volume= 0.731 af, Depth= 2.06"
Routed to Pond 1A : StomrTrap SingleTrap 4-6"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.46"

Area (ac)	CN	Description
1.622	69	50-75% Grass cover, Fair, HSG B
2.505	98	Paved parking, HSG B
0.056	98	Roofs, HSG B
0.069	60	Woods, Fair, HSG B
4.251	86	Weighted Average
1.691		39.77% Pervious Area
2.561		60.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.0146	0.14		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.46"
1.1	49	0.0123	0.78		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.7	113	0.0185	2.76		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
0.4	36	0.0441	1.47		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
0.4	75	0.0265	3.30		**Shallow Concentrated Flow, E-F** Paved Kv= 20.3 fps
0.1	123	0.5200	36.20	28.96	**Channel Flow, F-G** Area= 0.8 sf Perim= 3.1' r= 0.26' n= 0.012
0.1	138	0.5000	39.91	47.89	**Channel Flow, G-H** Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012
8.9	584	Total			

Summary for Subcatchment PR-1B: Subcat PR-1B

Runoff = 1.95 cfs @ 12.08 hrs, Volume= 0.156 af, Depth= 3.23"
Routed to Pond 1A : StomrTrap SingleTrap 4-6"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.46"

Area (sf)	CN	Description
25,241	98	Roofs, HSG B
25,241		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-1C: Subcat PR-1C

Runoff = 2.17 cfs @ 12.09 hrs, Volume= 0.158 af, Depth= 2.60"
Routed to Pond 1C : Rain Garden 1C

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.46"

Area (ac)	CN	Description
0.152	69	50-75% Grass cover, Fair, HSG B
0.579	98	Roofs, HSG B
0.732	92	Weighted Average
0.152		20.80% Pervious Area
0.579		79.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-1D: Subcat PR-1D

Runoff = 5.25 cfs @ 12.09 hrs, Volume= 0.374 af, Depth= 1.75"
Routed to Pond 1D : Infiltration Basin 1D

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.46"

Area (ac)	CN	Description
1.079	69	50-75% Grass cover, Fair, HSG B
0.396	84	50-75% Grass cover, Fair, HSG D
0.018	58	Meadow, non-grazed, HSG B
0.972	98	Paved parking, HSG B
0.024	98	Roofs, HSG B
0.075	60	Woods, Fair, HSG B
2.563	82	Weighted Average
1.567		61.15% Pervious Area
0.996		38.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-1E: Subcat PR-1E

Runoff = 6.01 cfs @ 12.09 hrs, Volume= 0.427 af, Depth= 2.06"
Routed to Pond 1E : Infiltration Basin 1E

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.46"

Area (sf)	CN	Description
13,827	69	50-75% Grass cover, Fair, HSG B
56,355	84	50-75% Grass cover, Fair, HSG D
22,254	98	Paved parking, HSG B
9,136	98	Paved parking, HSG D
6,714	79	Woods, Fair, HSG D
108,287	86	Weighted Average
76,896		71.01% Pervious Area
31,390		28.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-2A: Subcat PR-2A

Runoff = 2.86 cfs @ 12.11 hrs, Volume= 0.216 af, Depth= 1.82"
Routed to Reach DP-2 : DP-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.46"

Area (ac)	CN	Description
0.828	84	50-75% Grass cover, Fair, HSG D
0.112	98	Paved parking, HSG D
0.479	79	Woods, Fair, HSG D
1.419	83	Weighted Average
1.307		92.09% Pervious Area
0.112		7.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	45	0.0682	0.11		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.46"
0.7	85	0.0852	2.04		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.3	24	0.0681	1.30		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
7.7	154	Total			

Summary for Subcatchment PR-2B: Subcat PR-2B

Runoff = 0.73 cfs @ 12.09 hrs, Volume= 0.054 af, Depth= 1.21"
Routed to Reach DP-2 : DP-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.46"

Area (ac)	CN	Description
0.448	69	50-75% Grass cover, Fair, HSG B
0.001	84	50-75% Grass cover, Fair, HSG D
0.043	98	Paved parking, HSG B
0.044	98	Roofs, HSG B
0.536	74	Weighted Average
0.449		83.76% Pervious Area
0.087		16.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Reach DP-1: DP-1

Inflow Area = 15.233 ac, 35.83% Impervious, Inflow Depth = 0.21" for 2-YR event
Inflow = 2.27 cfs @ 12.32 hrs, Volume= 0.270 af
Outflow = 2.27 cfs @ 12.32 hrs, Volume= 0.270 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: DP-2

Inflow Area = 1.955 ac, 10.19% Impervious, Inflow Depth = 1.66" for 2-YR event
Inflow = 3.58 cfs @ 12.11 hrs, Volume= 0.270 af
Outflow = 3.58 cfs @ 12.11 hrs, Volume= 0.270 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Pond 1A: StomrTrap SingleTrap 4-6"

Inflow Area = 4.831 ac, 65.00% Impervious, Inflow Depth = 2.20" for 2-YR event
Inflow = 11.06 cfs @ 12.12 hrs, Volume= 0.887 af
Outflow = 1.51 cfs @ 12.77 hrs, Volume= 0.887 af, Atten= 86%, Lag= 39.4 min
Discarded = 1.51 cfs @ 12.77 hrs, Volume= 0.887 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-1 : DP-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 31.62' @ 12.77 hrs Surf.Area= 9,849 sf Storage= 13,482 cf

Plug-Flow detention time= 72.7 min calculated for 0.886 af (100% of inflow)
Center-of-Mass det. time= 72.7 min (882.8 - 810.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	29.50'	4,929 cf	**49.23'W x 200.06'L x 6.00'H Field A** 59,093 cf Overall - 46,772 cf Embedded = 12,322 cf x 40.0% Voids
#2A	30.50'	37,467 cf	**StormTrap SingleTrap 4-6** x 48 Inside #1 Inside= 101.7"W x 54.0"H => 34.42 sf x 15.40'L = 529.9 cf Outside= 101.7"W x 60.0"H => 42.40 sf x 15.40'L = 652.7 cf 48 Chambers in 4 Rows 33.92' x 184.75' Core + 6.66' Border = 47.23' x 198.06' System
		42,396 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	31.54'	**24.0" Round Culvert** L= 78.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 31.54' / 31.15' S= 0.0050 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 3.14 sf
#2	Device 1	33.60'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	32.30'	**12.0" W x 4.0" H Vert. 4" x 12" WQV Orfice** C= 0.600 Limited to weir flow at low heads
#4	Discarded	29.50'	**4.135 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 26.00' Phase-In= 0.01'

Discarded OutFlow Max=1.51 cfs @ 12.77 hrs HW=31.62' (Free Discharge)
└**4=Exfiltration** (Controls 1.51 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=29.50' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)
  ├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └**3=4" x 12" WQV Orfice** (Controls 0.00 cfs)

Summary for Pond 1C: Rain Garden 1C

Inflow Area = 0.732 ac, 79.20% Impervious, Inflow Depth = 2.60" for 2-YR event
Inflow = 2.17 cfs @ 12.09 hrs, Volume= 0.158 af
Outflow = 1.01 cfs @ 12.26 hrs, Volume= 0.154 af, Atten= 54%, Lag= 10.2 min
Discarded = 0.04 cfs @ 12.26 hrs, Volume= 0.097 af
Primary = 0.97 cfs @ 12.26 hrs, Volume= 0.056 af
Routed to Reach DP-1 : DP-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 35.88' @ 12.26 hrs Surf.Area= 2,480 sf Storage= 2,871 cf

Plug-Flow detention time= 526.4 min calculated for 0.154 af (97% of inflow)
Center-of-Mass det. time= 508.7 min (1,303.7 - 795.0)

Volume	Invert	Avail.Storage	Storage Description
#1	34.50'	6,033 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
34.50	1,680	0	0
35.00	1,955	909	909
36.00	2,548	2,252	3,160
37.00	3,198	2,873	6,033

Device	Routing	Invert	Outlet Devices
#1	Primary	30.34'	**12.0" Round Culvert** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 30.34' / 30.00' S= 0.0136 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	35.80'	**36.0" x 36.0" Horiz. 3' x 3' Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	34.50'	**0.500 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 30.00' Phase-In= 0.01'

Discarded OutFlow Max=0.04 cfs @ 12.26 hrs HW=35.88' (Free Discharge)
↑└**3=Exfiltration** (Controls 0.04 cfs)

Primary OutFlow Max=0.97 cfs @ 12.26 hrs HW=35.88' TW=0.00' (Dynamic Tailwater)
↑└**1=Culvert** (Passes 0.97 cfs of 8.49 cfs potential flow)
↑└**2=3' x 3' Grate** (Weir Controls 0.97 cfs @ 0.95 fps)

Summary for Pond 1D: Infiltration Basin 1D

Inflow Area = 2.563 ac, 38.85% Impervious, Inflow Depth = 1.75" for 2-YR event
Inflow = 5.25 cfs @ 12.09 hrs, Volume= 0.374 af
Outflow = 3.30 cfs @ 12.19 hrs, Volume= 0.374 af, Atten= 37%, Lag= 6.1 min
Discarded = 0.42 cfs @ 12.19 hrs, Volume= 0.207 af
Primary = 2.88 cfs @ 12.19 hrs, Volume= 0.167 af
Routed to Pond 1E : Infiltration Basin 1E
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-1 : DP-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 31.79' @ 12.19 hrs Surf.Area= 3,730 sf Storage= 2,560 cf

Plug-Flow detention time= 12.1 min calculated for 0.374 af (100% of inflow)
Center-of-Mass det. time= 12.1 min (844.6 - 832.5)

Volume	Invert	Avail.Storage	Storage Description
#1	31.00'	13,463 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
31.00	2,722	0	0
32.00	3,992	3,357	3,357
33.00	5,015	4,504	7,861
34.00	6,190	5,603	13,463

Device	Routing	Invert	Outlet Devices
#1	Primary	31.00'	**18.0" Round Culvert** L= 44.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 31.00' / 30.11' S= 0.0201 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Discarded	31.00'	**4.135 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 27.00' Phase-In= 0.01'
#3	Secondary	33.50'	**10.0' long + 3.0 '/' SideZ x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Discarded OutFlow Max=0.42 cfs @ 12.19 hrs HW=31.79' (Free Discharge)
2=Exfiltration (Controls 0.42 cfs)

Primary OutFlow Max=2.88 cfs @ 12.19 hrs HW=31.79' TW=30.53' (Dynamic Tailwater)
1=Culvert (Inlet Controls 2.88 cfs @ 3.03 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=31.00' TW=0.00' (Dynamic Tailwater)
3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 1E: Infiltration Basin 1E

Inflow Area = 5.049 ac, 34.00% Impervious, Inflow Depth = 1.41" for 2-YR event
Inflow = 8.16 cfs @ 12.10 hrs, Volume= 0.594 af
Outflow = 1.18 cfs @ 12.91 hrs, Volume= 0.594 af, Atten= 86%, Lag= 48.4 min
Discarded = 1.18 cfs @ 12.91 hrs, Volume= 0.594 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-1 : DP-1
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-1 : DP-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 30.96' @ 12.91 hrs Surf.Area= 9,488 sf Storage= 10,792 cf

Plug-Flow detention time= 82.6 min calculated for 0.594 af (100% of inflow)
Center-of-Mass det. time= 82.6 min (884.1 - 801.5)

Volume	Invert	Avail.Storage	Storage Description
#1	30.00'	5,328 cf	**Sediment Forebay (Prismatic)** Listed below (Recalc) -Impervious
#2	30.00'	19,104 cf	**Infiltration Basin (Prismatic)** Listed below (Recalc)
#3	32.00'	18,762 cf	**Area Above Forebay (Prismatic)** Listed below (Recalc) -Impervious
		43,193 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
30.00	2,081	0	0
31.00	2,648	2,365	2,365
32.00	3,278	2,963	5,328

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
30.00	8,310	0	0
31.00	9,538	8,924	8,924
32.00	10,822	10,180	19,104

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
32.00	13,216	0	0
33.00	14,552	13,884	13,884
33.33	15,010	4,878	18,762

Device	Routing	Invert	Outlet Devices
#1	Primary	28.37'	**24.0" Round Culvert** L= 45.8' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 28.37' / 28.14' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Device 1	31.65'	**36.0" x 36.0" Horiz. 3' x 3' Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	31.00'	**12.0" W x 3.0" H Vert. WQV Orifice** C= 0.600 Limited to weir flow at low heads
#4	Discarded	30.00'	**4.135 in/hr Exfiltration over Surface area**

Conductivity to Groundwater Elevation = 27.00' Phase-In= 0.01'
#5 Secondary 32.67' **10.0' long + 3.0 '/' SideZ x 10.0' breadth Broad-Crested Rectangular Weir**
Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.18 cfs @ 12.91 hrs HW=30.96' (Free Discharge)
└**4=Exfiltration** (Controls 1.18 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=30.00' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.00 cfs of 9.31 cfs potential flow)
├**2=3' x 3' Grate** (Controls 0.00 cfs)
└**3=WQV Orifice** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=30.00' TW=0.00' (Dynamic Tailwater)
└**5=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment BYPASS: Subcat BYPASS Runoff Area=4.622 ac 0.50% Impervious Runoff Depth=1.44"
Flow Length=510' Tc=20.8 min CN=61 Runoff=4.72 cfs 0.555 af

Subcatchment PR-1A: Subcat PR-1A Runoff Area=4.251 ac 60.23% Impervious Runoff Depth=3.58"
Flow Length=584' Tc=8.9 min CN=86 Runoff=15.93 cfs 1.268 af

Subcatchment PR-1B: Subcat PR-1B Runoff Area=25,241 sf 100.00% Impervious Runoff Depth=4.88"
Tc=6.0 min CN=98 Runoff=2.90 cfs 0.236 af

Subcatchment PR-1C: Subcat PR-1C Runoff Area=0.732 ac 79.20% Impervious Runoff Depth=4.21"
Tc=6.0 min CN=92 Runoff=3.42 cfs 0.256 af

Subcatchment PR-1D: Subcat PR-1D Runoff Area=2.563 ac 38.85% Impervious Runoff Depth=3.19"
Tc=6.0 min CN=82 Runoff=9.55 cfs 0.681 af

Subcatchment PR-1E: Subcat PR-1E Runoff Area=108,287 sf 28.99% Impervious Runoff Depth=3.58"
Tc=6.0 min CN=86 Runoff=10.28 cfs 0.741 af

Subcatchment PR-2A: Subcat PR-2A Runoff Area=1.419 ac 7.91% Impervious Runoff Depth=3.28"
Flow Length=154' Tc=7.7 min CN=83 Runoff=5.12 cfs 0.388 af

Subcatchment PR-2B: Subcat PR-2B Runoff Area=0.536 ac 16.24% Impervious Runoff Depth=2.46"
Tc=6.0 min CN=74 Runoff=1.54 cfs 0.110 af

Reach DP-1: DP-1 Inflow=7.34 cfs 0.991 af
Outflow=7.34 cfs 0.991 af

Reach DP-2: DP-2 Inflow=6.63 cfs 0.498 af
Outflow=6.63 cfs 0.498 af

Pond 1A: StomrTrap SingleTrap 4-6" Peak Elev=32.96' Storage=24,876 cf Inflow=18.57 cfs 1.504 af
Discarded=1.87 cfs 1.389 af Primary=1.12 cfs 0.114 af Outflow=2.99 cfs 1.504 af

Pond 1C: Rain Garden 1C Peak Elev=35.99' Storage=3,131 cf Inflow=3.42 cfs 0.256 af
Discarded=0.04 cfs 0.103 af Primary=3.21 cfs 0.147 af Outflow=3.24 cfs 0.250 af

Pond 1D: Infiltration Basin 1D Peak Elev=32.24' Storage=4,326 cf Inflow=9.55 cfs 0.681 af
Discarded=0.51 cfs 0.306 af Primary=5.89 cfs 0.374 af Secondary=0.00 cfs 0.000 af Outflow=6.40 cfs 0.681 af

Pond 1E: Infiltration Basin 1E Peak Elev=31.70' Storage=20,349 cf Inflow=15.17 cfs 1.116 af
Discarded=1.50 cfs 0.942 af Primary=1.41 cfs 0.174 af Secondary=0.00 cfs 0.000 af Outflow=2.91 cfs 1.116 af

Total Runoff Area = 17.188 ac Runoff Volume = 4.236 af Average Runoff Depth = 2.96"
67.08% Pervious = 11.530 ac 32.92% Impervious = 5.658 ac

Summary for Subcatchment BYPASS: Subcat BYPASS

Runoff = 4.72 cfs @ 12.32 hrs, Volume= 0.555 af, Depth= 1.44"
Routed to Reach DP-1 : DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=5.12"

Area (ac)	CN	Description
0.680	69	50-75% Grass cover, Fair, HSG B
3.108	58	Meadow, non-grazed, HSG B
0.025	78	Meadow, non-grazed, HSG D
0.023	98	Paved parking, HSG B
0.654	60	Woods, Fair, HSG B
0.133	79	Woods, Fair, HSG D
4.622	61	Weighted Average
4.599		99.50% Pervious Area
0.023		0.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0184	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.46"
8.5	460	0.0328	0.91		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
20.8	510	Total			

Summary for Subcatchment PR-1A: Subcat PR-1A

Runoff = 15.93 cfs @ 12.12 hrs, Volume= 1.268 af, Depth= 3.58"
Routed to Pond 1A : StomrTrap SingleTrap 4-6"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=5.12"

Area (ac)	CN	Description
1.622	69	50-75% Grass cover, Fair, HSG B
2.505	98	Paved parking, HSG B
0.056	98	Roofs, HSG B
0.069	60	Woods, Fair, HSG B
4.251	86	Weighted Average
1.691		39.77% Pervious Area
2.561		60.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.0146	0.14		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.46"
1.1	49	0.0123	0.78		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.7	113	0.0185	2.76		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
0.4	36	0.0441	1.47		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
0.4	75	0.0265	3.30		**Shallow Concentrated Flow, E-F** Paved Kv= 20.3 fps
0.1	123	0.5200	36.20	28.96	**Channel Flow, F-G** Area= 0.8 sf Perim= 3.1' r= 0.26' n= 0.012
0.1	138	0.5000	39.91	47.89	**Channel Flow, G-H** Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012
8.9	584	Total			

Summary for Subcatchment PR-1B: Subcat PR-1B

Runoff = 2.90 cfs @ 12.08 hrs, Volume= 0.236 af, Depth= 4.88"
Routed to Pond 1A : StomrTrap SingleTrap 4-6"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=5.12"

Area (sf)	CN	Description
25,241	98	Roofs, HSG B
25,241		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-1C: Subcat PR-1C

Runoff = 3.42 cfs @ 12.08 hrs, Volume= 0.256 af, Depth= 4.21"
Routed to Pond 1C : Rain Garden 1C

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=5.12"

Area (ac)	CN	Description
0.152	69	50-75% Grass cover, Fair, HSG B
0.579	98	Roofs, HSG B
0.732	92	Weighted Average
0.152		20.80% Pervious Area
0.579		79.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-1D: Subcat PR-1D

Runoff = 9.55 cfs @ 12.09 hrs, Volume= 0.681 af, Depth= 3.19"
Routed to Pond 1D : Infiltration Basin 1D

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=5.12"

Area (ac)	CN	Description
1.079	69	50-75% Grass cover, Fair, HSG B
0.396	84	50-75% Grass cover, Fair, HSG D
0.018	58	Meadow, non-grazed, HSG B
0.972	98	Paved parking, HSG B
0.024	98	Roofs, HSG B
0.075	60	Woods, Fair, HSG B
2.563	82	Weighted Average
1.567		61.15% Pervious Area
0.996		38.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-1E: Subcat PR-1E

Runoff = 10.28 cfs @ 12.09 hrs, Volume= 0.741 af, Depth= 3.58"
Routed to Pond 1E : Infiltration Basin 1E

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=5.12"

Area (sf)	CN	Description
13,827	69	50-75% Grass cover, Fair, HSG B
56,355	84	50-75% Grass cover, Fair, HSG D
22,254	98	Paved parking, HSG B
9,136	98	Paved parking, HSG D
6,714	79	Woods, Fair, HSG D
108,287	86	Weighted Average
76,896		71.01% Pervious Area
31,390		28.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-2A: Subcat PR-2A

Runoff = 5.12 cfs @ 12.11 hrs, Volume= 0.388 af, Depth= 3.28"
Routed to Reach DP-2 : DP-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=5.12"

Area (ac)	CN	Description
0.828	84	50-75% Grass cover, Fair, HSG D
0.112	98	Paved parking, HSG D
0.479	79	Woods, Fair, HSG D
1.419	83	Weighted Average
1.307		92.09% Pervious Area
0.112		7.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	45	0.0682	0.11		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.46"
0.7	85	0.0852	2.04		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.3	24	0.0681	1.30		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
7.7	154	Total			

Summary for Subcatchment PR-2B: Subcat PR-2B

Runoff = 1.54 cfs @ 12.09 hrs, Volume= 0.110 af, Depth= 2.46"
Routed to Reach DP-2 : DP-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=5.12"

Area (ac)	CN	Description
0.448	69	50-75% Grass cover, Fair, HSG B
0.001	84	50-75% Grass cover, Fair, HSG D
0.043	98	Paved parking, HSG B
0.044	98	Roofs, HSG B
0.536	74	Weighted Average
0.449		83.76% Pervious Area
0.087		16.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Reach DP-1: DP-1

Inflow Area = 15.233 ac, 35.83% Impervious, Inflow Depth = 0.78" for 10-YR event
Inflow = 7.34 cfs @ 12.36 hrs, Volume= 0.991 af
Outflow = 7.34 cfs @ 12.36 hrs, Volume= 0.991 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: DP-2

Inflow Area = 1.955 ac, 10.19% Impervious, Inflow Depth = 3.06" for 10-YR event
Inflow = 6.63 cfs @ 12.10 hrs, Volume= 0.498 af
Outflow = 6.63 cfs @ 12.10 hrs, Volume= 0.498 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Pond 1A: StomrTrap SingleTrap 4-6"

Inflow Area = 4.831 ac, 65.00% Impervious, Inflow Depth = 3.74" for 10-YR event
Inflow = 18.57 cfs @ 12.12 hrs, Volume= 1.504 af
Outflow = 2.99 cfs @ 12.65 hrs, Volume= 1.504 af, Atten= 84%, Lag= 31.8 min
Discarded = 1.87 cfs @ 12.65 hrs, Volume= 1.389 af
Primary = 1.12 cfs @ 12.65 hrs, Volume= 0.114 af
Routed to Reach DP-1 : DP-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 32.96' @ 12.65 hrs Surf.Area= 9,849 sf Storage= 24,876 cf

Plug-Flow detention time= 105.7 min calculated for 1.503 af (100% of inflow)
Center-of-Mass det. time= 105.7 min (902.7 - 797.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	29.50'	4,929 cf	**49.23'W x 200.06'L x 6.00'H Field A** 59,093 cf Overall - 46,772 cf Embedded = 12,322 cf x 40.0% Voids
#2A	30.50'	37,467 cf	**StormTrap SingleTrap 4-6** x 48 Inside #1 Inside= 101.7"W x 54.0"H => 34.42 sf x 15.40'L = 529.9 cf Outside= 101.7"W x 60.0"H => 42.40 sf x 15.40'L = 652.7 cf 48 Chambers in 4 Rows 33.92' x 184.75' Core + 6.66' Border = 47.23' x 198.06' System
		42,396 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	31.54'	**24.0" Round Culvert** L= 78.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 31.54' / 31.15' S= 0.0050 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 3.14 sf
#2	Device 1	33.60'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	32.30'	**12.0" W x 4.0" H Vert. 4" x 12" WQV Orfice** C= 0.600 Limited to weir flow at low heads
#4	Discarded	29.50'	**4.135 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 26.00' Phase-In= 0.01'

Discarded OutFlow Max=1.87 cfs @ 12.65 hrs HW=32.96' (Free Discharge)
└**4=Exfiltration** (Controls 1.87 cfs)

Primary OutFlow Max=1.12 cfs @ 12.65 hrs HW=32.96' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 1.12 cfs of 7.76 cfs potential flow)
├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
└**3=4" x 12" WQV Orfice** (Orifice Controls 1.12 cfs @ 3.35 fps)

Summary for Pond 1C: Rain Garden 1C

Inflow Area = 0.732 ac, 79.20% Impervious, Inflow Depth = 4.21" for 10-YR event
Inflow = 3.42 cfs @ 12.08 hrs, Volume= 0.256 af
Outflow = 3.24 cfs @ 12.11 hrs, Volume= 0.250 af, Atten= 5%, Lag= 1.6 min
Discarded = 0.04 cfs @ 12.11 hrs, Volume= 0.103 af
Primary = 3.21 cfs @ 12.11 hrs, Volume= 0.147 af
Routed to Reach DP-1 : DP-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 35.99' @ 12.11 hrs Surf.Area= 2,541 sf Storage= 3,131 cf

