IPDES Permit Writer Supplemental

In Support of…

Idaho Department of Environmental Quality
IPDES ELDG

Boise, Idaho
October 24, 2017

This page intentionally left blank.

Table of Contents

IPDES Permit Writer Supplemental

Introduction

This page intentionally left blank.

1 Introduction

Text to be inserted

The reference (DEQ 2017, Section #) is used throughout this document. The reference refers to the document State of Idaho, Department of Environmental Quality, Idaho Pollutant Discharge Elimination System, User's Guide to Permitting and Compliance, Volume 1 – General Information, April 2017. The reference is meant as a crosswalk between the documents.

This page intentionally left blank.

IPDES Permit Writer Supplemental

Process Application

This page intentionally left blank.

2 Process Application

IPDES permit applications received at DEQ shall be logged into the IPDES tracking system. The IPDES Program Manager shall assign each IPDES permit application to a Permit Writer.

2.1 Review Application

The Permit Writer shall review the IPDES permit application for completeness (DEQ 2017, Section 4). The completeness review shall be done within 30 days for new permits and 60 days for renewals. The following review shall be performed and documented.

1. Is the application on the correct form(s) and required information provided?
    a. If not, identify the deficiencies with instructions for submitting a complete application. Require the applicant submit modifications to the application.
2. Does the application include basic flow and parameter data or “n/a” where appropriate, and required signatures?
    a. If not, identify the deficiencies with instructions for submitting the data. Require the applicant submit modifications to the application.
3. Is the information in the application accurate? For example, does the address and outfall latitude/longitude seem appropriate, are concentrations within anticipated ranges such as for new facilities are the concentrations typical of the treatment process and for renewals are the concentrations typical of past performance and/or any changes in treatment?
    a. If not, identify the deficiencies with instructions for submitting the clarifications and/or corrections. Require the applicant submit modifications to the application.
4. Does the application have the information necessary to adequately characterize the nature and quantity of parameters in the effluent and their effect on the receiving water, including the use of sufficiently sensitive methods for analyses of parameters?
    a. Were the data collected from sufficiently identified, appropriate, and representative locations?
    b. Were the data collected within the last four and one-half years?
        i. Have any processes, conditions, and/or factors changed since the data were collected such that the data would not be representative of the permitted conditions?
    c. Were the data collected under a quality assurance program?
    d. Was a certified laboratory used to perform the analyses?
    e. Were the laboratory analyses performed using sufficiently sensitive methods (detection levels) as required by DEQ?
    f. Are there a minimum of three samples for each parameter?
    g. Are any of the data potentially not representative of the parameter in the water?
        i. The Permit Writer shall exclude outliers if reasonably explained as such by the applicant. The applicant should identify outliers in the data as the applicant most likely can also identify a cause, such as an anomalous flow or treatment issue potentially caused by maintenance or operations or an issue with the sampling collection, handling or analysis (especially

those defined as not meeting data quality objectives in a Quality Assurance Plan). However, the applicant may not recognize non-representative data. It is the Permit Writer's responsibility to examine the data for values that could skew permit requirements. Unfortunately, there is no rigid mathematical definition of what constitutes a non-representative value such as an outlier; determining whether or not an observation is an outlier is ultimately a subjective exercise.

   h. If no, then there are data gaps to adequately characterizing conditions. Recommend an option to start drafting the permit.
      i. Option 1. Enough information exists to draft the permit and data gaps will be addressed in the permit using monitoring requirements.
      ii. Option 2. Require the applicant submit application sampling plan to collect additional information to fill the data gaps before issuing a permit.
5. Are the calculations and flow diagrams in the application correct?
   a. If no, identify the required recalculation and/or clarifications with instructions for submitting the modifications. Require the applicant submit modifications to the application.
6. If there is supplemental information, is the information complete, clear, and correct?
   a. If no, identify the required additions, clarifications, and/or corrections with instructions for submitting the modifications. Require the applicant submit modifications to the application.
7. Is there a waiver, variance request, or administrative extension associated with the application?
   a. If yes and the application is otherwise complete, then the application is deemed complete (DEQ 2017, Section 8.3).

Incomplete applications shall either be supplemented with the information required to address missing contents or returned to the applicant for resubmittal prior to processing (DEQ 2017, Section 3.3.4).

The Permit Writer shall submit the completeness review documentation to the IPDES Program Manager.

2.2 Notify Applicant of Review

The IPDES Program Manager shall check the completeness review documentation. The IPDES Program Manager shall make the following determinations and perform the corresponding actions (DEQ 2017, Section 4.4).

1. Permit is complete.
   a. Use letter template DEQ-IPDES-AppComplete.
   b. State the permit application is complete and if there is an existing permit, it is administratively extended until the new permit is official.
   c. Identify the Permit Writer who will start drafting the permit.
   d. Send the letter (electronic correspondence notification) to the applicant.
2. Permit is complete with information gaps.

   a. Use letter template DEQ-IPDES-AppInfoGaps.
   b. State the permit is complete with information gaps and if there is an existing permit, it is administratively extended until the application is deemed complete or incomplete.
   c. Identify the information gaps.
      i. Option 1. State the information gaps will be addressed in the permit using monitoring requirements.
      ii. Option 2. Request the applicant fill the data gaps before issuing a permit. Provide instructions on the data collection, timeframe, and requirements. State whether the data gaps are minor and the Permit Writer will start drafting the permit or the data gaps are major and the Permit Writer will not work on the permit until these requirements are met by the applicant.
   d. Send the letter (electronic correspondence notification) to the applicant.
3. Permit is incomplete and if there is an existing permit, it is not administratively extended.
   a. Use letter template DEQ-IPDES-AppIncomplete.
   b. State the permit application is incomplete.
   c. Identify the deficiencies with instructions for submitting a complete application.
      i. State the Permit Writer will not work on the permit until these requirements are met by the applicant.
   d. Send the letter (electronic correspondence notification) to the applicant.

If the application is determined to be complete with data gaps or incomplete, the IPDES Program Manager and Permit Writer shall schedule a meeting with the applicant to discuss the deficiencies and required actions to be completed by the applicant before DEQ will start drafting the permit.

This page intentionally left blank.

IPDES Permit Writer Supplemental

Initiate Permit Development

This page intentionally left blank.

3 Initiate Permit Development

As directed by the IPDES Program Manager, the Permit Writer shall initiate preparation of the permit package (DEQ 2017, Section 5). The permit package includes the IPDES Permit and associated Fact Sheet. The Fact Sheet shall contain the supporting information, rationale for the permit conditions, and basis for effluent limitations, if needed.

The Permit Writer shall begin with the IPDES Permit and Fact Sheet templates that include the basic framework and standard conditions. Use the appropriate permit templates for the type of permit. For municipal permits use templates DEQ-IPDES-Permit and DEQ-IPDES-FactSheet. Complete the basic information, such as facility name, permit number, etc. The Permit Writer may strikethrough sections considered not applicable at this time to indicate these sections will not be kept or developed further and shall maintain these sections until the final draft version of the permit.

This page intentionally left blank.

IPDES Permit Writer Supplemental

Initiate Permit Analysis

This page intentionally left blank.

4 Initiate Permit Analysis

The Permit Writer shall use the standard technology based effluent limitations (TBELs) in the templates unless the TBELs are overridden by special considerations, such site specific WQBELs, or anti-degradation requirements (DEQ 2017, Section 5.1.2).

4.1 Receiving Water

Compile the available receiving water data from sources including the applicant's application, DEQ, other agencies, etc. Compile background information for water body characterization including: beneficial uses, 303(d) listings, applicable water quality criteria or site-specific criteria, and total maximum daily loads (if applicable). Review the quality of the data. Remove questionable, non-representative, and/or data outliers (DEQ 2017, Section 12.6.3). Use defensible methods and document the decisions. Address data gaps. If any processes, conditions, and/or other factors have changed such that the data would not be representative of the permitted conditions, do not use data from that period of record.

Calculate basic statistics to understand the variability of the receiving water data including minimum, median, geometric mean, average, 90^{th} percentile, 95^{th} percentile, and maximum. Review the data for seasonality patterns. Determine if the data should be parsed into unique seasons. Determine the critical receiving water flows from reference(s) and/or calculation(s), such as using DFLOW or equivalent, including, but not limited to, 7Q10, 30Q5, and harmonic mean.

4.2 Effluent

Compile the available effluent data from the application.

Calculate basic statistics to understand the variability of the data including minimum, median, geometric mean, average, 90^{th} percentile, 95^{th} percentile, maximum and coefficient of variation. Effluent data should be graphed to visually see the variability in treatment performance.

4.3 Parameter versus Water Quality Standards

The Permit Writer shall evaluate the reasonable potential to exceed water quality standards as instructed for each parameter.

4.4 Effluent Limitations

For parameters determined to warrant an effluent limitation, follow the parameter instructions about the effluent limit and the structure, e.g., seasonal, monthly, weekly, daily.

4.5 TMDL Wasteload Allocations

Check if there is a total maximum daily load (TMDL) for the receiving water and wasteload allocations (WLA). If there are, these supersede the effluent limitations. Check if the WLA explicitly defines the effluent limit and structure (frequency and duration) to satisfy the TMDL. If not, review the TMDL to identify whether it implicitly explains the intended effluent limit and structure. If not, use the effluent limitation structure as instructed for each parameter.

4.5.1 Distinction between TMDLs and NPDES Permits

Court rulings in TMDL lawsuits have found that some TMDLs did not comply with the Clean Water Act because they were not expressed as daily loads. As a result, EPA recommends that all TMDLs and associated load allocations (LAs) and wasteload allocations (WLAs) include a daily time increment in conjunction with other temporal expressions (e.g., annual, seasonal) that may be necessary to implement the relevant water quality standards (EPA 2006). For TMDLs in which it was determined that a non-daily allocation was more meaningful in understanding the pollutant/waterbody dynamics, EPA recommends that practitioners identify and include such an allocation, as well as a daily load expression with the final TMDL submission. This can provide NPDES permitting and the basis for other temporal expressions of effluent limits that are consistent with the TMDL.

NPDES permits limits are not required to be expressed as daily limits, nor are they required to be expressed in a form that is identical to the form in which a wasteload allocation is expressed in a TMDL. There is no statutory requirement that effluent limitations in NPDES permits necessarily be expressed in daily terms. NPDES permit limits need only be "consistent with the assumptions and requirements" of a TMDL's wasteload allocation (EPA 2006).

Permit writers have the flexibility to express effluent limits using an appropriate time frame consistent with the applicable water quality standard. Water quality standards include criteria for various pollutant parameters that are expressed in terms of differing temporal periods of duration, including hourly, daily, weekly, monthly, seasonal, and annual, as appropriate for each pollutant parameter (EPA 1991). Effluent limits in NPDES permits may be written in a form that complies with applicable water quality standards that use any of these various time measures.

4.6 Draft Permit Effluent Limitations Tables

Using the effluent limits and structure and fill in the effluent limitations table in the IPDES Permit and Fact Sheet templates.

4.6.1 Mixing Zone

The mixing zone analysis of dilution factors for the reasonable potential analysis will require several receiving water flow statistics be developed for each of the various seasons under consideration. This includes the following receiving water flow statistics:

- Acute dilution factor: 1Q10
- Chronic dilution factor: 7Q10
- Chronic Ammonia criterion dilution factor: 30Q10
- Human Health Non-carcinogen dilution factor: 30Q5
- Human Health Carcinogen dilution factor: Harmonic mean

4.6.2 Water Quality Offsets

The Permit Writer shall account for any offsets requested by the applicant in the development of effluent limitations. A water quality offset occurs when an applicant implements or finances the implementation of controls for point and/or nonpoint sources to reduce the levels of a parameter discharged by the applicant to provide capacity equivalent to, or greater than the discharge parameter. The purpose of a water quality offset is to sufficiently reduce the discharge of the parameter to levels in a water body so that the applicant's actions do not cause or contribute to a violation and so that they result in a net environmental benefit.

4.6.3 Watershed Permitting

See also Chapter 13 Watershed Permitting. The Permit Writer shall account for any watershed conditions as requested by the applicant for shared watershed loadings for combinations of sources in the development of effluent limitations. Watershed-based NPDES permitting is a process that addresses a variety of related water quality stressors within a hydrologic drainage basin for multiple sources, rather than individually addressing pollutant sources individually. Watershed-based permitting can encompass a variety of activities such as synchronizing permits within a basin; utilizing water quality-based effluent limits from multiple discharger modeling and analysis (e.g., Total Maximum Daily Loads, TMDLs); or apportioning a total shared (“bubble”) load among multiple facilities to foster intra-municipal trading.

4.6.4 Water Quality Trading

The Permit Writer shall account for any water quality trading as requested by the applicant in the development of effluent limitations. A water quality trade occurs when an applicant and one or more other party implements or finances the implementation of controls for point and/or nonpoint sources to reduce the levels of discharged to the receiving waters for a parameter to provide capacity equivalent or greater than the applicant’s discharge of the parameter.

4.7 Draft Permit Monitoring Tables

Modify the standard effluent monitoring tables in the IPDES Permit and Fact Sheet templates. Include in the monitoring tables those parameters for which effluent limits have been developed, as well as parameters for which, data are insufficient to conduct reasonable potential analysis, and those parameters for which a maximum reported effluent value falls within 95 percent of the aquatic life criterion, human health criterion, and/or other water quality standards applicable to the receiving waters.

4.8 References

EPA 2006. Ben Grumbles Memorandum. Establishing TMDL "Daily" Loads in Light of the Decision by the U.S. Court of Appeals for the D.C. Circuit. November 15, 2006.

EPA 1991. Technical Support Document for Water Quality-based Toxics Control. EPA/505/2-90-001. Office of Water. Washington DC.

This page intentionally left blank.

IPDES Permit Writer Supplemental

Evaluate Parameters (Parameter by Parameter Instructions)

This page intentionally left blank.

5 Evaluate Parameters (Parameter by Parameter Instructions)

The Permit Writer shall evaluate each parameter relative to water quality standards, TBELs requirements, and the potential need for WQBELs. Potential parameters subject to effluent limitations and associated guidance sections that provide permit development instructions are provided.

5.1 Parameter Introduction

Instructions are provided for the following parameters. For parameters not listed, follow the guidance for the parameter with the most similar characteristics that is provided. The following list is based on the parameters in the application form. This supplemental information as presented in the following sections is for parameters of particular interest and challenge for both the Permit Writer and applicant. These parameters necessitate the use of Clean Act Water methodologies other than those found in EPA's Technical Support Document for Water Quality-Based Toxics Control (TSD) (EPA 1991).

- Flow (not provided)
- Temperature
- pH (not provided explicitly, linked to nutrients)
- Biochemical oxygen demand (BOD-5, CBOD-5) (not provided explicitly, linked to nutrients)
- E. coli (not provided)
- Total suspended solids (TSS) (not provided)
- Ammonia
- Dissolved oxygen (not provided explicitly, linked to nutrients)
- Total Kjeldahl nitrogen (TKN) (not provided explicitly, linked to nutrients)
- Nitrate plus nitrite nitrogen (not provided explicitly, linked to nutrients)
- Phosphorus (not provided explicitly, linked to nutrients)
- Total dissolved solids (TDS) (not provided explicitly, linked to nutrients)
- Metals: antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, zinc
- Cyanide (not provided)
- Phenols (not provided)
- Toxics: volatile organic compounds, acid-extractable compounds, base-neutral compounds
- Nutrients

5.2 Parameter Calculations

The Permit Writer shall use the IDPES instructions for all parameters. When explicit instructions are not provided, the Permit Writer shall not default to EPA methodologies such as the TSD (EPA 1991). The Permit Writer shall adopt the instructions for the most similar and appropriate parameter for which instructions are provided.

5.2.1 Calculate Pollutant-Specific WQBELs using Probabilistic Methods

The Permit Writer may refer to the TSD (EPA 1991) for instructions regarding the use of probabilistic methods, including Monte Carlo. The standard mass balance steady-state equation can result in a single, worst-case concentration based on critical conditions that are unlikely to coincidentally occur. An alternative to the steady-state method is dynamic simulation using probabilistic techniques as outlined in the 1991 TSD. As described in the 1991 TSD (p. 98), probabilistic models "…use estimates of effluent variability and the variability of receiving water assimilation factors to develop effluent requirements in terms of concentration and variability..." and "…account for the daily variations of and relationships between flow, effluent, and environmental conditions and therefore directly determines the actual probability that a water quality standards exceedance will occur."

Monte Carlo analysis is a method for using the full probability distributions for each of the parameters in the mass balance approach to develop effluent limits. One application of a Monte Carlo simulation is to use the effluent and receiving water flow and concentration data and calculate the probability distribution for the downstream mixed conditions. With this Monte Carlo analysis, the Permit Writer can test multiple combinations of parameter values based on statistical distributions. The Permit Writer usually will have site-specific receiving water flow and ambient concentration data sets available to analyze for use in traditional deterministic permit calculations which can also be used to develop the probability distributions. A hypothetical example of the defining values for probability distributions of the receiving water and effluent parameters are shown in Table 5-1.

Table 5-1. Example of Probability Distributions for Receiving Water and Effluent.

Parameter	Mean	Standard Deviation	Minimum	Maximum
Receiving water flow (cfs)	1,183	1,663	86	9,560
Receiving water constituent (mg/L)	0.029	0.018	0.010	0.090
Effluent flow (cfs)	8.33	0.94	5.06	12.92
Effluent constituent (mg/L)	0.11	0.17	0.01	2.00

This particular example pertains to the application of Monte Carlo simulation to a nutrient such as phosphorus. The probability distributions are used within a model that performs Monte Carlo simulations to determine the effluent concentration for a range of downstream concentrations. Table 5-2 shows that if the receiving water target of 0.070 mg/L is interpreted as a 50th percentile value, that the mean effluent discharge concentration can be as high as 3.3 mg/L. If the receiving water target of 0.07 mg/L is required to be satisfied on a 95th percentile basis, then the effluent concentration can average 0.42 mg/L. Table 5-2 also shows that if the effluent is required to be the same concentration as the in-stream target at the end-of-pipe, then the resulting downstream concentration will be much lower than the criteria the vast majority of the time. The median (50th percentile) downstream concentration will be 0.026 mg/L. An effluent concentration of 0.070 mg/L results in a 95th percentile downstream concentration of 0.061 mg/L.

Table 5-2 Example Summary Statistics from Monte Carlo Simulation of Downstream Concentrations Resulting from Alternative Effluent Phosphorus Levels.

Effluent Characteristics	Resulting Downstream Concentration in mg/L	
	50%	**95%**
Mean 3.3 mg/L, Standard Deviation 0.17 mg/L	0.070 mg/L	0.204 mg/L
Mean 0.42 mg/L, Standard Deviation 0.17 mg/L	0.033 mg/L	0.070 mg/L
Mean 0.07 mg/L, Standard Deviation 0.17 mg/L	0.026 mg/L	0.061 mg/L

The resulting statistics of the Monte Carlo simulation can then be used to develop the permit limits. For non-toxic parameters, such as phosphorus used in this example, the Permit Writer will need to select the seasonality of the loading for effluent limitations. One possibility could be a March through October seasonal average limit of 18.8 lbs/day (0.42 mg/L x 8.33 cfs).

Another Monte Carlo simulation example is to use a mass balance model to calculate downstream concentrations of a toxic substance (i.e., zinc) and a parameter that affects toxicity (i.e., hardness) based on randomly simulated inputs per each repetitive calculation. Each variable (effluent and river flow, and effluent and river hardness and zinc concentrations) was simulated on a daily basis by randomly generating data based on the mean and standard deviation of each using a log-normal distribution using the program @Risk (Palisades Corp.) (Table 5-3). The mean and standard deviation of each parameter were selected to approximate the same hypothetical data set used for the steady-state analyses. This random simulation for each parameter for each day was done for a 21 year period (7,663 daily values).

Table 5-3. Example Summary of Statistical Characteristics of the Monte Carlo-Simulated Data where these Values were used as Inputs to Steady-State Methods.

	1Q10	7Q10	Mean	Standard Deviation	5th	95th	Geometric mean
River flow, cfs	138	258	NA	NA	NA	NA	NA
River zinc, µg/L	NA	NA	NA	NA	NA	5.3	2.2
River hardness mg/L	NA	NA	NA	NA	41	NA	59
Effluent. flow, mgd	NA	NA	20 design 14.5 daily 13.8 weekly	NA	NA	NA	NA
Effluent zinc, µg/L	NA	NA	15.8	6.9	NA	28.8	NA
Effluent hardness, mg/L	NA	NA	111	NA	87	NA	111

This process was repeated using successively different long-term average (LTA) effluent zinc concentrations until the model shows compliance with the water quality criteria for zinc. This is done separately for both acute and chronic criteria. The allowable frequency of excursion above the standard was once in 3 years (1 per 1095 days) as recommended in the TSD and included in Idaho water quality standards. The effluent LTA needed to protect for acute and chronic toxicity (LTAa and LTAc) obtained from the model outputs are used to calculate the Maximum Daily Limits and Average Monthly Limits (MDLa, MDLc AMLa, AMLc) using the TSD method. Note that the iterated LTAa and LTAc turned out to be 13.2 and 14.0 µg/L, respectively, for this Monte Carlo simulation, about a 9% reduction in the LTA compared to the originally simulated effluent dataset. Table 5-4 summarizes the outcome of the Monte Carlo simulation compared to a steady-state method. For this particular dataset, the Monte Carlo approach resulted in protective but less restrictive limits.

Table 5-4. Comparison of Monte Carlo and Steady-State Methods.

Effluent Limitation	Monte Carlo Method		Steady-State Method	
	Once per month sampling frequency	Four times per month sampling frequency	Once per month sampling frequency	Four times per month sampling frequency
Max. daily limit, µg/L	36	36	17	17
Average monthly limit, µg/L	33	24	13	10

Steady-State Method assumed 95th percentile zinc and 5th percentile hardness concentrations in the upstream receiving water.

Another application of Monte Carlo simulation is for WQBELs is for ammonia in relation to toxicity to aquatic life. Ammonia toxicity is related to pH, temperature and ammonia values in both the receiving water and effluent and sufficient data sets are often available for major municipal facilities to perform a robust Monte Carlo simulation. This may also be the case for Biotic Ligand Model (BLM) criteria, such as copper and zinc, that are related to an even larger number of environmental parameters in the effluent and receiving water (dissolved organic carbon, pH, temperature, anions, cations, etc.).

5.2.2 Permit Options for Impracticable WQBELs

The Permit Writer determines if the calculated specific WQBELs are impracticable. Examples of when WQBELs are impracticable include: treatment technology capabilities, natural background and legacy issues especially in the water supply, and lack of confidence in monitoring data due to a lack of approved methods, disparate detection limits, contamination issues, and blank correction methods. If the WQBEL cannot be met with treatment, then alterative(s) to effluent limit(s) will be included in the permit by the Permit Writer. When the WQBELs are determined to be impracticable, the Permit Writer will determine alternative permit options such as: permit variances, regional or statewide variances, management plans, minimization plans, intake credits, or collection of additional monitoring data.

