

Reasonable Potential Analysis Guidance for Implementation of Montana's Narrative Nutrient Criteria in
Montana Pollutant Discharge Elimination System Permits

I. Background

Montana Pollutant Discharge Elimination System (MPDES) permits regulate point source discharges of pollutants to state surface waters. The permit must include appropriate effluent limits, monitoring requirements, and other special conditions to protect the beneficial uses of the receiving water body. One way to ensure protection of beneficial uses is through the implementation of Montana's water quality standards found both in Circular DEQ-7 and in Administrative Rules of Montana (ARM) Title 17, Chapter 30, Subchapter 6. This guidance is specific to DEQ's determination if a discharge has the reasonable potential to cause or contribute to the presence of undesirable aquatic life, which is Montana's narrative nutrient water quality standard found in ARM) 17.30.637(1) (e).

The need for water quality-based effluent limits (WQBELs) in an MPDES permit is demonstrated through an analysis to determine whether a discharge alone or in combination has the reasonable potential to cause or contribute to an exceedance of a water quality standard. U.S. Environmental Protection Agency regulations at 40 CFR 122.44(d) as adopted by reference in ARM 17.30.1344, require this analysis.

EPA regulations at § 122.44(d)(1)(i) state, "Limitations must control all pollutants or pollutant parameters (either conventional, nonconventional, or toxic pollutants) which the Director determines are or may be discharged at a level that will cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard, including state narrative criteria for water quality." Because of that regulation, EPA and many authorized NPDES states refer to the process that a permit writer uses to determine whether a WQBEL is required as a reasonable potential analysis. Wording the requirements of the regulation another way, a reasonable potential analysis is used to determine whether a discharge, alone or in combination with other sources of pollutants to a waterbody and under a set of conditions arrived at by making a series of reasonable assumptions, could lead to an excursion above an applicable water quality standard. The regulation also specifies that the reasonable potential determination must apply not only to numeric criteria, but also to narrative criteria (e.g., no toxics in toxic amounts, or presence of pollutants or pollutant parameters in amounts that would result in undesirable aquatic life). A permit writer can conduct a reasonable potential analysis using effluent and receiving water data and modeling techniques or using a non-quantitative approach.

When conducting a reasonable potential analysis (RPA) for nutrients, permit writers consider multiple information sources, including but not limited to, effluent concentrations of total nitrogen (TN) and total phosphorus (TP), critical effluent and ambient flow rates, and instream water quality data of TN, TP, and any available in-stream response variable data. These data are compiled by the permit writer during development of an MPDES permit from Discharge Monitoring Reports, MPDES application materials, the Water Quality Portal and other credible sources of information.

Permit writers also consider other factors when gathering information to determine reasonable potential specific to Montana's narrative nutrient standard. This information includes effluent flow relative to low flow of the receiving water (expressed as a seasonal 14Q5), discharge strategy (continuous or intermittent), impairment status as documented in Montana's 303(d) list, any applicable Total Maximum Daily Load (TMDL) for the receiving water body, downstream impacts including distance to

the downstream waterbody, its impairment status, and whether it is a lake or reservoir, proximity of other discharges that may cause cumulative effects, optimization efforts, type of facility and treatment, upgrades and age of treatment, and any modeling conducted by DEQ or the permittee. For new or increased sources, DEQ also must account for Montana's Nondegradation Policy defined in ARM Title 17, Chapter 30, Subchapter 7.

