Fact Sheet for NPDES Permit WA0032182

King County Carnation Wastewater Treatment Plant

Public Notice of Draft Date: June 11, 2021

Purpose of this Fact Sheet

This fact sheet explains and documents the decisions the Department of Ecology (Ecology) made in drafting the proposed combined National Pollutant Discharge Elimination System (NPDES) and Reclaimed Water permit for the King County – Carnation Wastewater Treatment Plant (Carnation WWTP). It complies with Section 173-220-060 and Section 173-219-280 of the Washington Administrative Code (WAC), which require Ecology to prepare a draft permit and accompanying fact sheet for public evaluation before issuing a NPDES or Reclaimed Water permit.

Ecology makes the draft permit and fact sheet available for public review and comment at least thirty (30) days before issuing the final permit. Copies of the fact sheet and draft permit for Carnation WWTP, NPDES permit WA0032182, were available for public review and comment from June 11, 2021 until July 6, 2021. For more details on preparing and filing comments about these documents, please see **Appendix A - Public Involvement Information**.

King County's Department of Natural Resources and Parks – Wastewater Treatment Division (DNRP-WTD) reviewed the draft permit and fact sheet for factual accuracy. Ecology corrected any errors or omissions regarding the facility's location, history, wastewater discharges, reclaimed water uses, or receiving water prior to publishing this draft fact sheet for public notice.

After the public comment period closes, Ecology will summarize substantive comments and provide responses to them. Ecology will include the summary and responses to comments in this fact sheet as Appendix G - Response to Comments, and publish it when issuing the final combined NPDES and Reclaimed Water permit. Ecology generally will not revise the rest of the fact sheet. The full document will become part of the legal history contained in the facility's permit file.

Summary

King County DNRP-WTD owns and operates the Carnation WWTP located in the City of Carnation approximately twenty miles east of Bellevue in rural King County. The City owns and operates the collection system connected to the facility. The facility uses membrane biological reactor (MBR) technology and ultraviolet light disinfection to produce Class A reclaimed water. The facility also maintains the capability to discharge to the Snoqualmie River.

The proposed permit authorizes the facility to produce and distribute reclaimed water for use in the Chinook Bend Wetland Enhancement project site. The permit also authorizes the discharge of water to the Snoqualmie River. It includes limits based on reclaimed water performance standards, technology-based limits for secondary effluent and TMDL-based limits for low river flow periods (August through October). Ecology based the TMDL limits on the 1994 *Snoqualmie River Total Maximum Daily Load Study*.

Table of Contents

Tables

Figures

I. Introduction

The Federal Clean Water Act (FCWA, 1972, and later amendments in 1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. One mechanism for achieving the goals of the Clean Water Act is the National Pollutant Discharge Elimination System (NPDES), administered by the federal Environmental Protection Agency (EPA). The EPA authorized the state of Washington to manage the NPDES permit program in our state. Our state legislature accepted the delegation and assigned the power and duty for conducting NPDES permitting and enforcement to Ecology. The Legislature defined Ecology's authority and obligations for the wastewater discharge permit program in 90.48 RCW (Revised Code of Washington).

The following regulations apply to domestic wastewater NPDES permits:

- Procedures Ecology follows for issuing NPDES permits (chapter 173-220 WAC)
- Technical criteria for discharges from municipal wastewater treatment facilities (chapter 173-221 WAC)
- Water quality criteria for surface waters (chapter 173-201A WAC)
- Water quality criteria for groundwaters (chapter 173-200 WAC)
- Whole effluent toxicity testing and limits (chapter 173-205 WAC)
- Sediment management standards (chapter 173-204 WAC)
- Submission of plans and reports for construction of wastewater facilities (chapter 173-240 WAC)

These rules require any treatment facility owner/operator to obtain an NPDES permit before discharging wastewater to state waters. They also help define the basis for limits on each discharge and for requirements imposed by the permit.

In enacting the Reclaimed Water Use law, chapter 90.46 RCW, the Washington State Legislature found that it was in the best interest of present and future generations to encourage the use of reclaimed water in ways that protect the environment as well as the health and safety of all Washington citizens. The Legislature declared that the people of the state of Washington have a primary interest in the development of facilities to provide reclaimed water to replace potable water in nonpotable applications, to supplement existing surface and groundwater supplies, and to assist in meeting the future water requirements of the state. The law directed Ecology, in coordination with the Department of Health (DOH), to adopt rules for reclaimed water use. Ecology adopted the Reclaimed Water Rule, chapter 173-219 WAC, in January 2018.

RCW 90.46.220 and WAC 173-219-070 require any person proposing to generate any type of reclaimed water for a use regulated under the Reclaimed Water Use law to obtain a permit from either Ecology or DOH. The Reclaimed Water Rule designates the lead agency responsible for overseeing the engineering reviews and permitting of reclaimed water facilities based on the type of facility. Ecology is the lead agency when the source water for reclaimed water production is an effluent from a domestic wastewater treatment or water pollution control facility that would typically require a permit from Ecology for effluent disposal to surface water under

WAC 173-220 or to groundwater under WAC 173-216. Reclaimed water facility owners must obtain a permit before they may distribute or use any reclaimed water.

All reclaimed water permits issued by Ecology must specify conditions requiring the facility to adequately and reliably treat its wastewater to a level appropriate for the approved beneficial uses of the water. In addition to meeting the water quality limits, the standards require specific treatment and disinfection requirements beyond those of most conventional wastewater treatment facilities. The standards also require automated alarms, redundancy of treatment units, emergency storage, stringent operator training requirements and public notification of reclaimed water use.

In addition to the standards adopted in WAC 173-219, reclaimed water produced for beneficial uses of surface water augmentation, or wetland enhancement must also comply with rules adopted under the Water Pollution Control Act, chapter 90.48 RCW. The following rules and standards apply to these uses:

- Water quality standards for surface waters of the state of Washington (chapter 173-201A WAC)

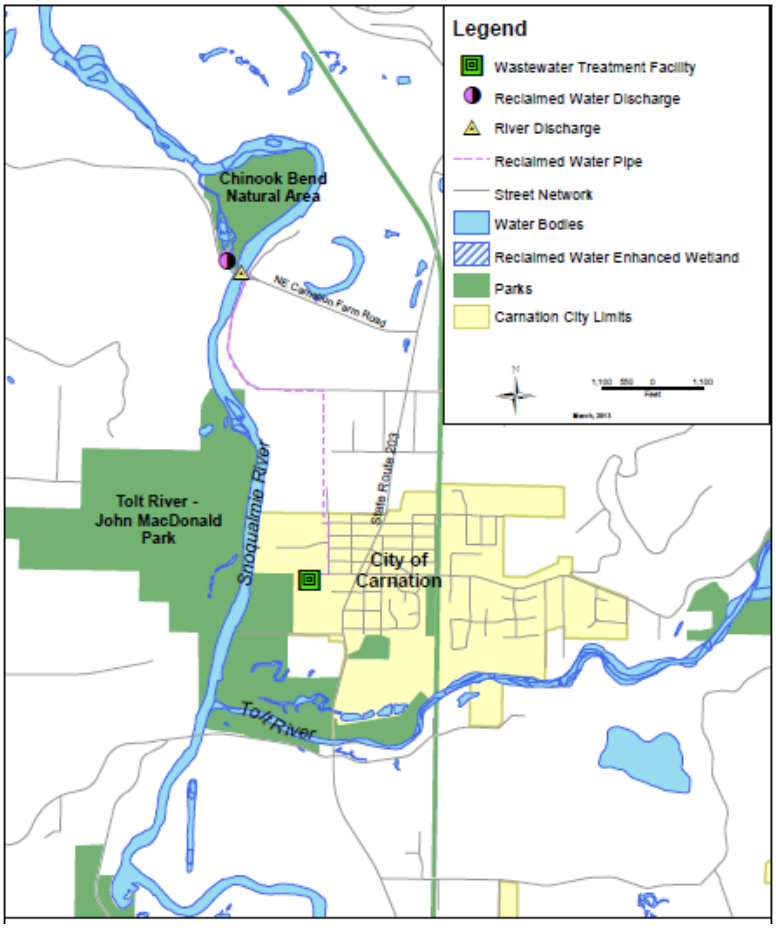
Under the NPDES and reclaimed water permit programs and in response to complete and accepted NPDES and reclaimed water permit applications, Ecology must prepare a draft permit and accompanying fact sheet, and make it available for public review before final issuance. Ecology must also publish an announcement (public notice) telling people where they can read the draft permit, and where to send their comments, during a period of thirty days (WAC 173-220-050 and WAC 173-219-110). See **Appendix A-Public Involvement Information** for more information about the public notice and comment procedures. After the public comment period ends, Ecology will summarize the responses to comments and any changes to the permit in **Appendix G**.

II. Background Information

Table 1 General Facility Information

Applicant	King County Dept. of Natural Resources & Parks Wastewater Treatment Division 201 S. Jackson Street Seattle, WA 98104-3855
Facility Name and Physical Address	Carnation Wastewater Treatment Plant 4405 Larson Avenue Carnation, WA 98014
Facility Mailing Address	1200 Monster Road SW Renton, WA 98057
Responsible Official	Name: Christie True Title: Director, Dept. of Natural Resources & Parks Address: 201 S. Jackson Street Seattle, WA 98104-3855 Telephone #:(206) 296-6500
Reclaimed Water Contact	Name: Kristina Westbrook Title: Recycled Water Program Manager Telephone #: (206) 477-5522
NPDES Permit Administration Contact	Name: Jeff Lafer Title: NPDES Permit Administrator Telephone #:(206)477-6315
Facility Operations Contact	Name: Pete Carter Title: Process Engineer Telephone #: (206) 263-1753
Facility Location (NAD83/WGS84 reference datum)	Latitude: 47.647560 Longitude: 121.918444
Type of Treatment	Membrane Bioreactor with ultraviolet light disinfection
Highest class of reclaimed water produced:	Class A
Approved beneficial use:	Enhancement of natural wetland adjacent to Snoqualmie River
Non-Reuse Discharge Waterbody Name and Location (NAD83/WGS84 reference datum)	Snoqualmie River (Outfall 001) Latitude: 47.665640 Longitude: 121.925215
Reclaimed water use area name and release location:	Chinook Bend Natural Area (Outfall 002) Latitude: 47.666389 Longitude: 121.926111

Figure 1 Facility Location Map



A. Facility description

History

King County (KC) Department of Natural Resources & Parks – Wastewater Treatment Division (WTD) owns and operates the Carnation wastewater treatment plant (WWTP) located east of the Snoqualmie River in the City of Carnation (City). This facility treats wastewater from the City, which is an incorporated city in King County located in the Snoqualmie Valley approximately 20 miles east of downtown Seattle.

In 2002, the City and King County entered into a partnership in which KC-WTD would design, build, and operate a wastewater treatment system to treat sewage conveyed through a collection system operated by the City. The agreement to jointly develop a wastewater collection and treatment system for the City addressed a 1987 public health hazard declaration issued by Seattle and King County Public Health. The declaration was based on the number of inadequate septic systems in the area and the likely contamination of the unprotected aquifer from which drinking water is derived.

Ecology approved the engineering report/facility plan for the Carnation WWTP on October 31, 2005 and approved the treatment plant plans and specifications on June 29, 2006. On April 30, 2007, Ecology approved an amendment to the 2005 engineering report. The amendment documented plans to beneficially reuse the water treated at the Carnation WWTP to enhance a degraded wetland at the Chinook Bend Natural Area. The facility began operating with a discharge to the Snoqualmie River in May 2008 and it began releasing water to the Chinook Bend Wetland in March 2009.

The Carnation WWTP treats domestic sewage from residents and businesses within the City of Carnation. The facility design approved by Ecology is capable of treating a monthly average flow of up to 0.48 million gallons per day (MGD) and will serve a design population of 3,871 within the City's incorporated area and designated urban growth area. The approved design allows for the production of Class A reclaimed water for use in enhancing the Chinook Bend Wetland along with discharges of treated wastewater to the Snoqualmie River. Ecology originally issued two separate permits for the facility – one to regulate secondary treated effluent to the Snoqualmie River (NPDES permit number WA0032182) and another to regulate reclaimed water to the Chinook Bend Wetland Enhancement project site (reclaimed water permit ST7450). Ecology combined the two authorizations into a single NPDES permit beginning in 2014.

Collection system

The City constructed the complete collection system in 2007 and is responsible for its operation and maintenance. The system consists of 15,500 feet of 10-inch vacuum sewer pipeline, 8,900 linear feet of 8-inch vacuum sewer pipeline, 9,100 linear feet of 6-inch vacuum sewer pipeline, and 23,400 linear feet of 4-inch vacuum sewer pipeline. All wastewater from the City collects at a central vacuum station located adjacent to the treatment plant. A generator at the vacuum station provides back up power for that facility.

While the City is responsible of operation and maintenance of the collection system, King County's Industrial Waste Program regulates discharges of commercial and industrial wastewater that may be conveyed to the treatment plant thought the City's collection system. At present no significant or categorical industrial users discharge to the facility through the collection system.

Treatment processes

The Carnation WWTP uses a membrane bioreactor (MBR) treatment process and ultraviolet (UV) light disinfection to meet secondary treatment standards for discharges to the Snoqualmie River. The facility also incorporates appropriate reliability necessary to meet the requirements for Class A reclaimed water production at all times. As is common with MBR treatment facilities, the Carnation WWTP process is configured to achieve some level of biological nitrogen removal. The process flow diagram in Appendix F illustrate the treatment path at the facility.

Pumps located at the city's vacuum sewer station convey influent directly to the headworks at the Carnation WWTP. A sample port in the force main from the influent pump station

allows for the collection of influent samples. After sampling, influent flows to 2-mm rotary screens, each designed to handle up to 0.5 MGD of flow.

Screened influent then flows to a splitter box that allows operators to direct flow to two parallel aeration basin trains. Return Activated Sludge (RAS) from the membrane basins combines with influent at the splitter box then enters into a series of two unaerated basins. The mixed liquor then enters two aerated basins in series before entering the membrane feed pump wet well where pumps transfer the mixed liquor to the five membrane tanks. Rotary lobe membrane pumps then draw clean water (permeate) through the membranes, leaving thickened solids behind to be recycled as RAS.

Membrane permeate flows from the permeate pumps to the disinfection area. Each of the five membrane tanks uses a dedicated permeate pump and each pump discharge line has a continuous turbidity meter monitoring water clarity. Operators calculate the daily average turbidity for each meter and report the highest value of the five meters as the plant's "daily average turbidity". Operators also report the highest 5-minute peak value of the five meters as the plant's "daily maximum turbidity".

The combined flow from all active permeate pumps route to the UV system for disinfection. The system consists of four units installed in two parallel trains of two units that operate in series. The system configuration ensures reliability for reclaimed water production. Due to the current low flow levels through the facility, operators only need to use one UV vessel at low intensity for current reclaimed water production.

Disinfected reclaimed water enters a vertical effluent standpipe at the facility that is used to provide a source of water for in-plant uses (membrane backpulse and other non-potable process water) and to provide sufficient head to overcome friction loss in the pipeline to the wetland and river outfall. A probe installed between the UV system and the standpipe continuously monitors pH and temperature of the water. A composite sampler in the same area collects samples with routine monitoring of BOD and TSS along with select nitrogen and phosphorous parameters. A sample port in the line allows collection of samples for coliform bacteria (total and fecal) and dissolved oxygen.

Residual solids management: The Carnation WWTP removes solids at the headworks (grit and screenings) with 2 mm rotary drum screens. Solids removed by the screens collect in washer-compactors where they are cleaned and dewatered prior to disposal as solid waste.

KC-WTD manages the amount of activated sludge in the MBR process by draining a portion of the solids from the process each day. Operators manually divert excess sludge using scum troughs located at the end of each aeration basin. Each diversion sends 1,000 to 1,500 gallons of waste activated sludge (WAS) to solids holding basins. A tanker truck then transports the solids one to two times per week to the County's South Treatment Plant in Renton for further processing into Class B biosolids.

Operator certification

Chapter 173-219-250 WAC requires an operator certified by Ecology under Chapter 173-230 WAC to operate reclaimed water treatment facilities. Guidance in Ecology's *Permit Writer's Manual* and in the *Reclaimed Water Facilities Manual* (Purple Book) classify the treatment system at the Carnation WWTP as a Class III facility. As such, the operator in responsible charge of the day-to-day operations at the facility must, at a minimum, be rated as a Group III operator. An operator certified for at least a Group II facility must be in charge of each scheduled shift at the facility. KC-WTD has assigned a Group III operator to oversee daily operation of the facility. Operators at King County's South Treatment Plant in Renton also remotely monitor operations at the facility when the assigned operator is not on site. A group IV operator oversees process control for the facility.

In addition to staffing the treatment facility with an Ecology-certified operator, the Reclaimed Water Rule requires an operator or consultant certified under DOH's Waterworks Operator Certification program (chapter 246-292 WAC) to perform certain tasks associated with the distribution of reclaimed water. This requirement generally applies to the operation of systems that distribute reclaimed water to multiple locations for use by third parties. Since the Carnation distribution system is limited to a single pipe from the treatment facility to the Chinook Bend Wetland with no other connected uses, operation does not require oversight by a DOH-certified water system operator.

Reclaimed water distribution

Reclaimed water produced at the Carnation WWTF flows from the effluent standpipe through a 1.5-mile long, 12-inch pipeline to the west end of the Carnation Farm Road Bridge (shown in Figure 1). A manually-operated valve at the base of the bridge allows operators to direct flow to either the Chinook Bend wetland or to the Snoqualmie River outfall. There are no other connections to the distribution line that allow water to flow to other locations. A separate outlet from the effluent standpipe provides water for exempt uses at the treatment plant.

Previous permits granted a request made by King County to waive the requirements to maintain a chlorine residual in the distribution system. Since King County uses reclaimed water produced at the Carnation WWTF solely for wetland enhancement and chlorine can be detrimental to that environmental use, Ecology plans to retain this waiver in the proposed permit. To keep the distribution line clean and free from biological regrowth, KC-WTD uses an alternative maintenance method of periodically dosing chlorine into the distribution line when TSS levels in samples collected from a monitoring station at the bridge increase. The increase in solids indicate that biological regrowth may have occurred. Ecology and DOH approved this alternative method as part of the County's *Amendment 1* of the *Wastewater Facilities Plan for the Carnation Wastewater Treatment Facility*.

Reclaimed water uses and discharge locations

The Carnation WWTP preferentially release Class A reclaimed water to a wetland at the Chinook Bend Natural Area for wetland enhancement. KC-WTD described their plan to

produce Class A reclaimed water at the facility and use it to enhance a degraded wetland at the Chinook Bend Natural Area in *Amendment 1 to the Wastewater Facilities Plan for the Carnation Wastewater Treatment Facility.* Ecology and DOH approved this amendment in April 2007 and subsequently authorized the production and in reclaimed water permits starting in 2009. The proposed permit continues to authorize the use of reclaimed water produced at the Carnation WWTP for the sole purpose of this natural wetland enhancement.

Operators use the valve vault at the west end of the Carnation Farm Road Bridge to manually direct reclaimed water to the wetland area. A buried pipe carries the water 200 feet from the valve vault to the edge of the natural area property line where the pipe transitions into a section of perforated pipe. Reclaimed water then flows from the perforated pipe and upwells through a river cobble pad before traveling overland to the wetland's open water pond (see Figure 2).

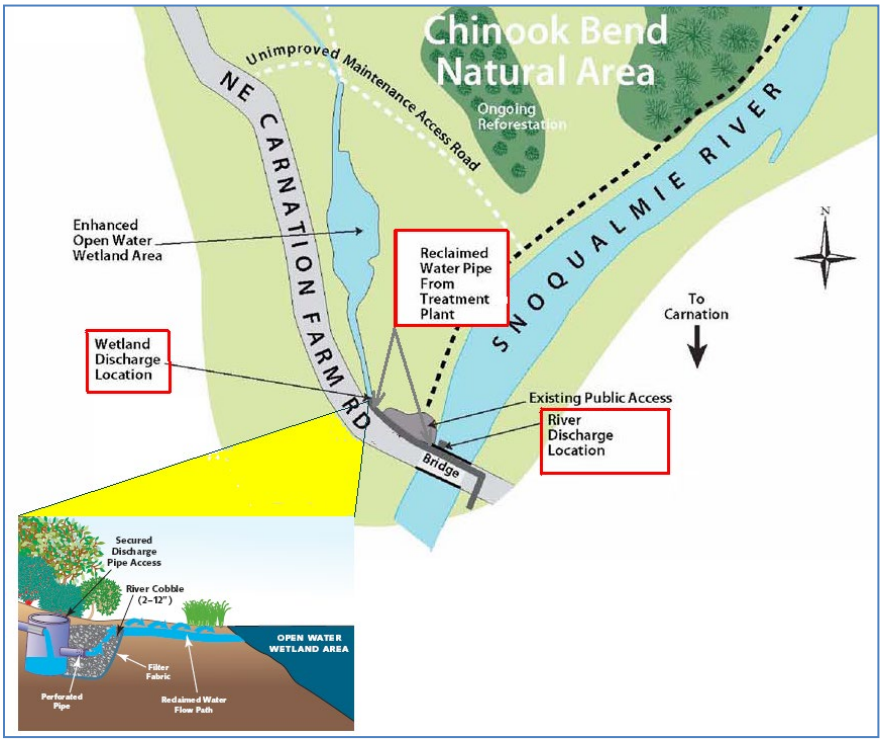


Figure 2 Outfall locations

A 2006 settlement agreement between Washington Trout, King County and the City of Carnation identifies the Chinook Bend Project as the preferential area for release of reclaimed water produced at the Carnation WWTP. However, the agreement identifies conditions where the Carnation WWTP will use the Snoqualmie River outfall (Outfall 001) as the "primary discharge location". These conditions include:

1. Any time period where a regulatory agency with jurisdiction requires discharge to the river to augment in-stream flows in the Snoqualmie River;

2. During periods of plant upset or emergency, or failure of the UV disinfection system at the Carnation WWTP;
3. During periods of scheduled maintenance of the piping, controls, or facilities associated with the Chinook Bend Project; or
4. During periods of time specified in or required as a condition of any permit or regulatory approval issued by a regulatory agency with jurisdiction.

In accordance with the "Treatment and reliability standards" in the Reclaimed Water Rule (WAC 173-219-350), the draft permit requires the Carnation WWTP to divert any water not treated to the reclaimed water quality or reliability standards contained in the permit to storage for retreatment or to the Snoqualmie River. To discharge water to the river, operators use the valve vault at the bridge to manually divert flow from the wetland to an outfall attached to the west pier footing of the Carnation Farm Road Bridge. Outfall 001 consists of a single 12-inch pipe equipped with a duckbill diffuser check valve.

Water rights protection

Chapter 90.46.120 RCW states that the owner of a wastewater treatment facility producing reclaimed water under a reclaimed water permit has the exclusive rights to that water. That right is tempered, however, by chapter 90.46.130 RCW, which states that the use of reclaimed water must not impair any existing water rights downstream of any freshwater discharge points of the facilities unless compensation or mitigation is agreed upon by the holder of the affected water right. Ecology cannot issue a reclaimed water permit unless the permit applicant demonstrates compliance with this water rights protection.

King County prepared an impairment analysis in 2007 that identified a regulatory-based instream resource flow protection limit as the only existing water right within the Carnation WWTP study area. The 2007 analysis also provided the following information:

- Wastewater baseline flows for the city were estimated at 150,000 gpd based on estimated potable water use or 238 gallons per day, per connection and a total of 632 connections.
- It was assumed that up to 139,200 gpd historically reached the river downstream of river mile 22 from existing septic systems after accounting for water lost through evaporation and transpiration (ET).
- The estimated ET losses from a wetlands sized 6 acres or less will be less than ET losses from historical on-site treatment on an annual basis.
- While removal of historic septic discharges will cause impairment of the instream flow right between river miles 24.5 and 22, the Snoqualmie and Tulalip tribes as well as Washington Trout recognized that the environmental benefits of the project adequately compensated for the impairment.

Ecology's Water Resource Program reviewed the impairment analysis and concluded that, although the project may impair the State's existing instream flow protection water right, the benefits of the wetland enhancement project provided sufficient compensation for the

impairment. Ecology agreed that the size of the wetland should be limited to 6 acres so that ET losses would not impair the river flow. Ecology also agreed that the facility would compensate for the reduction in groundwater recharge that occurred with the removal of the septic tanks by sending a minimum of 0.0893 MGD of flow to the river or wetlands on an annual average basis[1]. King County established the baseline flow based on data from the initial five years of treatment plant operation.

B. Description of the receiving waters

KC-WTD developed the Carnation WWTP with the intent of producing Class A reclaimed water for the sole beneficial use of enhancing a degraded Category II natural wetland at the Chinook Bend Natural Area. The facility primarily releases reclaimed water to the wetland, but also maintains the ability to discharge water to the Snoqualmie River during periods when the facility cannot meet reclaimed water standards.

Chinook Bend Wetland Project

In 2003, King County converted property donated by the Nestlé Company into an open space and habitat protection area known as the Chinook Bend Natural Area (Chinook Bend). Chinook Bend is located approximately two miles north of the City of Carnation in unincorporated King County and is a prominent meander on the Snoqualmie River. The 58.88-acre site lies adjacent the Snoqualmie River on three sides for the distance of 1.2 miles, from RM 22.5 to RM 21.3, and lies within its 100-year floodplain. The County's Department of Natural Resources and Parks (DNRP) manages the area for the protection of ecological values and, where appropriate, public access.

The County's 2003 *Chinook Bend Natural Area Site Management Guidelines* identified the presence of a degraded Category IV[2] wetland on the site. In partnership with Ducks Unlimited, DNRP developed the *Chinook Bend Natural Area Wetland Enhancement Plan* in 2007 to outline goals for enhancing the degraded wetland. A 2006 wetland inventory completed by Ducks Unlimited delineated approximately 7.5 acres of wetland area that included approximately 2-3 acres of open water. Vegetation in the area predominantly consisted of reed canary grass, Canadian thistle, and other non-native vegetation. Surface water runoff and ground seeps provided water inputs to the wetland. A small ditch and underground pipe allowed water from the wetland area to discharge to the Snoqualmie River. According to Amendment 1 to the Wastewater Facilities Plan, shallow groundwater in the area likely flows to the west and southwest towards the Snoqualmie River through alluvial deposits associated with a migrating river channel.

---

[1] Based on email communication between Steve Hirschey (King County DNRP) and Jacque Klug (Ecology – Water Resources) dated October 29, 2013.

[2] The 2003 site management guidelines describe the wetland as a "class 2 wetland according to the King County Wetland Classification System". This reference is to an outdated rating system used by King County. The county adopted the state's wetland rating system in 2004 and reclassified the wetland as a Category IV wetland in subsequent documents.

DNRP's Water and Land Resources Division began implementing enhancements of the Chinook Bend wetland in 2008. The project design focused on enhancing native plantings and controlling reed canary grass by expanding the open water area of the wetland. The enhancement plan called for the restoration of surface hydrology at the site through the use of a water control structure and by augmenting flows with reclaimed water. A series of wood slats located along a gravel road on the site control the water elevation at 54 feet above sea level. In addition, the plan called for the diversion of outflow from the wetland to a previously abandoned channel that connects to the Snoqualmie River. According to the enhancement plan, the water control combined with the addition of up to 0.5 cubic feet per second (cfs) of reclaimed water flow would expand the total wetland area and associated buffer to approximately 10 acres of mixed open water/emergent, scrub/shrub, and forested wetland areas.

King County and Ducks Unlimited developed the 2007 enhancement plan with two specific goals:

1. conserve and enhance ecological value,
2. accommodate appropriate public uses that do not harm ecological resources.

The plan identified the following project objectives as necessary to accomplishing the goals:

- Establish 1.5 acres of scrub/shrub and forested wetland communities surrounding an open water/emergent wetland.
- Re-vegetate 4.8 acres of forested buffer and maintain 2 acres of previous tree enhancement plantings. Increase the interspersion of vegetation communities by planting a mix of native shrubs and trees.
- Significantly reduce reed canary grass and Canadian thistle coverage.
- Use a water control structure to control reed canary grass and promote native emergent marsh, scrub-shrub, and forested wetland communities. Increase species diversity within the wetland unit, by controlling reed canary grass and providing moist soil management for the proper conditions for the native seed bank to flourish.
- Enhance the area for wildlife use, particularly waterfowl, amphibians, raptors, and song birds.

Although not specifically an objective of the enhancement plan, DNRP and Ducks Unlimited recognized that improvements made to the wetland ecosystem at Chinook Bend would support overall salmonid spawning, rearing, and holding success in the area.

KC-WTD's 2015 *Carnation Reclaimed Water Project Net Environmental Benefit Report* documented that the enhancement project achieved ecological restoration goals. Monitoring data from the report showed that the project has preserved existing beneficial uses of the wetland and created new uses through the enlargement of the open water wetland as well as increased vegetation diversity. The wetland supports native amphibians along with several waterfowl and migratory birds that were not observed prior to the enhancement project.

As part of the planning effort to support development of the Chinook Bend Wetland Enhancement Project, King County completed a water quality assessment of the wetland system in 2006. The assessment analyzed samples of the wetland pond, as it existed in 2006, for a variety of metals as well as conventional pollutants. Tables 2 and 3 summarizes select data from this effort.

