Idaho Antidegradation Implementation
Discussion Paper
Defining Significance Thresholds for Water Quality Degradation

Antidegradation is intended to protect existing and designated beneficial uses, and where warranted, to protect and maintain high quality waters. Federal regulations do not explicitly state that insignificant levels of degradation can be excluded from an analysis of whether the activity is necessary to accommodate important social and economic development ("Tier II analysis"). However, it has become a widely accepted practice for regulatory agencies to maximize limited resources by focusing the Tier II analyses on those activities with the potential to degrade water quality at a level that is deemed significant. In order to maximize their resources, regulatory agencies have defined "significance thresholds" (also referred to as "de minimis" discharges or "measurable" degradation) below which a Tier II analysis for a new or increased discharge is not required. EPA recognizes this as an acceptable "approach that allows States and Tribes to focus limited resources where they may result in the greatest environmental protection." (Federal Register Volume 63 No. 129, page 36783; Ephraim King *Tier 2 Antidegradation Reviews and Significance Thresholds* Memorandum, August 10, 2005, page 2).

The concept of "significance thresholds" has been challenged by environmental groups in various court cases. West Virginia regulations require Tier II analyses when the proposed activity is expected to cause a 10% or more reduction in the available assimilative capacity for the pollutant. In Ohio Valley Environmental Coalition v. Horinko, 279 F. Supp.2d 732 (S. D. of W. Va. 2003), the plaintiffs argued that allowing a 10% reduction of assimilative capacity without triggering a more detailed Tier II analysis was inconsistent with the federal regulations. The Court ruled that the federal regulations do not prohibit a State from permitting some insignificant amount of pollution prior to requiring a Tier II analysis and found, in light of the evidence on the record, that the West Virginia approach was reasonable. Similarly, in the Kentucky Waterways Alliance v. EPA 540 F.3d 466 (6^{th} Cir. 2008), the 6^{th} Circuit Court held that a de minimis categorical exemption from the Tier II analysis is allowable, but stated that based on the evidence presented, 10% of the assimilative capacity of the water body is the outer limit for a de minimis discharge.

Although there is precedence for using significance thresholds in determining whether a Tier II analysis is required and there is support for significance thresholds in both case law and EPA guidance, before deciding on the threshold magnitude, included/excluded activities or other details a preliminary decision for DEQ is whether or not to establish significance thresholds at all. There are many potential problems associated with establishing such thresholds, and the problems will depend on the threshold approach used. These problems could include:

- Documentation and tracking;
- Establishing baseline conditions and the scale at which those baseline conditions apply (assessment unit, stream reach, etc.); and
- Resolving disputes over what is considered insignificant.

In order to avoid some of these potential problems, DEQ could decide to require all new or expanded discharges to undergo a Tier II analysis and simply establish various levels of Tier II analyses depending upon the proposed discharge's relative risk for significant degradation. Of course, this will bring forth a different set of potential problems that should be explored if DEQ considers not establishing significance thresholds.

If DEQ determines that establishing significance thresholds is desirable, the difficult decision becomes deciding what significance threshold (e.g. measurability, proportion of assimilative capacity, etc.) and associated requirements (e.g. compliance point, cumulative caps, etc.) are demonstrated to be consistent with the antidegradation requirements. These are not simple questions, as there are many other factors that need to be taken into consideration. The rest of this document will briefly discuss potential approaches to addressing "significance thresholds" and associated issues that should be considered.

Defining a Significance Threshold

Because federal regulations do not explicitly prohibit nor define "significant threshold," EPA has given states much latitude in defining significance thresholds. The various approaches used include a "measurable" change, a "proportional" change, or a combination thereof. Each approach is summarized briefly below.

Measureable Changes in Concentrations

This approach sets the "significance threshold" equal to an estimated change (that is pre-determined to be "measurable") in pollutant concentrations at a compliance point downstream (either at the edge of a mixing zone or after full mixing). If the estimated concentration is "measurable" then the activity must go through a Tier II analysis.

The concept of "measurable" is currently embodied in the definition of lower water quality in Idaho's water quality standards as well as Idaho statutes. In Idaho statutes, the definition of lower water quality requires the use of statistics in determining whether a change has occurred. This implies that the water quality is being measured and the data is being statistically compared. The difficulty with this definition is that we cannot measure predicted changes and will have no data to statistically compare until after a change in discharge occurs. This is counter to antidegradation review which is a process that requires we make judgments about future conditions before we allow them to occur. The current definition of lower water quality in the water quality standards recognizes this difficulty and indicates that statistics <u>may be</u> used in determining whether a change in water quality can be measured. This allows that other methods could be used in determining whether a measurable and adverse change in water quality might occur with a proposed change in discharge. One other method DEQ considered in the use of method detection limits and associated method sensitivities or precisions to estimate what changes would be measurable even though not yet measured.

Washington has defined measurable degradation numerically for temperature (0.3ºC), dissolved oxygen (0.2 mg/L), bacteria (2 cfu/100mL), pH (0.1 units), and turbidity (0.5 NTU). Washington has also specified that any detectable increase (concentration greater than the quantification level associated with the analytical method with the lowest detection level) in the concentration of a toxic or radioactive substance is considered measurable degradation.

Oregon is similar in that it has defined a measurable change for two pollutants: temperature (0.25 ºC) and dissolved oxygen (0.1 mg/L). For the remaining pollutants, Oregon recognizes alternative methods for deciding whether an activity will result in a "measurable change" in water quality (proportional change in loading or assimilative capacity, etc.); however, Oregon does not provide specific thresholds for these alternative methods.

