SUMMARY

This discussion paper proposes quantitative methods for estimating: 1) Total Assimilative Capacity; 2) 10% Reserve Assimilative Capacity; 3) High Quality Waters; 4) Remaining Assimilative capacity, and 20% Remaining Assimilative Capacity. Quantification of these values is necessary to apply the antidegradation rules to a particular proposed discharge.

The water quality of high quality or “Tier 2” waters under federal antidegradation regulations 40CFR 131.12(a)(2) is required to be maintained and protected unless there are important economic or social reasons why lower quality should be allowed. High quality waters have some assimilative capacity that could be allocated, whereas “Tier 1” waters do not. Under Env-1708, 10% of the assimilative capacity of any waterbody must be reserved. Estimation of assimilative capacity is also required for determining if proposed degradation is significant for antidegradation review purposes, because a proposed discharge that will use 20% or more of the remaining assimilative capacity is considered significant and requires an economic and social analysis.

Assimilative capacity usually applies to dissolved oxygen (DO), bacteria, pH, and toxic substances, but may also be applicable to other parameters. Computation of assimilative capacity and the 10% of assimilative capacity that must be reserved requires specification of a computation method and associated assumptions.

DES proposes that assimilative capacity shall always mean the total change in the value of a water quality parameter that can occur without causing violations of applicable water quality criteria or negatively impacting uses.

APPLICABLE LAWS AND REGULATIONS

Env-Ws 1702.03 "Assimilative capacity" means the amount of a pollutant or pollutants that can safely be released to a waterbody without causing violations of applicable water quality criteria or negatively impacting uses.

Env-Ws 1705.01 Assimilative Capacity. Except for combined sewer overflows where 99 percent of the assimilative capacity shall be used to determine compliance, not less than 10 percent of the assimilative capacity of the surface water shall be held in reserve to provide for future needs.

Env-Ws 1708.09 Significant or Insignificant Determination.
(a) Any discharge or activity that is projected to utilize 20% or more of the remaining assimilative capacity for a water quality parameter, in terms of either concentration or mass of pollutants, or volume or flow rate for water quantity, shall be considered a significant lowering of water quality.

Federal regulations, 40CFR 131.12(a)(2) state:

“Where the quality of the waters exceed levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the State finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the State's continuing planning process, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing such degradation or lower water quality, the State shall assure water quality adequate to protect existing uses fully. Further, the State shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control.”

Surface water quality regulations, Env-Ws 1708.07 – 1708.08 implement this provision of federal regulations:

Env-Ws1708.07 Protection of Water Quality in High Quality Waters.

(a) Subject to (b) below, high quality waters shall be maintained and protected, except that insignificant changes in water quality, as determined by the department in accordance with Env-Ws 1708.09, shall be allowed.

(b) Degradation of significant increments of water quality, as determined in accordance with Env-Ws1708.09, in high quality waters shall be allowed only if it can be demonstrated to the department, in accordance with Env-Ws 1708.10, that allowing the water quality degradation is necessary to accommodate important economic or social development in the area in which the receiving waters are located.

(c) Economic/social benefits demonstration and alternatives analysis shall not be required for authorization of an insignificant lowering of water quality. However, in allowing a lowering of water quality, significant or insignificant, all reasonable measures to minimize degradation shall be utilized.

(d) If the waterbody is Class A Water, the requirements of Env-Ws 1708.06 shall also apply.

Env-Ws 1708.08 Assessing Waterbodies.

(a) The applicant shall characterize the existing instream water quality and determine if there is remaining assimilative capacity for each parameter in question.

(b) Existing instream water quality shall be calculated in accordance with Env-Ws 1705.02. Existing water quality shall be established based on point sources discharging at their allowed loadings and the highest loadings anticipated from nonpoint sources.

(c) Where flow alteration is involved, establishment of existing conditions shall be based on the existing maximum allowed water withdrawals or impoundment, diversion, or fluctuation of stream flow, as appropriate.
(d) Remaining assimilative capacity shall be evaluated by comparing existing instream water quality, as specified in (b) and (c) above, to the state's instream water quality criteria.

(e) If the type and frequency of the proposed discharge or activity causes the waterbody to be impacted at flows other than those listed in Env-Ws 1705.02, the department shall require the applicant to evaluate the impact of the proposed discharge at those other flows.

