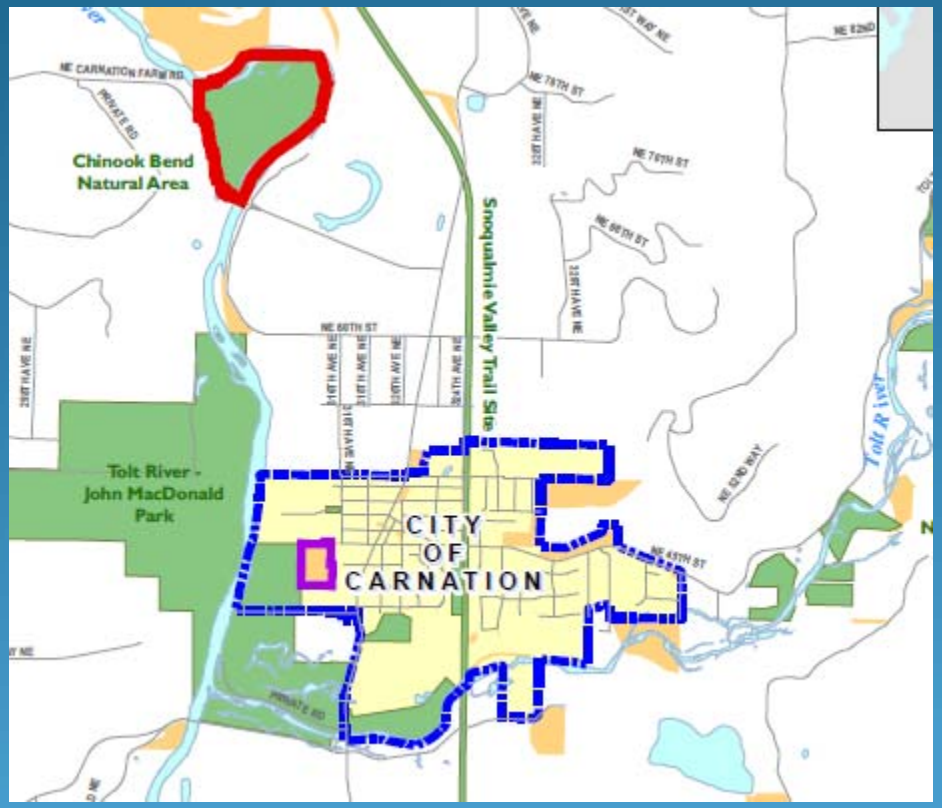
Permitting King County's Carnation Reclaimed Water Facility



Reclaimed Water Workshop

October 12, 2010

Background

- Prior to Plant operation, residents and businesses used individual septic systems
- Many sites unable to meet health standards
- In 1987, City declared a public health hazard area by the Seattle-King County Public Health Dept based on the number of inadequate septic systems and likely contamination of the underlying aquifer
- At the request of the City, KC built and now operates a membrane bioreactor (MBR) treatment plant to meet the needs of the City's designated Urban Growth Area

