Missouri
Department of
Natural Resources
Water Protection Program
Water Pollution Control Branch

4 Part IV: Specific WQBEL Processes and Reasonable Potential to Exceed (RPTE)

4.3.1 RPTE and WQBEL Calculations for Toxic and Nonconventional Pollutants

4.3.1.1 Wasteload Allocation Calculations for Ammonia

The *Total Ammonia Nitrogen Criteria Implementation Guidance* describes the processes that may be used to determine WLA for ammonia. The total ammonia nitrogen WLA may be determined by any of the following methods:

1) Mass balance with ammonia degradation or decay is permissible for unclassified streams only. Either default or site-specific values for temperature and pH may be used. Ammonia-degradation kinetics equation[1] (Chapra, S. 1997) may be used in wasteload allocation determinations:

   $[NH_3N]_t = [NH_3N]_{t=0} * e^{-kt}$

   Where: $NH_3N]_t$ = ammonia concentration at confluence with classified segment.
   $[NH_3N]_{t=0}$ = ammonia concentration at pipe = C_e
   k = NH_3 oxidation per day $(k_{1,20})\Xi_1^{(Temp-20)}$
   $k_{1,20} = 0.3\ (day^{-1})$
   Ξ_1 = temperature correction factor = 1.083
   t = time for effluent to travel to first classified segment (in days)

   An example of the process of developing winter and summer effluent limits is in *WQAR Instructional Guidance*, Appendix C: Ammonia Decay Example #1.

2) Mass-balance using either default or site-specific values for temperature, pH, and instream/lake dilution flow. Dilution and no ammonia decay will be assumed for Class P streams. No instream dilution or ammonia decay will be assumed for Class C streams (See *Total Ammonia Nitrogen Criteria Implementation Guidance,* Appendix A or *WQAR Instructional Guidance*, Appendix C).

$$WLA_c = C_e = \frac{(Q_e + Q_{mz})WQS - (Q_{mz} * C_s)}{Q_e}$$

   Where: *Qe* = volume of effluent discharge
   Qmz = volume of receiving stream available for mixing (Qs * *ff)*
   ff = fraction of flow based on the allowable mixing zone and zone of initial dilution
   Ce = concentration of a substance in the effluent
   Cs = upstream concentration of pollutant
   WQS = Water quality criteria for the pollutant

[1] Chapra, S. 1997. "Surface Water-Quality Modeling." Edited by B.J. Clark, D.A. Damstra, and J.W. Bradley. McGraw-Hill. 844 pp. Nitrification reference – page 426.

Lakes-- *WQAR Instructional Guidance*, Appendix C**:** In the limit determination process, when using the mixing zone flow volume to calculate the chronic WLA, the long-term average (LTA) acute is often the more stringent LTA; thus we can eliminate that chronic WLA step. The rationale is that chronic criteria can be exceeded in the MZ up to one hundred feet from the discharge point and acute criteria cannot be exceeded. This process assumes that the discharge will be diluted enough to meet chronic criteria by the time it reaches the smaller of 100 feet or 1/4 of the lake width. Large discharges may not achieve this dilution; however, we typically do not get large discharges to these L2 lakes.

3) Water quality model results as provided by the applicant or department. Either default or site-specific values (see Section 4.3.1.2) for temperature, pH, and instream dilution flow may be used.

4.3.1.2 WQBEL Calculations and Seasonal Considerations for Ammonia

The generalize WLA, long-term average, limit develop process is outlined in Appendix B of the *WQAR Instructional Guidance*. Two of three methods for WLA determination are treated in the *Total Ammonia Nitrogen Implementation Guidance* with examples for the various stream scenarios. Appendix C of the *WQAR Instructional Guidance* treats three stream examples and one lake example. As mentioned in Part III, Section 3.4.1.6, chronic ammonia criteria was developed using a 30-day exposure period [10 CSR 20-7.031(4)(B)(7)b.], and in contrast, the chronic toxic criteria are developed using a 4-day exposure or averaging period. Thus, the statistical multipliers in the ammonia limitation determination are based upon a 30-day sample period or n = 30.

Total ammonia nitrogen criteria are based on the ambient mean temperature and pH of the receiving water. Ammonia toxicity is dependent upon temperature and pH. To reproduce the natural variation in temperature and pH, we divided the year into two seasons. The summer and winter considerations for limitations are May 1 through October 31 and November 1 through April 30, respectively. In the absence of site-specific temperature and pH data, default values are used:

<u>Two Season Default Temperature and pH</u>:

May 1 through October 31	-- 26ºC	7.8 SU	82.4ºF
November 1 through April 30	-- 6ºC	7.8 SU	42.8ºF

Note: º F = 1.8 (º C) + 32

Site-specific temperature and pH may be used to determine ammonia criteria (see Guideline 1: *Guideline for Site-specific pH and Temperature for Ammonia Criteria Determination*).