Plug-Flow detention time= 339.9 min calculated for 0.250 af (97% of inflow)
Center-of-Mass det. time= 324.7 min (1,106.7 - 782.0)

Volume	Invert	Avail.Storage	Storage Description
#1	34.50'	6,033 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
34.50	1,680	0	0
35.00	1,955	909	909
36.00	2,548	2,252	3,160
37.00	3,198	2,873	6,033

Device	Routing	Invert	Outlet Devices
#1	Primary	30.34'	**12.0" Round Culvert** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 30.34' / 30.00' S= 0.0136 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	35.80'	**36.0" x 36.0" Horiz. 3' x 3' Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	34.50'	**0.500 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 30.00' Phase-In= 0.01'

Discarded OutFlow Max=0.04 cfs @ 12.11 hrs HW=35.99' (Free Discharge)
↑└**3=Exfiltration** (Controls 0.04 cfs)

Primary OutFlow Max=3.20 cfs @ 12.11 hrs HW=35.99' TW=0.00' (Dynamic Tailwater)
↑└**1=Culvert** (Passes 3.20 cfs of 8.58 cfs potential flow)
↑└**2=3' x 3' Grate** (Weir Controls 3.20 cfs @ 1.42 fps)

Summary for Pond 1D: Infiltration Basin 1D

Inflow Area = 2.563 ac, 38.85% Impervious, Inflow Depth = 3.19" for 10-YR event
Inflow = 9.55 cfs @ 12.09 hrs, Volume= 0.681 af
Outflow = 6.40 cfs @ 12.18 hrs, Volume= 0.681 af, Atten= 33%, Lag= 5.3 min
Discarded = 0.51 cfs @ 12.18 hrs, Volume= 0.306 af
Primary = 5.89 cfs @ 12.18 hrs, Volume= 0.374 af
Routed to Pond 1E : Infiltration Basin 1E
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-1 : DP-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 32.24' @ 12.18 hrs Surf.Area= 4,233 sf Storage= 4,326 cf

Plug-Flow detention time= 17.0 min calculated for 0.680 af (100% of inflow)
Center-of-Mass det. time= 17.0 min (832.3 - 815.3)

Volume	Invert	Avail.Storage	Storage Description
#1	31.00'	13,463 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
31.00	2,722	0	0
32.00	3,992	3,357	3,357
33.00	5,015	4,504	7,861
34.00	6,190	5,603	13,463

Device	Routing	Invert	Outlet Devices
#1	Primary	31.00'	**18.0" Round Culvert** L= 44.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 31.00' / 30.11' S= 0.0201 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Discarded	31.00'	**4.135 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 27.00' Phase-In= 0.01'
#3	Secondary	33.50'	**10.0' long + 3.0 '/' SideZ x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Discarded OutFlow Max=0.51 cfs @ 12.18 hrs HW=32.24' (Free Discharge)
└**2=Exfiltration** (Controls 0.51 cfs)

Primary OutFlow Max=5.89 cfs @ 12.18 hrs HW=32.24' TW=31.10' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 5.89 cfs @ 3.78 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=31.00' TW=0.00' (Dynamic Tailwater)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 1E: Infiltration Basin 1E

Inflow Area = 5.049 ac, 34.00% Impervious, Inflow Depth = 2.65" for 10-YR event
Inflow = 15.17 cfs @ 12.10 hrs, Volume= 1.116 af
Outflow = 2.91 cfs @ 12.64 hrs, Volume= 1.116 af, Atten= 81%, Lag= 32.3 min
Discarded = 1.50 cfs @ 12.64 hrs, Volume= 0.942 af
Primary = 1.41 cfs @ 12.64 hrs, Volume= 0.174 af
Routed to Reach DP-1 : DP-1
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-1 : DP-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 31.70' @ 12.64 hrs Surf.Area= 10,443 sf Storage= 20,349 cf

Plug-Flow detention time= 103.5 min calculated for 1.116 af (100% of inflow)
Center-of-Mass det. time= 103.4 min (894.7 - 791.2)

Volume	Invert	Avail.Storage	Storage Description
#1	30.00'	5,328 cf	**Sediment Forebay (Prismatic)** Listed below (Recalc) -Impervious
#2	30.00'	19,104 cf	**Infiltration Basin (Prismatic)** Listed below (Recalc)
#3	32.00'	18,762 cf	**Area Above Forebay (Prismatic)** Listed below (Recalc) -Impervious
		43,193 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
30.00	2,081	0	0
31.00	2,648	2,365	2,365
32.00	3,278	2,963	5,328

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
30.00	8,310	0	0
31.00	9,538	8,924	8,924
32.00	10,822	10,180	19,104

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
32.00	13,216	0	0
33.00	14,552	13,884	13,884
33.33	15,010	4,878	18,762

Device	Routing	Invert	Outlet Devices
#1	Primary	28.37'	**24.0" Round Culvert** L= 45.8' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 28.37' / 28.14' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Device 1	31.65'	**36.0" x 36.0" Horiz. 3' x 3' Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	31.00'	**12.0" W x 3.0" H Vert. WQV Orifice** C= 0.600 Limited to weir flow at low heads
#4	Discarded	30.00'	**4.135 in/hr Exfiltration over Surface area**

Conductivity to Groundwater Elevation = 27.00' Phase-In= 0.01'
#5 Secondary 32.67' **10.0' long + 3.0 '/' SideZ x 10.0' breadth Broad-Crested Rectangular Weir**
Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.50 cfs @ 12.64 hrs HW=31.70' (Free Discharge)
└**4=Exfiltration** (Controls 1.50 cfs)

Primary OutFlow Max=1.41 cfs @ 12.64 hrs HW=31.70' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 1.41 cfs of 22.37 cfs potential flow)
  ├**2=3' x 3' Grate** (Weir Controls 0.50 cfs @ 0.76 fps)
  └**3=WQV Orifice** (Orifice Controls 0.91 cfs @ 3.66 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=30.00' TW=0.00' (Dynamic Tailwater)
└**5=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment BYPASS: Subcat BYPASS Runoff Area=4.622 ac 0.50% Impervious Runoff Depth=2.11"
Flow Length=510' Tc=20.8 min CN=61 Runoff=7.20 cfs 0.811 af

Subcatchment PR-1A: Subcat PR-1A Runoff Area=4.251 ac 60.23% Impervious Runoff Depth=4.55"
Flow Length=584' Tc=8.9 min CN=86 Runoff=20.06 cfs 1.613 af

Subcatchment PR-1B: Subcat PR-1B Runoff Area=25,241 sf 100.00% Impervious Runoff Depth=5.91"
Tc=6.0 min CN=98 Runoff=3.49 cfs 0.285 af

Subcatchment PR-1C: Subcat PR-1C Runoff Area=0.732 ac 79.20% Impervious Runoff Depth=5.22"
Tc=6.0 min CN=92 Runoff=4.19 cfs 0.318 af

Subcatchment PR-1D: Subcat PR-1D Runoff Area=2.563 ac 38.85% Impervious Runoff Depth=4.13"
Tc=6.0 min CN=82 Runoff=12.28 cfs 0.881 af

Subcatchment PR-1E: Subcat PR-1E Runoff Area=108,287 sf 28.99% Impervious Runoff Depth=4.55"
Tc=6.0 min CN=86 Runoff=12.94 cfs 0.943 af

Subcatchment PR-2A: Subcat PR-2A Runoff Area=1.419 ac 7.91% Impervious Runoff Depth=4.23"
Flow Length=154' Tc=7.7 min CN=83 Runoff=6.56 cfs 0.500 af

Subcatchment PR-2B: Subcat PR-2B Runoff Area=0.536 ac 16.24% Impervious Runoff Depth=3.31"
Tc=6.0 min CN=74 Runoff=2.08 cfs 0.148 af

Reach DP-1: DP-1 Inflow=15.76 cfs 1.717 af
Outflow=15.76 cfs 1.717 af

Reach DP-2: DP-2 Inflow=8.60 cfs 0.648 af
Outflow=8.60 cfs 0.648 af

Pond 1A: StomrTrap SingleTrap 4-6" Peak Elev=33.75' Storage=31,615 cf Inflow=23.25 cfs 1.898 af
Discarded=2.09 cfs 1.601 af Primary=2.54 cfs 0.297 af Outflow=4.63 cfs 1.898 af

Pond 1C: Rain Garden 1C Peak Elev=36.02' Storage=3,204 cf Inflow=4.19 cfs 0.318 af
Discarded=0.04 cfs 0.105 af Primary=3.97 cfs 0.207 af Outflow=4.00 cfs 0.311 af

Pond 1D: Infiltration Basin 1D Peak Elev=32.50' Storage=5,497 cf Inflow=12.28 cfs 0.881 af
Discarded=0.56 cfs 0.354 af Primary=7.39 cfs 0.527 af Secondary=0.00 cfs 0.000 af Outflow=7.95 cfs 0.881 af

Pond 1E: Infiltration Basin 1E Peak Elev=31.91' Storage=23,111 cf Inflow=19.34 cfs 1.470 af
Discarded=1.59 cfs 1.068 af Primary=6.14 cfs 0.402 af Secondary=0.00 cfs 0.000 af Outflow=7.73 cfs 1.470 af

Total Runoff Area = 17.188 ac Runoff Volume = 5.500 af Average Runoff Depth = 3.84"
67.08% Pervious = 11.530 ac 32.92% Impervious = 5.658 ac

Summary for Subcatchment BYPASS: Subcat BYPASS

Runoff = 7.20 cfs @ 12.31 hrs, Volume= 0.811 af, Depth= 2.11"
Routed to Reach DP-1 : DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=6.15"

Area (ac)	CN	Description
0.680	69	50-75% Grass cover, Fair, HSG B
3.108	58	Meadow, non-grazed, HSG B
0.025	78	Meadow, non-grazed, HSG D
0.023	98	Paved parking, HSG B
0.654	60	Woods, Fair, HSG B
0.133	79	Woods, Fair, HSG D
4.622	61	Weighted Average
4.599		99.50% Pervious Area
0.023		0.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0184	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.46"
8.5	460	0.0328	0.91		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
20.8	510	Total			

Summary for Subcatchment PR-1A: Subcat PR-1A

Runoff = 20.06 cfs @ 12.12 hrs, Volume= 1.613 af, Depth= 4.55"
Routed to Pond 1A : StomrTrap SingleTrap 4-6"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=6.15"

Area (ac)	CN	Description
1.622	69	50-75% Grass cover, Fair, HSG B
2.505	98	Paved parking, HSG B
0.056	98	Roofs, HSG B
0.069	60	Woods, Fair, HSG B
4.251	86	Weighted Average
1.691		39.77% Pervious Area
2.561		60.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.0146	0.14		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.46"
1.1	49	0.0123	0.78		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.7	113	0.0185	2.76		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
0.4	36	0.0441	1.47		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
0.4	75	0.0265	3.30		**Shallow Concentrated Flow, E-F** Paved Kv= 20.3 fps
0.1	123	0.5200	36.20	28.96	**Channel Flow, F-G** Area= 0.8 sf Perim= 3.1' r= 0.26' n= 0.012
0.1	138	0.5000	39.91	47.89	**Channel Flow, G-H** Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012
8.9	584	Total			

Summary for Subcatchment PR-1B: Subcat PR-1B

Runoff = 3.49 cfs @ 12.08 hrs, Volume= 0.285 af, Depth= 5.91"
Routed to Pond 1A : StomrTrap SingleTrap 4-6"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=6.15"

Area (sf)	CN	Description
25,241	98	Roofs, HSG B
25,241		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-1C: Subcat PR-1C

Runoff = 4.19 cfs @ 12.08 hrs, Volume= 0.318 af, Depth= 5.22"
Routed to Pond 1C : Rain Garden 1C

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=6.15"

Area (ac)	CN	Description
0.152	69	50-75% Grass cover, Fair, HSG B
0.579	98	Roofs, HSG B
0.732	92	Weighted Average
0.152		20.80% Pervious Area
0.579		79.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-1D: Subcat PR-1D

Runoff = 12.28 cfs @ 12.09 hrs, Volume= 0.881 af, Depth= 4.13"
Routed to Pond 1D : Infiltration Basin 1D

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=6.15"

Area (ac)	CN	Description
1.079	69	50-75% Grass cover, Fair, HSG B
0.396	84	50-75% Grass cover, Fair, HSG D
0.018	58	Meadow, non-grazed, HSG B
0.972	98	Paved parking, HSG B
0.024	98	Roofs, HSG B
0.075	60	Woods, Fair, HSG B
2.563	82	Weighted Average
1.567		61.15% Pervious Area
0.996		38.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-1E: Subcat PR-1E

Runoff = 12.94 cfs @ 12.09 hrs, Volume= 0.943 af, Depth= 4.55"
Routed to Pond 1E : Infiltration Basin 1E

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=6.15"

Area (sf)	CN	Description
13,827	69	50-75% Grass cover, Fair, HSG B
56,355	84	50-75% Grass cover, Fair, HSG D
22,254	98	Paved parking, HSG B
9,136	98	Paved parking, HSG D
6,714	79	Woods, Fair, HSG D
108,287	86	Weighted Average
76,896		71.01% Pervious Area
31,390		28.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-2A: Subcat PR-2A

Runoff = 6.56 cfs @ 12.11 hrs, Volume= 0.500 af, Depth= 4.23"
Routed to Reach DP-2 : DP-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=6.15"

Area (ac)	CN	Description
0.828	84	50-75% Grass cover, Fair, HSG D
0.112	98	Paved parking, HSG D
0.479	79	Woods, Fair, HSG D
1.419	83	Weighted Average
1.307		92.09% Pervious Area
0.112		7.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	45	0.0682	0.11		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.46"
0.7	85	0.0852	2.04		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.3	24	0.0681	1.30		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
7.7	154	Total			

Summary for Subcatchment PR-2B: Subcat PR-2B

Runoff = 2.08 cfs @ 12.09 hrs, Volume= 0.148 af, Depth= 3.31"
Routed to Reach DP-2 : DP-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=6.15"

Area (ac)	CN	Description
0.448	69	50-75% Grass cover, Fair, HSG B
0.001	84	50-75% Grass cover, Fair, HSG D
0.043	98	Paved parking, HSG B
0.044	98	Roofs, HSG B
0.536	74	Weighted Average
0.449		83.76% Pervious Area
0.087		16.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Reach DP-1: DP-1

Inflow Area = 15.233 ac, 35.83% Impervious, Inflow Depth = 1.35" for 25-YR event
Inflow = 15.76 cfs @ 12.38 hrs, Volume= 1.717 af
Outflow = 15.76 cfs @ 12.38 hrs, Volume= 1.717 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: DP-2

Inflow Area = 1.955 ac, 10.19% Impervious, Inflow Depth = 3.98" for 25-YR event
Inflow = 8.60 cfs @ 12.10 hrs, Volume= 0.648 af
Outflow = 8.60 cfs @ 12.10 hrs, Volume= 0.648 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Pond 1A: StomrTrap SingleTrap 4-6"

Inflow Area = 4.831 ac, 65.00% Impervious, Inflow Depth = 4.72" for 25-YR event
Inflow = 23.25 cfs @ 12.12 hrs, Volume= 1.898 af
Outflow = 4.63 cfs @ 12.58 hrs, Volume= 1.898 af, Atten= 80%, Lag= 27.9 min
Discarded = 2.09 cfs @ 12.58 hrs, Volume= 1.601 af
Primary = 2.54 cfs @ 12.58 hrs, Volume= 0.297 af
Routed to Reach DP-1 : DP-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 33.75' @ 12.58 hrs Surf.Area= 9,849 sf Storage= 31,615 cf

Plug-Flow detention time= 106.8 min calculated for 1.898 af (100% of inflow)
Center-of-Mass det. time= 106.7 min (898.0 - 791.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	29.50'	4,929 cf	**49.23'W x 200.06'L x 6.00'H Field A** 59,093 cf Overall - 46,772 cf Embedded = 12,322 cf x 40.0% Voids
#2A	30.50'	37,467 cf	**StormTrap SingleTrap 4-6** x 48 Inside #1 Inside= 101.7"W x 54.0"H => 34.42 sf x 15.40'L = 529.9 cf Outside= 101.7"W x 60.0"H => 42.40 sf x 15.40'L = 652.7 cf 48 Chambers in 4 Rows 33.92' x 184.75' Core + 6.66' Border = 47.23' x 198.06' System
		42,396 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	31.54'	**24.0" Round Culvert** L= 78.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 31.54' / 31.15' S= 0.0050 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 3.14 sf
#2	Device 1	33.60'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	32.30'	**12.0" W x 4.0" H Vert. 4" x 12" WQV Orfice** C= 0.600 Limited to weir flow at low heads
#4	Discarded	29.50'	**4.135 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 26.00' Phase-In= 0.01'

Discarded OutFlow Max=2.09 cfs @ 12.58 hrs HW=33.75' (Free Discharge)
└**4=Exfiltration** (Controls 2.09 cfs)

Primary OutFlow Max=2.54 cfs @ 12.58 hrs HW=33.75' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 2.54 cfs of 14.81 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.73 cfs @ 1.25 fps)
  └**3=4" x 12" WQV Orfice** (Orifice Controls 1.81 cfs @ 5.44 fps)

Summary for Pond 1C: Rain Garden 1C

Inflow Area = 0.732 ac, 79.20% Impervious, Inflow Depth = 5.22" for 25-YR event
Inflow = 4.19 cfs @ 12.08 hrs, Volume= 0.318 af
Outflow = 4.00 cfs @ 12.11 hrs, Volume= 0.311 af, Atten= 4%, Lag= 1.5 min
Discarded = 0.04 cfs @ 12.11 hrs, Volume= 0.105 af
Primary = 3.97 cfs @ 12.11 hrs, Volume= 0.207 af
Routed to Reach DP-1 : DP-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 36.02' @ 12.11 hrs Surf.Area= 2,559 sf Storage= 3,204 cf

Plug-Flow detention time= 280.0 min calculated for 0.311 af (98% of inflow)
Center-of-Mass det. time= 267.4 min (1,043.8 - 776.4)

Volume	Invert	Avail.Storage	Storage Description
#1	34.50'	6,033 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
34.50	1,680	0	0
35.00	1,955	909	909
36.00	2,548	2,252	3,160
37.00	3,198	2,873	6,033

Device	Routing	Invert	Outlet Devices
#1	Primary	30.34'	**12.0" Round Culvert** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 30.34' / 30.00' S= 0.0136 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	35.80'	**36.0" x 36.0" Horiz. 3' x 3' Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	34.50'	**0.500 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 30.00' Phase-In= 0.01'

Discarded OutFlow Max=0.04 cfs @ 12.11 hrs HW=36.02' (Free Discharge)
↑└**3=Exfiltration** (Controls 0.04 cfs)

Primary OutFlow Max=3.96 cfs @ 12.11 hrs HW=36.02' TW=0.00' (Dynamic Tailwater)
↑└**1=Culvert** (Passes 3.96 cfs of 8.60 cfs potential flow)
↑└**2=3' x 3' Grate** (Weir Controls 3.96 cfs @ 1.52 fps)

Summary for Pond 1D: Infiltration Basin 1D

Inflow Area = 2.563 ac, 38.85% Impervious, Inflow Depth = 4.13" for 25-YR event
Inflow = 12.28 cfs @ 12.09 hrs, Volume= 0.881 af
Outflow = 7.95 cfs @ 12.18 hrs, Volume= 0.881 af, Atten= 35%, Lag= 5.6 min
Discarded = 0.56 cfs @ 12.18 hrs, Volume= 0.354 af
Primary = 7.39 cfs @ 12.18 hrs, Volume= 0.527 af
Routed to Pond 1E : Infiltration Basin 1E
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-1 : DP-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 32.50' @ 12.18 hrs Surf.Area= 4,507 sf Storage= 5,497 cf

Plug-Flow detention time= 17.3 min calculated for 0.881 af (100% of inflow)
Center-of-Mass det. time= 17.3 min (825.3 - 808.0)

Volume	Invert	Avail.Storage	Storage Description
#1	31.00'	13,463 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
31.00	2,722	0	0
32.00	3,992	3,357	3,357
33.00	5,015	4,504	7,861
34.00	6,190	5,603	13,463

Device	Routing	Invert	Outlet Devices
#1	Primary	31.00'	**18.0" Round Culvert** L= 44.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 31.00' / 30.11' S= 0.0201 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Discarded	31.00'	**4.135 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 27.00' Phase-In= 0.01'
#3	Secondary	33.50'	**10.0' long + 3.0 '/' SideZ x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Discarded OutFlow Max=0.56 cfs @ 12.18 hrs HW=32.50' (Free Discharge)
2=Exfiltration (Controls 0.56 cfs)

Primary OutFlow Max=7.39 cfs @ 12.18 hrs HW=32.50' TW=31.51' (Dynamic Tailwater)
1=Culvert (Inlet Controls 7.39 cfs @ 4.18 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=31.00' TW=0.00' (Dynamic Tailwater)
3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 1E: Infiltration Basin 1E

Inflow Area = 5.049 ac, 34.00% Impervious, Inflow Depth = 3.49" for 25-YR event
Inflow = 19.34 cfs @ 12.10 hrs, Volume= 1.470 af
Outflow = 7.73 cfs @ 12.44 hrs, Volume= 1.470 af, Atten= 60%, Lag= 20.2 min
Discarded = 1.59 cfs @ 12.44 hrs, Volume= 1.068 af
Primary = 6.14 cfs @ 12.44 hrs, Volume= 0.402 af
Routed to Reach DP-1 : DP-1
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-1 : DP-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 31.91' @ 12.44 hrs Surf.Area= 10,701 sf Storage= 23,111 cf

Plug-Flow detention time= 92.3 min calculated for 1.470 af (100% of inflow)
Center-of-Mass det. time= 92.3 min (879.0 - 786.7)

Volume	Invert	Avail.Storage	Storage Description
#1	30.00'	5,328 cf	**Sediment Forebay (Prismatic)** Listed below (Recalc) -Impervious
#2	30.00'	19,104 cf	**Infiltration Basin (Prismatic)** Listed below (Recalc)
#3	32.00'	18,762 cf	**Area Above Forebay (Prismatic)** Listed below (Recalc) -Impervious
		43,193 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
30.00	2,081	0	0
31.00	2,648	2,365	2,365
32.00	3,278	2,963	5,328

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
30.00	8,310	0	0
31.00	9,538	8,924	8,924
32.00	10,822	10,180	19,104

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
32.00	13,216	0	0
33.00	14,552	13,884	13,884
33.33	15,010	4,878	18,762

Device	Routing	Invert	Outlet Devices
#1	Primary	28.37'	**24.0" Round Culvert** L= 45.8' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 28.37' / 28.14' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Device 1	31.65'	**36.0" x 36.0" Horiz. 3' x 3' Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	31.00'	**12.0" W x 3.0" H Vert. WQV Orifice** C= 0.600 Limited to weir flow at low heads
#4	Discarded	30.00'	**4.135 in/hr Exfiltration over Surface area**

Conductivity to Groundwater Elevation = 27.00' Phase-In= 0.01'
#5 Secondary 32.67' **10.0' long + 3.0 '/' SideZ x 10.0' breadth Broad-Crested Rectangular Weir**
Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.59 cfs @ 12.44 hrs HW=31.91' (Free Discharge)
└**4=Exfiltration** (Controls 1.59 cfs)

Primary OutFlow Max=6.14 cfs @ 12.44 hrs HW=31.91' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 6.14 cfs of 23.77 cfs potential flow)
  ├**2=3' x 3' Grate** (Weir Controls 5.07 cfs @ 1.65 fps)
  └**3=WQV Orifice** (Orifice Controls 1.06 cfs @ 4.25 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=30.00' TW=0.00' (Dynamic Tailwater)
└**5=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment BYPASS: Subcat BYPASS Runoff Area=4.622 ac 0.50% Impervious Runoff Depth=3.26"
Flow Length=510' Tc=20.8 min CN=61 Runoff=11.47 cfs 1.254 af

Subcatchment PR-1A: Subcat PR-1A Runoff Area=4.251 ac 60.23% Impervious Runoff Depth=6.09"
Flow Length=584' Tc=8.9 min CN=86 Runoff=26.46 cfs 2.157 af

Subcatchment PR-1B: Subcat PR-1B Runoff Area=25,241 sf 100.00% Impervious Runoff Depth=7.51"
Tc=6.0 min CN=98 Runoff=4.41 cfs 0.363 af

Subcatchment PR-1C: Subcat PR-1C Runoff Area=0.732 ac 79.20% Impervious Runoff Depth=6.80"
Tc=6.0 min CN=92 Runoff=5.37 cfs 0.414 af

Subcatchment PR-1D: Subcat PR-1D Runoff Area=2.563 ac 38.85% Impervious Runoff Depth=5.62"
Tc=6.0 min CN=82 Runoff=16.54 cfs 1.201 af

Subcatchment PR-1E: Subcat PR-1E Runoff Area=108,287 sf 28.99% Impervious Runoff Depth=6.09"
Tc=6.0 min CN=86 Runoff=17.06 cfs 1.261 af

