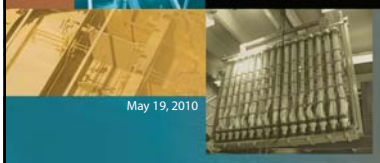
2010 Idaho Reuse Conference

Drivers for Reuse: TMDLs



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May 19, 2010

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Overview

- **Restrictive TMDLs**
  - Expense and Technical Difficulty of Compliance
- **Effluent Management Options**
- **Convergence of Treatment Technologies**
- **Strategic Benefits of Recycling**
  - Move the Nutrients to Land
- **Challenges for TMDL Compliance**

Restrictive TMDLs Drive Alternative Effluent Management Options

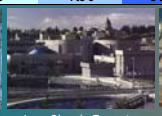
- **Expense and Technical Difficulty of Compliance**
  - Low In-stream Nutrient Targets
  - Potentially Applied End-of-Pipe
  - Potentially Lower Than Limits of Treatment Technology
- **Potential Synergy**
  - Convergence of Treatment Technology Requirements
  - New Opportunities for Reclamation and Reuse
    - High Quality
    - Draught Proof

Instream Nutrient Targets Below the Limits of Treatment Technology

Parameter	Typical Municipal Raw Wastewater, mg/l	Secondary Effluent (No Nutrient Removal), mg/l	Typical Advanced Treatment Nutrient Removal (BNR), mg/l	Enhanced Nutrient Removal (ENR), mg/l	Limits of Treatment Technology, mg/l	*Typical In-Stream Nutrient Criteria, mg/l*
Total Phosphorus	4 to 8	4 to 6	1	0.25 to 0.50	0.05 to 0.07	*0.020 to 0.050*
Total Nitrogen	25 to 35	20 to 30	10	4 to 6	3 to 4	*0.3 to 0.600*

Las Vegas, NV (TP 0.170 mg/l)

Clean Water Services, OR (TP 0.100 mg/l)



Lacy, Olympia, Tumwater Thurston Co (LOTT), WA (TIN 2 mg/l)

Coeur d'Alene, ID (TP 0.050 mg/l)

Reclamation Options to Meet Restrictive Surface Water TMDLs

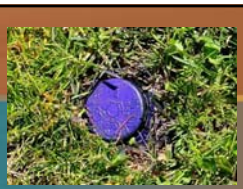
Water Reclamation Facility → Surface Water

Options

- Urban Irrigation
  - •Parks, Schools, Fairgrounds
- Industrial Reuse
  - •Paper Mill, Rock Crushing, Concrete
- Groundwater Recharge
  - • Surface Percolation
- Wetlands Restoration
  - •Creation, Restoration, Enhancement
- Other
  - •Agricultural Land, Poplar Farms

Urban Irrigation

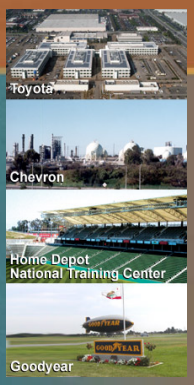
Washington State Capitol Grounds
(Olympia, Washington)



Sunken Garden
(Olympia, Washington)

Industrial Reuse

Recycled water from the West Basin Recycling Facility in El Segundo; CA is provided to industrial customers for non-potable uses.



Groundwater Recharge

Riparian Preserve
(Gilbert Arizona)

LOTT Hawks Prairie
(Lacey, Washington)

Wetlands Restoration

Oregon Nurseryman's Garden
(Silverton, Oregon)

Other Uses

Cochrane Park
(Yelm, Washington)
Source: Department of Ecology

Reclaimed Water Fire Hydrants
Top: (Portland, Oregon)
Bottom: (Maui, Hawaii)

Reuse Classification

- **Class A**
  - Least restricted uses, most regulated. Requires filtration and disinfection.
- **Class B**
  - Similar to Class A, but more restricted uses.
- **Class C**
  - No filtration. Disinfection (23 orgs/100 mL).
- **Class D**
  - No filtration. Disinfection (230 orgs/100 mL).
- **Class E**
  - Primary treatment only.

Convergence in Treatment Technologies

Low Phosphorus

- Biological Options
- Chemical Options
  - Effluent Filtration
  - Single and Multiple Stage Media Filtration
  - Membranes
- *Meets Reclaimed Water Standards*
- Technology Selections – Best Filter?