It can be argued that this approach is consistent with the antidegradation intent because it concludes that no lowering of water quality is occurring if the difference in water quality is not predicted to be measurable. The benefit of this type of an approach is that a measurable change for a particular pollutant would be known beforehand, and background ambient water quality data is not necessarily required. If one knew the pollutant concentration of the effluent, they could simply assume a zero background concentration (at least for conservative pollutants, this probably would not work for a pollutant like dissolved oxygen) and evaluate what the change in concentration would be at the downstream compliance point. If this calculated or modeled change in concentration is greater than the pre-determined measureable change, then a Tier II analysis would be required.

A disadvantage to this approach is that what is considered "measurable" will change as technological advances are made. A second disadvantage is that some method detection limits may not be sensitive enough to detect changes in the water chemistry which are meaningful to aquatic life or human health, an example is dioxin. For non-conservative pollutants, where modeling may be necessary (e.g. dissolved oxygen), natural background variability adds another component of uncertainty in the analysis.

Proportional Changes to Assimilative Capacity

This approach sets the "significance threshold" equal to an a priori proportion of the assimilative capacity. Assimilative capacity is defined as the difference between baseline water quality conditions and the most stringent applicable criterion for a particular pollutant. If the change in water quality downstream of a new or increased discharge is calculated to be greater than the significance threshold, then a Tier II analysis would be required. Conversely, if the change in downstream water quality is less than the significance threshold, then no Tier II analysis is necessary.

As an example let's assume DEQ establishes a significance threshold of 10% of the assimilative capacity, pollutant "Y" has a criterion of 100 ug/L, and baseline water quality in the Steam River is 0 ug/L. The significance threshold in this example would be 10 ug/L, so if a new discharger would not increase the downstream concentration of pollutant "Y" above 10 ug/L then the discharger would not have to undergo a Tier II analysis (Figure 1).

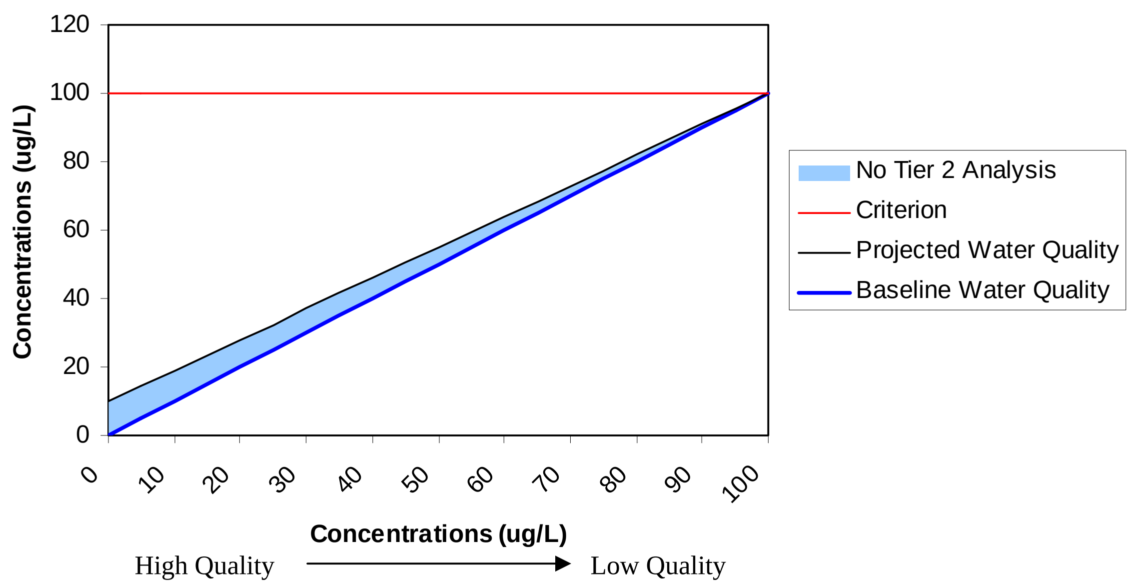

Figure 1. Significance threshold based upon 10% of the assimilative capacity. Discharges that would use less than 10% of the assimilative capacity (shaded in blue) would not be required to undergo a Tier II analysis.

A disadvantage to this approach is that it is necessary to gather baseline water quality data. Given the inherent variability of water quality, it would be necessary for DEQ to define procedures for characterizing baseline water quality conditions (e.g. number of samples, period of time to be sampled); choose a percentile, descriptive statistic (e,g, minimum observed value, average, median, upper 95^{th}% confidence limit, maximum observed value), or a projected value to characterize the baseline; and have a means for tracking this information. A second disadvantage to this approach is that it is the least protective of high quality waters, meaning it allows the most change to occur in the highest quality waters (where there is the greatest assimilative capacity available) before requiring a Tier II analysis. This is depicted in Figure 1, which shows the largest blue area in the lower left of the graph (which represents the highest quality waters) and smallest blue area in the upper right portion of the graph (which represents the lowest quality waters). A third disadvantage to this approach is it not as conducive for pollutants without numeric water quality criteria (e.g. nutrients). Application of assimilative capacity to a narrative criterion requires its interpretation into a numeric target first. While this is done all the time (especially in the context of TMDLs) it is not without its own points of contention which can be time consuming.

Various states implement this approach and specify (in rule or guidance) a proportion of assimilative capacity that may be considered insignificant. Examples include:

- Delaware[1] (5%)
- West Virginia (10%)
- New Hampshire (10%)
- Kentucky[2] (10%)
- Arizona (20%)
- Wyoming (20%)

Proportional Changes to Baseline Water Quality

This approach sets the "significance threshold" equal to a proportion of the baseline water quality. If the change in water quality downstream of a new or increased discharge is calculated to be greater than the significance threshold, then a Tier II analysis would be required. Conversely, if the change in downstream water quality is less than the significance threshold, then no Tier II analysis is necessary.

