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ECOLOGY
State of Washington

Reclaimed Water Facilities Manual

The Purple Book

Washington State Department of Ecology
and the Washington State Department of Health

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Water Quality Program
Washington State Department of Ecology
Olympia, Washington

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1 Introduction

1.1 Purpose of This Manual

The Washington State Department of Ecology (Ecology) prepared this guidance, the *Reclaimed Water Facilities Manual* or "Purple Book," with assistance from the Washington State Department of Health (Health) and significant input from stakeholders.

This manual provides assistance for reclaimed water project proponents, applicants, permittees, owners, generators, distributors, design engineers, and users regulated by chapter 173-219 Washington Administrative Code (WAC), the Reclaimed Water Rule (referred to as the "Rule"). It also provides guidance for both Ecology and Health staff that develop, issue, and manage reclaimed water permits.

The Purple Book provides additional process and technical information, including design criteria, intended to guide and assist reclaimed water permittees, project proponents, planners, and/or designers to better understand the Rule requirements.

This document is not a regulation.

The information in this guidance document is intended to clarify the requirements in the Rule.

It should not be used as a substitute to the Rule language.

It should also be noted that this guidance document is not designed to, nor does it, cover every aspect of the Rule that you might think needs further clarification. When in doubt please review the Rule language, it is fairly comprehensive. Then, reach out to your Ecology regional contacts for further clarification. Ecology and Health will update this guidance periodically as needed and will use input from the regions to identify areas needing future guidance.

1.2 Protection of Public Health

Reclaimed water is generated using domestic wastewater containing some portion of human waste or sewage. This means the protection of public health must be of paramount importance for those involved in the generation, distribution, and/or use of the reclaimed water.

First it is important to note that the Rule requires individual, five-year reclaimed water permit(s) be issued for the generation, distribution, and use of reclaimed water in Washington state, thus ensuring that each project is designed and evaluated on a case-by-case basis.

Reliability and effectiveness of pathogen inactivation must be assured and other safeguards taken to meet the reliability requirements in the Rule. The Rule establishes the minimum technology-based treatment methods and reliability (redundancy) standards as well as performance and use based standards specific to the intended use(s). These, along with a number of other important provision are included in the Rule. All of these standards, terms, and conditions are incorporated into a permit, including provisions for monitoring, storage and distribution, and importantly, preventing delivery of inadequately treated water to end users.

The Rule also contains provisions for cross-connection control and backflow prevention to protect higher quality water from lower quality water. The Rule includes notification and communication with public potable water suppliers and owners of public potable water supply sources at certain design stages to ensure adequate coordination with nearby potable water supplies/suppliers. Protection of the environment, including protecting the quality and quantity of future potable water supplies, while still encouraging reclaimed water use, is an essential aim of the Reclaimed Water Rule.

1.3 Overview of Reclaimed Water

It is important to begin by restating the legislative intent for encouraging and regulating reclaimed water as a new source of water supply:

> "The legislature finds that by encouraging the use of reclaimed water while assuring the health and safety of all Washington citizens and the protection of its environment, the state of Washington will continue to use water in the best interests of present and future generations. …It is hereby 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 non-potable applications, to supplement existing surface and groundwater supplies, and to assist in meeting the future water requirements of the state.
>
> The legislature further finds and declares that the utilization of reclaimed water by local communities for domestic, agricultural, industrial, recreational, and fish and wildlife habitat creation and enhancement purposes, including wetland enhancement, will contribute to the peace, health, safety, and welfare of the people of the state of Washington. To the extent reclaimed water is appropriate for beneficial uses, it should be so used to:
>
> - Preserve potable water for drinking purposes.
> - Contribute to the restoration and protection of instream flows that are crucial to preservation of the state's salmonid fishery resources.
> - Contribute to the restoration of Puget Sound by reducing wastewater discharge.
> - Provide a drought resistant source of water supply for non-potable needs.
> - Be a source of supply integrated into state, regional, and local strategies to respond to population growth and global warming.
>
> Use of reclaimed water constitutes the development of new basic water supplies needed for future generations and local and regional water management planning should consider coordination of infrastructure, development, storage, water reclamation and reuse, and source exchange as strategies to meet water demands associated with population growth and impacts of global warming." (RCW 90.46.005)

The legislature approved the Reclaimed Water Use Act in 1992 and codified it as chapter 90.46 Revised Code of Washington (RCW). This act initially encouraged using reclaimed water for land application and industrial and commercial uses, and treated wastewater as the source of supply for reclaimed water. The legislature amended chapter 90.46 RCW in 1995 to provide for additional uses of reclaimed water. This legislation extended the use of reclaimed water for groundwater recharge through surface percolation (infiltration), direct injection, and for surface water augmentation. The statute does not prohibit direct potable reuse and interest in this use is growing across the country. Given this, the Rule includes a pathway for direct potable reuse (Class A+ reclaimed water) to be beneficially used on a case-by-case basis if the State Board of Health issues a waiver or approves it as a new supply.

The law states that reclaimed water is *not* a wastewater (RCW 90.46.010).

The legislature directs that "reclaimed water" means water derived in any part from wastewater with a domestic wastewater component that has been adequately and reliably treated so that it can be used for beneficial purpose. The legislature instructed Health and Ecology to undertake necessary steps to encourage the development of reclaimed water facilities and to make reclaimed water available to help meet the growing water needs of the state.

Chapter 90.46 RCW establishes a joint role for Ecology and Health in the reclaimed water program. Ecology and Health have worked cooperatively to review and permit wastewater facility projects since their first interagency memorandum of understanding in 1972. Subsequent MOUs continued to have the same intent to avoid or minimize duplication of effort and to use each other's expertise in project review, including reclaimed water proposals. The Rule builds those goals into the lead and nonlead agency designation and roles and responsibilities.

Amendments to chapter 90.46 RCW in 2006 required the development of a new Rule for reclaimed water – chapter 173-219 WAC, Reclaimed Water. Ecology and Health developed the Rule with significant input from stakeholders over many years.

The Rule defines three classes of reclaimed water: A+, A, and B. Class A+ requires the highest level of treatment and refers to using reclaimed water for direct potable reuse (DPR) only. The Rule does not establish specific standards for Class A+. In fact, direct potable reuse is not a beneficial use of reclaimed water unless and until the Group A potable water suppliers or reclaimed water generator has applied for and received a waiver from the State Board of Health under WAC 246-290-060(4).

The Rule focuses its attention on Class A and Class B reclaimed water. Class A reclaimed water has fewer restrictions on its use than Class B. The major difference between Class A and Class B reclaimed water is the level of filtration undergone by Class A water and the level of allowable contact with the public.

To ensure the product is safe for the designated uses, the Rule requires the source water be adequately and reliably treated. To assure reliable treatment, redundant facilities are required in the treatment process. Without redundant facilities, generators and distributors could inadvertently deliver inadequately treated water to the users. For every unit treatment process, a

reclaimed water treatment facility must have an operational and functional backup component, or automatic diversion for inadequately treated water for retreatment should a component fail to provide adequate treatment.

The Rule describes specific allowable beneficial uses of reclaimed water, and the required level of treatment appropriate for each use. The Rule requires treatment, disinfection, and redundancy that is over and above what most conventional wastewater treatment facilities must provide. The Rule also requires automated alarms, treatment reliability, and stringent operator training and certification.

Many communities in this state are approaching or have reached the limits of their available water supplies. Generation and use of reclaimed water can become an attractive option for conserving and extending available water resources. Reclaimed water use may also present an opportunity for pollution abatement when it replaces effluent discharged to sensitive surface waters or groundwaters.

Reclaiming water for a beneficial purpose instead of discharging wastewater can help a community meet water supply and wastewater management needs in a sustainable and environmentally responsible way.

The use of reclaimed water to replace potable water in non-potable applications conserves potable water and stretches the potable water supply. Using reclaimed water may avoid the cost of adding additional potable water supply sources and treatment. Furthermore, using reclaimed water can help preserve water rights for potable water sources to accommodate growth.

A reclaimed water program can reduce or eliminate effluent discharge to surface bodies of water, thus reducing pollutant loading in the environment. Protection of salmon runs or shellfish beds is also a benefit.

Regulators view reclaimed water use as an environmentally progressive approach to dealing with a community's wastewater. Wastewater treatment facilities can view and use reclaimed water as a resource.

To that end, lead and nonlead agency staff will work with utilities to find pathways to reclaimed water whenever possible by helping them navigate the permitting process and otherwise minimize the administrative hurdles to reclaiming water when possible.

2 Definitions

2.1 Definitions (WAC 173-219-010)

The user of this manual should become familiar with the specialized terms in the Reclaimed Water Use Act and the Reclaimed Water Rule:

- Chapter 90.46 RCW Reclaimed Water Use
- Chapter 173-219 WAC Reclaimed Water

This list combines the definitions from both sources and adds additional definitions for clarity in using this manual.

The following definitions apply to all aspects of reclaimed water generation, distribution, and use. Additional definitions found in law and Rule are included, as well as definitions specific to this manual. The Rule distinguishes between potable water supplies/suppliers and reclaimed water supplies/generators to avoid confusion in shared terminology.

- "Agricultural industrial process water" means water that has been used for the purpose of agricultural processing and has been adequately and reliably treated, so that as a result of that treatment, it is suitable for other agricultural water use.

- "Agricultural irrigation" means the application of water to agricultural land with the intent of meeting the water needs for production of agricultural food or nonfood crops.

- "Agricultural processing" means the processing of crops or milk to produce a product primarily for wholesale or retail sale for human or animal consumption, including but not limited to potato, fruit, vegetable, and grain processing.

- "Agricultural water use" means the use of water for irrigation and other uses related to the production of agricultural products. These uses include, but are not limited to, construction, operation, and maintenance of agricultural facilities and livestock operations at farms, ranches, dairies, and nurseries. Examples of these uses include, but are not limited to, dust control, temperature control, and fire control.

- "Alarm" means an integrated system of sensor instruments or devices that continuously monitors a specific function or process and automatically alerts operators to abnormal conditions by means of visual, or audible signals, or both.

- "Applicant" means any person applying for a reclaimed water permit.

- "Approval" means written acceptance from Department of Ecology and/or Health as satisfying requirements.

- “Approved air gap” means the physical separation between the free-flowing end of a water supply pipeline and the overflow rim of an open or nonpressurized receiving vessel that has the following minimum separations:
    - Twice the diameter of the supply piping measured vertically from the overflow rim of the receiving vessel, and in no case be less than one inch, when unaffected by vertical surfaces (vertical sidewalls); and
    - Three times the diameter of the supply piping, if the horizontal distance between the supply pipe and the vertical surface (sidewall) is less than or equal to three times the diameter of the supply pipe, or if the horizontal distance between the supply pipe and the intersecting vertical surfaces (sidewalls) is less than or equal to four times the diameter of the supply pipe and in no case less than one and one-half inches.

- **“**Approved backflow prevention assembly**”** means an RPBA, RPDA, DCVA, DCDA, PVBA, or SVBA used for protecting a potable or reclaimed water supply.

- “Aquifer" means a geologic formation, group of formations or part of a formation capable of yielding a significant amount of groundwater to wells or springs.

- “ART” means adequate and reliable treatment, as provided for in 90.46 RCW.

- “Backflow” means the undesirable reversal of flow of water or other substances through a cross-connection into the public water system or consumer’s potable water system.

- “Backflow Assembly Tester” (BAT) means a person meeting the requirements of chapter 246-292 WAC and certified under chapter 70.119 RCW to inspect, field test, maintain, and repair backflow prevention assemblies, devices, and air gaps that protect public water systems.

- “Beneficial purpose” or “beneficial use” means the use 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 purpose or beneficial use of reclaimed water includes all uses authorized under chapter 90.46 RCW, and contained within WAC 173-219-390.

- "BOD_5" means five-day biochemical oxygen demand.

- “$CBOD_5$" means five-day carbonaceous biochemical oxygen demand.

- “Certified Operator” means a person who meets the requirements of WAC 173-219-250.

- “Chloramines” are products formed by the reactions between chlorine and ammonia-nitrogen often found in reclaimed water.

- "Class A reclaimed water" means a water resource that meets the treatment requirements of chapter 173-219 WAC, including, at a minimum, oxidation, coagulation, filtration, and disinfection.

- “Class A+ reclaimed water” means a water resource that meets the treatment requirements of chapter 173-219 WAC for Class A reclaimed water and any additional criteria determined necessary on a case-by-case basis by the Department of Health for direct potable reuse.

- "Class B reclaimed water," means a water resource that meets the treatment requirements of chapter 173-219 WAC, including, at a minimum, oxidation, and disinfection.

- “Commercial industrial and institutional use” means non-potable uses of water to produce products, provide goods and services, or for associated sanitary uses such as toilet flushing. The term does not include land application or irrigation uses.

- “Constructed beneficial wetlands” means those wetlands intentionally constructed on non-wetland sites to produce or create natural wetland functions and values.

- “Constructed treatment wetlands” means wetland-like impoundments intentionally constructed on non-wetland sites and managed for the primary purpose of further treatment or retention of reclaimed water as distinct from creating natural wetland functions and values.

- “Contaminant” means any chemical, physical, biological, or radiological substance or matter that does not occur naturally in surface water or groundwater or that occurs at concentrations greater than those in the natural environment.

- “Contaminants of emerging concern” or “CEC” means chemicals or compounds not regulated in drinking water, groundwater, surface water, or advanced treated water, some of which may be candidates for future regulation depending on their ecological toxicity, potential human health effects, public perception, and frequency of occurrence. Wastewater constituents such as pharmaceuticals and personal health care products are examples of CECs.

- “Cross-connection” means any actual or potential physical connection between a public water system or the consumer's water system and any source of non-potable liquid, solid, or gas that could contaminate the potable water supply by backflow.

- “Cross-connection control program” means the administrative and technical procedures the potable water supplier implements to protect the public water system from contamination via cross-connections as required in WAC 246-290-490, or in chapter 173-219-310 WAC. The purpose of the cross-connection control program is to protect potable water supplies and the public water supply system from contamination via cross-connections. Eliminate or control cross-connections by the installation of an approved backflow preventer commensurate with the degree of hazard, as defined in WAC 246-290-490.

- "Cross-connection control specialist" (CCS) means an individual meeting the requirements of chapter 246-292 WAC and certified under chapter 70.119 RCW to develop and implement a cross-connection control program.

- "DCDA" means double check detector assembly.

- **"**DCVA**"** means double check valve assembly.

- "Delivered dose" means the measured dose assigned to a reactor based on reactor validation testing by collimated-beam apparatus. Also known as Reduction Equivalent Dose (RED).

- "Depressional wetland" means a wetland that occurs in topographic depressions where the elevation of the surface within the wetland is lower than in the surrounding landscape and the lowest point of elevation is within the boundary of the wetland.

- "Direct potable reuse" (DPR) means the process in which Class A+ reclaimed water is introduced into an existing water distribution, storage or treatment system without an environmental buffer.

- "Distribution system" means the physical infrastructure (storage, piping, pumps) that delivers [reclaimed] water from the source to the intended end point or user.

- "Distributor" means 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.

- "DO" means dissolved oxygen

- "Domestic Wastewater" means wastewater from greywater, toilet, or urinal sources.

- "Ecology" means the Washington State Department of Ecology.

- "Effective (Modal) contact time" means the amount of time elapsed between the time that a tracer, such as salt or dye, is injected into the influent at the entrance to a contact chamber and the time that the highest concentration of the tracer is observed in the effluent from the chamber. This value is expressed as t_{modal}.

- "Engineering report" means a document that examines the engineering and administrative aspects of a reclaimed water generation facility, as required under chapter 173-219 WAC.

- "Entity" means any person, public or private corporation, political subdivision, governmental subdivision, governmental agency, municipality, co-partnership, association, firm, trust estate, or any other legal individual.

- “Existing Water Right” means any permits, certificates, instream flows established by rule pursuant to Chapters 90.22 and 90.54 RCW, vested water rights asserted by a water right claim, and all federally reserved water rights in existence when Ecology accepts a submitted water rights impairment analysis. (WAC 173-219-090)

- “Food crops” mean any crops intended for human consumption.

- “Generator” means any person that generates any type of reclaimed water for a use regulated under this chapter. A generator may also be a distributor or a user.

- “Greywater” or “gray water” means domestic type flows from bathtubs, showers, bathroom sinks, washing machines, dishwashers, and kitchen or utility sinks. Greywater does not include flow from a toilet or urinal.

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

- “Groundwater recharge” means introduction of reclaimed water to groundwater aquifers and includes the following:
  - Indirect recharge: where reclaimed water is introduced to groundwater through surface or subsurface infiltration or percolation, where the introduced water travels through an unsaturated vadose zone and the comingling with groundwater of the state is not immediate.
  - Direct recharge: where reclaimed water is released directly and immediately into groundwater of the state through direct injection or other means.

- "Health" means the Washington State Department of Health

- "Inadequately treated water” means water treated by a reclaimed water treatment process that does not meet reclaimed water permit limits and standards.

- “Industrial reuse water” means water that has been used for the purpose of industrial processing and has been adequately and reliably treated so that, as a result of that treatment, it is suitable for other uses. (RCW 90.46.010)

- “Instream flow” means either a stream flow level set in Rule that is needed to protect and preserve fish, wildlife, scenic, aesthetic, recreational, water quality, and other environmental values, and navigational values, or a federally reserved water right for a stream flow. The term “instream flow” means a base flow under chapter 90.54 RCW, a minimum flow under chapter 90.03 RCW or chapter 90.22 RCW, or a minimum instream flow under chapter 90.82 RCW, or a federally reserved water right for a stream flow.

- “Land application” means use of reclaimed water as permitted under WAC 173-219-390 for the purpose of irrigation or watering of landscape vegetation. Land application in this chapter is **not** synonymous with land treatment or reference to a biosolids land application.

- "Large on-site sewage system (LOSS)" means an On-site Sewage System with design flows of three thousand five hundred gallons per day (gpd) up to and including one hundred thousand gpd.

- “Lead agency” means either the Department of Health or the Department of Ecology that has been designated by chapter 173-219-050 WAC as the agency that will coordinate, review, issue, and enforce a reclaimed water permit issued under chapter 173-219 WAC.

- “Most recent edition” means that version of a specific guidance or reference document in effect at the time the lead agency begins the feasibility and design review process.

- “Net environmental benefit” means that the environmental benefits of the reclaimed water generation project are greater than the environmental impacts associated with the project.

- “Nonlead agency” means Health or Ecology when they are not the lead agency as defined in chapter 173-219 WAC.

- **“**Non-potable” means water that is not approved by Health or a local health jurisdiction as being safe for human consumption.

- “Non-potable reuse systems” means systems that collect and treat non-potable water, including greywater, from a single building or property for non-potable reuse at the single building or property, with no discharge to waters of the state, as regulated under WAC 51-56-1500 and by the appropriate authority having jurisdiction, or a rule adopted by Health. When reuse occurs on nearby properties, these may be called onsite non-potable water systems or decentralized non-potable water systems.

- "NPDES" means the National Pollutant Discharge Elimination System.

- "On-site sewage system (OSS)" means an integrated system of components, located on or nearby the property it serves, that conveys, stores, treats, and provides subsurface soil treatment and disposal of domestic sewage. It consists of a collection system, a treatment component or treatment sequence, and a drainfield. It may or may not include a mechanical treatment system. An OSS also refers to a holding tank sewage system or other system that does not have a drainfield. A holding tank that discharges to a sewer is not included in the definition of OSS. A system that receives discharges of stormwater or industrial wastewater is not included in the definition of OSS. In some contexts, an OSS means an on-site system that has design flows below three thousand five hundred gpd.

- “Operator” means a person who operates a reclaimed water facility and/or distribution system, and if applicable, who meets the operator certification requirements in the permit.

- “Owner” means a person with a security interest in a reclaimed water facility regulated under chapter 173-219 WAC.

- “Permittee” means any person issued a reclaimed water permit under chapter 173-219 WAC.

- “Person” means any state, individual, public, or private corporation, political subdivision, governmental subdivision, governmental agency, municipality, co-partnership, association, firm, trust estate, or any other legal entity whatever.

- "pH" means the negative logarithm of the hydrogen ion concentration, measured in standard units or s.u.

- “Plans and specifications” means the detailed engineering drawings and specifications prepared by a licensed professional engineer, used in the construction or modification of reclaimed water facilities, and other related facilities.

- “Potable water” or “drinking water” means water safe for human consumption and approved under chapter 246-290 or 246-291 WAC.

- "Potable water supply intake" means the works or structures at the head of a conduit through which water is diverted from a source (e.g., river or lake) into a treatment plant producing potable water. With or without treatment, it may also include a groundwater well and appurtenances, and any physical structures used for collecting spring and groundwater that is under the influence of surface water sources for potable supply.

- “Primary contact recreation” means activities where a human would have direct contact with water to the point of complete submergence.

- "Private utility" means all utilities, both public and private, which provide sewerage and/or water service and that are not municipal corporations as defined under RCW 36.94.010. The ownership of a private utility may be in a corporation, nonprofit or for profit, in a cooperative association, in a mutual organization, or in individuals.

- “Public water system” means any system providing water for human consumption through pipes or other constructed conveyances, excluding a system serving only one single-family residence and a system with four or fewer connections all of which serve residences on the same farm as defined in WAC 246-290-020. This term includes:
    - Collection, treatment, storage, and/or distribution facilities under control of the purveyor and used primarily in connection with the system; and
    - Collection or pretreatment storage facilities not under control of the purveyor, but primarily used in connection with the system.

- “Public entity” means a municipal, quasi-municipal, or other governmental entity or entities formed under the Interlocal Cooperation Act.

- "PVBA" means pressure vacuum breaker assembly.

- “Reclaimed water” means water derived in any part from wastewater with a domestic wastewater component that has been adequately and reliably treated to meet the requirements of Chapter 173-291 WAC, so that it can be used for beneficial purposes. Reclaimed water is not considered a wastewater.

- “Reclaimed water facility” or “facility” means the treatment plant, equipment, storage, conveyance devices, and dedicated sites for reclaimed water generation.

- "Reclaimed water permit” or “permit” means an operating permit identifying the terms and conditions, the required level of treatment, operating conditions and use-based standards, issued to a generator of reclaimed water by the lead agency.

- “Reclaimed Water Rule” or “Rule” means chapter 173-219 WAC.

- “Reclaimed water use” means the use of reclaimed water of required quality for a beneficial purpose.

- “Recovery of reclaimed water stored in an aquifer” means the recovery of reclaimed water artificially stored in an underground geological formation for beneficial use.

- “Recovery period” means a period of time defined by the duration, rate, and schedule of withdrawal of reclaimed water for a beneficial use from an underground geological formation.

- “Reliability” means the ability of a system or component(s) thereof to perform a required function under permit stated conditions for a permit stated period.

- “Reliability assessment” means both an evaluation performed and a report by a professional engineer on the reliability of facility components, equipment, and certified operators that are used or proposed to be used to generate and manage reclaimed water.

- "RPBA" means reduced pressure backflow assembly.

- "RPDA" means reduced pressure detector assembly

- “Secondary contact recreation” means activities where a person’s water contact would be limited to the extent that illness or infections due to exposure to pathogens would normally be avoided.

- "Source water" means raw or treated wastewater with a domestic component, depending on facility configuration, that supplies a reclaimed water generation facility.

- “Streamflow” or “surface water augmentation” means the intentional introduction of reclaimed water into rivers and streams of the state or other surface water bodies, for the purpose of increasing volumes.

- “Surface irrigation” means application of water to the land surface by means of spraying equipment or flood irrigation.

- “Surface percolation” means the controlled application of water to the ground surface or to unsaturated soil for replenishing groundwater.

- "SVBA" means spill resistant vacuum breaker assembly.

- “t_{10}” means the effective contact time, or the time it takes 10 percent of a slug tracer volume to pass through the reactor, or alternately the time where 90 percent of reclaimed water is kept in contact with a disinfection residual within the contact reactor.

- “Third party guarantor” means an entity approved by the lead agency to provide stand-by management services if a generator fails to operate a reclaimed water treatment facility in compliance with chapter 173-219 WAC.

- “Total chlorine” is the sum of both free and combined chlorine.

- "TSS" means total suspended solids.

- “Unit process” means one or more defined grouped processes that performs an identified step in a process.

- "Use" means an application of reclaimed water in a manner and for a purpose, as designated in a use agreement or permit, and in compliance with all applicable regulatory lead agency and permit requirements.

- "Use Agreement" means 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” means any facility, building, or land area, surface water, or groundwater identified in the use agreement.

- “USEPA” means the United States Environmental Protection Agency.

- “User” means any person who uses reclaimed water.

- “Vadose zone” means the unsaturated region of the soil which lies below the surface of the earth but above the saturated groundwater water table of the shallowest year-round aquifer.

- “Water right mitigation” means the use of reclaimed water for mitigation of new surface or groundwater rights or changes to existing surface or groundwater rights.

- "Waters of the state" means 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, as defined in RCW 90.48.020.

- "Water table" means the upper surface of groundwater saturation.

- "Wetland" or "wetlands" means areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands regulated under chapter 90.46 RCW shall be delineated in accordance with the manual adopted by the Department of Ecology pursuant to RCW 90.58.380.

- "Wetland enhancement" means intentional actions taken to improve the functions, processes, and values of existing wetlands.

- "Wetland mitigation" means a sequence of intentional steps or actions taken to reduce impacts to wetlands. Unless the context refers to the entire mitigation sequence, or clearly indicates other steps, the term "wetland mitigation" means compensatory mitigation or the compensation stage of the wetland mitigation sequence, where impacts to wetland functions are offset through the creation, restoration, enhancement, or preservation of other wetlands.

- "Wetland restoration" means intentional actions taken to return historic functions and processes to a former or degraded wetland site.

2.2 Abbreviations and Acronyms

AKART	All known available and reasonable methods of prevention, control, and treatment.
ART	adequate and reliable treatment
ASR	aquifer storage and recovery
AWWA	American Water Works Association
AWWARF	American Water Works Association Research Foundation (aka WRF)
BOD_5	five-day biochemical oxygen demand
$CBOD_5$	carbonaceous biochemical oxygen demand
CCP	cross-connection program
CFR	Code of Federal Regulations
cm	centimeter
COD	chemical oxygen demand
CT	concentration * time
Health	Washington State Department of Health
Ecology	Washington State Department of Ecology
G	velocity gradient

Gt	mixing energy * detention time
gpd	gallons per day
GWQS	Ground Water Quality Standards
ha	hectare
kg	kilogram
kV	kilovolt
LOSS	large on-site sewage system
MBR	membrane bioreactor
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MF	microfiltration
MGD	million gallons per day
mJ/cm^2	millijoule per square centimeter (unit of UV dose)
mg/l	milligrams per liter
mL	milliliter
mm	millimeter
OSS	on-site sewage system
PVBA	Pressure Vacuum Breaker Assembly
μ	dynamic viscosity
μg/l	micrograms per liter
MPN	most probable number
$mW*s/cm^2$	milliwatt seconds per square centimeter (unit of UV dose)
NEPA	National Environmental Policy Act
NF	nanofiltration
NPDES	National Pollutant Discharge Elimination System
NTU	nephelometric turbidity unit
NWRI	National Water Research Institute
OCPI	overriding consideration of public interest
ODW	Office of Drinking Water (Health)
O&M	operation and maintenance
PAA	peracetic acid
PAC	polyaluminum chloride
PWM	Permit Writer's Manual, Department of Ecology WQP
RCW	Revised Code of Washington
RED	reduction equivalent dose
RPBA	Reduced Pressure Backflow Assembly
RPDA	Reduced Pressure Detector Assembly
RWFM	Reclaimed Water Facilities Manual

RO	reverse osmosis
SEA	Shorelands and Environmental Assistance Program
SEPA	State Environmental Policy Act
SVBA	Spill Resistant Vacuum Breaker Assembly
SWD	State Waste Discharge
T	time, as in total time of a tracer test
t_{10}	time when 10% of the volume of a tracer exits a vessel
t_{modal}	time when peak concentration of a tracer exits a vessel
TDH	total dynamic head
TDS	total dissolved solids
THM	trihalomethane
TKN	total Kjeldahl nitrogen
TOC	total organic carbon
TSS	total suspended solids
UF	ultrafiltration
UIC	Underground Injection Control
UPC	United Plumbing Code
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
UV	ultraviolet
UVT	ultraviolet transmittance
WAC	Washington Administrative Code
WDFW	Washington State Department of Fish & Wildlife
WQP	Department of Ecology Water Quality Program
WRIA	Water Resource Inventory Area
WRP	Department of Ecology Water Resources Program
WSDOT	Washington State Department of Transportation

3 Regulatory Framework

The objective of any reclaimed water project design is to apply reclamation technologies and techniques to wastewater to ensure the resulting product can be beneficially used for intended beneficial purposes. To effectively meet project design requirements, application requirements, and permitting standards, terms, and conditions, the generator needs knowledge of specific reclaimed water statutes and applicable administrative regulations. Applicants for reclaimed water projects should review this section and corresponding regulations closely before proceeding with detailed design.

The legislature's direction to Health and Ecology is to coordinate efforts towards developing an efficient and streamlined process for review, approval, and permit issuance in order to encourage and enable the use of reclaimed water. The two state agencies have developed the assignment of the lead agency role to correspond with permit issuance already done by that agency. For example, a wastewater utility that has an existing discharge permit from Ecology and wishes to produce reclaimed water from its effluent will work with Ecology as the lead agency. See Table 5-1 for more information.

3.1 Reclaimed Water Rule

Legislative amendments to chapter 90.46 RCW in 2006 required the development of a new Washington Administrative Code (WAC) chapter for reclaimed water – chapter 173-219 WAC, Reclaimed Water. Ecology and Health cooperatively developed this Rule with significant input from stakeholders and technical advisory groups. The Rule sets forth minimum standards for reclaimed water projects. The agencies may incorporate additional enforceable conditions into a reclaimed water permit issued under the Rule as needed to protect public health and the environment.

The Rule provides treatment technology, reliability provisions, and water quality requirements for two classes of reclaimed water that will ensure adequate and reliable treatment (ART) for various uses. Although the Rule creates a pathway for a third class of water, Class A+, for Direct Potable Reuse, it does not establish standards. The standards for Class A+ water will be established on a case-by case basis by Health and will require a waiver/approval from the State Board of Health.

The Rule requires that the facility's permit establish conditions to assure operational reliability at all times (WAC 173-219-350). The Rule includes an "at all times" requirement because reclaimed water is no longer considered a wastewater and must meet the specified water quality for its approved uses. Further protective permit requirements may specify when and how a reclaimed water treatment facility must stop or control the generation, distribution and use of the reclaimed water, such as when there is a reduction in treatment or loss, failure, or bypass of any unit process at the facility.

ART requirements are in addition to (and slightly different than) the AKART requirements for wastewater treatment. AKART addresses the adequacy of treatment, and ART adds a focus on reliability.

All reclaimed water projects that incorporate an element of discharge to waters of the state must also meet the Washington State Water Pollution Control Act requirements for discharges to waters of the state (chapter 90.48 RCW).

Table 3-1 below lists some of the laws and regulations that may apply to a reclaimed water project.

Table 3-1 Laws and Regulations that may apply to Reclaimed Water

Statutes (RCWs) and Rules (WACs)	Application
Chapter 43.20 RCW State Board of Health	Provides the authority for Health to adopt rules (WACs) for sewage and drinking water systems.
Chapter 70.118 RCW On-site Sewage Disposal Systems	Establish a timely and orderly procedure for review and approval of on-site sewage disposal system additives; to prohibit the use, sale, or distribution of additives having an adverse effect on public health or the water quality of the state; to require the disclosure of the contents of additives that are advertised, sold, or distributed in the state; and to provide for consumer protection.
Chapter 70.118A RCW On-site Sewage Disposal Systems – Marine Recovery Areas	Authorizes enhanced local programs in marine recovery areas to inventory existing on-site sewage disposal systems, to identify the location of all on-site sewage disposal systems in marine recovery areas, to require inspection of on-site sewage disposal systems and repairs to failing systems, to develop electronic data systems capable of sharing information regarding on-site sewage disposal systems, and to monitor these programs to ensure that they are working to protect public health and Puget Sound water quality.
Chapter 70.118B RCW Large On-site Sewage Disposal Systems	Provides a framework for comprehensive management of large on-site sewage systems statewide (Systems that handle 3,500 gallons per day (gpd) up to and including 100,000 gpd.)
Title 21 RCW Public Utilities	Includes requirements under the Washington Utilities and Transportation Commission for public utilities. Chapters 80.04 and 80.28 RCW contain requirements for private wastewater companies.

Statutes (RCWs) and Rules (WACs)	Application
Chapter 90.03 RCW Water Code and Chapter 90.44 RCW Regulation of Public Groundwaters	Basis for the appropriation and beneficial uses of public waters. Use and distribution of reclaimed water is exempt from water rights permit requirements as described in RCW 90.46.130.
Chapter 90.46 RCW Reclaimed Water	Establishes requirements for reclaimed water use in Washington State, including for ongoing planning and assessment of opportunities for reclaimed water use during regional water supply planning. Basis for rule writing and permitting authority, establishment of initial standards and legislative intent of reclaimed water generation, distribution, and use.
Chapter 90.48 RCW Water Pollution Control	Establishes Ecology's authority to regulate all pollutants discharged into waters of the state.
Chapter 90.54 RCW	Basis for addressing the critical importance of providing and securing sufficient water to meet the needs of people, farms, and fish and the protection of sole source aquifers.
Chapter 51-56 WAC State Building Code Adoption and Amendment	Alternative water sources for non-potable applications, regulates treatment design and use of non-potable water in lieu of potable water within a building (WAC 51-56-1500).
Chapter 173-22 WAC Adoption of Designations of Shorelands and Wetlands Associated with Shorelines of the State	Designates wetland areas associated with the streams, lakes, and tidal waters which are subject to the provisions of Chapter 90.58 RCW.
Chapter 173-154 WAC Policies and Procedures	Establishes protection of upper aquifer zones from excessive water level declines or reductions in water quality.
Chapter 173-200 WAC Water Quality Standards for Groundwaters	Applies to any reclaimed water released to groundwaters of the state.
Chapter 173-201A WAC Water Quality Standards for Surface Waters	Applies to any reclaimed water released to surface waters of the state.
Chapter 173-216 WAC State Waste Discharge Permit Program	Regulates industrial and agricultural reuse water used for irrigation, impoundments, non-discharging wetlands (not regulated as waters of the state), and groundwater recharge projects.
Chapter 173-218 WAC Underground Injection Control Program	Establishes an underground injection control (UIC) program for the injection of fluids through wells. This rule is applicable to reclaimed water that would be released to groundwater by way of an injection well.

