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4 Tier 1 Review – Protecting Existing Uses

This section of the document describes the review that is performed to assure existing uses are protected.

Existing uses and the water quality necessary to protect those uses must be maintained. In addition~~Thus~~, all activities or discharges must not cause or contribute to a violation of water quality criteria. For National Pollutant Discharge Elimination System (NPDES) permitting, ensuring the water quality necessary to protect existing uses will generally be ~~this is~~ assured through evaluating reasonable potential to exceed (RPTE) water quality criteria for the most sensitive existing use, whether the existing uses are designated or not. The key in this process is to determine what the existing uses are and whether they are more sensitive than the water body's designated uses or undesignated presumed use protections.

Comment [BB1]: On October 1, 2010 EPA commented on IDEQ's proposed antidegradation implementation rule. EPA identified specific areas of concern where EPA approval would be unlikely if those concerns were not addressed. Existing use protection was one of those areas.

EPA expressed concern that the proposed rule was based on a premise that the criteria in Idaho's water quality standards will ensure protection of all existing uses in all cases, and that Idaho's list of potential designated uses at IDAPA 58.0102.100 covers all potential existing uses. EPA commented that it was important that the antidegradation provisions provide for protection of existing uses that are not designated in Idaho's water quality standards, and provide for the possibility that the criteria in Idaho's standards may not always ensure the water quality necessary to protect all existing uses.

IDEQ made suggested revisions to the proposed rule to address EPA concerns. However, the concerns are raised again in the draft guidance.

While it may be that in most cases, or potentially all cases, the criteria in Idaho's water quality standards will ensure protection of all existing uses, and that the list of potential designated uses at IDAPA 58.0102.100 covers all potential existing uses, foreclosing the ability to address exceptions is a concern. EPA has suggested edits intended to reflect IDEQ's expectation, without foreclosing the ability to address, consistent with 40 CFR 131.12(a)(1), other situations that may arise.

4.1 What is an Existing Use?

The regulatory definition of an existing use is:

> Those beneficial uses actually attained in waters on or after November 28, 1975, whether or not they are designated for those waters in Idaho Department of Environmental Quality Rules, IDAPA 58.01.02, "Water Quality Standards."

Thus if historical data indicates a use has once occurred (between now and November 28, 1975), it would be an existing use.

Two questions that regularly come up when discussing existing uses are:

- What does it mean for a use to be actually attained?
- Is the suite of possible use choices limited to those described in the Idaho WQS?

It is not the purpose of this guidance to fully explore these questions, so as a practical matter the following answers are provided for purposes of antidegradation:

- A use may be determined as existing as described in Chapter 3 of Idaho's WBAG II (Grafe and others 2002). DEQ will use all available information to make this determination including information in any completed Subbasin Assessment (SBA).
- Exiting uses will generally fall within the ~~The~~ beneficial use choices ~~under consideration for an existing use are those~~ defined in the Idaho WQS, and those existing uses will be generally be protected and maintained by applying the numeric and narrative criteria in the Idaho WQS that are associated with those beneficial uses.

Once the applicable uses are determined—for most water bodies, there are several uses—ensuring the water quality necessary to protect existing uses in a Tier 1 review is generally a matter of assuring that an activity or discharge will not cause or contribute to a failure to meet applicable criteria for the most sensitive use in the receiving water, which may mean at the edge of any authorized mixing zone.

Beneficial Uses

The Idaho WQS describe the beneficial uses that may be assigned to water bodies at IDAPA 58.0102.100, Surface Water Use Designations. Specifically, these are by category (aquatic life, recreation, or water supply) and subcategory (for example, *cold water* aquatic life or *primary contact* recreation):

Aquatic Life
Salmonid spawning, Cold water, Seasonal cold water, or Warm water

Recreation
Primary contact or Secondary contact

Water Supply
Domestic, Agricultural, or Industrial

In addition there are wildlife habitat and aesthetic uses recognized for all surface waters of Idaho.

Multiple use categories may apply to a given water body, and in fact all waters are required by the CWA to support both an aquatic life use and a recreation use. For aquatic life and recreation the subcategories are for the most part mutually exclusive; e.g. a water body is designated for either primary or secondary contact recreation and for either warm water or cold water aquatic life. An exception within the aquatic life category is that a water body may be designated as protected for both salmonid spawning and cold water aquatic life. Within the water supply category, however, the uses are not mutually exclusive. Agricultural and industrial water supply uses apply to all waters of the state; and domestic water supply is designated on a case-by-case basis. So any water body might have all three water supply uses designated.

Comment [BB2]: Designation of secondary contact recreation would be exclusive of primary contact recreation. However, does not ID's designation of primary contact recreation carry with it a goal of providing for secondary contact recreation as well?

The subcategories, as listed above, are in somewhat hierarchical order, e.g., domestic water supply generally requires better quality than agricultural water supply, but this is not strictly so. The most sensitive use is discussed in more detail below.

4.2 Determining Applicable Criteria

Uses are protected by criteria, which are specifications of:
For some pollutants—a numeric limit on quality (numeric criteria), or
For other pollutants—narrative statements that prohibit harmful quantities of a particular pollutant (e.g., sediment narrative) or class of pollutants (e.g., nutrient and toxics narratives).

Narrative criteria play an important role in protecting uses from harm due to pollutants for which there is limited knowledge of adverse effects or difficulty in specifying broadly applicable numeric criteria. A narrative criterion requires water body-specific interpretation, such as in a TMDL, to arrive at a numeric value useful in antidegradation. Together, numeric and narrative criteria cover all possible pollutants that may harm uses.

Ensuring the water quality necessary to protect existing uses in a ~~A~~ Tier 1 review will generally come~~s~~ down to assuring that the applicable criteria for the most sensitive existing use, designated or not, will not be exceeded by the proposed activity or discharge.