Constituents that are likely to have impracticable WQBELs when conventional approaches are used are shown as examples in Table 5-5. Alternative permitting options should be considered by the Permit Writer when addressing these constituents. Setting effluent limitations for toxics, particularly at extremely low and unattainable levels, are frequently inappropriate and should be avoided. Instead, the Permit Writer is to use other conditions and approaches (e.g. variances; pollution minimization plans; integrated plans; toxics reduction strategies…).

The Permit Writer should consider inserting other regulatory approaches into the permit when an analysis would be based on poorly characterized receiving water and/or effluent. The Permit Writer should consider an enhanced monitoring effort where the water is poorly characterized. The Permit Writer may consider a minimization and/or source identification program. The results can support improvement to pollution minimizations plans, purchasing policies, and source specific pretreatment requirements. The Permit Writer can consider more in-depth studies of the pollutant and its potential impact on the receiving water such as a Biotic Ligand Model (BLM study), fisheries study, evaluation of hardness, management plans, and/or other studies. Another approach for the Permit Writer to consider is an assessment of the subcomponents of a pollutant, for example, individual congeners or a smaller sub-set of the congeners occurring or responsible for the majority of the Human Health risk.

Table 5-5. Examples of Impracticable WQBELs determinations and Permit Options.

Parameter	Analysis and Determination	Permit Option	Reference Example
Arsenic	Effluent concentration similar to source water, source water much higher than applicable criterion, WQBELs not achievable with existing treatment technologies	Intake credit, variance	Oregon DEQ “intake credit” provision in NPDES regulations
Bis(2-ethylhexyl) phthalate	Infeasible to achieve reliable samples without contamination	QAPP addresses contamination issues in future monitoring	City of Meridian, ID NPDES Permit ID0020192
Mercury	Specific sources	Variance and minimization plans; watershed fish tissue monitoring	West Boise Wastewater Treatment Facility, City of Boise NPDES Permit ID-002398-1
Polychlorinated biphenyl (PCBs)	Low detection level method not approved, blank correction issues, multiple congeners to assess	Toxics management plan rather than WQBELs, congener-specific management plan, QAPP addresses blank contamination	City of Coeur d’Alene Wastewater Facility Permit ID0022853

5.3 References

EPA 1991. Technical Support Document for Water Quality-based Toxics Control. EPA/505/2-90-001. Office of Water. Washington DC.

IPDES Permit Writer Supplemental

Temperature

This page intentionally left blank.

6 Temperature

6.1 Introduction ("One-Page" Summary)

Pollutant: Temperature.

Water Quality Impact: Temperatures/thermal loads at levels that may negatively affect plants, ecosystem composition, and fish.

Toxic? No.

Numeric Standard: Yes. Refer to current IDAPA.

Narrative Standard: Yes. Refer to current IDAPA.

Permitting Considerations: Temperature is not a toxic pollutant under the Clean Water Act (CWA) and thus the need for effluent limits should be evaluated differently. For many facilities there are no cost-effective treatment options for temperature, and cooling towers and chillers are expensive and not environmentally responsible (very high energy use and associated greenhouse gas emissions). Many NPDES permits have not historically regulated temperature as a problem pollutant, thus the permit manager should use the next permit cycle to collect enough temperature data during the critical season to make this determination. Data should be collected to characterize effluent and background receiving water temperatures, and the available dilution during critical conditions. Also be aware that Section 316(a) of the CWA, and associated DEQ rules and guidance, provide alternative permitting approaches specifically related to temperature.

Determination of Need

1) For re-issued permits, are there requirements for a water quality based limit in the existing permit?
   a) Review current standards, treatment, receiving water and beneficial use conditions. Is removal of the effluent limit possible and consistent with anti-backsliding?
   b) Otherwise assess need for stricter requirements (e.g. a new TMDL); if stricter requirements are not necessary, maintain existing permit requirements.
2) Determine if there is a basis for the permit to include WQBELs pollutant requirements or effluent limitations.
   a) Check if a TMDL has been finalized for the receiving or downstream water body since the issuance of the existing permit. Identify wasteload allocation (WLA) and methodology for determination in the TMDL.
   b) Check if a TMDL is pending for the receiving or downstream water body. Discuss with DEQ management if these affect permit writing (e.g., need for specific performance based requirements).
   c) Check if water temperatures are impacting beneficial uses. Generally this is done by comparing water temperature standards in degrees to monitoring data and calculating the percent exceedance. If so, when does this occur, infrequently, specific hours,

specific seasons, etc. If Section 316(a) demonstration has been or will be prepared by the applicant, and is determined by DEQ to be a possible approach, can alternative thermal effluent limits (ATELs) be established to protect the Balanced Indigenous Community (BIC)?

Formulation of Requirement

1) If effluent limitations are reliably achievable, follow IDPES guidance for calculating limits.
2) If effluent limitations are not reliably achievable, use regulatory approaches in the permit and meet with applicant.
    a) Can an extended mixing zone be used?
    b) Can Section 316(a) be used or has it been requested by the applicant?
    c) Can performance-based limits, which may include alternate O&M methods or BMPs, be established?
    d) Can the effluent not be discharged to the receiving water during critical periods?
    e) Can a watershed or combined load (bubble) permitting approach be used?

Example

316(a) Demonstration Approach: ATELs established based on historical performance of the facility (maximum expected effluent temperatures per month or season) and justified by site-specific evaluations of how these ATELs are protective of the BIC in the river. For an existing discharge, this can be done with an upstream-downstream comparison of biological information showing no appreciable harm, for the future design case by thermal modeling and biothermal attributes and requirements of the BIC.

<A cross-reference could be provided to a Boise River 316(a) process when it has been accepted for permitting.>

6.2 Background

A number of industrial facilities in Idaho discharge cooling water and/or industrial process wastewater that have temperatures higher at times than the ambient receiving waters. In addition, facilities such as publicly owned treatment works (POTWs) also have a heat load (thermal load) when the effluent temperature is higher than that of the ambient receiving water. Municipal wastewater is warmed during treatment processes by a variety of mechanisms, including solar radiation on open tanks and air injected into the wastewater for aeration used to support biological treatment.

Temperature is not a toxic pollutant under the Clean Water Act and thus the need for limits (reasonable potential analysis) and effluent limits calculations (if needed) should be evaluated differently than for toxics. This has been recognized by DEQ in other guidance (Idaho Mixing Zone Implementation Guidance, December 2016, see page 4):

> “The TSD was written to specifically address toxic pollutants for which acute and chronic criteria were developed. Its procedures should be modified when addressing nontoxic pollutants such as phosphorus, sediment, bacteria, or temperature.”

The “TSD” referenced above is the Technical Support Document for Water Quality-Based Toxics Control (EPA, 1991).

6.3 Identify Applicable Water Quality Standards

Applicable water quality standards for temperature are described in Section XX of the ELDG, and that information is thus not replicated here. Of importance is the fact that all receiving waters in Idaho vary considerably on a seasonal basis, and designated uses such as Cold Water Aquatic Life and Salmonid Spawning, and associated numeric criteria, also have specific seasonal components. These may be identified in the water quality standards on site-specific basis (such as the Boise River).

6.4 Characterize Receiving Water

Many of the considerations for the receiving water identified in Section XX also pertain to temperature, and in particular how the natural hydrology in much of Idaho has been substantially altered by water management facilities and activities. Hydrologic alteration, in many cases, substantially changes the natural temperature regime. One key and common situation in Idaho is storage of water in large reservoirs that thermally stratify, with release from low level outlets during the summer irrigation season. This water management shifts water temperatures downstream on a seasonal basis because the reservoirs act as “thermal capacitors,” storing cold snow melt runoff in spring and early summer, releasing colder hypolimnetic (bottom) water during the summer, and then releasing warmer water than would be present naturally during the fall and early winter seasons when air temperatures fall faster than released water temperatures. Another common hydromodification in Idaho is diversion of water from rivers and streams for various uses, including domestic and industrial water supplies and irrigation water. Reduction in stream and river flow may allow more solar warming than would otherwise occur naturally. Thus, hydromodifications can either decrease or increase water temperatures compared to natural conditions, or even both on a seasonal basis.

Another critical consideration for temperature is that many streams and rivers in Idaho naturally warm longitudinally as water flows downstream due to solar radiation inputs and hot air temperatures in our semi-arid and hot climate (especially southern Idaho). Thermal discharges will also tend to equilibrate to ambient temperatures downstream of the discharge. This is because temperature is a “non-conservative” pollutant. Below is a relevant discussion taken from Washington Department of Ecology guidance (Water Quality Program Guidance Manual, *Procedures to Implement the State’s Temperature Standards through NPDES Permits, Revised October 2010*):

> “Non-conservative pollutants are defined as those that are mitigated by natural biodegradation or other environmental decay or removal processes in the receiving stream after in-stream mixing and dilution have occurred. The concentration of non-conservative pollutants is reduced after they are discharged into the receiving stream as a result of these removal processes.
>
> The temperature in effluent is considered a non-conservative pollutant and is reduced (i.e., cooled) after it is discharged into a cooler receiving stream. Cooling happens as a

> result of the transfer of thermal energy from the warmer effluent to the cooler stream and the thermal energy loss associated with evaporation of the effluent/ receiving water mixture. The rate of effluent temperature reduction is dependent upon many factors: dew point, radiant energy from the sun, receiving water surface temperature, flow, and currents and tides.
>
> It is important to remember that thermal energy is not "in" the water in the same sense that copper atoms and ammonium ions are in water. Thermal energy is absorbed by the water molecules, which is manifested as temperature and a property of the water."

In addition to characterizing seasonal flows and temperatures, it may also be important or necessary to compile available aquatic biological data for the receiving water, especially data regarding the fish and benthic macroinvertebrate communities upstream and downstream of effluent discharges. The biological data will be critical if any of the alternative regulatory approaches described in Section XX below are to be considered.

6.5 Characterize the Effluent

Effluent temperatures, especially for POTWs, can vary widely over the course of the year in relation to seasonal water temperatures in wastewater coming into the facility, process operations, and solar radiation. As noted above, receiving waters also vary considerably on a seasonal basis, and as noted below, the applicable water quality standards also have a seasonal component. As a result, it will be typical to characterize the effluent temperatures on a seasonal or similar long averaging period basis that aligns with the receiving water characteristics and water quality standards.

Another aspect of effluent characterization pertains to evaluation of the thermal plume and associated mixing zone. Section XX of DEQ's ELDG (DEQ, 2017) identifies specific considerations when evaluating thermal plumes:

> "DEQ will consider whether the heat in the discharge will cause unreasonable interference with, or danger to, beneficial uses as well as, the limitations expressed in *EPA Region 10 Guidance for Pacific Northwest State and Tribal Temperature Water Quality Standards* (EPA 2003). Thermal plumes should not cause: impairment to the integrity of the aquatic community, including interfering with successful spawning, egg incubation, rearing, or passage of aquatic life; and, thermal shock, lethality, or loss of cold water refugia (IDAPA 58.01.02.060.01.d). To minimize or avoid these types of unreasonable interference, the following will be considered when conducting a mixing zone analysis (EPA 2003):
>
> - Within 2 seconds of plume travel from the point of discharge, maximum temperatures should not exceed 32 ºC.
> - The cross-sectional area of the receiving water body exceeding 25 ºC should be limited to less than 5%.
> - The cross-sectional area of the receiving water body exceeding 21 ºC should be limited to less than 25%, or if upstream temperatures exceed 21 ºC, then at least

75% of the receiving water body should not have temperature increases of more than 0.3 ºC.

- In spawning and egg incubation areas, the maximum weekly maximum stream temperatures should not exceed 13 ºC, or the temperatures should not be increased by more than 0.3 ºC above ambient stream temperatures during times when spawning and incubation occur."

Field monitoring and mixing zone studies using computer models such as CORMIX and Visual Plumes are typically used to assess the effluent discharge in the context of these thermal plume criteria.

6.6 Evaluate Need for WQBELs

The reasonable potential analysis (RPA) for temperature in Idaho generally will be dictated primarily by temperature impairment listings (Category 5 of the Integrated Report) and related Total Maximum Daily Load (TMDL) processes. If a TMDL has been completed and approved then the temperature limits in a permit must be consistent with the wasteload allocation in the TMDL. If there is no impairment identified for a water body receiving a thermal discharge, and if a TMDL has not been scheduled or completed and approved by EPA, then it will be premature to consider effluent limits for temperature in a permit being developed. Additional temperature and other receiving water and effluent monitoring may be appropriate in these cases depending on existing data availability for listing decisions.

In some cases, the need for WQBELs for temperature may be determined even in the absence of impairment listings or TMDLs. This will not be the norm for most permits. In these cases, the various complexities and considerations associated with temperature in the sub-sections above and below will have to be considered and addressed, especially the alternative regulatory approaches in Sections 6.7.2 and 6.8.3.

6.7 Regulatory Approach

6.7.1 Traditional Regulatory Approaches

As noted above, if receiving waters have been listed as impaired for temperature, the most typical process will be to incorporate permit conditions consistent with the TMDL WLA for the specific IPDES applicant.

In unusual circumstances a particular facility may be discharging effluent (including industrial cooling water) that is warm enough and in sufficient loading to have, in and of itself, the reasonable potential to cause or contribute to exceedances of applicable temperature criteria for the specific receiving water in the vicinity of the discharge. Some of these discharges may be subject to the alternative approaches in Section 6.7.2 such as the 316(a) process, but others may be more appropriately addressed with a more traditional process outlined in this sub-section.

The more typical application of a traditional process may involve an industrial process or cooling water discharge. Municipal discharges in Idaho generally do not have effluent temperatures higher than the low to mid 20 degree Celsius range, but some industrial process or cooling water discharges may have higher effluent temperatures, some in the low- to mid-30s degree Celsius range. Such warmer discharges not only exceed ambient temperature criteria but may also exceed, at end of pipe, the thermal plume criteria noted in Section 6.5. Consequently, these warmer discharges may have reasonable potential and the need for limits depending on the amount of dilution allowable and other site specific considerations associated with the specific applicant and receiving water.

In higher dilution situations for these warmer discharges, the mixing zone dilution provisions may allow discharge without further need to reduce effluent temperatures or implement other compliance measures. For existing permits that are being reissued, it is likely that these issues have been adequately addressed in previous permit cycles. For new or proposed discharges, or for permits that have not addressed these in recent years (e.g., older administratively extended permits), these considerations will have to be addressed in the permit issuance process.

In these instances, where permit limits that account for allowable dilution and other site-specific factors may still lead to the need for limits that are lower than existing or proposed effluent discharge temperatures, limits and compliance schedules as appropriate will have to be established in the permit. If such limits and schedules are not feasible for the applicant to achieve, alternative approaches should be considered.

As noted earlier, standard TSD procedures to address temperature limits as if it were a toxic parameter are not appropriate or applicable. <Placeholder to add more guidance on this.>

6.7.2 Alternative Regulatory Approaches

Alternative regulatory approaches for temperature include Use Attainability Analyses (UAA) and general water quality standards variances. UAAs may be appropriate because many water bodies in Idaho have not been assigned formal use designations, and undesignated water are presumed by default to support Cold Water Aquatic Life. Standards variances and site-specific criteria may also be appropriate for some receiving waters. Another alternative regulatory approach pertaining specifically to temperature is the 316(a) variance process, described in Sections XX to XY below.

6.8 Determine Interim and Finals WQBELS (if needed)

6.8.1 Interim Limits

Interim limits are often used during compliance schedule periods so that effluent quality is maintained and related receiving effects are minimized or avoided until the final limits are achieved by the applicant. Sometimes these are set based on recent historical performance by the facility, referred to as performance-based limits. These limits are sometimes set as 95^{th} or 99^{th} percentile values, and in the case of temperature should be set as the maximum values for the applicable permit averaging period (e.g., maximum daily, weekly average, or monthly average) within the last several years.

Interim limits for temperature that are performance-based should consider potential climate change impacts to wastewater temperatures over the period of time in which the limits are expected to be in effect. Several key reports have been published documenting the effects of climate change (USDA 2016, EPA 2014). To quantify localized impacts of climate change on stream water temperature, the Permit Writer can utilize the modeling resource provided by the NorWest project, a multi-agency collaborative led by researchers the U.S. Forest Service Rocky Mountain Station. For example, NorWest provides projected increases in average August stream temperatures calculated as the difference between a 1993-2011 baseline estimate and a 2040 projection, and the Boise River at Veterans Parkway Bridge is expected to increase 1.2 °C by 2040. As a reasonable approximation, the increase in effluent temperature can be scaled to projected stream or river temperature increases.

The Idaho temperature standards also provide for an air temperature exceedance exemption that provides an approach for compliance during extremely hot air temperature periods. This exemption should be evaluated by the permit writer in the context of assessment of historical effluent, river and air temperatures as it pertains to reasonable potential and limits calculations. <Note: alternative exemption language may be requested in permit applications or reapplication, such as the City of Boise has requested in its permit reapplication.>

6.8.2 Final Temperature Limits

For the vast majority of permits, final temperature limits should be based on TMDL wasteload allocations or an alternative regulatory process described in Section XX such as the 316(a) variance demonstration.

6.8.3 316(a) Temperature Variance

The regulatory process followed in a 316(a) variance demonstration is summarized in Figure 6-1. The numbers in each box pertain to the major section numbers from a typical report outline for a 316(a) demonstration. This figure was developed consistent with federal and state regulations and guidance as summarized in Sections XX and XX below.

The left side of Figure 6-1 pertains to the short-term applicability of the 316(a) process for existing and near-term effluent discharges (that is, for the next permit cycle or so). This short-term application is based on EPA regulations for existing discharges that cause “no appreciable harm” per 40 Code of Federal Regulations (CFR) 125.73(c)(1).

The right side of this figure pertains to the longer-term applicability of the 316(a) process for future growth and development that is expected to occur in a city over time to the point where design flows are being treated at each POTW. Thus, the modeling for the thermal mixing zones and far-field thermal modeling at design flow conditions are integrated with the biothermal assessment to demonstrate that the balanced indigenous community (BIC), as characterized by representative important species (RIS), will be protected at these future conditions for the thermal component of those discharges.

Error! Reference source not found. also shows the inter-relationship between the short-term process and longer-term process, and the concept that the longer-term implementation of the process involves periodic monitoring and potential reassessment (e.g., for each 5 year permit cycle).

6.8.3.1 FEDERAL REGULATIONS AND GUIDANCE FOR 316(A) DEMONSTRATIONS

EPA's regulations pertaining to thermal discharges pursuant to Section 316(a) of the Clean Water Act are found at 40 CFR 125.70 through 125.73. The implementation of Section 316(a) thermal variances in NPDES permits is further summarized in an EPA memorandum from James A. Hanlon, Director of the Office of Wastewater Management, to EPA Water Division Directors in Regions 1–10 dated October 28, 2008. These regulations and memo identify several key regulatory elements applicable to a 316(a) demonstration:

> 40 CFR 125.73(c) provides direction for existing discharges in relation to the demonstration of "no appreciable harm."
>
> 40 CFR 125.71(a) defines alternative effluent limitations as "… all effluent limitations or standards of performance for the control of the thermal component of any discharge which are established under section 316(a) …"
>
> 40 CFR 125.71(c) and the EPA memo define BIC as:
>
>> "… a biotic community typically characterized by diversity, the capacity to sustain itself through cyclic seasonal changes, presence of necessary food chain species and by lack of domination by pollution tolerant species. Such a community may include historically non-native species introduced in connection with a program of wildlife management and species whose presence or abundance results from substantial, irreversible environmental modifications. Normally however, such a community will not include species whose presence or abundance is attributable to the introduction of pollutants that will be eliminated by compliance by all sources with section 301(b)(2) of the [Clean Water] Act; and may not include species whose presence or abundance is attributable to alternative effluent limitations imposed pursuant to section 316(a)."

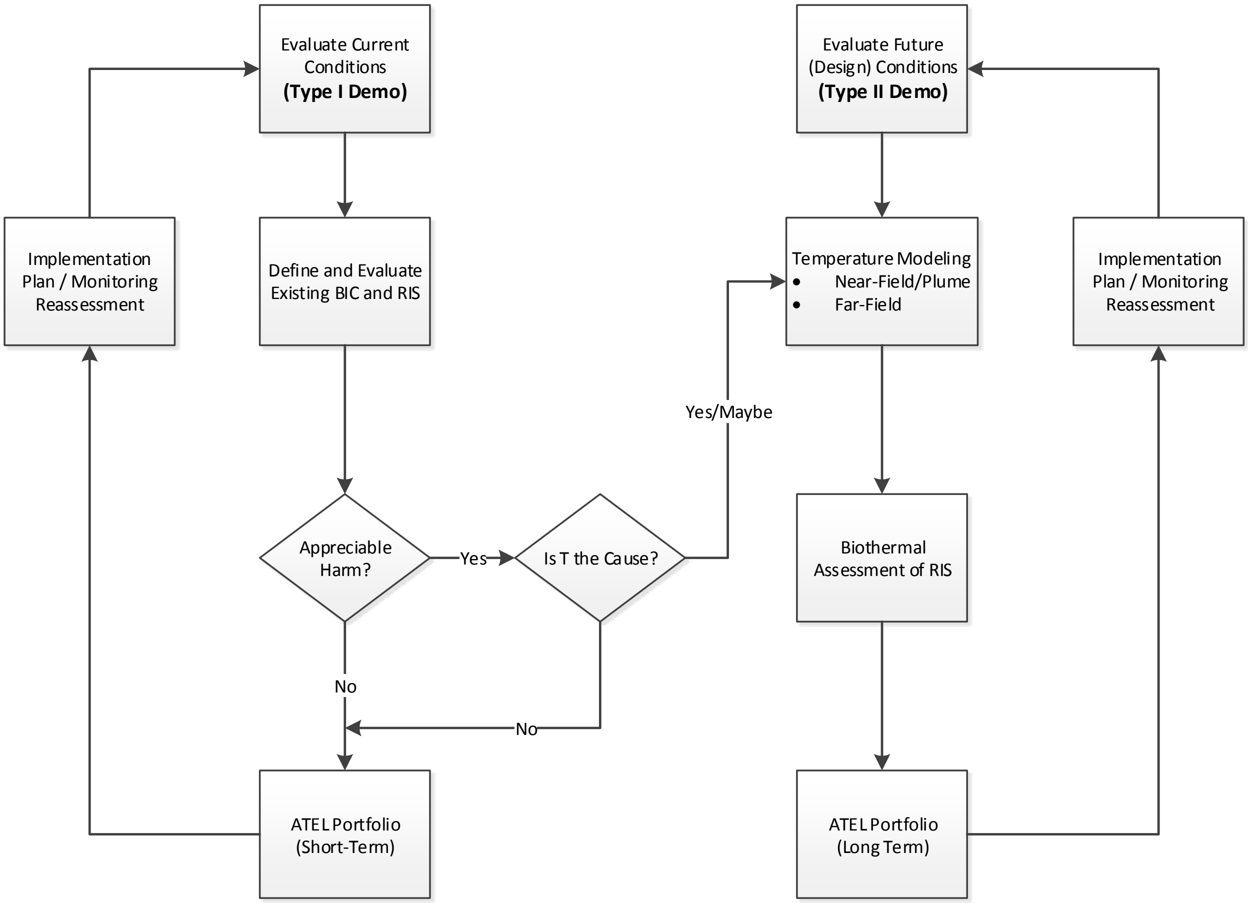


Figure 6-1. 316(a) Bioassessment Methodology

6.8.3.2 IDAHO REGULATIONS AND GUIDANCE FOR 316(A) DEMONSTRATIONS

DEQ has promulgated IPDES regulations at Idaho Administration Procedures Act (IDAPA) 58, Title 01, Chapter 25 (IDAPA 58.01.25). These state regulations have been adopted by the DEQ board and approved by the Idaho legislature. These regulations mirror, are consistent with, and cite the applicable federal regulations noted in Section XX. These rules become effective with EPA's approval of the IPDES program. In addition, DEQ has developed IPDES guidance, including elements specific to 316(a) demonstrations and variances. These 316(a) elements are consistent with the EPA and state regulations cited above (DEQ, User's Guide to Permitting and Compliance, Volume 1—General Information, June 2016). Section 8 of that guidance addresses variances, including Section 316(a). Table 5 in Section 8 establishes that 316(a) variances are applicable to industrial facilities and publicly owned treatment works (POTWs).