4.3.1.3 Dissolved vs. Total Recoverable Considerations for Metals

Metals criteria in Table A of 10 CSR 20-7.031 are expressed as dissolved metals, but effluent limitations for metals must be expressed as total recoverable metals. One exception is the permit limitation for chromium VI is expressed as total dissolved per 40 CFR 122.45 (c) (3), which states, "All approved analytical methods for the metal inherently measure only its dissolved form…." Total dissolved metal criteria were developed using total recoverable toxicity tests results and are thus articulated to the EPA as total recoverable components.

Freshwater criteria conversion factors are used as translators of the total recoverable metals to total dissolved metals. These conversion factors or translators can be found in Table A of 10 CSR 20-7.031. Metals criteria are express as dissolved components because EPA believes that the dissolved faction more closely approximates the bioavailable (gill surface adsorption) fraction in the water column than total recoverable components. The particulate portion of the total recoverable metal will not adhere to the gill surface. The gill surface behaves as a biotic ligand that attracts metal ions to its surface (see Figure 5 below).

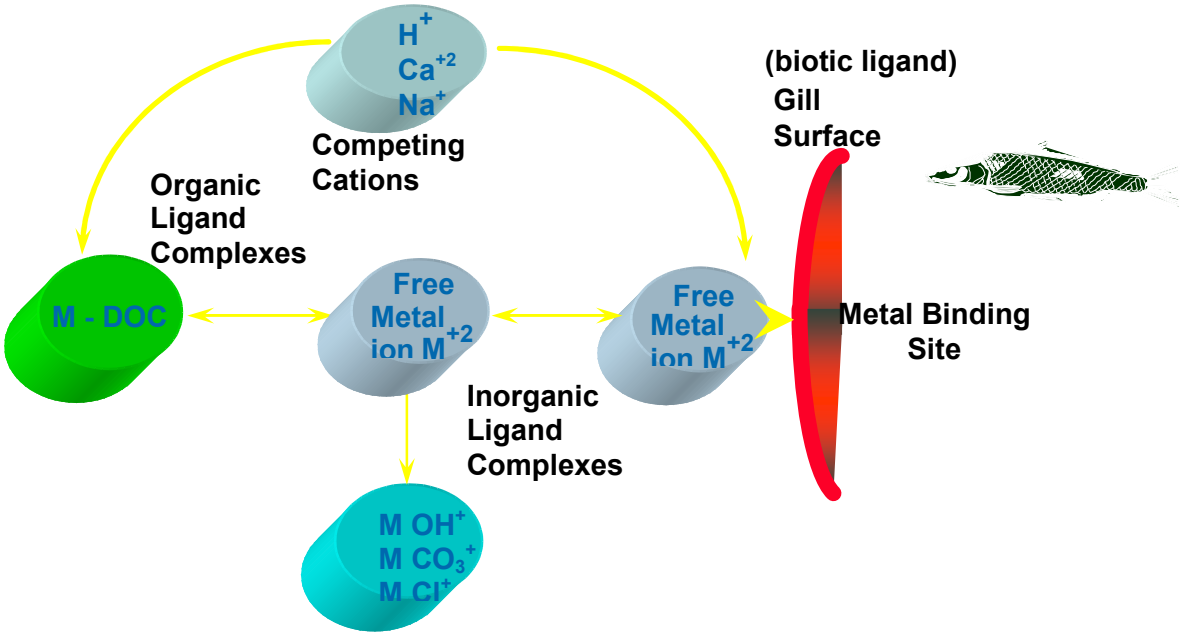

Figure 5. Fate of a Free Metal Ion and Ligand Complexes That Attract Metal Ions

The toxicity of metals is affected by the hardness of water. By contrast, inorganic complexes and dissolved organic carbon ($CaCO_3$) behave as inorganic and organic ligands, effectively reducing the toxicity of metals to aquatic organisms. The hardness components behave as ligand complexes that reduce the toxicity of the dissolved metal

ions. The degree to which toxicity is reduced is different with each metal (see Figure 5). The basic formula for the hardness-dependent (HD) metal criteria is:

Exp ^ (a * Natural Log (HD) – b), where a and b are metal-specific constants.

