ACWA NUTRIENT PERMITTING WORKSHOP

NUTRIENT REMOVAL TECHNOLOGIES AND PERMITTING

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NUTRIENT PERMITTING

Overview

- Current Permitting Practices
- Attainable and Protective Permits
  - Technology Based Effluent Limits
  - Technology Performance Statistics and Permitting
  - Predictive Water Quality Models
  - Probabilistic Permitting
  - Watershed Permitting
- Case Study Examples
- Conclusions and Recommendations

NUTRIENT PERMITTING WEBINAR

June 12th 2 pm – 4 pm EDT

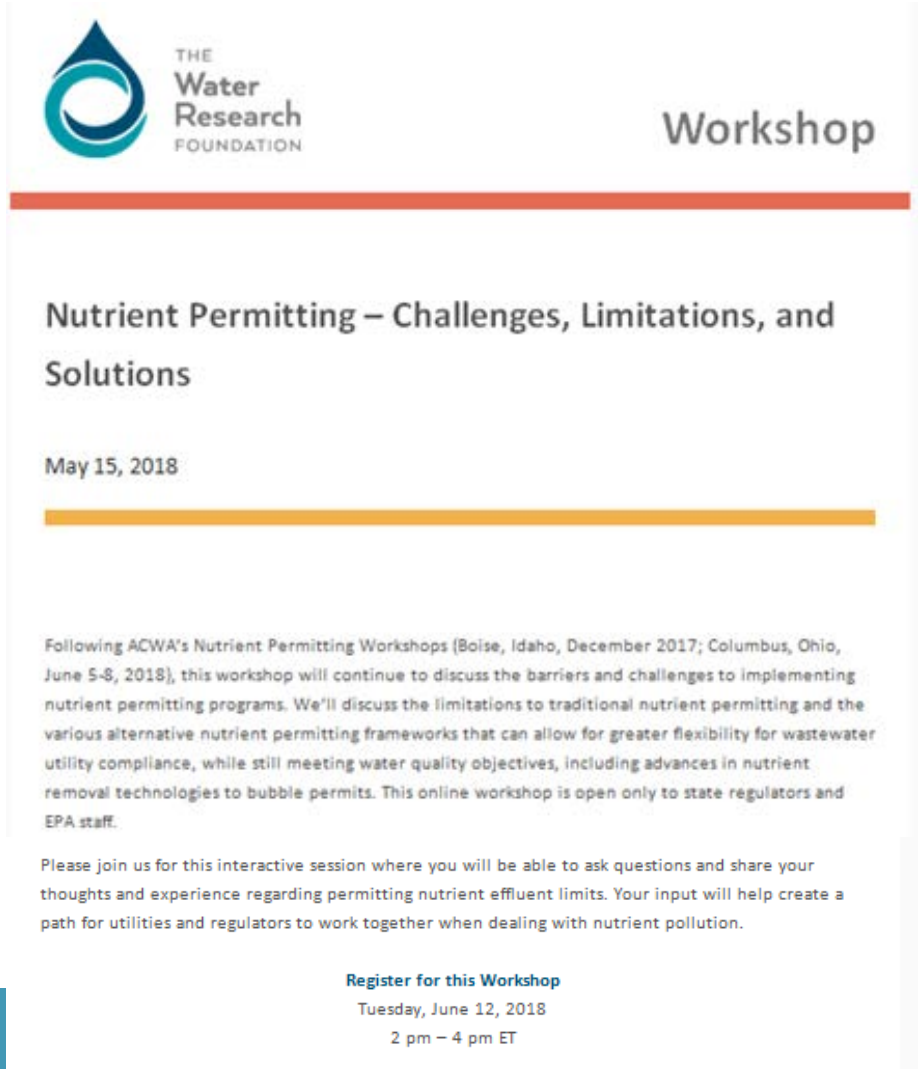
- https://register.gotowebinar.com/register/7836176880852031234
- dclark@hdrinc.com

THE Water Research FOUNDATION
www.waterrf.org

Association of Clean Water Administrators ACWA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Water Environment Federation
the water quality people



THE Water Research FOUNDATION

Workshop

Nutrient Permitting – Challenges, Limitations, and Solutions

May 15, 2018

Following ACWA's Nutrient Permitting Workshops (Boise, Idaho, December 2017; Columbus, Ohio, June 5-8, 2018), this workshop will continue to discuss the barriers and challenges to implementing nutrient permitting programs. We'll discuss the limitations to traditional nutrient permitting and the various alternative nutrient permitting frameworks that can allow for greater flexibility for wastewater utility compliance, while still meeting water quality objectives, including advances in nutrient removal technologies to bubble permits. This online workshop is open only to state regulators and EPA staff.