The federal regulations, as adopted into state law, provide limited instruction on how to perform this analysis. Therefore, this guidance provides details and context for DEQ's approach for determining reasonable potential for a discharge to cause or contribute to an excursion above water quality standards. The pertinent language provided in federal regulation and adopted into state law is as follows: "When determining whether a discharge causes, has the reasonable potential to cause, or contributes to an in-stream excursion above a narrative or numeric criteria within a State water quality standard, the permitting authority shall use procedures which account for existing controls on point and nonpoint sources of pollution, the variability of the pollutant or pollutant parameter in the effluent, the sensitivity of the species to toxicity testing (when evaluating whole effluent toxicity), and where appropriate, the dilution of the effluent in the receiving water." 40 CFR 122.44(d)(1)(ii)

RPA with Response Variable Data

DEQ identified in-stream response variables and associated thresholds for three distinct ecoregional areas of the state, Eastern Montana; Western Montana; and transitional areas. Within each of these ecoregional areas, DEQ further refined response variables and associated thresholds for demonstrating attainment of the narrative nutrient standard specific to recreation and aquatic life beneficial uses. Both uses must be protected to conclude that the narrative water quality standard is achieved, and the discharge does not have reasonable potential to cause or contribute to undesirable aquatic life. Both uses have different response variable and thresholds associated with each use. Recreation and aquatic life uses will be analyzed separately (note: recreation use assessments are restricted to western and transitional ecoregions). If the response data set shows that both uses are protected, then the narrative water quality standard is achieved; however, if the data show that either use is not protected, then the narrative standard is not being achieved. See below a series of tables that show data combinations for each ecoregion, along with beneficial use and associated response variables which identify whether the water quality standard is achieved and if reasonable potential exists. Nutrient casual variables refer to Total Nitrogen and Total Phosphorus. Please see Circular 15 (add reference) for final response variables and associated thresholds.

For purposes of interpreting the narrative nutrient standard and determining reasonable potential, both casual variables (TN and TP) will be measure instream at the same location as the response variables.

For purposes of demonstrating whether the response variable thresholds have been met or exceeded, DEQ will use the average of the site dataset. For the casual, DEQ will use the 75th percentile of the site dataset.

Table 1. Western & Transitional Ecoregions: Recreational Uses

Criteria			Is the Narrative Nutrient WQ Standard achieved?	Is there RP?
Nutrient Causal Variables	Benthic Chlorophyll a; Ash Free Dry Weight	% Filamentous Algae bottom cover		
Meets	Meets	Meets	Yes	No
Meets	Meets	Exceeds	No	Yes
Meets	Exceeds	Meets	No	Yes
Meets	Exceeds	Exceeds	No	Yes
Exceeds	Meets	Meets	Yes	No
Exceeds	Meets	Exceeds	No	Yes
Exceeds	Exceeds	Meets	No	Yes
Exceeds	Exceeds	Exceeds	No	Yes

Table 2. Western & Transitional Ecoregions: Aquatic Life

Criteria			Is the Narrative Nutrient WQ Standard achieved?	Is there RP?
Nutrient Causal Variables	Dissolved Oxygen delta	Macroinvertebrates		
Meets	Meets	Meets	Yes	No
Meets	Meets	Exceeds	TBD	TBD
Meets	Exceeds	Meets	TBD	TBD
Meets	Exceeds	Exceeds	No	Yes
Exceeds	Meets	Meets	Yes	No
Exceeds	Meets	Exceeds	No	Yes
Exceeds	Exceeds	Meets	No	Yes
Exceeds	Exceeds	Exceeds	No	Yes

Table 3. Western & Transitional Ecoregions: Recreational Uses in High Grades Streams

Criteria		Is the Narrative Nutrient WQ Standard achieved?	Is there RP?
Nutrient Causal Variables	Macroinvertebrates		
Meets	Meets	Yes	No

Meets	Exceeds	TBD	TBD
Exceeds	Exceeds	No	Yes

Table 4. Eastern Ecoregions: Aquatic Life

Criteria			Is the Narrative Nutrient WQ Standard achieved?	Is there RP?
Nutrient Causal Variables	Dissolved Oxygen delta	Macroinvertebrates		
Meets	Meets	Meets	Yes	No
Meets	Meets	Exceeds	TBD	TBD
Meets	Exceeds	Meets	TBD	TBD
Meets	Exceeds	Exceeds	No	Yes
Exceeds	Meets	Meets	Yes	No
Exceeds	Meets	Exceeds	No	Yes
Exceeds	Exceeds	Meets	No	Yes
Exceeds	Exceeds	Exceeds	No	Yes

Within Table 2, 3, and 4 some of the data combinations yield uncertain outcomes for whether the narrative nutrient standard is achieved and therefore a reasonable potential determination is made. DEQ will likely require additional data collection or information to support a site-specific determination. This may lead to a Permit Writer’s determination that the discharge does not have reasonable potential while additional data is collected to support a more definitive determination.