Statutes (RCWs) and Rules (WACs)	Application
Chapter 173-219 WAC Reclaimed Water Rule	Regulates reclaimed water facility review, permitting, technical standards, operations, and beneficial uses of reclaimed water.
Chapter 173-220 WAC National Pollutant Discharge Elimination System Program (NPDES)	Delegates to Ecology the NPDES permitting program from the United States Environmental Protection Agency (USEPA). Ecology will generally include provisions for reclaimed water generation, distribution, and use in a NPDES permit when the treatment facility also has an authorized discharge to surface water and if the beneficial use of reclaimed water involves distribution to surface water or to certain wetlands.
Chapter 173-230 WAC Certification Of Operators Of Wastewater Treatment Plants	Protect public health and the environment, including waters of the state, by ensuring wastewater treatment plants are properly operated and maintained. By requiring certification of wastewater treatment plant operators, the department ensures they demonstrate competence to operate and maintain wastewater treatment plants or reclaimed water facilities.
Chapter 173-240 WAC Submission of Plans and Report for Construction of Wastewater Facilities	Governs the submission of engineering reports to Ecology for the domestic wastewater treatment facilities. Entities proposing construction of reclaimed water facilities must submit engineering documents based on the requirements of this regulation and of chapter 173-219 WAC.
Chapter 246-260 WAC Water Recreation Facilities	Protects the health, safety, and welfare of users of water recreation facilities.
Chapter 246-262 WAC Recreational Water Contact Facilities	Protects the health, safety, and welfare of users of water contact facilities.
Chapter 246-272 WAC Wastewater and Reclaimed Water Use Fees	Establishes fees for Health sewage treatment and reclaimed water activities.
Chapter 246-272A WAC On-site Sewage Systems	Protects public health by regulating the location, design, installation, operation, maintenance, and monitoring of on-site systems with a design flow below 3,500 gallons/day by local health jurisdictions.
Chapter 246-272B WAC Large On-site Sewage System Regulations	Protects public health and the environment by establishing a comprehensive framework for statewide management by Department of Health of large on-site sewage systems with a design flow of 3,500 to 100,000 gallons/day.

Statutes (RCWs) and Rules (WACs)	Application
Chapter 246-272C WAC On-site Sewage Systems Tanks	Protects public health and safety by assuring proper design and construction of all tanks used in on-site sewage systems.
Chapter 246-274 WAC Greywater Reuse for Subsurface Irrigation	Establish requirements that provide building owners with simple, cost-effective options for reusing greywater for subsurface irrigation.
Chapter 246-290 WAC Group A Public Water Systems	Establishes requirements for public water systems consistent with the Safe Drinking Water Act and other Health statutes and WACs. For reclaimed water projects, requirements for water system plans, cross-connection controls, design standards (distribution systems), and source protection may apply to specific projects.
Chapter 246-292 WAC Waterworks Operator Certification	Protects public health by setting minimum requirements and standards for public water systems required to have a certified operator in responsible charge; certified operators of public water systems; certified operators that develop and implement cross-connection control programs; and certified operators that inspect, field test, maintain, and repair backflow assemblies, devices, and air gaps that protect public water systems.

3.2 Reclaimed Water Permits

There are basic statutory differences between *wastewater discharge permits*, *water right permits*, and *reclaimed water permits*.

3.2.1 Wastewater discharge permits

These include National Pollutant Discharge Elimination System (NPDES) permits and State Waste Discharge Permits (SWDP).

An NPDES Permit is required for a discharge of treated wastewater effluent to waters of the U.S. (surface waters). Ecology issues this permit by delegated authority of the Clean Water Act. Since waters of the U.S. are also waters of the State, Ecology's NPDES permits are actually NPDES/State Waste Discharge Permits issued under dual authorities.

A State Waste Discharge Permit is required for a discharge of treated wastewater effluent to waters of the state, which includes groundwater. Ecology regulates these under chapter 90.48 RCW, the Water Pollution Control Act. Similarly, Health or local health jurisdictions review and approve effluent dispersal from on-site sewage systems (OSS), chapter 70.118 RCW, and large on-site sewage systems (LOSS), chapter 70.118B RCW.

These permits include treatment, monitoring, and siting conditions providing for the least harmful disposal of treated wastewater effluent. Wastewater dischargers must treat their wastewater discharges to protect existing beneficial uses in groundwater and surface water and to protect public health. Typically, operators do not plan wastewater discharges for a specific beneficial use, although there may be some incidental benefit.

3.2.2 Water right permits

Chapter 90.03 RCW, Water Code and chapter 90.44 RCW, Groundwater Code authorize Ecology to regulate water rights. They govern the quantity, location, and purpose of water use and its relation to other water rights. A person reclaiming water with a permit issued under RCW 90.46 has the exclusive right to any reclaimed water generated by the wastewater treatment facility and as such does not need a water right for reclaimed water use.

3.2.3 Reclaimed water permit

Chapter 90.46 RCW, the Reclaimed Water Use Act, authorized Ecology, in coordination with Health to write a rule to establish standards for all aspects of reclaimed water use, including the distribution and storage. The Reclaimed Water Use Act considers reclaimed water a water supply produced for beneficial use(s) outlined in the law and expanded upon in the Rule. The law clearly states that reclaimed water is not a wastewater and that the use, distribution, storage, and the recovery from storage of reclaimed water by the owner of a wastewater treatment facility permitted under chapter 90.46 RCW is exempt from permit requirements of the Water Code.

The Rule requires individual permits to identify terms and conditions determined to be necessary by the lead agency for the protection of public health and the environment. Each permit may establish additional conditions on a case-by-case basis as needed to protect public health and the environment. The rule outlines the lead agency designation, and roles and responsibilities of each agency.

Generators issued a reclaimed water permit before the effective date of WAC 173-219 must comply with new Rule requirements on the effective date of February 23, 2018.

> The lead agency may issue an extension for compliance to those issued the permit before the effective date of WAC 173-219 to provide for a reasonable time to comply.
>
> Generators must request the extension in writing and provide good cause for the request. Acceptable "good cause" reasons include recent approval of a new permit (less than one year).

Generators are not required to obtain a modification of the existing reclaimed water permit until the application for the permit renewal is due under WAC 173-219-070.

Many facilities that generate reclaimed water also have wastewater effluent discharges. Effluent discharge may be an alternative when a reclaimed water facility cannot meet the required reclaimed water quality standards and the facility does not have the ability to store the water for re-treatment. Effluent discharge is also an option when the available supply of reclaimed water exceeds the demand by authorized users of the water or if there is only seasonal demand from beneficial users.

An NPDES permit is required under the federal Clean Water Act whenever effluent is discharged to surface water for the reasons stated above. In addition, if the beneficial use of the reclaimed water involves surface water augmentation or wetland enhancement, Ecology may issue a NPDES permit for that use. Similarly, a State Waste Discharge permit may be issued if wastewater effluent is discharged to the ground. In addition, ground and drinking water standards may apply when reclaimed water is used for groundwater recharge as a beneficial use.

While Ecology will typically issue a single permit to authorize effluent discharge (NPDES or SWDP) along with reclaimed water conditions, it may issue separate discharge and reclaimed water permits to a facility on a case-by-case basis. When a reclaimed water permit is combined with an NPDES or SWDP (both issued by Ecology), the reclaimed water requirements are included in a separate section from the effluent discharge conditions with headings beginning with "R" to indicate Reclaimed Water conditions.

Health may issue a reclaimed water permit in conjunction with an OSS or LOSS permit. OSS and LOSS discharge treated effluent to the vadose zone, and not directly to either surface water or groundwater.

The reclaimed Rule does not apply to the following activities:

- Non-potable reuse systems (WAC 173-219-030(2) (a)).
- Greywater or treated greywater as defined in RCW 90.46.010 and chapter 246-274 WAC. (WAC 173-219-030(2) (b)).
- Agricultural industrial process water as defined in RCW 90.46.010 (WAC 173-219-030(2) (c).
- Industrial reuse water as defined in RCW 90.46.010 (WAC 173-219-030(2) (d).
- The capture and redirection of wastewater effluent for treatment facility purposes when under the direct control of the operator in responsible charge of the facility.
- Land treatment of wastewater, in which wastewater is applied at agronomic rates to soil in a system that utilizes surface soils, cover crops, and/or soils in the vadose zone to provide additional treatment. For recommended design criteria and permitting procedures, refer to the most recent edition of *Guidelines for Preparation of Engineering Reports for Industrial Wastewater Land Application Systems* (Ecology).
- Discharge of 100,000 gallons per day or less (peak day flow) of wastewater effluent to groundwater through on-site sewage disposal systems regulated under chapters 70.118 and 70.118B RCW.

3.3 Agricultural Industrial Process Water and Industrial Reuse Water

In 2001 and 2002, legislative amendments to chapter 90.46 RCW added provisions for two additional types of industrial water reuse: agricultural industrial process water and industrial reuse water. The law did not specifically require or fund development of either new standards or regulations for the new categories. The current Reclaimed Water Rule, in accordance with RCW

90.46.150, does not apply to the use of agricultural industrial process water or industrial reuse water under RCW 90.46.160.

Due to the wide variety of potential wastewater sources and uses, Ecology envisions making most decisions on a case-by-case basis for these types of wastewater sources. All requirements for water quality and human health protection under chapter 90.48 RCW still apply. In addition, the permit must assure that the new water supply provides adequate and reliable treatment (ART) for the intended uses (RCW 90.46.010). Additional permitting information is provided in Sections 5.4.1, Agricultural Industrial Process Water Reuse Permits and 5.4.2, Industrial Process Water Reuse Permits.

3.4 Multiple Regulatory Agency Review Process

The Rule requires early consultation between potential generators and the lead and nonlead agency prior to the feasibility analysis for any new projects (WAC 173-219-170).

Two state agencies, Ecology and Health, have responsibility to review reclaimed water submittals and develop reclaimed water permits. Either agency may be designated as the lead agency for issuing and maintaining a reclaimed water permit in accordance with criteria in the Rule (WAC 173-219-050).

The nonlead agency may choose to limit the scope of its involvement. Chapter 5, Planning and Permitting Process, and Table 5-1 discuss and document which agency will be the lead agency for various types of reclaimed water projects. The lead agency will notify the nonlead agency of the receipt of applicant documents, coordinate reviews, and incorporate comments as requested.

Ecology's Water Resources Program (WRP) is responsible for the development of reclaimed water permit conditions regarding water rights, evaluating beneficial uses and controlled uses of reclaimed water relevant to the impairment analysis, as well as determining potential impairment of existing water rights (WAC 173-219-090(2)).

Early coordination or consultation with Ecology and Health is recommended for all significant issues related to public health and environmental protection.

3.5 Water Rights Considerations

The Reclaimed Water Use Act, chapter 90.46 RCW prohibits the cessation of a wastewater discharge, for the purpose of reclaiming it and putting it to beneficial use, if stopping that wastewater discharge will cause a downstream impairment of existing water rights. This is because typical wastewater effluent that is discharged to the environment is considered to be released and becomes waters of the state.

The Reclaimed Water Use Act requires that the reclaimed water project not impair existing water rights downstream from any freshwater discharge point of such facilities unless compensation or mitigation for such impairment is agreed to by the holder of the affected water right.

When wastewater that has been traditionally discharged is planned to be reclaimed for other uses, the Rule requires that the applicant demonstrate compliance with RCW 90.46.130. Ecology must evaluate and approve all reclaimed water projects to ensure compliance with RCW 90.46.130.

The Rule (WAC 173-219-090 (4)) contains the requirement that for all proposed reclaimed water projects, the project proponents must conduct and submit an initial impairment analysis of potentially impaired water rights to demonstrate compliance with this provision of the statute.

Ecology's Water Resources Program (WRP) reviews the initial impairment analysis, included as part of the feasibility analysis. A component of the initial impairment analysis is the identification of all potentially impaired water users and/or instream flows. As the statute allows for compensation or mitigation for impairment, a preliminary proposal for compensation or mitigation of any impaired water right may be included in the feasibility analysis. Once a project has proceeded past the feasibility analysis, the project proponent must prepare and include a formal, final impairment analysis within the final comprehensive engineering report that is submitted to Ecology. This would include a detailed description of any compensation or mitigation agreed to by all water right holders found to be subject to impairment. WRP reviews the complete impairment analysis provided in the engineering report, makes an adequacy determination on that review to the lead agency for project approvals, and develops permit conditions necessary to avoid violations of the Water Code.

Chapter 4 provides more detailed guidance.

Please note, the term "mitigation" is used in two different contexts in this guidance document. One context concerns statute RCW 90.46.130, where a reclaimed water user may provide compensation or mitigation to a downstream water right holder found to be subject to impairment. In this instance, mitigation could be in the form of water provided to the impaired water right holder in a way that offsets the impairment. The other context concerns using the reclaimed water itself as mitigation to allow for the issuance of a new water right(s). In this instance the reclaimed water use may offset the impacts associated with the new water right(s).

The specific circumstances of the original wastewater discharge and the proposed use of the reclaimed water governs the complexity of the impairment analysis. For example, an existing facility discharging to saltwater will need only to document the existing saltwater discharge while facilities discharging to fresh waters of the state will require a more thorough examination. Additionally, the direct use of reclaimed water piped from the facility requires a less complex impairment analysis than an applicant proposing to convey reclaimed water via waters of the state and withdraw the water for use downstream or down gradient.

For those proposing to convey reclaimed water using waters of the state. As long as the intent of subsequent withdrawal or diversion is recovery of the reclaimed water for a beneficial use by the owner of the reclaimed water facility and a portion of the reclaimed water is actually recovered, the complete project may be permitted under a single reclaimed water permit.

In some situations the use of reclaimed water may require that a new appropriative water right under chapter 90.03 or 90.44 RCW must be applied for and approved prior to initiating the withdrawal or diversion in addition to the reclaimed water permit. For example:

- Where reclaimed water is proposed as mitigation for withdrawal or diversion of waters of the state and no portion of the reclaimed water will be recovered, or
- When the reclaimed water is proposed as mitigation for new water use by a person other than the owner of the reclaimed water facility, regardless of whether a portion of the reclaimed water will be recovered.

4 Water Rights

4.1 Introduction

The Reclaimed Water Use Act (RCW 90.46.130) states, "…facilities that reclaim water under this chapter shall not impair any existing water right downstream from any freshwater discharge points of such facilities unless compensation or mitigation for such impairment is agreed to by the holder of the affected water right."

The Reclaimed Water Rule, WAC 173-219-090(1), requires that an applicant for a reclaimed water permit demonstrate compliance with RCW 90.46.130 for all new reclaimed water projects, and for existing reclaimed water permits when permit modifications that change capacity and/or discharge volume are proposed.

This chapter provides guidance for conducting an analysis of potential impairment of existing water rights. The purpose of the impairment analysis is to evaluate the potential for impairment of existing water rights when a new reclaimed water project is planned.

The specific circumstances of the original wastewater discharge and the use of the reclaimed water will affect the complexity of the impairment analysis needed to demonstrate compliance with RCW 90.46.130. (See Section 4.5 for more information.)

Ecology intends this guidance to assist both project applicants and Ecology staff in establishing a clear process for the analysis.

RCW 90.46.130 does not address potential impairment of existing water rights *upstream* of facility discharge points.

While not required by the statute, the applicant should consider evaluating potential impairment of upstream existing water rights to avoid potential litigation.

4.2 Applicant and Agency Responsibilities

The first step in an impairment analysis is for the project applicant to request the required pre-planning meeting with the lead and non-lead agencies, which needs to include Water Resources and Water Quality staff from Ecology (WAC 173-219-170(1)). This meeting is to scope the feasibility analysis, which must include an initial impairment analysis. The pre-planning meeting can include a discussion of process and possible approaches to the analysis. The applicant should contact Ecology Regional Offices early for coordination and technical assistance. An iterative process may be most appropriate.

Ecology encourages the project applicant to work with staff at any point in the process when questions arise about the procedure outlined in this section. Early contact with the Washington State Department of Fish and Wildlife (WDFW), tribes, potable water suppliers, and other water right holders in the basin will facilitate this process.

Project applicants may choose to perform the initial and final impairment analyses or may request that Ecology conduct the analyses. Note that adequate staffing may not be available at Ecology to perform these analyses in a timely manner. To ensure timely action on the project, Ecology will often recommend contracting with a qualified consultant, possibly through Ecology's cost reimbursement process, to conduct the analyses. In either case, Ecology can assist the applicant in locating relevant data for the analyses.

It is recommended that the applicant contact potential stakeholders, water users and water right holders early in the impairment analysis process. If the analysis reveals impairment and the applicant wishes to proceed with the project, mitigation or compensation is required.

4.2.1 Applicant Responsibilities

The applicant is responsible for submitting an initial and final water right impairment analysis to demonstrate compliance with RCW 90.46.130.

The initial water right impairment analysis, with or without an engineer's or hydrogeologist's stamp must be submitted with the feasibility analysis. The final, analysis must be stamped by an engineer or hydrogeologist licensed in Washington and, must be submitted as part of or with the final engineering report. Ecology may not accept any analysis until Ecology considers the analysis complete. See Section 4.6 for details on what to include in an impairment analysis.

Ecology's WRP has final determination of adequacy of a final impairment analysis and proposed mitigation and compensation. The Rule ties this determination to the permit issuance making it appealable at this point in the permitting process.

If there is potential water right impairment—requiring mitigation or compensation agreements with affected water right holders—the applicant must provide signed agreements before Ecology can make a final impairment determination and issue a reclaimed water permit.

Ecology recognizes it will take time to get agreements in place and therefore does not require signed agreements with the initial impairment analysis in the feasibility analysis. Signed mitigation or compensation agreements, if needed, should be submitted with the Engineering Report (WAC 173-219-210(2) (o) (iii)). Agreements will be included in a reclaimed water permit as part of the conditions of approval.

4.2.2 Ecology Responsibilities

Ecology, during the pre-planning meeting with the applicant, will assess the level of technical assistance to be provided, including but not limited to access to water rights data and defining the

area of influence to assess for potential impairment. If a cost reimbursement agreement is necessary, the scoping for this should happen at the pre-planning meeting or subsequent meeting if not practical to include as part of pre-planning meeting. Cost reimbursement agreements must meet the requirements of RCW 43.21A.690 and are subject to resource availability.

Ecology will notify WDFW and potentially affected tribes of the availability of any draft analyses. The applicant is encouraged to engage directly with WDFW and tribes.

Ecology will make a decision regarding the completeness of an initial impairment analysis for the feasibility analysis. Before Ecology makes a decision, they will consult with WDFW and affected tribes. Ecology may adopt, amend, reject or issue its own analysis beyond the applicant's analysis.

If approved, the final determination of impairment, and any finally executed agreements for mitigation or compensation will be included in the applicant's permit.

A reclaimed water permit application may be denied based on an impairment analysis determination. If a permit is denied the applicant must be given the basis for permit denial and appeal procedures.

The State is the holder of all adopted instream flow water rights and as such has the responsibility to protect these flows.

Applicants may receive approval of other planning documents that consider use of reclaimed water before an impairment analysis is completed. However, the State Environmental Policy Act (SEPA) reviewing agency might require water right impairment mitigation or compensation agreements prior to issuing a SEPA determination for a reclaimed water engineering report or for construction plans and specifications.

4.3 Water Right Impairment

An early stakeholder report[1] to the legislature recommended the following regarding water right impairment—as it relates to reclaimed water:

A water right is impaired when there is an interruption or interference in the availability of water, or degradation of the quality of water, caused by decreasing or ceasing a wastewater discharge to freshwater in order to reclaim the water, that would:

- Prevent an existing water right holder from partially or fully beneficially using the water right; or
- Require an existing water right holder to make significant modifications in order to beneficially use the water right; or

[1] Water Rights Impairment Standards for Reclaimed Water: Stakeholder Views and Ecology Recommendations 2009 Report to the Legislature.

- In the case of an existing instream flow established by Rule or otherwise, cause the flow of the stream to fall below the instream flow more frequently, for a longer duration, or by a greater amount than prior to decreasing or ceasing the discharge.

Ecology's consideration of a reclaimed water impairment analysis must be consistent with the provisions of chapter 90.03 RCW, chapter 90.44 RCW, RCW 90.46.130, and applicable case law.

Water quality degradation is a potential cause of impairment to senior water rights. An example of this could be seen when a decrease in volume of water causes an exceedance of water quality standards in the remaining water that impacts a downstream water right holder's ability to use their water. Ecology bases this on water rights case law including: Hillcrest Water Assoc. v. Ecology, PCHB No. 80-128 (1981) and Cheney v. Ecology, PCHB No. 96-186 (1997).

4.4 Instream Flow Water Rights

Ecology must accept and approve compensation or mitigation for any water right impairments to state adopted instream flows.

When instream flows are impaired due to changes in discharge associated with the establishment of reclaimed water activities, there are currently very few options available to address this impact.

Recent Supreme Court reinforce a narrow interpretation of impairment of instream flows adopted in rule, and limit the ability to mitigate that impairment. However, recent legislation may provide mitigation options. This area of the law continues to evolve. Under the current legal framework:

- Ecology cannot use Overriding Consideration of Public Interest (OCPI) to justify permanent allocations of water.
- No impairment of instream flows is permissible, regardless of magnitude or ecological impact (Foster2 extended the standard of impacts for availability in Postema to impairment of instream flows.)

If a reclaimed water project is proposed in a basin having adopted instream flows, the applicant may consider the following options:

- One potential option is to condition the reclaimed water permit as interruptible if removal of effluent results in any reduction of flows below the legal instream flow at any time of the year (i.e. interruptible during the summer months). This is similar to the condition placed on the diversion for a junior water right when instream flows are not met. Other conditions may apply, like the submittal of a metering plan.
- As another alternative, it may be possible for the project applicant to provide in-time, in-place, water-for-water compensation or mitigation to prevent the impairment of the instream flow right. The adequacy of mitigation is very case-specific.

[2] Foster v. Washington State Dept. of Ecology, 184 Wash. 2d 465 -Wash: Supreme Court, 2015

- New process changes or other actions at an existing facility that could result in increased discharges (above what has been discharged historically) may be available for purposes other than flow augmentation. Contact Ecology staff to discuss possible facility changes and site and case-specific mitigation measures.

4.5 Impairment Analysis

WAC 173-219-090(1) requires that an applicant for a reclaimed water permit demonstrate compliance with RCW 90.46.130. This section of the Reclaimed Water Use Act requires that the reclaimed water project not impair existing water rights downstream from any freshwater discharge point unless compensation or mitigation for such impairment is agreed to by the holder of the affected water right. In the case of impairment to instream flows adopted in Rule, recent court cases minimize any flexibility the state may have in compensating for or mitigating such impairment.

Surface water/groundwater interactions should be considered in an impairment analysis of whether the reclaimed water project may cause impairment to both groundwater and surface water.

Reclaimed water facilities permitted prior to the effective date of the Reclaimed Water Rule are not required to develop an impairment analysis for the existing facility. However, if an applicant proposes to modify an existing reclaimed water facility in a manner that may affect existing water rights, such as a change in the treatment capacity or a new consumptive use, an impairment analysis will be required. WAC 173-219-090. The change in uses or increase in the quantity of water reclaimed may only be allowed if they result in no impairment, or compensation/ mitigation has been agreed to by impaired water right holders.

The specific circumstances of the original wastewater discharge and the use of the reclaimed water will affect the complexity of the impairment analysis needed to demonstrate compliance with RCW 90.46.130.

An existing facility discharging to saltwater will need only to document the existing saltwater discharge.

4.6 Completing an Impairment Analysis

WAC 173-219-090(4) requires of the applicant prepare the water rights impairment analyses. The final impairment analysis must be stamped by an engineer or hydrogeologist licensed in Washington State. Unless discharging directly to saltwater, an impairment analysis, at a minimum, must:

1. Describe the characteristics of the historical wastewater discharge and disposal method to determine the amount of water that is the basis for the analysis. This initial assessment should include or take into consideration:
   - A multi-year discharge hydrograph (minimum 24 months).
   - Wastewater disposed of in a fully consumptive manner.
2. Determine the study area for the analysis. The study area should be based on geographic and geologic boundaries, and the extent of downstream or down gradient influence of the

existing discharge. The study area description should include data and/or a modeling analysis to provide evidence for the limit of influence. A map should be provided along with a written description of this area.

3. Identify all existing water rights and water right claims within the study area. Any downstream water right holder of any priority date in this area whose exercise of a water right relies in whole or in part on the water body to which wastewater has historically been discharged should be evaluated. Ecology has interpreted downstream to mean down-gradient in the context of groundwater.

   Relevant information that should be presented includes water right numbers, priority dates, points of withdrawal, instantaneous and annual withdrawal amounts, and purposes of use. Water right numbers and points of diversion/withdrawal should also be shown on the study area map.

   For groundwater rights, additional information should be included such as well depth, well construction, static water level, and any additional pertinent hydrogeologic information (e.g. pumping test information, geologic/hydrogeologic reports).

   Water Resources Program staff can assist with determining the location and characteristics of study area water rights. Any downstream instream flow control points should also be presented. Instream flows are water rights held by the Department of Ecology and potential impacts to these flows must be addressed in the impairment analysis.

4. Identify potentially impaired water rights, and the extent of potential impairment, based on proposed changes to the historical discharge.

4.6.1 Impairment Action Plan

In defining an action plan for addressing any impaired rights the applicant has several options to consider.

- Whether to alter the project to reduce or eliminate the impairment potential. Modifications to the proposed beneficial uses or to the project design may be possible to address impairment concerns. Phasing of the project may also be possible to provide the stakeholders time to explore additional options.
- Whether to "compensate or mitigate" for said impairment as described in RCW 90.46.130. A person seeking this option must obtain the water right holders' concurrence with the project in writing and present such in the plan.
- Impairment of instream flows must be fully mitigated, water-for-water, in-time and in-place.
- Whether to acquire/purchase potentially impaired rights.

WAC 173-219-090 allows a ***preliminary*** proposal for compensation or mitigation (as allowed under RCW 90.46.130) with the Feasibility Analysis, and a final proposal, with signed agreements, submitted with the Engineering Report.

5 The Planning and Permitting Process

Planning and permit requirements for reclaimed water facilities extend beyond any single program, so it is important for the proponent of a reclaimed water project to engage with staff from Ecology's Water Quality Program (WQP), the Water Resources Program (WRP), and Health early in the process.

This chapter discusses the general planning and permitting processes for most new reclaimed water projects. The Reclaimed Water Use Act, chapter 90.46 RCW, requires the Department of Ecology (Ecology) and the Department of Health (Health) to develop an efficient and streamlined process to allow generation and use of reclaimed water. Either agency may elect to issue a single permit to the reclaimed water generator that incorporates water quality, public health, and water resources provisions to govern the location and beneficial use of the water.

Health's Wastewater Management Section in the Division of Environmental Public Health is the primary contact for reclaimed water, and may consult with the Office of Drinking Water if appropriate.

Chapter 90.46.220 states, "Any person proposing to generate any type of reclaimed water for a use regulated under this chapter shall obtain a permit from the lead agency prior to distribution or use of that water." WAC 173-219-070 identifies the following as eligible to apply for a reclaimed water permit:

- A municipal, quasi-municipal, or other governmental entity.
- A private utility, if the lead agency determines that the private utility meets the requirements in WAC 173-219-180.
- The holder of an active on-site sewage treatment permit under chapter 70.118B RCW or a permit or approval under chapter 70.118A RCW.
- The holder of an active waste discharge permit issued under chapter 90.48 RCW.

Any of the above may propose constructing and operating a reclaimed water project that includes treatment and distribution facilities operated under a reclaimed water permit.

A successful reclaimed water project requires careful planning prior to constructing a facility or obtaining a reclaimed water permit. It is important to note that many reclaimed water projects require significant planning and design efforts that must start months, if not years, before submitting a permit application.

The project proponent must complete a feasibility analysis described in Section 5.2.4 prior to submitting an application.

The proponent may have completed and received approval of an engineering report (Section 5.2.6) and design plans and specifications (Section 5.2.7) for the proposed facility prior to submitting the application or may submit the engineering report with the application. Section 5.3 provides general information about permitting process specific to reclaimed water permits.

5.1 Determination of Lead Agency

Chapter 90.46 RCW and WAC 173-219-050 establish "lead" and "nonlead" roles for Ecology and Health in the review and approval of planning documents as well as in the development and oversight of reclaimed water permits. The lead agency is responsible for acting as the primary regulatory authority for a given project. These roles are further discussed in the following sections. Table 5-1 shows which agency will be lead for different types of reclaimed water projects.

Table 5-1 Lead Agency for Reclaimed Water Projects

Type of project	Lead Agency	
	Ecology	Health
Reclaimed water generator is already permitted by Ecology as a water pollution control facility	X	
Discharge to surface waters of the state	X	
Recharge to underground waters of the state (>100,000 gpd)	X	
On-site sewage system effluent discharge ≤ 100,000 gpd combined with reclaimed water uses that do not directly discharge to waters of the state		X
Reclaimed water generator is already permitted by Health or local health as an OSS or LOSS and with reclaimed water uses that do not directly discharge to waters of the state		X
Project proposal does not fall within the above categories	X The agencies may choose which will act as the lead after consultation	X The agencies may choose which will act as the lead after consultation

5.2 Planning Process

The reclaimed water planning process involves many steps common to other public works projects. The requirements and procedures discussed in the Planning Process section applies only to the development of new reclaimed water projects or the expansion of existing projects. Any reclaimed water facility approved by Ecology and Health prior to the enactment of the Reclaimed Water Rule, WAC 173-219, will not be required to complete new engineering documents until the facility owner propose an expansion or significant modification to the existing facilities.

Future updates to general sewer and water services plans should include appropriate feasibility analyses for new and expanded projects, but do not necessarily need to reassess the feasibility of existing reclaimed water projects for which no changes are proposed.

The legal owner of the proposed project must submit all documents for review and approval. Ecology will not accept documents submitted by a consultant or other third party unless accompanied by a transmittal letters signed by the proponent's signatory official or their duly authorized representative. Chapter 173-219-190(2) identifies acceptable signatories for various organizations:

- Municipal, state, or other public agency of facility: By either the principal executive officer or ranking elected official.
- Corporations: By a responsible corporate officer
- Partnership: By a general partner
- Sole proprietorship: By the proprietor
- Private Utility: By a responsible officer

All planning documents, engineering reports, plans and specifications, and operation and maintenance manuals must be prepared under the supervision of a professional engineer licensed in the state of Washington and bear the engineer's stamp and signature prescribed by the Board of Registration for Professional Engineers and Land Surveyors.

Other technical documents submitted for review and approval of the agencies must be prepared and stamped by the appropriate licensed professional.

Ecology must determine that a proposed reclaimed water project will not impair a water right before it can issue a reclaimed water permit. Project proponents must complete a water rights impairment analysis in consultation with Ecology's Water Resources Program early in the planning process to ensure that Ecology can ultimately permit the project. The feasibility analysis must include a preliminary water rights impairment analysis. The proponent must also include in the engineering report a detailed description of the compensation or mitigation plan, if one is necessary. See Chapter 4, Water Rights Impairment Analysis, for more information.

5.2.1 Pre-planning Steps

Chapter 90.46.120 RCW requires consideration in regional water supply plans or other potable water system plans the option of using reclaimed water to augment or replace the use of potable water or to potentially develop an additional new potable water supply. Reclaimed water project proponents must ensure that any water system planning under their organizational control includes appropriate consideration of reclaimed water use.

When the reclaimed water project proponent is not a local or regional potable water supplier, it should coordinate with the local or regional potable suppliers in the proposed project area to ensure that the suppliers appropriately consider the proposed reclaimed water supply in their water planning efforts. In addition, RCW 90.48.112 requires wastewater utilities to evaluate the opportunities for the use of reclaimed water as part of any wastewater utility planning effort.

Integrating wastewater and reclaimed water planning with these other planning documents will help identify opportunities as they arise, leading to more comprehensive, collaborative, and cost-effective alternatives. State law says that, to the extent reclaimed water is appropriate for beneficial uses, it should be used to preserve potable water for drinking purposes (RCW 90.46.050). The local public water suppliers and owners of any public water supply sources in the vicinity of proposed reclaimed water facilities should be contacted early in the process, so they can be informed stakeholders.

Beyond this broad water system planning consideration RCW 90.46 and WAC 173-219 require the proponent of a new or expanded reclaimed water project to submit feasibility, planning, design, and construction documents to the lead agency for review and approval prior to construction. To help ensure the success of a proposed project, WAC 173-219-170 requires early consultation with the lead and nonlead agencies to discuss the project objectives and to determine the scope of project-specific planning process.

When Ecology will be the lead agency, the project proponent should start by contacting the Water Quality Program staff at the regional Ecology office in their area to set up a pre-planning meeting.

The meeting will typically involve permitting and engineering staff from Ecology's Water Quality Program along with Health's reclaimed water engineering staff. Staff from Ecology's Water Resources Program may also be involved to address water rights protection topics.

The meeting also presents an opportunity for all parties to review the general project concept and determine if there are any obvious factors that may render the project infeasible.

The general goals of the meeting will be to identify specific requirements for planning and design document along with establishing general timelines for reviewing and approving project documents.

5.2.2 Pre-Planning Meeting

A pre-planning project meeting between the project proponent, their consultants and with Department of Ecology Water Quality permitting staff, Water Resources staff and Department of Health Drinking Water Program staff is required before the design work commences on the reclaimed water project.