The graphic below shows the hardness-dependent criteria for both total recoverable and dissolved copper and lead. The conversion factor from total recoverable to dissolved components is a multiplier to the above equation for copper but lead has a hardness-dependent conversion factor. The effect of the hardness-dependent conversion factor on the concentration of the criteria can be seen in the graphic below.

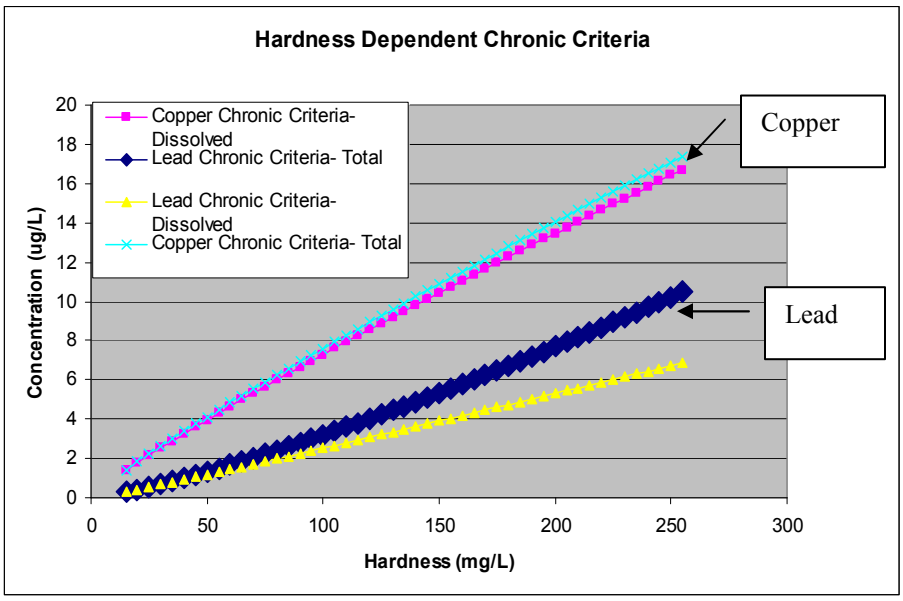

Figure 6. Hardness-Dependent Criteria -- Total Recoverable / Dissolved Copper and Lead

An applicant may seek a WQBEL based upon site-specific conditions. For instance, an assumed hardness of **162 mg/L** may be used in lieu of site-specific hardness data; however, site-specific hardness (by regulation is defined as the 25th percentile value) may yield a higher metal criteria concentration than default hardness. Toxicity decreases with increasing hardness. A number of permits use site-specific water hardness to develop WQBEL. Other options to develop a WQBEL based upon site-specific conditions include:

1) Translator Studies- Due to the potential absence of contemporaneous effluent and in-stream data for total recoverable metals, dissolved metals, hardness, and total suspended solids with which to calculate metals translators, partitioning between the dissolved and adsorbed phases should be assumed to be minimal (Section 5.7.3, EPA/505/2-90-001). However, metal-translator multipliers to convert to dissolved metals can be used as recommended in guidance (Section 1.3, 1.5.3 and Table 1 of *The Metals Translator:*

Guidance for Calculating a Total Recoverable Permit Limit from a Dissolved Criterion [EPA/823-B-96-007]). http://www.epa.gov/waterscience/models/guidance.pdf. If concurrent site-specific data (effluent and instream water quality data) for total recoverable metals, dissolved metals, hardness, and total suspended solids are available, partitioning evaluations may be conducted and site-specific translators developed. Before undertaking such an endeavor, facilities should consider 1) the reasonable potential for exceedences of water quality standards, 2) reduction or elimination of the source of the POC, 3) the EPA conversion factor (i.e., those values closer to one have little partitioning between dissolved and adsorbed phases), and 4) a meeting with department personnel. Translator studies require a department-approved quality assurance project plan (QAPP) but do not require a rule change.

2) Water-Effect Ratios or Biotic Ligand Model (BLM) - These studies produce site-specific criteria as an alternative to MO Water Quality Standard criteria. The water effect multiplier (http://www.epa.gov/waterscience/criteria/copper/copper.pdf) that can be applied to the Missouri Water Quality Standard criteria is the ratio of site-specific water toxicity concentration to the laboratory-water toxicity concentration or documented species mean acute toxicity concentration. BLM can be found at the following web site: http://www.epa.gov/waterscience/criteria/copper/2007. The BLM is designed to predict the site water LC50s from only site-specific water chemistry measurements. This eliminates costly bioassays.

