Chapter 5
Antidegradation

Development projects requiring any of the permits or certificates described in Chapter 4 are subject to a NHDES Antidegradation Review to ensure compliance with the New Hampshire Surface Water Quality Regulations (Env-Wq 1700).

Antidegradation Notice

In 2009, NHDES staff will be convening a workgroup of interested stakeholders to review the proposed antidegradation requirements described in Section 5-2. The workgroup will finalize the requirements for meeting the antidegradation provisions and the procedure for NHDES review of proposed activities. This manual will be updated to incorporate the requirements at the completion of the workgroup.

5-1. Antidegradation Provisions

This section defines the components of the antidegradation provisions including water quality categories used to classify waterbodies for each parameter, assimilative capacity of receiving waters, significant versus insignificant pollutant loading, and demonstration of economic or social development.

Water Quality Categories

Existing water quality places a waterbody into one of four categories for each water quality parameter, including: Impaired Waters, Tier One Waters, Tier Two Waters (High Quality Waters), and Outstanding Resource Waters. A single waterbody can fall into one or more categories depending on the parameter being evaluated.

For example, a river with a low phosphorus concentration and a high chloride concentration could be Tier Two (High Quality) for phosphorus and Tier One for chloride. Further, if the chloride concentration is so high that it violates the chloride water quality standard, the waterbody would be impaired for chlorides, but still Tier Two (High Quality) for phosphorus. These categories are described in detail below and a schematic is shown in Figure 5-1.

Impaired Waters

An impaired waterbody is one that does not meet one or more water quality criteria due to an individual pollutant, multiple pollutants, a cause other than pollution (e.g., hydrologic modification, such as dam construction and water withdrawals), or for reasons that have not yet been determined. By failing to meet the criteria, the waterbody fails to support one or more of its designated uses. Many of the waterbodies in New Hampshire are impaired by pollutants that are not associated with development activities (e.g., mercury). Although these pollutants are still a concern, they are not typically factored into the antidegradation review for development activities.

The list of impaired waters in New Hampshire, including the 303(d) list of impaired waters and waters that are impaired by sources other than pollutants, is available on the NHDES website at: http://des.nh.gov/organization/divisions/water/wmb/swqa/index.htm. This assessment is updated by NHDES and approved by EPA every two years.

Tier One Waters

A Tier One waterbody is one that supports the existing uses of that waterbody by meeting one or more water quality criteria within the reserve assimilative capacity of that waterbody. The reserve assimilative capacity is typically 10% of the total assimilative capacity of the waterbody for each parameter. Assimilative capacity is described further below. In general terms, the water quality criteria are met, but just barely (within sampling and analytical variation (10%)), so that any increase in pollutant loads could cause the quality to decrease below the criteria and make the waterbody impaired for those criteria. The Tier One classification should be determined on a project specific basis depending on the availability of data.

Spring flooding along the Merrimack River, Concord, New Hampshire

Tier Two Waters (High Quality)

A Tier Two waterbody is one that supports the existing uses of the waterbody by meeting one or more water quality criteria to support the existing uses by greater than the reserve assimilative capacity of that waterbody. In general terms, the water quality is better than the water quality criteria and an increase in pollutant loads would not cause the waterbody to become impaired. ***Insignificant*** increases in pollutant loading are allowed, however, significant increases in pollutant loading require a demonstration of social or economic development. Insignificant versus significant pollutant loading and the requirements of demonstration of social or economic development are described in greater details below. The Tier Two classification should be determined on a project specific basis depending on the availability of data.

Outstanding Resource Waters

In addition to the three water quality categories that are based solely on meeting water quality criteria, Outstanding Resource Waters (ORW) are administratively designated in New Hampshire for their outstanding natural or cultural resources. ORWs include waters of the national forests and natural segments of New Hampshire's designated rivers under the Rivers Management Protection Act (RSA 483:7-a). An ORW can be either Tier One, Tier Two or impaired depending on its existing water quality for each parameter.