Subcatchment PR-2A: Subcat PR-2A Runoff Area=1.419 ac 7.91% Impervious Runoff Depth=5.74"
Flow Length=154' Tc=7.7 min CN=83 Runoff=8.79 cfs 0.679 af

Subcatchment PR-2B: Subcat PR-2B Runoff Area=0.536 ac 16.24% Impervious Runoff Depth=4.70"
Tc=6.0 min CN=74 Runoff=2.95 cfs 0.210 af

Reach DP-1: DP-1 Inflow=36.61 cfs 3.047 af
Outflow=36.61 cfs 3.047 af

Reach DP-2: DP-2 Inflow=11.67 cfs 0.889 af
Outflow=11.67 cfs 0.889 af

Pond 1A: StomrTrap SingleTrap 4-6" Peak Elev=34.35' Storage=36,772 cf Inflow=30.51 cfs 2.520 af
Discarded=2.25 cfs 1.833 af Primary=10.41 cfs 0.687 af Outflow=12.66 cfs 2.520 af

Pond 1C: Rain Garden 1C Peak Elev=36.06' Storage=3,308 cf Inflow=5.37 cfs 0.414 af
Discarded=0.04 cfs 0.107 af Primary=5.13 cfs 0.300 af Outflow=5.17 cfs 0.408 af

Pond 1D: Infiltration Basin 1D Peak Elev=32.98' Storage=7,769 cf Inflow=16.54 cfs 1.201 af
Discarded=0.66 cfs 0.416 af Primary=8.73 cfs 0.785 af Secondary=0.00 cfs 0.000 af Outflow=9.36 cfs 1.201 af

Pond 1E: Infiltration Basin 1E Peak Elev=32.10' Storage=25,769 cf Inflow=25.11 cfs 2.047 af
Discarded=1.66 cfs 1.240 af Primary=13.06 cfs 0.806 af Secondary=0.00 cfs 0.000 af Outflow=14.72 cfs 2.047 af

Total Runoff Area = 17.188 ac Runoff Volume = 7.539 af Average Runoff Depth = 5.26"
67.08% Pervious = 11.530 ac 32.92% Impervious = 5.658 ac

Summary for Subcatchment BYPASS: Subcat BYPASS

Runoff = 11.47 cfs @ 12.30 hrs, Volume= 1.254 af, Depth= 3.26"
Routed to Reach DP-1 : DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=7.75"

Area (ac)	CN	Description
0.680	69	50-75% Grass cover, Fair, HSG B
3.108	58	Meadow, non-grazed, HSG B
0.025	78	Meadow, non-grazed, HSG D
0.023	98	Paved parking, HSG B
0.654	60	Woods, Fair, HSG B
0.133	79	Woods, Fair, HSG D
4.622	61	Weighted Average
4.599		99.50% Pervious Area
0.023		0.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0184	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.46"
8.5	460	0.0328	0.91		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
20.8	510	Total			

Summary for Subcatchment PR-1A: Subcat PR-1A

Runoff = 26.46 cfs @ 12.12 hrs, Volume= 2.157 af, Depth= 6.09"
Routed to Pond 1A : StomrTrap SingleTrap 4-6"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=7.75"

Area (ac)	CN	Description
1.622	69	50-75% Grass cover, Fair, HSG B
2.505	98	Paved parking, HSG B
0.056	98	Roofs, HSG B
0.069	60	Woods, Fair, HSG B
4.251	86	Weighted Average
1.691		39.77% Pervious Area
2.561		60.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.0146	0.14		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.46"
1.1	49	0.0123	0.78		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.7	113	0.0185	2.76		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
0.4	36	0.0441	1.47		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
0.4	75	0.0265	3.30		**Shallow Concentrated Flow, E-F** Paved Kv= 20.3 fps
0.1	123	0.5200	36.20	28.96	**Channel Flow, F-G** Area= 0.8 sf Perim= 3.1' r= 0.26' n= 0.012
0.1	138	0.5000	39.91	47.89	**Channel Flow, G-H** Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012
8.9	584	Total			

Summary for Subcatchment PR-1B: Subcat PR-1B

Runoff = 4.41 cfs @ 12.08 hrs, Volume= 0.363 af, Depth= 7.51"
Routed to Pond 1A : StomrTrap SingleTrap 4-6"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=7.75"

Area (sf)	CN	Description
25,241	98	Roofs, HSG B
25,241		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-1C: Subcat PR-1C

Runoff = 5.37 cfs @ 12.08 hrs, Volume= 0.414 af, Depth= 6.80"
Routed to Pond 1C : Rain Garden 1C

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=7.75"

Area (ac)	CN	Description
0.152	69	50-75% Grass cover, Fair, HSG B
0.579	98	Roofs, HSG B
0.732	92	Weighted Average
0.152		20.80% Pervious Area
0.579		79.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-1D: Subcat PR-1D

Runoff = 16.54 cfs @ 12.09 hrs, Volume= 1.201 af, Depth= 5.62"
Routed to Pond 1D : Infiltration Basin 1D

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=7.75"

Area (ac)	CN	Description
1.079	69	50-75% Grass cover, Fair, HSG B
0.396	84	50-75% Grass cover, Fair, HSG D
0.018	58	Meadow, non-grazed, HSG B
0.972	98	Paved parking, HSG B
0.024	98	Roofs, HSG B
0.075	60	Woods, Fair, HSG B
2.563	82	Weighted Average
1.567		61.15% Pervious Area
0.996		38.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-1E: Subcat PR-1E

Runoff = 17.06 cfs @ 12.08 hrs, Volume= 1.261 af, Depth= 6.09"
Routed to Pond 1E : Infiltration Basin 1E

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=7.75"

Area (sf)	CN	Description
13,827	69	50-75% Grass cover, Fair, HSG B
56,355	84	50-75% Grass cover, Fair, HSG D
22,254	98	Paved parking, HSG B
9,136	98	Paved parking, HSG D
6,714	79	Woods, Fair, HSG D
108,287	86	Weighted Average
76,896		71.01% Pervious Area
31,390		28.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-2A: Subcat PR-2A

Runoff = 8.79 cfs @ 12.11 hrs, Volume= 0.679 af, Depth= 5.74"
Routed to Reach DP-2 : DP-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=7.75"

Area (ac)	CN	Description
0.828	84	50-75% Grass cover, Fair, HSG D
0.112	98	Paved parking, HSG D
0.479	79	Woods, Fair, HSG D
1.419	83	Weighted Average
1.307		92.09% Pervious Area
0.112		7.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	45	0.0682	0.11		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.46"
0.7	85	0.0852	2.04		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.3	24	0.0681	1.30		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
7.7	154	Total			

Summary for Subcatchment PR-2B: Subcat PR-2B

Runoff = 2.95 cfs @ 12.09 hrs, Volume= 0.210 af, Depth= 4.70"
Routed to Reach DP-2 : DP-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=7.75"

Area (ac)	CN	Description
0.448	69	50-75% Grass cover, Fair, HSG B
0.001	84	50-75% Grass cover, Fair, HSG D
0.043	98	Paved parking, HSG B
0.044	98	Roofs, HSG B
0.536	74	Weighted Average
0.449		83.76% Pervious Area
0.087		16.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Reach DP-1: DP-1

Inflow Area = 15.233 ac, 35.83% Impervious, Inflow Depth = 2.40" for 100-YR event
Inflow = 36.61 cfs @ 12.32 hrs, Volume= 3.047 af
Outflow = 36.61 cfs @ 12.32 hrs, Volume= 3.047 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: DP-2

Inflow Area = 1.955 ac, 10.19% Impervious, Inflow Depth = 5.45" for 100-YR event
Inflow = 11.67 cfs @ 12.10 hrs, Volume= 0.889 af
Outflow = 11.67 cfs @ 12.10 hrs, Volume= 0.889 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Pond 1A: StomrTrap SingleTrap 4-6"

Inflow Area = 4.831 ac, 65.00% Impervious, Inflow Depth = 6.26" for 100-YR event
Inflow = 30.51 cfs @ 12.11 hrs, Volume= 2.520 af
Outflow = 12.66 cfs @ 12.37 hrs, Volume= 2.520 af, Atten= 59%, Lag= 15.4 min
Discarded = 2.25 cfs @ 12.37 hrs, Volume= 1.833 af
Primary = 10.41 cfs @ 12.37 hrs, Volume= 0.687 af
Routed to Reach DP-1 : DP-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 34.35' @ 12.37 hrs Surf.Area= 9,849 sf Storage= 36,772 cf

Plug-Flow detention time= 96.9 min calculated for 2.519 af (100% of inflow)
Center-of-Mass det. time= 96.9 min (881.2 - 784.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	29.50'	4,929 cf	**49.23'W x 200.06'L x 6.00'H Field A** 59,093 cf Overall - 46,772 cf Embedded = 12,322 cf x 40.0% Voids
#2A	30.50'	37,467 cf	**StormTrap SingleTrap 4-6** x 48 Inside #1 Inside= 101.7"W x 54.0"H => 34.42 sf x 15.40'L = 529.9 cf Outside= 101.7"W x 60.0"H => 42.40 sf x 15.40'L = 652.7 cf 48 Chambers in 4 Rows 33.92' x 184.75' Core + 6.66' Border = 47.23' x 198.06' System
		42,396 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	31.54'	**24.0" Round Culvert** L= 78.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 31.54' / 31.15' S= 0.0050 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 3.14 sf
#2	Device 1	33.60'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	32.30'	**12.0" W x 4.0" H Vert. 4" x 12" WQV Orfice** C= 0.600 Limited to weir flow at low heads
#4	Discarded	29.50'	**4.135 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 26.00' Phase-In= 0.01'

Discarded OutFlow Max=2.25 cfs @ 12.37 hrs HW=34.35' (Free Discharge)
└**4=Exfiltration** (Controls 2.25 cfs)

Primary OutFlow Max=10.41 cfs @ 12.37 hrs HW=34.35' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 10.41 cfs of 18.11 cfs potential flow)
├**2=Sharp-Crested Rectangular Weir** (Weir Controls 8.20 cfs @ 2.84 fps)
└**3=4" x 12" WQV Orfice** (Orifice Controls 2.20 cfs @ 6.61 fps)

Summary for Pond 1C: Rain Garden 1C

Inflow Area = 0.732 ac, 79.20% Impervious, Inflow Depth = 6.80" for 100-YR event
Inflow = 5.37 cfs @ 12.08 hrs, Volume= 0.414 af
Outflow = 5.17 cfs @ 12.11 hrs, Volume= 0.408 af, Atten= 4%, Lag= 1.4 min
Discarded = 0.04 cfs @ 12.11 hrs, Volume= 0.107 af
Primary = 5.13 cfs @ 12.11 hrs, Volume= 0.300 af
Routed to Reach DP-1 : DP-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 36.06' @ 12.11 hrs Surf.Area= 2,585 sf Storage= 3,308 cf

Plug-Flow detention time= 222.8 min calculated for 0.408 af (98% of inflow)
Center-of-Mass det. time= 212.5 min (982.4 - 769.9)

Volume	Invert	Avail.Storage	Storage Description
#1	34.50'	6,033 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
34.50	1,680	0	0
35.00	1,955	909	909
36.00	2,548	2,252	3,160
37.00	3,198	2,873	6,033

Device	Routing	Invert	Outlet Devices
#1	Primary	30.34'	**12.0" Round Culvert** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 30.34' / 30.00' S= 0.0136 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	35.80'	**36.0" x 36.0" Horiz. 3' x 3' Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	34.50'	**0.500 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 30.00' Phase-In= 0.01'

Discarded OutFlow Max=0.04 cfs @ 12.11 hrs HW=36.06' (Free Discharge)
↑└**3=Exfiltration** (Controls 0.04 cfs)

Primary OutFlow Max=5.12 cfs @ 12.11 hrs HW=36.06' TW=0.00' (Dynamic Tailwater)
↑└**1=Culvert** (Passes 5.12 cfs of 8.64 cfs potential flow)
↑└**2=3' x 3' Grate** (Weir Controls 5.12 cfs @ 1.66 fps)

Summary for Pond 1D: Infiltration Basin 1D

Inflow Area = 2.563 ac, 38.85% Impervious, Inflow Depth = 5.62" for 100-YR event
Inflow = 16.54 cfs @ 12.09 hrs, Volume= 1.201 af
Outflow = 9.36 cfs @ 12.12 hrs, Volume= 1.201 af, Atten= 43%, Lag= 2.2 min
Discarded = 0.66 cfs @ 12.22 hrs, Volume= 0.416 af
Primary = 8.73 cfs @ 12.12 hrs, Volume= 0.785 af
Routed to Pond 1E : Infiltration Basin 1E
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-1 : DP-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 32.98' @ 12.22 hrs Surf.Area= 4,996 sf Storage= 7,769 cf

Plug-Flow detention time= 17.6 min calculated for 1.201 af (100% of inflow)
Center-of-Mass det. time= 17.6 min (816.8 - 799.3)

Volume	Invert	Avail.Storage	Storage Description
#1	31.00'	13,463 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
31.00	2,722	0	0
32.00	3,992	3,357	3,357
33.00	5,015	4,504	7,861
34.00	6,190	5,603	13,463

Device	Routing	Invert	Outlet Devices
#1	Primary	31.00'	**18.0" Round Culvert** L= 44.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 31.00' / 30.11' S= 0.0201 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Discarded	31.00'	**4.135 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 27.00' Phase-In= 0.01'
#3	Secondary	33.50'	**10.0' long + 3.0 '/' SideZ x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Discarded OutFlow Max=0.66 cfs @ 12.22 hrs HW=32.98' (Free Discharge)
2=Exfiltration (Controls 0.66 cfs)

Primary OutFlow Max=8.49 cfs @ 12.12 hrs HW=32.82' TW=31.82' (Dynamic Tailwater)
1=Culvert (Inlet Controls 8.49 cfs @ 4.81 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=31.00' TW=0.00' (Dynamic Tailwater)
3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 1E: Infiltration Basin 1E

Inflow Area = 5.049 ac, 34.00% Impervious, Inflow Depth = 4.86" for 100-YR event
Inflow = 25.11 cfs @ 12.10 hrs, Volume= 2.047 af
Outflow = 14.72 cfs @ 12.30 hrs, Volume= 2.047 af, Atten= 41%, Lag= 12.1 min
Discarded = 1.66 cfs @ 12.30 hrs, Volume= 1.240 af
Primary = 13.06 cfs @ 12.30 hrs, Volume= 0.806 af
Routed to Reach DP-1 : DP-1
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-1 : DP-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 32.10' @ 12.30 hrs Surf.Area= 10,822 sf Storage= 25,769 cf

Plug-Flow detention time= 80.1 min calculated for 2.047 af (100% of inflow)
Center-of-Mass det. time= 80.1 min (861.6 - 781.5)

Volume	Invert	Avail.Storage	Storage Description
#1	30.00'	5,328 cf	**Sediment Forebay (Prismatic)** Listed below (Recalc) -Impervious
#2	30.00'	19,104 cf	**Infiltration Basin (Prismatic)** Listed below (Recalc)
#3	32.00'	18,762 cf	**Area Above Forebay (Prismatic)** Listed below (Recalc) -Impervious
		43,193 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
30.00	2,081	0	0
31.00	2,648	2,365	2,365
32.00	3,278	2,963	5,328

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
30.00	8,310	0	0
31.00	9,538	8,924	8,924
32.00	10,822	10,180	19,104

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
32.00	13,216	0	0
33.00	14,552	13,884	13,884
33.33	15,010	4,878	18,762

Device	Routing	Invert	Outlet Devices
#1	Primary	28.37'	**24.0" Round Culvert** L= 45.8' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 28.37' / 28.14' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Device 1	31.65'	**36.0" x 36.0" Horiz. 3' x 3' Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	31.00'	**12.0" W x 3.0" H Vert. WQV Orifice** C= 0.600 Limited to weir flow at low heads
#4	Discarded	30.00'	**4.135 in/hr Exfiltration over Surface area**

Conductivity to Groundwater Elevation = 27.00' Phase-In= 0.01'
#5 Secondary 32.67' **10.0' long + 3.0 '/' SideZ x 10.0' breadth Broad-Crested Rectangular Weir**
Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.66 cfs @ 12.30 hrs HW=32.10' (Free Discharge)
└**4=Exfiltration** (Controls 1.66 cfs)

Primary OutFlow Max=13.06 cfs @ 12.30 hrs HW=32.10' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 13.06 cfs of 25.00 cfs potential flow)
├**2=3' x 3' Grate** (Weir Controls 11.87 cfs @ 2.20 fps)
└**3=WQV Orifice** (Orifice Controls 1.19 cfs @ 4.75 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=30.00' TW=0.00' (Dynamic Tailwater)
└**5=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Stage-Area-Storage for Pond 1A: StomrTrap SingleTrap 4-6"

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
29.50	**9,849**	0
29.60	9,849	394
29.70	9,849	788
29.80	9,849	1,182
29.90	9,849	1,576
30.00	9,849	1,970
30.10	9,849	2,364
30.20	9,849	2,758
30.30	9,849	3,152
30.40	9,849	3,546
30.50	9,849	3,940
30.60	9,849	4,792
30.70	9,849	5,644
30.80	9,849	6,497
30.90	9,849	7,349
31.00	9,849	8,202
31.10	9,849	9,054
31.20	9,849	9,906
31.30	9,849	10,759
31.40	9,849	11,611
31.50	9,849	12,463
31.60	9,849	13,316
31.70	9,849	14,168
31.80	9,849	15,021
31.90	9,849	15,873
32.00	9,849	16,725
32.10	9,849	17,578
32.20	9,849	18,430
32.30	9,849	19,283
32.40	9,849	20,135
32.50	9,849	20,987
32.60	9,849	21,840
32.70	9,849	22,692
32.80	9,849	23,545
32.90	9,849	24,397
33.00	9,849	25,249
33.10	9,849	26,102
33.20	9,849	26,954
33.30	9,849	27,807
33.40	9,849	28,659
33.50	9,849	29,511
33.60	9,849	30,364
33.70	9,849	31,216
33.80	9,849	32,068
33.90	9,849	32,921
34.00	9,849	33,773
34.10	9,849	34,626
34.20	9,849	35,478
34.30	9,849	36,330
34.40	9,849	37,183
34.50	9,849	38,035
34.60	9,849	38,888
34.70	9,849	39,740
34.80	9,849	40,592
34.90	9,849	41,445
35.00	9,849	42,297
35.10	9,849	42,317
35.20	9,849	42,337
35.30	9,849	42,357
35.40	9,849	42,376
35.50	9,849	**42,396**

Stage-Area-Storage for Pond 1C: Rain Garden 1C

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
34.50	1,680	0
34.55	1,707	85
34.60	1,735	171
34.65	1,762	258
34.70	1,790	347
34.75	1,818	437
34.80	1,845	529
34.85	1,873	622
34.90	1,900	716
34.95	1,928	812
35.00	1,955	909
35.05	1,985	1,007
35.10	2,014	1,107
35.15	2,044	1,209
35.20	2,074	1,312
35.25	2,103	1,416
35.30	2,133	1,522
35.35	2,163	1,629
35.40	2,192	1,738
35.45	2,222	1,849
35.50	2,252	1,960
35.55	2,281	2,074
35.60	2,311	2,188
35.65	2,340	2,305
35.70	2,370	2,423
35.75	2,400	2,542
35.80	2,429	2,663
35.85	2,459	2,785
35.90	2,489	2,908
35.95	2,518	3,034
36.00	2,548	3,160
36.05	2,580	3,288
36.10	2,613	3,418
36.15	2,645	3,550
36.20	2,678	3,683
36.25	2,711	3,818
36.30	2,743	3,954
36.35	2,776	4,092
36.40	2,808	4,231
36.45	2,841	4,373
36.50	2,873	4,516
36.55	2,905	4,660
36.60	2,938	4,806
36.65	2,970	4,954
36.70	3,003	5,103
36.75	3,036	5,254
36.80	3,068	5,407
36.85	3,101	5,561
36.90	3,133	5,717
36.95	3,166	5,874
37.00	**3,198**	**6,033**

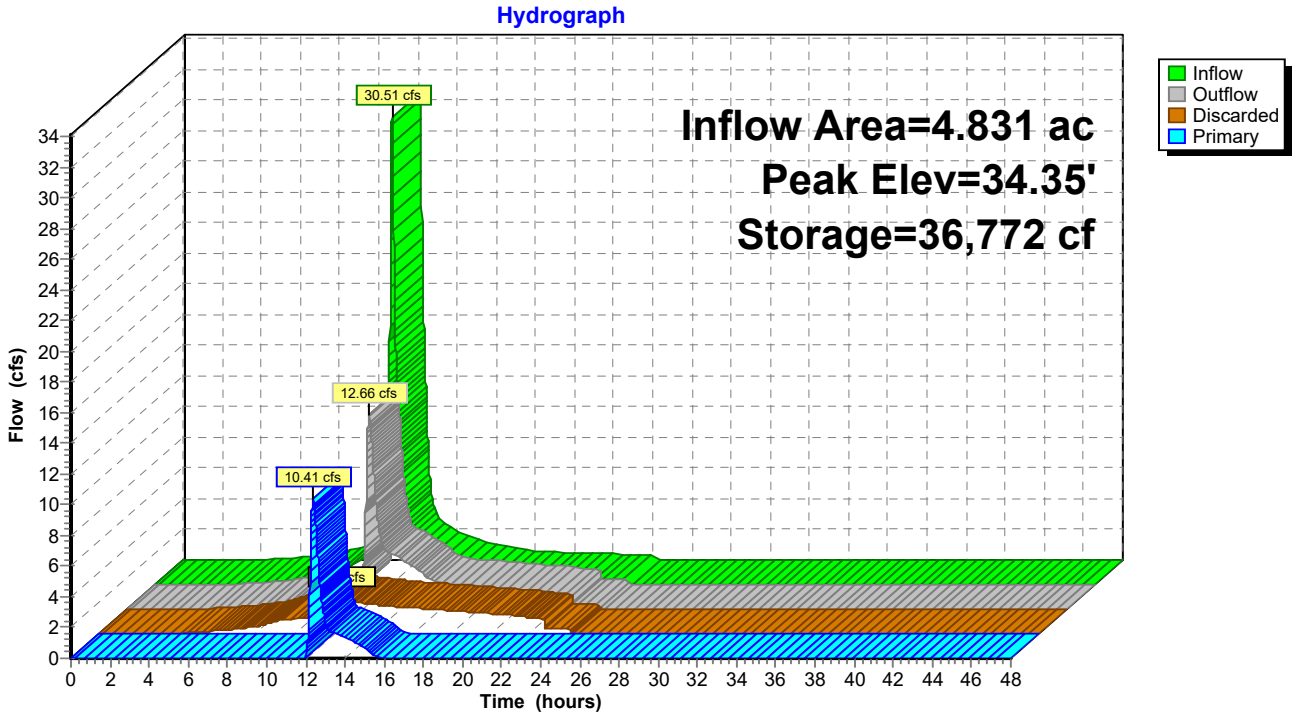
Stage-Area-Storage for Pond 1D: Infiltration Basin 1D

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
31.00	2,722	0
31.05	2,786	138
31.10	2,849	279
31.15	2,912	423
31.20	2,976	570
31.25	3,040	720
31.30	3,103	874
31.35	3,167	1,030
31.40	3,230	1,190
31.45	3,293	1,353
31.50	3,357	1,520
31.55	3,421	1,689
31.60	3,484	1,862
31.65	3,547	2,038
31.70	3,611	2,217
31.75	3,675	2,399
31.80	3,738	2,584
31.85	3,802	2,772
31.90	3,865	2,964
31.95	3,928	3,159
32.00	3,992	3,357
32.05	4,043	3,558
32.10	4,094	3,761
32.15	4,145	3,967
32.20	4,197	4,176
32.25	4,248	4,387
32.30	4,299	4,601
32.35	4,350	4,817
32.40	4,401	5,036
32.45	4,452	5,257
32.50	4,504	5,481
32.55	4,555	5,707
32.60	4,606	5,936
32.65	4,657	6,168
32.70	4,708	6,402
32.75	4,759	6,639
32.80	4,810	6,878
32.85	4,862	7,120
32.90	4,913	7,364
32.95	4,964	7,611
33.00	5,015	7,861
33.05	5,074	8,113
33.10	5,133	8,368
33.15	5,191	8,626
33.20	5,250	8,887
33.25	5,309	9,151
33.30	5,367	9,418
33.35	5,426	9,688
33.40	5,485	9,960
33.45	5,544	10,236
33.50	5,603	10,515
33.55	5,661	10,796
33.60	5,720	11,081
33.65	5,779	11,368
33.70	5,838	11,659
33.75	5,896	11,952
33.80	5,955	12,248
33.85	6,014	12,548
33.90	6,072	12,850
33.95	6,131	13,155
34.00	**6,190**	**13,463**