<Additional sections and detail regarding, and/or cross-reference to, the 316(a) process for rivers such as the Boise River can be added when that is accepted for permitting.>

6.9 References

Text to be inserted

This page intentionally left blank.

IPDES Permit Writer Supplemental

Ammonia

This page intentionally left blank.

7 Ammonia

7.1 Introduction ("One-Page" Summary)

Pollutant: Ammonia

Text to be inserted

Water Quality Impact: Text to be inserted

Toxic? Yes.

Numeric Standard: Text to be inserted.

Narrative Standard: Text to be inserted.

Permitting Considerations: Text to be inserted

Determination of Need

Text to be inserted

Formulation of Requirement

Text to be inserted

Example of Seasonal NPDES Effluent Limitations Permit Structure

Text to be inserted

7.2 Identify Applicable Water Quality Standards

Text to be inserted

7.3 Characterize Receiving Water

Text to be inserted

7.4 Characterize the Effluent

Text to be inserted

7.5 Evaluate Need for WQBELs

Text to be inserted

7.6 Regulatory Approach

Text to be inserted

7.7 Determine Interim and Finals WQBELS (if needed)

Text to be inserted

7.8 References

Text to be inserted

IPDES Permit Writer Supplemental

Metals

This page intentionally left blank.

8 Metals

8.1 Introduction ("One-Page" Summary)

Text to be inserted

Pollutant: Ammonia

Text to be inserted

Water Quality Impact: Text to be inserted

Toxic? Yes.

Numeric Standard: Text to be inserted.

Narrative Standard: Text to be inserted.

Permitting Considerations: Text to be inserted

Determination of Need

Text to be inserted

Formulation of Requirement

Text to be inserted

8.2 Identify Applicable Water Quality Standards

Text to be inserted

8.3 Characterize Receiving Water

Text to be inserted

8.4 Characterize the Effluent

Text to be inserted

8.5 Evaluate Need for WQBELs

Text to be inserted

8.6 Regulatory Approach

Text to be inserted

8.7 Determine Interim and Finals WQBELS (if needed)

Text to be inserted

8.8 References

Text to be inserted

IPDES Permit Writer Supplemental

Toxics (Aquatic WQS)

This page intentionally left blank.

9 Toxics (Aquatic WQS)

9.1 Introduction ("One-Page" Summary)

Pollutant: A broad group of chemicals with negative effects on aquatic organisms. Individual toxics may be described further.

Water Quality Impact: Surface waters of the state must be free from toxic substances in concentrations that impair designated beneficial uses. A toxic substance is a substance that can cause disease, malignancy, genetic mutation, death, or similar consequences such are reduced growth and reproduction for aquatic organisms. Impacts can be acute and/or chronic.

Toxic? Yes.

Numeric Standard: Yes, for numerous criteria. Refer to current IDAPA.

Narrative Standard: Yes. Refer to current IDAPA.

Permitting Considerations: Setting effluent limitations for toxics, particularly at extremely low and unattainable levels, are frequently inappropriate and should be avoided. Instead, the Permit Writer is to use other conditions and approaches (e.g. variances; pollution minimization plans; integrated plans; toxics reduction strategies). In addition, some toxics, such as PCBs and phthalates, have extremely low criteria that can only be measured using sampling and analytical procedures that can be highly influenced by incidental sample contamination

Determination of Need

1) For re-issued permits, are there requirements for a water quality based limit in the existing permit?
    a) Review current standards, treatment, receiving water and beneficial use conditions. Is removal of the effluent limit possible and consistent with anti-backsliding?
    b) Otherwise assess need for stricter requirements (e.g. a new TMDL); if stricter requirements are not necessary, maintain existing permit requirements.
2) Determine if there is a basis for the permit to include water quality based pollutant requirements or effluent limitations.
    a) Assess reasonable potential to exceed to determine whether an effluent limit is required (e.g., discharge-specific effects on the water body).
        i) If data are limited, questionable quality, and/or poorly characterized receiving water and/or effluent, the Permit Writer should include in the permit an enhanced monitoring effort and no effluent limitations.
        ii) How to do RPA with non-detects?
            (1) Laboratory analysis of monitoring data may generate results that fall below the detection limit (DL) of the analytical procedure and designated as not detected or non-detects. Non-detects indicate that the concentration of the chemical is unknown and lies somewhere between zero and the detection limit. EPA has published guidance on analytical values below detection limits (EPA 2000).

(2) EPA's suggested procedures for dealing with non-dects depend on the amount of data below the detection limit. For relatively small amounts below detection limit values, replacing the non-detects with a small number and proceeding with the usual analysis may be satisfactory. For moderate amounts of data below the detection limit, a more detailed adjustment is appropriate.

(3) It is important to note that EPA's suggestion that non-detects might be replaced with assumed values, such as one-half of the detection limit or the value of the detection, are not appropriate for all circumstances and are not recommended by EPA. EPA suggests a variety statistical methods to evaluate data that include values below the detection limit, depending upon the range of non-detects as a percentage of the total number of samples; less than 15%, between 15% and 50%, and greater than 50% to 90% of the samples. Only in situations with a small percentage of non-detects, less than 15%, does EPA suggest replacement with assumed values, such as one-half of the detection limit or the value of the detection limit (EPA 2000).

(4) Overall, EPA notes that if the number of sample observations is small (n<20), the statistical methods for dealing with non-detects can produce biased results since the methods are valid only if the number of samples is large (EPA 2000).

(5) When monitoring data sets are dominated by non-detects, the Permit Writer should include enhanced monitoring requirements in the permit to obtain a reliable data set that supports a valid reasonable potential analysis where the conclusions are not controlled by assumed values substituted for non-detects.

b) Check if a TMDL has been finalized for the receiving or downstream water body since the issuance of the existing permit. Identify wasteload allocation (WLA) and methodology for determination in the TMDL.

c) Check if a TMDL is pending for the receiving or downstream water body. Discuss with DEQ management if these affect permit writing (e.g., need for specific performance based requirements).

3) Determine if water quality based pollutant requirements or effluent limitations could currently be met at the facility or with foreseeable upgrades.

Formulation of Requirement

1) If effluent limitations are reliably achievable, follow typical IDPES ELDG guidance for calculating limits (e.g., TSD-based).
2) If effluent limitations are not reliably achievable, use other regulatory approaches in the permit.
3) If the toxic has very low level criteria, and sampling and analysis is commonly subject to incidental contamination, require monitoring with a QAPP tailored to how to address blank contamination. Reevaluate the need for effluent limitations in the subsequent permit cycle.
4) The Permit Writer may use a minimization and/or source identification program.
   a) If data exist and/or can be collected about the pollutant and its potential impact on the receiving water, then Permit Writer should require more in-depth studies of the pollutant such as fisheries study, evaluation of hardness, management plans, and/or other studies.

b) If data exist and/or can be collected showing source control is important, then pollution minimizations plans, purchasing policies, and/or source specific pretreatment requirements should be required.
c) If the pollutant has complex, multiple forms (such as PCBs), then the Permit Writer should require studies of the subcomponents of the pollutant and the majority of the Human Health risk.

Example

The applicant must submit a Toxics Management Plan (TMP). The goal of the TMP must be to reduce loadings of toxics to the receiving water to the maximum extent practicable. The TMP must address source control and elimination of toxics as follows:

a) From contaminated soils, sediments, storm water and groundwater entering the POTW collection system via inflow and infiltration.
b) From industrial and commercial sources.
c) The applicant must not allow any person to discharge to the POTW water containing toxic in excess of any applicable pretreatment local limit established by the POTW.
d) By means of eliminating existing sources that are within the direct control of the applicant.
e) By means of changing the applicant’s procurement practices, control and minimize the future generation and release of toxic that is within the direct control of the applicant, including preferential use of toxic free substitutes for those products containing toxics below the regulated level.
f) The applicant, either individually or in collaboration with other dischargers to the receiving water, must develop or implement a public education program to educate the public about toxic.
g) The education program must include distribution of appropriate educational materials to the target audiences at least once per year.
h) At least once per year, the applicant must prepare and distribute appropriate information relevant to the TMP to a newspaper(s) of general circulation within the jurisdiction(s) served by the POTW that provide(s) meaningful public notice.
i) The applicant must make all relevant TMP documents available to the public.

The applicant must submit an annual report. Each annual report must contain the following information:

a) Monitoring results for toxic for the previous 12-month period, including laboratory data sheets with full documentation including MDLs, RLs, etc.
b) Copies of education materials, ordinances (or other regulatory mechanisms), inventories, guidance materials, or other products produced as part of the TMP.
c) A summary of the actions taken to reduce discharges of toxics during the previous 12-month period.
d) A description and schedule for implementation of additional actions that may be necessary, based on monitoring results, to ensure compliance with applicable water quality standards.

e) A summary of the actions the applicant plans to undertake to reduce discharges of toxics during the next reporting cycle.

9.2 Identify Applicable Water Quality Standards

Text to be inserted

9.3 Characterize Receiving Water

Text to be inserted

9.4 Characterize the Effluent

Text to be inserted

9.5 Evaluate Need for WQBELs

Text to be inserted

9.6 Regulatory Approach

Text to be inserted

9.7 Determine Interim and Finals WQBELS (if needed)

Text to be inserted

9.8 References

EPA 2000. Guidance for Data Quality Assessment; Practical Methods for Data Analysis. EPA/600/R-96/084. July 2000.

IPDES Permit Writer Supplemental

Toxics (Human Health WQS)

This page intentionally left blank.

10 Toxics (Human Health WQS)

10.1 Introduction ("One-Page" Summary)

Pollutant: A broad group of chemicals with negative effects on humans. Numeric human health criteria are based on protection from consumption of fish and shellfish, and drinking water. They are based on the toxicity of individual chemicals to humans, and the bioaccumulation of those chemicals in fish consumed by humans.

Water Quality Impact: Section 303(c)(2)(B) of the Clean Water Act (CWA) requires States to adopt criteria for all toxic pollutants that EPA has identified under section 307 of the CWA, and for which EPA has published recommended criteria under section 304(a). Surface waters of the state must be free from toxic substances in concentrations that impair designated beneficial uses. A toxic is a substance that can cause disease, malignancy, genetic mutation, death, or similar consequences.

To meet requirements of the CWA and protect public health, Idaho water quality standards should do the following:

- Provide water quality for the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water (fishable/swimmable conditions), where attainable.
- Consider the use and value of state waters for public water supplies, propagation of fish and wildlife, recreation, agricultural and industrial purposes, and navigation.

Toxic? Yes.

Numeric Standard: Yes, for numerous compounds. Refer to current IDAPA 58.01.02 Water Quality Standards and Wastewater Treatment Requirements, Section 210. Numeric Criteria for Toxic Substances for Waters Designated for Aquatic Life, Recreation, or Domestic Water Supply Use.

In 2016, Idaho updated human health criteria for 104 toxic substances (10 of which are new) and submitted the rule to EPA for approval. There are 208 revised or new criteria, consisting of criteria for consumption of fish and ingestion of water (94 revised and 10 new criteria), and consumption of fish alone (94 revised and 10 new criteria). Idaho's 2016 human health criteria rule is based upon a fish consumption rate of 66.5 g/day.

Human health criteria are derived by equations that reflect both technical information and policy decisions. Many issues associated with establishing human health criteria are complex and controversial. Idaho's criteria provide a 10^{-5} incremental risk of cancer for someone consuming 66.5 g/day of fish. DEQ used bioaccumulation rates, toxicity values, reference dose and risk-specific dose from EPA's 2015 national recommended criteria. DEQ also used EPA's 2015 national recommendations for body weight of 80 kg and a drinking water intake of 2.4 L/day.

Until EPA approves the revisions in the 2016 Idaho rule, the human health criteria published in 2005 Idaho Administrative Code in Subsection 210.01 continue to apply and are effective for

CWA purposes. The previous human health criteria based on a fish consumption rate of 6.5 g/day.

Narrative Standard: Yes, refer to current IDAPA 58.01.02

Permitting Considerations: Permit Writers must consider whether a discharge is to a receiving water that is 303(d) listed as impaired for a chemical with human health-based criteria, whether that chemical is expected to be present in the effluent, and whether the discharge has a reasonable potential to exceed numeric human health-based criteria. In some cases when a TMDL is present for these criteria, Permit Writers must consider the allocation in the TMDL.

It is important to understand that human health based criteria based on increased fish consumption rates have recently been developed and have resulted in very low concentration thresholds for more than 100 chemicals. In many cases, data is not available to characterize chemical concentrations of either the effluent or receiving waters at these low levels. No data may be available for many of these chemicals and/or laboratory methods are not sufficient to yield accurate numerical results. Often laboratory results will be reported as “Non-Detect” or “Less Than Method Level” or “flagged” by the laboratory “Peak detected but did not meet quantification criteria,” and so on. Furthermore, monitoring and laboratory analysis at low method levels relevant to the criteria concentrations is challenging. Resulting data sets may not be representative and include gaps, qualified results, and questionable data resulting from analytical error, sample contamination, laboratory contamination, etc. Sampling and analysis results for chemicals at very low detection limits that are not frequently monitored are susceptible to misleading results that may not accurately reflect effluent or receiving water conditions. Screening level effluent characterization efforts and grab samples, such as quarterly sampling required for IPDES permit applications, are not likely to provide a robust data set to adequately support reasonable potential analysis calculations.

These circumstances result in challenges for Permit Writers because the data available for human health criteria chemicals may fall short of that necessary to proceed with the traditional approach to permitting. Data sets may be limited to only a few samples, perhaps 6 to 12 analytical results, or less. There may be gaps, high levels of variability, and widely disparate results, such as multiple “Non-Detects” mixed with some numerical results from the laboratory. This complicates the effort to conduct a reliable reasonable potential analysis. Plugging data gaps with assumed values and rules of thumb, such as using half of the laboratory detection limit in reasonable potential calculations, is invalid and should be avoided. Under these circumstances, Permit Writers should consider whether or not adequate data is available to proceed, or whether instead, monitoring requirements for the key chemicals of concern should be incorporated in the permit, in lieu of attempting to conduct a reasonable potential analysis with inadequate data.

When adequate data are available to characterize the effluent and receiving waters, the process for reasonable potential analysis for human health criteria may parallel the process for aquatic life-based criteria with a few key distinctions. Short term, acute toxic effects that are important to consider for protection of aquatic organisms living near discharges, are not relevant to human health criteria based on fish consumption over a 70-year period. Critical stream flow conditions, criterion values, and probability values such as effluent variability, all will differ from aquatic life in performing a reasonable potential determination and developing effluent limits. Other input data, such as the default value for the coefficient of variation of effluent variability, may not be representative of the higher degree of variability present in human health criteria chemicals.

Developing potential effluent limitations for human health based toxics, particularly at extremely low concentration levels may be impracticable. The federal regulations (40 CFR 122.45(d)) require publicly owned treatment works (POTWs) to have average weekly and monthly effluent limits, unless “impracticable”. Average weekly and monthly effluent limits for human health criteria may be “impracticable” because of a number of factors.

Determination of Need

4) For re-issued permits, are there requirements for a water quality based limit in the existing permit?
    c) Review current standards, treatment, receiving water and beneficial use conditions. Is removal of the effluent limit possible and consistent with anti-backsliding?
    d) Otherwise assess need for stricter requirements (e.g. a new TMDL); if stricter requirements are not necessary, maintain existing permit requirements.
5) Determine if there is a basis for the permit to include water quality based pollutant requirements or effluent limitations.
    d) Assess reasonable potential to exceed to determine whether an effluent limit is required (e.g., discharge-specific effects on the water body).
        i) If data are limited, questionable quality, and/or poorly characterized receiving water and/or effluent, the Permit Writer should include in the permit an enhanced monitoring effort and no effluent limitations.
    e) Check if a TMDL has been finalized for the receiving or downstream water body since the issuance of the existing permit. Identify wasteload allocation (WLA) and methodology for determination in the TMDL.
    f) Check if a TMDL is pending for the receiving or downstream water body. Discuss with DEQ management if these affect permit writing (e.g., need for specific performance based requirements).
6) Determine if water quality based pollutant requirements or effluent limitations could currently be met at the facility or with foreseeable upgrades.

Formulation of Requirement

1) If effluent limitations are reliably achievable, follow typical IDPES ELDG guidance for calculating limits (e.g. TSD-based).
2) If effluent limitations are not reliably achievable, use other regulatory approaches in the permit.
3) If the toxic has very low-level criteria, and sampling and analysis is commonly subject to incidental contamination, require monitoring with a QAPP tailored to how to address blank contamination. Reevaluate the need for effluent limitations in the subsequent permit cycle.
4) The Permit Writer may use a minimization and/or source identification program.

a) If data exist and/or can be collected about the pollutant and its potential impact on the receiving water, then Permit Writer should require more in-depth studies of the pollutant such as a Biotic Ligand Model (BLM study), fisheries study, evaluation of hardness, management plans, and/or other studies.
b) If data exist and/or can be collected showing source control is important, then pollution minimizations plans, purchasing policies, and/or source specific pretreatment requirements should be required.
c) If the pollutant has complex multiple forms (such as PCBs), then the Permit Writer should require studies of the subcomponents of the pollutant and the majority of the Human Health risk.

Example

The applicant must submit a Toxics Management Plan (TMP). The goal of the TMP must be to reduce loadings of toxic to the receiving water to the maximum extent practicable. The TMP must address source control and elimination of toxic as follows:

a) From contaminated soils, sediments, storm water and groundwater entering the POTW collection system via inflow and infiltration.
b) From industrial and commercial sources.
c) The applicant must not allow any person to discharge to the POTW water containing toxic in excess of any applicable pretreatment local limit established by the POTW.
d) By means of eliminating existing sources that are within the direct control of the applicant.
e) By means of changing the applicant's procurement practices, control and minimize the future generation and release of toxic that is within the direct control of the applicant, including preferential use of toxic free substitutes for those products containing toxics below the regulated level.
f) The applicant, either individually or in collaboration with other dischargers to the receiving water, must develop or implement a public education program to educate the public about toxic.
g) The education program must include distribution of appropriate educational materials to the target audiences at least once per year.
h) At least once per year, the applicant must prepare and distribute appropriate information relevant to the TMP to a newspaper(s) of general circulation within the jurisdiction(s) served by the POTW that provide(s) meaningful public notice.
i) The applicant must make all relevant TMP documents available to the public.

The applicant must submit an annual report. Each annual report must contain the following information:

f) Monitoring results for toxic for the previous 12-month period, including laboratory data sheets.
g) Copies of education materials, ordinances (or other regulatory mechanisms), inventories, guidance materials, or other products produced as part of the TMP.

h) A description and schedule for implementation of additional actions that may be necessary, based on monitoring results, to ensure compliance with applicable water quality standards.
i) A summary of the actions the applicant plans to undertake to reduce discharges of toxic during the next reporting cycle.
j) A summary of the actions taken to reduce discharges of toxic during the previous 12-month period.

10.2 Identify Applicable Water Quality Standards

Text to be inserted

10.3 Characterize Receiving Water

Text to be inserted

10.4 Characterize the Effluent

Text to be inserted

10.5 Evaluate Need for WQBELs

Text to be inserted

10.6 Regulatory Approach

Text to be inserted

10.7 Determine Interim and Finals WQBELS (if needed)

Text to be inserted

10.8 References

Text to be inserted

This page intentionally left blank.

IPDES Permit Writer Supplemental

Nutrients (Nitrogen and Phosphorus)

This page intentionally left blank.

11 Nutrients (Nitrogen and Phosphorus)

11.1 Introduction (“One-Page” Summary)

Pollutant: Nutrients: Nitrogen and Phosphorus

Pollutant: Nitrogen

Water Quality Impact: Text to be inserted

Toxic? No.

Numeric Standard: No. Refer to current IDAPA.

Narrative Standard: No. Indirectly linked to excess nutrients. Refer to current IDAPA.

Permitting Considerations: Text to be inserted

Determination of Need

Text to be inserted

Formulation of Requirement

Text to be inserted

Example of Seasonal NPDES Effluent Limitations Permit Structure

Text to be inserted

Pollutant: Phosphorus.

Phosphorus occurs in many forms and analytical results (e.g., total, ortho, dissolved, refractory, organic, etc.). It is important to recognize and understand the ecological differences among the various forms.

Water Quality Impact: Phosphorus is a plant nutrient necessary for algal growth. Excessive algal growth can cause eutrophication, which can result in violations of dissolved oxygen, pH, and aesthetic water quality standards. Eutrophication in rivers takes higher concentrations and more time than lakes and reservoirs, and is influenced by other conditions such as depth, velocity, shade, sediment concentration and temperature.

Toxic? No.

Numeric Standard: No. Refer to current IDAPA.

Narrative Standard: No. Indirectly linked to excess nutrients. Refer to current IDAPA.

Permitting Considerations: When necessary, discharge permit limits should reflect the pollutant characteristics and water quality impacts. For phosphorus, appropriate discharge permit limits should apply averaging period specific to the receiving water body. It is not appropriate to apply acute or chronic toxicity limit timeframes for phosphorus, such as those addressed by the TSD (EPA 1991). Developing effluent limits for phosphorus using the TSD guidance may result in unnecessary and impracticable effluent limits, treatment costs, and permit compliance risk. The water quality objective for phosphorus is to prevent eutrophication in lakes, reservoirs, and rivers and should be evaluated using large mixing zones or full dilution if applicable (e.g., no TMDL but localized single discharger effect).