Most Sensitive Use

There will always be multiple uses existing or designated for a water body, resulting in two kinds or levels of multiple criteria. First, each use has its own set of relevant parameters, e.g. dissolved oxygen, temperature, arsenic, etc. for aquatic life and bacteria and arsenic and other bioaccumulative toxins for recreation. Second, where parameters are the same, the criterion set for each use maybe different, e.g. the level of arsenic that will support aquatic life differs from that necessary to support fish consumption (recreational use). Thus, for each pollutant we are evaluating, we must determine whether there are multiple criteria values for that pollutant that differ by use. If different criterion values are applicable for a given pollutant, the focus in the Tier 1 review will be on the criterion for the use that requires better water quality. The use requiring better water quality is referred to as the most sensitive use9. This will vary from pollutant to pollutant. Some examples will clarify this.

Let us consider a water body that has cold water aquatic life and primary contact recreation as existing or designated uses.

Case 1 – Criterion for one use category but not the other.

If bacteria is the pollutant, then a criterion exists for the recreation use but not for aquatic life, so recreation use is the most sensitive use for bacteria. For temperature and dissolved oxygen, criteria exist for aquatic life but not recreational use, and so aquatic life is the most sensitive use for temperature and dissolved oxygen.

Case 2 – Criterion for both use categories.

If arsenic is the pollutant, then there are different criteria values to protect aquatic life uses and recreational uses. For arsenic, the criterion10 for recreation, set to protect human health, is at lower levels than the arsenic criteria for aquatic life; thus, recreation is the

9 When we say most sensitive it is in the context of what we know now. There may be a more sensitive use that we are not aware of when we make this determination.
10 Human health criteria for toxins such as arsenic applicable to water protected for recreation are based on exposure due to consumption of fish.

most sensitive use. If selenium, zinc, or cyanide is the pollutant under evaluation, then the most sensitive use is aquatic life.

The example described above involves numeric criteria. Narrative criteria are fundamentally no different and can create either of the situations exemplified in the two cases above. A common example is sediment, for which aquatic life is generally the most sensitive use.

5 Tier 2 Analysis – Is Degradation Necessary and Important?

This section of the document describes the analysis necessary to determine whether significant degradation of high quality (Tier 2) water is justified. It also describes how DEQ will determine if degradation is significant or not, and how DEQ will be assured that controls on other sources of pollution to a high quality water body are being implemented before allowing justifiable degradation. Examples of Tier 2 antidegradation reviews are provided in Appendix E.

For waters that are determined to be of high quality (see Tier 2 determination in section **Error! Reference source not found.**), the rules at IDAPA 58.0102.051.02 require that before DEQ allows degradation that is significant it must be shown to be:

> "…. necessary to accommodate important economic or social development in the area in which the waters are located."

This requirement can be broken down into two components: 1) necessity of the degradation in water quality; and 2) importance of social or economic development associated with an activity or discharge. Hereafter we refer to this simply as necessary and important. For the latter the geographic scope—the area in which the waters are located—is a necessary consideration that must be defined during the analysis. Assuring that degradation of high quality waters is necessary and important has been part of the federal regulation since 1983 and DEQ policy in rule since 1993.

While necessity and importance are the core of Tier 2 analysis, federal regulations (40 CFR 131.12(a)(2)) and Idaho policy in rule (IDAPA 58.0102.051.02) also require:

> "In allowing such degradation or lower water quality, the Department shall assure water quality adequate to protect existing uses fully. Further, the Department shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and cost-effective and reasonable best management practices for nonpoint source control."

In 2011, Idaho codified in rule antidegradation implementation procedures that address the above longstanding policy requirements and provide details on the determination of necessary and important degradation. The new rules also provide for allowing insignificant discharges without Tier 2 analysis.

For allowable degradation, it is always necessary to assure water quality will still adequately protect existing uses. That is the purpose of Tier 1 protection, which is provided to all waters and is addressed in section

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4 Tier 1 Review – Protecting Existing Uses. Tier 2 protection is, in effect, an extra level of protection for some waters that goes above and beyond Tier 1 protection.

The remainder of this section goes into detail on four questions that come up only in Tier 2 antidegradation analysis:

Is the discharge insignificant?

Are other required controls in place and operating?

Is the degradation necessary?

Does the activity bring important social or economic development to the affected community?

Before considering these questions, it should be noted they apply only to:

activities or discharges that will cause degradation, of

high quality water where Tier 2 protection is assigned, and

when an applicant applies for a new or renewed permit or license.

5.1 Insignificant Degradation

Although the federal regulations make no mention of insignificant degradation, court cases have allowed for activities or discharges that are "de minimis," that is, too trivial to warrant governmental regulatory concern11. The purpose of determining whether some degradation is insignificant is to ensure that limited state resources are focused where they can provide the most good. A determination of insignificance simply means that Idaho is willing to overlook degradation that has little effect in order to focus on discharges or activities that create a larger amount of degradation. Determining that a discharge or activity is significant does not mean that the activity or discharge cannot take place, only that the discharge or activity will need to be justified as necessary and important before it can be permitted.

Idaho's antidegradation rule provides for determining a discharge is insignificant. Specifically, Idaho's rule at IDAPA 58.01.02.052.08.a provides:

> **a.** Insignificant Activity or Discharge. The Department shall consider the size and character of an activity or discharge or the magnitude of its effect on the receiving stream and shall determine whether it is insignificant. If an activity or discharge is determined to be insignificant, then no further Tier II analysis, as set forth in Subsections 052.08.b., 052.08.c., and 052.08.d., shall be required.
>
> i. The Department shall determine insignificance when the proposed change in an activity or discharge, from conditions as of July 1, 2011:
>
> (1) Will not increase ambient concentrations by more than ten percent (10%); and
>
> (2) Will not cumulatively decrease assimilative capacity by more than ten percent (10%).

