Missouri Antidegradation Implementation ~~Procedure~~Methods

Commented [RJ1]: Consistent with terminology in 40 CFR 131.12(b). Also insert new title in header of the body of the document

~~July 13, 2016~~April 2021

DRAFT

Division of Environmental Quality

Water Protection Program

Antidegradation Implementation ~~Procedure~~Methods

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GLOSSARY

NOTES: This document occasionally refers to itself as "this document." The use of this phrase is meant to make reference to the entire document titled *Missouri Antidegradation Implementation ~~Procedure~~Methods*.

Definitions of terms used in this document that are also found in the definitions in Section (§) 644.016 of the Revised Statutes of the State of Missouri (RSMo) and 10 Code of State Regulations (CSR) 20-2.010 are the same unless otherwise noted below.

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Administrative Record of Decisions: The record of all information considered and decisions made during **A~~a~~ntidegradation** reviews. This record shall be made available for all interagency and public participation opportunities during an **A~~a~~ntidegradation** review. ~~This record shall also serve as a historical reference for subsequent antidegradation reviews involving the same water segment.~~

Alternatives Analysis: A structured evaluation of the ~~reasonableness~~ feasibility of **no-discharge options**, non-**degrading alternatives**, technological options that protect **beneficial uses (base case)**, and less degrading technology options beyond the protection of **beneficial uses** that results in the presentation and selection of a **preferred alternative** that is the least polluting and economically efficient option. ~~less- and non-degrading alternatives to a new or expanded discharge likely to cause significant degradation.~~

Antidegradation: The implementation of a rule ~~and procedure~~ adopted by the Missouri **Clean Water Commission** and approved by the United States Environmental Protection Agency (EPA) and the associated methods approved by the Missouri **Clean Water Commission** that specifies how the Missouri Department of Natural Resources (Department) will determine, on a case-by-case basis, whether and to what extent, **E~~e~~xisting W~~w~~ater Q~~q~~uality (EWQ)** may be degraded in a surface water of the state.

~~**Assimilative Capacity:** The amount of contaminant load that can be discharged to a specific water body without exceeding the Water Quality Standards (WQS) or the criteria associated with the pollutant of concern (POC). Assimilative capacity is used to define the ability of a water body to naturally attenuate a discharged substance without impairing beneficial uses. (Also see FAC and SAC.)~~

Base Case: The treatment alternative with the least cost treatment option that will reliably meet the minimum water quality requirements of the receiving water. The minimum (Base Case) effluent requirements include meeting water quality-based effluent limits, federal technology-based effluent limits (or in the absence of national guidelines or standards, technology-based limits developed using best professional judgment on a case-by-case basis), any limits established by a Total Maximum Daily Load (TMDL), or any other effluent limit established through existing enforceable agreements such as variances to **Water Quality Standards** (**WQS**).

Beneficial Uses: All **existing** and **designated uses** on or in **waters of the state** as defined in the **Water Quality Standards** (**WQS**) at 10 CSR 20-7.031(1)(L) and 10 CSR 20-7.031(1)(C).

Bioaccumulative Pollutant: Substances in Table A of 10 CSR 20-7.031 identified as "Bioaccumulative, Anthropogenic Toxics," pollutants specifically referenced as bioaccumulative elsewhere in 10 CSR 20-7.031, and other metals or persistent substances that are accumulated in aquatic

Commented [RJ2]: See topics 8 & 9.

Commented [RJ3]: See topic 20.

Commented [RJ4]: Historically Antidegradation reviews have been limited to systems designed for discharge to surface waters. This revised definition would continue to require an Antidegradation review for land application or subsurface disposal where surface waters may be degraded.

Commented [RJ5]: See topic 5.

Commented [RJ6]: Note: there are a number of edits in the document clarifying the difference between "beneficial," "existing," and "designated" uses. 10 CSR 20-7.031(1)(C) specifically defines "Designated uses," while 10 CSR 20-7.031(1)(L) defines "Existing uses" as those "actually attained in the water body on or after 1/28/75, whether or not they are identified in water quality standards. Therefore, this definition of "beneficial" means both "existing" and "designated." See topic 9.

Commented [RJ7]: Inserted to address approvability issue associated with Idaho case (*Greater Yellowstone Coalition v. EPA* Case No. 4:12-CV-60-BLW) in which the court rejected a *de minimis* exemption to Tier 2 review because the exemption failed to account for potential degradation from small discharges of bioaccumulative pollutants.

organisms through normal biological processes, such as mercury.

Clean Water Act: The federal Water Pollution Control Act, 33 U.S.C. §§1251 et seq.

Clean Water Commission: The water contaminant control agency formed in Missouri under §644.021 RSMo.

Continuing Planning Process: A framework for documenting the water pollution programmatic commitments and goals required under Section 303(e) of the Clean Water Act. This framework addresses how permit limits, schedules of compliance, water quality standards, Total Maximum Daily Loads (TMDLs), and other priorities are developed and managed.

Critical Flow Conditions: ~~–~~The point in time in which the **beneficial uses** within a surface water of the S~~s~~tate are most susceptible to the effects of pollution, which is generally but not necessarily when a stream is at or below its **7Q10** flow. A lake's critical condition shall be determined on a case-by-case basis but would normally be when the surface water is at or below its ordinary or base level.

Commented [RJ8]: Critical flow conditions only make sense for surface waters, not groundwater.

~~**Cumulative Degradation:** The reduction of a segment's assimilative capacity from separate discharges approved by the department following the establishment of the water's existing water quality.~~

Commented [RJ9]: See topic 8.

~~**GLOSSARY** (continued)~~

Degradation: An increase in the concentration of the **pollutants of concern** (**POCs**) within a surface water measured on a **pollutant-by-pollutant basis**. This includes any pollutants or their degradation products that can accumulate in sediments and **bioaccumulative pollutants**.

Commented [RJ10]: Inserted to address approvability issue associated with Idaho case (*Greater Yellowstone Coalition v. EPA* Case No. 4:12-CV-60-BLW) in which the court rejected a *de minimis* exemption to Tier 2 review because the exemption failed to account for potential degradation from small discharges of bioaccumulative pollutants.

Department: Missouri Department of Natural Resources.

Designated Use: A **beneficial use** ~~designated~~ assigned to a water of the state as defined in 10 CSR 20-7.031(1)(C) including those~~as~~ shown in Tables G and H of the **Water Quality Standards** (**WQS**).

Commented [RJ11]: See topic 9.

Existing Source: Permitted discharge facilities that are in compliance with the terms and conditions of their permits at the time ~~existing water quality (EWQ) is first determined for a segment~~of **Antidegradation** application submittal.

Commented [RJ12]: See topic 9.

Existing Use: Those ~~beneficial~~ uses actually attained in the water body on or after November 28, 1975, as defined in the **Water Quality Standards** (**WQS**) at 10 CSR 20-7.031(1)(L)~~whether or not they are designated in the Water Quality Standards~~.

Commented [RJ13]: See glossary definition of "Beneficial Uses" and 10 CSR 20-7.031(1)(L).

Existing Water Quality (EWQ): A characterization of the level of the **pollutant of concern** (**POC**) in a water **segment** as it exists on the date of an applicant's **Antidegradation** application submittal~~ed on August 30, 2008 (the effective date of the original Antidegradation Implementation Procedure)~~. The EWQ shall be representative of the water quality at or immediately upstream from the point a new discharge would enter the water body, or below the discharge location ~~point~~ of an existing facility located immediately upstream of the proposed new discharge.~~discharge that existed on August 30, 2008 (the effective date of the original Antidegradation Implementation Procedure).~~ This determination shall be made ~~at the time the discharge is subject to an antidegradation review~~ in accordance with the procedures in this document. ~~Once established, EWQ is a fixed quantity/quality expressed as a concentration of a water quality parameter.~~ When modeling pollutant concentrations f~~F~~or waters receiving pollutants from an **existing source** (where full design capacity has not been reached), the EWQ shall include the levels of pollutants already permitted to be discharged at maximum design flow.

Commented [RJ14]: See topics 1 & 9.

~~**EWQ:** See Existing Water Quality.~~

~~**FAC:** See Facility Assimilative Capacity.~~

~~**Facility Assimilative Capacity (FAC):** The assimilative capacity applicable to an individual facility and determined through the establishment of the existing and probable pollutant concentrations at the point where the facility's effluent enters the segment. (Also see SAC.)~~

Commented [RJ15]: See topics 5 & 8.

Less-Degrading Alternative: A reasonable discharging alternative identified through an **A~~a~~lternatives ~~a~~A~~A~~nalysis** that results in less degradation ~~then~~ than the **base case~~alternative that protects existing~~ uses** and achieves the highest statutory and regulatory requirements, i.e., the more stringent of the water quality-based effluent limits for ~~existing~~ **beneficial use** protection or the technology-based effluent limits.

Commented [RJ16]: See glossary definition of "Beneficial uses."

No-Discharge Option: Wastewater projects that do not require a discharge to **waters of the state**. This includes regionalization by connection to neighboring systems, land application, and subsurface irrigation projects, among others.

~~**Minimal Degradation:** The reduction of the facility assimilative capacity for any pollutant by less than 10 percent as a result of any single discharge or combination of discharges after existing water quality was determined. Events or activities causing minimal degradation are not required to undergo a Tier 2 review, except as otherwise specified in Section II.A.~~

Non-Degrading Alternative: A reasonable alternative to a proposed discharge that would not result in degradation of water quality as demonstrated by maintaining or decreasing pollutant load (typically expressed in terms of pounds per day) ~~as characterized by the existing water quality (EWQ) assessment~~. Non-Degrading Alternatives include regionalization by connection to neighboring systems, most land application and subsurface irrigation projects, and projects that will not increase pollutant load to the receiving water. Additionally, projects at facilities that discharge to effluent dominated streams (those with no **7Q10** flow) which will not increase pollutant concentrations are considered Non-Degrading.

Commented [RJ17]: See topic 5.

Commented [RJ18]: See topic 1.

~~**GLOSSARY** (continued)~~

Outstanding National Resource Water (ONRW): Waters listed in Table D of the **WQS** (10 CSR 20-7.031). These waters have outstanding national recreational and ecological significance. These waters shall receive special protection against any degradation in water quality. Congressionally designated rivers, including the Ozark National Scenic Riverways and the Wild and Scenic Rivers, are so designated.

Outstanding State Resource Water (OSRW): Waters listed in Table E of the **W~~ater~~ater Q~~uality ~~uality~~ S~~tandards~~tandards~~ (10 CSR 20-7.031). These waters are designated by the **Clean Water Commission** as high quality waters with significant aesthetic, recreational or scientific value.~~**GLOSSARY** (continued)~~

Permit: Unless otherwise specified, this term includes all permits issued to satisfy §644.051 RSMo, and to administer the federal National Pollution Discharge Elimination System (NPDES). Also included are any state certifications granted under §401 of the federal **Clean Water Act**.

Pollutant: Dredged spoil, solid waste, incinerator residue, sewage, garbage, sewer sludge, munitions, chemical waste, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, filter backwash or industrial, municipal or agricultural waste discharged into water.

Pollutant-by-Pollutant Basis: The review of the **pollutants** in a water body by assessing the level of each **pollutant of concern**, as opposed to assessing the overall condition of a water body, for the purpose of determining the level of **A~~a~~ntidegradation** review applicable to the water. (See **water body-by-water body approach**.)

Pollutant of Concern (POC): Discharged **pollutants**, or **pollutants** proposed for discharge that affect beneficial use(s) in **waters of the state**. POCs include **pollutants** that create conditions unfavorable to **beneficial uses** in the water body receiving the discharge or proposed to receive the discharge~~.~~. ~~For example, where pH, temperature, and dissolved oxygen are in noncompliance with applicable numeric criteria.~~For example, sulfuric acid and BOD are Pollutants of Concern because they directly impact water conditions that have established criteria (pH and Dissolved Oxygen).

~~**POC:** See pollutant of concern.~~

Preferred Alternative: A wastewater treatment or control alternative determined to be practicable, economically efficient and affordable through an alternatives analysis in accordance with this document.

Quality Assurance Project Plan (QAPP): A ~~QAPP or an equivalent~~ plan that provides a blueprint for designing and evaluating data collection to ensure the data are of the quality needed to meet specified goals. The plan sets forth the specific quality control steps to be taken while collecting and analyzing information to ensure the data are credible.

Regulated Discharge: Any discharge that requires and is permissible by a **permit** or a water quality certification from the D~~d~~epartment pursuant to a state or federal law.

~~**SAC:** See segment assimilative capacity.~~

~~**GLOSSARY** (continued)~~

Segment: A segment is a section of surface water that is bound, at a minimum, by significant **existing sources** and confluences with other significant water bodies. The use of this term is intended to provide a framework ~~for tracking changes in assimilative capacity~~ that bounds the assessment of the impact of a new or expanded source. An evaluation of the **Eexisting Wwater Qquality** (**EWQ**) ~~must~~ may be made for each segment to be ~~significantly degraded~~measurably affected by a new or expanded discharge. Because the **EWQ** will vary along the entire segment, the applicant may use statistical modeling to describe the variation in degradation for each segment spatially and/or during specific periods or seasons.

Commented [RJ19]: See topic 8.

~~**Segment Assimilative Capacity (SAC):** The assimilative capacity of a water segment at the first point of applicable Water Quality Standards (WQS) below a discharge point. (Also see FAC.)~~

Commented [RJ20]: See topics 5 & 8.

~~**SEI:** See social and economic importance.~~

7Q10: The lowest average stream flow that occurs for seven (7) consecutive days that has a probable recurrence interval of once in ten (10) years (10 CSR 20-7.031(1)(P)).

~~**Significant Degradation:** A reduction by 10 percent or more of the facility assimilative capacity for any pollutant as a result of any single discharge, or the reduction of the segment assimilative capacity for any pollutant by 10 percent or more as a result of all discharges combined (See cumulative degradation) after existing water quality (EWQ) is determined, or any new or expanded discharge that the department determines will likely result in the increased accumulation of pollutants or their degradation products in sediment or fish tissue (see Section II.A.). Events or activities causing significant degradation are required to undergo a Tier 2 review.~~

Commented [RJ21]: See topic 5 & 8.

Social and Economic Importance (SEI): The social and economic benefits to the community that will occur from any activity involving a new or expanded discharge.

Temporary Degradation: Degradation that is non-permanent and the effects can be regarded as insignificant following a review of the a) length of time during which water quality will be lowered, b) percent change in ambient conditions, c) parameters affected, d) likelihood for long term water quality benefits to the **segment** (e.g., as may result from dredging of contaminated sediments), e) degree to which achieving the applicable **Water Quality Standards** (**WQS**) during the proposed activity may be at risk, and
f) potential for any residual long-term influences on ~~existing~~ **beneficial uses**.

Commented [RJ22]: See glossary definition of "Beneficial uses."

Tier 1 Review: Policies and procedures that apply to surface waters that qualify for Tier 1 protection in accordance with this document. Tier 1 protection requires a Tier 1 review designed to prohibit degradation that may cause or contribute to the impairment of a **beneficial use**, or violation of **water quality criteria** and prohibit further degradation of **Eexisting Wwater Qquality** (**EWQ**) where **pollutants of concern** (**POCs**) have resulted in the water being included on the 303(d) List. Tier 1 review applies as the minimum review level to all surface waters regardless of **EWQ** and applies on a **pollutant-by-pollutant basis**.

Tier 2 Review: Policies and procedures that apply to surface waters that qualify for Tier 2 protection in accordance with this document. Tier 2 protection requires a Tier 2 review designed to prohibit

degrading the quality of a surface water unless a review of discharge necessity and social and economic considerations justifies the degradation of water quality. Tier 2 review applies to all surface waters where ~~existing water quality~~ **EWQ** is better than the applicable **Water Quality Standards** (**WQS**) as determined on a **pollutant-by-pollutant basis**.

~~**GLOSSARY** (continued)~~

Tier 3 Review: Policies and procedures that apply to surface waters given Tier 3 protection. Tier 3 protection requires a Tier 3 review designed to prohibit any degradation of water quality in **Outstanding National Resource Waters** (**ONRWs**) and **Outstanding State Resource Waters** (**OSRWs**) as identified in Tables D and E of the ~~**Water Quality Standards (**~~**WQS**~~)~~. **Temporary degradation** of a water under Tier 3 review may be allowed on a case-by-case basis by the D~~d~~epartment as explained in Section V~~I~~I.~~A.4 of this document.~~ Tier 3 reviews are performed on a **water body-by-water body approach,** except for **temporary degradation**, which shall be performed on a **pollutant-by-pollutant basis**.

Water Body-by-Water Body Approach: The review of the **pollutants** in a water body by assessing the overall or combined levels of the **pollutants of concern** (**POCs**) as opposed to assessing the level of each POC in a water body for the purpose of determining the level of review applicable to the water. (See **pollutant-by-pollutant basis**.)

Waters of the State: Waters defined in §644.016(~~26~~27) RSMo as: "[A]ll waters within the jurisdiction of this state, including all rivers, streams, lakes and other bodies of surface and subsurface water lying within or forming a part of the boundaries of the state which are not entirely confined and located completely upon lands owned, leased or otherwise controlled by a single person or by two or more persons jointly or as tenants in common ~~and includes waters of the United States lying within the state~~." The term "water," or "waters," is often used in this document in place of "waters of the state."

Commented [RJ23]: Inserted revised statutory definition for Waters of the State.

Water Quality Criteria (WQC): Chemical, physical and biological properties of water that are necessary to protect **beneficial ~~water~~ uses** or the **Water Quality Standards** (**WQS**) that are expressed as the maximum allowable **pollutant** concentrations, or other conditions necessary for a water to fully support a **beneficial use**, i.e., 10 CSR 20-7.031(4) and (5).

Water Quality Standards (WQS): The provisions of 10 CSR 20-7.031 covering water classification, **beneficial uses**, general and specific **W~~w~~ater Q~~q~~uality C~~c~~riteria** (**WQC**), **A~~a~~ntidegradation** and all other requirements establishing limits on the amount of pollution permissible in **waters of the state**.

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ANTIDEGRADATION IMPLEMENTATION ~~PROCEDURE~~METHODS

I. Introduction:~~Missouri's Water Quality Antidegradation Rule~~

This document specifies the methods the Missouri Department of Natural Resources (Department) will use to implement **Antidegradation** as required in the Code of State Regulations (10 CSR 20-7.031(3)) and ~~The following are the implementation procedures for Missouri's antidegradation rule found at Title 10 Code of State Regulations, Division 20, Chapter 7.031(3) (i.e., 10 CSR 20- 7.031(3)) and~~ in federal **A~~a~~ntidegradation** policy at Title 40 Code of Federal Regulations (CFR) Section (§)131.12. ~~-~~The D~~Missouri Department of Natural Resources (d~~epartment~~)~~ is required by 40 CFR §131.12(a) to develop and adopt a statewide **A~~a~~ntidegradation** policy and implementation methods~~to identify procedures for implementing that policy~~. ~~-~~For each individual project, i~~I~~mplementation generally includes:

- Assessing the applicability of **Antidegradation** based on whether the proposed project involves a new or expanded discharge;
- I~~i~~dentifying the **A~~a~~ntidegradation** review levels (i.e., the "tiers") that apply to ~~a~~ the receiving ~~surface~~ water;
- ~~determining existing water quality (EWQ);~~
- Requesting and considering a Geohydrologic Evaluation (Missouri Geological Survey) and Natural Heritage Reviews (Missouri Department of Conservation);
- I~~i~~dentifying and assessing potential **no-discharge options** and ~~**less-degrading or non-degrading alternatives**~~;
- Determining the **base case** effluent limits that are protective of water quality and meet any applicable federal technology-based effluent limits (or technology-based limits developed using best professional judgment on a case by case basis in the absence of national guidelines or standards);
- Conducting a structured **Alternatives Analysis** of discharging technologies to select the **preferred alternative** that is the least degrading and economically efficient option;~~assessing and determining appropriate extent of water quality degradation;~~
- Developing effluent limits for discharging options that allow a limited lowering of water quality that achieves the highest statutory and regulatory requirements for all new or expanded point source discharges;
- ~~identifying and assessing less-degrading or non-degrading alternatives;~~
- D~~d~~etermining the importance of economic or social development to justify degradation of waters; ~~-~~and~~and~~
- Undergoing ~~establishing~~ intergovernmental coordination and public participation processes to consider input from the affected community~~-~~.

Commented [RJ24]: See item 16. This reorganization makes the document flow better for applicants as they prepare their submittals.

A. Summary of Applicable Laws and Regulations on Antidegradation

The Missouri Clean Water Law (Sections (§§) 644.006 - 644.150 of the Revised Statutes of the State of Missouri (RSMo)) establishes requirements for the protection and management of surface water and groundwater quality. The Missouri **Clean Water Commission**, through the assistance of the D~~d~~epartment, promulgates regulations on water quality. Missouri's **Water Quality Standards** (**WQS**)[1] ~~1~~ are written into regulation at 10 CSR 20-7.031. The specific portion of the regulation prescribing the policy on **A~~a~~ntidegradation** is 10 CSR 20-7.031(3).

The **A~~a~~ntidegradation** rule is one of four required regulatory elements of the **WQS**. The other three elements include water classification, **beneficial uses**, and **W~~w~~ater Q~~q~~uality C~~c~~riteria** (**WQC**), ~~(~~narrative and numeric~~)~~. All of these review elements must be administered as a whole.

All surface **waters of the state** are subject to the *Missouri Antidegradation Implementation ~~Procedure~~ Methods* (this document) ~~.~~regardless of use designations or water classification. Regardless of the level of review assigned, an **Antidegradation** review must not result in the impairment of a **beneficial use.**

~~1 For purposes of this document, the terms "criteria" and "standards" have separate meanings (See the Glossary of this document). This document uses the phrase "Water Quality Standards," or WQS, when referring to the collective provisions of 10 CSR 20-7.031. The phrase "water quality criteria," or WQC, strictly refers to the provisions of 10 CSR 20-7.031(3) and (4) (i.e., the narrative and numeric limits placed on specific pollutants based on designated use). "Beneficial uses" is a term used in this document to mean both "existing" and "designated" uses. See Glossary of this document.~~

[1] For purposes of this document, the terms "criteria" and "standards" have separate meanings (See the Glossary). This document uses the phrase "**Water Quality Standards**," or **WQS**, when referring to the collective provisions of 10 CSR 20-7.031. The phrase "**water quality criteria**," or **WQC**, strictly refers to the provisions of 10 CSR 20-7.031(3) and (4) (i.e., the narrative and numeric limits placed on specific **pollutants** based on **designated use**). "**Beneficial uses**" is a term used in this document to mean both "existing" and "designated" uses.

The **beneficial uses**[22] and the applicable ~~**water quality criteria (**~~**WQC**~~)~~ can be found in 10 CSR 20-7.031. All **waters of the state** are subject to general criteria contained in 10 CSR 20-7.031(4). All waters listed in Tables G and H and those listed in the Missouri Use Designation Dataset (see 10 CSR 20-7.031(1)(F)) have **beneficial uses** and are subject to the specific (i.e., numeric) **WQC** contained in 10 CSR 20-7.031(5).

Beneficial uses may vary in a water body and may change at various locations. Most waters have more than one **beneficial use**. Where more than one **beneficial use** exists ~~(See definition of existing use in the Glossary of this document), or has been designated (See definition of designated use in the Glossary) for a water~~, the **beneficial use** with the most stringent water quality requirements must be maintained and protected. An **Alternatives Analysis**~~antidegradation review~~ shall be performed for the entire **segment** (or multiple **segments**) of water expected to be ~~significantly degraded~~degraded by a new or expanded discharge. Depending on the pollutant load within the discharge and distance to, and assimilative capacity of, waters down gradient of the discharge point, the review may extend into more than one classified **segment**. The review must extend down gradient as far as ~~significant degradation~~measurable effects are ~~is~~ expected regardless of the classification status of the receiving waters. If the expected, degradation is confined within a single **segment**, the review may be limited to only the portion of the **segment** to be affected.

Waters listed in Tables D and E of the **WQS** are waters of outstanding quality. These waters include the state's ~~**Outstanding National Resource Waters (**~~**ONRWs** and the ~~**Outstanding State Resource Waters**~~**OSRWs**. The degradation of water quality of these surface waters is prohibited except from short-term effects of **temporary degradation**.

Waters listed in Table F of the **WQS** are defined as Metropolitan No-Discharge Streams. With the exception of uncontaminated cooling water, no new or expanded discharges into the watersheds of these streams will be allowed unless they are intended as interim facilities in accordance with a regional wastewater treatment plan approved by the Department.

All surface **waters of the state** are protected under at least one of three tiers of the **A~~a~~ntidegradation** rule. Section II.B. ~~of this document~~ describes these tiers and explains how the protection levels are assigned to each water. The **Clean Water Commission** can be petitioned to change the tier level of protection for a specific water body, and that process ~~How the tier protection level may be revised~~ is explained in Section ~~II.C~~B.4 ~~of this document~~.

B. ~~Assigning~~ Tier Protection Levels

The following three levels (or tiers) protect water quality from degradation in all surface **waters of the state** on a **pollutant-by-pollutant basis**. The tiers are specified in rule at 10 CSR 20-7.031(3) as follows:

~~(A)~~ Antidegradation. The antidegradation policy shall provide three (3) levels of protection.
(3)

~~(B)~~ (A) Tier One. Public health, existing instream water uses and a level of water quality necessary to protect existing uses shall be maintained and protected.

~~(C)~~ (B) Tier Two. For all waters of the state, if existing water quality is better than applicable water quality criteria established in these rules, that existing quality shall be fully

[2] "**Beneficial uses**" is a general term used in this document to mean both "existing" and "designated" uses. See the Glossary.