Table 2 Wetland pond water quality – conventional parameters

Parameter	Units	Average Value	Maximum Value	Minimum Value
Total Organic Carbon	mg/L	4.95	5.92	4.32
Dissolved Oxygen	mg/L	7.8	13.3	3.9
Ammonia	mg/L as N	<0.01	<0.01	<0.01
Total Nitrogen	mg/L as N	0.962	1.05	0.851
Total Phosphorous	mg/L as P	0.244	0.313	0.168
Ortho-Phosphorous	mg/L as P	0.142	0.207	0.0751
pH	Standard Units	8.66	9.4	8.1
Temperature	Deg. C	24.4	30.8	19.9
E. Coli	CFU/100 mL	83.6	180	18
fecal coliform	CFU/100 mL	49.4	110	9
Total Hardness	mg/L as CaCO3	109	110	108

Table 3 Wetland pond water quality – metals

Parameter	Units	Average Value	Maximum Value	Minimum Value
Aluminum (total)	µg/L	118	217	54.9
Barium (dissolved)	µg/L	5.8	6.37	4.9
Calcium	mg/L	21.3	21.6	20.7
Iron (dissolved)	µg/L	149	156	144
Magnesium (dissolved)	mg/l	12.9	13.1	12.4
Arsenic (dissolved)	µg/L	4.84	6.1	3.45
Cadmium (dissolved)	µg/L	<0.01	<0.01	<0.01
Chromium (dissolved)	µg/L	0.212	0.23	0.2
Copper (dissolved)	µg/L	0.507	0.591	0.41
Lead (dissolved)	µg/L	0.05404	0.058	0.035
Mercury (total)	µg/L	0.001	0.0013	0.0005
Nickel(dissolved)	µg/L	1.11	1.12	1.09
Selenium (total)	µg/L	<0.05	<0.05	<0.05
Silver (total)	µg/L	<0.025	<0.025	<0.025
Zinc (total)	µg/L	0.266	0.42	0.15

Snoqualmie River

The Carnation WWTP ultimately discharges to the Snoqualmie River, either indirectly through the Chinook Bend Wetland or directly through an outfall at the Carnation Farm Road Bridge. Washington's water quality standards designate the Snoqualmie River in the vicinity of the outfall as a Core Summer Salmonid Habitat. Table 4 summarizes historical ambient water quality data for this area. Ecology took temperature data from King County monitoring done between 2008 and 2012 and used 7Q10 flow data from a 2004 Outfall mixing evaluation conducted by Cosmopolitan Engineers. Remaining data were summarized from monitoring conducted by Ecology from 1976 to 1992 (monitoring station #07D070).

Table 4 Ambient Water Quality Data

Parameter	Value
Flow – 7Q10 Low Flow	443 cfs
Temperature: July 1 – Sept 14 (90% Confidence level 7-DADMax)	21.2˚C
Temperature: Sept 15 - July 1 (90% Confidence level 7-DADMax)	16.7˚C
Temperature: Nov - July (10% Confidence level)	3.2˚C
Temperature: Nov - July (90% Confidence level)	12.2˚C
pH (high - 90% Confidence level)	7.4
pH (low - 10% Confidence level)	6.9
Dissolved Oxygen (10% Confidence level)	9.7 mg/L
Total Ammonia-N (90% Confidence level)	0.03 mg/L
Fecal Coliform (90% Confidence level)	57/100 mL

Other point source outfalls in the vicinity include the City of Duvall WWTP, the City of Snoqualmie WWTP, the City of North Bend WWTP, and the Tokul Creek Hatchery. Significant nearby non-point sources of pollutants include silvicultural and agricultural activities.

C. Wastewater influent characterization

Table 5 - Influent characteristics

Parameter	Units	Average Value	Maximum Value
BOD_5	mg/L	316	516
BOD_5	lbs/day	259	529
TSS	mg/L	264	584
TSS	lbs/day	218	593
Flow	MGD	0.100	0.202

Ecology characterizes the influent to the Carnation WWTP based on the concentrations and mass loadings of the 5-day Biochemical Oxygen Demand (BOD_5) and Total Suspended Solids (TSS). KC-WTD reported theses parameters along with the wastewater flow rates in discharge monitoring reports (DMR) required by the previous permit. Table 5 summarizes

the average and maximum values reported on monthly DMRs for the period between January 2014 and December 2019.

D. Reclaimed water characterization

The previous permit also required KC-WTD to monitor the concentration of pollutants detected in the final reclaimed water and to report the results in monthly DMRs and in the permit renewal applications. Table 6 below summarizes the characteristics of the reclaimed water prior to transmission to the Chinook Bend wetland. Ecology used values from the permit applications and DMRs from the period of January 2014 through December 2019.

Table 6 Reclaimed Water Characterization

Parameter	Units	Average Value	Maximum Value	Minimum Value
Flow	MGD	0.096	0.186	0.085
BOD_5	mg/L	1.1*	1.9*	1.0*
BOD_5	lbs/day	0.9*	1.3*	0.7*
TSS	mg/L	2.0*	2.2*	2*
TSS	lbs/day	1.6*	2.0*	1.3*
Dissolved Oxygen	mg/L	6.0	9.1	3.9
pH	Std. Units	7.1	6.1	8.8
Temperature – Daily **	Deg. C	17.8	26.2	11.8
Temperature – 7-day Avg. **	Deg. C	17.8	24.8	12.2
Turbidity	NTU	0.11	0.42	0.07
Ammonia	mg/L as N	0.4	35.1	0.1
Total Kjeldahl Nitrogen	mg/L as N	2.3	36.2	0.8
Total Nitrogen	mg/L as N	15.7	39.3	3.5
Total Phosphorous	mg/L as P	4.7	8.2	2.9
Ortho-Phosphorous	mg/L as P	4.1	5.8	2.8
Total Hardness	mg/L as CaCO3	68.7	70.8	-
Total Dissolved Solids (TDS)	mg/L	406	537	354
Calcium	mg/L	16.9	23.5	15.4
Chloride	mg/l	43.7	67.5	36.3
Magnesium	mg/l	34.479	59.2	6.74
Potassium	mg/l	17.523	21	15.5
Sodium	mg/l	63.392	103	39
Sulfate	mg/L	28.5	30.9	26.6
Barium (total)	µg/L	3.54	4.59	3.06
Cadmium (total)	µg/L	<0.05	<0.05	<0.05
Copper (total)	µg/L	10.8	11.9	9.76
Iron (total)	µg/L	20.9	24	19
Lead (total)	µg/L	<0.13	0.27	<0.1

Parameter	Units	Average Value	Maximum Value	Minimum Value
Manganese (total)	µg/L	3.29	7.97	1.95
Selenium (total)	µg/L	<0.05	<0.05	<0.05
Silver (total)	µg/L	<0.04	<0.04	<0.04
Zinc (total)	µg/L	50.9	58.9	47.6
Parameter	**Units**	**Typical 7-day median value**		**Maximum single daily test value**
Total Coliforms	#/100 mL	1.1		200
** BOD_5 and TSS samples were typically below detection limits.*				
*** Temperature monitoring limited to the period of July 2014 through May 2015.*				

E. Permit status and compliance summary

Ecology issued the previous permit for this facility on December 13, 2013, with an effective date of January 1, 2014. KC-WTD submitted an application for permit renewal on December 27, 2017, and Ecology accepted it as complete on February 17, 2018. The permit was set to expire on December 31, 2018, but has been administratively extended.

KC-WTD maintained good compliance with the limits and conditions of the previous permit throughout its duration. Ecology assessed compliance based on its review of the facility's compliance information in the Ecology Permitting and Reporting Information System (PARIS), discharge monitoring reports (DMRs) and on inspections. The records show two violations of the reclaimed water daily maximum total coliform limit in July 2018, as detailed in Table 7. In addition, KC-WTD had a late submittal of the required "Net Environmental Benefit" report due on December 31, 2015 (submitted on June 20, 2016).

Table 7 Violation Summary

Violation	Violation Date	Reported Value	Limit
Exceeded daily Total Coliform limit	7/24/2018	23.5 cfu/100 mL	23 cfu/100 mL
Exceeded daily Total Coliform limit	7/25/2018	>200 cfu/100 mL	23 cfu/100 mL

F. State environmental policy act (SEPA) compliance

State law exempts the issuance, reissuance or modification of any wastewater discharge permit from the SEPA process as long as the permit contains conditions that are no less stringent than federal and state rules and regulations (RCW 43.21C.0383). The exemption applies only to existing discharges, not to new discharges. Although the proposed permit regulates the production, distribution, and beneficial use of reclaimed water under the authority of RCW 90.46, Ecology will issue the permit as a combined reclaimed water and "Waste Discharge Permit". Therefore, this exemption applies.

III. Proposed Permit Limits

The Reclaimed Water Use law, Chapter 90.46 RCW requires reclaimed water generators to adequately and reliably treat reclaimed water prior to distribution and beneficial use. Chapter 173-219-270 WAC requires Ecology to include enforceable limits on water quality in the reclaimed water permits it issues. The enforceable limits are based on:

- General performance standards listed in chapter 173-219-330 WAC.
- Specific use-based requirements listed in chapter 173-219-390 WAC.

When the authorize reclaimed water uses include releases to the environment that are subject to federal Clean Water Act permitting, such as for surface water augmentation and enhancement of wetlands that are hydraulically connected to surface waters, Ecology must issue a NPDES permit to authorize the water release. In accordance with federal and state regulations, discharge limits in permits authorizing surface water and wetland uses must be either technology- or water quality-based.

- Technology-based limits are based upon the treatment methods available to treat specific pollutants. Technology-based limits are set by the EPA and published as a regulation, or Ecology develops the limit on a case-by-case basis (40 CFR 125.3, and chapter 173-220 WAC).
- Water quality-based limits are calculated so that the effluent will comply with the Surface Water Quality Standards (chapter 173-201A WAC), Ground Water Standards (chapter 173-200 WAC), Sediment Quality Standards (chapter 173-204 WAC), or the Federal water quality criteria applicable to Washington (40 CFR 131.45).
- Ecology must apply the most stringent of the limits required by the Reclaimed Water Use law and the federal Clean Water Act to each parameter of concern. Limits applicable for release of reclaimed water to the Chinook Bend wetland are described below. Only limits required by the federal clean water act apply to discharges of water to the Snoqualmie River through outfall 001.

The limits in this permit reflect information received in the application and from supporting reports (engineering, hydrogeology, etc.). Ecology evaluated the permit application and determined the limits needed to comply with the rules adopted by the state of Washington. Ecology does not develop effluent limits for all reported pollutants. Some pollutants are not treatable at the concentrations reported, are not controllable at the source, are not listed in regulation, and do not have a reasonable potential to cause a water quality violation.

Ecology does not usually develop limits for pollutants not reported in the permit application but may be present in the discharge. The permit does not authorize discharge of the non-reported pollutants. During the five-year permit term, the facility's effluent discharge conditions may change from those conditions reported in the permit application. The facility must notify Ecology if significant changes occur in any constituent [40 CFR 122.42(a)]. Until Ecology modifies the permit to reflect additional discharge of pollutants, a permitted facility could be violating its permit.

A. Design criteria

Under WAC 173-219-240 and WAC 173-220-150 (1)(g), flows and waste loadings must not exceed approved design criteria. Ecology approved design criteria shown in Table 8 for the Carnation WWTP in this facility's treatment plant in the *Carnation Wastewater Treatment Facility Plans & Specifications* prepared by Carollo Engineers, Inc.

Table 8 Design Criteria for Carnation Wastewater Treatment Plant

Parameter	Design Quantity
Maximum Month Design Flow (MMDF)	0.48 MGD
BOD_5 Loading for Maximum Month	1,669 lbs/day
TSS Loading for Maximum Month	1,669 lbs/day

B. Technology-based limits

Secondary Treatment Standards

Federal and state regulations define technology-based effluent limits for domestic wastewater treatment plants. These effluent limits are given in 40 CFR Part 133 (federal) and in chapter 173-221 WAC (state). These regulations are performance standards that constitute all known, available, and reasonable methods of prevention, control, and treatment (AKART) for domestic wastewater.

Table 9 below identifies technology-based limits for pH, fecal coliform, BOD_5, and TSS, as listed in chapter 173-221 WAC that apply to the Carnation WWTP. Discharges to the Snoqualmie River must comply with these baseline limits unless the analysis in section III.G of this fact sheet demonstrates a need for more restrictive water quality-based limits.

The previous permit included limits on BOD_5 rather than $CBOD_5$. As discussed in section III.G, seasonal TMDL-based limits for the facility use $CBOD_5$. For consistency with limits applied to other dischargers to the Snoqualmie River, Ecology will include the $CBOD_5$ limits shown below in the proposed permit.

Table 9 Technology-based concentration limits

Parameter	Average Monthly Limit	Average Weekly Limit
BOD_5 or $CBOD_5$	30 mg/L 25 mg/L	45 mg/L 40 mg/L
BOD_5 or $CBOD_5$	In addition, the BOD_5/$CBOD_5$ effluent concentration must not exceed fifteen percent (15%) of the average influent concentration.	
TSS	30 mg/L	45 mg/L
TSS	In addition, the TSS effluent concentration must not exceed fifteen percent (15%) of the average influent concentration.	

Technology-based concentration limits - Continued

Parameter	Monthly Geometric Mean Limit	Weekly Geometric Mean Limit
Fecal Coliform Bacteria	200 organisms/100 mL	400 organisms/100 mL
Parameter	**Daily Minimum**	**Daily Maximum**
pH	6.0 standard units	9.0 standard units

Technology-based mass limits in table 10 are based on WAC 173-220-130(3)(b) and 173-221-030(11)(b). Ecology calculated the monthly and weekly average mass limits for BOD_5 and Total Suspended Solids as follows:

Mass Limit = CL x DF x CF

where,

CL = Technology-based concentration limits listed in the above table

DF = Maximum Monthly Average Design flow (MGD)

CF = Conversion factor of 8.34

Table 10 Technology-based Mass Limits

Parameter	Concentration Limit (mg/L)	Mass Limit (lbs/day)
BOD_5 Monthly Average	30	120
BOD_5 Weekly Average	45	180
$CBOD_5$ Monthly Average	25	100
$CBOD_5$ Weekly Average	40	160
TSS Monthly Average	30	120
TSS Weekly Average	45	180

Reclaimed Water Performance Standards

All reclaimed water must meet minimum standards for biological oxidation, water clarity, and disinfection based on the class of water a facility produces. In addition, certain reclaimed water uses require expanded performance standards. The following describes the performance-based standards that apply to the Carnation WWTP.

Biological Oxidation: In general, compliance with the biological oxidation standard in Chapter 173-219-330 WAC requires that reclaimed water must, at a minimum, comply with the BOD_5/$CBOD_5$, TSS, and pH standards listed in Table 9 above. However, WAC 173-219-390 includes additional oxidation standards for water used to enhance wetlands. Table 11 below identifies the complete set of biological oxidation standards applicable to Class A Reclaimed Water used to enhance Category IV wetlands.

Table 11 Reclaimed water use-based performance standards

Parameter	Average Monthly Limit	Average Weekly Limit	Annual Average Limit
Dissolved Oxygen	Must be measurably present (minimum of 0.2 mg/L)		
pH	As shown in Table 9		
BOD_5 or $CBOD_5$	30 mg/L 25 mg/L	45 mg/L 40 mg/L	20 mg/L 17 mg/L[1]
TSS	30 mg/L	45 mg/L	20 mg/L
Total Nitrogen (as N)	10 mg/L	15 mg/L	N/A
Total Kjeldahl Nitrogen (as N)	N/A	N/A	3 mg/L
Total Phosphorous (as P)	N/A	N/A	1 mg/L
Hydraulic loading (to wetland)[2]	N/A	N/A	3 cm/day

[1] Annual average $CBOD_5$ limit calculated as 2/3 of monthly average limit. This value is consistent with typical observations of $CBOD_5$ being approximately 85% of BOD_5 at treatment plants in Washington.

[2] Hydraulic loading equivalent calculated based on distributing water to the 10 acre (4.05 ha) area of the Chinook Bend Wetland. The annual average loading rate of 3 cm/day is equivalent to an annual average daily flow rate of 0.321 MGD.

The performance standards require that dissolved oxygen be "measurably present" at the compliance point. Ecology includes a minimum limit of 0.2 mg/L in the permit for dissolved oxygen based on the quantitation level for dissolved oxygen testing using Standard Method 4500-OC/OG, as listed in Appendix A of the proposed permit.

The previous permit for the Carnation WWTP set reclaimed water limits on BOD_5 and TSS at 20 mg/L for monthly average limits and at 30 mg/L for weekly average limits. Discharge monitoring data collected during the previous permit term demonstrates that the facility routinely complied with these limits. However, the previous permit incorrectly applied the technology criteria established in the 1997 interim reclaimed water standards and the limits are inconsistent with the current requirements of WAC 173-219. Therefore, Ecology will not retain the previous limits in the proposed permit. The proposed permit will use the performance-based standards established in rule for weekly, monthly, and annual average based limits.

The previous permit also did not include limits on total nitrogen, TKN, total phosphorous, or hydraulic loading. Monitoring data from the last five years show that annual average flow rates through the Carnation WWTP are well below 0.321 MGD and the approved facility design is based on an annual average daily flow of 0.21 MGD. Therefore, the facility can comply with the 3 cm/day annual average hydraulic loading limit. In addition, the data indicates that the facility can comply with an annual average TKN limit of 3.0 mg/L. The proposed permit includes both annual hydraulic loading and TKN concentration limits.

The historical data shows that the facility cannot comply with the 1 mg/L total phosphorous performance standard and may not routinely comply with the total nitrogen standard. The performance standards for Class A reclaimed water released to wetlands allow Ecology to set alternative limits if doing so does not decrease existing significant wetland functions and the addition of reclaimed water provides a net environmental benefit. As discussed in section II.B of this fact sheet, KC-WTD has documented historical net environmental benefits from using reclaimed water from the Carnation WWTP for enhancement of the Chinook Bend Wetland. KC-WTD also developed a conceptual model to estimate the water quality impacts reclaimed water would have on the wetland system. The model estimated that the wetland has an assimilation capacity of between 0.7 – 1.2 kilograms per hectare, per day (kg/ha/d) for total nitrogen and between 0.2 – 0.3 kg/ha/d for total phosphorous. Past reports have documented that existing nitrogen and phosphorous loading rates are within the modeled assimilation capacity of the wetland. Therefore, the wetland can support higher loading rates than those listed in the performance standards. Given this data, the Reclaimed Water Rule allows Ecology to use past facility performance to set higher nitrogen and phosphorous limits in the proposed permit.

Total Nitrogen: Ecology calculated the performance-based limit using the most recent two-years' worth of weekly monitoring data collected between January 1, 2018 and December 31, 2019 (92 data points) and procedures discussed in EPA's *Technical Support Document for Water Quality-Based Toxics Control* (EPA/505/2-90-001). The calculations result in a monthly average total nitrogen limit of 14.8 mg/L and a weekly average limit of 22.2 mg/L (see Appendix E, Table E-1).

Total Phosphorous: Ecology used weekly total phosphorous data reported by the Carnation WWTP between January 1, 2014 and December 31, 2019 to calculate annual average concentrations for each of the previous six years. Ecology then selected the 95th percentile of the annual average data points to set an annual average performance-based limit of 4.7 mg/L (see Appendix E, Table E-2).

Clarity and Disinfection: In addition to the biological oxidation standards above for all Class A and B reclaimed water, each class of water must comply with separate standards for turbidity, a measure of water clarity, and disinfection. KC-WTD must ensure Class A reclaimed water from the permitted facility complies with following standards prior to distribution.

Table 12 Class A Turbidity and Disinfection Standards

Parameter	Average Monthly Limit	Sample Maximum Limit
Turbidity	0.2 NTU	0.5 NTU
	7-day median limit	**Sample Maximum Limit**
Total Coliform	2.2 CFU/100 mL	23 CFU/100 mL
Virus Removal	Minimum 4-log virus removal or inactivation see WAC 173-219-340	

Ecology based the turbidity standard on the levels typically achievable from a properly operated and maintained membrane filtration system, with the compliance point at the end of the filtration system prior to disinfection. Since continuous turbidity meters often record momentary fluctuations over the course of a day, the standards specify that a treatment system only violates the standard when the maximum turbidity remains over the sample maximum limit for more than five minutes.

Although chapter 173-219-330 WAC include virus removal as a performance standard for Class A reclaimed water, Ecology does not place a numeric limit for this parameter in permits. As stated in WAC 173-219-340, the combination of biological treatment, filtration and disinfection must achieve a minimum of 4-log virus removal or inactivation. In addition, the system must be capable of consistently complying with the water quality standard through the proper design, operation, and maintenance of each unit process in the treatment system. Ecology assesses whether proposed facility designs will comply with the virus removal standard during initial facility engineering reviews and approves the system designs before construction. The proposed permit requires KC-WTD to properly operate and maintain all reclaimed water treatment processes according to the approved operations and maintenance manual to maintain compliance with the performance standards.

C. Surface water quality-based effluent limits

The Washington State surface water quality standards (chapter 173-201A WAC) are designed to protect existing water quality and preserve the beneficial uses of Washington's surface waters. Waste discharge permits must include conditions that ensure the discharge will meet the surface water quality standards (WAC 173-201A-510). Water quality-based effluent limits may be based on an individual waste load allocation or on a waste load allocation developed during a basin wide total maximum daily load study (TMDL).

Numerical criteria for the protection of aquatic life and recreation

Numerical water quality criteria are listed in the water quality standards for surface waters (chapter 173-201A WAC). They specify the maximum levels of pollutants allowed in receiving water to protect aquatic life and recreation in and on the water. Ecology uses numerical criteria along with chemical and physical data for the wastewater and receiving water to derive the effluent limits in the discharge permit. When surface water quality-based limits are more stringent or potentially more stringent than technology-based limits, the discharge must meet the water quality-based limits.

Numerical criteria for the protection of human health

Effective numeric water quality criteria for the protection of human health are promulgated in Chapter 173-201A WAC and 40 CFR 131.45. These criteria are designed to protect humans from exposure to pollutants linked to cancer and other diseases, based on consuming fish and shellfish and drinking contaminated surface waters. The water quality standards also include radionuclide criteria to protect humans from the effects of radioactive substances.

Narrative criteria

Narrative water quality criteria (e.g., WAC 173-201A-240(1); 2016) limit the toxic, radioactive, or other deleterious material concentrations that the facility may discharge to levels below those which have the potential to:

- Adversely affect designated water uses.
- Cause acute or chronic toxicity to biota.
- Impair aesthetic values.
- Adversely affect human health.

Narrative criteria protect the specific designated uses of all fresh waters (WAC 173-201A-200, 2016) and of all marine waters (WAC 173-201A-210, 2016) in the state of Washington.

Antidegradation

Description--The purpose of Washington's Antidegradation Policy (WAC 173-201A-300-330; 2016) is to:

- Restore and maintain the highest possible quality of the surface waters of Washington.
- Describe situations under which water quality may be lowered from its current condition.
- Apply to human activities that are likely to have an impact on the water quality of surface water.
- Ensure that all human activities likely to contribute to a lowering of water quality, at a minimum, apply all known, available, and reasonable methods of prevention, control, and treatment (AKART).
- Apply three tiers of protection (described below) for surface waters of the state.

Tier I ensures existing and designated uses are maintained and protected and applies to all waters and all sources of pollutions. Tier II ensures that waters of a higher quality than the criteria assigned are not degraded unless such lowering of water quality is necessary and in the overriding public interest. Tier II applies only to a specific list of polluting activities. Tier III prevents the degradation of waters formally listed as "outstanding resource waters," and applies to all sources of pollution.

A facility must prepare a Tier II analysis when all three of the following conditions are met:

- The facility is planning a new or expanded action.
- Ecology regulates or authorizes the action.
- The action has the potential to cause measurable degradation to existing water quality at the edge of a chronic mixing zone.

Facility Specific Requirements--This facility must meet Tier I requirements.

- Dischargers must maintain and protect existing and designated uses. Ecology must not allow any degradation that will interfere with, or become injurious to, existing or designated uses, except as provided for in chapter 173-201A WAC.

- For waters that do not meet assigned criteria, or protect existing or designated uses, Ecology will take appropriate and definitive steps to bring the water quality back into compliance with the water quality standards.
- Whenever the natural conditions of a water body are of a lower quality than the assigned criteria, the natural conditions constitute the water quality criteria. Where water quality criteria are not met because of natural conditions, human actions are not allowed to further lower the water quality, except where explicitly allowed in chapter 173-201A WAC.

Ecology's analysis described in this section of the fact sheet demonstrates that the proposed permit conditions will protect existing and designated uses of the receiving water.

Mixing zones

A mixing zone is the defined area in the receiving water surrounding the discharge port(s), where wastewater mixes with receiving water. Within mixing zones the pollutant concentrations may exceed water quality numeric standards, so long as the discharge doesn't interfere with designated uses of the receiving water body (for example, recreation, water supply, and aquatic life and wildlife habitat, etc.) The pollutant concentrations outside of the mixing zones must meet water quality numeric standards.

State and federal rules allow mixing zones because the concentrations and effects of most pollutants diminish rapidly after discharge, due to dilution. Ecology defines mixing zone sizes to limit the amount of time any exposure to the end-of-pipe discharge could harm water quality, plants, or fish.

The state's water quality standards allow Ecology to authorize mixing zones for the facility's permitted wastewater discharges only if those discharges already receive all known, available, and reasonable methods of prevention, control, and treatment (AKART). Mixing zones typically require compliance with water quality criteria within a specified distance from the point of discharge and must not use more than 25% of the available width of the water body for dilution [WAC 173-201A-400 (7)(a)(i-iii)].

Ecology uses modeling to estimate the amount of mixing within the mixing zone. Through modeling Ecology determines the potential for violating the water quality standards at the edge of the mixing zone and derives any necessary effluent limits. Steady-state models are the most frequently used tools for conducting mixing zone analyses. Ecology chooses values for each effluent and for receiving water variables that correspond to the time period when the most critical condition is likely to occur (see Ecology's *Permit Writer's Manual*). Each critical condition parameter, by itself, has a low probability of occurrence and the resulting dilution factor is conservative. The term "reasonable worst-case" applies to these values.

The mixing zone analysis produces a numerical value called a dilution factor (DF). A dilution factor represents the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. For example, a dilution factor of 4 means the effluent is 25% and the receiving water is 75% of the total volume of water at the boundary of the mixing zone. Ecology uses dilution factors with the water quality criteria to calculate

reasonable potentials and effluent limits. Water quality standards include both aquatic life-based criteria and human health-based criteria. The former are applied at both the acute and chronic mixing zone boundaries; the latter are applied only at the chronic boundary. The concentration of pollutants at the boundaries of any of these mixing zones may not exceed the numerical criteria for that zone.

Most aquatic life *acute* criteria are based on the assumption that organisms are not exposed to that concentration for more than one hour and more often than one exposure in three years. Most aquatic life *chronic* criteria are based on the assumption that organisms are not exposed to that concentration for more than four consecutive days and more often than once in three years.

The two types of human health-based water quality criteria distinguish between those pollutants linked to non-cancer effects (non-carcinogenic) and those linked to cancer effects (carcinogenic). The human health-based water quality criteria incorporate several exposure and risk assumptions. These assumptions include:

- A 70-year lifetime of daily exposures.
- An ingestion rate for fish or shellfish measured in kg/day.
- An ingestion rate of two and four tenths (2.4) liters/day for drinking water (increased from two liters/day in the 2016 Water Quality Standards update).
- A one-in-one-million cancer risk for carcinogenic chemicals.

Chinook Bend Wetland: This permit does not authorize a mixing zone for reclaimed water released to the Chinook Bend Wetland. Ecology developed the use-based performance standards for reclaimed water used in wetland enhancement projects based on conventional pollutant loading that is generally protective of or beneficial to the flora and fauna of the specific class of wetland. Ecology will evaluate compliance with water quality standards for any toxic pollutants by comparing detected concentrations with numeric criteria established to protect aquatic life or human health.

Snoqualmie River: This permit authorizes a small acute mixing zone, surrounded by a chronic mixing zone around the outfall 001 point of discharge to the Snoqualmie River at the Carnation Farm Road bridge (WAC 173-201A-400). The water quality standards impose certain conditions before allowing the discharger a mixing zone:

1. **Ecology must specify both the allowed size and location in a permit.**

   The proposed permit specifies the size and location of the allowed mixing zone (as specified below).

2. **The facility must fully apply "all known, available, and reasonable methods of prevention, control and treatment" (AKART) to its discharge.**

   Ecology has determined that the treatment provided at the Carnation WWTP meets the requirements of AKART (see "Technology-based Limits").

3. Ecology must consider critical discharge conditions.

Surface water quality-based limits are derived for the water body's critical condition (the receiving water and waste discharge condition with the highest potential for adverse impact on the aquatic biota, human health, and existing or designated waterbody uses). The critical discharge condition is often pollutant-specific or waterbody-specific.

Critical discharge conditions are those conditions that result in reduced dilution or increased effect of the pollutant. Factors affecting dilution include the depth of water, the density stratification in the water column, the currents, and the rate of discharge. Density stratification is determined by the salinity and temperature of the receiving water. Temperatures are warmer in the surface waters in summer. Therefore, density stratification is generally greatest during the summer months. Density stratification affects how far up in the water column a freshwater plume may rise. The rate of mixing is greatest when an effluent is rising. The effluent stops rising when the mixed effluent is the same density as the surrounding water. After the effluent stops rising, the rate of mixing is much more gradual. Water depth can affect dilution when a plume might rise to the surface when there is little or no stratification. Ecology's *Permit Writer's Manual* describes additional guidance on criteria/design conditions for determining dilution factors. The manual can be obtained from Ecology's website at: https://apps.ecology.wa.gov/publications/documents/92109.pdf.

Ecology used several sources to obtain mixing model input values for ambient critical conditions in the vicinity of the outfall, including a preliminary outfall mixing study performed by Carollo Engineers and Cosmopolitan in 2003 and Ecology's EIM database. King County provided facility flow data in monthly DMRs and their NPDES and reclaimed water permit applications. Table 13 lists the parameters Ecology used in the model.

Table 13 Critical Conditions Used to Model the Discharge

Critical Condition	Value
The 7-day average low river flow with a 10 year recurrence interval (7Q10)	443 cfs
The 30-day low river flow with a 5 year recurrence interval (30Q5)	620 cfs
Harmonic mean river flow	1329 cfs
River depth at the 7Q10 period	5.0 feet
River velocity	0.4 - 0.7 fps
Slope	0.00097 ft/ft
Channel width	200 feet
Maximum average monthly effluent flow (chronic and non-carcinogenic human health mixing zones)	0.12 MGD
Maximum daily flow (acute mixing zone)	0.186 MGD
Annual average flow (carcinogenic human health mixing zone)	0.1 MGD

4. **Supporting information must clearly indicate the mixing zone would not:**

   - Have a reasonable potential to cause the loss of sensitive or important habitat.
   - Substantially interfere with the existing or characteristic uses.
   - Result in damage to the ecosystem.
   - Adversely affect public health.

   Ecology established Washington State water quality criteria for toxic chemicals using EPA criteria. EPA developed the criteria using toxicity tests with numerous organisms and set the criteria to generally protect the species tested and to fully protect all commercially and recreationally important species.

   EPA sets acute criteria for toxic chemicals assuming organisms are exposed to the pollutant at the criteria concentration for one hour. They set chronic standards assuming organisms are exposed to the pollutant at the criteria concentration for four days. Dilution modeling under critical conditions generally shows that both acute and chronic criteria concentrations are reached within minutes of discharge.

