



*Northeast
Civil
Solutions, Inc.*

381 Payne Road
Scarborough, Maine 04074
(800) 882-2227/ (207) 883-1000
FAX: (207) 883-1001

Memorandum

TO: Town of Manchester, Maine

FROM: Travis Letellier, P.E.

DATE: February 29, 2016

RE: **Drainage Analysis – Dollar General**

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Northeast Civil Solutions, INC. (NCS) has completed a drainage analysis of a proposed Dollar General Retail Store development located at 1034 Western Avenue, in Manchester, Maine.

Site Layout

The existing site consists of a relatively flat front section with a drainage swale along the easterly property line. The rear and east side of the property drops sharply and is largely undevelopable due to the severe elevation change. The placement of the building takes full advantage of the filled level section in the front site, however due to the standard building length, parking stalls and extended aisle width a small retaining wall will be required to avoid disturbance too close to the stream. The layout of the building will preserve the natural drainage paths of the site.

38 parking spaces will be provided for the development, two of which will be designed per ADA accessible parking standards. The proposed driveway will include one entrance and one exit lane and will be a total of 36 feet in width, easily handling the anticipated average daily and peak hourly traffic demands. The parking aisle and entrance is designed wider than needed to accommodate a WB-67 delivery truck without impacting any parking stalls.

Construction will disturb 63,270 sf (1.45 ac) and will result in 34,054sf (0.78 ac) of impervious area and 19,000 sf (0.44 ac) of landscaped area.

Study Methodology

In this study, the Soil Conservation Services Urban Hydrology for Small watersheds, Technical Release 20 (also known as SCS-TR20) was utilized to model the surface water drainage patterns for the post development drainage conditions. HydroCAD Stormwater Modeling System Software (Version 10.00) was used for the SCS TR20 calculations. The SCS TR-55 method was used to estimate the Time of Concentration (Tc). This method involves estimating the length of sheet flow, shallow concentrated flow and channel flow that occurs within each sub-catchment. From this information, the time of concentration is determined for the watershed. HydroCAD calculations are included with this report.

Modeling was conducted using the 2, 10 and 25-year storm events. The estimated watershed area of 2.44 acres was derived from an on the ground survey completed by NCS, Inc.

Stormwater Quality/Quantity

The development is located in the watershed of Cobbosseecontee Lake and is identified as an impaired lake per the state Department of Environmental Protection (DEP). The development will also disturb more than an acre of land and will require a Stormwater Law Permit through the DEP. Treatment will be handled by an underground collection system within the bounds of the parking lot which will direct stormwater to a large forested buffer in the rear of the site beyond the electric easement. The buffer is designed per Maine DEP standards and will mitigate both the peak stormwater flow and phosphorous export and will provide a maximum allowable treatment factor (TF) of 0.20.

The Maine Department of Environmental Protection (DEP) has developed phosphorus budgets for the watershed of each lake in the State of Maine. Each budget is based on how much additional phosphorus loading a lake could accept without risking a perceivable change in the lake's water quality. The budget allocates this additional phosphorus load amongst anticipated new development sources in the lakes watershed on a per acre basis. The per acre phosphorus allocation defines how much phosphorus each acre of land in a lake's watershed is allowed to discharge in stormwater runoff when developed. The proposed retail facility is located in the Woodbury Pond watershed.

Appendix C of *Stormwater Management for Maine, Volume II*, provides the per acre phosphorus allocations for selected Maine Lakes and specified the loading rate for Woodbury Pond of 0.035 lbs P/year. This rate is used to calculate the sites Phosphorous budget. The accumulation of this rate over the entire project area of 8.333 acres, less the 0.283 acres of steep slopes, provides a budget of 0.2818 lbs P/year. There are no areas on the site meeting the criteria of a steep slopes preventing development.

The development will increase the impervious area to roughly 34,000 sf and have a total landscaped area of 19,000 sf. Left untreated this would translate to a phosphorous export of 0.9500 lbs P/year.

