Nutrient Control - POTWs

- Nutrient Removal Strategies
  - Treatment technology
  - POTW optimization
  - Source control
- Pretreatment as a tool for POTW permitting
- Nutrient Non-domestic sources
Progress on Establishing Nutrient Criteria – Region 8

- CO – Nutrient Table Values for the State (Regulation 31.17)
  - Control Reg 85 for TP (1.0 mg/L) and TIN (15 mg/L)
- MT – Eco-Regional Nutrient Criteria for wade-able streams; variances
- UT – TBEL for P
- ND, SD, WY – criteria in progress
Biological Nutrient Removal (BNR)

Oxygen Poor Habitat (Anoxic)

- Denitrification: Nitrates as N (NO$_3$) converts to Nitrogen$_{(g)}$ – N$_2$

- Phosphorus
  - Bacteria break down BOD to create volatile fatty acids (VFAs)
  - Phosphate Accumulating organisms (PAO) use VFAs as a fuel source, release soluble ortho-P
Biological Nutrient Removal (BNR)

Oxygen Rich Habitat

- **Nitrification**: Ammonia-N (NH$_4$) converts to Nitrates-N (NO$_3$)
- **Phosphorus**
  - PAOs assimilation of soluble P

**P Removal** - convert soluble P to TSS: PAOs are wasted to digesters
Biological Nutrient Removal (BNR) Treatments

- IFAS - Integrated Fixed Film Activated Sludge
- SBR - Sequential Batch Reactor
- Oxidation Ditch
- MBR – Membrane Biological Reactor
- MBBR - Moving Bed Biofilm Reactor
- Step Feed Process
POTW Optimization

• Creating optimal habitat for bacteria involved in N and P removal
  – Denitrifying bacteria will outcompete PAOs for VFAs
  – Dial in anaerobic, anoxic, and aerobic habitats
• Utilizing skills, expertise, and institutional knowledge of WWTP operators
Pretreatment 101

• Established in the Clean Water Act; regulations for commercial and industrial process wastewaters.

• **Direct Dischargers** - National Pollution Discharge Elimination System

• **Indirect Dischargers** – National Pretreatment Program
Damage to Collection System and/or Treatment Plant

Explosions

Interference with Wastewater Treatment Facility

Injury to Workers from Hazardous Fumes

Limitations on Sludge Disposal Options and/or Greater Expense

Pass-Through of Pollutants into Surface Waters
Goals of the National Pretreatment Program

Prevention:

• Pass Through of Pollutants
• Interference of the wastewater facilities operations
• Contamination of the treatment sludge
• Impact to worker health and safety
Non-Domestic Sources

- Characterize Service Area: Non-Domestic Sources or Industrial Users (IU)
- Characterize IUs in service area
  - Determine impact to POTW
- Determine and Control SIUs
Pretreatment Standards

• **Effluent Limitation Guidelines**
  – Based on processes
  – Establish National level of technology

• **General/Specific Prohibited Standards**

• **Local Limits**
  – Calculated based on NPDES Standards
Who Needs a Pretreatment Program?

- POTWs with a total design flow greater than 5 MGD
- Receive pollutants from IUs which Pass Through or Interfere with the operation of the POTW or are otherwise subject to Pretreatment Standards
Smaller POTWs

16,000 POTWS in U.S.

- 1,600 POTWs with approved programs
  - Treat ~80% of the national wastewater flow to waters of the U.S
  - 23,000 Significant Industrial Users (SIUs) that account for at least 30% of all industrial wastewater generated in the U.S.
Region 8 Non-Approved Program Initiative

- Outreach to Region 8 non-approved programs
  - Wastewater Operator Training
  - Non-Approved Programs Traveling Road Show
    - Phone Calls, Visits
    - NPDES Requirements and Pretreatment Authority
- Region 8 Non-Approved Programs Ordinance example
- NPDES Permit Language
Establishment of Nutrient WQ Criteria/NPDES permit limits

- Establishes Pollutants of Concern
- Develop local limits based on NPDES Standards, including variances
  - “maintain current conditions or loadings” without quantifying baseline
- Determine loadings from IUs in service area and provide control
Nutrient Point Sources

- Fish hatcheries
- Oil and gas lagoons
- Metal Finishing – phosphate coating
- Ortho-phosphate corrosion control - drinking water distribution lines
- Breweries/distilleries, car washes, industrial laundries - detergents
- Mining – explosives
- Food Processing Facilities
Food Processing Facilities

- Slaughterhouse
- Cheese Processing
- Bacon Processing
- Egg Processing
- Meat Packing
- Poultry Packing
- Food Products
EPA National Enforcement Initiative

• Food Processing Facilities
  – Ties to nutrients

• Pressures on smaller POTWs to address nutrient loadings when NPDES permit limits are established
Small Town, CO

- Design Capacity
  - BOD – 238 lbs/day
  - Flow – 0.109 MGD
Non-Compliance History

- The Town often receives more flow and BOD than the design capacity.
- The Town consistently fails to meet limits for BOD, BOD percent removal, TSS, and flow when it discharged in 2012-2014.
Blue Ribbon Processing

- Slaughter Monday-Wednesday
  - 20 cattle are processed per week, can process up to 12 cattle in a day.
  - 20 to 25 hogs are processed one day every other week.
  - 20 lamb are processed every other week.
- 14 employees
- The facility discharges an average of 15,620 gpd on processing days
EPA Investigation and Sampling Event

- Operating days, the facility is discharging an average of 14.3% of the POTW’s daily flow capacity and about 21% of the POTW’s BOD capacity.
- Facility appears to be discharging process wastewater in concentrations and amounts that are causing pass through and/or interference.
Nutrient Loadings

• Cheese Plant –
  – process 3 million lbs milk/day, expand to 9 million lbs/day

• WWTP expansion
  – Flow – 2MGD
  – COD – 55,000 lbs/day
  – TKN – 928 lbs/day
  – NO₃-N – 618 lbs/day
  – NH₄-N – 234 lbs/day
  – PO₄-P – 234 lbs/day
Nutrient Loadings

- **Egg Processing Facility-1.25 million per day**
  - Flow – 0.1 MGD
  - TKN – 158 lbs/day
  - BOD – 1,986 lbs/day

- **Meat Packing Facility-after anaerobic lagoon treatment**
  - Flow – 2.83 MGD
  - TKN – 2,891 lbs/day
  - NH$_4$-N – 2,529 lbs/day
  - BOD – 11,389 lbs/day
Summary

- Nutrient compliance will impact smaller POTWs
  - affordability of treatment
- Pretreatment authority can used as a source control tool
  - Need complete permit applications
  - Adequate Permit conditions
  - “Pollutant minimization plans as conditions for variances