   The discharge plume does not impact drifting and non-strong swimming organisms because they cannot stay in the plume close to the outfall long enough to be affected. Strong swimming fish could maintain a position within the plume, but they can also avoid the discharge by swimming away. Mixing zones generally do not affect benthic organisms (bottom dwellers) because the buoyant plume rises in the water column. Ecology has additionally determined that the effluent will not exceed 33 degrees C for more than two seconds after discharge; and that the temperature of the water will not create lethal conditions or blockages to fish migration.

   Ecology evaluates the cumulative toxicity of an effluent by testing the discharge with whole effluent toxicity (WET) testing.

   Ecology reviewed the above information, the specific information on the characteristics of the discharge, the receiving water characteristics, and the discharge location. Based on this review, Ecology concluded that the discharge does not have a reasonable potential to cause the loss of sensitive or important habitat, substantially interfere with existing or characteristics uses, result in damage to the ecosystem, or adversely affect public health if the permit limits are met.

5. **The discharge/receiving water mixture must not exceed water quality criteria outside the boundary of a mixing zone.**

   Ecology conducted a reasonable potential analysis, using procedures established by the EPA and by Ecology, for each pollutant and concluded the discharge/receiving water mixture will not violate water quality criteria outside the boundary of the mixing zone if permit limits are met.

6. **The size of the mixing zone and the concentrations of the pollutants must be minimized.**

   At any given time, the effluent plume uses only a portion of the acute and chronic mixing zone, which minimizes the volume of water involved in mixing. The plume mixes as it rises through the water column therefore much of the receiving water volume at lower depths in the mixing zone is not mixed with discharge. Similarly, because the discharge may stop rising at some depth due to density stratification, waters above that depth will not mix with the discharge. Ecology determined it is impractical to specify in the permit the actual, much more limited volume in which the dilution occurs as the plume rises and moves with the current.

   Ecology minimizes the size of mixing zones by requiring dischargers to install diffusers when they are appropriate to the discharge and the specific receiving waterbody. When a diffuser is installed, the discharge is more completely mixed with the receiving water in a shorter time. Ecology also minimizes the size of the mixing zone (in the form of the dilution factor) using design criteria with a low probability of occurrence. For example, Ecology uses the expected 95th percentile pollutant concentration, the 90th percentile background concentration, the centerline dilution factor, and the lowest flow occurring once in every ten years to perform the reasonable potential analysis.

   Because of the above reasons, Ecology has effectively minimized the size of the mixing zone authorized in the proposed permit.

7. **Maximum size of mixing zone.**

   The authorized mixing zone does not exceed the maximum size restriction.

8. **Acute mixing zone.**

   - **The discharge/receiving water mixture must comply with acute criteria as near to the point of discharge as practicably attainable.**

     Ecology determined the acute criteria will be met at 10% of the volume fraction of the chronic mixing zone at the ten year low flow.

   - **The pollutant concentration, duration, and frequency of exposure to the discharge will not create a barrier to migration or translocation of indigenous organisms to a degree that has the potential to cause damage to the ecosystem.**

     As described above, the toxicity of any pollutant depends upon the exposure, the pollutant concentration, and the time the organism is exposed to that concentration. Authorizing a limited acute mixing zone for this discharge assures that it will not create a barrier to migration. The effluent from this discharge will rise as it enters the receiving water, assuring that the rising effluent will not cause translocation of indigenous organisms near the point of discharge (below the rising effluent).

   - **Comply with size restrictions.**

The mixing zone authorized for this discharge complies with the size restrictions published in chapter 173-201A WAC.

9. Overlap of mixing zones.

This mixing zone does not overlap another mixing zone.

D. Designated uses and surface water quality criteria

Applicable designated uses and surface water quality criteria are defined in chapter 173-201A WAC. In addition, the U.S. EPA set human health criteria for toxic pollutants (EPA 1992). The tables included below summarize the criteria applicable to the receiving water's designated uses.

- Aquatic Life Uses are designated based on the presence of, or the intent to provide protection for the key uses. All indigenous fish and non-fish aquatic species must be protected in waters of the state in addition to the key species. The Aquatic Life Uses for this receiving water are identified below.

Freshwater Aquatic Life Uses and Associated Criteria

Table 14 Core Summer Salmonid Habitat

Criteria	Limit
Temperature Criteria – Highest 7-DAD MAX	16°C (60.8°F)
Dissolved Oxygen Criteria	9.5 mg/L
Turbidity Criteria	• 5 NTU over background when the background is 50 NTU or less; or • A 10 percent increase in turbidity when the background turbidity is more than 50 NTU.
Total Dissolved Gas Criteria	Total dissolved gas must not exceed 110 percent of saturation at any point of sample collection.
pH Criteria	The pH must measure within the range of 6.5 to 8.5, with a human-caused variation within the above range of less than 0.2 units.

Salmon and Trout Spawning (Applies seasonally from September 15th to May 15th)

Criteria	Limit
Temperature Criteria – Highest 7-DAD MAX	13°C (55.4°F)

- The *recreational uses* for this receiving water are identified below.

Table 15 Recreational Uses and Associated Criteria

Recreational Use	Criteria
Primary Contact Recreation	*E. coli* organism levels must not exceed a geometric mean value of 100 CFU or MPN per 100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained within the averaging period exceeding 320 CFU or MPN per 100 mL.

- The *water supply uses* are domestic, agricultural, industrial, and stock watering.
- The *miscellaneous freshwater uses* are wildlife habitat, harvesting, commerce and navigation, boating, and aesthetics.

E. Water quality impairments

Ecology conducted water quality assessments of the Snoqualmie River in 1989-91 that identified impairments existed within the basin between North Bend and Monroe. The *Snoqualmie River Total Maximum Daily Load Study* (#94-71) published in May 1994 recommended waste load allocations for $CBOD_5$, ammonia, and fecal coliform necessary to correct impairments. Although the Carnation WWTP did not exist at the time, Ecology's study included waste load allocations for a treatment plant in Carnation. The proposed permit implements the waste load allocations the study provides for discharges from the Carnation WWTP.

Ecology also published the *Snoqualmie River Basin Temperature Total Maximum Daily Load: Water Quality Improvement Report and Implementation Plan* (#11-10-041) in 2011 to address temperature impairments in the system. The 2011 study includes waste load allocations for temperature that apply to discharges from the Carnation WWTP.

F. Evaluation of surface water quality-based effluent limits for narrative criteria

Ecology must consider the narrative criteria described in WAC 173-201A-260 when it determines permit limits and conditions. Narrative water quality criteria limit the toxic, radioactive, or other deleterious material concentrations that the facility may discharge which have the potential to adversely affect designated uses, cause acute or chronic toxicity to biota, impair aesthetic values, or adversely affect human health.

Ecology considers narrative criteria when it evaluates the characteristics of the wastewater and when it implements all known, available, and reasonable methods of treatment and prevention (AKART) as described above in the technology-based limits section. When Ecology determines if a facility is meeting AKART it considers the pollutants in the wastewater and the adequacy of the treatment to prevent the violation of narrative criteria.

In addition, Ecology considers the toxicity of the wastewater discharge by requiring whole effluent toxicity (WET) testing when there is a reasonable potential for the discharge to

contain toxics. Ecology's analysis of the need for WET testing for this discharge is described later in the fact sheet.

G. Evaluation of surface water quality-based effluent limits for numeric criteria

Pollutants in an effluent may affect the aquatic environment near the point of discharge (near-field) or at a considerable distance from the point of discharge (far-field). Toxic pollutants, for example, are near-field pollutants; their adverse effects diminish rapidly with mixing in the receiving water. Conversely, a pollutant such as biochemical oxygen demand (BOD_5) is a far-field pollutant whose adverse effect occurs away from the discharge even after dilution has occurred. Thus, the method of calculating surface water quality-based effluent limits varies with the point at which the pollutant has its maximum effect.

With technology-based controls (AKART), predicted pollutant concentrations in the discharge exceed water quality criteria. Ecology therefore authorizes a mixing zone in accordance with the geometric configuration, flow restriction, and other restrictions imposed on mixing zones by chapter 173-201A WAC.

Outfall 001 to the Snoqualmie River consists of a single pipe equipped with a duckbill diffuser check valve. The outfall discharges into the downstream direction of the river flow at a depth two feet above the riverbed. As noted in section II of this fact sheet, the treatment plant does not routinely use this outfall for discharge. However, Ecology evaluated a continuous discharge from the outfall to establish maximum mixing zone sizes and dilution for the proposed permit using the RiverPlume6 spreadsheet model in the PermitCalc Workbook tool. Appendix C of Ecology's *Permit Writer's Manual* contains a detailed explanation of this model. Please refer to appendix E of this fact sheet for the detailed results from the RiverPlume6 model.

Chronic Mixing Zone--WAC 173-201A-400(7)(a) specifies that mixing zones must not extend in a downstream direction from the discharge ports for a distance greater than 300 feet plus the depth of water over the discharge ports or extend upstream for a distance of over 100 feet, not utilize greater than 25% of the flow, and not occupy greater than 25% of the width of the water body. Based on the outfall depth of 5 feet and river width of 200 feet, the maximum allowable chronic mixing zone shown in figure 3 extends 305 feet downriver from the outfall, 100 feet upriver, and 50 feet across the river channel. In evaluating mixing, Ecology determined that the river width restriction resulted in a smaller chronic dilution factor than the distance downstream restriction. Therefore, dilution factors shown in Table 16 were calculated using the river width restriction approach.

Acute Mixing Zone--WAC 173-201A-400(8)(a) specifies that in rivers and streams a zone where acute toxics criteria may be exceeded must not extend beyond 10% of the distance towards the upstream and downstream boundaries of the chronic zone, not use greater than 2.5% of the flow and not occupy greater than 25% of the width of the water body. The maximum allowable acute mixing zone shown in figure 3 extends 30.5 feet downriver from the outfall, 10 feet upriver, and 50 feet across the river channel. In evaluating mixing, Ecology determined that the flow volume restriction resulted in a smaller acute dilution

factor than the distance downstream restriction. Therefore, the acute dilution factor shown in Table 16 was calculated using the volume restriction approach.

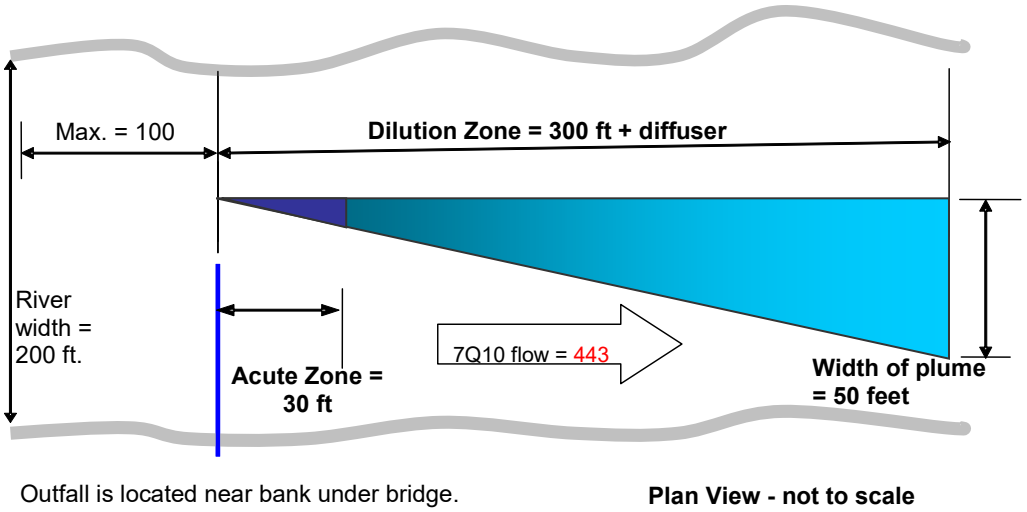


Figure 3. Mixing Zone Diagram.

Ecology determined the impacts of pH, fecal coliform/E. Coli, chlorine, ammonia, and certain metals as described below, using the dilution factors in Table 16. The derivation of surface water quality-based limits also takes into account the variability of pollutant concentrations in both the effluent and the receiving water.

Table 16 Dilution Factors (DF)

Criteria	Acute	Chronic
Aquatic Life	39	375
Human Health – Non-carcinogen		520
Human Health – Carcinogen		1315

Dissolved Oxygen--BOD_5/$CBOD_5$ and Ammonia Effects--Natural decomposition of organic material in wastewater effluent impacts dissolved oxygen in the receiving water at distances far outside of the regulated mixing zone. The 5-day Biochemical Oxygen Demand (BOD_5) of an effluent sample indicates the amount of biodegradable material in the wastewater and estimates the magnitude of oxygen consumption the wastewater will generate in the receiving water. The amount of ammonia-based nitrogen in the wastewater also provides an indication of oxygen demand potential in the receiving water.

TMDL-based Limits (August – October)

The *1994 Snoqualmie River Total Maximum Daily Load Study* established waste load allocations (WLAs) for "BOD_5" and ammonia for discharges occurring during the August –

October critical season. Ecology recognizes that the previous permit expressed the waste load allocation in terms of "BOD_5" rather than "$CBOD_5$". This was an error. The original TMDL intended for the "Biochemical Oxygen Demand" parameter stated in the document to represent only the carbonaceous portion of the total biochemical oxygen demand; the ammonia limit addressed the nitrogenous oxygen demand separately. For consistency with the other facilities covered by the TMDL, the proposed permit includes the following waste load allocations for the Carnation WWTP:

- $CBOD_5$: 25 lbs/day
- Ammonia: 8.4 lbs/day (N)

The above WLAs represent the maximum daily limit (MDL) for each parameter. According to federal NPDES regulations, permits express limits as both average monthly and maximum daily limits. Ecology calculated the average monthly limit (AML) according to the method in EPA's *Technical Support Document for Water Quality-based Toxics Control* (1991). Since limits in the previous permit were based on assumed performance capabilities that relied on data from a similar facility rather than actual performance data from the Carnation WWTP, Ecology reevaluated the average monthly limit calculation using performance data for the past three years. The revised calculations resulted in an increased allowable average monthly limit for BOD_5 (now enforced as $CBOD_5$) and a decreased limit for ammonia. The proposed permit includes the following TMDL-based limits:

- $CBOD_5$: MDL = WLA = 25 lb/day
  AML = 20.1 lb/day
- Ammonia: MDL = WLA = 8.4 lb/day
  AML = 4.1 lb/day

These limits apply to both the river discharge and to reclaimed water released to the Chinook Bend Wetland. See Appendix E, Table E-4, for detailed calculations.

Non-critical Season (November – July)

Ecology evaluated the impact discharges of $CBOD_5$ and NBOD from outfall 001 would have on the Snoqualmie River using the Streeter-Phelps equations, as shown in Appendix E, Table E-5. The calculations use ambient dissolved oxygen and temperature conditions for the November through July period shown in Table 4. The analysis also assumed a worst-case $CBOD_5$ concentration of 40 mg/L, an ammonia concentration of 2.2 mg/L, a maximum effluent temperature of 26.2° C, and the minimum dissolved oxygen concentration of 3.9 mg/L. Ecology used monitoring data from 2014 through 2019 to determine appropriate effluent values, except for $CBOD_5$.

The analysis predicted no violation of the surface water quality standards for dissolved oxygen due to the impacts of $CBOD_5$ and ammonia-nitrogen under critical conditions. Therefore, the proposed permit contains the technology-based effluent limit for $CBOD_5$. The permit also does not contain a limit on ammonia based on dissolved oxygen impacts (ammonia toxicity is examined elsewhere in this fact sheet).

pH--Ecology modeled the impact of the effluent pH on the receiving water using the calculations from EPA, 1988, and the chronic dilution factor tabulated above. Appendix E includes the model results. Ecology predicts no violation of the pH criteria under critical conditions. Therefore, the proposed permit includes technology-based effluent limits for pH.

Fecal Coliform-- Ecology calculated the numbers of fecal coliform by simple mixing analysis (see Appendix E) using the technology-based limit of 400 organisms per 100 ml and a dilution factor of 375. Under these conditions, the calculation predicts no reasonable potential to exceed the water quality criterion for fecal coliform. Therefore, the proposed permit includes technology-based effluent limits for fecal coliform bacteria throughout the year. Furthermore, compliance with the Class A reclaimed water standard for total coliform ensures that any water released to the Chinook Bend wetland meets applicable surface water quality standards.

For the low-flow season (August – October), the TMDL allocates a maximum daily fecal coliform limit of 3.1E+09 cfu/day. This value is based on an assumed effluent concentration of 400 cfu/100 mL at a facility flow of 0.2 MGD. The TMDL document states that the fecal coliform load to the river system from the wastewater treatment plants is 'inconsequential' compared to the non-point sources as long as the technology-based limit of 400 cfu/100mL was met. For this reason, the proposed permit requires the facility to meet the technology-based fecal coliform limits throughout the year.

As of January 1, 2021, the recreational water quality criterion for bacteria changed from fecal coliform to E. coli. Technology based effluent limits listed in WAC 173-221 were not modified with the recreational water quality standards update. Because modeling under critical conditions showed no violation of the previous fecal coliform water quality criteria and the transition is a change in bacterial indicator not more or less stringent than the current standards, the effluent limits will remain unchanged throughout the duration of the permit term. Dual indicator monitoring will be a part of this permit so that a site-specific correlation can be developed during the permit cycle. Ecology will use this data to assess the reasonable potential to exceed the applicable water quality criterion in the next iteration of this permit.

Turbidity—Historical monitoring of the Snoqualmie River near Carnation indicates that turbidity in the river ranges between 2 NTU and 50 NTU. These values are 10 to 250 times higher than the Class A reclaimed water performance limit for the Carnation WWTP. Therefore, compliance with the reclaimed water performance standard ensures with applicable water quality standards for discharges to either the Chinook Bend wetland or to the Snoqualmie River. Ecology also expects no violations of the turbidity criteria outside the designated mixing zone in the Snoqualmie River when the facility meets its technology-based total suspended solids permit limits.

Temperature--The state temperature standards [WAC 173-201A-200 and 600-612] include multiple elements:

- Annual summer maximum threshold criteria (June 15 to September 15)
- Supplemental spawning and rearing season criteria (September 15 to June 15)

- Incremental warming restrictions
- Protections against acute effects

Ecology evaluates each criterion independently to determine reasonable potential and derive permit limits.

- Annual summer maximum and supplementary spawning/rearing criteria

  Each water body has an annual maximum temperature criterion [WAC 173-201A-200(1)(c) and Table 602]. These threshold criteria (e.g., 12, 16, 17.5, 20°C) protect specific categories of aquatic life by controlling the effect of human actions on summer temperatures.

  Some waters have an additional threshold criterion to protect the spawning and incubation of salmonids (9°C for char and 13°C for salmon and trout) [WAC 173-201A-602, Table 602]. These criteria apply during specific date-windows.

  The threshold criteria apply at the edge of the chronic mixing zone. Criteria for most fresh waters are expressed as the highest 7-Day average of daily maximum temperature (7-DADMax). The 7-DADMax temperature is the arithmetic average of seven consecutive measures of daily maximum temperatures. Criteria for marine waters and some fresh waters are expressed as the highest 1-Day annual maximum temperature (1-DMax).

- Incremental warming criteria

  The water quality standards limit the amount of warming human sources can cause under specific situations [WAC 173-201A-200(1)(c)(i)-(ii)].) The incremental warming criteria apply at the edge of the chronic mixing zone.

  At locations and times when background temperatures are cooler than the assigned threshold criterion, point sources are permitted to warm the water by only a defined increment. These increments are permitted only to the extent doing so does not cause temperatures to exceed either the annual maximum or supplemental spawning criteria.

  At locations and times when a threshold criterion is being exceeded due to natural conditions, all human sources, considered cumulatively, must not warm the water more than 0.3°C above the naturally warm condition.

  When Ecology has not yet completed a TMDL, our policy allows each point source to warm water at the edge of the chronic mixing zone by 0.3°C. This is true regardless of the background temperature and even if doing so would cause the temperature at the edge of a standard mixing zone to exceed the numeric threshold criteria. Allowing a 0.3°C warming for each point source is reasonable and protective where the dilution factor is based on 25% or less of the critical flow. This is because the fully mixed effect on temperature will only be a fraction of the 0.3°C cumulative allowance (0.075°C or less) for all human sources combined.

- Protections for temperature acute effects

Instantaneous lethality to passing fish: The upper 99th percentile daily maximum effluent temperature must not exceed 33°C, unless a dilution analysis indicates ambient temperatures will not exceed 33°C two seconds after discharge.

General lethality and migration blockage: Measurable (0.3°C) increases in temperature at the edge of a chronic mixing zone are not allowed when the receiving water temperature exceeds either a 1DMax of 23°C or a 7DADMax of 22°C.

Lethality to incubating fish: Human actions must not cause a measurable (0.3°C) warming above 17.5°C at locations where eggs are incubating.

Reasonable Potential Analysis

Annual summer maximum and incremental warming criteria: Due to documented temperature impairments in the Snoqualmie River basin, Ecology completed The *Snoqualmie River Basin Temperature Total Maximum Daily Load: Water Quality Improvement Report and Implementation Plan* in 2011. This plan established strategies and waste load allocations necessary to restore river temperatures to levels consistent with approved standards for summer maximum, supplemental spawning (in areas with supplemental temperature criteria), and incremental warming. The plan includes a temperature waste load allocation of 33.0° C for discharges from the Carnation WWTP to the Snoqualmie River during the period of June 1st through September 30th. Ecology will incorporate this allocation into the proposed permit as a seasonal daily temperature limit whenever the plant discharges through outfall 001. The temperature limit does not apply for reclaimed water released to the Chinook Bend wetland.

Protection against acute effects: A discharge does not pose a reasonable potential to risk acute effects when it meets the following conditions:

- Effluent temperature must not exceed 33°C or cause ambient temperature to exceed 33°C two seconds after discharge.
- Does not increase ambient temperature more than 0.3°C when receiving water temperature exceeds either a 1DMax of 23°C or a 7DADMax of 22°C.
- Does not cause temperature to warm more than 0.3°C above 17.5°C at locations where eggs are incubating.

The reclaimed water characterization in Table 6 of this fact sheet shows that discharges from the Carnation WWTP do not approach a temperature of 33°C. In addition, ambient data in Table 3 shows that the river temperature remains below a 7DADMax temperature of 22°C and the facility does not discharge into an area in which eggs are incubating. Therefore, the proposed permit does not require a limit to protect against acute effects since the discharge complies with the acute criteria listed above.

Toxic Pollutants--Federal regulations (40 CFR 122.44) require Ecology to place limits in NPDES permits on toxic chemicals in an effluent whenever there is a reasonable potential for those chemicals to exceed the surface water quality criteria. Ecology does not exempt

facilities with technology-based effluent limits from meeting the surface water quality standards.

Data submitted in the NPDES and reclaimed water permit applications identify that the following toxic pollutants are present in the discharge: ammonia, chloride, copper, iron, lead, and zinc. In addition, the proposed permit authorizes the Carnation WWTP to use chlorine as a backup disinfectant and, therefore, may occasionally contain chlorine. Ecology conducted a reasonable potential analysis (See Appendix E) on these parameters to determine whether it would require effluent limits in this permit. The analysis examined discharges to both the Snoqualmie River and to the Chinook Bend wetland.

Ammonia: Ammonia's toxicity depends on the portion available in the unionized form. The amount of unionized ammonia depends on the receiving water's temperature and pH. Ecology evaluated ammonia toxicity for discharges from outfall 001 into the Snoqualmie River using Ecology spreadsheet tools and available receiving water information shown in Table 4. Ambient data included temperature, pH, and background ammonia concentrations. The analysis revealed no reasonable potential for ammonia toxicity for discharges to the Snoqualmie River. In addition, compliance with the total nitrogen and TKN performance standards for reclaimed water released to Category II wetlands should ensure ammonia concentrations in the reclaimed water remain at or below applicable water quality standards at the point of release to the Chinook Bend wetland.

Chloride and Metals: No valid ambient background data were available for chloride, copper, iron, lead, manganese, and zinc in the Snoqualmie River. Ecology's analysis used zero for background concentrations for these parameters. Since the Carnation WWTP infrequently discharges through outfall 001 and this outfall has relatively high dilution, Ecology does not believe additional background data is necessary to analyze this discharge. Ecology's analysis determined that the pollutants listed above pose no reasonable potential to exceed the water quality criteria at the critical condition. Ecology's determination assumes that this facility meets the other effluent limits of this permit.

For releases of reclaimed water to the Chinook Bend wetland, Ecology compared reported concentrations of chloride and metals to applicable surface water quality numeric criteria to protect against acute and chronic aquatic toxicity. This analysis assumed a surface water hardness of 108 mg/L (as $CaCO_3$) for the wetland, as reported in Amendment 1 to the Carnation Wastewater Facilities Plan, for calculating numeric criteria for metals with hardness-dependent criteria (copper, lead, and zinc). In all cases, reported concentrations of metals were lower than the applicable numeric criteria. Therefore, the existing reclaimed water quality remains protective of water quality in the wetland.

Chlorine: The Carnation WWTP may occasionally use chlorine when the UV disinfection system is inoperable or when there is a need to clean the pipeline from the treatment plant to the Chinook Bend wetland. Therefore, the proposed permit must include a limit on chlorine during periods when chlorine is present in water discharged from the facility. As shown in Appendix E, Ecology calculated that a daily maximum chlorine limit of 741 µg/L is necessary to protect aquatic life when the facility discharges water from outfall 001 into the

Snoqualmie River. Due to the intermittent use of chlorine, the permit will not include an average monthly limit.

Ecology expects the facility to use chlorine intermittently for short periods of time (a few hours to a few days). For example, over the last five years the facility discharged water containing chlorine for a total of eight days in 2018. Given the infrequent use, Ecology does not consider monthly or weekly average limits appropriate for the proposed permit. For non-continuous discharges, 40 CFR 122.45(e) requires the establishment of limits that are appropriate for the nature of the discharge. Ecology considers a daily maximum limit applied each day in which the facility discharges chlorine an appropriate limit for POTWs that use chlorine as a backup disinfectant.

To protect the wetland flora and fauna, Ecology determined a residual chlorine limit for the wetlands discharge assuming no mixing zone. This results in a maximum daily chlorine limit of 19 µg/L (equivalent to the freshwater acute toxicity threshold). Since the facility disinfects with ultraviolet and since Ecology and DOH waived the residual chlorine requirement in the reclaimed water distribution system to the wetland, the facility does not use chlorine on a daily basis. Therefore, the facility should meet the chlorine limit during normal operation. In addition, the proposed permit requires the facility to divert flow to outfall 001 when using chlorine to disinfect the distribution line after any total coliform exceedance occurs or if the UV system is not operating. Condition S1.A of the permit contains procedures KC-WTD staff must follow to minimize chlorine discharge to the wetlands.

H. Human health

Washington's water quality standards include numeric human health-based criteria for priority pollutants that Ecology must consider when writing NPDES permits. Pollutant monitoring reported in the State Reclaimed Water Permit Application identified that water from the Carnation WWTP contains the following pollutants that are toxic to human health: copper, iron, manganese, and zinc. Ecology evaluated the potential for discharges to the Snoqualmie River to violate the water quality standards, as required by 40 CFR 122.44(d). The analysis followed procedures published in the *Technical Support Document for Water Quality-Based Toxics Control* (EPA/505/2-90-001) and Ecology's in *Permit Writer's Manual* for making a reasonable potential determination. The evaluation showed no reasonable potential for discharge to the Snoqualmie River to cause a violation of water quality standards. Therefore, limits are not needed for these pollutants.

Ecology also considered the human health impact potential for reclaimed water released from the Carnation WWTP to the Chinook Bend wetland. We believe no reasonable potential exists for the following reasons:

1. Water is released to the wetland in an area with limited access to the public.
2. As shown in Table 17, the detected concentrations of pollutants with identified human health risk are far below the critical levels identified in surface water and groundwater quality standards.

Table 17 Comparison of sample results

Parameter	Units	# of Samples	Average Value	Maximum Value	Human Health Criteria [1]	Groundwater Standards [2]
Copper	µg/L	9	10.8	11.9	1300	1000
Iron	µg/L	9	20.9	24	300[3]	300
Manganese	µg/L	9	3.29	7.91	50[3]	50
Zinc	µg/L	9	50.9	58.9	1000	5000

[1] Human Health Criteria for consumption of water and organisms, as promulgated by Washington State in WAC 173-201A-240.

[2] Secondary contaminant levels, as promulgated in Washington's Water Quality Standards for Groundwater, WAC 173-200-040. Values are equivalent to the primary and secondary MCLs listed in Washington's Drinking Water Quality Standards, WAC 246-290-310.

[3] The Human Health Criteria values listed for iron and manganese are based on EPA's National Recommended Water Quality Criteria – 1986 (EPA 440/5-86-001).

Therefore, Ecology does not intend to include human health-based limits on the reclaimed water released to the Chinook Bend wetland.

I. Sediment quality

The aquatic sediment standards (chapter 173-204 WAC) protect aquatic biota and human health. Under these standards Ecology may require a facility to evaluate the potential for its discharge to cause a violation of sediment standards (WAC 173-204-400). You can obtain additional information about sediments at the Aquatic Lands Cleanup Unit website. https://ecology.wa.gov/Spills-Cleanup/Contamination-cleanup/Sediment-cleanups.

Through a review of the discharger characteristics and of the reclaimed water characteristics, Ecology determined that releases of water from the Carnation WWTP to the Chinook Bend wetland or to the Snoqualmie River have no reasonable potential to violate the sediment management standards.

J. Whole effluent toxicity

The water quality standards for surface waters forbid discharge of effluent that has the potential to cause toxic effects in the receiving waters. Many toxic pollutants cannot be measured by commonly available detection methods. However, laboratory tests can measure toxicity directly by exposing living organisms to the wastewater and measuring their responses. These tests measure the aggregate toxicity of the whole effluent, so this approach is called whole effluent toxicity (WET) testing. Some WET tests measure acute toxicity and other WET tests measure chronic toxicity.

Using the screening criteria in chapter 173-205-040 WAC, Ecology determined that toxic effects caused by unidentified pollutants in the effluent are unlikely. Therefore, this permit does not require WET testing. Ecology may require WET testing in the future if it receives information indicating that toxicity may be present in this effluent.

K. Groundwater quality limits

The groundwater quality standards (chapter 173-200 WAC) protect beneficial uses of groundwater. Permits issued by Ecology must not allow violations of those standards (WAC 173-200-100). Reclaimed water released to the Chinook Bend wetland may infiltration into groundwater that is hydraulically connected to the Snoqualmie River. Therefore, no permit limits are required to protect groundwater.