The Maine DEP requires a minimum treatment factor (TF) of 0.40 for projects that must meet the phosphorous standard. With an undisturbed forested buffer the site provides a TF of 0.22 for most of the developed area.

The Town of Manchester requires developments, that exceed 3,000 square feet of impervious area, to develop a Phosphorous Control Plan in accordance with that Maine DEP's manual "Phosphorous Control in Lake Watersheds: A Technical Guide for Evaluating New Development". The proposed development proposes a phosphorous export of 0.2573 lbs P/year. This number is less than that sites phosphorous budget by 0.0244 lbs P/year.

Please see the attached phosphorous export and buffer sizing calculations that show conformance with the town ordinance for meeting the phosphorous budget on phosphorous export.

In summary, this project meets the Phosphorus Budget by:

- a.) Treating 0.78 acres of impervious cover (building and pavement/driveway) and 0.23 acres of landscape areas.
- b.) Use of an undisturbed forested buffer for phosphorus treatment.

During construction the site will utilize erosion control measures, per Maine DEP standards, to ensure there is no adverse impact downstream.

Table 1 below compares the pre-development and post-development peak stormwater flows from the area of analysis at study point #1 (SP-1)

Table 1

Storm Event	Pre-Development (cfs)	Post-Development (cfs)	Difference (cfs)
2-year	2.4	2.7	+0.3
10-year	5.1	4.8	(0.3)
25-year	7.1	6.5	(0.6)

By inspection of table 1 above the peak discharge only increases minimally in the 2 year storm even and due to the length of the stone lipped spreader where stormwater will be discharged there is no anticipated detrimental downstream effect due to the slight increase.

Maintenance Plan

Franklin Land Associates, LLC will be responsible for the maintenance of the stormwater infrastructure as well as the establishment of maintenance contracts. At a minimum the appropriate and relevant activities for each of the stormwater management facilities will be performed on the prescribed schedule.

A sample of the Maintenance Log is included with this report. Records of all inspections and maintenance work accomplished must be kept on file and retained for a minimum 5-year time span. The maintenance logbook shall be made available to the DEP upon request.

Recertification Requirement

Within three months of the expiration of each five-year interval from the date of issuance of the permit, the permittee shall certify the following to the department.

- (a) All areas of the project site have been inspected for areas of erosion, and appropriate steps have been taken to permanently stabilize these areas.
- (b) All aspects of the stormwater control system have been inspected for damage, wear, and malfunction, and appropriate steps have been taken to repair or replace the facilities.
- (c) The erosion and stormwater maintenance plan for the site is being implemented as written, or modifications to the plan have been submitted to and approved by the department, and the maintenance log is being maintained.

Sweeping

Paved surfaces shall be swept or vacuumed at least twice annually in the spring to remove all winter sand, and periodically during the year on an as-needed basis to minimize transportation of sediment during rainfall events. The Town of Scarborough will accept the maintenance responsibilities within the public right-of-way.

Closed Drainage Structures

If sediment in culverts or piped drainage systems exceeds 20% of the diameter of the pipe, it should be removed. This may be accomplished by hydraulic flushing or any mechanical means; however, care should be taken as to not flush the sediment into the pond or filter as it will reduce the capacity and hasten the time when it must be cleaned. All pipes should be inspected on an annual basis.

Ditches and Swales

Open swales and ditches need to be inspected on a monthly basis or after a major rainfall event to ensure that debris or sediments do not reduce the effectiveness of the system. All debris needs to be removed. Any sign of erosion or blockage shall be immediately repaired to promote a vigorous growth of vegetation. Vegetated ditches should be mowed at least monthly during the growing season. Larger brush or trees must be prevented from becoming established in the channel. Any areas where the vegetation fails will be subject to erosion and should be repaired and re-vegetated.

Rip Rap

Areas where stone is displaced should be repaired to assure stability. With time, riprap may need to be added. Vegetation growing through riprap should be removed on a yearly schedule.

