



# Nondegradation Rulemaking

## Issue Paper 9: How should cumulative impacts be addressed?

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**B**ecause federal antidegradation regulations at 40 CFR § 131.12<sup>1</sup> regulate degradation of water quality we need to address not only individual sources of pollution, but cumulative impacts of those sources as well. Cumulative impacts or loadings may come from multiple sources on a given waterbody at one point in time and/or from increased incremental loadings from single sources over time.

Although typically thought of in terms of increased loading of persistent or conservative pollutants, cumulative impacts also include alterations in habitat and aquatic communities. Particularly challenging to the determination of cumulative impacts is accounting for those impacts that not typically addressed in antidegradation review, either because the scale or level of risk of given regulated activities are considered insignificant (*de minimis*) or where the impacts are a result of unregulated activities.

### Cumulative impacts and antidegradation decisions for high-quality waters

An understanding of cumulative impacts may be used in antidegradation decisions in several ways.

- *As a threshold or trigger for review*  
Where significance tests for individual activities are used to define thresholds below which antidegradation reviews are not required, a cumulative threshold or trigger may be employed to ensure that multiple sub-significant activities do not unnecessarily degrade water quality. For example, if on a given waterbody a

cumulative threshold has not been reached, individual activities may be permitted without antidegradation review if the activity falls below the individual significance test. If on the other hand, the cumulative threshold has been reached, any additional activity, even if it is below the individual significance threshold, would be required to undergo review.

- *Determining level of review*  
If levels of review are scaled to the amount of degradation or the risk associated with an activity, cumulative impacts could be a criteria used to determine what level of review is appropriate. In other words, where potential degradation indicates the cumulative lowering of water quality will likely occur beyond predetermined levels more stringent reviews may be required. An example of a more stringent review may include a more thorough review of social and economic justification for the activity.

- *To create a margin of safety*  
To account for the uncertainty of calculating cumulative impacts, a margin of safety may be used to create a safety buffer to protect a given standard. For example, a certain percentage of water quality (e.g. assimilative capacity) above a standard could be protected from any additional impacts in order to protect the standard.

- *To create a reserve or set-aside*  
Reserves or set-asides may be employed to prohibit or restrict activities once a predetermined amount of the assimilative

capacity of a high-quality water has been consumed. Set-asides could be used to protect waters that have unique characteristics or that are especially sensitive.

- *To identify downward trending waters*

Identifying and tracking cumulative impacts could be used to identify waters that, although they may be high-quality, are potentially being degraded at a relative rapid rate. This would allow the agency and other entities to prioritize the allocation of resources used to protect those water resources.

## **EPA guidance**

Guidance from EPA Region 5<sup>2</sup> suggests that if a state chooses to establish significance tests, due consideration must also be given to the possibility that the repeated or multiple “insignificant” changes could cumulatively cause significant changes in water quality. To prevent degradation from unaccounted impacts EPA’s Office of Science and Technology recommends<sup>3</sup> the incorporation of a cumulative cap based on total assimilative capacity (i.e., the baseline assimilative capacity of a waterbody established at a specific point in time). An antidegradation review would be required for any lowering of water quality after a prescribed percentage of total assimilative capacity has been used.

Guidance from EPA Region 8<sup>4</sup> suggests that where multiple new or expanded sources are proposed within a short time period, a determination of the significance on the cumulative effect of all the proposed sources be evaluated through a Total Maximum Daily Load (TMDL) analysis. Where sources are found to be significant in a cumulative sense, each individual proposed source would be subject to further Tier 2 review.

EPA Region 9 antidegradation guidance<sup>5</sup> suggests that to prevent adverse cumulative impacts, baseline water quality conditions would need to be established for each potentially affected water body, prior to allowing any action which would lower the quality of that water. This baseline should remain fixed unless some action improves water quality. At such time, the baseline should be adjusted accordingly.

## **Litigation related to antidegradation and cumulative impacts**

In 2003 a U.S. District Court found<sup>6</sup> that EPA was reasonable in approving West Virginia’s antidegradation provisions that allowed for a 10% reduction in the available assimilative capacity of individual pollutant

parameters from an individual discharge before Tier 2 review is required. However the court found that EPA acted arbitrarily and capriciously in approving West Virginia’s (WV) allowance for a 20% cumulative reduction from all discharges before Tier 2 review is required, stating it was not supported by any evidence in the record.