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11 In the specific case of antidegradation, the courts have accepted a loss of up to 10% of a water body's assimilative capacity as de minimis, as long as there is a cumulative cap on excused degradation (Kentucky Waterways Alliance v. EPA, 540 F.3d 466 (6th Circuit) Decided Sept. 3, 2008). A 10% threshold for significance is also stated in a August 10, 2005 EPA memo regarding "Tier 2 Antidegradation Reviews and Significance Thresholds" signed by Office of Science and Technology Director Ephraim King.

ii. The Department reserves the right to request additional information from the applicant in making a determination a proposed change in discharge is insignificant.

If ambient concentrations were the only factor in determining significance of degradation the water quality criteria could be exceeded or all the assimilative capacity used up without a Tier 2 analysis. This is prevented by having a cap on cumulative degradation in water quality that is considered insignificant. Idaho bases its cap on assimilative capacity.

Assimilative capacity is the difference between ambient concentration and concentration allowed by the controlling criterion. Idaho set a cumulative cap at 10% of assimilative capacity and establishes water quality conditions as of July 1, 2011 as the baseline. Without a cumulative cap, a series of insignificant discharges over time could cumulatively consume a significant share, or all, of the assimilative capacity and ultimately degrade water quality down to the level of the criterion without necessity and importance ever being questioned. A cumulative cap merely prevents the lack of analysis that could occur through a series of incremental steps, none of which are significant in themselves.

If a 10% reduction in assimilative capacity were the only factor used to determine insignificance it would result in the largest change in water quality in the best quality water. Additionally, the first activity to occur could use up the entire allowance for insignificance resulting in all later increases in discharge being subject to Tier 2 analysis. In Idaho's view, the better the water quality is to start with, the more significant a given quantity of change is. Therefore, Idaho limits the cumulative reduction in assimilative capacity to 10% combined with a limit on increase in ambient concentration of 10% for insignificance. The latter is not cumulative; thus, each change in discharge is limited to 10% of ambient concentration and if water quality is very high to begin with allows for multiple insignificant discharges before the cap is hit.

The two work together as depicted in Figure 1, so that the greatest amount of change in a pollutant concentration that can be dismissed as insignificant would occur when the ambient concentration of that pollutant as of July 1, 2011, is at half its criterion.

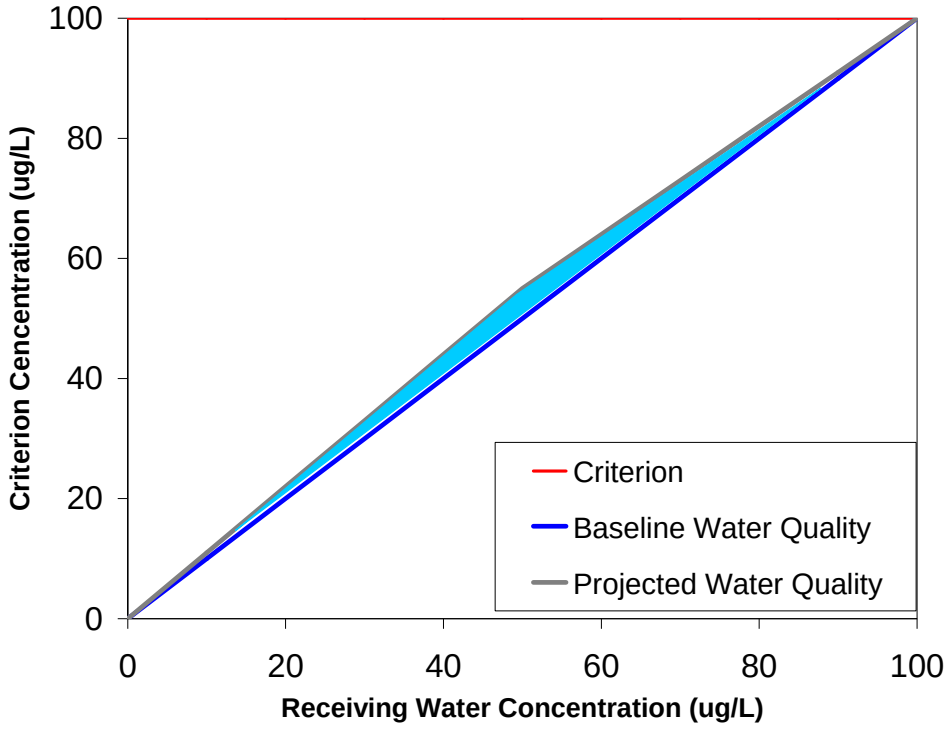

Figure 1. This graph illustrates what would be considered "insignificant" when examining a single new/increased discharge in a high quality water without consideration of a cumulative cap. First, you determine the applicable baseline water quality. From this information, you compare and determine which is more limiting – the proportion of baseline or the proportion of assimilative capacity. Whichever is more limiting is the basis for an insignificance determination. The blue shaded area is considered insignificant in this example.

This can also be tabulated as shown in Table 1.

As an example, consider pollutant "Y" with a criterion of 100 ug/L and an ambient concentration of 20 ug/L as of July 1, 2011. The threshold for determining significance based on ambient concentration is 2.0 µg/L. The assimilative capacity for Y in the water is 80 ug/L and the threshold based on assimilative capacity would be 8.0 ug/L with a cumulative cap of 28.0 ug/L (10% of 80 ug/L = 8 ug/L added to the ambient concentration of 20 ug/L = 28 ug/L). In this example 2.0 µg/L (10% of ambient),

determines the significance of individual changes, up to the cumulative cap, after which all additional change is significant.

Table 1. Example of Ambient Concentration, Assimilative Capacity, and Associated Significance Thresholds (all values in ug/L)

Ambient Concentration (July 1, 2011)	Assimilative Capacity (July 1, 2011)	10% of Assimilative Capacity	10% of Ambient Concentration	Threshold Water Quality Change for Significance
10	90	9.0	1.0	1.0
20	80	8.0	2.0	2.0
30	70	7.0	3.0	3.0
40	60	6.0	4.0	4.0
50	50	5.0	5.0	5.0
60	40	4.0	6.0	4.0
70	30	3.0	7.0	3.0
80	20	2.0	8.0	2.0
90	10	1.0	9.0	1.0
100	0	0	10	0

For pollutant Y (ambient concentration of 20 ug/L as of July 1 2011 and criterion of 100 ug/L), Example 1 (Table 2) illustrates how this would work for a series of six proposed changes in discharge. In only two of the illustrated cases would the change in water quality be considered significant. The first case is the one caused by the discharge change on Aug 1, 2012 when the corresponding change in receiving water concentration would be greater than the 2.0 ug/L threshold. The second case is the final discharge. Although, in the latter case, the receiving water concentration would only change by 1 ug/L from the previous concentration, the cumulative change would exceed the allowed 10% change in assimilative capacity. Therefore, the last discharge would not be insignificant.