Refer to the following resources to determine if the waterbody in question is an Outstanding Resource Water:

- New Hampshire Designated Rivers, Natural Segments: this list is updated as additional New Hampshire rivers are designated as natural and is available on the NHDES website at: http://des.nh.gov/organization/divisions/water/wmb/rivers/index.htm. Details of river segment delineation are described in RSA 483.
- If the waterbody is within the designated National Forest boundaries. A map of the White Mountain National Forest is available at: http://www.fs.fed.us/r9/forests/white_mountain/maps/location_map.php

Assimilative Capacity

A waterbody may be able to accept additions of some pollutants without violating water quality standards. However, the addition of other pollutants to the same waterbody may cause an impairment. The amount of each

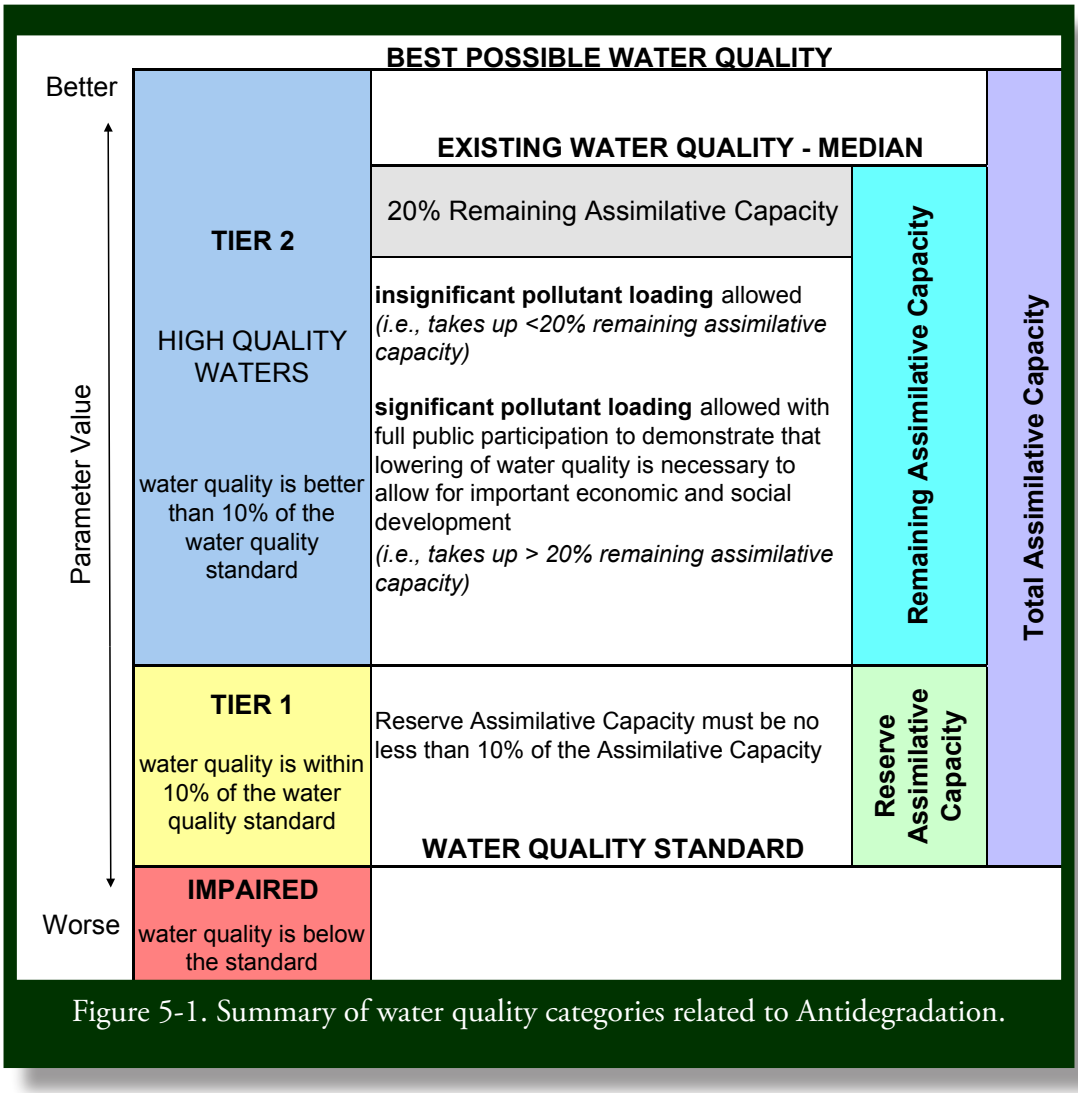

Figure 5-1. Summary of water quality categories related to Antidegradation.

pollutant that can be released to a waterbody without causing violations of applicable water quality criteria is called the assimilative capacity.

