Coastal ENGINEERING & SURVEYING, INC.

8179 Caratoke Highway, Powells Point NC

Stormwater Narrative, Application and Calculations

(Existing NCDEQ Permit SW7050838 Included)

05/02/2025

CE&S Project: P1121.24

Coastal Roofing and Siding

Phase 2

Prepared by:

E.J. Gwin, PE

05/02/2025

Narrative

Project Description

The second and final phase of the overall project will consist of a single metal building and associated parking, sidewalks and drainage devices for a total of 11,489 sq. ft. of additional built upon area. Approximately 0.5 acres will be disturbed during construction. The total site is 1.92 acres. Current use consists of Contractor Services and the proposed development to the site with remain as Contractor Services. The site is located in Powell's Point, Currituck County, North Carolina. There is an existing stormwater pond on the site, which will capture runoff from all existing and proposed impervious surfaces.

Site Description and Existing Conditions

The site currently consists of a single metal building with associated parking, sidewalks and drainage devices. The proposed metal building will be very similar in size and design as the existing structure. Current coverage on the site is 24,916 sq. ft. or 29.7%. Proposed Phase 2 will have a total increase of 13.7% bringing the new coverage total to 36,405 sq. ft. or 43.4%. Existing slopes range from 1 – 25% but are generally within 1-3% in the developed portion. 3:1 slopes are at the north end of the phase 2 building.

Stormwater Management and Existing NCDEQ Permit

There is an existing NCDEQ Stormwater Permit for the site under NCDEQ Permit: SW7050838. This permit was issued October 17, 2005 and is currently expired. It is the intent of the owner to complete the stormwater repairs, as shown on the attached site plan, during the construction the new building and parking. Upon completion of the stormwater pond repairs, Coastal Engineering & Surveying (CE&S) will certify the basin's repairs and NCDEQ will re-issue the permit. The existing NCDEQ stormwater permit includes the future development and the permit is for up to 40,685 sq. ft. of total impervious surfaces. After the current proposed development the site will have a total impervious surface of 36,405 sq. ft. The project thus remains substantially compliant within the conditions of the existing NCDEQ stormwater permit. NCDEQ Permit SW7050838 and the approved plans are attached to this package for your convenience.

Currituck County Stormwater Rationale

Due to the existing NCDEQ Stormwater Permit and because the proposed conditions remain compliant with that permit, it is our understanding that a Currituck County Stormwater Permit is not required per the Currituck County Stormwater Manual item 2.2.3 B, which states that improvements or additions to lots with an approved state stormwater permit, which do not exceed the allowable coverage, are exempt from the county stormwater plan requirements. Regardless of the interpretation of the county rules, CE&S has still completed the county's stormwater application materials. Please find attached SW-002 and SW-003. The following pages summarize the Rational Method Peak Flow Calculations and the Currituck County Simple BMP Volume Calculations for Small Sites.

Currituck County Simple Volume Calculation for Small Sites

See also attached SW-003

Rational Method to Calculate Pre- and Post- Development Peak Flows

1. Total Drainage Area: 1.92 Ac
2. Runoff Coefficient, C, for Pre-Development wooded Conditions : 0.2
   *From Table 2-2, Currituck County Stormwater Manual
3. Time of Concentration, T_c
   a. Pre-Development T_c
   *Assume only sheet flow in Pre-Development Conditions

Sheet Flow

$$T_{C1} = \frac{0.42(nL)^{0.8}}{P^{0.5}S^{0.4}}$$

Where:
T_{C1} = time of concentration of sheet flow in minutes
n = Manning's roughness coefficient (see Table 2-4: Manning's Roughness Coefficients)
P = 4.0 inches (rainfall depth for the 2-yr, 24-hr design storm)
S = slope of hydraulic grade line (feet/feet), usually taken as the land slope
L = length of sheet flow (less than 300 feet)

	Pre-
Sheet Flow	
Manning's roughness, n (Table 2-4)	0.1
2-year, 24-hour Rainfall, P	4.0
Slope, S	0.023
Length of Sheet Flow, L (<=300 feet)	215
Total Time for Sheet Flow	11.05