5.2.2.1 The meeting should include discussion of:

- Drinking Water System(s) in the vicinity of the reclaimed water treatment and distribution system supply network
- Protection of Drinking Water Systems' source water quality
- Applicable reclaimed water beneficial uses, such as:
    - Land application or irrigation, including
        - Landscape irrigation
        - Irrigation of orchards, vineyards and other food and non-food crops
        - Irrigation of pasture lands

        - Irrigation of forest lands and other fiber, fodder and seed crops
        - Frost protection of orchards
    - Ground water recharge along with recovery of reclaimed water stored in an aquifer. (Aquifer Storage and Recovery)
        - Discussions about requirements for aquifer characterization
    - Commercial, industrial or institutional beneficial uses
    - Wetland enhancement
    - Streamflow or surface water augmentation
- Feasibility analysis criteria
    - Identifying all stakeholders that may be impacted directly or indirectly by the proposed project
    - Potential impacts to existing water rights (need for an impairment analysis)

Project proponents required to complete a water rights impairment analysis may need additional consultation with Ecology Water Resources Program staff to develop the scope of the impairment analysis. The final water rights impairment analysis and documentation of compensation or mitigation agreements should be included with the engineering report (WAC 173-219-090(4)). See Chapter 4, Water Rights, for more information.

5.2.2.2 Pre-planning testing and data collection

Early consultation with the lead agency provides the opportunity to assess whether a proposed project requires detailed environmental testing or studies prior to determining whether a beneficial use will be approvable. Potential data collection may include:

- Pilot testing for groundwater (aquifer) recharge and recovery of reclaimed water stored in an aquifer. While this is required for the engineering report, the study can occur prior to the submission of the feasibility analysis.
- Wetland studies to demonstrate how reclaimed water may provide a beneficial enhancement to a natural or constructed wetland.
- Pilot testing necessary to demonstrate proposed reclaimed water treatment systems will produce the acceptable class of water. This may be necessary for treatment processes not discussed in the Orange Book or to validate virus inactivation for the proposed disinfection process.

5.2.3 Planning Documents

Project proponents may include some form of reclaimed water planning at multiple levels depending on the scale and scope of a proposal. Because state law requires consideration of reclaimed water in several instances, a number of planning documents may include descriptions of proposed reclaimed water projects at varying levels of detail.

The Reclaimed Water Rule lists specific content requirements of all reclaimed water planning and engineering documents submitted for lead agency review and approval. To avoid unnecessary duplication of efforts, the lead agency may accept the following documents on a case-by-case basis to replace or supplement documents required by WAC 173-219.

- General sewer plans and engineering reports/facility plan for domestic wastewater facilities under RCW 90.48.110 and 90.48.112, or WAC 173-240-050 and 173-240-060;
- Coordinated water system plans, small water system management plans, sewage and sewage treatment works system plans or predesign reports under chapter 43.20, 70.116, or 70.118B RCW or chapter 246-290, 246-291, 246-272A, or 246-272B WAC;
- Water supply plans under chapter 90.44 or 90.82 RCW (WAC173-219-180(2)(c));
- A regional water supply plan or plans addressing potable water supply service by multiple water suppliers under chapter 246-290 WAC;
- Groundwater and aquifer protection plans, under RCW 90.44.400 and chapter 173-100 WAC;
- Comprehensive reclaimed water plans under RCW 57.16.010; and
- A stand-alone or supplemental reclaimed water plan.

In general, planning for all proposed new or expanded reclaimed water projects will require lead agency review and approval of the following documents:

- Feasibility Analysis
- Engineering Report
- Plans and Specifications

The project proponent must also submit an operations and maintenance manual to the lead agency for review and approval prior to completing construction of the reclaimed water facility. In addition, if substantial changes are made to the approved plans and specifications during construction, the proponent must submit those changes to the lead agency for review approval prior to implementing the change. Substantial changes are those that impact the ability of the reclaimed water facility to adequately and reliably produce reclaimed water.

Once construction is complete, the facility owner must submit the Declaration of Construction Completion form found in WAC 173-240-095 to certify that the reclaimed water facility was constructed according to the approved plans and specifications, including approved changes. The proponent should discus schedules for document submittals and reviews early in the planning process, ideally as part of a pre-planning meeting. It is the responsibility of the project proponent to manage the document development and submittal schedule to ensure reviews and approvals can be completed in sufficient time to meet funding, contractual, and other project deadlines, including deadlines in compliance schedules.

The lead agency will typically comment on, approve, or reject documents within ninety calendar days of receipt. However, additional review time may be necessary on a case-by-case basis depending on to the complexity of a project or due to

If the proponent does not begin construction within three years of the lead agency's approval of the engineering report or the plans and specifications, the lead agency may require an update to the engineering documents to address changes in reclaimed water standards, regulatory requirements, or treatment technology.

other workload constraints. If circumstances prevent adequate review within ninety days, the lead agency will notify the project proponent of the reason for the delay and provide an estimated review completion date. It is important to note that each time the lead agency reviews a document version may require ninety days for completion.

Communicating regularly with the lead and nonlead agency about various technical and policy topics during document development can help streamline the review process and minimize the number of reviews by the lead agency.

The lead agency and nonlead agency, if applicable, may rely on several resources when reviewing plans, analyses, engineering reports, and operations and maintenance manuals to ensure they comply with the intent of the Reclaimed Water Rule. Resources include appropriate sections of the most recent editions of Ecology's *Criteria for Sewage Works Design* and this guidance manual. Additional review references may include, but are not limited to the following documents listed in WAC 173-240-040:

- *Manuals of Practice*, Water Pollution Control Federation
- *Manuals of Engineering Practice,* American Society of Civil Engineering.
- *Standard Specifications for Municipal Public Works Construction*, American Public Works Association.
- *Considerations for Preparation of Operation and Maintenance Manuals*, United States Environmental Protection Agency.
- *Process Design Manuals*, United States Environmental Protection Agency.
- *Design Criteria for Mechanical, Electric, and Fluid System and Component Reliability*, United States Environmental Protection Agency.
- *Design Manual: Onsite Wastewater Treatment and Disposal Systems*, United States Environmental Protection Agency, October 1980.
- *Guidelines for Larger On-Site Sewage Disposal Systems*, Washington State Department of Social and Health Services and Department of Ecology.

The lead agency will review the planning and engineering documents to determine whether the proposed reclaimed water facilities meet:

- State standards and other requirements for the generation, distribution, and use of reclaimed water under chapter 173-219 WAC and chapter 90.46 RCW.
- Applicable requirements of chapters 90.48 and 90.54 RCW necessary to prevent and control pollution of waters of the state.
- Applicable requirements of chapter 70.118, 70.118A, 70.118B, 70.119, 70.119A, or 43.20 RCW with respect to on-site sewage systems or public water systems.

5.2.4 Feasibility Analysis

Proponents of a reclaimed water project must develop a feasibility analysis that demonstrates they have the long-term technical, management, legal, and financial capacity to design, construct, operate, and maintain the reclaimed water facility. The analysis must also show that distribution and beneficial end uses of the reclaimed water are feasible. The general purpose of

the analysis is to document that the proponent has sufficient resources to provide public health and the environmental protection over a 20-year planning period.

As was discussed in Section 5.2.1 and 5.2.2, early consultation with the lead agency and nonlead agency is an important component of successful project planning. Whether a proposed project involves building a new reclaimed water facility or expanding an existing facility, early consultation allows time for the lead agency and nonlead agency to provide technical assistance and to help identify whether there are any obvious factors that may make a proposed project infeasible.

Since a number of state laws and administrative rules require evaluating opportunities for reclaimed water use during comprehensive water and sewer planning, some existing planning documents may include sufficient information to satisfy some or all of the feasibility analysis requirement. The lead and nonlead agency can help evaluate whether existing documents can be used as a replacement or supplement. In many cases, documents approved for other purposes may meet the needs of this section with minor to moderate amendments or additions.

The following documents may be considered for use in meeting the feasibility analysis requirements under this section:

- General sewer plans and engineering reports for domestic wastewater facilities under RCW 90.48.110 and 90.48.112, or WAC 173-240-050 and 173-240-060;
- Coordinated water system plans, small water system management plans, sewage and sewage treatment works system plans or predesign reports under chapter 43.20, 70.116, or 70.118B RCW or chapter 246-290, 246-291, 246-272A, or 246-272B WAC;
- Water supply plans under chapter 90.44 or 90.82 RCW (WAC173-219-180(2)(c));
- A regional water supply plan or plans addressing potable water supply service by multiple water suppliers under chapter 246-290 WAC;
- Groundwater and aquifer protection plans, under RCW 90.44.400 and chapter 173-100 WAC; and
- Comprehensive reclaimed water plans under RCW 57.16.010.

If the above documents do not contain sufficient information, or if the information is outdated, the project proponent may need to develop a separate Reclaimed Water Feasibility Analysis to satisfy the rule requirement.

It is also critical that (potential) reclaimed water generators identify and communicate with public water systems early and often. In recognizing that both reclaimed water generators and public water systems provide water supplies to consumers, the reclaimed water generator should be prepared to discuss service area impacts, including revenue and public water system protection when customers shift from potable to reclaimed water supply with the public water supplier and the Department of Health Drinking Water Division.

The reclaimed water generator may need to participate in processes typically aimed at potable suppliers, including local planning for coordination of water service areas.

In addition, location of proposed reclaimed water facilities and beneficial use sites, in relation to potable water facilities and source water should be discussed with respect to financial and water quality implications of the reclaimed water distribution system, as well as any other relevant topics.

The project proponent must submit all documents that make up the feasibility analysis to the lead agency for review and approval. The lead agency may approve the submittal, return it for revisions, or disapprove the feasibility analysis based on a determination of inadequate technical, management, legal, and financial capacity or lack of sufficient information on which to make a determination.

For all reclaimed water projects the feasibility analysis must contain the information found in WAC 173-219-180(1) (c), and any other relevant information required by either the lead or nonlead agency. Table 5-2 below provides a summary of the items required in the feasibility analysis.

Table 5-2 Items Required in Feasibility Analysis

Text from WAC 173-219-180	Explanation
180 (1) (c) (i) Explanation of who will own, operate, and maintain the reclaimed water facility.	Provide the name, phone number, street address, and email address of the person that will own, operate, and maintain the reclaimed water facility as well as the names of the legally responsible official(s). If the owner plans to partner with a contract operator or other service provider to operator and/or maintain any or all of the proposed reclaimed water facilities, the feasibility plan must disclose that intention and, if known, provide the name and contact information for the contract operator.
180 (1) (c) (ii) For a planning period of 20 years, projected capital and operational costs, in terms of total annual cost and present worth, and projected revenues from user fees and other sources, if applicable.	Prepare a spreadsheet(s) showing projected capital and operating costs, including any debt service cost for bonds or loans used to finance the project, for a period of 20-years. Show total annualized costs and the net present worth using appropriate discount rates for public works projects. Develop estimated project revenues for the same 20-year period including any potential user fees or other sources of revenue. As part of the analysis, discuss whether user fees are already in place or if they are only proposed. Also clearly describe all sources of other revenue for the project, including whether the proponent anticipates using grants or loans to assist with initial capital costs. Compare all annual estimates to show financial viability of the facility.

180 (1) (c) (iii) Estimate of the annual or seasonal volumes of wastewater required and available and proposed production (generation) rate of reclaimed water.	Demonstrate adequate supply of source (waste) water to match the demand for reclaimed water. To satisfy this requirement the project proponent must be able to show that there are viable opportunities for using reclaimed water produced at the proposed facility and that the facility will be capable of meeting all or part of that potential demand. The proponent may need to rely on a number of different existing resources and studies to estimate potential demand. Water usage reports and water system plans may be used to estimate water demands for commercial, industrial, and institutional uses along with some irrigation uses. Site-specific crop or irrigation plans may also be needed for larger irrigation projects. Hydrogeological reports and other environmental studies may be required to support estimates when proposed uses involve groundwater recharge or wetland enhancements. Each of these resources should give the proponent sufficient information to estimate the non-potable water needs that can be satisfied with reclaimed water on a seasonal and/or annual basis. Since the feasibility analysis is a preliminary planning document, Ecology does not expect the proponent to develop new, detailed water use studies unless there are no existing resources available to provide sufficient information. To estimate the potential reclaimed water supply, the proponent should rely on an up-to-date general sewer plan. The general sewer plan provides appropriate planning level information on the existing and projected amount of wastewater available for further processing into reclaimed water. It is also the appropriate place for a community to examine alternatives for long-term wastewater treatment, including the alternative to produce reclaimed water. If the project involves a small treatment system operated by a private utility or is part of an on-site treatment system, the proponent must be able to show how they came up with flow estimates for the proposed project. Once the proponent has developed estimates for reclaimed water demand and supply, it must develop a water balance to compare supply and demand to show whether they balance or if there are projected surpluses or deficits in supply. The results of this balance will be used elsewhere in the feasibility analysis in relation to managing any surplus or deficit.

180 (1) (c)(iv) Description of the proposed level of reclaimed water quality the project will generate, along with general descriptions of the treatment systems and reliability features used by the proposed facility. The project proponent must demonstrate that the proposed facility concept is capable of meeting and ensuring the minimum requirements for water quality, treatment and reliability for the proposed uses	The project proponent must identify the minimum class of reclaimed water required for the anticipated beneficial uses along with any additional requirements listed for those uses in the Use-Based Performance Standards shown in Table 3 of WAC 173-219-390. The feasibility analysis must present a general process description of the proposed reclaimed water treatment facility including, all process steps necessary to treat raw domestic wastewater to the appropriate class of reclaimed water. While the proposed reclaimed water facility may operate separately from a secondary wastewater treatment facility, the proponent must be able to demonstrate that the source water to the reclaimed water facility will meet the minimum performance standards listed in Table 2 of WAC 173-219-330. The process description must also generally describe design alternatives the proponent will evaluate to ensure the future facility will comply with the treatment reliability standards listed in WAC 173-219-350.
180 (1) (c) (v) Description of plans for alternative use, storage, or release of any reclaimed water or inadequately treated water.	The feasibility analysis must generally discuss how the proponent propose to manage any excess or inadequately treated reclaimed water. It should discuss whether the proposed facility will include discharge alternatives for excess water or if it will include provisions for long-term or short-term storage of treated water. If storage is included, the proponent should discuss alternatives that may be used to ensure the stored water remains at an appropriate quality. The analysis should also discuss whether inadequately treated water will be stored and returned to the treatment process for re-treatment or discharge through any other authorized method.
180 (1) (c) (vi) Initial assessment of potential water quality and quantity impairment and potential strategies to prevent, compensate, and/or mitigate for such impairment.	The project proponent must complete the Impairment Analysis required by WAC 173-219-090(4) to fulfill this requirement. Please refer to Chapter 4 of this document for further details on that analysis.
180 (1) (c) (vii) List of all public potable water suppliers that provide water to the reclaimed water generation, storage, and distribution facilities in addition to prosed reclaimed water use areas. Describe proposed methods to coordinate with potable water suppliers on reclaimed water service including cross connection prevention actions in design and operation of the reclaimed water system. Results of coordination with the listed potable water suppliers must be included in the engineering report under Chapter 173-219-210 (2) (f).	As is noted in Section 5.2.1, potable water suppliers in the area of the proposed reclaimed water generation and distribution facilities are key stakeholders that the project proponent must engage with early in the planning process. The project proponent must work closely with all local potable water suppliers in the project area to create a list and map of all public water system facilities, including wells, wellhead protection areas, critical aquifer recharge areas (if appropriate), intakes, piping, and storage areas within at least 1,000 feet of any reclaimed

	water generation, storage, or proposed use area. Include strategies for evaluating the need for cross-connection controls at locations where the potential for cross-connection may arise. In addition, establish roles and responsibilities of each party for identifying, evaluating, and resolving cross-connection issues. The feasibility analysis must include documentation that describes the notification and communication efforts with other public water systems and identifies how their concerns will be addressed in future facility designs.
180 (1) (c) (viii) Description of the contingency plan for both temporary and permanent reversion to domestic wastewater facilities and alternative water supply systems where applicable, if reclaimed water production (generation) is discontinued. Include the impact of increased demand to water purveyors.	The feasibility analysis should identify whether proposed reclaimed water uses require uninterruptible water supplies. If so, the project proponent should discuss whether the use agreements will commit to providing an alternate water source should the proposed facility fail to produce an adequate amount of reclaimed water to meet the use area demands. The analysis should contain details about any proposed water supply contingency plans including documentation of communication with local potable water suppliers to that may serve as a source of additional water.
180 (1) (c) (ix) A brief description of the community outreach and public involvement conducted or planned to be conducted, as you determine feasibility, to demonstrate awareness of and community support for the reclaimed water project.	Provide documentation of any public outreach involvement activities that have been or will be undertaken in support of the reclaimed water project. Include a plan for continued public outreach to develop community support for the project. Also include any documentation that shows community support for reclaimed water projects.
180 (1) (c) (x) Identification of existing or proposed interlocal or interagency agreements related to reclaimed water, if any, with local governments or local potable water utilities within the area of existing or proposed distribution and use of reclaimed water.	List all existing and proposed interlocal or interagency agreements required for the successful operation of the reclaimed water facility and distribution system. Identify existing or proposed interlocal or interagency agreements, if any, with local governments or local potable water utilities within the area of existing or proposed distribution and use of reclaimed water.
180 (1) (c) (xi) Statement of compliance with the State Environmental Policy Act (SEPA) and the National Environmental Policy Act (NEPA), where applicable.	The project proponent must comply with the appropriate state or federal environmental review process during the planning and design of the proposed facility. Ecology can assist the proponent in determining the appropriate process for the project.
180 (3) (a) Proposed reclaimed water facility customers	The beneficial uses anticipated for allocation or consumption of reclaimed water. Describe the anticipated infrastructure and delivery schedules and amounts. Include any water use

	agreements already signed or anticipated for implementation. For projects proposing direct groundwater recharge as a beneficial use, provide known aquifer properties that demonstrate the aquifer capacity to receive and store injected reclaimed water. Include potential for impacts to nearby groundwater rights holders and surface features with the possible susceptibility to impacts due to increased groundwater recharge. For projects planning to recover reclaimed water stored in an aquifer, present estimates of recovery rates and annual withdrawal totals. Describe any planned aquifer pilot testing.

5.2.5 Private Utility Capacity

Beginning in 2005, chapter 90.46 RCW authorized Ecology and Health to issue reclaimed water permits to private utilities, provided the applicant demonstrates to the lead agency that it has the financial and other resources to ensure the reliability, continuity, and supervision of the reclaimed water facilities. The lead agency may require a private utility to submit adequate information to demonstrate that the private utility has capacity to design, construct, operate, and maintain the reclaimed water facility and that distribution and end uses are feasible. Private utilities that may propose a reclaimed water project and apply for a reclaimed water permit must demonstrate private utility capacity to the lead agency as part of their feasibility analysis. The assessment must include the content listed in WAC 173-219-180(3). If the project involves a private wastewater company, the company may have to comply with requirements under chapters 80.04 and 80.28 RCW and other applicable provisions through the Washington Utilities and Transportation Commission.

The lead agency may decline to approve a reclaimed water project or issue a reclaimed water permit based on a determination of inadequate technical, managerial, or financial capacity, or lack of sufficient information on which to make a determination. If this occurs:

- The lead agency may allow the private utility to make changes, such as managerial or financial changes, and the agency may re-evaluate the proposed project.
- The private utility may establish adequate capacity by entering into an agreement with a person acceptable to the lead agency to serve as the primary management entity or as a third-party guarantor. The management agreement must be binding on both parties to remain in force until the lead agency determines that the private utility has the technical, managerial, and financial capacity to qualify for a reclaimed water permit, or until the private utility enters into an agreement with another acceptable person.

Table 5-3 provides a review of the items listed in the Rule as required in the demonstration of private utility capacity.

Table 5-3 Items for Demonstrating Private Utility Capacity

Text from WAC 173-219-180 (3)	Explanation
180 (3) (a) A description of the proposed reclaimed water facility and its proposed customers	The demonstration of private utility capacity must be a part of, or accompany, the feasibility analysis described in Section 5.2.4, which requires a project description that satisfies this requirement. A separate project description is generally not necessary.
180 (3) (b) A description of the technical, managerial, administrative, operational, legal, and financial capacity of the entity to comply with 90.46 RCW and chapter 173-219 WAC.	Management of the system, in all its forms is an important aspect of a Private Utility. The project proponent must use this section to provide sufficient information necessary to demonstrate how their proposed management structure for the reclaimed water utility will ensure adequate and reliable operation of the system on a long-term basis. The proponent must provide specific and detailed information about the technical managerial, administrative, operational, legal, and financial capacity of the private entity.
180 (3) (c) A description of other requirements, if a private utility is considered a private wastewater company under chapters 80.04 or 36.94 RCW.	Private water utilities have other responsibilities to state, County, and City governments as well as those within the reclaimed water permit. The private utility proponent must describe any additional responsibilities from other state or local governments they have identified as applicable and discuss how they intend to meet those issues.
180 (3) (d) Demonstration of ability of the entity to hire and retain certified operators who will be directly responsible for achieving effective and reliable routine operations.	All generators and distributors of reclaimed water must comply with the Certified Operators requirements in WAC 173-219-250. As part of this assessment the private utility must present a clear plan for hiring and retaining appropriate certified operators to operate and maintain the proposed reclaimed water facilities.
180 (3) (e) A list of all subcontracted services such as engineering, legal, and accounting.	The private utility must provide a list of all the organizations they propose to subcontract with for the planning, design, operation, maintenance, and management of the proposed reclaimed water facilities. Provide names, addresses, phone numbers, information on what tasks the entity will perform, and detailed information necessary to demonstrate that the contractors have appropriate expertise to perform the contracted tasks.

5.2.6 Engineering Report

The proponent of a reclaimed water project must submit a project specific engineering report to the lead agency review and approval. The engineering report is the primary document that thoroughly examines the engineering and administrative aspects of the reclaimed water project. It provides the basis for the design of the proposed reclaimed water project including the reclaimed water treatment, storage, and distribution systems up to the meter connection at the potential use areas. It should also include standard design elements that will be required for distribution systems operated by others under distribution and use agreements.

The engineering report must provide sufficient detail so that a professional engineer that has not been previously involved in the project can complete plans and specifications consistent with the information within the approved report without making more than minor changes.

The engineering report for a reclaimed water project will often need to rely on or be part of an engineering report for a domestic wastewater treatment facility required by WAC 172-240. The reclaimed water engineering report may also need to coordinate with the engineering report completed under the requirements of WAC 246-272B-04000 for a LOSS system regulated by Health. When Ecology is the lead agency, it encourages development of a single engineering report to satisfy the requirements of WAC 173-219-210 and WAC 173-240-060 whenever practical.

For all reclaimed water projects the engineering report must contain the information found in WAC 173-219-210(2), and any other relevant information required by either the lead or nonlead agency. See Table 5-4 for a review of the items listed in the Rule as required for engineering reports.

Given the close relationship with other engineering reports for wastewater facilities, it is important for a reclaimed water project proponent to coordinate early with Ecology and Health to identify where opportunities for streamlining exists.

Table 5-4 Engineering Report Requirements

Text from WAC 173-219-210	Explanation
210 (2) (a) Sufficient detail for a professional engineer to complete plans and specifications without substantial changes.	"Sufficient detail" as used here is defined to mean the report must contain sufficient design information to allow an engineer not involved in writing the report to produce construction drawings for the facility as envisioned by the report writer without any need for process change or more than minor unit-sizing modifications. "Substantial change" means a change in the selected treatment process, facility size, design criteria, performance standards, or environmental impacts, or an increase in total project cost. A substantial change requires an amendment to the approved engineering report.
210 (2) (b) Name and contact information for the owner and the owner's authorized representative(s).	The report must include the name, street and mailing address, email address (if applicable), and telephone number of the owner and the owner's representative(s). The named person or position must have the authority to sign contracts relating to this project. Examples of the owner's representative include the mayor, chair of the city council sewer committee, city manager, public works director, etc. Additionally, the entity may identify a specific project contact person other than the legal representative.
210 (2) (c) A project description and location maps. The maps must include:	The project description includes the where, what, and why of the report along documentation to support the need for the proposed project and commitments for beneficial uses of the reclaimed water. The project proponent should reference relevant project information submitted in the Feasibility Analysis and, if necessary, modify the feasibility analysis information to reflect any changes made since approval.
210 (2) (c) (i) Location of all wastewater treatment and reclaimed water generation facilities, as well as all reclaimed and inadequately treated water storage facilities under direct control of the generator.	Include a location map of the project area, along with a map showing the current (if applicable) and proposed reclaimed water facility, the secondary wastewater treatment facility that provides the source water to the reclaimed water facility (if different from the reclaimed facility), and all storage areas for either inadequately treated or final product reclaimed water. The location map(s) must

	show the service area for the wastewater collection system that will provide domestic sewage to the reclaimed water facility as well as show the proposed reclaimed water distribution area. Maps should show service areas for wastewater collection and reclaimed water distribution of nearby jurisdictions. If the proposed facility serves as a regional treatment facility, show the service areas for each jurisdiction contributing domestic sewage flow to the facility.
210 (2) (c) (ii) All additional facilities that may be under control of the generator, such as for storage and distribution of reclaimed water.	As applicable to the project, show all reclaimed water distribution lines, pump station, and other reclaimed water distribution and storage facilities under the control of the project proponent. Clearly identify locations where control of the reclaimed water will transfer to another distributor or user operating under distribution and use agreements.
210 (2) (c) (iii) All potable water supply sources, wellhead protection areas for municipal water sources, and system facilities within one thousand (1000) feet of all identified potential reclaimed water generation, reclaimed water storage, and inadequately treated water storage facility areas and any proposed use areas.	Identify on location maps the service area boundaries of all potable water suppliers in the vicinity of the reclaimed water generation and distribution facilities and use area(s). Include maps showing the location of all potable water supply sources, including surface water intakes, wellheads, critical aquifer recharge areas (if appropriate), and wellhead protection areas, within 1,000 feet of any proposed reclaimed water generation or distribution facility or use area.
210 (2) (d) Proposed quantity and quality of the reclaimed water generated by the reclaimed water facility including an assessment that the proposed water quality meets the requirements for the highest proposed beneficial use included in WAC 173-219-390 on Table 3.	Identify the class of reclaimed water required for each proposed beneficial use of water produced at the proposed facility. Also identify the quantity of water needed by identified beneficial uses. Discuss generally how the proposed facilities will meet the reclaimed water quantity and quality demands for the identified beneficial uses. This general discussion should draw from information presented in the approved feasibility analysis and expand on or modify that information as necessary. The project proponent may include this general discussion as part of the more detailed descriptions of the source water and reclaimed treatment processes required by sections 210(2)(i) and 210(2)(j).
210 (2) (e) Description of who will operate and maintain the reclaimed water facility.	Provide a detailed staffing plan that describes the staffing requirements to operate and maintain the reclaimed water treatment, distribution, and storage facilities. Identify the minimum number of operators required for the proposed treatment and distribution facilities along with the required certification levels for those operators. Include provisions for laboratory staff as well as other staff that do not require certification as operators (i.e., mechanics, electricians, and technicians). If the project proponent plans to use a contract operator to operate and/or maintain any part of the treatment or distribution system, identify the contractor(s) and describe their roles and responsibilities.
210 (2) (f) Documentation of contact with potable water systems and their concerns, if any, as required in 173-219-180(1) (c).	Discuss efforts undertaken or in progress to notify and communicate with potable water suppliers. Identify concerns raised by the suppliers and discuss how those concerns have been or will be addressed. Include descriptions of design, operation, and communication strategies that will be included in the project to prevent cross-connections between the reclaimed water and potable water supplies or otherwise necessary to protect the sources of potable water.

210 (2) (g) Applicable requirements of chapter 51-50 WAC, including pipe colors and labeling.	Identify the elements of the Uniform Plumbing Code as adopted and amended by Washington State (WAC 51-56) that apply to the proposed project. Discuss how requirements will be used in the design of the proposed reclaimed water treatment and distribution facilities. Describe color coding and labeling procedures for new and repurposed piping and storage.
210 (2) (h) Design information for the reclaimed water distribution system directly under the control of the generator including meeting the requirements of WAC 173-219-360, and, if applicable, consistent with pressurized distribution systems in the most recent edition of the Department of Health's *Water System Design Manual*.	When the proposed project includes construction or modification of reclaimed water distribution and/or storage facilities, the engineering report must identify the design criteria from WAC 173-219-360 and the most recent edition of Health's *Water System Design Manual* that are relevant to the proposed project's scope. Also describe how the project design will incorporate those requirements. Note any anticipated variances from the criteria listed in the WAC or Health manual.
210 (2) (i) The anticipated amount, characteristics, and strength of the source water to be treated, including BOD_5, DO, TSS, and nitrate levels, and the degree of treatment required to generate proposed reclaimed water quality, and other influencing factors. And 210 (2) (l) Hydraulic, organic, and influent loading rates to the reclaimed water treatment facility.	Discuss the characteristics of the secondary effluent to be used as the source water for the reclaimed treatment facility or process. Provide information about the quantity of effluent typically available for treatment to reclaimed quality along with the effluent quality in terms of BOD_5 or $CBOD_5$ (as appropriate) DO, TSS, pH, and total Nitrogen (if applicable for proposed uses). The proponent must be able to demonstrate that the source water to the reclaimed water treatment facility or process will comply with the minimum biological oxidation standards in Table 1 of WAC 173-219-330. They must also describe the treatment necessary to meet the applicable performance standards in Table 2 of WAC 173-219-330 as well as any use-based performance standards in Table 3 of WAC 173-219-390. The proponent may also need to include information in the engineering report about the waste load (flow, BOD_5, TSS, etc.) received by the treatment plant, its sources (the percentages of domestic, commercial, and industrial dischargers), and other relevant information required by WAC 173-240-060(3)(c).This is especially important when the proposed facility will not have a separate discharge of secondary effluent or when the proposed facility will use a membrane bioreactor or other advance treatment system. Ecology's staff will assist the proponent in determining when additional information about the untreated wastewater is necessary. For additional information about the requirements of WAC 173-240-060, please refer to Table G1-2 of the *Criteria for Sewage Works Design*.
210 (2) (j) Descriptions of proposed treatment processes, including preliminary flow diagrams of critical reclaimed water unit processes, as well as anticipated reliability features and controls. The report must contain sufficient detail to verify the proposed facility will comply with the water quality and reliability requirements of this chapter.	Provide basic sizing calculations and design criteria for the selected reclaimed water treatment system alternative. Identified criteria must agree with the appropriate chapters of the Orange Book, this manual, or other authoritative references. Thoroughly justify any deviation from the design criteria listed in recognized references. Describe the age, capacities, and adequacy of all existing treatment units used in the upgraded facilities. The proponent must present flow diagrams for the proposed reclaimed water treatment facility or unit processes. Include a schematic flow diagram showing all liquid and solids flow paths

	along with proposed sampling locations for compliance and process control monitoring. Also present a scaled site layout (with the site topography) that show how the proposed treatment units fit on the land available. Develop hydraulic profile(s) in detail for the proposed reclaimed water treatment facility or unit processes. Include the hydraulic profile for the average flow conditions as well as the highest and lowest anticipated elevations. Describe the conditions that would result in high water level and low water level conditions. Include hydraulic profiles for other critical flow conditions if necessary to justify unique design elements or operating conditions. The description developed according to this requirement along with the assessment of the degree of treatment discussed as part of section 210(2)(i) above must together demonstrate that the proposed facility will adequately and reliably produce reclaimed water of sufficient quantity and quality to meet use demands. The report must demonstrate that the constructed facilities will comply with applicable requirements listed in WAC 173-219-320 through 390.
210 (2) (k) Description of alternative design options considered	The engineering report must thoroughly describe all treatment alternatives evaluated to produce reclaimed water, including alternative filtration methods and disinfection processes. Present a ranked assessment of the alternatives based on their abilities to meet the project objectives, estimated cost, and any other identified critical factors. Describe all factors used in the evaluation and discuss whether any factors were given higher relative weight over others.
210 (2) (m) Summary of preliminary engineering design criteria for reclaimed water treatment processes including: 210 (2) (m) (i) Aeration/anaerobic organic carbon reduction. 210 (2) (m) (ii) Nutrient reduction (if required). 210 (2) (m) (iii) Disinfection system selection meeting the requirements of WAC 173-219-340 210 (2) (m) (iv) Contact time with disinfectant reactor. 210 (2) (m) (v) Coagulation and filtration processes (if required). 210 (2) (m) (vi) Reverse osmosis or comparable technology process (if required).	Provide one or more summary tables as necessary to list key design criteria for unit processes involved in the following treatment goals: biological oxidation of wastewater; treatment for nitrogen and/or phosphorus reduction (if appropriate for identified uses); coagulation and filtration; disinfection of reclaimed water; and any other advanced treatment targeting specific pollutants of concern. For any existing wastewater treatment unit processes that will become part of the reclaimed water treatment process, include a reference to the original engineering report approved by Ecology (either under WAC 173-240-060 or WAC 173-219-210) as the source for design criteria. Summary tables must show key criteria for a variety of operating conditions appropriate for the unit process and parameter listed (peak day or hour, annual average, the highest monthly average, etc.) Please see section G2-1 of the Orange Book for additional guidance on selecting appropriate design criteria. For disinfection unit processes the engineering report must clearly show the effective contact time within the disinfection reactor or contact chamber along with the dose of disinfectant (chlorine, UV light, or other approved disinfectant). It must demonstrate to the satisfaction of the lead agency that the proposed disinfection method consistently provides the required level of adequate and reliable disinfection necessary to meet the performance standards in Table 2 of WAC 173-219-330. All facilities producing Class A reclaimed water must use a disinfection process that complies with the disinfection process