As an example let's assume DEQ establishes a significance threshold of 20% of the baseline concentration, pollutant "Y" has a criterion of 100 ug/L, and baseline water quality in the Steam River is 50 ug/L. The significance threshold in this example would be 10 ug/L, so if a new discharger would not increase the downstream concentration of pollutant "Y" above 60 ug/L then the discharger would not have to undergo a Tier II analysis (Figure 2).

[1] Although not specified in guidance or rule, this represents the "general rule of thumb" for a significance threshold (*Evaluation of Options for Antidegradation Implementation Guidance*, Tetra Tech, 2008).
[2] Submitted to EPA for approval in November 2009. Unsure if EPA has acted on the rule submittal to date.

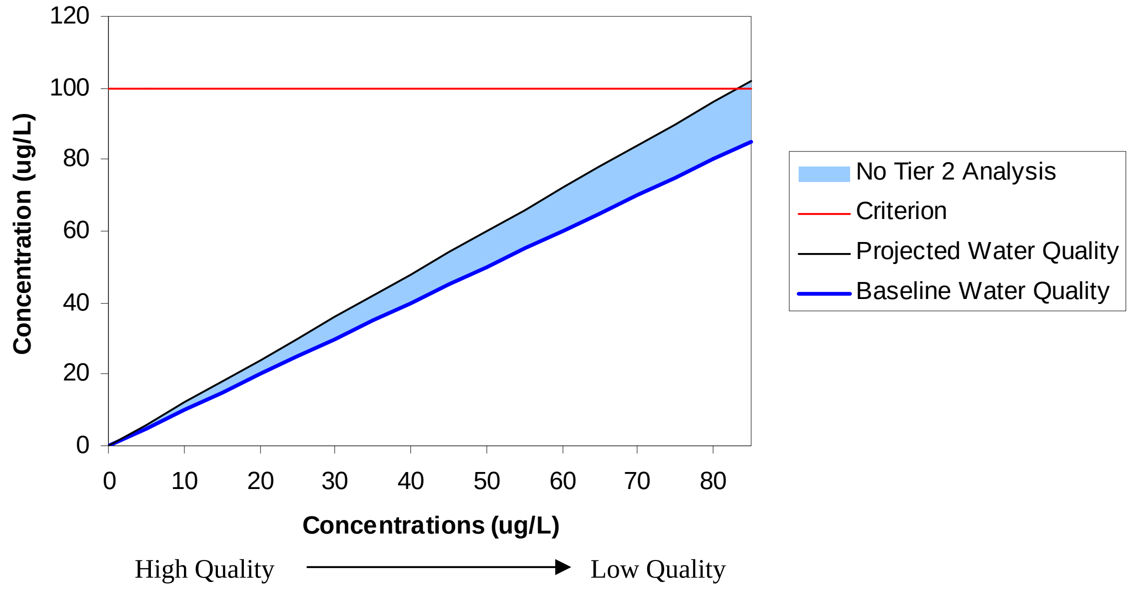

Figure 2. Significance threshold based upon 20% of the baseline water quality. Discharges that would cause an increase in concentrations of downstream water quality by less than 20% of the baseline water quality (shaded in blue) would not be required to undergo a Tier II analysis.

Similar to the assimilative capacity approach, it is necessary to develop procedures for characterizing the baseline water quality. Establishing a significance threshold based on a proportion of the baseline water quality offers the greatest protection of the highest quality water; however, it would allow the least protection for those waters with quality nearing criteria levels (Figure 2). It is arguable that waters nearing criteria levels are more sensitive to degradation and allowing greater change in lower quality waters would be more likely to cause adverse affects to the beneficial uses. Furthermore, it would be mathematically possible to exceed criteria (as depicted in Figure 2); however, the Tier I protection of protecting beneficial uses could serve as the backstop (assuming there were no other cumulative cap considerations, which are discussed later in this paper).

Examples of states that implement this approach in rule or guidance include Colorado (10% of existing load for bioaccumulatives and 15% of existing concentration for other pollutants) and Ohio (5% change for superior high quality waters of existing ambient water quality).

Proportional Changes to the Criterion

This approach sets the significance threshold equal to a proportion of the applicable standard. The allowable amount of change will remain constant, regardless of the baseline water quality. If the water quality downstream of a new or increased discharge is calculated to be greater than the significance threshold, then a Tier II analysis would be required. Conversely, if the downstream water quality is less than the significance threshold, then no Tier II analysis is necessary.

As an example let's assume DEQ establishes a significance threshold of 10% of the criterion and pollutant "Y" has a criterion of 100 ug/L, and baseline water quality in the Steam River is 50 ug/L. The significance threshold in this example would be 10 ug/L (100 ug/L x 0.10), so if a new discharger would not increase the downstream concentration of pollutant "Y" above 60 ug/L then the discharger would not have to undergo a Tier II analysis (Figure 3).