In a more recent (2008) case<sup>7</sup>, a concurring opinion noted that Kentucky’s proposed antidegradation provision’s allowance of individual exemptions for Tier 2 review avoided accounting for cumulative effects. The proposed exemptions included individual activities where an increase in pollutant loading less than 20% was insignificant. The court indicated that cumulative impacts must be taken into consideration where “insignificant” (*de minimis*) degradation is allowed.

## **Minnesota’s current rules**

Minnesota’s current rule for Nondegradation of All Waters (Minn. R. 7050.0185, Subp. 4<sup>8</sup>) states that “the agency shall consider the...cumulative impacts of all new or expanded discharges on the receiving water...” in the decision of whether additional control measures will be required. Minnesota Pollution Control Agency guidance<sup>9</sup> does not provide any specific information on how information on cumulative impacts should be used in the decision regarding the requirement of additional control measures.

## **Other states’ approaches**

Utah’s Department of Environmental Quality surveyed 12 states’ current or draft cumulative degradation provisions and presented their results at a recent work group meeting<sup>10</sup>. The survey showed that nine states utilize or intend to utilize cumulative impacts to trigger review based on a percentage use of assimilative capacity. The threshold percentages ranged from 10% to 33%. Two of the states have created a margin of safety after a predetermined amount of the water quality has been consumed; New Hampshire reserves 10% of the total assimilate capacity, while North Carolina has created a cap for toxic substances where no additional lowering of water quality is allowed beyond one-half of the normal standard. One state (Maryland) requires an analysis of social and economic justification in the review process when more than 25% of the assimilative capacity is cumulatively reduced.

Ohio’s antidegradation provisions<sup>11</sup> for high-quality waters establish both set-asides and triggers for full

antidegradation review. The table below illustrates this for different class waters.

Water Class	Set-aside	Trigger, threshold where a full review is required <sup>a</sup>
Outstanding State Waters	70% of the remaining available pollutant assimilative capacity <sup>b,c</sup>	≥ 5% change in ambient water quality concentration, provided set aside is maintained
Superior High Quality Waters	35% of the remaining available pollutant assimilative capacity	≥ 5% change in ambient water quality concentration, provided set aside is maintained
Lake Erie	Limited to the water body pollutant assimilative capacity <sup>d</sup>	≥ 10% of the water body pollutant assimilative capacity
General High Quality Waters	Not less than the standard, unless authorized by a variance	For regulated pollutants, ≥ 10% of wasteload allocation (WLA) to maintain water quality standard, provided the proposed lowering does not exceed 80% of the WLA
Limited Quality Waters	Not less than the standard, unless authorized by a variance	Review is not required

<sup>a</sup>These triggers do not apply to bioaccumulative chemicals of concern within the Lake Erie basin.

<sup>b</sup>“Remaining available pollutant assimilative capacity” is the available pollutant assimilative capacity minus the load already allocated to existing NPDES permits for discharges in the waterbody segment receiving the allocation.

<sup>c</sup>Set-aside requirement for Outstanding State Waters that are solely based on its exceptional recreational value do not apply. For these waters no permits are granted where there would be significant long-term increases in the frequency and duration of bacteriological pollution. Aesthetic quality must also be maintained.

<sup>d</sup>“Water body pollutant assimilative capacity” for a lake is the total maximum load of a substance for a specific water body segment calculated as a value equal to the permitted discharge flow times Y, where Y equals eleven times the water quality criteria minus ten times the background concentration.

## Measuring cumulative impacts

- *Baselines*

Baseline conditions may be used to define new and expanding individual activities, and to measure cumulative effects of multiple activities. Creating baseline conditions for protecting high quality waters is not a simple matter and states have taken various approaches. Minnesota Rules 7050.0185<sup>7</sup> (Nondegradation for All Waters) establish baseline conditions of a receiving water based on the date (Jan. 1, 1988) on which Tier 2 protection was established in their antidegradation provisions. Baseline conditions may be adjusted to reflect improvements in water quality where loadings to a waterbody have been significantly reduced or eliminated. The baseline may also be adjusted where better information than that found on 1988 is available. Examples of where this may occur include where the baseline condition was set in error or where there was a lack of adequate information in 1988.

Baseline conditions may be established through water quality monitoring or modeling, and may employ surrogate measures. Challenges and options in establishing baselines are discussed in more detail in Issue Paper 7<sup>12</sup>.