	standards in WAC 173-219-340. The report must show that the disinfection process, in combination with other treatment processes following biological oxidation, result in a minimum of 4-log virus removal or inactivation.
210 (2) (n) A description of compliance with treatment reliability standards as provided for in WAC 173-219-350.	The engineering report must describe all design and operational strategies the proponent will implement to ensure reliable operation of the reclaimed water facilities. It must clearly identify all unit process redundancy, alarms, and automated diversions necessary to prevent the bypass of any inadequately treated water to any use area. It must also provide a clear plan for managing inadequately treated water during emergencies or maintenance periods. Management strategies may include retaining water at the treatment facility for additional treatment or discharging the water under the authority of a waste discharge permit. The report must describe strategies for ensuring the proper disposal of solids removed during treatment. The facility must not allow removed solids to return to the product reclaimed water or discharge to waters of the state.
210 (2) (o) A statement regarding compliance with: 210 (2) (o) (i) State Environmental Protection Act (SEPA), State Environmental Review Process (SERP), or National Environmental Protection Act (NEPA). 210 (2) (o) (ii) Any applicable state or local water quality management plan or any plan adopted under the Federal Water Pollution Control Act as amended. 210 (2) (o) (iii) RCW 90.46.130, including any compensation or mitigation plans. 210 (2) (o) (iv) Governor's Executive Order 05-05 Archaeological and Cultural Resources	SEPA/NEPA: Prepare an environmental report that identifies the potential environmental impacts of the project. Include a copy of the completed SEPA checklist along with the appropriate adopted SEPA determination (Determination of Nonsignificance, mitigation plan, Environmental Impact Statement, etc.) in the engineering report. The action taken that requires SEPA is the adoption of the engineering report and its recommended project. For federally funded projects, excluding SRF Loans, append a NEPA environmental assessment or reference to an applicable FEIS and final NEPA action in the engineering report. **NOTE:** The local government must make final SEPA declaration prior to approval of the engineering report. Water Quality Plan: Identify any water quality plan associated with the proposed reclaimed water project. Include discussions about how the project connects with or impacts that plan. Water Rights: If the water rights impairment analysis completed during the feasibility analysis identified that the project would impair a water right, include a brief discussion in the engineering report about any compensation or mitigation needed to address the impairment. Archaeology: The project proponent must briefly describe actions they will take during the design and construction to protect archaeological and cultural resources, as required by Governor's Executive Order 05-05.
210 (2) (p) A pilot study proposal, if required. The lead agency may require a pilot reclaimed water facility study to evaluate the ability of the proposed facility to meet all reclaimed water quality requirements applicable to the project. The generator must include	The lead agency may require a project proponent to conduct a pilot study on a case-by case basis of a proposed treatment component, unit process, or combination of processes that may make up a reclaimed water facility. A pilot study is generally required when a project uses new or developmental technology or otherwise proposes a treatment strategy that lacks sufficient operational history to justify that it can meet the requirements of

discussion and determination of the need for a pilot study in the engineering report and include the proposal for it, if required.	the reclaimed water rule. A pilot study may also be required to validate that a specific disinfection system design will achieve appropriate viral reduction. If the lead agency determines a pilot study is necessary, the proponent must include in the engineering report a detailed plan for conducting the study.
210 (2) (q) Proposed pipeline separation distances, both horizontal and vertical, consistent with the most recent edition of Ecology's and Health's *Pipeline Separation Design and Installation Reference Guide,* in order to ensure trench stability and adequate access for repair and replacement, to minimize impacts to nearby utility pipes, and to protect public health.	If the proposed project includes the design and construction of distribution pipelines from the treatment facility to a use location, the proponent must ensure the pipeline design will comply with the referenced separation guidance. The Engineering report must identify the appropriate separation requirements that will be incorporated into the project design. If the proponent proposes using alternative separation strategies, they must include justification for using the alternate strategy.
210 (2) (r) **Wetlands**. If a proposed beneficial use of the reclaimed water is for a wetland or wetland restoration and/or enhancement, the engineering report must include the following: 210 (2) (r) (i) The wetland-rating category, size, hydrogeomorphic class, and vegetation class of the existing and proposed wetlands. 210 (2) (r) (ii) The beneficial uses of the existing and proposed wetland. 210 (2) (r) (iii) The hydrologic regime of the existing and proposed wetland, including depth and duration of inundation, average monthly water level fluctuations, and annual loadings of reclaimed water to the wetlands. 210 (2) (r) (iv) Demonstration that the proposed quality of reclaimed water meets the requirements for this beneficial use. 210 (2) (r) (v) Any studies conducted or additional information applicable to the specific project or site. 210 (2) (r) (vi) Information to support a claim of net environmental benefit, if proposed. At a minimum, a claim of net environmental benefit must demonstrate that: 210 (2) (r) (vi) (A) The use of reclaimed water provides full and uninterrupted protection of all significant beneficial uses existing in the wetland prior to the use of reclaimed water. 210 (2) (s) (vi) (B) Creates new, or enhances the existing beneficial uses of the wetland.	Ecology recommends any proponent of a reclaimed water project that would provide water to wetlands for beneficial purposes to develop a separate companion report or appendix dedicated to examining this topic. Work with wetland specialists to develop the necessary supporting document. Documentation will include detailed descriptions of the current conditions of the wetlands and the anticipated future conditions after the introduction of reclaimed water. Include all of the physical and biological characteristics of the existing and proposed conditions as outlined in the text of the rule. Provide an analysis of the hydrologic regime of the wetland under both current and proposed conditions. Evaluate the monthly water level fluctuations to ensure that the addition of reclaimed water does not adversely impact the wetland conditions. Calculate the annual loading of reclaimed water into the wetland. Determine the water quality needed to provide the proposed benefit to the wetland based on the use-based performance standards in Table 3 of WAC 173-219-390 (rows 14-19). Also identify if the wetland analysis determines that additional water quality restrictions are needed to provide the intended benefit to the wetland. Discuss how the reclaimed water produced at the proposed facility will comply with the use-based performance standards and any site-specific water quality standards. Discuss and attach any studies performed to evaluate the impact of discharging reclaimed water into the wetland. Provide information on any claim of net environmental benefit from directing reclaimed water to an existing or new wetland. Discuss how reclaimed water enhances any existing beneficial uses of the wetland and what would happen without the use of reclaimed water. If the wetland currently exists, discuss how the addition of reclaimed water will protect the existing beneficial uses. Include a discussion of the impact on the wetland of ceasing the addition of reclaimed water.

210 (2) (s) **Surface water augmentation**. If a proposed beneficial use of the reclaimed water is for surface water augmentation, the engineering report must include the following: 210 (2) (s) (i) The location and proposed augmentation uses of the reclaimed water. 210 (2) (s) (ii) Demonstration of how the reclaimed water meets water quality standards at the point of release. 210 (2) (s) (iii) If applicable, identify potable water supply intakes that are within one thousand feet of the reclaimed water use area, and discuss whether a two hundred foot minimum separation distance between them is sufficient to protect the potable water supply intake(s) from physical impairment potentially created from a reclaimed water use for surface water augmentation. Include demonstration that reclaimed water quality and quantity will not cause need for intake modifications or additional treatment requirements for the production of potable water.	Engineering reports for projects that propose to use reclaimed water for surface water augmentation must clearly demonstrate an increase to the volume of water flowing into a specific river, lake, or other surface water. In most situations the release of the reclaimed water to surface water will require authorization under a NPDES permit. As such the engineering report must fully describe how the addition of reclaimed water will impact the surface water quality and demonstrate that the addition will not violate applicable water quality standards, including the state's antidegradation policy. The engineering report must include all information required by WAC 173-240-060(3)(e) related to the description of the receiving water. Give the name, location (river mile, latitude/longitude, waterway segment number, township/range, etc.), and water quality classification of the proposed receiving water. Summarize any existing receiving water data (monitoring stations reporting to STORET, CRMS, USGS reports, NOAA reports, FERC license reports, data collected for this report, etc.). Include data collected for this report in an appendix to the report. For fresh water streams and rivers, determine and provide the 7Q10 (seven-day, ten-year recurrence low flow) flow in the report. The proponent must identify the applicable water quality standards for the receiving water and whether the receiving water is listed for any water quality impairment. If the water body is listed as impaired, discuss the status of any Total Maximum Daily Load for the water body and list any allocations provided for the reclaimed water. Discuss the following topics related to the hydraulic regime of the receiving water: • Describe the intended water rights status for the augmented streamflow. Are they intended to be reserved for instream flows, or available for appropriation and diversion? If intended to be reserved for instream flows, the proponent should enroll the portion of the water right that will remain instream in the trust water right program and include a copy in the engineering report. • Describe the overall management and operational long-term commitment to maintain a reliable discharge of reclaimed water to the stream or lake once the downstream ecosystem and diversion water rights (if any) have come to depend upon this inflow of water. Future appropriations of water conditioned upon a reclaimed water discharge should include provisions that reflect that relationship. Also discuss the following related to outfall design: The physical release of reclaimed water to the receiving stream, lake, or reservoir may occur directly through a piped outfall or indirectly through a pond, bank infiltration, or transport through groundwater connected to the surface water body. Include the following information in the Engineering Report: • A site map showing outfall location and key design features, and identifying the receiving surface water body by name.

	• A stage-storage curve for any reservoir, presented in graphical or tabular format, with both formats preferred. • For reservoirs, calculations of the shortest hydraulic residence time for reclaimed water in the reservoir prior to withdrawal for a drinking water source. Consider the combination of low stream flows, high diversion flows, and low reservoir water levels and storage volumes that will give the shortest hydraulic residence time in the reservoir. For a direct piped outfall, provide: • Reclaimed water pipeline diameter and material. • If pumping is required, pump location and capacity (flow, total dynamic head (TDH), motor size). • A drawing showing details for diffuser or other outfall structure. • A hydraulic profile for reclaimed water releases. Verify hydraulic performance over the normal range of water levels for the stream, lake, or reservoir. • Outfall site soils, geology, and fluvial geomorphology. Is the natural stream channel migrating? Is the channel subject to significant scour or sedimentation at this location? • A discussion of design features that will keep the outfall pipeline, diffuser, and/or structure in place and functioning during the normal range of streamflows, especially during high flow periods.
210 (2) (t) **Groundwater/aquifer recharge**. If a proposed beneficial use of the reclaimed water is for aquifer recharge, the engineering report must include the following: 210 (2) (t) (i) Information requested by the lead agency necessary to assess the specific treatment and use of reclaimed water for application to recharge groundwater. 210 (2) (t) (ii) Site specific information presented in the following: 210 (2) (t) (ii) (A) Project operation plan. 210 (2) (t) (ii) (B) Conceptual model of the Hydrogeologic system. 210 (2) (t) (ii) (C) Description of the legal framework. 210 (2) (t) (ii) (D) Environmental assessment and analysis of any potential adverse conditions or potential impacts to the surrounding ecosystem. 210 (2) (t) (ii) (E) Project mitigation plan, if required by the lead agency. 210 (2) (t) (ii) (F) Project monitoring plan.	The following information is required of all projects seeking permits for indirect or direct Groundwater Recharge (173-219-210 (2) (u)) or Recovery of Reclaimed water in an aquifer (173-219-210 (2) (v)). A professional hydrogeologist licensed by the state of Washington shall prepare the hydrogeological information required. Refer to Section 12.6, Hydrogeological Evaluation for Reclaimed Water used to Recharge Groundwater, for more information. In order to generate accurate data with which to design the aquifer injection (and recovery) portion of the Reclaimed Water system pilot testing of aquifer properties and groundwater quality may be conducted prior to Engineering Report submission. Before testing commences, pilot test(s) must be authorized by Ecology, which entails Ecology review and approval of: 1) pilot well test plan and 2) Water Quality testing plan (QAPP) submitted by the applicant. Provide map showing location of aquifer recharge facility features that might be vulnerable to high water tables or high artesian pressures, including building foundations, buried tanks (septic tanks, fuel tanks), pipelines (water, sewer, gas, fuels), surface slopes, and deep excavations. Show geologic and subsurface conditions map.

210 (2) (t) (ii) (G) Pilot demonstration of project performance.	Discuss water table or artesian pressure elevations, including capillary fringe and natural fluctuations, in the aquifer recharge area. Discuss changes in soil strength and slope stability that might be induced by higher water tables or higher artesian pressures resulting from recharged ground water. Assess the potential for changes in soil strength and slope stability to jeopardize these features or cause other damage. Monitoring and mitigation for changes with the potential to generate detrimental effects should be included in the Monitoring Plan (173-219-210 (2)(t)(ii)(F) and measures to control or minimize them included in the Mitigation Plan (173-219-210 (2)(t)(ii)(E). Information on the aquifer proposed for recharge must include: • Hydrogeologic system (conceptual model) • Properties of aquifer targeted for storage • Estimated groundwater flow direction and rate of movement • Anticipated changes to groundwater system due to recharge or recovery activities. Mounding analysis is required for indirect recharge. • Area impacted by project (affected area) • General geologic conditions including stratigraphy and structure • Location of existing natural hazards, contaminated areas, wetland habitat, flood plains, surface water bodies, or springs • Surface water conditions • Locations of all wells or other sources of groundwater in the affected area • Source water and receiving aquifer quality and water compatibility Project Operation Plan must include • Recharge water availability, quantity and times of year • Recharge and recovery rates and durations • Storage period • Proposed recharge and recovery facilities; location, number, and capacity • Variability in source water quality and reliability • Water treatment methods to meet GWQS • Plan if discharge after recovery is to surface water • Operation and maintenance plans to manage suspended sediment from ASR well • Discharge permitting and destination for flushing water Legal Framework • Project water rights documentation • Other water rights in aquifer recharge project area • Instream flows or stream closures within groundwater recharge project area

	• Ownership and control of project facilities • Impairment analyses (if potential exists for water rights holders to be impacted by groundwater recharge, storage or recovery of reclaimed water stored in an aquifer) Environmental Assessment and Analysis • Environmental aspects of aquifer recharge project area; contaminated areas, land uses, wetland habitat, flood plains, surface water bodies or springs • Adverse impacts to slope stability, wetlands, flood plains, ground deformation, surface water bodies or springs • If past environmental assessment completed, reference the document(s) Mitigation Plan • Mitigation plan actions to be taken to prevent adverse impacts to the environment Project Monitoring Plan (for pilot and operation phases • Water quality sampling and subsequent reporting. A QAPP that includes source and aquifer water quality testing is recommended. • Water quality sampling to support geochemical modeling of aquifer response to source water injection • Measurement methods, threshold values, and evaluation techniques to assess aquifer elevation changes, areal extent of impacts to aquifer from injection, quantity injected and recovered, and cumulative amount of groundwater recovered over time • Evaluation of effectiveness of mitigation measures (if project includes mitigation)
210 (2) (u) **Recovery of reclaimed water stored in an aquifer**. Aquifer recovery projects will be evaluated based on the information provided in the engineering report under (u) using the following criteria: 210 (2) (u) (i) Aquifer vulnerability and hydraulic continuity. 210 (2) (u) (ii) Aquifer boundaries and characteristics. 210 (2) (u) (iii) Geotechnical impacts of project operation. 210 (2) (u) (iv) Chemical compatibility of surface waters and groundwater. 210 (2) (u) (v) Recharge and recovery treatment procedures. 210 (2) (u) (vi) System Operation. 210 (2) (u) (vii) Potential impairment of existing water rights. 210 (2) (u) (viii) Environmental Impacts.	See additional information listed above for 173-219-210 (2) (u) Reclaimed water injected to an aquifer remains the property of the entity generating the reclaimed water, and is available for recovery from the aquifer without additional permitting. The quantity of the injected water authorized for recovery will be determined by findings of the pilot testing, aquifer capacity testing (pump tests and injection tests), water quality data, geochemical modeling predictions, aquifer geologic and hydrogeologic properties, protection of existing water rights, avoidance of aquifer injection and recovery operations impacts to nearby infrastructure, hydrologic features, and any other hazards. Chemical compatibility of source water and groundwater entails geochemical modeling of: groundwater quality, source water quality, aquifer matrix compositions, injection quantities, storage duration, volume and extent of storage reservoir, and hydrogeologic properties.

210 (2) (u) (ix) Pilot demonstration project performance.	
210 (2) (v) **On-site sewage treatment**. If the generator is or will be operating an on-site sewage treatment system, the generator may reference an approved engineering report, but he reclaimed water engineering report must also include the on-site sewage treatment system predesign report, site and environmental review, and engineering report as required under WAC 246-272B, Parts 3 and 4.	The owner and operator of an on-site sewage treatment system may propose developing a reclaimed water project that includes the beneficial uses identified in WAC 173-219. In many cases, Health will be the lead agency for reclaimed water projects involving on-site systems. However, Ecology is the lead agency when the proposed project includes beneficial uses that may require a permit from Ecology, such as groundwater recharge, surface water augmentation, and most wetland enhancement uses. When the proposed reclaimed water project involves an on-site system with a design capacity of less than 100,000 gallons per day, the reclaimed water engineering report must include Health-approved technical documents related to the on-site system that will provide the source water to the reclaimed water treatment system. The documents are those required by WAC 246-272B-03000 through WAC 246-272B-04400 (Site and Environmental Review Requirements and Engineering Requirements).
210 (2) (w) **Conveyance in waters of state.** For projects, proposing conveyance in waters of the state, the engineering report must include the technical basis for the proposal.	Conveyance of reclaimed water through waters of the state may require permitting under RCW 90.48. This is especially the case for conveyance through surface waters of the state, which will required authorization under a NPDES permit. As such, the engineering report for a project proposing conveyance through waters of the state must include the information discussed above for the beneficial use of surface water augmentation. The proponent must also provide detailed technical information about the conveyance. The engineering report must describe: • How the facility will introduce reclaimed water into waters of the state for conveyance? • Where and how will the reclaimed water be removed from waters of the state? • How the proponent will track and record the amounts of water introduced and withdrawn?

5.2.7 Plans, Specifications and Construction Documents

The reclaimed water project proponent must submit detailed design documents (plans and specifications) to the lead agency for review and approval prior to the start of construction. No construction may begin before the lead agency is satisfied that the design complies with the requirements of WAC 173-219. Although the discussion in this section assumes a traditional design-bid-build construction delivery, a proponent may use any alternative public works contracting procedures authorized under RCW 39.10 for proposed project. This includes design-build, design-build-operate, and general contractor/construction manager contracting methods. If the proponent intends to use any alternative contracting methods, it must discuss that intent with the lead agency in order to develop an appropriate schedule for design reviews.

The construction plans and specifications should be prepared in accordance with the following documents:

- The most recent edition of this document, *Reclaimed Water Facilities Manual (Purple Book)*, Ecology.
- The most recent edition of *Criteria for Sewage Works Design (Orange Book)*, #98-37, Ecology, if Ecology is the lead agency, or
- Chapter 246-272B WAC if Health, is the lead agency
- The most recent edition of the *Water System Design Manual*, Health publication number 331-123, (appropriate for distribution and storage system design), or
- Accepted engineering practices for the design of wastewater treatment, water reclamation treatment, and water system storage and distribution.

Plans and specifications contain the complete technical details and drawings a contractor will use to construct a reclaimed water facility. Together with any appropriate supplemental documents, the plans and specifications constitute the contract documents for the construction project. The reclaimed water rule requires the construction of facilities to conform to the plans and specifications approved by the lead agency. In addition, operating permits for the reclaimed water facility may include certain design criteria from the approved plans and specifications as enforceable loading or operating limits for the facility.

Design documents for all treatment, storage, and distribution facilities under the direct control of the reclaimed water generator must receive approval by the lead agency. However, the generator may elect to separate the design of various facilities for phasing or convenience purposes. When separating the design into multiple packages, each related design package must clearly show how facilities in one package interact with facilities designed under separate packages. The project proponent should discuss with the lead agency early in the design process whether they contemplate any separation of design documents into multiple contract packages.

Plans and specifications must be sufficiently clear so that a third party can interpret and construct the facilities without excessive clarification from the design engineer.

Plan sets, in general, must include a title sheet, facility and/or unit process plan and profile sheets, design criteria sheets, and other sheets appropriate to sufficiently detail and outline the facilities being designed. The designer must consecutively number all plan sheets and include drawings showing plan views, elevations, sections, profiles, general layouts, and supplemental views as necessary to represent the intended design. Plans must be clear, legible, and drawn to a scale that permits all necessary information to be shown plainly. Numerical units should be expressed consistently throughout the plan set.

Specifications must include all construction information not shown on the drawings that is necessary to inform the builder in detail of the design requirements, including the quality and type of materials and equipment to be used. They must include requirements for all mechanical and electrical components, instructions for complete testing of materials and equipment, and operating performance tests. Each specification section should clearly identify the information

required in the submittal for the construction manager to properly review the contractor's proposal (such as equipment, pipe type, site work facilities, measures to mitigate construction activities regarding noise, traffic, stormwater, etc.).

The reclaimed water rule requires the owner of the prospective reclaimed water facility to submit two complete paper sets and one complete electronic set of the final plans and specifications to the lead agency for approval. Digital signatures on electronic documents must conform to the requirements of WAC 196-23-070(2). Once approved, the lead agency will return one paper set stamped as "Approved" to the project owner. On a case-by-case basis lead agency may waive the requirement for paper submittals.

The final documents, including electronic documents, must be stamped and signed by a professional engineer licensed in the state of Washington.

Although the rule requires multiple, stamped paper copies of the final documents submitted for approval, the same requirement does not apply to draft copies submitted for review.

A single unstamped copy, either paper or electronic, is typically acceptable for a draft review submittal. The proponent should discuss with the lead agency early in the design process the preferred method and timing of submitting draft documents.

The project proponent must coordinate with the lead agency for document review and eventual approval. Draft plans and specifications submitted for review should have all technical aspects of the documents mostly (approximately 90%) complete. For large, complex projects, an early review or consultation with the lead agency at approximately 60% design completion is encouraged. Since construction must conform to the approved documents, the proponent must submit the final "bid-ready" plans and specifications to the lead agency for approval. Any changes made after lead agency approval must be documented through addenda (if made prior to or during the bid process) or as change orders (if made during construction).

Changes made to the approved plans and specifications prior to or during construction may require additional review and approval by the lead agency. If the project receives financial assistance from Ecology through a State Revolving Fund loan or Centennial Clean Water grant, Ecology must review all changes regardless of scope to assess the eligibility of the change for grant or loan funding. In addition, any substantial change to the approved design must be reviewed and approved by the lead agency prior to incorporating the change into the project. A substantial change is one that alters the performance, reliability, or functionality of the facility.

Table 5-5 provides a review of the items listed in the Rule as required in plans and specifications.

Table 5-5 Content Requirements for Reclaimed Water Project Plans and Specifications

Text from WAC 173-219-220	Explanation
220 (2) The construction document must:	
220 (2) (a) Include a list of the design criteria for each unit process and for the overall facility.	List applicable design criteria for the complete facility and each unit process included in the design documents. Include all treatment, distribution, and storage facilities that are part of specific design package. Design criteria must be consistent with appropriate standards in references listed at the beginning of this section.
220 (2) (b) Include a field-commissioning plan for new facilities, if applicable. The plan must include testing of all processes, equipment, and reactors used in the generation of reclaimed water and be consistent with the review standards provided in WAC 173-219-200.	The design documents must describe how each new major treatment, storage, or distribution unit will be tested for proper and reliable operation prior to being placed into service. This may be included as part of the specifications or as a separate start-up or commissioning plan submitted as part of the design package. This plan should be updated during facility construction to include any requirements of vendors of specific equipment selected and installed at the new facility.
220 (2) (c) Include a plan for interim operation of facilities during construction, if applicable.	The design documents must include a plan for maintaining continuous operation of any existing reclaimed water or wastewater treatment facility if the proposed project involves expansion or modification of existing facilities. Clearly state the obligations of the construction contractor for maintaining operation of existing facilities and describe in detail the process for approvals, reporting, and monitoring of any anticipated equipment or process shutdown. Also include detailed bypassing plans for any project that may disrupt existing flow paths within a treatment facility or distribution system.
220 (2) (d) Comply with WAC 173-219-310 and identify all potential cross-connections, and the device or assembly to be installed to prevent them, as described in 173-219-310 WAC. This information must also be included in the as-built drawings and final operations and maintenance manual under WAC 173-219-240.	The project design team must include a cross-connection control specialist responsible for evaluating the risk for cross connections in the proposed facility design. They must identify areas of concern and present appropriate devices or strategies to minimize or eliminate cross connections between all higher quality and lower quality water sources. The plans must evaluate and mitigate potential cross-connections in the following areas: • Between potable water lines and all other lower quality water within the fence line of the treatment, distribution, or storage facilities. • Between reclaimed water and all lower quality waters, including partially-treated or inadequately-treated reclaimed water, in all areas covered by the design documents. The design team and project owner must gain approval from the local potable water supplier for any device installed at a reclaimed water facility to protect the public water supply. This is typically a property isolation device installed at the fence line of the treatment, distribution, or storage facility property. For all other potable water lines at the reclaimed facility, the design engineer and owner must ensure the design complies with all applicable plumbing codes. The design engineer and facility owner is also responsible for ensuring cross-connection control devices consistent with the requirements of WAC173-219-310 and applicable pluming codes are included in the design to protect the reclaimed water form contamination.

As well as including the content described above, the plans and specifications must comply with all applicable requirements for the design of the source water treatment facility. When the project involves a domestic wastewater facility that is otherwise regulated by Ecology, the plans and specifications must comply with the requirements of WAC 173-240-070. Please refer to section G1-4.2 of the *Criteria for Sewage Works Design* for guidance on these requirements. When the project involves an on-site sewage system regulated by Health, the plans and specifications must comply with the requirements of WAC 246-272B-4400.

Upon construction completion, the generator must submit appropriate post-construction documents to the lead agency. For projects where Ecology is the lead agency, the generator must comply with the requirements of WAC 173-240-090. This regulation requires submittal of a "Declaration of Construction Completion" to Ecology within 30 days of the acceptance by the owner of the new or modified facility. The specific wording of the declaration form is found in WAC 173-240-095. The professional engineer responsible for inspection of the project must stamp and sign the "declaration of construction" form and the generator must submit the form along with one set of record drawings to regional Ecology office that oversees the area where the facility is located.

For reclaimed facilities that involve on-site systems with Health as the lead agency, the generator must submit post-construction documents consistent with WAC 246-272B-05400. Documents include a LOSS construction completion report, record drawings, a final management plan meeting the requirements of WAC 246-272B-04100, and a final operations and maintenance manual for the LOSS system, as specified in WAC 246-272B-04200.

5.2.8 Operation and Maintenance Manuals

Chapter 173-219-240 WAC requires that "the generator must at all times properly operate and maintain any facilities or systems of control installed by the generator to achieve compliance with the terms and conditions of the [reclaimed water] permit". The rule requires the submission of an operations and maintenance (O&M) manual to the lead agency to document how the generator will comply with this requirement. This section provides an overview of this requirement.

The O&M manual is a guide and handbook operators use to ensure continuous, effective, efficient, and economical operation of the facilities while meeting the goal of producing reclaimed water that meets or exceeds the quality requirements of chapter 173-219 WAC. The manual required by the reclaimed water rule should not be confused with O&M manuals provided by vendors for each individual piece of equipment at the facility. While the equipment-specific manuals are vital for plant operation and maintenance, they do not provide the necessary information to explain how all of the equipment work together to adequately and reliably produce reclaimed water. The objective of the manual required by the rule is to describe the integrated operation and maintenance of the complete reclaimed water treatment, storage, and distribution facilities.

The manual also provides guidance on responding to emergency situations within the facility and should be considered a foundation for training new staff on plant operations.

O&M manuals are "living" documents. As such, Ecology expects generators to modify or clarify them over time based on operational experience. Changes in operational procedures and equipment require modification or amendment of the manual; substantial manual changes require Ecology review and approval. Generators should prepare and format the manual in a manner that allows revisions to be made easily. The manual should also identify the revision history of the document.

The lead agency must review and approve the O&M manual for a reclaimed water facility prior to that facility being placed into operation. Because of this constraint, it is important to coordinate closely the timing of draft submittals with the lead agency. The generator should consider early consultation with the lead agency on the scope and outline of the manual when construction is at approximately 50% completion. The initial draft of the manual should be submitted for review at least 90 days or more before the anticipated beginning of equipment testing. This should allow sufficient time for necessary revisions and final review and approval prior to the anticipated facility startup date. On a case-by-case basis, the lead agency may agree to a shorter review and approval timeline for small projects with low complexity.

Section G1-4.4 and table G1-3 of the *Criteria for Sewage Works Design* manual presents detailed discussions about the topics and organization of a functional O&M manual for domestic wastewater facilities. Most of this information generally applies to O&M manuals for reclaimed water facilities. Table 5-6 provides a review of the specific items listed in the WAC 173-219-240 as requirements for reclaimed water facility O&M manuals.

Table 5-6 Operation and Maintenance Manual Requirements

Text from WAC 173-219-240	Explanation
240 (2) (a) Sufficient detail to describe the operation and maintenance and treatment reliability of the entire reclaimed water facility, storage, and as applicable, the distribution system.	The generator must develop and maintain an O&M manual that describes the operation and maintenance of all reclaimed water facilities, including all treatment, storage, and distribution facilities under their direct control. The manual should provide concise information that gives operators an understanding of how the designers intended for the facilities to operate. It provides the instructions operators will follow to adequately and reliably produce and distribute reclaimed water. The contents should focus on describing how various equipment and unit processes interact with each other along with identifying critical control points and conditions. It must also establish standard operating procedures operators will follow during routine and emergency operating conditions.
240 (2) (b) A copy of the reclaimed water permit.	Maintain a current copy of the reclaimed water permit for the facility along with all other operating permits applicable to the facility's operations (NPDES or State Waste Discharge Permits for alternative discharges, State Biosolids Permit, Industrial Stormwater Permit, etc.). Facility operators are responsible for ensuring operations at the reclaimed facilities comply with applicable permits.

240 (2) (c) Manufacturer's information on the reclaimed water facility equipment.	Include a list of all major equipment at the facility along with detailed manufacturer manuals for each individual piece or type of equipment. The generator may keep individual equipment manuals bound separate from the facility O&M manual, but must keep an overview list in the main manual as an index to those separate manuals. Include the following quick reference information on the index list: the manufacturer/vendor name, the address and phone number of nearest representative, complete identification/specification tag data with serial number, and location of the individual equipment manual. The individual equipment manuals should include all contact and identification information in the index list plus the following: any maintenance summaries provided by original equipment manufacturers or vendors, parts lists and exploded views of equipment identifying parts numbers, a list of spare parts kept in inventory, and information about all applicable warranties. If a spare parts inventory is not maintained at the plant, provide appropriate information necessary for ordering parts.
240 (2) (d) Technical guidance for both normal and emergency operating conditions.	Identify standard operating procedures for normal operation of the facilities as well as for emergency operating conditions. Emergency procedures should address steps to take in response to plant or treatment unit upset, releases of inadequately treated water, releases of water at unpermitted locations, and, if applicable, failures of cross-connection control devices. Include detailed emergency response and notification procedures for common emergency situations. Maintain an accurate list of contact numbers required for response to common emergency situations (facility management or other on-call staff, local police, fire, hospital, and health department; Ecology's regional Emergency Reporting and Tracking System, etc.). Format the contact list so that it can be easily referenced during an emergency. Also see WAC 173-219-240 (l) for additional emergency response requirements.
240 (2) (e) A section containing the generator's cross-connection control plan, in conformance with WAC 173-219-310.	WAC 173-219-310(4) requires the reclaimed water generator to develop a written cross-connection control program. Include a copy of this plan as a component of the O&M manual. Please see Section 7.6 of this document for further information regarding the cross-connection control plan.
240 (2) (f) A communication plan outlining notification of any potable water purveyors identified in WAC 173-219-180 and any other affected agencies.	The generator must build on the collaboration with local potable water suppliers and other stakeholders that began during the feasibility analysis phase. As the facilities transition into operation, it is important to ensure that there is continued identification and discussion of issues that may arise between the parties. The communication plan should include up-to-date contact information for operations staff and management for each potable water suppliers and other stakeholders. The plan must also describe events or conditions that warrant communication with others along with any

	requirements for making contact within a specific amount of time after becoming aware of an issue. Common issues to cover in the plan include, but are not limited to: identifying cross-connection control failures, adding new use locations, unanticipated releases of reclaimed water to a stormwater system, planning for maintenance activities that may impact the demand for potable water or cause controlled releases of reclaimed water.
240 (2) (g) Roles and responsibilities for managerial and operational staff. (i) Include facility classification and the classification and certification requirements for treatment, distribution, and cross-connection control operators and personnel, if applicable. (ii) A discussion of provisions to provide a sufficient number of qualified personnel to operate the facility, storage, and distribution system, if applicable. (iii) List of persons and contact numbers to be alerted in case of emergency.	Provide a complete staffing plan that includes recommendations on the numbers, qualifications, duties, and grades of operators, laboratory staff, technicians, and managers required to operate and maintain all reclaimed water facilities under the direct control of the generator. Discuss how the proposed staffing complies with the operator certification requirements outlined in WAC 173-219-250. Additional guidance related to operator certification is provided in Section 5.2.9 below. Staffing recommendations should reflect realistic estimates of the time and effort needed for staff to operate the facilities at all times to reliably produce and distribute reclaimed water. Provide detailed justification for each position to ensure adequate budgeting and fund allocation for personnel. Include organizational charts to show lines of responsibilities along with contact numbers for emergency situations.
240 (2) (h) Principal design criteria including: 240 (2) (h) (i) A process description of each facility unit, including function, relationship to other facility units, and schematic diagrams. 240 (2) (h) (ii) Details of each unit operations and various controls, recommended settings, fail-safe features, and other elements that ensure proper operation of equipment. 240 (2) (h) (iii) Operation instructions for anticipated maintenance procedures, routine operations, less than design loading conditions, overload conditions, and if applicable, initial loading on a system designed for substantial growth. 240 (2) (h) (iv) Information on any maintenance procedures that contribute to the generation of wastewater or residual solids and the proper handling of the wastewater and solids generated. 240 (2) (h) (v) A maintenance log and schedule that incorporates manufacturer's recommendations, preventative maintenance, and housekeeping schedules, and special tools and equipment used to ensure that all unit processes and equipment are in reliable operating condition at all times.	Include in the O&M manual for quick reference copies of the following sheets from the as-built plans: design criteria sheets for the entire facility and for each major unit process, process flow diagrams, hydraulic profiles, equipment schedules, yard piping diagrams, general electrical schematics and one-line diagrams, and control loop diagrams. The generator should keep a complete set of the as-built plans available at the reclaimed facilities. Provide the detailed facility and process descriptions prescribed by the rule along with the prescribed operation and maintenance instructions, schedules, and logs. Discuss general routine maintenance activities including what to do for general maintenance and the schedule for maintenance. Include a discussion of possible failures and how to evaluate the system to determine what may have occurred. Maintain a log of maintenance activities showing when operators performed the maintenance, what activities operators performed and any notes for additional follow-up or for future inspections.
240 (2) (i) Laboratory procedures, including sampling techniques, monitoring requirements, sample analysis and record keeping procedures, including sample and chain of custody forms.	Develop a detailed laboratory procedures manual that documents how operators and/or laboratory staff will collect samples and conduct analyses necessary to demonstrate compliance with the reclaimed water permit

	and to ensure proper process control. Include a copy of the laboratory quality assurance manual approved by Ecology's Laboratory Accreditation unit. Additional guidance for the laboratory procedures can be found below this table.
240 (2) (j) Safety procedures.	Thoroughly illustrate, discuss, and explain the particular safety and security risks associated with each reclaimed water facility under the direct control of the generator. Include emergency response and notification procedures and discuss policies that ensure the safety and security of the plant's equipment and personnel. Include a statement regarding general security of computer networks, especially networks with connections to plant control systems (DO NOT include sensitive security details in any document that may be subject to public disclosure). Include in appropriate locations of the manual all procedures for the lock out and tag out of equipment, confined space entry, proper handling of chemicals and other hazardous materials, responding to security violations and reporting safety concerns. Also discuss protocols for responding to floods, earthquakes, and other natural disasters from the perspective of ensuring staff safety while continuing to operate the facility, if ongoing operation is necessary, or for shutting down facilities during a disaster response.
240 (2) (k) Spare parts inventory, address of local suppliers, equipment warranties, and appropriate equipment catalogues.	Maintain lists of spare parts kept in inventory at the reclaimed water facilities along with information about equipment warranties and local parts suppliers. The generator should include this information as part of the "manufacturer's information on the reclaimed water facility equipment" required by WAC 123-219-240(2)(c).
240 (2) (l) Emergency plans and procedures including, but not limited to: (i) Facility shutdown and cleanup of a treatment process upset or failure. (ii) Response plan to ensure that no inadequately treated water is delivered to a reclaimed water user.	The generator must ensure that the "technical guidance for both normal and emergency operating conditions" required by WAC 173-219-240-(d) includes detailed instructions for shutting down reclaimed water facilities and for appropriate cleanup following a treatment process upset or failure. Also include procedures operators must follow during emergency situations to prevent or minimize the delivery of inadequately treated water to any use area. Identify all alarms that will trigger automated diversions of inadequately treated water. Discuss procedures for draining and/or disinfecting storage and distribution systems should inadequately treated water enter the systems.
240 (2) (m) If the generator is the distributor, include a section on the distribution system including, but not limited to: (i) Responsibilities for operation and maintenance. (ii) Operational controls, maintenance requirements, monitoring, and inspection.	Whenever the generator has operational control over any part of the distribution system, the reclaimed water facilities O&M manual must include appropriate information as described above for the systems under their control. The generator may include this information in a single manual for all reclaimed water facilities, or they may develop a separate manual dedicated to the

	distribution system. If developing separate manuals, both sets of manuals must clearly define the point(s) where operations transition from one manual to the other.
240 (2) (n) If the generator is the user, include a section on the reclaimed water use areas including, but not limited to: (i) Responsibilities for operation and maintenance. (ii) Operational controls, maintenance requirements, and monitoring and inspection.	Whenever the generator has operational control over any use area, the reclaimed water facilities O&M manual must include appropriate information as described above for the use area(s) under their control. The generator may include this information in a single manual for all reclaimed water facilities, or they may develop a separate manual dedicated to the use area(s). If developing separate manuals, both sets of manuals must clearly define the point(s) where operations transition from one manual to the other.