Please join us for this interactive session where you will be able to ask questions and share your thoughts and experience regarding permitting nutrient effluent limits. Your input will help create a path for utilities and regulators to work together when dealing with nutrient pollution.

Register for this Workshop
Tuesday, June 12, 2018
2 pm – 4 pm ET

CURRENT PERMITTING PRACTICES

- Development of Effluent Limits:
  - (1) Technology-based Effluent Limitations (TBELs)
  - (2) Water Quality-based Effluent Limits (WQBELs)
  - (3) Determine Final Limits and Conduct Anti-backsliding Analysis

WATER QUALITY BASED EFFLUENT LIMITS (WQBELS)

- Traditional Deterministic Permitting
  - Determine the Need for Water Quality Based Limits
    - Reasonable Potential Analysis (RPA)
  - Calculation of Water Quality Based Limits

Deterministic Calculation of Water Quality Based Limits

- Mass Balance Calculation in Effluent Mixing Zone

  $CdQd = CeQe + CuQu$

  Cd = Receiving water concentration downstream of discharge
  Ce = Maximum projected effluent concentration
  Cu = 95th percentile measured receiving water upstream concentration
  Qd = Receiving water flow rate downstream of the effluent discharge = Qe + Qu
  Qe = Effluent flow rate
  Set equal to the design flow of the wastewater facility
  Qu = Receiving water low flow rate upstream of the discharge
  e.g. 1Q10, 7Q10 or 30B3

- Dilution Reduced by Allowable Mixing Zone
  - Typical State Water Quality Standards Limit to 25% of Streamflow

Worst Case Assumptions -- Restrictive Limits

Key EPA Reference: "*Technical Support Document for Water Quality-based Toxics Control*" (EPA 1991)

"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)

- *"…at critical conditions, which are usually combinations of worst-case assumptions of flow, effluent, and environmental effects."*
- *"…may rarely or never occur…"*
- *"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."*

DETERMINISTIC PERMITTING

Benefits

- Common Approach
- Familiar to Permit Writers

Limitations

- Based on Toxicity Guidance (EPA 1991)
- Nutrient Criteria As *Not to Exceed* Values
- Narrow Mixing Zone Focus
- Based on Critical Conditions Unlikely to Occur
- Excludes:
  - Effluent Variability, Treatment Efficiency and Reliability
  - Temporal and Spatial Variability of Receiving Water, Acceptable Risks of Exceedance of Nutrient Criteria, and Stressor Response Relationships

EXAMPLE OF NPDES PERMIT CHARACTERISTICS TO AVOID

- Over-specified Limits
  - Mass and Concentration
  - Monthly and Weekly
- Unattainable Limits
  - Total Nitrogen
    - 1 mg/L 30 Day Average
    - 1.5 mg/L Daily Max
  - Total Phosphorus
    - 0.1 mg/L 30 Day Average
    - 0.15 mg/L Daily Max

REGION 6
1445 ROSS AVENUE
DALLAS, TEXAS 75202-2733

NPDES Permit No NM0029165

AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Clean Water Act, as amended, (33 U.S.C. 1251 et. seq; the "Act"),

City of Ruidoso Downs and Village of Ruidoso WWTP
313 Cree Meadows Drive
Ruidoso, NM 88345