Commented [RJ25]: See glossary definition of "Beneficial uses."

Commented [RJ26]: Throughout the document eliminated the term "significant degradation." No longer a need to distinguish "significant" from "minimal" because "minimal degradation" is eliminated from this draft.

Commented [RJ27]: Assuring that the requirements of 10 CSR 7.015 are met and clear in this document.

maintained and protected. Water quality may be lowered only if the state finds, after full satisfaction of the intergovernmental coordination and public participation requirements, that the lowered water quality is necessary to allow important economic and social development in the geographical area in which the waters are located. In allowing the lowering of water quality, the state shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control before allowing any lowering of water quality. This provision allows a proposed new or modified point or nonpoint source of pollution to result in limited lowering of water quality provided that –

~~2 "Beneficial uses" is a general term used in this document to mean both "existing" and "designated" uses. See the Glossary of this document.~~

1. The source does not violate any of the general criteria set forth in section (4) of this rule [not shown here], or any of the criteria for protection of beneficial uses set forth in section (5) of this rule [not shown here];
2. The source meets all applicable technological effluent limitations and minimum standards of design for point sources or minimum pollution control practices for nonpoint sources; and
3. The lowering of water quality, in the judgment of the department, is necessary for the accommodation of important economic and social development in the geographical vicinity of the discharge. In making a preliminary determination based on socioeconomic development considerations, the department may consider the potential for regional increases in utility rates, taxation levels or recoverable costs associated with the production of goods or services that may result from the imposition of a strict no-degradation policy. Consideration may also be given to the possible indirect effects of a policy on per capita income and the level of employment in the geographical vicinity of the proposed pollution source. Any preliminary decision by the department to allow a limited lowering of water quality will be stated as such in a public notice issued pursuant to 10 CSR 20-6.010. Pursuant to that provision, a public hearing will be held in the geographical vicinity of the proposed pollution source, if the department determines there is significant public interest in and need for a hearing.

~~(D)~~(C) Tier Three. There shall be no lowering of water quality in outstanding national resource waters or outstanding state resource waters, as designated in Tables D and E [of the Water Quality Standards].

The protections created by those sections of the rule, in combination with the policies and ~~procedures~~ methods outlined in this document, can be comprehensively summarized as follows:

Tier 1 Protection:
Policies and procedures that prohibit degradation that may cause or contribute to the impairment of a **beneficial use** or violation of **WQC**; and prohibit further degradation of **E~~e~~xisting W~~w~~ater Q~~q~~uality** (**EWQ**) where additional **pollutants of concern** (**POCs**) would result in the water being included on the 303(d) List. Tier 1 protection applies as the minimum protection level to all surface waters, regardless of ~~the~~ **EWQ**.

Tier 2 Protection:
Policies and procedures that prohibit the degradation of water quality of a surface water unless a review of reasonable alternatives and social and economic considerations justifies the degradation in accordance with the ~~procedures~~ methods presented in this document. Tier 2 protection applies on a **pollutant-by-pollutant basis** to all waters where **EWQ** is significantly better than the applicable **WQS**.

Tier 3 Protection:
Policies and procedures that prohibit any degradation of water quality of ~~**Outstanding National Resource Waters (**~~**ONRWs**~~**)**~~ and ~~**Outstanding State Resource Waters (**~~**OSRWs**~~**)**~~ as identified in Tables D and E of the **WQS**. **Temporary degradation** of water receiving Tier 3 protection may be allowed by the D~~d~~epartment on a case-by-case basis as explained in Section V~~I~~I.~~A of this document.~~

The level of protection identified above determines the type of **A~~a~~ntidegradation** review required when new or expanded discharges are proposed, such that Tier 1 protection requires a **Tier 1 review**, Tier 2 protection requires a **Tier 2 review** and Tier 3 protection requires a **Tier 3 review**. Because the Tier 1 and 2 reviews are conducted on a **pollutant-by-pollutant basis**, this document refers to these reviews as a review of a

"pollutant" as opposed to a review of the overall quality of a "water body." (See the definitions of "**pollutant-by-pollutant basis**" and "**water body-by-water body approach**" in the Glossary ~~of this document~~.)

*In the absence of information on **EWQ**, waters shall automatically receive **Tier 2 review** prior to receiving any additional **POCs** that might result in degrading the water quality.*

Tier 1 reviews allow **pollutants** to be discharged in accordance with the **WQS** without performing the **Aa~~a~~lternatives ~~a~~Analysis**, reviewing the implementation of nonpoint source controls, or determining **Ss~~s~~ocial and Ee~~e~~conomic I~~i~~mportance** (SEI) in accordance with Sections II.F. and H.~~B, D and E of this document, respectively.~~ A~~lso, a~~ll other requirements for the development of appropriate **permit** effluent limits still apply (such as application of appropriate federal effluent limitation guidelines (ELGs) for certain industries and secondary treatment standards for domestic wastewater). For **pollutants** receiving a **Tier 1 review**, the target water quality is determined by the **WQS** in combination with these other permitting requirements.

Because Tier 1 and 2 reviews are conducted on a **pollutant-by-pollutant basis**, as opposed to ~~on a~~ **water body-by-water body approach**, the allowance for degradation of water quality through a discharge of a **pollutant** depends on the existing level of that **pollutant** within the receiving water (i.e., the **EWQ**)~~,~~ and the probability of promptly restoring the quality where **pollutant~~s~~** levels are elevated. Waters already containing **POCs** from other sources "at or near" (See Section I.B.1.) ~~below)~~ **WQS** will qualify for Tier 1 protection for those **POCs**. The water may receive the same **pollutants** if: 1) the discharge would not cause or contribute to a violation of the **WQS**; 2) all other conditions of the state permitting requirements are met (i.e., **no-discharge options** are explored~~, and~~ technology-based requirements (including ELGs) are met, and the requirements of 10 CSR 20-7.015 are met); and 3) the **permit** is issued reflecting the highest statutory and regulatory requirements including Total Maximum Daily Load (TMDL) limits if established. Section II.A.3. ~~of this document~~ lists other examples of discharges not requiring a **Tier 2 review** ~~based on the minimal degradation that results during those~~ discharges.

Commented [RJ28]: This phrase is added to avoid situations in which an existing facility that is discharging with effluent limits based on WQS can claim that by definition they must be "at or near" impairment levels and therefore qualify for a Tier 1 review and avoid the alternative analysis.

Commented [RJ29]: See item 5.

~~In the absence of information on **EWQ**, waters shall automatically receive **Tier 2 review** prior to receiving any additional **POCs** that might result in degrading the water quality.~~

This ~~procedure~~ document requires an **Alternatives Analysis** for all new or expanded discharges subject to ~~waters to receive a~~ **Tier 2 review** ~~where a discharge will significantly degrade water quality~~. ~~An exception is made for~~ **ONRWs** and **OSRWs** ~~that~~ shall always be given Tier 3 protection (no degradation of water quality allowed). And finally, for **Tier 1** waters, applicants must show that their project will not "cause of contribute" to the impairment.

1. Assigning Tier 1 Review

Tier 1 review is assigned on a **pollutant-by-pollutant basis** by the D~~d~~epartment when the concentration of the **POC** is statistically similar to the applicable **WQC**. Additionally, 303(d) listed **segments** including waters for which a TMDL has been developed are considered Tier 1 for **POCs** attributed to the use impairment. The United States Environmental Protection Agency's (EPA's) published list of impaired waters lists the entire water body, but only those **segments** impaired should

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be considered Tier 1. These **segments** are indicated on Missouri's Water Quality Standards Map Viewer. Prior to allowing any new or expanded discharges of that **pollutant**, the D~~d~~epartment and applicant must conduct a **Tier 1 review** and demonstrate that the discharge would not violate the water quality criterion for that **pollutant**. *Only those **pollutants** that are documented by environmental data collected in the receiving waters as already being at, near or violating **WQS** qualify for a **Tier 1 review**.* To determine the concentration of individual **POCs** please refer to Section IV., which details the process for determining **EWQ**.

2. Assigning Tier 2 Review

~~2. Assigning Tier 2 Review~~

A **Tier 2 review** shall be conducted by default on all surface **waters of the state** before an application for a **permit** to discharge is filed, unless one of the following conditions apply:

- ~~the water is an **ONRW** or **OSRW** to which Tier 3 protection applies,~~
- a.
- the project is considered exempt from an **Alternatives Analysis** in accordance with Section II.A.3.~~discharge is considered insignificant in accordance with the criteria explained in Section II.A of this document~~, or
- b.
- c. environmental data collected in the receiving waters shows that the **POC** is already at a level that qualifies the water for Tier 1 protection.
- ~~**Assigning Tier 3 Review**~~

3. Assigning Tier 3 Review

This review shall automatically apply to **ONRWs** and **OSRWs** listed in Tables D and E in the **WQS** at 10 CSR 20-7.031. All **ONRWs** and **OSRWs** are presumed to have no significant levels of **pollutants** under normal circumstances. Any degradation of water quality is prohibited in these waters unless the discharge only results in **temporary degradation**.

~~C. Revising Tier Review Levels~~

~~The default tier review will change from Tier 3 to Tier 2 if the water is no longer designated in rule as an ONRW or OSRW. The department may also change a review level from Tier 2 to Tier 1 if a pollutant reaches the levels explained in Section I.B.1 of this document. The change in a review level of any pollutant will require an opportunity for public review as outlined in Section II.F of this document.~~

4. Creation of Tier 3 Waters

Any person may petition the **Clean Water Commission** to designate, through rulemaking, a water as an OSRW, and thus requiring **Tier 3 review**, if the water is documented to have the following conditions in accordance with 10 CSR 20-7.031(~~98~~):

- ~~A~~a high level of aesthetic or scientific value;
- An undeveloped watershed; and
- L~~l~~ocated on or passes through lands which are state or federally owned, or which are leased or held in perpetual easement for conservation purposes by a state, federal or private conservation agency or organization.

Unique waters such as those that are highly aesthetic; provide critical needs for threatened, rare or endangered species; have archeological, cultural, scientific or exceptional recreational importance; or provide a special educational opportunity, should be given protection through the designation of a special use under 10 CSR 20- 7.031(9). When these special use designations are assigned, the D~~d~~epartment should recommend appropriate site-specific criteria to protect the unique quality of these waters.

C. Application

Commented [RJ31]: See item 20.

Applicants submitting **Antidegradation** requests must provide a report that details all of the project considerations. At a minimum, the report should include the following information:

- Project location;
- Receiving water and Tier determination;
- Geohydrologic Evaluation of the site from the Missouri Geological Survey;
- Natural Heritage Review provided by the Department of Conservation;
- A complete evaluation of **no-discharge options** and **non-degrading alternatives**;
- The identification of a **base case** technology that will meet minimum effluent limits at lowest lifecycle costs;
- An analysis of less degrading, discharging, treatment alternatives;
- A recommendation / selection of the preferred treatment alternative;
- A set of effluent limits that the **preferred alternative** can reliably meet; and
- A demonstration that the project is socially and economically important.

Applicants must also submit the Water Quality Review / Summary Request form along with the other applicable forms. The application review fees must also be submitted via check or the JetPay system (https://magic.collectorsolutions.com/magic-ui/en-US/Pay/Process/CartInformation) according to the type of review. The review fees are listed in 10 CSR 20-6.011(2)(I).

If the application will require water quality modeling or a metals translator study, applicants are encouraged to contact the Department and compete these details prior to formal application.

Most applicants provide hard copies of the report and forms. Hard copy documents can often times be easier and quicker to review, particularly maps and other large format documents. Applicants must also provide an electronic version of all documents in Portable Document Format (pdf) searchable format.

~~The tier review level assigned to these unique waters will follow the same procedures developed for all other waters.~~

II. Missouri's Antidegradation Implementation Procedure

This portion of the document outlines the procedure for determining whether or not degradation is allowed in surface **waters of the state** from **regulated discharges**. ~~The antidegradation review procedure is based on:~~

Commented [RJ32]: See item 16.

- ~~the level of protection (i.e., Tier 1, 2 or 3) assigned to the pollutants of concern (POCs) within the water receiving the discharge,~~
- ~~the type of receiving water,~~
- ~~existing water quality (EWQ) of the receiving water,~~
- ~~the necessity of degradation, and~~
- ~~the social and economic importance (SEI) of the proposed discharge.~~

*All new or expanded **regulated discharges** are subject to A~~a~~ntidegradation review requirements.* These activities include those involving point source discharges regulated under Missouri's permit program (e.g., State Operating Permits) and discharges regulated under federal permits or licenses that are subject to state water quality certification under §401 of the federal Water Pollution Control Act (a.k.a. **Clean Water Act**).

~~Antidegradation reviews are required when proposed new or expanded discharges will significantly degrade water quality.~~ The review process is intended to ensure that the proposed discharges fully protect **beneficial uses** and achieve the highest statutory and regulatory requirements. In addition, the applicant must demonstrate that the discharge is necessary and has **SEI**. ~~to reviewing the necessity for a discharge and the social and economic importance of the discharging activity, the department and applicants must ensure that proposed discharges fully protect beneficial uses, and achieve the highest statutory and regulatory requirements. The department must also assure that activities within the watershed are implementing cost-effective, reasonable best management practices to control nonpoint source pollution (See Section II.D of this document).~~ Determinations issued under these provisions must be made in accordance with the public notification process described in Section II.~~F.~~1.~~ of this document.~~ A decision diagram of the A~~a~~**ntidegradation** review process is provided as Appendix 1~~ of this document~~.

Applicants will initiate **Antidegradation** review requests by submitting an **Antidegradation** report along with summary forms and proper fees established in 10 CSR 20-6.011(2)(I). If needed, the Department will assess **EWQ** for the purpose of assisting in the development of **permit** effluent limits. Applicants that are seeking funding from the Department's Financial Assistance Center (FAC) must complete the **Antidegradation** review process prior to approval of any loans or grants.

Commented [RJ33]: See item 16.

A. Applicability

Commented [RJ34]: See item 16.

1. New Discharges.

All new discharges are subject to **Antidegradation** review. New sources are those sources that do not hold an effective or administratively continued operating **permit**. A minor change in discharge

location or reconstruction of a discharging structure does not trigger an **Alternatives Analysis** unless the Department determines that the project will have specific environmental impacts that warrant review. In these cases, please contact the Department for a determination.

2. Expanded Discharges.

Except for discharges to Tier 1 waters, all expanded discharges are subject to an **Alternatives Analysis**. Expanded discharges are those in which the pollutant load from a facility holding an effective or administratively continued **permit** is expected to increase for any **POC**.

Commented [RJ35]: See topic 1.

The existing load is calculated by multiplying the permitted design flow by the effluent concentration limit established in the operating **permit**. If the **permit** does not limit the effluent concentration of a particular **pollutant**, then the existing load is calculated by multiplying the permitted design flow by the effluent concentration established by evaluating the water quality-based effluent limit. These calculations are typically based on daily load as shown in the following equation:

Existing Load ≥ Proposed Load

EDF (MGD) * PC (mg/l) [conv factor] ≥ PDF (MGD) * PEC (mg/L) [conv factor]

Where:

EDF = Existing Design Flow
PC = Permitted Concentration
PDF = Proposed Design Flow
PEC = Proposed Effluent Concentration
conv factor = 8.3453 (pounds/gal)

The equation is frequently rearranged to be more useful as:

PEC (mg/L) ≤ PC (mg/L) * [EDF (MGD) / PDF (MGD)]

Using this equation, an applicant can demonstrate that a particular **pollutant** is not an expanded discharge. For projects that are non-degrading (that maintain or decrease load), the applicant does not have to conduct an analysis of less-degrading treatment alternatives for that particular **pollutant**. An example of this calculation is provided in Appendix 3.

3. Exemptions from Alternatives Analysis.

Commented [RJ36]: See item 5 & 17. These exemptions take the place of the minimal degradation approach.

There are a limited number of situations in which a project may be exempt from conducting an **Alternatives Analysis** as provided in the following list:

Commented [RJ37]: See item 5; these exemptions along with clarification of non-degrading calculations serve to replace minimally degrading path.

- Relocating an outfall without increasing pollutant load to a stream that has more mixing (but not from a gaining setting to a losing setting);
- Making a minor change in discharge location or construction of a new outfall structure;
- Retaining equivalent permitted effluent limits when discharging to a stream in which mixing is not available;
- An existing facility is applying for an operating **permit** renewal with no new or expanded discharge;
- The activity will result in only **temporary degradation** of water quality. (See Section VI.);
- The activity is a thermal discharge that has been approved through a **Clean Water Act** 316(a)

Commented [RJ38]: See item 17.

demonstration; and

- Permit limits changing due to schedule of compliance in an Operating Permit.

B. Tier of Receiving Water

The receiving water Tier level is determined by the method outlined in Section I.B. Note that it is possible for a water body to be Tier 2 for some **pollutants** and be Tier 1 for others.

C. Geohydrologic Evaluation and Natural Heritage Review

Commented [RJ39]: See item 16.

Applicants must request a Geohydrologic Evaluation from the Missouri Geological Survey for all projects that involve new earthen basins, earthen basins undergoing major modifications, new wastewater irrigation sites, and subsurface absorption fields. A Geohydrologic Evaluation is also required for new discharges to confirm that the receiving water body is gaining or losing. The gaining and losing evaluation is also necessary for facilities that are relocating their discharge to a new receiving water. The Geohydrologic site evaluation from the Missouri Geological Survey is required for all earthen basin structures because it provides site collapse potentials. Earthen basin structures shall not be located in areas receiving a severe collapse potential rating. Earthen basin structures located in areas receiving a moderate collapse potential rating with appropriate engineering solutions are reviewed on a case-by-case basis. Existing facilities that are expanding within the same footprint need not request a Geohydrologic Evaluation.

The project must address any recommendations provided in the Geohydrologic Evaluation. The Missouri Geological Survey provides these evaluations free of charge. Online requests for Geohydrologic Evaluation of Liquid-Waste Treatment Facility/Site, can be made online through GeoEDGE, which is located at: https://dnr.mo.gov/geology/geoedge.htm

Natural Heritage Reviews are conducted by the Missouri Department of Conservation. These reviews provide information about species and natural communities of conservation concern that could be affected by development projects. Incorporating information from the Natural Heritage Review into the project plans is an important step in helping to reduce unnecessary impacts to Missouri's sensitive species. The Missouri Department of Conservation provides these reviews free of charge. Applicants can submit their requests for a Natural Heritage Review at: http://help.natureserve.org/ert/mo

Both the Geohydrologic Evaluation request and the Natural Heritage Review request are free and can be requested by the facility owner or consulting engineer. Both sites require the requestor to set up an account prior to completing the request.

D. Evaluate and Assess No-Discharge Options & Non-Degrading Alternatives

An applicant proposing any new or expanded discharge is required to prepare an evaluation of alternatives to the proposed discharge. The purpose of this evaluation is to determine whether or not the proposed discharge is "necessary," that is, no reasonable alternative(s) exist to install a no discharge system or a system that will prevent degradation. These alternatives are compared (in terms of practicability, economic efficiency and affordability) to the controls required to protect **beneficial uses** and to achieve the highest statutory and regulatory requirements. **No-discharge options** and **non-degrading alternatives** shall be considered feasible unless an evaluation to the contrary is provided.

For any proposed discharge, there may be a number of pollution control measures that prevent or minimize water quality degradation. For discharges likely to cause degradation, applicants must provide

an analysis of **non-degrading alternatives**. The applicant should evaluate a range of **no-discharge options** and **non-degrading alternatives** with the intent of identifying reliable, demonstrated processes or practices that can be reasonably expected to avoid degradation. The following alternatives are examples that may be considered depending upon applicability:

No Discharge:
- Land application;
- Subsurface irrigation;
- Recycling or reuse (i.e., closed loop system);
- Discharge to a regional wastewater collection and treatment system;

Non-Degrading:
- Improved operation and maintenance of existing treatment system;
- Alternative discharge locations;
- Expansions that incorporate treatment technology enabling the facility to meet permit limits such that the project is non-degrading (See Section II.A.2. and 3.); and
- Seasonal or controlled discharges to avoid critical water quality periods.

For facilities that already have an active or administratively continued **permit** an applicant shall use the method outlined in Section II.A.2. to show that a particular project is non-degrading. In addition, for projects involving an increase in design flow that currently discharge to effluent dominated streams (streams that do not have flow during critical conditions) maintaining effluent concentration is considered non-degrading.

Commented [RJ40]: See item 1.

E. Base Case

For all new or expanded discharges that involve at least one **POC** that is expected to result in water quality degradation, the applicant must identify a reliable treatment design (a **base case**) that will meet the minimum water quality requirements of the receiving water. To determine minimum water quality requirements applicants must identify all **POCs**, and the anticipated discharge flowrates and location. The minimum (**base case**) effluent requirements include meeting water quality-based effluent limits, federal technology-based effluent limits (or in the absence of national guidelines or standards, technology-based limits developed using best professional judgment on a case by case basis), any limits established by a Total Maximum Daily Load (TMDL), or any other effluent limit established through existing enforceable agreements such as variances to **WQS**. Compliance shall be considered assured if all **permits** are in effect and the discharges from permitted facilities are not in significant noncompliance and/or are implementing all required best management practices (BMPs). Appropriate enforcement action and/or compliance schedules on facilities that are out of compliance will satisfy the assurance requirement. It is important to note that the treatment design must be capable of meeting these minimum requirements for not only the **pollutants** that are found to be degrading, but for those found to be non-degrading.

POCs for **Antidegradation** reviews include those **pollutants** reasonably expected to be present in the discharge and for which the assimilative capacity and permissible loads can be reasonably calculated. There are **pollutants** that have no numeric criteria, and therefore, there is no direct means to calculate a water-quality based effluent limit. Please refer to Section III.B.6. for more information about pollutants that have no numeric criteria.

When the Department determines an increased pollutant load has the potential to cause an increased accumulation of the **pollutant** within sediments or in fish tissue, the applicant may be required to assess this potential to degrade the receiving water body. Such an assessment would consider the physical, chemical and biological properties of the affected surface water, the circumstances surrounding the

lowering of water quality, and the cumulative risks to the environment and to human health. (See Section III.B.8. for more discussion concerning **bioaccumulative pollutants**).

The Department intends to develop a **pollutant** trading program with specific emphasis on nutrient **pollutants**. Depending on the specific elements of this future program, applicants and the Department may be able to consider a watershed based pollutant loading scenario and establish limits according to the trading program guidelines so that the overall effort improves the water quality of the receiving water. If applicants are interested in pursuing such an approach, they are advised to contact the Department early in the planning process to plan the project and work out the parameters associated with the trades.

F. Conduct an Alternatives Analysis and Select the Preferred Alternative

Following the evaluation of possible alternatives, the applicant must provide a basis for selecting the most reasonable alternative, the **preferred alternative**. The **preferred alternative** is one that is practicable, economically efficient, and affordable. Typically, the **Alternatives Analysis** should include in the evaluation a **base case** treatment option along with two to four less degrading options.
~~a)~~

1. Practicability

The practicability of alternatives is considered by evaluating the effectiveness, reliability, and potential impacts on the overall natural environment (i.e., land, air, and water) resulting from implementation of the alternatives. The following are examples of the factors that may be evaluated during this process:

~~1)~~
a. Effectiveness and Reliability

- Certainty of achieving technology-based requirements and **WQC** to protect **beneficial uses;**
- Technical feasibility of alternatives (e.g., no-discharge of large discharges within dense urban areas);
- System or technology reliability, potential for upsets/accidents;
- Nature of **pollutants** discharged;
- Discharge timing and duration;
- Need for low-flow augmentation;
- Dilution ratio for **pollutants** discharged;
- Operator familiarity and use of similar equipment when the applicant owns or operates more than one facility;

~~2)~~
b. Environmental Factors

- Sensitivity of stream uses;
- Sensitivity of groundwater uses in the area;
- Effect on endangered species; and
- Potential to generate secondary water quality impacts (storm water, hydrology).

Commented [RJ41]: See glossary definition of "beneficial uses."

Review of these factors might be on a qualitative or quantitative basis, as appropriate. Other secondary environmental impacts should also be considered, such as the potential impact of alternatives on odor, noise, aesthetics, energy consumption, air emissions, and solid waste generation. Other practicability factors that should be considered during the review include the technical, legal, and local considerations of the various alternatives examined. The schedule and the estimated time of completion of the project should also be provided for each alternative discussed.

2. Economic Efficiency

Alternatives that are deemed practicable must undergo a direct cost comparison. An analysis of pollution control costs, or economic efficiency, is appropriate when the applicant desires to optimize the balance between water quality benefits and project costs. General cost categories that should be considered include:

- Capital costs;
- Annual operating costs (including cost escalation); and
- Other costs (one-time costs, savings, opportunity cost, salvage value).

Opportunity costs may be considered in the estimate of overall cost, as appropriate. For example, lost opportunity costs for lots in a proposed subdivision that would be used for land application rather than housing, or losses related to process changes that results in missed production runs are legitimate and should be documented.

In order to develop a standardized framework for projecting, evaluating, and comparing costs associated with various pollution control alternatives, applicants should use a present worth framework for reporting cost information. However, applicants may propose alternate economic demonstrations if appropriate. Alternative direct cost comparisons may be presented if the present worth calculation is complicated by the amount of difference in the effective design lives of the alternatives examined. The following calculation may be used to determine present worth:

$$P = C + O + [A \cdot (1/(1+d)^n] - S$$

Where:

P = Present worth
C = Capital cost
O = Other costs (expressed as present worth)
A = Average annual operating cost (alternatively a gradient factor may be applied to account for cost escalation)
d = Discount rate
n = Useful life
S = Salvage value of facilities and land (expressed as net worth)

Applicants should evaluate the alternatives based on a common life of the equipment approach, typically twenty (20) years. Applicants seeking longer term loans, for instance from the United States Department of Agriculture, may extend the calculation to cover the expected length of the loan. The costs associated with the each degrading alternative that is economically efficient are then compared to the costs of the **base case** treatment technology.