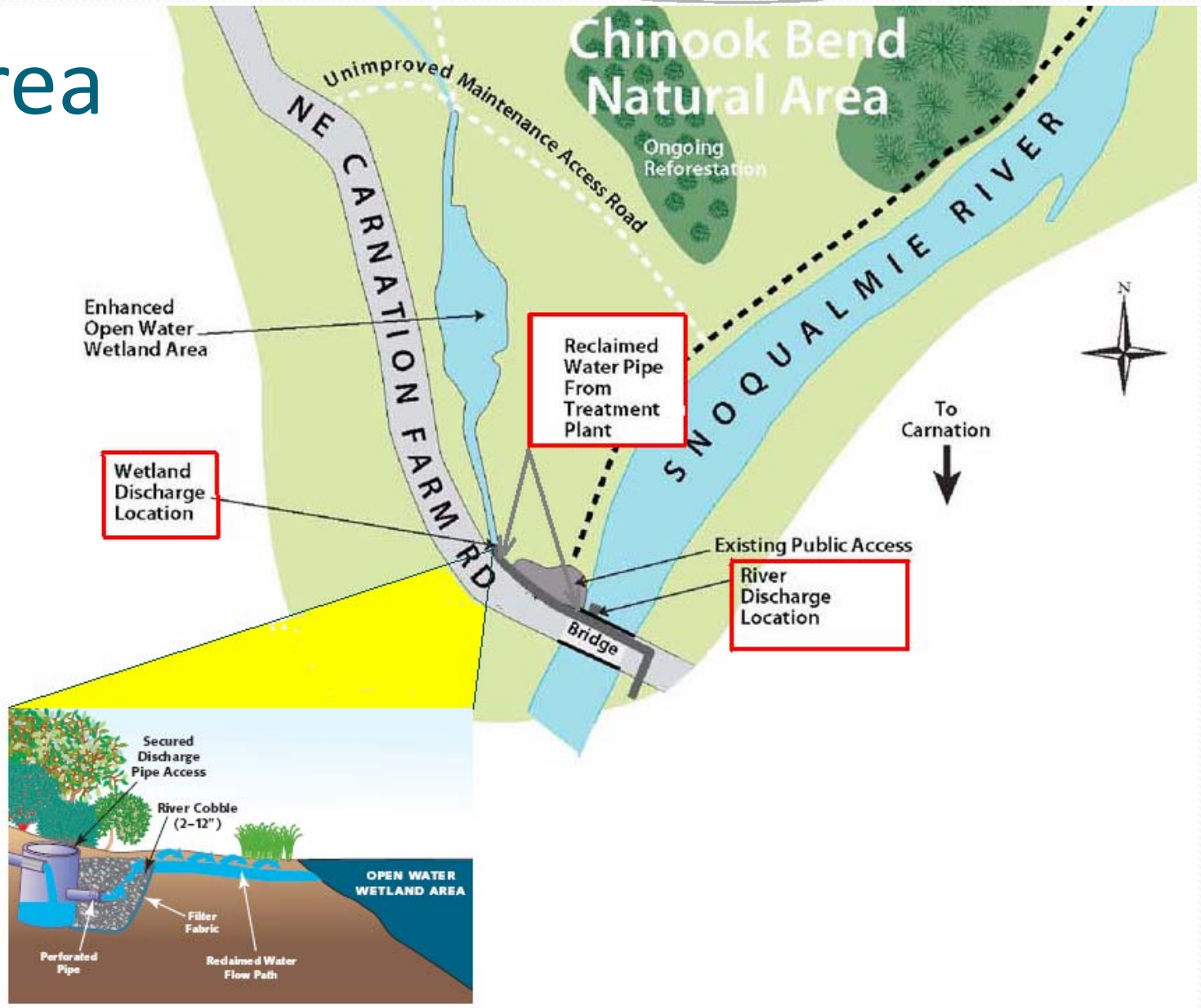
Facility Description

- Design max month flow: 0.48 MGD
- Treatment Level: Class A reclaimed water
- Treatment includes: fine rotary drum screens, zoned activated sludge basins, flow equalization, membrane bioreactor (MBR), and UV disinfection
- Reclaimed water use: enhancement of the Chinook Bend Wetland Enhancement project
- NPDES outfall in Snoqualmie River used as backup if reclaimed water standards are not met

Use Area

- Chinook Bend Wetland Enhancement project planned by Ducks Unlimited Inc., KC, and other groups
- Goals of the project:
  - establish native plant species in the wetland area
  - restore surface stream flow to the Snoqualmie River
  - enhance up to 10 acres of wetland habitat and associated buffer
- Wetland is fed from many sources including stormwater and groundwater seeps
- Considered ‘constructed wetlands’, not a natural wetlands

Use Area


Chinook Bend
Natural Area
Ongoing
Reforestation
Unimproved Maintenance Access Road
NE CARNATION FARM RD
SNOQUALMIE RIVER
Enhanced
Open Water
Wetland Area
Reclaimed
Water Pipe
From
Treatment
Plant
Wetland
Discharge
Location
To
Carnation
N
Existing Public Access
River
Discharge
Location
Bridge
Secured
Discharge
Pipe Access
River Cobble
(2–12")
OPEN WATER
WETLAND AREA
Filter
Fabric
Perforated
Pipe
Reclaimed Water
Flow Path