Post-Construction Effluent Limits – 2.6 MGD Design Flow – OUTFALL 001 Continued

EFFLUENT CHARACTERISTICS		DISCHARGE LIMITATIONS					MONITORING REQUIREMENTS	
		lbs/day, unless noted		mg/l, unless noted				
POLLUTANT	STORET CODE	30-DAY AVG	7-DAY AVG	30-DAY AVG	7-DAY AVG	DAILY MAX	MEASUREMENT FREQUENCY	SAMPLE TYPE
Flow	50050	Report MGD	Report MGD	***	***	***	Continuous	Totalizing Meter
Biochemical Oxygen Demand, 5-day	00310	651	976	30	45	N/A	1/Week	6-Hr Composite
Total Suspended Solids	00530	651	976	30	45	N/A	1/Week	6-Hr Composite
E. coli Bacteria (*1)	51040	N/A	N/A	126 (*2)	N/A	410 (*2)	1/Week	Grab
Cyanide (WAD) (*4)	00718	Report	N/A	Report	N/A	Report	Once/Quarter	24-Hr Composite
Total Nitrogen ,Ti <13°C (*5, *6, *7)	00600	≤195.2	N/A	≤9	N/A	≤ 9 (*8)	Once/2 weeks	24-Hr Composite
Total Nitrogen, Ti ≥ 13°C (*5, *6, *7)	00600	≤130.1	N/A	≤6	N/A	≤ 6 (*9)	Once/2 weeks	24-Hr Composite
Total Nitrogen (*5, *15)	00600	21.7	N/A	1	N/A	1.5	Once/Month	24-Hr Composite
Total Phosphorus (*10)	00665	2.2	N/A	0.1	N/A	0.15	Once/Month	24-Hr Composite
Total Thallium (*11)	01059	0.37	N/A	10.87 ug/l	N/A	16.30 ug/l	Once/Month	24-Hr Composite
TRC (*12)	50060	N/A	N/A	N/A	M/A	19 ug/l	Daily	Grab

NPDES Permit No. NM0029165, September 2007

Final effluent limitation for total Nitrogen of 1 mg/l (30 day average) and 1.5 mg/l (daily maximum) for discharges of total Nitrogen from the new wastewater treatment plant is effective on the last day of the permit term.

TECHNOLOGY BASED NUTRIENT LIMITS

- Direct Definition of Effluent Phosphorus and Nitrogen Concentrations
  - i.e. TP 1 mg/L and TN 10 mg/L
- No Federally Mandated Technology Based Standards for Nutrients
  - Nutrient Removal Not Required in Secondary Treatment Standards

SIMPLIFIED EXAMPLE OF TECHNOLOGY BASED EFFLUENT LIMITS

- Discharge 10 mgd
- Receiving Water Quality Requirements
  - N and P Reductions May Be Needed
  - No Definitive In-stream Criteria or TMDL
    - Selected TBELs: TN 10 mg/L & TP 1 mg/L

Final Effluent Limits – Outfall 001				
Parameter	**Units**	**Average Monthly Limit**	**Average Weekly Limit**	**Maximum Daily Limit**
Total Nitrogen as N	**mg/L**	**10.0**	**--**	**--**
	lb/day	**834**	**--**	**--**
Total Phosphorus as P	**mg/L**	**1.0**	**--**	**--**
	lb/day	**83.4**	**--**	**--**

TECHNOLOGY BASED EFFLUENT LIMITS

Benefits

- Simplicity
- Selected Limits at Levels Where Compliance is Assured
  - Initial Step for Adaptive Management

Limitations

- Lacks Linkage with Receiving Water Quality
- Suggests Uniformity in Nutrients Limits is Appropriate
  - Contradicted by Site Specific Circumstances in Individual Waterbodies

EXAMPLE APPLICATIONS OF TECHNOLOGY BASED EFFLUENT LIMITS

Bridging State Numeric Nutrient Criteria Rulemaking

- Wisconsin Dual Legislation
  - 2010 Chapter NR 217 Effluent Standards
    - Treatment Technology Standard
    - TP 1 mg/L, <0.6 mg/L, <0.50 mg/L, WQBELs & Adaptive Management
- Colorado Regulation #31 and #85
  - Treatment Technology Standard
    - TP 1 mg/L, TIN 15 mg/L
- Montana Senate Bill 95 and Senate Bill 367
  - Treatment Technology Standard
    - TP 1 mg/L, TN 10 mg/L