As a *non-binding rule-of-thumb,* alternatives less than 120 percent of the cost of the **base case** alternative are considered economically efficient. In general, this amount represents the point beyond which increasing costs yield less proportional increases in water quality. Unless evidence exists to the

contrary, alternatives greater than 120 percent of the **base case** costs are generally considered to not be economically efficient. Conditions that might warrant consideration of alternatives of greater cost (above 120 percent) are the practicability factors identified under Section II.F.1.

Applicants performing the direct cost comparison approach should evaluate the economic efficiency of the treatment options for each of the primary **POCs** related to the proposed discharge. For example, the primary **POCs** for domestic wastewater discharges include biochemical oxygen demand (influencing in-stream dissolved oxygen concentration), ammonia, bacteria, and potentially other **pollutants** for which a wasteload allocation (WLA) can be reasonably determined. An applicant may need to evaluate the costs associated with one specific **POC** if additional treatment process alternatives do not affect treatment for other **POCs**. This quantitative water quality analysis is not needed when the receiving water quality is not a significant factor for a specific alternative (e.g., in-stream dissolved oxygen concentrations in relation to a **no-discharge option**). Alternatives analyses use qualitative and quantitative assessments of water quality benefits and consider treatment costs and feasibility. For this reason best professional judgment is of the utmost importance when evaluating alternatives and selecting the **preferred alternative**. For example, there are cases in which a **base case** option is very inexpensive and it is immediately evident that all other less degrading options are not economically efficient. For these cases, applicants can make this demonstration with reasonable information, rather than costing out and evaluating complete preliminary designs.

Commented [RJ42]: See item 17.

3. Affordability

Following an analysis of economic efficiency, the affordability of the most practicable and efficient alternative may be assessed at the applicant's discretion. This assessment may be used to determine if the alternative is too expensive to reasonably implement. This approach results in the selection of the most practicable and efficient alternative, while maintaining affordability to the public or private entity. *Alternatives identified as practicable and economically efficient are considered affordable if the applicant does not supply an affordability analysis.*

To meet the requirements of 644.145 RSMo, the Department developed a method to analyze the costs associated with wastewater compliance at publicly-owned facilities. This method is called the Cost Analysis for Compliance (CAFCom) and it directs the Department to consider a specific set of criteria when evaluating whether a project is affordable for the specific community. Applicants that wish to assert that a particular treatment alternative is not affordable will be asked to provide supporting information and include the data necessary for the Department to conduct a CAFCom evaluation. Although the CAFCom evaluations were developed to address publicly-owned systems, the Department will use similar considerations for private systems as well.

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If the applicant determines that the least **degrading** economically efficient alternative is affordable, then it is the **preferred alternative**. If this alternative is not affordable, then the next least degrading economically efficient alternative should be evaluated until an alternative is chosen that is practical, economically efficient and affordable.

Following the analysis of pollution control alternatives, the alternative that is the most practicable, economically efficient, and affordable should be considered the **preferred alternative**.

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G. Develop Effluent Limits

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An important outcome of each **Antidegradation** review is the establishment of effluent limits for all new and expanded discharges. These limits ensures a limited lowering of water quality that achieves the highest statutory and regulatory requirements for the project. For **pollutants** shown to be non-degrading

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using the method presented in Section II.A.2., effluent limits shall reflect the maintenance of pollutant load or the maintenance of pollutant concentration for cases in which the applicant is increasing design flow but discharging to effluent dominated streams. For **pollutants** that are degrading, the effluent limits shall reflect the concentrations that can be reliably met by the **preferred alternative** determined in Section II.F.

In developing those limits, the Department will use both internal and applicant-supplied data and evaluations, identify **beneficial uses** of the receiving water and analyze the impacts of the discharge. Depending on the **pollutant** and situation, there are several types of effluent limits developed during an **Antidegradation** Review. These include: Preferred Alternative Effluent Limits (PELs, based on an analysis of less degrading treatment alternatives), Non-Degrading Effluent Limits (NDELs, based on mass balance calculations or existing effluent limits for expanded discharges to effluent dominated streams), Federal or State Regulation limits (FSRs, limits from 10 CSR 20-7.015 such as pH or phosphorus, among others), Technology-Based Effluent Limits (TBELs, from the federal effluent limit guidelines or case-by-case review), and Water Quality-Based Effluent Limits (WQBELs from 10 CSR 20-7.031).

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Commented [RJ48]:

Commented [RJ49]: See item 1.

Refer to Section III for more information on the development of effluent limits related to specific pollutants.

H. Determine the Social and Economic Importance of the Preferred Alternative

1. Steps in Determining Social and Economic Importance (SEI)

If the **preferred alternative** identified in Section II.F. will result in degradation of the receiving waters, then the applicant must demonstrate that the **preferred alternative** (or "project") will allow important economic and social development. **SEI** is defined as the social and economic benefits to the community that will occur from any activity involving a new or expanded discharge. The applicant should use the following three steps to demonstrate the **SEI**:

- Identify the affected community;
- Identify relevant factors that characterize the social and economic conditions of the affected community; and
- Describe the important social and economic development associated with the project.

The affected community is defined in 10 CSR 20-7.031(3)(B) as the community "in the geographical area in which the waters are located." The affected community should include those living near the site of the proposed project as well as those in the community that are expected to directly or indirectly benefit from the project.

To describe the economic and 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:

- Measures of employment or income;
- Increasing industrial production;
- Increasing or improving housing;
- Increasing the community tax base;
- Providing necessary public services (e.g., fire department, school, infrastructure); and

- Correcting a public health, safety or environmental problem.

Other typical documents that can be used to show local support for a particular project are rezoning determinations and letters of support from local elected officials such as mayors or county officials.

The social and economic measures identified above do not constitute a comprehensive list. 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.

Following the identification of appropriate social and economic measures, the applicant must describe the expected change in these factors that is associated with the project. The purpose of this step is to demonstrate whether or not important social and economic development will result from the project. The applicant should first describe the existing condition of the affected community. This base condition should then be compared to the predicted change (benefit) in social and economic condition after the discharge is allowed. The area's use or dependence upon the water resource affected by the proposed discharge should also be described in the analysis. In doing so, the applicant may evaluate any associated environmental related benefits or costs, such as:

- Promoting/impacting fishing, recreation and tourism industries; and
- Reserving assimilative capacity for future industry and development.

Upon the consideration of all relevant factors, the project constitutes important social and economic development if the applicant demonstrates that the project will lead to beneficial changes in the factors presented (i.e., increased jobs, employment, housing or other appropriate factors). This determination will be made on a case-by-case basis using information provided with the application.

2. Preliminary Determination of Social and Economic Importance

When information available to the Department is not sufficient to make a determination regarding the social and economic benefits or environmental impacts associated with the proposed activity, the Department may request that the applicant submit additional information to support a preliminary determination. Once the Department has reviewed the final information pertaining to the **SEI** of the proposed activity, the Department shall make a preliminary determination regarding how the **SEI** was considered in light of the changes to water quality. The Department will prepare draft determination for public review under Section II.I. provided the applicant has demonstrated that the proposed activity is important and that the highest applicable and established statutory and regulatory requirements are achieved. This preliminary determination also becomes part of the **Administrative Record of Decisions** described in Section XIII.

If the Department determines, after appropriate discussions with the discharger, that either the **SEI** of the proposed project has not been demonstrated or that alternatives to the proposed discharge have not been appropriately considered, the Department shall post its **Antidegradation** review findings and the preliminary decision to deny the proposed activity. This preliminary determination also becomes part of the **Administrative Record of Decisions**.

I. Public and Interagency Participation in Antidegradation Reviews

Public participation is a component of the **Antidegradation** review process. Public notice of **Antidegradation** review findings, solicitations of public comment and maintenance of **Antidegradation** review documents as part of the public record help ensure that interested parties

can be engaged and involved throughout the review process. In addition, intergovernmental coordination and review is required prior to any action that allows degradation of water quality in a surface water afforded a **Tier 2 review**.

This section outlines the public participation and the intergovernmental coordination and review requirements. The processes for both must follow existing state rules regarding public notice, response to comments and maintenance of records. **Antidegradation** reviews for permitted facilities will employ the public participation procedures that are available through the permitting process (e.g., draft **permits**, Fact Sheets, Water Quality Review Sheets, opportunities to comment, etc.). The Fact Sheet on a permitted action will include a discussion on the **Antidegradation** review.

1. Public Notification Requirements

The Department will provide public notice and opportunity for public comment on all **Antidegradation** reviews. The Department will combine these public participation opportunities with other procedures, such as the public notices related to permitting processes or intergovernmental coordination and review procedures.

Discharges that may result in degradation of waters can only be approved after the Department allows for public comment on whether degradation should be allowed (under the general public hearing procedures prescribed at 10 CSR 20-6.020) and the Department makes all of the following findings:

- The level of water quality necessary to protect applicable **beneficial uses** is fully maintained. Water quality shall not be degraded to a level that does not comply with the applicable **WQS**;
- The highest statutory and regulatory requirements for new and existing point sources are achieved; and
- Allowing degradation of water quality is necessary and accommodates important economic or social development in the area where the surface water is located.

After an **Antidegradation** review has been conducted for a discharge that may result in water quality degradation, the public notice will include a notice of availability of:

- The decision as to whether or not the proposed discharge meets **Antidegradation** requirements;
- Determination of projected impacts on **EWQ**;
- Findings and determinations from the **Alternatives Analysis**, when required;
- The conclusions of any social and economic evaluation of the proposed activity, where necessary; and
- A description of the surface water that is subject to the **Antidegradation** review.

Unless public participation on the **Antidegradation** review is incorporated into a permitting process, a 30-day public notice will be published on the Department's website. The notice will identify the action being considered, list all **beneficial uses** identified of the surface water and call for comments from the public regarding the proposed discharge.

All **Antidegradation** review findings shall be documented by the Department and made part of the **Administrative Record of Decisions**. *Review documents, including **EWQ** assessments, determination on amount of degradation, alternatives analyses, demonstration of **SEI** and any other decisions or findings, will be made available to the public.*

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Commented [RJ52]: See item 4.

2. Opportunities for Public Participation

Public participation in Missouri's water quality **Antidegradation** program is both broad and specific. Opportunities for broad participation include involvement in the Department's triennial review of the **WQS** (i.e., use designations, **WQC** determinations, and **Antidegradation** review requirements) and participation in rule development relative to permitting processes. In addition, any interested party may nominate a water body for review at the Tier 3 level by following the procedure for consideration outlined under Section I.B.4. Finally, interested groups can conduct volunteer monitoring to support **EWQ** determinations.

When **Antidegradation** reviews and notices of findings related to such reviews are incorporated into the permit process, any required notice of the permit hearing or solicitation of comments shall note that elements of the **Antidegradation** review (e.g., decisions, analyses, studies, and water quality impacts) are also under consideration. Public participation processes that may include opportunities for **Antidegradation** review and public involvement include –

a. The permit issuance process for individual or general permit templates, which must abide by the requirements of 10 CSR 20-6.

b. Permitting, planning or funding actions, which require public notices, comment opportunities and meetings as part of the application process and planning requirements.

c. Individual **Clean Water Act** §401 water quality certifications, which specify public participation requirements executed by the Department.

d. Provisions for public participation in **Antidegradation** reviews and related matters as outlined in the Department's **Continuing Planning Process**.

e. Rulemaking involving revisions to the **WQS** related to **Antidegradation**.

3. Intergovernmental Coordination and Review

Intergovernmental coordination is required prior to approving a discharge that would degrade a surface water protected at the Tier 2 level. This requirement seeks to ensure that all relevant public entities at the local, state and federal levels are aware of any proposal to degrade water quality and are provided with an opportunity to review, seek additional information and comment on the proposal.

The intergovernmental coordination and review process occurs prior to the issuance of any final determination on the **SEI** of the proposed discharge and may occur in tandem with public notice procedures outlined in the previous section. The time period afforded to commenting agencies will be consistent with the requirements for submission of public comments.

Element 5 of the **Continuing Planning Process** also outlines the intergovernmental coordination process on activities involving the protection of water quality. Element 5 may be reviewed by contacting the Department and requesting a copy of the **Continuing Planning Process** document or accessing the Department's Web site.

Agencies will have access to summary information on the proposed activity, the receiving water **segment**, the **EWQ** of the receiving water **segment**, the **POCs**, the tier designation, estimated amount of degradation to the receiving waters, the treatment alternatives reviewed and the **SEI** of the proposed activity.

Once the intergovernmental coordination and public notice requirements outlined above are satisfied,

the Department shall make a final determination concerning the proposed activity. All determinations, including determinations to prohibit the activity, shall be documented and made a part of the **Administrative Record of Decisions**.

III. Considerations for Individual Pollutants

Although a final treatment design will treat all of the wastewater for each new or expanded discharge, the evaluation of treatment alternatives is to be done using a **pollutant-by-pollutant basis**. To that end, this section provides considerations and guidance regarding individual **pollutants**. It is not possible to address all **pollutants**, and it is important to note that this section is intended to provide only consideration and guidance for common situations. Each project for a new or expanded discharge is unique and presents with individual circumstances that are distinctive to its setting. The list of elements that are unique to each project is lengthy and includes the nature of the receiving waters, condition of the current treatment plant and compliance history (if any), characteristics of the influent in concentration and flow regimes, geographic setting, land availability, neighbor or community issues, and financial situation, among many others. Industrial wastewater brings an even greater variability in **pollutants**, treatment options, and other local considerations.

Commented [RJ53]: See item 16. Guidance on individual pollutants.

For each **pollutant** the first step is to determine the **base case** requirement. In many cases this is the water quality-based effluent limit, and as such, mixing in the receiving water is a consideration. Missouri's **WQS**, 10 CSR 20-7.031(5)(A)4., provide the applicability and requirements for Mixing Zones and Zone of Initial Dilution. 10 CSR 20-7.931(5)(A)4.B.(IV) provides mixing considerations for lakes, saying that the mixing zone for lakes are not to exceed one-quarter (1/4) of the lake width at the discharge point or one hundred feet (100') from the discharge point, whichever is less. In practice the Department has used the triangular prism method to calculate a mixing zone volume. This method makes the assumption that the bottom of the lake tapers off in a linear fashion. So the volume is one half the distance from the shore to the center of the cove, multiplied by the cove depth, multiplied by the length of the prism which is one-hundred feet (100').

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For **Antidegradation** purposes applicants compare the TBELs provided in 10 CSR 20-7.015, the federal effluent limitation guidelines (if applicable), and the water quality-based effluent limits (with mixing applied as appropriate), choosing the most stringent to serve as the **base case** technology from which applicants can begin to evaluate less degrading treatment options. The following section provides guidance regarding less degrading effluent concentration levels that are generally considered economically efficient. Again, individual circumstances are a key element in making these determinations and the guidance provided is not intended to overlook unique project considerations.

A. Conventional Pollutants

1. Biological Oxygen Demand (BOD_5)

10 CSR 20-7.031(5)(J) establishes the Water Quality Standard for dissolved oxygen to be a minimum of 5 milligrams per liter for warm water and cool water aquatic habitats and 6 milligrams per liter for cold water aquatic habitats. Dissolved oxygen is not a **pollutant of concern**. However, the Biological Oxygen Demand (BOD_5) of wastewater has a direct effect on oxygen concentrations in receiving waters. Dissolved oxygen modeling is required to demonstrate that the waste load allocations for BOD_5 are protective of this standard. If the waste load allocation will cause a downstream dissolved oxygen sag below the Missouri minimum water quality standard, the **Clean Water Act** and its implementing regulations require the development of water quality-based effluent limits for BOD_5 to ensure that **beneficial uses** are met. The water quality-based effluent limit is compared to the Technology-based limit, and the most stringent will then serve as the **base case** as described in Section II.E. Applicants for

projects that are non-degrading and are in compliance with the terms and conditions of their existing **permit** will not be required to complete dissolved oxygen modeling provided that the stream does not have a waste load allocation from a Total Maximum Daily Load or an impairment listing for dissolved oxygen.

Dissolved oxygen modeling must use Department approved models such as Streeter-Phelps or QUAL2K/QUAL2E (QUAL2). The Streeter-Phelps model involves minimal time and effort and provides reliable results where this basic model is generally appropriate. Situations when the Streeter-Phelps model is not useful include:

- Significant tributaries in the flow **segment**;
- Discharge to losing stream **segments**;
- Groundwater inflow from springs;
- Where pollutant loading from other sources exist; or
- When the water body is impaired for dissolved oxygen.

The following table describes different levels of modeling sophistication to be used in the appropriate situations.

Analysis	**Model**	**Site-Specific Data Requirements**
Level 1	Streeter-Phelps (spreadsheet)	Default assumptions from literature and predictive equations
Level 2	Streeter-Phelps (spreadsheet)	Stream geometry, time of travel using geometry only
		Stream geometry, time of travel using tracers
Level 3	QUAL2 or Equivalent*	Stream geometry, time of travel using tracers, One (1) 48-hour water quality study
Level 4	QUAL2 or Equivalent*	Stream geometry, time of travel using tracers, Two (2) 48-hour water quality studies

Must be a Department-approved model. Two water quality studies should target the low-flow conditions at slightly different temperatures and/or discharge conditions. A third study conducted during a cooler season may be needed to establish seasonal waste load allocations and **permit limits.*

An applicant may begin analysis with Level 1 screening. If the Streeter-Phelps model indicates that dissolved oxygen concentrations will fall below the water quality standard in the receiving water, then a less degrading BOD_5 concentration must be chosen and the process repeated. If Level 1 screening cannot demonstrate compliance, the applicant can proceed to a Level 2 modeling analysis and input appropriate stream geometry and time of travel data. If this additional refinement produces a critical dissolved oxygen concentration that is not in compliance with **WQS**, then the applicant must use a more sophisticated model such as QUAL2 and a Level 3 or 4 analysis. If, as a result of Level 3 or 4 analysis, the waste load allocation produces a critical dissolved oxygen concentration that is not in compliance with the Water Quality Standard, a less degrading BOD_5 and/or ammonia concentration must be chosen and evaluated. A Level 3 or 4 analysis is required for all projects discharging to waters classified as Tier 1 for dissolved oxygen.

For modeling purposes the BOD_5 average monthly limit (AML) is multiplied by 1.5 to calculate an average weekly limit (AWL). EPA's "Technical Support Document For Water Quality-based Toxics Control (EPA/505/2-90-001)" (TSD) provides the basis for this calculation in Section 5.4.2. (pg. 104). In addition to establishing limits for BOD_5, dissolved oxygen effluent limits may be applied to the discharge if this is necessary to maintain the critical dissolved oxygen concentration in the receiving waters. Dissolved oxygen monitoring is also required for facilities that have TRC limits or in cases where an existing permitted facility has sufficient reasonable potential to exceed a previously

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established dissolved oxygen limit. However, for other cases dissolved oxygen effluent limits will not be assigned unless a waste load allocation study or dissolved oxygen modeling has been completed and approved.

Applicants that are not familiar or comfortable applying the Streeter-Phelps model (Level 1 & 2) are encouraged to contact the Department for assistance. Applicants wishing to utilize QUAL2 (Level 3 & 4) modeling are also encouraged to contact the Department to assure that the study parameters are acceptable prior to initiating the work. Regardless of Level, applicants conducting modeling must provide all of the modeling inputs (along with an explanation of their sources) and at a minimum provide the critical dissolved oxygen concentration, the distance to the critical dissolved oxygen concentration, as well as overall plots of distance versus BOD_5 and dissolved oxygen concentrations.

The previous modeling discussion provides a method for determining the water quality-based effluent limit for BOD_5. 10 CSR 20-7.015 also provide BOD_5 effluent limits which are dependent upon the receiving stream. These limits are then compared, and the lower of the two serve to establish the **base case** effluent limit for BOD_5. For Tier 2 waters, applicants installing new or expanded discharges must then evaluate effluent limits that are less degrading than the **base case**.

A common **Antidegradation** technology driver for domestic wastewater treatment is the level of ammonia treatment. Seventy to eighty percent of organic reduction must occur prior to the nitrification step. Therefore, it is common to see relatively low BOD_5 concentrations in the effluent of domestic treatment plants designed to denitrify. Under these circumstances *modeling is not required for new or expanded facilities with a design flow of less than 100,000 gallons per day proposing advanced BOD_5 treatment less than or equal to an average monthly concentration of 10 milligrams per liter and average weekly concentration of 15 milligrams per liter.*

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2. Total Suspended Solids (TSS)

Missouri has no numeric Water Quality Standard for Total Suspended Solids (TSS). The **base case** for TSS is dependent on the receiving stream and the effluent limits established in 10 CSR 20-7.015. Since the treatment capacity of TSS for domestic wastewater is typically the same as BOD_5, effluent limits for TSS will mirror the BOD_5 limits. This generally holds true for the **base case** as well as for situations in which the preferred treatment alternative reflects less degrading effluent limits for BOD_5. If there is a particular concern or reason whereby a TSS limit equivalent to BOD_5 is not achievable, an alternate effluent limit can be applied based on the particular situation.

3. Bacteria

10 CSR 20-7.031(5)(C) and Table A1 of the **WQS** use *E. coli* as an indicator species and establishes counts that are protective of various uses. These uses are whole body contact (A), whole body contact (B) and secondary contact recreational.

It is important that wastewater be adequately treated prior to disinfection because incomplete treatment can interfere with disinfection effectiveness. Chlorination and ultraviolet radiation are the two most common treatment options for domestic wastewater. For optimum performance, chlorine disinfection systems should provide rapid initial mixing and enough time for the free chlorine to have direct contact with the microorganisms to result in a complete oxidation and kill. Regarding ultraviolet disinfection, the dosage and time are designed such that the infectious microorganisms are inactivated. In either case, the systems are designed for complete kill or inactivation. As a practical matter, the most stringent effluent limits, whole body contact (A), should be applied to all new or expanded discharges as the **preferred alternative** and less degrading option. There may be exceptions for cases in which existing

collection systems suffer from very significant inflow and infiltration and may have trouble with treatment interference during significant rainfall events; in that case the situation may warrant slightly higher effluent limits that can reliably be met so long as the effluent limits are protective of the **WQS** for bacteria.

4. pH

pH itself is not a **pollutant of concern**, but rather a condition of the receiving water that must be maintained for the protection of aquatic life. pH is treated on the application forms as a **POC** because it governs the toxicity of metals and ammonia. Therefore, pH is a consideration when establishing effluent limits for these other **pollutants**.

The Effluent Regulations (10 CSR 20-7.015) provide TBELs for pH for each of the different receiving water groups of 6.0 to 9.0 standard pH units. The Water Quality Standard for pH is given in 10 CSR 20-7.031(5)(E), which requires the maintenance of pH between 6.5 and 9.0 standard pH units in the receiving water body. Generally, permit limits for pH are established at 6.0 to 9.0 standard pH units unless there is a reasonable potential that this will not be protective of the Water Quality Standard; and in that case the range is limited to 6.5 to 9.0 standard pH units.

In either case pH effluent limits are expressed in terms maintaining pH within a range. Given this fact, a search for **less-degrading alternatives** does not make sense. So for pH, the **base case** limits will be applied regardless of treatment alternatives.

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5. Oil and Grease

Permit limits for oil and grease are routinely set to meet a MDL and AML of 15 milligrams per liter and 10 milligrams per liter, respectively. These limits are water quality-based and are recognized as proper for protecting the narrative criteria established in 10 CSR 20-7.031(4)(B). Therefore, there are no alternative analysis requirements for oil and grease beyond meeting the above limits.

B. Toxic Pollutants, Nonconventional Pollutants, and Other Considerations

1. Ammonia

Aquatic life protection criteria, such as total ammonia nitrogen, are designated to protect aquatic organisms from acute and chronic toxicity and are based on toxicity testing that measures the **pollutant's** effect on aquatic organisms. Toxicity test results are then converted into **WQC** with components of magnitude, duration, and frequency. The magnitude of a criteria is the maximum amount of the **pollutant** that can be in the aquatic environment before toxicity, either acute or chronic, occurs. The duration of a criteria is the time period that aquatic organisms can be exposed to the **pollutant** at a given magnitude before toxicity occurs. Acute toxicity criteria are protective of short duration exposure, such as 1-hour or 1-day, while chronic toxicity criteria are protective of longer durations, such as 4 or 30 day periods. The frequency of a criteria is how often the aquatic organisms can be exposed to the magnitude and duration of concern before toxicity occurs. Most toxicity criteria are set at a frequency to not exceed more than once every three years, which is protective of the aquatic life **designated use**.

Effluent limit calculations translate acute and chronic toxicity criteria into limitations for discharge that maintain and protect the applicable **designated use**. EPA's TSD provides the mathematical and statistical calculations to protect **designated uses**. Additionally, the TSD provides a number of options to convert aquatic life protection criteria into effluent limitations. A common approach for acute and chronic criteria uses effluent variability to establish maximum daily limits (MDL) and average monthly

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limits (AML) for toxics of concern. The underlying premise of these calculations, however, is that the criteria duration (1-day, 4-day, or 30-day) is properly aligned with the criteria development in order to ensure the effluent limitation is protective.

The duration of the total ammonia nitrogen acute and chronic criteria are 1-day and 30-days, respectively. Missouri applies the acute criteria (1-day duration) as a MDL and the chronic criteria (30-day duration) as an AML. Missouri's **WQS** for Ammonia were based on EPA's TSD and are found in 10 CSR 20-7.031(5)(B)7. and 10 CSR 20-7.031, Tables B1, B2 and B3.