L. Comparison of limits with the previous permit issued on December 13, 2013

The following provides a comparison of limits in the proposed permit to limits in the previous permit. Table 18 compares limits for reclaimed water released to the Chinook Bend wetland and table 19 compares limits for water released to the Snoqualmie River through outfall 001.

Table 18 Reclaimed water limits comparison

Parameter	Previous Reclaimed Water Limits			Proposed Reclaimed Water Limits		
	Average Monthly	**Average Weekly**	**Maximum Daily**	**Average Monthly**	**Average Weekly**	**Maximum Daily**
BOD_5	20 mg/L, 85% removal	30 mg/L	N/A	Parameter Removed and replaced with $CBOD_5$		
BOD_5 (Nov. – July)	80 lbs/day	120 lbs/day	N/A			
BOD_5 (Aug. – Oct.)	12 lbs/day	N/A	25 lbs/day			
$CBOD_5$	Parameter not previously used			25 mg/L, 85% removal	40 mg/L	N/A
$CBOD_5$ (Nov. – July)				100 lbs/day	160 lbs/day	N/A
$CBOD_5$ (Aug. – Oct.)				20.1 lbs/day	N/A	25 lbs/day
TSS	20 mg/L, 85% removal	30 mg/L,	N/A	30 mg/L, 85% removal	45 mg/L	N/A
TSS	80 lbs/day	120 lbs/day	N/A	120 lbs/day	180 lbs/day	N/A
Turbidity	0.2 NTU	N/A	0.5 NTU *	0.2 NTU	N/A	0.5 NTU *
Total Residual Chlorine	7 µg/L	N/A	18 µg/L	N/A	N/A	19 µg/L
Total Nitrogen	No limit specified			14.8 mg/L (as N)	22.2 mg/L (as N)	N/A
Ammonia (Aug. – Oct.)	4.4 lbs/day (as N)	N/A	8.4 lbs/day (as N)	4.1 lbs/day (as N)	N/A	8.4 lbs/day (as N)
	Minimum Daily		**Maximum Daily**	**Minimum Daily**		**Maximum Daily**
pH	6.0 standard units		9.0 standard units	6.0 standard units		9.0 standard units
Dissolved Oxygen	No limit specified			≥ 0.2 mg/L	N/A	N/A
		7-day Median	**Sample Maximum**		**7-day Median**	**Sample Maximum**
Total Coliform		2.2 cfu Per 100 ml	23 cfu Per 100 ml		2.2 cfu Per 100 ml	23 cfu Per 100 ml
* Maximum turbidity limit is expressed as “Instantaneous Maximum”.						
Annual Average Limits						
Annual Average limits not included in previous permit				Flow	0.321 MGD	
				$CBOD_5$	17 mg/L	
				TSS	20 mg/L	
				TKN (as N)	3 mg/L	
				Total Phosphorous (as P)	4.7 mg/L	

Table 19 Effluent limits for discharge to Snoqualmie River (outfall 001)

Parameter	Previous Reclaimed Water Limits			Proposed Reclaimed Water Limits		
	Average Monthly	**Average Weekly**	**Maximum Daily**	**Average Monthly**	**Average Weekly**	**Maximum Daily**
BOD_5	30 mg/L, 85% removal	45 mg/L	N/A	Parameter Removed and replaced with $CBOD_5$		
BOD_5 (Nov. – July)	120 lbs/day	180 lbs/day	N/A			
BOD_5 (Aug. – Oct.)	12 lbs/day	N/A	25 lbs/day			
$CBOD_5$	Parameter not previously used			25 mg/L, 85% removal	40 mg/L	N/A
$CBOD_5$ (Nov. – July)				100 lbs/day	160 lbs/day	N/A
$CBOD_5$ (Aug. – Oct.)				20.1 lbs/day	N/A	25 lbs/day
TSS	30 mg/L, 85% removal	45 mg/L	N/A	30 mg/L, 85% removal	45 mg/L	N/A
TSS	80 lbs/day	120 lbs/day	N/A	120 lbs/day	180 lbs/day	N/A
Total Residual Chlorine	354 µg/L	N/A	926 µg/L	N/A	N/A	741 µg/L
Ammonia (Aug. – Oct.)	4.4 lbs/day (as N)	N/A	8.4 lbs/day (as N)	4.1 lbs/day (as N)	N/A	8.4 lbs/day (as N)
Temperature	No limit specified			N/A	N/A	33° C
	Minimum Daily		**Maximum Daily**	**Minimum Daily**		**Maximum Daily**
pH	6.0 standard units		9.0 standard units	6.0 standard units		9.0 standard units
		Monthly Geometric Mean	**Weekly Geometric Mean**		**Monthly Geometric Mean**	**Weekly Geometric Mean**
Total Coliform		200 cfu Per 100 ml	400 cfu Per 100 ml		200 cfu Per 100 ml	400 cfu Per 100 ml

IV. Monitoring Requirements

Ecology requires monitoring, recording, and reporting (WAC 173-220-210 and 40 CFR 122.41) to verify that the treatment process is functioning correctly and that the discharge complies with the permit's effluent limits. In addition, Chapter 173-219-260 WAC authorizes Ecology to require monitoring, recording, and reporting in reclaimed water permits as reasonably necessary to verify that the production, distribution or storage of reclaimed water complies with the terms and conditions of the permit.

If a facility uses a contract laboratory to monitor wastewater, it must ensure that the laboratory uses the methods and meets or exceeds the method detection levels required by the permit. The permit describes when facilities may use alternative methods. It also describes what to do in certain situations when the laboratory encounters matrix effects. When a facility uses an alternative method as allowed by the permit, it must report the test method, detection level (DL), and quantitation level (QL) on the discharge monitoring report or in the required report.

A. Wastewater and reclaimed water monitoring

The monitoring schedule is detailed in the proposed permit under Special Condition S.2. Specified monitoring frequencies take into account the quantity and variability of the discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring. The required monitoring frequency is consistent with agency guidance given in the current version of Ecology's *Permit Writer's Manual* (Publication Number 92-109) for activated sludge treatment facilities with less than 2.0 MGD average design flow.

Monitoring of sludge quantity and quality is necessary to determine the appropriate uses of the sludge. Biosolids monitoring is required by the current state and local solid waste management program and also by EPA under 40 CFR 503.

Ecology requires POTWs with delegated pretreatment programs to monitor influent, effluent and sludge in order to establish or revise local limits and to determine if pollutants interfere with or pass through the treatment process. Although KC-WTD is a delegated pretreatment authority, the Carnation WWTP does not treat wastewater from any categorical industrial discharges. As such, Ecology does not consider monitoring of influent and sludge for the purpose of local limit development necessary. Future permits may require influent and sludge monitoring if the Carnation facility begins treating wastewater from categorical industries.

The proposed permit also requires KC-WTD to monitor priority pollutant metals on at least an annual basis. Although federal regulations do not require metals testing for facilities the size of the Carnation WWTP, Ecology believes testing is prudent in order to evaluate the potential impacts to the Chinook Bend Wetland of metals in the reclaimed water.

B. Lab accreditation

Ecology requires that facilities use a laboratory registered or accredited under the provisions of chapter 173-50 WAC, Accreditation of Environmental Laboratories, to prepare all monitoring data (with the exception of certain parameters). KC-WTD uses the accredited lab at their South WWTP for most compliance monitoring. Ecology accredited the laboratory at the South WWTP (Accreditation #R687) for most general chemistry and microbiology parameters in non-potable water. The South WWTP lab is also accredited for some general chemistry parameters in solid and chemical materials. KC-WTD also maintains accreditation for the lab at the Carnation WWTP (#R927) for the following parameters: total chlorine residual, pH, total coliform, and fecal coliform. Priority pollutant testing is conducted by King County's Environmental Lab (#G656). Complete lists of accredited parameters and methods

for both labs are available through Ecology's searchable Lab Accreditation database at the following web addresses.

Carnation WWTP:
https://apps.ecology.wa.gov/laboratorysearch/SearchLabName.aspx?CompanyID=927

South WWTP: https://
apps.ecology.wa.gov/ecy/laboratorysearch/SearchLabName.aspx?CompanyID=687

King County Environmental Lab: https://
apps.ecology.wa.gov/ecy/laboratorysearch/SearchLabName.aspx?CompanyID=656

V. Other Permit Conditions

A. Reporting and recordkeeping

Ecology based Special Condition S3 on its authority to specify appropriate reporting and recordkeeping requirements. Requirements in S3 are based on Ecology's authority to prevent and control waste discharges (WAC 173-220-210). The requirements are also necessary to verify that the production, distribution and storage of reclaimed water complies the terms and conditions WAC 173-219 and the reclaimed water permit.

B. Prevention of facility overloading

Overloading of the treatment plant is a violation of the terms and conditions of the permit. To prevent this from occurring, RCW 90.48.110 and WAC 173-220-150 require KC-WTD to:

- Take the actions detailed in proposed permit Special Condition S.4.
- Design and construct expansions or modifications before the treatment plant reaches existing capacity.
- Report and correct conditions that could result in new or increased discharges of pollutants.

In addition, chapter 173-219-240 states that "where design criteria have been established, the generator must not allow flows or waste loadings to exceed approved design criteria". Ecology includes design criteria for the reclaimed water treatment system as enforceable conditions in the permit to ensure KC-WTD operates the permitted facility within the approved design capacity. Special Condition S.4 restricts the amount of flow or waste loading that may enter the plant. Compliance with Special Condition S.4 of the proposed permit will ensure compliance with comparable reclaimed water requirements.

C. Operation and maintenance

The proposed permit contains Special Condition S.5 as authorized under RCW 90.48.110, WAC 173-220-150, WAC 173-230, and WAC 173-240-080. Ecology included it to ensure proper operation and regular maintenance of equipment, and to ensure that KC-WTD takes

adequate safeguards so that it uses constructed facilities to their optimum potential in terms of pollutant capture and treatment.

Ecology also requires the owner and operator of reclaimed water facilities to take all reasonable steps to properly operate and maintain their reclaimed water system in accordance with state regulations (WAC 173-219-240). They must ensure that ensure that facility operators use operation and maintenance (O&M) manuals that include detailed instructions for operating and maintaining all components of the reclaimed water production and distribution system under its control.

Ecology approved an O&M manual for the Carnation WWTP and reclaimed water system in 2009. The proposed permit requires KC-WTD to periodically review the O&M manual to ensure the contents are up to date and consistent with applicable regulations. If significant changes are made, they must to submit the updates to Ecology for review and approval.

D. Pretreatment

Duty to enforce discharge prohibitions

This provision prohibits the publicly owned treatment works (POTW) from authorizing or permitting an industrial discharger to discharge certain types of waste into the sanitary sewer.

- The first section of the pretreatment requirements prohibits the POTW from accepting pollutants which causes "pass-through" or "interference". This general prohibition is from 40 CFR §403.5(a). **Appendix C** of this fact sheet defines these terms.
- The second section reinforces a number of specific state and federal pretreatment prohibitions found in WAC 173-216-060 and 40 CFR §403.5(b). These reinforce that the POTW may not accept certain wastes, which:
    a. Are prohibited due to dangerous waste rules.
    b. Are explosive or flammable.
    c. Have too high or low of a pH (too corrosive, acidic or basic).
    d. May cause a blockage such as grease, sand, rocks, or viscous materials.
    e. Are hot enough to cause a problem.
    f. Are of sufficient strength or volume to interfere with treatment.
    g. Contain too much petroleum-based oils, mineral oil, or cutting fluid.
    h. Create noxious or toxic gases at any point.

40 CFR Part 403 contains the regulatory basis for these prohibitions, with the exception of the pH provisions which are based on WAC 173-216-060.

- The third section of pretreatment conditions reflects state prohibitions on the POTW accepting certain types of discharges unless the discharge has received prior written authorization from Ecology. These discharges include:

a. Cooling water in significant volumes.

b. Stormwater and other direct inflow sources.

c. Wastewaters significantly affecting system hydraulic loading, which do not require treatment.

Ecology delegated authority to King County for permitting, monitoring, and enforcement over industrial users discharging to their treatment system to provide more direct and effective control of pollutants. Ecology oversees the delegated Industrial Pretreatment Program to assure compliance with federal pretreatment regulations (40 CFR Part 403) and categorical standards and state regulations (chapter 90.48 RCW and chapter 173-216 WAC).

As sufficient data becomes available, King County must, in consultation with Ecology, reevaluate its local limits in order to prevent pass-through or interference. If any pollutant causes pass-through or interference, or exceeds established sludge standards, King County must establish new local limits or revise existing local limits as required by 40 CFR 403.5. In addition, Ecology may require revision or establishment of local limits for any pollutant that causes a violation of water quality standards or established effluent limits, adversely impact authorized reclaimed water use, or that causes whole effluent toxicity.

Ecology may modify this permit to incorporate additional requirements relating to the establishment and enforcement of local limits for pollutants of concern.

E. Reclaimed water distribution and use

Reclaimed water condition R1 includes requirements governing the distribution and use of reclaimed water from the permitted facility. Ecology based these permit requirements on the following sections of the Reclaimed Water Rule:

- WAC 173-219-270 – Reclaimed water permit terms and conditions.
- WAC 173-219-290 – Use agreements.
- WAC 173-219-310 – Cross-connection control.
- WAC 173-219-360 – Storage and distribution system requirements.

This condition specifies the beneficial uses authorized by the permit and the areas in which reclaimed water from the permitted facility may be used. It also provides a mechanism for KC-WTD to expand the use of reclaimed water to areas not listed in the permit without modifying the permit.

The condition also specifies that KC-WTD may not allow the distribution or use of reclaimed water from the permitted facility unless it has signed enforceable use or distribution agreements with each user or distributor. The agreements must include specific conditions on the use and distribution of the water that are included in the proposed permit.

The reclaimed water rule requires reclaimed water distributors to develop and implement a cross-connection control program designed to protect the reclaimed water produced at the

permitted facility from contamination with lower quality water. The rule also requires coordination with local water purveyors to ensure properties supplied with both reclaimed water and potable water have appropriate cross-connection controls in place to protect the potable water supply. Ecology determined that these requirements do not apply to the proposed permit since the reclaimed water flows through a dedicated pipeline that is under the exclusive control of the generator and there is no potential for cross connections to the pipeline between the treatment plant and the point of use. Ecology will reassess this determination if KC-WTD proposes connecting other reclaimed water use locations in the future.

F. Solid wastes

To prevent water quality problems, the facility is required in permit Special Condition S7 to store and handle all residual solids (grit, screenings, scum, sludge, and other solid waste) in accordance with the requirements of RCW 90.48.080 and state water quality standards.

The final use and disposal of sewage sludge from this facility is regulated by U.S. EPA under 40 CFR 503, and by Ecology under chapter 70.95J RCW, chapter 173-308 WAC "Biosolids Management," and chapter 173-350 WAC "Solid Waste Handling Standards." The disposal of other solid waste is under the jurisdiction of the department of Public Health of Seattle and King County.

Requirements for monitoring sewage sludge and record keeping are included in this permit. Ecology will use this information, required under 40 CFR 503, to develop or update local limits.

G. Outfall evaluation

KC-WTD last inspected the outfall to the Snoqualmie River in May 2013. Ecology generally requires outfall inspections on a 10-year frequency, unless the outfall is located in an area that makes it susceptible to damage. The proposed permit requires KC-WTD to repeat the outfall inspection by the end of 2023 and to submit a report detailing the findings of that inspection (Special Condition S.8). The inspection must evaluate the physical condition of the discharge pipe and diffuser, and evaluate the extent of sediment accumulations in the vicinity of the outfall.

H. Wetland Water Quality Study

As was discussed in section III.B of this fact sheet (Reclaimed Water Performance Standards), historical data shows that the Carnation WWTP does comply with the total phosphorous performance limit of 1 mg/L (as P). It also may not routinely comply with reclaimed water nitrogen limits of 10 mg/L (as N) on a monthly average or 15 mg/L (as N) on a weekly average. Ecology has used provisions in WAC 173-219-390 to allow the release of reclaimed water that does not meet the performance standards when doing so provides a net environmental benefit. To support KC-WTD's ongoing claim of net environmental benefit, Ecology has included reclaimed water condition R2 in the propose permit to require a detailed water quality

assessment of the Chinook Bend Wetland. General goals of the study include assessing the overall impact continuous release of Class A reclaimed water has on water quality in the wetland and in the adjacent Snoqualmie River. The permit includes the following specific objectives:

- Establishing site-specific nutrient (nitrogen and phosphorous) assimilation capacity of the wetland.
- Evaluate the impacts of long-term phosphorous loading in excess of the 1 mg/L performance standard.
- To the extent practical, evaluate changes in wetland water quality compared to conditions established through sampling conducted in 2006 and presented in Appendix B of *Amendment 1 to the Wastewater Facilities Plan for the Carnation Wastewater Treatment Facility*.
- Evaluate ambient conditions of the Snoqualmie River, both upstream and downstream of the Chinook Bend Wetland area, to assess whether there are detectable changes in the river's water quality downstream of the wetland site.

I. General conditions

Ecology bases the standardized General Conditions on state and federal law and regulations. They are included in all individual domestic wastewater NPDES permits and reclaimed water permits issued by Ecology.

VI. Permit Issuance Procedures

A. Permit modifications

Ecology may modify this permit to impose numerical limits, if necessary to comply with water quality standards for surface water, with sediment quality standards, with reclaimed water performance standards or with water quality standards for groundwaters, based on new information from sources such as inspections, effluent monitoring, or groundwater studies.

Ecology may also modify this permit to comply with new or amended state or federal regulations.

B. Proposed permit issuance

This proposed permit meets all statutory requirements for Ecology to authorize a wastewater discharge to waters of the state and to authorize the beneficial use of reclaimed water. The permit includes limits and conditions necessary to protect public health, aquatic life, and the designated uses of waters of the state of Washington. The permit also implements applicable state laws and regulations governing the production, distribution, and use of reclaimed water. Ecology proposes to issue this permit for a term of 5 years.

VII. References for Text and Appendices

Environmental Protection Agency (EPA)

1992. National Toxics Rule. Federal Register, V. 57, No. 246, Tuesday, December 22, 1992.

1991. *Technical Support Document for Water Quality-based Toxics Control*. EPA/505/2-90-001.

1988. *Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling*. USEPA Office of Water, Washington, D.C.

1985. *Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water*. EPA/600/6-85/002a.

1983. *Water Quality Standards Handbook*. USEPA Office of Water, Washington, D.C.

1999. *Manual: Constructed Wetlands Treatment of Municipal Wastewaters.* EPA/625/R-99/010.

2000. *Guiding Principles for Constructed Treatment Wetlands.* EPA/843/B-00/003.

Kadlec, Robert H., and Knight, Robert L.

1996. *Treatment Wetlands*. CRC Press LLC. ISBN-0-87371-930-1

King County Department of Natural Resources and Parks

May 2003. *Technical Memorandum No.12: Carnation Outfall.*

June 2003. *Chinook Bend Natural Area Site Management Guidelines.*

April 2005. *Tolt and Snoqualmie Rivers 2003-2004 Monitoring Results.*

October 2005. *Wastewater Facilities Plan for the Carnation Wastewater Treatment Facility*. Prepared by Carollo Engineers.

August 2007. *Chinook Bend Natural Area Wetland Enhancement Plan.* Prepared by Ducks Unlimited, Inc., and King County

April 2007. *Amendment 1 to the Wastewater Facilities Plan for the Carnation Wastewater Treatment Facility*. Prepared by Carollo Engineers.

April 2007. *Carnation Wastewater Treatment Facility: Reclaimed Water – Water Rights Impairment Analysis*.

December 2015. *Carnation Reclaimed Water Project Net Environmental Benefits Report.*

Tsivoglou, E.C., and J.R. Wallace.

1972. *Characterization of Stream Reaeration Capacity*. EPA-R3-72-012. (Cited in EPA 1985 op.cit.)

Washington State Department of Ecology.

May 1994. *Snoqualmie River Total Maximum Daily Load Study.* Publication Number 94-71.

June 2011. *Snoqualmie River Basin Temperature Total Maximum Daily Load: Water Quality Improvement Report and Implementation Plan.* Publication Number 11-10-041.

July 2018. *Permit Writer's Manual*. Publication Number 92-109 (https://apps.ecology.wa.gov/publications/documents/92109.pdf)

September 2011. *Water Quality Program Guidance Manual – Supplemental Guidance on Implementing Tier II Antidegradation*. Publication Number 11-10-073 (https://apps.ecology.wa.gov/publications/documents/1110073.pdf)

October 2010 (revised). *Water Quality Program Guidance Manual – Procedures to Implement the State's Temperature Standards through NPDES Permits*. Publication Number 06-10-100 (https://apps.ecology.wa.gov/publications/documents/0610100.pdf)

February 2019. *Reclaimed Water Facilities Manual: The Purple Book.* Publication Number 15-10-024. (https://apps.ecology.wa.gov/publications/documents/1510024.pdf)

Laws and Regulations (http://leg.wa.gov/LawsAndAgencyRules/Pages/default.aspx)

Permit and Wastewater Related Information

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Water-quality-permits-guidance

Water Pollution Control Federation.

1976. *Chlorination of Wastewater*.

Wright, R.M., and A.J. McDonnell.

1979. *In-stream Deoxygenation Rate Prediction*. Journal Environmental Engineering Division, ASCE. 105(EE2). (Cited in EPA 1985 op.cit.)

Appendix A – Public Involvement Information

Ecology proposes to reissue a permit to the King County – Carnation Wastewater Treatment Plant. The permit includes wastewater discharge limits, reclaimed water limits and other conditions. This fact sheet describes the facility and Ecology's reasons for requiring permit conditions.

Ecology placed a Public Notice of Application on May 4, 2018 and May 11, 2018 in the Snoqualmie Valley Record to inform the public about the submitted application and to invite comment on the reissuance of this permit.

Ecology placed a Public Notice of Draft on June 11, 2021 in the Snoqualmie Valley Record to inform the public and to invite comment on the proposed draft National Pollutant Discharge Elimination System permit and fact sheet.

The notice:

- Tells where copies of the draft permit and fact sheet are available for public evaluation (a local public library, the closest regional or field office, posted on our website).
- Offers to provide the documents in an alternate format to accommodate special needs.
- Asks people to tell us how well the proposed permit would protect the receiving water.
- Invites people to suggest fairer conditions, limits, and requirements for the permit.
- Invites comments on Ecology's determination of compliance with antidegradation rules.
- Urges people to submit their comments, in writing, before the end of the comment period.
- Tells how to request a public hearing about the proposed NPDES permit.
- Explains the next step(s) in the permitting process.

Ecology has published a document entitled *Frequently Asked Questions about Effective Public Commenting,* which is available on our website at https://apps.ecology.wa.gov/publications/documents/0307023.pdf.

You may obtain further information from Ecology by telephone, 206-594-0167 or by writing to the address listed below.

Water Quality Permit Coordinator
Department of Ecology
Northwest Regional Office
PO Box 330316
Shoreline, WA 98133-9716

The primary author of this permit and fact sheet is Shawn McKone, PE.

Appendix B – Your Right to Appeal

You have a right to appeal this permit to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of the final permit. The appeal process is governed by chapter 43.21B RCW and chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2) (see glossary).

To appeal you must do the following within 30 days of the date of receipt of this permit:

- File your appeal and a copy of this permit with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.
- Serve a copy of your appeal and this permit on Ecology in paper form - by mail or in person. (See addresses below.) E-mail is not accepted.

You must also comply with other applicable requirements in chapter 43.21B RCW and chapter 371-08 WAC.

ADDRESS AND LOCATION INFORMATION

Street Addresses	Mailing Addresses
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive SE Lacey, WA 98503	**Department of Ecology** Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608
Pollution Control Hearings Board 1111 Israel RD SW STE 301 Tumwater, WA 98501	**Pollution Control Hearings Board** PO Box 40903 Olympia, WA 98504-0903

Appendix C – Glossary

1-DMax or 1-day maximum temperature -- The highest water temperature reached on any given day. This measure can be obtained using calibrated maximum/minimum thermometers or continuous monitoring probes having sampling intervals of thirty minutes or less.

7-DADMax or 7-day average of the daily maximum temperatures -- The arithmetic average of seven consecutive measures of daily maximum temperatures. The 7-DADMax for any individual day is calculated by averaging that day's daily maximum temperature with the daily maximum temperatures of the three days prior and the three days after that date.

Acute toxicity --The lethal effect of a compound on an organism that occurs in a short time period, usually 48 to 96 hours.

AKART -- The acronym for "all known, available, and reasonable methods of prevention, control and treatment." AKART is a technology-based approach to limiting pollutants from wastewater discharges, which requires an engineering judgment and an economic judgment. AKART must be applied to all wastes and contaminants prior to entry into waters of the state in accordance with RCW 90.48.010 and 520, WAC 173-200-030(2)(c)(ii), and WAC 173-216-110(1)(a).

Alternate point of compliance -- An alternative location in the groundwater from the point of compliance where compliance with the groundwater standards is measured. It may be established in the groundwater at locations some distance from the discharge source, up to, but not exceeding the property boundary and is determined on a site specific basis following an AKART analysis. An "early warning value" must be used when an alternate point is established. An alternate point of compliance must be determined and approved in accordance with WAC 173-200-060(2).

Ambient water quality -- The existing environmental condition of the water in a receiving water body.

Ammonia -- Ammonia is produced by the breakdown of nitrogenous materials in wastewater. Ammonia is toxic to aquatic organisms, exerts an oxygen demand, and contributes to eutrophication. It also increases the amount of chlorine needed to disinfect wastewater.

Annual average design flow (AADF) -- average of the daily flow volumes anticipated to occur over a calendar year.

Average monthly (intermittent) discharge limit-- The average of the measured values obtained over a calendar month's time taking into account zero discharge days.

Average monthly discharge limit -- The average of the measured values obtained over a calendar month's time.

Background water quality -- The concentrations of chemical, physical, biological or radiological constituents or other characteristics in or of groundwater at a particular point in time upgradient of an activity that has not been affected by that activity, [WAC 173-200-020(3)]. Background water quality for any parameter is statistically defined as the 95% upper

tolerance interval with a 95% confidence based on at least eight hydraulically upgradient water quality samples. The eight samples are collected over a period of at least one year, with no more than one sample collected during any month in a single calendar year.

Best management practices (BMPs) -- Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the state. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

BOD5 -- Determining the five-day Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD5 is used in modeling to measure the reduction of dissolved oxygen in receiving waters after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD_5 is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

Bypass -- The intentional diversion of waste streams from any portion of a treatment facility.

Categorical pretreatment standards -- National pretreatment standards specifying quantities or concentrations of pollutants or pollutant properties, which may be discharged to a POTW by existing or new industrial users in specific industrial subcategories.

Chlorine -- A chemical used to disinfect wastewaters of pathogens harmful to human health. It is also extremely toxic to aquatic life.

Chronic toxicity -- The effect of a compound on an organism over a relatively long time, often 1/10 of an organism's lifespan or more. Chronic toxicity can measure survival, reproduction or growth rates, or other parameters to measure the toxic effects of a compound or combination of compounds.

Clean water act (CWA) -- The federal Water Pollution Control Act enacted by Public Law 92-500, as amended by Public Laws 95-217, 95-576, 96-483, 97-117; USC 1251 et seq.

Compliance inspection-without sampling -- A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations.

Compliance inspection-with sampling -- A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations. In addition, it includes as a minimum, sampling and analysis for all parameters with limits in the permit to ascertain compliance with those limits; and, for municipal facilities, sampling of influent to ascertain compliance with the 85 percent removal requirement. Ecology may conduct additional sampling.

Composite sample -- A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing discrete samples. May be

"time-composite" (collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots).

Construction activity -- Clearing, grading, excavation, and any other activity, which disturbs the surface of the land. Such activities may include road building; construction of residential houses, office buildings, or industrial buildings; and demolition activity.

Continuous monitoring -- Uninterrupted, unless otherwise noted in the permit.

Critical condition -- The time during which the combination of receiving water and waste discharge conditions have the highest potential for causing toxicity in the receiving water environment. This situation usually occurs when the flow within a water body is low, thus, its ability to dilute effluent is reduced.

Date of receipt – This is defined in RCW 43.21B.001(2) as five business days after the date of mailing; or the date of actual receipt, when the actual receipt date can be proven by a preponderance of the evidence. The recipient's sworn affidavit or declaration indicating the date of receipt, which is unchallenged by the agency, constitutes sufficient evidence of actual receipt. The date of actual receipt, however, may not exceed forty-five days from the date of mailing.

Detection limit -- The minimum concentration of a substance that can be measured and reported with 99 percent confidence that the pollutant concentration is above zero and is determined from analysis of a sample in a given matrix containing the pollutant.

Dilution factor (DF) -- A measure of the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. Expressed as the inverse of the percent effluent fraction, for example, a dilution factor of 10 means the effluent comprises 10% by volume and the receiving water 90%.

Distribution uniformity -- The uniformity of infiltration (or application in the case of sprinkle or trickle irrigation) throughout the field expressed as a percent relating to the average depth infiltrated in the lowest one-quarter of the area to the average depth of water infiltrated.

Early warning value -- The concentration of a pollutant set in accordance with WAC 173-200-070 that is a percentage of an enforcement limit. It may be established in the effluent, groundwater, surface water, the vadose zone or within the treatment process. This value acts as a trigger to detect and respond to increasing contaminant concentrations prior to the degradation of a beneficial use.

Enforcement limit -- The concentration assigned to a contaminant in the groundwater at the point of compliance for the purpose of regulation, [WAC 173-200-020(11)]. This limit assures that a groundwater criterion will not be exceeded and that background water quality will be protected.

Engineering report -- A document that thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report must contain the appropriate information required in WAC 173-240-060 or 173-240-130.

E. coli – A bacterium in the family Enterobacteriaceae named Escherichia coli and is a common inhabitant of the intestinal tract of warm-blooded animals, and its presence in water samples is an indication of fecal pollution and the possible presence of enteric pathogens.

Fecal coliform bacteria -- Fecal coliform bacteria are used as indicators of pathogenic bacteria in the effluent that are harmful to humans. Pathogenic bacteria in wastewater discharges are controlled by disinfecting the wastewater. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater and/or the presence of animal feces.

Grab sample -- A single sample or measurement taken at a specific time or over as short a period of time as is feasible.

Groundwater -- Water in a saturated zone or stratum beneath the surface of land or below a surface water body.

Industrial user -- A discharger of wastewater to the sanitary sewer that is not sanitary wastewater or is not equivalent to sanitary wastewater in character.

Industrial wastewater -- Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business; from the development of any natural resource; or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated stormwater and, also, leachate from solid waste facilities.

Interference -- A discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

- Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and

- Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to subtitle D of the SWDA), sludge regulations appearing in 40 CFR Part 507, the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act.