2007 NRDC Petition on Secondary Treatment Standards

- Natural Resources Defense Council (NRDC) Contention
  - Nutrient control is properly included within "*secondary treatment*"
- NRDC Proposed EPA Select TBELs
  - TP 0.3 mg/l and TN 3 mg/l currently attainable
  - TP 1 mg/l and TN 8.0 mg/l attainable only using biological processes
  - EPA must assess whether this constitutes "secondary treatment"
- EPA Denied Petition December 14, 2012

TECHNOLOGY PERFORMANCE STATISTICS (TPS)

- Quantifies Effluent N and P Performance and Reliability
  - Statistical Description of Probability of Achieving a Specific Concentration
  - Examples
    - Median Performance Represents Average Treatment: TPS-50%
      - 50% Data is Below and 50% is Above This Concentration
    - TPS-95%: Performance Achieved 95% of Time
      - Exceeded 5% of Time

APPLICATION OF KEY TECHNOLOGY PERFORMANCE STATISTIC VALUES

Limit	Technology Performance Statistics (TPS)	Statistical Probability	Interpretation	Effluent Performance Implication
Best Achievable Performance	TPS-14d	3.84th percentile[1]	The best performance possible with the technology under the optimal or best operating conditions. This represents the LOT (Limit of Technology).	This limit will be exceeded 96% of the time.
Average Technology Achievable Limit	TPS-50%	50th percentile	This represents a measure of the concentration that was achieved on a statistical annual average basis.	As the median performance, the process exceeds this 6 times per year.[2]
Reliable Technology Achievable Limit	TPS-95%	95th percentile	This represents the concentration that can be achieved reliably by the technology.	This limit is exceeded 0.6 times[2] per year – 3 times in a 5 year period.

EXAMPLE OF FINAL EFFLUENT LIMITATIONS BASED ON TECHNOLOGY PERFORMANCE STATISTICS

- Discharge 10 mgd
- Receiving Water Quality Requirements
  - TMDL Wasteload Allocation TP 0.100 mg/L
    - Impaired Receiving Water ~ End-of-Pipe Effluent TP 0.100 mg/L
    - TPS for BPR w/Effluent Filtration
      - Median (50th percentile)
      - Weekly Limits, If Necessary (80th percentile)

Final Effluent Limits – Outfall 001				
Parameter	**Units**	**Median Monthly Limit**	**Median Weekly Limit**	**Maximum Daily Limit**
Total Phosphorus as P	**mg/L**	**0.100**	**0.180**	**--**
	lb/day	**8.3**	**15.0**	**--**

TECHNOLOGY PERFORMANCE STATISTICS

Benefits

- Accurate Numerical Depiction of Treatment
- Direct Accounting for Effluent Variability
- Statistical Definition of Effluent Performance Requirements
  - Defines Process Design Requirements in Terms of Average and Reliable Performance

Limitations

- Requires Detailed Treatment Performance Data
  - WERF Nutrient Challenge Key Resource
- Lacks Direct Linkage to Receiving Water Quality

PREDICTIVE WATER QUALITY MODELS

- Powerful Tools to Estimate Future Receiving Water Conditions
  - Based on Historical Information and Scientific Relationships
- Process-based Load-response Models
  - Simulate Dissolved Oxygen, pH, Algae, etc.
    - AQUATOX, CE-QUAL-W2, QUAL2K, WASP, etc.

EXAMPLE OF FINAL EFFLUENT LIMITATIONS BASED ON MONTHLY MASS

- Discharge 10 mgd
- Receiving Water Quality Requirements
  - Water Quality Model Simulation of Response to Nutrient Loadings
    - Chlorophyll a, Dissolved Oxygen, pH
  - Wasteload Allocations Based on TP 0.100 mg/l
    - Monthly Timeframe for Nutrient Management

Final Effluent Limits – Outfall 001		
Parameter	**Units**	**Monthly Average Limit**
Total Phosphorus as P	**lb/day**	**8.3**

PREDICTIVE WATER QUALITY MODELS

Benefits

- Science Based Relationships Between Nutrient Loadings and Water Quality Response
  - Avoids Reliance on N and P Concentrations
- Watershed Basis
- Ability to Simulate Alternative Scenarios
  - Ability to Tailor Permit Limits
  - Dynamic Simulations to Evaluate Seasonal Loadings

Limitations

- Availability of Water Quality Data to Support Model development
- Availability of Water Quality Modeling Skills
- Availability of Adequate Budget and Time