Temperature and pH impact the toxicity of ammonia so these values directly impact effluent limit derivation. These values vary across the State, so default ecoregional values have been developed and are provided in Table 1. A map showing the regions is provided a Figure 1.

Figure 1: Missouri Ecoregions

Table 1: Default Values for pH, Temperature, Hardness, and Effluent Limits Without Mixing

Ecoregion Category Description & Default Hardness Value	Calendar Month	Median pH	75th Percentile Temp °C	Current Missouri Criteria Without Mixing		EPA Proposed Criteria Without Mixing	
				MDL WQBEL mg/L	AML WQBEL mg/L	MDL WQBEL mg/L	AML WQBEL mg/L
Central Irregular Plains 200 mg/L	January	7.80	2.8	12.1	3.1	12.7	2.3
	February	7.90	4.0	10.1	2.7	10.6	2.1
	March	7.90	10.6	10.1	2.7	10.3	1.6
	April	7.90	17.0	10.1	2.3	6.0	1.1
	May	7.80	22.0	12.1	1.9	4.8	0.9
	June	7.80	26.0	12.1	1.5	3.4	0.7
	July	7.90	28.9	10.1	1.1	2.2	0.5
	August	7.80	28.0	12.1	1.3	2.9	0.6
	September	7.80	24.1	12.1	1.7	4.0	0.8
	October	7.80	17.5	12.1	2.6	6.9	1.2
	November	7.80	11.6	12.1	3.1	11.3	1.7
	December	7.90	4.9	10.1	2.7	10.6	2.1

Ecoregion Category Description & Default Hardness Value	Calendar Month	Median pH	75th Percentile Temp °C	Current Missouri Criteria Without Mixing		EPA Proposed Criteria Without Mixing	
				MDL WQBEL mg/L	AML WQBEL mg/L	MDL WQBEL mg/L	AML WQBEL mg/L
Interior River Valleys and Hills 208 mg/L	January	7.80	2.8	12.1	3.1	12.7	2.3
	February	7.80	4.4	12.1	3.1	12.7	2.3
	March	7.90	9.4	10.1	2.7	10.6	1.8
	April	8.00	16.1	8.4	2.1	5.4	1.0
	May	7.80	21.0	12.1	2.1	5.2	1.0
	June	7.90	26.0	10.1	1.3	2.9	0.6
	July	8.00	29.4	8.4	0.9	1.8	0.4
	August	8.00	29.3	8.4	0.9	1.8	0.4
	September	8.00	25.6	8.4	1.2	2.5	0.5
	October	8.00	19.0	8.4	1.8	4.2	0.8
	November	8.00	12.0	8.4	2.4	7.6	1.3
	December	7.90	6.9	10.1	2.7	10.6	2.1
Ecoregion Category Description & Default Hardness Value	Calendar Month	Median pH	75th Percentile Temp °C	Current Missouri Criteria Without Mixing		EPA Proposed Criteria Without Mixing	
				MDL WQBEL mg/L	AML WQBEL mg/L	MDL WQBEL mg/L	AML WQBEL mg/L
Mississippi Alluvial Plain 130 mg/L	January	7.6	7.2	17.0	3.9	17.8	2.9
	February	7.6	7.0	17.0	3.9	17.8	2.9
	March	7.6	12.5	17.0	3.9	14.7	2.1
	April	7.7	17.95	14.4	2.8	7.9	1.3
	May	7.4	22.0	23.0	2.9	9.0	1.3
	June	7.7	26.4	14.4	1.7	3.9	0.8
	July	7.7	29.3	14.4	1.4	3.1	0.6
	August	7.8	29.2	12.1	1.2	2.6	0.6
	September	7.7	26.08	14.4	1.7	4.1	0.8
	October	7.9	19.1	10.1	2.0	5.1	0.9
	November	7.6	14.0	17.0	3.9	13.0	1.9
	December	7.7	8.0	14.4	3.5	15.1	2.5
Ecoregion Category Description & Default Hardness Value	Calendar Month	Median pH	75th Percentile Temp °C	Current Missouri Criteria Without Mixing		EPA Proposed Criteria Without Mixing	
				MDL WQBEL mg/L	AML WQBEL mg/L	MDL WQBEL mg/L	AML WQBEL mg/L
Ozark Highlands 170 mg/L	January	7.8	8.1	12.1	3.1	12.7	2.2
	February	7.9	9.3	10.1	2.7	10.6	1.8
	March	7.8	13.0	12.1	3.1	10.1	1.6
	April	7.8	16.7	12.1	2.7	7.4	1.3
	May	7.8	20.0	12.1	2.2	5.6	1.0
	June	7.8	24.0	12.1	1.7	4.0	0.8
	July	7.8	26.6	12.1	1.5	3.3	0.7
	August	7.9	26.5	10.1	1.3	2.7	0.6
	September	7.8	23.5	12.1	1.8	4.2	0.8
	October	7.8	18.0	12.1	2.5	6.7	1.2
	November	7.8	14.0	12.1	3.1	9.3	1.5
	December	7.8	10.0	12.1	3.1	12.7	1.9

Ecoregion Category Description & Default Hardness Value	Calendar Month	Median pH	75th Percentile Temp °C	Current Missouri Criteria Without Mixing		EPA Proposed Criteria Without Mixing	
				MDL WQBEL mg/L	AML WQBEL mg/L	MDL WQBEL mg/L	AML WQBEL mg/L
Western Corn Belt Plains 240 mg/L	January	8.0	2.25	8.4	2.4	8.8	1.8
	February	8.0	2.7	8.4	2.4	8.8	1.8
	March	8.0	9.05	8.4	2.4	8.8	1.6
	April	8.1	15.8	6.9	1.9	4.6	0.9
	May	8.0	20.3	8.4	1.6	3.8	0.8
	June	8.1	26.0	6.9	1.0	2.0	0.5
	July	8.1	28.8	6.9	0.8	1.6	0.4
	August	8.0	28.1	8.4	1.0	2.0	0.5
	September	8.1	23.58	6.9	1.1	2.4	0.5
	October	8.1	16.1	6.9	1.8	4.5	0.9
	November	8.0	10.28	8.4	2.4	8.7	1.5
	December	8.0	4.0	8.4	2.4	8.8	1.8

Applicants may opt for the use of site-specific pH and temperature data for effluent limit calculations. For the parameter of pH, the 50th percentile will be used to determine monthly values. For the parameter of temperature, the 75th percentile will be used to determine monthly values.

If the receiving water body does not provide mixing considerations, then the chemistry of the expected effluent may be used to determine the site-specific data. If mixing considerations are applicable, then the edge of the Zone of Initial Dilution (ZID) will be used for acute criteria site-specific data and the edge of the mixing zone will be used for chronic criteria site-specific data. All other applicable mixing considerations are to be implemented per regulations. If there are no site specific pH or hardness data available then the default values in Table 1 may be applied.

For ammonia, the MDL and AML align with the development of Criterion Maximum Concentration (CMC) and Criterion Continuous Concentration (CCC). This approach allows for the direct application of both the CMC (i.e., acute criteria) and CCC, i.e., chronic criteria, as acute and chronic WLAs, which are subsequently established as **permit** limits. The CMC or acute WLA is established as the MDL and the CCC or chronic WLA is established as the AML, as shown below:

CMC = WLAacute = MDL
CCC = WLAchronic = AML

The direct application of both acute and chronic criteria as WLA is also applicable for facilities that discharge into receiving waterbodies with mixing considerations. The CCC and CMC will need to be calculated into WLA with mixing considerations using the mass-balance equation:

$$Ce = \frac{(Qe+Qs)C-(Qs\times Cs)}{(Qe)}$$

Where C = downstream concentration Ce = effluent concentration
Cs = upstream concentration Qe = effluent flow
Qs = upstream flow

After the WLA for both acute and chronic have been calculated, the acute and chronic WLA values are directly applied as the MDL and AML. In certain circumstances, utilizing the direct application

approach with mixing considerations, the AML calculations can result in a value greater than the MDL. When this circumstance occurs the AML is changed so that its value equals the MDL.

Ammonia toxicity to aquatic organisms is dependent upon pH and temperature, and a two-value aquatic life criteria process is used by Missouri to calculate acute and chronic waste load allocations that are protective. Missouri has long relied on EPA's TSD to provide the method by which effluent limits for toxics, like ammonia, are developed. According to this document, daily effluent concentrations are generally lognormal distributed. Ambient water quality data are also considered lognormal distributed.

All of the preceding discussion explains how the **base case** ammonia effluent limits are calculated. Table 1 provides the water quality-based effluent limits for ammonia for Missouri's current **WQS** for situations in which there is no mixing available.

In most circumstances, domestic dischargers find that less degrading ammonia concentrations are achievable and economically efficient. Applicants are expected to evaluate treatment options that incorporate biological nitrification. This often involves the construction of potentially larger aeration basins where ammonia conversion occurs and the use of more expensive mechanical equipment (blowers, pumps, larger clarifiers, anoxic zones). For smaller operations more ammonia conversion can occur with simply larger sized components that allow longer retention/treatment time. Many applicants find that it is economically efficient to meet or nearly meet EPA's proposed criteria for the protection of mussels and gill breathing snails. These concentrations are also provided in Table 1.

There are a number of retrofits for lagoon systems that have been shown to be effective at removing ammonia. These include moving bed bioreactors and other fixed film processes provided the temperature doesn't get too cold.

2. Metals

The **WQS** for metals were established for the protection of various uses. Because of this the criteria for some metals are expressed with explicit acute and chronic concentrations (Table A1 of 10 CSR 20-7.031). Others are dependent on water hardness and the acute and chronic concentrations are established by equation (Table A2 of 10 CSR 20-7.031). Like ammonia, a default hardness can be applied based on the ecoregion (see Table 1). The applicant can base their equation on data collected in the subject receiving stream. If applicants wish to collect data to support an **Antidegradation** review, they must submit a **Quality Assurance Project Plan** (**QAPP**) that details how the study will be conducted and get approval from the Department prior to sample collection.

The original toxicity testing used to establish the **WQS** for metals was based on the concentration of dissolved metals because the dissolved fraction is a better representation of the biologically active portion of the metal. However, **permit** limits, in most instances, are expressed as total recoverable metal. In many cases, **permit** limits simply apply the Water Quality Standard (dissolved fraction) as the limit. However, we can ask the question, "What fraction of metal in the effluent will be dissolved in the receiving water?" A metals translator study that considers local chemistry can be applied to adapt the effluent limit from the dissolved criteria to a total recoverable limit. It is important to note that translators and translator studies are not designed to consider the bioaccumulation of metals. Applicants that are interested in undertaking a metals translator study are encouraged to contact the Department's Watershed Monitoring Section early in the process because these studies must be reviewed and approved. Metals translator studies must be completed prior to formal **Antidegradation** application.

Metals are most frequently associated with industrial wastewater, in either an industrial permit or through a pretreatment program in a municipality. There are several common methods of metals treatment including 1) pH adjustment followed by settling (often enhanced with flocculation), 2)

catalytic media filtration, 3) advanced oxidation, and 4) reverse osmosis among others. Treatment designs are typically driven by flows and **pollutant** concentrations. Often a well-designed single stage system can be expected to produce effluent concentrations that are sufficient to meet **base case** limits. Applicants that are conducting an analysis of less degrading options should evaluate additional stages, combining additional treatment, or improving setting or recovery.

3. Nutrients (Total Phosphorus and Total Nitrogen)

The numeric criteria for nutrients are found in 10 CSR 20-7.031(5)(N), and the general criteria apply as well. There is no direct method for determining a waste load allocation for nutrients because of the complexity of the fate and transport of phosphorus and nitrogen once released to the environment. In addition, in most watersheds, non-point sources are the dominant contributors. For this reason it is not possible to calculate nutrient effluent concentrations that will serve as a **base case** which are protective of the **WQS**. Applicants for domestic wastewater systems must identify a **preferred alternative** for ammonia, and this **preferred alternative** may serve as the **base case** for total nitrogen and phosphorus. For most reservoirs in Missouri, total phosphorus is the **pollutant** that is driving eutrophication and therefore is to be treated as the primary **POC,** unless there is data that otherwise indicates total nitrogen plays a significant role in the watershed. For discharges to waterbodies that are not lakes or tributaries of lakes that have been assigned a nutrient water quality standard, applicants can assume that the addition of total phosphorus and total nitrogen will not result in degradation of general criteria unless there is evidence or site-specific concerns to the contrary.

Commented [RJ59]: See item 7.

The method used to calculate existing load for other **pollutants** may not work for nutrients. One of the variables in the equation is the permitted effluent limit (see Section II.A.2.). Few facilities have effluent limits for nutrient **pollutants** because numeric nutrient **WQS** are relatively new. Until a **permit** limit exists, for nutrients only, the existing load calculation may be based on average effluent concentrations as reported in discharge monitoring reports. The minimum amount of data needed to use this method is one year (quarterly reporting); however, all of the available data that is representative of current operations should be utilized. If a **permit** limit is put into place, the method used to calculate existing load should mirror the method used for other **pollutants**.

Applicants must also determine if the discharge of the proposed project is to a water body that is Tier 1 for nutrients. One such indication is if the water body is listed on the 303(d) list or is being proposed for listing. It is important to note that since nutrient pollution has the potential to affect the entire watershed, applicants must review the Tier status of the entire watershed, not just the receiving water body at the immediate discharge. Projects that are Tier 1 for nutrients must make a demonstration that they will not cause or contribute to the impairment. If a formal WLA has been developed for nutrients through a TMDL process, the new or expanded sources will be subject to such WLAs.

For situations in which a TMDL has not been approved, applicants for domestic wastewater treatment plants may assume that an effluent concentration of 0.5 milligrams per liter for total phosphorus is appropriate. If it is understood that nitrogen plays a driving roll in the impairment, then for discharges of 500,000 gallons per day, or greater, domestic applicants may assume an effluent concentration for total nitrogen of 8 milligrams per liter is expected. For smaller domestic discharges, the applicant may assume that an effluent concentration for total nitrogen of 10 milligrams per liter.

Prior to submittal of the formal **Antidegradation** report and application, Tier 1 applicants are encouraged to notify the Department with preliminary design flows so that a modeling exercise can be conducted to evaluate the impact. If the exercise shows that the proposed project would cause or contribute to the impairment, in consultation with the Department, the applicant may choose a less-degrading option for further evaluation. If the exercise shows that the project will not cause or contribute to the impairment, then the applicant will have this information available for the formal

Antidegradation report and application. These values will then be applied as effluent limits as part of the Water Quality / Antidegradation Review. If applicants for domestic wastewater systems wish to assert that the nutrient concentrations listed above are not appropriate, the applicant may provide an engineering study that evaluates alternatives and demonstrates that achieving these values are not economically efficient for their particular case and purpose. Remember, there may be situations in which any additional loading is prohibited, in which case the design must involve some sort of no-discharge system and not be subject to further **Antidegradation** review.

Applicants that will be discharging to Tier 2 waterbodies that are lakes or tributaries of lakes that have been assigned numeric nutrient criteria must include an analysis of treatment alternatives as part of their **Antidegradation** submission. This analysis of less degrading treatment alternatives is to be done with the intent of identifying a reliable, demonstrated process or practice that can reasonably be expected to achieve greater pollution reduction than the **base case**. Applicants for domestic projects will be asked to evaluate at least three less degrading options, specifically chemical addition and settling, biological nutrient removal (BNR), and enhanced nutrient removal (ENR).

Chemical addition typically uses ferric chloride or alum to bind and precipitate phosphorus which is then settled out. There are other proprietary phosphorus binding compounds that are effective as well. While the addition of these compounds does introduce a new **POC** (such as iron or aluminum), applicants need not provide an **Alternative Analysis** for these pollutants.

Commented [RJ60]: See item 15.

The biological processes facilitate biological denitrification via conversion of nitrate to nitrogen gas and "luxury" uptake of phosphorus by the biomass with subsequent removal through wasting of sludge. ENR typically employs BNR with the addition of chemical precipitations and additional filtration to achieve even lower effluent concentrations that can be achieved through BNR alone. Table 2 below provides the generally expected concentration ranges for domestic wastewater sources associated with these technology levels.

Table 2: Effluent Concentration Ranges for Less Degrading Options

	Chemical Addition and Settling, Monthly Average (mg/L)	Biological Nutrient Removal, Monthly Average (mg/L)	Enhanced Nutrient Removal, Monthly Average (mg/L)
Total Phosphorus	0.5 -1.0	0.5 – 2.0	0.2-0.5
Total Nitrogen	20	6-10	4-6

For industrial sources, these "cut points" are not defined, and it will be the obligation of the applicant to identify a **base case** and less degrading options to consider.

Applicants should develop annualized costs comparisons for the **base case** option and the three less degrading options as noted above. The costs should be presented on a present worth basis and include both capital and operating expenses. They are typically calculated for a twenty-year plant life. As a non-binding rule-of-thumb, alternatives less than 120 percent of the annualized cost of the **base case** are considered economically efficient, and the applicant will be required to install this level of technology, unless they find it unaffordable under the process outlined in Section II.F.3.

4. Organics (Volatiles)

Volatile organics are usually associated with industrial discharges and are such a diverse set of **pollutants,** so general guidance for these **pollutants** is quite limited. Some species are quite toxic and hence do not lend themselves to biological treatment. One of the more common treatment applications is air stripping to treat groundwater that is contaminated by some industrial solvent. Stripping itself

typically removes 95 percent or more with typical designs. Applicants evaluating less degrading options should review the feasibility and cost associated with the addition of an activated carbon filtration systems or other options that might enhance the stripping efficiency.

5. Process Additives

The use of additives at wastewater treatment plants is common and can serve a variety of purposes. The addition of acids and bases such as hydrochloric acid and sodium hydroxide are commonly used to adjust pH. Chlorine gas and sodium hypochlorite are often used to kill pathogens and disinfect wastewater and sodium sulfite or sodium bisulfite are often used in tandem to dechlorinate these effluents. There are many compounds that serve as coagulants, flocculants, and filter aids such as aluminum sulfate, ferric chloride, and polymer based compounds. Quite a few facilities use herbicides to control algae or other nuisance aquatic plants. Some operations can be improved with the use of enzymes and surfactants that stimulate bacterial action by cleaving fat, oil and grease, and sugar and starch molecules into basic components so that they can be destroyed by bacterial action. Other operations can also benefit from the addition of nutrient solutions or bacteria that also can serve to augment biological action. Foam control agents might be useful for systems that have foam drift of overflow problems. And some wastewater treatment systems require the addition of alkalinity and carbon sources such as methanol to function properly.

Commented [RJ61]: See item 6.

It is not practical for the Department to review operational choices when it comes to applying these additives, so long as they are done according to vendor instructions. Operating **permits** do not prohibit the addition of chemical additives unless they are expected to result in a change or impact to effluent quality, however Standard Conditions Part I, Section b requires all permittees to "give notice to the Department as soon as reasonably possible of any planned physical alterations or additions to the permitted facility." It is important to remember, that chemical addition has the potential to change biosolid characteristics.

6. Pollutants Having No Water Quality Criteria

If there is no **WQC** or TBEL for a specific **pollutant**, there is no direct way to establish a **base case** treatment technology that is protective of **beneficial uses**. This makes it impossible to quantifiably evaluate less degrading options. From an operating permit standpoint, these **pollutants** are often best addressed through a requirement to conduct Whole Effluent Toxicity (WET) tests, and this approach will be noted as part of the Water Quality / Antidegradation Review.

Commented [RJ62]: See item 11.

On a case-by-case basis, the Department may establish an effluent limit relying on published aquatic toxicity concentrations or ones provided on material data safety sheets as necessary to protect a specific use in the receiving water.

7. Temperature

Temperature can be a **POC**. Section 316(b) applies to electric power plants, chemical manufacturers, and petroleum refiners that withdraw at least 2 million gallons of cooling water per day and use at least 25 percent of that water for cooling purposes. It requires that the location, design, construction and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impacts. Effluent limits established under the Section 316 process are accepted as the preferred treatment alternative for these sources.

Commented [RJ63]: See item 16.

Temperature is not a concern for domestic wastewater unless there are specific water quality concerns associated with the discharge. For industrial sources, the effects of heat in a discharge must be taken into account when the effect of the discharge is expected to have a significant effect on water quality.

8. Bioaccumulative Pollutants

The Department's determination of whether the discharge will likely result in the increased accumulation of **pollutants** in sediment or fish tissue will consider all existing and readily available physical, chemical, and biological data relevant to the **POC**. This includes any discharge and receiving stream water chemistry data, sediment quality and toxicity data, and fish tissue and other "organism" data (including mollusks and other shellfish). The scientific literature would also be considered and used to determine relevant and applicable toxicity, bioaccumulation, and probable effects concentrations or other endpoints protective of human health and the environment. The determination would be made for each bioaccumulative **POC**, as well as for any known synergies between multiple bioaccumulative **POCs**. Historically, the human health protections focused on fish consumption as the primary route of exposure, but future updates to the **WQS** rule may include human health protection endpoints protective of the consumption of other organisms.

When the Department determines that a **POC** is a **bioaccumulative pollutant** for which a Water Quality Standard applies, the applicant must identify a **base case** treatment technology that is protective of the Standard and undergo an evaluation of less degrading treatment alternatives (**Alternatives Analysis**).

IV. Determining Existing Water Quality (EWQ)

Commented [RJ64]: See item 5 & 8.

Determining **EWQ** may be avoided if the discharger chooses to proceed on the assumption that all **POCs** will cause water quality degradation. Dischargers wishing to make this assumption may skip to an **Alternatives Analysis** discussed in Section II.F. However the following provides the method to establish that **EWQ** for a **POC** is below, at, or near **WQS** and therefore justifies a **Tier 1 review**.

The **WQS**, not **EWQ**, establishes the target for waters receiving **Tier 1 review**. However, no degradation of **EWQ** is allowed for any **pollutant** already causing water quality to not meet the applicable **WQS**. For waters receiving **pollutants** from permitted facilities that are in compliance with the terms and conditions of their **permits**, the **EWQ** shall include the levels of pollutants already permitted to be discharged from other facilities.

The Department intends to delineate water **segments** in sufficient detail to allow for distinct **EWQ** assessments. **Segments** should not overlap and should be bound, at a minimum, by significant **existing sources** and/or confluences with other water bodies. Where proposed new or expanded discharges may affect (degrade) multiple **segments**, multiple **EWQ** evaluations may be needed.

This section describes how **EWQ** is characterized through:

- Establishment of **EWQ** for surface waters using existing assessment data when available;
- Approaches which consider the size and potential impacts of the proposed discharge; and
- Cooperative action by both the Department and the applicant to generate new **EWQ** information where little or no data exist.

A. Approaches

In general, **EWQ** will be based upon existing assessments conducted under the current Department monitoring and assessment programs. **EWQ** assessments will seek to gather information only on the **pollutants** reasonably expected to be in discharges.

The preferred approach for assessing **EWQ** is to use previously collected data where available. Where adequate data are not available, the second preferred approach is to collect water quality data. The third preferred approach for assessing **EWQ** is to use an appropriate water quality model. Sometimes more than one approach may be needed to characterize **EWQ** for all **POCs**.

The Department can advise the applicant on what approaches may be most appropriate to establish the **EWQ**. If a data collection effort is chosen, the Department can advise the applicant on what data are needed and can provide guidance on how to collect and report the needed information to the Department. Statistical approaches to determine the appropriate level of tier review for each **POC** are discussed in Section IV.D. and Appendix 2.

B. Water Quality Assessment Procedures

EWQ must be established at **critical flow conditions**. **Critical flow conditions** are the point in time in which the **beneficial uses** within a water of the state are most susceptible to the effects of pollution, which is generally but not necessarily when a stream is at or near its **7Q10** flow. Therefore, stream water quality data used to establish **EWQ** should target critical conditions. If no measurable surface flow is present during critical conditions, then sampling should be collected at a representative pool. A lake's critical condition shall be determined on a case-by-case basis but would normally be when the surface water is at or below its ordinary or base level.

Although **EWQ** is established for **critical flow conditions**, the period of critical flow and maximum permitted pollutant loading often does not coincide with water quality sampling. Water quality models are useful for developing defensible **EWQ** values for **POCs** when water quality samples do not necessarily reflect the critical flow and loading conditions.

When data collection is involved, it is recommended that dischargers submit their monitoring and quality assurance/quality control (QA/QC) plans (e.g., a **QAPP** or similar quality assurance/quality control document) to the Department's Watershed Monitoring Section well in advance (i.e., at least six months) of any planned activities or **permit** application submittals. This will facilitate and help streamline the permitting process. Environmental groups, trade organizations, the general public, the Department and other governmental agencies may also elect to generate **EWQ** data with the prior approval of the Department and under appropriate, documented QA/QC procedures (e.g., a **QAPP**). Multiple dischargers to a surface water may combine resources to generate **EWQ** data and may join with other watershed stakeholders in the effort. The technical complexity associated with this process precludes establishment of universally applicable procedures.

However, the objective of this effort – generating a reasonable, credible and scientifically defensible characterization of **EWQ** – provides a framework for conducting such activities when needed for **Antidegradation** reviews.

Given the complexity of the issue, potential generators of **EWQ** data are expected to notify the Department of their intent to generate data and to obtain agency concurrence on proposed sampling protocols, sampling locations, **POCs**, reporting format, etc., prior to initiating data collection efforts. The initial consultation with the Department may also be used by regulated entities to evaluate the availability of existing data that may be used as a supplement to, or in lieu of, new **EWQ** data.