Stage-Area-Storage for Pond 1E: Infiltration Basin 1E

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
30.00	8,310	0
30.05	8,371	522
30.10	8,433	1,048
30.15	8,494	1,579
30.20	8,556	2,114
30.25	8,617	2,654
30.30	8,678	3,198
30.35	8,740	3,747
30.40	8,801	4,300
30.45	8,863	4,858
30.50	8,924	5,420
30.55	8,985	5,987
30.60	9,047	6,558
30.65	9,108	7,133
30.70	9,170	7,713
30.75	9,231	8,298
30.80	9,292	8,887
30.85	9,354	9,481
30.90	9,415	10,079
30.95	9,477	10,681
31.00	9,538	11,289
31.05	9,602	11,900
31.10	9,666	12,517
31.15	9,731	13,138
31.20	9,795	13,764
31.25	9,859	14,395
31.30	9,923	15,030
31.35	9,987	15,671
31.40	10,052	16,316
31.45	10,116	16,966
31.50	10,180	17,621
31.55	10,244	18,280
31.60	10,308	18,945
31.65	10,373	19,614
31.70	10,437	20,288
31.75	10,501	20,966
31.80	10,565	21,650
31.85	10,629	22,338
31.90	10,694	23,031
31.95	10,758	23,729
32.00	**10,822**	24,432
32.05	10,822	25,094
32.10	10,822	25,760
32.15	10,822	26,429
32.20	10,822	27,101
32.25	10,822	27,777
32.30	10,822	28,456
32.35	10,822	29,139
32.40	10,822	29,825
32.45	10,822	30,514
32.50	10,822	31,207
32.55	10,822	31,902
32.60	10,822	32,602
32.65	10,822	33,304
32.70	10,822	34,010
32.75	10,822	34,719
32.80	10,822	35,432
32.85	10,822	36,148
32.90	10,822	36,867
32.95	10,822	37,590
33.00	10,822	38,316
33.05	10,822	39,045
33.10	10,822	39,778
33.15	10,822	40,514
33.20	10,822	41,254
33.25	10,822	41,997
33.30	10,822	**42,744**

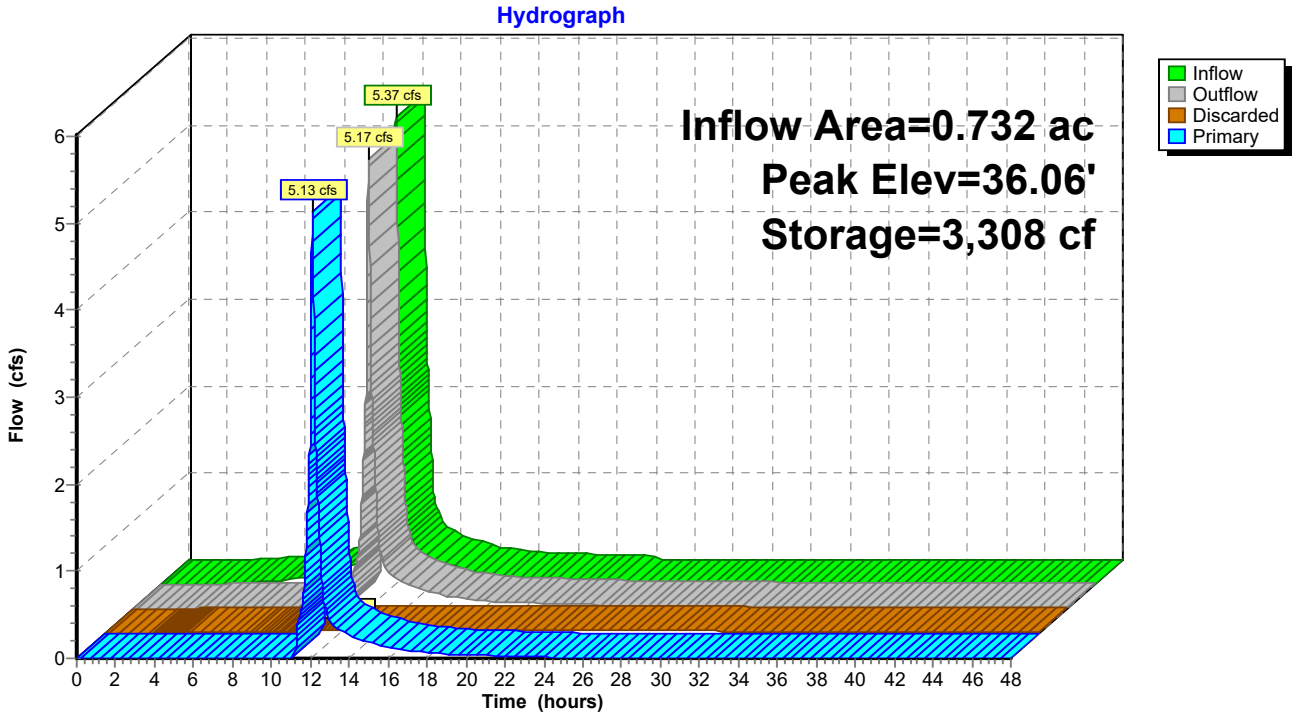
Pond 1A: StomrTrap SingleTrap 4-6"



Hydrograph for Pond 1A: StomrTrap SingleTrap 4-6"

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	29.50	0.00	0.00	0.00
1.00	0.01	0	29.50	0.01	0.01	0.00
2.00	0.03	1	29.50	0.03	0.03	0.00
3.00	0.04	2	29.50	0.04	0.04	0.00
4.00	0.05	2	29.50	0.05	0.05	0.00
5.00	0.11	5	29.50	0.11	0.11	0.00
6.00	0.18	8	29.50	0.18	0.18	0.00
7.00	0.31	13	29.50	0.31	0.31	0.00
8.00	0.47	20	29.50	0.47	0.47	0.00
9.00	0.80	33	29.51	0.80	0.80	0.00
10.00	1.22	339	29.59	0.97	0.97	0.00
11.00	2.02	2,391	30.11	1.11	1.11	0.00
12.00	**16.90**	**16,432**	**31.97**	**1.61**	**1.61**	**0.00**
13.00	**3.06**	**31,486**	**33.73**	**4.51**	**2.08**	**2.42**
14.00	1.89	26,755	33.18	3.28	1.93	1.35
15.00	1.42	22,234	32.65	2.44	1.79	0.65
16.00	1.00	19,412	32.32	1.71	1.70	0.01
17.00	0.79	16,623	31.99	1.61	1.61	0.00
18.00	0.61	13,508	31.62	1.51	1.51	0.00
19.00	0.54	10,279	31.24	1.41	1.41	0.00
20.00	0.48	7,207	30.88	1.32	1.32	0.00
21.00	0.44	4,297	30.54	1.22	1.22	0.00
22.00	0.40	1,691	29.93	1.06	1.06	0.00
23.00	0.36	15	29.50	0.36	0.36	0.00
24.00	0.32	13	29.50	0.32	0.32	0.00
25.00	0.00	0	29.50	0.00	0.00	0.00
26.00	0.00	0	29.50	0.00	0.00	0.00
27.00	0.00	0	29.50	0.00	0.00	0.00
28.00	0.00	0	29.50	0.00	0.00	0.00
29.00	0.00	0	29.50	0.00	0.00	0.00
30.00	0.00	0	29.50	0.00	0.00	0.00
31.00	0.00	0	29.50	0.00	0.00	0.00
32.00	0.00	0	29.50	0.00	0.00	0.00
33.00	0.00	0	29.50	0.00	0.00	0.00
34.00	0.00	0	29.50	0.00	0.00	0.00
35.00	0.00	0	29.50	0.00	0.00	0.00
36.00	0.00	0	29.50	0.00	0.00	0.00
37.00	0.00	0	29.50	0.00	0.00	0.00
38.00	0.00	0	29.50	0.00	0.00	0.00
39.00	0.00	0	29.50	0.00	0.00	0.00
40.00	0.00	0	29.50	0.00	0.00	0.00
41.00	0.00	0	29.50	0.00	0.00	0.00
42.00	0.00	0	29.50	0.00	0.00	0.00
43.00	0.00	0	29.50	0.00	0.00	0.00
44.00	0.00	0	29.50	0.00	0.00	0.00
45.00	0.00	0	29.50	0.00	0.00	0.00
46.00	0.00	0	29.50	0.00	0.00	0.00
47.00	0.00	0	29.50	0.00	0.00	0.00
48.00	0.00	0	29.50	0.00	0.00	0.00

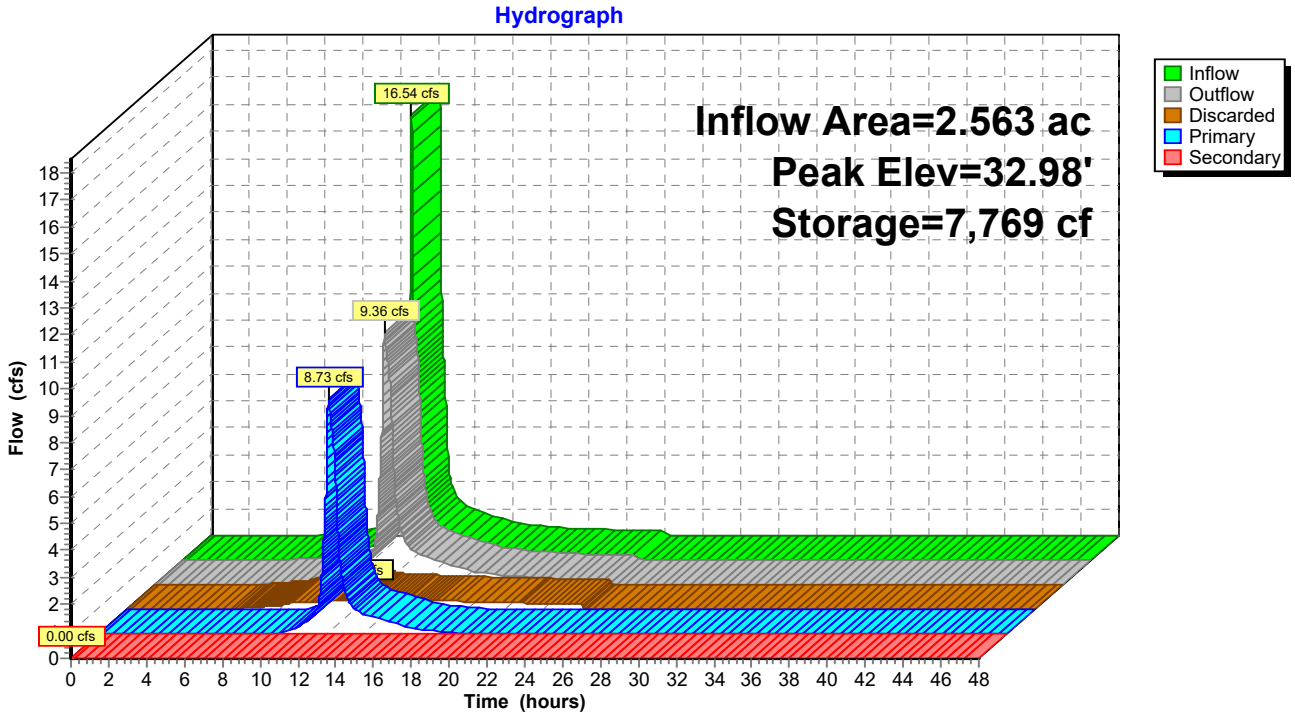
Pond 1C: Rain Garden 1C



Hydrograph for Pond 1C: Rain Garden 1C

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	34.50	0.00	0.00	0.00
1.00	0.00	0	34.50	0.00	0.00	0.00
2.00	0.00	0	34.50	0.00	0.00	0.00
3.00	0.01	4	34.50	0.01	0.01	0.00
4.00	0.02	15	34.51	0.02	0.02	0.00
5.00	0.03	40	34.52	0.02	0.02	0.00
6.00	0.05	112	34.57	0.02	0.02	0.00
7.00	0.07	246	34.64	0.02	0.02	0.00
8.00	0.10	476	34.77	0.02	0.02	0.00
9.00	0.16	853	34.97	0.02	0.02	0.00
10.00	0.23	1,455	35.27	0.03	0.03	0.00
11.00	0.36	2,389	35.69	0.03	0.03	0.00
12.00	**3.35**	**3,085**	**35.97**	**2.80**	**0.04**	**2.76**
13.00	**0.46**	**2,786**	**35.85**	**0.48**	**0.04**	**0.45**
14.00	0.29	2,749	35.84	0.30	0.04	0.26
15.00	0.22	2,731	35.83	0.22	0.04	0.19
16.00	0.15	2,715	35.82	0.16	0.04	0.12
17.00	0.12	2,704	35.82	0.12	0.04	0.09
18.00	0.09	2,695	35.81	0.10	0.04	0.06
19.00	0.08	2,691	35.81	0.08	0.03	0.05
20.00	0.07	2,687	35.81	0.08	0.03	0.04
21.00	0.07	2,684	35.81	0.07	0.03	0.03
22.00	0.06	2,682	35.81	0.06	0.03	0.03
23.00	0.06	2,679	35.81	0.06	0.03	0.02
24.00	0.05	2,675	35.81	0.05	0.03	0.01
25.00	0.00	2,561	35.76	0.03	0.03	0.00
26.00	0.00	2,439	35.71	0.03	0.03	0.00
27.00	0.00	2,319	35.66	0.03	0.03	0.00
28.00	0.00	2,201	35.61	0.03	0.03	0.00
29.00	0.00	2,086	35.56	0.03	0.03	0.00
30.00	0.00	1,973	35.51	0.03	0.03	0.00
31.00	0.00	1,862	35.46	0.03	0.03	0.00
32.00	0.00	1,753	35.41	0.03	0.03	0.00
33.00	0.00	1,647	35.36	0.03	0.03	0.00
34.00	0.00	1,542	35.31	0.03	0.03	0.00
35.00	0.00	1,440	35.26	0.03	0.03	0.00
36.00	0.00	1,340	35.21	0.03	0.03	0.00
37.00	0.00	1,242	35.17	0.03	0.03	0.00
38.00	0.00	1,146	35.12	0.03	0.03	0.00
39.00	0.00	1,052	35.07	0.03	0.03	0.00
40.00	0.00	960	35.03	0.03	0.03	0.00
41.00	0.00	870	34.98	0.02	0.02	0.00
42.00	0.00	782	34.93	0.02	0.02	0.00
43.00	0.00	696	34.89	0.02	0.02	0.00
44.00	0.00	611	34.84	0.02	0.02	0.00
45.00	0.00	529	34.80	0.02	0.02	0.00
46.00	0.00	448	34.76	0.02	0.02	0.00
47.00	0.00	369	34.71	0.02	0.02	0.00
48.00	0.00	291	34.67	0.02	0.02	0.00

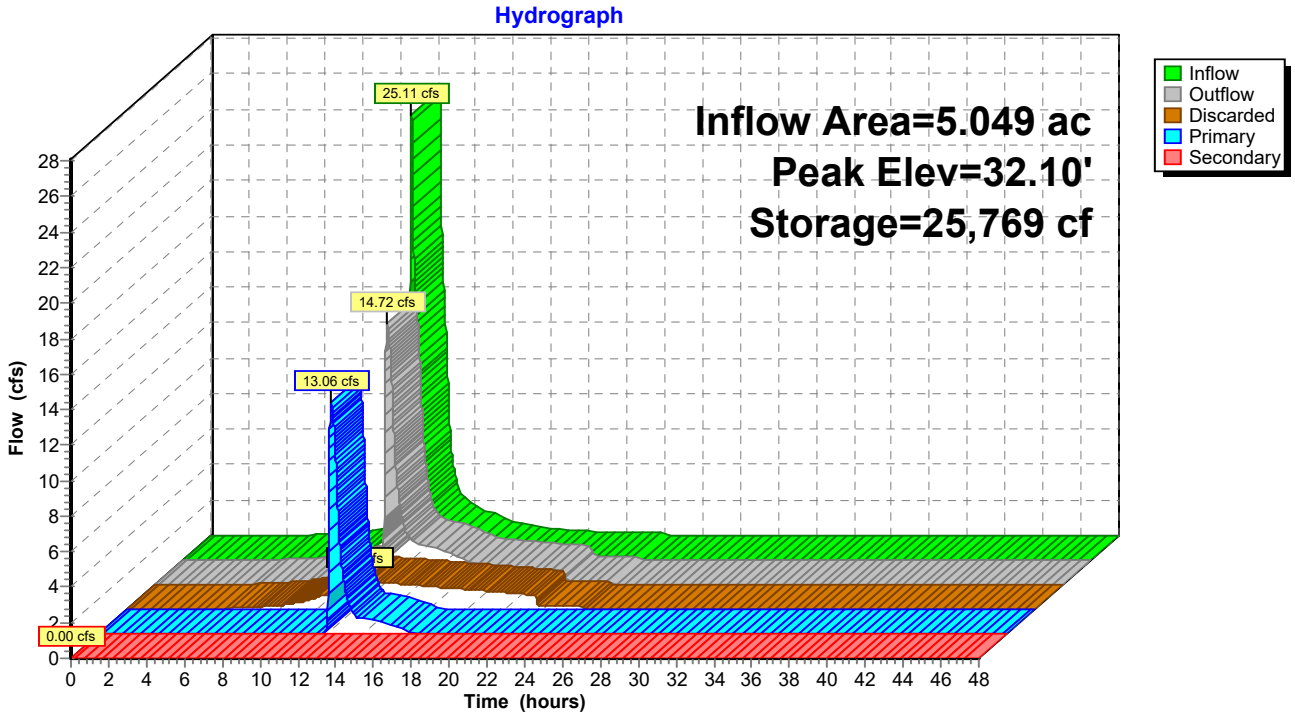
Pond 1D: Infiltration Basin 1D



Hydrograph for Pond 1D: Infiltration Basin 1D

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.00	0	31.00	0.00	0.00	0.00	**0.00**
1.00	0.00	0	31.00	0.00	0.00	0.00	0.00
2.00	0.00	0	31.00	0.00	0.00	0.00	0.00
3.00	0.00	0	31.00	0.00	0.00	0.00	0.00
4.00	0.00	0	31.00	0.00	0.00	0.00	0.00
5.00	0.00	0	31.00	0.00	0.00	0.00	0.00
6.00	0.03	3	31.00	0.03	0.03	0.00	0.00
7.00	0.08	8	31.00	0.08	0.08	0.00	0.00
8.00	0.15	16	31.01	0.15	0.15	0.00	0.00
9.00	0.30	40	31.01	0.26	0.26	0.00	0.00
10.00	0.50	379	31.13	0.38	0.29	0.10	0.00
11.00	0.90	858	31.29	0.77	0.32	0.45	0.00
12.00	**10.02**	**3,917**	**32.14**	**5.71**	**0.49**	**5.22**	0.00
13.00	**1.49**	**3,044**	**31.92**	**2.06**	**0.44**	**1.62**	0.00
14.00	0.95	2,160	31.68	1.12	0.39	0.72	0.00
15.00	0.72	1,557	31.51	0.88	0.36	0.52	0.00
16.00	0.51	1,007	31.34	0.65	0.33	0.32	0.00
17.00	0.40	639	31.22	0.48	0.30	0.18	0.00
18.00	0.31	392	31.14	0.37	0.29	0.09	0.00
19.00	0.28	223	31.08	0.31	0.28	0.03	0.00
20.00	0.25	113	31.04	0.28	0.27	0.01	0.00
21.00	0.23	24	31.01	0.23	0.23	0.00	0.00
22.00	0.21	21	31.01	0.21	0.21	0.00	0.00
23.00	0.18	19	31.01	0.18	0.18	0.00	0.00
24.00	0.16	17	31.01	0.16	0.16	0.00	0.00
25.00	0.00	0	31.00	0.00	0.00	0.00	0.00
26.00	0.00	0	31.00	0.00	0.00	0.00	0.00
27.00	0.00	0	31.00	0.00	0.00	0.00	0.00
28.00	0.00	0	31.00	0.00	0.00	0.00	0.00
29.00	0.00	0	31.00	0.00	0.00	0.00	0.00
30.00	0.00	0	31.00	0.00	0.00	0.00	0.00
31.00	0.00	0	31.00	0.00	0.00	0.00	0.00
32.00	0.00	0	31.00	0.00	0.00	0.00	0.00
33.00	0.00	0	31.00	0.00	0.00	0.00	0.00
34.00	0.00	0	31.00	0.00	0.00	0.00	0.00
35.00	0.00	0	31.00	0.00	0.00	0.00	0.00
36.00	0.00	0	31.00	0.00	0.00	0.00	0.00
37.00	0.00	0	31.00	0.00	0.00	0.00	0.00
38.00	0.00	0	31.00	0.00	0.00	0.00	0.00
39.00	0.00	0	31.00	0.00	0.00	0.00	0.00
40.00	0.00	0	31.00	0.00	0.00	0.00	0.00
41.00	0.00	0	31.00	0.00	0.00	0.00	0.00
42.00	0.00	0	31.00	0.00	0.00	0.00	0.00
43.00	0.00	0	31.00	0.00	0.00	0.00	0.00
44.00	0.00	0	31.00	0.00	0.00	0.00	0.00
45.00	0.00	0	31.00	0.00	0.00	0.00	0.00
46.00	0.00	0	31.00	0.00	0.00	0.00	0.00
47.00	0.00	0	31.00	0.00	0.00	0.00	0.00
48.00	0.00	0	31.00	0.00	0.00	0.00	0.00

Pond 1E: Infiltration Basin 1E



Hydrograph for Pond 1E: Infiltration Basin 1E

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.00	0	30.00	0.00	0.00	0.00	**0.00**
1.00	0.00	0	30.00	0.00	0.00	0.00	0.00
2.00	0.00	0	30.00	0.00	0.00	0.00	0.00
3.00	0.00	0	30.00	0.00	0.00	0.00	0.00
4.00	0.00	0	30.00	0.00	0.00	0.00	0.00
5.00	0.03	4	30.00	0.03	0.03	0.00	0.00
6.00	0.07	9	30.00	0.07	0.07	0.00	0.00
7.00	0.13	17	30.00	0.13	0.13	0.00	0.00
8.00	0.22	28	30.00	0.21	0.21	0.00	0.00
9.00	0.38	49	30.00	0.38	0.38	0.00	0.00
10.00	0.70	89	30.01	0.68	0.68	0.00	0.00
11.00	1.47	1,009	30.10	0.83	0.83	0.00	0.00
12.00	**15.70**	**13,156**	**31.15**	**1.45**	**1.26**	**0.19**	0.00
13.00	**3.12**	**21,278**	**31.77**	**4.19**	**1.53**	**2.66**	0.00
14.00	1.67	19,098	31.61	2.30	1.46	0.84	0.00
15.00	1.24	16,489	31.41	2.01	1.37	0.64	0.00
16.00	0.82	13,705	31.20	1.56	1.28	0.28	0.00
17.00	0.58	11,333	31.00	1.20	1.20	0.00	0.00
18.00	0.40	8,916	30.80	1.11	1.11	0.00	0.00
19.00	0.31	6,312	30.58	1.02	1.02	0.00	0.00
20.00	0.26	3,803	30.36	0.93	0.93	0.00	0.00
21.00	0.23	1,456	30.14	0.85	0.85	0.00	0.00
22.00	0.20	27	30.00	0.20	0.20	0.00	0.00
23.00	0.18	24	30.00	0.18	0.18	0.00	0.00
24.00	0.16	21	30.00	0.16	0.16	0.00	0.00
25.00	0.00	0	30.00	0.00	0.00	0.00	0.00
26.00	0.00	0	30.00	0.00	0.00	0.00	0.00
27.00	0.00	0	30.00	0.00	0.00	0.00	0.00
28.00	0.00	0	30.00	0.00	0.00	0.00	0.00
29.00	0.00	0	30.00	0.00	0.00	0.00	0.00
30.00	0.00	0	30.00	0.00	0.00	0.00	0.00
31.00	0.00	0	30.00	0.00	0.00	0.00	0.00
32.00	0.00	0	30.00	0.00	0.00	0.00	0.00
33.00	0.00	0	30.00	0.00	0.00	0.00	0.00
34.00	0.00	0	30.00	0.00	0.00	0.00	0.00
35.00	0.00	0	30.00	0.00	0.00	0.00	0.00
36.00	0.00	0	30.00	0.00	0.00	0.00	0.00
37.00	0.00	0	30.00	0.00	0.00	0.00	0.00
38.00	0.00	0	30.00	0.00	0.00	0.00	0.00
39.00	0.00	0	30.00	0.00	0.00	0.00	0.00
40.00	0.00	0	30.00	0.00	0.00	0.00	0.00
41.00	0.00	0	30.00	0.00	0.00	0.00	0.00
42.00	0.00	0	30.00	0.00	0.00	0.00	0.00
43.00	0.00	0	30.00	0.00	0.00	0.00	0.00
44.00	0.00	0	30.00	0.00	0.00	0.00	0.00
45.00	0.00	0	30.00	0.00	0.00	0.00	0.00
46.00	0.00	0	30.00	0.00	0.00	0.00	0.00
47.00	0.00	0	30.00	0.00	0.00	0.00	0.00
48.00	0.00	0	30.00	0.00	0.00	0.00	0.00