Laboratory Procedures Manual

Proper sampling and laboratory practices are important for ensuring compliance with permit limits and reporting requirements along with maintaining good process control. Detailed descriptions of laboratory practices and procedures at the reclaimed water facility is an important component of the plant's O&M manual. Ecology's Lab Accreditation Program has resources available online to assist with developing a lab procedure manual. The reclaimed water generator should include the following topics in a laboratory procedures manual that becomes part of the overall plant O&M manual.

- **Sampling System and Locations:** Include an illustrated plan identifying all sample locations. Discuss special sampling considerations, such as automatic sampling systems or devices and the requirement for representative sampling.
- **Process Control Summary:** This section should reinforce the goals of process monitoring and performance evaluation. Prepare a table summarizing the sampling frequency, time (if important), location, and type of sample for all required process control tests. Discuss sample graphs and special analysis equipment to be used.
- **Laboratory Accreditation:** Discuss monitoring parameters for which the on-site laboratory has received performance accreditation. Provide a list of analytical services and laboratories available for use in conducting analyses for which the on-site lab is not accredited or may be unable to perform due to temporary problems with the on-site lab.
- **Laboratory Practices:** Discuss generally acceptable laboratory practices including identification of the appropriate Standard Methods protocols used for analyses, sample bench sheets and sample calculations, QA/QC tolerances and guidelines, laboratory safety, and procedures for submitting monthly discharge monitoring reports. Place emphasis on the integrity of collected data and policies regarding proper ways to correct errors in recording data (i.e., prohibitions on the use of correcting fluids and altering numbers).
- **Record Keeping System:** Develop a record keeping system that organizes data collection for process control and any information required by regulatory agencies. Show samples of records to be kept and reinforce the types of records to keep, such as calibration records, maintenance logs, and alarm logs. Clearly define that records must be kept at the treatment plant location unless special circumstances necessitate their storage at a different location.

5.2.9 Operator Certification

WAC 173-219-250 requires reclaimed water generators to staff the treatment facilities with operators certified by Ecology and Health under the authority of chapter 173-230 and 246-292 WAC.

Certification levels are based on the combined complexity of processes used at the source domestic wastewater treatment facility and the additional processes needed to produce reclaimed water. In most cases Ecology considers reclaimed water treatment facilities producing Class A water as "tertiary" treatment facilities, while facilities producing Class B water are classified based on the underlying secondary treatment process. Reclaimed water distributors must also retain certified operators as described below.

WWTP Operator Certifications for Reclaimed Water Facilities

A certified wastewater treatment plant operator in responsible charge or in charge of a shift is required to be on-site and must meet the requirements in WAC 173-230-040.

Table 5-7 lists the certification levels for typical reclaimed water treatment facilities. On a case-by-case basis Ecology may classify a plant higher than the listed classification depending on the complexity of the facility and/or the risks associated with the identified beneficial uses.

Table 5-7 Reclaimed Water Facility Operator Certification Classifications

Treatment Facility Description	Design Flow (MGD)	Classification
Any secondary treatment facility combined with coagulation and filtration producing Class A water	≤5	III
	>5	IV
Membrane Bioreactor (MBR) producing Class A or Class B* water	≤10	III
	>10	IV
Conventional activated sludge facility or biofiltration facility producing Class B water	≤1	II
	>1, ≤10	III
	>10	IV
Extended aeration facility producing Class B water	≤5 MGD	II
	>5 MGD	III
*On a case-by-case basis, Ecology may allow a lower classification of Class II for MBR facilities with design capacities of ≤1 MGD and producing Class B water.		

The table above does not list classification levels for reclaimed water facilities using lagoons or constructed wetlands as the source domestic wastewater treatment facility due to the uncertainty of whether these facilities are suitable for use in a reclaimed water project. If the lead agency determines during the feasibility analysis and engineering report stages that a lagoon or wetlands based facility can adequately and reliably produce reclaimed water, Ecology will determine the appropriate facility classification based on the proposed overall facility design.

Ecology and Health will determine operator certification requirements on a case-by-case basis for any facility proposing to produce Class A+ water for direct potable reuse. Such facilities will require operators certified by Ecology as wastewater treatment plant operators and by Health as waterworks treatment plant operators.

Waterworks Operator Certifications for Reclaimed Water Distribution
Along with requiring certified operators for the reclaimed water treatment facilities, the reclaimed water rule requires certified operators for reclaimed water distribution systems. Ecology and Health determined that some reclaimed water distribution systems have characteristics and complexities similar to potable water supplier distribution systems.

Therefore, some distribution systems will require operators certified by Health under the authority of chapter 246-292 WAC for distribution management. This requirement applies to all entities that have operational control over any portion of a distribution system, which may include the generator and/or an independent distributor.

Reclaimed water projects that have distribution systems serving multiple use locations will likely require an operator certified as an OIT (operator in training) Water Distribution Manger 2 (WDM-IT 2) in responsible charge of the distribution system. The lead agency may waive this requirement when the project does not include a distribution system or when the distribution system serves a single use area that is under the direct control of the generator.

The designated WDM-IT 2 for a reclaimed water distributor must comply with the requirements in WAC 246-292-032, but is not subject to the on-site requirements of WAC 173-230-040.

Water Distribution Manager In-Training (WDM-IT)
A certified wastewater operator can obtain a WDM In-Training (WDM-IT) certification by meeting the minimum education and "water-related experience" requirements as defined in WAC 246-292-060. "Water-related experience" is defined in WAC 246-292-010(52) as follows:

> (52) **"Water-related experience"** means experience:
>
> (a) Operating a water treatment plant or distribution system;
>
> (b) Working in water quality, water resources, or water infrastructure in a federal, state, county, local, or other governmental agency;
>
> (c) Working in industrial water;
>
> (d) Working in wastewater treatment; or
>
> (e) Working as a consulting engineer or operations consultant in water quality, water resources, or water infrastructure.

In addition to employing certified operators for routine operation of the reclaimed water distribution system, generators and distributors must also use staff certified to oversee cross-connection controls. A person certified as a cross-connection control specialist (CCS) must review all engineering reports, design documents, and O&M manuals prior to submitting them to the lead agency for review to ensure the documents contain appropriate cross-connection protections for all systems under the control of the generator or distributor. The CCS must also be responsible for developing and implementing the cross-connection control program required by WAC 173-219-310.

Cross-connection control Specialist (CCS)
Minimum education and experience requirements for the CCS certification are in WAC 246-292-060(3). CCS duties are defined in WAC 246-292-033.

All testing of backflow assemblies installed to prevent cross-connections must be done by a person certified as a backflow assembly tester (BAT). The education and experience requirements for and typical duties of a persons certified as a CCS or BAT are defined in Chapter 246-292 WAC. The generator and distributor may either employ the CCS and BAT as a member of their staff or under contract as a consultant.

Backflow Assembly Tester (BAT)
BAT certification requirements are defined in WAC 246-292-034. Backflow preventer inspection and field test report content is outlined in WAC 246-292-036. Additional details on backflow prevention can be found in WAC 173-219-310.

Ecology and Health will continue to consider developing a reclaimed water operator certification program.

5.2.10 Use and Distribution Agreements

The reclaimed water rule regulates the generation, distribution, and use of reclaimed water to ensure all activities comply with the chapter 90.46 RCW. While the reclaimed water permit issued by the lead agency to the generator includes specific requirements related to the distribution and use of reclaimed water produced at the permitted facility, the rule recognizes that the generator may not always have direct control over these areas. When the generator does not maintain direct control over the reclaimed water from the point of generation to the point of use, the generator must enter into binding agreements with each end user or distributor that receives water from the permitted facility. The rule contemplates the following ownership and agreement relationships, as shown in Table 5-8:

Table 5-8 Scenarios for Use and Distribution Agreements

Ownership scenario	Agreement requirement
1. The generator has complete operational control over all generation, distribution and use.	No agreements required. All distribution and use area requirements are enforced directly through the reclaimed water permit.
2. The generator has operational control over the generation and all distribution systems, but does not have operational control over some or all of the use areas.	For all use areas where the generator does not have operational control, they must enter into use agreements with each end user receiving water.
3. The generator has operational control over the generation, but does not have operational control over any part of the distribution system or the use areas.	The generator must enter into distribution agreements with all entities receiving water for distribution to approved uses. In addition, each distributor must enter into use agreements with each end user receiving water from that distributor.

The reclaimed water permit will include conditions that apply to all distribution and use of reclaimed water. The conditions apply to the generator for all systems under their direct control. For all other systems, the generator must include these conditions in agreements to ensure compliance. The agreements must, at a minimum, contain specific requirements related to the following topics, as identified in WAC 173-219-290 (2):

- Cross-connection control measures.
- Monitoring points, parameters, and sample times, if applicable.
- Identification of the use site's inclusion in a wellhead protection area or critical aquifer recharge area, if applicable.
- If applicable, a copy of the generator's notice to the potable water supplier(s) linked to any such area(s), of any treatment requirements and proposed use(s), and, if any, special protection measures proposed.
- Best management practices to ensure permit compliance.
- General Use Based Requirements in WAC 173-219-380.

The use or distribution agreements are binding contracts that obligate the user or distributor to comply with specific requirements from the reclaimed water rule related to the use or distribution of the water.

The agreements must also include enforcement provisions that specify actions the generator will take if the distributor or user does not comply with the agreement. Enforcement may include temporarily discontinuing the supply of reclaimed water, permanent disconnection of the use area or distribution system, or implementing specific remedial actions necessary to ensure compliance. Failure of a generator to enforce the agreement will constitute a permit violation.

The rule allows for the use agreement to take a variety of forms. The generator may develop individual agreements with each distributor or user. They may also develop general agreement templates that apply to a defined set of users or distributors or they may enact local codes or ordinances that establish requirements of all reclaimed water users or distributors. Regardless of the form of the agreement, the lead agency must review and approve the agreements (individual agreement, template, code, or ordinance) prior to its use.

Reclaimed water permits may include conditions authorizing the addition of new users or similar beneficial uses without reopening and modifying the permit. Similar beneficial uses are uses contained within the same general use category(s) the permit has authorized as uses. The permittee may add users and uses when the permit authorizes the following general uses listed in Table 3 of WAC 173-219-390:

- Indoor Use
- Commercial, industrial, and institutional uses
- Land application or irrigation uses

When adding new users for a beneficial use identified in the permit, the permittee must submit a copy of the use agreement to the lead agency prior to allowing the use. If the beneficial use is not a currently permitted beneficial use, but is within the same category as existing uses (i.e., adding Class A landscape irrigation as a use for a permit that authorizes Class A food crop irrigation) the permittee must provide a new user agreement for approval by the lead agency before the new use can begin.

The ability to add new uses without modifying the permit does not generally apply to the authorized uses of groundwater recharge, release to wetlands, or surface water augmentation. These uses typically include a higher degree of site-specific review by Ecology and Health that must be completed prior to authorizing the use. In cases where the use must be authorized in a NPDES permit, the addition may only be made through a permit modification.

Joint permits issued by Ecology are issued under the legal authorities of the State Water Pollution Control Act (RCW 90.48), the state's Reclaimed Water Use law (RCW 90.46) and the federal Clean Water Act (Title 33 United States Code, Section 1342 – applicable only to NPDES permits).

5.2.11 Use Site Evaluation

The purpose of the evaluation is to verify the site's suitability to accept reclaimed water. While site assessments are an important aspect of all reclaimed water feasibility analyses and engineering reports, evaluations done at this early stage may not provide adequate insight for all potential use sites. This is especially true when the proposed uses involve irrigation uses, indoor uses, or other commercial, industrial, and institutional uses. Evaluations done during the early stages for facilities proposing these uses often focus on the general feasibility and suitability to provide water for identified uses over a broad distribution area. They may not evaluate each potential site in detail. In addition, opportunities for uses at sites not identified in the planning documents may arise after the facility is in operation. A separate site evaluation is necessary to demonstrate that uses at these previously unidentified sites are consistent with uses proposed in the approved feasibility assessment and/or engineering report.

The reclaimed water generator must evaluate each proposed use site prior to distributing any water to the site.

The general use-based requirements of the reclaimed water rule, WAC 173-219-380, require a site evaluation to determine the feasibility of reclaimed water use in a specific area. The analysis must review local codes or ordinances for the proposed use location to ensure they do not contain prohibitions for the use. The generator must also review all aspects of the proposed use to ensure the use is protective of public health and the environment. It must determine if the use area includes any sensitive or critical areas that may make the reclaimed water use infeasible or may make restrictions to the use necessary. If the evaluation determines the need for restrictions, the use agreement must include those restrictions as a use condition. Restrictions may include time limits for irrigation, uses of specific types of sprinklers, or limiting the rate at which the user may apply water to a crop.

5.3 Permitting Process Overview

Chapter 90.46 RCW authorizes the lead agency to issue permits to regulate the generation, distribution, and use of reclaimed water in Washington State. In most cases, a reclaimed water facility will operate in tandem with an existing domestic wastewater treatment facility that has been issued a waste discharge permit under the authority of RCW 90.48 (either NPDES or State Waste Discharge Permit). The reclaimed facility may also operate in tandem with a large on-site treatment system with a permit issued by Health under the authority of RCW 70.118B. In each case, the lead agency will typically issue a single permit for the facility that includes conditions

related to the treatment and beneficial use of reclaimed water along with conditions regulating waste discharges to waters of the state.

Not all reclaimed water facilities operate in tandem with domestic wastewater treatment facilities that require a waste discharge permit. In these cases, the lead agency will issue a reclaimed water permit under the sole authority of chapter 90.46 RCW.

In addition, the reclaimed water rule does not obligate the lead agency to issue combined reclaimed water and waste discharge permits to facilities that also have authorized wastewater discharges. The lead agency may issue a separate reclaimed water permit under the authority of RCW 90.46 to any facility on a case-by-case basis. The lead agency may choose to issue separate permits for the following reasons:

The reclaimed water rule does not require a facility to maintain a means of "waste discharge" for inadequately treated water or excess reclaimed water as long as the facility has sufficient storage on site.

- It is more convenient for the lead agency to manage the reclaimed water and waste discharge conditions for a particular facility when issued in separate permits.
- The organizational structure of the generator has different staff or departments overseeing implementation of the separate permit conditions.
- The reclaimed water facility begins operating sometime in the middle of the term of the waste discharge permit for the domestic wastewater plant.

The authorized beneficial use of reclaimed water from a facility also influences the type of permit issued. Uses that include the release of reclaimed water to surface waters of the state must have that release authorized by a NPDES permit. This includes uses for surface water augmentation, most wetland enhancement uses, and uses that include conveyance through surface waters of the state. The reclaimed water permit for these uses must ensure that the use complies with the use-based requirements of the reclaimed water rule as well as with applicable water quality standards for the surface water (Chapter 173-201A WAC).

The Rule requires the generator to submit an application for a reclaimed water permit to the lead agency at least one hundred eighty calendar days before the planned distribution of reclaimed water for use.

Prior to submitting the permit application, the generator or potential generator must have gain approval from the lead agency of their project's feasibility analysis and should also have completed an engineering report for approval. While the reclaimed water rule allows for the submission of the engineering report in conjunction with the permit application, this timing is not appropriate for most large and complex reclaimed water projects where the typical length of time between the engineering report approval and construction completion may be on the order of one to three years.

Earlier submission may be warranted if the generator expects the necessary construction to take less than six months. In all cases, the generator should consult with Ecology's regional staff during the facility planning and design phases to determine the appropriate timing of application

submission. While the permitting process typically takes 4-6 months to developing the draft permit and fact sheet and to complete the required public comment period, some complex projects may require additional time.

Ecology assess application and permit fees for reclaimed water permits according to chapter 173-224 WAC. When the project involves issues that require direct review by Health as the nonlead agency, it will assess an hourly fee based according to chapter 246-272 WAC. When Health is the lead agency for a reclaimed water project, it requires payment of fees at the start of project review with the permit application.

Upon receipt of the application for a new reclaimed water permit or for a permit renewal, the lead agency will review the application for completeness within ninety calendar days. If the review reveals inaccuracies or if the lead agency determines the application is incomplete, it may reject the application and ask the generator to resubmit a corrected application. If the issues require relatively minor corrections, the lead agency will work with the generator to get corrected information prior to accepting the application.

Health requires a permit application at the start of project review for any project where they are the lead agency.

To coincide with established processes for permitting on-site treatment facilities, Health must issue the final permit before it allows the generator to proceed to construction.

Health will notify the project proponent when to apply for a permit, consistent with chapter 246-272B WAC.

After the lead agency accepts the application as complete, it begins drafting the reclaimed water permit and fact sheet. The permit provides the specific conditions the generator must comply with in order to produce and distribute reclaimed water. It identifies the specific authorized uses of the water, the use locations and restrictions for the water's use. The conditions are based on the requirements outlined in chapter 90.46 RCW, chapter 173-219 WAC, as well as other state and federal laws and regulations relevant to the operation of the reclaimed water facilities and to the protection of public health and the environment. The fact sheet documents the lead agency's reasons for including specific conditions in the permit.

Once the lead agency completes the draft permit and fact sheet, it will typically allow the permittee an opportunity to review the facts included in the documents to ensure it includes correct names, locations, phone numbers, and that data used in making decisions are accurate. After correcting any factual errors, the lead agency will issue a notice alerting the public that the draft permit and fact sheet are available for review and comment.

Upon completion of the public review process, the lead agency finalizes and issues the permit for a five-year term. The final permit may include changes to conditions based on comments received during the public comment period. The final fact sheet will include a summary of all comments received during the comment period along with the lead agency's responses to the comments.

Further details on the Ecology permitting process may be found in chapter 173-219 WAC and the most recent edition of the *Water Quality Program Permit Writer's Manual*, #92-109, Ecology.

5.4 Ecology Role

Under chapter 90.46 RCW and chapter 173-219-050 WAC, Ecology is the lead agency for review of reclaimed water documents and development of reclaimed water permits for the following types of reclaimed water projects:

- New water pollution control facilities permitted by Ecology.
- Existing water pollution control facilities permitted by Ecology.
- Specific projects where for environmental protection or water right administration reasons, Ecology and Health agree that Ecology should be the lead agency.

For all reclaimed water projects where Ecology is the lead agency, the Water Quality Program (WQP) is responsible for developing reclaimed water permit conditions as necessary to ensure adequate design, construction, and operation of reclaimed water facilities. Ecology will incorporate public health conditions prepared by Health, when requested by Health. Ecology uses the authority under chapters 90.46 and 90.48 RCW to review, approve, permit and inspect the reclaimed water facilities.

Ecology also has responsibility for the following:

- Maintaining a certification program for operators of facilities that generate reclaimed water.
- Notifying Health in a timely manner of project submittals, initial permit applications, renewals or modifications that contain reclaimed water provisions.
- Consulting with Health to assure that public health is adequately addressed in engineering approvals, permits, and enforcement orders.
- Reporting to Health any permit violations of public health significance that may affect reclaimed water permits including copies of inspections, monitoring records, or correspondence with permittee, distributors, or users.
- Notifying Health of any complaints of public health significance on reclaimed water permittees.

5.4.1 Agricultural Industrial Process Water Reuse Permits

The Reclaimed Water Rule, in accordance with WAC 173-219-030, does *not* apply to the use of agricultural industrial process water or industrial reuse water.

Beginning in 2001, RCW 90.46.150 authorized Ecology to issue a permit for agricultural reuse of water derived from food processing wastewater. All existing requirements for water quality and human health protection under chapter 90.48 RCW still apply, including protection of waters of the state per the surface water standards (chapter 173-201A WAC) and the groundwater standards (chapter 173-200 WAC).

Due to the wide variety of potential wastewater sources and uses, Ecology envisions that most agricultural industrial process water decisions will be made on a case-by-case basis. If the wastewater has a domestic wastewater component, then it must meet the requirements for reclaimed water (WAC 173-219-030).

RCW 90.46.130 requires an impairment analyses for agricultural industrial process water. The applicant and WQP staff should coordinate with the Water Resources Program (WRP) regarding the potential for water right impairment and any additional permit conditions.

The law requires Ecology to refer the permit application to Health for review and consultation if a significant risk to public health exists in the proposed use of the water. Public health risks that may warrant referral to Health are included under Section 5.5.1, Public Health Risk Consultation.

5.4.2 Industrial Process Water Reuse Permits

Beginning in 2002, RCW 90.46.160 authorized Ecology to issue a permit for water reuse projects derived from industrial process wastewaters. All existing requirements for water quality and human health protection under chapter 90.48 RCW still apply, including protection of waters of the state per the surface water standards (chapter 173-201A WAC) and the groundwater standards (chapter 173-200 WAC).

The Reclaimed Water Rule, in accordance with WAC 173-219-030, does *not* apply to the use of industrial reuse water.

The law is very broad regarding the types of industrial wastewaters and potential use. Projects are likely to be very case specific and no specific standards or regulations have been written to cover this category. Ecology has several sets of standards and regulations for industrial wastewaters that can be applied on a case-by-case basis to meet this AKART requirement. These include:

- AKART and Industrial Pre-treatment Standards (40 CFR Parts 400 through 471 and other sources)
- Surface water standards (chapter 173-201A WAC)
- Groundwater standards (chapter 173-200 WAC)
- Reclaimed Water Rule (chapter 173-219 WAC)

If the wastewater has a domestic wastewater component, then it must meet the requirements for reclaimed water (WAC 173-219-030). The applicant may investigate excluding the domestic sewage from the reuse stream.

RCW 90.46.130 requires an impairment analyses for industrial reuse water. The applicant and WQP staff should coordinate with the WRP regarding the potential for water right impairment and any additional permit conditions.

The law requires Ecology to refer the permit application to Health for review and consultation if a significant risk to public health exists in the proposed use of the water. Health will also be

notified of project proposals through the dual submittal of plans and designs noted elsewhere. Public health risks that may warrant referral to Health are included under Section 5.5.1, Public Health Risk Consultation.

5.5 Department of Health Role

The Department of Health (Health) will be the lead agency for review of reclaimed water documents and development of reclaimed water permits for the following types of reclaimed water projects (WAC 173-219-050) (2):

- On-site (OSS or LOSS) effluent discharge ≤100,000 gpd combined with reclaimed water uses not directly discharging to the waters of the state, or with uses specified as being within Ecology's responsibility.
- Specific projects where for public health protection reasons Ecology and Health agree that Health should be the lead agency.

For all reclaimed water projects, Health may develop reclaimed water permit conditions to ensure adequate public health protection, and to ensure adequate public health-related treatment, reliability and exposure provisions in the reclaimed water facilities. Health will ensure adequate public health-related reliability provisions are implemented in reclaimed water generation.

Health has responsibility for the following:

- Cross-connection control measures and public health requirements for reclaimed water permits. Most are spelled out in the Rule.
- Notifying Ecology of any reclaimed water permit violations for permits it issues and enforces through copies of inspections, monitoring records or correspondence with permittees, distributors or users.
- Reporting any other alleged permit violation to Ecology that is found as a result of a Health inspection or notification.

5.5.1 Public Health Risk Consultation

Public health risks in the use of reclaimed water or industrial reuse water that may be of interest to Health include the following:

- Proposed irrigation, other direct reclaimed water use within areas served by potable water systems. The Rule requires certain advance notifications to and communication with the public water supplier(s).
- Proposed installation of non-potable water pipelines in a public right-of-way that also incorporates potable water lines when pipe separation recommendations are not met.
- Projects creating cross-connections between reclaimed water and potable water in any water supply systems. The Rule has provisions to deal with this.
- Projects where aerosols are introduced into public areas.
- Projects that propose use in a water recreation facility or feature regulated under chapters 246-260 and 246-262 WAC.

- Projects with groundwater recharge occurring in areas adjacent to or contiguous with existing potable source water protection areas.
- Projects where uses might be compromised by microbial pathogens or other contaminants in the reclaimed or industrial reuse water.
- Projects where reclaimed water quality for public contact uses could potentially be contaminated by lower quality water, such as sewage or incompletely treated reclaimed water.

5.6 Public Role

The public plays an important role in the planning, development, and permitting of reclaimed water projects. The success of a proposed reclaimed water project depends greatly on public acceptance. The planning and permitting processes described in this chapter provide opportunities for public involvement at the following phases.

Feasibility Analysis: In enacting RCW 90.46, the legislature declared, "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 non-potable applications, to supplement existing surface and ground water supplies, and to assist in meeting the future water requirements of the state. Given this declaration, it is important for the public to weigh in at this early stage of project development to help identify the community needs and to build support and acceptance for the dedication of resources. The members of the communities where reclaimed water is to be produced and uses are the ones in the best position to identify the potential uses of reclaimed water as well as to identify the potential barriers.

Engineering Report: The engineering report is the project-specific document that thoroughly evaluates the technical aspects of a proposed reclaimed water project. WAC 173-219-210 requires the engineering report to include a statement demonstrating compliance with SEPA. Project proponents typically accomplish this by including a copy of the SEPA checklist for the project and the SEPA determination.

Public participation is an important part of this process. Critical decisions related to the reclaimed water facility are made at this stage.

Some decisions made at this stage, such as those involving land use and environmental justice, may be irreversible once the facility is constructed. It is critical for the public to work closely with the project proponent during this stage of project development to identify all potential impacts of the project.

For additional guidance on SEPA, please see Ecology's SEPA guidance web site: https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance.

Permit Development: Public participation is also an important part of the process to issue a reclaimed water permit to a generator. It is important to note, however, that the scope of participation at this stage differs significantly from the previous stages.

The public may weigh in on decisions the lead agency makes in establishing conditions for the generation, distribution, and use of reclaimed water regulated under the permit.

Public involvement at this phase focuses on whether the permit the lead agency proposes to issue complies with WAC 173-219, RCW 90.46, and other state and federal laws related to the release of the water from the facility.

When Ecology is the lead agency, the opportunities for public participation in the permit start shortly after the generator submits a permit application. After Ecology accepts the application as complete, it will publish a Public Notice of Application. This notice is generally an advisory notice that the Ecology has received the application and will begin drafting a permit. It does not initiate a formal comment period; however, the public may provide general comments for the permit writer to consider during the permit drafting.

Once Ecology completes the draft permit and fact sheet, it will publish a Public Notice of Draft Permit to alert the public of the availability of the draft permit and fact sheet. This notice starts the thirty-day public comment period of the draft permit. During this time, anyone may request a public hearing on the draft permit and fact sheet.

Ecology may schedule a hearing if it determines there is sufficient public interest. After the comment period has ended and after any public hearing has been held, Ecology will finalize the permit for issuance. The final permit may include changes requested during the comment period or hearing.

In all cases, Ecology will summarize comments received during the comment period and provide responses to those comments as part of the final fact sheet. Ecology will publish a Public Notice of Final Permit Decision when it issues the final permit (or permit denial, if warranted). This notice will include procedures for appealing the decision.

When Health is the lead agency, it will require the applicant to provide public notices consistent with the permitting process of large on-site systems, as described in chapter 246-272B WAC.

6 Treatment Performance, Monitoring, and Reliability

This chapter provides guidance on specific requirements for assuring adequate technology-based treatment of reclaimed water. The Ecology Water Quality Program (WQP) and the Department of Health (Health) issue a permit to the generator, governing the quality of the water for public health protection, environmental protection and suitability of the water for the intended beneficial uses authorized in the reclaimed water law and Rule. Reclaimed water must have adequate and reliable treatment (ART) and other reliability requirements, technology-based water quality limits, and specific use-based standards. The Reclaimed Water Rule (Rule), chapter 173-219 WAC governs the generation and use of reclaimed water.

6.1 Source Control and Pretreatment

Source control is the first line of defense. An effective industrial pretreatment program is necessary to provide a high quality influent so that the resulting effluent will be suitable for reclaimed water treatment and use. The Rule requires the permittee either to have an Ecology delegated industrial wastewater pretreatment program or to assure that all industries discharging into the collection system have waste discharge permits issued by Ecology (WAC 173-219-300).

6.2 Technology-Based Treatment Requirements

There are two classes of reclaimed water, Class A and Class B, with Class A as the higher level reflecting a process that includes coagulation and filtration by traditional methods, or enhanced filtration by membrane filtration processes. These levels are appropriate for direct beneficial uses of reclaimed water for irrigation and various commercial and industrial uses. Similar to surface water quality use-based standards, the degree of treatment required varies according to the specific use. Additional treatment may be required for some commercial and industrial uses, irrigation uses, groundwater recharge, surface water augmentation, or wetlands projects.

The reclaimed water treatment processes described in WAC 173-219-320 and in this manual are derived from requirements for both conventional wastewater treatment and drinking water treatment systems. The effectiveness and reliability of these measures is considered a critical element of the system. Operators of the reclaimed water treatment processes must ensure that the facility produces consistent, high quality reclaimed water for its users.

Effective treatment relies on the multiple barrier approach that includes properly certified operators and multiple unit processes that create redundancy and reliability of treatment (WAC 173-219-350).

Since it is not feasible or cost effective to measure the wide variety of pathogens and pollutants that may be present in the wastewater at any given time, water quality surrogates are used to gauge performance of the treatment processes.

To assure final quality, the wastewater flows through a series of sequential treatment processes. This provides multiple opportunities to remove pollutants and provides a high level of reliability to final water quality.

None of the required treatment steps may be eliminated and still produce reclaimed water. A more detailed description of these processes may be found in the most recent edition of *Criteria for Sewage Works Design*, #98-37, Ecology.

When using stabilization ponds or lagoons for treatment, reclaimed water engineering design should include additional treatment units for reliable aeration and solids separation. Lagoons and stabilization ponds cannot consistently produce an effluent with BOD_5 and TSS concentrations of less than 30 mg/L.

6.2.1 Class A Reclaimed Water

Class A reclaimed water may be produced by meeting the performance criteria for one of the two primary methods outlined in WAC 173-219-320(2), or meeting a demonstrated equivalent treatment method as prescribed in the Rule (WAC 173-219-320(2) (d)).

Class A reclaimed water generation using the four step process requires a minimum level of oxidized secondary treatment, coagulation, filtration and a high level of disinfection, in that order. The *Criteria for Sewage Works Design* provides information on these individual treatment processes including reclaimed water disinfection requirements.

Table 6-1 provides the minimum reclaimed water quality limits and sampling points for Class A water. Note that the BOD_5, TSS, and dissolved oxygen performance standards are met after the secondary treatment step rather than in the final reclaimed water. This assures the effectiveness of the treatment technique. An alternative to allow BOD_5 and TSS measurement after filtration may be considered on a case-by-case basis. Turbidity is regulated after filtration and prior to disinfection.