When regulated entities or third parties collect data, the Department may conduct field or laboratory audits to verify that data generators are adhering to established sampling protocols, and may split samples for independent analysis. Data generators that proceed without the Department notification and concurrence, risk rejection of the data and significant delays in the permitting process. Potential

generators of **EWQ** data are also encouraged to notify other regulated entities and stakeholders in the **segment** of their intent to generate **EWQ** data. Area-wide cooperation in the **EWQ** assessment process may allow for sharing of the cost of data generation and avoidance of conflict in subsequent permitting actions.

For proposals that entail a discharge into a water for which there is no **EWQ** data (i.e., where new data must be collected or a model performed for assessment of **EWQ**), the location of the **EWQ** assessment generally will be immediately upstream of the proposed new discharge location.

In some instances, particularly discharge expansions, it may be necessary to establish **EWQ** downstream of an **existing source**. In these instances, the water must be receiving a discharge at the time it is sampled. When such specific periods are analyzed, the resulting **EWQ** determination must clearly define the location and period for which the **EWQ** is representative, e.g., "x" distance below a mixing zone, at a specific flow rate (cubic feet per second, or "cfs") or flow level (e.g., 8.1 feet at a specific gauge). An alternative approach would be to measure **pollutant** concentration upstream of the **existing source** and model the **EWQ** in the downstream **segment** of interest based on **permit** conditions.

For lakes, **EWQ** will be assessed near tributary inlet mixing areas, in the main body of the lake or in other areas of the lake as appropriate. The Department will make determinations regarding **EWQ** characterization and accommodation of variations caused by seasonal impacts, water level fluctuations or other factors.

Where there are adequate **EWQ** data from multiple sampling sites on a water, these stations can become the **EWQ** stations from which a composite **EWQ** characterization can be developed. Alternatively, the Department may choose one existing monitoring site as the station from which to characterize **EWQ**. The Department may request additional monitoring at the site if the existing data are insufficient (e.g., where no information has been collected on **POCs** that would reasonably be expected in the proposed discharge).

It is important to note that when **EWQ pollutant** concentrations are presented as one numeric value applicable year-around, that it be representative of the concentration present during the **critical flow conditions**. Multiple values applicable to seasons, or other defined periods, may be used if supported by the data or modeling approach. Where uncertainty in the **EWQ** analysis is great, either a factor of safety may be incorporated into the calculation or applicants may be required to collect **EWQ** data after the **permit** is issued. Such data will serve to develop an **EWQ** profile during build-out of the activity's discharge capacity in order to verify the model results.

Before initiating **EWQ** sampling, the discharger should develop and submit a sampling plan to the Department for review. The sampling plan should address the following elements:

- Project goals and objectives;
- Identification of target conditions (including a discussion of any weather, seasonal variations, stream flow, lake level or site access that may affect the project);
- Sampling and handling methods;
- Data quality objectives;
- List of chemical parameters to be analyzed;
- Sampling frequency;
- Sampling period, including time of day;
- Sampling locations and rationale for site selection;
- Evaluation criteria for data results; and

- A list of field equipment (including tolerance range and any other specifications related to accuracy and precision).

Analytical methods for samples collected must comply with the parameters below.

- A person conducting an analysis of a sample taken to determine compliance with a **WQS** shall use an EPA-approved analytical method or an alternative analytical method that is approved by the Department.
- Samples, containers, preservation techniques, holding times and analysis shall be conducted in accordance with Guidelines Establishing Test Procedures and Analysis of Pollutants in 40 CFR Part 136. The use of other validated analytical methodologies may be authorized here if such use can be technically justified. Stream flow shall be measured possible each time **EWQ** sampling is performed.
- Acceptable methods for flow measurement include those described in the U.S Geological Survey manual, Techniques of Water Resources Investigations of the United States Geologic Survey (Chapter A8, Book 3, "Discharge Measurements at Gauging Stations") and the Department's Environmental Services Program's Standard Operating Procedure MDNR-WQMS-113, Flow Measurements in Open Channels. Each time **EWQ** sampling is performed on lakes, lake levels shall be measured using procedures approved by the Department.

As noted, the Department may consider existing data for establishing the **EWQ** from a federal or state agency, the regulated entity, the public or any other source as long as the data:

- Were collected in accordance with an appropriate quality assurance plan;
- Were collected using specified assessment or sample collection and analysis protocols; and
- Meet Missouri's credible data and data interpretation requirements specified by Missouri's 303(d) Listing Methodology Document.

Commented [RJ65]: Updated reference.

C. Pollutants of Concern/Data Collection

Dischargers will be required to generate **EWQ** for all **POCs** associated with the proposed discharge unless the discharger wishes to assume that **degradation** will result. In addition to the **POCs**, regulated entities may also be requested to provide water quality data or representative values for parameters necessary to determine the appropriate value range of **WQC** (e.g., pH, temperature, hardness) or to assess synergistic effects of multiple **pollutants**. If a dissolved metal is a **POC**, a regulated entity may also be requested to provide the information necessary to translate the total metal present in the discharge to an in-stream dissolved concentration. Again, the importance of consultation between **EWQ** data generators and the Department staff prior to **EWQ** data generation cannot be overstated.

D. Interpreting Data on EWQ

The water quality information generated from observed data should be used to assign the correct tier review level and to develop the **EWQ** value for the **POC**. A **POC** will be considered a Tier 1 **pollutant** where the 90th percentile of at least five samples is greater than or equal to 95 percent of applicable water quality standard. All consideration should be given to the distributional and statistical properties of the data to ensure that appropriate statistical tests are utilized. Appendix 2 is an example of a statistical test of an assumed lognormal distribution to determine the appropriate level of tier review for a **POC**. Generators of **EWQ** data are expected to provide documentation of their adherence to approved or established protocols and assure that the submitted information is accurate and complete. Only credible data will be reviewed in order to determine the **EWQ** on a **pollutant-by-pollutant basis** for each **POC**. Data generators should make every effort to use the most sensitive, practical analytical

methods available. The use of less sensitive analytical methods may cause rejection of the data set.

~~A. Determining the Significance and Appropriateness of Degradation~~

~~To determine the required scope of an antidegradation review, the department shall first determine whether or not the proposed new or expanded discharge will result in a significant degradation for a POC. POCs for antidegradation reviews include those pollutants reasonably expected to be present in the discharge and for which the assimilative capacity and permissible loads can be reasonably calculated. The permit applicant may avoid having to determine the assimilative capacity of the receiving water and, consequently, may proceed directly into defining the "necessity" (i.e., performing the alternatives analysis) of the discharge under Section II.B of this document by assuming (instead of demonstrating) that the proposed discharge will result in significant degradation for each of the POCs.~~

~~The activity shall be considered not to result in significant degradation, if:~~

- ~~The proposed net increase in the discharge of a POC does not result in an increase in the ambient water quality concentration of the receiving water after mixing.~~

Commented [RJ66]: See item 8.

~~When the department determines an increased pollutant load has the potential to cause an increased accumulation of the pollutant within sediments or in fish tissue, the applicant may be required to assess this potential in determining the significance of degradation. Such an assessment would consider the physical, chemical and biological properties of the affected surface water, the circumstances surrounding the lowering of water quality, and the cumulative risks to the environment and to human health;~~

- ~~The activity will result in only temporary degradation of water quality;~~
- ~~An existing facility is applying for renewal with no new or expanded discharge;~~
- ~~The reduction of the facility assimilative capacity (FAC) for any pollutant is less than 10 percent as a result of any single discharge and the reduction of the segment assimilative capacity (SAC) for any pollutant is less than 10 percent as a result of all discharges combined after EWQ is determined. In situations involving bioaccumulative pollutants and SAC reductions of less than ten percent, the applicant may be required by the department to proceed directly into defining the "necessity" of the discharge under Section II.B of this document unless it can be demonstrated [to the department] that there is no attendant risks to the environment and human health;~~
- ~~Combined sewer overflow (CSO) control projects resulting in a net decrease in the CSO related pollutant loadings to surface waters shall be excluded from review requirements when these loadings are included in department approved plans (e.g., Nine Minimum Controls, Long Term Control Plan) in accordance with national guidance or policies. Treatment byproducts created by CSO discharges are also excluded from review requirements when the discharges are identified in a department approved plan;~~
- ~~The department concludes that the proposed activity will not cause significant degradation based upon the specifics of any watershed based trading that has been agreed to by the project applicant. NOTE: Because Missouri does not currently have a watershed based trading program in place, the applicant might experience some permitting delays in pursuing this exemption unless the department is given significant advanced notice of the applicant's proposal; or~~
- ~~The activity is a thermal discharge that has been approved through a Clean Water Act 316(a) demonstration.~~

~~If a determination is made that significant degradation will occur, or it is assumed, the department will determine from information provided by the discharger whether or not the degradation is necessary to allow important economical and social development in the geographical areas in which the waters are located (See Sections II.B and II.E of this document).~~

~~1. Determining Existing Water Quality~~

~~Determining existing water quality (EWQ) may be avoided if the discharger chooses to proceed on the assumption that all POCs will cause significant degradation. Dischargers wishing to make this assumption may skip to an~~

~~alternatives analysis discussed in Section II.B of this document. Dischargers wishing to determine EWQ shall perform the following steps:~~

~~a) Summary of Approach EWQ either:~~

- ~~provides confirmation that the water quality for a POC is below, at or near WQS and therefore justifies a Tier 1 review, or~~
- ~~serves as the yardstick by which available assimilative capacity is measured for the POCs to receive a Tier 2 review.~~

~~The Water Quality Standards (WQS), not EWQ, establishes the target for waters receiving Tier 1 review. However, no degradation of EWQ is allowed for any pollutant already causing water quality to not meet the applicable WQS. *For waters receiving pollutants from permitted facilities that are in compliance with the terms and conditions of their permits, the EWQ shall include the levels of pollutants already permitted to be discharged to the waters at the time EWQ is first determined.* Also, EWQ, when determined for the same segment over multiple times, will track cumulative degradation.~~

Commented [RJ67]: See topics 8&9.

~~The department intends to delineate water segments in sufficient detail to allow for distinct EWQ assessments. Segments should not overlap and should be bound, at a minimum, by significant existing sources and/or confluences with other water bodies. Where proposed new or expanded discharges may affect (degrade) multiple segments, multiple EWQ evaluations may be needed. Finalization of a statewide water segment delineation and EWQ tracking system may require years to complete. The present uncertainty associated with segment delineation emphasizes the need for potential EWQ data generators to consult with the department prior to initiating data generation activities.~~

~~This section describes how EWQ is characterized through:~~

- ~~Establishment of EWQ for waters using existing assessment data when available;~~
- ~~Approaches which consider the size and potential impacts of the proposed discharge; and~~
- ~~Cooperative action by both the department and the applicant to generate new EWQ information where little or no data exist.~~

~~In general, EWQ will be based upon existing assessments conducted under the current department monitoring and assessment programs. EWQ assessments will seek to gather information only on the pollutants reasonably expected to be in discharges.~~

~~The preferred approach for assessing EWQ is to use previously collected data where available. Where adequate data are not available, the second preferred approach is to collect water quality data. The third preferred approach for~~

~~assessing EWQ is to use an appropriate water quality model. Sometimes more than one approach may be needed to characterize EWQ for all POCs.~~

~~The department can advise the applicant on what approaches may be most appropriate to establish the EWQ. If a data collection effort is chosen, the department can advise the applicant on what data are needed and can provide guidance on how to collect and report the needed information to the department. Statistical approaches to determine the appropriate level of tier review for each POC are discussed in Section II.A.1.d and Appendix 2 of this document.~~

~~b) Water Quality Assessment Procedures~~

~~EWQ must be established at critical flow conditions. Critical flow conditions are the point in time in which the beneficial uses within a water of the state are most susceptible to the effects of pollution, which is generally but not necessarily when a stream is at or near its 7Q10 flow. Therefore, stream water quality data used to establish EWQ should target critical conditions. If no measurable surface flow is present during critical conditions, then sampling should be collected at a representative pool. A lake's critical condition shall be determined on a case-by-case basis but would normally be when the surface water is at or below its ordinary or base level.~~

~~Although EWQ is established for critical flow conditions, the period of critical flow and maximum permitted pollutant loading often does not coincide with water quality sampling. Water quality models are useful for developing defensible EWQ values for POCs when water quality samples do not necessarily reflect the critical flow and loading conditions.~~

~~When data collection is involved, it is recommended that dischargers submit their monitoring and quality assurance/quality control (QA/QC) plans (e.g., a Quality Assurance Project Plan (QAPP) or similar quality assurance/quality control document) to the department well in advance (i.e., at least six months) of any planned activities or permit application submittals. This will facilitate and help streamline the permitting process. Environmental groups, trade organizations, the general public, the department and other governmental agencies may also elect to generate EWQ data with the prior approval of the department and under appropriate, documented QA/QC procedures (e.g., a QAPP). Multiple dischargers to a surface water may combine resources to generate EWQ data and may join with other watershed stakeholders in the effort. The technical complexity associated with this process precludes establishment of universally applicable procedures.~~

~~However, the objective of this effort – generating a reasonable, credible and scientifically defensible characterization of EWQ – provides a framework for conducting such activities when needed for antidegradation reviews.~~

~~Given the complexity of the issue, potential generators of EWQ data are expected to notify the department of their intent to generate data and to obtain agency concurrence on proposed sampling protocols, sampling locations, POCs, reporting format, etc., prior to initiating data collection efforts. The initial consultation with the department may also be used by regulated entities to evaluate the availability of existing data that may be used as a supplement to, or in lieu of, new EWQ data.~~

~~When regulated entities or third parties collect data, the department may conduct field or laboratory audits to verify that data generators are adhering to established sampling protocols, and may split samples for independent analysis. Data generators that proceed without the department notification and concurrence, risk rejection of the data and significant delays in the permitting process. Potential generators of EWQ data are also encouraged to notify other regulated entities and stakeholders in the segment of their intent to generate EWQ data. Area-wide cooperation in the EWQ assessment process may allow for sharing of the cost of data generation and avoidance of conflict in subsequent permitting actions.~~

~~*Once EWQ is established for a surface water, it is the yardstick against which degradation is measured during all future antidegradation reviews on the segment.* If future monitoring data indicate that EWQ is improving due to upstream water pollution controls or water quality is changing due to natural conditions, the department may revise EWQ to reflect those water quality changes. Antidegradation rule generally does not allow a revision of the original EWQ measurement, that is, *EWQ is not a moving target, unless it moves in the direction that reflects improving water quality*. However, if it is shown that an error in determining EWQ or additional data collection significantly increases the certainty of the results, then EWQ should be reevaluated.~~

~~For proposals that entail a discharge into a water for which there is no EWQ data (i.e., where new data must be collected or a model performed for assessment of EWQ), the location of the EWQ assessment generally will be immediately upstream of the proposed new discharge location.~~

~~In some instances, particularly discharge expansions, it may be necessary to establish EWQ downstream of an existing source. In these instances, the water must be receiving a discharge at the time it is sampled. When such specific periods are analyzed, the resulting EWQ determination must clearly define the location and period for which the EWQ is representative, e.g., "x" distance below a mixing zone, at a specific flow rate (cubic feet per second, or "cfs") or flow level (e.g., 8.1 feet at a specific gauge). An alternative approach would be to measure pollutant concentration upstream of the existing source and model the EWQ in the downstream segment of interest based on permit conditions.~~

~~For lakes, EWQ will be assessed near tributary inlet mixing areas, in the main body of the lake or in other areas of the lake as appropriate. The department will make determinations regarding EWQ characterization and accommodation of variations caused by seasonal impacts, water level fluctuations or other factors.~~

~~Where there are adequate EWQ data from multiple sampling sites on a water, these stations can become the EWQ stations from which a composite EWQ characterization can be developed. Alternatively, the department may choose one existing monitoring site as the station from which to characterize EWQ. The department may request additional monitoring at the site if the existing data are insufficient (e.g., where no information has been collected on POCs that would reasonably be expected in the proposed discharge).~~

~~It is important to note that when EWQ pollutant concentrations are presented as one numeric value applicable year-around, that it be representative of the concentration present during the critical flow conditions. Multiple values applicable to seasons, or other defined periods, may be used if supported by the data or modeling approach. Where uncertainty in the EWQ analysis is great, either a factor of safety may be incorporated into the calculation or applicants may be required to collect EWQ data after the permit is issued.~~
~~Such data will serve to develop an EWQ profile during build-out of the activity's discharge capacity in order to verify the model results.~~

~~Before initiating EWQ sampling, the discharger should develop and submit a sampling plan to the department for review. The sampling plan should address the following elements:~~

- ~~Project goals and objectives,~~
- ~~Identification of target conditions (including a discussion of any weather, seasonal variations, stream flow, lake level or site access that may affect the project),~~
- ~~Sampling and handling methods,~~
- ~~Data quality objectives,~~
- ~~List of chemical parameters to be analyzed,~~
- ~~Sampling frequency,~~
- ~~Sampling period, including time of day,~~
- ~~Sampling locations and rationale for site selection,~~
- ~~Evaluation criteria for data results, and~~
- ~~A list of field equipment (including tolerance range and any other specifications related to accuracy and precision).~~

~~Analytical methods for samples collected must comply with the parameters below.~~

- ~~A person conducting an analysis of a sample taken to determine compliance with a WQS shall use an Environmental Protection Agency~~

~~(EPA) approved analytical method or an alternative analytical method that is approved by the department.~~

- ~~Samples, containers, preservation techniques, holding times and analysis shall be conducted in accordance with *Guidelines Establishing Test Procedures and Analysis of Pollutants* in 40 CFR Part 136. The use of other validated analytical methodologies may be authorized here if such use can be technically justified. Stream flow shall be measured possible each time EWQ sampling is performed.~~
- ~~Acceptable methods for flow measurement include those described in the U.S Geological Survey manual, *Techniques of Water Resources Investigations of the United States Geologic Survey* (Chapter A8, Book 3, "Discharge Measurements at Gauging Stations") and the department's Environmental Services Program's Standard Operating Procedure MDNR-WQMS-113, Flow Measurements in Open Channels. Each time EWQ sampling is performed on lakes, lake levels shall be measured using procedures approved by the department.~~

~~As noted, the department may consider existing data for establishing the EWQ from a federal or state agency, the regulated entity, the public or any other source as long as the data:~~

- ~~were collected in accordance with an appropriate quality assurance plan;~~
- ~~were collected using specified assessment or sample collection and analysis protocols; and~~
- ~~meet Missouri's credible data and data interpretation requirements specified by Missouri's 303(d) Listing Methodology Document (*Methodology for the Development of the 2006 Section 303(d) List in Missouri* or subsequent approved revisions).~~

~~c) Pollutants of Concern/Data Collection~~

~~Dischargers will be required to generate EWQ for all POCs associated with the proposed discharge unless the discharger wishes to assume that significant degradation will result. In addition to the POCs, regulated entities may also be requested to provide water quality data or representative values for parameters necessary to determine the appropriate value range of WQC (e.g., pH, temperature, hardness) or to assess synergistic effects of multiple pollutants. If a dissolved metal is a POC, a regulated entity may also be requested to provide the information necessary to translate the total metal present in the discharge to an in-stream dissolved concentration. Again, the importance of consultation between EWQ data generators and the department staff prior to EWQ data generation cannot be overstated.~~

~~d) Interpreting Data on Existing Water Quality~~

~~The water quality information generated from observed data should be used to assign the correct tier review level and to develop the EWQ value for the POC. A POC will be considered a Tier 1 pollutant where the 90th percentile of at least five samples is greater than or equal to 95 percent of applicable water quality standard. All consideration should be given to the distributional and statistical properties of the data to ensure that appropriate statistical tests are utilized. Appendix 2 is an example of a statistical test of an assumed lognormal distribution to determine the appropriate level of tier review for a POC.~~

~~Generators of EWQ data are expected to provide documentation of their adherence to approved or established protocols and assure that the submitted information is accurate and complete. Only credible data will be reviewed in order to determine the EWQ on a pollutant-by-pollutant basis for each POC. Data generators should make every effort to use the most sensitive, practical analytical methods available. The use of less sensitive analytical methods may cause rejection of the data set. *The discharger must consider the current EWQ value contained in the administrative record from previous sampling events. Established EWQ for any particular pollutant must be used to judge the impact of all subsequent proposals for discharges involving that pollutant.* EWQ reassessments may be appropriate if the data used in the original determination are shown to be invalid or if the water quality of the segment is believed to be significantly improved over that which existed at the time of the original EWQ determination.~~

~~2. Relationship of Antidegradation to Beneficial Uses and Classifications~~
~~This antidegradation implementation procedure applies to all waters of the state regardless of use designations or water classification. Regardless of the level of review assigned, an antidegradation review must not result in the impairment of an existing or designated beneficial use.~~

V. General Antidegradation and Findings

Commented [RJ68]: See item 19.

For smaller domestic wastewater facilities, those with a design flow of 50,000 gallons per day or less, the Department conducted an analysis of less degrading treatment alternatives than those that meet typical operating **permit** limits. This analysis looked at dozens of smaller wastewater projects, their costs, and treatment capabilities. As a result of this engineering study the Department public-noticed and published a General Antidegradation review that provides less degrading effluent limits along with a list of treatment technologies that when designed properly can meet these limits.

Applicants wishing to pursue the General Antidegradation path are asked to use the forms that are provided by the Department. These forms assist the applicant by directing them to complete the other critical elements of an **Antidegradation** review, namely an evaluation of **no-discharge options** and the information necessary to show that the project is socially and economically important.

The General Antidegradation provides applicants a quicker review path, more certainty, and the opportunity to direct funds that may have been spent on independent alternative analyses to capital improvements capable of clearly superior effluent quality.

From time to time, the Department may identify other common elements of review and publish findings that may save applicants and staff review time. Any such approach must be put on public notice and all comments must be addressed prior to use.

~~3. Determining Event-Specific and Cumulative Degradation~~

Commented [RJ69]: See items 5 & 8.

~~Degradation of a water's assimilative capacity may be allowed if it is considered minimal degradation or if it is justified in accordance with an antidegradation review performed in accordance with this document. The assimilative capacity represents the amount of contamination load that can be discharged to a specific water body without exceeding the WQS applicable to the POC. Degradation is considered minimal if the new or proposed loading (i.e., event-specific) is less than 10 percent of the facility assimilative capacity (FAC) and the cumulative degradation is less than 10 percent of the segment assimilative capacity (SAC).~~

~~The FAC for a new or expanded facility may be calculated as follows:~~

~~FAC = [(WQC·(Qs+Qd)) – (Cs·Qs)] · CF~~
~~Where:~~

~~WQC = water quality criterion (represented as a concentration, e.g., mg/L)~~

~~Qs = stream flow (7Q10 or other representative flow) in cubic feet per second (cfs)~~
~~Qd = average daily design flow of discharge in cfs~~
~~Cs = pollutant concentration in stream immediately below the point where the facility's effluent enters the segment~~
~~CF = conversion factor to convert a pollutant mass loading into the desired units. For example, a CF of 5.4 to derive a load in "lbs/day" is appropriate when the WQC is represented in mg/L and flow is represented in cfs [(mg/L) (cfs) 5.4) = (lbs/day)].~~

~~If the net increase in loading from the new or expanded facility is 10 percent or more of the FAC, then a Tier 2 review is required.~~

~~The SAC is calculated similar to the FAC but~~
- ~~Cs is established for the entire segment, and~~
- ~~The applicable flow is equal to the flow at the most downstream extent of the water segment (i.e., sum of the stream critical flow and all upstream discharge flows).~~

~~If the cumulative net increase in loadings for a water segment is 10 percent or more of the SAC, then a Tier 2 review is required. The cumulative loading used for comparison to the SAC is limited to loadings attributed to new or expanded discharges since establishment of EWQ. The FAC and SAC should always be calculated at appropriate critical flow conditions (e.g., 7Q10).~~

~~Methods for calculating FAC, SAC, and minimal degradation for various scenarios are available in Appendix 3 of this document. The example calculations are based on conservative pollutants. Consideration for assimilation of the pollutant within the water body should be given when calculating minimal degradation for non- conservative pollutants.~~

VI. Temporary Degradation

~~4. Temporary Degradation~~

Activities resulting only in **temporary degradation** will be given a **Tier 1 review**. Although it may vary with circumstance, **temporary degradation** may be allowed for a period of less than two year's duration. The D~~d~~epartment will determine if **degradation** from a discharge qualifies as temporary following a review of information provided by the applicant. The information provided by the applicant must include a) length of time during which water quality will be lowered, b) percent change in ambient conditions, c) parameters affected, d) likelihood for long-term water quality benefits to the **segment** (e.g., as may result from dredging of contaminated sediments), e) degree to which achieving the applicable **WQS** during the proposed activity may be at risk, and f) potential for any residual long-term influences on ~~existing~~ **beneficial uses**.

Commented [RJ70]: See item 20.

Commented [RJ71]: See glossary definition of "Beneficial uses."