Timeline

- Facility began operating and discharging to the Snoqualmie River in May 2008 under NPDES permit WA-003218-2 (issued April 15, 2008)
- Reclaimed water permit:
  - issued December 29, 2008
  - effective January 1, 2009
  - expires December 29, 2013

Permitting

- Based on information provided in:
  - Water Quality Program Permit Writer's Manual
  - 1997 Water Reclamation and Reuse Standards
  - *Snoqualmie River DO TMDL Load Study,* Ecology May 1994
  - *Wastewater Facilities Plan for the Carnation Wastewater Treatment Facility, Amendment 1*
  - *Carnation Wastewater Treatment Facility Plans & Specifications,* Carollo
  - Permit Application
  - *Wetland Enhancement Plan*, KC May 2007
  - Technical Memorandum No. 5B, Hydrologic Aspects of the Wetland Disposal Alternative – Stillwater, Carollo 2004
  - MBR data from KC's South Plant

Point of Compliance – End of Pipe

- Insufficient mixing in wetlands to warrant a mixing zone
- Presence of other variable water sources (stormwater, streams, gw seeps) in the wetlands makes downstream compliance assessment difficult

Reclaimed Water Permit Limits

Parameter		Carnation Reclaimed Water Permit	Limit Basis
BOD_5	Ave Monthly	20 mg/L	1997 WRRS* - Wetlands
	Ave Weekly	30 mg/L	
TSS	Ave Monthly	20 mg/L	1997 WRRS - Wetlands
	Ave Weekly	30 mg/L	
Turbidity	Ave Monthly	0.2 NTU	Performance standard for membranes
	Max	0.5 NTU	
Total Coliform	Ave Monthly	2.2 MPN/ 100 ml	1997 WRRS - Class A
	Max	23 MPN/ 100 ml	
pH	Min	6.0	Technology-based limits
	Max	9.0	
Chlorine Residual	Ave Monthly	6.9 ug/L	Calculated based on no dilution, end-of-pipe
	Max Daily	18.1 ug/L	
Seasonal Limits (August - October)			
BOD_5	Ave Monthly	12.5 lb/day	TMDL limit
	Max Daily	25 lb/day	
Total Ammonia	Ave Monthly	4.2 lb/day	TMDL Limit
	Max Daily	8.4 lb/day	

*WRRS = Water Reclamation and Reuse Standards

Groundwater Limits

- No Groundwater limits or monitoring in permit
- Groundwater degradation was not expected because:
  - Strong hydraulic connectivity with Snoqualmie River:
    - Wetlands on river valley floor, surrounded by river on 3 sides
    - Hydrologic principles suggest groundwater flows towards river
    - Carollo found low permeability sediments of the upper ten feet with no groundwater connectivity for the Stillwater site (approx. 1 mile north of Chinook Bend, Tech Memo 5B)
  - Effluent highly treated with MBR
  - Some nutrient uptake assumed by wetland vegetation (study required by permit)
  - No data available to suggest otherwise
- Drinking well survey showed no wells in close proximity

Reclaimed Water Monitoring

- Influent (required by NPDES permit):

  Flow, BOD_5, TSS, pH

- Effluent:

  Flow, BOD_5, TSS, pH, DO, Temperature, Turbidity,

  Total N, Total P,

  Total Coliform, Chlorine Residual, and UV dosage

  (priority pollutant and WET testing required by NPDES permit)

Water Rights Analysis

- Ecology's WR Program reviewed and approved the impairment analysis prepared by KC (April 2007), acknowledging:
  - Instream flow impairment caused by removal of historical septic discharge
  - the State of Washington is the only water right holder in this study area
  - the wetland enhancement project was sufficient compensation for the impairment
  - the facility must provide the same flow obtained from the old septic systems to the Snoqualmie River year-round
  - Wetland size held to 6 acres or less to limit evapotranspiration losses

Special Conditions

- Reclaimed Water Limits
- Reclaimed Water Monitoring Requirements
- Reporting and Recordkeeping Requirements
- Operation and Maintenance
- Residual Solids
- Pretreatment
- Reclaimed Water Distribution and Use