Table 2. Example 1 of Significance Determinations for a Series of Changes in Discharge

Date of Change in Discharge	Receiving Water Concentration (ug/L) After Mixing	Water Quality Change Significant?
(as of July 1, 2011)	20 ug/L	—
Sept 30, 2011	21	No
July 30, 2012	22	No
Aug 1, 2012	25	Yes, change is greater than 10% of starting ambient water concentration
Nov 30, 2012	26.5	No
Dec 16, 2012	28	No
Jan 1, 2013	29	Yes, cumulative change in receiving water concentration exceeds 10% of starting assimilative capacity

Consider a second example for the same pollutant (criterion of 100 ug/L) in another water body where the ambient concentration was 80 ug/L as of July 1, 2011. The threshold for

determining significance based on ambient concentration would be 8.0 ug/L. The assimilative capacity for pollutant Y in the water would be 20 ug/L and the threshold based on assimilative capacity would be 2.0 ug/L with a cumulative cap of 82.0 ug/L (10% of 20 ug/L = 2 ug/L added to the ambient concentration of 80 ug/L = 82 ug/L). In this example 2.0 µg/L (10% of assimilative capacity), determines the significance of individual changes, up to the cumulative cap, after which all additional change is significant.

Example 2 in Table 3 illustrates how this would work for the same series of proposed discharge changes in discharge as in Example 1. Only the first discharge could claim insignificance. All subsequent discharges are over the cumulative cap and are thus significant, even though the incremental change for each of the fourth through sixth discharges is less than 2.0 µg/L.

Table 3. Example 2 of Significance Determinations for a Series of Changes in Discharge

Date of Change in Discharge	Receiving Water Concentration (ug/L) After Mixing	Water Quality Change Significant?
(as of July 1, 2011)	80	—
Sept 30, 2011	81	No, change is < 10% of assimilative capacity and under cap
July 30, 2012	82.1	Yes, change is < 10% of assimilative capacity but over cap
Aug 1, 2012	85	Yes, over cumulative cap
Nov 30, 2012	86.5	Yes, over cumulative cap
Dec 16, 2012	88	Yes, over cumulative cap
Jan 1, 2013	89	Yes, over cumulative cap

Analysis of insignificance is necessarily done by pollutant. Thus, it is possible that some proposed changes in pollutant discharge will be found insignificant while others are significant for the same discharge. When this is the case, even one pollutant causing significant change in water quality will trigger the need to take Tier 2 analysis further. If the proposed change in all pollutants evaluated is insignificant, then the discharge as a whole is insignificant and further Tier 2 analysis is not needed.

If a proposed activity or discharge is determined significant, it only means further Tier 2 analysis is required, it does not automatically mean the discharge is not allowed. It is possible that no changes in the discharge as proposed are needed before allowing the discharge but that is the subject of alternatives analysis.

Baseline Water Quality as of July 1, 2011

Conditions as of July 1, 2011 does not mean the water quality exactly on that date and that date alone, but rather the water quality under critical conditions that would exist given authorized discharges as of that date. This is the baseline water quality for judging degradation from new or increased activities or discharges after July 1, 2011.

For many water bodies, DEQ will lack the monitoring data to document the baseline water quality as of July 1, 2011. In this situation, it will be necessary for DEQ to do its best to estimate water quality under critical conditions by starting with measurements or calculations of present water quality, then "backing out" all increases in pollutant loads authorized since July 1, 2011, to find water quality as of that date.

See section **Error! Reference source not found.** for more on determining baseline water quality.

5.2 Assurance Other Controls Are Achieved

Federal regulations (40 CFR 131.12(a)(2)) and Idaho's policy in rule (IDAPA 58.0102.051.02) require that degradation of high quality water cannot be allowed unless measures to control other sources of water quality degradation in the watershed will be achieved. In the Idaho policy, this is stated as:

> In allowing any degradation of high water quality, the Department must assure that there shall be achieved in the watershed the highest statutory and regulatory requirements for all new and existing point sources and cost-effective and reasonable best management practices for nonpoint source controls. In providing such assurance, the Department may enter together into an agreement with other State of Idaho or federal agencies in accordance with Sections 67-2326 through 67-2333, Idaho Code.

The WQS define "cost-effective and reasonable best management practices (BMPs) for nonpoint source" as approved BMPs specified in the Idaho WQS and "highest statutory and regulatory requirements for point sources" as:

> "All applicable effluent limits required by the Clean Water Act and other permit conditions. It also includes any compliance schedules or consent orders requiring measures to achieve applicable effluent limits and other permit conditions required by the Clean Water Act. " IDAPA 58.0102.010.45

Because water and its pollutant load flow downhill this mandatory obligation on the part of DEQ is interpreted to apply only to sources that are upstream of the discharge under review. While no more is required of other sources than already is required before a new activity or discharge is proposed, this rule language does require DEQ to check up on other sources, in the context of proposed degradation of water quality, and verify they are doing what is required of them.

For other point sources that have NPDES permits, this verification means looking at permit compliance reports and identifying any matters of non-compliance that indicate more pollutants are being discharged than permitted, or that information is lacking, such as in any failure to monitor effluent as required. This is required to determine whether permitted discharges upstream are being exceeded. For nonpoint sources with mandatory BMPs, e.g., forestry activities, DEQ will assume programs that are in place, such as

Comment [BB3]: Language added to reflect the entire proposed regulatory language.