Determination of Need

1) For re-issued permits, are there requirements for a water quality based limit in the existing permit?
    a) Review current standards, treatment, receiving water and beneficial use conditions. Is removal of the effluent limit possible and consistent with anti-backsliding?
    b) Otherwise assess need for stricter requirements (e.g. a new TMDL); if stricter requirements are not necessary, maintain existing permit requirements.
2) Determine if there is a basis for the permit to include water quality based pollutant requirements or effluent limitations.
    a) Assess whether an effluent limit may be required based on the weight of evidence (e.g., discharge-specific effects on the water body).
    b) Check if a TMDL has been finalized for the receiving or downstream water body since the issuance of the existing permit. Identify wasteload allocation (WLA) and methodology for determination in the TMDL.
    c) Check if a TMDL is pending for the receiving or downstream water body. Discuss with DEQ management if these affect permit writing (e.g., need for specific performance based requirements).

Formulation of Requirement

1) Effluent limitations for phosphorus should usually be seasonal, annual average, or 12 month rolling average loads. (See guidance document for discussion and examples of impracticable WQBELs.) Shorter periods should be used only when required by a TMDL, a scientific basis, or a specific policy decision.
2) Check if pollutant requirements or effluent limitations are for a single facility or part of a watershed permit or a combined (bubble) load for multiple facilities. (See guidance document for discussion of watershed/bubble permits.)
3) Using facility information, and in consultation with the facility owner, assess whether an interim limit and/or a compliance schedule is necessary.

Example of Seasonal NPDES Effluent Limitations Permit Structure

Parameter	Seasonal Limit	Average Monthly Limit	Average Weekly Limit	Maximum Daily Limit
Total Phosphorus (March 1 – October 31)	2.80 lbs/day	---	---	---

11.2 Identify Applicable Water Quality Standards

Rules of the Department of Environmental Quality, IDAPA 58.01.02 "Water Quality Standards" include narrative surface water criteria that prohibit excess nutrients that can cause visible slime growths or other nuisance aquatic growths impairing designated beneficial uses. Narrative nutrient criteria require an interpretation to determine what level of nutrients constitute an impairment of beneficial uses. This generally requires an impairment listing and TMDL to define a wasteload allocation in order to form the basis for point source discharge permit limitations. Direct interpretations of narrative criteria have been discussed in some locations but have not been applied in Idaho.

11.2.1 No Numeric Nutrient Criteria in Idaho

The state of Idaho has not developed or implemented numeric nutrient criteria. The DEQ has not identified this as a priority (DEQ 2007). A lack of data has been cited as one of the challenges for developing numeric nutrient criteria. In 2012, the DEQ initiated a review of procedures related to nutrients and proposed a project to monitor for effects of nutrients on surface waters in Idaho that was to be initiated in 2013 and potentially continue for additional years. This data may be useful for future numeric nutrient criteria development.

11.2.2 Idaho TMDLs and Nutrients

In Idaho, nutrient related impairment listings and total maximum daily loads have emphasized phosphorus control for a number of key waterbodies. These include Cascade Reservoir, American Falls Reservoir, Swan Falls and C.J. Strike Reservoirs, Spokane River, Mid-Snake River and others in the Magic Valley area, Snake River Hells Canyon, Boise River, Big Wood River, Portneuf River, and others. In Idaho, phosphorus has been the nutrient historically targeted for TMDLs because eutrophication problems in Idaho related to nitrogen have not been identified to date. In some states both phosphorus and nitrogen have been or are being targeted. In some of these the reason for nitrogen control relates to eutrophication and/or dead zone impacts in estuaries and coastal waters such as Chesapeake Bay and the Gulf of Mexico, or because the state has determined that both nitrogen and phosphorus limit algae growth (e.g., Montana). Idaho is somewhat unique in that our rivers do not flow to estuarine or coastal waters (e.g., Columbia River basin) that are considered impaired by eutrophic conditions. In addition, the downstream states of Oregon and Washington have also been primarily focused on phosphorus for eutrophication control for rivers in the Columbia basin. This chapter includes information and discussion about both phosphorus and nitrogen because nutrient limitation or co-limitation will likely need to be determined on a case-by-case basis and nitrogen could become of greater concern in the future in some receiving waters.

As noted above, most of the recently issued NPDES permits in Idaho that have included nutrient limits were based on TMDLs for specific waterbodies. TMDLs form the basis for effluent limits for phosphorus on the Big Wood River, Boise River, and the Portneuf River. In two watersheds, TMDLs were developed with the neighboring state that included WLAs for Idaho dischargers and that EPA used as the basis for NPDES permits; Washington Ecology for the Spokane River Dissolved Oxygen TMDL and Oregon DEQ and Idaho DEQ for the Snake River-Hells Canyon Dissolved Oxygen TMDL.

In Montana, the Clark Fork Voluntary Nutrient Reduction Program (VNRP) was approved by EPA Region 8 in 1998 as a functionally equivalent TMDL for the river to restore beneficial uses and eliminate nuisance algae growth in Montana streams and protect Pend Oreille Lake water quality in Idaho.

11.2.3 Pending TMDLs and No Net Increase

In some cases, no net increase policies have served as methods to control nutrient loadings when pending TMDLs have not yet been completed. No net increase goals may be achieved using methods such as pollutant trading, best management practices, and nutrient removal technologies. Elements of the no net increase include the selection of a baseline year, specific pollutant of concern, time period for the no net increase, and proposed loads such as season average with mass total.

11.3 Characterize Receiving Water

Nutrient loadings from both point and nonpoint sources contribute to water quality impairments in waterways. Nutrients are of concern because at high concentrations, they can result in excessive and nuisance biological growth, such as algae, which may potentially lead to low dissolved oxygen conditions and the overall impairment of the receiving water. Point source discharges from wastewater treatment plants can be a significant source of nitrogen and phosphorus in watersheds. Nonpoint sources may contribute substantial amounts of nutrients from land use activities such as agriculture, forestry, and urban/suburban development.

11.3.1 Ambient Monitoring

Water quality monitoring for potential use in establishing nutrient TMDLs that may lead to nutrient discharge limitations should be developed specifically for the watershed objectives and adequate to support the water quality modeling used to establish wasteload allocations. Targeted nutrient levels in lakes, streams, and estuaries can be very low concentrations that are challenging to meet with treatment of point sources and application of best management practices (BMPs) to nonpoint sources. The resulting nutrient control requirements may require very large capital investments and be expensive to operate. Therefore, credible and reliable monitoring data upon which to base potentially expensive decisions is essential.

Water quality monitoring may range from short-term and limited data collection to complex undertakings. If the data will be used for decision making and modeling, then the data must be collected and analyzed under standards and protocols that demonstrate the data are of high quality, relevant, and credible to the study. This is particularly important for water quality model applications representing the dynamics between wastewater effluent and receiving water conditions.

There is a continuum of approaches for effluent and receiving water body monitoring, including the breadth of duration and number of constituents analyzed. Typical constituents include:

- Flow
- Temperature
- pH
- Dissolved oxygen
- Total nitrogen
- Total dissolved nitrogen/total inorganic nitrogen
- Total Kjeldahl nitrogen
- Nitrate
- Nitrite
- Total ammonia
- Urea
- Total phosphorus
- Total dissolved phosphorus
- Total and dissolved inorganic phosphorus.
- Dissolved silica
- Biochemical oxygen demand (BOD)
- Carbonaceous Biochemical oxygen demand (CBOD)
- Total organic carbon (TOC)

The sample types may be grab samples or composite as determined in the quality assurance plan for the monitoring program. The duration of the monitoring program may be a few days or extend to years. The frequency may be random or designed to capture different types of events, such as irrigation versus non-irrigation seasons, wet and dry seasons, or high and low flow periods.

11.3.2 Suitability for Permitting Considerations

The adequacy of water quality monitoring data for use in permitting should correspond to and complement the level of decisions to be made with the resulting management scenarios. For example, nutrient speciation and bioavailability can be expected to be an important factor under the following circumstances:

- A receiving water body with low nutrient concentration targets.
- Management scenarios where nutrient reductions are planned, especially those approaching the limits of treatment technology.

A different approach should be taken when very low nutrient concentrations become more important and there is a need to understand refractory compounds. For refractory compounds, the methods of analysis are more complex and may use newly evolving methods (Brett 2015) (Li 2013) (Sedlak 2003).

11.3.3 Current Impairment versus Future Conditions

The availability and interpretation of data to characterize nutrient speciation and bioavailable and refractory organic compounds in ambient waters, as well as wastewater effluent and nonpoint sources, is important to the characterization of impaired conditions. Site specific water quality monitoring data for effluent and receiving waters provides data applicable at a given location under current conditions. It is important to also consider that future managed conditions will alter nutrient speciation and the relative contribution of point and nonpoint source loadings.

11.4 Characterize the Effluent

Advanced levels of nutrient removal treatment impact effluent quality in multiple ways. First, effluent nitrogen and phosphorus concentrations are reduced. Second, nitrogen and phosphorus speciation is altered as a result of the advanced treatment processes. Third, because of the shift in speciation, the bioavailability of the remaining effluent nitrogen and phosphorus is reduced.

After advanced nutrient removal treatment, the remaining nitrogen and phosphorus in treatment plant discharges may not be removable with current treatment technology. Tables 4-1 and 4-2 identify the soluble dissolved organic nutrient fractions that cannot be removed in wastewater treatment by filtration, coagulation, or degradation. Nitrogen and phosphorus speciation is an important area of nutrient research, both in terms of biodegradability in wastewater treatment and bioavailability in the water environment.

Appropriate consideration should be given to effluent discharge permitting regarding emerging areas of advanced scientific understanding of the effect of advanced nutrient removal treatment on both nutrient speciation and bioavailability. At the boundaries of the current understanding of science is investigation of nitrogen and phosphorus remaining after advanced treatment that may not be removable with current treatment technology and may not be bioavailable in receiving waters.

Nutrients are commonly assumed to be biodegradable in wastewater treatment and readily bioavailable to plant growth in the aquatic environment. However, refractory dissolved organic nitrogen and phosphorus remaining in effluent after advanced levels of treatment may not be bioavailable, as shown in recent bioavailability studies. Inaccurate conclusions may be reached about the response of a waterbody to nutrient loadings following advanced levels of nutrient removal treatment which alters effluent speciation and bioavailability. That could result in more restrictive discharge limitations than necessary to achieve water quality objectives. Further, this may also misrepresent the relative magnitudes of point source and nonpoint source nutrient loadings in ways that may mislead watershed management efforts. This is unfortunate because misrepresentation of the changes that occur following nutrient removal treatment may result in further point source reduction requirements that provide limited additional environmental benefits. This is because there are negative environmental impacts from the most advanced levels of treatment which require greater use of energy and chemicals, produce more excess residual biosolids, and increase atmospheric emissions of greenhouse gases.

Nitrogen and phosphorus speciation are also important areas of nutrient research, both in terms of biodegradability in wastewater treatment and bioavailability in the water environment.

11.4.1 Wastewater Effluent Monitoring

Wastewater process monitoring and analysis is focused on the physical, chemical, and biological processes employed in treatment facilities. Refractory nutrient compounds are those that resist removal by treatment, pass through the process, and are present in the effluent discharge (Neethling 2013a,b,c) (Stensel 2016). Relevant timeframes in wastewater facilities are on the order of hours to days.

An evaluation of the performance of full-scale and pilot-scale wastewater treatment nutrient removal processes has shown that ammonia can be reduced to very low concentrations (below 0.1 mg/L) with conventional biological treatment and nitrate and nitrite can be reduced in post denitrification basin to less than 1.0 mg/L with addition of supplemental carbon (Neethling 2013). Particulate N can be eliminated with high efficiency filters or membranes, however, some soluble organic nitrogen (SON) persists and can range from 0.70 to 2.5 mg/L in nutrient removal plant effluents. Similarly, orthophosphate and particulate P is readily removed, but soluble non-reactive phosphorus (SNRP) and soluble organic P remains recalcitrant. Expected performance from advanced nutrient removal processes will reduce SRP to 5 to 15 ug/L. Remaining refractory SNRP effluent concentrations will be in the range of 15 to 25 ug/L (Neethling, 2013).

Refractory nutrient compounds that are not biodegradable in wastewater treatment facilities may become bioavailable in the natural environment. In receiving water monitoring and modeling analysis, refractory nutrient compounds are those that break down slowly as a result of natural processes that include biological and chemical degradation, solar, wind, and physical mechanisms. Relevant timeframes in the receiving water environment may range from days to months or years.

11.4.2 Current Impairment versus Future Conditions

Effluent characterization must include consideration of both current conditions, in order to be useful in interpreting current impairments, and future effluent characteristics to accurately represent future management scenarios with advanced nutrient removal treatment that alter speciation. Similar considerations for monitoring data apply to ambient water quality and nonpoint sources. Literature references may be useful in characterize potential future conditions.

11.5 Evaluate Need for WQBELs

The Permit Writer sets the effluent limitations after evaluating technology based effluent limits (TBELs) and water quality based effluent limits (WQBELs). There are no technology based effluent limits for nutrients nationally, and although some states have applied TBELs for nutrients under some circumstances, such as with water quality variances, this has not occurred in Idaho. WQBELs are meant to be protective of state water quality standards and incorporate wasteload allocations (WLAs) assigned in an approved TMDL for the receiving water. Since there are no numeric nutrient criteria in Idaho, traditional reasonable potential analysis (RPA) to calculate potential exceedence of standards is not applicable. Therefore, in Idaho, potential effluent nutrient limits are based upon the WLA from a TMDL.

11.5.1 Interpretation of TMDLs for Nutrient Permitting

The Permit Writer must prepare effluent limits that are consistent with the TMDL and translate the in-stream nutrient targets from the TMDL, expressed in terms of magnitude, duration, and frequency, into effluent limitations expressed in terms of magnitude and averaging period. Often, the applicable magnitude, duration, and frequency of the nutrient endpoints is not well defined in the TMDL. It is also important to note that discharge permit limits are not required to be an exact match with a TMDL, such as necessitating expression of permit limits as Maximum Daily Limits because the terminology TMDL includes the words “daily load.”

11.5.2 Nutrient Speciation

Nitrogen and phosphorus can be subdivided into compounds. Nitrogen compounds are represented as organic nitrogen, ammonia, nitrate, and nitrite. Phosphorus compounds are represented as organic phosphorus and dissolved phosphorus. These compounds may be further defined as labile or refractory. Some of these compounds, including ammonia and nitrite/nitrate can be both plant nutrients and toxic to aquatic species.

Nutrient speciation is an important consideration in monitoring programs and an area of potential confusion in vocabulary and laboratory analysis, especially at low concentration levels. A comparison of commonly used terminology in wastewater effluent monitoring and ambient receiving water quality monitoring and modeling is shown (Clark 2016b). Similar terms commonly used in water quality monitoring and modeling are shown in the tables in the un-shaded cells (red italics text). For N, the terms generally align and are fairly synonymous. For P, the terminology varies. These tables demonstrate the need for translation between the water quality terminology and the wastewater vocabulary used for nutrients. Recognizing these differences promotes more effective communication about nutrient management issues by offering synonymous terminology for all stakeholders to use.

Not all of the information to define nutrient species is available from conventional laboratory analysis. For N, a majority of the fractions may be analyzed in the laboratory with the remaining fractions calculated from the analyzed values, or estimated. Estimations may be necessary for the labile and refractory fractions. For P, a minority of the fractions may be analyzed in the laboratory with the remaining fractions calculated from the analyzed values, or estimated. Therefore, monitoring recommendations for wastewater effluent and ambient receiving waters are generally to analyze for as many of the nutrient species fractions as possible with standard methods to provide the most information for the calculation or estimation of the remaining fractions.

Table 11-1. Wastewater Terminology for Nitrogen Species.

<table>
<tr><td colspan="7">Total Nitrogen (TN)</td></tr>
<tr><td colspan="5">Total Soluble N (TSN)</td><td colspan="2">Total Particulate N (TpN)</td></tr>
<tr><td>Ammonia (NH_3) + Ammonium (NH_4)</td><td>Nitrate (NO_3)</td><td>Nitrite (NO_2)</td><td colspan="2">Soluble Organic N (SON)</td><td colspan="2">Particulate Organic N (pON)</td></tr>
<tr><td>Ammonia + Ammonium</td><td>Nitrate</td><td>Nitrite</td><td>Dissolved Organic Nitrogen Labile</td><td>Dissolved Organic Nitrogen Refractory</td><td>Particulate Organic Nitrogen Labile</td><td>Particulate Organic Nitrogen Refractory</td></tr>
<tr><td>Total Ammonical N (TAN)</td><td colspan="2">Total Oxidized N (NO_x)</td><td colspan="4"></td></tr>
<tr><td colspan="3">Total Inorganic N (TIN)</td><td colspan="4">Total Organic N (TON)</td></tr>
</table>

Table 11-2. Wastewater Terminology for Phosphorus Species.

<table>
<tr><td colspan="6">Total Phosphorus (TP)</td></tr>
<tr><td colspan="3">Total Soluble P (TSP)</td><td colspan="3">Total Particulate P (TpP)</td></tr>
<tr><td>Soluble Reactive P (SRP)</td><td colspan="2">Soluble Non-reactive P (SNRP)</td><td>Particulate Reactive P (pRP)</td><td colspan="2">Particulate Non-reactive P (pNRP)</td></tr>
<tr><td>Phosphate</td><td colspan="2">Dissolved Organic Phosphorus

Labile and Refractory</td><td>Particulate Organic Phosphate Labile</td><td colspan="2">Particulate Organic Phosphate Refractory</td></tr>
<tr><td>Soluble Reactive P (SRP)</td><td>Soluble Acid Hydrolyzable P (SAHP)</td><td>Soluble Organic P (SOP)</td><td>Particulate Reactive P (pRP)</td><td>Particulate Acid Hydrolyzable P (pAHP)</td><td>Particulate Organic P (pOP)</td></tr>
</table>

11.5.3 Impracticable Determinations

Average weekly and monthly effluent limits are required for POTWs (40 CFR 122.45(d)), unless "impracticable". Impracticable determinations have been made in key watersheds, including in Idaho, where more suitable structures for nutrient permit limits were found to be appropriate. EPA found that annual nutrient permit limits were appropriate for the Chesapeake Bay, because is impracticable to express limits on a shorter time scale (Hanlon 2004). In an example pertaining to an individual municipal wastewater facility, EPA determined that for the City of Coeur d'Alene wastewater treatment plant (EPA 2014):

> *"it is impracticable to express the water quality-based effluent limits for TP, ammonia, and Carbonaceous Biochemical Oxygen Demand (CBOD) that are necessary to meet Washington's water quality criteria for dissolved oxygen as monthly average and weekly average limits…... The water quality-based effluent limits for total phosphorus (TP), ammonia and CBOD are expressed as seasonal average loading limits that are identical to the loads of TP simulated in the modeling."*

The result of this impracticable determination was that seasonal mass loading limits were used for the phosphorus, ammonia and CBOD discharges to the Spokane River.

11.6 Regulatory Approach

Section 402 of the Clean Water Act (CWA) specifically required EPA to develop and implement the NPDES program. NPDES permits include effluent limitations for Publicly Owned Treatment Works (POTWs). The CWA authorizes the Permit Writer "to use his or her best professional judgment (BPJ) to establish case-by-case limitations" (EPA 2010). The Permit Writer is to use his or her knowledge of the industry, the specific discharge, and the receiving water, to develop effluent limitations specific to the facility. Thus, "the limitations and conditions in NPDES individual permits are unique to each" (EPA 2010).

11.6.1 Nutrients Are Not Toxics

Much of the existing guidance to Permit Writers is based on EPA's Technical Support Document for Water Quality-based Toxics Control Basis (TSD) (EPA 1991). Nutrient impacts on water quality are distinctly different than the impact of toxics. Rather than directly impacting aquatic organisms in a harmful way, nutrients act as a stimulating growth factor, often on longer spatiotemporal scales than are typically seen for toxic compounds. It is important to note that when Permit Writer applies toxics control approaches to nutrients, the resulting effluent limits are likely to be unnecessarily low concentrations and perhaps lower than achievable with advanced nutrient removal treatment technology.

Toxics impact the physiology of aquatic organisms in a harmful way, often on short spatiotemporal scales. Consequently, the approach to permitting is overly conservative and restrictive to protect aquatic life and guidance (EPA 1991) guidance is based on conditions that would occur rarely, or never, and would result in permit limits more stringent than necessary:

> *"Traditional single-value or two-value steady-state WLA models calculate WLAs at critical conditions, which are usually combinations of worst-case assumptions of flow, effluent, and environmental effects. For example, a steady-state model for ammonia*

considers the maximum effluent discharge to occur on the day of lowest river flow, highest upstream concentration, highest pH, and highest temperature. Each condition by itself has a low probability of occurrence; the combination of conditions may rarely or never occur. Permit limits derived from a steady-state WLA model will be protective of water quality standards at the critical conditions and for all environmental conditions less than critical. However, such permit limits may be more stringent than necessary to meet the return frequency requirements of the water quality criterion for the pollutant of concern." (EPA, 1991)

11.7 Determine Interim and Finals WQBELS (if needed)

Surface water nutrient discharges should receive special considerations in discharge permitting for distinction from other effluent parameters, in particular toxic parameters, upon which much of the existing EPA Permit Writer's guidance is based. Appropriate NPDES discharge permit structures for nutrients can be protective of surface water quality and also be based on long averaging periods, such as seasonal or annual limits that are based on mean or median statistics. It is important that consideration be given to variability and reliability of effluent performance from advanced nutrient removal facilities because these technologies are highly effective in nutrient removal despite their inherent variability in effluent quality, particularly at low phosphorus and nitrogen concentrations.

11.7.1 Case-by-Case Analysis

Although receiving water quality requirements vary depending upon location and Permit Writers are to use their best professional judgment to establish case-by-case effluent limitations for water quality-based effluent limitations, it is important that permits be technically attainable and flexible. Permits should be attainable from the standpoint of treatment performance for successful compliance. Permits should be flexible in terms of fostering opportunities for effective effluent management, trading, water quality offsets, effluent recycling and reuse to improve water quality and meet nutrient discharge limitations.

11.7.2 Avoiding Immaterial Compliance Issues

Appropriate NPDES permit structures for nutrients will avoid the creation of frameworks that result in compliance issues that are immaterial to surface water quality protection. Examples of immaterial conditions include: maximum daily and maximum weekly limits, overly restrictive receiving water streamflow assumptions, and the assumption of extreme and improbable coincident events, such as statistical extremes occurring in both receiving waters and effluent discharge quality. Over specifying nutrient permit limits beyond the capabilities of treatment technology will not result in improved water quality, but may result in permit compliance issues for wastewater utilities along with inefficient spending of public funds.

11.7.3 Nutrient Permitting Considerations

There are unique considerations regarding nutrients that a Permit Writer and applicant may examine when drafting a new permit or renewing an existing permit. These considerations are a part of applying appropriate approaches in the development of effluent nutrient limits, including the following:

- Advanced nutrient removal treatment is costly and complex.
- Nutrients should be distinguished from toxics.
- Effluent nutrient concentrations vary even in the best nutrient removal facilities (Clark 2016a).
- A variety of nutrient discharge permit structures have been successful (Clark 2016a).
- Flexibility in permitting promotes reuse, recharge and restoration.

