In Greenwich, a high water table is common in coastal areas and areas with poor soils. Shallow bedrock and rock outcrops are also common in many areas of Greenwich. Similar to soil infiltration capacity, water table and bedrock conditions vary considerably from site to site and therefore must be considered and evaluated for every site. The soil evaluation requirements in *Appendix B* include field evaluation of depth to seasonal high groundwater and bedrock.

In areas with a high groundwater table, incorporating LID may be more challenging and may require additional or more creative site engineering to take advantage of swales, bioretention, and sand filters for filtration of pollutants. In these situations, it may be more feasible to rely on conservation of natural features and vegetation to the greatest extent possible. This approach will also reduce both quantity of runoff and the amount of pollutants generated. While infiltration may not be practical in these areas, bioretention systems designed for water filtration are viable options. Soils and groundwater challenges may make it more attractive to rely on conservation of natural vegetation and use of conservation areas to filter runoff prior to discharging to sensitive waters.

There must be at least a 2-foot separation distance from the bottom of the infiltration structure to seasonal high groundwater or bedrock/ledge (this separation requirement may be waived or reduced by the approving authority on a case-by-case basis). The top two feet is the biologically active zone of a plant and soil complex and is where most of the physical, chemical, and biological pollutant removal occurs. A 3-foot separation distance is required from the bottom of the infiltration structure to seasonal high groundwater for land uses with higher potential pollutant loads (high load areas).

5.7.3 Downstream Resources

It is important to consider not only the impacts the development will have at a site, but also how downstream resources may be impacted by development activities. The Connecticut Stormwater Quality Manual provides guidance on the downstream resources that should be considered when selecting stormwater BMPs.

In addition to the general guidance provided in the Connecticut Stormwater Quality Manual, the following sections discuss specific types of downstream resources within the Town of Greenwich, referred to as "Critical Areas" in this manual, and recommended and restricted BMPs for stormwater discharges to or near[14] these resources.

Critical areas (see *Figure 5-2*) are defined as:

- All parcels within the Coastal Area Management Zone that have a property boundary along the water are considered within the "Critical Area".
- Shellfish growing areas and public swimming beaches (entire Greenwich coastline),
- Recharge areas for public water supplies (groundwater and surface water supplies),
- Other sensitive receiving water bodies or wetlands as designated by the Town of Greenwich or the Connecticut Department of Energy and Environmental Protection.

[14] A discharge is "near" a critical area if there is a strong likelihood of a significant impact occurring to the area, taking into account site-specific factors.

Infiltration BMPs should not be installed in Hydrologic Soil Group D soils, as confirmed through the soil evaluation methods contained in *Appendix B*. When fill materials are present or are added prior to construction of the system, a soil textural analysis must be conducted in both the fill material and the underlying native material below the fill layer, and the Hydrologic Soil Group of the more restrictive layer shall be used. Stormwater infiltration is not permitted through fill materials composed of asphalt, brick, concrete, construction debris, and materials classified as solid or hazardous waste. Alternatively, the debris or waste may be removed in accordance with applicable State solid waste regulations and replaced with clean material suitable for infiltration.

Water Table and Bedrock

The depth to the seasonal high water table and depth to bedrock (or other impermeable layers) will also influence the selection and performance of stormwater BMPs. High groundwater may be appropriate for some BMPs where a permanent pool is required, since the interception of groundwater will aid in maintaining such a pool. Other BMPs, such as infiltration systems, may not be appropriate if the separation between the bottom of the infiltration system and groundwater table is not sufficient to allow for water to drain from the device and to adequately remove pollutants from stormwater runoff. Bedrock impedes the downward exfiltration of stormwater and prevents infiltration BMPs from draining properly. Shallow bedrock may preclude the use of some BMPs or limit infiltration rates and result in excessive groundwater mounding below stormwater BMPs. An area is generally not suitable for infiltration BMPs if bedrock is within two feet of the bottom of the BMP.

stormwater detention and retention facilities are described in Chapter 10 of the Connecticut Department of Transportation Drainage Manual.

- Storage facilities must be set a minimum of 12 inches above ledge or seasonal high groundwater regardless of the use of a water-tight liner or system.
- Minimum freeboard of a storage facility is 12 inches (does not apply to subsurface infiltration systems). The Engineering Bureau may require additional freeboard depending on the type and location of the storage facility.
- Storage facilities shall observe the following setback requirements:
    - Minimum 10 foot separation from any structure including retaining walls
    - Minimum 10 foot separation from any property line
    - Minimum 25 foot separation from any footing drain, wall drain, or under-drain system
    - Refer to the Health Code for separation distance from wells and septic systems
- Access shall be provided to each part of the facility (e.g., sediment forebay, outlet structure).
- An emergency outlet shall be provided for all storage facilities. Emergency outlets shall be sized to safely convey the 100-year, 24-hour storm without causing significant erosion or damage to the downstream drainage system or properties beyond the erosion or damage that would occur during a similar storm event under pre-development conditions.
- High overflow/discharge point shall have a minimum 10 foot separation from any property line.
- Applicants shall assume a 40% void ratio for crushed stone.