APPENDIX E: STORMWATER CALCULATIONS

- *NOAA RAINFALL DATA*
- *POLLUTANT REDUCTION*
- *CONVEYANCE PROTECTION CALCULATIONS*

NOAA Atlas 14, Volume 10, Version 3
Location name: Gales Ferry, Connecticut, USA*
Latitude: 41.4265°, Longitude: -72.0865°
Elevation: m/ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.341 (0.265-0.431)	0.407 (0.316-0.516)	0.515 (0.399-0.654)	0.605 (0.466-0.771)	0.728 (0.544-0.960)	0.821 (0.600-1.10)	0.918 (0.653-1.26)	1.03 (0.693-1.43)	1.19 (0.771-1.70)	1.32 (0.837-1.92)
10-min	0.482 (0.376-0.611)	0.576 (0.448-0.730)	0.729 (0.565-0.927)	0.856 (0.660-1.09)	1.03 (0.770-1.36)	1.16 (0.850-1.56)	1.30 (0.925-1.79)	1.46 (0.982-2.03)	1.69 (1.09-2.41)	1.87 (1.19-2.72)
15-min	0.568 (0.442-0.719)	0.678 (0.527-0.859)	0.858 (0.665-1.09)	1.01 (0.775-1.28)	1.21 (0.906-1.60)	1.37 (1.00-1.83)	1.53 (1.09-2.11)	1.72 (1.16-2.39)	1.98 (1.28-2.83)	2.20 (1.39-3.20)
30-min	0.805 (0.626-1.02)	0.960 (0.746-1.22)	1.21 (0.940-1.54)	1.42 (1.10-1.82)	1.71 (1.28-2.26)	1.93 (1.41-2.59)	2.16 (1.54-2.98)	2.42 (1.63-3.37)	2.80 (1.81-4.00)	3.11 (1.97-4.51)
60-min	1.04 (0.811-1.32)	1.24 (0.965-1.57)	1.57 (1.22-1.99)	1.84 (1.42-2.35)	2.21 (1.65-2.92)	2.49 (1.82-3.34)	2.79 (1.98-3.84)	3.12 (2.10-4.35)	3.61 (2.34-5.16)	4.01 (2.54-5.82)
2-hr	1.37 (1.08-1.72)	1.63 (1.28-2.05)	2.06 (1.61-2.59)	2.42 (1.88-3.05)	2.90 (2.19-3.80)	3.27 (2.41-4.34)	3.66 (2.62-5.00)	4.10 (2.78-5.67)	4.75 (3.09-6.73)	5.28 (3.36-7.60)
3-hr	1.59 (1.25-1.98)	1.89 (1.49-2.36)	2.39 (1.88-2.99)	2.80 (2.19-3.52)	3.36 (2.54-4.37)	3.79 (2.81-5.00)	4.23 (3.05-5.76)	4.75 (3.23-6.52)	5.49 (3.59-7.75)	6.12 (3.90-8.75)
6-hr	2.01 (1.61-2.49)	2.39 (1.90-2.96)	3.01 (2.39-3.73)	3.52 (2.78-4.39)	4.23 (3.23-5.45)	4.76 (3.55-6.23)	5.32 (3.86-7.17)	5.96 (4.08-8.12)	6.89 (4.53-9.63)	7.67 (4.91-10.9)
12-hr	2.48 (2.00-3.04)	2.94 (2.37-3.61)	3.69 (2.96-4.54)	4.32 (3.44-5.33)	5.18 (3.99-6.61)	5.82 (4.39-7.55)	6.50 (4.75-8.69)	7.28 (5.01-9.84)	8.42 (5.56-11.7)	9.37 (6.03-13.2)
24-hr	2.90 (2.36-3.52)	3.46 (2.81-4.20)	4.36 (3.53-5.31)	5.12 (4.11-6.26)	6.15 (4.78-7.79)	6.92 (5.26-8.92)	7.75 (5.71-10.3)	8.71 (6.03-11.7)	10.1 (6.72-13.9)	11.3 (7.32-15.8)
2-day	3.24 (2.66-3.90)	3.90 (3.20-4.69)	4.98 (4.06-6.00)	5.87 (4.76-7.11)	7.10 (5.57-8.93)	8.02 (6.15-10.3)	9.00 (6.71-11.9)	10.2 (7.09-13.5)	11.9 (7.97-16.3)	13.5 (8.75-18.6)
3-day	3.51 (2.90-4.20)	4.22 (3.48-5.05)	5.38 (4.42-6.46)	6.35 (5.18-7.65)	7.68 (6.05-9.60)	8.66 (6.68-11.0)	9.72 (7.28-12.8)	11.0 (7.69-14.5)	12.9 (8.65-17.5)	14.6 (9.50-20.0)
4-day	3.77 (3.12-4.49)	4.51 (3.74-5.38)	5.73 (4.73-6.85)	6.74 (5.52-8.09)	8.13 (6.44-10.1)	9.17 (7.10-11.6)	10.3 (7.72-13.5)	11.6 (8.14-15.3)	13.6 (9.13-18.4)	15.3 (10.0-21.0)
7-day	4.49 (3.75-5.30)	5.30 (4.42-6.27)	6.62 (5.51-7.86)	7.73 (6.38-9.20)	9.24 (7.36-11.4)	10.4 (8.07-13.0)	11.6 (8.72-15.0)	13.0 (9.16-17.0)	15.1 (10.2-20.2)	16.9 (11.1-22.9)
10-day	5.20 (4.37-6.11)	6.05 (5.07-7.12)	7.43 (6.21-8.78)	8.59 (7.13-10.2)	10.2 (8.13-12.5)	11.4 (8.87-14.1)	12.6 (9.51-16.2)	14.1 (9.95-18.2)	16.1 (10.9-21.5)	17.9 (11.8-24.2)
20-day	7.38 (6.26-8.60)	8.29 (7.02-9.66)	9.77 (8.25-11.4)	11.0 (9.22-12.9)	12.7 (10.2-15.3)	14.0 (11.0-17.1)	15.3 (11.5-19.2)	16.7 (11.9-21.4)	18.5 (12.6-24.4)	20.0 (13.2-26.8)
30-day	9.20 (7.85-10.7)	10.1 (8.65-11.8)	11.7 (9.93-13.6)	13.0 (10.9-15.1)	14.7 (11.9-17.6)	16.1 (12.7-19.5)	17.5 (13.1-21.6)	18.8 (13.5-24.0)	20.4 (14.0-26.8)	21.6 (14.3-28.8)
45-day	11.4 (9.83-13.2)	12.4 (10.7-14.3)	14.1 (12.0-16.3)	15.4 (13.1-17.9)	17.3 (14.1-20.5)	18.8 (14.8-22.6)	20.2 (15.2-24.7)	21.4 (15.5-27.2)	22.9 (15.8-29.9)	23.9 (15.9-31.7)
60-day	13.3 (11.5-15.3)	14.4 (12.4-16.5)	16.1 (13.8-18.5)	17.5 (14.9-20.2)	19.5 (15.9-23.0)	21.1 (16.7-25.2)	22.5 (17.0-27.4)	23.8 (17.2-30.0)	25.2 (17.4-32.7)	26.0 (17.5-34.4)

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

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

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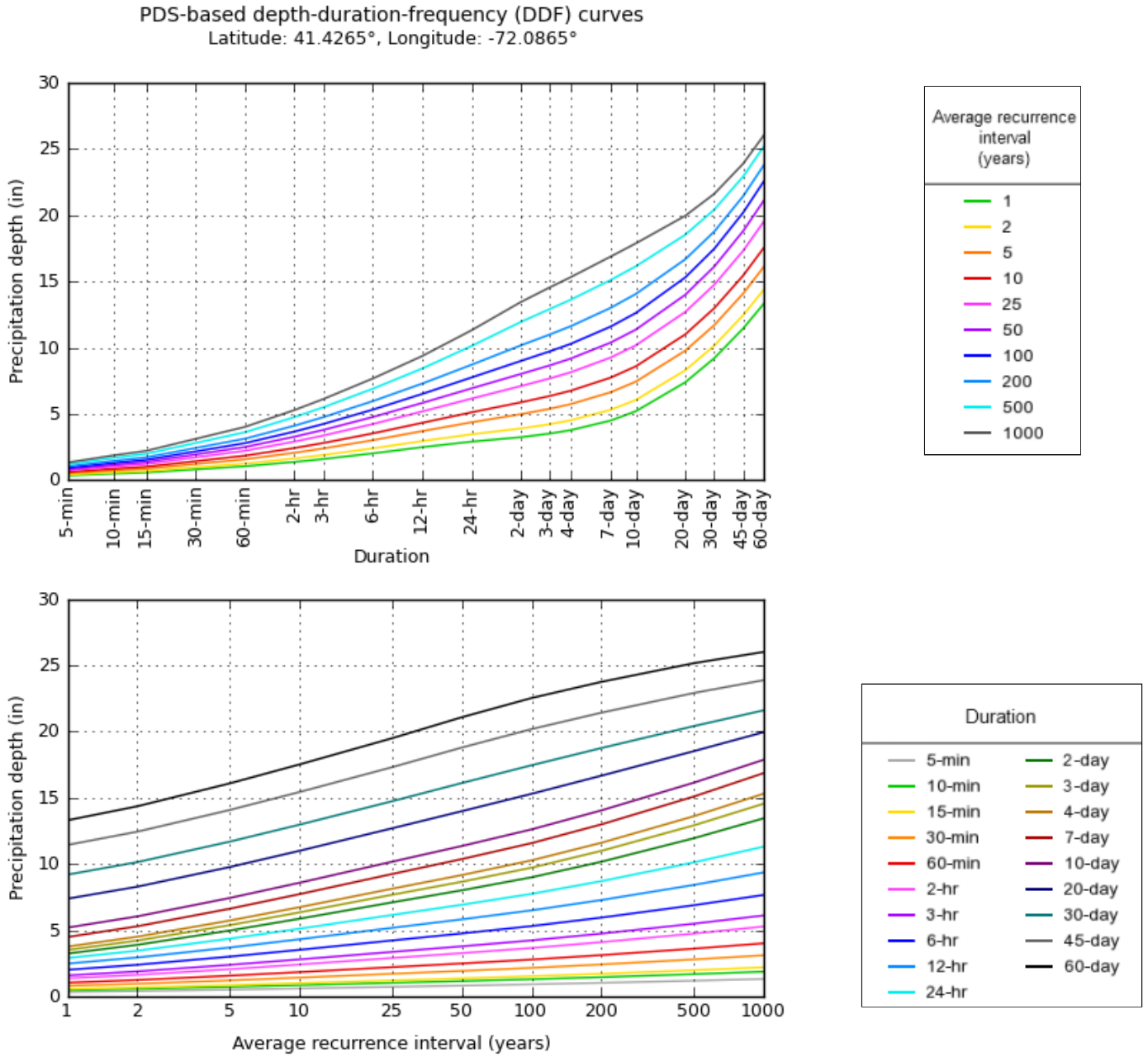
PF graphical



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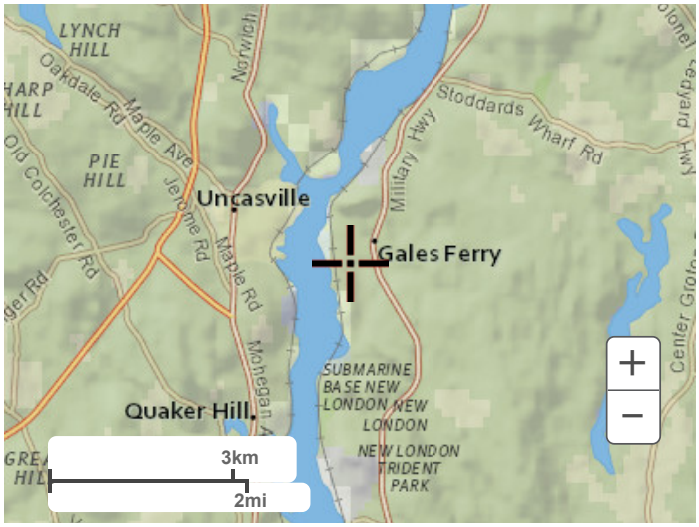
Small scale terrain



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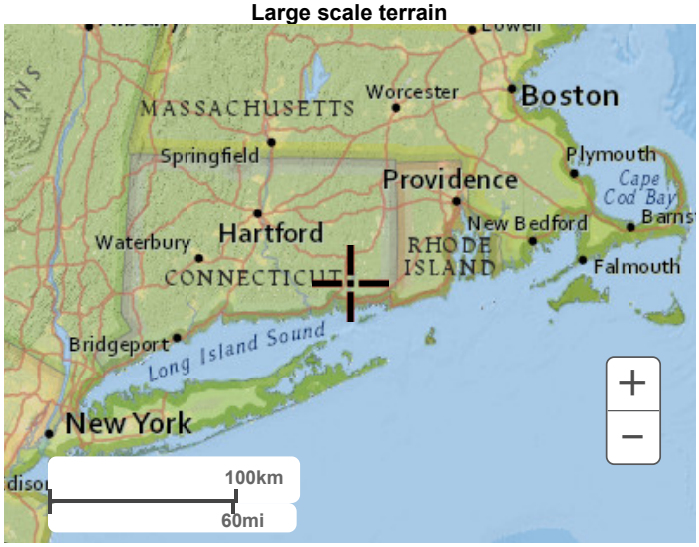

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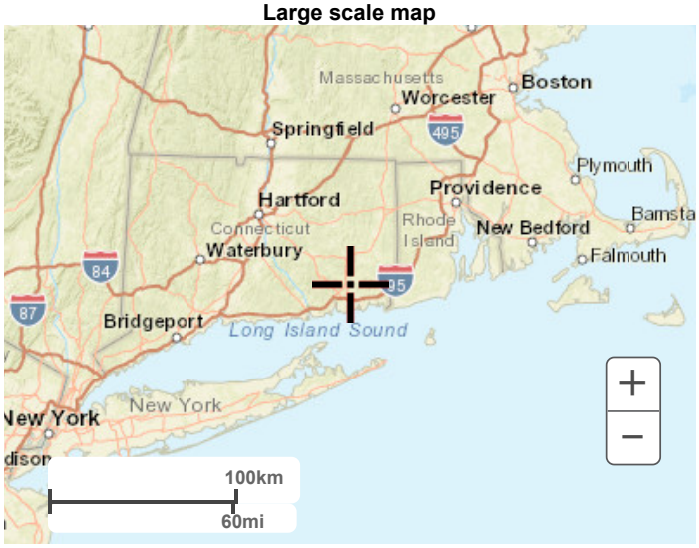

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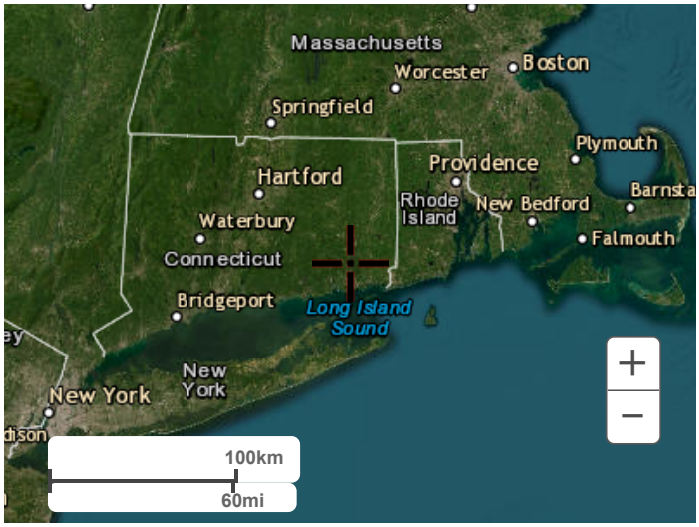

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NOAA Atlas 14, Volume 10, Version 3
Location name: Gales Ferry, Connecticut, USA*
Latitude: 41.4265°, Longitude: -72.0865°
Elevation: m/ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**4.09** (3.18-5.17)	**4.88** (3.79-6.19)	**6.18** (4.79-7.85)	**7.26** (5.59-9.25)	**8.74** (6.53-11.5)	**9.85** (7.20-13.2)	**11.0** (7.84-15.2)	**12.3** (8.32-17.2)	**14.3** (9.25-20.4)	**15.9** (10.0-23.0)
10-min	**2.89** (2.26-3.67)	**3.46** (2.69-4.38)	**4.37** (3.39-5.56)	**5.14** (3.96-6.56)	**6.19** (4.62-8.16)	**6.97** (5.10-9.34)	**7.81** (5.55-10.8)	**8.75** (5.89-12.2)	**10.1** (6.55-14.4)	**11.2** (7.11-16.3)
15-min	**2.27** (1.77-2.88)	**2.71** (2.11-3.44)	**3.43** (2.66-4.36)	**4.03** (3.10-5.14)	**4.85** (3.62-6.40)	**5.47** (4.00-7.32)	**6.12** (4.36-8.44)	**6.86** (4.62-9.56)	**7.93** (5.14-11.3)	**8.81** (5.58-12.8)
30-min	**1.61** (1.25-2.04)	**1.92** (1.49-2.43)	**2.43** (1.88-3.08)	**2.85** (2.20-3.63)	**3.43** (2.56-4.52)	**3.86** (2.83-5.17)	**4.32** (3.07-5.95)	**4.84** (3.26-6.74)	**5.59** (3.63-8.00)	**6.22** (3.93-9.02)
60-min	**1.04** (0.811-1.32)	**1.24** (0.965-1.57)	**1.57** (1.22-1.99)	**1.84** (1.42-2.35)	**2.21** (1.65-2.92)	**2.49** (1.82-3.34)	**2.79** (1.98-3.84)	**3.12** (2.10-4.35)	**3.61** (2.34-5.16)	**4.01** (2.54-5.82)
2-hr	**0.684** (0.538-0.859)	**0.816** (0.640-1.02)	**1.03** (0.806-1.30)	**1.21** (0.938-1.53)	**1.45** (1.09-1.90)	**1.64** (1.21-2.17)	**1.83** (1.31-2.50)	**2.05** (1.39-2.83)	**2.37** (1.55-3.36)	**2.64** (1.68-3.80)
3-hr	**0.529** (0.418-0.660)	**0.630** (0.497-0.787)	**0.795** (0.625-0.995)	**0.931** (0.728-1.17)	**1.12** (0.847-1.46)	**1.26** (0.934-1.67)	**1.41** (1.01-1.92)	**1.58** (1.07-2.17)	**1.83** (1.20-2.58)	**2.04** (1.30-2.91)
6-hr	**0.336** (0.268-0.416)	**0.399** (0.318-0.494)	**0.503** (0.399-0.624)	**0.588** (0.464-0.733)	**0.706** (0.539-0.910)	**0.794** (0.594-1.04)	**0.888** (0.644-1.20)	**0.995** (0.681-1.36)	**1.15** (0.756-1.61)	**1.28** (0.820-1.82)
12-hr	**0.206** (0.166-0.252)	**0.244** (0.196-0.300)	**0.307** (0.246-0.377)	**0.358** (0.286-0.443)	**0.430** (0.331-0.549)	**0.483** (0.364-0.627)	**0.540** (0.394-0.721)	**0.604** (0.416-0.816)	**0.699** (0.462-0.969)	**0.777** (0.501-1.09)
24-hr	**0.121** (0.098-0.147)	**0.144** (0.117-0.175)	**0.182** (0.147-0.221)	**0.213** (0.171-0.261)	**0.256** (0.199-0.325)	**0.289** (0.219-0.372)	**0.323** (0.238-0.429)	**0.363** (0.251-0.486)	**0.422** (0.280-0.580)	**0.471** (0.305-0.657)
2-day	**0.067** (0.055-0.081)	**0.081** (0.067-0.098)	**0.104** (0.085-0.125)	**0.122** (0.099-0.148)	**0.148** (0.116-0.186)	**0.167** (0.128-0.214)	**0.187** (0.140-0.248)	**0.212** (0.148-0.281)	**0.249** (0.166-0.339)	**0.280** (0.182-0.387)
3-day	**0.049** (0.040-0.058)	**0.059** (0.048-0.070)	**0.075** (0.061-0.090)	**0.088** (0.072-0.106)	**0.107** (0.084-0.133)	**0.120** (0.093-0.153)	**0.135** (0.101-0.178)	**0.153** (0.107-0.202)	**0.179** (0.120-0.243)	**0.202** (0.132-0.278)
4-day	**0.039** (0.033-0.047)	**0.047** (0.039-0.056)	**0.060** (0.049-0.071)	**0.070** (0.058-0.084)	**0.085** (0.067-0.105)	**0.095** (0.074-0.121)	**0.107** (0.080-0.140)	**0.121** (0.085-0.159)	**0.142** (0.095-0.191)	**0.160** (0.104-0.219)
7-day	**0.027** (0.022-0.032)	**0.032** (0.026-0.037)	**0.039** (0.033-0.047)	**0.046** (0.038-0.055)	**0.055** (0.044-0.068)	**0.062** (0.048-0.077)	**0.069** (0.052-0.089)	**0.077** (0.055-0.101)	**0.090** (0.061-0.120)	**0.100** (0.066-0.137)
10-day	**0.022** (0.018-0.025)	**0.025** (0.021-0.030)	**0.031** (0.026-0.037)	**0.036** (0.030-0.042)	**0.042** (0.034-0.052)	**0.047** (0.037-0.059)	**0.053** (0.040-0.067)	**0.059** (0.041-0.076)	**0.067** (0.046-0.090)	**0.074** (0.049-0.101)
20-day	**0.015** (0.013-0.018)	**0.017** (0.015-0.020)	**0.020** (0.017-0.024)	**0.023** (0.019-0.027)	**0.026** (0.021-0.032)	**0.029** (0.023-0.036)	**0.032** (0.024-0.040)	**0.035** (0.025-0.045)	**0.039** (0.026-0.051)	**0.042** (0.028-0.056)
30-day	**0.013** (0.011-0.015)	**0.014** (0.012-0.016)	**0.016** (0.014-0.019)	**0.018** (0.015-0.021)	**0.020** (0.017-0.024)	**0.022** (0.018-0.027)	**0.024** (0.018-0.030)	**0.026** (0.019-0.033)	**0.028** (0.019-0.037)	**0.030** (0.020-0.040)
45-day	**0.011** (0.009-0.012)	**0.012** (0.010-0.013)	**0.013** (0.011-0.015)	**0.014** (0.012-0.017)	**0.016** (0.013-0.019)	**0.017** (0.014-0.021)	**0.019** (0.014-0.023)	**0.020** (0.014-0.025)	**0.021** (0.015-0.028)	**0.022** (0.015-0.029)
60-day	**0.009** (0.008-0.011)	**0.010** (0.009-0.011)	**0.011** (0.010-0.013)	**0.012** (0.010-0.014)	**0.014** (0.011-0.016)	**0.015** (0.012-0.017)	**0.016** (0.012-0.019)	**0.016** (0.012-0.021)	**0.017** (0.012-0.023)	**0.018** (0.012-0.024)

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

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

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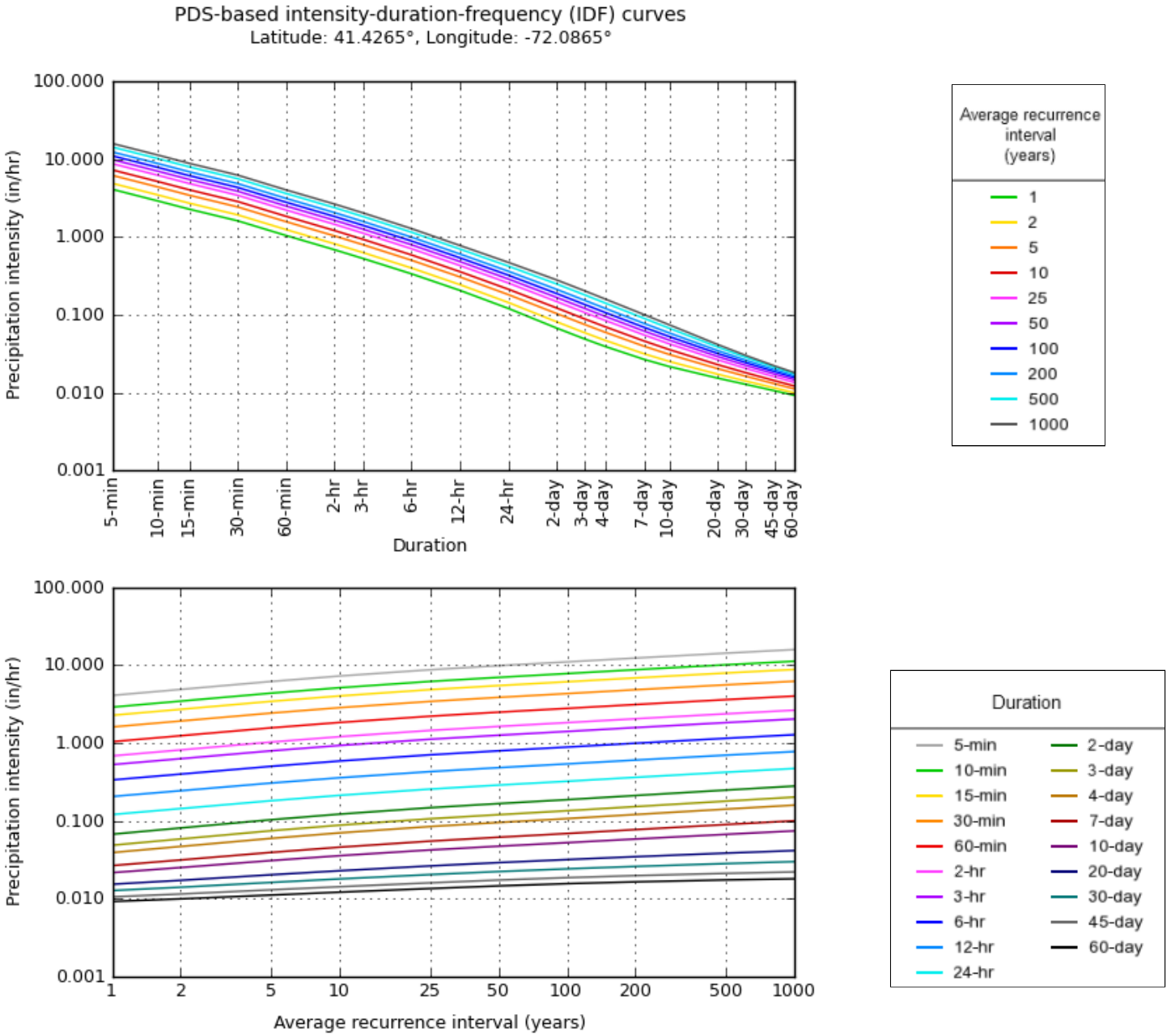
PF graphical