EXAMPLE APPLICATION PREDICTIVE MODEL BASED PERMIT LIMITS

- Spokane River Dissolved Oxygen TMDL
  - CE-QUAL-W2 Water Quality Model
  - Restrictive Wasteload Allocation Based on TP 0.042 mg/L

Spokane County Regional Water Reclamation Facility Nutrient Limits (Washington Ecology 2011)

Effluent Limits: Outfall #001		
Parameter	**Seasonal Limit Applies March 1 to October 31 See notes f and g**	
Cabonaceous Biochemical Oxygen Demand (5-day)(CBOD5)	**280 pounds/day (lbs/day)**	
Total Phosphorus (as P) March 1 to Oct. 31	**2.80 lbs/day**	
Total Ammonia (as NH3-N)	**Seasonal Limit**	**Maximum Daily Limit**
For "season" of March 1 to March 31	**1067.5 lbs/day average**	**16 mg/l**
For "season" of April 1 to May 31	**66.7 lbs/day average**	**16 mg/l**
For "season" of June 1 to Sept. 30	**16.7 lbs/day average**	**8.0 mg/l**
For "season" of Oct. 1 to Oct. 31	**66.7 lbs/day average**	**16 mg/l**

PROBABILISTIC PERMITTING

- Probabilistic Calculations of Mixed Receiving Water Conditions to Develop Effluent Limits
  - Uses Full Distribution Values for Key Parameters
    - Portrays Variability in Effluent and Receiving Waters
- Produces Distribution of Downstream Conditions for Comparison to:
  - Allowable Frequency of Exceedance of Criteria
  - Probabilistic Representation of Acceptable Downstream Condition
- EPA's 1991 TSD Identifies Monte Carlo Analysis as Appropriate Approach for Development of Effluent Limits to Address Variability

EXAMPLE OF PROBABILISTIC APPROACH TO CALCULATION OF ALLOWABLE EFFLUENT LIMITS

Sample Event	WWTF Flow (cfs)	Upstream River Flow (cfs)	Upstream River Concentration (mg/L)	Downstream Flow (cfs)	Downstream Target Concentration (mg/L)	Calculated Effluent Concentration to Meet Target (mg/L)
1	16.2	200	0.099	216.2	0.10	0.1
2	15.5	1,550	0.095	1,565.5		0.6
3	14.5	1,800	0.094	1,814.5		0.8
4	15.3	2,000	0.093	2,015.3		1.0
5	14.7	2,300	0.092	2,314.7		1.4
6	14.2	2,600	0.092	2,614.2		1.6
7	15.5	2,700	0.091	2,715.5		1.7
8	14.6	3,000	0.090	3,014.6		2.2
9	14.8	3,400	0.089	3,414.8		2.6
10	15.2	4,000	0.088	4,015.2		3.3
11	15.0	5,000	0.087	5,015.0		4.4
Estimated Minimum	14.0	100	0.06	100	n/a	17.8
Estimated Maximum	18.0	8,000	0.099	8,000	n/a	0.1
Monte Carlo 50th Percentile						1.37
Monte Carlo 95th Percentile						0.65

TRADITIONAL DETERMINISTIC APPROACH (TP 0.100 MG/L) V. PROBABILISTIC APPROACH (TP 1.37 MG/L)

Sample Event	WWTF Flow (cfs)	Upstream River Flow (cfs)	Upstream River Concentration (mg/L)	Downstream Flow (cfs)	Downstream Target Concentration (mg/L)	Calculated Effluent Concentration to Meet Target (mg/L)
1	16.2	200	0.099	216.2	0.10	0.1
2	15.5	1,550	0.095	1,565.5		0.6
3	14.5	1,800	0.094	1,814.5		0.8
4	15.3	2,000	0.093	2,015.3		1.0
5	14.7	2,300	0.092	2,314.7		1.4
6	14.2	2,600	0.092	2,614.2		1.6
7	15.5	2,700	0.091	2,715.5		1.7
8	14.6	3,000	0.090	3,014.6		2.2
9	14.8	3,400	0.089	3,414.8		2.6
10	15.2	4,000	0.088	4,015.2		3.3
11	15.0	5,000	0.087	5,015.0		4.4
Estimated Minimum	14.0	100	0.06	100	n/a	17.8
Estimated Maximum	18.0	8,000	0.099	8,000	n/a	0.1
Monte Carlo 50th Percentile						1.37
Monte Carlo 95th Percentile						0.65