When detention is proposed, a downstream hydrologic analysis may be required by the Engineering Bureau to determine whether peak flows, velocities, and hydraulic effects are attenuated by controlling the 1-year, 2-year, 5-year, 10-year, and 25-year, 24-hour design storms. Analysis of larger design storms may be required by the Engineering Bureau for large developments and special or sensitive situations. This analysis must be performed at the outlet(s) of the site and at critical downstream locations (stream confluences, culverts, other channel constrictions, and flood-prone areas) to a confluence point where the site drainage area represents 10% of the total drainage area above that point (see CTDEEP Stormwater Quality Manual, Chapter 7, Section 6.5).

4.12 Erosion and Sediment Control

All projects requiring approval from the Engineering Bureau shall include methods to minimize the harmful effects of soil erosion and sedimentation during construction. The proposed sedimentation and erosion control measures shall be included with the Stormwater Management Plan (see Section 6). Erosion and sedimentation control measures shall be designed in accordance with the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control (as amended). All proposed developments, regardless of the area of proposed disturbance, must implement erosion and sedimentation controls prior to and throughout the duration of construction. Refer to Section 15B of the Stamford Zoning Regulations for additional soil erosion and sediment control regulations.

Other outlet discharges, such as high level overflows or metered outflows, shall discharge in a manner that will not concentrate flow or adversely affect adjacent or downstream properties. Proposed connections to Town of Westport drainage systems shall be allowed only by permit and only if the existing Town-owned system is investigated and analyzed by the design engineer and found to be adequate to handle the increase in proposed flow.

4. All detention systems shall be designed to store a minimum volume equal to 1" of runoff from all new impervious surfaces, i.e. a "first flush" of runoff. If there is an outflow discharge in the proposed system, the first flush storage volume must be accounted for below the invert of the discharge. In addition, a water quality evaluation in accordance with the 2004 Connecticut Stormwater Quality Manual shall be performed and incorporated into every storm drainage design submission.

5. The use of Low Impact Design (LID) methodology is encouraged; however any such design must also meet the design requirements herein. Rain gardens, pervious pavement systems, and pervious pavers must be designed as complete drainage systems, with appropriate subsoil investigation, including test pits and percolation tests, hydrological and hydraulic analysis of the system, inspection of the installation by the Design Engineer and the Town, and a maintenance plan. Rain gardens in particular must drain out fully within 24 hours of a design storm, and include a maintenance narrative that will prevent them from becoming regulated wetlands.

6. Each engineered design shall include the appropriate soils test data taken from the general area of the proposed system installation. Soil testing shall be performed and witnessed by the Town of Westport Engineering Department, and reported as part of the proposed development submission plans and report.

   Soil test data shall include:

   a) Deep test pits indicating and identifying the elevation of soil strata, and indicating the presence (or lack of) mottling, groundwater, and/or ledge. If no restrictive layers are found the minimum depth of the test pit shall be 8 feet deep.
   b) A percolation test performed in accordance with the guidelines of the Connecticut State Health Code, or a permeability test performed by an approved testing laboratory.
   c) An assessment of the soils classification as designated by the Natural Resources Conservation Service, NRCS. This information is available from the NRCS Web Soil Survey at the following link:

      http://websoilsurvey.sc.egov.usda.gov

   The bottom of the proposed detention system shall be a minimum of 24" above any ledge and a minimum of 12" above any mottling layer.

7. If underground detention systems are proposed to be used for foundation footing drains that utilize a pit and pump system, such systems shall be designed to adequately handle a base flow of 0.05 cfs (~ 22 gpm), or the actual maximum flow rate of the pump, whichever is greater. Pump specifications and flow data shall be included in the design package.

Lifting above ground? Get the load as close to the excavator as possible. Use a short cable and position the excavator to put the load lift point in the optimum lifting range.

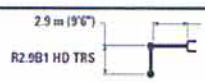
Lifting below grade? Use a cable of sufficient length to position the load lift point in the optimum lifting range.

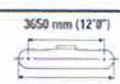
GET TO KNOW YOUR LIFTING CAPACITIES CHART

The following tables list capacities based on a lifting point at ground level. Lifting capacities are different for each machine and vary by machine configuration. For lifting capacities at other heights or with other tools, refer to the current specification sheets.

Determine your lift point height by considering how high you will need to lift your load. Determine the lifting radius from the centerline of the swing point. Then, find on the chart the cell where the lift point height and lifting radius intersect. The number you find in the cell is the rated lift capacity. If the cell is blank, your excavator cannot lift the load safely.