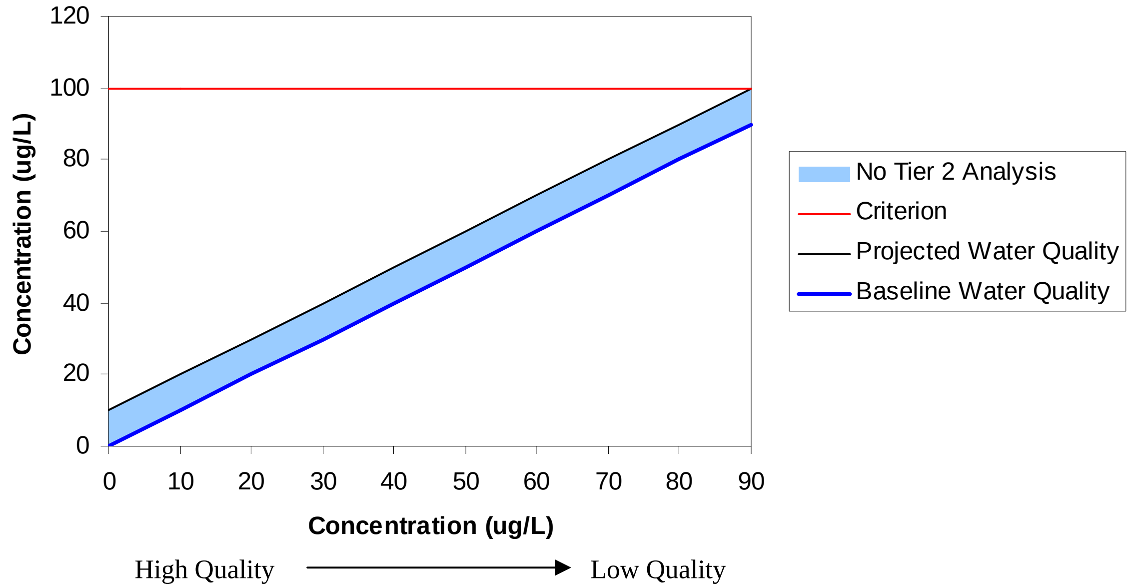

Figure 3. Significance threshold based upon 10% of the criterion. Discharges that would cause an increase in concentrations in water quality by less than 10% of the criterion (shaded in blue) would not be required to undergo a Tier II analysis.

Unlike a few of the other approaches, it is not necessary to have baseline water quality in order to assess whether the discharge will surpass the pre-established significance threshold. The disadvantage to this approach is that it doesn't focus on maintaining the baseline water quality, rather it is focused on ensuring the water quality doesn't increase by a more than certain proportion of the applicable criterion without a Tier II analysis. Furthermore, as with assimilative capacity, this approach is not conducive to pollutants without numeric criteria.

Montana stipulates that insignificant changes for particular pollutants are considered those less than 10% of the applicable standard (when the surface water quality is less than 40% of the standard). Additionally, for toxic parameters and nutrients, Montana rules state that when specified trigger values[3] are exceeded, but the resulting receiving water concentration is less than 15% of the lowest applicable standard, then the discharge is considered insignificant.

Combination Approaches

Some states have a combination approach where they either can 1) consider one or more of the above (or other) approaches, or 2) where they must consider a combination of the above approaches. For example, Delaware allows consideration of a variety of approaches in that a discharge may be considered insignificant if it would lower the ambient water quality by less than 5%, reduce the assimilative capacity by less than 5%, or increase pollutant loadings by less than 5%. On the other hand, Utah's 2008 rule language determined significance by examining a combination of a proportion of the assimilative capacity and a proportion of the applicable criterion. As an example, if the estimated concentration downstream of the mixing zone is less than 50% of the applicable criterion and the activity would consume less than 20% of the remaining assimilative capacity then a Tier II analysis is not required. If the estimated

[3] Trigger values are listed in Montana DEQ Circular 7 in the same table as the numeric toxics criteria. As an example, Antimony has a trigger value of 0.4 ug/L. It is unclear how the trigger values were derived or what they represent.

concentration downstream of the mixing zone is greater than 50% but less than 75% of the applicable criterion and the project would consume less than 10% of the remaining assimilative capacity, then a Tier II analysis is not required. In September 2009, EPA Region 8 disapproved of these provisions in Utah's regulations; as a result, Utah has recently (in 2010) changed its approach to determining when a Tier II analysis would be required. They no longer use a proportion of the assimilative capacity or criterion as a measure of significance.

A possible combination approach that DEQ could entertain is use of a proportion of the baseline water quality when the baseline water quality is less than 50% of the criterion and use of a proportion of the assimilative capacity when the baseline water quality is greater than 50% of the criterion (Figure 4). This would be equally protective of the highest and the lowest quality waters. The most change would be allowable in moderate quality waters before requiring a Tier II analysis.

As an example let's assume DEQ establishes a significance threshold of 10% of the criterion or the assimilative criterion, pollutant "Y" has a criterion of 100 ug/L, and baseline water quality in the Steam River is 30 ug/L. Because the baseline water quality is less than one-half of the criterion, DEQ would examine whether the discharge will result in downstream water quality increasing by 10% of the baseline water quality. So, 10% of 30 ug/L equals 3 ug/L. If the downstream concentration is calculated to be greater than 33 ug/L, then a Tier II analysis would be required (Figure 4). If the baseline water quality is 70 ug/L, then DEQ would consider a proportional change based upon the assimilative capacity. The assimilative capacity in this example would be 30 ug/L (100 – 70), so if the resulting downstream concentration was greater than 73 ug/L, then a Tier II analysis would be required.