Local limits -- Specific prohibitions or limits on pollutants or pollutant parameters developed by a POTW.

Major facility -- A facility discharging to surface water with an EPA rating score of > 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Maximum daily discharge limit -- The highest allowable daily discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. The daily discharge is calculated as the average measurement of the pollutant over the day.

Maximum day design flow (MDDF) -- The largest volume of flow anticipated to occur during a one-day period, expressed as a daily average.

Maximum month design flow (MMDF) -- The largest volume of flow anticipated to occur during a continuous 30-day period, expressed as a daily average.

Maximum week design flow (MWDF) -- The largest volume of flow anticipated to occur during a continuous 7-day period, expressed as a daily average.

Method detection level (MDL) -- See Detection Limit.

Minor facility -- A facility discharging to surface water with an EPA rating score of < 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Mixing zone -- An area that surrounds an effluent discharge within which water quality criteria may be exceeded. The permit specifies the area of the authorized mixing zone that Ecology defines following procedures outlined in state regulations (chapter 173-201A WAC).

National pollutant discharge elimination system (NPDES) -- The NPDES (Section 402 of the Clean Water Act) is the federal wastewater permitting system for discharges to navigable waters of the United States. Many states, including the state of Washington, have been delegated the authority to issue these permits. NPDES permits issued by Washington State permit writers are joint NPDES/State permits issued under both state and federal laws.

pH -- The pH of a liquid measures its acidity or alkalinity. It is the negative logarithm of the hydrogen ion concentration. A pH of 7 is defined as neutral and large variations above or below this value are considered harmful to most aquatic life.

Pass-through -- A discharge which exits the POTW into waters of the State in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation), or which is a cause of a violation of State water quality standards.

Peak hour design flow (PHDF) -- The largest volume of flow anticipated to occur during a one-hour period, expressed as a daily or hourly average.

Peak instantaneous design flow (PIDF) -- The maximum anticipated instantaneous flow.

Point of compliance -- The location in the groundwater where the enforcement limit must not be exceeded and a facility must comply with the Ground Water Quality Standards. Ecology determines this limit on a site-specific basis. Ecology locates the point of compliance in the

groundwater as near and directly downgradient from the pollutant source as technically, hydrogeologically, and geographically feasible, unless it approves an alternative point of compliance.

Potential significant industrial user (PSIU) --A potential significant industrial user is defined as an Industrial User that does not meet the criteria for a Significant Industrial User, but which discharges wastewater meeting one or more of the following criteria:

a. Exceeds 0.5 % of treatment plant design capacity criteria and discharges <25,000 gallons per day or;

b. Is a member of a group of similar industrial users which, taken together, have the potential to cause pass through or interference at the POTW (e.g. facilities which develop photographic film or paper, and car washes).
Ecology may determine that a discharger initially classified as a potential significant industrial user should be managed as a significant industrial user.

Quantitation level (QL) -- Also known as Minimum Level of Quantitation (ML) – The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration standard, assuming that the lab has used all method-specified sample weights, volumes, and cleanup procedures. The QL is calculated by multiplying the MDL by 3.18 and rounding the result to the number nearest to (1, 2, or 5) x 10^n, where n is an integer. (64 FR 30417).
ALSO GIVEN AS:
The smallest detectable concentration of analyte greater than the Detection Limit (DL) where the accuracy (precision & bias) achieves the objectives of the intended purpose. (Report of the Federal Advisory Committee on Detection and Quantitation Approaches and Uses in Clean Water Act Programs Submitted to the US Environmental Protection Agency December 2007).

Reasonable potential -- A reasonable potential to cause a water quality violation, or loss of sensitive and/or important habitat.

Responsible corporate officer -- A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or have gross annual sales or expenditures exceeding $25 million (in second quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures (40 CFR 122.22).

Sample Maximum -- No sample may exceed this value.

Significant industrial user (SIU) --

1) All industrial users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N and;

2) Any other industrial user that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling, and boiler blow-down wastewater); contributes a process wastestream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority* on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement [in accordance with 40 CFR 403.8(f)(6)].

Upon finding that the industrial user meeting the criteria in paragraph 2, above, has no reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement, the Control Authority* may at any time, on its own initiative or in response to a petition received from an industrial user or POTW, and in accordance with 40 CFR 403.8(f)(6), determine that such industrial user is not a significant industrial user.

*The term "Control Authority" refers to the Washington State Department of Ecology in the case of non-delegated POTWs or to the POTW in the case of delegated POTWs.

Slug discharge -- Any discharge of a non-routine, episodic nature, including but not limited to an accidental spill or a non-customary batch discharge to the POTW. This may include any pollutant released at a flow rate that may cause interference or pass through with the POTW or in any way violate the permit conditions or the POTW's regulations and local limits.

Soil scientist -- An individual who is registered as a Certified or Registered Professional Soil Scientist or as a Certified Professional Soil Specialist by the American Registry of Certified Professionals in Agronomy, Crops, and Soils or by the National Society of Consulting Scientists or who has the credentials for membership. Minimum requirements for eligibility are: possession of a baccalaureate, masters, or doctorate degree from a U.S. or Canadian institution with a minimum of 30 semester hours or 45 quarter hours professional core courses in agronomy, crops or soils, and have 5, 3, or 1 years, respectively, of professional experience working in the area of agronomy, crops, or soils.

Solid waste -- All putrescible and non-putrescible solid and semisolid wastes including, but not limited to, garbage, rubbish, ashes, industrial wastes, swill, sewage sludge, demolition and construction wastes, abandoned vehicles or parts thereof, contaminated soils and contaminated dredged material, and recyclable materials.

Soluble BOD_5 -- Determining the soluble fraction of Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of soluble organic material present in an effluent that is utilized by bacteria. Although the soluble BOD_5 test is not specifically described in Standard Methods, filtering the raw sample through at least a 1.2 um filter prior to running the standard BOD_5 test is sufficient to remove the particulate organic fraction.

State waters -- Lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses within the jurisdiction of the state of Washington.

Stormwater -- That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a stormwater drainage system into a defined surface water body, or a constructed infiltration facility.

Technology-based effluent limit -- A permit limit based on the ability of a treatment method to reduce the pollutant.

Total coliform bacteria -- A microbiological test, which detects and enumerates the total coliform group of bacteria in water samples.

Total dissolved solids--That portion of total solids in water or wastewater that passes through a specific filter.

Total maximum daily load (TMDL) --A determination of the amount of pollutant that a water body can receive and still meet water quality standards.

Total suspended solids (TSS) -- Total suspended solids is the particulate material in an effluent. Large quantities of TSS discharged to a receiving water may result in solids accumulation. Apart from any toxic effects attributable to substances leached out by water, suspended solids may kill fish, shellfish, and other aquatic organisms by causing abrasive injuries and by clogging the gills and respiratory passages of various aquatic fauna. Indirectly, suspended solids can screen out light and can promote and maintain the development of noxious conditions through oxygen depletion.

Upset -- An exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, lack of preventative maintenance, or careless or improper operation.

Water quality-based effluent limit -- A limit imposed on the concentration of an effluent parameter to prevent the concentration of that parameter from exceeding its water quality criterion after discharge into receiving waters.

The following terms apply to the discussions in this fact sheet related to reclaimed water.

Beneficial use -- the uses of reclaimed water for domestic, stock watering, industrial, commercial, agricultural, irrigation, hydroelectric power production, mining, fish and wildlife maintenance and enhancement, recreational, and thermal power production purposes, and for preservation of environmental and aesthetic values, and for all other uses compatible with the enjoyment of the waters of the state. Beneficial use of reclaimed water includes all uses authorized under chapter 90.46 RCW, and contained within WAC 173-219-390.

Chlorine -- A chemical used to disinfect wastewaters of pathogens harmful to human health. It is also extremely toxic to aquatic life.

Chlorine, free -- the amount of chlorine available in a water sample as dissolved gas (Cl_2), hypochlorous acid (HOCl), or hypochlorite ion (ClO^-).

Chlorine, total -- the sum of free chlorine and combined chloramines (compounds of organic or inorganic nitrogen and chlorine).

Class A reclaimed water -- a high-quality water resource derived from treated domestic wastewater that is suitable for use in areas with unlimited public access. The water must meet or exceed the minimum Class A performance standards in WAC 173-219-330 including, at a minimum, oxidation, coagulation, filtration, and disinfection.

Class B reclaimed water -- a high-quality water resource derived from treated domestic wastewater that is suitable for regulated use in areas with restricted public access. The water must meet or exceed the minimum Class B performance standards in WAC 173-219-330 including, at a minimum, oxidation, and disinfection.

Cross-connection Control -- The practice of using approved devices and management strategies designed to eliminate or prevent the potential for contaminating high-quality waters with lower quality waters.

Distributor -- the person authorized through a use agreement with a reclaimed water generator to distribute or supply reclaimed water to users. A distributor may also be a generator or a user. Users that distribute reclaimed water to use areas through a gravity conveyance system for agricultural water uses are not distributors.

Domestic wastewater -- wastewater predominantly from residential sources that includes greywater, toilet, or urinal sources. Also includes wastewater generated by commercial, institutional and light industrial entities including restaurants, office complexes, schools, and hospitals. It may include process wastewaters from industrial sources when allowed under federal pretreatment regulations.

Greywater -- domestic type wastewater flows from bathtubs, showers, bathroom sinks, washing machines, dishwashers, and kitchen or utility sinks. It does not include wastewater from a toilet or urinal.

Generator -- any person that generates any type of reclaimed water for a use regulated under RCW 90.46 and WAC 173-219. A generator may also be a distributor or a user.

Nonpotable -- water that is not approved by state or local health authorities as being safe for human consumption.

Potable water or drinking water -- water that is approved under WAC 246-290 or WAC 246-291 as being safe for human consumption.

Reclaimed water -- water derived in any part from a wastewater with a domestic wastewater component that has been adequately and reliably treated to meet the requirements of WAC 173-219, so that it can be used for beneficial purposes. Reclaimed water is not considered a wastewater.

Source water -- Water entering the reclaimed water treatment facility or unit processes from which Class A or Class B reclaimed water is generated. Source water generally refers to the

effluent from a domestic wastewater treatment facility that meets or exceeds secondary treatment standards defined in WAC 173-221.

Use -- application of reclaimed water in a manner and for a purpose, as designated in a permit or use agreement, and in compliance with all applicable requirements of the permit and WAC 173-219.

Use agreement -- an agreement or contract between the generator and the distributor or user, or between the distributor and user, that identifies terms and conditions for reclaimed water distribution and use to ensure compliance with the reclaimed water permit conditions.

Use area -- any facility, building, or land area, surface water, or groundwater identified in the use agreement as the location where reclaimed water is beneficially used.

User -- any person who uses reclaimed water under an agreement with a reclaimed water generator or distributor.

Appendix D – Monitoring Data Summary

The following appendix contains monitoring data reported by the Carnation WWTP on monthly Discharge Monitoring Reports for the period between January 2014 and December 2019.

Reclaimed Water Monitoring Data, 2014-2019

Facility: King County - Carnation WWTP
Permit No: WA0032182

	Influent									
Date	Flow, MGD	Flow, MGD	BOD, mg/L	BOD, mg/L	BOD, ppd	BOD, ppd	TSS, mg/L	TSS, mg/L	TSS, ppd	TSS, ppd
	Monthly Average	Monthly Maximum	Monthly Average	Monthly Maximum	Monthly Average	Monthly Maximum	Monthly Average	Monthly Maximum	Monthly Average	Monthly Maximum
January-14	0.094	0.104	313	368	245	298	264	328	207	241
February-14	0.092	0.105	301	395	237	310	230	284	189	243
March-14	0.095	0.113	337	443	259	347	239	286	183	224
April-14	0.090	0.101	352	441	259	324	287	438	212	321
May-14	0.090	0.103	327	410	245	294	264	324	209	278
June-14	0.091	0.102	315	348	232	258	266	302	198	239
July-14	0.097	0.121	305	386	239	315	235	316	186	258
August-14	0.092	0.102	320	423	237	318	250	316	186	229
September-14	0.095	0.115	296	374	233	359	234	274	184	253
October-14	0.094	0.108	309	389	238	306	254	328	196	263
November-14	0.096	0.112	297	391	227	290	247	318	189	231
December-14	0.091	0.124	328	397	249	411	242	288	184	244
January-15	0.093	0.108	304	353	233	271	252	308	197	267
February-15	0.091	0.106	311	392	227	288	241	298	177	234
March-15	0.093	0.117	312	368	233	275	260	322	194	231
April-15	0.091	0.111	323	482	232	318	262	300	200	238
May-15	0.091	0.107	317	365	234	273	281	322	209	234
June-15	0.091	0.108	317	367	232	272	277	310	203	238
July-15	0.092	0.105	290	360	222	276	254	292	191	214
August-15	0.091	0.107	306	354	224	260	264	296	192	212
September-15	0.094	0.110	317	365	239	285	266	284	205	227
October-15	0.092	0.111	338	423	247	303	293	330	214	245
November-15	0.096	0.111	353	439	269	344	282	300	214	233
December-15	0.097	0.110	316	390	255	305	268	300	218	291
January-16	0.095	0.109	344	389	263	311	276	376	210	285
February-16	0.094	0.125	311	441	236	335	249	312	189	232
March-16	0.096	0.117	327	489	259	371	257	306	205	242
April-16	0.095	0.127	337	417	263	305	294	418	234	443
May-16	0.099	0.128	307	387	243	307	260	386	210	332
June-16	0.097	0.111	331	385	266	335	290	330	231	281
July-16	0.097	0.111	326	451	243	297	288	352	224	299
August-16	0.096	0.111	325	402	256	311	300	430	237	330
September-16	0.096	0.115	302	389	233	308	297	358	229	275
October-16	0.099	0.128	310	384	243	314	279	302	219	239
November-16	0.098	0.115	326	427	265	385	287	318	233	284
December-16	0.099	0.123	347	458	286	374	284	448	233	347
January-17	0.103	0.118	288	422	242	345	275	330	232	272
February-17	0.103	0.119	316	368	272	292	297	344	255	297
March-17	0.099	0.115	361	472	299	378	302	512	249	410
April-17	0.098	0.120	383	423	305	381	284	318	227	286
May-17	0.101	0.130	382	516	332	485	354	584	310	589
June-17	0.102	0.134	384	482	328	494	326	576	279	500
July-17	0.097	0.115	389	445	311	359	310	366	248	311
August-17	0.097	0.110	308	398	245	305	249	418	198	328
September-17	0.101	0.119	299	388	253	385	263	362	222	308
October-17	0.103	0.124	335	432	276	367	277	434	229	366
November-17	0.101	0.116	312	403	259	333	256	402	213	372
December-17	0.103	0.120	294	398	242	320	240	332	198	274

Reclaimed Water Monitoring Data, 2014-2019

Facility: King County - Carnation WWTP
Permit No: WA0032182

	Influent									
Date	Flow, MGD	Flow, MGD	BOD, mg/L	BOD, mg/L	BOD, ppd	BOD, ppd	TSS, mg/L	TSS, mg/L	TSS, ppd	TSS, ppd
	Monthly Average	Monthly Maximum	Monthly Average	Monthly Maximum	Monthly Average	Monthly Maximum	Monthly Average	Monthly Maximum	Monthly Average	Monthly Maximum
January-18	0.104	0.119	264	362	225	305	216	328	184	287
February-18	0.105	0.125	301	386	260	328	252	358	218	311
March-18	0.105	0.122	306	426	257	379	278	438	233	395
April-18	0.103	0.115	319	443	266	367	256	328	214	283
May-18	0.104	0.119	309	403	264	351	257	408	220	367
June-18	0.108	0.120	322	383	287	343	271	368	242	335
July-18	0.103	0.118	318	387	265	342	246	334	205	301
August-18	0.120	0.202	308	393	282	361	248	448	222	411
September-18	0.112	0.131	323	385	300	353	279	372	260	350
October-18	0.113	0.133	332	401	309	425	290	340	269	351
November-18	0.112	0.129	310	417	286	393	244	306	225	288
December-18	0.111	0.129	305	405	278	375	246	438	224	405
January-19	0.108	0.130	238	349	213	309	176	276	157	249
February-19	0.112	0.133	298	391	279	368	236	322	220	301
March-19	0.116	0.135	298	395	290	379	268	358	261	343
April-19	0.110	0.137	302	463	282	529	260	490	248	593
May-19	0.109	0.161	303	386	276	369	242	350	222	354
June-19	0.110	0.124	285	373	251	311	229	302	202	267
July-19	0.109	0.124	285	360	257	330	259	320	233	294
August-19	0.108	0.121	300	394	272	368	285	492	259	460
September-19	0.113	0.135	296	352	279	396	281	478	268	538
October-19	0.110	0.132	263	360	236	324	222	392	199	353
November-19	0.112	0.128	338	488	309	521	243	314	220	275
December-19	0.115	0.129	282	351	267	319	225	318	213	289
AVE:	0.100	0.120	316	403	259	341	264	356	218	308
MIN:	0.090	0.101	238	348	213	258	176	274	157	212
MAX:	0.120	0.202	389	516	332	529	354	584	310	593
Median	0.099	0.119	312	394	257	329	263	329	214	287
95th Percentile	0.113	0.135	370	482	309	452	301	491	264	478
99th Percentile	0.117	0.173	385	497	329	523	334	578	288	590
Standard Deviation	0.008	0.015	26	38	26	56	27	69	27	83
CV	0.076	0.121	0.1	0.1	0.1	0.2	0.1	0.2	0.1	0.3
DESIGN:	0.48				1,669				1,669	
85% DESIGN:	0.41				1,419				1,419	

approaching design limits (85%)
exceeds design limits

Reclaimed Water Monitoring Data, 2014-2019

Facility: King County - Carnation WWTP
Permit No: WA0032182

	Reclaimed Water Quality								
Date	Flow, MGD	Flow, MGD	BOD, mg/L	BOD, mg/L	BOD, ppd	BOD, ppd	BOD, % Removal	TSS, mg/L	TSS, mg/L
	Monthly Average	Monthly Maximum	Monthly Average	Weekly Average	Monthly Average	Weekly Average	Monthly Average	Monthly Average	Weekly Average
January-14	0.090	0.105	1.3	1.5	0.9	1.0	99.6	2.0	2.0
February-14	0.088	0.123	1.2	1.4	0.9	0.1	99.6	2.1	2.3
March-14	0.092	0.108	1.3	1.5	0.9	1.2	99.0	2.1	2.3
April-14	0.086	0.097	1.7	1.9	1.1	1.3	99.6	2.0	2.0
May-14	0.088	0.119	1.6	1.9	1.2	1.3	99.5	2.0	2.0
June-14	0.088	0.096	1.5	2.2	1.1	1.6	99.5	2.0	2.0
July-14	0.093	0.120	1.3	1.5	1.0	1.1	99.6	2.1	2.3
August-14	0.089	0.100	1.3	1.5	0.9	0.1	99.0	2.0	2.0
September-14	0.091	0.109	1.2	1.3	0.9	1.1	99.6	2.0	2.0
October-14	0.089	0.105	1.1	1.2	0.8	0.9	99.2	2.0	2.0
November-14	0.091	0.107	1.1	1.3	0.8	0.9	99.0	2.0	2.0
December-14	0.087	0.107	1.2	1.3	0.8	1.0	99.7	2.0	0.2
January-15	0.088	0.106	1.1	1.2	0.8	0.9	99.6	2.0	2.0
February-15	0.086	0.101	1.2	1.3	0.8	0.8	99.6	2.0	2.0
March-15	0.087	0.110	1.1	1.3	0.8	0.9	99.7	2.0	2.0
April-15	0.085	0.103	1.1	1.2	0.7	0.8	99.0	2.1	2.3
May-15	0.086	0.103	1.2	1.5	0.9	1.1	99.6	2.0	2.0
June-15	0.086	0.102	1.1	1.1	0.7	0.7	99.7	2.0	2.0
July-15	0.088	0.104	1.1	1.4	0.8	1.1	99.7	2.0	2.0
August-15	0.088	0.101	1.1	1.2	0.8	0.9	99.7	2.0	2.0
September-15	0.089	0.109	1.1	1.2	0.8	0.9	99.7	2.0	2.0
October-15	0.088	0.107	1.1	1.2	0.8	0.8	99.7	2.0	2.0
November-15	0.092	0.108	1.2	1.4	0.9	1.1	99.0	2.0	2.0
December-15	0.092	0.108	1.1	1.3	1.3	1.6	99.7	2.1	2.3
January-16	0.091	0.103	1.1	1.3	0.8	0.9	99.7	2.2	2.7
February-16	0.087	0.105	1.0	1.2	0.8	0.8	99.7	2.0	2.0
March-16	0.091	0.119	1.1	1.3	0.8	1.0	99.7	2.0	2.0
April-16	0.089	0.102	1.0	1.2	0.8	0.9	99.8	2.1	2.3
May-16	0.095	0.132	1.1	1.2	0.8	1.0	99.3	2.0	2.0
June-16	0.092	0.108	1.2	1.4	0.9	1.1	99.7	2.0	2.0
July-16	0.092	0.106	1.0	1.1	0.7	0.8	99.7	2.0	2.0
August-16	0.092	0.102	1.0	1.0	0.8	0.9	99.7	2.0	2.0
September-16	0.091	0.108	1.4	2.7	1.0	2.0	99.6	2.0	2.0
October-16	0.093	0.123	1.9	7.8	1.3	5.3	99.5	2.0	2.0
November-16	0.093	0.111	1.6	2.8	1.2	1.9	99.5	2.0	2.0
December-16	0.094	0.113	1.2	1.4	0.9	1.0	99.7	2.0	2.0
January-17	0.098	0.113	1.5	1.6	1.2	1.3	99.5	2.0	2.0
February-17	0.098	0.112	1.3	1.7	1.0	1.3	99.7	2.0	2.0
March-17	0.094	0.106	1.3	1.5	1.0	1.2	99.7	2.0	2.0
April-17	0.094	0.119	1.5	1.6	1.1	1.4	99.3	2.0	2.0
May-17	0.094	0.113	1.1	1.3	0.9	0.9	99.7	2.0	2.0
June-17	0.096	0.127	1.1	1.1	0.8	0.9	99.7	2.0	2.0
July-17	0.093	0.109	1.2	1.3	0.9	1.0	99.7	2.0	2.0
August-17	0.091	0.105	1.1	1.2	0.8	0.9	99.7	2.0	2.0
September-17	0.096	0.113	1.0	1.1	0.8	0.9	99.7	2.0	2.1
October-17	0.096	0.111	1.1	1.1	0.9	0.9	99.7	2.0	2.0
November-17	0.097	0.116	1.1	1.3	0.7	1.0	99.7	2.0	2.0
December-17	0.097	0.114	1.0	1.1	0.8	0.8	99.7	2.0	2.0

Reclaimed Water Monitoring Data, 2014-2019

Facility: King County - Carnation WWTP
Permit No: WA0032182

	Reclaimed Water Quality								
Date	Flow, MGD	Flow, MGD	BOD, mg/L	BOD, mg/L	BOD, ppd	BOD, ppd	BOD, % Removal	TSS, mg/L	TSS, mg/L
	Monthly Average	Monthly Maximum	Monthly Average	Weekly Average	Monthly Average	Weekly Average	Monthly Average	Monthly Average	Weekly Average
January-18	0.099	0.109	1.0	1.0	0.8	0.9	99.6	2.0	2.0
February-18	0.095	0.114	1.1	1.2	0.8	1.0	99.7	2.0	2.0
March-18	0.099	0.116	1.1	1.1	0.9	0.9	99.6	2.0	2.0
April-18	0.097	0.112	1.0	1.2	0.8	0.9	99.7	2.0	2.0
May-18	0.098	0.113	1.2	1.3	1.0	1.1	99.6	2.0	2.0
June-18	0.100	0.113	1.2	1.3	0.9	1.1	99.7	2.1	2.3
July-18	0.099	0.112	1.1	1.3	0.9	1.0	99.7	2.0	2.0
August-18	0.099	0.186	1.2	1.6	0.8	0.8	99.7	2.0	2.0
September-18	0.104	0.122	1.1	1.1	0.9	0.9	99.7	2.0	2.0
October-18	0.104	0.124	1.0	1.3	0.9	1.0	99.7	2.0	2.0
November-18	0.105	0.121	1.0	1.0	0.9	0.9	99.2	2.0	2.0
December-18	0.106	0.124	1.0	1.1	0.9	1.0	99.7	2.0	2.0
January-19	0.103	0.125	1.1	1.1	0.9	1.0	98.7	2.0	2.0
February-19	0.103	0.124	1.1	1.4	0.9	1.2	99.6	2.0	2.0
March-19	0.105	0.120	1.0	1.0	0.9	0.9	99.7	2.0	2.0
April-19	0.104	0.185	1.4	2.7	1.3	2.5	99.5	2.0	2.0
May-19	0.103	0.162	1.2	1.3	1.0	1.1	99.6	2.0	2.0
June-19	0.104	0.120	1.3	1.6	1.1	1.3	99.5	2.0	2.0
July-19	0.105	0.118	1.1	1.2	1.0	1.1	99.6	2.0	2.0
August-19	0.103	0.132	1.1	1.2	0.9	1.0	99.6	2.0	2.0
September-19	0.108	0.127	1.1	1.1	1.0	1.0	99.7	2.0	2.0
October-19	0.110	0.154	1.1	1.2	0.9	1.0	99.6	2.0	2.0
November-19	0.108	0.131	1.0	1.1	0.9	1.0	99.7	2.0	2.0
December-19	0.109	0.126	1.0	1.0	0.9	0.9	99.7	2.0	2.0
AVE:	0.096	0.118	1.1	1.4	0.9	1.1	99.6	2.0	2.0
MIN:	0.085	0.101	1.0	1.0	0.7	0.7	98.7	2.0	2.0
MAX:	0.110	0.186	1.9	7.8	1.3	5.3	99.8	2.2	2.7
Median	0.096	0.113	1.1	1.2	0.9	1.0	99.7	2.0	2.0
95th Percentile	0.108	0.155	1.5	2.7	1.2	1.9	99.7	2.1	2.3
99th Percentile	0.109	0.185	1.8	4.3	1.3	3.3	99.7	2.1	2.4
Standard Deviation	0.007	0.017	0.2	0.9	0.1	0.6	0.2	0.0	0.1
CV	0.068	0.147	0.1	0.6	0.2	0.6	0.0	0.0	0.1
LIMIT:			20	30	80	120	85	20	30
Effective November 2012					12				

Water discharge to Snoqualmie River via outfall 001 during August 2018

Reclaimed Water Monitoring Data, 2014-2019

Facility: King County - Carnation WWTP
Permit No: WA0032182

	Reclaimed Water Quality										
Date	TSS, ppd	TSS, ppd	TSS, % Removal	Dissolved Oxygen, mg/L	Dissolved Oxygen, mg/L	PH	PH	Total Coliform, #/100 ml	Total Coliform, #/100 ml	Turbidity, NTU	Turbidity, NTU
	Monthly Average	Weekly Average	Monthly Average	Monthly Average	Monthly Minimum	Monthly Minimum	Monthly Maximum	Daily Maximum	7-day Median	Monthly Average	Sample Maximum
January-14	1.5	1.6	99.3	8.6	7.8	6.6	7.3	1.0	1.0	0.08	0.48
February-14	1.5	1.6	99.2	8.9	8.5	6.3	7.3	1.0	1.0	0.07	0.47
March-14	1.5	1.7	99.0	9.2	8.5	6.7	7.5	1.0	1.0	0.07	0.50
April-14	1.4	1.4	99.3	8.0	7.1	6.8	7.6	1.0	1.0	0.07	0.39
May-14	1.5	1.6	99.0	8.0	7.5	6.7	7.6	1.0	1.0	0.07	0.50
June-14	1.4	1.5	99.3	7.6	5.5	6.3	8.4	1.0	1.0	0.09	0.48
July-14	1.6	1.8	99.1	7.6	6.9	6.9	8.7	1.0	1.0	0.07	0.24
August-14	1.4	1.5	99.0	7.1	6.9	6.9	7.8	1.0	1.0	0.07	0.39
September-14	1.5	1.7	99.1	7.5	7.1	6.9	7.6	1.0	1.0	0.07	0.11
October-14	1.5	1.6	99.6	6.9	6.2	7.0	7.7	1.0	1.0	0.07	0.47
November-14	1.4	1.6	99.0	7.6	7.0	6.8	8.1	1.0	1.0	0.08	0.14
December-14	1.4	1.6	99.2	7.9	7.0	6.9	7.6	1.0	1.0	0.10	0.21
January-15	1.5	1.6	99.2	8.5	7.8	6.6	7.7	1.0	1.0	0.08	0.36
February-15	1.4	1.4	99.2	8.6	8.4	6.7	7.3	1.0	1.0	0.12	0.50
March-15	1.4	1.4	99.3	7.8	6.2	6.8	7.4	1.0	1.0	0.08	0.50
April-15	1.4	1.9	99.0	6.7	3.9	6.4	7.4	1.0	1.0	0.12	0.50
May-15	1.4	1.5	99.3	4.9	3.6	6.7	7.5	1.0	1.0	0.12	0.46
June-15	1.4	1.4	99.3	5.5	4.0	6.1	8.8	1.0	1.0	0.14	0.50
July-15	1.4	1.5	99.2	5.6	5.0	6.7	8.5	1.0	1.0	0.11	0.37
August-15	1.4	1.5	99.3	5.0	4.5	6.9	7.7	1.0	1.0	0.10	0.34
September-15	1.4	1.5	99.3	5.4	4.1	6.3	7.6	1.0	1.0	0.11	0.50
October-15	1.4	1.4	99.4	5.5	5.0	6.8	7.5	1.0	1.0	0.10	0.41
November-15	1.5	1.5	99.0	6.3	5.6	6.8	7.4	1.0	1.0	0.13	0.29
December-15	1.3	2.0	99.2	6.5	6.0	6.2	7.3	1.0	1.0	0.13	0.45
January-16	1.6	2.0	99.2	6.1	5.4	6.6	7.3	1.0	1.0	0.14	0.31
February-16	1.5	1.5	99.2	9.0	7.5	6.8	8.6	1.0	1.0	0.13	0.38
March-16	1.5	1.5	99.2	9.1	8.3	6.7	7.3	1.0	1.0	0.11	0.41
April-16	1.5	1.8	99.3	8.6	8.0	6.8	7.4	1.0	1.0	0.12	0.22
May-16	1.5	1.8	99.3	6.5	4.3	6.5	7.7	1.0	1.0	0.11	0.38
June-16	1.5	1.6	99.4	4.7	3.4	6.9	7.5	1.0	1.0	0.11	0.28
July-16	1.5	1.6	99.3	4.6	3.6	6.8	7.5	1.0	1.0	0.14	0.43
August-16	1.5	1.5	99.4	5.5	5.0	6.7	7.4	1.0	1.0	0.13	0.34
September-16	2.0	2.0	99.4	5.6	5.1	6.8	7.7	1.0	1.0	0.11	0.49
October-16	1.5	1.5	99.4	5.6	**0.0**	6.6	7.7	1.0	1.0	0.11	0.45
November-16	1.5	1.7	99.3	6.7	5.9	6.8	7.7	1.0	1.0	0.14	0.32
December-16	1.5	1.7	99.3	7.1	6.1	6.7	7.8	1.0	1.0	0.11	0.48
January-17	1.6	1.7	99.3	7.6	7.2	6.4	7.6	1.0	1.0	0.16	0.50
February-17	1.6	1.6	99.4	7.9	7.4	6.5	7.1	1.0	1.0	0.13	0.48
March-17	1.6	1.6	99.4	7.7	6.8	6.6	7.3	1.0	1.0	0.13	0.35
April-17	1.5	1.7	99.3	7.0	5.8	6.2	7.5	1.0	1.0	0.13	0.39
May-17	1.5	1.7	99.5	6.2	5.2	6.6	7.6	1.0	1.0	0.11	0.50
June-17	1.6	1.7	99.4	5.1	4.5	6.7	7.5	4.0	1.0	0.12	0.50
July-17	1.5	1.7	99.4	5.7	5.3	6.8	7.3	1.0	1.0	0.17	0.26
August-17	1.5	1.5	99.0	5.6	5.2	6.7	7.3	1.0	1.0	0.10	0.39
September-17	1.5	1.7	99.2	5.4	4.7	6.6	7.4	2.0	1.1	0.10	0.23
October-17	1.5	1.6	99.3	5.8	5.3	6.7	7.3	1.3	1.0	0.11	0.36
November-17	1.6	1.7	99.2	5.8	3.5	6.7	7.3	1.0	1.0	0.10	0.50
December-17	1.5	1.6	99.1	5.9	5.4	6.7	7.4	5.7	1.0	0.07	0.31