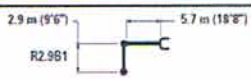
HD Reach Boom Lift Capacities – Counterweight: 5.4 mt (11,900 lb) – without Bucket – Heavy Lift: On

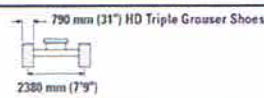




		1.5 m/5.0 ft		3.0 m/10.0 ft		4.5 m/15.0 ft		6.0 m/20.0 ft		7.5 m/25.0 ft				
														m ft
7.5 m 25.0 ft	kg lb							*4900	*4900			*4250 *9,400	*4250 *9,400	6.15 20.00
6.0 m 20.0 ft	kg lb							*5350 *11,750	*5350 *11,750			*3900 *8,650	*3900 *8,650	7.29 24.17
4.5 m 15.0 ft	kg lb							*5900 *12,800	*5900 *12,800	*5500 *12,100	4500 9,700	*3850 *8,450	*3850 *8,450	7.99 26.67
3.0 m 10.0 ft	kg lb					*8600 *18,500	*8600 *18,500	*6750 *14,650	6100 13,150	*5900 *12,850	4400 9,500	*3950 *8,600	3750 8,250	8.36 27.50
1.5 m 5.0 ft	kg lb					*10 400 *22,450	8700 18,800	*7650 *16,600	5850 12,600	*6350 *13,750	4300 9,250	*4150 *9,150	3650 7,950	8.45 28.33
0 m 0 ft	kg lb			*6550 *15,050	*6550 *15,050	*11 400 *24,700	8400 18,100	*8300 *18,000	5650 12,200	6450 13,850	4200 9,050	*4600 *10,150	3700 8,100	8.26 27.50
-1.5 m -5.0 ft	kg lb	*7000 *15,650	*7000 *15,650	*11 350 *25,750	*11 350 *25,750	*11 500 *24,950	8350 17,900	*8500 *18,400	5600 12,050	6400 13,800	4150 9,000	*5400 *11,950	4000 8,750	7.78 25.83
-3.0 m -10.0 ft	kg lb	*12 050 *27,000	*12 050 *27,000	*15 300 *33,100	*15 300 *33,100	*10 800 *23,300	8400 18,050	*8000 *17,200	5600 12,100			*6550 *14,400	4650 10,300	6.95 23.33
-4.5 m -15.0 ft	kg lb			*12 150 *26,050	*12 150 *26,050	*8750 *18,600	8600 18,550					*6600 *14,500	6400 14,350	5.60 18.33

Reach Boom Lift Capacities – Counterweight: 5.4 mt (11,900 lb) – without Bucket – Heavy Lift: On





		1.5 m/5.0 ft		3.0 m/10.0 ft		4.5 m/15.0 ft		6.0 m/20.0 ft		7.5 m/25.0 ft				
														m ft
7.5 m 25.0 ft	kg lb							*4950	*4950			*4300 *9,500	*4300 *9,500	6.15 20.00
6.0 m 20.0 ft	kg lb							*5450 *12,000	*5450 *12,000			*3950 *8,750	*3950 *8,750	7.29 24.17
4.5 m 15.0 ft	kg lb							*6000 *13,050	*6000 *13,050	*5650 *12,400	4600 9,900	*3900 *8,550	*3900 *8,550	7.99 26.67
3.0 m 10.0 ft	kg lb					*8750 *18,850	*8750 *18,850	*6900 *14,950	6200 13,350	*6050 *13,150	4500 9,700	*4000 *8,750	3850 8,500	8.36 27.50
1.5 m 5.0 ft	kg lb					*10 650 *22,950	8850 19,100	*7850 *17,000	5950 12,850	*6500 *14,100	4400 9,500	*4250 *9,300	3750 8,200	8.45 28.33
0 m 0 ft	kg lb			*6600 *15,150	*6600 *15,150	*11 650 *25,200	8600 18,500	*8500 *18,450	5800 12,500	6550 14,100	4300 9,300	*4700 *10,300	3800 8,350	8.26 27.50
-1.5 m -5.0 ft	kg lb	*7050 *15,750	*7050 *15,750	*11 400 *25,850	*11 400 *25,850	*11 750 *25,500	8550 18,350	*8700 *18,850	5750 12,350	6550 14,050	4300 9,250	*5500 *12,100	4100 9,050	7.78 25.83
-3.0 m -10.0 ft	kg lb	*12 100 *27,100	*12 100 *27,100	*15 600 *33,800	*15 600 *33,800	*11 000 *23,800	8600 18,450	*8200 *17,650	5750 12,450			*6700 *14,800	4800 10,600	6.95 23.33
-4.5 m -15.0 ft	kg lb			*12 500 *26,700	*12 500 *26,700	*9000 *19,100	8800 18,900					*6800 *14,950	6500 14,650	5.60 18.33

ISO 10567:2007

* Indicates that the load is limited by hydraulic lifting capacity rather than tipping load. The above loads are in compliance with hydraulic excavator lift capacity standard ISO 10567:2007. They do not exceed 87% of hydraulic lifting capacity or 75% of tipping load. Weight of all lifting accessories must be deducted from the above lifting capacities. Lifting capacities are based on the machine standing on a firm, uniform supporting surface. The use of a work tool attachment point to handle/lift objects, could affect the machine lift performance.

Lift capacity stays with ±5% for all available track shoes.

Always refer to the appropriate Operation and Maintenance Manual for specific product information.

TRS = Thumb Ready Stick