RPA without Response Variable Dataset

Lacking a response variable dataset to demonstrate how the receiving water body is responding to nutrients, the Permit Writer will, on a case-by-case basis, determine reasonable potential based on other available information. Other available information may include: any assessment and impairment listing on DEQ’s most recent 303(d) List, ambient TN and TP concentrations, variability of effluent TN and TP concentrations, compliance history, effluent flow volume relative to the low flow of the receiving water body (seasonal 14Q5), past reasonable potential determinations, TMDLs, and existing controls of point and nonpoint sources of pollution, including upgrades to the facility to reduce nutrient loading.

Nutrient Impaired Receiving Waters

1. If the receiving water body or immediate downstream assessment unit is listed as impaired on the most recent 303(d) list with the probable cause listed as nutrients (Total Nitrogen, Total Phosphorus, Chlorophyll-a, eutrophication, algae, Dissolved Oxygen) then the discharge has the reasonable potential to cause or contribute to an exceedance of the narrative nutrient standard. [see Boxes 1-2 on flowcharts? Or see Section X of DEQ Circular 15].

Impaired water bodies may have a completed TMDL. Any waste load allocation assigned to an MPDES regulated facility must be incorporated in the permit, consistent with the assumptions of the TMDL. Because TMDLs are planning tools written to identify appropriate load allocations that achieve water quality standards, a reasonable potential analysis is unnecessary.

Unimpaired Receiving Waters

2. If the receiving water body and the immediate downstream assessment unit are not listed on the most recent 303(d) list with the probable cause identified as nutrients (or the other parameters provided in bullet 1) then the permit writer will consider other available information and document the decision whether to include water quality-based effluent limits in the fact sheet. This analysis is case-by-case using site specific and facility specific information. See the Guidance Document for a case-study example.

If a facility is optimized, operated and maintained properly, and consistently achieves TN and TP load reductions anticipated or better than expected, the permit writer may also consider the effluent flow volume relative to the seasonal 14Q5 of the receiving water body. A dilution ratio of greater than a 100:1 is considered significant dilution and may support the conclusion of no reasonable potential for an optimized, and properly operated and maintained facility.

A subset of MPDES permits have final and effective effluent limits for nutrients. These effluent limits may be a prohibition on discharge during the summer months, cap at current performance loads, or others. DEQ may find that these existing effluent limits protect beneficial uses and new or more stringent effluent limits are not required.

Calculating Water Quality-based Effluent Limits for Total Nitrogen and/or Total Phosphorus

If DEQ finds a facility has RP to cause or contribute to an exceedance of the narrative nutrient standard and a numeric water quality based effluent limit is required. DEQ will identify a single value from the ecoregional range for limit development. When selecting a value DEQ will consider the following: water body specific information that may mitigate nutrient effects (e.g. naturally high turbidity, water depth great than one meter), any response variable data and what the data indicates as far as health of the surface water body, and the regulatory path selected by the permittee.

For permittees under the Adaptive Management Program with a phosphorus focus, DEQ will use a P value on the higher end of the range unless ancillary data suggests this is inappropriate.

For permittees under an Individual Variance, DEQ will use a TP and/or TN values from the middle of the range unless ancillary data suggests this is inappropriate.

Regardless of regulatory path selected, DEQ will not revisit the value selected with each permit renewal unless sufficient information suggests the identified value is inappropriate.

Once a value is selected, limits will be expressed in two ways:

- 1) Monthly average concentration equal to the ecoregional value
- 2) Monthly average load equal to the ecoregional value multiplied by the critical discharge flow.