Comment [BB4]: Believe this is "46" rather than "45"?

Comment [BB5]: The rational for limiting the "assurance that other controls are achieved" to sources upstream of the discharge under consideration is unclear.

Because of fate and transport mechanisms, downstream sources can also effect use attainment and available assimilative capacity for the same stretch of water that would be effected by the discharge under consideration, and thus affect regulatory decisions for that discharge. An example would be a case where several sources of oxygen demanding materials between point A and a downstream point B, contribute to a peak oxygen deficit at point B, say due to an impoundment at point B.

The scope should be revised to include sources, upstream and downstream, that influence the water quality and use attainment of the water that would be affected by the new or increased activity (i.e., the activity that would cause degradation).

forest practice audits and development of site-specific BMPs, are ensuring compliance, unless DEQ is provided with information to the contrary.

DEQ will work with and rely on other agencies to verify all required pollution controls for point sources and cost-effective and reasonable BMPs for nonpoint sources are in fact in place and operating.

Comment [BB6]: Please clarify whether DEQ's assumption that BMPs are in place/in compliance "unless provided with info to the contrary" is totally passive on DEQ's part, or in the context of DEQ working with other agencies responsible for oversight of BMPs and actively soliciting verification.

If noncompliance with required pollutant discharge controls is identified anywhere upstream, that will be reason for denying certification of a proposal for an activity or discharge that will significantly degrade water quality, at which point there is no point to carrying the analysis further. If other controls are what they should be, then it is appropriate to look at alternatives to degradation.

5.3 Assuring Necessity through Analysis of Alternatives to Degradation

As stated at the outset of this chapter, federal and state regulations require that in order for DEQ to allow degradation of high quality water it must be *necessary and important*. This section describes the process of determining whether it is necessary, and the process of determining importance is described in the next section.

Determining whether the proposed pollution is necessary requires an analysis of the various alternatives that are available to the discharger to reduce or eliminate the amount of pollution associated with the discharge. This analysis of alternatives identifies feasible alternatives, evaluates the reasonableness of implementing them, and selects one that contributes the least amount of pollution possible under reasonable circumstances.

The Idaho antidegradation implementation rule (IDAPA 58.0102.052.08) establishes principles to be followed in identifying alternatives and selecting the least degrading alternative that is reasonable.

c. Alternatives Analysis. Degradation will be deemed necessary only if there are no reasonable alternatives to discharging at the levels proposed. The applicant seeking authorization to degrade high water quality must provide an analysis of alternatives aimed at selecting the best combination of site, structural, managerial and treatment approaches that can be reasonably implemented to avoid or minimize the degradation of water quality. To identify the least degrading alternative that is reasonable, the following principles shall be followed:

i. Controls to avoid or minimize degradation should be considered at the earliest possible stage of project design.

ii. Alternatives that must be evaluated, as appropriate, are:
(1) Relocation or configuration of outfall or diffuser;
(2) Process changes/improved efficiency that reduces pollutant discharge;
(3) Seasonal discharge to avoid critical time periods for water quality;
(4) Non-discharge alternatives such as land application; and
(5) Offsets to the activity or discharge's effect on water quality.

iii. The Department retains the discretion to require the applicant to examine specific alternatives or provide additional information to conduct the analysis.

iv. In selecting the preferred alternative the applicant shall:
(1) Evaluate economic impacts (total cost effectiveness, incremental cost effectiveness) of all technologically feasible alternatives;
(2) Rank all technologically feasible treatment alternatives by their cost effectiveness at pollutant reduction;
(3) Consider the environmental costs and benefits across media and between pollutants; and
(4) Select the least degrading option or show that a more degrading alternative is justified based on Subsections 052.08.c.iv.(1), 052.08.c.iv.(2), or 052.08.c.iv.(3) above.

Thus, consideration of alternatives that would still allow the desired development with less or no pollution is a required part of the Tier 2 demonstration of necessity.12

Timing and Integration of Alternatives Analysis

DEQ believes earliest possible consideration of alternatives that will reduce or eliminate pollutant discharge is of paramount importance to minimizing project delay or redesign during water quality permitting and ultimately meeting the intent of antidegradation to maintain high water quality.

It is not DEQ's intent to create a whole separate analysis of alternatives in project design. Rather, to the extent there is a proposed discharge of pollutants that could degrade water quality, DEQ believes it is prudent to consider the implication of water quality degradation and the Idaho antidegradation requirements at the outset and integrate them into project design. To this end DEQ encourages early communication between project designers, EPA or ACOE permit writers, and DEQ staff that will be responsible for review of an application for permit or license.

Identifying Non-Degrading and Less-Degrading Pollution Control Measures

Minimizing degradation of water quality is not just a matter of better waste treatment. It is a matter of thinking through an entire process with attention to waste generation as well as treatment, and manner of waste disposal. This can involve changes in location or timing of discharge to surface water, as well alternatives to direct discharge to surface waters, such as land application, groundwater injection, or reuse. Finally an entity considering new or increased discharge of pollutants could work with other dischargers upstream in the same watershed to reduce upstream degradation and thereby offset their own proposed adverse effect on water quality.

For facilities that have an outfall, relocation or reconfiguration of an outfall or diffuser must be considered. While this action alone will not reduce pollutant loads it can be effective in reducing receiving water concentrations and thus the effect on beneficial uses. This is particularly true where a larger stream offering greater assimilative capacity is nearby and will be most useful as a consideration in location of a new facility, but for existing discharges it could be beneficial to extend pipe to a larger stream. Diffusers,

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12 See EPA Advance Notice of Proposed Rulemaking (ANPRM) 63 Federal Register 36742, 36784 (1998).

which do not alter fully mixed concentrations, are effective in altering the extent and distribution of elevated pollutant concentrations and thus minimizing harmful effects..