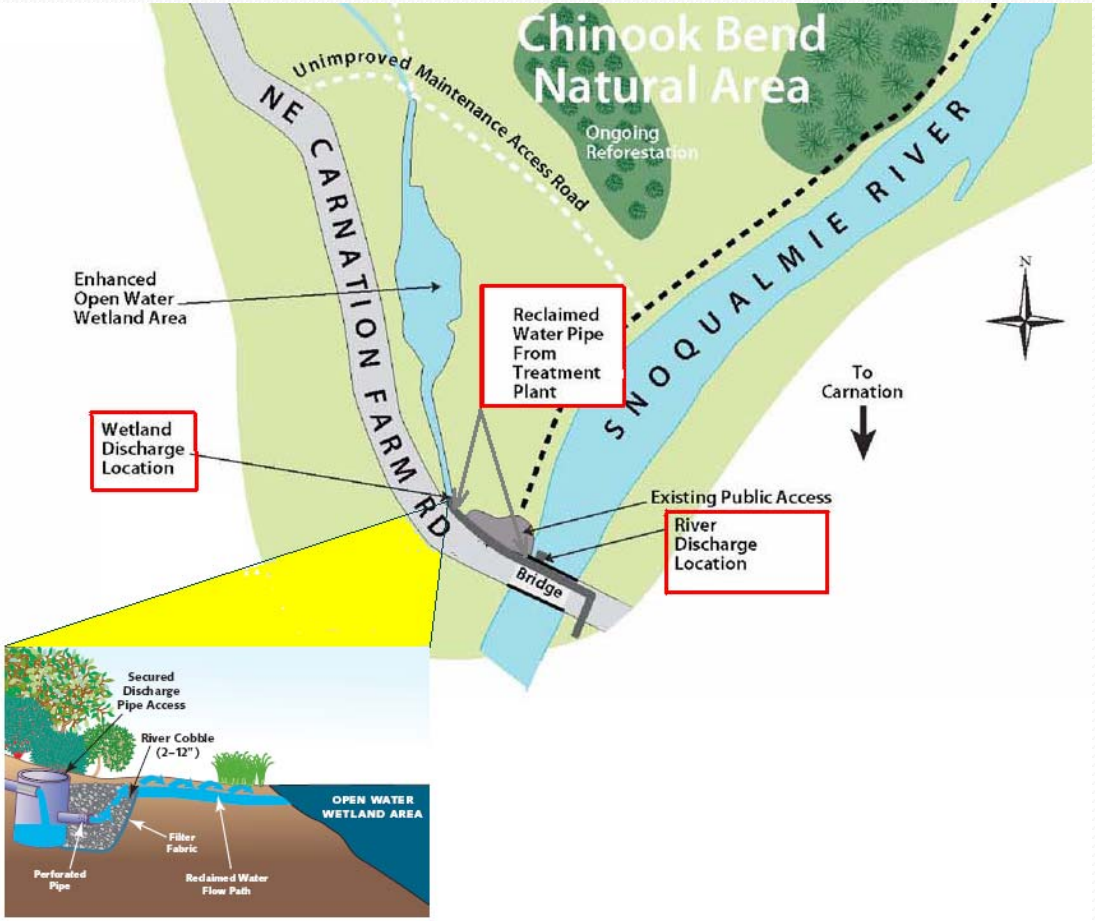
General Conditions

- Twenty-three General Conditions
- Signatory Requirements
- Right of Inspection
- Permit Actions
- Duty to Reapply
- Penalties for Violating Permit Conditions
- Reporting Planned Changes

Fact Sheet

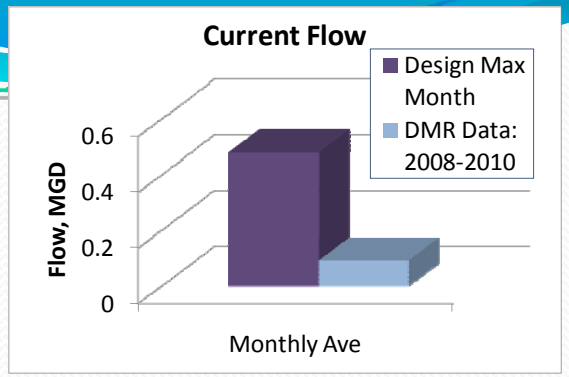
- Gives background information
- Description of the facility
- Description of permit requirements
- Explains permit decisions
- Response to comments