Point source permitted dischargers are the most highly regulated sources subject to nutrient control requirements resulting from numeric nutrient standards, total maximum daily loads, and water quality based permit limits. The costs for nutrient removal are substantial and vary widely depending upon existing treatment facilities and site specific circumstances. While high levels of nutrient removal can be achieved in advanced wastewater treatment, nutrient removal processes require additional energy, chemicals, maintenance, materials, and labor, which increase the complexity of plant operations and costs. It is therefore important that effluent nutrient permitting requirements are attainable from a treatment technology standpoint and protective of receiving water quality.

It is also important that consideration be given to variability and reliability of effluent performance from advanced nutrient removal facilities, especially those operating at low or very low levels. Appropriate NPDES permitting methodologies will avoid compliance issues that are immaterial to surface water quality protection. Short-term limitations, such as maximum daily and maximum weekly, should not be imposed for nutrients. Technology performance statistics provide a science based approach to characterize feasible effluent limits within the capabilities of advanced nutrient removal treatment and also characterize the variability in effluent performance and reliability of treatment.

Nutrient discharge permits that are restrictive in ways unrelated to water quality protection because of the structure of the permit itself should be avoided. Unnecessarily restrictive permits do not enhance water quality protection, but may create circumstances that result in noncompliance. From a sustainability standpoint, little additional nutrient removal is accomplished approaching the limits of treatment technology, however there are other environmental impacts that result from the additional use of energy and chemicals, and from increased atmospheric emissions.

A wide variety of nutrient permit structures have been utilized across the country and flexibility is available for Permit Writers to prepare permits for successful compliance with attainable treatment technology. Nutrient permit structures that provide utilities with flexibility foster creative solutions to best meet overall water quality objectives, such as watershed permitting, shared loading capacity, and trading. Flexible permits can be developed to facilitate opportunities for effluent reuse, recharge, and restoration.

11.7.4 Nutrient Permit Structure

Emphasis in nutrient discharge permitting should focus on providing the greatest amount of flexibility possible in the structure of nutrient limits in order to preserve the opportunity for the most creative and economical approaches to managing nutrients. Traditional permit structures for publically owned treatment works generally include both monthly and weekly limits on both a concentration and mass basis. This may inadvertently eliminate the most effective watershed solutions to nutrient management by creating disincentives to wastewater dischargers to explore combinations of advanced wastewater treatment and other watershed management practices.

11.7.5 Water Quality Linkages

The most appropriate nutrient discharge permits will be prepared based on an understanding of both receiving water quality requirements and the capabilities of advanced nutrient removal treatment. Where either is lacking, an investment may be necessary to determine the level of nutrient management required to meet water quality objectives and link that analysis with specific objectives for effluent quality. When the relationship between nutrient loadings and water quality responses is not well defined, it is advisable to avoid overly restrictive effluent limits at the outset, since they may later prove unnecessary to meeting actual receiving water needs when they eventually become better understood. Preserving an opportunity for adaptive management approaches to guide the process of nutrient management over time may improve water quality incrementally, without overly restrictive discharge permits that result in over investment in advanced treatment. Permits structured around no net increase in existing loadings, or simple seasonal or annual loading reductions, may provide a foundation for adaptive management.

Where the linkages with water quality requirements are less well defined, the following approaches are recommended:

- Establish a foundation for adaptive management whereby the impact of nutrient loadings on receiving water quality can be better understood over time.
    - Permits structure with interim limits and monitoring requirements provide an opportunity to gather more information on both the treatment process and the response of receiving waters to nutrient load reductions prior to setting final effluent limits. The may provide the opportunity to find better ways of achieving water quality objectives and the time needed to more fully develop watershed management efforts such as nonpoint source reductions, water quality offsets and trades, etc. Premature establishment of final effluent limits, especially those approaching or exceeding the limits of treatment technology may result in unanticipated disincentives for participation in potentially more effective watershed management efforts.
- In cases where nutrient limitations are warranted, develop nutrient discharge permit limits based on no net increase in existing loadings.
    - If necessary, utilize technology based effluent limits at the basic biological nutrient removal level.
- Utilize compliance schedules in discharge permitting to provide the time necessary to develop a water quality based set of requirements for effluent limits linked with water quality response variables.

Where the linkages with water quality requirements are defined but overall watershed nutrient management and nonpoint source controls are uncertain, the following additional approaches are recommended:

- Incorporate the most basic level of nutrient limits possible in discharge permits to preserve the ability to optimize the combination of point and nonpoint source nutrient controls through adaptive management.
  - When nonpoint source controls are uncertain, additional information should be gathered prior to considering point source controls.
  - Utilize mass loading limits or technology based effluent limits at the basic biological nutrient removal level.

11.7.6 Technology Performance Statistics

When the linkage between water quality requirements and nutrient loadings result in the need for advanced levels of nutrient removal treatment, technology performance statistics (TPS) provide a basis to define effluent performance and reliability. TPS describes the performance of a technology or process or facility under specific conditions (Bott 2011)(Neethling 2013a,b,c). In this approach, the treatment plant or technology performance is tied to the statistical rank to express the probability of achieving a certain performance. The TPS is determined from performance data and is linked to the operational conditions during which the data were collected (pilot, full scale, summer, winter, excess capacity available, SRT, etc.). The conditions must also include external factors that impact the technology, industrial loadings, seasonality, absence of recycle streams, etc.

A number of readily available technical resources are useful to inform the characterization of effluent speciation, including WERF research projects and operating data from other nutrient removal facilities. WERF has compiled a statistical analysis of the effluent from 22 leading nutrient removal facilities across the U.S. that each provided three years of operational data that were analyzed using a consistent statistical approach (WERF, 2011). The nutrient removal treatment processes are described for each of the facilities and effluent N and P speciation data is presented. Technology Performance Statistics (TPS) were defined as three separate values representing the ideal, median, and reliably achievable performance. Also, monthly average 95th percentiles of effluent data were used to compare the 22 plants in terms of their ability to achieve the 3.0 mg/L TN or 0.1 mg/L TP effluent targets.

Where the linkages with water quality requirements are not well defined, the following approaches are recommended:

- Consider whether technology performance statistics are warranted.

Where the linkages with water quality requirements are well defined, the following approaches are recommended:

- Utilize technology performance statistics to define effluent limits based on receiving water quality requirements in terms of effluent quality and reliability.
  - Where appropriate, utilize median statistics (50^{th} percentile) to define effluent quality such that inherent variability in treatment performance with advanced nutrient removal can be allowed.
  - Specify effluent limits in terms of average (50^{th}), 90^{th}, or 95^{th} percentile statistics depending upon the reliability of treatment required for receiving water conditions.

- Establish a foundation for adaptive management whereby the impact of nutrient loadings on receiving water quality can be better understood over time.

Where the linkages with water quality requirements are well defined but water quality based effluent limits result in technically infeasible nutrient limits, the following approaches are recommended:

- Utilize the following regulatory implementation tools and define a level of feasible effluent performance for interim operation:
  - Site specific nutrient criteria.
  - Compliance schedules.
  - Variances.
  - Use attainability analysis.

11.7.7 Predictive Water Quality Models

When water quality models are available to simulate the water quality response to nutrient loadings, discharge permit scenarios can be simulated to develop the basis for the most flexible and sustainable permit structure possible. Water quality models are powerful tools that can provide significant insights into receiving water conditions and the impacts of wastewater discharges and other nutrient loading sources on water quality. A number of water quality models of varying complexity and capabilities are available for simulation of water quality. Many of these models include quantitative relationships between nutrients, site-specific water quality, and ecological response indicators (dissolved oxygen, pH, algae). Process based load-response models use mathematical representations that link nutrient loads to in situ water quality and/or ecological responses.

Where water quality models are available to define the impact on receiving water beneficial uses in terms water quality response variables (dissolved oxygen, pH, algae, etc.), the following approaches are recommended:

- Utilize water quality models to simulate receiving water quality responses to define effluent limits in terms of effluent quality and reliability.
- Utilized water quality models to simulate effluent discharges in alternative ways such that the critical factors affecting the response variables can be better understood, such as extended period simulations.
- Combine water quality modeling and monitoring in adaptive management approaches whereby the impact of nutrient loadings on receiving water quality can be better understood over time in pursuit of optimal watershed nutrient management.
  - Consider the changes in receiving water quality that occur following the initial reduction of point source nutrient loadings, along with each successive reduction in both point and nonpoint source loadings.
  - Select effluent nutrient limits that provide proportionate improvements in receiving water quality.
- Pursue sustainable combinations of point source nutrient removal and nonpoint source watershed nutrient management.

- Avoid overly restrictive effluent limits that do not provide a commensurate improvement in receiving water quality, but may result in excessive use of energy and chemicals, and over production of residual biosolids.

11.7.8 Probabilistic Analysis

Where there is recognition that variability exists in receiving water flows and water quality, consider the application of probabilistic approaches to define levels of effluent performance to meet performance objectives and at what frequency. Extremely low receiving water flow conditions are not likely to coincide with maximum effluent discharge conditions. Likewise, aquatic life and recreational beneficial uses would generally not be thought to be impaired if a single rock, pool or riffle, or even a short reach of river had benthic algae higher than a target value. Probabilistic analysis can provide a tool to analyze the frequency at which specific conditions may occur in receiving waters based on variability in both effluent and receiving water.

Effluent limits developed in the traditional deterministic approach are back calculated directly from an acceptable downstream mixed concentration condition based on the applicable water quality standard or wasteload allocation. Probabilistic calculations result in a distribution of downstream conditions that can be compared to either an allowable frequency of exceedance of the applicable standard, or a probabilistic representation of an acceptable downstream condition as a probability distribution rather than a single value. Development of effluent limits using a probabilistic approach will require calculation of the downstream conditions, followed by a comparison with the allowable frequency of exceedance. This may be followed by successive iterations with refined effluent flow and nutrient concentration values to converge on the effluent limits necessary to satisfy the downstream conditions.

Monte Carlo analysis is a method for using the full probability distributions for each of the parameters in the mass balance approach to develop effluent limits. A Monte Carlo simulation may be used to combine the effluent and receiving water flow and concentration data and calculate the probability distribution for the downstream mixed conditions. The Monte Carlo analysis results in the probability distribution of calculated in-stream concentrations, which can then be evaluated in comparison to the in-stream target concentration.

Probabilistic analysis is recommended in the following circumstances:

- Where there are conditions in which there is a high degree of variability in receiving water and effluent flows and/or concentrations.
- Extremes in receiving water low flow conditions, or high ambient concentrations, are short lived or infrequent.

11.8 References

Bott, C.B. and D.S. Parker (2011) Nutrient Management Volume II: Removal Technology Performance & Reliability, WERF Research Project under Nutrient Challenge, WERF Report NUTR1R06k.

Brett, M.T. and Li, B. (2015) “The Bioavailable Phosphorus (BAP) Fraction in BNR System Effluents.” WE&RF Nutrient Removal Challenge project NUTR1R06m.

Clark, D.L., Dupuis, T., Falconer, H., Hatch, L., Kasch, M.S., and Neethling, J.B. (2016a) “Nutrient Management Volume III: Development of Nutrient Permitting Frameworks.” WE&RF Report NUTR1R06z.

Clark, D.L., Hunt, G. Kasch, M.S., and Lemonds, P.J. (2016b) “Nutrient Speciation and Refractory Compounds in Water Quality Models. WE&RF Report NUTR1R06aa.

Code of Federal Regulations (40 CFR §122.44 Establishing limitations, standards, and other permit conditions (applicable to State NPDES Programs).

DEQ (2017) Lower Boise River Water Quality Trading Watershed Framework.

DEQ (2016) Water Quality Trading Guidance.

DEQ (2007) Numeric Nutrient Criteria Development Plan. Idaho Department of Environmental Quality, Boise, ID.

DEQ (1998) No Net Increase Total Phosphorus Loads for the Lower Boise River Watershed: A Discussion of Issues and Proposed Loads for Sources.

EPA (2014) Final NPDES Permit, City of Coeur d’Alene Wastewater Facility (ID0022853). http://www.epa.gov/region10/pdf/permits/npdes/id/cda_fp_id0022853_2014.pdf

EPA (2010) NPDES Permit Writers’ Manual. U.S. Environmental Protection Agency, Office of Wastewater Management, Water Permits Division, State and Regional Branch, EPA-833-K-10-001.

EPA (1991) Technical Support Document for Water Quality-based Toxics Control. US Environmental Protection Agency. Office of Water. The EPA/505/2-90-001. http://www.epa.gov/npdes/pubs/owm0264.pdf

EPA (2004) Memorandum from James A. Hanlon to John Capacasa and Rebecca Hanmer. Subject: Annual Permit Limits for Nitrogen and Phosphorus for Permits Designed to Protect Chesapeake Bay and its tidal tributaries from Excess Nutrient Loading under the National Pollutant Discharge Elimination System. http://www.epa.gov/reg3wapd/npdes/pdf/ches_bay_nutrients_hanlon.pdf

Falk, M.W., Reardon, D.J., and Neethling, J.B. (2011) “Striking the Balance Between Nutrient Removal in Wastewater Treatment and Sustainability.” WERF Report NUTR1R06n.

Gu, A.Z., Liu, L., Onnis-Hayden, A. Smith, S. Gray, H. Dwight Houweling, H.D. and Takács, I. (2014) “Phosphorus Fractionation and Removal in Wastewater Treatment- Implications for Minimizing Effluent Phosphorus”, WE&RF F Nutrient Removal Challenge report NUTR1R06l.

Gu, A.Z., Liu, L., and Onnis-Hayden, A. (2014) “Bioavailability and characteristics of dissolved organic nutrients in wastewater effluents”, WE&RF Nutrient Removal Challenge report NUTR1R06o.

Li, B., Fan, L., and Brett, M.T. (2015) “Mineralization Kinetics Of Soluble Phosphorus And Soluble Organic Nitrogen In Advanced Nutrient Removal Effluents” WE&RF Nutrient Removal Challenge project NUTR1R06p.

Li, B. and Brett, M.T. (2012) “The Bioavailable Phosphorus (BAP) Fraction in Effluent from advanced secondary and tertiary treatment, University of Washington.

Neethling, J.B., and Stensel, H.D. (2013a) Nutrient Species Implications for Technology Performance and Water Quality Impacts. WERF.

Neethling, J.B. and Stensel, H.D. (2013b) “Nutrient Species Implications for Technology Performance and Water Quality Impacts,” WEF/IWA Nutrient Removal and Recovery Conference, Vancouver, BC.

Neethling, J.B. and Pramanik, A. (2013c) Phosphorus Recovery and Stochastic Permitting. Crafting a Vision for Nutrient Management in Wastewater Treatment, Part 2. WERF.

Neethling, J.B., Stensel, D., Parker, D., Bott, C., Murthy, S., Pramanik, A., and Clark, D. (2009) “What is the Limit of Technology (LOT)? A Rational and Quantitative Approach” WEFTEC.

Sedlak, D. (2003). The Speciation and Reactivity of Wastewater-Derived Organic Nitrogen. Department of Civil and Environmental Engineering UC Berkeley. Berkeley, CA.

Sedlak, D.L., Jeong, J., and Liu, H. (2013) “Uptake Of Dissolved Organic Nitrogen From BNR Treatment Plant Effluents By Algae” WERF Nutrient Removal Challenge project NUTR1R06e.

Stensel, H.D. (2016) “Soluble Organic Nitrogen (SON) in Biological Nutrient Removal Wastewater Treatment Processes” WE&RF Compendium.

Tri-State Water Quality Council Border Agreement Technical Team (2001), Montana and Idaho Border Nutrient Load Agreement Technical Guidance.

IPDES Permit Writer Supplemental

Special Topics

This page intentionally left blank.

12 Special Topics

Text to be inserted

This page intentionally left blank.

IPDES Permit Writer Supplemental

Watershed Permitting

This page intentionally left blank.

13 Watershed Permitting

13.1 Introduction ("One-Page" Summary)

Pollutant: Any non-toxic.

Water Quality Impact: No net effect. Single sources are combined for evaluating impact and setting effluent limitations.

Toxic? No.

Numeric Standard: No.

Narrative Standard: No.

Permitting Considerations: Do two or more sources in the same area, discharging the same pollutants to the same water body want effluent limitations to be determined as shared or combined load? Watershed-based NPDES permitting is a process that addresses a variety of related water quality stressors within a hydrologically-defined drainage basin, rather than individually addressing pollutant sources. Watershed-based permitting can encompass a variety of activities such as synchronizing permits within a basin; utilizing water quality-based effluent limits from multiple discharger modeling and analysis (e.g., Total Maximum Daily Loads, TMDLs); or apportioning a total (combined or "bubble") load among multiple facilities to foster intra-municipal trades or offsets.

Determination of Need

Determine if there is a basis for the permit to include water quality based pollutant requirements or effluent limitations for non-toxic pollutants that could be combined.

Applicant(s) may request and/or DEQ management may select. Suitable applications for watershed permitting may exist in a number of Idaho watersheds and provide advantages over the preparation and renewal of individual permits. In particular, permits driven by watershed management efforts and TMDLs for nutrients and temperature that transcend individual mixing zones and reflect broader water quality objectives may be especially appropriate. Opportunities for collaboration and optimization of management efforts can be supported with watershed permitting for individual entities interested in shared responsibility for watershed-based bubble limits.

Formulation of Requirement

Watershed based effluent limitations may be for any non-toxic pollutant for which WQBELs are necessary. Follow the guidance on the specific pollutant for determining effluent limitations.

Determine if individual effluent limitations for each facility are additive. Use water quality analysis or modeling, if available from TMDL or other studies.

Assess combined permit effluent limitations to water quality standards and compliance monitoring locations.

Using facility information, and in consultation with the facility owner, assess whether an interim limit and/or a compliance schedule is necessary.

Example

Various case studies are available including: Tualatin River, Oregon, San Francisco Bay, California, Long Island Sound, New York and Connecticut, Jamaica Bay, New York, Chesapeake Bay, Virginia, and Las Vegas Wash, Nevada.

Example of Seasonal NPDES Effluent Limitations Permit Structure

<table>
<tr><th>Parameter</th><th>Seasonal Limit</th><th>Average Monthly Limit</th><th>Average Weekly Limit</th><th>Maximum Daily Limit</th></tr>
<tr><td>Total Phosphorus (March 1 – October 31)</td><td>Plant A Outfall 001 A_1 lbs/day
Plant B Outfall 001 B_1 lbs/day
$A_1 + B_1 \leq 4.30$ lbs/day</td><td>---</td><td>---</td><td>---</td></tr>
<tr><td colspan="5">A_1 = Plant A seasonal median discharge concentration of total P mg/L x Plant A seasonal median effluent volume MGD x 8.34 conversion factor
B_1 = Plant B seasonal median discharge concentration of total P mg/L x Plant B seasonal median effluent volume MGD x 8.34 conversion factor</td></tr>
</table>

13.2 Watershed and Bubble Permitting

Watershed-based NPDES permitting is a process that addresses a variety of related water quality stressors within a hydrologic drainage basin, rather than individually addressing pollutant sources. Watershed-based permitting can encompass a variety of activities such as synchronizing permits within a basin; utilizing water quality-based effluent limits from multiple discharger modeling and analysis (e.g., Total Maximum Daily Loads, TMDLs); or apportioning a total (“bubble”) load among multiple facilities to foster intra-municipal trading. The type of permitting activity will vary depending on the unique characteristics of the watershed and the sources of pollution. The ultimate goal of watershed permitting is to develop and issue NPDES permits that better protect entire watersheds (EPA, 2014).

Suitable applications for watershed permitting may exist in a number of Idaho watersheds and provide advantages over the preparation and renewal of individual permits. In particular, permits driven by watershed management efforts and TMDLs for nutrients that transcend individual mixing zones and reflect broader water quality objectives may be especially appropriate. Watershed permitting provides flexibility in compliance and implementation efforts while applying creative approaches that meet entire watershed goals. Opportunities for collaboration and optimization of management efforts can be supported with watershed permitting for individual entities interested in shared responsibility for watershed-based bubble limits.

This section summarizes EPA policy on watershed permitting and provides summary discussions of a number of case study examples of important receiving waters that have employed watershed permits.

13.2.1 EPA Policy

EPA has published a significant amount of information about the watershed approach to permitting (e.g. EPA, 1996; EPA, 2003a; EPA, 2007). EPA released four policy statements regarding watershed-based NPDES permitting during the 2002 to 2003 period.

In December 2002 EPA Office of Water Assistant Administrator Mehan released the memorandum titled “Committing EPA’s Water Program to Advancing the Watershed Approach” to office directors and regional water division directors (Mehan, 2002). Mehan argued that although the watershed approach had been embraced by EPA for nearly a decade, substantial gaps in actual implementation existed. The memorandum announced creation of a Watershed Management Council with the charge of implementing a series of specific initiatives regarding the watershed approach including:

- Integrating and focusing internal EPA programs.
- Funding local watershed strategies and building local capacity.
- Providing assistance to States and Tribes.
- Fostering innovations.

As part of the last initiative, Mehan requested that efforts to develop and issue NPDES permits on a watershed basis be accelerated. Specifically, Mehan asked the Office of Wastewater Management to issue the watershed-based permitting policy statement and to work with the Regions to accomplish the following:

“Develop and implement a “roadmap” for advancing watershed-based NPDES permitting activities. Implement the watershed-based NPDES permitting policy immediately in those Regions that administer the NPDES permit program. Have regions identify watershed-based permit case studies; if no regional examples already exist, create watershed-based pilots. Include watershed-based permitting approaches as priority decision criteria for Water Quality Cooperative Agreement funding. Characterize the permit universe to determine permits or groups of permits that may be a high priority for reissuance based on watershed specific goals, impacts, and specific results.”

In January 2003, EPA Office of Water Assistant Administrator Mehan released the memorandum titled “Watershed-Based National Pollutant Discharge Elimination System (NPDES) Permitting Policy Statement” to regional water division directors (Mehan, 2003a). In the memorandum Mehan states:

“For this Policy, watershed-based permitting is defined as an approach that produces NPDES permits that are issued to point sources on a geographic or watershed basis to meet watershed goals. This policy statement communicates EPA’s policy on implementing NPDES permitting activities on a watershed basis, discusses the benefits of watershed-based permitting, presents an explanation of the process and several mechanisms to implement

watershed-based permitting, and outlines how EPA will be encouraging watershed-based permitting."

Mehan emphasized that the recommendations in the memorandum are not binding and that the memorandum does not substitute for provisions or regulations (i.e., CWA and EPA's NPDES implementing regulations).

In May 2003, EPA released the document "Watershed-Based NPDES Permitting: Rethinking Permitting as Usual." The document (EPA, 2003) is a summary fact sheet describing the process and differs from the memoranda because specific nutrient case studies are mentioned.