Generation of waste that needs to be treated and discharged might be reduced through changes in industrial process or greater efficiency in raw material utilization. The latter will save material cost as well as reduce waste. Sometimes a substitution in materials is found to be worthwhile if more costly raw materials create even greater savings in waste treatment costs. For a municipality, waste reduction could include such things as hazardous waste education and collection to reduce loads at the source. Another example might be cogeneration or recovery of heat from an effluent.

Usually there is a critical or limiting time for waste discharge, typically during seasonal low flows when assimilative capacity of flowing waters is at a minimum. Such low flows also often correspond with seasonally high temperatures which are adverse to some forms of aquatic life. If wastewater can be stored seasonally or alternatively discharged seasonally, e.g. through land application or irrigation use during the summer, the critical time for aquatic life and recreation use may be avoided and thus reduce overall degradation of water quality and need for load reduction.

An overall goal of the CWA is zero discharge, an intent also captured in the National Pollution Discharge *Elimination* System. One way to achieve zero discharge, an alternative to total treatment, is to not discharge wastewater to surface water but rather to land apply it, inject it into ground water or use a closed loop reuse system. These all have their limitations, e.g. potential impacts to groundwater and indirectly to surface water, and their own permitting requirements. But for some processes in some settings such non-discharge alternatives can be viable. With the increasing shortage of water in many areas and overall increase in the value of water as a resource, some form of reuse, even if not in the original process, will likely become more attractive and commonplace with time.

Often there are multiple sources of pollution especially for any sizeable receiving water body. Some sources may have been operating for a long time and although they are discharging legally, redesigning their facilities or processes may provide for greater pollution reduction than better design of a new source would. This creates an opportunity for the operator of a proposed new or increased discharge to join forces with other dischargers and forge a binding agreement that would reduce their combined pollutant loads and improve water quality of the water body as a whole compared to what may otherwise be the case.

Technology advances, and society’s values change as well. There are plenty of examples in which what was once unreasonable or not even considered becomes possible, then reasonable, and eventually the norm. This is the likely progression for water use and treatment. New efficiencies and treatment technologies are almost certain to arise, driven in part by society’s values and also made affordable by society’s relative values. But these things cannot be predicted beyond general terms. To account for such changes,

DEQ has reserved the right to require an applicant to examine specific alternatives to reducing waste generation.

The overall goal of alternative analysis is to find ways to minimize or eliminate the detrimental effect on water quality by whatever means can be reasonably implemented. This analysis will likely result in the identification of multiple reasonable alternatives. While some cost savings may ensue from some of the alternatives, for the most part steps to discharge less pollution are going to cost more.

Evaluating Alternatives and Making a Choice

While only technologically feasible alternatives should be considered, they will likely vary in their level of pollutant loading and may not all be reasonable. They may vary widely and non-linearly in cost-effectiveness of pollution reduction and involve competing environmental costs and benefits. Discharge alternatives will also rank in cost to the discharger and at some point will become unaffordable. Choosing the preferred alternative becomes a matter of balancing cost of pollution reduction versus overall environmental gain, while remaining affordable.
This is not easy as it pits societal values and costs, often hard to quantify, against treatment costs to the project sponsor that are easier to quantify or otherwise delineate. It is always cheaper for a discharger to do the minimum level of pollution control and up to society to demand otherwise. In many cases, treatment costs can be and are passed on to the consumer, e.g. ratepayers in the case of a publicly-owned sewage treatment plant. Who will ultimately bear the cost is important in fairly assessing affordability.
To make the selection process more systematic a four step winnowing of alternatives is recommended, in which the following are determined:

1. amount of degradation caused,
2. cost-effectiveness of pollutant removal,
3. environmental cost-benefit tradeoffs, and
4. affordability of alternatives.

Because there are steps described in both the analysis of alternatives and the analysis of social and economic importance, the alternative analysis steps are labeled AA (the socioeconomic importance steps, in the next section, are labeled SEI).

AA Step 1 – Ranking alternatives from least to most degrading

First, all feasible alternatives should be ranked from least to most degrading of water quality. The applicant may bypass further analysis of alternatives (steps 2-4) by selecting the least degrading alternative feasible.
If the applicant opts for the least degrading alternative at this point, the test of degradation necessity is met and analysis to determine social and economic importance should be conducted. If the least degrading feasible option is not preferred, then the next least-degrading alternative may be justified as reasonable on the basis of cost-effectiveness of improved pollutant reduction, environmental trade-offs, or affordability.

Steps 2-4 are optional, needed only if the applicant wishes to justify that an alternative other than the least degrading feasible alternative is reasonable.

AA Step 2 – Ranking alternatives by the cost-effectiveness of their pollutant reduction

If proceeding, step 2 is to rank alternatives by their pollutant-reduction cost-effectiveness. Cost-effectiveness looks at the cost per unit mass of pollutant removed, e.g., dollars per pound ($/lb). Most processes generate an effluent stream or volume per day, therefore cost-effectiveness becomes unitized as $/lb/million gallons per day [MGD], or other comparable units.

Greater pollution reduction will typically cost more, but economies of scale and alternate technologies will result in different per-unit costs.13 It is not within the scope of this guidance to go into detail on treatment costing and the amortization of initial capital costs versus ongoing operation and maintenance costs. Suffice it to say that if alternatives are ranked by their per-unit pollutant reduction costs, the marginal cost of improved pollutant reduction can be simply compared. Doing so may allow the justification of a more-degrading alternative if the incremental cost of improved treatment far outweighs the incremental gain in pollutant reduction.

For example, if the least-degrading alternative removes 100 lbs of a pollutant for $10,000 per MGD, the unit cost is $100/lb/MGD. If the second-least-degrading alternative removes 90 lbs of the pollutant for only $900 per MGD, its unit cost is only $10/lb/MGD. The latter is much more cost-effective as there is a sharp jump in per- pound cost for removing the additional 10 lbs/MGD, a marginal cost of $910/lb/MGD (($10,000 - $900) / 10 lbs). In this case, it would be easy for the discharger to argue that the marginal cost of removing 10 more lbs of pollutant was unreasonable and thus the next best alternative should be accepted as the preferred alternative. In this way, alternatives that impose a cost that is disproportionate to the possible environmental gain may be eliminated from further consideration.

