7 January 2025

Jonathan Mullen
Planning Director
Town of Waterford
15 Rope Ferry Road
Waterford, CT 06385

RE: Stormwater Management Report
Oswegatchie Fire Station
441 Boston Post Road
Waterford, Connecticut
Langan Project No.: 140286501

Dear Mr. Mullen,

This report provides an analysis of the proposed peak runoff discharges and the engineering design for the proposed stormwater conveyance system at 441 Boston Post Road.

PROJECT DESPCRIPTION

Existing Conditions

The project site is located at 441 Boston Post Road in Waterford CT; see Figure 1. The overall approximately 2.0-acre parcel is currently occupied by the existing Oswegatchie Fire Station, including impervious and grass areas. The parcel is located within the Niantic River sub regional drainage basin. The parcel area does not contain any known locations of State and Federal Listed Species and Critical Habitats per the CT Natural Diversity Data Base Areas map of Waterford, CT dated June 2024. The project site is located on the western part of the parcel within the limits of the existing fire station site. To the west the project site is bordered by a garden shop. To the south, the project site is bordered by Boston Post Road. To the east the project site is bordered by residential properties on Boston Post Road. To the north the site is bordered by lightly wooded wetland areas. The existing project site is mostly impervious areas with the majority of stormwater running overland towards the wetlands in the north.

Based upon a topographic survey prepared by Langan, dated June 28, 2024, the site grades slope downward from the southern corner of the property towards the northern property line, with elevations ranging from approximately 35 feet to about 30 feet.

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Study of the town of Waterford, Connecticut map number 09011C0481J with an effective date of August 5, 2013, the proposed development is located within Zone X (Unshaded). Zone X (Unshaded) is considered a Low-Risk Area and described by FEMA as areas outside the 0.2-percent-annual-chance chance flood. No base flood elevations or base flood depths are shown within these zones.

According to the USDA Natural Resources Conservation Service Web Soil Survey, the site's soil type varies throughout. The site is mostly classified as Hinckley Loamy Sand with an A hydrologic rating and slopes between 3 and 15 percent. Additionally, the eastern corner of the site is classified as Walpole Sandy Loam with a D hydrologic rating and slopes between 0 and 3 percent.

There are wetland areas to the east and north of the site. While some of the site work is proposed within the 100-foot upland review area, no direct wetland impacts are proposed.

Proposed Project

The proposed project consists of the demolition of the existing fire station and the construction of a new fire station building with new landscaped areas, driveways, and parking areas. Additional improvements include new stormwater and utility infrastructure. A summary of the change in impervious is shown below.

Project Site Impervious Cover [SF]

Existing Conditions	Proposed Conditions	Net Decrease
±52,200	±31,500	±20,700

The proposed stormwater system has been designed to maintain existing site hydrology to the maximum extent practicable. The majority of runoff from the new development will be conveyed to various stormwater management systems before discharging to either the existing stormwater network in Boston Post Road or overland towards the existing offsite wetlands. Water quality improvements include yard drains with sumps, a pretreatment swale and a rain garden. These water quality improvements have been designed to retain 100% of the proposed project's water quality volume onsite. This achieves the average annual pollutant load reduction requirements as per the recommendations of the 2024 CT Stormwater Quality Manual.

Details of the size and location of the stormwater network can be found on the Grading &

Drainage Plans, detail sheets and supporting calculations in the appendices of this report.

PEAK RUNOFF ANALYSIS (See Appendices A & B)

The stormwater management system is designed to control the rate of runoff from the site's watersheds to be equal or less than existing conditions up to, and including, a 100-year design storm event.