Pre-Development Total Time of Concentration, T_c = 11.05 minutes

b. Post Development, T_c

*Post Development T_c Segmental Method Route is: Sheet flow ->12" HDPE ->15" HDPE -> 18" HDPE

Sheet Flow

$$T_{C1} = \frac{0.42(nL)^{0.8}}{P^{0.5}S^{0.4}}$$

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n = Manning's roughness coefficient (see Table 2-4: Manning's Roughness Coefficients)
P = 4.0 inches (rainfall depth for the 2-yr, 24-hr design storm)
S = slope of hydraulic grade line (feet/feet), usually taken as the land slope
L = length of sheet flow (less than 300 feet)

		Post-	
Sheet Flow			
Manning's roughness, n (Table 2-4)		0.035	
2-year, 24-hour Rainfall, P		6.0	in
Slope, S		0.016	ft/ft
Length of Sheet Flow, L (<=300 feet)		99	ft
Total Time for Sheet Flow		2.42	**min**

Post-Development Sheet Flow Time of Concentration, T_{c1} = 2.42 minutes

Channel Flow

$$R = \frac{A}{W_p}$$

Where:

R = hydraulic radius in feet
A = cross sectional area of channel in square feet
W = wetted perimeter in feet

$$V = 1.49\,\frac{R^{0.67}S^{0.5}}{n}$$

Where:

V = channel velocity in feet per second
R = hydraulic radius in feet
S = slope of hydraulic grade line
n = Manning's roughness coefficient (see Table 2-4: Manning's Roughness Coefficients)

$$T_{C3} = \frac{L}{60V}$$

Where:

T_{C3} = time of concentration of channel flow in minutes
L = length of shallow concentrated flow in feet
V = channel flow velocity in feet per minute

Pipe (P) or Channel (C)		P		P	P
If pipe: Diameter, D		12	in	15	18
If channel: Bottom Width, w			ft		
If channel: side slope 1 (___:1)					
If channel: side slope 2 (___:1)					
Cross sectional flow area, A		0.79	sq ft	1.23	1.77
Wetted perimeter, Wp		3.14	ft	3.93	4.71
Hydraulic radius, R = A/Wp		0.25	ft	0.31	0.38
Channel slope, S		0.005	ft/ft	0.0005	0.009
Manning's roughness, n (Table 2-4)		0.012		0.012	0.012
Channel velocity		3.47	ft/sec	1.27	6.16
Length of Flow, L		139	ft/~~sec~~	86	36
Total Time for Channel Flow		0.67	**min**	1.13	0.097

12" HDPE

R= $\frac{0.79}{3.14}$ = 0.25 ft

V=1.49 $*$ $\frac{(0.25^{.67})(0.005^{.5})}{0.012}$ = 3.47 ft/sec

$T_{c2} = \frac{139}{60*3.47}$ = 0.67 minutes

T_{c2} = 0.67 minutes

15" HDPE

R= $\frac{1.23}{3.93}$ = 0.31 ft

V=1.49 $*$ $\frac{(0.31^{.67})(0.0005^{.5})}{0.012}$ = 1.27 ft/sec

$T_{c3} = \frac{86}{60*1.27}$ = 1.13 minutes

T_{c3} = 1.13 minutes

18" HDPE

R= $\frac{1.77}{4.71}$ = 0.38 ft

V=$1.49 * \frac{(0.38^{.67})(0.009^{.5})}{0.012}$ = 6.16 ft/sec

$T_{c4} = \frac{36}{60*6.16}$ = 0.097 minutes

T_{c4} = 0.097 minutes

Post-Development Total Time of Concentration, $T_{c-post} = T_{c1} + T_{c2} + T_{c3} + T_{c4}$

2.42+0.67+1.13+0.097 = 4.32

Post-Development Total Time of Concentration, T_{c-post} = 4.32 minutes

4. Peak Rainfall Intensities
    a. Pre-Development 2-year, 24-hour Storm, T_c = 10 minutes: i = 4.84 in/hr
    b. Post-Development 5-year, 24-hour Storm, T_c = 5 minutes: i = 6.82 in/hr