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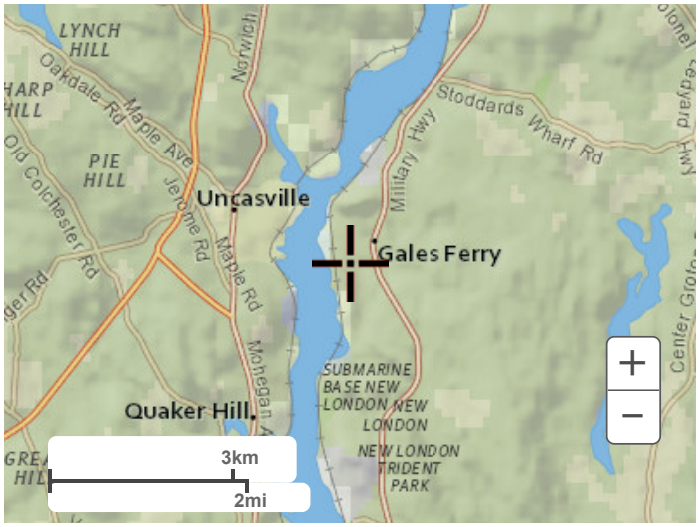

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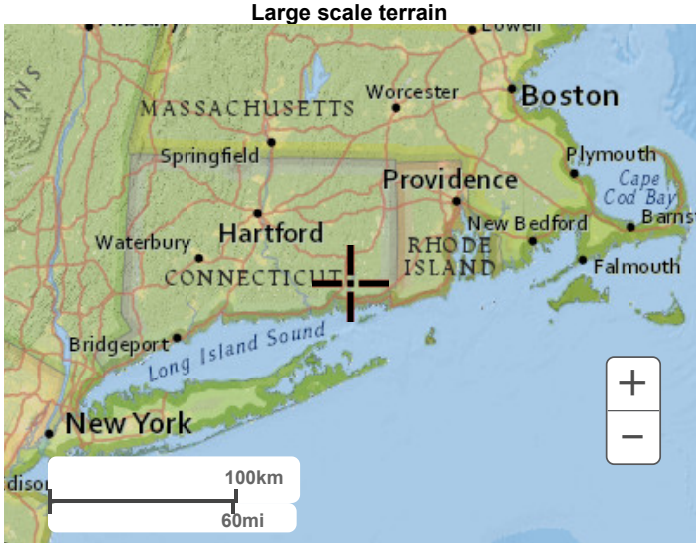

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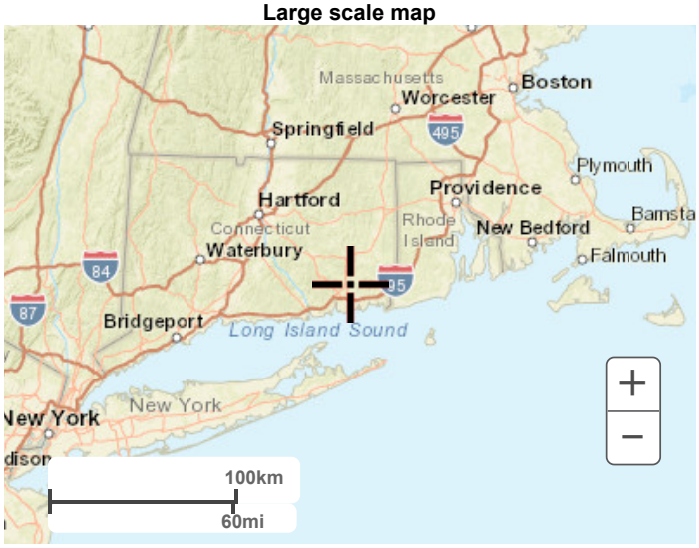

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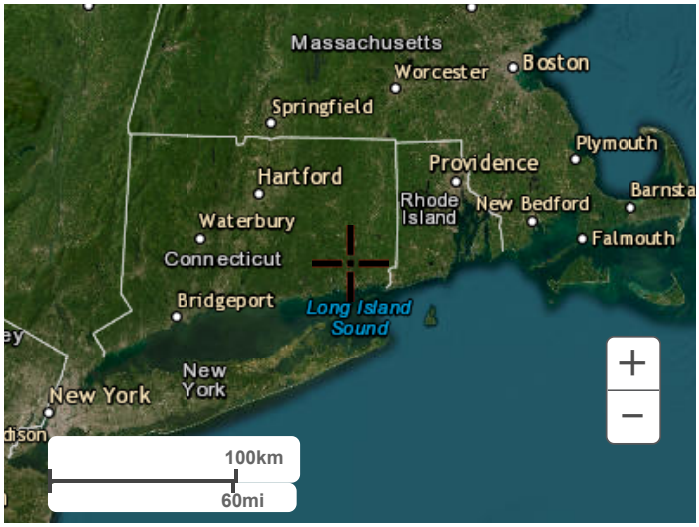

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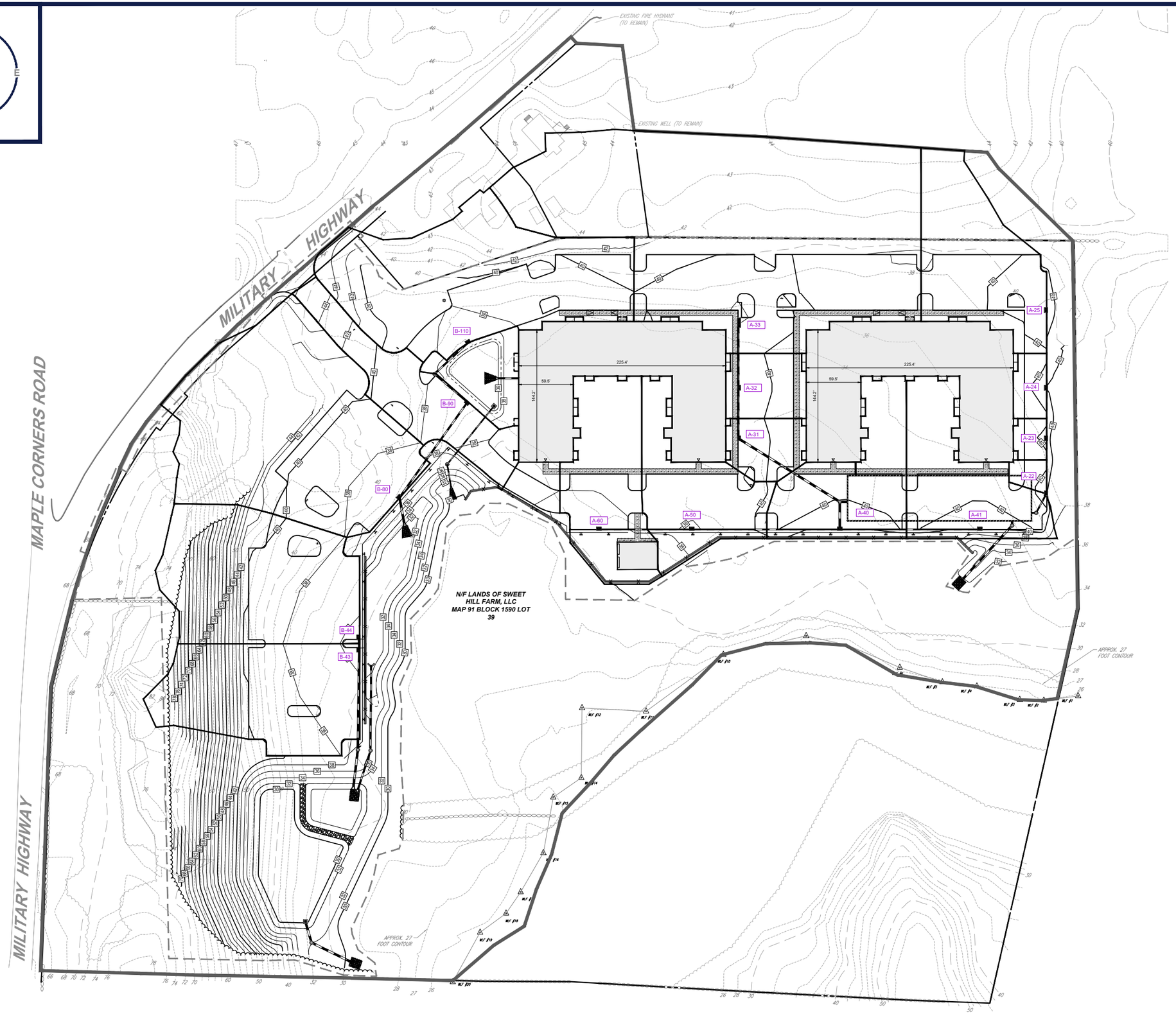

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DATE:	02/19/2025
CAD I.D.:	CTA220061.00-PDAM-5A

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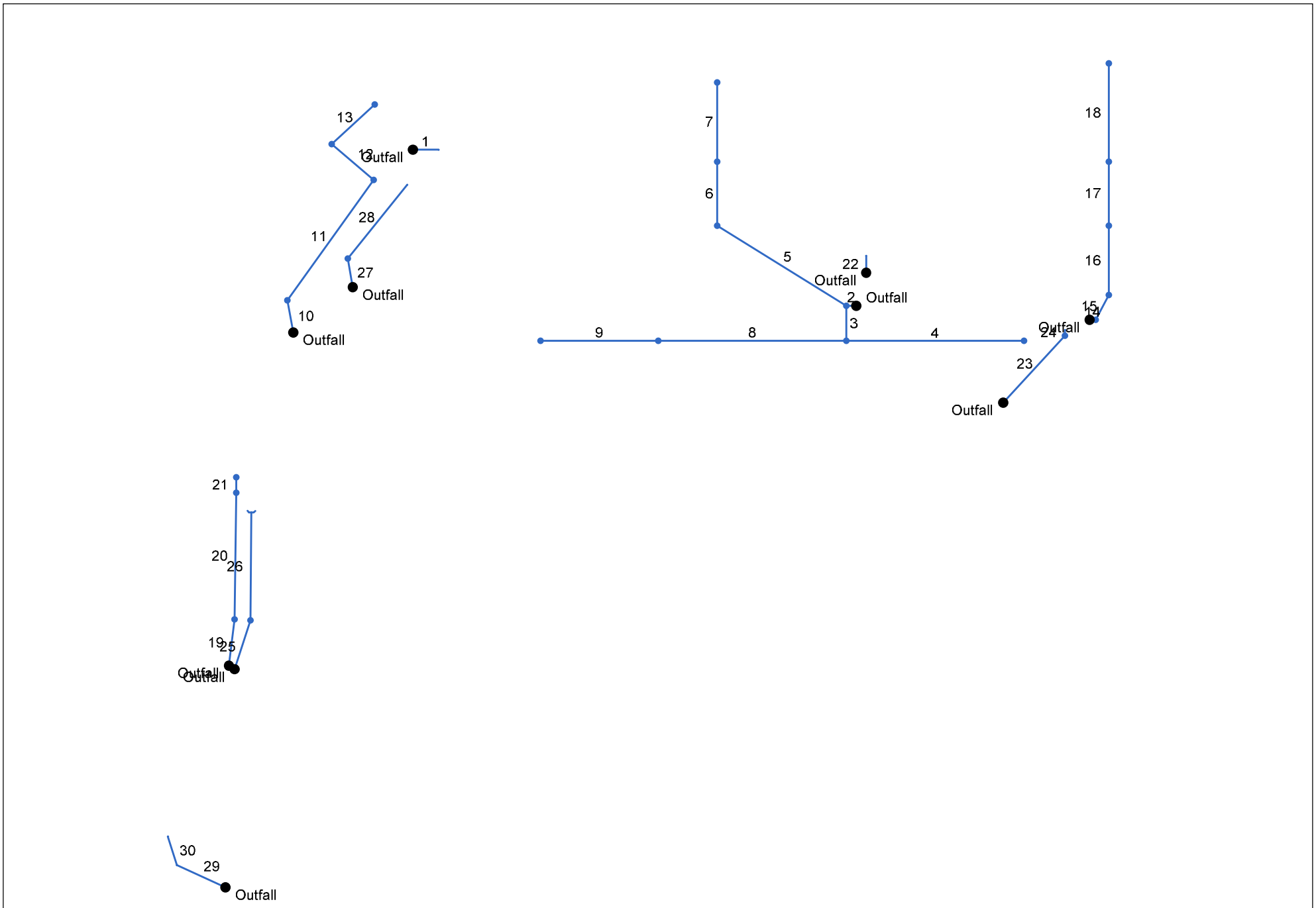
Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: CTA220061.00 - Storm Sewers.stm	Number of lines: 30	Date: 2/17/2025

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	22	0	None	0.00	0.58	0.90	6.0	36.00	1.00	36.22	18	Cir	0.012	1.00	40.00	C-40toBLDG B
2	End	8	180	MH	0.00	0.00	0.00	6.0	31.00	0.94	31.08	24	Cir	0.012	1.00	39.92	Inlet -A-30
3	2	30	-90	Comb	0.00	0.37	0.70	6.0	31.70	1.00	32.00	24	Cir	0.012	2.25	38.86	A-30-A-40
4	3	152	-90	Comb	0.00	0.39	0.70	6.0	32.75	1.88	35.62	15	Cir	0.012	1.00	38.87	A-40-A-41
5	2	130	32	Comb	0.00	0.12	0.79	6.0	31.33	1.00	32.63	24	Cir	0.012	1.31	38.87	A-30-A-31
6	5	55	58	Comb	0.00	0.14	0.81	6.0	32.73	1.00	33.28	24	Cir	0.012	0.50	38.62	A-31-A-32
7	6	68	0	Comb	0.00	1.84	0.63	6.0	33.38	1.00	34.06	24	Cir	0.012	1.00	38.02	A-32-A-33
8	3	161	90	Comb	0.00	0.34	0.66	6.0	32.75	1.00	34.36	15	Cir	0.012	0.50	37.75	A-40-A-50
9	8	101	0	Comb	0.00	0.41	0.65	6.0	34.36	1.00	35.37	15	Cir	0.012	1.00	38.50	A-50-A-60
10	End	28	-100	Comb	0.00	1.07	0.46	6.0	32.00	0.50	32.14	24	Cir	0.012	1.14	37.56	B-70toB-80
11	10	127	46	Comb	0.00	0.33	0.71	6.0	32.64	0.61	33.42	18	Cir	0.012	1.50	37.89	B-80toB-90
12	11	47	-85	MH	0.00	0.00	0.00	6.0	33.42	0.51	33.66	18	Cir	0.012	1.00	38.35	B-90toB-100
13	12	50	97	Comb	0.00	0.88	0.51	6.0	33.66	0.50	33.91	18	Cir	0.012	1.00	36.93	B-100toB-110
14	End	5	0	MH	0.00	0.00	0.00	6.0	32.76	0.59	32.79	15	Cir	0.012	0.90	40.17	Inlet-A-21
15	14	24	-62	Comb	0.00	0.03	0.69	6.0	32.97	0.50	33.09	15	Cir	0.012	0.79	39.49	A-21-A-22
16	15	60	-28	Comb	0.00	0.04	0.72	6.0	33.09	0.50	33.39	15	Cir	0.012	0.50	39.72	A-22-A-23
17	16	55	0	Comb	0.00	0.06	0.71	6.0	33.39	0.49	33.66	15	Cir	0.012	0.50	39.46	A-23-A-24
18	17	85	0	Comb	0.00	0.46	0.61	6.0	33.66	0.50	34.08	15	Cir	0.012	1.00	38.38	A-24-A-25
19	End	40	-83	MH	0.00	0.00	0.00	6.0	31.00	1.00	31.40	24	Cir	0.012	0.15	37.51	B-41toB-42
20	19	109	-6	Comb	0.00	0.53	0.62	6.0	31.40	0.50	31.95	24	Cir	0.012	0.50	35.53	B-42toB-43
21	20	13	-1	Comb	0.00	0.66	0.51	6.0	31.95	0.52	32.02	24	Cir	0.012	1.00	35.53	B-43toB-44
22	End	15	-90	None	0.00	0.58	0.90	6.0	32.00	1.99	32.29	18	Cir	0.012	1.00	40.00	Inlet-BLDG A
23	End	78	-47	MH	0.00	0.00	0.00	6.0	31.15	0.50	31.54	24	Cir	0.012	0.72	39.68	A-10-A-20

Project File: CTA220061.00 - Storm Sewers.stm

Number of lines: 30

Date: 2/17/2025

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
24	23	5	-43	None	2.54	0.00	0.00	6.0	31.54	0.00	31.54	24	Cir	0.012	1.00	35.50	A-20-Outlet
25	End	44	-72	MH	0.00	0.00	0.00	6.0	30.11	2.01	31.00	18	Cir	0.012	0.35	35.66	B-40toB-50
26	25	93	-18	Hdwl	7.39	0.00	0.00	6.0	31.00	0.00	31.00	18	Cir	0.012	1.00	33.50	B-50toB-60
27	End	25	-100	MH	0.00	0.00	0.00	6.0	30.00	1.36	30.34	12	Cir	0.012	0.79	37.16	C-10toC-20
28	27	81	48	None	3.97	0.00	0.00	6.0	30.34	1.99	31.96	12	Cir	0.012	1.00	35.76	C-20toC-30
29	End	46	-155	MH	0.00	0.00	0.00	6.0	28.10	0.59	28.37	24	Cir	0.012	0.78	32.31	B-10toB-20
30	29	26	48	None	6.14	0.00	0.00	6.0	28.37	0.50	28.50	24	Cir	0.012	1.00	31.65	B-20toB-30

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	22	0.58	0.58	0.90	0.52	0.52	6.0	6.0	8.1	4.23	11.36	5.23	18	1.00	36.00	36.22	36.63	37.01	37.65	40.00	C-40toBLDG B
2	End	8	0.00	3.61	0.00	0.00	2.39	6.0	7.4	7.4	17.63	23.78	5.61	24	0.94	31.00	31.08	33.75	33.79	35.50	39.92	Inlet -A-30
3	2	30	0.37	1.51	0.70	0.26	1.02	6.0	7.2	7.5	7.64	24.50	2.43	24	1.00	31.70	32.00	34.28	34.31	39.92	38.86	A-30-A-40
4	3	152	0.39	0.39	0.70	0.27	0.27	6.0	6.0	8.1	2.21	9.60	2.83	15	1.88	32.75	35.62	34.52	36.21	38.86	38.87	A-40-A-41
5	2	130	0.12	2.10	0.79	0.09	1.37	6.0	6.5	7.8	10.70	24.47	3.45	24	1.00	31.33	32.63	34.28	34.51	39.92	38.87	A-30-A-31
6	5	55	0.14	1.98	0.81	0.11	1.27	6.0	6.3	8.0	10.13	24.51	3.64	24	1.00	32.73	33.28	34.75	34.77	38.87	38.62	A-31-A-32
7	6	68	1.84	1.84	0.63	1.16	1.16	6.0	6.0	8.1	9.39	24.46	4.51	24	1.00	33.38	34.06	34.89	35.15	38.62	38.02	A-32-A-33
8	3	161	0.34	0.75	0.66	0.22	0.49	6.0	6.5	7.8	3.84	6.99	3.91	15	1.00	32.75	34.36	34.52	35.15	38.86	37.75	A-40-A-50
9	8	101	0.41	0.41	0.65	0.27	0.27	6.0	6.0	8.1	2.16	7.00	3.23	15	1.00	34.36	35.37	35.15	35.96	37.75	38.50	A-50-A-60
10	End	28	1.07	2.28	0.46	0.49	1.18	6.0	6.8	7.7	9.01	17.27	5.39	24	0.50	32.00	32.14	33.03	33.21	34.53	37.56	B-70toB-80
11	10	127	0.33	1.21	0.71	0.23	0.68	6.0	6.4	7.9	5.38	8.90	5.09	18	0.61	32.64	33.42	33.48	34.31	37.56	37.89	B-80toB-90
12	11	47	0.00	0.88	0.00	0.00	0.45	6.0	6.2	8.0	3.59	8.11	3.76	18	0.51	33.42	33.66	34.31	34.38	37.89	38.35	B-90toB-100
13	12	50	0.88	0.88	0.51	0.45	0.45	6.0	6.0	8.1	3.64	8.03	4.30	18	0.50	33.66	33.91	34.38	34.64	38.35	36.93	B-100toB-110
14	End	5	0.00	0.59	0.00	0.00	0.37	6.0	7.0	7.6	2.82	5.38	3.44	15	0.59	32.76	32.79	33.75	33.46	33.93	40.17	Inlet-A-21
15	14	24	0.03	0.59	0.69	0.02	0.37	6.0	6.9	7.6	2.83	4.93	4.16	15	0.50	32.97	33.09	33.65	33.77	40.17	39.49	A-21-A-22
16	15	60	0.04	0.56	0.72	0.03	0.35	6.0	6.6	7.7	2.73	4.96	3.52	15	0.50	33.09	33.39	33.98	34.05	39.49	39.72	A-22-A-23
17	16	55	0.06	0.52	0.71	0.04	0.32	6.0	6.4	7.9	2.54	4.90	3.93	15	0.49	33.39	33.66	34.05	34.30	39.72	39.46	A-23-A-24
18	17	85	0.46	0.46	0.61	0.28	0.28	6.0	6.0	8.1	2.27	4.93	3.38	15	0.50	33.66	34.08	34.43	34.68	39.46	38.38	A-24-A-25
19	End	40	0.00	1.19	0.00	0.00	0.67	6.0	6.5	7.8	5.21	24.44	4.08	24	1.00	31.00	31.40	31.91	32.20	32.23	37.51	B-41toB-42
20	19	109	0.53	1.19	0.62	0.33	0.67	6.0	6.1	8.1	5.36	17.41	4.49	24	0.50	31.40	31.95	32.20	32.77	37.51	35.53	B-42toB-43
21	20	13	0.66	0.66	0.51	0.34	0.34	6.0	6.0	8.1	2.73	17.75	2.96	24	0.52	31.95	32.02	32.77	32.60	35.53	35.53	B-43toB-44
22	End	15	0.58	0.58	0.90	0.52	0.52	6.0	6.0	8.1	4.23	16.04	2.40	18	1.99	32.00	32.29	33.75	33.77	35.50	40.00	Inlet-BLDG A

Project File: CTA220061.00 - Storm Sewers.stm

Number of lines: 30

Run Date: 2/17/2025

NOTES:Intensity = 38.90 / (Inlet time + 3.70) ^ 0.69; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
23	End	78	0.00	0.00	0.00	0.00	0.00	6.0	6.0	0.0	2.54	17.30	3.75	24	0.50	31.15	31.54	31.67	32.09	33.15	39.68	A-10-A-20
24	23	5	0.00	0.00	0.00	0.00	0.00	6.0	6.0	0.0	2.54	0.00	3.29	24	0.00	31.54	31.54	32.09	32.17	39.68	35.50	A-20-Outlet
25	End	44	0.00	0.00	0.00	0.00	0.00	6.0	6.3	0.0	7.39	16.13	4.88	18	2.01	30.11	31.00	31.91	32.05	32.27	35.66	B-40toB-50
26	25	93	0.00	0.00	0.00	0.00	0.00	6.0	6.0	0.0	7.39	0.00	4.88	18	0.00	31.00	31.00	32.05	32.74	35.66	33.50	B-50toB-60
27	End	25	0.00	0.00	0.00	0.00	0.00	6.0	6.2	0.0	3.97	4.50	6.04	12	1.36	30.00	30.34	30.73	31.18	31.19	37.16	C-10toC-20
28	27	81	0.00	0.00	0.00	0.00	0.00	6.0	6.0	0.0	3.97	5.45	5.61	12	1.99	30.34	31.96	31.18	32.80	37.16	35.76	C-20toC-30
29	End	46	0.00	0.00	0.00	0.00	0.00	6.0	6.1	0.0	6.14	18.81	4.98	24	0.59	28.10	28.37	28.89	29.25	30.36	32.31	B-10toB-20
30	29	26	0.00	0.00	0.00	0.00	0.00	6.0	6.0	0.0	6.14	17.35	4.64	24	0.50	28.37	28.50	29.25	29.38	32.31	31.65	B-20toB-30

