# Metro Wastewater Reclamation District's Innovative Integrated Plan

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# **Presentation Topics**

- Metro District Background
- Why Do an Integrated Plan?
- Integrated Plan Approach and Structure
- Phosphorus Initiative
- How to Implement the IP



# **Metro District Background**

## **Metro District Background**

- Largest wholesale
   wastewater treatment
   provider in Colorado
- 1.7 million people
- 50 Member Municipalities and Special Connectors
- 36-member Board of Directors



#### **Two Treatment Facilities**

#### Two treatment facilities:

- Robert W. Hite Treatment Facility (startup 1966, 130-mgd flow)
- New Northern Treatment Plant (startup 2016 at 24-mgd capacity)





# Why Do An Integrated Plan?

# What is an Integrated Plan

- EPA's Framework
  - Voluntary opportunity
  - Compliance with CWA requirements
  - Identify highest priorities and efficiencies
  - Sequence and optimize investments
  - Sustainable and comprehensive solutions
  - Multiple benefits to enhance community vitality
- Real World Benefits
  - Uses adaptive management principles
  - Opportunities for Partnering
  - Balances treatment priorities with costs and associated water quality improvements
  - Provides flexibility for less urgent water quality issues



# **Goal of Metro Integrated Plan**

- Design a well-developed and comprehensive regulatory master plan for Metro District facilities
  - Address priority issues based on current and future CWA requirements
  - Use a watershed approach, including modeling for other dischargers
  - Implement through CPDS permits
- Find the most effective and sustainable management approach for nutrients

# **Priority Issues**

- Total phosphorus reductions
  - Enhanced biological phosphorus removal will be implemented at the RWHTF
  - NTP will be capable of tertiary treatment
  - Reg. 31 interim TP value 0.17 mg/L
  - Barr-Milton TMDL requires 0.1 mg/L in-reservoir
- Total nitrogen reductions
  - Deammonification will be implemented at the RWHTF
  - Pilot projects have been completed at the RWHTF
  - Reg. 31 interim TN value 2.01 mg/L
- Temperature



# **Integrated Plan Approach and Structure**

#### **Focus: Nutrients**

This initial version of the Metro District's Integrated Plan focuses on providing adequate <u>space and time to innovate</u> to cost-effectively address priority pollutant impacts, primarily from phosphorus, within the watershed to improve receiving and downstream water quality and enhance overall watershed protection.

This approach will emphasize sustainable approaches to maximize treatment performance at District facilities as well as facilitate comprehensive watershed planning in the Denver metropolitan area based on Colorado water resource quality and federal Clean Water Act goals.

# **Integrated Plan is a Synthesis of Three Components**

- (1) Infrastructure and Watershed Protection Activities
- (2) Comprehensive Planning Activities
- (3) Water Quality Monitoring and Modeling Activities



# **Consistent with EPA Frameworks**

- EPA's Watershed Approach Framework:
  - Geographically focused area
  - Input from stakeholders to ensure transparency
  - Strategically addressing priority water resource goals
  - Integrating multiple programs
  - Sound science
  - Adaptive management
- EPA's Integrated Municipal Stormwater and Wastewater Planning Approach Framework
  - 6 Elements



Service area by basin, March 2014

#### **Elements**

Water Quality, Human Health, and Regulatory Issues

Wastewater and Stormwater Characterization and Performance

Public, Stakeholder and Regulatory Agency Involvement

Planning/Implementation Approaches to Meet Identified CWA Requirements

Measuring Success

Improvements to the Plan



## **Phosphorus Initiative**

# **Phosphorus Initiative (2015-2020)**



- *Phosphorus Initiative* includes:
  - Enhanced biological phosphorus removal
  - Phosphorus recovery
  - Watershed studies
  - Simultaneous reduction of nitrogen, e.g., through deammonification
  - Performance improvements

# **Facility Planning—Phosphorus**

2003







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BLACK & VEATCH



2013



2013 FACILITY PLAN Robert W. Hite Treatment Facility METRO WASTEWATER RECLAMATION DISTRICT

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- Biological Phosphorus Removal Upgrades
- Tertiary Treatment Facilities

## Nutrient Removal (Phosphorus & Nitrogen)

- Provisions in the South Secondary to Enhanced Biological (EBPR)
  - Start evaluating and optimizing in 2nd Quarter 2015



- Construct permanent sidestream Bio-P Mods for North Secondary
  - Pilot completed in 2012
- Construct sidestream deammonification
  - Pilot completed in 2013



#### **Cost-Benefit**

Capital Cost (\$ Mil)

Effluent Phopshorus (lb/day)



#### **Tertiary Facilities**



#### **Three P-Management Steps**



21

#### **Potential Yield**



# **Total Value of Phosphorus Recovery**

- Enhance mainstream Bio-P reliability
- Mitigate nuisance struvite on equipment/pipes
- Achieve chemical and energy savings
- Reduce phosphorus content in biosolids to help nitrogen land application rates
- Minimize sludge production