In December 2003, EPA Office of Water Assistant Administrator Mehan released the memorandum titled "Watershed-Based National Pollutant Discharge Elimination System (NPDES) Permitting Implementation Guidance" to regional water division directors (Mehan, 2003b). This memorandum provided the implementation guidance document as an attachment, and also referenced the December 2002 and January 2003 memoranda. The implementation guidance focuses on program implementation, but not technical, procedural, or administrative actions related to permit issuance. Mehan indicated that the Office of Wastewater Management would work with regional directors and the states to develop the technical guidance.

The four documents from EPA on watershed permitting lay the foundation for a watershed framework for NPDES permitting, but provide flexibility for state Permit Writers by not dictating a "one size fits all" type of framework. Watershed goals are often mentioned, implying that TMDLs and/or WQS are necessary. This suggests that a given state has developed nutrient TMDLs and/or WQS that result in the need for nutrient discharge permitting in a given watershed.

13.2.2 Case Study Watershed Permitting Examples

EPA has provided several examples of watershed-based NPDES permitting (EPA, 2014). Nationwide, there are a number of widely recognized receiving waters where watershed permitting has been applied in creative ways that may illustrate potentially applicable approaches for consideration in Idaho. Case study examples of watershed permitting for nutrients that highlight some key features are summarized in the following sections for these watersheds:

- Tualatin River, Oregon
- Long Island Sound, New York and Connecticut
- Jamaica Bay, New York
- Chesapeake Bay, Virginia
- Las Vegas Wash, Nevada
- San Francisco Bay, California
- Mississippi River – Lake Pepin, Minnesota

The discussions presented in the following sections highlight both the unique nature of watershed permitting as it is applied to individual watersheds, as well as some similarities in characteristics. It is clear that watershed permitting has been an attractive approach to stakeholders in many diverse watersheds across the country. The discussions that follow highlight the broader watershed considerations. The details of the resulting individual permit structures can be found in the permits themselves (see Reference list), and in other reports (Clark, 2016).

13.2.3 Tualatin River, Oregon

Clean Water Services of Washington County operates four treatment plants in the suburban Portland, Oregon area with innovative discharge permits. In 1988 Total Maximum Daily Loads (TMDLs) were established for ammonia and TP to address low dissolved oxygen (DO) and high pH levels in the Tualatin River, a subbasin of the Willamette River in Oregon. While the ammonia TMDL addressed low DO levels, the phosphorus TMDL addressed nuisance algal growth and accompanying high pH levels. The TMDLs were updated in 2001 and expanded to include new parameters (water temperature, bacteria, and DO in tributaries).

In the late 1990s and early 2000s, several individual NPDES permits were expiring, allowing a unique opportunity for the Oregon Department of Environmental Quality (OR DEQ) to consolidate Clean Water Services' permits for 4 wastewater facilities and their stormwater discharges with the Municipal Separate Storm Sewer System (MS4) permit into a single watershed NPDES permit (OR DEQ, 2004). Oregon DEQ issued a single, watershed-based, integrated NPDES permit to Clean Water Services. This permit incorporated the NPDES requirements for four advanced wastewater treatment facilities, one municipal separate storm sewage system (MS4) permit and individual storm water permits for the Durham and Rock Creek Advanced Wastewater Treatment Facilities.

In 2012, a revised TMDL to address dissolved oxygen and phosphorus also included creation of a new phosphorus trading program (OR DEQ, 2012). Phosphorus wasteload allocations (WLAs) for the treatment facilities were revised, and trading of phosphorus load among the facilities was implemented under the watershed permit reissued in April 2016. The 2012 amendment to the 2001 TMDL provided new phosphorus allocations for the Forest Grove and Hillsboro discharge locations, and provides daily load equivalents for the monthly targets set out in the 2001 TMDL (WLAs for the Rock Creek and Durham facilities are unchanged from the 2001 TMDL). The 2012 TMDL update provided a bubble allocation for the Forest Grove, Hillsboro, and Rock Creek facilities, which placed a ceiling on the allowable discharge load from multiple sites combined. The bubble allocation provides Clean Water Services with the flexibility to adopt innovative treatment at one, or both, of the upstream treatment plants, knowing that minor variations in phosphorus treatment at the upstream plants can be offset by proven advance treatment technology already in place at the Rock Creek facility (OR DEQ, 2012). While the Forest Grove and Hillsboro facilities were online at the time of the 2001 TMDL, they had not been discharging during the summer months. Instead, during the summer, raw wastewater from these treatment plants are conveyed to the Rock Creek facility. As population in the Tualatin Basin increases, Clean Water Services proposes (OR DEQ, 2012) to increase treatment capacity by maintaining the current capacity at its two downstream facilities, the Rock Creek and Durham plants, and by commencing summertime discharges at its two upstream facilities at Forest Grove and Hillsboro (along with proposed plant upgrades to reduce nutrients prior to summer discharge). The Rock Creek and Durham facilities will increase capacity as needed once Forest Grove and Hillsboro are operating at full capacity during the summer.

For the initial implementation of the 2012 TMDL, Clean Water Services has elected to apply the bubble concept to the Forest Grove and Rock Creek facilities. In addition, Clean Water Services has recently implemented a Natural Treatment System at the Forest Grove facility to provide additional tertiary treatment and other environmental benefits for the watershed.

This type of trading, also called intra-municipal trading, allows Clean Water Services to manage multiple discharges as a system, apportioning a total load among multiple facilities. In this case, DEQ had already issued a watershed permit that includes all four discharges under a single permit order. Describing the phosphorus allocation as a bubble load in this TMDL will enable the Permit Writer to incorporate intra-municipal trading in subsequent watershed permits for CWS. One requirement for this type of trade is a demonstration that localized impacts are not expected at any of the discharge locations (OR DEQ, 2012). This was demonstrated by extensive water quality modeling and assessment for the 2012 TMDL and 2016 permit reissuance.

The phosphorus bubble limits in the 2106 permit are shown Table 13-1 (note: Outfall D001 is Durham, R001 is Rock Creek, and F001A is the Forest Grove facility):

Table 13-1. Phosphorus Limits in Clean Water Services Watershed Permit.

Table A7: Phosphorus Limitations

Outfall Number	Parameter	Monthly Median Limit	Seasonal Median Limit	Applicable Time Period
D001	Total Phosphorus	0.11 mg/L	Not Applicable	May 1 – October 15**
R001	Total Phosphorus	0.10 mg/L	Not Applicable	May 1 – September 30**
F001A	Total Phosphorus	81.6 lbs/day – (calculated monthly median total phosphorus mass load from R001 [lbs/day])*	66.1 lbs/day – (calculated seasonal median total phosphorus mass load from R001 [lbs/day])*	May 1 – September 30**

* Phosphorous limitations for F001A based upon Table 2-13 in Chapter 2 of 2012 Tualatin TMDL. The monthly median limit at F001A will be calculated as follows: [Monthly median load (81.6 pounds per day) - ((Monthly median Rock Creek discharge concentration of total P mg/L) × (Actual monthly median Rock Creek effluent volume MGD) × (8.34 conversion factor))]. The seasonal median limit at F001A will be calculated as follows: [Seasonal median load (66.1 pounds per day) - ((Seasonal median Rock Creek discharge concentration of total P mg/L) × (Actual seasonal median Rock Creek effluent volume MGD) × (8.34 conversion factor))].

** Phosphorus limitations do not apply after September 15th provided diversions to Lake Oswego have ceased and the 7-day-average river flow at the Farmington Gauge is ≥ 130 cfs.

13.2.4 Long Island Sound, New York and Connecticut

Low DO levels in Long Island Sound have been attributed to excess nitrogen originating from New York and Connecticut. Both states collaborated to develop a nitrogen TMDL to achieve each state's respective water quality standards (CT DEEP, 2000). In Connecticut, 79 publically owned treatment works (POTWs) were issued a nitrogen WLA. A nitrogen general NPDES permit and a Nitrogen Credit Exchange Program were developed in 2002. The general permit addresses TN discharges from the 79 POTWs and sets TN limits for each facility. The exchange program was developed to allow purchase of credits for POTWs that have difficulty meeting their individual TN limits.

The general permit for Connecticut POTWs was reissued for the 2011-2015 period (CT DEEP, 2010). Annual discharge limits (pounds/day) were issued based in part on how far an individual POTW was located from the Long Island Sound via an “equivalency factor”, which means a ratio of the unit response of dissolved oxygen to nitrogen in Long Island Sound for each POTW based on the geographic location of the specific POTW’s discharge point divided by the unit response of the geographic area with the highest impact. The 2015 WLAs for each POTW are equivalent to the final WLAs set forth in the TMDL (CT DEEP, 2000).

Table 13-2 summarizes the annual total nitrogen discharge from a select group of Connecticut facilities from each of the Water Pollution Control Facilities (WPCFs) in the 6 zones in the general permit for nitrogen discharges. The table illustrates the nitrogen loadings and the equivalency factors assigned to individual dischargers. The annual discharge limits are expressed in pounds per day allocated at the end-of-pipe from each facility. Compliance with the annual discharge limits is based either discharging less than the mass in the general permit, or by securing nitrogen credits equivalent to the amount exceeding the annual discharge load assigned to an individual facility. The limits are subject to revision in the course of the permit as new information becomes available about the achievement of the aggregate wasteload allocation for the Long Island Sound TMDL.

Table 13-2. Annual Discharge Limits for Select Facilities under Connecticut General Permit for Nitrogen Discharges (CT DEEP, 2010)

Zone	Publicly Owned Treatment Works	Equivalency Factor	Total Nitrogen (Pounds/Day)				
			2011	2012	2013	2014	2015
1	New London WPCF	0.18	**424**	**404**	**395**	**386**	**386**
2	Hartford WPCF	0.20	**2,611**	**2,491**	**2,431**	**2,377**	**2,377**
3	New Haven East WPCF	0.60	**1,722**	**1,643**	**1,603**	**1,568**	**1,568**
4	Waterbury WPCF	0.60	**1,109**	**1,058**	**1,049**	**1,049**	**1,049**
5	Bridgeport West WPCF	0.85	**1,144**	**1,091**	**1,065**	**1,041**	**1,041**
6	Stamford WPCF	1.00	**1,017**	**970**	**947**	**926**	**926**

The Connecticut Department of Energy and Environmental Protection (DEEP) purchases all of the equivalent nitrogen credits generated by facilities that achieve compliance and discharge less than their nitrogen load limit. The number of equivalent nitrogen credits required to achieve compliance is calculated by subtracting the annual mass loading of nitrogen discharged by a facility from the annual mass loading limit and multiplying the result by the equivalency factor for the facility. Facilities must purchase the equivalent nitrogen credits needed to achieve a zero equivalent nitrogen credit balance by July 31 to remain in compliance with the permit.

13.2.5 Jamaica Bay, New York

Jamaica Bay is located at the southern end of Brooklyn and Queens, and abuts the JFK airport. The Bay has experienced dissolved oxygen water quality standard violations associated with ongoing hypoxia issues. The primary driver of the hypoxia is nitrogen input from the watershed. Four major New York City wastewater treatment plants discharge into Jamaica Bay (Coney Island, Jamaica, Rockaway, and 26th Ward). To address the hypoxia issue, the four treatment plants are subject to a total nitrogen limit that is imposed through the First Amended Nitrogen Consent Judgment (NYSC, 2011). The limit is an aggregate 12 month rolling average mass limit, with incremental TN limits to be implemented as performance-based limits following completion of treatment plant upgrades which provide biological nitrogen removal (Table 13-3). The performance-based total nitrogen limits incrementally step down in phases 19 months after commencement of operations of the upgraded facilities. The schedule for wastewater treatment plant upgrades is outlined in a compliance schedule (NYSC, 2011), which anticipates completion of upgrades for the Jamaica and 26th plants by 2016, and completion of upgrades for the Rockaway and Coney Island plants by 2020.

Table 13-3. Total Nitrogen Interim Effluent Limits for Jamaica Bay (NYDEC, 2013)

Effective Date	**Jamaica Bay Limits** – These interim limits are step-down aggregate limits for all four Jamaica Bay WWTPs, expressed as a 12 month rolling average.
November 1, 2009	41,600 lbs/day
January 1, 2012 (19 months after commencement of operation of the Level 2 upgrade at the 26th Ward WWTP on June 1, 2010).	36,500 lbs/day
19 months after commencement of operation of the interim chemical addition facility for AT#3 at the 26th Ward WWTP.	Performance-Based Limit.
19 months after the last of commencement of: (a) the Level 3 BNR upgrades at the 26th Ward WWTP, or (b) the Level 2 BNR upgrades at the Jamaica WWTP.	Performance-Based Limit.
19 months after the last of: (a) construction completion of the Level 1 BNR upgrade at Coney Island WWTP; or (b) construction completion of the Level 1 BNR upgrade at the Rockaway WWTP.	Performance-Based Limit.

A final aggregate nitrogen limit of 7,400 lbs/day was established for the four Jamaica Bay treatment plants (NYDEC, 2013). A comprehensive report (NYC DEP, 2006) determined that the nitrogen discharges from the four treatment plants would have to be equal, or close to zero, in order to attain water quality standards for dissolved oxygen. The aggregate limit was calculated from the current limit of technology for nitrogen treatment which reflects a concentration of 3.0 mg/L and a projected flow of 296 mgd for the four Jamaica Bay plants in 2045. The report was approved by the NYC DEC and the projected 2045 flows were used in additional modeling efforts for projected performance to include impacts from population increases.

13.2.6 Chesapeake Bay, Virginia

In 2000, the states in the Chesapeake Bay watershed signed an agreement to reduce nitrogen and phosphorus loads into the Bay (CBP, 2000), with wasteload allocations assigned to major river basins in each state. The Virginia DEQ developed strategies for each of its tributaries entering the Bay (Eastern Shore, Potomac, Rappahannock, York, and James), assigning nutrient load allocations to both point and nonpoint sources. A watershed based general permit was developed to encompass 125 dischargers in 2006 (EPA, 2007; VA, 2014), as well as a nutrient trading program.

A “delivery factor” has been assigned to each of the dischargers, much like was done for Connecticut with respect to “equivalency factors”. For a given facility, different delivery factors are assigned for TN and TP. To date, all five river basins have met and exceeded their WLAs assigned in the general permit for TN, TP, as well as TSS. It is anticipated that the existing general permit will be extended.

Dischargers have two basic options for compliance, either directly meet their annual wasteload allocation for N and P in their discharge, or obtain N and P credits to offset N and P loads exceeding their wasteload allocations. Effluent limits in the permit are set as annual wasteload allocations (i.e., lbs/yr of TN and TP). Concentration limits typically are included in individual VPDES permits when the treatment plant has received state Water Quality Improvement fund grants or revolving load funds to construction nutrient removal upgrades. The concentration limits are set as annual average (mg/l) limits and are technology-based and depend upon what the wastewater utility indicates to the state that the treatment process is designed to achieve. The technology-based concentration limits are used to ensure that the facility is operating the nutrient removal process as intended. Since most discharge flows are below the plant design flow (upon which the wasteload allocation is based), concentration-based limits also help ensure that dischargers are able to generate nitrogen and phosphorus credits for trading.

In 2010 EPA finalized the Chesapeake Bay TMDL for nitrogen, phosphorus, and sediment (EPA, 2010). As part of compliance requirements, each state in the watershed is required to develop Phase I and Phase II Watershed Implementation Plans (WIPs), which contain details on how each state intends to implement TMDL provisions in their own NPDES permitting programs and consider trading and other strategies. For example, the Virginia Phase I WIP (VA, 2010) included creation of a watershed cap on nutrient loads from significant point source dischargers. The Virginia Phase II WIP (VA, 2012) focuses primarily on agricultural, stormwater, and septic issues, but also reports on the expansion of the nutrient credit trading program. Regarding wastewater, the Phase II WIP provides some technical changes to Phase I WIP strategies and presents an updated approach for permitting of combined sewer overflows (CSOs).

13.2.6.1 NUTRIENT EXCHANGE

The Virginia State Water Control Board issued a general VPDES watershed permit for total nitrogen and total phosphorus discharges and nutrient trading in the Chesapeake Bay watershed in Virginia. The general permit establishes annual effluent loading limits for nitrogen and phosphorus, and establishes the conditions by which credits (the difference in pounds between the facility’s limit and the mass actually discharged) may be exchanged, or offsets (an alternate nutrient removal mechanism) may be purchased by existing facilities that have exceeded their allocation, or by new and expanded facilities not assigned a waste load allocation.

The Virginia Nutrient Credit Exchange uses voluntary, market-based nutrient credit trading as a means of achieving compliance and prepares an annual update to the Chesapeake Bay Nutrient Credit Exchange Program Compliance Plan. The initial focus of the Exchange was on nutrient removal upgrades for compliance with the Chesapeake Bay nitrogen and phosphorus waste load allocations. Since compliance was achieved in 2011 the focus has shifted to maintaining compliance through an ongoing program of additional facility upgrades.

Virginia DEQ is required to prepare a report on the total annual mass loads of nitrogen and phosphorus discharged to the Chesapeake Bay watershed by each permitted facility by April 1st each year. The actual loads and delivered loads are identified for each discharger and compared with the corresponding wasteload allocation. Virginia DEQ determines the number of point source nitrogen and phosphorus credits generated, or required, by each facility in the previous calendar year. If there are insufficient point source credits available for exchange to provide for full compliance by every applicant, then DEQ determines the number of credits to be purchased from the Water Quality Improvement Fund.

13.2.6.2 HRSD BUBBLE PERMIT EXAMPLE

Table 13-4 presents an example of the annual loading analysis for the Hampton Roads Sanitation District (HRSD) facilities discharging to the James River in 2013. HRSD has a "bubble" allocation for 7 facilities discharging to the James River in the Chesapeake Bay watershed. These facilities have an aggregated mass load limit referred to as an "owner bubble" and compliance is determined on an aggregate basis rather than by comparison of individual facility loads with respective individual WLAs.

Table 13-4. Hampton Roads Sanitation District (HRSD) 2013 Nitrogen and Phosphorus Wasteload Allocations and Delivered Loadings for the James River

Facility	Design Flow, mgd	Total Nitrogen			Total Phosphorus		
		Wasteload Allocation, lbs	Delivery Factor	2013 Discharged Load, lbs	Wasteload Allocation, lbs	Delivery Factor	2013 Discharged Load, lbs
HRSD James River Aggregate		**6,000,000**	**--**	**5,169,763**	**373,247**	**--**	**335,408**
Boat Harbor STP	20	740,000	1.0	925,895	53,239	1.0	26,671
James River STP	25	1,250,000	1.0	312,511	42,591	1.0	39,428
Williamsburg STP	22.5	800,000	1.0	241,899	47,915	1.0	33,924
Nansemond STP	30	750,000	1.0	283,001	63,887	1.0	82,696
Army Base STP	18	610,000	1.0	1,006,188	38,332	1.0	31,590
Virginia Initiative STP	40	750,000	1.0	798,691	85,183	1.0	69,656
Chesapeake -Elizabeth STP	24	1,100,000	1.0	1,601,578	51,110	1.0	51,443
2013 Delivered Nitrogen Exceedance/ (Credit) (lbs)				**-830,237**	**2013 Delivered Phosphorus Exceedance/ (Credit) (lbs)**		**-37,839**

Table 13-4 shows that for both nitrogen and phosphorus, the aggregate of the actual discharges from HDRSD facilities to the James River was less than the "bubble" and therefore credits were generated. Individual facilities actual discharges varied in comparison to their individual wasteload allocations. For example, the Boat Harbor STP exceeded its individual nitrogen allocation and the James River STP was far below its nitrogen allocation. The HRSD aggregate James River nitrogen wasteload allocation was 6 million pounds and the actual 2013 discharge was 5.17 million pounds, which results in the generation of a 0.83 million pound credit. HRSD can make transfers within the “owner bubble” based on the actual performance of individual facilities. If credits are generated, the owner may pledge a percentage of credits to the Exchange. If loads exceed the bubble, credits must be purchased from the exchange to comply with the aggregate delivered wasteload allocation.

13.2.7 Las Vegas Wash, Nevada

Wastewater facilities serving City of Las Vegas, Clark County Water Reclamation District, and the City of Henderson discharge into the Las Vegas Wash, which ultimately flows into Lake Mead and the Colorado River. TMDLs were developed for total ammonia as nitrogen and phosphorus in 1989. Seasonal phosphorus and ammonia limitations apply to the dischargers and mass load allocations to the Las Vegas Wash are shared between three wastewater utilities. The dischargers were allocated individual wasteload allocations and a cumulative total loading, as shown in Table 13-5.

Table 13-5. Las Vegas Wash Wasteload Allocations for Phosphorus and Ammonia

Constituent	City of Las Vegas IWLA	Clark County Sanitation District IWLA	City of Henderson IWLA	Sum of Waste Load Allocations ΣWLA
Total Phosphorus	**123 lb/day**	**173 lb/day**	**38 lb/day**	**334 lb/day** Note: This WLA only applies March 1 - October 31; no limit applies the rest of the year. Non-point source load is 100 lb/day.
Total Ammonia	**358 lb/day**	**502 lb/day**	**110 lb/day**	**970 lb/day** Note: This WLA only applies April 1 - September 30; no limit applies the rest of the year. No non-point source load.
IWLA = Individual Waste Load Allocation				

The associated NPDES permits include language which allows allocation trading between the dischargers. This permit condition constitutes a cooperative agreement between the utilities to allow discharge flexibility. Each facility has an Individual Waste Load Allocation (IWLA) and there is a Sum of Waste Load Allocations (∑WLA) defined for all three of the facilities.

Annually, the dischargers may modify their individual allocations by transferring or receiving loadings from another discharger. The annual re-allocation must be documented and signed by all three dischargers and is to be submitted to the state May 31st. The notification is required to include the flow, waste load discharged, and treatment plant removal efficiency. An annual re-allocation is considered a minor modification to the permit as long as the cumulative total load allocation is not changed.

Temporary trading of loadings is allowed and is again required to be documented in writing and signed by all three dischargers. The documentation must include the amount of the individual load allocation transferred, the length of time the transfer is effective, and the basis for the transfer to identify the last monthly flows and waste load discharged for each discharger. Transfers are binding on the parties and cannot be revoked without a notification signed by all three dischargers. The transferred load reverts back to the original applicant at the end of the specified time.

13.2.8 San Francisco Bay, California

The San Francisco Bay estuary has long been known to be nutrient-enriched. Despite this, the abundance of phytoplankton in the estuary is lower than would be expected due to a number of factors, including strong tidal mixing; high turbidity, which limits light penetration; and high filtration by clams. The estuary ecosystem is quite complex, with food web components being influenced by both anthropogenic and natural drivers over decadal time scales (Cloern and Jassby, 2012). While nutrient discharges to the San Francisco Bay have not yet resulted in impairment problems (e.g., excessive algal growth), recent studies have shown that the Bay's historic resilience to nutrient loading may be weakening. As a result, nutrients are a growing concern for the health of the ecosystem.