Regulated discharges that may temporarily degrade waters protected at the Tier 3 level must comply with the **Antidegradation** requirements applicable to that review level (i.e., provide proof that the **degradation** is only temporary) before a **permit** will be granted. *Any discharge to an **ONRW** or **OSRW** will require a site-specific **permit** or individual §401 certification to ensure that impacts will be temporary and that the public can participate in the decision.*

~~B. Review for Alternatives to Degradation~~

~~An applicant proposing any new or expanded discharge that would significantly degrade water quality is required to prepare an evaluation of alternatives to the proposed discharge. The purpose of this evaluation is to determine whether or not the proposed discharge is "necessary," that is, no reasonable alternative(s) exist to prevent~~

~~significant degradation. These alternatives are compared (in terms of practicability, economic efficiency and affordability) to the controls required to protect existing uses and to achieve the highest statutory and regulatory requirements (i.e., the more stringent between the water quality-based effluent limits to protect an existing use and the applicable technology-based effluent limits).~~

~~1. Identifying Non-Degrading and Less-Degrading Pollution Control Measures~~

~~For any proposed discharge, there may be a number of pollution control measures that prevent or minimize water quality degradation. For discharges likely to cause significant degradation, applicants must provide an analysis of non-degrading and less-degrading alternatives to the minimum level pollution control. The minimum level of pollution control is the controls required to protect existing uses and to achieve the highest statutory and regulatory requirements, i.e., the more stringent of water quality-based effluent limits for existing use protection or technology-based effluent limits.~~

~~The applicant should evaluate a range of non-degrading or less-degrading pollution control alternatives with the intent of identifying reliable, demonstrated processes or practices that can be reasonably expected to achieve greater pollution reduction. The following alternatives are examples that may be considered depending upon applicability:~~

- ~~Land application~~
- ~~Subsurface irrigation~~

- ~~Recycling or reuse (i.e., closed loop system)~~
- ~~Discharge to a regional wastewater collection and treatment system~~
- ~~Improved operation and maintenance of existing treatment system~~
- ~~Alternative discharge locations~~
- ~~Installation of biological/physical/chemical treatment processes that provide higher levels of treatment~~
- ~~Seasonal or controlled discharges to avoid critical water quality periods~~

~~If experimental or unproven methods are proposed, the department may request information on previous applications of the method, effectiveness, transferability (if applicable), costs and other information as appropriate. Applications containing proposals for new or experimental methods will be required to append information regarding likely performance results. Such applications may be approved at the discretion of the department with the condition that if the proposed technology does not meet project pollutant control targets, the applicant must adopt conventional or other pollution control measures that meet state antidegradation requirements. The department may require that the applicant analyze additional alternatives if an appropriate range of alternatives were not evaluated. The department staff and the applicant should meet to discuss these and other issues early in the process. The~~

~~applicant should also document any alternatives that were determined to be unreasonable and provide a basis for the conclusion.~~

~~2. Evaluating and Selecting Alternatives~~

~~Following the evaluation of possible alternatives, the applicant must provide a basis for selecting the most reasonable alternative. A reasonable alternative is one that is practicable, economically efficient, and affordable.~~

~~b) Practicability~~

~~The practicability of alternatives is considered by evaluating the effectiveness, reliability, and potential impacts on the overall natural environment (i.e., land, air, and water) resulting from implementation of the alternatives. Non- degrading and less-degrading alternatives shall be considered effective unless an evaluation to the contrary is provided. The following are examples of the factors that may be evaluated during this process:~~

~~1) Effectiveness and Reliability~~
~~• Certainty of achieving technology-based requirements and water quality criteria to protect existing uses~~
~~• Technical feasibility of alternatives (e.g., no-discharge of large discharges within dense urban areas)~~
~~• System or technology reliability, potential for upsets/accidents~~
~~• Nature of pollutants discharged~~
~~• Discharge timing and duration~~
~~• Need for low-flow augmentation~~

- ~~Dilution ratio for pollutants discharged~~

~~2)~~ ~~Environmental Factors~~

- ~~Sensitivity of stream uses~~
- ~~Sensitivity of groundwater uses in the area~~
- ~~Effect on endangered species~~
- ~~Potential to generate secondary water quality impacts (storm water, hydrology)~~

~~Review of these factors might be on a qualitative or quantitative basis, as appropriate. Other secondary environmental impacts should also be considered, such as the potential impact of alternatives on odor, noise, energy consumption, air emissions, and solid waste generation. Other practicability factors that should be considered during the review include the technical, legal, and local considerations of the various alternatives examined. The schedule and the estimated time of completion of the project should also be provided for each alternative discussed.~~

~~e)~~ ~~Economic Efficiency~~

~~Alternatives that are deemed practicable must undergo a direct cost comparison. An analysis of pollution control costs, or economic efficiency, is appropriate when the applicant desires to optimize the balance between water quality benefits and project costs. General cost categories that should be considered include:~~

- ~~Capital costs~~
- ~~Annual operating costs (including cost escalation)~~
- ~~Other costs (one-time costs, savings, opportunity cost, salvage value)~~

~~Opportunity costs may be considered in the estimate of overall cost, as appropriate. For example, lost opportunity costs for lots in a proposed subdivision that would be used for land application rather than housing, or losses related to process changes that results in missed production runs are legitimate and should be documented.~~

~~In order to develop a standardized framework for projecting, evaluating, and comparing costs associated with various pollution control alternatives, applicants should use a present worth framework for reporting cost information. However, applicants may propose alternate economic demonstrations if appropriate. Alternative direct cost comparisons may be presented if the present worth calculation is complicated by the amount of difference in the effective design lives of the alternatives examined. The following calculation may be used to determine present worth:~~

~~$P = C + O + [A \cdot (P/A, d, n)] - S$~~

~~Where:~~

~~P = Present worth~~
~~C = Capital cost~~
~~O = Other costs (expressed as present worth)~~
~~A = Average annual operating cost (alternatively a gradient factor may be applied to account for cost escalation)~~
~~d = Discount rate~~
~~n = Useful life~~
~~S = Salvage value of facilities and land (expressed as net worth)~~
~~(P/A, d, n) = Equal series present worth factor = $[(1 + d)^n - 1] / [1 + d)^n]$~~
~~The alternative that is most economically efficient is then compared to the base cost of pollution control. The base cost of pollution control is the cost of the controls required to protect existing uses and to achieve the highest statutory and regulatory requirements, i.e., the more stringent of water quality- based effluent limits for existing use protection or technology-based effluent limits.~~

~~As a *non-binding rule-of-thumb*, alternatives less than 120 percent of the base cost of pollution control measures are economically efficient. In general, this amount represents the point beyond which increasing costs yield less proportional increases in water quality. Unless evidence exists to the contrary, alternatives greater than 120 percent of the base costs are generally considered to not be economically efficient. Conditions that might warrant consideration of alternatives of greater cost (above 120 percent) are the practicability factors identified under Section II.B.2.a of this document.~~

~~Applicants performing the direct cost comparison approach should evaluate the economic efficiency of the treatment options for each of the primary POCs related to the proposed discharge. For example, the primary POCs for domestic wastewater discharges include biochemical oxygen demand (influencing in-stream dissolved oxygen concentration), ammonia, bacteria, and potentially other pollutants for which a wasteload allocation can be reasonably determined. An applicant may need to evaluate the costs associated with one POC if additional treatment process alternatives do not effect treatment for other POCs. This quantitative water quality analysis is not needed when the receiving water quality is not a significant factor for a specific alternative (e.g., in-stream dissolved oxygen concentrations in relation to a no-discharge alternative). Since all alternatives analyses use qualitative and quantitative assessments of water quality benefits and treatment costs and feasibility, best professional judgment is of the utmost importance when evaluating alternatives.~~

~~d) Affordability~~

~~Following an analysis of economic efficiency, the affordability of the most practicable and efficient alternative may be assessed at the applicant's discretion. This assessment may be used to determine if the alternative is too expensive to reasonably implement. This approach results in the selection of the most practicable and efficient alternative, while maintaining affordability to the public or private entity.~~ ~~*Alternatives identified as most practicable and economically efficient 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. Therefore, the applicant may select the most appropriate analysis of affordability for the specific scenario. The U.S. Environmental Protection Agency's water quality standards handbook – "*Interim Economic Guidance for Water Quality Standards*," EPA-823-B-95-002 (1995) presents one set of public and private sector approaches which consider the absolute value of the alternative rather than through cost comparisons. This interim guidance is in no way binding and may be replaced or supplemented with other methods of analysis.~~

~~The applicant's analysis of affordability may also include a consideration of whether or not the alternative is equitable. For example, a project that will significantly impact the low-income members of the community may not be equitable, as opposed to the evaluation of impacts to median income households used in the EPA approach. Thresholds for equity may differ from community to community, therefore, an understanding of the social needs and conditions of the community are necessary to determine if an alternative is socially equitable. Additionally, the review should consider the overall needs in the community. For instance, the analysis of affordability may consider funds that are available to the community to pay for pollution control but that are already targeted for education, health care, and other needs of high priority in the affected community. Such analyses must consider the ability of the community to obtain additional funding for expanding treatment in a manner equivalent to that presented in EPA guidance.~~

~~If the applicant determines that the most efficient alternative is affordable, then it is the preferred alternative. If the most efficient alternative is not affordable, then the affordability of the next most efficient alternative should be evaluated until an alternative is chosen that is practical, economically efficient and affordable.~~

~~Following the analysis of pollution control alternatives, the alternative that is the most practicable, economically efficient, and affordable should be considered the preferred pollution control alternative. If this alternative results in greater than minimal degradation, the applicant must then document the social and economic importance (SEI) of the discharge according to the guidelines in Section II.E. of this document.~~

~~C. Review for Conformance to Technology-Based Requirements~~

~~Prior to authorizing any proposed activity that would degrade a water, the department shall assure compliance with the state-required controls and federal effluent limitation guidelines on all point sources discharging to the water segment receiving the new or expanding discharge. Compliance shall be considered assured if all permits are in effect and the discharges from permitted facilities are not in significant noncompliance and/or are implementing all required best management practices (BMPs). Appropriate enforcement action and/or compliance schedules on facilities that are out of compliance will satisfy the assurance requirement.~~

VII. Nonpoint Pollution Sources

~~D. Review for Implementation of Controls for Nonpoint Pollution Sources~~

In March 1994, EPA transmitted guidance regarding nonpoint sources of pollution ~~(NPS)~~ and the **A~~a~~ntidegradation** provisions of the ~~**Water Quality Standards (**~~**WQS**~~)~~, with clarifying remarks for **A~~a~~ntidegradation** implementation. EPA's regulatory interpretation of 40 CFR Section 131.12(a)(2) is that federal **A~~a~~ntidegradation** policy does not require the D~~d~~epartment to establish ~~best management practices (~~BMPs~~)~~ for nonpoint source pollution control where regulatory programs requiring BMPs do not exist. The **Clean Water Act** leaves it to the states to determine what, if any, controls on nonpoint sources

are needed to provide for attainment of state **WQS**. States may adopt regulatory or voluntary programs to address nonpoint sources of pollution. Federal rules at 40 CFR Section 131.12(a)(2) do not require that states adopt or implement ~~best management practices~~ BMPs for nonpoint sources prior to allowing point source **degradation** of a water. However, where a state has adopted a regulatory program for nonpoint source pollution control, the state must assure that such controls are properly implemented before authorization is granted to allow **degradation** of water quality. EPA also interprets 40 CFR Section 131.12(a) to mean that **degradation** is unnecessary for accommodating important social and economic development if the **degradation** could be partially or completely prevented through implementation of existing state-required BMPs.

The State of Missouri documents its program for nonpoint source pollution control in its **Continuing Planning Process**. This document explains how the program functions - that is, how it is funded, how funds are allocated to specific projects and how the program oversees the project completion. This document is updated regularly to keep the program priority-based, cost-effective and open to the public.

Nonpoint source discharges are not exempt from **A~~a~~ntidegradation** requirements because nonpoint sources affect **EWQ**. The D~~d~~epartment will take aggressive action to prevent water quality~~significant~~ **degradation** from nonpoint pollution sources and to restore waters that are impaired by nonpoint sources. However, nonpoint source discharges of **pollutants** are not currently regulated, and there are no regulatory control documents that are subject to an **Antidegradation** review. Consequently, activities resulting in a new or expanded amounts of **pollutants** entering waters from nonpoint sources are not subject to an **Antidegradation** review prior to these activities commencing.

Commented [RJ72]: See item 18.

~~However, nonpoint source discharges of pollutants are not currently regulated, and there are no regulatory control documents that are subject to an antidegradation review. Consequently, activities resulting in a new or expanded amounts of pollutants entering waters from nonpoint sources are not subject to an antidegradation review prior to these activities commencing.~~

~~E. Determining Social and Economic Importance of the Preferred Alternative~~

~~1. Steps in Determining Social and Economic Importance (SEI)~~

~~If the preferred alternative identified in Section II.B. of this document will result in significant degradation to the receiving waters, then the applicant must demonstrate that the preferred alternative (or "project") will allow important economic and social development. SEI is defined as the social and economic benefits to the community that will occur from any activity involving a new or expanded discharge. The applicant should use the following three steps to demonstrate the SEI:~~

- ~~Identify the affected community~~
- ~~Identify relevant factors that characterize the social and economic conditions of the affected community~~
- ~~Describe the important social and economic development associated with the project~~

~~The affected community is defined in 10 CSR 20-7.031(3)(B) as the community "in the geographical area in which the waters are located." The affected community~~

~~should include those living near the site of the proposed project as well as those in the community that are expected to directly or indirectly benefit from the project.~~

~~In order to describe the economic and 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:~~

- ~~Measures of employment or income~~
- ~~Increasing production~~
- ~~Increasing or improving housing~~
- ~~Increasing the community tax base~~
- ~~Providing necessary public services (e.g., fire department, school, infrastructure)~~
- ~~Correcting a public health, safety or environmental problem~~

~~The social and economic measures identified above do not constitute a comprehensive list. 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.~~

~~Following the identification of appropriate social and economic measures, the applicant must describe the expected change in these factors that is associated with the project. The purpose of this step is to demonstrate whether or not important social and economic development will result from the project. The applicant should first describe the existing condition of the affected community. This base condition should then be compared to the predicted change (benefit) in social and economic condition after the discharge is allowed. The area's use or dependence upon the water resource affected by the proposed discharge should also be described in the analysis. In doing so, the applicant may evaluate any associated environmental related benefits or costs, such as:~~

- ~~Promoting/impacting fishing, recreation and tourism industries~~
- ~~Reserving assimilative capacity for future industry and development~~

~~Upon the consideration of all relevant factors, the project constitutes important social and economic development if the applicant demonstrates that the project will lead to beneficial changes in the factors presented (i.e., increased jobs, employment, housing or other appropriate factors). This determination will be made on a case- by-case basis using information provided with the application.~~

~~2. Preliminary Determination of Social and Economic Importance~~

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

~~submit additional information to support a preliminary determination. Once the department has reviewed the final information pertaining to the SEI of the proposed activity, the department shall make a preliminary determination regarding how the SEI was considered in light of the changes to water quality. If the applicant has demonstrated that the proposed activity is important and if the highest applicable and established statutory and regulatory requirements are achieved, the department will prepare draft determination for public review under Section II.F of this document. This preliminary determination also becomes part of the Administrative Record of Decisions described in Section VI of this document.~~

~~If the department determines, after appropriate discussions with the discharger, that either the SEI of the proposed project has not been demonstrated or that alternatives to the proposed discharge have not been appropriately considered, the department shall post its antidegradation review findings and the preliminary decision to deny the proposed activity. This preliminary determination also becomes part of the Administrative Record of Decisions.~~

~~F. Public and Interagency Participation in Antidegradation Reviews~~

~~Public participation is a component of the antidegradation review process. Public notice of antidegradation review findings, solicitations of public comment and maintenance of antidegradation review documents as part of the public record help ensure that interested parties can be engaged and involved throughout the review process. In addition, intergovernmental coordination and review is required prior to any action that allows degradation of water quality in a surface water afforded a Tier 2 review.~~

~~This section outlines the public participation *and* the intergovernmental coordination and review requirements. The processes for both must follow existing state rules regarding public notice, response to comments and maintenance of records.~~
~~Antidegradation reviews for permitted facilities will employ the public participation procedures that are available through the permitting process (e.g., draft permits, Fact Sheets, Water Quality Review Sheets, opportunities to comment, etc.). The Fact Sheet on a permitted action will include a discussion on the antidegradation review.~~

~~1. Public Notification Requirements~~

~~The department will provide public notice and opportunity for public comment on all antidegradation reviews. The department will combine these public participation opportunities with other procedures, such as the public notices related to permitting processes or intergovernmental coordination and review procedures.~~

~~Discharges that may result in degradation of waters can only be approved after the department allows for public comment on whether degradation should be allowed (under the general public hearing procedures prescribed at 10 CSR 20-6.010) and the department makes all of the following findings:~~

- ~~The level of water quality necessary to protect applicable beneficial uses is fully maintained. Water quality shall not be degraded to a level that does not comply with the applicable Water Quality Standards (WQS).~~
- ~~The highest statutory and regulatory requirements for new and existing point sources are achieved.~~
- ~~All cost-effective and reasonable BMPs for nonpoint source pollution control are implemented.~~
- ~~Allowing degradation of water quality is necessary and accommodates important economic or social development in the area where the surface water is located.~~

~~After an antidegradation review has been conducted for a discharge that may result in significant degradation, the public notice will include a notice of availability of~~

- ~~the decision as to whether or not the proposed discharge meets antidegradation requirements;~~
- ~~determination of projected impacts on existing water quality (EWQ);~~
- ~~findings and determinations from the alternatives analysis, when required;~~
- ~~the conclusions of any social and economic evaluation of the proposed activity, where necessary; and~~
- ~~a description of the surface water that is subject to the antidegradation review.~~

~~Unless public participation on the antidegradation review is incorporated into a permitting process, a public notice will be provided through the appropriate legal advertisement in a qualified newspaper with the largest circulation for the county where the discharge will occur. The notice will identify the action being considered, list all beneficial uses identified of the surface water and call for comments from the public regarding the proposed discharge.~~

~~All antidegradation review findings shall be documented by the department and made part of the Administrative Record of Decisions. *Review documents, including EWQ assessments, determination on significance of degradation, alternatives analyses, demonstration of social and economic importance and any other decisions or findings, will be made available to the public.*~~

~~2. Opportunities for Public Participation~~

~~Public participation in Missouri's water quality antidegradation program is both broad and specific. Opportunities for broad participation include involvement in the department's triennial review of the WQS (i.e., use designations, water quality criteria determinations, antidegradation review requirements) and participation in rule development relative to permitting processes. In addition, any interested party may nominate a water body for review at the Tier 3 level by following the procedure for consideration outlined under Section I.C of this document. Finally,~~

~~interested groups can conduct volunteer monitoring to support EWQ determinations.~~

~~Wherever possible, the department will seek to integrate public participation regarding antidegradation reviews with existing public participation procedures (e.g., permitting procedures). Public notice, opportunity for public comment and opportunity for a public hearing will be provided for all activities approved after a Tier 1, 2 or 3 antidegradation review, as noted above. Public hearings and the collection of public comments on antidegradation reviews related to permit actions will be integrated into the existing hearing and comment provisions of permit processes.~~

~~When antidegradation reviews and notices of findings related to such reviews are incorporated into the permit process, any required notice of the permit hearing or solicitation of comments shall note that elements of the antidegradation review (e.g., decisions, analyses, studies, water quality impacts) are also under consideration. Public participation processes that may include opportunities for antidegradation review and public involvement include –~~

- ~~The permit issuance process for individual or general permit templates, which must abide by the requirements of 10 CSR 20-6.~~
- ~~Permitting, planning or funding actions, which require public notices, comment opportunities and meetings as part of the application process and planning requirements.~~
- ~~Individual Clean Water Act §401 water quality certifications, which specify public participation requirements executed by the department.~~
- ~~Provisions for public participation in antidegradation reviews and related matters as outlined in the department's Continuing Planning Process.~~
- ~~Rulemaking involving revisions to the WQS related to antidegradation.~~

~~3. Intergovernmental Coordination and Review~~

~~Intergovernmental coordination is required prior to approving a discharge that would degrade a surface water protected at the Tier 2 level. This requirement seeks to ensure that all relevant public entities at the local, state and federal levels are aware of any proposal to degrade water quality and are provided with an opportunity to review, seek additional information and comment on the proposal. The intergovernmental coordination and review process occurs prior to the issuance of any final determination on the social and economic importance of the proposed discharge and may occur in tandem with public notice procedures outlined in the previous section. The time period afforded to commenting agencies will be consistent with the requirements for submission of public comments.~~

~~Element 5 of the Continuing Planning Process (CPP) also outlines the intergovernmental coordination process on activities involving the protection of~~

~~water quality. Element 5 may be reviewed by contacting the department and requesting a copy of the CPP document or accessing the department's Web site.~~

~~Agencies will have access to summary information on the proposed activity, the receiving water segment, the EWQ of the receiving water segment, the POCs, the tier designation, estimated amount of degradation to the receiving waters, the treatment alternatives reviewed and the social and economic importance of the proposed activity.~~

~~Once the intergovernmental coordination and public notice requirements outlined above are satisfied, the department shall make a final determination concerning the proposed activity. All determinations, including determinations to prohibit the activity, shall be documented and made a part of the Administrative Record of Decisions.~~

VIII. Appeals of Antidegradation Review Decisions

~~4. Appeals of Antidegradation Review Decisions~~

If a preliminary decision on **A~~a~~ntidegradation** is made in advance of a permitting decision, the discharger may appeal the preliminary decision to the D~~d~~epartment director, or authorized delegate, within 30 days of when the preliminary decision is announced. After any modifications are made consistent with the D~~d~~epartment director's recommendations, the review shall be public noticed pursuant to the permitting procedures within 10 CSR 20-6.020. The D~~d~~epartment's final decision on a **permit** may be appealed pursuant to §§621.250 and 644.051 RSMo (i.e., of the Missouri state statutes) and 10 CSR 20-6.020 ~~(i.e., of the Missouri Code of State Regulations)~~.

IX. Confidentiality

~~5. Confidentiality~~

To the extent Missouri's statutes allow, any information submitted pursuant to the *Missouri Antidegradation Implementation Procedure* or other rules of the **Clean Water Commission** that contains confidential business information shall be kept confidential by the commission and employees and agents of the D~~d~~epartment if a timely request for confidentiality is made by the person submitting the information. Confidential business information includes secret processes, secret methods of manufacturing or production, trade secrets, sensitive financial information and other information possessed by a business, that under existing legal concepts, the business has a right to preserve as confidential, and to limit its use by not disclosing it to others.

~~III.~~X. Permit Considerations

~~The department will not require an antidegradation review for any proposed new or expanded discharge for which an entity submits an application for a construction or an operating permit prior to August 30, 2008, the original effective date of these procedures.~~

~~Antidegradation reviews will be initiated by requests for water quality-based effluent permit effluent limits for the individual permits. The department will assess existing water~~

~~quality (EWQ) for the purpose of assisting in the development of permit effluent limits. In developing those limits, the department will use both internal and applicant-supplied data and evaluations, identify existing and beneficial uses of the receiving water and analyze the impacts of the discharge, as well as cumulative discharges, that might affect the assimilative capacity of the receiving surface water for relevant pollutants of concern (POCs).~~

~~Because the permit effluent limits have a significant impact on the treatment processes, technologies and procedures used by the applicant, it is important that the department be notified early as to the nature of the discharge, discharge location and effluent characteristics. Developing permit effluent limits requires collection of a considerable amount of information on the receiving water, the applicant's discharge and other activities in the drainage area. Early notification will ensure that the information collection process begins well before the applicant needs a permit to conduct planning activities, design facilities or proceed with project construction. In cases where the applicant intends to collect water quality data in preparation for an antidegradation review, the department recommends that the applicant meet with the department in a pre-application conference at least one year prior to the expected date of permit issuance. Applicants seeking funding through state-managed grants or loans should consider visiting with the state at least two years in advance of permit issuance.~~

~~Much of the antidegradation review for a point source discharge regulated by a permit will occur during the permitting process. Proposed new or expanded discharges that may significantly degrade waters protected at the Tier 2 level must undergo a comprehensive antidegradation review to determine whether less-degrading or non-degrading alternatives exist and whether significant degradation is necessary to allow important social and economic development in the area of the point source discharge.~~

~~Early notification and consultation between the applicant and the department will help ensure that the permitting process proceeds efficiently. The following steps outline the general procedure for processing a permit:~~

- ~~Applicant notifies the department of intent to apply for permit coverage;~~
- ~~The department determines eligibility for general permit or site-specific permit coverage, and if not a general permit;~~
- ~~Applicant and/or the department collects EWQ information for applicable POCs;~~
- ~~The department develops draft permit effluent limits based on effluent guidelines, the applicable Water Quality Standards (WQS), EWQ and antidegradation requirements;~~
- ~~Applicant applies for permit after consultation with the department;~~
- ~~The department develops final permit effluent limits for POCs; and~~
- ~~The department issues permit to applicant after the antidegradation review.~~

~~Regulated discharges that may temporarily degrade waters protected at the Tier 3 level must comply with the antidegradation requirements applicable to that review level (i.e.,~~

~~provide proof that the degradation is only temporary) before a permit will be granted. *Any discharge to an Outstanding National Resource Water or Outstanding State Resource Water will require a site-specific permit or individual §401 certification to ensure that impacts will be temporary and that the public can participate in the decision.*~~

A. General Permits

T~~In order t~~o implement the procedure for **Aa**ntidegradation without causing major disruption to workflow and permit timeliness, an **Aa**ntidegradation review will not be required for discharges covered under Missouri's general permits until the general permit templates are reissued to incorporate the procedure. General permits will be addressed as they expire ~~after the effective date of the *Missouri Antidegradation Implementation Procedure*. (The scheduled expiration dates of general permits issued by the department can be found on the department's Web page.)~~

Incorporating the **Aa**ntidegradation requirements in this manner will provide an opportunity to review **less-degrading alternatives** every five years.~~incrementally address all general permits within five years from the effective date of this document. Incrementally addressing the renewals avoids an excessive workload both on the public (during the required public participation on the permit renewal process) and on the department (when evaluating the various discharge alternatives and the overall social and economic importance (SEI) of the discharges authorized by each general permit).~~

B. Site-Specific Permits

The effluent limits established in each site-specific operating **permit** shall be consistent with the assumptions and requirements of the **Antidegradation** review and specifically the effluent limits established according to Section II.G.