- *Describing cumulative impacts*

How cumulative impacts are described depends on our understanding of current and baseline conditions, and the nature, persistence and impacts of the pollutants or polluting activities at critical conditions. Some general criteria that may be used to describe impacts include:

- Dilution ratios (ratio of stream flow or volume to discharge flow or volume)
- Duration of discharges or activities
- Use of assimilative capacity
- Expected changes in concentration
- Expected changes in mass loading
- Degree of confidence in evaluation procedures
- Background conditions

States vary on their approach to evaluating impact criteria, with some relying heavily on quantitative tests (e.g., dilution ratios of greater than a predetermined amount may be considered sufficient to assimilate discharge without impact), while others use a more subjective approach on a case by case basis. EPA Region 8 *Antidegradation Implementation*<sup>4</sup> recommends that guidelines be established and that all relevant information (e.g. dilution ratio, duration, degree of change in instream quality, nature of pollutants—conservative vs. non-conservative vs. persistent, percentage of assimilative capacity used, degree of confidence in evaluation procedures) be considered.

- *Scale*

One of the challenges when making antidegradation decisions, particularly those involving cumulative impacts, is determining what spatial scale should be considered. Options include decisions for discrete locations where specific activities impact water quality to some defined waterbody, such as river segments, where multiple activities are tracked.

Location-specific decisions may be directly regulated through control documents, such as NPDES permits and 401 certifications. The cumulative amount of water quality consumed (i.e. assimilative capacity) would be established for each proposed activity with a discrete permitted discharge at that specific location as part of the antidegradation review process. This information would then be used in the decision of whether and to what extent water quality should be lowered.

Decisions regarding cumulative impacts may also be considered on a watershed scale. Information from condition monitoring of watersheds may be used to identify trends and to inform decisions regarding regulated activities in those watersheds.

- *Parameters of concern*

Identifying which parameters should be considered in the evaluation of cumulative impacts would benefit both the regulated community and the MPCA in that it would create consistency and efficiency. Procedures for identifying “parameters of concern” will likely be in implementation guidance to allow for flexibility in addressing the diversity of situations coming under antidegradation review.

When determining which parameters should be addressed in the analysis of cumulative impacts the nature, persistence and potential impact of the parameters need to be considered. Impacts may be evaluated in terms of:

- Toxicity
- Long-term chronic effects
- Carcinogenetic, mutagenic or teratogenic effects
- Persistency in the water column or sediments (conservative vs. non-conservative)
- Bioaccumulation
- Effects on reproduction or other population changes
- Effects on habitat
- Synergistic or additive effects
- Duration, frequency and magnitude

- Bioavailability
- Surrogate measures, where there is a strong correlation between the surrogate and the parameter of concern
- Others?

- *General permits*

Where general permit conditions are protective of receiving waters and the applicant is able to meet those conditions an antidegradation review would not be required. If on the other hand, an applicant is not able to meet the permit conditions a review (including cumulative impacts analysis) would be needed.

## **Responsibilities**

Gaining an understanding of cumulative impacts requires the gathering, storage and analysis of assessment information. This is essentially an accounting or tracking system.

Information is already gathered from many sources including regulated entities, MPCA, watershed organizations, volunteer efforts, etc. Additional effort may be required to ensure that adequate information is obtained and that the information is in a useable form to determine cumulative effects. Regulated entities with discrete discharges may be required to provide additional assessment information on the receiving water as part of their permit requirements to adequately gauge cumulative impacts.

The responsibility of obtaining additional assessment information (i.e. through condition monitoring), and the storage and analysis of the information falls upon the Agency who will use that information to ultimately make decisions regarding the protection of water quality.

## **Summary**

The cumulative lowering of quality in high quality waters results from regulated activities (either approved through a finding of necessity or from *de minimis* activities) and from unregulated activities. An understanding of cumulative impacts may be used in a number of ways including triggering review, determining the scale of review, establishing margins of safety or set asides, and identifying downward trending waters. Some of the challenges in gaining and utilizing this understanding include gathering adequate information from regulated and unregulated sources, establishing baseline conditions, determining how cumulative impacts should be measured, and the scale



and parameters to which decisions regarding cumulative impacts should be applied.