According to 10 CSR 20-7.031(4)(S), "when water quality criteria….are either under-protective or over-protective….a petitioner may request site-specific criteria….[and] provide the department with...documentation to show....1) current criteria are not adequate….or 2) proposed site-specific criteria will protect all existing and/or potential uses of the water body." These projects require a rule change and an EPA review under Section 303(c). We do not have specific provisions in the water quality standards for Water-Effect Ratios studies or Biotic Ligand Modeling, so we send these individually to EPA for review. If we get more requests for these studies, we will incorporate provisions into the water quality standards. Regulations state that department "coordination will insure the use of adequate, relevant, and quality data; proper analysis and testing; and defendable procedures [10 CSR 20-7.031(4)(S) 2.];" thus this study requires a quality assurance project plan (QAPP). Applicants should request a meeting with the department before undertaking such an endeavor.

In summary, to derive criteria for metals that are hardness dependent, assumptions can be made for hardness and the translator. Note that hardness effluent monitoring must be included as an effluent monitoring requirement in conjunction with any hardness-dependent metal effluent limit. *This monitoring is useful for U and C stream, but P streams and lakes will require monitoring after the mixing zone.* An assumed hardness of 162 mg/L may be used in lieu of data. As mentioned above, site-specific translators or criteria may be sought by the applicant to create site-specific WQBELs.

4.3.1.4 RPTE Evaluation Considerations for Toxics and Non-conventional Pollutants

The reasonable potential analysis using data that is based on current design flow (use actual flow only if actual flow is greater than design flow) and facility treatment reasonably would indicate whether the current design flow and facility treatment exceeds or does not exceed water quality standards. The *Total Ammonia Nitrogen Criteria Implementation Guidance* says RPAs can be conducted with changes in facility operation; however, the policy is silent on the application of RPA on effluent limitations. Conducting a RPA on non-conventional pollutants such as ammonia, phosphorus or chlorides, for instance, may help understand operator reliability but cannot predict an expansions future potential for exceedence of criteria. By contrast, facilities with metals and toxic chemicals that are derived from industrial sources with constant influent flow and a pretreatment program, an RPA completed for an expansion should be representative of the expanded design flow's RPTE.

RPTE evaluations for facilities for which ammonia decay was applied to the effluent limitation will have additional consideration for the ammonia concentration at the classified segment. The reviewer should then multiply the receiving water concentration (RWC) by the determined decay percentage remaining value to compare with the chronic ammonia water quality standard. This value was determined during the effluent limit determination and may be found in the fact sheet of the state operating permit.

For toxic metals that are hardness dependent, we recommend monitoring for hardness. Establishing RPTE is more accurate with site-specific values for hardness.

4.3.1.5 WQBEL Calculations for Toxics

Effluent limitations for toxic chemicals and total recoverable metals should be developed using methods and procedures outlined in TSD [EPA/505/2-90-001] and [EPA 823-B-96-007]. Appendix D of the *WQAR Instructional Guidance* outlines the specific WLA process for toxics that have either aquatic life criteria and human health criteria. Toxic chemicals that affect aquatic life use the two-value wasteload allocation process and those that affect human health, use the process shown in Appendix B and Appendix D of the *WQAR Instructional Guidance*. Because chronic criteria are developed using 4-day exposure period, statistical multipliers that are used in the toxic substances effluent limitation determination are based upon a 4-day sample period or n = 4.

4.3.2 RPTE and WQBEL Calculations for Bioaccumulative Pollutants

When we consider bioaccumulative pollutants, we are mainly concerned with human health exposures. Bioaccumulation reflects uptake of a substance by aquatic organisms exposed to the substance through all routes (i.e., ambient water and food), as would occur in nature. So a complete estimate of the human exposure to toxic pollutants would not just be the exposure due to fish consumption but all other possible routes of exposure.

Bioconcentration reflects uptake of a substance by aquatic organisms exposed to the substance only through the ambient water (TSD) [EPA/505/2-90-001]. Assessing the potential for a pollutant to bioaccumulate or bioconcentrate is outlined in the TSD [EPA/505/2-90-001] on page 38. This process may lead to developing a reference ambient concentration (RAC) for POCs in terms of derived bioaccumulative factors. This may be an important consideration when applying water quality controls or analyzing reasonable potential. These RACs may be applied as site-specific interpretations of the narrative standards and as a basis for permit limitations under EPA regulations at 40 CFR 122.44 (d)(1)(vi), which states, "Where a state has not established water quality criteria for a specific pollutant that is present in effluent at a concentration that causes, has the reasonable potential to cause, or contributes to an excursion above a narrative criterion ….the permitting authority may establish effluent limits using one or more of the following options:" A) Calculate numeric water quality criteria for the pollutant which the permitting authority demonstrates will attain and maintain applicable narrative water quality criteria and will fully protect the designated use. B) Use EPA's water quality criteria published under 304(a) of the Clean Water Act. C) Use an indicator parameter for the POC with sufficient documentation as provided in the federal regulation at 40 CFR 122.44 (d)(1)(vi)(c).