Reclaimed Water Monitoring Data, 2014-2019

Facility: King County - Carnation WWTP
Permit No: WA0032182

Date	Reclaimed Water Quality										
	TSS, ppd	TSS, ppd	TSS, % Removal	Dissolved Oxygen, mg/L	Dissolved Oxygen, mg/L	PH	PH	Total Coliform, #/100 ml	Total Coliform, #/100 ml	Turbidity, NTU	Turbidity, NTU
	Monthly Average	Weekly Average	Monthly Average	Monthly Average	Monthly Minimum	Monthly Minimum	Monthly Maximum	Daily Maximum	7-day Median	Monthly Average	Sample Maximum
January-18	1.6	1.7	99.0	6.0	5.6	6.5	7.4	1.0	1.0	0.08	0.30
February-18	1.6	1.6	99.2	5.1	4.3	6.7	7.2	1.0	1.0	0.07	0.28
March-18	1.6	1.6	99.2	5.0	3.7	6.6	7.3	5.4	1.0	0.07	0.47
April-18	1.6	1.6	99.2	5.7	4.6	6.8	7.6	2.3	1.1	0.08	0.38
May-18	1.6	1.6	99.1	5.0	4.2	6.7	8.6	9.3	1.9	0.09	0.47
June-18	1.7	2.0	99.2	5.1	4.2	6.6	7.3	1.0	1.0	0.17	0.48
July-18	1.6	1.8	99.0	3.9	2.9	6.6	7.5	**200.0**	1.3	0.10	0.42
August-18	1.4	1.8	99.2	NR	NR	6.2	8.3	NR	NR	NR	NR
September-18	1.7	1.7	99.3	6.1	6.1	7.0	7.8	1.0	1.0	0.11	0.47
October-18	1.7	1.6	99.4	6.0	5.3	6.9	8.2	1.0	1.0	0.10	
November-18	1.7	1.8	99.2	6.1	4.1	6.3	7.9	1.0	1.0	0.08	0.37
December-18	1.7	1.8	99.0	6.6	5.9	6.7	7.6	2.7	1.0	0.08	0.48
January-19	1.7	1.8	98.7	6.5	5.5	7.0	7.4	1.0	1.0	0.11	0.50
February-19	1.7	1.8	99.1	6.6	5.7	6.8	7.6	2.7	1.0	0.15	0.48
March-19	1.7	1.8	99.3	6.1	4.9	6.9	7.9	3.0	1.0	0.10	
April-19	1.8	1.8	99.2	5.1	4.0	6.5	7.8	1.0	1.0	0.12	0.50
May-19	1.7	1.9	99.2	5.3	4.0	6.7	7.9	1.0	1.0	0.16	0.50
June-19	1.7	1.7	99.1	5.1	3.2	6.8	7.5	1.0	1.0	0.09	0.44
July-19	1.8	1.8	99.2	5.2	3.8	6.2	7.6	1.0	1.0	0.10	0.43
August-19	1.7	1.7	99.3	5.0	3.5	6.8	7.3	1.0	1.0	0.09	0.50
September-19	1.8	2.0	99.3	5.3	4.4	6.7	7.2	1.0	1.0	0.10	0.50
October-19	1.8	2.0	99.0	6.1	5.2	6.6	7.3	1.0	1.0	0.10	0.47
November-19	1.8	2.0	99.2	6.1	4.3	6.7	7.8	1.0	1.0	0.13	0.49
December-19	1.8	1.9	99.7	6.6	5.3	6.7	7.3	1.0	1.0	0.13	0.36
AVE:	1.6	1.7	99.2	6.0	4.9	6.6	7.6	5.0	1.0	0.11	0.42
MIN:	1.3	1.4	98.7	3.9	0.0	6.1	7.1	1.0	1.0	0.07	0.22
MAX:	2.0	2.0	99.7	9.1	8.3	7.0	8.8	200.0	1.9	0.17	0.50
Median	1.6	1.7	99.3	5.8	5.0	6.7	7.5	1.0	1.0	0.11	0.44
95th Percentile	1.8	2.0	99.4	8.0	7.4	6.9	8.5	5.5	1.1	0.16	0.50
99th Percentile	1.9	2.0	99.6	9.1	8.5	7.0	8.7	66.5	1.5	0.17	0.50
Standard Deviation	0.1	0.2	0.2	1.1	1.4	0.2	0.4	26.3	0.1	0.02	0.08
CV	0.1	0.1	0.0	0.2	0.3	0.0	0.0	5.3	0.1	0.21	0.20
LIMIT: Effective November 2012	80	120	85.0		0.2	6.0	9.0	23	2.2	0.2	0.5

Water discharge to Snoqualmie River via outfall 001 during August 2018

exceeds permit limits

Reclaimed Water Monitoring Data, 2014-2019

Facility: King County - Carnation WWTP
Permit No: WA0032182

	Reclaimed Water Quality								
Date	UV Light Dosage, mJ/cm2	UV Light Dosage, mJ/cm2	Ammonia, mg/l (as N)	Ammonia, mg/l (as N)	Ammonia, ppd (as N)	Ammonia, ppd (as N)	Total Kjeldahl Nit., mg/L (as N)	Total Nitrogen, mg/L (as N)	Total Phosph., mg/l (as P)
	Monthly Average	Monthly Minimum	Monthly Average	Monthly Maximum	Monthly Average	Monthly Maximum	Monthly Maximum	Monthly Maximum	Monthly Maximum
January-14	130	85	0.5	0.8	0.4	0.6	2.0	29.5	5.2
February-14	121	81	0.6	1.1	0.5	0.9	2.7	40.3	5.3
March-14	122	80	0.6	2.6	0.5	2.1	2.3	33.1	6.2
April-14	146	80	0.1	0.2	0.1	0.1	2.3	23.8	5.0
May-14	128	80	0.2	0.3	0.2	0.2	2.2	14.6	6.6
June-14	132	83	0.1	0.1	0.1	0.1	1.6	22.8	6.4
July-14	154	80	0.1	0.2	0.1	0.2	1.4	10.4	5.5
August-14	139	83	0.1	0.1	0.1	0.1	2.4	10.7	5.6
September-14	125	80	0.1	0.1	0.1	0.1	1.8	10.7	5.3
October-14	124	80	1.3	0.2	1.3	0.2	1.8	7.9	4.5
November-14	123	80	0.1	0.1	0.1	0.1	1.2	17.2	3.4
December-14	126	80	0.2	0.4	0.1	0.3	1.7	15.0	4.4
January-15	125	80	0.2	0.2	0.1	0.2	2.2	9.7	3.5
February-15	117	80	0.1	0.2	0.1	0.1	1.4	12.3	5.5
March-15	149	80	0.2	0.3	0.1	0.2	1.7	10.9	3.7
April-15	134	82	0.3	0.7	0.2	0.6	1.7	8.8	4.8
May-15	169	89	0.5	1.4	0.4	1.1	2.2	3.5	4.1
June-15	202	98	0.2	0.2	0.1	0.1	2.1	6.1	5.1
July-15	184	81	0.1	0.1	0.1	0.1	1.9	7.5	3.5
August-15	228	90	0.1	0.1	0.1	0.1	1.8	4.8	3.9
September-15	213	87	0.3	0.8	0.2	0.7	1.7	4.7	3.4
October-15	232	80	0.1	0.1	0.1	0.1	2.9	7.9	4.7
November-15	229	80	0.1	0.2	0.1	0.2	1.1	12.8	3.6
December-15	190	80	0.1	0.1	0.1	0.1	0.9	18.1	3.7
January-16	239	81	0.1	0.1	0.1	0.1	1.2	19.0	4.3
February-16	164	82	0.1	0.1	0.1	0.1	2.0	29.1	6.9
March-16	167	80	0.1	0.1	0.1	0.1	1.7	27.2	4.8
April-16	188	80	0.1	0.1	0.1	0.1	1.2	15.1	4.1
May-16	144	81	0.1	0.1	0.1	0.1	2.1	18.7	4.1
June-16	166	84	0.1	0.1	0.1	0.1	1.4	6.1	4.2
July-16	165	81	0.1	0.1	0.1	0.1	1.2	8.0	4.5
August-16	148	80	0.1	0.1	0.1	0.1	1.2	11.7	5.0
September-16	133	80	0.1	0.1	0.1	0.1	1.3	11.9	4.7
October-16	149	82	0.1	0.1	0.1	0.1	1.3	24.0	4.5
November-16	203	85	0.1	0.1	0.1	0.1	1.3	26.0	5.7
December-16	227	105	0.1	0.1	0.1	0.1	1.3	29.3	4.6
January-17	199	80	0.4	1.4	0.3	1.2	2.5	34.0	3.6
February-17	191	80	0.1	0.1	0.1	0.1	1.4	34.6	3.3
March-17	220	81	0.1	0.1	0.1	0.1	1.8	32.0	3.7
April-17	203	80	0.1	0.1	0.1	0.1	1.3	39.3	5.6
May-17	171	80	0.1	0.1	0.1	0.1	1.3	25.8	5.3
June-17	106	80	0.1	0.1	0.1	0.1	1.5	24.8	6.4
July-17	131	80	0.1	0.1	0.1	0.1	1.0	14.5	5.3
August-17	135	80	0.1	0.1	0.1	0.1	1.3	17.7	5.9
September-17	137	81	0.1	0.1	0.1	0.1	1.1	14.4	6.2
October-17	136	81	0.1	0.1	0.1	0.1	2.2	19.3	5.2
November-17	151	83	0.1	0.1	0.1	0.1	1.3	14.9	3.5
December-17	133	80	0.1	0.2	0.1	0.1	1.4	13.3	3.4

Reclaimed Water Monitoring Data, 2014-2019

Facility: King County - Carnation WWTP
Permit No: WA0032182

	Reclaimed Water Quality								
Date	UV Light Dosage, mJ/cm2	UV Light Dosage, mJ/cm2	Ammonia, mg/l (as N)	Ammonia, mg/l (as N)	Ammonia, ppd (as N)	Ammonia, ppd (as N)	Total Kjeldahl Nit., mg/L (as N)	Total Nitrogen, mg/L (as N)	Total Phosph., mg/l (as P)
	Monthly Average	Monthly Minimum	Monthly Average	Monthly Maximum	Monthly Average	Monthly Maximum	Monthly Maximum	Monthly Maximum	Monthly Maximum
January-18	110	81	0.1	0.1	0.1	0.1	1.2	14.6	2.9
February-18	132	82	0.1	0.1	0.1	0.1	1.7	16.4	3.2
March-18	121	82	0.1	0.1	0.1	0.1	1.0	11.4	2.9
April-18	126	80	0.1	0.1	0.1	0.1	2.3	13.6	3.6
May-18	122	80	0.1	0.1	0.1	0.1	1.7	17.3	4.4
June-18	144	80	0.1	0.1	0.1	0.1	1.4	17.9	5.8
July-18	131	80	0.1	0.1	0.1	0.1	1.0	7.1	8.2
August-18	NR	NR	1.5	4.7	1.0	3.1	5.4	6.6	8.0
September-18	1	83	0.1	0.1	0.1	0.1	0.8	7.5	4.8
October-18	121	80	0.1	0.1	0.1	0.1	1.0	9.7	7.1
November-18	115	80	0.1	0.1	0.1	0.1	2.2	18.7	4.6
December-18	114	80	0.1	0.1	0.1	0.1	1.3	15.5	4.1
January-19	111	80	0.1	0.1	0.1	0.1	2.5	13.3	3.7
February-19	122	81	0.2	0.4	0.2	0.3	2.1	20.3	3.7
March-19	136	80	0.6	1.9	0.5	1.9	3.2	10.0	3.8
April-19	125	80	12.2	35.1	10.7	29.9	36.2	36.8	6.4
May-19	112	80	1.1	4.2	1.5	5.7	5.8	8.7	7.0
June-19	111	80	0.1	0.1	0.1	0.1	1.3	7.0	3.9
July-19	114	82	0.1	0.1	0.1	0.1	1.2	5.7	4.6
August-19	127	81	0.1	0.1	0.1	0.1	1.1	9.3	5.5
September-19	110	81	0.2	0.3	0.2	0.3	1.5	8.7	7.7
October-19	125	81	0.1	0.1	0.1	0.1	1.2	9.6	4.3
November-19	95	80	0.2	0.3	0.2	0.3	1.4	8.6	5.0
December-19	115	80	0.1	0.2	0.1	0.2	1.3	18.8	3.5
AVE:	150	82	0.4	1.0	0.3	0.9	2.3	15.7	4.7
MIN:	1	80	0.1	0.1	0.1	0.1	0.8	3.5	2.9
MAX:	239	105	12.2	35.1	10.7	29.9	36.2	39.3	8.2
Median	136	80	0.1	0.1	0.1	0.1	1.4	14.0	4.5
95th Percentile	228	89	0.7	2.2	0.6	2.1	3.5	34.1	7.2
99th Percentile	234	100	4.6	13.5	4.2	12.7	14.6	39.6	8.1
Standard Deviation	44	4	1.6	4.6	1.4	4.0	4.6	8.9	1.3
CV	0	0	4.1	4.8	4.0	4.6	2.0	0.6	0.3
LIMIT: Effective November 2012					4.4				

Water discharge to Snoqualmie River via outfall 001 during August 2018

Appendix E –Technical Calculations

Several of the Excel® spreadsheet tools used to evaluate a discharger's ability to meet Washington State water quality standards can be found in the PermitCalc workbook on Ecology's webpage at: https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Water-quality-permits-guidance.

Simple Mixing:

Ecology uses simple mixing calculations to assess the impacts of certain conservative pollutants, such as the expected increase in fecal coliform bacteria at the edge of the chronic mixing zone boundary. Simple mixing uses a mass balance approach to proportionally distribute a pollutant load from a discharge into the authorized mixing zone. The approach assumes no decay or generation of the pollutant of concern within the mixing zone. The predicted concentration at the edge of a mixing zone (C_{mix}) is based on the following calculation:

$$C_{mix} = C_a + \frac{C_e - C_a}{DF}$$

where:

C_e = Effluent Concentration

C_a = Ambient Concentration

DF = Dilution Factor

Performance-based Limits:

Ecology used procedures outlined in Table E-3 of EPA's *Technical Support Document for Water Quality-based Toxics Control*, (EPA 505/2-90-001) to calculate performance-based limits for total nitrogen. The procedure estimates the 95th percentile of daily effluent data when more than ten data points are available and the data is lognormally distributed. Ecology used the estimated 95th percentile value as the average monthly performance-based limit (AML). The weekly average performance-based limit is 1.5 times the average monthly limit.

Calculation of the 95th percentile uses the following equation:

$$AML = e^{(\mu_y + 0.5\sigma_y^2)} + 1.645\left[\frac{e^{(2\mu_y+\sigma_y^2)}(e^{\sigma_y^2}-1)}{n}\right]^{1/2}$$

where,

μ_y = the mean of lognormal transformed data

σ_y^2 = the variance of lognormal transformed data

n = the number of monthly samples for compliance monitoring

Total Nitrogen

Table E-1 summarizes Ecology's calculations of performance-based total nitrogen limits based on individual sample results reported between January 2018 and December 2019 (92 sample results).

Table E-1 Performance-based Nitrogen limits

INPUT	
LogNormal Transformed Mean:	2.2800
LogNormal Transformed Variance:	0.1720
Number of Samples per month for compliance monitoring:	4
Autocorrelation factor (n_e) (use 0 if unknown):	0
OUTPUT	
E(X) =	10.6547
V(X) =	21.306
VARn	0.0459
MEANn=	2.3431
VAR(Xn)=	5.326
RESULTS	
Average Monthly Effluent Limit:	**14.8**
Average Weekly Effluent Limit:	**22.2**

Total Phosphorus

Ecology used the 95th percentile of reported annual average total phosphorous concentrations to establish the annual average performance-based limit for the proposed permit. In calculating this limit, Ecology first calculated the annual average of reported weekly sample results for each year between January 2014 and December 2019 (more than 300 total sample values). We then used the "Percentile" function in Excel to estimate the 95th percentile of the six annual average concentrations. Table E-2 shows the calculated annual average values for each year and the 95th percentile value.

Table E-2 Performance-based Phosphorous limits

Annual Average Total Phosphorous (mg/L as P)	
Year	**Annual Value**
2014	4.81
2015	3.46
2016	4.20
2017	4.30
2018	4.37
2019	4.00
95th Percentile	**4.70**

Dilution factor calculations:

Ecology uses the smallest dilution factor determined through two separate calculations methods when establishing a regulatory mixing zone for discharges into rivers. The first method uses the following zero-dimensional model to determine the maximum dilution factor allowed under Washington State law for rivers.

$$DF_{max} = \frac{(RF\% * Q_{amb}) + Q_{eff}}{Q_{eff}}$$

where,

DF_{max} = maximum regulatory dilution factor

RF% = the percentage of ambient flow allowed by regulation

Q_{amb} = Ambient flow rate

Q_{eff} = Effluent flow rate

The second method uses the RiverPlume6 model that relies on methodologies described in Fischer et al's 1979 *Mixing in Inland and Coastal Waters*. RiverPlume6 is a one-dimensional model that calculates dilution at a specified point of interest downstream in a river. The calculation for dilution factors incorporates the boundary effect of shorelines using the method of superposition. Ecology incorporated this spreadsheet-based model into its PermitCalc Workbook.

Table E-3 provides the output calculations from both methods for the Carnation WWTP's discharge into the Snoqualmie River.

Table E-3 Dilution Factor Calculations

Spread of a Plume from a Point Source in a River with Boundary Effects from the Shoreline

Based on the method of Fischer et al. (1979) with correction for the effective origin of effluent.

	Chronic	Acute	HH Non-Carcinogen	HH Carcinogen
INPUT				
1. Effluent Discharge Rate (MGD)	0.12	0.19	0.12	0.10
or, Effluent Discharge Rate (cfs)	0.19	0.29	0.19	0.15
2. Receiving Water Characteristics Downstream from Discharge:				
Stream Depth (ft)	5.00	5.00	5.80	9.00
Stream Flow (cfs) (7Q10 chronic & acute, 30Q5 for non-carc, harm. mean for carc)	443	443	620	1329
% of stream flow allowed for Dilution Factor (e.g., 25% for chronic & 2.5% for acute)	25	2.5	25	25
Stream Velocity (fps)	0.44	0.44	0.52	0.69
Channel Width (ft)	200.0	200.0	205.0	215.0
Stream Slope (ft/ft) or Manning roughness "n"	0.00097	0.00097	0.00097	0.00097
0 if slope or 1 if Manning "n" in previous cell	0	0	0	0
3. Discharge Distance from Nearest Shoreline (ft)	15	15	15	15
4. Location of Point of Interest to Estimate Dilution:				
Distance Downstream to Point of Interest (ft)	56.7	30.5	57.6	45.2
Distance From Nearest Shoreline (ft)	0	0	0	0
5. Transverse Mixing Coefficient Constant (usually 0.6):	0.6	0.6	0.6	0.6
6. Original Fischer Method (enter 0) or Effective Origin Modification (enter 1)	0	0	0	0
7. Is the Plume bounded by the shoreline?	Yes	Yes	Yes	Yes
OUTPUT				
1. Source Conservative Mass Input Rate:				
Concentration of Conservative Substance (%)	100.00	100.00	100.00	100.00
Source Conservative Mass Input Rate (cfs*%)	18.57	28.78	18.57	15.47
2. Shear Velocity based on slope (ft/sec)	0.395	0.395	0.426	0.530
Shear Velocity based on Manning "n" (using Prasuhn equations 8-26 and 8-54 assuming hydraulic radius equals depth for wide channel):				
Darcy-Weisbach friction factor "f"	#N/A	#N/A	#N/A	#N/A
Shear Velocity from Darcy-Weisbach "f" (ft/sec)	#N/A	#N/A	#N/A	#N/A
Selected Shear Velocity for next step (ft/sec)	0.395	0.395	0.426	0.530
3. Transverse Mixing Coefficient (ft2/sec)	1.186	1.186	1.481	2.863
4. Plume Characteristics Accounting for Shoreline Effect (Fischer et al., 1979):				
Co	4.22E-02	6.54E-02	3.00E-02	1.16E-02
x'	3.82E-03	2.05E-03	3.90E-03	4.06E-03
y'o	7.50E-02	7.50E-02	7.32E-02	6.98E-02
y' at point of interest	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Solution using superposition equation (Fischer eqn 5.9):				
Term for n= -2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Term for n= -1	4.57E-106	1.48E-196	5.62E-104	1.99E-100
Term for n= 0	1.38E+00	1.01E+00	1.42E+00	1.48E+00
Term for n= 1	4.57E-106	1.48E-196	5.62E-104	1.99E-100
Term for n= 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Upstream Distance from Outfall to Effective Origin of Effluent Source (ft)	#N/A	#N/A	#N/A	#N/A
Effective Distance Downstream from Effluent to Point of Interest (ft)	56.7	30.5	57.6	45.2
x' Adjusted for Effective Origin	3.82E-03	2.05E-03	3.90E-03	4.06E-03
C/Co (dimensionless)	6.32E+00	6.28E+00	6.41E+00	6.56E+00
Concentration at Point of Interest (Fischer Eqn 5.9)	2.67E-01	4.11E-01	1.92E-01	7.61E-02
Unbounded Plume half-width (ft)	35.0	25.6	36.2	38.7
Distance from near shore to discharge point (ft)	15.0	15.0	15.0	15.0
Distance from far shore to discharge point (ft)	185.0	185.0	190.0	200.0
RESULTS				
W, Plume width bounded by shoreline (ft)	**50.0**	**40.6**	**51.2**	**53.7**
W, Unbounded Plume Width at Point of Interest (ft)	**69.9**	**51.3**	**72.5**	**77.5**
Approximate Downstream Distance to Complete Mix (ft)	**5,081**	**5,081**	**5,069**	**3,856**
Theoretical Dilution Factor at Complete Mix	**2,370**	**1,529**	**3,330**	**8,629**
Calculated Flux-Average Dilution Factor Across Entire Plume Width	**592**	**311**	**832**	**2,157**
Calculated Dilution Factor at Point of Interest	**375**	**244**	**520**	**1,315**

Regulatory Max Plume Widths and Dilution Factors

Wmax, Regulatory Max Plume Width (ft)	50.0	50.0	51.3	53.8
Regulatory Max Dilution Factor (e.g, effluent well-mixed with 25% of 7Q10 flow)	597	39	836	2148

Most Restrictive Dilution Factor	**375**	**39**	**520**	**1315**

Calculation of Water Quality-Based Effluent Limits:

Water quality-based effluent limits are calculated by the two-value wasteload allocation process as described on page 100 of the TSD (EPA, 1991) and shown below.

1. Calculate the acute wasteload allocation WLA_a by multiplying the acute criteria by the acute dilution factor and subtracting the background factor. Calculate the chronic wasteload allocation (WLA_c) by multiplying the chronic criteria by the chronic dilution factor and subtracting the background factor.

   WLA_a = (acute criteria x DF_a) – [(background conc. x (DF_a - 1)]

   WLA_c = (chronic criteria x DF_c) – [(background conc. x (DF_c -1)]

   where:

   DF_a = Acute Dilution Factor

   DF_c = Chronic Dilution Factor

   When calculating TMDL-based limits, the maximum daily limit from the approved TMDL becomes the wasteload allocation.

2. Calculate the long term averages (LTA_a and LTA_c) which will comply with the wasteload allocations WLA_a and WLA_c.

   $LTA_a = WLA_a \times e^{[0.5\sigma^2 - z\sigma]}$

   where:

   $\sigma^2 = \ln[CV^2 + 1]$

   $z = 2.326$

   CV = coefficient of variation = std. dev/mean

   $LTA_c = WLA_c \times e^{[0.5\sigma^2 - z\sigma]}$

   where:

   $\sigma^2 = \ln[(CV^2 \div 4) + 1]$

   $z = 2.326$

3. Use the smallest LTA of the LTA_a or LTA_c to calculate the maximum daily effluent limit (MDL) and the monthly average effluent limit (AML).

   Maximum Daily Limit

   $MDL=(LTA_x)\, e^{(z\sigma - 0.5\sigma^2)}$

   where:

   LTA_x = the Limiting Long Term Average

   $\sigma^2 = \ln[CV^2 + 1]$

   $z = 2.326$ (99^{th} percentile occurrence probability)

Average Monthly Limit

$$AML = (LTA_x)e^{(z\sigma_n - 0.5\sigma_n^2)}$$

where:

LTA_x = the Limiting Long Term Average

$\sigma^2 = \ln[(CV^2 \div n) + 1]$

z = 1.645 (95th percentile occurrence probability)

n = number of samples per month

Ecology used the above method to calculate the maximum daily discharge limit for total residual chlorine when the Carnation WWTP uses sodium hypochlorite for disinfection or distribution line cleaning and discharges the water to the Snoqualmie River through outfall 001. Table E-4 shows the results of this calculation.

Table E-4 Calculation of Chlorine Limits

Facility	Carnation WWTP - 001
Water Body Type	Freshwater
Rec. Water Hardness	15.8 mg/L

Dilution Factors:	Acute	Chronic
Aquatic Life	39.0	375.0
Human Health Carcinogenic		1315.0
Human Health Non-Carcinogenic		520.0

Pollutant, CAS No. & NPDES Application Ref. No.		CHLORINE (Total Residual) 7782505									
Effluent Data	Coeff of Variation (Cv)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Receiving Water Data	90th Percentile Conc., ug/L	0	0	0	0	0					
	Geo Mean, ug/L		0	0		0					
Water Quality Criteria	Aquatic Life Criteria, ug/L Acute	19									
	Aquatic Life Criteria, ug/L Chronic	11									
	WQ Criteria for Protection of Human Health, ug/L	-									
	Metal Criteria Translator, decimal Acute	-									
	Metal Criteria Translator, decimal Chronic	-									
	Carcinogen?	N									

Aquatic Life Limit Calculation

# of Compliance Samples Expected per month		4									
LTA Coeff. Var. (CV), decimal		0.6									
Permit Limit Coeff. Var. (CV), decimal		0.6									
Waste Load Allocations, ug/L	Acute	741									
	Chronic	4125									
Long Term Averages, ug/L	Acute	237.92									
	Chronic	2175.7									
Limiting LTA, ug/L		237.92									
Metal Translator or 1?		1.00									
Average Monthly Limit (AML), ug/L		**369.4**									
Maximum Daily Limit (MDL), ug/L		**741.0**									

Ecology also used the above method to calculate the average monthly TMDL-based limits for $CBOD_5$ and ammonia. The calculations shown in Table E-5 use the wasteload allocations from the approved TMDL along with the observed variability (coefficient of variation) calculated from reported discharge data from January 2017 through December 2019. The ammonia CV value excludes three data points from abnormal facility operating conditions.

Table E-5 Calculation of TMDL-based Limits

1. Determine Waste Load Allocation	**$CBOD_5$**	**Ammonia**
Maximum Daily Limit from TMDL (lbs/day)	25.0	8.4
2. Calculate Long Term Average (LTA) from Maximum Daily Limit (MDL)		
σ^2	0.0164	0.3339
z_{99}	2.326	2.326
CV	0.13	0.63
Long-term average (lbs/day)	18.7	2.6
3. Calculate Average Monthly Limit (AML) from LTA		
# of Samples	8	4
z_{95}	1.645	1.645
σ_n^2	0.0021	0.0945
CV	0.13	0.63
Average Monthly Limit (lbs/day)	20.1	4.1

Dissolved oxygen depletion using Streeter-Phelps:

Ecology calculates the critical dissolved oxygen sag and concentration downstream from a point source load of BOD in a river using the Streeter-Phelps equations. The method used is documented in EPA/600/6-85/002a - *Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water*. Ecology's uses a spreadsheet tool as a screening method to determine the potential for dissolved oxygen standards to be violated. If the analysis suggests that the dissolved oxygen sag is close to or below the water quality standard, Ecology will use more sophisticated models such as QUAL2E or WASP5 to derive appropriate effluent limits. Table E-6 shows the results of this evaluation for discharges to the Snoqualmie River from the Carnation WWTP.