Worksheet 1 PPB Calculations			
Project Name:	Dollar General Manchester		
Standard Calculations			
Watershed per acre phosphorus allocation (Appendix C):	P	0.035	lbs/acre/year
Total acreage of development parcel	TA	8.333	acres
Existing impervious area (Pre 1980)	EIA _B	0.000	acres
Existing impervious area (Post 1980)	EIA _A	0.000	acres
NWI wetland acreage:	WA	0.000	acres
Steep slope acreage:	SA	0.283	acres
Project acreage: A = TA - (WA + SA + EIA _B + EIA _A)	A	8.050	acres
Project Phosphorus Budget: PPB = P x A	PPB	0.2818	lbs P/yr

**Worksheet 2
Pre-PPE Calculations**

Project Name: Dollar General Manchester

Development Type: Commercial

	Land Surface Type of Lot #(s) with description	Acres/#	Export Coefficient from Table 3.1	Pre-treatment Algal Av. P Export (lbs P/year)	Treatment Factor for BMP(s) from Chapter 6	Post-treatment Algal Av. P Export (lbs P/year)	Description of BMPs
Untreated	Acces Road/Driveway (low export)	0.00	1.25	0.0000	1.0	0.0000	
	Access Road (high export)	0.00	1.75	0.0000	1.0	0.0000	
	Buildings	0.00	0.50	0.0000	1.0	0.0000	
	Lawn/Landscape (HSG C)	0.21	0.30	0.0620	1.0	0.0620	
Treated via Buffers	Acces Road/Driveway (low export)	0.57	1.25	0.7136	0.22	0.1570	Forested Buffer
	Access Road (high export)	0.00	1.75	0.0000	0.22	0.0000	Forested Buffer
	Buildings	0.21	0.50	0.1055	0.22	0.0232	Forested Buffer
	Lawn/Landscape (HSG C)	0.23	0.30	0.0689	0.22	0.0152	Forested Buffer
			Pre-PPE (lbs P/year)	0.9500	Post-PPE (lbs P/year)	0.2573	

Worksheet 3
Mitigation: Source Elimination Credit

Project Name: Retail Facility					Development Type: Commercial			
Mitigation Source Area Land Use	Acres	Export Coefficient (lbs P/acre/year)	Modifier	Pre-Treatment Historical P Export (lbs P/year)	Treatment Factor for Historical BMP(s) (1.0 if no BMPs)	Historical P Export (lbs P/year)	Mitigation Credit (lbs P/year)	Comments
Access Road/Driveway (low export)	0.0000	0	0	0.0000	1.0	0.0000	0.0000	
Total Source Elimination Mitigation Credit							0.0000 lbs P/year	

Worksheet 4 Project Phosphorus Export Summary			
Summarizing the project's algal available phosphorus export (PPE)			
Project Name: Dollar General Sabattus			
Project Phosphorus Budget	PPB	0.2818	lbs P/year
Mitigation Credit- Source Elimination Credit	SEC	0.0000	lbs P/year
Source Treatment Credit	STC	0.0000	lbs P/year
Total Phosphorus Mitigation Credit (SEC+STC)	TMC	0.0000	lbs P/year
Total Pre-treatment Phosphorus Export Worksheet 2	Pre-PPE	0.9500	lbs P/year
Total Post-treatment Phosphorus Export Worksheet 2	Post-PPE	0.2573	lbs P/year
Project Phosphorus Export (Post-PPE - TMC)	PPE	0.2573	lbs P/year

NORTHEAST CIVIL SOLUTIONS, INC.

