3.0 APPLICATION OF THE IC METHOD FOR TMDL DEVELOPMENT

This section provides a step-by-step description of how the IC Method may be applied to meet the requirements of the TMDL development process. A compilation of required TMDL components is provided below, including allocation of loading capacity, margin of safety, and seasonal variability. TMDL implementation is introduced below and described in Section 5.

A TMDL calculation is an analysis that establishes the maximum pollutant loadings that a water body may receive and maintain its water quality standards and support designated uses, including compliance with numeric and narrative standards and consideration of antidegradation policies. The TMDL requires specification of existing conditions, specification of reductions required to remove impairments, and a margin of safety. The TMDL development process may be described in the four steps described below. The approach for applying the IC method to meet each TMDL requirement is described in italics and described in detail in subsequent sections.

1. Establish Impaired Status. Determination and documentation of whether or not a water body is presently meeting its water quality standards and designated uses, and if impaired, for what designated use. *Impaired status for each of the IC Method applications was established as part of the 303(d) listing process*.

2. Evaluate Impairments. This step requires assessment of present water quality conditions in the water body, including estimation of present loadings of constituents of concerns from both point and non-point sources. *The IC method provides estimation of present stormwater loading of constituents through empirical correlation between percent IC to stream quality parameters. Loadings from wastewater sources are not included in the pilot applications because the cause of impairment is believed to be primarily stormwater. Wastewater source loadings could be readily added, however, to the overall loading budget for each application. Section 3.1 provides a description of the impairment evaluation process.*

3. Specifying TMDL Targets. This step requires determination of the water body's loading capacity and specification of load allocations for non-point sources (NPS) and point sources (PS), that will ensure that the water body will not violate water quality standards (i.e., will remove impairments). Loading capacity is defined as the greatest amount of loading that a water body may receive without violating water quality standards (WQS). If the water body is not presently meeting its WQS, then the loading capacity will represent a reduction relative to present loadings. *Evaluation of extensive watershed data has led to the finding that stream impairment is generally present in watersheds with 10% or greater impervious cover. A TMDL target of 9% IC has been selected for the pilot TMDL applications. Point source loadings other than stormwater (industrial and municipal waste water discharges) were not*

included in the TMDL pilot projects because the watersheds were believed to be impaired by NPS. TMDL targets are described in Section 3.2.

4. Allocating Loading Capacity. This step requires allocating the TMDL or loading capacity among:

    - Waste load allocations for point source discharge and regulated stormwater,
    - Load allocations for nonpoint sources, background, and non-regulated stormwater,
    - Margin of safety to compensate for uncertainty, and
    - Consideration of seasonal variation.

    Section 3.3 provides a description of allocating loading capacity.

5. TMDL Management and Implementation. This task is conducted after the TMDL development process is complete. This task requires generating a plan to (a) implement load allocations and wasteload allocations developed based on the water body loading capacity determination, and (b) monitor the water body to ensure compliance with water quality standards. Although not a part of the TMDL required for EPA review and approval, management planning and TMDL implementation are the most critical steps towards achieving and verifying improvements in water quality. *The impervious cover approach includes evaluation of the relative effectiveness of various best management practices (BMPs) in reducing the impact of impervious cover. Section 5 provides an overview and a general description of BMPs designed to reduce the impact of impervious cover on aquatic systems.*

The following sections describe how each of the TMDL development components may be developed using the impervious cover method.

3.1 Evaluation of Impairments

The first step in the TMDL process is to evaluate watershed impairments. The impervious cover method, coupled with geographic information system (GIS) analysis, is well suited for rapidly assessing the impairment of watersheds and identifying the relative contribution of sub-watersheds to the impairments. Implementation of the impervious cover method to quantify impairments involves the following:

- Develop watershed boundary GIS datalayer based on best available topographic data. Subdivide watershed into sub-watersheds based on tributary drainage areas and other major outfalls.