~~Following the effective date of this document, all applications for new or expanded site-specific permits, except for permits issued on non-discharging facilities, shall undergo an antidegradation review if significant degradation is likely in the receiving water or downstream waters. In these cases, site-specific permit effluent limits will be based upon applicable effluent guidelines, the characteristics of the discharge, cumulative effects and the alternatives analysis. In addition, the permit effluent limits must ensure that beneficial uses are maintained and protected in the receiving waters and downstream waters.~~

Applicants seeking site-specific **permit** coverage may be required to provide or collect **EWQ** information on any **POCs** reasonably expected to be in the discharge, if that information is not already available. Data collection requirements may depend on the nature of the proposed discharge and the **pollutants** reasonably expected in the discharge.

To address pollution related to stormwater runoff, facilities are typically required to develop a Stormwater Pollution Prevention Plan (SWPPP) as a condition of their operating **permit**. A SWPPP is a site-specific, written document that identifies all of the activities and conditions at the site that could case pollution via stormwater runoff, and a set of BMPs that will mitigate this pollution. Because the development of a SWPPP involves the consideration and selection of BMPs, **Antidegradation** requirements will be deemed to be met if the facility develops a SWPPP and implements all appropriate and reasonable stormwater BMPs.

Commented [RJ73]: See item 3.

C. §401 Certifications

Section 404 of the **Clean Water Act** regulates the placement of dredged or fill material into the "waters of the United States," including small streams and wetlands adjacent or connected to "waters of the United States." The U.S. Army Corps of Engineers (COE) administers the §404 permit program dealing with these activities (e.g., wetland fills, in-stream sand/gravel work, etc.) in cooperation with the EPA and in consultation with other public agencies.

T~~In order t~~o ensure that A~~a~~**ntidegradation** and other water quality protection requirements are considered, reviewed, and met in a comprehensive and efficient manner, these requirements will be addressed and implemented through the permitting and §401 water quality certification processes. Under this approach, applicants who fulfill the terms and conditions of applicable §404 **permits**, and the terms and conditions of the D~~d~~epartment's corresponding §401 water quality certification, will have fulfilled the A~~a~~**ntidegradation** requirements. **Antidegradation** considerations will be incorporated into
§404 **permits** and the corresponding §401 certifications at the time of **permit** issuance.

For minor activities covered under §404 general permits (e.g., road culvert installation, utility line activities, bank stabilization, etc.), A~~a~~**ntidegradation** requirements will be deemed to be met if all appropriate and reasonable BMPs related to erosion and sediment control, project stabilization and prevention of water quality degradation (e.g., preserving vegetation, stream bank stability and basic drainage) are applied and maintained. Applicants desiring to fulfill A~~a~~**ntidegradation** review requirements under this approach will be responsible for ensuring that **permit** requirements and relevant water quality certification conditions are met.

Missouri manages its §401 water quality certification program to ensure that the placement of dredged or fill material into surface waters do not create any unmitigated water quality impairments or significant degradation of surface waters. Under the BMP-based approach adopted by Missouri, regulated activities for which mitigation has been certified by the state pursuant to §401 of the **Clean Water Act** will not be required to undergo a separate **Tier 2 review** in accordance with this document.

The decision making process for §404 individual **permits** is contained in the §404(b)(1) guidelines (40 CFR Part 230) and contains all of the required elements for a **Tier 1** and **Tier 2 review**. Prior to issuing a **permit** under the §404(b)(1) guidelines, the COE must:

1) make a determination that the proposed discharges are unavoidable (i.e., necessary);
2) examine alternatives to the proposed activity and authorize only the least damaging practicable alternative; and
~~2) 3)~~ require mitigation for all impacts associated with the activity. A §404(b)(1) findings document is produced as a result of this procedure and is the basis for the permit decision. Public participation is also provided for in this process. Because the §404(b)(1) guidelines meet the requirements of a **Tier 1** and **Tier 2 review**, the D~~d~~epartment will not conduct a separate review for the proposed activity. **Tier 1** and **Tier 2 review** will be met through §401 certification of individual §404 **permits** and will rely upon the information contained in the §404(b)(1) findings document.
3)

D. Innovative Technology

If innovative treatment methods are proposed, the Department may request information on previous applications of the method, effectiveness, transferability (if applicable), costs and other information as appropriate. Applications containing proposals for new or experimental methods will be required to append information regarding likely performance results. Such applications may be approved at the discretion of the Department with the condition that if the proposed technology does not meet project **pollutant** control targets, the applicant must adopt conventional or other pollution control measures that meet **Antidegradation** requirements. The Department may require that the applicant analyze additional

Commented [RJ74]: See item 16.

alternatives if an appropriate range of alternatives were not evaluated. The Department staff and the applicant should meet to discuss these and other issues early in the process. For innovative processes, The Water Quality / Antidegradation Review may recommend more frequent effluent or internal process monitoring to demonstrate treatment performance. More information on the additional requirements for innovative treatment technologies is available on the Department's Innovative Technology Webpage, 10 CSR 20-6.010(5)(F), and 10 CSR 20-8.110(6).

~~IV. Monitoring an~~XI.d ~~-~~Assessment Considerations

A. Data Collection and Evaluation

Data gathered during the D~~d~~epartment's regular monitoring and assessment efforts shall be evaluated in accordance with the level of tier review designated to the waters. Data gathered on a water being given a **Tier 1 review** shall be assessed for compliance with the narrative and numeric ~~**Water Quality Standards (**~~**WQS**~~)~~ of 10 CSR 20-7.031.

Waters receiving **Tier 3 review** shall be assessed against the ~~existing water quality~~

~~(~~**EWQ**~~)~~ data or other appropriate reference stream data. Waters receiving **Tier 2 review** shall be assessed against **EWQ** data or other appropriate stream data unless **degradation** has been authorized since the **EWQ** data was collected. Assessments on waters that have undergone authorized **degradation** shall be assessed against the level of water quality that was predicted and documented in the **Administrative Record of Decisions** when the **degradation** was authorized. Such assessments shall be made on the same **pollutant-by-pollutant basis**, as authorized by the **A~~a~~ntidegradation** review.

B. Applicability to §305(b) Report and §303(d) List

Section 305(b) of the **Clean Water Act** requires each state to prepare and submit to EPA a biennial report describing water quality of all surface waters in the state. Each state must monitor water quality and review available data to determine if the **WQS** are being met. ~~-~~From this review, waters that do not meet **WQS** are identified. ~~-~~These waters are known as impaired waters. Those impaired waters that are impaired by a discrete **pollutant** or chemical condition, do not yet have sufficient water quality protection measures in place, and do not yet have an approved TMDL are used to form the §303(d) list. Identification of a surface water as impaired may be based on a violation of a numeric or narrative **WQS**.

To coordinate **A~~a~~ntidegradation** reviews with the §305(b) and §303(d) listing process, the D~~d~~epartment will implement the following procedures:

- Tier 1 Protection (applicable to all waters):

  No further **degradation** of **EWQ** for a ~~pollutant of concern (~~**POC**~~)~~ is allowed in a surface water where the **EWQ** for the **POC** does not meet the applicable **WQS**. Impaired waters are identified on Missouri's §303(d) List and targeted for future ~~Total Maximum Daily Load (~~TMDL~~)~~ development.

- Tier 2 Protection:

  ~~If performed properly,~~ **Tier 2 reviews** ~~will~~ shall not result in **degradation** sufficient to cause **beneficial use** impairment. ~~-~~If a §305(b) water quality assessment shows that significant degradation of a surface water is occurring, and that the **WQS** might be violated over time, the D~~d~~epartment may conduct a special study of the extent and source(s) of **degradation** to determine the cause for the trend and identify appropriate **A~~a~~ntidegradation** actions to reverse any preventable trends. The plan may include providing technical and other assistance to address probable sources of **degradation** and implement appropriate management practices. Other possible options include awarding priority points for grant or other funding programs targeted at water quality protection, amending **permits** or water quality certification conditions and working with stakeholders to support actions needed to protect and restore water quality.

- Tier 3 Protection:

No **degradation,** except for **temporary degradation,** is allowed in the unique waters afforded Tier 3 protection. If a §305(b) assessment shows that long-term **degradation** (i.e., not **temporary degradation**) of an ~~Outstanding~~ **ONRW** ~~National Resource Water~~ or **OSRW**~~utstanding State Resource Water~~ is occurring, the D~~d~~epartment may conduct a special study of the extent and source(s) of **degradation** to determine likely trends and explore possible **A**~~a~~**ntidegradation** actions needed to reverse the trend, similar to what was described for ensuring Tier 2 protection.

~~V.~~ XII. Applicability to Total Maximum Daily Loads

The D~~d~~epartment is required to develop ~~Total Maximum Daily Loads (~~TMDLs~~)~~ for the restoration of impaired waters. When developing these TMDLs, the D~~d~~epartment shall allocate pollution loads in accordance with the level of tier review designated to the ~~pollutant of concern (~~**POC**~~)~~. TMDLs developed for Tier 1 protection shall be designed to achieve compliance with the ~~water quality criteria (~~**WQC**~~)~~. TMDLs on waters receiving Tier 3 protection shall be designed to meet the water's ~~existing water quality (~~**EWQ**~~)~~ or other appropriate reference stream quality. ~~TMDLs on **POCs** receiving **Tier 2 review** shall be designed to meet the water's **EWQ** data or other appropriate stream quality unless **degradation** has been authorized since the **EWQ** data were collected.~~ TMDLs on waters that have undergone authorized **degradation** shall be developed for the level of water quality that was predicted and documented in the **Administrative Record of Decisions** when the **degradation** was authorized. Such TMDLs shall be made on the same pollutant-by- pollutant basis, as authorized by the **A**~~a~~**ntidegradation** review.

~~VI.~~ XIII. Administrative Record of Decisions

The D~~d~~epartment shall prepare a record of all information considered and decisions made during **A**~~a~~**ntidegradation** reviews. The purpose of this record is to create a historical reference to the basis for decisions and a complete explanation of the conclusions reached. The following list describes the documents necessary to complete the **Administrative Record of Decisions** on each **A**~~a~~**ntidegradation** review:~~.~~

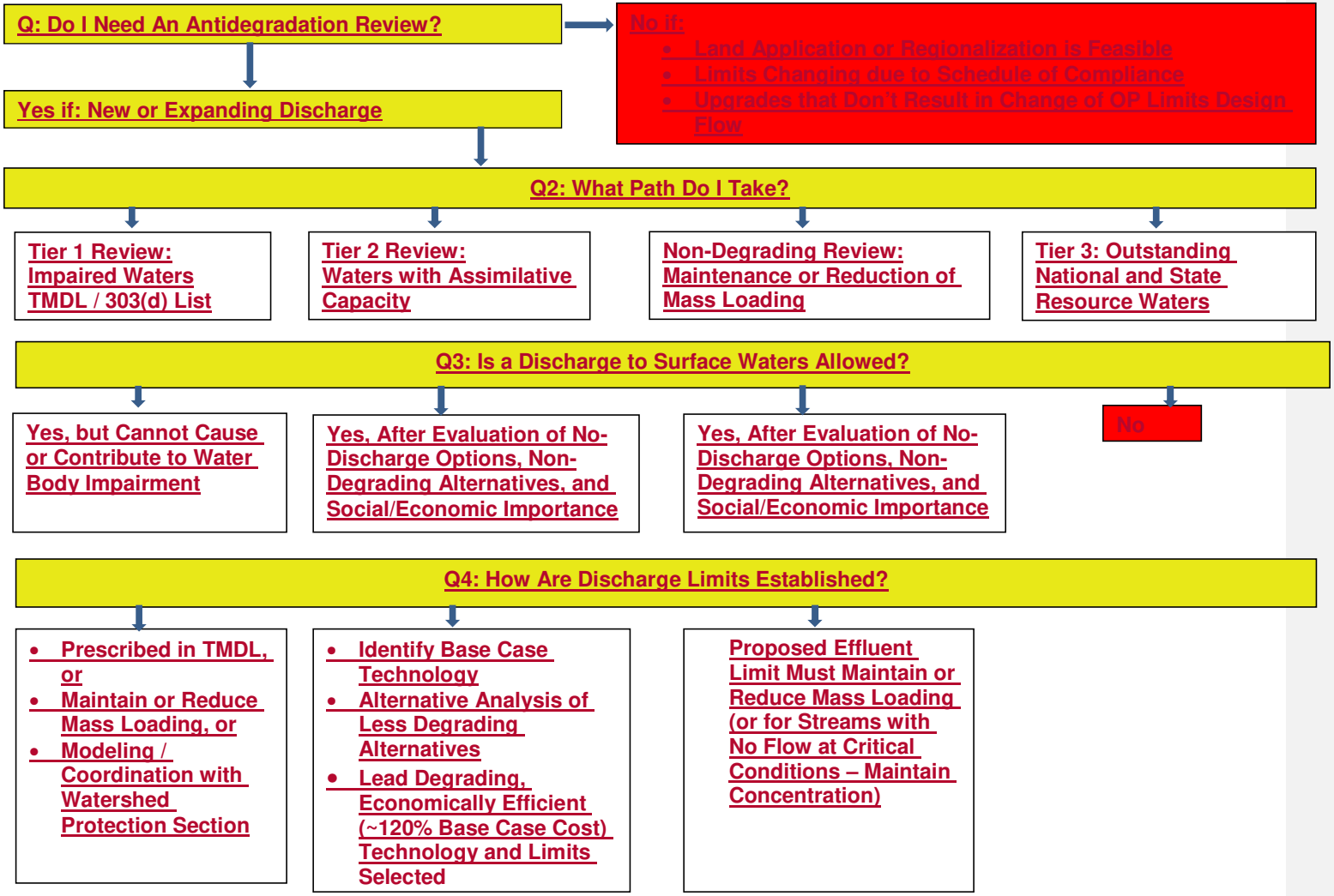
- Final written decision on acceptability of **degradation;**
- **EWQ** data or model on evaluated **segment** (or reference to the data) and the final **EWQ** of the **segment** determined following the last data or model interpretation;
- Calculations for determining a project is non-degrading~~minimal degradation~~, if applicable; and
- Any other worksheets and calculations used during the **A**~~a~~**ntidegradation** review.

Each Water Quality / Antidegradation Review is typically valid for two years, but the Department may allow for longer time frames if the **WQS** have not changed and the costs could be assumed to be nearly equivalent.

Commented [RJ75]: See item 20.

***

APPENDIX 1


Q: Do I Need An Antidegradation Review?
No if:
Land Application or Regionalization is Feasible
Limits Changing due to Schedule of Compliance
Upgrades that Don't Result in Change of OP Limits Design Flow
Yes if: New or Expanding Discharge
Q2: What Path Do I Take?
Tier 1 Review: Impaired Waters TMDL / 303(d) List
Tier 2 Review: Waters with Assimilative Capacity
Non-Degrading Review: Maintenance or Reduction of Mass Loading
Tier 3: Outstanding National and State Resource Waters
Q3: Is a Discharge to Surface Waters Allowed?
Yes, but Cannot Cause or Contribute to Water Body Impairment
Yes, After Evaluation of No-Discharge Options, Non-Degrading Alternatives, and Social/Economic Importance
Yes, After Evaluation of No-Discharge Options, Non-Degrading Alternatives, and Social/Economic Importance
No
Q4: How Are Discharge Limits Established?
Prescribed in TMDL, or
Maintain or Reduce Mass Loading, or
Modeling / Coordination with Watershed Protection Section
Identify Base Case Technology
Alternative Analysis of Less Degrading Alternatives
Lead Degrading, Economically Efficient (~120% Base Case Cost) Technology and Limits Selected
Proposed Effluent Limit Must Maintain or Reduce Mass Loading (or for Streams with No Flow at Critical Conditions – Maintain Concentration)

Appendix 1. Antidegradation Decision Diagram

~~Is the water body listed as an ONRW or OSRW in Tables D and E of the WQS?~~

~~Yes~~

~~Will the activity result in~~

~~No degradation to water quality?~~

~~Proceed with application~~

Provide basis for conclusion

~~No~~

~~Determine existing~~

~~Yes~~

~~Will the degradation of~~

~~No water quality be temporary?~~

~~Deny Activity~~ water quality or assume Tier 2. ~~y~~

~~Yes~~

~~Following a determination of EWQ, does the POC qualify for Tier 2 review?~~

~~Yes~~

~~Is the project expected to result in minimal or temporary degradation?~~

~~Yes~~

~~Proceed with application~~

Provide basis for conclusion

~~No~~

~~Is the proposed discharge necessary based upon alternatives analysis? See Section II.B.~~ ~~No~~

~~No~~

~~Yes~~

~~Does the proposed discharge create an important social and economic benefit? See Section II.E.~~ ~~No~~

Missouri Antidegradation Implementation Procedure

Proceed with Inter-governmental coordination and public participation

~~Deny Activit y~~

~~Ye~~Provide basis for conclusion

~~Proceed with application~~

~~Following a determination of EWQ, does the POC qualify for Tier 1 review?~~

~~Yes~~

~~Will the project protect existing uses and achieve the highest statutory and regulatory requirements?~~

~~Yes~~

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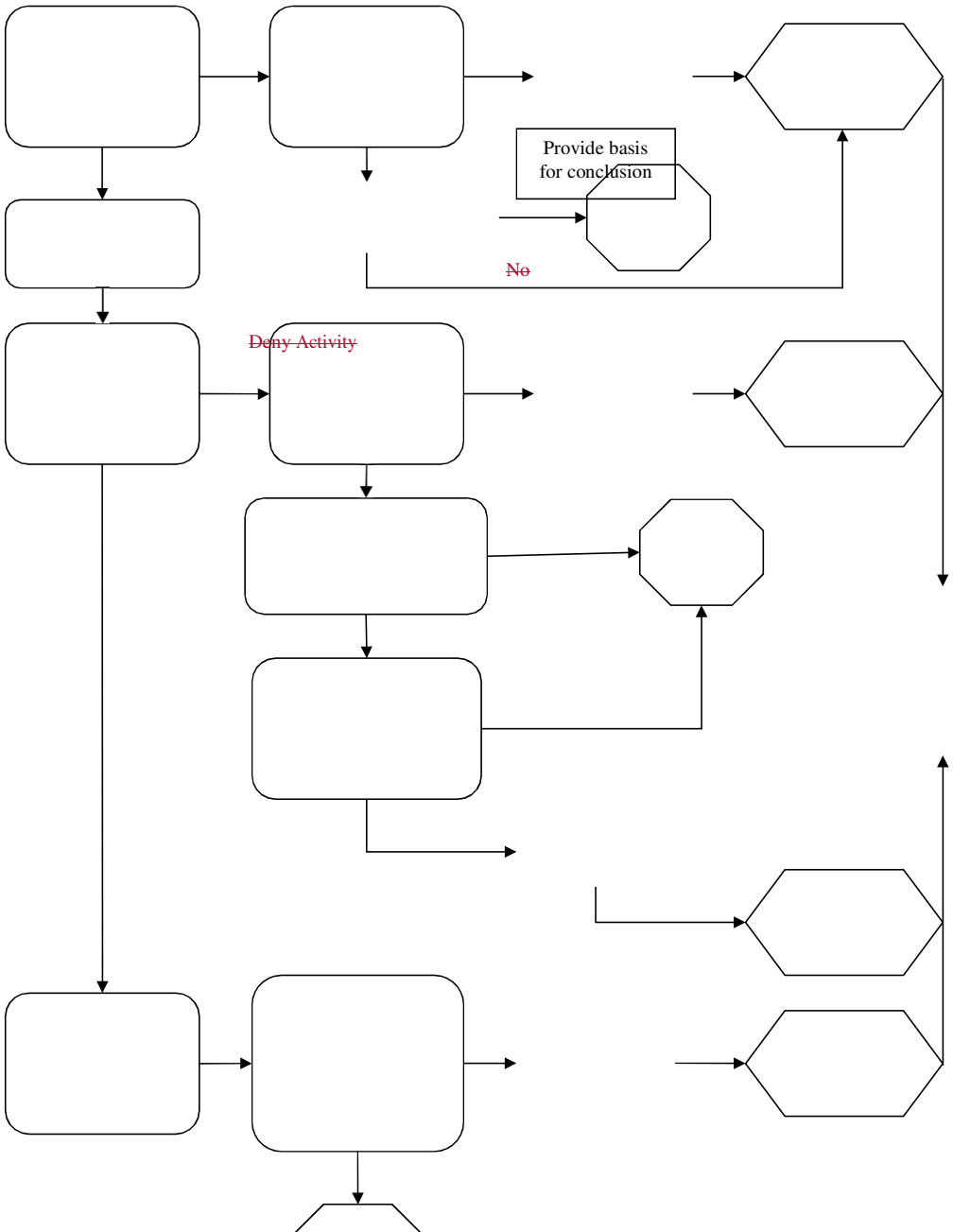
~~Proceed with application~~



APPENDIX 2

Example Statistical Approach for Determining a Water's Eligibility for a Tier 1 Review

The following presents a method for determining whether or not a **pollutant** parameter or **pollutant of concern** (**POC**) is at, near, or violating the water quality standard in the water that would be receiving the discharge. The method below could be used regardless of data set size. This method may also be used in *Microsoft Excel*.

The following is the procedure to determine the 90th percentile of the observed data for a particular **POC**:

Step 1: Rank the list of values (concentrations) into ascending order and assign them values from 1 to N (N = total number of values)

Step 2: Use the following formula to calculate the corresponding ranking (which will be split into integer and decimal components).

$$\mathbf{R = 1 + \frac{P\,(N-1)}{100} = I + D}$$

Where:

R = the rank of the data value (in this example, "3.7") that corresponds to the percentile to be determined
P = the percentile to be determined (in this example, "90", so written, "P90")
N = total number of data values from the receiving water (in this example, 4 values)
I = integer part of the ranking (in this example, "3")
D = decimal part of the ranking (in this example, "0.7")

Step 3: Use the following formula to interpolate between the necessary two values (in this example, "the two necessary values" are those representing the 3rd and 4th ranking):

$$\mathbf{P = Y_i + D\,(Y_{i+1} - Y_i)}$$

EXAMPLE:

POC	=	Dissolved Aluminum (µg/L)
Sample Results	=	40 µg/L, 30 µg/L, 850 µg/L, 20 µg/L (four values)
Water Quality Standard	=	750 µg/L

Step 1: Rank the values in ascending order (e.g., 20, 30, 40, 850)

Step 2: Rank for 90th percentile = 1 + [90(N – 1)/100] = 1 + (90 · 3/100) = **3.7** (where "3" = the integer component, and "0.7" = the decimal component)

Since the rank, "3.7", is between 3 and 4, you must interpolate between the two values that represent the 3rd and 4th rankings. In this case, the value "40" was ranked 3rd ($\mathbf{Y_i}$), and "850" was ranked 4th ($\mathbf{Y_{i+1}}$). So use the formula in Step 3 to come up with a value between 40 and 850 (specifically, seven tenths of the way between 40 and 850).

Step 3: P90 = 40 + [0.7 · (850 – 40)] = **607 µg/L** Dissolved Aluminum

[For *Excel* users, there is no need to sort the data. Just use the formula: "=PERCENT(array,k)" where the array represents the list of values (20, 40, 30, 850) and k =0.90.]

If P90 ≥ 95% of the standard, then a Tier 1 review is appropriate.
If P90 < 95% of the standard, a Tier 1 review is not appropriate. A Tier 2 review is required.

In this example, since the P90 (607 µg/L) is less than 95% of the 750 µg/L standard for dissolved aluminum (95% being 712.5 µg/L), the P90 is judged to be *significantly* less than the standard. Therefore, a significant available assimilative capacity exists for aluminum and the proposed discharge does not qualify for a **Tier 1 review**. Instead, a **Tier 2 review** is required to justify the amount of reduction, if any, in the available assimilative capacity.

APPENDIX 3

Example calculations for determining non-degrading effluent limits from an existing discharge

Commented [RJ76]: See item 20.

Scenario:

- An existing wastewater treatment facility proposes to increase permitted design flow from 80,000 gpd to 140,000 gpd to accommodate growth in the area.
- Current Effluent Limits
  - Biochemical Oxygen Demand$_5$ (BOD_5): 30 mg/L average monthly, 45 mg/L average weekly
  - Total Suspended Solids (TSS): 30 mg/L average monthly, 45 mg/L average weekly
  - Ammonia, Summer: 1.4 mg/L average monthly, 3.6 mg/L daily maximum

Variables:

- Q_c = Current Design Flow (MGD)
- WLA_c = Current Wasteload Allocation (permitted effluent limit) (mg/L)
- Q_p = Proposed Design Flow (MGD)
- WLA_p = Proposed Wasteload Allocation (permitted effluent limit) (mg/L)
- CF = Mass Conversion Factor [Typically 8.34 lbs/million gallons per 1 mg/L]

Equations:

- Current Load (lbs/day) = Q_c * WLA_c * CF
- Proposed Load (lbs/day) = Q_p * WLA_p * CF

Proposed new effluent limits for BOD_5 and TSS:

- Average monthly WLA_p = (WLA_c * Q_c) / Q_p = (30 mg/L * 0.08 MGD) / 0.140 MGD = 17.1 mg/L
- Average weekly WLA_p = (WLA_c * Q_c) / Q_p = (45 mg/L * 0.08 MGD) / 0.140 MGD = 25.7 mg/L

-	Current			Proposed			Net Change in Loading (lbs/day)
	Flow (MGD)	Limit (mg/L)	Loading (lbs/day)	Flow (MGD)	Limit (mg/L)	Loading (lbs/day)	
Average Monthly	0.08	30	20.0	0.140	17.1	20.0	0.0
Average Weekly	0.08	45	30.0	0.140	25.7	30.0	0.0

Proposed new effluent limits for Ammonia, Summer:

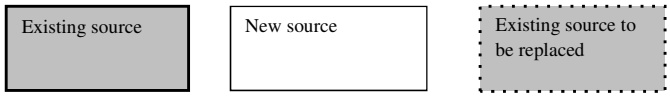
- Average monthly WLA_p = (WLA_c * Q_c) / Q_p = (1.4 mg/L * 0.08 MGD) / 0.140 MGD = 0.8 mg/L
- Daily maximum WLA_p = (WLA_c * Q_c) / Q_p = (3.6 mg/L * 0.08 MGD) / 0.140 MGD = 2.0 mg/L

-	Current			Proposed			Net Change in Loading (lbs/day)
	Flow (MGD)	Limit (mg/L)	Loading (lbs/day)	Flow (MGD)	Limit (mg/L)	Loading (lbs/day)	
Average Monthly	0.08	1.4	0.93	0.140	0.8	0.93	0.0
Daily Maximum	0.08	3.6	2.40	0.140	2.0	2.33	0.0

~~Examples of Calculations for Minimal Degradation~~

~~NOTE: For the following six examples, the variables/terms are defined as follows~~ *~~(as is true in this entire document, bolded terms are defined in the Glossary):~~*

Symbols:



cfs = cubic feet per second

Cc = chronic criterion (Note: Although the provided examples use the "chronic" criterion, in some cases it may be more appropriate to use the "acute" criterion.)