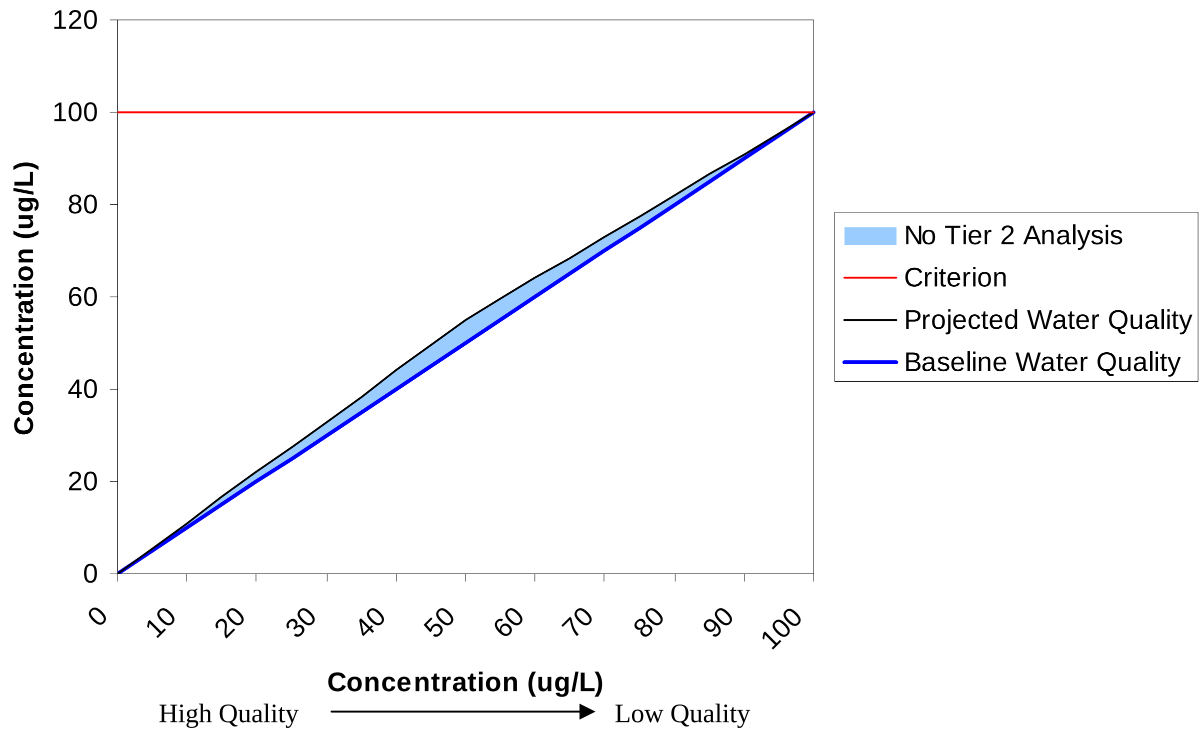

Figure 4. Significance threshold based upon 1) 10% of baseline water quality when existing conditions are less than ½ of the criterion or 2) 10% of the assimilative capacity when baseline conditions are greater than ½ of the criterion. Discharges that would cause an increase in concentrations in water quality by less than 10% of either baseline concentration or assimilative capacity (shaded in blue) would not be required to undergo a Tier II analysis.

The disadvantages of this approach are similar to those of the two approaches it combines (proportion of assimilative capacity and proportion of baseline water quality). First, this combination approach would require characterization of the baseline water quality. Second, narrative criteria would have to be numerically interpreted. Third, criteria are likely to change over time (as evidenced by the ammonia criterion). Lastly, depending on how this approach is crafted, it could be overly complicated and difficult to implement.

Table 1 summarizes the advantages and disadvantages of each of the approaches discussed in this section.

Table 1. Pros and cons of "significance thresholds" approaches.

	Pro	Con
Measurable Change	• Objective, rather than subjective like the other approaches • Established a priori, if using analytical method detection and sensitivity/precision • Ambient water quality data may not be necessary	• Changing analytical methodologies • Some changes that are biologically meaningful might not be measurable (for a particular pollutant) • Some measurable changes aren't biologically meaningful • What is considered measurable could depend on the concentrations being compared (smaller changes are measurable at greater concentrations)
Proportion of Assimilative Capacity	• Tied directly to the existing water quality coupled with the water quality criteria • Fairly straight-forward • EPA and Court precedent for this approach being acceptable (depending on the selected proportion)	• Best quality waters can be degraded the most • Must have baseline water quality data[1] • Document and track baseline data • Not conducive to pollutants without numeric criteria (e.g. nutrients) • Will change as criteria change (e.g. ammonia criteria)
Proportion of Baseline Water Quality	• Supportive of pollutants without numeric criteria • Fairly straight-forward • Tied directly to existing water quality and not affected by changing criteria • The baseline water quality is fixed	• Lowest quality waters can be degraded the most (up to a certain point) • Must have baseline water quality data[1] • Documentation and tracking of baseline data
Proportion of the Water Quality Standard	• Tied with protection of the beneficial use (because criteria are designed to be protective of the beneficial use) • Every discharger would be treated equally (equal proportion of the criterion) until the baseline water quality approaches the cumulative cap	• Doesn't tie as cleanly to maintaining existing water quality conditions • May require baseline water quality data[1] • Will change as criteria change (e.g. ammonia criteria)
Combination	• Could be designed to be most protective of best and lowest quality waters by allowing the most change in "mediocre" quality waters	• Depending upon its structure, this could be more complicated and confusing • Requires baseline water quality data[1] • Documentation and tracking of baseline data

1. How to address non-detects and characterizing baseline water quality are issues that will need to be addressed once we get into the detailed aspects of implementation. Characterizing baseline water quality may require conservative assumptions in order to gain EPA approval. DEQ will also have to address the scale of applicability (WBID, assessment unit, hydrologic unit) – meaning how far upstream and downstream would the baseline water quality characterization apply?

EPA Position
In the *Tier 2 Antidegradation Reviews and Significance Thresholds* memorandum (Ephraim King 2005), EPA clarified that significance thresholds should be defined at a minimum in terms of assimilative capacity, unless it can be shown that an alternative approach is equally protective. Furthermore, EPA recommends that states incorporate a cumulative cap on the amount of assimilative capacity used in order to create a "backstop" on the amount of allowable degradation before requiring detailed Tier II analysis (alternatives analysis [AA] and socio-economic justification [SEJ]).

Current Idaho Regulations
For high quality (otherwise called Tier II) waters, Idaho rules (IDAPA 58.01.02.051.02) state:

> "Where the quality of the waters exceeds 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 Department finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the Department's continuing planning process, that allowing <u>lower water quality</u> is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing such <u>degradation</u> or <u>lower water quality</u>, the Department shall assure water quality adequate to protect existing uses fully." [emphasis added]

Idaho WQS define "lower water quality" as:

> "a measurable and adverse anthropogenic change in a chemical, physical, or biological parameter of water relevant to a beneficial use, and which can be expressed numerically. Measurable change may be determined by a statistically significant difference using standard methods for analysis and statistical interpretation appropriate to the parameter. Statistical significance is defined as the ninety-five percent (95%) confidence limit when significance is not otherwise defined for the parameter in standard methods or practices."