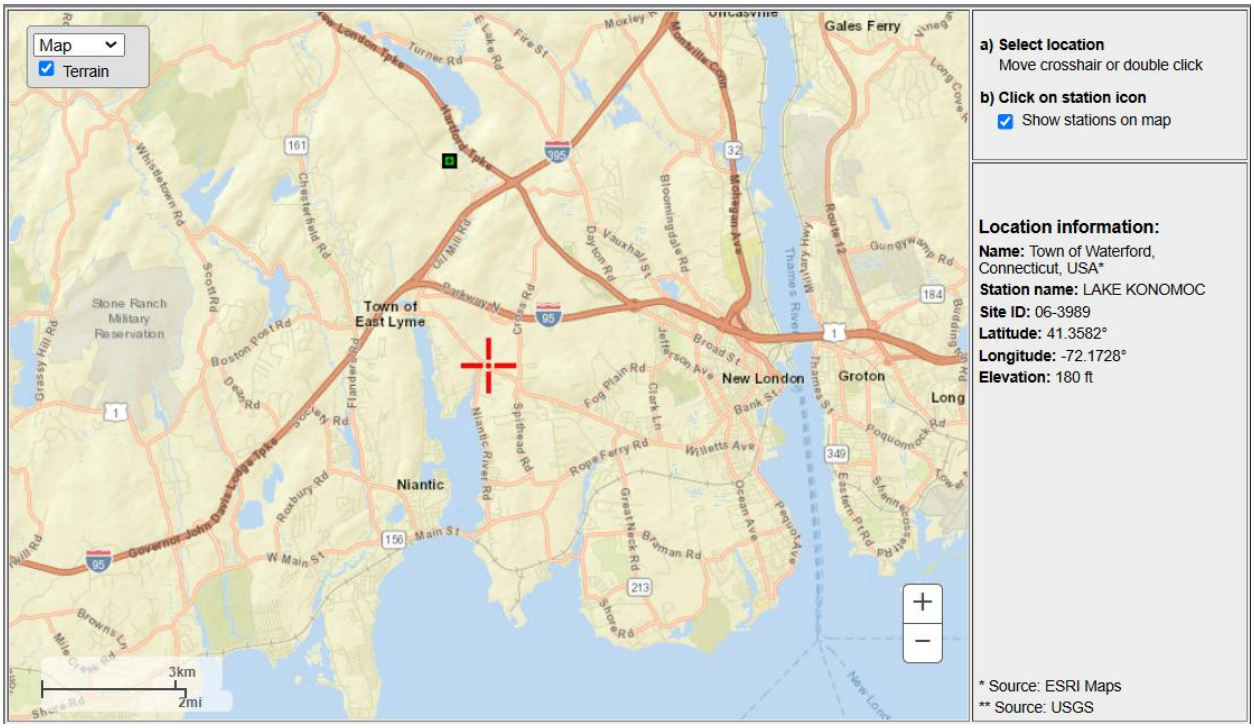
The peak runoff discharges for the existing and proposed conditions were analyzed using Soil Conservation Service (SCS) methodology which outlines procedures for calculating peak rates of runoff resulting from precipitation events as well as procedures for developing runoff hydrographs. The entire site was included in the analysis; see Figures EXWS and PRWS. Values for area, curve number (CN), and a time of concentration were calculated for the existing and proposed conditions.

The curve number is a land sensitive coefficient that dictates the relationship between total rainfall depth and direct storm runoff. The soils within the watershed are divided into hydrologic soil groups (A, B, C, and D). The SCS classification system evaluates the runoff potential of a soil according to its infiltration and transmission rates. "A" soils have the lowest runoff potential, while "D" soils have the greatest runoff potential.

The time of concentration (Tc) is defined as the time for runoff to travel from the hydraulically most distant point in the watershed to a point of interest. Values of time of concentration were determined for existing and proposed conditions based on land cover and slope of the flow path using methods outlined in TR-55.

For this study, a 24-hour SCS Type III standard rainfall distribution was used to determine the peak flow rate and volume to all points of discharge from the site. Precipitation data used for the various storm events is based on the "NOAA Atlas 14 Point Precipitation Frequency Estimates: CT" for Lake Konomoc Station. Lake Konomoc Station was chosen for rainfall data because it is the station located within the closest proximity of the project location as shown in Graphic 1. A summary of all rainfall data utilized in the analysis for this site is provided below and a complete compilation of data provided by NOAA for this location is included in Appendix C.