Low Nitrogen

- Biological Options
- Chemical Addition
  - Supplemental Carbon Source for Denitrification
- Effluent Filters?
  - Separate Stage Denitrification

Idaho TMDLs with Low Phosphorus Wasteload Allocations

- **Spokane River**
- **Snake River/Hells Canyon**
  - **Lower Boise River**
- **Middle Snake River**
- **Portneuf River**
- **Paradise Creek**
- **Cascade Reservoir**
- **Others……..**

Spokane River Dissolved Oxygen TMDL

- Original Phosphorus TMDL Limits Not Low Enough
  - 85% Removal/~ 1 mg/l (1,000 ug/l)
- Washington Department of Ecology TMDL (Total Maximum Daily Load) for Dissolved Oxygen
  - Draft TMDL October 2004
- Negotiated Agreement to Pursue Facilitated Collaboration on TMDL
  - January 2005 to July 2006
  - "Foundational Concepts for the Spokane River TMDL Managed Implementation Plan" July 2006
- September 2007 Draft TMDL
- May 2008 Draft TMDL
- Revised 2009 TMDL
  - *2010 Final*

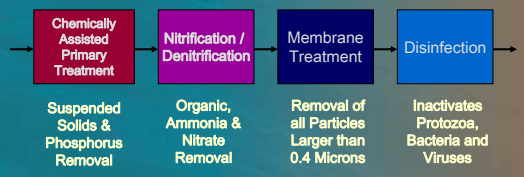
Spokane River TMDL Scenarios

Scenario	$CBOD_5$, mg/l	Ammonia-N Permit, mg/l	Ammonia-N Average, mg/l	TP Permit, mg/l[1]	TP Average, mg/l
1	5.0	1.0	0.71	0.050	0.036
2	5.0	1.0	0.71	0.070	0.050
3[a]	5.0	1.0	0.71	0.050	0.036

[1]Maximum Month Limits for Phosphorus Based on Assumed Relationship Between Max Month and Long Term Average from BOD Data Set
[a] Scenario 3 Same as Scenario 1 Except for Hayden Summer Reuse (Mar-Jun TP = 0.150 mg/l and July-Sept 0.010 mg/l)

- Ecology Selected Scenario 1 for TMDL Wasteload Allocation (WLA) in Washington
  - Revised Idaho Permits to Ensure Compliance with Washington Standards

Spokane County Regional Water Reclamation Facility



100% Meets Washington Class A Reclaimed Standards

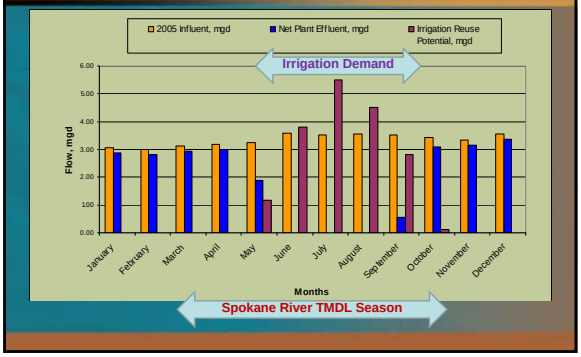
Multiple Effluent Options Strengthen Wastewater Programs

- **Clean Water Services (CWS) Durham Plant**
  - –Tualatin River - Ammonia and Phosphorus Limits
  - –River Discharge and Effluent Reuse
- **Silverton Treatment Plant**
  - –Silver Creek - Ammonia Limits
  - –Wetlands, Creek Discharge and Effluent Reuse
  - –Oregon Nurseryman's Gardens
- **Spokane County**
  - –Spokane River DO TMDL
  - –River Discharge, Effluent Reuse, Groundwater Recharge, Wetlands
- **Bozeman**
  - –East Gallatin River Pending TMDL
  - –River Discharge, Effluent Reuse, Groundwater Recharge, Wetlands, Hyporheic Discharge

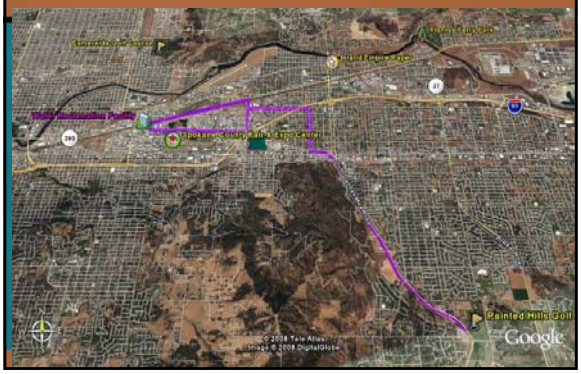
Limitations of Effluent Reuse in Satisfying TMDL Requirements

- **Seasonal Demand for Urban Irrigation Uses**
- **Expense of Reclaimed Water Distribution Systems**
- **Limited Potential for Substantial Diversion of Loadings From Surface Water**
- **Over-specified Effluent Discharge Permits**