Surveying - Engineering - Land Planning
381 Payne Road, Scarborough, Maine 04074
Tel: 207-883-1000 Fax: 207-883-1001

Project: Manchester, Maine 34355.2
Sheet No. 1 Of 1
Calc by: TAL Date: 2.29.16
Check by: _____ Date: _____
Scale: _____

Buffer Sizing Calculation

Given: Forested Buffer with HSG C soils on 0-8% slope,
Impervious Area = 34057 sf = 0.75 ac
Lawn Area = 10000 sf = 0.22 ac

Assume: 100 ft flow path length, stone bermed level lip spreader

Berm Length = 100 ft/ac of impervious + 30 ft/ac of lawn

Berm Length = 75.1 ft + 6.6 ft

Berm Length = 81.7 ft

Treatment Factor

Given: TF = 0.4 at a berm length calculated above
Max allowed TF(d) for HSG C soils is 0.20

Assume: Design Berm L (ft) = 150 feet

Tf(d) = TF x Calculated Berm L (ft) / Design Berm L (ft)

Tf(d) = 0.40 x 81.7 ft / 150 ft*

Tf(d) = 0.22

0.22 is greater than the allowed maximum value of 0.20, therefore 0.22 will be used

Tf(d) = 0.22

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DEP Project #

Dollare General Retail Store, Manchester Maine
BMP MAINTENANCE LOG

PAGE ____

BMP STRUCTURE	INSPECTOR (NAME)	WORK PERFORMED	DATE PERFORMED	COMMENTS
Stone Bermed Level Lip Spreader				
Ditches/Swales				
Culverts				
Forested Buffer				
Other				
Additional Comments:				



Albert Frick Associates, Inc

Environmental Consultants

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www.albertfrick.com info@albertfrick.com

Albert Frick, SS, SE
James Logan, SS, SE
Matthew Logan, SE
Brady Frick, SE
Bryan Jordan, SE
William O'Connor, SE
Noel Dunn, Office Manager

February 9, 2016

Mr. Travis Letellier, P.E.
Northeast Civil Solutions
381 Payne Road
Scarborough, ME 04074

Re: Dollar General site, 1034 Western Avenue, Manchester

Dear Mr. Letellier,

As requested, I revisited the above-referenced site on February 8, 2016 to observe and classify soils for a proposed forested buffer for the proposed project.

Enclosed for your review and use are a sketch plan of the test pit site, along with a soil profile description of the soil observed.

The soils at TP A consist of moderately well-drained Nicholville, which is lacustrine in origin and comprised of fine sandy loam underlain by loamy fine sand and silt in lenses. This soil is a hydrologic Group C soil. A general soil description is also enclosed for your use.

I trust you will find this and the enclosed information helpful in the appropriate stormwater design for the project. Otherwise, feel free to call should you have any questions or additional matters for discussion regarding the site.

Sincerely,

James Logan
Senior Project Manager
Certified Soil Scientist # 213
Licensed Site Evaluator # 237
USACE Certified Wetland Delineator

JL/bo

Town, City, Plantation
MANCHESTER

Street, Road Subdivision
1034 ROUTE 202

(FOR) Owner's Name
NCS/GBT REALTY

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP A Test Pit Boring
" Depth of Organic Horizon Above Mineral Soil

Texture	Consistency	Color	Mottling
0		DARK BROWN	
FINE SANDY LOAM		DARK	
10	FRIBLE	YELLOWISH BROWN	
LOAMY FINE SAND		LT. OL. BR.	FAUFAINT
20	SOMEWHAT FIRM	OLIVE	COMMON
30	TO FIRM		DISTINCT
40	IN LENSES		
50	LENSES		

Soil Classification: Profile B Condition C
Slope: _____ %
Limiting Factor: 15
 Ground Water
 Restrictive Layer
 Bedrock
 Pit Depth

Soil Series Name: NICHOLVILLE Drainage Class: MWD Hydrologic Group: C

FOR WASTEWATER DISPOSAL

FOR SOILS MAPPING

Observation Hole _____ Test Pit Boring
" Depth of Organic Horizon Above Mineral Soil

Texture	Consistency	Color	Mottling
0			
10			
20			
30			
40			
50			

Soil Classification: Profile _____ Condition _____
Slope: _____ %
Limiting Factor: _____
 Ground Water
 Restrictive Layer
 Bedrock
 Pit Depth