Consider the previous example further. If the third-least-degrading alternative could achieve pollutant reduction of 50 lbs at a cost of $450 per MGD, the cost per lb of treatment would be only slightly better at $9/lb/MGD and the marginal cost of nearly doubling pollutant removal compared to using the second-least-degrading alternative would be $11.25/lb/MGD ($900 - $450 / 40 lbs). Cost-effectiveness alone should not rule; it should be tempered by consideration of affordability and standard practice in the industry. In this example, the second-best alternative is only slightly less cost effective

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13 Some costs of treatment will be scalable. For example, power costs and cost of reagents such as alum go up in proportion to the volume treated. However, differing treatment alternatives have differing costs that aren't always proportional to volume. Instead, a doubling of pollutant reduction may cost more or less than twice as much. Therefore, options are best compared on a per unit basis, taking into account all various costs and their timing.

than the third-best ($11.25/lb/MGD vs $10/lb/MGD) but offers a large improvement in pollutant load reduction. While overall treatment costs double they may still be quite reasonable—both affordable and worthwhile give their cost-effectiveness. Furthermore, if the $900 per MGD second-best alternative is commonly practiced by similar modern dischargers, then the argument for the cheaper option is even weaker.

AA Step 3 – Considering environmental trade-offs

The example above, comparing alternatives' cost-effectiveness, looks at only one pollutant in isolation. There are almost always multiple pollutants in a discharge and what may be the best alternative for one may not be the best for another. This is a situation in which a lot of judgment is involved, both professional and through engagement with the public and their sense of value.

As a hypothetical example, a discharge may involve adding heat as well as phosphorus to a receiving water. Some of the treatment processes and alternatives may be quite different, e.g., chilling for temperature and ultra-filtration for phosphorus; maximizing one will do nothing for the other and treatment costs will be additive. Finding the optimum environmental solution in this situation may involve some intermediate level of treatment of both, especially if affordability is an issue. A compromise in treatment may also be warranted if it is found that one of the pollutants is more limiting to support of beneficial uses. In the latter case, it would make more environmental sense to favor the treatment of the limiting pollutant; in this example, favoring temperature reduction over phosphorus reduction. This could be further complicated if costs of treating temperature are substantially greater than the cost of treating phosphorus. In that case phosphorus treatment may offer more environmental benefit per unit cost of pollutant reduction, even though temperature overall is judged the more limiting pollutant. Another alternative for treating both may avoid all this, e.g. land application could deal with both temperature and phosphorus at once, without additive costs for each pollutant, but a trade-off may occur in that there would be less water in the receiving water body.

Another form of environmental trade-off is between media—that is, reducing discharge to water may create more air pollution or solid waste to be disposed of. In addition to the direct effects of increased pollutant loads to other media, either of the latter may eventually affect water quality as well. For example, we may question the virtue of using electricity to run chillers to cool effluent temperatures (to keep our streams cooler) when we have every reason to believe the release of carbon dioxide from thermo-electric power generation contributes to global warming and thus to warming stream temperatures.

The choices may be difficult to delineate and hard to illuminate. It will be difficult if not impossible to quantify such trade-offs in a common currency such as $/lb/MGD but efforts to do so will be useful and will help reduce the amount of judgment that will otherwise be required. No easy answers can be given, but nonetheless DEQ believes that thinking about and considering such trade-offs is important if not necessary. The applicant is encouraged to raise issues of environmental trade-offs, and may but is not required to quantify them.

The only thing we know for sure is that the less pollution discharged to the environment the better environmental quality will be. Finding the best place or medium in which to discharge them, and determining what is the most economically efficient way to treat and handle waste considering both public and environmental health versus public or private economic health is an ongoing challenge. It is suggested that the best way to proceed through the fog of understanding that is still developing and values that are changing as well is to have open public discourse on the most environmentally beneficial alternative. The applicant must get concurrence from the agency and public in eliminating an alternative due to adverse environmental trade-offs.

AA Step 4 – Judging affordability

Following an analysis of pollutant-reduction cost-effectiveness and environmental trade-offs, the affordability of the best remaining alternatives may be assessed at the applicant's discretion. This assessment may be used to determine if an alternative is too expensive to reasonably implement. This approach might result in the selection of the next-least-degrading alternative, while maintaining affordability to the public or private entity. Alternatives identified as technologically feasible are considered affordable if the applicant does not supply an affordability analysis.

The determination of affordability for public and private entities is an emerging issue nationally. As such, federal guidance has not yet been finalized. Until such time, the applicant should use EPA's water quality standards handbook – "Interim Economic Guidance for Water Quality Standards," EPA-823-B-95-002 (1995). This guidance document presents one set of public and private sector approaches. This interim guidance is not binding and may be replaced or supplemented with other methods of analysis, if sufficiently justified.

If the applicant determines that the least-degrading remaining alternative is affordable, then it is the preferred alternative. If it is not affordable, then the affordability of the next alternative should be evaluated until an alternative is chosen that is practicable, economically efficient, and affordable.

A demonstration that an alternative is not affordable should be clearly documented and should show that it would have a substantial adverse economic impact that would preclude its use for the activity/discharge under review.

If, after appropriate discussions with the discharger, DEQ determines that the necessity of the preferred alternative has not been demonstrated, DEQ shall deny certification of the activity as proposed.

5.4 Evaluating Social or Economic Importance

If the preferred alternative will result in degradation to the receiving waters, then the applicant must demonstrate that this alternative (or "activity") will result in important

economic or social development in the area in which the waters are located. *Social or Economic Justification* (SEJ) entails showing that the social or economic benefits occurring from an activity are important to the affected community. An activity need be socially or economically important, not both. Depending on the nature of the project, it may be prudent to focus on one or the other.