Determining the assimilative capacity of a waterbody for the purposes of antidegradation only applies to Tier 2 - High Quality Waters that have useable remaining assimilative capacity. Tier one waters have assimilative capacity, but it is held in reserve. Each waterbody has a unique remaining assimilative capacity for each water quality parameter that is based on the current concentration of that parameter in the waterbody.

The total assimilative capacity of a waterbody is the difference between the best possible water quality and the water quality standard, below which we observe impairments. The remaining assimilative capacity is the difference between the existing water quality, typically the median value, and the reserve assimilative capacity. The reserve assimilative capacity must be at least 10% of the total assimilative capacity. This is to provide additional water quality protection and prevent the quality of a waterbody from being degraded all the way down to the water quality standard. Figure 5-1 describes this further.

Insignificant Versus Significant Pollutant Loading

An increase in loading to a waterbody is allowed for parameters that classify that waterbody as Tier 2. The Antidegradation Provisions of the New Hampshire Surface Water Quality Regulations (Env-Wq 1708) describe insignificant and significant pollutant loading and the requirements for each classification.

Insignificant pollutant loading is defined as a discharge or activity that is projected to utilize less than 20% of the remaining assimilative capacity for a given parameter, in terms of either concentration or mass of pollutants, or volume or flow rate for water quantity. In most situations insignificant discharges are acceptable. However, if NHDES determines that the effect of the discharge will have a greater impact than a normal insignificant discharge, either because of the cumulative lowering of water quality over time, possible additive or synergistic effects, or for other reasons defined in Env-Wq 1708.09(d), the discharge would be considered significant and would be subject to the requirements for significant pollutant loading.

Significant pollutant loading is defined as a discharge or activity that is projected to utilize 20% or more of the remaining assimilative capacity for a water quality parameter. Significant discharges must demonstrate that the proposed lowering of water quality is necessary to achieve important economic or social development.

Demonstration of Economic or Social Development

Development activity in a Tier Two (High Quality) watershed that is determined to result in a significant discharge, requires the submittal of documentation to demonstrate that the lowering of water quality is necessary

to achieve important economic or social development in the area where the waterbody is located.

At this time, the New Hampshire Water Quality Standards Advisory Committee is defining the guidelines for development and the process for reviewing a Demonstration of Economic and Social Development. Until this process has been completed, the following information is required for NHDES to determine if sufficient justification exists, as described in Env-Wq 1708.10:

- Alternative methods of production or operation;
- Improved process controls;
- Water conservation practices;
- Wastewater minimization technologies;
- Non-discharging alternatives;
- Improved wastewater treatment facility operations;
- Alternative methods of treatment, including advanced treatment beyond applicable technology requirements of the Clean Water Act; and
- Alternative sites, and associated water quality impacts at those sites.

More information on the Demonstration of Economic or Social Development can be found in Interim Economic Guidelines for Water Quality Standards, EPA-823-B-95-002, published by the EPA in March 1995. Additional information is also available on the New Hampshire Water Quality Standards Advisory Committee website at: http://des.nh.gov/organization/divisions/water/wmb/wqs/index.htm.

Antidegradation Notice

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5-2. Proposed Antidegradation Requirements

The antidegradation requirements are based on the existing water quality of a waterbody. Recognizing that water quality data may not always be available or may be costly to obtain, NHDES has proposed specific targets for meeting the Antidegradation Provisions based on the availability of water quality data. This section describes the proposed water quality requirements that must be met and the items that should be submitted by the applicant to satisfy the NHDES Antidegradation Review.

Refer to the flow chart presented as Figure 5-4 for a summary of the proposed requirements of the Antidegradation Provisions.