Soil Series Name: _____ Drainage Class: _____ Hydrologic Group: _____

SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole _____ Test Pit Boring
" Depth of Organic Horizon Above Mineral Soil

Texture	Consistency	Color	Mottling
0			
10			
20			
30			
40			
50			

Soil Classification: Profile _____ Condition _____
Slope: _____ %
Limiting Factor: _____
 Ground Water
 Restrictive Layer
 Bedrock
 Pit Depth

Soil Series Name: _____ Drainage Class: _____ Hydrologic Group: _____

FOR WASTEWATER DISPOSAL

FOR SOILS MAPPING

Observation Hole _____ Test Pit Boring
" Depth of Organic Horizon Above Mineral Soil

Texture	Consistency	Color	Mottling
0			
10			
20			
30			
40			
50			

Soil Classification: Profile _____ Condition _____
Slope: _____ %
Limiting Factor: _____
 Ground Water
 Restrictive Layer
 Bedrock
 Pit Depth

Soil Series Name: _____ Drainage Class: _____ Hydrologic Group: _____

James Logan
Site Evaluator / Soil Scientist Signature

237/213 SE/CSS

2/8/16 Date

NICHOLVILLE (Aquic Haplorthods)

SETTING

Parent Material:	Lacustrine material having a high content of silt and fine sand.
Landform:	Commonly found on lake plains and upland till plains that have a mantle of water-deposited silt or very fine sand.
Position in Landscape:	Intermediate and upper portions of landscape feature.
Slope Gradient Ranges:	(B) 3-8% (C) 8-20% (D) 20+%

COMPOSITION AND SOIL CHARACTERISTICS

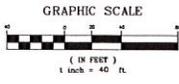
Drainage Class:	Moderately well drained, with a perched water table 1.5 to 2.0 feet below the soil surface from November through May.								
Typical Profile Description:	<table><tr><td>Surface layer:</td><td>Very dark grayish brown silt loam, 0-10"</td></tr><tr><td>Subsurface layer:</td><td>Dark yellowish brown silt loam, 10-13"</td></tr><tr><td>Subsoil layer:</td><td>Yellowish brown and grayish brown very fine sandy loam, 13-18"</td></tr><tr><td>Substratum:</td><td>Grayish brown loamy very fine sand, 18-70"</td></tr></table>	Surface layer:	Very dark grayish brown silt loam, 0-10"	Subsurface layer:	Dark yellowish brown silt loam, 10-13"	Subsoil layer:	Yellowish brown and grayish brown very fine sandy loam, 13-18"	Substratum:	Grayish brown loamy very fine sand, 18-70"
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Subsurface layer:	Dark yellowish brown silt loam, 10-13"								
Subsoil layer:	Yellowish brown and grayish brown very fine sandy loam, 13-18"								
Substratum:	Grayish brown loamy very fine sand, 18-70"								
Hydrologic Group:	Group C								
Surface Run Off:	Medium								
Permeability:	Moderate throughout the profile.								
Depth to Bedrock:	Very deep, greater than 60".								
Hazard to Flooding:	None								

INCLUSIONS (Within Mapping Unit)

Similar:	Croghan, Elmwood
Dissimilar:	Nicholville (S.W.P.), Buxton

USE AND MANAGEMENT

Stormwater design: Nicholville is a moderately well drained soil, exhibiting a seasonal high groundwater table 1.5-2.0 feet beneath the soil surface in the spring and during periods of high precipitation. Nicholville soils exhibit permeabilities of 0.6-2.0 inches/hour, through the profile.



DATE:	REVISIONS:

WATERCOURSE/RUNOFF
REVIEW SITE PLAN
 PREPARED FOR
NORTHEAST CIVIL SOLUTIONS
 WESTERN AVENUE
 (MAP U-11, LOT 8-1)
 MANCHESTER, MAINE


Albert Frick Associates, Inc.
 Environmental Consultants
 Gorham, Maine

Drawn By: B.O. Plotted By: J.L.
 Date: 11/3/15 Scale: 1" = 40'