- Acquire and analyze land cover and impervious cover GIS datalayers for the watershed.
- Develop a table correlating land cover to impervious cover based either on published values (e.g., TR-55) or based on watershed-specific data.
- Calculate overall watershed and sub-watershed impervious cover percentages. Rank sub-watersheds by impervious cover percentage. Sub-watershed assessment is important to identify problem areas and support specification of BMPs during TMDL implementation.
- Assess watershed impairments. Watersheds with greater than 10 percent overall impervious cover are likely to be impaired. Watersheds with greater than 25 percent impervious cover likely to be significantly impaired.

3.2 Specifying TMDL Targets

A TMDL target is the water body's loading capacity or the sum of the WLA, LAs, and MOS that will result in removal of impairments. Using the impervious cover method, the target TMDL should aim to achieve a total watershed impervious cover of 9 percent or less, consistent with meeting applicable water quality standards. This may be achieved by either removing impervious cover, which may not be practicable, or by implementing management practices designed to mitigate the effects of impervious cover, as well as with stream restoration measures that address aquatic habitat, riparian, and floodplain recovery (see Section 5).

A TMDL target of 9% IC has been selected and applied for the pilot TMDL projects presented in Section 4.

3.3 Allocating Loading Capacity

Loading capacity is the amount of a pollutant that has been identified through the TMDL process as the maximum that a water body can receive and maintain its water quality standards and designated uses. Allocating loading capacity is the process of assigning those reduced pollutant loads to a set of sources (PS and NPS) in the watershed. The three key components of the allocation process are allocations, margin of safety, and seasonal variation. Each component is described below.

3.3.1 Allocations

Targets for % IC can serve as surrogates for establishing loading capacity and for determining the necessary pollutant load reductions or allocations. Whether the allocations are characterized as

WLAs or LAs depends on whether the stormwater runoff is from regulated or unregulated areas under the NPDES stormwater regulations. Whereas traditional point source TMDLs must present discharge-specific WLAs, regulated stormwater (technically point sources in NPDES) can receive an allocation expressed as a *gross allotment*, as do LAs from nonpoint sources. Therefore, if the stormwater runoff is from regulated urbanized areas (MS4 communities under Phase I and II of the stormwater regulations), then the gross allotment should be expressed as WLAs. If the stormwater runoff is unregulated, along with other NPS and background sources, then the gross allotment can be expressed as LA. If there is a complex mix of regulated and unregulated stormwater (which cannot be subdivided into regulated (MS4) and non-regulated components), a simple solution for the TMDL is to assign the same allocation to both the WLA and LA (i.e., WLA = LA = 9% IC).

3.3.2 Margin of Safety (MOS)

The ICM-based TMDLs in this report include an implicit margin of safety through the relatively conservative selection of the numeric water quality target of 9% IC, which is less than the lowest end of the range of % IC cover for the range of “impacted stream quality” from 10 – 25% (Figure 2-2; less than 10% is “sensitive”.) This range is based on data from the Center for Watershed Protection. It may be necessary, in some cases, to set an even lower IC target to maintain a margin of safety if, for example, an impaired water body already has a IC rating close to 9%. These assumptions provide a margin of safety to account for any uncertainty in determining the water body’s loading capacity.

3.3.3 Seasonal Variation

Critical conditions can occur for aquatic life and habitat in stormwater-impaired streams at both low and high flows. High flows can cause channel alterations, increased pollutant loads from scouring and bank erosion, wash-out of biota, and high volume pollutant loading. Increased % IC, and the resulting increase in surface runoff, reduces the amount of infiltrating rainfall that recharges groundwater. The resulting diminished base flow can further stress aquatic life and cause or contribute to aquatic life impairments through loss of aquatic habitat and increased susceptibility of pollutants at low flow.

Specific BMPs implemented will be designed to address loadings during all seasons.

Section 4 below presents pilot TMDL applications developed using the ICM throughout New England and Section 5 describes the TMDL implementation process using the ICM.