Qs = stream flow (7Q10 or other representative flow)

Qd_1 = average daily design flow of existing discharge in cubic feet per second (cfs) Qd_2 = average daily design flow of new or expanded discharge (cfs)

Cs = pollutant concentration in stream immediately below the point where the facility's effluent enters the segment

CF = conversion factor used to convert a pollutant mass loading into the desired units. For example, using a CF of 5.4 to derive a load in "lbs/day" is appropriate when the WQS is represented in mg/L and flow is represented in cfs [(mg/L) · (cfs) · 5.4) = (lbs/day)]

Cd_1 = existing discharge concentration (mg/L)

Cd_2 = new or expanded discharge concentration (mg/L)

EWQ = existing water quality, a characterization of the current approved levels of pollutants within a segment of water at the point of discharge (Also see the definition in the Glossary of this document.)

SAC = Segment assimilative capacity (lbs/day) – See Glossary. FAC = Facility assimilative capacity (lbs/day) – See Glossary.

Steps for Calculating the Percent Reduction in FAC from a Proposed Discharge:

Step 1: Calculate the FAC

(1a) FAC for proposed new discharges = $[(WQC \cdot (Qs+Qd_2)) - (Cs \cdot Qs)] \cdot CF$

(1b) FAC for existing (expanding) discharges = $[(WQC \cdot (Qs+Qd_2)) - (Cs \cdot (Qs+Qd_1))] \cdot CF$

Step 2: Calculate the load of the new or expanded discharge and the current load of the existing discharge (if applicable)

(2a) Load of proposed new or expanded = $(Cd_2 \cdot Qd_2) \cdot CF$ = "New discharge load" (2b) Load of existing discharge = $(Cd_1 \cdot Qd_1) \cdot CF$ = "Current discharge load"

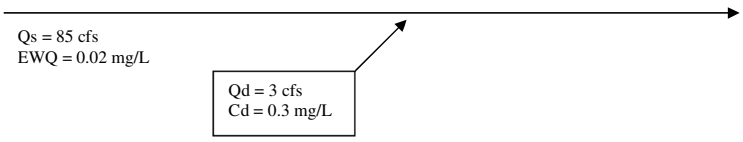
Step 3: Determine whether the new or expanded load is greater than 10 percent of the FAC

(3) Percent of FAC = [(New discharge load – Current discharge load)/FAC] 100

Example 1. Example calculation for determining minimal degradation from a new discharge

Scenario:

- A municipality plans to build a new wastewater treatment facility with a design flow of 3 cfs (Qd) and an effluent zinc concentration of 0.3 mg/L (Cd).
- The receiving stream has a 7Q10 (Qs) of 85 cfs.
- The EWQ for the segment is 0.02 mg/L of zinc.
- The chronic criterion (Cc) of zinc is 0.151 mg/L.



FAC = [(Cc·(Qs+Qd)) − (EWQ·Qs)]·CF

= [(0.151 mg/L·(85 cfs + 3 cfs)) − (0.02 mg/L·85 cfs)]·5.4

= [(0.151·88) − (1.7)]·5.4

= 62.6 lbs/day

New discharge load = Qd·Cd·CF

= 3 cfs·0.3 mg/L·5.4

= 4.9 lbs/day

Percent of FAC = (New discharge load/FAC)·100

= (4.9/62.6)·100

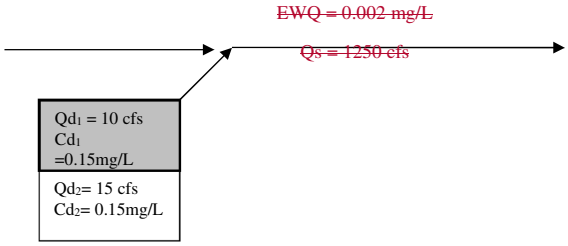
= 7.8%

The discharge could be allowed without further antidegradation review since the FAC consumption is less than the 10% minimal degradation threshold. A higher total discharge could be allowed if an antidegradation review indicates the activity may proceed.

Example 2. Example calculation for determining minimal degradation from an expanding discharge

Scenario:

- A municipality plans to expand its current wastewater treatment facility (an existing source) from 10 cfs (Qd_1) to 15 cfs (Qd_2) and maintain its effluent copper concentration of 0.15 mg/L (Cd_1 and Cd_2).
- The receiving stream has a 7Q10 (Qs) of 1250 cfs.
- The EWQ upstream of plant is 0.002 mg/L of copper.
- The chronic criterion (Cc) of copper is 0.010 mg/L.



Cs: Stream load = EWQ·Stream flow (i.e., Qs)·CF = 0.002 mg/L·1250 cfs·5.4 = 13.5 lbs/day Current discharge load =Current copper effluent concentration·Current discharge flow·CF

= Cd_1·Qd_1·CF = 0.15 mg/L·10 cfs·5.4

= 8.1 lbs/day

Total load = Stream load+Current discharge load = 13.5+8.1 = 21.6 lbs/day

To solve for Cs:

21.6 lbs/day = [Cs·(Qs+Qd_1)]·5.4 = [Cs·(1250 cfs+10 cfs)]·5.4 = [Cs·1260 cfs]·5.4

21.6/5.4 = [Cs·1260]·5.4/5.4

4 = Cs·1260

4/1260 = Cs

Cs = 0.0031746 mg/L

FAC = [(Cc·(Qs+Qd_2)) – (Cs·(Qs+Qd_1))]·CF

= [(0.01 mg/L·(1250 cfs+15 cfs)) – (0.0031746 mg/L·(1250 cfs+10 cfs))]·5.4

= 46.71 lbs/day

New discharge load = Qd_2·Cd·CF

= 15 cfs·0.15 mg/L·5.4

= 12.2 lbs/day

Net increase = New discharge load – Current discharge load

= 12.2 lbs/day – 8.1 lbs/day

= 4.1 lbs/day

Percent of FAC = (Net increase/FAC)·100

= (4.1/46.71)·100

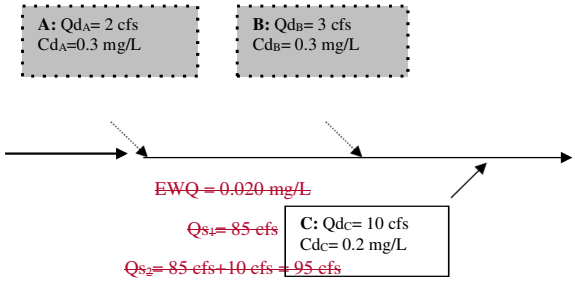
= 8.78%

The discharge could be allowed without further antidegradation review since the net percent consumption of the FAC is less than the 10% minimal degradation threshold. A higher total discharge could be allowed if an antidegradation review indicates the activity may proceed.

Example 3. Example calculation for determining minimal degradation from a new discharge replacing two existing discharges *(Page 1 of 2)*

Scenario:

- A municipality plans to build a new wastewater treatment facility (Plant C) with a design flow of 10 cfs (Qd_C) and an effluent zinc concentration of 0.2 mg/L (Cd_C).
- The new wastewater treatment facility is to replace two current facilities (Plants A and B).
- Plant A (existing source) has a design flow of 2 cfs (Qd_A) and an effluent zinc concentration of 0.3 mg/L (Qd_A).
- Plant B (existing source) has a design flow of 3 cfs and an effluent zinc concentration of 0.3 mg/L (Cd_B).
- The receiving stream has a 7Q10 (Qs_1) of 85 cfs.
- The EWQ upstream of Plant A is 0.020 mg/L of zinc.
- The chronic criterion (Cc) of zinc is 0.151 mg/L.



Note: Qs_1 is the flow upstream of the affected segment (i.e., upstream of Plant A) and Qs_2 is the flow downstream of Plant C after the consolidation.

Cs: Stream load = EWQ·Stream flow (i.e., Qs_1)·CF = 0.020 mg/L·85 cfs·5.4 = 9.2 lbs/day Current discharge load = (Current zinc effluent concentration·Current discharge flow·CF)

for Plants A and B combined.

= [(Cd_A·Qd_A·CF)+(Cd_B·Qd_B·CF)]

= [(0.3 mg/L·2 cfs·5.4)+ (0.3 mg/L·3 cfs·5.4)]

= [(3.24)+(4.86)]

= 8.1 lbs/day

Total load = Stream load+Current discharge load = 9.2+8.1 = 17.2 lbs/day

To solve for Cs:

17.3 lbs/day = [Cs·(Qs_1+Qd_A+Qd_B)]·CF = [Cs·(85 cfs+2 cfs+3 cfs)]·5.4 =[Cs·90]·5.4

17.3/5.4 = [Cs·90]·5.4/5.4

3.2 = Cs·90

3.2/90 = Cs

Cs = 0.03556 mg/L

FAC = [(Cc·Qs_2) – (Cs·(Qs_1+Qd_A+Qd_B))]·CF

= [(0.151 mg/L·95 cfs) – (0.03556 mg/L·(85 cfs+2 cfs+3 cfs))]·5.4

= [(14.345) – (0.03556·3.2004)]·5.4 = [11.1446]·5.4

= 60.181 lbs/day

New discharge load = Qd_C·Cd_C·CF

= 10 cfs·0.2 mg/L·5.4

= 10.8 lbs/day

Net increase = New discharge load – Current discharge load

= 10.8 lbs/day – 8.1 lbs/day

= 2.7 lbs/day

Example 3. Example calculation for determining minimal degradation from a new discharge replacing two existing discharges *(Page 2 of 2)*

Percent of FAC = (Net increase/FAC)·100

= (2.7/60.181)·100

= 4.5%

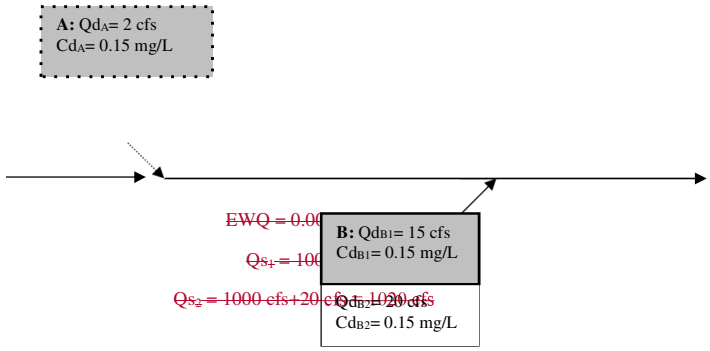
The discharge could be allowed without further antidegradation review since the net percent consumption of the FAC is less than the 10% minimal degradation threshold. A higher total discharge could be allowed if an antidegradation review indicates the activity may proceed.

Example 4. Example calculation for determining minimal degradation from an expanding discharge replacing an existing discharge *(Page 1 of 2)*

Scenario:

A municipality plans to expand its current wastewater treatment facility (Plant B) (an existing source) from 15 cfs to 20 cfs while maintaining its effluent copper concentration at 0.15 mg/L.

- The expansion will replace Plant A (an existing source).
- Plant A has a design flow of 2 cfs (Qd_A) and an effluent copper concentration of 0.15 mg/L (Cd_A).
- Plant B has a design flow of 15 cfs (Qd_{B1}) and an effluent copper concentration of 0.15 mg/L (Cd_{B1}).
- The receiving stream has a 7Q10 (Qs_1) of 1000 cfs.
- The EWQ upstream of Plant A is 0.003 mg/L of copper.
- The chronic criterion (Cc) of copper is 0.010 mg/L.



Note: Qs_1 is the flow upstream of the affected segment (i.e., upstream of Plant A) and Qs_2 is the flow downstream of Plant B after the consolidation/expansion.

Cs: Stream load = EWQ·Stream flow (i.e., Qs_1)·CF = 0.003 mg/L·1000 cfs·5.4 = 16.2 lbs/day Current discharge load = (Current copper effluent concentration·Current discharge flow·CF) for Plants A and B combined.

$= [(Cd_A \cdot Qd_A \cdot CF)+(Cd_{B1} \cdot Qd_{B1} \cdot CF)]$

= [(0.15 mg/L·2 cfs·5.4)+(0.15 mg/L·15 cfs·5.4)]

= [(1.62)+(12.15)]

= 13.8 lbs/day

Total load = Stream load+Current discharge load = 16.2+13.8 = 30 lbs/day

To solve for Cs:

30 lbs/day = [Cs·(Qs$_1$+Qd$_A$+Qd$_{B1}$)]·CF = [Cs·(1000 cfs+2 cfs+15 cfs)]·5.4 =[Cs·1017]·5.4

30/5.4 = [Cs·1017]·5.4/5.4

5.556 = Cs·1017

5.556/1017 = Cs

Cs = 0.005463 mg/L

FAC = [(Cc·Qs$_2$) – (Cs·(Qs$_1$+Qd$_A$+Qd$_{B1}$))]·CF

= [(0.010 mg/L·1020 cfs) – (0.005463 mg/L·(1000+2+15 cfs))]·5.4

= [(10.2) – (0.005463·1017)]·5.4

= [10.2 – 5.555871]·5.4

= 25.1 lbs/day

New discharge load = Qd$_{B2}$·Cd$_{B2}$·CF

= 20 cfs·0.15 mg/L·5.4

= 16.2 lbs/day

Example 4. Example calculation for determining minimal degradation from an expanding discharge replacing an existing discharge *(Page 2 of 2)*

Net increase = New discharge load – Current discharge load

= 16.2 lbs/day – 13.8 lbs/day

= 2.4 lbs/day

Percent of FAC = (Net increase/FAC)·100

= (2.4/25.1)·100

= 9.6%

The discharge could be allowed without further antidegradation review since the net percent consumption of the FAC is less than the 10% minimal degradation threshold. A higher total discharge could be allowed if an antidegradation review indicates the activity may proceed.

Example 5. Example calculation for determining minimal degradation from an expanding discharge undergoing multiple expansions *(Page 1 of 2)*

Scenario: Over a period of many years a municipality plans three separate expansions of its wastewater treatment facility (WWTF).

- Each expansion increases the design flow by an additional cfs while maintaining its effluent copper concentration at 0.15 mg/L.
- The original design (Qd_1 = 10 cfs; Cd_1 = 0.15 mg/L of copper) is an existing source.
- The EWQ upstream of the WWTF is 0.002 mg/L of copper.
- The receiving stream has a 7Q10 (Qs) of 1000 cfs.
- The chronic criterion (Cc) of copper is 0.010 mg/L.

Qd_1= 10 cfs Cd_1= 0.15mg/L	Qd_3= 18 cfs Cd_3= 0.15mg/L
Qd_2= 13 cfs Cd_2= 0.15mg/L	Qd_4= 22 cfs Cd_4= 0.15mg/L

Qs_1= 1013 cfs

Qs_2= 1018 cfs

Qs_3= 1022 cfs

Note: Qs is the 7Q10 stream flow. Qs_1, Qs_2, and Qs_3 are the stream flows (i.e., 7Q10 plus facility flow) downstream of the WWTF after the first, second, and third expansions, respectively.

First Expansion:

Cs: Stream load = EWQ·Stream flow (i.e., Qs)·CF = 0.002 mg/L·1000 cfs·5.4 = 10.8 lbs/day Current discharge load = Current copper effluent conc.·Current discharge flow·CF

= Cd_1·Qd_1·CF = 0.15 mg/L·10 cfs·5.4

= 8.1 lbs/day

Total load = Stream load+Current discharge load = 10.8+8.1 = 18.9 lbs/day

To solve for Cs:

18.9 lbs/day = [Cs·(Qs+Qd_1)]·CF = [Cs·(1000 cfs+10 cfs)]·5.4 = [Cs·1010 cfs]·5.4

18.9/5.4 = [Cs·1010]·5.4/5.4

3.5 = Cs·1010

3.5/1010 = Cs

Cs = 0.003465 mg/L

FAC = [(Cc·Qs$_t$) – (Cs·(Qs+Qd$_t$))]·CF

= [(0.010 mg/L·1013 cfs) – (0.003465 mg/L·(1000 cfs+10 cfs))]·5.4

= [(10.13) – (0.003465 mg/L·1010 cfs)]·5.4 = [(10.13) – (3.49965)]·5.4

= 35.804 lbs/day

New discharge load = Qd$_2$·Cd$_2$·CF

= 13 cfs·0.15 mg/L·5.4

= 10.5 lbs/day

Net increase = New discharge load – Current discharge load

= 10.5 lbs/day – 8.1 lbs/day

= 2.4 lbs/day

Percent of FAC = (Net increase/FAC)·100

= (2.4/35.804)·100

= 6.7%

The first expansion could be allowed without further antidegradation review since the net percent consumption of the FAC is less than the 10% minimal degradation threshold.

Example 5. Example calculation for determining minimal degradation from an expanding discharge undergoing multiple expansions ***(Page 2 of 2)***

Second Expansion:

Cs: Stream load = EWQ·Stream flow (i.e., Qs)·CF = 0.002 mg/L·1000 cfs·5.4 = 10.8 lbs/day Current discharge load = Current copper effluent conc.·Current discharge flow·CF

= Cd_2·Qd_2·CF = 0.15 mg/L·13 cfs·5.4

= 10.5 lbs/day

Total load = Stream load+Current discharge load = 10.8+10.5 = 21.3 lbs/day

To solve for Cs:

21.3 lbs/day = [Cs·(Qs+Qd_2)]·CF = [Cs·(1000 cfs+13 cfs)]·5.4 = [Cs·1013 cfs]·5.4

21.3 /5.4 = [Cs·1013]·5.4/5.4

3.9 = Cs·1013

3.9/1013 = Cs

Cs = 0.0038 mg/L

FAC = [(Cc·Qs_2) – (Cs·(Qs+Qd_2))]·CF

= [(0.010 mg/L·1018 cfs) – (0.0038 mg/L·(1000 cfs+13 cfs))]·5.4

= [(10.18) – (0.0038·1013)]·5.4 = [(10.18) – (3.849)]·5.4 = [6.33]·5.4

= 34.18 lbs/day

New discharge load = Qd_3·Cd_3·CF

= 18 cfs·0.15 mg/L·5.4

= 14.6 lbs/day

Net increase = New discharge load – Current discharge load

= 14.6 lbs/day – 10.5 lbs/day

= 4.1 lbs/day

Percent of FAC = (Net increase/FAC)·100

= (4.1/34.18)·100

= 12.0%

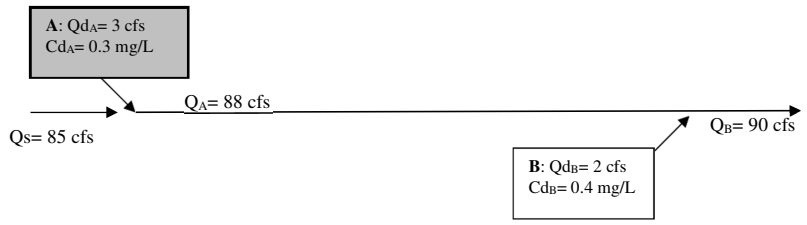
~~The second expansion will consume more than 10% of the FAC, therefore, further antidegradation review is needed.~~

Example 6. Example calculation for determining minimal degradation from multiple new discharges *(Page 1 of 2)*

Scenario:

- Plant A (an existing source) discharges into a stream segment with a 7Q10 of 85 cfs (Q_S).
- The EWQ upstream of Plant A is 0.03 mg/L of zinc.
- Plants B, C, and D are subsequently constructed on the same segment of river as the existing source.
- All four plants discharge zinc at concentrations shown below.
- The chronic criterion (Cc) of zinc is 0.151 mg/L.

Plant B (1st Addition):



Note: Q_S is the 7Q10 stream flow. Q_A and Q_B are the stream flows downstream of Plants A and B, respectively (i.e., 7Q10 plus facility flows).

The EWQ for plants B, C, and D would include the discharge from Plant A because it existed at the time the procedures become final. In other words, Plant A is "grandfathered" in and included in the determination of EWQ for Plant B, C, and D.

When Plant B is constructed this would be a "new" discharge to a segment that has an existing facility. The Cs would therefore be the same as the existing water quality that is downstream of Plant A.

Cs: Stream load = EWQ·Stream flow (i.e., Qs)·CF = 0.03 mg/L·85 cfs·5.4 = 13.8 lbs/day Current discharge load = Current zinc effluent conc.·Current discharge flow·CF

$= Cd_A \cdot Qd_A \cdot CF = 0.3 \text{ mg/L} \cdot 3 \text{ cfs} \cdot 5.4$

$= 4.9$ lbs/day

Total load = Stream load+Current discharge load = 13.8+4.9 = 18.7 lbs/day

To solve for Cs:

$18.7 = (Cs \cdot Q_A) \cdot CF = (Cs \cdot 88) \cdot 5.4$ $18.7/5.4 = (Cs \cdot 88) \cdot 5.4/5.4$

$3.46 = Cs \cdot 88$ $3.46/88 = Cs$

$Cs = 0.0393$ mg/L

FAC = [(Cc·Q_B) – (Cs·(Qs+Qd_A))]·CF

= [(0.151 mg/L·90 cfs) – (.0393 mg/L·(85 cfs+3 cfs))]·5.4

= [13.59 – 3.4584]·5.4 = [10.1316]·5.4

= 54.711 lbs/day

New discharge load = Qd_B·Cd_B·CF Percent of FAC = (New discharge load/FAC)·100

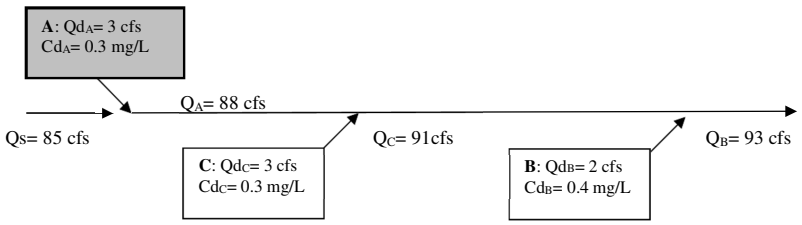
= 2 cfs·0.4 mg/L·5.4 = (4.3/54.711)·100

= 4.3 lbs/day = 7.86%

Plant B discharge could be allowed without further antidegradation review since the percent consumption of the FAC is less than the 10% minimal degradation threshold.

Example 6. Example calculation for determining minimal degradation from multiple new discharges *(Page 2 of 2)*

Plant C (2nd Addition):



Note: Q_S is the 7Q10 stream flow. Q_A, Q_B, and Q_C are the stream flows downstream of Plants A, B, and C, respectively (i.e., 7Q10 plus facility flows).

C_S = 0.0393 mg/L

Note: C_S remains the same as calculated for the 1st Addition because the 2nd Addition is downstream of Plant A (the original source) but upstream from Plant B (the 1st Addition).

$FAC = [(C_C \cdot Q_C) - (C_S \cdot (Q_S + Qd_A))] \cdot CF$

$= [(0.151\ mg/L \cdot 91\ cfs) - (0.0393\ mg/L \cdot (85\ cfs + 3\ cfs))] \cdot 5.4$

$= [(13.741) - (0.0393\ mg/L \cdot 88)] \cdot 5.4$

$= 55.526\ lbs/day$

New discharge load = $Qd_C \cdot Cd_C \cdot CF$ Percent of FAC = (New discharge load/FAC) 100

$= 3\ cfs \cdot 0.3\ mg/L \cdot 5.4$ = (4.9/55.526) 100

= 4.9 lbs/day = 8.82%

Since Plant C will consume less than 10% of the FAC, an antidegradation review may not be needed. However, the cumulative increase needs to be compared to the cumulative 10% threshold before a final determination may be made regarding the necessity of an antidegradation review.

$SAC = [(C_C \cdot Q_B) - (C_S \cdot Q_A)] \cdot CF$

$= [(0.151\ mg/L \cdot 93\ cfs) - (0.0393\ mg/L \cdot 88\ cfs)] \cdot 5.4$

= 57.204 lbs/day

Cumulative net increase in load = Plant B New discharge load+Plant C New discharge load

= 4.3 lbs/day+4.9 lbs/day

= 9.2 lbs/day

Cumulative Percent of SAC = (Cumulative net increase/SAC)·100

= (9.2 lbs/day /57.204 lbs/day)·100

= 16.1%

Plant C discharge will require further antidegradation review even though the percent consumption of the FAC is less than the 10% minimal degradation threshold because the cumulative percent consumption of the SAC is more than the 10% cumulative degradation threshold.