Proposed Surrogate Measures for Pollutant Loading Analysis – The 1065 Rule

NHDES has proposed a target 10% effective impervious cover (%EIC) maximum and 65% undisturbed cover (% UDC) minimum for development sites, referred to as "the 1065 Rule." This is based on the Center for Watershed Protection's Impervious Cover Model, discussed in greater detail below. It means that, in general and regardless of land use type, there should be no greater than 10% EIC and no less than 65% UDC within the property boundary of a site; otherwise, pollutant loading calculations need to be performed to quantify the effects of the development.

Effective Impervious Cover (EIC)

Effective impervious cover (EIC) is best described in relation to total impervious cover. The total impervious cover of a site includes all impervious areas on the land surface, such as pavement, roofs, roadways, or other human structures with a low capacity for soil infiltration and having a curve number (CN) of 98 or greater. Refer to the call out box on Curve Numbers on page 41. Total impervious cover is typically expressed as a percentage of the total project area or subwatershed area.

The EIC of a site is the portion of the total impervious cover that is directly connected to the storm drain network. EIC usually includes roadways,

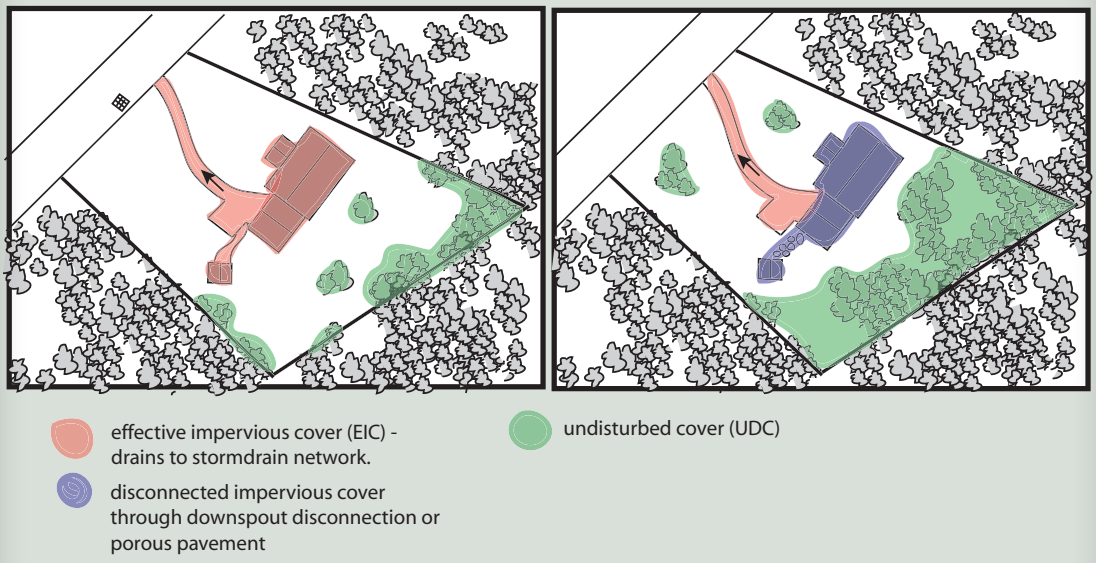


Figure 5-2. The volume of stormwater entering the storm drainage network can be reduced by decreasing the amount of effective impervious cover and increasing the amount of undisturbed cover on a site.

Common Misconception about Effective Impervious Cover

The EIC limit is often misinterpreted as a limit on total impervious cover and therefore a limit on development in general. It is also often thought to promote sprawl by limiting development in a watershed, which would expand the amount of disturbed land as development is pushed outward. This is incorrect. In actuality, sprawl is often caused by regulations on minimum lot size, e.g., 2-acre single family lots. Municipalities in New Hampshire often enforce minimum lot sizes in an attempt to maintain the towns' rural character and limit development. In reality, they may be contributing to sprawl.