Missouri Water Quality Criteria should be available in order to perform RPTE and develop WQBELs as described in Section 4.1. The reviewer should note that Standard Methods for these POCs may have detection limits that are above the water quality standards for human health fish consumption. For resolution to this problem, see Section 4.2.3.

Although the permit limit development process is different for bioaccumulative pollutants that affect human health, the wasteload allocation process used for the RPTE evaluation is the same as the toxics evaluation. Mixing in lakes and P streams is still a consideration for POCs that affect human health. Likewise, no mixing for U and C streams is still used.

See Appendix B and D of the *WQAR Instruction Guidance* for the WQBEL procedure for those bioaccumulative pollutants that affect human health. Reviewers should also refer to the WLAs that are provided in the Total Maximum Daily Load documents, if one exists.

4.3.3 RPTE and WQBEL Calculations for All Other Pollutants

Nutrients criteria (total nitrogen, total phosphorus, and chlorophyll) apply to 1) classified lakes greater than 10 acres in size (10 CSR 20-7.031, Table G), and 2) unclassified lakes as waters of the state that are greater than 10 acres in size and outside the Big River Floodplain eco-region. Waters of the state are defined as (Missouri Statues Chapter 644, Section 644.016): "[A]ll 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 *Nutrient and Chlorophyll Criteria for Lakes, Reservoirs and Streams: Implementation Procedure for Permitted Facilities* addresses the watersheds to these lakes. The department will consider every lake as a water of the state unless the applicant can show that the lake owner has complete ownership control of the lake drainage area. Thus, discharges to tributaries of these lakes and reservoirs as defined in the procedure are subject to the requirements of the water quality standards. To see whether a discharge will be required to address nutrients in the effluent, the reviewer will first determine whether the discharge is in the watershed of a 10 acres or greater lake. For determination of the waters of the state, a GIS layer or plat map from the county of the facility discharge may be used.

The *Nutrient and Chlorophyll Criteria for Lakes, Reservoirs and Streams: Implementation Procedure for Permitted Facilities* includes procedures to implement Missouri's nutrient and chlorophyll standards for 1) regulated existing nutrient point sources, or 2) new or expanding nutrient point sources.