Graphic 1. NOAA Rainfall Data Location Map



NOAA Precipitation Depth per Average Recurrence Interval [in]

Duration	2-Year	10-Year	25-Year	100-Year
24-hour	3.45	5.13	6.17	7.79

Existing Condition (See Appendix A)

The project area's existing drainage conditions were analyzed as Watersheds A, B, and C (See Drawing EXWS).

Existing Watershed A is approximately 0.26 acres and comprises grassy areas, driveway aprons onto the site and the southwestern portion of the existing building. Stormwater runoff from this watershed either flows into the existing storm drainage network or overland and offsite towards Boston Post Road.

Existing Watershed B is approximately 0.08 acres and consists of grass and brush areas at the east of the site. Stormwater runoff from this watershed flows overland to the wetlands #2 to the east of the site.

Existing Watershed C is about 1.27 acres and consists of the existing building and parking areas along with grassy and brush areas. Stormwater runoff from this watershed flows overland to the wetlands #1 offsite to the north.

Proposed Condition (See Appendix B)

In the proposed condition, site hydrology attempts to mimic existing conditions and all watershed outlets remain the same.

Proposed Watershed A is about 0.37 acres and consists of grassy areas and the proposed driveway aprons. Stormwater will continue to flow overland to Boston Post Road. The proposed site within this watershed has been designed to significantly reduce impervious area as compared with the existing condition.

Proposed Watershed B is about 0.09 acres and includes grass and brush areas to the east of the site. This watershed will remain generally unchanged, and stormwater collected within this watershed will flow overland to the wetlands #2 offside to the east.

Proposed Watershed C is divided into two sub-watersheds: Sub-watershed C1 and Sub-watershed C2. Sub-watershed C1 is about 1.04 acres and consists of the proposed building and parking areas along with grassy areas; stormwater within this watershed will flow either through a pretreatment swale conveyance feature or directly into a rain garden before flowing to the wetlands #2 offsite to the north. Sub-watershed C2 is about 0.12 acres and consists of grassy and brush areas; stormwater within this watershed will continue to flow overland to the wetlands #2 offsite to the north.

Details of the sizes and locations of the stormwater collection systems can be found on drawings CG101. A conservative design infiltration rate for the rain garden is 1 inch per hour. The design infiltration rate will be confirmed with on-site testing prior to construction. Please refer to Appendix F for boring log data within the vicinity of the proposed rain garden. This testing was performed by Barton & Loguidice as a part of a Limited Phase II Environmental Site Assessment report, dated 08/27/2024. According to the boring log data, groundwater was encountered between 6’ and 13’ below existing grade, and existing site soils within the rain gardens consist of a mainly sandy material.

Site Discharge Peak Flow Comparison for WS-A (CF)

Storm	Current	Proposed	Delta	% Reduction
2-Year	0.37	0.09	-0.28	75.68%
10-Year	0.77	0.44	-0.33	42.86%
25-Year	1.04	0.71	-0.33	31.73%
100-Year	1.46	1.20	-0.26	17.81%

Site Discharge Peak Flow Comparison for WS-B (CF)

Storm	Current	Proposed	Delta	% Reduction
2-Year	0.02	0.01	-0.01	50.00%
10-Year	0.09	0.09	0.00	0.00%
25-Year	0.15	0.19	0.00	0.00%
100-Year	0.26	0.26	0.00	0.00%

Site Discharge Peak Flow Comparison for WS-C (CF)

Storm	Current	Proposed	Delta	% Reduction
2-Year	3.77	0.32	-3.45	91.51%
10-Year	5.91	2.04	-3.87	65.48%
25-Year	7.22	3.73	-3.49	48.34%
100-Year	9.24	5.62	-3.62	39.18%

Site Discharge Peak Flow Comparison for Total Site (CF)

Storm	Current	Proposed	Delta	% Reduction
2-Year	4.15	0.38	-3.77	90.84%
10-Year	6.76	2.39	-4.37	64.65%
25-Year	8.39	4.44	-3.95	47.08%
100-Year	10.95	6.93	-4.02	36.71%

As can be seen from the tables above, runoff from each watershed and the total site will be attenuated for the storms up to and including the 100-year storm. Additionally, per the 2024 CT Stormwater Quality Manual requirements, runoff from each watershed that includes proposed site development will be attenuated by 50% for the 2-year storm event.