Historically, DEQ has interpreted what is measurable in a variety of ways. We have interpreted it to be what is actually measurable based upon analytical capabilities (SF Landing proposed discharge to South Fork Payette River, a Special Resource Water). We have also interpreted "measurable" as a proportion of the assimilative capacity (Thompson Creek Mine discharge).

Proposed Approach for Rule
The primary purpose of establishing significance thresholds is to focus limited resources on those activities that have the potential to significantly lower water quality. Thus, we have concluded that establishing significance thresholds is an appropriate and rational approach for balancing limited resources with environmental risks.

However, we discourage the typical approach of equating significance thresholds with what is considered lowering of water quality. Rather, we recommend the two questions be addressed separately. We should allow for the recognition that a discharge will potentially lower water quality, while concurrently allowing for the conclusion (based upon a different set of conditions) that such lowering of water quality might not be significant enough to warrant a more rigorous Tier II analysis.

We propose that we should always evaluate the potential of a new or increased discharge to lower water quality. Our rules define lower water quality as anything that is measurable and adverse. We propose that we take an approach similar to Washington in that we determine what is considered measurable for each pollutant. This may entail incorporating a table in the implementation guidance document summarizing what is considered measurable for each pollutant that can be reasonably expected in Idaho discharges. It will also entail revising our current definition of “lower water quality” by omitting the potential for considering statistics and instead, focus on the most up-to-date analytical capabilities.

Recognizing that many discharges have the potential to result in a measurable lowering of water quality, we recommend that we consider significance thresholds in order to focus limited resources on those activities with the potential to cause significant degradation. We also recognize the need for establishing a justifiable rationale in the record to support any determination of insignificance.

After much discussion, we recommend that a proportion of the baseline water quality, coupled with a cumulative cap be used for selecting a significance threshold for Tier II analysis. We came to this conclusion because the baseline water quality, once established, will be fixed, unlike the criteria or assimilative capacity. It is possible the criteria (and the associated assimilative capacity) could change as more scientific studies are undertaken. Furthermore, using the baseline water quality approach allows the agency to more readily address pollutants without numeric criteria. We did not discuss what proportion of baseline water quality should be used; however, recent court cases and EPA disapproval actions indicate that the proportional change should not exceed 10% of the assimilative capacity (this is the outer limits) of the receiving water body. It will be challenging to determine what general proportion of the baseline water quality would comply with the 10% of the assimilative capacity.

Other Issues

When evaluating options for evaluating whether an activity has the potential to significantly degrade water quality (and thereby require a Tier II analysis), a variety of other considerations should be taken into account. Those include whether and how to consider biological data, whether there should be a cumulative cap on the “significance threshold” consideration, determining the appropriate compliance point (at the edge of an assigned chronic mixing zone or after complete mixing), whether pollutant trading or offsets can be considered, and how to address pollutants without numeric criteria. Each of these issues is discussed in greater detail below.

Biological Data

It is possible to consider biological data in antidegradation reviews. The advantage to this approach is that it directly accounts for the beneficial uses (aquatic life) of the receiving water body. Maryland is at the forefront in using indices of biological integrity (IBI) for antidegradation purposes. For example, Maryland designates high quality waters based upon their IBI scores and establishes baseline condition scores for high quality waters in their rules. If a project is expected to use more than 25% of the IBI assimilative capacity, then AA and SEJ analysis is required. For example, if a water body has an IBI of 4.5 and the supporting IBI is 3.0, then there are 1.5 IBI units of assimilative capacity available.

The most difficult aspect of implementing this type of approach is predicting how a discharge will impact the IBI scores. With pollutants that are measurable in a discharge, it is "easier" to predict, through modeling or mass-balance calculations, how a discharge will affect the chemical composition of the water. This is not so with IBIs.

After a negotiated rulemaking meeting on June 2, 2010, DEQ is proposing to use a waterbody-by-waterbody approach that utilizes biological data, in assigning either a Tier I or Tier II level of protection. DEQ is not proposing to use biological data in determining whether a there is a measurable or significant lowering of water quality, rather, that determination will be made for each pollutant of concern.

Cumulative Cap for Tier II Analysis

A cumulative cap establishes a maximum cumulative threshold (e.g. 10% of the assimilative capacity), where once it is exceeded, all new or expanded activities would require a Tier II analysis regardless of how little they are predicted to impact the receiving water quality. Without a cumulative cap, it is conceivable that multiple new or expanded discharges could degrade the water quality to a level equivalent to the criterion (hence, the water would no longer be considered "high quality') without an AA and SEJ ever being conducted (Figure 5). With a cumulative cap, some new or increased dischargers may have to undergo a more detailed Tier II analysis before being authorized to discharge (Figure 6). Clearly, while it is necessary to focus limited resources, it is not the intent of antidegradation to allow a continual decline in water quality without appropriate reviews and justifications.