Project File: CTA220061.00 - Storm Sewers.stm | Number of lines: 30 | Run Date: 2/17/2025

NOTES:Intensity = 38.90 / (Inlet time + 3.70) ^ 0.69; Return period =Yrs. 25 ; c = cir e = ellip b = box

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	Building B Roof Dr	4.23	0.00	0.00	4.23	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
2	A-30	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
3	A-40	2.10	0.00	2.10	0.00	Comb	4.0	2.73	3.12	2.31	1.35	Sag	2.53	0.020	0.020	0.000	0.28	13.93	0.28	13.93	0.0	Off
4	A-41	2.21	0.00	2.21	0.00	Comb	4.0	2.73	3.12	2.31	1.35	Sag	2.53	0.020	0.020	0.000	0.29	14.38	0.29	14.38	0.0	Off
5	A-31	0.77	0.00	0.77	0.00	Comb	4.0	2.73	3.12	2.31	1.35	Sag	2.53	0.020	0.020	0.000	0.15	7.69	0.15	7.69	0.0	Off
6	A-32	0.92	0.00	0.92	0.00	Comb	4.0	2.73	3.12	2.31	1.35	Sag	2.53	0.020	0.020	0.000	0.17	8.52	0.17	8.52	0.0	Off
7	A-33	9.39	0.00	9.39	0.00	Comb	4.0	5.46	6.26	4.62	2.70	Sag	2.53	0.020	0.020	0.000	0.46	22.99	0.46	22.99	0.0	Off
8	A-50	1.82	0.00	1.82	0.00	Comb	4.0	2.73	3.12	2.31	1.35	Sag	2.53	0.020	0.020	0.000	0.26	12.76	0.26	12.76	0.0	Off
9	A-60	2.16	0.00	2.16	0.00	Comb	4.0	2.73	3.12	2.31	1.35	Sag	2.53	0.020	0.020	0.000	0.28	14.17	0.28	14.17	0.0	Off
10	B-80	3.99	0.00	3.99	0.00	Comb	4.0	2.73	3.12	2.31	1.35	Sag	2.53	0.020	0.020	0.000	0.41	20.74	0.41	20.74	0.0	Off
11	B-90	1.90	0.00	1.90	0.00	Comb	4.0	2.73	3.12	2.31	1.35	Sag	2.53	0.020	0.020	0.000	0.26	13.10	0.26	13.10	0.0	Off
12	B-100	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
13	B-110	3.64	0.00	3.64	0.00	Comb	4.0	2.73	3.12	2.31	1.35	Sag	2.53	0.020	0.020	0.000	0.39	19.57	0.39	19.57	0.0	Off
14	A-21	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
15	A-22	0.17	0.00	0.17	0.00	Comb	4.0	2.73	3.12	2.31	1.35	Sag	2.53	0.020	0.020	0.000	0.07	3.53	0.07	3.53	0.0	Off
16	A-23	0.23	0.00	0.23	0.00	Comb	4.0	2.73	3.12	2.31	1.35	Sag	2.53	0.020	0.020	0.000	0.08	4.11	0.08	4.11	0.0	Off
17	A-24	0.35	0.00	0.35	0.00	Comb	4.0	2.73	3.12	2.31	1.35	Sag	2.53	0.020	0.020	0.000	0.10	4.99	0.10	4.99	0.0	Off
18	A-25	2.27	0.00	2.27	0.00	Comb	4.0	2.73	3.12	2.31	1.35	Sag	2.53	0.020	0.020	0.000	0.29	14.62	0.29	14.62	0.0	Off
19	B-42	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
20	B-43	2.66	0.00	2.66	0.00	Comb	4.0	2.73	3.12	2.31	1.35	Sag	2.53	0.020	0.020	0.000	0.32	16.11	0.32	16.11	0.0	Off
21	B-44	2.73	0.00	2.73	0.00	Comb	4.0	2.73	3.12	2.31	1.35	Sag	2.53	0.020	0.020	0.000	0.33	16.36	0.33	16.36	0.0	Off
22	Building A Roof Dr	4.23	0.00	0.00	4.23	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
23	A-20	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off

Project File: CTA220061.00 - Storm Sewers.stm | Number of lines: 30 | Run Date: 2/17/2025

NOTES: Inlet N-Values = 0.016; Intensity = 38.90 / (Inlet time + 3.70) ^ 0.69; Return period = 25 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
24	1A Outlet	2.54*	0.00	0.00	2.54	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
25	B-50	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
26	B-60	7.39*	0.00	7.39	0.00	Hdwl	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
27	C-20	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
28	C-30	3.97*	0.00	0.00	3.97	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
29	B-20	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
30	B-30	6.14*	0.00	0.00	6.14	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off

Project File: CTA220061.00 - Storm Sewers.stm | Number of lines: 30 | Run Date: 2/17/2025

NOTES: Inlet N-Values = 0.016; Intensity = 38.90 / (Inlet time + 3.70) ^ 0.69; Return period = 25 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	18	4.23	36.00	36.63	0.63	0.71	5.95	0.31	36.95	0.000	22	36.22	37.01	0.79**	0.94	4.50	0.31	37.32	0.000	0.000	n/a	1.00	n/a
2	24	17.63	31.00	33.75	2.00	3.14	5.61	0.49	34.24	0.518	8	31.08	33.79	2.00	3.14	5.61	0.49	34.28	0.518	0.518	0.044	1.00	0.49
3	24	7.64	31.70	34.28	2.00	3.14	2.43	0.09	34.38	0.097	30	32.00	34.31	2.00	3.14	2.43	0.09	34.41	0.097	0.097	0.029	2.25	0.21
4	15	2.21	32.75	34.52	1.25	0.57	1.80	0.05	34.57	0.100	152	35.62	36.21 j	0.59**	0.57	3.85	0.23	36.44	0.478	0.289	n/a	1.00	0.23
5	24	10.70	31.33	34.28	2.00	3.14	3.41	0.18	34.46	0.191	130	32.63	34.51	1.88	3.06	3.50	0.19	34.70	0.165	0.178	0.232	1.31	0.25
6	24	10.13	32.73	34.75	2.00	3.14	3.23	0.16	34.92	0.171	55	33.28	34.77	1.49	2.50	4.05	0.25	35.02	0.210	0.190	0.105	0.50	0.13
7	24	9.39	33.38	34.89	1.51	1.76	3.68	0.44	35.34	0.000	68	34.06	35.15 j	1.09**	1.76	5.34	0.44	35.60	0.000	0.000	n/a	1.00	0.44
8	15	3.84	32.75	34.52	1.25	0.82	3.13	0.15	34.67	0.301	161	34.36	35.15 j	0.79**	0.82	4.69	0.34	35.49	0.568	0.434	n/a	0.50	0.17
9	15	2.16	34.36	35.15	0.79	0.56	2.64	0.23	35.38	0.000	101	35.37	35.96 j	0.59**	0.56	3.82	0.23	36.18	0.000	0.000	n/a	1.00	0.23
10	24	9.01	32.00	33.03	1.03	1.63	5.52	0.43	33.46	0.000	28	32.14	33.21	1.07**	1.71	5.26	0.43	33.64	0.000	0.000	n/a	1.14	n/a
11	18	5.38	32.64	33.48	0.84*	1.02	5.27	0.37	33.86	0.000	127	33.42	34.31	0.89**	1.10	4.91	0.37	34.69	0.000	0.000	n/a	1.50	n/a
12	18	3.59	33.42	34.31	0.89	0.84	3.27	0.28	34.60	0.000	47	33.66	34.38 j	0.72**	0.84	4.26	0.28	34.66	0.000	0.000	n/a	1.00	n/a
13	18	3.64	33.66	34.38	0.72	0.84	4.32	0.28	34.67	0.000	50	33.91	34.64	0.73**	0.85	4.28	0.28	34.92	0.000	0.000	n/a	1.00	0.28
14	15	2.82	32.76	33.75	0.99	0.67	2.70	0.27	34.02	0.000	5	32.79	33.46	0.67**	0.67	4.18	0.27	33.74	0.000	0.000	n/a	0.90	0.24
15	15	2.83	32.97	33.65	0.68*	0.68	4.15	0.27	33.92	0.496	24	33.09	33.77 j	0.68**	0.68	4.16	0.27	34.04	0.499	0.497	0.120	0.79	0.21
16	15	2.73	33.09	33.98	0.89	0.66	2.91	0.27	34.25	0.000	60	33.39	34.05 j	0.66**	0.66	4.13	0.27	34.32	0.000	0.000	n/a	0.50	0.13
17	15	2.54	33.39	34.05	0.66	0.63	3.85	0.23	34.28	0.436	55	33.66	34.30 j	0.64**	0.63	4.01	0.25	34.55	0.484	0.460	0.253	0.50	0.13
18	15	2.27	33.66	34.43	0.77	0.58	2.88	0.24	34.66	0.000	85	34.08	34.68 j	0.60**	0.58	3.89	0.24	34.92	0.000	0.000	n/a	1.00	n/a
19	24	5.21	31.00	31.91	0.91	1.18	3.75	0.30	32.21	0.000	40	31.40	32.20 j	0.80**	1.18	4.41	0.30	32.51	0.000	0.000	n/a	0.15	0.05
20	24	5.36	31.40	32.20	0.80	1.18	4.54	0.31	32.51	0.000	109	31.95	32.77	0.82**	1.21	4.45	0.31	33.07	0.000	0.000	n/a	0.50	0.15
21	24	2.73	31.95	32.77	0.82	0.75	2.26	0.21	32.97	0.000	13	32.02	32.60	0.58**	0.75	3.65	0.21	32.80	0.000	0.000	n/a	1.00	n/a
22	18	4.23	32.00	33.75	1.50	1.77	2.39	0.09	33.84	0.138	15	32.29	33.77	1.48	1.76	2.40	0.09	33.86	0.126	0.132	0.019	1.00	0.09

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Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
23	24	2.54	31.15	31.67	0.52	0.65	3.91	0.20	31.87	0.000	78	31.54	32.09	0.55**	0.71	3.58	0.20	32.29	0.000	0.000	n/a	0.72	n/a
24	24	2.54	31.54	32.09	0.55*	0.71	3.58	0.20	32.29	0.381	5	31.54	32.17	0.63	0.84	3.01	0.14	32.31	0.236	0.309	0.015	1.00	0.14
25	18	7.39	30.11	31.91	1.50	1.32	4.18	0.27	32.18	0.422	44	31.00	32.05 j	1.05**	1.32	5.58	0.48	32.54	0.599	0.510	n/a	0.35	0.17
26	18	7.39	31.00	32.05	1.05*	1.32	5.58	0.48	32.54	0.599	93	31.00	32.74	1.50	1.77	4.18	0.27	33.01	0.422	0.510	0.473	1.00	0.27
27	12	3.97	30.00	30.73	0.73	0.61	6.46	0.49	31.22	0.000	25	30.34	31.18	0.84**	0.71	5.61	0.49	31.67	0.000	0.000	n/a	0.79	n/a
28	12	3.97	30.34	31.18	0.84*	0.71	5.61	0.49	31.67	0.000	81	31.96	32.80	0.84**	0.71	5.61	0.49	33.29	0.000	0.000	n/a	1.00	n/a
29	24	6.14	28.10	28.89	0.79	1.15	5.32	0.33	29.22	0.000	46	28.37	29.25	0.88**	1.32	4.64	0.33	29.58	0.000	0.000	n/a	0.78	n/a
30	24	6.14	28.37	29.25	0.88*	1.32	4.64	0.33	29.58	0.000	26	28.50	29.38	0.88**	1.32	4.64	0.33	29.71	0.000	0.000	n/a	1.00	n/a

Project File: CTA220061.00 - Storm Sewers.stm | Number of lines: 30 | Run Date: 2/17/2025

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

C.R Klewin
39 Military Highway
Town of Ledyard
Bohler Job Number: CTA220061.00
February 17, 2025

Water Quality Calculations - Water Quality Volume

From CT 2024 Stormwater Quality Manual:

$$WQV = \frac{(1.3")(R)(A)}{12}$$

$$R = 0.05 + 0.009(I)$$

WQV = water quality volume (ac-ft)
R = volumetric runoff coefficient
I = percent impervious cover
A = site area in acres

Watershed Area	BMP Selection	Total Area		Impervious Area		Impervious Cover	Volumetric Runoff Coefficient	Water Quality Volume (WQV)		Pretreatment Volume Required[1]	Pretreatment Volume Provided	WQV provided	Notes
ID		ac	ft²	ac	ft²	%	R	acre-feet	ft³	ft³	ft³	ft³	
PR-1A	StormTrap SingleTrap 4-6 (1A)	4.252	185,217	2.561	111,557	60.23	0.592	0.273	11,880	2,970	Equivalent WQF	19,283	4" x 12" Orifice = 32.30
PR-1B		0.579	25,221	0.579	25,221	100.00	0.950	0.060	2,596	-	-		Roof Runoff. No pretreatment
PR-1C	Rain Garden (1C)	0.731	31,842	0.579	25,221	79.21	0.763	0.060	2,632	-	-	2,663	3' x 3' Grate = 35.80
PR-1D	Infiltration Basin (1E)	2.564	111,687	0.996	43,385	38.85	0.400	0.111	4,835	1,209	2,365	8,924	3" x 12" Orifice = 31.00
PR-1E		2.486	108,291	0.721	31,407	29.00	0.311	0.084	3,649	912			
TOTALS		10.612	462,258		236,791	51.22%			25,591			30,870	

1- 10% of WQV for Stormwater ponds; 25% for infiltration practice

C.R Klewin
39 Military Highway
Town of Ledyard
Bohler Job Number: CTA220061.00
February 17, 2025

Rip Rap Sizing Calculations

Design Period Storm: 100 Year

Rip Rap Apron Sizing Calculations

Location	Pipe Size (in.)	Pipe Size (ft.)	Q (cfs)	TW (ft.)	V (fps)	W1 (ft.)	La (ft.)	W2 (ft.)	W3 (ft.)	Apron Type	Rip Rap Type
B-70	24	2.0	16.54	2.00	6.28	6.00	12	11	NA	B	Modified
C-10	12	1.0	5.13	0.65	7.89	3.00	12	8	NA	B	Modified
C-40	18	1.5	4.41	0.65	5.98	4.50	12	13	NA	A	Modified

Based ConnDOT Drainage Manual - Type A, B, and C Riprap Aprons

Outlet Velocity (fps)
0-8 - Modified
8-10 - Intermediate

Scour Hole Sizing Calculations

Location	Pipe Size/ Span (in)	Pipe Size/ Span (ft)	Q (cfs)	TW (ft.)	Scour Hole Type	D_{50} (ft)	F (ft)	C (ft)	B (ft)	Rip Rap Type
A-10	24	2.0	10.41	1.12	Type 1	0.10	1.00	12	10	Modified
B-10	24	2.0	13.06	1.50	Type 1	0.10	1.00	12	10	Modified
B-40 / B-41	24	2.0	25.11	1.50	Type 1	0.24	1.00	12	10	Modified

Based on ConnDOT Drainage Manual - Type 1 and 2 Scour Holes

D_{50} < 0.42 ft - Modified
0.42 ft < D_{50} < 0.67 ft - Intermediate
0.67 ft < D_{50} < 1.25 ft - Standard

Riprap Type D_{50} (inches)
Modified - 5
Intermediate - 8

APPENDIX F: STORMWATER OPERATION & MAINTENANCE PLAN

- *O & M PLAN*

STORMWATER OPERATION AND MAINTENANCE PLAN

C.R. Klewin
19, 29 & 39 Military Highway
Gales Ferry/Ledyard, CT

RESPONSIBLE PARTY DURING CONSTRUCTION:

TBD

RESPONSIBLE PARTY POST CONSTRUCTION:

TBD

Construction Phase

During the construction phase, all erosion control devices and measures shall be maintained in accordance with the final record plans, local/state approvals and conditions, and the CT General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities, if applicable. Additionally, the maintenance of all erosion / siltation control measures during construction shall be the responsibility of the general contractor. Contact information of the OWNER and CONTRACTOR shall be listed in the Stormwater Pollution Control Plan (SWPCP) for this site. The SWPCP also includes information regarding construction period allowable and illicit discharges, housekeeping and emergency response procedures. Upon proper notice to the property owner, the Town/City or its authorized designee shall be allowed to enter the property at a reasonable time and in a reasonable manner for the purposes of inspection.

Post Development Controls

Once construction is completed, the post development stormwater controls are to be operated and maintained in compliance with the following permanent procedures (note that the continued implementation of these procedures shall be the responsibility of the Owner or its assignee):

1. Parking lots: Sweep at least four (4) times per year and on a more frequent basis depending on sanding operations. All resulting sweepings shall be collected and properly disposed of offsite in accordance with local, state, federal, and other applicable requirements.

2. Roadways: Sweep at least four (4) times per year and on a more frequent basis depending on sanding operations. All resulting sweepings shall be collected and properly disposed of off site in accordance with local, state, federal, and other applicable requirements.

3. Catch basins, yard drains, trench drains, manholes and piping: Inspect four (4) times per year and at the end of foliage and snow-removal seasons. These features shall be cleaned four (4) times per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the catch basin or underground system. Accumulated sediment and hydrocarbons present must be removed and properly disposed of off-site in accordance with local, state, federal, and other applicable requirements.

4. Riprap apron / Scour Hole: Riprap and scour holes should be checked at least annually and after every major storm event (generally equal or greater to 3.0 inches in 24 hours) for displaced stones, slumping, and erosion at edges, especially downstream or downslope. If the riprap is damaged, it should be repaired before further damage can take place. Note and repair any erosion, stone displacement or low spots in the areas. Woody vegetation should be removed from the riprap annually.

5. Water Quality Unit (Proprietary Separator): Follow manufacturer's recommendations (attached).

6. Underground Infiltration Basins: Preventative maintenance after every major storm event during the first three (3) months of operation and at least twice per year thereafter. Inspect structure and pretreatment BMP to ensure proper operation after every major storm event (generally equal or greater to 3.0 inches in 24 hours) for the first three months. The outlet of the basin, if any, shall be inspected for erosion and sedimentation, and rip-rap shall be promptly repaired in the case of erosion. Sediment collecting in the bottom of the basin shall be inspected twice annually, and removal shall commence any time the sediment reaches a depth of six inches anywhere in the basin. Any sediment removed shall be disposed of in accordance with local, state, federal, and other applicable requirements.

7. Bioretention Areas: shall be inspected and cleared of trashed monthly; mowed 2 to 12 times per year; mulched annually; fertilized annually; dead vegetation removed annually; pruned annually; replace entire media and all vegetation as needed. Any sediment removed shall be disposed of in accordance with local, state, federal, and other applicable requirements.

All components of the stormwater system will be accessible by the owner or their assignee.

STORMWATER MANAGEMENT SYSTEM

POST-CONSTRUCTION INSPECTION REPORT

LOCATION:

C.R. Klewin
19, 29 & 39 Military Highway
Gales Ferry/Ledyard, CT

RESPONSIBLE PARTY:

TBD

NAME OF INSPECTOR:	INSPECTION DATE:
Note Condition of the Following (sediment depth, debris, standing water, damage, etc.):	
Catch Basins:	
Discharge Points/ Flared End Sections / Rip Rap:	
Underground Infiltration Basin:	
Water Quality Units:	
Other:	
Note Recommended Actions to be taken on the Following (sediment and/or debris removal, repairs, etc.):	

Catch Basins:
Discharge Points / Flared End Sections / Rip Rap:
Underground Infiltration Basin:
Water Quality Units:
Other:
Comments:

STORMWATER INSPECTION AND MAINTENANCE LOG FORM

C.R. Klewin
19, 29 & 39 Military Highway
Gales Ferry/Ledyard, CT

Stormwater Management Practice	Responsible Party	Date	Maintenance Activity Performed

April 2019

STORMTRAP MAINTENANCE MANUAL

1. Introduction

As with any Stormwater system regular inspections are recommended to ensure the long-term function of the system per design. As Stormwater migrates through the system, both sediment and debris could collect or settle within the system invert. Such events would prompt a regular inspection and or maintenance plan. Please call your Authorized StormTrap Representative (877-867-6872) if you have questions regarding the inspection and/or maintenance of the StormTrap system(s). Prior to entry into any underground storm sewer or underground detention systems, appropriate OSHA and local safety regulations and guidelines should be followed.

2. Inspection Schedules

StormTrap Stormwater Management Systems are recommended for inspection whenever the upstream and downstream catch basins and stormwater pipes of the stormwater collection system are inspected and/or maintained. This will economize the cost of the inspection if it is done at the same time the municipal crews are servicing the area.

During the first year of service, StormTrap recommends an accelerated inspection schedule to establish baseline levels of debris and/or sediment within the system. Inspections should be made after each significant rain event or runoff period. We also recommend a quarterly inspection in addition to the event-based inspections for the first 12 months. Based upon the results of the first year of inspections, a more appropriate schedule can be generated.

StormTrap Stormwater Management Systems for a private development are recommended for inspection after construction activities are complete and system is functioning per design and after each major storm water event. Until a cleaning schedule can be established, a quarterly inspection is recommended for the first 12 months. After the first 12 months, a

regular schedule can be implemented. If inspected on a biannual basis, the inspection should be conducted before the stormwater season begins to be sure that everything is functioning properly for the upcoming storm season. If inspected on an annual basis, the inspection should be conducted before the stormwater season begins to be sure that everything is functioning properly for the upcoming storm season.

3. Inspection Process

Inspections should be done such that at least 2-3 days has lapsed since the most recent rain event to allow for complete draining. Visually inspect the system at all manhole locations. Utilizing a sediment pole, measure and document the amount of silt at each manhole location (Figure 1). Inspect each pipe opening to ensure that the silt level or any foreign objects are not blocking the pipes. Be sure to inspect the outlet pipe(s) because this is typically the smallest pipe in the system. It is common that most of the larger materials will be collected upstream of the system in catch basins, and it is therefore important at time of inspections to check these structures for large trash or blockages.

Remove any blockages if you can during the inspection process only if you can do so safely from the top of the system without entering into the system**. Do not go into the system under any circumstances** without proper ventilation equipment and confined space training. Pass any information requiring action onto the appropriate maintenance personnel if you cannot remove the blockages from above during the inspection process. Be sure to describe the location of each manhole and the type of material that needs to be removed.

The sediment level of the system should also be measured and recorded during the inspection process. Recording the sediment level at each manhole is very important in order get a history of sediment that can be graphed over time (i.e. years) in order to estimate when the system will need to be maintained next. It is also important to keep these records to verify that the inspection process was actually performed if anyone asks for your records in the future. ***(Please see Appendix A for reference)***

The sediment level in the underground detention system can be determined from the outside of the system by opening up all the manholes and using a sediment pole to measure the

amount of sediment at each location. Force the stick to the bottom of the system and then remove it and measure the amount of sediment at that location. Again, do not enter into the system under any circumstances without proper ventilation equipment and training. Please see Appendix A for a sample inspection document.

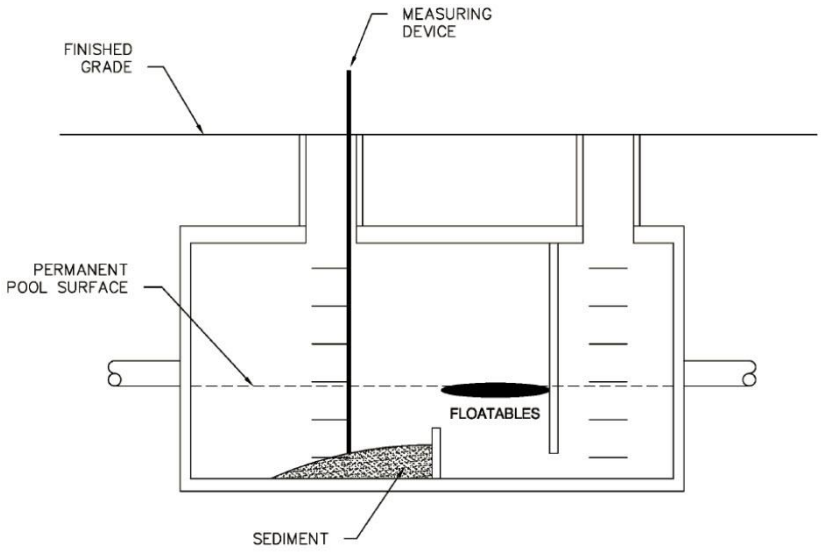


Figure 1. During inspection, measure the distance from finished grade to the top of the sediment inside the system.