STORMWATER CONVEYANCE SYSTEM (See Appendix D)

The stormwater conveyance system was sized using the Rational Method for the 10-year storm event as per the CTDEEP Stormwater Quality Manual. Values for area, runoff coefficient, C, and

a time of concentration were calculated for each drainage area. The average runoff coefficient was calculated based upon the following cover types:

Cover	C
Grass/Pervious	0.3
Roof/Pavement/Impervious	0.9

Rainfall intensities were taken from the "NOAA Atlas 14 Point Precipitation Frequency Estimates: CT" for Lake Konomoc. Stormwater pipes were then sized based upon the Manning's Equation for full flow pipe capacity and solving for the hydraulic grade line. The computer program Hydraflow Storm Sewers 2011 by Intellisolve was used in the analysis.

Each proposed storm sewer system has been analyzed sing a starting HGL elevation equal to the outlet pipe's crown elevation. This mimics a tailwater elevation equal to the outlet pipe's diameter or a scenario where a proposed pipe is entering an existing pipe flow at full capacity.

STORMWATER QUALITY (See Appendix E)

The proposed stormwater management system has been designed to incorporate stormwater quality measures including a significant decrease in site imperviousness, yard drains with sumps, a pretreatment swale conveyance feature, and a rain garden. These measures will be implemented to increase water quality and minimize the passage of pollutants to the existing stormwater systems as compared to current conditions.

Under current conditions, the entirety of the site impervious cover (±52,200 SF) is considered directly connected impervious area (DCIA). This project proposes to decrease DCIA by over 90%, which will decrease surface runoff and increase infiltration of rainfall into the soil.

Per Table 4.1 of the CT Stormwater Quality Manual, the site is considered a redevelopment with existing DCIA of 40% or more. As such, the Required Retention Volume (RRV) is 50% of the site's Water Quality Volume (WQV). Through coordination with the town of Waterford Environmental Planner, this project occurs within the Stony Brook watershed area. Stormwater discharge from the site contributes to an intermittent watercourse and wetland system located north of the parcel. The receiving portion of Stony Brook south of Route 1 has been designated as an impaired waterbody by CTDEEP. Because of this information, the stormwater system has

been designed to retain 100% of the site WQV and exceed the RRV requirements for our redevelopment site.

Table 4.3 of the CT Stormwater Quality Manual shows the minimum average annual pollutant load reductions for Total Suspended Solids (TSS), Total Phosphorus (TP) and Total Nitrogen (TN). Per the manual, "a proposed stormwater management system meets or exceeds these average pollutant load reductions when the RRV is retained on-site using suitable stormwater retention practices. Achieving these minimum required load reductions for sediment and nutrients is assumed to provide adequate reductions of other stormwater pollutants including floatable materials." Through the use of the proposed rain garden, the stormwater system designed exceeds our RRV and will retain 100% of the WQV, thereby also exceeding the required average annual pollutant load reductions.

CONCLUSION

The proposed stormwater management system has been designed in general accordance with the 2024 CTDEEP Stormwater Quality Manual and the 2000 CTDOT Drainage Manual. It has been designed to maintain existing site hydrology to the maximum extent practicable with attenuated peak flows and multiple water quality improvements.

This Langan report shows that the proposed stormwater management system, as designed, will effectively manage quality and quantity of stormwater runoff for the proposed development. Please refer to the Drawings for additional drainage information.

Sincerely,
Langan CT, Inc.

Brian Phillips, P.E.
Senior Project Manager