Seasonal Reuse Demand for Irrigation in Coeur d'Alene v. Spokane River TMDL Season



Potential Sites for Reclaimed Water Use in Spokane County – Painted Hills Golf Course



Phased Coeur d'Alene Central Reuse Distribution System

Estimated P Load Diversion from Spokane River and Distribution System Cost

Phase	Average Daily Irrigation Demand, gpd	P Load Applied to Reuse, lbs/day*	Opinion of Project Cost**
SUBTOTAL PHASE 1	351,300	0.15	$684,000
SUBTOTAL PHASE 2	94,000	0.04	$1,000,000
SUBTOTAL PHASE 3	559,000	0.23	$3,600,000
SUBTOTAL PHASE 4	1,865,000	0.78	$2,400,000
TOTAL FOR CENTRAL DISTRIBUTION	2,870,000	1.20	$7,680,000

* P reduction is based upon 0.05 mg/L effluent P.

** Cost opinion does not include the cost of treatment, offsets from deferring new source development, and potential revenue from the sale of reclaimed water.

Summary of Spokane County Potential Phosphorus Load Reductions to the Spokane River from Potential P Reduction Activities

Year	To Be Developed by Spokane County and Other Stakeholders as Part of the Spokane River TMDL Managed Implementation Plan (MIP)																Total Phosphorus Reduction for "Delta Elimination Plan"	
	Septic Tank, Elimination[1]		Treatment Technology Reserves[2]		Water Conservation[3]		Water Reuse		Regional Phosphorus Reduction Programs		Bio- Available Phosphorus Reduction		Source Control Programs		Regional Non-Point Source Reduction			
	lbs/d	lbs/yr	lbs/d	lbs/yr	lbs/d	lbs/yr	lbs/d	lbs/yr	lbs/d	lbs/yr	lbs/d	lbs/yr	lbs/d	lbs/yr	lbs/d	lbs/yr	lbs/d	lbs/yr
2005	3.8	1,387	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.8	1,387
2010/12	6.1	2,227	0	0	0	0	0.768	280	0	0	0.742	271	0	0	7.63	2,785	15.2	5,567
2015	12.2	4,453	2.13	778	0.126	46	1.08	394	0	0	0.934	341	0.422	154	7.63	2,785	24.5	8,951
2020	12.2	4,453	2.13	778	0.308	112	2.16	788	0	0	1.16	423	0.555	203	7.63	2,785	26.1	9,542
2025	12.2	4,453	2.13	778	0.543	198	3.24	1,183	0	0	1.38	504	0.688	251	7.63	2,785	27.8	10,152
2030	12.2	4,453	2.13	778	0.837	306	4.32	1,577	0	0	1.60	584	0.822	300	7.63	2,785	29.5	10,782

Avoid Over-specifying NPDES Effluent Limits and Discouraging Reuse

Mass and Concentration

- Long Averaging Periods Preferred
- Maximum monthly, weekly, and daily limits likely to be exceeded by even the best designed and operated low nutrient treatment facilities

Mass Only

- Mass Limits Provide Greater Flexibility
  - Supports Effluent Reuse
  - Supports Trading/Water Quality Off-sets

NPDES Permitting Regulations

- **40 CFR 122.45(d) requires that all permit limits be expressed as average monthly limits and average weekly limits for publicly owned treatment works (POTWs) and as both average monthly limits and maximum daily limits for all others, unless "impracticable."**

Mass Limits Required for NPDES Permitting

Effluent N and P concentration is highly variable for even the best designed and operated low nutrient treatment facilities

Individual permit writers in every nutrient limited watershed must interpret these NPDES regulations and the definition of "impracticable" with limited guidance

Integrated Water Planning Goals and Objectives in Billings

Example Internal Goals

- Economical Operation
- Efficiency
- New Technology
- Automation
- Health and Safety
- Energy Management

Drinking Water
- ***Residuals***

Wastewater
- ***Effluent Reuse***
- ***Biosolids***
- ***Energy Recovery***

Stormwater

Example External Goals

- Regulatory Compliance
- Available Capacity
- Service Area Policies
- Competitive User Rates
- Customer Satisfaction

Potential Priorities in Integrated Water Planning

- **Identify Opportunities**
  - Cost Savings, Environmental Benefits, Social Benefits
  - Efficiency and Innovation
- **Identify Which Utility**
  - Water, Wastewater, Stormwater
- **Identify Benefits**
- **Identify Barriers**
  - Regulatory, Physical, Policy
- **Identify Policy Needs**
- **Special Interests**
  - Internal Utility Staff
  - Public Interests
  - Council Interests
  - 3rd Parties