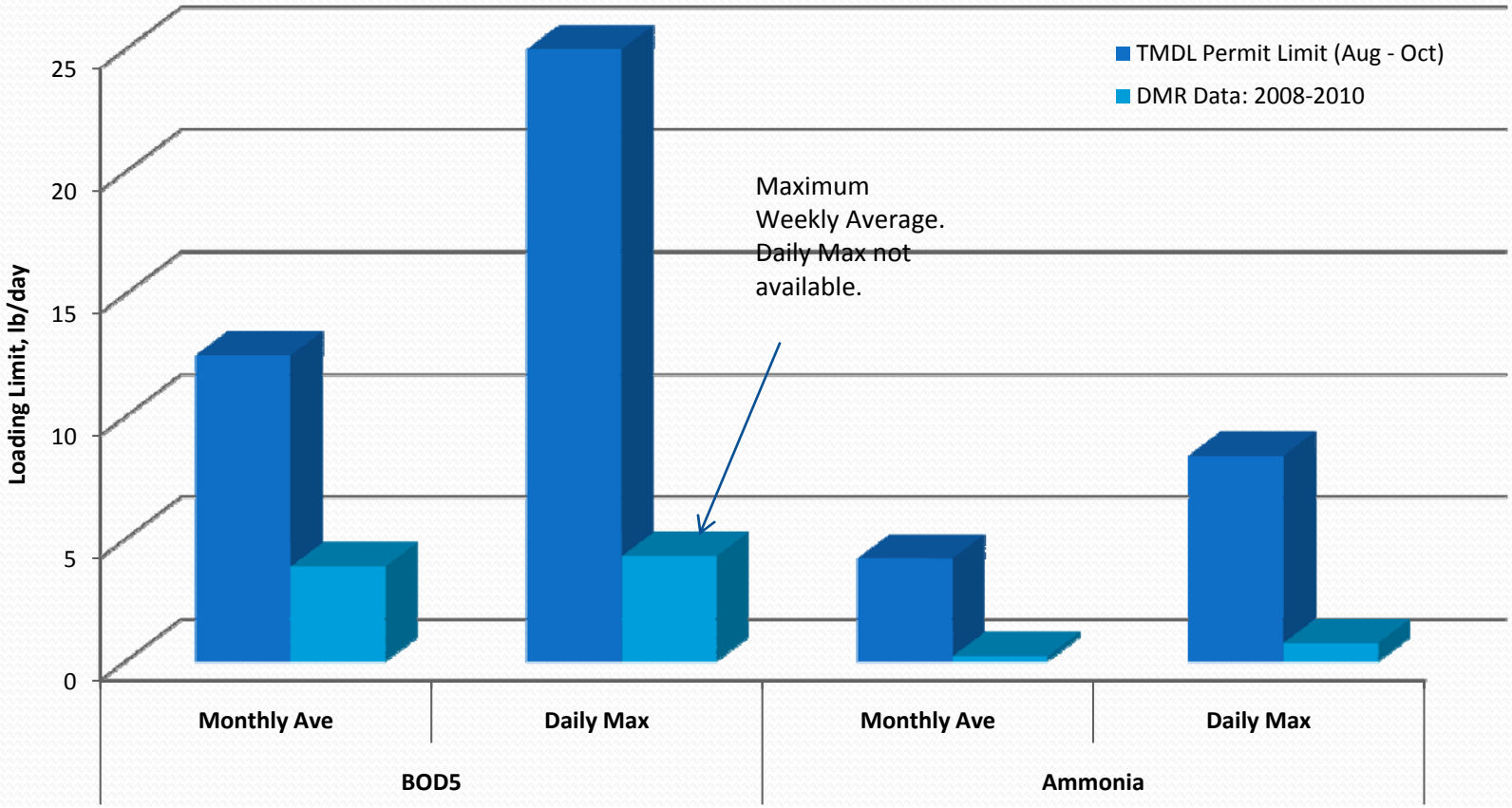
Questions?