A. EXAMPLE OF PROBABILISTIC APPROACH TO CALCULATION OF ALLOWABLE EFFLUENT LIMITS

- Example of Annual Average Effluent Limitations Based on Probabilistic Analysis at 50th Percentile

Final Effluent Limits – Outfall 001				
Parameter	**Units**	**Annual Average Limit**	**Median Weekly Limit**	**Maximum Daily Limit**
Total Phosphorus as P	**mg/L**	**1.37**	**--**	**--**
	lb/day	**114**	**--**	**--**

B. EXAMPLE OF PROBABILISTIC APPROACH TO CALCULATION OF ALLOWABLE EFFLUENT LIMITS

- Example of Monthly Average Effluent Limitations Based on Probabilistic Analysis at 95th Percentile

Final Effluent Limits – Outfall 001				
Parameter	**Units**	**Monthly Average Limit**	**Median Weekly Limit**	**Maximum Daily Limit**
Total Phosphorus as P	**mg/L**	**0.65**	**--**	**--**
	lb/day	**54**	**--**	**--**

PROBABILISTIC PERMITTING

Benefits

- Allows Consideration of Variability
  - Effluent and Receiving Water Flows and Concentrations
- Direct Link to Receiving Water Quality Requirements
- Avoids Overly Restrictive Effluent Nutrient Limits Based on Combination of Conservative Assumptions

Limitations

- Requires Acceptable Frequency of Exceedance of Receiving Water Quality Target be Defined
- Narrow Focus on Mixing Zone
- Requires Statistical Analysis
  - May Require Successive Iteration to Converge on Acceptable Effluent Concentration to Satisfy Receiving Water Requirement

NUTRIENT PERMITTING CASE STUDY EXAMPLES

- Las Vegas Wash and City of Las Vegas, Nevada
- Tualatin River and Clean Water Services, Oregon
- San Francisco Bay Nutrient Watershed Permit, California
- Colorado Early Nutrient Reduction Incentive

Las Vegas Wash/Lake Mead Phosphorus Limits

- Las Vegas, Clark County, Henderson, NV

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

Clean Water Services (CWS), Oregon

Tualatin River Phosphorus

- Monthly and Seasonal Medians
- Bubble Permits New Seasonal Discharge (Outfall F001A) for Forest Grove WWTF

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.

Minneapolis Met Council (MCES)

Mississippi River “Umbrella” Discharge Permit for Phosphorus

- Total Phosphorus Limit 5 Facilities

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

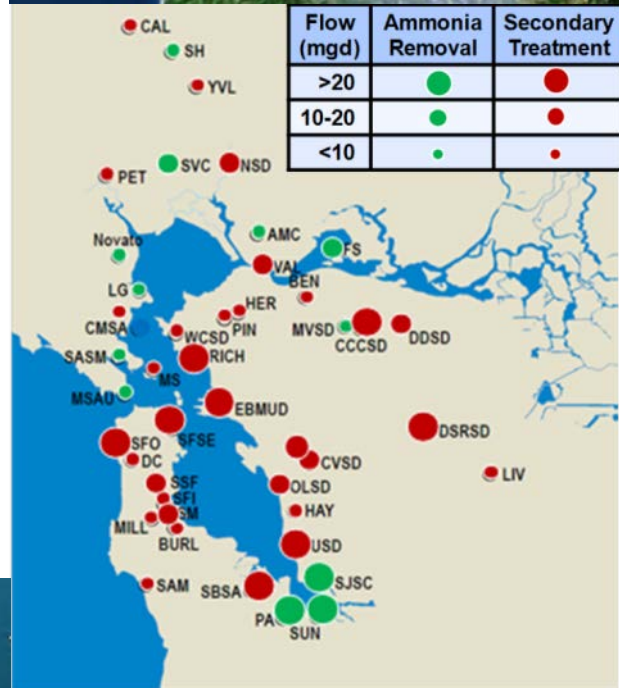
Parameter	Limit	Limit Type	Effective Period	Sample Frequency
Total Phosphorus	159,349 kg/yr	12 Month Moving Total	Jan - Dec	1X Month
Total Phosphorus	916.8 kg/day	Calendar Month Average	Jan - Dec	1 X Month