#### Long-Term Nutrient Control Alternatives

- Traditional Approach
- Nutrient Co-Benefit Approach
- Watershed Control Regulation Approach



**Robert W. Hite Treatment Facility** 

#### Exhibit O-3: Future RWTHF Nutrient Removal Alternatives

RWHTF Nutrient Alternatives and Projected Effluent Quality		Alternative Description
Tradition TP (mg/L) <b>0.1</b>	mal Approach TN (mg/L) ~2.65 mg/L	<ul> <li>Approach would be consistent with current regulatory framework in Regulation No. 31 and Regulation No. 85</li> <li>Tertiary treatment would include Flocculation/Sedimentation/ Filtration or Membranes with completion by ~2037</li> <li>Capital costs would be ~\$318 million; another \$168 million in capital costs would be required for nitrogen</li> <li>Net additional operation &amp; maintenance costs would be \$4.6 million/ year; net additional costs for nitrogen would be \$2.7 million/year</li> </ul>
Nutrient Co-Benefit Approach		<ul> <li>Approach would require revisions to Regulations No. 31 &amp; 85</li> <li>A period of biological treatment technical evaluation, coupled with watershed monitoring activities, would evaluate treatment capabilities and impacts on receiving and downstream water body use attainment</li> </ul>
TP (mg/L)	TN (mg/L)	• Tertiary infrastructure would include biological phosphorus removal with deep bed filtration (or similar)
0.2 to 0.5	5 mg/L	<ul> <li>Tertiary treatment capital costs would be ~\$198 million</li> <li>Net tertiary treatment operation &amp; maintenance costs would be ~\$1.2 million/year</li> </ul>
Watershed Control Regulation Approach		<ul> <li>TP and TN concentrations would need to be determined</li> <li>Approach would need adoption of new Watershed control regulation by the Commission</li> <li>Effluent limitations would be determined through the control regulation</li> </ul>

#### **Traditional Approach**

- Stimated achievable WQBELs:
  - 0.1 mg/L TP
  - 2.65 mg/L TN (but would not meet interim numeric TN value end-of-pipe)
- Significant costs:
  - Capital improvements
    - \$318 million (P) + \$168 million (N)
  - Operating costs (due to increased carbon & energy)
    - \$4.6 million (P) + \$2.7 million (N)
- Additional environmental impacts:
  - Chloride & sulfate loading
  - Increased greenhouse gas emissions

#### **Traditional Approach Timelines**



#### **Nutrient Co-Benefit Approach**

- Stimated achievable WQBELs:
  - 5 mg/L TN
  - 0.2 mg/L TP
- Biological performance & adaptive management, with emphasis on sustainable particle separation
- Watershed monitoring activities
- Would require regulatory modification
  - Delay nutrient Phase 2 effective date to 2027 to optimize biological treatment strategies and determine watershed responses
- Tertiary treatment costs (if needed)
  - Infrastructure costs \$198 million
  - Operating costs \$1.4 million annually

#### Nutrient Co-Benefit Approach Timelines



#### Watershed Control Regulation Approach

- Similar to other nutrient Control Regulations already in effect
- Would need approval by Commission
- Effluent Limitations would be determined through development of the Control Reg.
- Potentially could be based on Barr-Milton requirements

#### **Control Regulation Approach Timeline**



# **Recommendation: Nutrient Co-Benefit Approach**

- Would provide optimal treatment flexibility
- Would result in reductions more quickly than traditional approach
- Would support adaptive management evaluations on a watershed scale
- Is the most environmentally sustainable and cost-effective approach
- Associated monitoring and studies would determine protectiveness of in-stream and in-reservoir conditions

# Temperature

- Metro issue is stream temperature in winter
  - Metro discharge is 85% percent of the in-stream flow 50% of the time on average
- Water Quality Control Division Study
  - Technical evaluation of feasible treatment options
- Metro's Temperature Mitigation Alternatives Analysis and Feasibility Study
  - Plant/Collection System heat analysis
    - Process opportunities
    - Sewer system heat recovery
  - In-stream projects
  - Partnering
- Integrated Plan Prioritization

#### **How to Implement An Integrated Plan?**

# **Options for Implementation**

- IPs traditionally implemented through consent decrees **not** an option
  - No basis for enforcement action
  - Must address future regulatory requirement for sustainable planning
  - Uses the IP as the rationale for applying available regulatory flexibility
  - Regulation 85 and 31.17
    - Part of basis for revisions
    - Support for change in phase 2 timing
  - Compliance Schedules Rationale/Fact Sheet
  - Site-Specific standards actions/Basis & Purpose
    - Variances
    - Temp Mod
  - Other possibilities?
    - MOU
    - Control Regulation
    - Environmental Management System permit

# **Questions?**