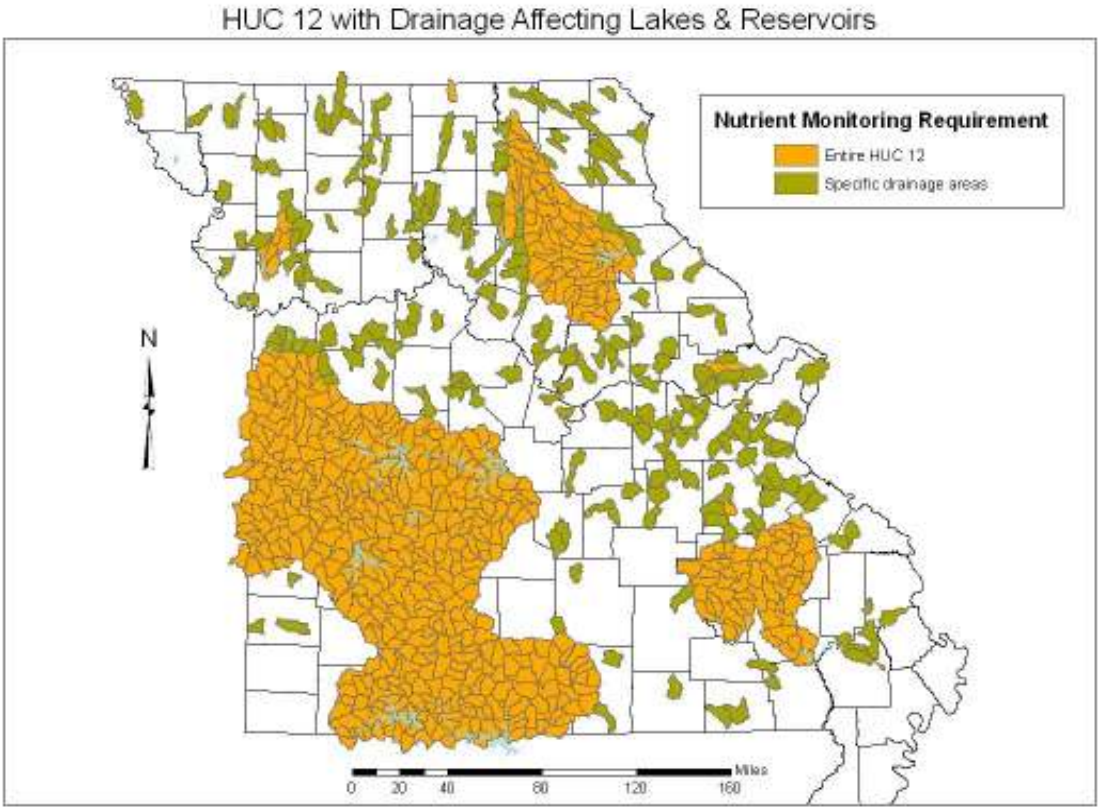

Figure 6. Watershed Delineation for Drainages to "some" Lakes and Reservoirs affected by the nutrient criteria within the water quality standards.

The above figure should help estimate those discharges in watersheds that will require additional consideration for nutrients. A more detailed map of the watersheds that are

affected by the rule is being developed. A more detailed evaluation will be required for individual discharges.

4.3.4 Special Antidegradation Considerations: RPTE and Tier 2 Minimally-Degrading Limitation for Toxics, Nonconventional and Conventional Pollutants

When insignificant degradation is proposed by an applicant, the effluent limits in these antidegradation reviews are developed to be protective of beneficial uses and to protect and retain the remaining assimilative capacity for Tier 2 POCs. The facility assimilative capacity (FAC) percentage should not exceed 10% and can be assumed to be less than 10% in the FACratio variable shown in the equations below. For some POCs, limits are determined based on only the assimilative capacity consumed; however, in other cases, especially where reasonable potential analysis will be used to determine the need for limits, a value just less than 10% should be used for the FACratio to determine limits.

4.3.5 Wasteload Allocation Calculations for Toxics and Non-Conventional Pollutants

Chronic WLA are determined using applicable chronic water quality criteria (CCC: criteria continuous concentration) and upstream stream flow without mixing considerations. If drinking water standards exist for the receiving stream, then the lesser of the two standards is used. Acute WLAs are only determined in the absence of applicable chronic criteria. FAC can be determined using acute criteria in circumstances where chronic criteria do not exist.

Mixing considerations are only used for water quality-based effluent limit; otherwise, complete mixing or total flow are assumed for facility assimilative capacity and minimal degradation limit determination.

Note: As an alternative to the equations below, the chronic WLA as mass could be derived as follows:

WLA as proposed load (lbs/day) = FAC (lbs/day)*0.1 + current load (lbs/day)

Treat the combination of Qd2 * Cd2 * CF as the proposed load as single variable and the same with current load and FAC which will already be in lbs/day.

New Facilities:
For a new facility the WLA is facility assimilative capacity-based – using existing water quality (EWQ), water quality criteria, and the facility assimilative capacity ratio within the following equation:

Cd = [FACratio * ((Cc * (Qs + Qd))-(EWQ*Qs)*CF)]/Qd

Where: Cc = downstream concentration, the Water Quality Standard (WQS)
Qs = Stream 7Q10 flow (ft^3/s), 30Q10 or 30Q5 flow.
Where: 7Q10 flow is used for toxics; 30Q10 flow is used chronic calculations of ammonia and 30Q5, for human health chronic calculations. Acute ammonia calculations use the 1Q10 flow. See Part 2, Low Flow Conditions for complete list of low flows.
Qd = Proposed effluent **design** flow (ft^3/s) – static value in the spreadsheet
EWQ = upstream concentration
Cd = Proposed effluent concentration – static value in the spreadsheet. Cd must meet water quality standards. If does not meet standards, determine WQBEL and use the maximum daily limit for FAC, MDEL calculations
FACratio = facility assimilative capacity (FAC) ratio (calculated or assumed). Equal to FAC divided by the net increase in loading. If FAC is assumed, less than 10% should be used
CF = Conversion factors for assimilative capacity calculations are: 0.0054 for ug/L, 5.4 for mg/L

$$\boxed{FAC = Cc(Q_s + Qd1) - EWQ(Q_s)}$$

<u>Expanding Facilities</u>:
For an expanding facility, the WLA is facility assimilative capacity-based – using existing water quality (EWQ), water quality criteria, and the facility assimilative capacity ratio within the following equation:

Cd2 = ([Cc*(Qs+Qd2) - Cs*(Qs+Qd1)*CF]*FACratio+Qd1*Cd1)/Qd2

Where: Cc = downstream concentration, the Water Quality Standard (WQS)
Qs = Stream 7Q10 flow (ft^3/s), 30Q10 or 30Q5 flow.
Where: 7Q10 flow is used for toxics; 30Q10 flow is used chronic calculations of ammonia and 30Q5, for human health chronic calculations. Acute ammonia calculations use the 1Q10 flow. See Part 2, Low Flow Conditions for complete list of low flows.
Qd1 = Current effluent **design** flow (ft^3/s) – static value in the spreadsheet
Qd2 = Proposed effluent design flow (ft^3/s) – static value in the spreadsheet
Cs = upstream concentration (calculated using EWQ—see below)
Cd1 = effluent concentration of the current facility
Cd1 with no permitted level and permitted level use the following:
1) If **POC is ammonia**, determine WQBEL for all discharges regardless of performance and use the maximum daily limit for FAC, MDEL calculations that involve Cd1. **All other POCs**, a reasonable potential analysis should be conducted for these POCs (POCs must not exceed water quality standards). Use the 99th percentile for all other POCs as Cd1.
2) For POCs with permitted levels, Cd1 should be the concentration in the permit (MDL).

Cd2 = effluent concentration of the proposed facility
FACratio = facility assimilative capacity (FAC) ratio (calculated or assumed)
Equal to FAC divided by the net increase in loading. If FAC is assumed, less than 10% should be used
CF = Conversion factors for assimilative capacity calculations are: 0.0054 for ug/L, 5.4 for mg/L

$$FAC = Cc(Q_s + Q_{d2}) - C_s(Q_s + Q_{d1})$$

Note: The FAC calculation uses the minimum of the aquatic life chronic or the drinking water criteria.

The upstream concentration, Cs, can be calculated as follows (AIP uses the symbol Cs as the combined facility contribution and upstream sources):

The upstream facilities concentrations and flows can be combined in the following equation:

$$Cs = ((Qc * EWQ) + (Qd2 * Cd2))/(Qc + Qd2)$$

Where: Qc = critical stream flow (cfs);
Qd2 = combined flow from facility #1 and #2 (cfs);
EWQ = stream concentration at upstream monitoring point (units depend on parameter); and
Cd2 = combined effluent concentration from current facility and upstream facility #1 and #2 (units depend on parameter).

4.3.5.1 Minimally-Degrading Effluent Limit (MDEL) Calculations

The question that remains unanswered in the AIP is whether the FAC ratio represents average or maximum assimilation conditions. The AIP defines the EWQ as being that assessed under critical conditions but does not define the condition upon which the FAC ratio represents. The argument for average conditions for the FAC ratio is muted when one considers the representation of MDEL value as pounds per daily. We assume this MDEL value represents a maximum daily value. We further require the use of a maximum value for the discharge concentration, either the permitted maximum daily limit or the 99th percentile of the discharge monitoring data.

The minimally-degrading effluent limit (MDEL) can be determined for many pollutants of concern. This MDEL value is first a concentration that is converted to a mass-based limitation and applied as a maximum daily limit (see Appendix E. Example #1). The MDEL concentration value is then compared to the WQBEL (see section below).

A confirmation that the MDL will produce less than 10% water quality degradation should be performed. The MDL is used in the net increase calculation for the proposed

load increase. The FAC value does not change in the new ratio and should return the less than 10% degradation assumed or calculated in the WLA.

4.3.5.2 Reasonable Potential Analysis to Exceed MDL of Minimally-degrading Effluent Limit

For existing discharges with pollutants other than conventional, to determine the need for permit limits of POCs, a reasonable potential analysis should be conducted. The consultant may complete the statistical analysis of the raw discharge monitoring data or department may complete this analysis (see Appendix A of *WQAR Instructional Guidance*). No POC may exceed the MDL of the MDEL developed in the preceding process. In the event of an exceedance, the applicant will receive the MDEL in the permit.

Future renewals will use the MDL of MDEL to compare with the resultant receiving water concentration to determine the RPTE for that POC. This fact should be referenced below the effluent limit summary table of the WQAR document.