## Discussion Points

- 1) Should there be an understanding of cumulative impacts before an individual permit or certification is issued?
- 2) How should information regarding cumulative impacts be used? (May be more than one.)
  - As a trigger for review?
  - Determining level of review?
  - To create a margin of safety?
  - To create a reserve or set-aside?
  - To identify downward trending waters?
- 3) What are the best ways to describe cumulative impacts and why? Some considerations include:
  - assimilative capacity,
  - dilution,
  - changes in ambient conditions,
  - changes in concentration and/or mass
  - parameters of concern
  - surrogate measures
  - others?
- 4) At what spatial scale should cumulative impacts be considered?
- 5) To adequately gauge cumulative impacts, should additional information be required of regulated entities with discrete discharges to provide additional assessment information on the receiving water as part of their permit requirements?
- 6) Should the MPCA develop and implement a tracking system to monitor cumulative impacts?

## References and Links

- <sup>1</sup>40 CFR § 131.12, Antidegradation policy.  
[http://edocket.access.gpo.gov/cfr\\_2007/julqtr/40cfr131.12.htm](http://edocket.access.gpo.gov/cfr_2007/julqtr/40cfr131.12.htm)
- <sup>2</sup>EPA Region V Guidance for Antidegradation Policy Implementation for High Quality Waters, 1986.
- <sup>3</sup>2005 Memorandum from Ephraim King, EPA Office of Science and Technology, to Water Management Division Directors, Regions 1-10, entitled "Tier 2 Antidegradation Reviews and Significant Thresholds".  
[www.dnr.mo.gov/env/wpp/cwforum/documents/8-05-epa-tier2-memo4.pdf](http://www.dnr.mo.gov/env/wpp/cwforum/documents/8-05-epa-tier2-memo4.pdf)
- <sup>4</sup>EPA Region VIII Guidance: Antidegradation Implementation.  
[www.epa.gov/region8/water/wqs/wqsdocs.html](http://www.epa.gov/region8/water/wqs/wqsdocs.html)
- <sup>5</sup>EPA Region 9 Guidance on Implementing the Antidegradation Provisions of 40 CFR 131.12, 1987.
- <sup>6</sup>Ohio Valley Environmental Coalition, et. al. v. Marianne Lamont Horinko, Acting Administrator, United States Environmental Protection Agency; Civil Action No. 3:02-0058, Aug. 29, 2003.  
[www.ohvec.org/issues/mountaintop\\_removal/articles/antideg.pdf](http://www.ohvec.org/issues/mountaintop_removal/articles/antideg.pdf)
- <sup>7</sup>Kentucky Waterways Alliance, et. al. v. Stephen L. Johnson, Administrator of the United States Environmental Protection Agency, et. al.; No.06-5614, Sept. 3, 2008.  
[www.ca6.uscourts.gov/opinions.pdf/08a0333p-06.pdf](http://www.ca6.uscourts.gov/opinions.pdf/08a0333p-06.pdf)
- <sup>8</sup>Minnesota Administrative Rules Chapter 7050.0185, Waters of the State, Nondegradation for All Waters.  
[www.revisor.leg.state.mn.us/rules/?id=7050.0185](http://www.revisor.leg.state.mn.us/rules/?id=7050.0185)
- <sup>9</sup>Guidance Manual for Applying Nondegradation Requirements for All Waters (non-ORVW) in Minnesota, September, 1988.
- <sup>10</sup>Water Quality Standards Workgroup Meeting, Utah Department of Environmental Quality, August 12, 2007.  
[www.waterquality.utah.gov/WQS/20070912\\_7\\_Cumulative\\_Degradation\\_Provisions\\_Summary.pdf](http://www.waterquality.utah.gov/WQS/20070912_7_Cumulative_Degradation_Provisions_Summary.pdf)
- <sup>11</sup>Ohio antidegradation provisions, Rule 3745-1-05  
[www.epa.state.oh.us/dsw/rules/01-05.pdf](http://www.epa.state.oh.us/dsw/rules/01-05.pdf)

<sup>12</sup>Issue Paper 7. Is it important to have a baseline from which potential impacts can be measured?

[www.pca.state.mn.us/publications/wq-rule3-16.pdf](http://www.pca.state.mn.us/publications/wq-rule3-16.pdf)

**Please keep in mind that these issue papers are to generate discussion and are not to be taken as representing MPCA decisions or recommendations at this time. Your participation and input in this rule revision is much appreciated.**

## **Contacts**

For additional information regarding the nondegradation rulemaking contact the Minnesota Pollution Control Agency at 651-296-6300 or 800-657-3864.