San Francisco Bay
Nutrient Watershed Permit

- Bay Area Clean Water Agencies (BACWA)
- 37 Dischargers
- Cumulative Permitted Discharge ~860 mgd
- Serving 6.5 Million People

San Francisco Bay Nutrient Watershed Permit

1. Evaluate the 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.
2. Evaluate the 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.
3. Support Monitoring, Modeling, and Embayment Studies
   - This provision focuses on a science plan development and implementation, as well as monitoring nutrients in receiving waters.



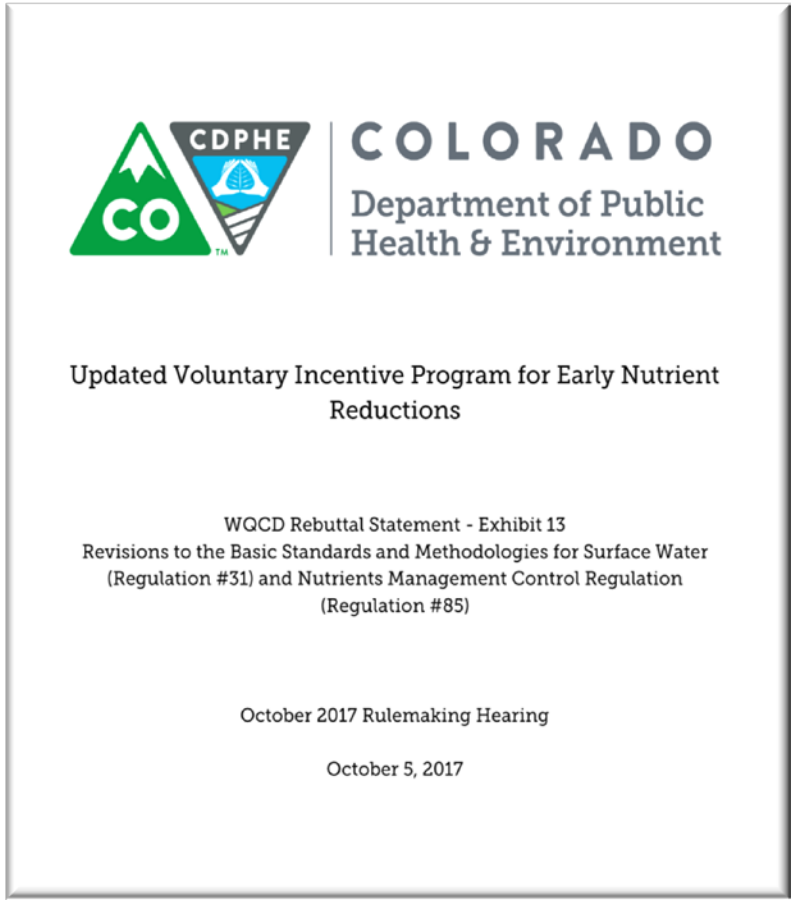
Incentive Program for Early Nutrient Reduction

Incentive Programs for Early Nutrient Reductions

- Regulation #31 Basic Standards and Methodologies for Surface Water
  - Numeric Nutrient Criteria
  - Delayed Implementation 10 Years
  - Very Low In-stream TP and TIN Concentrations

Rivers and Streams	Cold Water	Warm Water
Chl a mg/m^2	150	150
TP, ug/L	110	160
TIN, ug/L	400	2,000

- Regulation #85 – Nutrients Management Control Regulation
  - Technology Based Effluent Limits
  - TP 1 mg/L and TIN 15 mg/L



Colorado Methodology

- Linear Scaling Between Upper and Lower Boundaries to Earn Incentive Months
  - Annual Median Concentration TP and TIN
  - Each Year Below Upper Boundary Earns % of Year Extension in Months
  - A maximum of an additional 90 months (7.5 years) will be available for both TP and TIN.
    - However, the total additional years that can be allotted after TP and TN are added together shall not exceed 10 years.
  - The performance based program is designed to provide the maximum incentive to a facility that achieves the targeted reduction concentration for 7 out of 10 years for one parameter and half of the targeted reduction for the other parameter.
    - 7 x 12 months = 84 months and 7 x 6 months = 42 months, for a total of 126 months or approximately 10 years.