Since 2006, the California State Water Resources Control Board (SWRCB) and the San Francisco Bay Regional Water Quality Control Board (SFRWQCB) have been facilitating development of Nutrient Numeric Endpoints (NNEs) for the Bay. Additional activities include examination of nutrient management strategies (SFRWQCB, 2012) and development of a nutrient assessment framework (SFRWQCB, 2013).

The Bay Area Clean Water Agencies (BACWA) is a joint powers agency formed under the California Government Code by the five largest wastewater treatment agencies in the San Francisco Bay Area (BACWA, 2014). The BACWA, SFRWQCB, and the San Francisco Estuary Institute (SFEI) have had a strong working relationship for many years. One of the initial efforts was to better understand the nutrient loadings to the Bay. SFEI compiled data which found municipal wastewater treatment plants represent about 63% of the annual nitrogen load to the Bay (SFEI, 2013). About 90% of the annual nitrogen load from municipal wastewater treatment plants is from facilities that have a permitted design flow of 10 mgd or greater.

In 2012, BACWA requested a nutrient watershed permit concept evaluation (Grovhoug et al., 2012a). The evaluation considered seven different regulatory approaches and five different overarching frameworks, along with several evaluation criteria. It was concluded that there were three best apparent alternatives for the regulatory approach to nutrient management (individual NPDES permits, nutrient watershed permit, and narrative objective implementation) and two for the overarching framework (Basin Plan Amendment and Memorandum of Agreement/ Memorandum of Understanding (MOA/MOU)). A follow-up evaluation (Grovhoug et al., 2012b) examined implementation of a narrative objective implemented in a nutrient watershed permit (i.e., regulatory approach) with an MOA/MOU and subsequent basin plan amendment (i.e., overarching framework).

13.2.8.1 SAN FRANCISCO NUTRIENT WATERSHED PERMIT

BACWA then approached the SFRWQCB with a proposal for a nutrient watershed permit. Many ideas were exchanged between BACWA and the SFRWQCB regarding the content of the

NPDES permit, with little involvement from the EPA. The nutrient watershed permit was signed in April 2014 (SFRWQCB, 2014) with an effective date of July 1, 2014 and an expiration date of June 30, 2019. Thirty-seven dischargers with cumulative permitted discharge capacity nearing 860 mgd are participating in this permit. The design flows and existing nutrient loadings from the five largest dischargers who are the Principal Members of BACWA out of the total group of 37 dischargers are summarized in Table 13-6.

Table 13-6. Design Flows and Existing Nutrient Loadings from Principal Members of Bay Area Clean Water Agencies (BACWA)

Discharger	Design Flow, mgd	Average Annual Load, kg/day	
		Total Nitrogen	Total Phosphorus
San Jose/Santa Clara WPCP	167	5,233	332
City and County of San Francisco (Southeast Plant)	150	8,307	101
East Bay Municipal Utility District (EBMUD)	120	10,583	973
East Bay Dischargers Authority (EBDA)	107.8	8,641	555
Central Contra Costa Sanitary District (CCCSD)	53.8	4,187	138

Special provisions of the nutrient watershed permit require that each facility conduct or support the following three main areas to address nutrient reduction and receiving water quality:

1. **Evaluation of Potential Nutrient Discharge Reduction by Treatment Optimization and Side-Stream Treatment**. This evaluation focuses on options and costs for nutrient discharge reduction by optimization of current treatment works and side-stream treatment opportunities.

- Describe the treatment plant, treatment plant process, and service area.
- Evaluate site-specific alternatives, along with associated nitrogen and phosphorus removal levels, to reduce nutrient discharges through methods such as operational adjustments to existing treatment systems, process changes, or minor upgrades.
- Evaluate side-stream treatment opportunities along with associated nitrogen and phosphorus removal levels.
- Describe where optimization, minor upgrades, and sidestream treatment have already been implemented.
- Evaluate beneficial and adverse ancillary impacts associated with each optimization proposal, such as changes in the treatment plant’s energy usage, greenhouse gas emissions, or sludge and biosolids treatment or disposal.
- Identify planning level costs of each option evaluated.
- Evaluate the impact on nutrient loads due to treatment plant optimization implemented in response to other regulations or requirements.

2. **Evaluation of Potential Nutrient Discharge Reduction by Treatment Upgrades or Other Means**. This evaluation focuses on identification of options and costs for potential treatment upgrades for nutrient removal.

- Identify potential upgrade technologies for each treatment plant category along with associated nitrogen and phosphorous removal levels.
- Identify site-specific constraints or circumstances that may cause implementation challenges or eliminate any specific technologies from consideration.
- Include planning level capital and operating cost estimates associated with the upgrades and for different levels of nutrient reduction, applying correction factors associated with site-specific challenges and constraints.
- Describe where Dischargers have already upgraded existing treatment systems or implemented pilot studies for nutrient removal. As part of this description, document the level of nutrient removal the upgrade or pilot study is achieving for total nitrogen and phosphorus.
- Evaluate the impact on nutrient loads due to treatment plant upgrades implemented in response to other regulations and requirements.
- Evaluate beneficial and adverse ancillary impacts associated with each upgrade, such as changes in the treatment plant’s energy use, changes in greenhouse gas emissions, changes in sludge and biosolids treatment or disposal, and reduction of other pollutants (e.g., pharmaceuticals) through advanced treatment.

Nutrient removal by other means includes evaluation of ways to reduce nutrient loading through alternative discharge scenarios, such as water recycling or use of wetlands, in combination with, or in-lieu of, the treatment plant upgrades to achieve similar levels of nutrient load reductions.

- Reduction in potable water use through enhanced reclamation.
- Creation of additional wetland or upland habitat.
- Changes in energy use, greenhouse gas emissions, sludge and biosolids quality and quantities.
- Reduction of other pollutant discharges.
- Impacts to existing permit requirements related to alternative discharge scenarios.
- Implications related to discharge of brine or other side-streams associated with advanced recycling technologies.

3. **Monitoring, Modeling, and Embayment Studies**. This provision focuses on science plan development and implementation, as well as monitoring nutrients in receiving waters.
    - Support the science plan development and implementation.
    - Support receiving water monitoring for nutrients.

The NPDES permit allows the wastewater facilities to perform the permit tasks collectively as a group, or individually. All 37 participating facilities decided to perform the efforts collectively as a group. The first two tasks are being performed by a consulting firm team, whereby a report for each facility will be produced to address these task requirements for nutrient removal optimization and upgrade.

The third task, supporting the science plan is an on-going effort led by SFEI. The key elements that comprise the science plan are as follows:

1. Monitoring special studies (e.g., algal toxin pigment studies).
2. Modeling of San Francisco Bay.
3. Loads analysis (e.g., moored sensors data).
4. Developing a water quality assessment framework.

5. The emphasis is to integrate across the plans to develop an overarching nutrient strategy framework for San Francisco Bay.

13.2.9 Mississippi River- Lake Pepin, Minnesota

The Mississippi River - Lake Pepin watershed extends over 205,747 acres and includes the metropolitan Minneapolis area. Lake Pepin is 21 miles long and is the naturally widest part of the Mississippi River bordered by the states of Minnesota and Wisconsin. Lake Pepin is impaired by high levels of nutrients that cause excessive growth of algae, as well as high levels of sediment. The Minnesota Pollution Control Agency (MPCA) prepared Lake Pepin Site Specific Eutrophication Criteria, which were adopted as part of amendments to state water quality standards and consist of the following:

- Total Phosphorus 100 ug/L
- Chlorophyll-a 28 ug/L

The Metropolitan Council Environmental Services (MCES) operates seven wastewater treatment facilities in the Minneapolis metropolitan area that discharge to the Mississippi River - Lake Pepin watershed. Over the past 15 years, MCES has made improvements to these facilities that have resulted in a dramatic reduction of effluent phosphorus loads discharged to the river. The implementation of biological phosphorus removal at the Metropolitan Wastewater Treatment Plant (Metro Plant) decreased the phosphorus effluent load by approximately 90 percent between 2000 and 2011. Metro Plant performance has been at, or below 0.6 mg/L, operating under the historical effluent discharge limitation of 1 mg/L total phosphorus.

13.2.9.1 METROPOLITAN COUNCIL TOTAL PHOSPHORUS PERMIT

In September 2015, the MPCA issued a total phosphorus discharge permit for the 5 MCES wastewater facilities discharging to, or upstream of, the Mississippi River Pools 2, 3, and 4 and Lake Pepin. This permit defined the specific conditions to implement a combined Total Phosphorus Water Quality Based Effluent Limit (WQBEL) for the 5 wastewater facilities covered by the permit.

The Total Phosphorus Water Quality Based Effluent Limit covers the following MCES wastewater facilities: Eagles Point WWTP, Empire WWTP, Hastings WWTP, Metropolitan WWTP, and Seneca WWTP. Table 13-7 provides a summary of the wastewater facilities covered by the phosphorus bubble permit.

Table 13-7. MCES Wastewater Facilities Covered in Mississippi River Bubble Discharge Permit for Phosphorus

Facility Name	Average Wet Weather Design Flow, mgd	Treatment Process Description
Eagles Point	11.9	Biological Phosphorus Removal
Empire	28.6	Biological Phosphorus Removal
Hastings	2.69	Conventional Activated Sludge
Metropolitan	314	Biological Phosphorus Removal
Hastings	38	Biological Phosphorus Removal

The permit authorizes MCES to aggregate the total phosphorus limit among the 5 wastewater facilities with the total mass loading limits as shown in Table 13-8. The permit covers only the discharge of phosphorus. Individual permits for the five facilities address all other conditions associated with the discharges to the Mississippi River.

Table 13-8. MCES Total Phosphorus Limits for Five Facilities

Parameter	Limit	Limit Type	Effective Period	Sample Frequency
Total Phosphorus	159,349 kg/yr	12 Month Moving Total	Jan - Dec	1X Month
Total Phosphorus	916.8 kg/day	Calendar Month Average	Jan - Dec	1 X Month

[1]Combined limit for 5 MCES wastewater facilities included in Mississippi River Bubble Discharge Permit for Phosphorus

13.2.9.2 BUBBLE PERMIT APPEAL

In May of 2015 MPCA published a draft of the total phosphorous bubble permit for the five MCES facilities and the Minnesota Center for Environmental Advocacy (MCEA) submitted comments opposing the permit. MPCA responded to the MCEA comments and issued the permit in September 2015. MCEA petitioned to challenge the issuance of the permit. MCEA argued that the MPCA decision to issue the permit was arbitrary and capricious because the effluent limits relied on voluntary reductions in unregulated nonpoint source pollution and that the permit violated federal law by allowing discharges in excess of water quality standards.

The Minnesota Court of Appeals issued a ruling in June 2016 that affirmed the permit as issued by MPCA. The appeals court found that while MPCA must consider both point and nonpoint sources of pollution in setting effluent limits, the fact that the permit by itself does not ensure meeting water quality standards does not render the permit arbitrary and capricious. Further, the appeals court found that there was substantial evidence that voluntary reductions from nonpoint source have occurred in the past and can be reasonably expected to occur in the future. A Nutrient Reduction Strategy report that found that phosphorus pollution from nonpoint sources had been reduced by 8 percent in the Mississippi River basin since 2000 was cited. The appeals court also found that since the MPCA based the phosphorus limit on long-term summer concentrations, that the intent was not to focus on a single summer, and therefore MPCA did not act arbitrarily and capriciously in issuing the permit.

13.3 References

Bay Area Clean Water Agencies (BACWA) (2014) Bay Area Clean Water Agencies Webpage. http://bacwa.org/

Clark, D.L., Dupuis, T., Falconer, H., Hatch, L., Kasch, M.S., and Neethling, J.B. (2016) “Nutrient Management Volume III: Development of Nutrient Permitting Frameworks.” WE&RF Report NUTR1R06z.

Cloern, J.E. and Jassby, A.D. (2012) Drivers of change in estuarine-coastal ecosystems: Discoveries from four decades of study in San Francisco Bay, Rev. Geophys., 50, RG4001, doi:10.1029/2012RG000397.

http://www.restorethedelta.org/wp-content/uploads/2012/11/CloernJassbyDriversofChange.pdf

Connecticut Department of Energy & Environmental Protection (DEEP) (2000) A Total Maximum Daily Load Analysis to Achieve Water Quality Standards for Dissolved Oxygen in Long Island Sound.
http://www.ct.gov/deep/lib/deep/water/lis_water_quality/nitrogen_control_program/tmdl.pdf

Connecticut Department of Energy & Environmental Protection (DEEP) (2010) General Permit for Nitrogen Discharges.
http://www.ct.gov/deep/lib/deep/water/municipal_wastewater/2011_2015_nitrogen_gp.pdf

Connecticut Department of Energy & Environmental Protection (DEEP) (2013) Report of the Nitrogen Credit Advisory Board for Calendar Year 2012 to the Joint Standing Environment Committee of the General Assembly.
http://www.ct.gov/deep/lib/deep/water/municipal_wastewater/nitrogen_report_2012.pdf

EPA (1996) EPA Watershed Approach Framework. U.S. Environmental Protection Agency, Washington, DC.
http://www.epa.gov/OWOW/watershed/framework.html

EPA (2003) National Water Quality Trading Policy, Office of Water.
http://water.epa.gov/type/watersheds/trading/finalpolicy2003.cfm

EPA (2003) Watershed-Based NPDES Permitting: Rethinking Permitting as Usual. EPA-833-F-03-004.

EPA (2003a) Watershed-Based National Pollutant Discharge Elimination System (NPDES) Permitting Implementation Guidance, EPA 833-B-03-004.
http://water.epa.gov/polwaste/npdes/basics/upload/watershedpermitting_finalguidance.pdf

EPA (2003b) Watershed NPDES Permitting: Rethinking Permitting as Usual, EPA-833-F-03-004.
http://water.epa.gov/polwaste/npdes/basics/upload/watershed-basedpermitting_brochure.pdf

EPA (2007) Watershed-Based National Pollutant Discharge Elimination System (NPDES) Permitting Technical Guidance, EPA 833-B-07-004. http://water.epa.gov/polwaste/npdes/basics/upload/watershed_techguidance.pdf

EPA (2007) Watershed-Based Permitting Case Study: Chesapeake Bay Watershed, Virginia. http://water.epa.gov/polwaste/npdes/basics/upload/wq_casestudy_factsht13.pdf

EPA (2014) Watershed-Based NPDES Permitting, http://cfpub.epa.gov/npdes/wqbasedpermitting/wspermitting.cfm

Grovhoug, T., Conners, D., and Clark, D. (2012a) Evaluation of BACWA Nutrient Watershed Permit Concept, Draft.

Grovhoug, T., Conners, D., and Kennedy, H. (2012b) Evaluation of BACWA Nutrient Watershed Permit Concept: Implementing the Best Apparent Alternative, Draft.

Mehan, G.T., Assistant Administrator, EPA Office of Water (2003a) Memorandum to Water Division Directors, EPA Regions 1-10, “Watershed-Based National Pollutant Discharge Elimination System (NPDES) Permitting Policy Statement.” http://water.epa.gov/polwaste/npdes/basics/upload/watershed-permitting-policy.pdf

Mehan, G.T., Assistant Administrator, EPA Office of Water (2003b) Memorandum to Water Division Directors, EPA Regions 1-10, “Watershed-Based National Pollutant Discharge Elimination System (NPDES) Permitting Implementation Guidance.” http://water.epa.gov/polwaste/npdes/basics/upload/watershed_transmittal_memo.pdf

Minnesota Pollution Control Agency (MPCA) (2015) Final Issued NPDES/SDS Permit Number MN0070629 Metropolitan Council – Mississippi Basin Total Phosphorus Permit.

State of Minnesota In Court of Appeals A15-1622. June 13, 2016. Minnesota Center for Environmental Advocacy, Realtor, vs. Minnesota Pollution Control Agency, Respondent and Metropolitan Council Environmental Services, Respondent. Minnesota Pollution Control Agency Permit No. MN0070629.

New York City Department of Environmental Protection (NYC DEP) (2006) Comprehensive Jamaica Bay Report. http://www.ciesin.org/jamaicabay/stakeholder/city_dep.jsp

New York State Department of Environmental Conservation (NYSDEC) (2011) New York State Nutrient Standards Plan. New York State Department of Environmental Conservation (NYSDEC) (2013) 26th Ward Wastewater Treatment Plant SPDES Draft Discharge Permit NY0026212, Jamaica WWTP SPDES Draft Discharge Permit NY0026115, Rockaway Water Pollution Control Plant SPDES Draft Discharge Permit NY0026221, and Coney Island WWTP SPDES Draft Discharge Permit NY0026182. http://www.dec.ny.gov/permits/92038.html

New York Supreme Court (2011) First Amended Nitrogen Consent Judgment. http://docs.nrdc.org/water/files/wat_11062901a.pdf

Oregon Department of Environmental Quality (DEQ) (2004) NPDES Watershed-Based Waste Discharge Permit, Clean Water Services. http://www.cleanwaterservices.org/Content/Documents/Permit/Watershed-based%20Permit.pdf

Oregon Department of Environmental Quality (DEQ) (2012) Tualatin Subbasin Total Maximum Daily Load and Water Quality Management Plan), Oregon Department of Environmental

Quality.
http://www.deq.state.or.us/WQ/TMDLs/docs/willamettebasin/tualatin/revision/Ch0CoverExecSummary.pdf

San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) (2012) San Francisco Bay Nutrient Management Strategy.
http://bayareanutrients.aquaticscience.org/sites/default/files/u23/Nutrient_Strategy%20November%202012.pdf

San Francisco Bay Regional Water Quality Control Board (SFRWQCB) (2013) A Review of Scientific Approaches Supporting Nutrient Assessment Framework Development for San Francisco Bay, prepared for the San Francisco Regional Water Quality Control Board Basin Planning and TMDL Unit.
http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/planningtmdls/amendments/estuarineNNE/SAG-June-2013/NNE_Framework_White_Paper.pdf

San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) (2014) Waste Discharge Requirements for Nutrients from Municipal Wastewater Discharges to San Francisco Bay, Order No. R2-2014-0014; NPDES No. CA0038873.
http://www.waterboards.ca.gov/sanfranciscobay/board_decisions/adopted_orders/2014/R2-2014-0014.pdf

San Francisco Estuary Institute (SFEI) (2013) External Nutrient Loads to San Francisco Bay, Draft.
http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/planningtmdls/amendments/estuarineNNE/NutrientLoadsDRAFT_Apr2013.pdf

Virginia Department of Environmental Quality (DEQ) (2012b) Chapter 820: General Virginia Pollutant Discharge Elimination System (VPDES) Watershed Permit Regulation for TN and TP Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia (9VAC25-820).
http://lis.virginia.gov/cgi-bin/legp604.exe?000+reg+9VAC25-820
http://www.deq.virginia.gov/Portals/0/DEQ/Water/TMDL/Baywip/vatmdlwipphase2.pdf

Virginia Department of Environmental Quality (DEQ) (2014a) 2013 Nutrient Loads Analysis.
http://www.deq.virginia.gov/Portals/0/DEQ/Water/PollutionDischargeElimination/PublishedLoads2013.pdf.

Virginia Department of Environmental Quality (DEQ) (2014b) 2013 Nutrient Trading Report.
http://www.deq.virginia.gov/Portals/0/DEQ/Water/PollutionDischargeElimination/NutrientTradesReport2013.pdf.

Virginia Department of Environmental Quality (DEQ) (2014a) Administrative Code Chapter 820, Sections 10-80: General Virginia Pollutant Discharge Elimination System (VPDES) Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia.
http://leg1.state.va.us/000/reg/TOC09025.HTM#C0040.

Virginia Department of Environmental Quality (DEQ) (2014b) Certification of Nonpoint Source Nutrient Credits, proposed text. http://townhall.virginia.gov/L/ViewXML.cfm?textid=8436.
Virginia Nutrient Credit Exchange Association (2014) Exchange Compliance Plan 2014 Annual Update.

http://www.deq.virginia.gov/Portals/0/DEQ/Water/PollutionDischargeElimination/ExchangeCompliancePlan-2014AnnualUpdate.pdf.

IPDES Permit Writer Supplemental

Watershed Permitting

This page intentionally left blank.

14 Integrated Planning

14.1 Introduction ("One-Page" Summary)

14.1.1 What is Integrated Planning?

In June 2012, the U.S. Environmental Protection Agency (EPA) released an "Integrated Municipal Stormwater and Wastewater Planning Approach Framework" **to help local governments meet CWA water quality objectives and prioritize capital investments**. According to EPA: "An integrated planning approach offers a voluntary opportunity for a municipality to propose to meet multiple CWA requirements by identifying efficiencies from separate wastewater and stormwater programs and sequencing investments so that the highest priority projects come first. **This approach can also lead to more sustainable and comprehensive solutions, such as green infrastructure, that improve water quality and provide multiple benefits that enhance community vitality**" (EPA 2017).

In developing the framework, EPA offers communities the operating principles and elements of a plan that will justify the prioritization of local implementation actions relevant to storm and wastewater facilities. Integrated Plan components are shown in Figure 1.

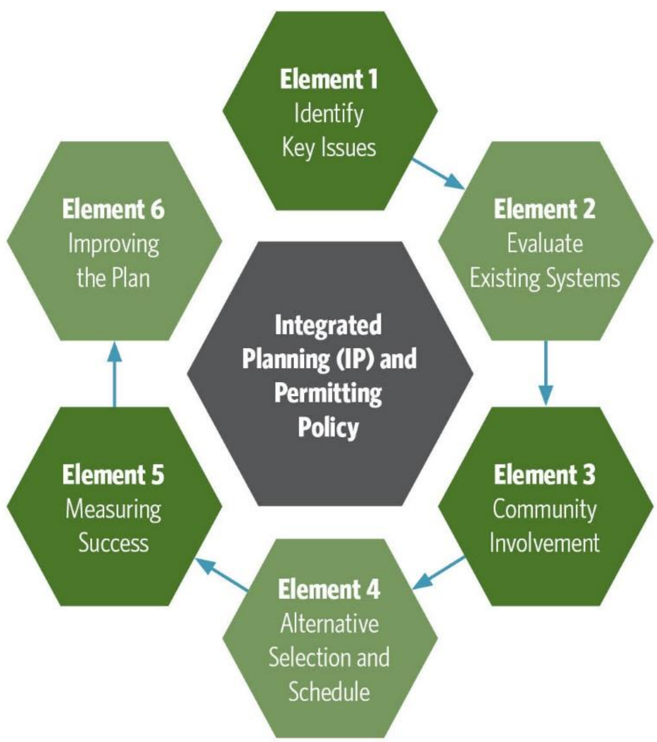


Figure 1. Integrated Planning and Permitting Policy approach provides the flexibility to make smart decisions based on community priorities.

14.2 Integrated Planning

In June 2012, the U.S. Environmental Protection Agency (EPA) released an Integrated Municipal Stormwater and Wastewater Planning Approach Framework to help local governments meet CWA water quality objectives and prioritize capital investments. Simply, this process provides the flexibility to make smart decisions based upon community priorities (HDR 2016).