4. When to Clean the System

Any blockages should be safely removed as soon as it is safely possible to ensure the StormTrap detention system will fill and drain properly before the next stormwater event.

The dry detention system should be completely cleaned whenever the sediment occupies more than 10% to 15% of the originally designed system's volume. A wet system (sometimes referred to as a wet vault) should be cleaned when the sediment occupies more than 30% or 1/3rd of the originally designed system's volume.

NOTE: Check with your municipality to ensure compliance with local guidelines regarding cleaning criteria, as the allowable sediment before cleaning may different that StormTrap's recommended ranges.

5. How to Clean the StormTrap

StormTrap systems should be completely cleaned back to 100% of the originally designed storage volume whenever the above sediment levels have been reached. Be sure to wait at least 3 days after a stormwater event to be sure that the system is completely drained (if it is a dry detention system), and all the sediments have settled to the bottom of the system (if it is a wet detention system).

There are many maintenance companies that can be contracted to clean your underground stormwater detention systems and water quality units. Please call your StormTrap representative for referrals in your area.

Product Specific Maintenance Recommendations

A. SingleTrap on a Concrete Slab

Maintenance is typically performed using a vacuum truck or jet-vac system. If headroom allows, sediment can be manually gathered near access openings and removed with suction. Shorter systems will require a mobile jet vac system that operates throughout the system to collect and remove sediment.

Sediment should be flushed towards a vacuum hose for thorough removal. For a dry system, remove the manhole cover at the top of the system and lower a vacuum hose into one of the rows of the StormTrap system. If present, open the manhole at the opposite end of the StormTrap and use sewer jetting equipment to force water in the same row from one end of the StormTrap row to the opposite side. The rows of the StormTrap are completely open in one contiguous channel from one end to the other for easy cleaning.

If the system was designed to maintain a permanent pool of water, floatables and any oil should be removed in a separate procedure prior to the removal of all sediment.

The floatable trash is removed first by using a bucket strainer to capture and remove any floating debris.

The floatable oils are then removed off the top of the water by using the vacuum truck to suck off any floatable fluids and liquids.

The next step is to use the vacuum truck to gently remove the clarified water above the sediment layer.

The final step is to clean the sediment for each row as described above. For smaller systems, the vacuum truck can remove all the sediment in the basin without using the sewer jetting equipment because of the smaller space.

B. SingleTrap on Stone

SingleTrap systems on a stone base require a similar cleaning process as a SingleTrap on a concrete slab. However, extra care needs to be taken to make sure the stone base retains levelness. If system headroom allows, manual raking of sediment a debris can be performed. Shorter systems may require jet vac equipment. Adjusting the pressure setting on the jet vac to ensure the stability of the stone base.

Sediment should be flushed towards a vacuum hose for thorough removal. Remove the manhole cover at the top of the system and lower a vacuum hose into one of the rows of the StormTrap system. Access the manhole at the opposite end of the StormTrap and use sewer jetting equipment to force water in the same row from one end of the StormTrap row to the opposite side. The rows of the StormTrap are completely open in one contiguous channel from one end to the other for easy cleaning.

C. DoubleTrap

A DoubleTrap system can be maintained in a similar fashion as a SingleTrap on a concrete slab. Typically, headroom is greater in DoubleTrap systems and access is easier for manual

gathering of sediment and debris. Again, maintenance is typically performed using a vacuum truck or jet-vac system. Sediment can be gathered near access openings and removed with suction. Alternately, a jet vac system that operates throughout the system can be used to remove sediment.

Sediment should be flushed towards a vacuum hose for thorough removal. For a dry system, remove the manhole cover at the top of the system and lower a vacuum hose into one of the rows of the StormTrap system. If present, open the manhole at the opposite end of the StormTrap and use sewer jetting equipment to force water in the same row from one end of the StormTrap row to the opposite side. The rows of the StormTrap are completely open in one contiguous channel from one end to the other for easy cleaning.

If the system was designed to maintain a permanent pool of water, floatables and any oil should be removed in a separate procedure prior to the removal of all sediment.

The floatable trash is removed first by using a bucket strainer to capture and remove any floating debris.

The floatable oils are then removed off the top of the water by using the vacuum truck to suck off any floatable fluids and liquids.

The next step is to use the vacuum truck to gently remove the clarified water above the sediment layer.

The final step is to clean the sediment for each row as described above. For smaller systems, the vacuum truck can remove all the sediment in the basin without using the sewer jetting equipment because of the smaller space.

D. ShallowTrap

A ShallowTrap system can be cleaned in a similar fashion as a Single Trap on a stone base. The headroom limitation will not allow for manual entry removal of sediment. Precautions will need to be taken to ensure the stone base retains levelness. Using a jet vac system to flush out the sediment is the recommended method.

Sediment should be flushed towards a vacuum hose for thorough removal. Remove the manhole cover at the top of the system and lower a vacuum hose into one of the rows of the ShallowTrap system. Access the manhole at the opposite end of the ShallowTrap and use sewer jetting equipment to force water in the same row from one end of the ShallowTrap row to the opposite side. The rows of the ShallowTrap are completely open in one contiguous channel from one end to the other for easy cleaning.

E. SiteSaver

Site Savers have 3 potential components that require maintenance and cleaning. Depending on the specifications of the system, trash nets, oil mats, and sediment removal will all need to be addressed.

Inspections should be done such that a enough time has lapsed since the most recent rain event to allow for a static water condition. Visually inspect the system at all manhole and access opening locations. For debris accumulation, visually inspect the netting or screening basket components (if utilized) to determine the bag or basket capacity. Nets or baskets containing only minor quantities of debris may be retained in place. It is recommended to replace the nets or clean the screening baskets when they appear 1/2 - 2/3 full. Failure to replace nets and/or remove floatables from bypass screening (if applicable) will lead to hydraulic relief, drain down deficiencies, and decrease the long-term functionality of the system.

For sediment accumulation, utilize either a sludge sampler or a sediment pole to measure and document the amount of sediment accumulation. To determine the amount of sediment in the system with a sludge sampler follow the manufacturer's instructions. If utilizing a sediment pole, first insert the pole to the top of the sediment layer and record the depth. Then, insert the pole to the bottom of the system and record the depth. The difference in the two measurements corresponds to the amount of sediment in the system. Finally, inspect the inlet pipe opening to ensure that the silt level or any foreign objects are not blocking the pipe.

Maintenance should be done utilizing proper personal protective equipment such as: safety glasses, hard-hat, gloves, first aid kit, etc. Maintenance should occur only when a sufficient

time has lapsed since the most recent rain event to allow for a static water condition for the duration of the maintenance process.
In the case that only trash and floatables need to be removed, and a netting configuration or a removable screening basket is utilized, a vacuum truck is not required. However, a vacuum truck is required if a fixed screening basket configuration is utilized. If the maintenance event is to include oil removal and or sediment removal a vacuum truck or similar equipment would be needed.

Install a new net assembly by sliding the netting frame down the support frame and ensure the netting lays over the plate assembly such that the netting is not restricted. To order additional disposable nets, contact your local SiteSaver representative. New nets come with tie wraps temporarily holding the net material to the frame component for easy handling and storage. It is not recommended to remove the tie wraps until the net is ready to be installed. The frame is tapered from top (widest part) to bottom, and is also tapered from front (towards the sewer) to back. Cut the tie wraps that secures the netting material to the frame for shipment and lower the net down the guide rails. If debris has accumulated in the net support frame, remove the objects so the new net seats fully in the channel when installed.
When lowering the net, the following details should be exercised when placing the net:

- Watch the lowering to make sure that there are no unexpected entanglements.
- Be careful not to let the toe of the net get caught under the frame when it reaches the bottom of the support frame. This is typically accomplished by holding the toe of the net until after the net has started to prop into place.
- Ensure the netting lays over the plate assembly such that the netting is not restricted.

Access to the netting chamber can be achieved via the square grated opening atop the Site Saver unit. Trash net needs to be removed completely (including the frame) with a service vehicle (crane/hoist/boom truck).

For sediment removal, the SiteSaver is designed with clear access at both the inlet and outlet. A vacuum truck, or similar trailer mounted equipment, can be used to remove the sediment, hydrocarbons, and water within the unit. For more effective removal, it is recommended to use sewer jetting equipment or a spray lance to force the sediment to the vacuum hose. When the floor is sufficiently cleaned, fill the system back to its normal water elevation (to the pipe inverts).

Complete a post maintenance inspection to ensure that all components have been replaced and are properly secured within the SiteSaver device. It is a good practice to take time stamped photographs after every maintenance event to include within maintenance logs. After verifying all components, secure the access openings and ensure proper disposal of all pollutants removed during maintenance per local, state, and federal guidelines.

Proof of inspections and maintenance is the responsibility of the owner. All inspection reports and data should be kept on site or at a location where they will be accessible for years in the future. Some municipalities require these inspection and cleaning reports to be forwarded to the proper governmental permitting agency on an annual basis. Refer to your local and national regulations for any additional maintenance requirements and schedules not contained herein. Inspections should be a part of the standard operating procedure. It is good practice to keep records of rainfall events between maintenance events and the weight of material removed, even if no report is required.

F. Sand Filter

Sand filter beds can crust over and become clogged or partially clogged, for this reason we recommend inspecting the sand filters at least annually. To remove this, the upper layer of clogged and / or hardened sand will need to be broken up with a steel rake or a similar device. After breaking up the top 2-5 inches of contaminated media, the lose sand can be scrapped off and removed via a vacuum truck. Replace and regrade the media with the approved material per the original design.

Various contractors specialize in this work. Maintenance methodologies range from manual replacement and removal to robotic devices that require no human entry into the system. Please consult to local maintenance contractors for additional information.

6. Inspection Reports

Proof of these inspections is the responsibility of the property owner. All inspection reports and data should be kept on site or at a location where they will be accessible for years in the future. Some municipalities require these inspection and cleaning reports to be forwarded to the proper governmental permitting agency on an annual basis.

Refer to your local and national regulations for any additional maintenance requirements and schedules not contained herein. Inspections should be a part of your standard operating procedure. Please see Appendix A for a sample Inspection and Maintenance form.

Appendix A

Sample inspection and maintenance log

Underground Detention System Inspection and Maintenance Checklist

Facility:			
Location/Address:			
Date:	**Time:**	**Weather Conditions:**	**Date of Last Inspection:**
Inspector:		**Title:**	
Rain in Last 48 Hours □ **Yes** □ **No**		**If yes, list amount and timing:**	
Pretreatment: □ **vegetated filter strip** □ **swale** □ **turf grass** □ **forebay** □ **other, specify:**			□ **none**
Site Plan or As-Built Plan Available: □ **Yes** □ **No**			

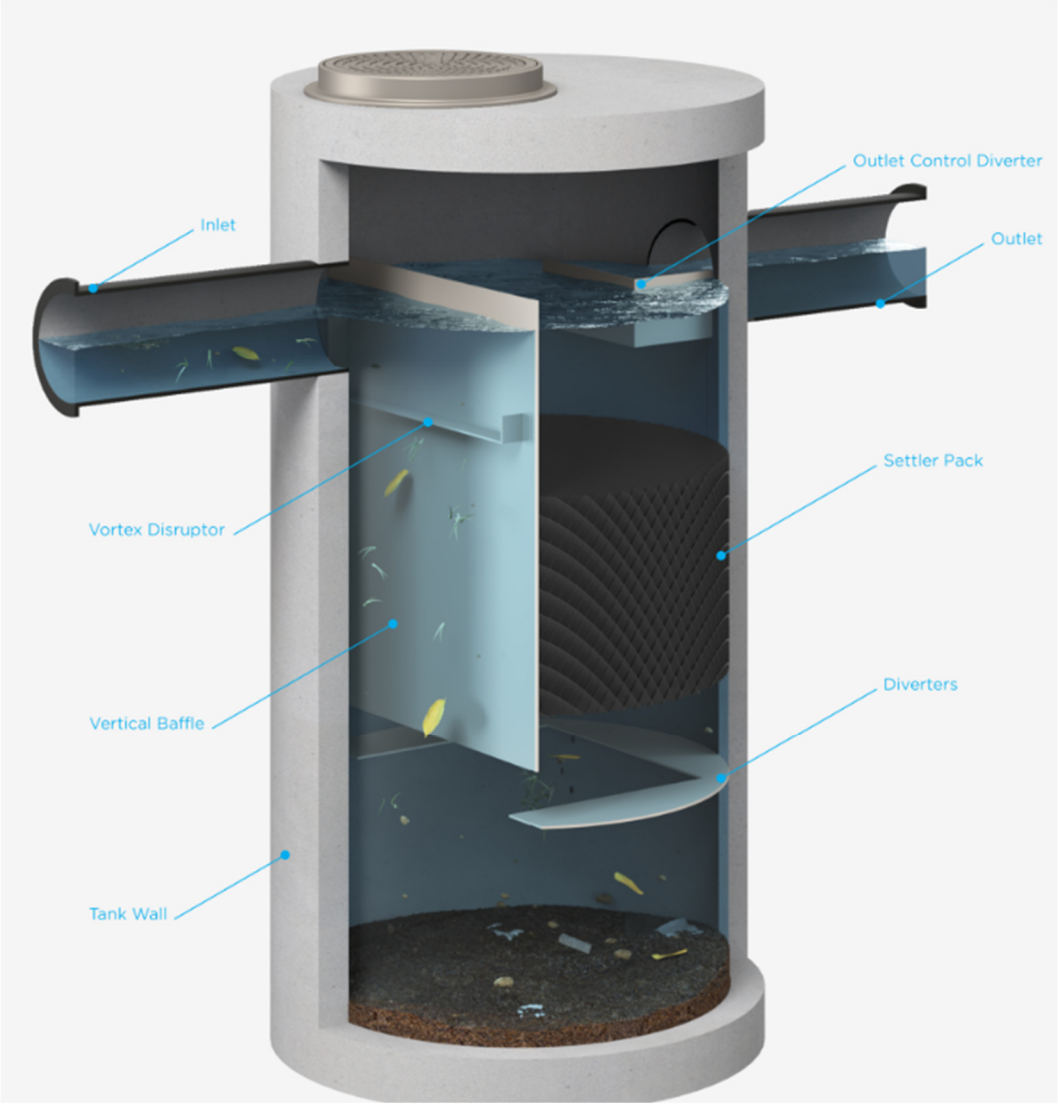
*Do not enter underground detention chambers to inspect system unless Occupational Safety & Health Administration (OSHA) regulations for confined space entry are followed.
*Follow inspection and maintenance instructions and schedules provided by system manufacturer and installer.
* Properly dispose of all wastes.

Inspection Item		Comment	Action Needed
1. PRETREATMENT			
Sediment has accumulated.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
Trash and debris have accumulated.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
2. INLETS			
Inlets are in poor structural condition.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
Sediment, trash, or debris have accumulated and/or is blocking the inlets.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
3. CHAMBERS			
Sediment accumulation threshold has been reached.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
Trash and debris have accumulated in chambers.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
4. OTHER SYSTEM COMPONENTS			
Structural deterioration is evident.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
5. OUTLETS			
Outlets in poor structural condition.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
Sediment, trash or debris are blocking outlets.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
Erosion is occurring around outlets.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
6. OTHER			
Evidence of ponding water on area draining to system.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
Evidence that water is not being conveyed through the system.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
Additional Notes			
Wet weather inspection needed □ **Yes** □ **No**			

StormTrap®

StormSettler®

StormSettler® Inspection and Maintenance Manual



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StormSettler® Manufacturer's Inspection and Maintenance Manual

The StormSettler treatment device, manufactured by StormTrap, is a hydrodynamic separating device designed to capture and store pollutants from stormwater. StormSettler's maintenance frequency is site dependent and routine inspections are recommended to ensure that the system is functioning as designed. Please contact your authorized StormTrap representative if you have questions regarding the inspection and maintenance of the StormSettler system.

Inspection Scheduling

StormSettler inspections are important to assess the condition of the system internals to ensure peak performance. The frequency of inspections and maintenance is dependent on site specific loading conditions and rainfall frequency. Within the first year of operation, it is recommended that the unit be inspected quarterly to determine the rate of pollutant accumulation in order to develop a more accurate maintenance schedule. Inspections should be performed during dry weather conditions when no flow is entering the system. StormSettler systems are recommended to be inspected whenever the upstream and downstream catch basins and stormwater pipes of the stormwater collection system are inspected or maintained. If checked on an annual basis, the inspection should be conducted before the stormwater season begins to ensure that the system is functioning properly for the upcoming storm season.

Inspection and Maintenance Equipment

The following equipment is recommended to have during inspections:

- StormSettler Inspection and Maintenance Manual and Inspection Checklist
- Flashlight

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- Manhole hook/lifter or pry bar to lift the manhole cover
- Measuring device(s) of sufficient length to reach the bottom of the device's sump
- Proper personal protective equipment
- Adequate traffic control signage
- Pole with skimmer or net (optional for maintenance procedure)
- Vacuum truck or similar trailer mounted equipment (for maintenance procedure)

Inspection Procedure

Inspections should be done such that a sufficient time has lapsed since the most recent rain event to allow for a static water condition and rainfall is not anticipated to occur during the duration of the inspection procedure. StormSettler does not require entry into the system for inspection or maintenance; however, if entering the system is deemed necessary, it is prudent to note that prior to entry into any underground storm sewer or underground structure, appropriate OSHA and local safety regulations and guidelines should be followed.

To begin the inspection process, set up the necessary traffic control signage per local ordinances. Open all manhole covers using appropriate equipment and ensure the manhole covers are in a location that would not prohibit the inspection process. Visually inspect the system at all manhole access opening locations. During the visual inspection, ensure that all components are in working order. An inspection checklist is provided within this guide for ease and reference.

If any components are not in working order, contact your authorized StormTrap representative.

After the components are inspected, visually quantify the accumulation of trash, debris, and hydrocarbons within the system by using a measuring device such as a tape measure, grade stick, dipstick, etc. Measure and record the depth of trash, debris, and hydrocarbon

accumulation from the static water elevation (pipe elevation) to the average elevation of the trash and debris.

If sorbent materials are used for retention of hydrocarbons, the level of discoloration of the sorbent material should also be noted during the inspection process.

For sediment accumulation, utilize either a sludge sampler or a sediment pole to measure and document the amount of sediment accumulation. To determine the amount of sediment in the system with a sludge sampler, follow the manufacturer's instructions. If utilizing a sediment pole or similar device, first insert the pole to the top of the sediment layer and record the depth. Then, insert the pole to the bottom of the system and record the depth. The difference in the two measurements corresponds to the amount of sediment in the system. Alternatively, sediment depth can also be determined by taking a measurement from a known and consistent elevation (manhole frame, pipe invert, vertical baffle top, etc.) to the top of the sediment layer. That distance can then be compared to the measurement between the known elevation to the sump floor. The difference between these two measurements will correspond to the sediment layer depth.

After completion of the inspection process, ensure that manhole covers are replaced and securely seated in the manhole frame and remove traffic control signage.

StormSettler units can also be installed with remote monitoring technology that measures the current capacities within the system and reports the data to any internet capable device. If a remote monitoring device is used, proper maintenance of the device, such as replacement of batteries, cleaning sensor, etc. needs to be completed to ensure functionality of the remote monitoring technology.

If it is determined during the inspection process that the accumulation of trash and debris or sediment is at or near the capacities of the StormSettler device, maintenance should be performed to ensure performance is not impacted for subsequent storm events.

Maintenance Procedure

Maintenance should be done such that a sufficient time has lapsed since the most recent rain event to allow for a static water condition and rainfall is not anticipated to occur during the duration of the maintenance procedure.

To begin the maintenance process, set up the necessary traffic control signage per local ordinances. Open all manhole covers using appropriate equipment and ensure the manhole covers are in a location that would not prohibit the maintenance process.

Visually inspect the system at all manhole access opening locations. During the visual inspection, ensure that all components are undamaged. If any components are not in working order, contact your authorized StormTrap representative.

After the components are inspected, remove all accumulated trash, debris, and hydrocarbons stored on the surface of the water using the vacuum hose or pole with attached skimmer or net.

If sorbent materials are used, the materials may have to be moved to not impact pollutant removal. If significant discoloration of the sorbent material has occurred, simply remove the sorbent materials and replace upon completion of maintenance activities.

To remove sediment, insert the vacuum truck's hose on the inlet side of the vertical baffle into the sump. The system should be completely drained, and all sediment should be removed from the sump. For smaller diameter devices (3' or 4' units), a 6" or smaller vacuum hose diameter may be required for effective cleaning due to maneuverability constraints. If the vacuum truck that is being utilized has a hose diameter greater than 6", a smaller tube can be affixed to the boom hose with duct tape to improve maneuverability within the device.

If excessive sediment or debris buildup occurs within the device, components can be washed with sewer jetting equipment or a spray lance to remove stubborn materials. Particular

attention must be taken when spraying the settler pack. A wide spray nozzle is recommended around the settler pack to ensure there is no damage to the material.

After completion of the maintenance procedure, complete a post maintenance inspection to ensure that all components are in good condition. Ensure that manhole covers are replaced and securely seated in the manhole frame and remove traffic control signage. Dispose of all pollutants removed during maintenance per local, state, and federal guidelines and regulations.

Inspection and Maintenance Documentation

Proof of inspections and maintenance activities is the responsibility of the owner. All inspection and maintenance reports and any relevant data should be kept on site or at a location where they will be accessible in accordance with local requirements. It is a good practice to take time stamped photographs after every inspection and maintenance event to include within logs. It is also good practice to keep records of rainfall events between maintenance events and the weight of material removed, even if no report is required. Some municipalities may require inspection and maintenance reports be forwarded to the proper governmental permitting agency on an annual basis. Refer to your local regulations and ordinances for any additional maintenance requirements and schedules not contained herein. Inspections and maintenance activities should be performed to ensure performance is not impacted and the device performs as designed.

Inspection Items

- StormSettler Maintenance Manual and Inspection Checklist
- Flashlight
- Manhole hook/lifter or pry bar to lift the manhole cover
- Measuring device(s) of sufficient length to reach the bottom of the device's sump
- Proper personal protective equipment
- Adequate traffic control signage

Maintenance Items

- StormSettler Maintenance Manual and Inspection Checklist
- Flashlight
- Manhole hook/lifter or pry bar to lift the manhole cover
- Measuring device(s) of sufficient length to reach the bottom of the device's sump
- Proper personal protective equipment
- Adequate traffic control signage
- Pole with skimmer or net (optional for maintenance procedure)
- Vacuum truck or similar trailer mounted equipment (for maintenance procedure)

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StormTrap

StormSettler Inspection Checklist

Structure ID:		
Location/Address:		
Inspector Name:		Inspector Contact Information:
Date:	Time:	Weather Conditions:
Rain in the Last 48hrs:		If yes, list amount and timing:

*Do not enter underground chambers to inspect system unless Occupational Safety & Health Administration (OSHA) regulations for confined space entry are followed.
*Follow inspection and maintenance instructions provided by system manufacturer.
*Please circle the condition of each inspection item below. 1 being the worst and 5 being the best condition.

Inspection Item	Condition					Comment	Action Needed	
1.) Frames and Covers								
Accumulation of debris and/or sediment	1	2	3	4	5		Yes	No
Component(s) structural condition	1	2	3	4	5		Yes	No
2.) Inlet Pipe(s)								
Accumulation of debris and/or sediment	1	2	3	4	5		Yes	No
Component(s) structural condition	1	2	3	4	5		Yes	No
3.) Vortex Disruptor								
Accumulation of debris and/or sediment	1	2	3	4	5		Yes	No
Component(s) structural condition	1	2	3	4	5		Yes	No
4.) Verticle Baffle								
Accumulation of debris and/or sediment	1	2	3	4	5		Yes	No
Component(s) structural condition	1	2	3	4	5		Yes	No
5.) Enhanced Settling Pack								
Accumulation of debris and/or sediment	1	2	3	4	5		Yes	No
Component(s) structural condition	1	2	3	4	5		Yes	No
6.) Flow Modifiers								
Accumulation of debris and/or sediment	1	2	3	4	5		Yes	No
Component(s) structural condition	1	2	3	4	5		Yes	No

7.) Outlet Control Diverter								
Excessive accumulation of debris and/or sediment present	1	2	3	4	5		Yes	No
Component(s) structurally sound	1	2	3	4	5		Yes	No
8.) Outlet Pipe								
Accumulation of debris and/or sediment	1	2	3	4	5		Yes	No
Component(s) structurally sound	1	2	3	4	5		Yes	No
9.) Concrete Chamber								
Component(s) structural condition	1	2	3	4	5		Yes	No
10.) Sediment Storage Capacity								
Sediment storage capacity	1	2	3	4	5		Yes	No
Additional Notes:								
Wet Weather Inspection Needed:			Yes	No				
Maintenance Activities Needed:			Yes	No				