Table 6-1 Minimum Performance Standards for Class A Reclaimed Water

Parameter	Water Quality Limits	
Oxidized Wastewater – Secondary Effluent [a]		
	Average Monthly [b]	**Average Weekly [c]**
BOD_5	30 mg/L	45 mg/L
$CBOD_5$	25 mg/L	40 mg/L
TSS	30 mg/L	45 mg/L
Dissolved Oxygen	Must be measurably present in secondary effluent at all times	
pH	Minimum	Maximum
	6 s.u.	9 s.u.
pH (Groundwater recharge)	6.5 s.u.	8.5 s.u.
Coagulated and Filtered Wastewater and Membrane Filtered Wastewater		
	Average Monthly [b]	**Sample Maximum**
Turbidity: After Coagulation/ Filtration	2 NTU	5 NTU

Parameter	Water Quality Limits	
Turbidity: Membrane Filtration	0.2 NTU	0.5 NTU (for more than 5 minutes)
Disinfection		
	7-day Median [d]	**Sample Maximum**
Total Coliform	2.2 MPN/ 100 mL or CFU/100 mL	23 MPN/100 mL or CFU/100mL
Virus Removal	See disinfection process standards-in WAC 173-219-340 and Ecology's *Criteria for Sewage Design Works* (Orange Book)	
Denitrification		
	Average Monthly [ab]	**Sample Maximum**
Total Nitrogen[f]	10 mg/L	15 mg/L
Distribution System		
	Minimum Daily	
Chlorine Residual	0.2 mg/L free (0.5 mg/L total) [e]	

[a] The compliance point for BOD_5 and TSS is the end of the unit process or alternative monitoring location as set in a reclaimed water permit.

[b] The average monthly value for compliance is calculated as the sum of all daily samples measured during a calendar month divided by the number of samples measured that month.

[c] The average weekly value for compliance is calculated as the sum of all daily samples measured during a calendar week divided by the number of daily samples measured during that week.

[d] The median number of total coliform organisms in the reclaimed water after disinfection is determined from the bacteriological results of the last 7 days of analyses.

[e] A chlorine residual of at least 0.2 mg/L measured as free chlorine or 0.5 mg/L total chlorine must be maintained in the reclaimed water during conveyance to the location of use or to the storage pond if reclaimed water is not directly piped to the location of use. (WAC 173-219-370).

[f] Total nitrogen is the sum of Kjeldahl nitrogen (TKN), Nitrate (NO_3) and Nitrite (NO_2). Denitrification is not applicable for beneficial uses 1 – 13 shown in Table 3 of WAC 173-219-390.

6.2.2 Class B Reclaimed Water

Generation of Class B reclaimed water requires biological oxidation followed by enhanced disinfection (WAC 173-219-330). Coagulation and filtration and the associated treatment steps are not required for this class. Biological oxidation performance standards are identical to those required for Class A reclaimed water. Total coliform bacteria for Class B reclaimed water must not exceed a 7-day median of 23 MPN/100 mL or a sample maximum of 240 MPN/100 mL.

Table 6-2 provides the basic reclaimed water quality performance standards and sampling points for Class B water.

Table 6-2 Minimum Performance Standards for Class B Reclaimed Water

Parameter	Water Quality Limits	
Oxidized Wastewater – Secondary Effluent [a]		
Parameter	**Average Monthly [b]**	**Average Weekly [c]**
BOD_5	30 mg/L	45 mg/L
TSS	30 mg/L	45 mg/L
Dissolved Oxygen	Must be measurably present in secondary effluent at all times	
Disinfected - Reclaimed Water		
	7-day Median [d]	**Sample Maximum**
Class B	23 MPN/ 100 mL	240 MPN/100 mL
pH	Must be between 6.0 and 9.0 standard units at all times	
Distribution System		
	Minimum Daily	
Chlorine Residual	0.2 mg/L free (0.5 mg/L total) [e]	

[a] The compliance point for BOD_5 and TSS is at the end of the unit process or alternative monitoring location as set in a reclaimed water permit.

[b] The average monthly value for compliance is calculated as the sum of all daily samples measured during a calendar month divided by the number of sample measured that month.

[c] The average weekly value for compliance is calculated as the sum of all daily samples measured during a calendar week divided by the number of daily samples measured during that week.

[d] The median number of total coliform organisms in the reclaimed water after disinfection is determined from the bacteriological results of the last 7 days of analyses.

[e] A chlorine residual of at least 0.2 mg/L measured as free chlorine must be maintained in the reclaimed water during conveyance to the location of use or to the storage pond if reclaimed water is not directly piped to the location of use. Alternatively, a chlorine residual of 0.5 mg/L total chlorine may apply to distribution line reclaimed water (WAC 173-219-370).

6.3 Equivalent Treatment Processes

The applicant should demonstrate in the engineering report that with the alternative treatment method, water quality limits will be consistently achieved through proper design, operation, and maintenance of each component of the treatment method.

Pilot facility studies may be proposed or recommended by the lead agency to evaluate the ability of the proposed treatment process to reliably meet all reclaimed water quality requirements applicable to the project. A study protocol must be submitted for agency review and approval before the pilot facility startup (WAC 173-219-210(2) (p)). The protocol should provide a description of the:

- Equipment and facilities proposed for use during the study.
- Treatment capacity of the pilot facility.
- Operation and maintenance procedures.

The Reclaimed Water Rule allows the lead agency to authorize alternative treatment processes that the lead agency determines to be equivalent to the processes required in the Rule.

- Parameters monitored, monitoring frequency, sampling techniques, and analytical methods.
- Length of the pilot facility study.
- Steps taken to protect both public health and the environment if any use or distribution of reclaimed water is anticipated during the pilot facility study.

6.4 Monitoring Conditions

As monitoring is used as a tool to assure the quality of the water *at all times*, it is important that reclaimed water permits are very clear regarding monitoring specifics. Typical monitoring plans for Class A and Class B reclaimed water are provided in the sections below. Additional monitoring recommendations for specific uses of reclaimed water are provided in the respective chapter in this manual for that use.

Sampling and analysis for reclaimed water will be as follows, unless alternative sampling and analysis methods are approved by the lead agency:

- Samples for BOD_5 will be collected based on frequencies in the most recent version of the Permit Writers Manual and must be 24-hour flow proportional composite samples (WAC 173-219-260). Compliance with the BOD requirement will be determined both weekly and monthly, based on the arithmetic average of all samples collected during either a calendar week or calendar month.
- Samples for TSS will be collected based on frequencies in the most recent version of the Permit Writers Manual and must be 24-hour composite samples. Compliance with the TSS requirement will be determined both weekly and monthly, based on the arithmetic average of all samples collected during either a calendar week or calendar month.
- Grab samples for dissolved oxygen will be collected at least daily and at a time when wastewater characteristics are most demanding on the treatment facilities.
- Turbidity analysis (Class A reclaimed water only) will be performed by a continuous recording turbidimeter. Turbidity measurements will be read at least every fifteen minutes. Compliance with the average operating turbidity requirement will be determined monthly, based on the arithmetic average of all measurements (fifteen minutes or less frequency) read during the month. The sample maximum is defined as the value not to be exceeded at any time. The turbidity sample maximum is defined as the highest daily value that lasts longer than five (5) minutes
- Grab samples for total coliform organisms will be collected at least daily (frequencies will depend on size of facility and treatment processes utilized) and at a time when wastewater characteristics are most demanding on the treatment facilities and disinfection procedures. Compliance with the coliform requirements must be determined daily, based on each sample value (sample maximum limit) and on the median value determined from the bacteriological results of the last 7 days for which analyses have been completed.

6.4.1 Reclaimed Water Monitoring

The lead agency will incorporate monitoring requirements into reclaimed water permits (WAC 173-219-260) in order to demonstrate that the reclaimed water has been adequately and reliably

treated and that the environment and human health are adequately protected. Table 6-3 lists typical monitoring requirements for Class A reclaimed water and Table 6-4 lists the typical monitoring requirements for Class B reclaimed water. Note that generators must continuously monitor flow and turbidity for Class A, but only continuously monitor flow for Class B. Actual monitoring requirements will vary based on facility size and type of treatment.

Table 6-3 Typical Monitoring for Class A Reclaimed Water

Parameter	Units	Sample Point [a]	Sampling Frequency	Sample Type
Flow	MGD	Point of compliance	Continuous	Recording meter
BOD_5	mg/l	Oxidation effluent	Weekly [b]	24-hour composite
		Filtration effluent	Weekly [b]	24-hour composite
TSS	mg/l	Oxidation effluent	Weekly [b]	24-hour composite
		Filtration effluent	Daily [g]	24-hour composite
pH	Standard Units	Oxidation effluent	Daily [g]	Measurement
		Filtration effluent	Daily [g]	Measurement
		Disinfected reclaimed water	Daily [g]	Measurement
Dissolved Oxygen	mg/L	Oxidation effluent	Daily [g]	Grab [c]
		Disinfected reclaimed water	Daily [g]	Grab [c]
Turbidity	NTU	Filter effluent	Continuous	Recording meter [d]
	Lbs.	Coagulant feed	Daily [g]	Metered usage
Coagulant	Mg/L	Coagulant Feed	Daily [g]	Calculation
Coagulant	Lbs.	Coagulant feed	Daily [g]	Metered usage
Coagulant Aid	mg/l	Disinfected reclaimed water	Monthly	24-hour composite
Total Nitrogen (as N) – Optional	mg/L	Disinfected reclaimed water	Monthly	Grab [c] 24-hour composite
Ammonia (as N) – Optional	mg/L	Disinfected reclaimed water	Monthly	Grab [c] 24-hour composite
Nitrate (as N) – Optional	No. of org. per 100 mL	Disinfected reclaimed water	Daily [g]	Grab [c]
Total Coliform [e]	µg/L	Disinfected reclaimed water	Once per permit cycle	Varies
Priority Pollutants [f]	mg/L	Reclaimed Water Distribution Line	Varies	Grab [c]
Total Chlorine Residual				

[a] Samples must be taken at the location identified above or at compliance point(s) identified in the approved engineering report or permit.

[b] Weekly is the typical minimum monitoring frequency. More frequent monitoring may be appropriate based on the reclaimed water facility size and processes.

[c] Grab samples must be taken at the same time each day when wastewater characteristics are the most demanding on the treatment facilities and disinfection processes. Alternatively, continuous monitoring is recommended.

[d] Filter effluent turbidity analysis must be performed by a continuous recording turbidimeter and must also be manually read and recorded at least every fifteen minutes.

[e] As an alternate method, total coliform bacteria may be monitored using the ONPUG-MUG test (also called Autoanalysis Colilert System) per latest edition of standard methods.

[f] Priority pollutant scans will only be required when surface water augmentation is the identified beneficial use and flows exceed 1 MGD.

[g] Daily means five (5) times per week, excluding weekends and holidays.

Table 6-4 Typical Monitoring for Class B Reclaimed Water

Parameter	Units	Sample Point [a]	Sampling Frequency	Sample Type
Flow	MGD	Point of compliance	Continuous	Recording meter
BOD_5	mg/l	Oxidation effluent	Weekly [b]	24-hour composite
COD_5	Mg/l	Oxidation effluent	Weekly [b]	24-hour composite
TSS	mg/l	Oxidation effluent	Weekly [b]	24-hour composite
pH	Standard Units	Oxidation effluent	Daily [f]	Measurement
Dissolved Oxygen	mg/L	Oxidation effluent	Daily [f]	Grab [c]
Temperature	Celsius	Final reclaimed water	Daily [f]	Grab [c]
Total Nitrogen (as N)-Optional	mg/l	Disinfected reclaimed water	Monthly	Grab [c] 24-hour composite
Ammonia (as N)-Optional	mg/L	Disinfected reclaimed water	Monthly	Grab [c] 24-hour composite
Nitrate (as N)-Optional	mg/L	Disinfected reclaimed water	Monthly	Grab [c] 24-hour composite
Total Coliform [d]	MPN per 100 mL	Disinfected reclaimed water	Daily [f]	Grab [c]
Priority Pollutants [e]	µg/L	Disinfected reclaimed water	Once per permit cycle	Varies
Total Chlorine Residual	mg/L	Reclaimed Water Distribution Line	Varies	Grab [c]

[a] Samples must be taken at the location identified above or at compliance points identified in the approved engineering report.

[b] The typical minimum monitoring frequency is weekly. More frequent monitoring may be appropriate based on the reclaimed water facility size and processes.

[c] Grab samples must be taken at the same time each day when wastewater characteristics are the most demanding on the treatment facilities and disinfection processes. Alternatively, continuous monitoring is recommended.

[d] As an alternate method, total coliform bacteria may be monitored using the ONPUG-MUG test (also called Autoanalysis Colilert System) per latest edition of standard methods.

[e] Priority pollutant scans will only be required when surface water augmentation is the identified beneficial use and flows exceed 1 MGD.

[f] Daily means five (5) times per week, excluding weekends and holidays

6.5 Reliability Guidelines

Generators may not distribute water that has not received adequate and reliable treatment based on the requirements of the reclaimed water rule and the facility's reclaimed water permit. Water that does not receive treatment according to requirements in the reclaimed water rule and

reclaimed water permit must be diverted to temporary storage and re-treatment, or discharged under authorization by a state waste discharge permit or NPDES permit.

Engineering reports for reclaimed water facilities must include a reliability assessment of the proposed facilities (WAC 173-219-210(2) (k)).

All reclaimed water facilities must comply with the reliability requirements of WAC 173-219-350.

Table 6-6 below provides guidelines for reliability provisions that satisfy the requirements in the Rule. Other alternatives to the reliability guidelines in Table 6-6 may be accepted if the applicant demonstrates to the satisfaction of the lead agency that the proposed alternative provides an equal degree of reliability in accordance with the requirements of WAC 173-219-350.

Table 6-6 Reliability Guidelines for Reclaimed Water Facilities

Reliability Guidelines
1. Bypassing Prohibited Generators may not divert any water that does not receive adequate and reliable treatment to any distribution system or use area. Water diverted around any unit process at the secondary treatment facility or reclaimed water treatment facility must be stored for re-treatment or discharged under the authorization of a NPDES or state waste discharge permit. (WAC 173-219-350(2)).
2. Flexibility of Design The design of process piping, equipment arrangement, and unit structures in the reclaimed water facility should allow for efficiency and convenience in operation and maintenance. The design should provide flexibility for operation that will result in the highest possible degree of treatment to be obtained under varying circumstances.
3. Alarms All reclaimed water facilities must provide alarm signals for any of the following, as applicable: • Loss of power from the primary power supply. • Failure of a biological treatment process. • Failure of a coagulation process (interruption of required chemical feeds). • Failure of a filtration process. • Failure of a disinfection process. • Any other specific process failure for which warning included in the approved Engineering Report or is required by the lead agency.
Alarms (cont'd) All required alarms must be independent of the primary power supply of the reclaimed water facility. Alarms must sound at an attended location (such as a police station, fire station etc.) or on a monitored electronic device that will alert the responsible operator in charge or designee available to take immediate corrective action. This requirement is in addition to any other alarm communication features proposed for the reclaimed water facility.

Reliability Guidelines

4. Power Supply

An alarm must be provided for loss of power from the primary power supply (WAC 173-219-350(5)(b)).

The following items must be provided with a standby power source or a power supply independent of the primary power supply:

- Alarm systems (WAC 173-219-350(4) (b)).
- Diversion equipment for diversion to treatment reliability storage (WAC 173-219-350(4) (b)), or diversion to alternate discharge locations used for treatment reliability (WAC 173-219-350(4) (c)).

The power supply to the reclaimed water facility should be provided with one of the following reliability features:

- Standby power source. The standby power supply should be independent of the primary power supply or be a source of power supply separate from the primary power supply.
- Treatment reliability storage or discharge provisions via an automated diversion. The provisions should be suitable for the maximum duration of the primary power supply loss.

5. Storage or Discharge for Treatment Reliability

a. Where short-term storage or discharge provisions are used as a reliability feature, these facilities must be reserved for the purpose of storing or discharging of untreated or partially treated wastewater (WAC 173-219-350(2)(a)). Capacity should be provided for the duration needed to avoid releasing into the reclaimed water distribution system or use areas, as determined in the reliability assessment contained in an approved Engineering Report. Typically, this duration will be at least 24-hours. The facilities must include all the necessary diversion works, provisions for odor control, conduits, and pumping and pump-back equipment. All of the equipment other than the pump-back equipment must be either independent of the normal power supply or provided with a standby power source.

b. Where long-term storage or discharge provisions are used as a reliability feature, these must consist of ponds, reservoirs, downstream sewers leading to other treatment or discharge facilities, or any other facilities reserved for the purpose of storage or discharge of untreated or partially treated wastewater . These facilities should be of sufficient capacity to provide discharge or storage of wastewater for the duration needed to avoid bypassing to the reclaimed water distribution system or use areas, as determined in the reliability assessment contained in an approved Engineering Report. Typically, this duration will be at least 20 days. The facilities must include all the necessary diversion works, provisions for odor and nuisance control, conduits, and pumping and pump-back equipment. All of the equipment other than the pump-back equipment must be either independent of the normal power supply or provided with a standby power source.

c. Diversion to a different type of reclaimed water use is an acceptable alternative to storage or discharge of partially treated wastewater, provided that the quality of the partially treated wastewater is suitable for that type of use.

d. Diversion of partially treated wastewater to a permitted discharge point where the wastewater meets all discharge requirements is an acceptable alternative to storage of partially treated wastewater (WAC 173-219-350(2)).

Storage or Discharge for Treatment Reliability (cont'd)

e. Automated diversions used for treatment reliability must include, in addition to provisions of (a), (b), (c), and (d) listed above, all the necessary sensors, instruments, valves, and other devices to enable fully automatic diversion of untreated or partially treated wastewater to approved storage or discharge facilities in the event of failure of the treatment process, and a manual reset to prevent automatic restart until the failure is corrected (WAC 173-219-350(4)(c)).

Reliability Guidelines
6. Biological Treatment All biological treatment unit processes should be provided with one of the following reliability features: a. Alarm systems and multiple biological treatment units capable of producing oxidized wastewater with one unit not in operation. b. Alarm systems, short-term storage or discharge provisions, and standby replacement equipment. c. Alarm systems and long-term storage or discharge provisions.
7. Secondary Sedimentation All secondary sedimentation unit processes should be provided with one of the following reliability features: a. Multiple sedimentation units capable of treating the entire flow with one unit not in operation. b. Standby sedimentation unit process. c. Long-term storage or discharge provisions.
8. Coagulation (not applicable to Class B) a. All coagulation unit processes should be provided with all of the following features for uninterrupted chemical feed: • Standby feeders. • Adequate chemical storage and conveyance facilities. • Adequate reserve chemical supply. • Automatic dosage control. b. All coagulation unit processes should be provided with one of the following reliability features: • Alarm systems and multiple coagulation units capable of treating the entire flow with one unit not in operation. • Alarm systems and standby coagulation unit process. • Alarm systems, short-term storage or discharge provisions, and standby replacement equipment. • Alarm systems and long-term storage or discharge provisions.
9. Filtration (Not applicable to Class B) All filtration unit processes should be provided with one of the following reliability features: a. Alarm systems and multiple filter units capable of treating the entire flow with one unit not in operation. b. Alarm systems and standby filtration unit process. c. Alarm systems, short-term storage or discharge provisions, and standby replacement equipment. d. Alarm systems and long-term storage or discharge provisions.

Reliability Guidelines

10. Disinfection

a. All disinfection unit processes where chlorine is used as the disinfectant should be provided with all of the following features for uninterrupted chlorine feed:
   - Standby chlorinator.
   - Standby chlorine supply.
   - Manifold systems to connect chlorine cylinders.
   - Chlorine scales.
   - Automatic switchover to full chlorine cylinders.
   - Continuous measuring and recording of chlorine residual.

b. All disinfection unit processes where chlorine is used as the disinfectant should be provided with one of the following reliability features:
   - Alarm systems and standby chlorinator.
   - Alarm systems, short-term storage or discharge provisions, and standby replacement equipment.
   - Alarm systems and long-term storage or discharge provisions.
   - Alarm systems and multiple point chlorination. Each point of chlorination should have an independent power source, separate chlorinator, and separate chlorine supply.

c. All other disinfection unit processes should be provided with one of the following reliability features:
   - Alarm systems and standby disinfection unit capable of treating the design flow rate with the largest operating unit out of service.
   - Alarm systems, short-term storage or discharge provisions, and standby replacement equipment.
   - Alarm systems and long-term storage or discharge provisions.

7 Storage, Distribution, and Use

This chapter provides guidelines for the Reclaimed Water Rule requirements for distribution of reclaimed water, storage, and impoundments of reclaimed water, and requirements common to various uses.

7.1 Operational Storage and Other Impoundments

Whenever a permittee generates reclaimed water in excess of the demand for permitted uses, the permittee may have an option to divert the excess water for discharge or dispose of the water under the authority of a current NPDES or SWDP permit. Where there is no permitted alternative use or discharge system, operational storage must be provided to assure the retention of reclaimed water under adverse weather conditions or at other times when reclaimed water use is precluded. The guidance in this section does not apply to storage of inadequately treated reclaimed water for treatment reliability discussed in Section 6.5, Reliability Guidelines.

The stored reclaimed water must meet the provisions of WAC 173-219-370: Maintenance of chlorine residual, unless waived by the lead agency, in consultation with Health when Health is the nonlead agency.

The generator or person maintaining control of the reclaimed water should consider the type of use and potential for impact to human health and the environment when designing storage. It will be necessary to balance supply with demand and consider operating agreements between the generator, distributor and user if there are multiple entities involved. Operational storage provides a continuous supply of water during periods of downtime at the treatment facility, meets peak daily fluctuations in water demands, and allows for optimum facility operation beyond the reclaimed water facility.

Water that is of equal or better quality than reclaimed water may be used with reclaimed water in storage or distributions systems provided the water supply is protected by an approved air gap.

Determination of operational storage capacity should consider all of the following factors:

- Types of use.
- Variations in supply of and demand for reclaimed water, including peak summer demand and seasonal (wet weather) low demand.
- Reliability of treatment processes.
- Operating requirements and agreements with end users.
- Availability of backup supply sources.
- Potential for impact to human health and the environment.
- Frequency and duration of adverse weather conditions such as precipitation or frozen ground that would preclude use.
- Shut down for system maintenance and repair.
- Other factors that may limit or prevent the planned use of reclaimed water.

When wet weather conditions could preclude the use of reclaimed water, the operational storage volume in open reservoirs, exposed to rainfall, should be established by determining the storage period needed for a 10-year, 24-hour storm using weather data that is available from, or is representative of, the area involved. Designers should use a minimum of 20 years of climatic data in storage volume determinations.

When sizing operational storage facilities, designers should consider the degree of fluctuation and availability of supplemental (backup) supply sources. When supplementary water sources (potable or other supplies) can help meet peak demands, smaller operational storage facilities may be sufficient to control supplies into the distribution system.

7.1.1 Storage and Impoundment Design Considerations

Typical design solutions for reclaimed water storage include:

- Storage of reclaimed water in leak-proof, fabricated tanks where feasible.
- Design of all storage ponds or reservoirs to prevent groundwater exchange.
- Use of synthetic membrane liners meeting the criteria in Chapter G3-3.5 of *Criteria for Sewage Works Design*.
- Justification for use of earthen or other liner designs based on the reclaimed water quality and site conditions as described in Section 7.1.3, Alternative Design for Reclaimed Water Storage Ponds.
- Design and location of all storage ponds or reservoirs so that stormwater runoff from surrounding property will not enter the pond.

7.1.2 Setbacks for Impoundments

The minimum horizontal distance between a potable water supply well and storage facilities such as reclaimed water impoundments or ponds must comply with restrictions for the sanitary control area established under WAC 246-290-135 for Group A public water systems and WAC 246-291-125 for all other potable water supplies.

7.1.3 Alternative Design for Reclaimed Water Storage Ponds

The lead agency may consider other designs if, after the review of data submitted by the reclaimed water generator or user, the agency determines complete containment of the reclaimed water is not necessary. Factors include the reclaimed water quality, volume of storage, soil and geologic data, and groundwater data, including groundwater quality, uses, quantity and yield, and an adequate demonstration that the reclaimed water will not adversely impact groundwater quality. The lead agency may require groundwater monitoring.

Reclaimed water storage ponds with volumes greater than 10 acre-feet or with embankment heights greater than 6 feet above the downstream toe must comply with Ecology Dam Safety regulations. (WAC 173-175-020)

If proposing earthen liners, the generator or user must include the following or justify alternatives:

- Soils used for pond lining should be free from foreign material such as paper, brush, trees, and large rocks.
- All soil liners constructed of compacted material should be at least 24 inches thick, compacted in lifts no greater than 6 inches thick, and compacted to 95 percent of maximum density as determined by the Standard Proctor Density test (WSDOT test method No. 606).
- For in-situ clay soils meeting the soils liner criteria above, a minimum of 6 inches below planned grade should be excavated and re-compacted to assure a uniformly compacted finished surface.
- Soil liners should meet the following particle size gradation and Atterberg limits:
  - Thirty percent or more passing a number 200 mesh sieve.
  - A liquid limit of 30 percent or greater.
  - A plasticity index of 15 or greater.
  - A permeability less than or equal to 1 X 10-7 cm/sec.
- Soil embankment walls should have a top width of at least five feet.
- The interior and exterior slopes of soil embankment walls should be no steeper than one foot vertical to three feet horizontal.
- All soil embankment walls should have a vegetative cover or other stabilizing material to prevent erosion.
- All piping penetrating the embankments should have erosion stops and water seals.

7.1.3.1 Seasonal Storage

Open reservoirs may be the most economical alternative for seasonal storage. However, algal growth and suspended solids from open reservoirs are sources of particles that may clog the user's system. Reservoirs may also require additional measures to prevent breeding of vectors and the creation of odors, slimes, or aesthetically displeasing deposits.

All water that enters the distribution system from open reservoirs should be filtered or screened. The minimum acceptable screen size is 200-mesh (microstrainer). The use of a very fine strainer or filter will remove the greatest percentage of suspended solids at central reservoir sites and minimize the need for special maintenance of the local systems. Most system control valves readily pass particles through a 30-mesh screen (screen opening of 0.0233 inch or 600 microns).

7.1.3.2 Operational Storage Facilities

Operational storage provides a continuous supply of water during periods of downtime at the treatment plant, meets peak daily fluctuations in water demands, and allows for optimum plant operation. Standard design for operational storage facilities is 1.5 to 2.0 times the average summer-day demand volume. At a minimum, operational storage capacity should be the volume equal to three times the portion of the average daily reclaimed water flow capacity for which there is no alternative use or discharge system. The lead agency may approve lesser volumes of operational storage capacity for reclaimed water facilities with groundwater recharge, surface water augmentation, or controlled uses.

When sizing the storage facilities, consider the degree of fluctuation and availability of supplemental supplies. Reducing peak period pumping charges may also reduce costs. When supplementary water sources (potable or other supplies) can meet peak demands, smaller operational storage facilities may be sufficient to control supplies into the distribution system.

7.1.4 Backup Supply Considerations

Distribution systems may need supplementary sources to meet demand during a facility disruption or main supply interruption.

Required storage capacity for each system will be different, depending on the following factors:

- Reliability of treatment processes.
- Peak summer demands.
- Availability of other sources.
- The proposed reliability of the system.
- End user (customer) agreements.
- Ability to recover to normal conditions.

Seasonal or operational storage facilities may be able to meet emergency storage requirements depending on their storage capacities. If a system lacks necessary operational storage capacity and the generator has made commitments ensuring an uninterrupted supply, it should have at least one reliable backup supply source to meet its demand. If a generator proposes potable water as a backup supply source, they must introduce the potable water into the reclaimed water system through a Health-approved backflow prevention device between the two systems (See Table 7-3). When reclaimed water contracts allow interruption of supply, backup supply systems may not be necessary.

7.1.5 Fencing

Enclose reclaimed water ponds and impoundments, not open to the public, within a securable fenced area or other acceptable enclosure that will prohibit public access, if required. Fencing also helps minimize vandalism and damage from animals.

7.1.6 Identification

Use signs to identify all storage facilities. Signs (color-coded, as referenced in Section 7.5, Labeling Reclaimed Water Components) should include the wording in high-contrast lettering and should have the internationally recognized symbol for “not drinking water.” The operator should post an adequate number of signs in English and other primary languages spoken in the area on the surrounding fence and at the entrance of each facility.

7.1.7 Relationship to Stormwater Ponds

Ecology considers incidental precipitation falling directly on impoundments or water features storing reclaimed water as reclaimed water. Stormwater ponds (designed specifically for the diversion, retention, or treatment of stormwater) are not included under chapter 90.46 RCW. Stormwater must meet the applicable stormwater quality requirements, and (if put to beneficial use) must be permitted as an appropriative water right or meet existing WRP policy for de minimus use.

7.1.8 Runoff and Releases from Impoundments

It may not be possible to entirely prevent the runoff of rainwater from decorative or storage ponds filled with reclaimed water, particularly during major storm events.

> A principal water quality concern with reclaimed water ponds is the presence of locally added pollutants, such as fertilizers and algaecides.

Although Washington state law no longer regards reclaimed water as wastewater, generators could interpret regulations and permit conditions to mean any amount of incidental runoff to waters of the United States would require an NPDES permit per the Clean Water Act. This is undesirable for several reasons. Incidental runoff would be of small volumes and individual customer permits would be difficult to administer. Customers would not be willing to use reclaimed water given the cost and the potential liability associated with either securing an individual NPDES permit or ensuring that no incidental runoff will ever leave the permitted area. Ecology and Health have already regulated reclaimed water quality under the reclaimed water permit. Once produced, reclaimed water should be subject to essentially the same requirements as other non-potable water supplies.

Generators should interpret water quality laws consistent with the intent of the Legislature to encourage reclaimed water use.

Similar to other non-potable water impoundments, generators should manage runoff around reclaimed water storage reservoirs to minimize runoff into the pond. If discharges from a reclaimed water pond due to rainfall occur routinely or by design, Ecology will regulate such discharges under NPDES permit conditions in the reclaimed water permit.

7.2 Chlorine Residual

Maintenance of chlorine residual is required in distribution lines that convey reclaimed water from the treatment facility to the use area. Designers can consider this as an additional pathogen protection barrier. A chlorine residual will also inhibit regrowth that results in fouling or plugging of the distribution pipeline. A minimum chlorine residual of 0.2 mg/L or greater measured as free chlorine, or 0.5 mg/L or greater measured as total chlorine, is required unless waived or modified by the lead agency.

The lead agency might not require a chlorine residual:

- When the hydraulic retention time in the distribution system prevents significant deterioration in water quality from the point of compliance.
- When alternative treatment of recycled water maintains water quality comparable to the point of compliance.
- When in some other manner the generator demonstrates a benefit from reducing or eliminating the chlorine residual (WAC 173-219-370(1).

In addition, the lead agency might not require a chlorine residual for:

- Reclaimed water impoundments at the point of use
- Storage ponds at the point of use
- Storage tanks at the point of use
- Distribution lines to groundwater recharge
- Conveyance along natural streams, lakes, or surface waters of the state.

The lead agency may waive or modify the requirement when the generator demonstrates a benefit from reducing or eliminating the chlorine residual (WAC 173-219-370(1) or for a specific application. (WAC 173-219-370(2).)

7.3 Discharges from Distribution System for Maintenance Purposes

7.3.1 Flushing Reclaimed Water Lines

Incidental or planned discharges of reclaimed water from distribution system maintenance procedures must conform to the permit conditions regarding notification to the regulatory agencies and the public. Ecology may approve other methods of control, discharge or disposal of this water when documented in the reclaimed water facility's engineering report. If Ecology approves alternative control methods, it will include those provisions in the permit. In all cases the operator must appropriately manage the release of chlorinated water, if the reclaimed water contains chlorine.

The reclaimed water permit will generally require diverting water released due to line maintenance to the sanitary sewer or to an approved use location.

7.3.2 Pipeline Repair Discharges

Ecology considers reclaimed water discharge or drainage resulting from pipeline repair activities an unanticipated discharge. Permittees should address management and disposal of this water within the operations and maintenance manual. If the pipe repair results in water being released into a municipal stormwater system, the generator or distributor responsible for the conveyance line must notify the appropriate stormwater utility of the discharge to their system.

7.4 Distribution System Construction Standards

All reclaimed water valves and outlets must be of a type (or secured in a manner) that permits operation only by authorized personnel. Reclaimed water generators must ensure the design of all system under their operational control comply with these standards. For systems not under their operational control, generators must include requirements in distribution and use agreements for distributors and users to comply with these requirements.

7.4.1 Pipelines

The installation of new or replacement distribution pipelines for reclaimed water distribution systems must comply with the most recent edition of *Planning for the Distribution of Reclaimed Water*, Manual M24, American Water Works Association, the most recent edition of the

Department of Health Water System Design Manual, or equivalent standard engineering practices (WAC 173-219-360(3)). Permittees must document pipe material, valves, valve covers, hydrants, associated components, installation, and testing practices in the engineering report and/or the construction plans and specifications for the project. Section 7.5 describes the labeling requirements.

Ecology addresses separation distances between reclaimed water pipelines and other public or private utilities in the *Pipeline Separation Design and Installation Reference Guide*, #06-10-029, Ecology and Health (173-219-360(4)). The top of pipelines should be buried a minimum of 36 inches below the finished street grade or the ground surface, unless frost penetration dictates a deeper burial is appropriate for the climatic conditions of the site. Pipelines for Class A and Class B reclaimed water must be located at least 200 feet away from potable water wells (WAC 173-219-360 (5)).

7.4.2 Pressure Differentials

Designers should base pressure criteria for reclaimed water distribution on system design and practice. In any case, operators should maintain positive pressure at the user's meter at the peak hour demand (PHD).

7.4.3 Blowoff Assemblies

Either an inline or end-of-line type blow-off or drain assembly should be installed for removing water or sediment from the pipe. The line tap for the assembly should be no closer than 18 inches to a valve, coupling, joint, or fitting unless it is at the end of the line. If there are restrictions on discharge or runoff due to chlorine residual or turbidity, operators should consult the Health Guidance Manual to find an acceptable means of disposal.

7.4.4 Valve Boxes

All valve covers on reclaimed water transmission lines shall be of a non-interchangeable shape with potable water covers and include identification information as reclaimed water with a recognizable inscription cast on the top surface, triangular shaped covers or purple colored covers.

7.4.5 Fire Hydrants

Where the reclaimed water distribution and use systems includes fire hydrants, identify each fire hydrant with a labeled tag in addition to being color-coded (WAC 173-219-360(2)) (see Section 7.5, Labeling Reclaimed Water Components). Operators should instruct the fire department and the local potable water utility in the use and care of the equipment when flushing the hydrants to avoid overspray, and on the care of any equipment that they might subsequently use with potable water.