The misunderstanding of the Impervious Cover Model is most often due to not recognizing the distinction between effective impervious cover and total impervious cover. In theory, a development can create the same amount of impervious cover (i.e. the same size houses and driveways or the same size commercial development) as in traditional development as long as site design techniques are implemented to disconnect the impervious surfaces from each other and route runoff to pervious areas where it can be infiltrated. Therefore, the density of development can remain the same and continues to be a function of local zoning. Site design techniques used to minimize the effective impervious cover are explained further in Chapter 6.

driveways and other impervious surfaces, such as rooftops, that are hydraulically connected to the drainage network. However, if a roof drain transporting rooftop runoff is directed to a pervious, vegetated area to infiltrate into the ground, it may be considered disconnected and is not included as EIC (see Figure 5-2). EIC is also typically expressed as a percentage of the total project area.

Undisturbed Cover (UDC)

Undisturbed cover is land surface that has not been altered by human activity. In the northeastern United States there are very few truly undisturbed, natural areas. At one point the majority of land in New Hampshire had been cleared of its forests to make way for agriculture. When agriculture was abandoned for industry, the forests were able to re-establish. NHDES considers the reclaimed forests and other land left to return to its natural state over time as undisturbed cover. Therefore, a forest, meadow, field, or other vegetated land area that has been allowed to return to its natural state and is not maintained is considered undisturbed cover. Undisturbed Cover (UDC) is typically expressed as a percentage of the total project area.

Impervious Cover Model Background

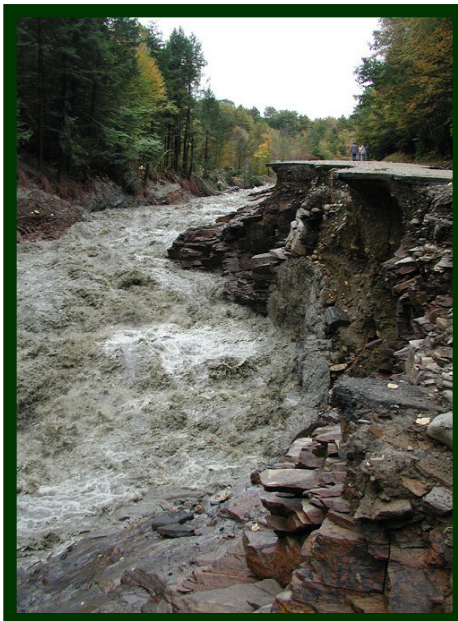
The Impervious Cover Model (ICM) was developed by the Center for Watershed Protection to relate surface water quality (state of impairment) to the amount of impervious cover in the watershed. It is based on several studies that relate EIC to the extent of impairment to receiving waters. The studies indicate that when EIC is in the range of 0 to 10%, receiving waters are slightly impacted by watershed development, while EIC values exceeding 25% are associated with significant impairment (CWP, 2003), as shown in Figure 5-3. Although these percentages are typically measured on a watershed scale, for purposes of permitting and reviewing the impact of individual development activities, this concept has been modified to the site level. This allows permit applicants and reviewers the ability to quickly assess the potential impact of a proposed project on the receiving waters.

There are several assumptions and limitations to the ICM including:

- It does not account for wastewater pollutant loadings
- It does not account for in-stream water quality processes
- It is best suited for 1st through 3rd order streams
- Additional site specific information is required for identification and specification of BMPs to achieve water quality goals

The majority of information required to calculate the effective impervious cover and the undisturbed cover of a site is already completed when the project drainage analysis is prepared. The following should be used when calculating the EIC and UDC to improve the accuracy of the calculations:

- Project-specific impervious cover data-layer
- Project-specific estimates of directly-connected (effective) impervious cover
- Incorporation of storm sewer networks to refine watershed delineation and directly-connected impervious cover
- Accounting for existing BMPs in impervious cover and load determinations.



New Hampshire's Route 123 after flooding of the Cold River in October, 2005.