(f) Subject to (h) below, if the department determines, based on the information submitted, that there is no remaining assimilative capacity, no further degradation with regard to that parameter shall be allowed.

(g) Subject to (h) below, if the department determines, based on the information submitted, that there is some remaining assimilative capacity, then the department shall proceed in accordance with Env-Ws 1708.09 below.

(h) The above determinations shall take into account Env-Ws 1705.01 which requires the department to reserve no less than 10% of a surface water's assimilative capacity.

DISCUSSION

I. Estimating Assimilative Capacity

Assimilative capacity applies independently to each applicable parameter. It also applies independently to each assessment unit.

To estimate assimilative capacity, the “best” value of the parameter and the values of loading factors that affect it under most favorable conditions are estimated. The value of the parameter is then set at the standard, the values of loading factors that affect it are estimated under conditions that just meet standards, and these values are subtracted from the estimated best case values to obtain the assimilative capacity.

II. Estimating Reserve Assimilative Capacity

The required 10% reserve capacity would be estimated by multiplying the value of assimilative capacity obtained in the paragraph above by 10%. This result is then added to the estimated value of the parameter or loading factor under conditions that just meet standards to obtain the value of the parameter or loading factor required to maintain 10% reserve assimilative capacity.

II. Estimating High Quality Waters

Tier 1 waters are waters that support a designated use, but for which there is no assimilative capacity that can be allocated. Where there are numeric criteria for a use, or for a parameter, this means that water quality is better than the standard but within the 10% reserve assimilative capacity (Figure 1). No discharges resulting in additional pollutant loading or negative concentration changes are allowed. High quality (Tier 2) waters, on the other hand, are waters in which water quality is
better than the standard + 10% reserve, and there is some assimilative capacity that can be allocated, as long as antidegradation rules are followed.

A small number of water quality monitoring data points are generally used to represent conditions that vary with both time and space within an Assessment Unit (AU). These data are a sample from the population of possible monitoring data points, and this population has a mean or other measure of central tendency, and a distribution (normal, lognormal,...) which can be estimated from the sample, or inferred from understanding of the biogeochemistry of the waterbody.

For numeric standards, the standards usually specify a single value. For example, the pH standard is “The pH of Class B waters shall be 6.5 to 8.0, unless due to natural causes.” In the CALM for the 2006 assessments, DES is adopting EPA guidance that, for many parameters with numeric standards (including DO, pH, toxics), a waterbody is impaired if >10% of grab samples do not meet the numerical standard. This is roughly equivalent to saying that the attainment of the numerical standard is evaluated using the 10th percentile of the estimated distribution. Thus if data for a particular parameter and assessment unit yield an estimated 10th percentile that is better than a numerical standard plus 10% of the assimilative capacity, then the assessment unit would be a high quality water and an antidegradation review must be conducted to determine whether or not any additional degradation will be allowed (Figure 1).

A HQW analysis can be based on any water quality parameter. Determination of HQW will be AU by AU and parameter by parameter. For example, an AU might HQW for aquatic life based on DO measurements, but not HQW for primary contact recreation based on e. coli bacteria measurements. In general, we will use the procedures in the CALM for HQW analysis, which means that the same sample procedures and index periods will be used for HQW assessment as for 305(b) assessments.

IV. Estimating Remaining Assimilative Capacity

For a HQW, remaining assimilative capacity is the amount of assimilative capacity that can be allocated or “used up” before the waterbody becomes Tier 1 for the parameter or loading factor. Remaining assimilative capacity is estimated by using monitoring data and models to assess the existing value of a parameter or loading factor, and then subtracting the value of the parameter or loading factor estimated to maintain the required 10% reserve assimilative capacity (Figure 1). For applicable parameters, existing water quality will be evaluated using the 10th percentile of the estimated distribution.

**Figure 1 (rev 2)**

**CHANGES:**

1) Removed explicit margin of safety for Tier 1
2) Changed (Total) Assimilative Capacity definition

rev. 1: Difference between reference condition and WQ standard
rev. 2: Difference between best possible condition and WQ standard
CONCEPTUAL DIAGRAM
FOR TIER 1 AND TIER 2 WATERS ESTIMATION
(not to scale)