7.4.6 Hose Bibbs

Access to hose bibbs on reclaimed water lines must be controlled or restricted to permit operation only by authorized personnel. Operators must identify hose bibs with a labeled tag in addition to being color-coded (WAC 173-219-360(2)) (see Section 7.5, Labeling Reclaimed Water Components). Design fittings to prevent interconnection between potable and reclaimed

water distribution systems. Do not use hoses from reclaimed water systems with potable water systems.

Hose bibbs on potable water lines within reclaimed water use areas should have an approved hose bibb vacuum-breaker or other approved backflow assemblies.

7.4.7 Drinking Fountain/Public Facilities

Potable drinking water fountains and other public facilities must be located away from the irrigation area in which reclaimed water is used. Or, they must be otherwise isolated and protected from overspray of reclaimed water onto drinking fountains and other public facilities. Exterior drinking fountains and other public facilities should be shown on the construction plans for distribution systems.

7.4.8 Special Provisions for Class B Reclaimed Water

Some special restrictions are placed on the operation of reclaimed water systems as a matter of good practice and to protect public health. Restrictions applied by the regulatory agencies that should be in the detailed design are listed in Table 7-1.

Table 7-1 Class B Special Restrictions

Runoff conditions	Conditions which directly or indirectly cause runoff outside the approved use area are prohibited.
Ponding conditions	Conditions which directly or indirectly cause ponding outside or within the approved use area are prohibited.
Overspray conditions	Conditions which directly or indirectly cause windblown spray or overspray to pass outside the approved use area are prohibited.
Unapproved uses and use areas	In approving the engineering report and plans and specifications for a proposed reclaimed water system, Ecology is affirming that the generator will construct a facility that will adequately and reliable produce reclaimed water to meet the needs of the proposed beneficial uses. Furthermore, the Reclaimed Water Rule requires the generator to complete a site assessment prior to delivering reclaimed water to a proposed use site. The main purpose of this assessment is to verify that the site is appropriate for the proposed water use. These approvals and reviews become the basis for authorizing in a reclaimed water permit the specific uses locations of reclaimed water use. Delivering reclaimed water for uses not authorized in the permit or to locations not identified in use agreements is prohibited because the use or area have not been appropriately reviewed.
Food establishments/ public facilities	To prevent food exposure to spray from irrigation systems, reclaimed water irrigation systems should not install systems near food establishments or public facilities such as picnic tables and drinking fountains (see 7.4.7).

7.4.9 Reclaimed Water Pumping Stations

Permittees with pumping facilities to distribute reclaimed water shall make special provisions to identify the type of water handled, provide acceptable backflow protection, and avoid release of reclaimed water in an uncontrolled manner.

- **Labeling:** Label and color-code all exposed and aboveground piping, fittings, pumps, and valves, in accordance with Section 7.5, Labeling Reclaimed Water Components.
- **Signage:** In a fenced pump station area, post at least one sign (see Section 7.5.2, Use Area Notifications) on the fence, which all operations personnel using the facility can easily read.
- **Seal Water:** Any potable water used as seal water for reclaimed water pump seals should be adequately protected from backflow (with an air gap) per Section 7.6, Cross-Connection Control, and proper drainage of the packing seal water should be provided.
- **Surge Protection:** All pumping systems should have proper surge protection facilities to prevent damage resulting from water hammer and pressure surges that can cause broken piping or damage to pumping equipment.

7.4.10 Conversion of Existing Distribution Systems to Reclaimed Water

The conversion of an existing potable water system to another type of water conveyance (reclaimed water, irrigation, etc.) introduces a potential risk to public health (WAC 173-219-360(8)). It is important for operators to verify that there are no cross-connections or unapproved connections to the system, and to ensure that all potable customers have been removed from the water distribution system.

Existing potable water lines converted to reclaimed use should first be accurately located and tested in coordination with Ecology and Health. The lines should be thoroughly tested prior to use, using dye, pressure, or other methods, to ensure there are no cross-connections or unapproved connections. If verification of the existing lines is not possible, the lines should be uncovered, inspected, and identified prior to use. Specific precautions may be necessary to ensure there are no unintended connections to an existing potable water system. Operators can use the lines for reclaimed water distribution if the existing lines are satisfactory to the regulatory agencies.

In actual practice, it may be very difficult to fulfill the above requirements. At a minimum, verify that there are no cross connections or unapproved connections, and ensure that you removed all potable water customers from the intended water lines.

If the lead agency approves the conversion of existing storage and distribution systems to reclaimed water use, all accessible points must be labeled as reclaimed water at the time of conversion and any inaccessible locations must be labeled at the time of repair or replacement (WAC 173-219-360(9)(a)).

Ecology and Health may approve the conversion of decommissioned sanitary sewer or storm sewer pipelines for use in a reclaimed water conveyance system. While the practice is uncommon, there is precedence in Washington State for the successful conversion of a sewer

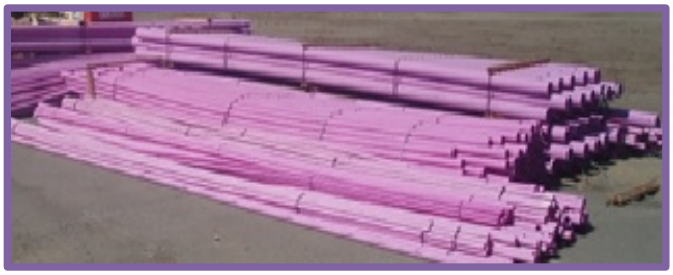
force main owned by King County for use as a reclaimed water main from the Brightwater Reclaimed Water Facility. Such conversions will only be approved on a case-by-case basis following a detailed review of an engineering report that documents the plans for conversion. That engineering report must describe in detail the pipeline cleaning and disinfection efforts the proponent will use prior to conversion for reclaimed water use.

7.5 Labeling Reclaimed Water Components

Generators and distributors must identify and label reclaimed water distribution system components, operational storage areas, and use areas in accordance with WAC 173-219-360(2). This section provides additional guidance.

7.5.1 Color Coding and Labeling

All new reclaimed water piping, valves, outlets, storage facilities and other appurtenances, in the distribution system and at use areas, must be labeled and color-coded purple (Pantone 512, 522 or other shade identified in the approved engineering report), identified with purple tape, or otherwise marked to clearly identify the water conveyed as non-potable reclaimed water. The identifying labels should be acceptable to the lead agency and in accordance with the approved engineering report.



The following guidelines apply to ***color-coded pipes***:

- Color-coded purple (Pantone 512, 522 or other shade identified in the approved engineering report); or
- Embossed or integrally stamped/marked with the approved label, repeated on opposite sides of the pipe every three feet or less.

The following guidelines apply to ***tape-identified pipes***:

- Purple identification tape or polyethylene vinyl wrap (Pantone 512, 522 or other shade identified in the approved engineering report).
- Identification tape labeled with the approved text in high-contrast lettering.
- Overall tape width at least 3 inches.
- Identification tape installed and centered on top of the transmission pipe longitudinally.
- Identification tape should be continuous and fastened to each pipe length at least every 10 feet. Tape attached to sections of pipe before placing pipe in the trench should have flaps sufficient for continuous coverage. Installers may use other satisfactory means of securing the tape during backfill of the trench if approved by the lead agency.

The following guidelines apply to appurtenances:

- Clearly inscribe the words “Reclaimed Water,” or similar label acceptable to the lead agency and in accordance with the approved engineering report, on equipment tags and the top surface of below-grade appurtenances, such as valve boxes.

Other pipe and construction warning tape schemes may be acceptable to the lead agency provided the colors and messages are consistent with the details of this section.

Color-coded pipe, identification tape and/or labels differentiating the reclaimed piping from other utility lines should be consistent throughout the service area. The permittee should develop a standard specification and details for meeting these guidelines, and be consistent. Table 7-2 summarizes the identification standards.

Table 7-2. Identification Standards for Reclaimed Water Systems

Item	Suggested Standard (Must be Acceptable to the Review Agencies)
Color	Pantone 512 or 522 or other shades of purple acceptable to review agencies.
Warning	Should be either one of the following phrases: • WARNING: RECLAIMED WATER-—DO NOT DRINK • WARNING: NON-POTABLE WATER-—DO NOT DRINK
Identification (Warning) Tape	The tape (color-coded, as listed above) should include the warning (listed above) in high-contrast lettering. The overall width of the tape should be at least 3 inches.
Equipment Tags and Surface Identification	The words RECLAIMED WATER should be clearly inscribed on equipment tags and the top surface of below-grade appurtenances, such as valve boxes.
Facility Signs	Signs (color-coded, as listed above) should include the warning (listed above) in high-contrast lettering and must have the universal symbol for “do not drink.” An adequate number of signs in English and other primary languages spoken in the area should also be posted on the surrounding fence and at the entrance of each facility.

7.5.2 Use Area Notifications

The permittee must notify the public and other utility employees of the use of reclaimed water in all use areas. One or more of the following can meet the notification requirements:

- Post an adequate number of clearly visible signs in English, and other primary languages spoken in the area, on the surrounding fence (if applicable) and at the entrance of each use area. Signs should be purple in color with white or black lettering, or another comparable color combination acceptable to the lead agency. Signs should read "Reclaimed Water – Not Intended for Drinking" or other advisory or educational language acceptable to the lead agency.
- Other lead agency approved methods of notification that provide equivalent protection.

In addition, for Class B reclaimed water, signs, and notices should inform the public or utility employees that the lead agency does not recommend body contact with the water.

7.6 Cross-Connection Control

A cross-connection is defined as any actual or potential physical connection between a high quality water system and any source of lower quality liquid, solid, or gas that could contaminate the water supply by backflow. Cross-connections exist everywhere; in all plumbing and facilities.

The task of eliminating all cross-connections is enormous. Implementing CCC programs reasonably reduce the risk of contamination. For a reclaimed water supply to become contaminated via a cross-connection, three things need to happen simultaneously:

1. The water supply piping must be unprotected (no backflow prevention device) from a cross-connection;
2. A physical cross-connection must be made between the water supply piping and a contaminant source; and
3. Backflow conditions must occur.

Backflow is the flow of water (or other solid, liquid, or gas from any source) back into the reclaimed water supply. Backflow may be due to either:

Backsiphonage is backflow caused by a negative pressure (vacuum or partial vacuum) in the supply piping. Backsiphonage occurs when system pressure is reduced below atmospheric pressure. The effect is similar to sipping water through a straw.

Backpressure is backflow caused by pressure in the downstream plumbing being greater than the pressure in the water supply piping. The higher pressure in the downstream plumbing may be from a pump, thermal expansion, heating boiler, etc.

Backflow can be prevented in two ways, either through installation of:

1. An approved air gap (AG) that provides a physical separation between the contaminant and the water supply; or
2. Mechanical devices or assemblies that prevent backflow from occurring.

7.6.1 Types of Contaminants

The reason for developing and implementing a CCC program is to protect the quality of reclaimed water by preventing contamination via cross-connections. The reclaimed water distributor has the responsibility to deliver water to its consumers that meets all standards set forth by the department. The water must be desirable from an aesthetic and health standpoint to reduce the likelihood of consumers turning to another water supply. The reclaimed water distribution system is an efficient means of transporting water to consumers served by the system. However, the distribution system can also become the conduit for the spread of a contaminant to a large population.

7.6.1.1 Microbiological Contaminants

In cross-connection control, waterborne diseases are a primary health concern. Microbiological organisms that may cause waterborne disease include: bacteria, viruses, protozoa, and parasitic helminths (worms).

The risk of a waterborne disease transmitted through the reclaimed water supply is a major concern because of the:

- Large population that may be exposed to the disease in a short timeframe;
- Inability to immediately detect contamination (in fact, the first indicator may be the outbreak of disease); and
- Difficulty in tracing the contaminant source (e.g., *Giardia* cysts may enter the distribution system from a holding tank or through a cross-connection with auxiliary lower quality water supply).

Individuals with underdeveloped or weakened immune systems, such as infants, the elderly, and persons receiving treatment for cancer, are more vulnerable to waterborne diseases than persons with fully functioning immune systems.

7.6.1.2 Chemical Contaminants

Every chemical will have some effect on anything exposed to it. The severity of the effect experienced depends on the type of chemical, amount of chemical in the water, and the duration of exposure. Chemical contamination can have dramatic effects on the environment and property.

Some chemicals may normally have low levels of toxicity. However, when these chemicals are introduced into the water system via cross-connections, they may react to form more toxic chemicals. This occurs when the chemicals introduced via backflow combine with the chemicals intentionally added to treat the water supply. Chemical contaminants may also react with the piping

material in the distribution system to leach toxic metals into the water. Other chemicals, such as gasoline, may damage piping materials and lead to structural failure of the pipe.

Some chemical contaminants may adhere strongly to the distribution piping walls and/or plumbing. Once a backflow incident has introduced chemicals with this characteristic into the water system, it is extremely difficult and/or virtually impossible to completely clean/remove the contaminant from the system. There have been well-documented backflow incidents where the only viable remedy was to replace the pipe affected by the chemical contaminant.

Concerns about chemical contamination may be different from system to system, since each system is unique.

7.6.1.3 Physical Hazards

Examples of physical hazards are compressed air and steam. Compressed air and steam may result in heat damage to the environment or property or breakage of piping or fixtures. Physical hazards may also cause the release of settled contaminants already in the distribution system.

Physical hazards may also be chemical hazards. The risks posed by a gas, such as propane, in addition to toxic effects, may cause an explosion.

7.6.2 Multiple Barrier Concept

Cross-connection control is a vital part of the multiple barrier concept to protecting reclaimed water. The major barriers include:

- **Providing Treatment.** Treatment is provided to comply with the maximum contaminant level and treatment technique requirements established by the reclaimed water regulations.
- **Secondary Disinfection. Secondary disinfection** is used to maintain a disinfectant residual in the distribution system to control microbiological water quality.
- **Storage. Storage reservoirs** provide protected storage and prevent microbiological contamination of the treated water.
- **Distribution System Design.** The design, installation and material standards, and minimum operating pressures prevent contaminants from entering the distribution system.
- **Cross-Connection Control Programs.** Require approved backflow preventers to prevent contaminants from entering the distribution system.
- **Water Quality Monitoring.** Provide a means of surveillance of the system to detect microbiological and/or chemical contaminants in the water supply.
- **Operation by Qualified Personnel.** Provide certified treatment plant operators, distribution system managers, and CCSs to ensure proper operation of the system.
- **Emergency Planning.** Establish emergency procedures for correcting problems detected in water quality monitoring, caused by natural disasters, or created by backflow incidents.

7.6.3 Backflow Prevention Methods

The Cross-connection Control Specialist (CCS) must determine the type and degree of backflow prevention by the degree of hazard, probability of occurrence, acceptable risk level, and reliability of the backflow preventer. Backflow will be the result of either backpressure or back

siphonage conditions. The CCS must identify the degree of hazard, and provide adequate protection for the most severe hazard encountered.

Table 7-3 Backflow Hazards

Backflow Preventer	Degree of Hazard	Backflow Type
Air gap (AG)	High and low	Back pressure and back siphonage
Reduced pressure backflow assembly (RPBA)	High and low	Back pressure and back siphonage
Double-check valve assembly (DCVA)	Low	Back pressure and back siphonage
Pressure vacuum breaker (PVBA)	High and low	Back siphonage
Spill-resistant vacuum breaker (SBVB)	High and low	Back siphonage
Atmospheric vacuum breaker (AVB)	Very low	Back siphonage
Hose bibb vacuum breaker (HBVB)	Very low	Back siphonage

Detailed descriptions of the design, function, and operation of each backflow assembly are found in:

- *Manual of Cross-Connection Control*, published by the University of Southern California - Foundation for Cross-Connection Control & Hydraulic Research (USC-FCCCHR); and
- *Cross-Connection Control Manual, Accepted Procedure and Practice*, published by the Pacific Northwest Section, American Water Works Association.

7.6.3.1 Approved Backflow Prevention Assemblies

State regulation requires that all installed RPBAs, DCVAs, and must be models included on the current list of approved backflow assemblies from the University of California Foundation for Cross-Connection Control and Hydraulic Research approved backflow prevention assemblies (WAC 173-219-310(5)).

7.6.3.1.1.1 Degree of Hazard

Degrees of hazards posed by potential contaminants must be assessed by a DOH certified Cross-connection Control Specialist (CCS). Almost all substances are considered a hazard of some degree. Normally the risk can be divided into high or low hazard categories.

- **High Hazard** is a substance that can pose an immediate impact on the environment or property.
- **Low Hazard** is a substance that effects the aesthetics of the reclaimed water or increase operating costs for the end user.

7.6.4 Legal Aspects of Cross-connection Control

Once contamination occurs, one or more persons may suffer a loss. The history of backflow incidents reveals that the loss can range from a minor financial loss (e.g., the cost of flushing a plumbing system) to significant damage to property, financial loss, or even death.

7.6.4.1 Whenever there is a backflow incident, one must assume that litigation will follow.

The litigation may be based on a violation of regulations, a tort action, and/or a breach of contract. In general, the reclaimed water distributor's liability may flow from the following sources:

- Having a statutory/regulatory obligation and failing to follow it (i.e., breach of the law);
- Failing to develop a "reasonable" CCC program and/or failing to take follow-up enforcement action, once aware of a hazard (i.e., negligence);
  - Supplying a customer with contaminated water that causes the customer to suffer a loss (e.g., breach of contract/product liability);
- Imposing unreasonable requirements on the customer (e.g., requiring an RPBA on all services);
  - Extending a CCC program beyond their jurisdiction (e.g., inspecting plumbing and enforcing the Uniform Plumbing Code); and
  - Misrepresenting the actions of the distributor (i.e., making an implied contract).

7.6.4.2 To reduce the exposure to liability, the distributor should implement a CCC program that:

- Complies with regulatory requirements set forth in the reclaimed water regulations (WAC 173-219-310);
- Follows the "standards" of the water industry for the application of backflow assemblies;
- Includes the testing of backflow assemblies by a method and at a frequency stipulated in regulations;
- Includes the testing of backflow assemblies by DOH-certified testers; and
- Includes procedures for investigating backflow incidents and restoring water quality after an incident occurs.

7.6.5 Jurisdictions of Washington State Agencies Relating to Cross-Connection Control

The state legislature assigns the administration and enforcement of statutes and regulations to different departments (agencies) within state government. In Washington, several state departments have responsibilities for the administration and/or enforcement of CCC-related regulations. These agencies include:

7.6.5.1 Washington State Department of Ecology Regulates Cross-Connection Control for Reclaimed Water and Wastewater

Ecology holds authority over reclaimed water generators and distributors who are responsible for protecting reclaimed water and partially treated reclaimed water from contamination via cross-connections with lower quality water. This includes the generation facility, includes all treatment stages, storage, and distribution facilities, and ending at the point of delivery to the user's reclaimed water meter at the property line or the use area (WAC 173-219-310(3)).

Ecology is also responsible for ensuring the reclaimed water generators and distributors coordinate with DOH and potable water suppliers for the protection of drinking water from contamination via cross connections with reclaimed water, partially treated wastewater, and wastewater. This

coordination includes providing potable water suppliers, if any, written notification prior to providing reclaimed water service to any property within the distributor's service area so the distributor can ensure users comply with the cross-connection control requirements under WAC 246-290-490 and locally adopted regulations..

7.6.5.2 Washington State Department of Health Regulates Cross-Connection Control for Public Drinking Water Systems

DOH Office of Drinking Water administers and enforces drinking water regulations for public water systems as set forth in WAC 246-290-490. The mission of the Office of Drinking Water is to protect the health of the people of Washington State by ensuring safe and reliable drinking water.

DOH is also responsible for ensuring the potable water suppliers coordinate with Ecology and reclaimed water generators and distributors for the protection of drinking water from contamination via cross-connections with reclaimed water, partially treated wastewater, and wastewater. This coordination includes working with reclaimed water generators and distributors to identify any properties within the distributor's service area so the distributor can ensure users comply with the cross-connection control requirements under WAC 246-290-490 and locally adopted regulations.

7.6.5.3 Washington State Building Code Council (SBCC)

The SBCC adopts the Uniform Plumbing Code (UPC) with state amendments specific to Washington (under RCW 19.27). The UPC applies within the property lines of the customer's premises. The UPC is applicable statewide and includes amendments specific to Washington (WAC 51-60). These include a number of CCC amendments.

Although the SBCC is responsible for adoption of the UPC, Local Administrative Authorities (i.e., local building and/or plumbing officials) administer and enforce the UPC. Customers must comply with the UPC in effect at the time of installation, whether or not the Local Administrative Authority inspects the plumbing.

7.6.5.4 Washington State Department of Labor and Industries

Washington State Department of Labor and Industries (L&I) requires persons engaged in the craft of plumbing to be certified (under RCW 18.106). The craft of plumbing includes installing, repairing and replacing plumbing and applies *within buildings only*. Some plumbing activities require a journeyman's plumber certificate, whereas other plumbing activities, such as backflow assembly repair, require only a specialty plumber certificate.
The plumber certification requirements impacts some DOH-certified Backflow Assembly Testers (BATs). BATs that repair backflow prevention assemblies within buildings must hold a valid specialty plumber certificate issued by Labor & Industries.

Most DOH-certified BATs must also maintain an L&I issued contractor's license to operate in Washington State.

7.6.6 Cross-Connection Control Regulations for Reclaimed Water Systems in Washington State

The purpose of this guidance is to help reclaimed water generators and distributors protect reclaimed water from potential contamination via cross-connections with lower quality water. This section does not include technical information to cover protection of potable water systems from

reclaimed water, this is the responsibility of the potable water distributor. The operator of the reclaimed water system must coordinate with other agencies to ensure all cross-connection rules are followed.

7.6.6.1 WAC 246-290-490 Drinking Water Rule

Department of Ecology standards prohibit direct connections between reclaimed water systems and potable water systems. The Department of Health considers all classes of reclaimed water a high health hazard. ***Properties provided with both reclaimed water and potable water are required to have an air gap or reduced-pressure backflow assembly at the potable water service meter.*** The requirement is based on the assessment of a high health hazard of the reclaimed water, and the high probability that a connection could be made between the potable and non-potable systems (e.g., in the event of the disruption of the reclaimed water supply).

Where the customer uses potable water to supplement a reclaimed water system, the water must be supplied through an approved AG inspected by a DOH certified Backflow Assembly Tester or Cross-connection Control Specialist at least annually.

7.6.6.2 WAC 51-56-0600 and WAC 51-56-1500 Amendment to the Uniform Plumbing Code

Along with the adopted Uniform Plumbing Code; this provides cross-connection control guidance within buildings. This rule provided immediate actions upon discovery of any cross-connections with reclaimed water and describes some preventative measures.

7.6.6.3 Reclaimed Water Rule WAC 173-219-310

Must eliminate or control cross-connections between the distribution system and potential contaminants. In most cases, eliminating cross-connections is almost impossible. Thus, control of cross-connections is the more common approach used to protect reclaimed water systems from contamination. Control of cross-connections must be accomplished by the installation of approved backflow preventers commensurate with the degree of hazard.

Reclaimed water generators and distributors must develop and implement a written cross-connection control program that meets the requirements of WAC 173-219-310. They must also provide a certified cross-connection control specialist (CCS) to review all plans, engineering reports, and operation and maintenance manuals to ensure compliance with cross-connection control requirements before submitting documents to the lead agency for review (WAC 173-219-310 (4) (b)).

Reclaimed water generators and distributors must use good engineering practices in the development and implementation of cross-connection control programs. Guidance publications and references such as, but not limited to, the most recent edition of the following, may be used for cross-connection program development and implementation:

- Foundation for Cross-Connection Control and Hydraulic Re-search, University of Southern California, *Manual of Cross-Connection Control.*
- Washington State Department of Ecology, *Criteria for Sewage Works Design.*
- Washington State Department of Ecology, *Reclaimed Water Facilities Manual* (This document).

- Pacific Northwest Section of the American Water Works Association *Cross-Connection Control Manual, Accepted Procedure and Practice.*

Table 7-4 Considerations for Reclaimed Water

Situation	Comment
General	Distributors must not have any unprotected cross-connections between reclaimed water and lower quality water of any classification under any circumstance. The reclaimed water generator is responsible for ensuring compliance with provisions of their approved cross-connection control program (CCP). The reclaimed water permit holder must complete an annual summary report documenting facility inspections, test results, repair and replacement requirements, and the proper installation of new backflow prevention assemblies at reclaimed water use sites during the year to the lead agency upon request.
Potable Water Make-up	If a potable water source is blended with reclaimed water at a use area or site, there must be an air gap separation on the potable water supply. The potable water system distributor must approve and inspect the air gap separation, as directed in the potable water distributor's CCP, or the locally adopted plumbing code or ordinance, whichever is more stringent.
Reclaimed Water Lines Serving and Within a Dwelling Unit	Reclaimed water may not enter any dwelling unit or building containing a dwelling unit, except to provide fire protection water, toilet flushing water, or other indoor residential water uses consistent with locally adopted plumbing codes at approved sites. The reclaimed water service pipe and building plumbing must conform to all pipeline separation, marking, and warning guidelines of this section, reclaimed water use standards, and state and local plumbing codes.
Pipeline Separation	The Reclaimed Water Rule defines adequate separation as "consistent with the most recent edition of *Pipeline Separation Design and Installation Reference Guide* by Ecology and Health. The selected separation distance must be justified in the engineering report."
Bypasses	Bypass piping installed around any approved backflow prevention assembly is equipped with an approved backflow prevention assembly that affords at least the same level of protection as the assembly that is being bypassed.
Hose Bibbs on Reclaimed Water Lines	Only authorized personnel may control or permit operational access to hose bibbs on reclaimed water lines.
Markings and Warnings	All backflow-prevention assemblies and downstream piping must be adequately marked and color-coded in conformance with the industry practice and applicable standards to identify the hazards and fluids downstream of the assembly.

7.6.7 Minimum Elements of a CCC Program

To be acceptable to the lead agency, the reclaimed water distributor's CCC program must include the 6 minimum elements specified in WAC 173-219-310(5).

7.6.7.1 Element 1: Establish Legal Authority

The reclaimed water distributor must adopt a local ordinance, resolution, code, bylaw, or other written legal instrument that:

- Establishes the distributor's legal authority to implement a CCC program;

- Describes the operating policies and technical provisions of the distributor's CCC program; and
- Describes the corrective actions used to ensure that consumers comply with the distributor's CCC requirements.

Where the Distributor owns both the generating facility and the facilities served by the reclaimed water system, they may already have the legal authority to establish a CCC program.

7.6.7.2 Element 2: Procedures/Schedules

The distributor must develop and implement procedures and schedules for ensuring that:

- Cross-connections are eliminated whenever possible
- When cross-connections cannot be eliminated, they are controlled by installation of approved backflow prevention assemblies commensurate with the degree of hazard.
- Approved backflow prevention assemblies are installed in the approved orientation and in accordance with industry standards.
- New and existing points of use are assessed for compliance with the cross-connection control program.
- Approved backflow prevention assemblies are inspected and tested as required.

7.6.7.3 Element 3: Provide Qualified Personnel

The distributor must ensure that personnel, including at least one person certified as a CCS, are provided to develop and implement the CCC program.

7.6.7.4 Element 4: Assembly Testing Quality Assurance/Quality Control (QA/QC)

The distributor must develop and implement a BPA testing quality assurance/quality control program including, but not limited to, documentation of tester certification and test kit calibration, test report contents, and time frames for submitting completed test reports.

7.6.7.5 Element 5: Backflow Incident Response Plan

The distributor must develop and implement (when appropriate) procedures for responding to backflow incidents.

7.6.7.6 Element 6: Establish/Maintain Cross-Connection Control Records

The distributor must develop and maintain CCC records including, but not limited to, the following:

- Locations in the generation facility where cross-connections between higher quality and lower quality water have been identified.
- Property locations where reclaimed water is provided.
- Property locations where users are served by both reclaimed water and potable water, and identification of and notification to the potable distributor.
- Approved backflow assemblies and air gaps protecting the reclaimed water generation and distribution systems; including exact location, description of the type, manufacturer, model, size, and serial number, assessed degree of hazard, installation date, history of inspections, tests and repairs, test results, and person performing tests.
- Cross-connection control program annual summary reports and backflow incident reports.

7.6.8 Coordination

WAC 173-219-310 requires coordination between the reclaimed water generator, reclaimed water distributor, potable water supplier, and the Local Administrative Authority on CCC matters. The level of coordination between these parties may vary. Coordination options include:

- A simple exchange of information (minimum effort);
- Interacting (cooperating) with each other; or
- Operating a combined (joint) program.

7.6.8.1 Exchange of Information Program

For an exchange of information level of coordination, the distributor should:

- Notify the drinking water supplier and Local Administrative Authority of the distributor's CCC program and policies;
- Notify the drinking water supplier and Local Administrative Authority of all permits for new services and ask to be notified of any permits for plumbing changes to existing premises served by the reclaimed water system; and
- Notify the drinking water supplier and Local Administrative Authority of any enforcement action in which reclaimed water service is discontinued and of any backflow incidents known to have contaminated the public drinking water system, the reclaimed water distribution system, or the customer's plumbing.

7.6.8.2 Interaction Level of Coordination

For an interaction level of coordination (cooperation) the distributor may:

- Conduct joint surveys/inspections of the customer's premises; and
- Share assembly location and testing information.

7.6.8.3 Combined/Joint Program Level of Coordination

In joint programs, it is common for distributors to delegate CCC responsibilities to the drinking water supplier including filling the required Cross-connection Control Specialist position. Distributors that wish to implement a combined/joint program with the drinking water supplier should establish:

- Which agency will be in overall charge (take the lead) of the joint CCC program;
- A written agreement that clearly delineates the authority and responsibility of each party with regards to cross-connection control; and
- A list of the tasks to be performed by each party.

7.6.8.4 Written Agreements

Distributors wanting to implement joint programs are encouraged to develop written agreements. At a minimum, the written agreement should:

- Define the purpose of the joint program;
- Identify the parties to the agreement;
- Define terms used in the agreement (e.g., health hazard);
- Cite the regulations that the combined program is based upon (e.g., WAC 246-290, UPC);

- Cite the authority (e.g., ordinance or council vote) to enter into a written agreement and implement a combined program;
- List the technical references used (e.g., PNWS-AWWA Manual, USC Manual, etc.);
- Delineate the respective responsibilities;
- Describe administration procedures;
- Designate the DOH certified Cross-connection Control Specialist responsible for overall program supervision;
- Provide detailed operating procedures for:
    - Construction plan review;
    - Authorization for connection of new service;
    - Conducting initial and periodic hazard assessments (surveys); and
    - Communicating with customers.
- Include procedures for responding to:
    - General water quality complaints;
    - Health-related complaints; and
    - Backflow incident investigations.
- Describe enforcement procedures for:
    - Addressing Uniform Plumbing Code violations; and
    - Ensuring compliance with WAC 173-219-310;
- Include procedures for record-keeping;
- Contain provisions for amending and/or canceling the written agreement; and
- Delineate responsibilities for various program costs, cost recovery and transfer of funds between parties.

7.6.9 Relationship to Customer

The main enforcement tool for the reclaimed water distributor is to formalize the business relationship with the customers. This applies to more than the CCC program issues and good business practices should be followed.

The purpose of a service agreement is to make clear to the customer the:

- Legally binding conditions of service; and
- And actions for the customer's breach of contract.

At a minimum, a service agreement should:

- Be in writing and signed by the customer or authorized agent of the customer;
- Be short, but explicit (in that the customer agrees to the service policy including the CCC requirements);
- Clearly state the corrective actions, if the customer fails to comply with the agreement; and
- Include by attachment the written service policy and standards.

A customer's application for service is a policy (terms) for providing service and requires the distributor to:

- Review the customer's usage plans and/or conduct a cross-connection survey to assess the hazard posed usage plan; and
- Request, as a result of the hazard assessment from the plan review and/or survey, the installation of premises isolation backflow assemblies to protect the reclaimed water distribution system if applicable.

If the distributor chose not to conduct a plan review and/or hazard survey, by default, the distributor accepted the liability for any cross-connection hazards.

7.6.9.1 Enforcement of Corrective Actions

A CCC program must describe the corrective actions used to ensure consumers comply with CCC requirements. Take corrective actions if the customer:

- Fails to install backflow protection necessary to protect the distribution system; or
- Fails to test or maintain backflow assemblies; or
- Makes a change to the plumbing system that necessitates the installation of additional assemblies and/or different types of assemblies.

Distributors are required to take appropriate corrective action if a cross-connection or potential cross-connection exists that is not controlled by the installation of an approved backflow prevention assembly. Corrective action may include, but is not limited to:

- Diverting potentially contaminated reclaimed water or taking other action to prevent it from leaving the reclaimed water facility and entering the distribution system until the hazard is controlled or eliminated.
- Denying or discontinuing reclaimed water service to a user's property until the cross-connection hazard is eliminated or controlled.
- Requiring the user to install, repair, or replace an approved backflow prevention assembly appropriate for the level of risk of contamination for premises isolation of the reclaimed water system.

7.6.10 Location and Ownership of Backflow Assemblies

Distributors must ensure that cross-connections, that cannot be eliminated, are controlled by the installation of approved backflow preventers commensurate with the degree of hazard. The general options are premises isolation backflow preventer owned by the:

- Distributor and installed with the meter on the public right-of-way (ROW) or in a utility easement alongside the public ROW; or
- Customer and installed on the service line on the customer's side of the property line immediately downstream of the meter.

Accepting a customer-installed backflow assembly at a location other than immediately downstream of the distributor's meter (i.e., at the property line) brings the risk of customers making additional connections upstream of the backflow protection without the distributor’s knowledge.

The major advantage to the distributor's ownership of backflow assemblies is the increase in the reliability of the assemblies that protect the distribution system because the distributor purchases, installs, tests, maintains, and repairs the assemblies. The major advantage to the distributor of the customer owning the assembly is avoiding the responsibility (and cost) for purchase, installation, maintenance, repairs, or replacement and the accompanying potential liability for assembly failure.

7.6.11 Cross-connection Specialist Options

At least one person certified as a cross-connection specialist (CCS) must be provided to develop and implement the distributor's CCC program. The options available to comply with the CCS requirement are:

- Distributor's existing staff obtains CCS certification;
- Distributor contracts with another reclaimed water distributor, drinking water utility, or agency to use the services of their CCS; or
- Distributor contracts with an independent CCS to provide services.