The Idaho antidegradation implementation rule (IDAPA 58.0102.052.08) establishes principles to be followed in showing socio-economic justification of an activity that will cause significant degradation:

d. Socioeconomic Justification. Degradation of water quality deemed necessary must also be determined by the Department to accommodate important economic or social development. Therefore, the applicant seeking authorization to degrade water quality must at a minimum identify the important economic or social development for which lowering water quality is necessary and should use the following steps to demonstrate this:

i. Identify the affected community;

ii. Describe the important social or economic development associated with the activity which can include cleanup/restoration of a closed facility;

iii. Identify the relevant social, economic and environmental health benefits and costs associated with the proposed degradation in water quality for the preferred alternative. Benefits and costs that must be analyzed include, but are not limited to:

(1) Economic benefits to the community such as changes in employment, household incomes and tax base;

(2) Provision of necessary services to the community; (3) Potential health impacts related to the proposed activity;

(4) Impacts to direct and indirect uses associated with high quality water, e.g., fishing, recreation, and tourism; and

(5) Retention of assimilative capacity for future activities or discharges.

iv. Factors identified in the socioeconomic justification should be quantified whenever possible but for those factors that cannot be quantified a qualitative description of the impacts may be accepted; and

v. If the Department determines that more information is required, then the Department may require the applicant to provide further information or seek additional sources of information.

A project that is socially justified is one that is important to the social development of the local community in at least one aspect, e.g., population growth. Socially justified projects are likely to be publicly-owned treatment works that provide capacity for wastewater treatment. Socially justified projects would need to demonstrate that there is some local need for the project, i.e., identify the social conditions and relate how the project would fulfill those needs.

A project that is economically justified is a project that is important to the economic development of the local community. Economic development projects would include those that increase the economic base of the local community. An analysis of the economic importance of a project would likely require more in-depth analysis covering how the costs of the proposed degradation (including downstream effects) are offset by benefits to the community. This would be a simplified cost-benefit analysis and is more applicable to non-public dischargers.

The applicant should use the following three steps to show the SEJ:

1. Identify the affected community.
2. Identify the relevant factors that characterize the environmental and social or economic conditions of the affected community.
3. Describe the important social or economic development associated with the activity.

SEI Step 1 – Identify the affected community

The affected community is the community in the geographical area in which the waters are located. This area should be large enough to include both the people living near the site of the proposed activity and those in the community who are expected to directly or indirectly benefit from the activity.

SEI Step 2 – Identify the factors that characterize the environmental and social or economic conditions of the affected community

In order to describe the economic or social development associated with the proposed project, the applicant will first need to determine the social and economic factors that best characterize the affected community. Examples of social and economic factors include:

Comment [BB7]: Note that much (or all?) of what is listed here as "examples" are listed in IDEQ's proposed reg. as factors that must be analyzed.

- Employment rate
- Personal or household income
- Property values / community tax base
- Provision of necessary public services (e.g., fire department, school, infrastructure)
- Current or potential public health or safety problems (e.g., levels of lead in people's blood)

- Impacts to uses based on water quality (e.g. fishing, recreation, tourism)
- Retaining assimilative capacity for future industry and development

The social and economic measures identified above do not constitute a comprehensive list. Nor will all be relevant to all activities or discharges. Each situation and community is different and will require an analysis of unique social and economic factors. The applicant is encouraged to consider analyzing additional factors that characterize the specific community under consideration.

SEI Step 3 – Describe the important social or economic development associated with the activity

Following the identification of appropriate social and economic measures, the applicant must describe the expected changes in these factors that are associated with the project. The purpose of this step is to demonstrate whether important social or economic development will result from the project. The applicant should first describe the existing condition of the affected community. This baseline condition should then be compared to the predicted change (benefit or loss) in social or economic condition should the activity be allowed.

Upon the consideration of all relevant factors, the project will be considered to provide important social or economic development if the applicant demonstrates that the project will lead to overall beneficial changes in the factors presented (i.e., increased jobs, employment, housing, or other appropriate factors balanced against the benefits associated with maintaining a higher level of water quality). This determination will be made on a case-by-case basis using information provided with the application and obtained from the public. Activities which provide necessary public service such as a wastewater treatment plant, hospital, or school, or their expansion, will always be likely to be socially important regardless of economic effect on the community.

When information available to DEQ is not sufficient to make a determination regarding the social and economic benefits or environmental impacts associated with the proposed activity, DEQ may request that the applicant submit additional information.

If, after appropriate discussions with the discharger, DEQ determines that the SEI of the proposed activity has not been demonstrated, DEQ shall deny certification of the proposed activity.

5.5 Summary of the Justification for Degrading Water Quality

The preceding discussion describes the approach that shall be followed by the applicant for determining whether less- or non-degrading alternatives to the proposed activity will be required to prevent degradation of Idaho surface waters. The following steps

summarize the alternatives analysis process and other relevant actions conducted during Tier 2 antidegradation reviews:

- If it is determined that significant degradation would likely occur due to the proposed activity, an analysis of less-degrading and non-degrading alternatives to the proposed activity will be required.
- The applicant will be required to identify feasible pollution control alternatives including those that would result in no degradation, and other less-degrading alternatives as appropriate, in addition to the minimum level of pollution control required.
- If the applicant does not prefer the least degrading feasible alternative, the applicant may justify the next least-degrading alternative or mix of alternatives as reasonable.
- To justify a more-degrading option as reasonable the applicant must evaluate the pollutant reduction cost-efficiency, environmental trade-offs, or affordability associated with each option or mix of options.
- The applicant will identify the least degrading alternative – or mix of alternatives – that is reasonable based on the above evaluation. This will be the preferred option.
- If the preferred option (i.e., pollution control alternative or mix of alternatives) will not result in significant degradation of the receiving water segment, DEQ will certify the activity.
- If the preferred option (i.e., pollution control alternative or mix of alternatives) will result in significant degradation of the receiving water, the applicant will be required to conduct an analysis of economic or social benefit.
- If the preferred option is deemed to be socially or economically important, DEQ will certify the activity.