Accumulation of incentive months

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

- Example
  - Median Effluent TP 0.85 mg/L for 1 Year
    - Months Earned Calculation

(1 mg/L – 0.85 mg/L/(1 mg/L – 0.7 mg/L) * 12 Months = 6 Months Earned

Revised Final Compliance Date = Original Date + 6 Months

EXAMPLE APPLICATION

Example Application of Early Nutrient Incentive

- 2012 NPDES Permit
  - Pending Total Maximum Daily Load (TMDL)
  - Established Interim Effluent Limit TP 2.8 mg/L
  - Final Effluent Limit TP 0.070 mg/L
  - Compliance with Final Limits in 2022
- 2015 TMDL Completed
  - Revised Final Effluent Limits
    - TMDL PS WLA is Oct-Apr 0.350 mg/L and May-Sept 0.100 mg/L
- 2018 NPDES Permit Negotiation
  - Interim Phosphorus Removal Performance Better Than Interim Limits
  - Final Limits in 2022 Drive Peak in Capital Program Expenditures
    - More Time Required to Level Cash Flow

Potential Application of Incentive Program for Early Nutrient Reductions

- Scenario A: Effluent TP 1.7 mg/L (less than Interim Limit 2.8 mg/L)
  - 5 Years of Performance Earns 24 Month Time Extension on Final Limits

	Upper Bound 2016 Annual Ave Limit	Lower Bound Final TMDL in 2022	Actual Effluent Average Ann. Conc.	Years of Performance
TP mg/L	2.8	0.1	1.7	5
Months Earned	0	12	5	24

- Scenario B: Effluent TP 0.6 mg/L (less than Interim Limit 2.8 mg/L)
  - 5 Years of Performance Earns 49 Month Time Extension on Final Limits

	Upper Bound 2016 Annual Ave Limit	Lower Bound Final TMDL in 2022	Actual Effluent Average Ann. Conc.	Years of Performance
TP mg/L	2.8	0.1	0.6	5
Months Earned	0	12	10	49

Model Nutrient NPDES Permit

Features

- Focus on Water Quality Linkages
  - Predictive WQ Models
  - Probabilistic Analysis
- Effluent Variability and Reliability
  - Technology Performance Statistics
- Long Averaging Periods
  - Seasonal or Annual Preferred
- Mass Loadings
  - Supports Trading, Offsets, Reuse, etc.
- Include Compliance Schedule
  - Watershed Perspectives
    - Adaptive Management

Benefits

- Water Quality Improvements
- Successful Compliance
- Technically Achievable
- Adaptive Management Opportunities
  - Monitor Receiving Water Response
  - Adapt Treatment Process Over Time
  - Develop Trades and Offsets
  - Quantify and Manage Nonpoint Sources
  - Consider Sustainability

Nutrient Permitting Recommendations

Maintain Watershed Perspective

- Early Engagement in Process
  - State Numeric Nutrient Criteria Development
  - Watershed TMDLs
  - Individual Permits
- Technical Input and Support
  - Capabilities of Treatment
  - Effluent Characterization
    - Data
    - Nutrient Speciation
- Long-term Support
  - Lay Foundation for Regulatory “Solutions”
  - Sustained Watershed Perspective
    - Compliance Schedule and Beyond
  - Design Treatment Process for Adaptability

Permit Structure Development

- Dialog with Regulators
  - Permit Writers
- Solution Orientation
  - Technology Exchange
  - Foster Shared Understanding
    - Treatment Capabilities
    - Limitations
- Apply Regulatory “Solutions” When Necessary
  - Avoid Unattainable Effluent Limits
    - Compliance Schedules, Variances, Site Specific Criteria, etc.
- Invest the Time
  - NPDES Renewal Period Alone is Inadequate

ACWA NUTRIENT PERMITTING WORKSHOP

Nutrient Removal Technologies and Permitting

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