Chinook Bend
Natural Area
Ongoing
Reforestation
Unimproved Maintenance Access Road
NE CARNATION FARM RD
SNOQUALMIE RIVER
Enhanced
Open Water
Wetland Area
Reclaimed
Water Pipe
From
Treatment
Plant
Wetland
Discharge
Location
To
Carnation
Existing Public Access
River
Discharge
Location
Bridge
Secured
Discharge
Pipe Access
River Cobble
(2–12")
OPEN WATER
WETLAND AREA
Filter
Fabric
Perforated
Pipe
Reclaimed Water
Flow Path

Facility Data Update

Carnation Reclaimed Water Plant
Currently well below TMDL limits





Wetlands Nutrient Mass Balance

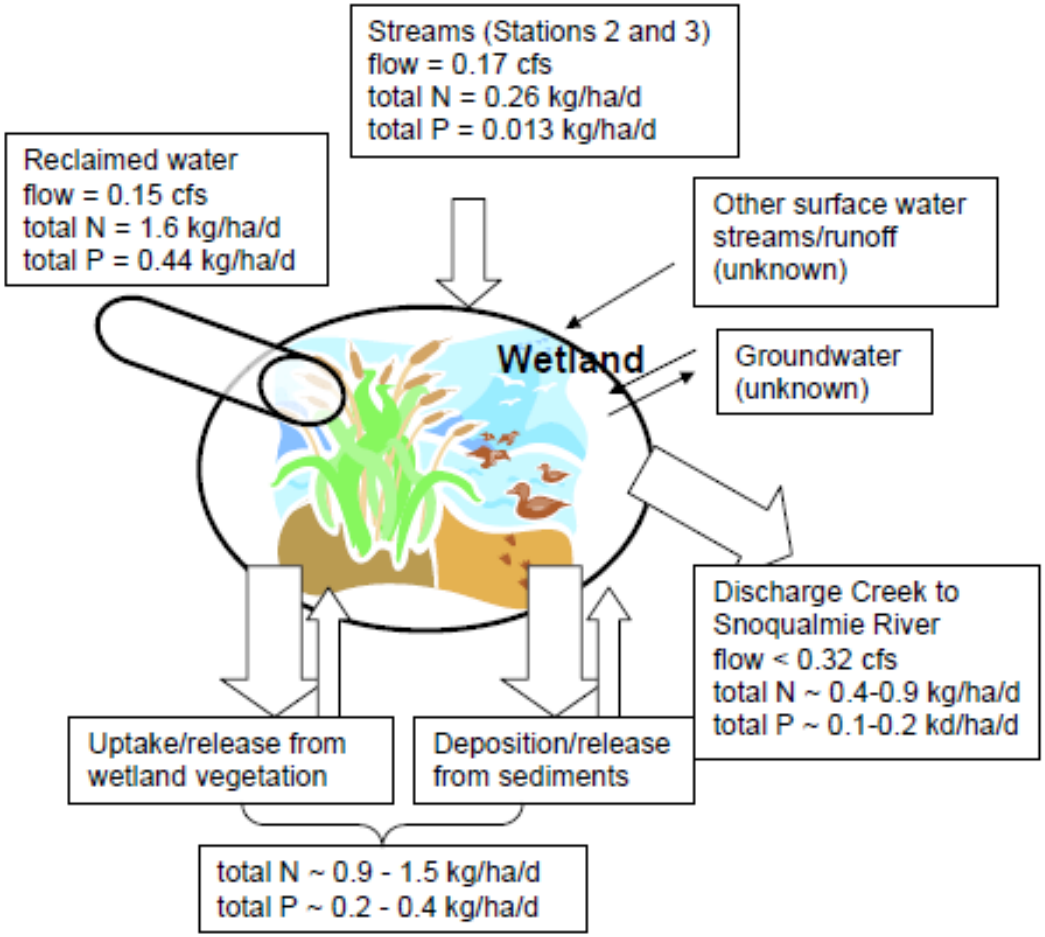


Figure 6. 2010 Nutrient Mass Balance for Chinook Bend Wetland, based on annual averages and expected reclaimed water discharge rates for 2010