Table E-6 Streeter-Phelps Analysis of Critical Dissolved Oxygen Sag

INPUT			
1. EFFLUENT CHARACTERISTICS			
Discharge (cfs):			0.17
$CBOD_5$ (mg/L):			40
NBOD (mg/L):			10.054
Dissolved Oxygen (mg/L):			3.9
Temperature (deg C):			26.2
2. RECEIVING WATER CHARACTERISTICS			
Upstream Discharge (cfs):			443
Upstream $CBOD_5$ (mg/L):			1.0
Upstream NBOD (mg/L):			0.1371
Upstream Dissolved Oxygen (mg/L):			9.7
Upstream Temperature (deg C):			12.2
Elevation (ft NGVD):			89
Downstream Average Channel Slope (ft/ft):			0.00097
Downstream Average Channel Depth (ft):			5
Downstream Average Channel Velocity (fps):			0.4
3. REAERATION RATE (Base e) at 20 deg C (day^{-1}):			0.73
Reference	Applic. Vel (fps)	Applic. Dep (ft)	Suggested Values
Churchill	1.5 - 6	2 - 50	0.32
O'Connor and Dobbins	0.1 - 1.5	2 - 50	0.73
Owens	0.1 - 6	1 - 2	0.60
Tsivoglou-Wallace	0.1 - 6	0.1 - 2	1.61
4. BOD DECAY RATE (Base e) AT 20 deg C (day^{-1}):			0.52
(or use *Wright and McDonnell eqn, 1979, for small rivers.) Enter this value -->*			0.52

OUTPUT	
1. INITIAL MIXED RIVER CONDITION	
$CBOD_5$ (mg/L):	1.0
NBOD (mg/L):	0.1
Dissolved Oxygen (mg/L):	9.7
Temperature (deg C):	12.2
2. TEMPERATURE ADJUSTED RATE CONSTANTS (Base e)	
Reaeration (day^-1):	0.61
BOD Decay (day^-1):	0.36
3. CALCULATED INITIAL ULTIMATE CBODU AND TOTAL BODU	
Initial Mixed CBODU (mg/L):	1.5
Initial Mixed Total BODU (CBODU + NBOD, mg/L):	1.6
4. INITIAL DISSOLVED OXYGEN DEFICIT	
Saturation Dissolved Oxygen (mg/L):	10.693
Initial Deficit (mg/L):	1.00
5. TRAVEL TIME TO CRITICAL DO CONCENTRATION (days):	-0.06
6. DISTANCE TO CRITICAL DO CONCENTRATION (miles):	-0.38
7. CRITICAL DO DEFICIT (mg/L):	1.00
8. CRITICAL DO CONCENTRATION (mg/L):	**9.70**

pH Analysis

Ecology uses a spreadsheet tool to calculate the pH of a mixture of two flows using the procedure in EPA's DESCON program (EPA, 1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. EPA Office of Water, Washington DC). The major form of alkalinity is assumed to be carbonate alkalinity. Also, alkalinity and total inorganic carbon are assumed to be conservative. Table E-7 presents the calculated pH at the edge of the chronic mixing zone for outfall 001. Ecology evaluated resultant pH when effluent is at the extremes of the technology standards of 6.0 and 9.0.

Table E-7 Calculation of pH of a Mixture of Two Flows

Based on the procedure in EPA's DESCON program (EPA, 1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. USEPA Office of Water, Washington D.C.)

INPUT		
	pH at 6.0	**pH at 9.0**
1. Dilution Factor at Mixing Zone Boundary	375.0	375.0
2. Ambient/Upstream/Background Conditions		
Temperature (deg C):	21.20	21.20
pH:	7.40	7.40
Alkalinity (mg CaCO3/L):	9.00	9.00
3. Effluent Characteristics		
Temperature (deg C):	26.20	26.20
pH:	6.00	9.00
Alkalinity (mg CaCO3/L):	65.00	65.00
4. Aquatic Life Use Designation	Char spawning & rearing and/or core summer habitat	
OUTPUT		
1. Ionization Constants		
Upstream/Background pKa:	6.37	6.37
Effluent pKa:	6.34	6.34
2. Ionization Fractions		
Upstream/Background Ionization Fraction:	0.91	0.91
Effluent Ionization Fraction:	0.31	1.00
3. Total Inorganic Carbon		
Upstream/Background Total Inorganic Carbon (mg CaCO3/L):	10	10
Effluent Total Inorganic Carbon (mg CaCO3/L):	208	65
4. Condtions at Mixing Zone Boundary		
Temperature (deg C):	21.21	21.21
Alkalinity (mg CaCO3/L):	9.15	9.15
Total Inorganic Carbon (mg CaCO3/L):	10.38	9.99
pKa:	6.37	6.37
5. Allowable pH change	0.20	0.20
RESULTS		
pH at Mixing Zone Boundary:	**7.25**	**7.41**
pH change at Mixing Zone Boundary:	0.15	0.01
Is permit limit needed?	NO	NO

Reasonable Potential Analysis:

The spreadsheets Input 2 – Reasonable Potential, and LimitCalc in Ecology's PermitCalc Workbook determine reasonable potential (to violate the aquatic life and human health water quality standards) and calculate effluent limits. The process and formulas for determining reasonable potential and effluent limits in these spreadsheets are taken directly from the *Technical Support Document for Water Quality-based Toxics Control*, (EPA 505/2-90-001). The adjustment for autocorrelation is from EPA (1996a), and EPA (1996b).

Ammonia Criteria Calculation

The reasonable potential analysis for Ammonia depends on site-specific criteria for this parameter since ammonia's toxicity depends on that portion which is available in the unionized form. The amount of unionized ammonia depends on the temperature and pH in the receiving freshwater. To evaluate ammonia toxicity, Ecology used the available receiving water information for its historical monitoring station #07D070, located near Carnation, and equations presented in 173-201A-240 WAC. The following table summarizes the calculations.

Table E-8 Freshwater Un-Ionized Ammonia Criteria Calculation

Based on Chapter 173-201A WAC, amended November 20, 2006

INPUT	
1. Receiving Water Temperature (deg C):	21.2
2. Receiving Water pH:	7.4
3. Is salmonid habitat an existing or designated use?	Yes
4. Are non-salmonid early life stages present or absent?	Present
OUTPUT	
Using mixed temp and pH at mixing zone boundaries?	no
Ratio	20.202
FT	1.400
FPH	1.600
pKa	9.365
Unionized Fraction	0.011
Unionized ammonia NH3 criteria (mg/L as NH_3)	
Acute:	0.200
Chronic:	0.018
RESULTS	
Total ammonia nitrogen criteria (mg/L as N):	
Acute:	15.341
Chronic:	1.355

Table E-9 Reasonable Potential Calculation – Outfall 001

Facility	Carnation WWTP - 001
Water Body Type	Freshwater
Rec. Water Hardness	15.8 mg/L

Dilution Factors:	Acute	Chronic
Aquatic Life	39.0	375.0
Human Health Carcinogenic		1315.0
Human Health Non-Carcinogenic		520.0

Pollutant, CAS No. & NPDES Application Ref. No.		AMMONIA, Criteria as Total NH3	CHLORIDE (dissolved) in mg/L 16887006	COPPER - 7440508 6M Hardness dependent	IRON 7439896	LEAD - 7439921 7M Dependent on hardness	MANGANESE 7439965	ZINC- 7440666 13M hardness dependent				
Effluent Data	# of Samples (n)	1	4	9	9	9	9	9				
	Coeff of Variation (Cv)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	Effluent Concentration, ug/L (Max. or 95th Percentile)	2,200	67.5	11.9	24	0.27	7.97	58.9				
	Calculated 50th percentile Effluent Conc. (when n>10)											
Receiving Water Data	90th Percentile Conc., ug/L	30.00	0	0	0	0		0				
	Geo Mean, ug/L			0	0		0	0				
Water Quality Criteria	Aquatic Life Criteria, ug/L Acute	15,341	860	2.9912	-	8.2617	-	23.968				
	Aquatic Life Criteria, ug/L Chronic	1,355	230	2.3458	1000	0.3219	-	21.886				
	WQ Criteria for Protection of Human Health, ug/L	-	-	1300	300	-	50	1000				
	Metal Criteria Translator, decimal Acute	-	-	0.9814	-	0.466	-	1				
	Metal Criteria Translator, decimal Chronic	-	-	0.9814	-	0.466	-	1				
	Carcinogen?	N	N	N	N	N	N	N				

Aquatic Life Reasonable Potential

Effluent percentile value		0.950	0.950	0.950	0.950	0.950		0.950			
s	$s^2=\ln(CV^2+1)$	0.555	0.555	0.555	0.555	0.555		0.555			
Pn	$Pn=(1\text{-confidence level})^{1/n}$	0.050	0.473	0.717	0.717	0.717		0.717			
Multiplier		6.20	2.59	1.81	1.81	1.81		1.81			
Max concentration (ug/L) at edge of…	Acute	379	4.475	0.542	1.115	0.006		2.736			
	Chronic	66	0.465	0.056	0.116	0.001		0.284			
Reasonable Potential? Limit Required?		**NO**	**NO**	**NO**	**NO**	**NO**		**NO**			

Human Health Reasonable Potential

s	$s^2=\ln(CV^2+1)$			0.5545	0.5545		0.5545	0.5545			
Pn	Pn=(1-confidence level)1/n			0.717	0.717		0.717	0.717			
Multiplier				0.7276	0.7276		0.7276	0.7276			
Dilution Factor				520	520		520	520			
Max Conc. at edge of Chronic Zone, ug/L				0.0167	0.0336		1.1E-02	8.2E-02			
Reasonable Potential? Limit Required?				**NO**	**NO**		**NO**	**NO**			

Appendix F – Process Flow Diagram

Overall Process Flow Diagram – Carnation WWTP

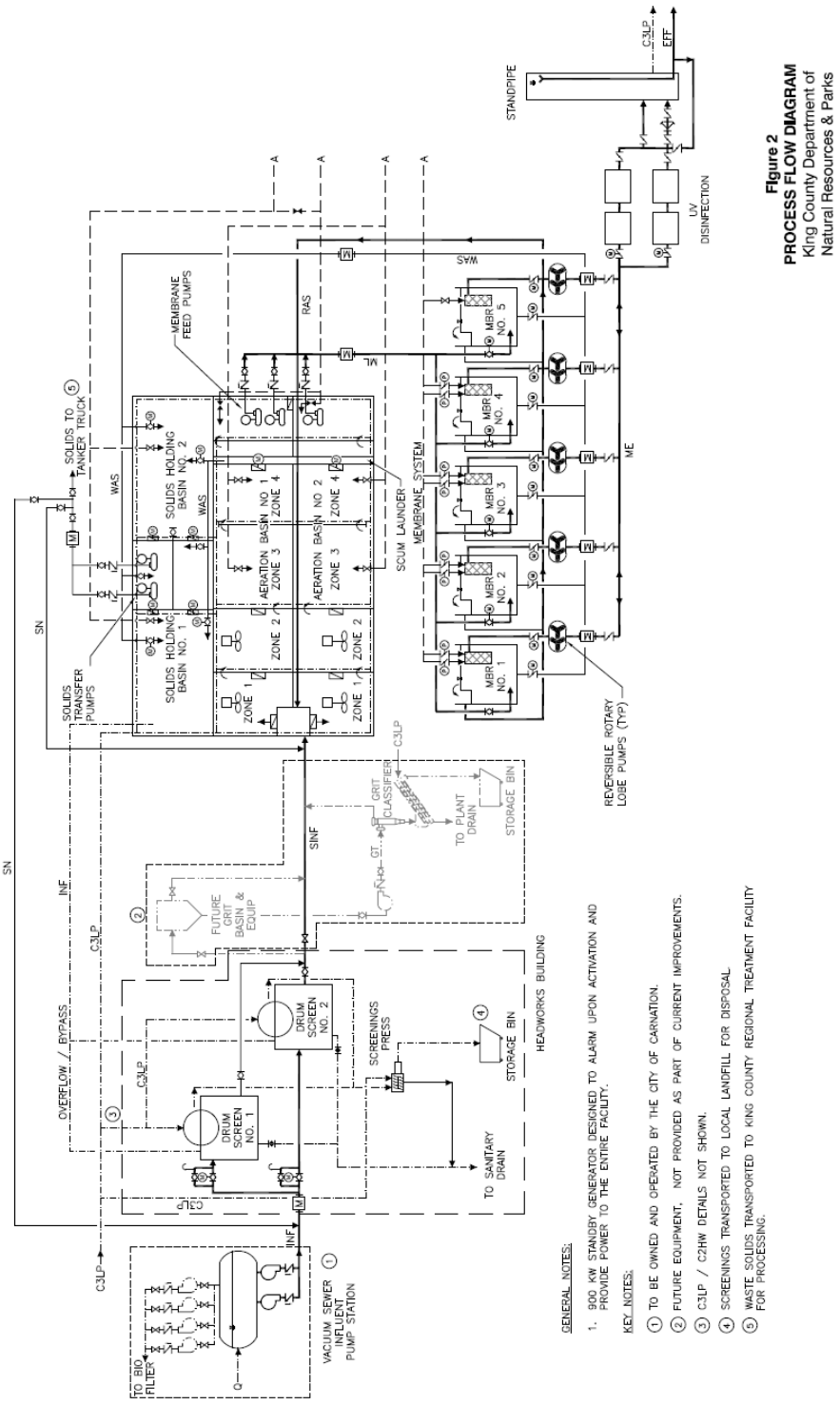


Figure 2
PROCESS FLOW DIAGRAM
King County Department of Natural Resources & Parks

GENERAL NOTES:

1. 900 KW STANDBY GENERATOR DESIGNED TO ALARM UPON ACTIVATION AND PROVIDE POWER TO THE ENTIRE FACILITY.

KEY NOTES:

(1) TO BE OWNED AND OPERATED BY THE CITY OF CARNATION.
(2) FUTURE EQUIPMENT, NOT PROVIDED AS PART OF CURRENT IMPROVEMENTS.
(3) C3LP / C2HW DETAILS NOT SHOWN.
(4) SCREENINGS TRANSPORTED TO LOCAL LANDFILL FOR DISPOSAL
(5) WASTE SOLIDS TRANSPORTED TO KING COUNTY REGIONAL TREATMENT FACILITY FOR PROCESSING.

Hydraulic Profile – Carnation WWTP

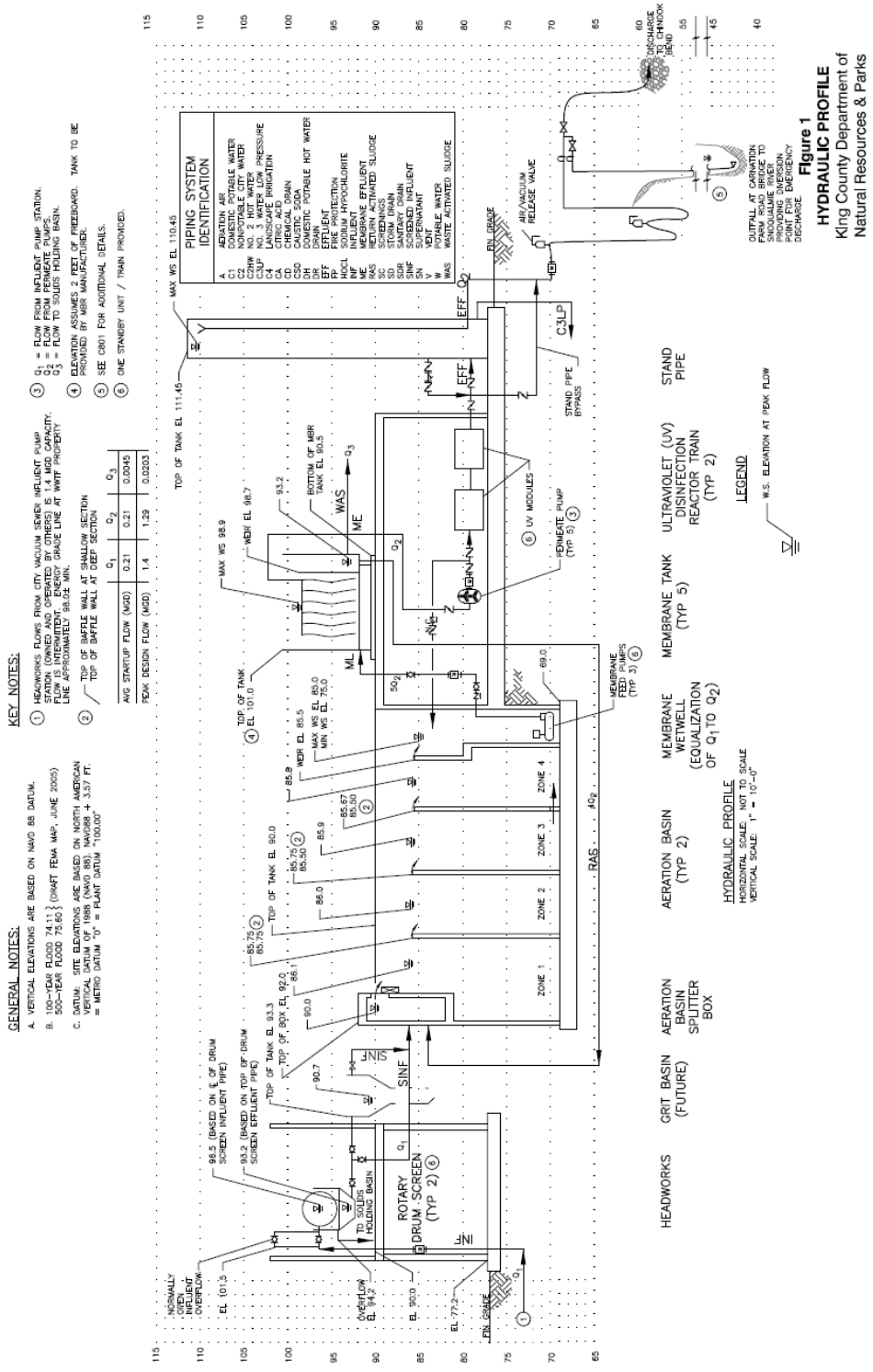


Figure 1
HYDRAULIC PROFILE
King County Department of Natural Resources & Parks

Appendix G – Response to Comments

Ecology provided King County Department of Natural Resources and Parks' Wastewater Treatment Division (WTD) with a preliminary version of this fact sheet and draft permit in March 2021 for a factual review of the documents. Following that review, Ecology corrected factual errors identified by WTD. King County WTD also submitted substantive comments on some limits and conditions in the in the preliminary draft permit. Ecology will not respond to these comments until after the formal public comment period has completed. We will update this section after the public comment period with summaries of all substantive comments received from King County and other interested parties as well as with our responses to those comments.

Public Review 30-Day Comment Period:

Ecology received two sets of comments on the draft NPDES permit and fact sheet for King County's Carnation WWTP. King County's Wastewater Treatment Division (KC-WTD) and Northwest Environmental Advocates (NWEA) submitted comments on the drafts during the public comment period. Ecology also received substantive comments from KC-WTD during a courtesy preliminary review of factual content, but deferred responding to those comments until after the public comment period closed. The follow summarizes the comments received from each commenter and documents Ecology's responses. Due to the length of some of the comments, Ecology has not included the complete text of each comment. However, Ecology will preserve the complete set of comments as part of the official permit record.

Comments from King County

Comment #1 – Net environmental benefits created by the project do not warrant water quality loading limits.

A. The comment states that "The Reclaimed Water Rule (WAC 173-219-390) allows exceptions to the water quality criteria for wetland enhancement applications of reclaimed water if the facility owner can demonstrate overall net environmental benefits." It notes that KC-WTD submitted a Net Environmental Benefit (NEB) report in 2016 to document that the Chinook Bend reclaimed water wetland enhancement project:

   a. Provides full and uninterrupted protection of all significant beneficial uses existing in the wetland prior to the use of reclaimed water, and

   b. Creates new, or enhances existing, beneficial uses of the wetland.

   In addition, the comment states that project met the biological criteria [of the enhancement plan] through increasing the diversity and abundance of vegetation and fish and wildlife and has created new beneficial uses.

   The comment relies on a "wetland nutrient model" developed by KC-WTD and cited on page 23 of the fact sheet to support a claim that Ecology should not limit nutrient discharges. As shown in the fact sheet, the model "estimated that the wetland has an assimilation capacity of between 0.7 – 1.2 kilograms per hectare, per day (kg/ha/d) for total nitrogen and between 0.2 – 0.3 kg/ha/d for total phosphorous." The comment goes on to

state "this model has not presented the full assimilative capacity of the wetland for flow or nitrogen and phosphorus, but rather the estimated partitioning of sources and sinks for nitrogen and phosphorus in the wetland. Thus, the assimilative capacity could be greater than indicated by the current performance and water quality conditions in the wetland." Because of these factors, KC-WTD asserts that water quality loading limits are not warranted at this time.

Although the comment states that "the Carnation facility produces high quality effluent and can likely comply with most of the proposed limits", KC-WTD requested that Ecology reconsider its application of reclaimed water rule performance standards in the permit. The comment specifically identified concerns with the following limits:

- Monthly and weekly limits for total nitrogen
- Annual average limit for Total Kjeldahl Nitrogen (TKN),
- Annual average limit for total phosphorus,
- Annual average limit for flow

Ecology Response:

Ecology acknowledges KC-WTD's conclusions from the 2015 Net Environmental Benefit report that the Chinook Bend Wetland Enhancement Project has meet the goals of the original restoration plan. The report documents the project's success in improving the functions of a previously-degraded wetland to one that now supports a greater diversity of plant and animal life, including threatened Chinook Salmon and other salmonid species. Ecology agrees that the historical use of reclaimed water has contributed to a net environmental benefit by supporting the original restoration goals. However, allowing an unrestricted application of reclaimed water can result in overloading of the wetland from both a water quantity and water quality perspective, which can lead to future degradation. Maintaining this successful restoration requires the use of appropriate limits in the permit. Ecology placed limits in the draft permit that it believes appropriately protects the future functions of the wetland system.

Despite being highly modified by historical land use practices, the Chinook Bend wetland is a natural wetland – not a treatment wetland or artificial wetland. As such, the wetland is considered a surface water of the state that is subject to state's surface water quality standards. The water quality standards require Ecology to protect designated uses of natural wetlands through implementation of the state's antidegradation policy. As discussed on page 20 of the fact sheet, Ecology must place limits in permits it issues that apply either technology-based or water quality-based restrictions on any water discharged or released to surface waters of the state. Application of these limits is consistent with the requirements in the state's water quality standards. Pages 22 through 24 describe how Ecology applies the Reclaimed Water Performance Standards as appropriate technology-based standards for water released to a wetland restoration project. Table 11 lists average weekly, monthly, and annual numeric standards that apply to releases of reclaimed water to Category IV Wetlands like the Chinook Bend wetland. This table includes standards for Total Nitrogen (TN), Total Kjeldahal Nitrogen (TKN), Total Phosphorous (TP) and hydraulic loading.

While WAC 173-219-390 provides flexibility in applying the reclaimed water performance standards when a net environmental benefit exists, the regulation does not allow an "exception" from limits as suggested by KC-WTD's comment. Line 17 of Table 3 (WAC 173-219-390(17)) identifies the annual average performance standards for BOD, TSS, TKN, TP, and hydraulic loading. The standard also states that a reclaimed water release must meet the annual average limits "unless it can be demonstrated that no existing significant wetlands functions will be decreased and overall net environmental benefits will result from the release of reclaimed". While this allows Ecology to set less stringent standards when a net environmental benefit exist, it cannot override the requirements of state's surface water quality standards. Ecology must place limits in the permit to comply with the surface water quality standards.

As documented in the fact sheet, the discharge records for the facility clearly show that it can currently comply with the annual average performance standards in WAC 173-219-390(17) for BOD, TSS, TKN and hydraulic loading. Therefore, the annual average limits in the permit for these parameters are reasonable and appropriate.

The fact sheet acknowledges that the facility has not demonstrated a capability of removing phosphorous and nitrogen to levels necessary to meet the annual average TP performance standard or the weekly and monthly average TN standards. Although the 2015 Net Environmental Benefit Report concluded that the nitrogen and phosphorus loading from the Carnation facility was within the "estimated assimilation capacity" of the wetland, that conclusion assumed a reclaimed water flow rate of 0.14 cfs (approximately 0.09 MGD). Under current conditions with the average reclaimed water flow rate at or above 0.1 MGD (>0.15 cfs), the mass of phosphorous and nitrogen released to the wetland by the facility now exceeds the "estimated assimilation capacity". Ecology estimates the current average loading to the wetland at 1.45 kg/ha/day for Total Nitrogen and 0.44 kg/ha/day for Total Phosphorous. Ecology believes the discharge records clearly demonstrate that limits on nitrogen and phosphorous are necessary to maintain the environmental benefits and prevent degradation from nutrient overloading. As documented in the fact sheet, the permit includes performance-based limits for TN and TP.

B. The comment notes that the proposed annual average flow limit of 0.321 mgd is less than the average annual flow design capacity of 0.37 mgd, and the monthly maximum flow design capacity of 0.48 mgd, as indicated in the approved Carnation Wastewater Facility Plan. Although KC-WTD recognizes that the proposed 0.321 mgd flow limit is based on hydraulic loading requirements for category IV wetlands in the reclaimed water rule, their comment expresses concern that imposing a loading limit of 0.321 mgd on an annual average basis would unnecessarily cap King County's ability to discharge to the wetland as the community and wastewater flows increase. They note that the flow limits are contingent on the size of the wetland, which they claim is not well defined in the design documents and will be refined as part of condition R2 (wetland and river water quality study). Consequently, the flow limit should be defined as an interim limit applicable only to the reclaimed water discharge to the wetland and does not cap the hydraulic design capacity of the treatment plant.

Ecology Response:

As discussed above, the release of reclaimed water to the Chinook Bend wetland must comply with the state's surface water quality standards. Ecology relies on the wetland-specific reclaimed water performance standards to establish loading limits that support environmental restoration goals while complying with the surface water quality standards for the protection of wetlands. These criteria include maintaining water levels to protect designated beneficial uses.

Ecology disagrees that the flow limit "unnecessarily caps King County's ability to discharge to the wetland as the community and wastewater flows increase". The permit cannot authorize distribution of reclaimed water in an amount that exceeds the volume necessary to support the approved beneficial use(s). The annual average flow limit is consistent with the reclaimed water performance standards for wetland enhancement and with the flow expectations established for the Chinook Bend restoration project by King County and Ducks Unlimited in 2007 (see August 2007 report "Chinook Bend Natural Area Wetland Enhancement Plan" by Daniel Golner, Ducks Unlimited, and Tina Miller, King County DNRP). The enhancement plan describes the restoration project as using "up to 0.5 cfs [approximately 0.323 MGD] of reclaimed water" from the Carnation facility. It also states on page 5 that "the goal of this project is to restore/enhance approximately 10 acres of wetland and associated buffer within the Chinook Bend Natural Area". Finally, the County's 2013 Special Use Permit (SUPS13-0010) issued to KC-WTD for operation and maintenance of the reclaimed water facilities at the Chinook Bend Natural Area, recognizes this document as the County's resource for operations, maintenance, and monitoring guidelines for the restoration project (see special terms and conditions 15.h). Since the annual average flow limit complies with the county's own restoration plans as well as the performance standard in the reclaimed water rule, Ecology considers the limit reasonable and necessary.

Comment #2 – Any reclaimed water loading limits should be interim.

The comment requests that Ecology list loading limits to the Chinook Bend wetland as "interim limits". As justification, KC-WTD notes that the draft permit requires a wetland water quality study (condition R2) that analyzes water quality of the wetland including estimating the nutrient uptake of the wetland, assessing the impact of phosphorus loading, and comparing current water quality in the wetland with historic pre-project conditions. This study will provide the technical basis for establishing water quality loading limits. Consequently, any loading limits (performance-based reclaimed water discharge limits) established in this permit should be interim until the wetland water quality study is complete and the flow and nutrient capacity of the wetland for reclaimed water discharge is defined. King County supports the wetland water quality study as a means to provide information sufficient to justify the continued exceptions to default wetland performance standards under the Reclaimed Water Rule and establish performance-based flow and discharge quality standards for the facility.

Ecology Response:

Ecology cannot characterize the loading limits as "interim" limits. Ecology sets interim limits when a facility cannot meet specific water quality-based limits and requires a compliance

schedule to implement necessary process improvements. That does not apply in this case. The loading limits in the permit are technology-based limits consistent with either the regulatory performance standards for facilities producing reclaimed water used for wetland enhancement or with the current demonstrated performance capabilities of the facility. Ecology may modify the permit condition in the future if new information becomes available to support such a change.

Comment #3 – Total Nitrogen reclaimed water loading limits are not achievable for Carnation WWTP.

The comment claims that, though constructed with an anoxic zone, the Carnation WWTP was designed to achieve only limited nitrogen removal based on internal recycle ratio. KC-WTD states that the facility was not designed with the necessary internal Mixed Liquor Suspended Solids (MLSS) recycle, RAS deaeration tankage and other equipment, controls and redundancy required to consistently achieve a monthly permit limit of 14.8 mg/L over a five-year permit period. Although KC-WTD notes that the "Carnation WWTP has achieved longer durations of lower TN values during 2018-2019 in part because of installation of the LEAP agitation aeration system in the membrane tank (for energy reasons) and in part by operating the aeration basins in a manner not envisioned during design (i.e. something akin to Simultaneous Nitrification Denitrification)", they claim that it will be problematic to consistently achieve a high degree of denitrification and low effluent TN levels throughout a five-year period. They also state that future upgrades to utilize the plant's full treatment capacity will require phased equipment and operating conditions that may affect future TN performance that cannot be specified at this time. The comment points out that "even looking at the 2018-2019 actual data, the Carnation WWTP would have exceeded the TN monthly loading limit five times in 24 months."

KC-WTD suggests using the entire data set across 2014-2019 to establish the performance-based nitrogen limits for this permit. They suggest that the longer data set best reflects the actual performance and TN levels that have been observed and are to be expected of the current facility over the next 5-year permit period. The comment presented a proposed performance-based limit of 22.2 mg/L for monthly average total nitrogen. In doing so, KC-WTD states that this limit "reflects a significant reduction in TN, approximately 65%, with an annual average TN removal likely as high as, or greater than, 70%"

Ecology Response:

The 2005 approved engineering report titled "Final Wastewater Facilities Plan – Carnation Wastewater Facility" (Carollo) described the recommended biological treatment process as "a modified BNR removal configuration (similar to the A^2O process) combined with separate MBR tanks" (see section 7.4.4 on page 7-24). It also notes that the process configuration will provide anoxic, anaerobic, and aerobic zones. The approved 2009 operations and maintenance manual for the facility refined the process description to characterize it as a "Modified Johannesburg process" that "removes both phosphorous and nitrogen" (see section 1.3, page 1-6). While the original design documents did not include specific nitrogen and phosphorous removal efficiencies, facilities operating with these process configurations can generally achieve effluent

total nitrogen concentrations of at least 10 mg/L and total phosphorous concentrations of 1-2 mg/L.