The National Association of Clean Water Agencies (NACWA) described EPA's Integrated Planning Framework as "…a pragmatic yet effective path for communities to more affordability address water quality obligations. Simply put, integrated planning allows a community to prioritize its obligations so communities can spend their limited resources on the most pressing water quality challenges first. The Framework puts in place a path toward greater opportunities for innovation and strategic prioritization that can usher in a smarter way of doing business: achieving net environmental benefit outcomes that protect water quality and public health at the most efficient ratepayer cost" (NACWA 2017).

What is integrated planning?

One explanation by EPA is: "An integrated planning approach offers a voluntary opportunity for a municipality to propose to meet multiple CWA requirements by identifying efficiencies from separate wastewater and stormwater programs and sequencing investments so that the highest priority projects come first. This approach can also lead to more sustainable and comprehensive solutions, such as green infrastructure, that improve water quality and provide multiple benefits that enhance community vitality" (EPA 2017).

14.2.1 Connections – How to use integrated planning?

Integrated planning encourages the use of sustainable and comprehensive solutions, including green infrastructure, to protect human health, improve water quality, manage stormwater as a resource, and support other economic benefits and quality of life attributes that enhance the vitality of communities. Through the integrated planning process, these solutions are prioritized, taking into consideration stakeholder input and community values, the cost and benefits of water quality improvement projects, and the community's ability to afford these costs over time (HDR 2016).

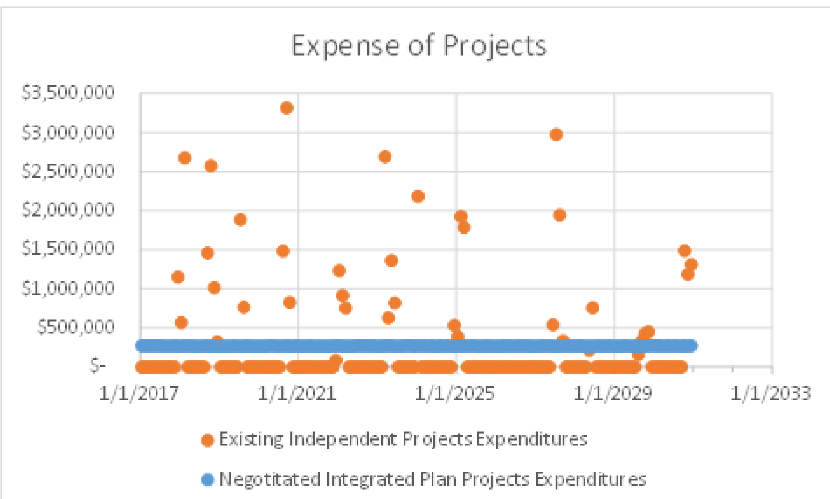
Affordability is fundamental to the integrated planning process. Further discussion with the U.S. Conference of Mayors (USCM) regarding the EPA's use of the median household income (MHI) to assess a community's ability to afford water quality improvements led to the EPA's issuance of a January 2013 memorandum, Assessing Financial Capability for Municipal Clean Water Act Compliance that allows for a broadened scope for assessing affordability. Subsequently, in a collaborative effort with the American Water Works Association (AWWA), and the Water Environment Federation (WEF), the USCM published the Affordability Assessment Tool for Federal Water Mandates (Assessment Tool) to help further define the alternative ways affordability may be viewed in any given community (HDR 2016).

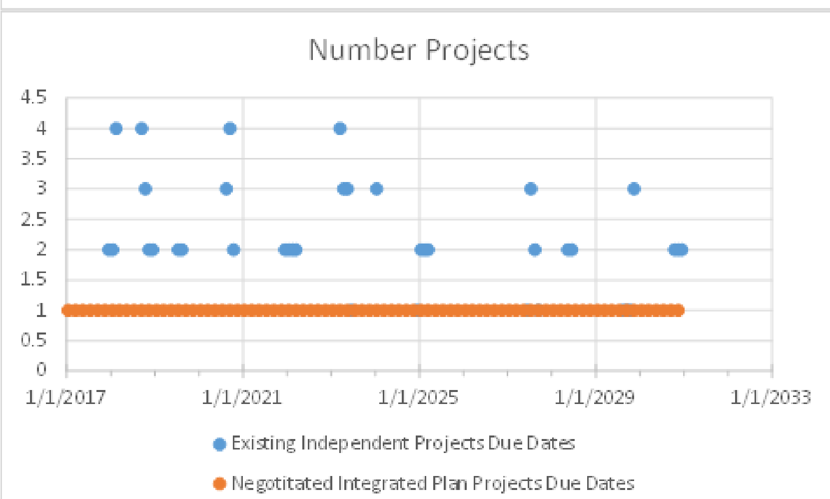
Adopting an integrated approach to CWA obligations is a voluntary and locally driven process, requiring a collaborative effort between the permitted agency, local permit authorities, the EPA, and local enforcement officials.

14.2.2 Why Should You Develop an Integrated Plan?

For example, a City could anticipate the capital cost of compliance for new and upgraded treatment facilities to be upwards of tens or even a hundred million dollars or more. The cash flow challenges associated with these capital investments are substantial. Using the permitting framework of Integrated Planning, a City may be able to arrange these facilities improvements, with potentially extended schedules for temperature and/or phosphorus, in a way that makes the most sense for the priorities of the particular City and community.

A major benefit of the Integrated Plan is analogous to workload planning and budgeting. For the existing path, when all the random projects and costs are charted out then there are periods of heavy workload and big expenditures and periods of no workload and no expenditures. This is difficult to manage. With IP these are leveled out to have more consistent number of projects and costs throughout the planning horizon, as indicated in the hypothetical charts below:





Adding to the challenge could be a municipal separate storm sewer system (MS4) NPDES permit. Although the financial implications of this existing permits in Idaho are not as challenging as the treatment permit, there will still be staffing and other costs that the City will have to bear. Moreover, one of the existing and some of the proposed permits are “next generation” MS4 permits, which include advocacy for Green Stormwater Infrastructure (GSI).

Cities must also do facilities planning efforts for their treatment and the collection systems. The Integrated Plan would supplement and augment this planning effort, not duplicate or replace any of the evaluations, studies, or decision-making processes of these facilities plan. In fact, the permitting and planning tasks generally included in facilities plans provide virtually all of the information needed for the first four elements of the Integrated Plan, as illustrated in Figure 1.

In summary, the Integrated Planning framework is primarily a permitting vehicle that can be effectively applied to wastewater treatment and MS4 permits. IP provides opportunity to establish compliance schedules and MS4 obligations that are the most cost-effective in alignment with community priorities, and implementation of other aspects of a City’s plan for which flexibility and time are of value to the City. In fact, EPA has recently endorsed broader application of its Integrated Planning framework across the country (EPA 2017), and especially to include communities that are not subject to combined sewer or sanitary sewer overflow consent decrees, such that the normal NPDES processes can be used to implement the plans rather than court-mediated processes.

14.2.3 General Approaches for the Key Elements in an Integrated Plan

14.2.3.1 INTEGRATED PLANNING FRAMEWORK

In developing the framework, EPA offers communities the operating principles and elements of a plan that will justify the prioritization of local implementation actions relevant to storm and wastewater facilities. Ultimately, the integrated plan will provide the basis for conditions, actions, and schedules. It is important to recognize that the Framework does not waive existing requirements under the CWA, but focuses on how a community plans to achieve compliance. The desired outcome is a “bigger bang for the buck” process that incorporates innovative strategies, green infrastructure elements and project sequencing that is more affordable and beneficial than traditional approaches. Components of developing an integrated plan include:

1. Identify Key Issues.
    - A description of the water quality, human health and regulatory issues to be addressed.
2. Evaluate Existing Systems.
    - A description of existing wastewater and stormwater systems under consideration and summary information describing the systems’ current performance.
3. Community Involvement.
    - A process which opens and maintains channels of communication with relevant community stakeholders in order to give full consideration of the views of others in the planning process and during implementation of the plan.
4. Alternative Selection and Schedule.

    - A process for identifying, evaluating, and selecting alternatives and proposing implementation schedules.
5. Measuring Success
    - A process for evaluating the performance of projects identified in a plan.
6. Improving the Plan
    - An adaptive management process for making improvements to the plan.

14.2.3.2 STARTING AN INTEGRATED PLAN

The first step in an integrated plan is to define the scope of the plan and determine which systems will be included in the plan. The plan should define the scope of the study, determine the geographic area under evaluation and the systems within the integrated plan, and identify relevant stakeholders. As part of identifying the systems, it is helpful to also describe the relative importance of adverse impacts on human health and water quality and the municipality's financial capability.

The water and non-water obligations that may affect the City's ability to implement the water-related obligations should be identified and listed. This may include collection system and WWTP improvements, requirements for secondary treatment at existing facilities, stormwater management, nutrient control, and compliance with state water quality standards including temperature. The list should include a description of the water quality, human health and regulatory issues to be addressed. Additionally, the challenges of meeting current and projected future CWA requirements should be assessed and evaluated.

It is important to kind in mind likely benefits and risks of an Integrated Plan, available financial capacity, and the ability to continue through with each next key step necessary to fully develop and implement the plan.

Other items to be addressed include identification and characterization of water quality and human health threats as well as identification of sensitive areas and environmental justice concerns. These findings will help identify stakeholders, evaluate community impacts and consider disproportionate burdens resulting from current approaches as well as proposed options.

14.2.3.3 REGULATORY DRIVERS

Regulatory drivers are a focal point for developing an integrated plan. Relevant regulatory drivers to characterize include TMDLs, wastewater and stormwater permits, new and emerging criteria such as the BLM, ammonia, and human health toxics criteria.

14.2.3.4 CURRENT PERFORMANCE AND METHODS OF EVALUATION

The next step is the development of criteria or metrics to be used for the evaluation of alternatives. Metrics are used to assess economic (e.g. construction costs, O&M costs, etc.), social (e.g. human health, recreational uses, etc.) and environmental (e.g. water quality, wildlife impacts, etc.). The baseline alternative is continued compliance with requirements following the independent actions set for each individual system. Other alternatives are comparable projects that meet requirements but make greater strides in improving water quality in the short term. It is important to identify the benefits and disadvantages of each alternative to provide sufficient information for prioritization.

This step is the innovative step that requires brainstorming alternatives. These alternatives then need to be culled to those that are most viable and can be advanced. Alternatives that continue along the pathway of advance will be developed into greater detail at each stage.

14.2.3.5 COMMUNITY INVOLVEMENT

Once systems and assets have been defined and alternatives developed, then a process for involving relevant community stakeholders into the planning and selection process should occur. This process should allow for opportunities for the public and stakeholders to provide input to the integrated plan and the identification and evaluation of alternatives within the integrated plan. The process should also address how information will be communicated to the public as the integrated plan is developed and as new information becomes available.

Community and stakeholder involvement in selecting and prioritizing proposed improvement projects will be critical in getting EPA's approval of the integrated plan. There are numerous avenues for developing dialogue with the local community, including the ones listed below.

- Town Hall or American Assembly style Meetings
- Neighborhood Board Meetings
- Council Briefings
- Legislative Briefings
- Public Hearings
- Creative, interactive website
- Public Service Announcements
- Academia Involvement (break it down for youth stewards)
- Special Interest Group Advocates

A well-coordinated and targeted effort is recommended so that the integrated planning process achieves sustainable, widespread support from the local community.

14.3 References

EPA 2017. National Pollutant Discharge Elimination System (NPDES). Integrated Planning for Municipal Stormwater and Wastewater. https://www.epa.gov/npdes/integrated-planning-municipal-stormwater-and-wastewater

HDR 2016. Integrated Planning. The Time Is Now EPA's CWA Framework for Local Prioritization and Flexibility. Jeff Eger, Trent Stober, David Clark, Amanda McInnis and Jennifer Duffy. HDR, Inc. Omaha, NE.

NACWA 2017. Written Testimony Submitted By: National Association of Clean Water Agencies, 1816 Jefferson Place NW, Washington, DC. Submitted for the Record of the Hearing: Building a 21st Century Infrastructure for America: Improving Water Quality through Integrated Planning. May 18, 2017, 10:00 AM, 2167 Rayburn House Office Building,

Subcommittee on Water Resources and Environment, Transportation & Infrastructure Committee, U.S. House of Representatives.

IPDES Permit Writer Supplemental

Watershed Permitting

This page intentionally left blank.

15 Nutrient Incentive Program

15.1 Introduction ("One-Page" Summary)

Text to be inserted

Pollutant: Ammonia

Text to be inserted

Water Quality Impact: Text to be inserted

Toxic? Yes.

Numeric Standard: Text to be inserted.

Narrative Standard: Text to be inserted.

Permitting Considerations: Text to be inserted

Determination of Need

Text to be inserted

Formulation of Requirement

Text to be inserted

15.2 Voluntary Early Nutrient Reduction Incentive Program

An Idaho incentive program will encourage wastewater utilities to make voluntary reductions of nutrients earlier than required and in exchange the utility will receive an extended compliance schedule for final effluent limits. Receiving water quality may benefit from earlier nutrient reductions resulting from wastewater treatment optimization, pilot testing, stress testing, new technology trials, etc. as well as from trading for other nutrient reductions or offsets.

The extended compliance schedule will provide additional time to comply with effluent limits based on water quality standards, TMDLs, variances, or other nutrient related wasteload allocations. Extended compliance schedule time will be earned for each month in which actual effluent performance bests interim limits, in proportion to the extent of attainment towards the final limits based on linear scaling. Incentive months earned will be tracked monthly and summarized annually. Incentive months can be earned and accumulated over a period of years. Incentive months earned will be rounded down to the nearest whole month and partial months will not be incorporated into extended compliance schedules. Receiving water quality will benefit because nutrient reductions will be achieved earlier and extend for a longer period than would otherwise occur. In this way, an early nutrient reduction incentive program will satisfy the federal regulation requirements for inclusion of compliance schedules in permits "when appropriate" and providing that "Any schedules of compliance under this section shall require compliance as soon as possible" (40 CFR 122.47(a)(1)).

Wastewater utility participation in an early nutrient reduction incentive program is voluntary. Any method of achieving early reductions in nutrients is allowable, whether achieved with nutrient removal optimization, a water quality trade, a source reduction plan, watershed nutrient reductions, or capital improvements to implement nutrient removal.

Wastewater utilities are required to submit a nutrient reduction plan and annual nutrient monitoring reports to the Department of Environmental Quality to participate in the Idaho incentive program. The amount of additional compliance time granted will depend on the amount of nutrient concentration reduction that the wastewater facility achieves below interim limits for the period between when interim limits and final effluent limits are scheduled. In the event that continued discharge of nutrients by a participant in the incentive program constitutes a danger to public health, the compliance schedule may be revised or terminated.

15.2.1.1 INCENTIVE TIME ACCOUNTING

Accounting for early nutrient reductions will be based on composite sampling and median concentration statistics will be used to characterize annual performance. The calculation of incentive compliance schedule months will be based on a linear scaling of the annual median nutrient concentration between the interim and final effluent limits. An example is shown in Table 15-1 where the interim phosphorus limits have been established as 1 mg/L and the final effluent limits are 0.10 mg/L. Actual median effluent performance is 0.5 mg/L and is sustained for a period of 5 years. In the example shown in Table 15-1, each year of actual effluent performance of 0.5 mg/L phosphorus earns 6 months of additional compliance time. Sustaining performance of 0.5 mg/L phosphorus for 5 years would earn an additional 30 months of compliance time with rounding to the nearest lower number of months.

Table 15-1. Example Early Nutrient Reduction Incentive Calculation for Wastewater Facility with Interim and Final Effluent Phosphorus Limits

Nutrient	Interim Effluent Limits, mg/L	Final Effluent Limits, mg/L	Actual Median Effluent Concentration, mg/L	Years of Actual Performance, Years
Total Phosphorus (TP), mg/L	1.00	0.10	0.50	5
Months Earned	0	12	Compliance Months Earned per Year, Months	Compliance Months Earned for Period, Months
			6	30

15.2.2 Colorado Nutrient Incentive Program Case Study

In 2012, Colorado passed two state regulations to establish in-stream nutrient target values and technology based effluent limits. A revision to Colorado Regulation 31 for surface water nutrient standards for cold and warm waters established in-stream target values for chlorophyll-a, phosphorus and nitrogen. A new Nutrients Management Control Regulation (Colorado

Regulation No. 85) established technology-based numeric nutrient limits for point source discharges. Effluent limits for existing treatment plants will be 1 mg/L total phosphorus (TP) and 15 mg/L TIN based on what has been labeled “first level” 3-stage BNR. New treatment plants will be expected to be 4 and 5-stage BNR for effluent of 0.7 mg/L TP and 7 mg/L TIN. Discharge permit compliance will be based on a running annual median basis.

In 2012, Colorado envisioned adoption of water quality standards for surface waters in 2022. In 2016, EPA approved interim numeric values for chlorophyll a, and approved nitrogen and phosphorus for lakes and reservoirs with recommendations, and took no action on nitrogen and phosphorus for rivers and streams. Colorado concluded that additional analysis was needed for phosphorus and nitrogen for lakes and reservoirs, and with the exception of direct use water supply reservoirs and areas with public swim beaches, the state elected to delay the effective dates for numeric phosphorus and nitrogen values to 2027. Colorado further determined that more time was needed to revisit the phosphorus and nitrogen values for rivers and streams. Colorado acknowledged that removing dissolved organic nitrogen to low levels is a technological challenge that needs to be considered in future policy reviews and rulemaking along with advances in technology.

Colorado is also addressing further challenges associated with nonpoint source nutrient control, as well as revised standards for selenium and ammonia. Colorado also anticipates that there will be a need to develop feasibility information to assist dischargers with proposing discharger specific variances which will take into account the challenges of treating for nutrients, selenium, and ammonia, as well as temperature. In consideration of all of these factors, the Colorado Water Quality Control Commission has decided to delay adoption of number nutrient values to 2027.

The Colorado Water Quality Control Commission believes that the best way to make progress in the interim period is through an incentives program to encourage early reductions of nutrients. The incentives program will encourage facilities to make voluntary reductions of nutrients, and in exchange the facility will receive an extended compliance schedule as well as certainty about the year in which the facility will need to meet future water quality based effluent limits. An extended compliance schedule means the facility will be given additional time to comply with water quality based effluent limits that would be based on the numeric values adopted in 2027.

15.2.2.1 COLORADO NUTRIENT INCENTIVE PROGRAM

In October of 2017, Colorado published final drafts of the proposed revisions to Colorado Regulation 31 Basic Standards and Methodologies for Surface Water, Control Regulation 85 Nutrient Management Control Regulation, and Commission Policy 17-1 Voluntary Incentive Program for Early Nutrient Reductions (Colorado 2017a,b,c).

Wastewater utilities that achieve early reduction of nutrients will be offered an extension to their compliance schedule in the NPDES permit for achieving water quality based effluent limits to comply with future numeric nutrient standards in Control Regulation 31. Participation is voluntary and there are no constraints on the methods or technologies applied to reduce nutrients. Acceptable reductions can be achieved with nutrient removal optimization, a water quality trade, a source reduction plan, watershed nutrient reductions, or capital improvements to implement nutrient removal.

In order to participate in the Colorado incentive program, wastewater utilities are required to submit a nutrient reduction plan and annual nutrient monitoring reports. In Colorado, the amount of additional time granted will depend on the amount of nutrient concentration reduction that the wastewater facility achieves between 2019 and 2026, prior to the planned 2027 implementation date for numeric nutrient standards.

In Colorado, annual reports will serve as the basis for the state to make determinations of compliance schedule extensions. In the event that continued discharge of nutrients by a participant in the incentive program constitutes a danger to public health or existing uses of state waters, the compliance schedule may be revised or terminated. Examples of such situations include a toxic algae bloom in receiving waters downstream of a wastewater treatment facility, or the presence of pollutants that cause or contribute to unacceptably high concentrations of disinfection byproducts in drinking water treatment facilities with intake locations downstream of a wastewater treatment facility.

15.2.2.2 INCENTIVE TIME ACCOUNTING

Accounting for early nutrient reductions in Colorado is based on monthly composite sampling, at a minimum, at the permitted outfall. Median statistics will be used to characterize annual performance. The Colorado methodology to earn incentive compliance schedule months is based on a linear scaling of the annual median total phosphorus and total inorganic nitrogen concentrations between the upper and lower boundaries in Control Regulation 85. The table from the Colorado Policy 17-1 is as follows:

Accumulation of incentive months[a]

Total phosphorus annual median (mg/L)	**≥1**	**≤0.7**
Months earned	**0**	**12**
Total inorganic nitrogen annual median (mg/L)	**≥15**	**≤7**
Months earned	**0**	**12**

[a] Control Regulation 85 effluent limits for existing treatment plants will be 1 mg/L total phosphorus (TP) and 15 mg/L TIN based on what has been labeled “first level” 3-stage BNR. New treatment plants will be expected to be 4 and 5-stage BNR for effluent of 0.7 mg/L TP and 7 mg/L TIN

Annual median concentrations must be below the median values in Control Regulation 85 in order to be eligible for an incentive. The scale for earning incentive months is implemented in a linear fashion based on annual median concentrations that fall within the ranges shown on the table. For example, if a facility’s annual median concentration is 0.85 mg/L total phosphorus, the facility is eligible to earn incentive credit for that year. Based on the linear scaling of the total phosphorus median, the facility would earn six months toward a compliance schedule. The months of incentive credit from each year will be summed at the end of the 10-year period and rounded down to the next whole month. Partial months will not be incorporated into compliance schedules.

15.2.2.3 COMPLIANCE WITH FEDERAL REQUIREMENTS

Colorado plans to renew discharge permits within 2 years of the conclusion of the incentive program and the 2027 planned date for implementation date for Control Regulation 31 numeric nutrient standards. Federal regulations allow for the inclusion of compliance schedules in permits “when appropriate” and providing that “Any schedules of compliance under this section shall require compliance as soon as possible” (40 CFR 122.47(a)(1)). The Colorado Water Quality Control Commission found that incentive program meets the “when appropriate” and “as soon as possible” requirements of the federal regulations.

15.3 References

Code of Federal Regulations. 40 CFR 122.47 Schedules of Compliance.

Colorado (2017a). Colorado Department of Public Health and Environment. Water Quality Control Commission. Regulation No. 31 The Basic Standards and Methodologies for Surface Water. 5 CCR 1002-31.

Colorado (2017b). Colorado Department of Public Health and Environment. Water Quality Control Commission. Regulation No. 85. Nutrients Management Control Regulation. 5 CCR 1002-85.

Colorado (2017c). Colorado Department of Public Health and Environment. Water Quality Control Commission. Policy 17-1 Voluntary Incentive Program for Early Nutrient Reductions. Regulation #85 – Section 85.5(1.5). Approved: October 10, 2017. Expires: December 31, 2020

EPA (20007). Memorandum from James A. Hanlon, Director Office of Wastewater Management to Alexis Strauss, Director Water Division EPA Region 9. Compliance Schedules for Water Quality-Based Effluent Limitations in NPDES Permits. May 10, 2007.