4.3.5.3 Compare MDEL to Water Quality-Based Limit

The final step in the limit determination process is the comparison of the WQBEL and the MDEL. Water quality-based calculator shows the WQBEL calculation process for the POCs. If mixing is allowed for the water body, we apply the appropriate dilution calculation (i.e., ¼ of the flow value) to the mass balance equation. WLA and limit determination process follows the EPA's TSD [EPA/505/2-90-001] and procedures found in Appendix B of the *WQAR Instructional Guidance*.

By comparison, if the MDEL concentration value is greater than the water quality-based maximum and average monthly limits, only the water quality-based limits will apply. If the MDEL concentration value is less than the water quality-based maximum and average monthly limits, both the water quality-based limits and the MDEL maximum daily as a mass limit will apply. The WQBEL will be more stringent than the MDEL on occasions where mixing zone flow volume provides less dilution for the effluent concentration. The mixing zone flow is not used for the MDEL calculation.

4.3.5.4 Conventional Pollutants-WLA and Limits using Facility Assimilative Capacity

Conventional pollutants included biochemical oxygen demand (BOD), total suspended solids (TSS), pH, Escherichia coliform (E. coli), and oil and grease. For BOD and TSS, facility assimilative capacity cannot be determined by use of the AIP's assimilative capacity equations. Also, only E. coli and oil and grease have water quality standards for which to determine assimilative capacity, thus the AIP process above could be used for oil and grease. In all cases, if the waterbody has a Total Maximum Daily Load (TMDL) for a POC, then the WLA for that POC must be followed.

For the reasons provided below, when assigning permit limits we cannot use assimilative capacity for oil and grease, E. coli, BOD, TSS, or pH. For E. coli in the future, alternative permit limits that are protective of downstream recreational uses may be proposed with supporting additional decay studies.

Oil and Grease. If facility is a publically-owned treatment facility (POTW), the requirements in 10 CSR 20-7.031 Table A applies. Permit limits for oil and grease are routinely set to meet a MDL and average monthly limit (AML) of 15 mg/L and 10 mg/L, respectively. These limits are water quality based and created to prevent a sheen on surface water. Therefore, there are no antidegradation requirements for oil and grease beyond meeting the above limits.

BOD5. Streeter-Phelps or Qual2 water quality model should be used to verify that proposed BOD5 limits are protective of water quality criteria or existing water quality for dissolved oxygen. For a classified stream, results from the model will suggest discharging a BOD5 of XX mg/L that will result in a critical DO concentration that is below the existing water quality but must be greater than the DO criterion of 5.0 mg/L. The DO sag should be nearly restored in the classified segment with a small deficit of DO that does not significantly degrade water quality. This is necessary when minimal degradation is assumed for this POC. To show this, a simulation with the current facility flow and the proposed facility flow is necessary. The deficit difference between the current and proposed must be insignificant. A DO sag below the water quality standard is allowed in an unclassified stream but must be restored at the confluence with the classified waterbody. The WQAR should conclude that the proposed BOD5 concentration that is protective of DO criteria (See *DO Modeling Administrative Guidance* for further information).

Total Suspended Solids. Because TSS has no criterion, it is not possible to calculate an assimilative capacity. Therefore, for minimal degradation no antidegradation requirements are currently required for TSS beyond meeting regulatory effluent limits, or proposed limitation that meet water quality standard for BOD5 (TSS will mirror the limits of TSS as EPA indicated that treatment capacity typically is the same for both POCs), or a TMDL WLA.

pH. Because the criterion for pH is expressed as a range of values, it is not possible to calculate an assimilative capacity. Therefore, for minimal degradation, no antidegradation requirements are currently required for pH beyond meeting its regulatory effluent limitation or water quality standard criteria.

E. coli. Current requirements for E. coli are limited to default limits based on treatment system designed for removal of bacteria. The current effluent regulation allows decay considerations for discharges to unclassified stream.

If minimal degradation is proposed, determination of BOD5 and TSS limits are based on the capacity of the wastewater treatment, protection of the water quality standards, and existing water quality. TSS will mirror the limits of BOD5 as EPA indicated that treatment capacity typically is the same for both POCs. As stated above, the DO sag should be nearly restored in the classified segment with a small deficit of DO that does not significantly degrade water quality. Follow the department's *DO Modeling Administrative Guidance.*

Below is a list and brief description of revisions:

Version	Date Completed	Description
Version 1.0	December 22, 2009	Original version written by Todd Blanc.
Version 1.1	January 2, 2012	Revised by Todd Blanc.