Ecology acknowledges that the final facility design did not adequately address factors that now limit nitrogen and phosphorous reduction. Therefore, we recognize that the Carnation facility cannot currently achieve typical treatment efficiencies for BNR facilities using similar process configurations. However, sufficient data exists to establish limits based on demonstrated performance. As described in the fact sheet, Ecology used observed data and procedures established by EPA to determine the monthly and weekly average Total Nitrogen limits in the permit. Since the analysis used data that accurately represents the performance capabilities of the facility, Ecology considers the limits appropriate.

The procedure discussed in Appendix E of the fact sheet for determining performance-based limits uses statistical analyses to calculate the 95th percentile of the observed data in a manner that accounts for the distribution and variability of the data. Ecology limited the data set used in the analysis to the most recent two years to ensure that the analysis more closely represented current operating conditions.

Consistent with protocols established by EPA, Ecology uses the calculated 95th percentile of the distributed data to set an appropriate monthly average limit. Since the 95th percentile represents the value that is greater than 95% of the other observed data, a statistical probability of any observed data point exceeding that value still exists. Performance-based limits must represent the average performance of a facility. Using the 95th percentile value to set a monthly average limit provides a high degree of certainty that the facility's average performance will achieve a total nitrogen concentration that is lower than the limit.

Comment #4 – Use of annual averages to calculate the total phosphorous limit.

KC-WTD asked why Ecology used annual averages in calculating the total phosphorous limit as compared to the approach used for total nitrogen that relied on individual total nitrogen sample data values. They note that an Excel-based calculated 95th percentile value of a small data set may underestimate the true variability and probability of the plant effluent concentrations exceeding the limit, thus resulting in a greater risk of noncompliance.

Ecology Response:

Ecology elected to use a different approach for calculating the performance-based total phosphorous limit since the statistical basis for the limit is an annual average rather than a monthly average or daily maximum. As discussed in the fact sheet, the limit calculation first used observed data from each day the facility monitored total phosphorous to calculate the average concentration observed over each year of the permit term. Ecology then selected the 95th percentile of these five annual average data points to use as the annual average limit. However, Ecology could have used the same method it used for total nitrogen and applied the 95th percentile from that analysis as an annual average limit rather than a monthly average limit. That method would have yielded the same result of an annual average limit of 4.7 mg/L.

Comment #5 – Requirement to discharge to the Snoqualmie River when water does not comply with reclaimed water standards.

This comment pertains to special condition S1.B, which states (first sentence): "*The Permittee must discharge any water that does not comply with the reclaimed water limits in special condition S1.A above, or with the requirements of chapter 173-219 WAC, to the Snoqualmie River*." KC-WTD notes that this provision is new and claims that it "potentially results in the County needing to make decisions on discharging effluent that is noncompliant with either discharge location." The comment included an example related to the total nitrogen concentration limits. KC-WTD theorized that "if initial sample results indicate likely exceedance of the limits, the time lag that occurs with sampling and receiving lab results could result in the County responding by diverting flow to the river discharge location. Likewise, decisions to divert to the river may be required if annual average values approach or exceed the limits, regardless of an assessment of the environmental conditions in the wetland."

KC-WTD requested that Ecology remove the identified provision and instead rely on practices under the current (2014) permit "where the required diversion to the river is not specified". They claim that it may result in "unnecessary diversions of the discharge to the river" and "a reduction in needed flow to the wetland." The County also states that is "has legal agreements to primarily discharge to the wetland" and that the requirement "presents risk to King County with regards to its legal agreements with local stakeholders to primarily rely on the discharge of reclaimed water to the wetland."

Ecology Response:

The reliability standards in the Reclaimed Water Rule (WAC 173-219-350) and special condition S5.B.1 prohibit the distribution of reclaimed water that does not comply with the reclaimed water limits. The reliability standards specifically require either storage of non-compliant water or discharge to a non-reclaimed water outfall, such as the outfall to the Snoqualmie River. Ecology included the wording in question to acknowledge this regulatory requirement. Based on this comment, Ecology revised the sentence to explicitly reference the discharge authorization's relationship special condition S5.B.1.

The comment expresses general concern with the Ecology's implementation of the reliability requirements in the reclaimed water rule. KC-WTD stated the requirement puts them in a position of "needing to make decisions on discharging effluent that is noncompliant with either discharge location". They also claim that it places them at risk of violating legal agreements with stakeholders. Ecology does not consider these concerns valid. KC-WTD must comply with all terms and conditions of the permit regardless of the discharge location. This includes properly operating and maintaining the facility so that the discharges at all times comply with the limits in the permit. Should a violation occur, Ecology evaluates all relevant circumstances related to the violation prior to assessing whether the situation warrants enforcement action. With respect to the county's legal agreements with stakeholders, these agreements cannot preempt Ecology's obligation to implement and enforce state and federal laws and regulations.

Comment #6 – King County requests that the frequency of total coliform monitoring be reduced to 4/week rather than daily.

This comment relates to the monitoring of total coliform shown in Table S2.A.3. KC-WTD requests that the frequency of total coliform monitoring be reduced to 4 per week, rather than daily. They claim that "for a small plant with limited staff, the 1/d monitoring requires additional labor on weekends when the facility is operating unattended. We believe the plant's operating record demonstrates reliable filtration and disinfection system performance. The plant's GE Zeeweed membrane technology, continuous effluent turbidity monitoring, redundant disinfection equipment, alarm capabilities, and ability of King County's offsite operators to respond to any events, ensures that public health and environmental protection would not be adversely affected by a reduced monitoring frequency."

Ecology Response:

Ecology retained the daily monitoring requirement in the permit. Nearly all reclaimed water permits issued in the state require daily total coliform monitoring, including facilities smaller than the Carnation facility. Of the three facilities with less frequent monitoring, two produce water distributed for indirect groundwater recharge. These permits also include groundwater monitoring for total coliform. The fact sheet for the third facility with less frequent monitoring does not include justification for the reduction.

Comment #7 – Wetland Water Quality Study (Reclaimed Water condition R2).

This comment relates to the requirement for a Wetland Water Quality Study in Reclaimed Water Condition R2. KC-WTD requests changing the wording of the first bullet that reads: "*Determine site-specific nutrient (nitrogen and phosphorous) assimilation capacity of the wetland*". Their proposal would change the requirement to read: "*Estimate the site-specific nutrient (nitrogen and phosphorous) assimilation capacity of the wetland*". As justification for the change they state that it is expected that there will be considerable variability and uncertainty in monitoring data and the ability to quantify nutrient assimilation characteristics. The phrase 'determine' could be interpreted as an obligation to definitively quantify nutrient assimilation, which may not be necessary to evaluate the effects of nutrients to the wetland. KC-WTD states that they will seek Ecology and Health input on the study scope including objectives and evaluation criteria. However, they request the language change to "estimate" to provide flexibility in scoping the study.

Ecology Response:

Ecology considers the word "determine" appropriate for this requirement. The intent of this permit condition is to "definitively quantify" site-specific nutrient assimilation in the Chinook Bend wetland as one of the project's goals. Ecology recognizes that all environmental studies include inherent variability and uncertainty. KC-WTD must identify the known variabilities and uncertainties as part of the quality assurance project plan (QAPP) it submits to Ecology for approval prior to initiating the study. In approving the QAPP, Ecology accepts the identified variability and uncertainty. Based on this comment, Ecology modified the permit condition to

clarify that KC-WTD must define the specific project scope in the QAPP and that the project must achieve the general goals outlined in the permit "to the greatest extent possible".

Comment #8 – Suggested Edits on various permit sections.

KC-WTD offered the following wording changes to the text of the permit:

- In Table S2.A.6: Hexavalent chromium should be added to the "Parameter" title as follows "Priority Pollutants – Total Metals, and Chromium (hex)" (or added as a separate line item parameter in this table) since it is not identified as a designated EPA priority pollutant in 40 CFR Part 423 Appendix A. Furthermore, hexavalent chromium is only a fraction of the Total Chromium, and must be analyzed on a filtered sample as specified in 40 CFR Part 136 and thus it is confusing to include it with the other metals that are to be measured and reported on a total basis. Please see the associated comment on hexavalent chromium under Appendix A).
- On p. 15, bullet #8: The phrase "Not report zero...", should be reworded as "*Do* not report zero…"

Ecology Response:

Comments noted. Ecology did not make these changes.

Comment #9 – Comments on Appendix A.

KC-WTD offered the following comments on Appendix A of the permit.

- General comment regarding p. 43, bullet #6: Please consider moving and incorporating this bullet into the preamble to this appendix, as it sets up the overall expectations for the exceptions described by other bullets, as well as supports our rationale for comments on other bullets below.
- p. 43, bullet #2: Monitoring should not have to detect a parameter when the method is approved in 40 CFR and has similar DL and QL as listed in Appendix A. Non-detects are valid data, especially when they meet the desired Appendix A limits. Please modify the bullet as suggested below: *The method used is an EPA-approved method in 40 CFR Part 136 and meets the detection and quantitation levels listed in Appendix A or produces measurable results.*
- p. 43, bullet #4: EPA changes to the method detection limit determination process makes this requirement very difficult. As written, this condition could unnecessarily require a complex and expensive DL/QL study, despite the method used providing useful results. Each matrix study for a parameter could take over a year to complete. King County requests the following modification of the requirement to provide a framework to allow for exceedance of the specified detection limits if the method is sufficient to compare results to the applicable water quality standards/criteria. *If the Permittee is unable to consistently obtain the required DL and QL in its effluent due to matrix effects, the Permittee must submit a matrix-specific detection limit (MDL) and a quantitation limit*

(QL) to Ecology with appropriate laboratory documentation when the detection limits are too high to provide results near or below criteria.

- Appendix A, Table 2 (E. coli method): Please add SM9222G, which is approved in 40CFR for ambient water and King County laboratory staff support it as an appropriate method for tertiary treated wastewater.
- Appendix A, Table 3. The title should be changed to "Table 3: Priority Pollutant Metals, Chromium (hex), Cyanide & Total Phenols" because while hexavalent chromium is a metal included in the state water quality standards for toxic substances (WAC 173-201A, Table 240), it is not a recognized federal priority pollutant as that term is conventionally used.

Ecology Response:

Comments noted. Ecology did not change the appendix.

Comment #10 – Comments of various portions of the fact sheet.

A. p. 12: These bullet points are paraphrasing a settlement agreement with King County and stakeholders, and thus may not have the same meaning (particularly bullet 1). We recommend that the preamble sentence and bullets be replaced with the following:

> "King County independently entered into a settlement agreement with stakeholders to prioritize reclaimed water discharge to the wetland over discharge to the river, as follows:
>
> Although the primary discharge location is the Chinook Bend wetland project, the Plant can discharge treated water to the river outfall (as regulated by the NPDES permit) for the following reasons: (1) during initial facility startup and certification process; (2) to augment in-river flows in the Snoqualmie River as required by a regulatory agency with jurisdiction; (3) during plant upset or emergency or during periods of failure of the ultraviolet light disinfection system; (4) as part of scheduled maintenance within the months of May, June, and July of the piping, controls, or facilities associated with the Chinook Bend Project; and (5) as a condition required of any permit or regulatory approval issued by a regulatory agency with jurisdiction."

B. p. 18 (Table 5): The maximum flow of 0.202 MGD shown in this table does not represent the true maximum inflow rate to the facility. King County requests that this entry include a footnote that states: "*Influent flows can be artificially inflated by storing a great portion of flow from one day and recycling it back to headworks next day. The maximum value shown in Table 5 was the result of such a 'store and release' operation*."

C. p. 23 (2nd paragraph): This paragraph includes the statement: *"However, the previous permit incorrectly applied the technology criteria established in the 1997 interim reclaimed water standards and the limits are inconsistent with the current requirements of WAC 173-219."* The NEB report documents the effects and net benefits of reclaimed

water discharge to the wetland. King County has concerns with the rationale and approach to the State's reclaimed water performance limit rules as King County has followed the associated exception process in WAC 173-219 through the NEB report submittal.

D. p. 23 (3rd paragraph): The second sentence incorrectly states that the "…approved facility design is based on an annual average daily flow of 0.21 MGD". The approved facility design is based on an annual average daily flow of 0.37 MGD.

E. p. 24 (2nd paragraph, "Total Nitrogen"): This paragraph describes that *"…weekly monitoring data collected between January 1, 2018 and December 31, 2019 (92 data points)…"* was used to calculate the performance-based limits. King County has concerns that such a short monitoring period of data is not fully representative of the historic record of effluent nitrogen concentrations for the facility since the treatment processes were not designed for consistently high levels of nutrient removal over a five-year period.

F. p. 49 (first paragraph): The requirement described in this bullet is not listed in the pretreatment section of the draft permit (S.6). The King County Industrial Waste Program (KCIW) is a delegated pretreatment program and we believe that we are capable of making the determination of when the referenced discharges may be appropriate to accept into the POTW. Specifically, KCIW has recently revised public rules concerning the acceptance of cooling water, construction wastewaters, including stormwater, and contaminated ground water. These rules underwent a public review process and KCIW does not believe that receiving a written authorization from Ecology is necessary or appropriate. King County WTD respectfully requests that this section be deleted from the fact sheet.

Ecology Response:

Ecology acknowledges the county's comments, but declines to change the fact sheet. Except for comment 10.D, KC-WTD submitted each comment after their courtesy preliminary review as well as during the public comment period. In the case of comment 10.A, Ecology made minor revisions to the text on page 12 following the courtesy review, but chose not to use the county's proposed text. Ecology also chose not to make changes recommended in comment 10.B after the courtesy review since the data presented is accurate based on monitoring records and is presented only for informational purposes. Ecology's responses to comments #1 and #3 above address the topics included in comments 10.C and 10.E and comments 10.D and 10.F do not influence conditions in the permit.

Comments from Northwest Environmental Advocates

Section I. and the majority of Section II. (up to Part C on page 22 and parts D and E from page 23-26) of the NWEA comment letter were general in nature and not specific to this permit. Likewise, the first paragraph of Section III. of letter was general in nature and not specific to this permit. Parts C, F, and G of Section II. contained comments specific to this permit. In addition, Section III. of the comment letter stated that the proposed permit failed to meet legal

requirements. Ecology has summarized below the comments specific to this permit and provides our response following each comment.

Comment #1 – This Discharge Contributes to Violations of Water Quality Standards (Section II.C of letter).

A. The comment notes that the Snoqualmie River is listed as impaired for PCBs and toxaphene (Listing ID Nos. 78966, 76547). The comment goes on to state that there is no discussion of PCBs or toxaphene and the potential for this discharger to contribute PCBs or toxaphene to an already impaired downstream water in the fact sheet. The commenter also claims that "there are no data reflected on the 303(d) list for the segment of the river at the point of discharge or the wetland".

Ecology Response:

The identified listings are based on fish tissue sampling conducted from June through December of 2008. The Carnation WWTP began discharging to the Snoqualmie River in May 2008. As required by the facility's first NPDES permit, issued April 15, 2008, KC-WTD conducted priority pollutant testing of the facility's influent and effluent in January 2009, August 2009, and July 2011. Each testing effort included analyses for PCB-Aroclors and toxaphene using EPA method 608 with minimum detection levels of 0.24 µg/L for each parameter. The analytical method and detection levels complied with Ecology's monitoring requirements at the time testing occurred and with the requirements of 40 CFR 136. None of the tests detected the presence of PCBs or toxaphene in the plant's effluent or influent. Therefore, there is no evidence to suggest that the facility has a reasonable potential to contribute pollutants associated with the impairment listing.

B. The comment claims that "Ecology has failed to address the commitment that Ecology made [in denying NWEA's AKART rulemaking petition] with regard to effluent limits where facilities, such as Carnation, have the capacity to remove nutrients."

Ecology Response:

Although the process configuration for the Carnation facility can generally reduce nitrogen and phosphorous, the original design documents do not identify specific treatment efficiencies with respect to "nutrients" (i.e., nitrogen or phosphorous). There is no engineering basis for setting design-based limits for these parameters. Ecology has, however, included performance-based limits on Total Nitrogen and Total Phosphorus that apply to the Class A reclaimed water produced at the Carnation facility. Since the facility almost exclusively operates to produce reclaimed water to support an environmental restoration project, the facility must comply with these performance-based limits at all times. The permit also includes water quality-based limits on $CBOD_5$ and ammonia in accordance with EPA-approved waste load allocations from the 1994 Snoqualmie River TMDL. These limits apply during the critical season of August through October regardless of whether the facility distributes reclaimed water to the Chinook Bend wetland or discharges water directly to the Snoqualmie River.

C. The comment alleges that "Ecology's draft permit treats the discharge to a natural wetland as if wetlands are not waters of the state subject to water quality standards." It claims that Ecology does not discuss:

- the narrative criteria in Washington's standards that apply to wetlands and how Ecology interprets them;
- the designated uses in Washington's standards and how this discharge to a wetland will not impair those uses;
- does not present data on water quality in the wetland that represents conditions following the start of "discharges" to the wetland.

Ecology Response:

This comment generally criticizes the information presented in the fact sheet and does not challenge specific requirements in the permit. Ecology notes, however, that page 20 of the fact sheet clearly identifies that reclaimed water releases authorized by the permit must comply with the federal clean water act. The first sentence of the second paragraph on this page states that "when the authorized reclaimed water uses include releases to the environment that are subject to federal clean water act permitting, such as for surface water augmentation or ***enhancement of wetland that are hydraulically connected to surface water****, Ecology must issue a NPDES permit to authorize the water release" (emphasis added).*

The state's water quality standards rely on the antidegradation policy as the primary means of protecting wetlands. The antidegradation policy specifically allows for "temporary harm or permanent loss of existing uses" when necessary to "secure greater ecological benefits through major habitat restoration projects". Pages 14-16 of the fact sheet discuss in detail the scope of the wetland restoration project at the Chinook Bend Natural Area and the role Class A reclaimed water from the Carnation facility plays in supporting the project. The fact sheet also summarizes findings from the 2015 Net Environmental Benefit report that documents how the use of reclaimed water has contributed to meeting or exceeding the project's goals for improving the diversity of plant and animal life, including threatened Chinook Salmon and other salmonid species.

Comment #2 – Snoqualmie River TMDL (Section II.F of letter).

A. The comment specifically asserts "use of a stale and inadequate TMDL and reliance on a 27-year old 'phased' TMDL for which no subsequent phases were completed seriously undermines the basis for effluent limits established in this draft permit." It claims that Ecology has not completed any follow up studies, although it acknowledges that Ecology issued a report in 2008 that describes the findings from effectiveness monitoring. It criticizes Ecology for not discussing "the Snohomish TMDL or its load allocations, benthic biomass responses to nutrient loading, nonpoint source controls, or population growth" in the fact sheet.

The comment also contains several general criticisms related to Ecology's discussion of the Snoqualmie River TMDL in the fact sheet and with Ecology's TMDL development practices. Those criticisms include claims of Ecology:

- not discussing "extraordinary population increases" in the study area since the 1994 TMDL was completed.
- not discussing connections between temperature and dissolved oxygen levels in the Snoqualmie River or how implementation of the 2011 temperature TMDL may impact the 1994 TMDL.
- not discussing how the 1994 TMDL relates to the 1999 Snohomish Estuary TMDL and not examining the validity of the boundary conditions the Snohomish TMDL used for inputs from the Snoqualmie River.
- not referencing the 2008 Snoqualmie River TMDL Effectiveness Monitoring Study. The comment also criticizes the methods Ecology used to conducting water quality sampling related to the study.

Finally, the comment asserts that Ecology must evaluate, presumably in the fact sheet for the Carnation permit, the implementation of nonpoint strategies contained in TMDLs that may contain waste load allocations applicable to the facility. The commenter would also have Ecology assess the effectiveness of TMDLs that do not contain waste load allocations for the Carnation facility as part of the permit record.

Ecology Response:

This comment relates to Ecology's development of waste load allocations in the 1994 Snoqualmie River TMDL and with Ecology's practices for developing TMDLs in general. As required by state and federal regulations, the permit appropriately applies the waste load allocations published in an EPA-approved TMDL report as water quality-based permit limits for the Carnation facility. The TMDL-based limits for $CBOD_5$ and ammonia apply regardless of whether the facility directly discharges water to the Snoqualmie River through outfall 001 or releases the water as reclaimed water to the Chinook Bend wetland.

While 40 CFR 122.44(d)(1)(ii) requires consideration of nonpoint pollution as part of a reasonable potential analysis, the regulation does not require an NPDES permittee to address nonpoint sources of pollution. The Snoqualmie River TMDLs relevant to the Carnation facility considered nonpoint contribution in the development of waste load allocations. The waste load allocations used as the basis for limits in the permit assumed little to no improvements from nonpoint activities.

B. The comment claims that the TMDL established loading for soluble reactive phosphorus of 10 μg/L during the low flow season. It goes on to state that "Ecology makes no reference to the TMDL's SRP loading at all, does not discuss nonpoint source controls and their relationship to relying on the TMDL or other basis for calculating limits." The comment goes on to state that the fact sheet "contains no reference to periphyton, phytoplankton, and

macrophyte growth or biomass issues in the river" and claims that "the proposed permit does not require the permittee to conduct instream monitoring [for these organisms]."

Ecology Response:

The commenter erroneously characterizes the TMDL's discussions related to soluble reactive phosphorous (SRP). Contrary to the commenter's claim, the approved TMDL does not include enforceable waste load allocations on SRP from any facilities in the Snoqualmie basin except for the City of North Bend's wastewater treatment plant located approximately 22 miles upriver in a tributary branch of the Snoqualmie River. The 1994 TMDL established a concentration of 10 μg/L in the main stem of the Snoqualmie as a trigger that would require additional study and potential development of waste load allocations. The 2008 effectiveness monitoring report shows that SRP concentrations at all monitoring locations, except for the South Fork Snoqualmie near North Bend, remain well below 10 μg/l – with most below 5 μg/L.

C. The comment claims that Ecology did not calculate WQBELs that are consistent with the assumptions and requirements of the TMDL. The commenter identifies that the "1994 TMDL evaluates discharges from two as-yet operational sewage treatment plants at 0.2 mgd, Carnation and Fall River [sic]" and notes that Carnation facility has an approved design capacity of 0.48 mgd. They argue that "Ecology's reliance on the TMDL is incorrect" and that the permit must include a "flow rate for the discharge to the Snoqualmie River".

Ecology Response:

The 1994 TMDL established waste load allocations under the assumption of five wastewater treatment plants discharging to the river. These included facilities in the cities of North Bend, Snoqualmie, Carnation, and Duvall along with one in the unincorporated area of Fall City. Only four of these facilities currently operate – no facility exists in Fall City. Although the TMDL assumed possible design flow rates for the Carnation and Fall City facilities, those flow rates are irrelevant to implementing the TMDL. Ecology uses the mass-based waste load allocation for each facility to calculate the applicable permit limits. The Carnation facility can operate at flow rates greater than 0.2 MGD and still comply with the mass-based waste load allocation.

Comment #3 – Reclaimed Water Limits for Wetland Enhancement (Section II.F of letter).

The comment selectively cites limits on nitrogen and (incorrectly) on phosphorus for Class A reclaimed water produced by the Carnation facility that King County beneficially uses as part of a wetland restoration project at the Chinook Bend Natural Area. While the comment does not articulate a clear or specific concern with the proposed limits, it states that "there is no discussion…of what this high nutrient loading to the wetlands will produce over time, including, for example, an overabundance of plant and invertebrate species that flourish in high pollution conditions". It goes on to suggest that the proposed permit conditions related to the wetland enhancement are "inconsistent" with the TMDL.

Ecology Response:

The fact sheet describes how Ecology regulates the quality of Class A reclaimed water distributed to natural wetlands for the beneficial purpose of supporting an enhancement or restoration project. The fact sheet also summarizes conclusions from King County's 2015 report documenting the environmental benefits of the restoration project. Furthermore, the permit requires KC-WTD to perform additional water quality assessments of the wetland and Snoqualmie River to evaluate the impacts nutrient loading has on the wetland and whether the project allows for measurable changes in water quality in the main stem of the Snoqualmie River.

Comment #4 – The Proposed Permit Does not Require Sufficient Monitoring (Section II.G of letter).

The comment claims that Ecology has in the past failed to ensure that the permittee obtained sufficient data on the receiving water quality of the Snoqualmie River at the point of discharge, the downstream waters of the Snoqualmie and Snohomish Rivers, and the wetlands. It goes on to claim that the draft permit perpetuates the problem.

Ecology Response:

The commenter does not articulate what they believe are specific shortcomings in monitoring required by the permit. They instead refer to an analysis of discharges from the City of Medford, Oregon, into the Rogue River without citing how this study has relevance to a facility operating 365 miles to the north. The Wetland Water Quality Study required in reclaimed water condition R2 requires KC-WTD to conduct ambient monitoring of both the Chinook Bend wetland and the Snoqualmie River as necessary to achieve the study goals.

Comment #5 – Water Quality-Based Effluent Limits for Nutrients (Section III.A of letter).

The comment states that "the discharge causes or contributes to violations of water quality standards [in Puget Sound] and therefore a WQBEL is required for nutrients".

Ecology Response:

Ecology disagrees with this claim. Based on information currently available, Ecology cannot establish a reasonable potential for discharges from the Carnation WWTP to cause or contribute to violations of water quality standards for dissolved oxygen in Puget Sound. The Carnation facility does not directly discharged treated wastewater to Puget Sound. It instead almost exclusively distributes Class A reclaimed water to support a wetland restoration project at the Chinook Bend Natural Area located in the Snoqualmie River watershed more than 40 river miles from Puget Sound. The permit includes water quality-based limits on $CBOD_5$ and ammonia as required by waste load allocations in the 1994 dissolved oxygen TMDL for the Snoqualmie River. The permit also includes a limit on temperature consistent with the waste load allocation in the 2011 Snoqualmie River temperature TMDL. In addition to these TMDL-based limits, the permit contains facility-specific performance-based limits on total nitrogen and total

phosphorous along with use-based performance limits on TKN, as required by the state's reclaimed water standards for Class A water used to support wetland restoration projects.

Comment #6 – Reasonable Potential assessment (Section III.B of letter).

The comment claims that "the permit fails to assess reasonable potential for this discharge to cause or contribute to violations of water quality standards and to establish required effluent limits."

Ecology Response:

Ecology discusses its assessment of reasonable potential for the Carnation facility to cause or contribute to violations of applicable water quality standards for various pollutant on pages 35-42 of the fact sheet. These discussions also identify how Ecology calculated water quality-based limits, when necessary. Appendix E of the fact sheet also includes additional details on technical calculations.

Comment #7 – Compliance with 40 CFR 122.44(d)(1)(ii) (Section III.C of letter).

Comment states that the permit must "address the lack of controls on nonpoint sources" to comply with the Clean Water Act.

Ecology Response:

See response to NWEA comment #2.

Comment #8 – Evaluation of narrative water quality criteria (Section III.D of letter).

Comment states that Ecology has not made the necessary examination of "how this discharge violates narrative criteria and what effluent limits are necessary to prevent that". The comment summarizes observations of algae growth, jellyfish, and aesthetic impairments that may be associated with excess nutrients in Puget Sound.

Ecology Response:

The Carnation facility almost exclusively distributes Class A reclaimed water to support a wetland restoration project at the Chinook Bend Natural Area located more than 40 river miles from Puget Sound. The fact sheet describes in detail the derivation of limits and other conditions appropriate to support the beneficial use of the water for this purpose.

Comment #9 – Antidegradation (Section III.E of letter).

The comment alleges that the "permit violates Tier I of the Antidegradation Policy contained in Washington's Water Quality Standards and likely violates Tier II." It states that the fact sheet does not explain how the permit is consistent with Tier I antidegradation requirements, and that Ecology does not point to any appropriate and definitive steps to bring water quality back into compliance with standards. It also claims that "Ecology ignores Tier I…by concluding that this facility must meet Tier II requirements".

Ecology Response:

This comment does not correctly cite Ecology's conclusions related to Antidegradation. Page 26 of the fact sheet clearly states that "this facility must meet Tier I requirements". Tier I antidegradation requires that dischargers protect existing and designated uses. The permit includes water quality-based limits consistent with waste load allocations in two EPA-approved TMDLs. The permit also contains limits consistent with Washington's Reclaimed Water Rule that specifically identify use-based limits appropriate for using Class A reclaimed water to restore the functions of degraded natural wetlands. The fact sheet clearly demonstrates that the use of reclaimed water from the Carnation facility not only protects, but has enhanced the designated uses of the wetland.

Comment #10 – Implementation of AKART (Section III.F of letter).

Comment that AKART as defined for secondary standards in the WAC is too old to still be valid and should have been updated by now.

Ecology Response:

The overall requirements of this permit constitute AKART. These requirements include numeric effluent limits, performance standards to ensure adequate and reliable treatment in the production of reclaimed water, and restrictions on the appropriate use of the water for a specified environmental restoration project. The permit also requires KC-WTD to conduct an environmental study to further assess the impacts continued use of reclaimed water has on the restoration project and to assess whether the use has any detectable impacts outside the wetland.

Comment #11 – Mixing zone authorization (Section III.G of letter).

The comment states that there is no basis on which to conclude that this facility is meeting AKART and therefore, it cannot be granted a mixing zone.

Ecology Response:

As discussed on page 28 of the fact sheet, the permit does not authorize a mixing zone for the release of reclaimed water to the Chinook Bend wetland. The water produced at the Carnation facility must comply with applicable limits prior to distribution. During the period from January 1, 2014 and December 31, 2019, the Carnation facility distributed water to the Chinook Bend wetland approximately 98% of the time.

The permit authorizes a mixing zone for the limited times the facility discharges water directly to the Snoqualmie River. During the 2014-1019 period, the facility discharged to the Snoqualmie River for a total of 56 of 2,190 days (from July 26, 2018 through September 16, 2018). As discussed in the response to NWEA comment #10, the fact sheet describes the full set of permit requirements that collectively constitute AKART.

Comment #12 – Fact sheet page 33 (Conclusion Section of letter).

Comment disagrees with the following language in the fact sheet: "Ecology considers narrative criteria when it evaluates the characteristics of the wastewater and when it implements all known, available, and reasonable methods of treatment and prevention (AKART) as described above in the technology-based limits section. When Ecology determines if a facility is meeting AKART it considers the pollutants in the wastewater and the adequacy of the treatment to prevent the violation of narrative criteria."

Ecology Response:

The comment does not affect any condition of the proposed permit.