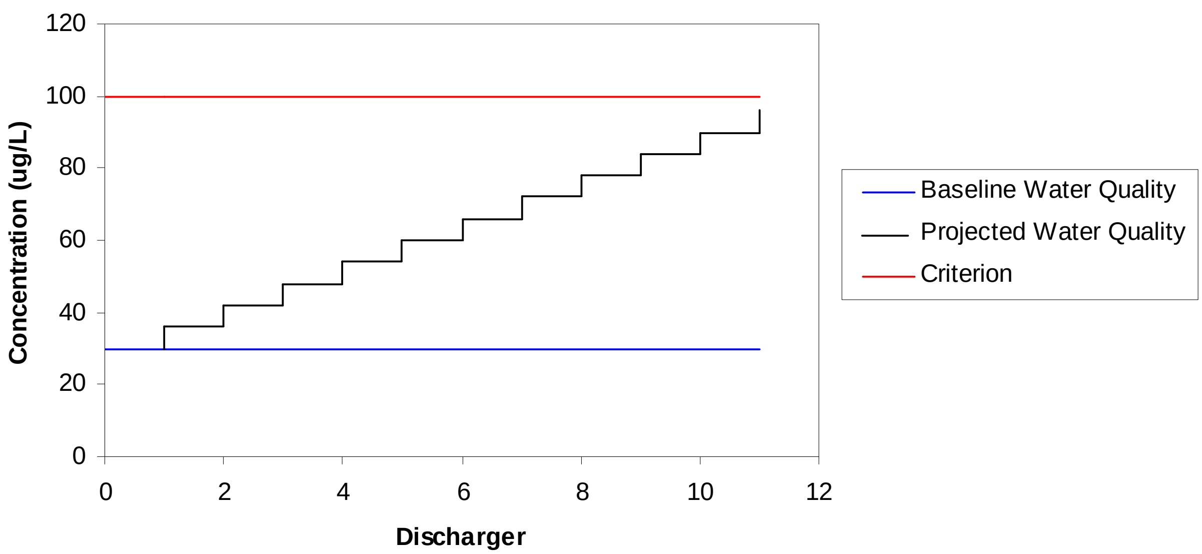

Figure 5. Step chart of water quality changes with each new discharger. The significance threshold depicted here is based upon 20% of the baseline water quality. In this example, the significance threshold for requiring a Tier II analysis is 6 ug/L (30 ug/L x 0.2) and there is no cumulative cap. Each discharger causes a 6 ug/L increase in the water quality concentration. Without a cumulative cap, this figure demonstrates that 11 dischargers could be authorized without requiring a Tier II analysis. Water quality after the addition of the 11th discharger is 96 ug/L, which is just shy of the 100 ug/L criterion.

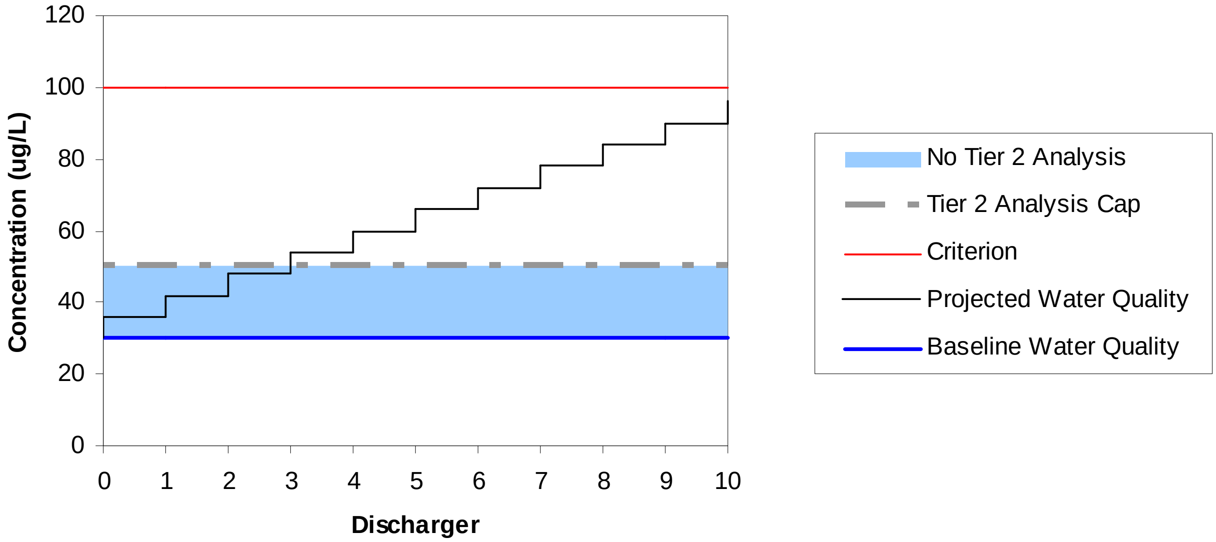

Figure 6. Step chart of water quality changes with each new discharger. The significance threshold for requiring a Tier II analysis depicted in this example is based upon 20% of the baseline water quality. So the significance threshold is 6 ug/L (30 ug/L x 0.2) and the cumulative cap is established at 50% of the criterion. Each discharger causes a 6 ug/L increase in the water quality concentration. The first three dischargers could be authorized without requiring a Tier II analysis. Each of the remaining dischargers would have to undergo a Tier II analysis.

The following states do not appear to have a cumulative cap: Washington, Oregon, and Nevada. Washington's lack of a cumulative cap may be appropriate given their significance threshold is based upon measurability. Similarly, Nevada's lack of a cumulative cap is likely due to the fact that they treat their requirements to maintain high water quality as criteria in establishing water quality based effluent limits. Oregon performs its significance thresholds determination on a case by case basis and can approach it in a variety of ways, which might explain the apparent lack of a cumulative cap.

Montana, Wyoming, New Mexico, New Hampshire, and Massachusetts appear to have a cumulative cap (Table 2).

Table 2. Examples of cumulative caps used in other states.

Montana	Toxics/Nutrients – 15% of the lowest applicable standard Bioaccumulatives (BCF > 300)/carcinogens – no change allowed Other parameters – 40% of the standard
Wyoming	10% of baseline load
New Mexico	10% of the assimilative capacity, where assimilative (concentration) capacity = baseline concentration – criterion
New Hampshire	90% of the assimilative capacity
Massachusetts	10% of the unused assimilative (loading) capacity

Because we are recommending that we consider using a proportion of baseline water quality as a significance threshold, then a cumulative cap will need to be incorporated into the rule.