5. Peak Discharge, Q

Q=CiA

    a. Pre-Development Q = 0.2 * 4.84 * 1.92

Q_{pre}= 1.86 cfs

6. Post-Development Weighted runoff coefficient, C

$$C_W = \frac{\sum(A * C)}{\sum A}$$

Where:
C_W = weighted runoff coefficient
A = area in acres
C = runoff coefficient

Post-development Conditions			
Land Use Description	C	Area (acres)	C*A
Impervious Area	.95	0.93	0.88
Open Space	.25	0.99	0.25
Totals		1.92	1.13

Area-weighted C: 0.59

Post-Development Weighted Runoff Coefficient, C = 0.59

Peak Discharge, Q

Q=CiA

Post-Development Q = 0.59 * 6.82 * 1.92

$$Q_{post} = 7.73 \text{ cfs}$$

Simple Volume Calculations for Small Sites

Depth of Runoff

$$Q = \frac{(P - 0.2S)^2}{(P + 0.8S)}$$

Where:

Q = runoff depth in inches

P = rainfall depth for the pre-development design storm (see Table 2-7)

$S = \frac{1000}{CN} - 10$

CN = curve number for wooded condition (see Table 2-6)

Table 2-7: Depth of Precipitation for Required Design Storms

Design Storm	Inches of Rainfall
2-YR, 24-HR	4.0
5-YR, 24-HR	5.0

Pre-Construction Runoff Depth

Wooded Conditions, Hydrological Soil Group A: CN=30

$S=\frac{1000}{30}-10$ => S=23.3

$Q_{2-pre}=\frac{(4-(0.2(23.3)))^2}{(4+(0.8(23.3)))}$ = 0.019 in

Post-Construction Runoff Depth

Commercial, Hydrological Soil Group A: CN = 89

$S=\frac{1000}{89}-10$ => S=1.24

$Q_{5-post}=\frac{(5-(0.2(1.24)))^2}{(5+(0.8(1.24)))}$ = 3.77 in

Runoff Volume

$$V_r=\frac{Q}{12}*A$$

$V_r=\frac{3.77}{12}$ * 1.92 => 0.6032 acre-ft

V_s, Storage Volume Required for Major Stormwater Plans

$$V_s=1613.33*V_r*\left(1-\frac{Q_{2-pre}}{Q_{5-post}}\right)$$

V_s= 1613.33 * (0.6032) * (1-$\frac{1.86}{7.73}$) = 739 cu. yds => 19,953 cu. ft.

V_s = 19,953 cu. ft. = Required Storage Volume

Post-Development Total BMP Volume Provided after Repairs = 23,119 cu. ft.

Total BMP Volume include Swale Volumes which would be used as temporary storage during large storm events.

ALBEMARLE REGIONAL HEALTH SERVICES

419391

Applicant:
EJ Gwin Coastal Engineering & Surveying Inc
PO Box 1129
Kill Devil Hills, NC 27949

Owner:
Frasca Holdings LLC
2401 Colington Rd
Kill Devil Hills, NC 27948

Site Location:
8181 Caratoke Hwy
Powells Point, NC 27966

GPD: 400	**LTAR:** 0.600	**Classification:**

If unsuitable, the site may be reclassified to provisionally suitable with the following modification(s):

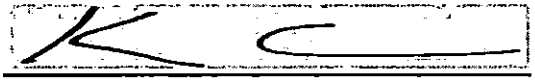
* Fill Area 77 ft. by 52 ft. with 18 in. of Sand
* Other: Fill area is based on 4 lines, 54' long, 9' on-center

To obtain an Authorization to Construct:

* Submit a plat or scale drawing of the lot, showing location and dimensions of all property lines, proposed structures and driveways
* Pay permit fee of $420

Comments:

**Building to be designed for 400gpd (4 units @ 100gpd/unit). North side of proposed septic area 20-25' from property is considered unsuitable due to seasonal soil wetness and possible wetlands. Septic system and 100% repair area is to be entirely out of unsuitable area. Septic system and repair area to be designed by NC Licensed Surveyor or NC Professional Engineer. Site plan is to include septic fill area with toe slope greater than 10' to property line and cannot be in unsuitable soils.

EHS: 

Carver, Kevin

Date: 10/15/2024

THIS APPROVAL WILL BECOME VOID AFTER 12 MONTHS AND A NEW APPLICATION WILL BE NECESSARY.