Proposed Water Quality Requirements

Under the proposed requirements, the majority of projects, with the exception of those listed below, would need to show that the proposed activity would not significantly degrade water quality. This is accomplished through one of the following proposed options, summarized in Figure 5-4:

1. Submit calculations showing that the project meets the 1065 Rule, i.e., creates ≤ 10% EIC and maintains ≥ 65% UDC within the property boundary (or no increase in EIC or decrease in UDC for redevelopment projects), or

2. Submit calculations showing that the project will not increase pollutant loading, will not increase the stormwater peak flow, and will maintain the ground water recharge volume , or

3. Conduct a water quality analysis to determine the remaining assimilative capacity of the water body. If it is determined that the waterbody is:
   Tier 1: Submit calculations showing that the project will not increase pollutant loading, will not increase the stormwater peak flow, and will maintain the groundwater recharge volume.
   Tier 2: a. Submit calculations showing that any pollutant from the

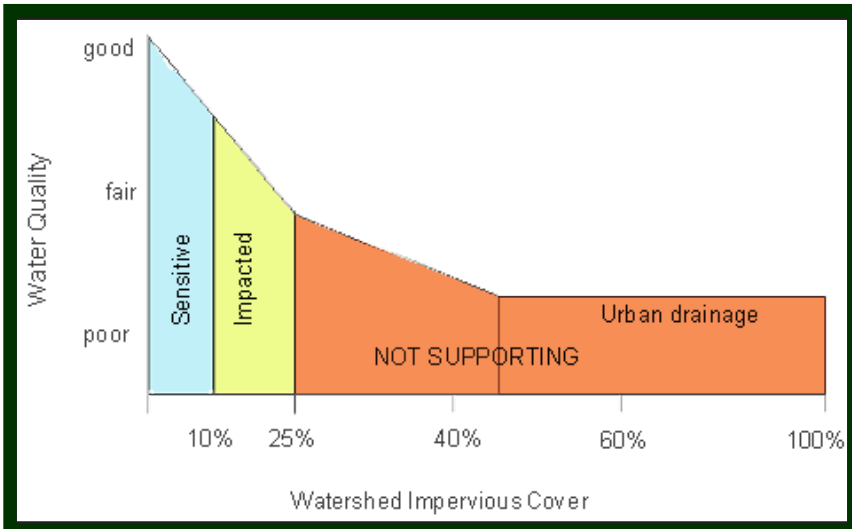


Figure 5-3. Impervious Cover Model relating percent watershed impervious cover to stream quality. Adapted from Center for Watershed Protection's *Impacts of Impervious Cover on Aquatic Systems*.

project will not take up more than 20% of the remaining assimilative capacity of the surface water, or

b. Submit calculations showing that any pollutant from the project will not take up more than 90% of the total assimilative capacity of the surface water, and demonstrate, in accordance with Env-Wq 1708.10, that significantly lowering the water quality is necessary for important social or economic development. Note that this is considered a significant impact (see Section 5-1).

Exceptions to the Proposed Water Quality Requirements

Impaired Waters

If the project is within one-mile upstream of an impaired water the following is required:

a. Submit pollutant loading calculations showing that the proposed activity complies with the TMDL (if a TMDL has been completed) or does not increase the loading of any pollutant that could affect the impairment; and,

b. Submit pollutant loading calculations (or approved surrogate measure) for all other pollutants not affecting the impairment (see options 1 through 3 above).

Outstanding Resource Waters

If the project is within one-mile upstream of an ORW the following is required:

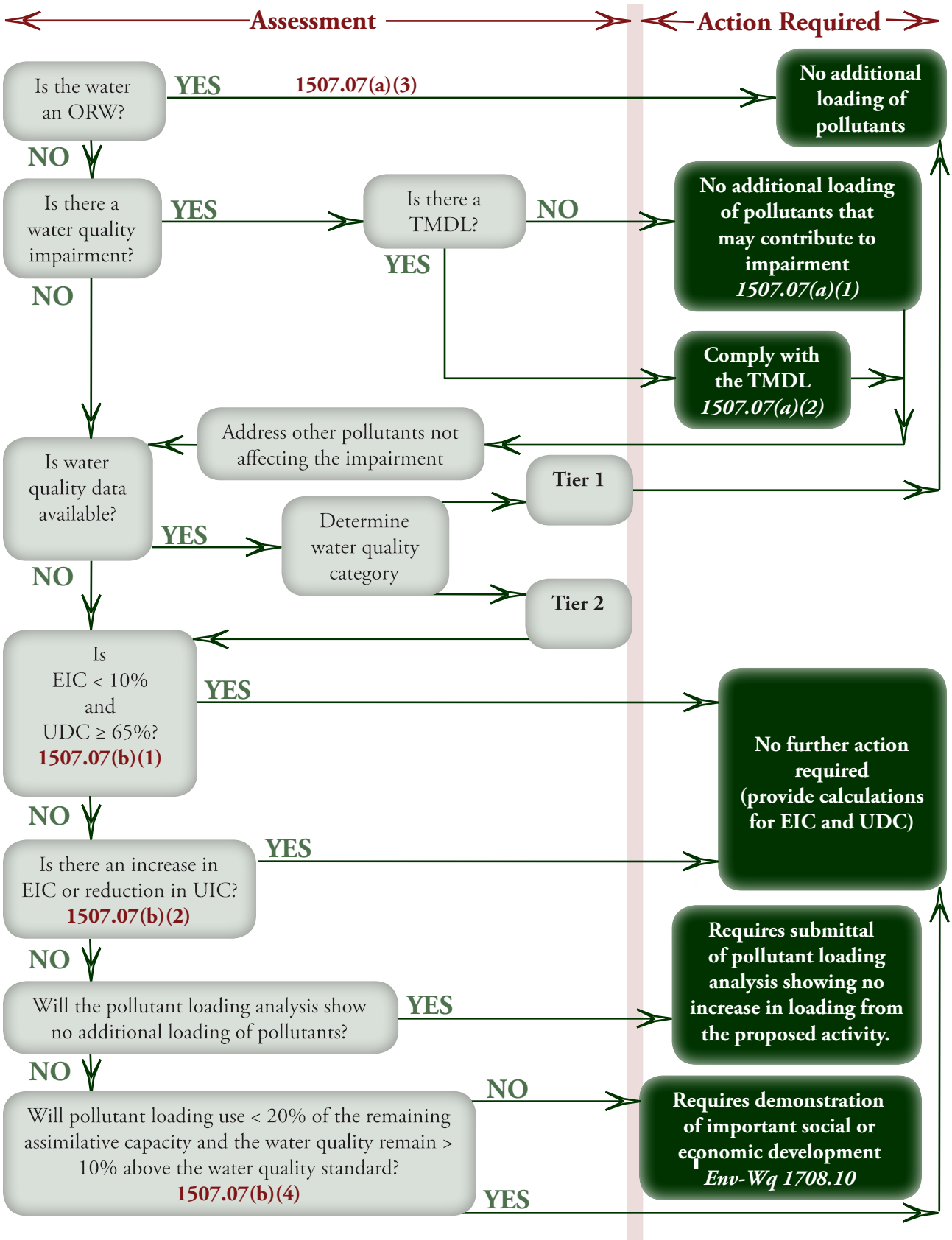
a. Submit pollutant loading calculations showing that the project will not increase pollutant loading, will not increase the stormwater peak flow, and will maintain the ground water recharge volume.

Proposed Submittal Items and Formats

For the purposes of Antidegradation Review, it is proposed that documentation of meeting the above Water Quality Requirements should be submitted electronically to NHDES in accordance with the submittal matrix below, with hard copies to be submitted upon request by NHDES. Electronic submittals should include the following:

- Reference to the Alteration of Terrain, NPDES-Construction General Permit, or other permit or certificate application,
- Site plans showing the project boundaries, lot lines, surface waters, drainage system and drainage divides, areas of undisturbed cover, and the location of all existing and proposed impervious areas, including but not limited to roadways, sidewalks, rooftops, buildings, and driveways,
- Calculations of percent EIC,
- Calculations of percent UDC,
- If the EIC and UDC targets are not met, pollutant loading calculations including:
    - Event mean concentrations
    - BMP descriptions and removal efficiencies for each land use
    - Schematic showing how the project was modeled (i.e., locations of subwatersheds and BMPs)
    - A summary of pre- and post-development annual loads for all pollutants of concern (see Chapter 8 for guidance on completing the necessary calculations).
    - A certification stating that the project, if built as designed, will meet the pollutant loading criteria set forth by the Department, signed and stamped by a New Hampshire licensed Professional Engineer (please provide an original certification, P.E. stamp and signature).
- For an area to be disconnected, copies of the recorded deed restrictions when the plans show that the drainage for individual lots or portions of individual lots will be maintained within the lot boundary and not connected to the site drainage network stating that the current and future connection of the lot drainage to the site drainage network is prohibited and that all stormwater must be treated and drainage maintained, as approved, on the individual lot.
- A Stormwater System Operation and Maintenance Plan (the Plan). The purpose of the Plan is to show how the stormwater system will be maintained so that it will continue to achieve the estimated post-development pollutant loads. At a minimum, the Plan should address inspection and maintenance of all aspects of the stormwater drainage system and associated BMPs as described in Section 7-5 and give the authority of a second entity (e.g., town, neighborhood association, etc.) to maintain systems if a site owner fails to do so.

Figure 5-4. Applicability of the Proposed Antidegradation Provisions



Curve Numbers

Curve number (CN) values are commonly used parameters to determine how much rainfall will become runoff. They are based on land use cover and soil type, with higher CN values corresponding to poorly drained soils and more impervious area, resulting in increased runoff. Thus, a natural wooded area that infiltrates runoff will have a lower CN value than a paved area where no runoff can infiltrate. Impervious areas have a CN value of 98 or greater. The following table contains a condensed version of the Natural Resource Conservation Service (formerly the Soil Conservation Service) Runoff Curve Number values from TR-55.

Runoff Curve Numbers[1]				
Cover Description	Curve Number for Hydrologic Soil Group			
Cover Type and Hydrological Condition	A	B	C	D
Open Space (lawns, parks, golf courses, cemeteries, etc)[2]:				
Poor condition (grass cover <50%)	68	79	86	89
Fair condition (grass cover 50% to 75%)	49	69	79	84
Good condition (grass cover >75%)	39	61	74	80
Impervious areas:				
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	98	98	98	98
Streets and roads:				
Paved; curbs and storm sewers (excluding right-of- way)	98	98	98	98
Paved; open ditches (including right-of-way)	83	89	92	93
Gravel (including right-of-way)	76	85	89	91
Dirt (including right-of-way)	72	82	87	89
Woods:				
Poor condition (forest litter, small trees, and brush are destroyed by heavy grazing or regular burning)	45	66	77	83
Fair condition (Woods are grazed but not burned, and some forest litter covers the soil)	36	60	73	79
Good condition (Woods are protected from grazing, and litter & brush adequately cover the soil)	30[3]	55	70	77

[1] Condensed from Tables 2-2 (a-d) of NRCS (formerly SCS) TR-55(1986).

[2] CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

[3] Actual curve number is < 30; use CN = 30 for runoff computations.

Chapter 5 References

Center for Watershed Protection. 2003. *Impacts of Impervious Cover on Aquatic Systems.* Watershed Protection Research Monograph No. 1. March 2003.

Center for Watershed Protection. Better Site Design: A Handbook for Changing Development Rules in Your Community. August 1998.

ENSR Corporation. Pilot TMDL Applications Using the Impervious Cover Method. October 2005.

Partnership for Environmental Technology Education and Maine Department of Environmental Protection, Bureau of Land and Water Quality. *Barberry Creek Total Maximum Daily Load (TMDL) Draft Report.* July 2005.

Prince George's County Maryland Department of Environmental Resources, Programs and Planning Division. *Low Impact Development Design Strategies: An Integrated Design Approach*. January 2000.

State of New Hampshire Code of Administrative Rules. *PART Env-Ws 415 Alteration of Terrain Activities Revised Draft.* February 16, 2006.

United States Environmental Protection Agency. National Management Measures to Control Nonpoint Source Pollution from Urban Areas. 2006.

United States Environmental Protection Agency Office of Science and Technology Region 1 and New England Interstate Water Pollution Control Commission. Water Quality Standards Academy – Basic Course. June 21-24, 2005. *Water Quality Standards Academy Participant Manual Module 14 – Antidegradation.* 2005.