Compliance Point
For clarity, it would be beneficial to address the point at which DEQ intends to evaluate compliance with the antidegradation provisions. Should this compliance point be at the edge of the approved chronic mixing zone (which may be 25% or less of the critical flow of the receiving waterbody), or should the compliance point be established after full and complete mixing (using 100% of the critical, or some other, flow)?

Determining the compliance point varies by state. Washington requires the antidegradation analysis to occur at the edge of the <u>maximum</u> chronic mixing zone dimensions, which is established in accordance with their mixing zone regulations. By using the maximum dimensions, Washington fixes the point of assessing compliance with the antidegradation policy rather than having it ‘float’ with the size of the actually granted regulatory mixing zone. Oregon and Montana specify that the antidegradation analysis applies outside of the mixing zone and do not specify if this means at the edge of a chronic mixing zone or after assuming complete mixing. Nevada does not specify the compliance point; however, it appears as though the expectation is to maintain the RMHQs at the edge of the mixing zone. Although not specifically mentioned, it appears as though Massachusetts, Wyoming, and New Hampshire conduct an antidegradation review assuming 100% mixing.

In their March 4, 2004 technical justification for the approval of Oregon’s WQS, EPA stated, “This provision [Tier II requirements not applying within the mixing zone] only speaks to pollutants within a mixing zone; it does not exempt from Tier II review a lowering that would occur at the edge of the mixing zone; and if such a lowering occurs at that point, Tier II antidegradation review will apply.” This may indicated EPA’s expectation that antidegradation reviews be conducted at the edge of the regulatory mixing zone.

A regulatory mixing zone can vary in size, and the location of the mixing zone edge will thus change, but for water quality based effluent limits the target concentration at the edge will not change. For this reason it seems best to have a fixed point of reference for gaging changes in ambient water quality. The full mixed condition would be the simplest, but Washington’s approach would work as well. Because we are concerned with maintaining and protecting the overall water quality of the receiving water body, it makes intuitive sense to use 100% of a selected (e.g. critical, 5th percentile, etc) flow.

Pollutant Offsets
A pollutant offset occurs when a discharge contributes a certain amount of pollutant to a water body, but then implements remedial measures upstream of its discharge to remove or prevent that same amount of pollutant from entering the water body. It may be acceptable to consider pollutant offsets when evaluating whether an activity is expected to significantly degrade high water quality.

Washington allows offsets to be used to reduce the impact of an action such that there would not be a measurable degradation of water quality, thus eliminating the need for AA and SEJ. Similarly, South Dakota also allows offsets to be considered when determining whether a discharge will result in significant degradation. On the flipside,
Oregon explicitly prohibits this approach, stating: “If such trading is proposed, then the discharger/applicant/source should still be subjected to an antidegradation review; the trade can be used to show how environmental costs will be lowered as a result of allowing the lowering of water quality due to the proposed activity.”

DEQ views offsets as different from pollution trades. Pollutant trades occur in the context of a TMDL to restore impaired water quality, as a means to more efficiently meet load or wasteload allocations and are only available from a source that attain a load less than its allocation. While offsets are similar in concept they are a means to maintain high water quality. There is no TMDL or allocations of pollutant loads to constrain offsets. Offsets can maintain high water quality only if they occur upstream and in advance of a potentially degrading activity. They get to a situation in which there is no degradation of overall water quality, not even locally or temporarily. In this situation no AA and SEJ is then needed. In a sense, offsets are the alternative that provides the least degradation. Like pollutant trading a framework, some way of formalizing offsets and making them binding, would be needed

Many of the states reviewed did not speak to offsets or pollutant trading and those that did, addressed offsets in terms of being a practicable alternative that may be considered during the alternatives analysis rather than in the context of using offsets to conclude that a discharge will not significantly degrade water quality. Examples are provided in Table 3 below.

Table 2. Examples of how offsets are considered in the antidegradation (Tier II) review.

Oregon	"…the trade can be used to show how environmental costs will be lowered as a result of allowing the lowering of water quality due to the proposed activity."
West Virginia	"A proposed activity that will result in a new or expanded discharge in a water subject to Tier II protection may be allowed where the applicant agrees to implement or finance upstream controls of point or nonpoint sources sufficient to offset the water quality effects of the proposed activity from the same parameters and insure an improvement in water quality as a result of the trade."
New Mexico	Limited degradation may be allowed after consideration of a variety of things, including pollutant trading with point and non point sources of pollutants.

Based on past documentation, EPA doesn't appear to be adverse to the use of offsets (or trades in the context of a TMDL) in antidegradation reviews. In their ANPRM (July 7, 1998), EPA indicated that pollutant trading (or offsets) could be considered in the antidegradation process. "EPA has also allowed a proposed activity that will result in a new or expanded source where the applicant agrees to implement or finance upstream controls of point or nonpoint sources sufficient to offset the water quality effects of the proposed activity." Although this is mentioned in the context of the Tier III antidegradation review, it may provide insight into the potential of EPA considering a state's desire to consider offsets in antidegradation Tier II reviews.

Based on this research, DEQ concluded that offsets should be a part of Idaho's antidegradation implementation provisions. We recommend that offsets be used when assessing whether a discharge to high quality water (Tier II and Tier III) will degrade overall water quality.

Pollutants without numeric criteria

Depending upon the significance threshold approach taken, addressing pollutants without numeric criteria could be difficult. For example, without numeric water quality criteria it could be more difficult, time consuming, and costly to determine the available assimilative capacity.

Because we are recommending that lower water quality be assessed by what is measurable and a significance threshold and cumulative cap based upon the proportion of baseline water quality, developing a methodology for dealing with pollutants without numeric criteria is not necessary. However if our approaches change, we may have to come back to this issue.