Table 7-5, below, shows benefits and drawbacks associated with selection of a CCS.

Table 7-5 Cross Connection Specialist Selection Guidance

	Distributor's Program – CCS Options		
	Distributor's Staff Certified	***Contract with Another Utility or Agency***	***Contract with Consultant CCS***
Major Advantages	CCS is readily available. Minimum cost.	CCS will likely have more experience.	CCS will likely have the most experience.
Major Disadvantages	Potential staff turnover. Experience may be limited. May require training.	CCS may not be readily available Requires interagency agreement.	CCS may not be readily available. Requires service contract.

When soliciting proposals from contract CCSs, at a minimum, distributors should request:

- Documentation of current CCS certification, and the date of initial CCS certification;
- A resume of applicable training, certification, and work experience with specific emphasis on experience in program development and implementation to meet the most recently published CCC regulations;
- A list of systems the CCS is currently under contract with and/or systems they have provided CCC program services to within the past five years and a description of the services provided to each system;
- The names of at least three systems the CCS has worked for within the previous three to five years (to contact as references);
- Information on the scope of services the CCS is willing to provide; and
- A sample of the CCS's written work.

7.6.12 Backflow Assembly Testing Options

At least one person certified as a cross-connection specialist (CCS) must be provided to develop and implement the distributor's CCC program.

The distributor must develop and implement a policy for the testing of backflow assemblies protecting the distribution system. Guidance for selection of a backflow assembly tester (BAT) can be found in Table 7-6. The general options are:

1. Distributor's hires a BAT to test all assemblies; or
2. Distributor has on staff BAT test all assemblies; or
3. Distributor requires the customer to hire a BAT.

Table 7-6 Backflow Assembly Tester Selection Guidance

	Testing of Assemblies	
	By Distributor-Employed BAT (on Staff or Contract)	***By Customer-Employed BAT (i.e., Contractor)***
Major Advantages	Ensures quality assurance/control of test results for the distributor. Reduces the administrative costs for the distributor. Results in good public relations for utility. Decreases customer costs.	Cost is borne by the customers with cross-connections.
Major Disadvantages	Increases staff/consultant costs for the distributor. Increases staff training requirements for the distributor	Testing quality assurance/control is not ensured. Increased administrative costs for the distributor.

7.6.13 Programs for Small Systems

A common characteristic of many small reclaimed water systems is that they are under single ownership. As such, the reclaimed water system includes all facilities from the source of supply to the discharge point. Small systems should apply the principles of the reclaimed water regulations to ensure the source of supply and the distribution facilities are not contaminated through unprotected cross-connections. All minimum elements should be evaluated for applicability.

The general administration tasks for a CCC program are the same for both small and larger public water systems. The primary difference is in the amount of administrative work associated with implementation of the program. For small systems the administration of a CCC program should only result in a small workload.

7.6.14 Personnel

All reclaimed water system employees (staff and/or contract manager/operator) should have a general knowledge of cross-connection control. The CCS involved in the development and implementation of the program will likely be the most knowledgeable about the principles and practices of cross-connection control. However, all staff members may be involved in CCC issues because:

- Customers may ask general questions of office and/or field staff;

- Office staff will process the paper work related to the CCC program (survey records, correspondence, annual summary report forms, etc.);
- Field staff may encounter backflow conditions (e.g., main break causes backsiphonage conditions, meter reader may notice meter running backwards) or may need to respond to a backflow incident; and
- Field staff may spot a new cross-connection.

7.6.15 Backflow Assembly Installation Standards

Backflow prevention assemblies must be installed in a manner that:

- Facilitates their proper operation, maintenance, inspection, and/or in-line testing using standard procedures.
- Ensures that the assembly will not become submerged due to equipment failure or weather-related conditions such as flooding.
- Ensures compliance with all applicable safety regulations.

These requirements are established, because an improper installation decreases the assembly's reliability of preventing backflow due to:

- An unsafe or inaccessible location reduces the likelihood of an assembly being inspected, tested and maintained;
- Improper assembly orientation may prevent proper operation;
- Installation in a hazardous environment may allow contaminants to enter the assembly through test cocks, relief valve ports, or air inlets, and/or may cause corrosion damage; and
- Freezing temperatures or high temperatures may damage the assembly.

Manufacturers provide recommendations for the proper installation of their assemblies, and it is important to consult the manufacturer's instructions prior to the installation of any assembly. However, the distributor or other approval authorities may have established installation requirements that differ from the manufacturer's recommendations. If the manufacturer's recommendations conflict with the distributor's requirements; the more stringent installation requirements take precedence.

Recommended installation standards are provided in technical publications such as the:

- Manual of Cross-Connection Control, published by the University of Southern California - Foundation for Cross-Connection Control & Hydraulic Research (USC-FCCCHR); and
- Cross-Connection Control Manual, Accepted Procedure and Practice, published by the Pacific Northwest Section, American Water Works Association.

7.6.16 Cross-Connections in Wastewater Facility

An essential component of the distributor's CCC program is to provide protection from cross-connections at wastewater facilities. There are a number of common cross-connections typically found between reclaimed water and wastewater. Examples are included in Table 7-7.

Table 7-7 Cross-connections Associated with Reclaimed Water and Wastewater

Facilities	Water Uses	Equipment
Reclaimed water treatment facilities Wastewater treatment facilities Lift stations Combined sewage overflows Pressure regulator stations	Pump seal water Foam control Flushing Cleaning screens and racks Washdown activities Pump primers Chlorinators Cooling Heating (boilers)	Water-operated sewage sump ejectors Water-cooled compressors Aspirators (laboratory) Sterilizers (laboratory) Janitor sinks Trap primers Flush-O-Meter valves Condensers Heat exchangers Hand tools

The Washington State Department of Ecology *Criteria for Sewage Works Design* manual, contains extensive diagrams and descriptions of potential cross-connection.

7.6.17 Common Cross-Connections Associated with Distributed Systems

Reclaimed water systems serve many water uses that pose cross-connection hazards to the distribution system. Some of these hazards are listed on the table below; however, other specific hazards encountered in the system may not be listed.

Table 7-8 Recommended Protection to Protect Reclaimed Water Systems

Description of Hazard or Premises	Minimum Protection Required/Recommended
Auxiliary water supply, interconnected with reclaimed water system	RPBA
Auxiliary water supply, not interconnected	DCVA
Commercial farms	RPBA
Surface Water, Ponds, Fountains	AG
Hobby farms (5 – 10 acres, non-commercial)	DCVA
Hydroponics, non-commercial greenhouse	RPBA
Livestock watering trough	AG or AVB
Fire Suppression (booster pump, chemical addition)	RPBA
Fire Suppression (no pump, chemical addition)	DCVA
Irrigation system (booster pump, chemical addition)	RPBA
Irrigation system (no pump, chemical addition)	DCVA
Industrial Cooling	RPBA
Boiler Feed	RPBA
Solar heating system, heat exchangers (with chemicals)	RPBA
Solar heating system, heat exchangers (no chemicals used)	DCVA
Swimming pool, spa	DCVA
Hydroponics, greenhouses	RPBA or DCVA
Discharge to sewer	AG or RPBA
Sewage Pumps, Lift Stations, Grinder Pumps	AG or RPBA
Tank Truck Hauling	AG or RPBA

Toilet and Urinal Flushing	AG or RPBA
Washing and Washdown	AG
Dust Control	DCVA
Ship Ballast	AG or RPBA

7.6.18 Requirements for Backflow Assembly Testing

Backflow assemblies are mechanical devices subject to fouling and wear. History has shown that backflow preventers that are not tested periodically will not be maintained or repaired. Backflow preventers that are not maintained or repaired have a much higher likelihood of failure. Similarly, AGs that are not inspected periodically may be by-passed or re-plumbed.

Backflow assemblies and AGs used in place of assemblies relied protecting the distribution system must be inspected for proper installation and tested for proper operation:

- At the time of installation;
- Annually after installation (minimum frequency);
- After a backflow incident; and
- After an assembly is repaired, reinstalled, or relocated (or an AG is re-plumbed).

Backflow assemblies must be tested using acceptable procedures specified in the most recently published edition of the *Manual of Cross-Connection Control*, published by the University of Southern California Foundation for Cross-Connection Control & Hydraulic Research.

Only a DOH-certified backflow assembly tester (BAT) may conduct all field tests of assemblies relied upon to protect the reclaimed water system. A public listing of certified testers is maintained on the DOH Office of Drinking Water website.

7.6.19 Quality Assurance Program

An adequate quality assurance program must:

- Document that test reports are submitted by DOH-certified backflow assembly testers;
- Document the type of test kit used, serial number, and that the test kit has been verified for accuracy within the last year and calibrated if necessary (some test kits can't be re-calibrated),
- Specify the minimum content of backflow assembly test reports and establish procedures for test report review; and
- Establish a timeframe for submitting completed backflow assembly test reports.

To comply with the quality assurance/quality control requirement, distributors must maintain documentation of all tester's Backflow Assembly Tester Certification, and test kit calibration. Example backflow assembly inspection and test report forms can be found on the Office of Drinking Water webpage.

The distributor's CCS (either on staff or contract) should have the training and experience to review test reports for quality assurance purposes. The reviews should be made at least annually, and preferably more often, if previous reviews show problems.

7.6.20 Record Keeping and Reporting Requirements

Distributors should keep all original records (correspondence, plans, etc.) in the system files. If contractors (i.e., CCSs) are used, the contractors should give the original records to the distributor and retain photocopies of the records in their own files.

Section 173-219-310 (10) Recordkeeping and reporting identifies specific timeframes that Cross-connection control records must be kept. Records pertaining to the list of properties using reclaimed water must be kept as long as reclaimed water is provided to the property. Records regarding information pertaining to cross-connection incidents must be kept for five years or for the life of the approved backflow prevention assembly, whichever is shorter.

7.6.20.1 Record of Risk Assessment

For each customer, the distributor shall maintain a record of the initial risk assessment and subsequent re-assessments, because these:

- Document that the distributor has complied with the Ecology requirement to evaluate new and existing customers to assess the degree of hazard;
- Provide a historical perspective that may be needed by a new CCS, Program Manager, or supervisor;
- Contain a signed statement from the customer or customer's CCS about his water use, and/or assessed degree of hazard; and
- Contain information useful for investigating a backflow incident.

For each connection requiring a backflow preventer to protect the reclaimed water system, records should be kept indicating the assessed hazard level of the connection and the required backflow preventer.

7.6.20.2 Inventory of Backflow Preventers

It is critical to keep accurate records on backflow preventers. For each customer where an approved BPA or AG is required to protect the distribution system the inventory should:

- Information on the exact location of the backflow preventer or AG (adequate details to find the backflow preventers);
- Description of hazard isolated;
- Type, size, make, model, serial number and installation date of backflow assembly, or AG details including installation date; and
- Size, make, model and installation date of AVBs used on irrigation systems.

7.6.20.3 Inventory of Backflow Preventer Test/Inspection Reports

For each assembly field test or AG inspection, the test report inventory information should include at a minimum:

- The name and certification number of the BAT performing each test or inspection;

- Test results (pass/fail and actual readings) or inspection results; and
- Repair/re-plumbing history.

7.6.20.4 Correspondence

The distributor should maintain copies of all correspondence with customers for a period of at least five years, including the:

- Most current service agreement with each customer; and
- Notification to the customer to install a backflow preventer(s).
- All correspondence with Ecology and the Local Administrative Authority should be maintained for at least five years.

7.6.20.5 Reporting Requirements

Reporting requirements include completing the CCC Annual Summary Report (ASR) forms and making them available to Ecology on request. The forms provide a means for distributors to report on the:

- Status of their written program plans
- Progress of their implementation activities

7.6.21 Backflow Incident Response Plan

A distributor's failure to properly respond to a backflow incident may:

- Significantly increase the number of persons and/or property exposed to a hazard;
- Increase the distributor's effort (cost) to contain a contaminant and clean the contaminant from the distribution system; and
- Expose the distributor to increased liability from a claim for punitive damages for negligence.

Distributors should consult with Ecology, DOH, Local Administrative Authorities, and Local Health jurisdiction when developing the response plan to identify communication lines, responsibilities, etc.

Report backflow incidents on a form acceptable to Ecology with additional supporting information, photos, laboratory analyses, etc.

7.7 General Use Area Requirements

Generators and distributors may only supply reclaimed water to specific use locations and for specific beneficial uses authorized by the lead agency. In general, requirements for construction standards in Section 7.4, the labeling guidelines in Section 7.5 and the cross-connection control guidelines in Section 7.6 apply to systems at each use area. Reclaimed water permits will include general use area requirements that the generator must implement at use areas under their direct control or as part of their agreements with reclaimed water users.

While requirements may differ for each use area based on the specific beneficial use and site constraints identified during the site evaluation, the Reclaimed Water Rule includes a few

general requirements for all uses. The user must post advisory signs at the use area to alert the public and employees of the use of reclaimed water. In addition, all pipes carrying reclaimed water at the use area must be labeled as reclaimed water and designed with pipeline separation consistent with the construction and labeling standards in this document.

> The reclaimed water user must control access to the reclaimed water.
>
> It must restrict operation of valves and outlets to authorized personnel trained in the use of the reclaimed water system.

The system design should also use locking valves and hose bibs or other measures to limit access to the system controls. When Class B water is used at an area, the user must confine the water to the use site, including all runoff and spray.

In some use areas, care should be taken with respect to locating irrigation sprinklers using reclaimed water. Irrigation systems using reclaimed water should be designed in a way that prevents spray from reaching walkways, picnic tables, drinking water fountains passing vehicles, or domestic water facilities.

Reclaimed water facilities must meet the applicable requirements of chapters 90.48 and 90.54 RCW necessary to prevent and control pollution of waters of the state. Reclaimed water facilities must also meet applicable requirements of RCW 43.20.050 and chapter 70.119 RCW necessary to protect public health and potable drinking water supplies. In addition, permit requirements will assure the suitability of the water for the planned beneficial uses.

This does not mean that all contaminants believed present should have limits or be included in monitoring requirements in every permit. Detection of chemicals at low levels does not automatically translate into possible impacts on human or aquatic health or the suitability of the water for the proposed use. For example, generators may complete United States Geological Survey (USGS) water quality assessments at the parts-per-trillion levels, which is an amount that can be up to 100 times lower than the threshold used for setting standards and guidelines. The lead agency will use best professional judgment in determining when to include additional parameters in the permit for limits or environmental monitoring.

7.7.1 Distribution or Use by Other Parties

Requirements in the Reclaimed Water Rule related to the distribution and use of reclaimed water apply to all generators, distributors and users regardless of whether they have been issued a reclaimed water permit by the lead agency. The reclaimed water permit will include specific distribution and use requirements that the permittee must comply with whenever the water is under their direct control. The permit also includes the ability for the permittee to enter into agreements with third parties to distribute or use water generated at the permitted facility. Those agreements must include specific requirements governing the distribution and use of the water. If a third party distributor or user does not comply with the conditions in the agreement, the permittee must take actions to enforce the agreement, which may include discontinuing the reclaimed water service.

7.7.2 Tank Truck Distribution

Reclaimed water generators or other authorized users may use tank trucks or similar transport vehicles to transport and distribute reclaimed water, in accordance with the provisions in an approved Operation and Maintenance Manual and in binding use agreements. or other advisory or educational language acceptable to Ecology and Health. Such vehicles must be filled from sources protected by an approved air gap or other approved cross-connection control device. Permittees must inspect and approve all vehicles used to transport reclaimed water for such use prior to transporting the reclaimed water. Vehicles that have previously transported hazardous or dangerous waste, or will potentially transport potable water, must not transport reclaimed. Vehicles used for delivering potable water for potable uses should never be used to transport reclaimed water, unless they then stop transporting potable water for potable purposes.

> The vehicle must be clearly identified with signs labeled "Reclaimed Water – Not Intended for Drinking"

7.7.3 Strainers at Use Sites

Depending on the quality of reclaimed water and the type of storage used strainers may be needed at the use area consumer's meter. If a strainer is needed, the generator and user (if different individuals) should document in the use agreement who is responsible for installing and maintaining the equipment. Satisfactory strainer types are as follows:

- Wye strainers: Not recommended for below-ground installations (in vaults).
- Basket strainers: Suitable for above-ground or below-ground installations (in vaults).
- Filter strainers: Normally used above ground in drip systems.

Generators/Distributors/users may install strainers, normally the same size as the line, before or after the meter. In choosing the location, consider the following:

- Installation before the meter will protect the meter as well as the on-site reclaimed water system. Maintenance of the strainer will be the responsibility of the reclaimed water generator.
- Installation after the meter will not provide meter protection, and maintenance is usually not the responsibility of the reclaimed water generator. It should be noted prior to installing the strainer if there will be debris in the reclaimed water that may plug the screen in the meter.

Strainers can range in mesh size from 20 to 325. A mesh size of 20 to 80 is normally adequate. An analysis of the potential debris in the reclaimed water will aid in prescribing the optimum size. In order to reduce maintenance, Distributors should allow material that will not plug on-site irrigation nozzles to pass through any mesh.

7.7.4 Irrigation Controllers

Reclaimed water users may use controllers to automatically open and close on-site distribution valves. Designers should consider the following design features:

- Controllers should be fully automatic.

- Controllers should select from multiple starting times for any time of day, seven days a week, and should be equipped with moisture sensors to avoid activation during rainy periods.
- A station's duration should be capable of delivering water from 1 to 60 minutes per each start time.
- Controllers for reclaimed water should be color coded per Section 7.5, Labeling Reclaimed Water Components, to distinguish them from potable water. Controllers should be labeled inside and outside to indicate that the system uses reclaimed water. The labels should also alert operations and maintenance personnel of any operational constraints.
- Seal an appropriately sized drawing of the area served by the controller in a sealable plastic sleeve, placed in the controller, and updated as needed.

7.8 Conveying Reclaimed Water in Surface Waters of the State

When reclaimed water commingles with waters of the state for indirect use, it does not necessarily lose its character as reclaimed water. The generator of reclaimed water may retain the exclusive right to some of the reclaimed water for storage or conveyance and subsequent recovery. Generators should clearly document the intent to retain this exclusive right, known as a "controlled use," in the approved planning documents and reclaimed water engineering report (WAC 173-219-210(w)).

Reclaimed water conveyed through any surface water of the state for downstream withdrawal must meet all applicable requirements of the Federal Water Pollution Control Act and chapter 90.48 RCW. The generator will be issued a single NPDES permit that contains all necessary requirements to protect surface water quality along the provisions of a Reclaimed Water Permit that allow the beneficial use of the water. Ecology will issue the permit under the authorities of both chapter 173-220 WAC and WAC 173-219-270.

For projects proposing conveyance in waters of the state, the lead agency must approve a conveyance report as part of the engineering report (WAC 173-219-210(w)). The report must address how the generator plans to meet the requirements for controlled uses. The reclaimed water permit will include conditions assuring the conveyance and diversion of water as approved in the engineering report.

The following requirements apply to conveyance of reclaimed water through surface waters of the state:

- The maximum quantity of water diverted for beneficial use must equal the amount discharged minus evaporation, seepage, and other losses as determined by Ecology.
- The generator must be responsible for all activities required to put reclaimed water into, or take reclaimed water out of, surface waters of the state.
- Include a proposal for the distance and time interval between distribution to and diversion from surface waters in the conveyance report. Ecology will approve this report and include appropriate provisions in the reclaimed water permit conditions.

- The total volume of reclaimed water distributed and conveyed must not raise the intervening surface water body above the ordinary high water mark of that body of water.
- The generator must measure and record the location, rate, frequency, timing, and duration of each diversion.

7.9 Facilities Producing both Class A and B Reclaimed Water

Operating a dual-class facility may be viable in an area where the demand for Class B water is much greater than the demand for Class A. Ecology and Health will consider proposals for dual-class facilities on a case-by-case basis.

While Class A water must be filtered (either membrane filtration or coagulation plus sand or fabric filtration), Class B water does not require filtration. In addition, disinfection of Class B water does not have to meet the same low Total Coliform level as Class A water and does not need to demonstrate viral removal. As a result, the use of Class B water is limited to controlled applications in areas that have restricted public access. While a generator cannot allow the use of Class B water in any application that is restricted to Class A, they may allow Class A water use for any application that requires a minimum Class B standard. Therefore, reclaimed water proponent must weigh the cost difference between operating and maintaining separate treatment and distribution systems for each class against the cost of treating all water to a Class A standard.

While the Reclaimed Water Rule does not prohibit a reclaimed water treatment facility from producing both Class A and Class B reclaimed, Ecology discourages the practice since the infrastructure requirements to maintain adequate separation between the two product water streams may be cost prohibitive.

If a generator chooses to produce both classes of water, it may do so by either splitting the source water to the water reclamation facility into two separate treatment trains dedicated to each class, or by diverting a portion of Class B product water for further treatment to Class A standards. In either case the engineering documents for the proposed facility must clearly show how the generator will maintain compete separation between the higher-quality Class A water and the lower-quality Class B water. The generator must also use pipe labeling that clearly differentiates between the classes of waters conveyed by the pipes. The generator may not use any pipe designated for Class A water to convey Class B water. In addition, Ecology will not approve any plan that proposes the generation and distribution of variable classes of water (either Class A or Class B) through the same infrastructure.

8 Commercial, Residential, Industrial, and Institutional Uses

This chapter describes the regulations, parameters and considerations for commercial, industrial, and institutional uses of reclaimed water.

8.1 Class of Reclaimed Water Required

Table 8-1 lists the most common commercial, industrial, institutional, and residential uses of reclaimed water and the class of water required for each use (WAC 173-219-390). When other uses are proposed by an applicant, the lead agency should determine, on a case-by-case basis, whether the use is within the intent of the Reclaimed Water Rule and the applicable class of reclaimed water, based on the following overarching criteria. The lead agency will identify the applicable class of reclaimed water for the proposed use based on the following:

- Class A technology-based standards apply to all uses where public or general employee contact is likely. Class A standards also apply to uses with a significant potential for site runoff or seepage.
- Class B technology-based standards apply to uses with restricted access to qualified personnel with no contact by the public or general employee and limited potential for environmental impact. Use of Class B reclaimed water must be confined to the use area (WAC 173-219-380(3)).

Table 8-1 Class of Reclaimed Water Required for Commercial, Residential, Industrial, and Institutional Uses

Use	Allowed Classes of Reclaimed Water		Issues that may affect use selection
	Class A	Class B	
Commercial, and Institutional			
Toilet and urinal flushing	YES	NO	Discoloration of fixtures. Users must **not** have access to the plumbing system for repairs or modifications. Where the residents have access to the plumbing system for repairs or modifications no use of reclaimed water is permitted.
Street washing, Spray	YES	NO	See BMP S430 in the Stormwater Management Manual for Western Washington (SWMMWW) and/or the Best Management Practices (BMPs) for Urban Streets in the Stormwater Management Manual for Eastern Washington (SWMMEW)

Use	Allowed Classes of Reclaimed Water		Issues that may affect use selection
	Class A	Class B	
Exterior pressure washing of building and sidewalks	YES	NO	Discoloration and spotting due to increased TDS in the reclaimed water. See BMP S431 in the SWMMWW and/or the BMPs for Washing and Steam Cleaning Vehicles/Equipment/ Building Structures in the SWMMEW
Street sweeping, Brush dampening	YES	YES	See BMP S406 in the SWMMWW and/or the BMPs for Urban Streets in the SWMMEW
Decorative fountains or water features	YES	NO	Increased TDS may affect quality of the vegetation and aquatic life. Nutrients in standard Class A reclaimed water may result in excess algal growth. This issue may be minimized if the reclaimed water facility removes nutrients as part of their treatment process.
Flushing/cleaning of sanitary sewers	YES	YES	
Washing of corporation yards, lots, and sidewalks	YES	NO	See BMP S430 in the SWMMWW and/or the BMPs for Urban Streets in the SWMMEW
Dust control (Dampening unpaved roads and other surfaces)	YES	YES	See BMP S407 in the SWMMWW and/or the BMPs for Dust Control at Disturbed Land Areas and Unpaved Roadways and Parking Lots in the SWMMEW
Dampening of soil for compaction (at construction sites, landfills, etc.)	YES	YES	
Water jetting for consolidation of backfill around pipelines	YES	YES	
Aerial firefighting and prevention	YES	YES	
Interior fire hydrants or sprinkler systems	YES	NO	Increased TDS may affect pumps, pipes and nozzles. Users must **not** have access to the plumbing system for repairs or modifications. Where the residents have access to the plumbing system for repairs or modifications no use of reclaimed water is permitted.
Industrial			
Boiler feed-water	YES	YES	Due to TDS and nutrients typically found in reclaimed water all industrial uses may require additional treatment and conditioning. This will result in a
Closed loop cooling – No creation of aerosols or other mist	YES	YES	
Cooling aerosols or other mist created (e.g., Use in cooling towers, Forced air evaporation, or spraying)	YES	NO	
Process water - Without exposure of workers	YES	YES	

Use	Allowed Classes of Reclaimed Water		Issues that may affect use selection
	Class A	Class B	
Process water - With exposure of workers	YES	NO	high TDS waste stream that may not be accepted by the local POTW or industrial wastewater treatment system.
Ship ballast	YES	YES	
Washing aggregate and making concrete	YES	YES	
Residential (Indoor)			
Toilet and urinal flushing	YES	NO	Fixture discoloration. The higher TDS may result in deposition of salt on surfaces. Nutrients and TDS may affect plants and grasses. Residents must **not** have access to the plumbing system for repairs or modifications. Where the residents have access to the plumbing system for repairs or modifications no use of reclaimed water is permitted.
Sprinkler systems in buildings	YES	NO	
Other indoor uses permitted by local plumbing codes	YES	NO	
Residential (Outdoor)			
Lawn and garden irrigation	YES	NO	Nutrients and TDS may affect plants and grasses. Residents must **not** have access to the plumbing system for repairs or modifications. Where the residents have access to the plumbing system for repairs or modifications no use of reclaimed water is permitted.

8.2 Other Water Quality Considerations

In addition to meeting Class A or Class B water quality standards, uses must minimize the potential for adverse impacts to the environment including aesthetics, algal growth, runoff, and discharges to waters of the state. This includes decorative ponds or other water features that are not lined or sealed to prevent seepage. Document the design in the project engineering report in accordance with the procedure and criteria presented in Section 7.1.3, Alternative Design for Reclaimed Water Storage Ponds. Provide sufficient information to demonstrate how groundwater quality standards (chapter 173-200 WAC) are met. Any outlets from storage or use sites to surface water must meet federal water pollution control act and chapter 90.48 RCW standards.

9 Land Application/Irrigation Uses

Irrigation is typically the most common use of reclaimed water. This chapter describes the regulations, parameters and considerations for land application and irrigation uses.

> Land application or irrigation with reclaimed water should not be confused with land treatment that is regulated under a State Waste Discharge Permit.
>
> The distinct difference is that reclaimed water is highly-treated water that is no longer considered a wastewater and is of a quality appropriate for the identified irrigation uses and needs no additional treatment.

9.1 Class of Reclaimed Water Required

Table 9-1 lists the minimum class of reclaimed water that may be used for the most common irrigation uses per WAC 173-219-390. When an applicant proposes other uses, the lead agency should determine, on a case-by-case basis, whether the use is within the intent of the Reclaimed Water Rule and the applicable class of reclaimed water, based on the following overarching criteria.

- Class A technology-based standards apply to all uses where public or general employee contact is likely. Class A standards also apply to uses with a significant potential for site runoff or seepage. Class A standards apply to most situations where reclaimed water is to be used on food crops.
- Class B technology-based standards apply to uses with restricted access to qualified personnel with no contact by the public or general employee and limited potential for environmental impact. Use of Class B reclaimed water must be confined to the use area (WAC 173-219-380(3).

Table 9-1 Class of Reclaimed Water Required for Landscape and Agricultural Irrigation Uses

Use	Allowed Classes of Reclaimed Water	
	Class A	Class B [1, 2]
Irrigation of Nonfood Crops		
Trees and fodder, fiber, and seed crops and pastures accessed by milking animals.	YES	NO
Trees and fodder, fiber, and seed crops in pastures to which milking animals do not have access	YES	YES
Uses with public contact	YES	NO
Irrigation of Food Crops		
Irrigation of all food crops that do not undergo processing before consumption.	YES	NO
Irrigation - Orchards and vineyards	YES	YES [3]
Irrigation for frost protection of orchards	YES	YES [4]

Use	Allowed Classes of Reclaimed Water	
	Class A	Class B [1, 2]
Irrigation of food crops that undergo physical or chemical processing sufficient to destroy all pathogenic agents	YES	YES
Landscape Irrigation		
Restricted access areas (e.g., freeway landscapes, fenced industrial areas)	YES	YES
Open access areas (e.g., Golf courses, parks, playgrounds, common areas, and private property including residential landscapes)	YES	NO

[1] A minimum 50 foot setback applies between the irrigation area and public use areas or property lines.

[2] 240 MPN/100 mL median total coliform standard applies.

[3] Fruit must not contact the irrigation water or the ground.

4 Crops may not be harvested for at least 15 days following the application of Class B reclaimed water.

9.2 Incidental Site Runoff

Reclaimed water approved for irrigation uses have not necessarily been evaluated for potential impacts to surface waters or groundwaters of the state. Therefore, reclaimed water permits for the generating facilities do not authorize release of water outside of the intended use areas.

To prevent incidental runoff, reclaimed water users must take care to use water at rates appropriate for the crop and for weather conditions. They must also apply water in ways that minimize overspray and application to pavement or other hard surfaces. Use agreements must include appropriate BMPs designed to minimized incidental runoff.

10 Wetlands

Ecology has chosen to delay publishing guidance specific to the beneficial use of reclaimed water for Wetland Enhancement until 2020. A successful proposal requires that the proponent of a project that would use reclaimed water for wetland enhancement be able to demonstrate that their proposal will improve the functions, processes, and values of the existing wetland(s).

To improve the likelihood of successful proposals, additional time is necessary to develop comprehensive guidance on the characteristics of an approvable wetland enhancement project. The pending guidance will concentrate on two primary goals:

- Identify the improvements to the functions, processes, and values of an existing wetland. A project proponent must discuss these improvements in detail in planning and engineering documents in order to obtain approval for wetland enhancement as the beneficial use
- Discuss the regulatory and technical considerations a project proponent must examine when developing a wetland enhancement project that uses reclaimed water.

While this guidance is under development, Ecology will continue to work with project proponents on a case-by-case basis to examine the merits of a proposal. Anyone interested in evaluating a potential wetland enhancement project should consult with Ecology's regional office for the project area to discuss the requirements for developing an approvable project. Project evaluations will require input from the following Ecology programs: Water Quality, Water Resources, and Shorelands & Environmental Assistance. Project proponents should rely on Ecology's regional Water Quality Program staff as their primary project contacts.

11 Streamflow and Surface Water Augmentation

Ecology has chosen to delay publishing guidance specific to the beneficial use of reclaimed water for Streamflow and Surface Water Augmentation until 2020. A successful proposal requires that the proponent of a project that would use reclaimed water for surface water augmentation be able to demonstrate that their proposal will result in increased volume.

To improve the likelihood of successful proposals, additional time is necessary to develop comprehensive guidance on the characteristics of an approvable project. The pending guidance will concentrate on two primary goals:

- Identify necessary detail in planning and engineering documents necessary for a project proponent to gain approval for surface water augmentation as the beneficial use.
- Discuss the regulatory and technical considerations a project proponent must examine when developing a surface water augmentation project that uses reclaimed water.

While this guidance is under development, Ecology will continue to work with project proponents on a case-by-case basis to examine the merits of a proposal. Anyone interested in evaluating a potential surface water augmentation project should consult with Water Quality staff in Ecology's regional office for the project area to discuss the requirements for developing an approvable project. Ecology's regional Water Resources staff will also provide valuable input for project development.

12 Groundwater Recharge and Recovery

This chapter describes the reclaimed water Rule requirements for projects proposing to recharge groundwater with reclaimed water. Groundwater recharge projects include indirect and direct groundwater recharge and storage, and may include recovery of reclaimed water stored in an aquifer. The intent of groundwater recharge is planned replenishment of the groundwater for an in situ value (salt-water intrusion barrier, increase base flows for instream flows, maintain geologic structure), for recovery later for beneficial uses, to maintain a consistent sustainable yield from an aquifer, or as mitigation for other groundwater withdrawals.

Indirect groundwater recharge introduces reclaimed water to groundwater by way of surface or shallow subsurface percolation (infiltration). The reclaimed water travels through an unsaturated/vadose zone before reaching the groundwater. Direct groundwater recharge introduces reclaimed water directly and immediately into a groundwater aquifer through direct injection using a well completed in the saturated zone, or other means.

The Reclaimed Water Rule requires that an applicant provide complete project details in the reclaimed water engineering report for all projects proposed to use reclaimed water for groundwater recharge (WAC 173-219-210). The project description must specify the planned use for the reclaimed water, whether abandonment, recovery for beneficial uses, or as mitigation for other water right appropriations (WAC 173-219-290).

Prior to distributing to the ground, the reclaimed water must meet all other requirements for treatment, reliability, conveyance, distribution, identification, etc. as addressed in other chapters of this manual. In particular, the reclaimed water project must comply with all applicable requirements of chapter 90.48 RCW, and chapter 173-200 WAC for groundwater quality and chapter 246-290 WAC for drinking water standards.

The following groundwater protection areas have been recognized in state and federal laws and regulations:

- Wellhead protection areas: One, Five and Ten-year Time of Travel Zones (WAC 246-290-130; WAC 246-290-135).
- Sole source aquifers (federal Safe Drinking Water Act).
- Aquifer protection areas (chapter 36.36 RCW).
- Critical aquifer recharge areas (Growth Management Act - RCW 36.70A.170; WAC 365-190-100).
- Special (groundwater) protection area (WAC 173-200-090).
- Groundwater management area (RCW 90.44.400; chapter 173-100 WAC).

Projects that distribute reclaimed water to locations within or near a designated groundwater protection area must identify in the facilities plan or project engineering report the aquifer protection designation and any special requirements to be implemented for the preservation or protection of groundwater quality in the designated aquifer.

12.1 Water Quality Requirements for Indirect Groundwater Recharge

This manual classifies indirect groundwater recharge as reclaimed water applied to the ground under any of the following conditions:

- Percolated through unlined lagoons or percolation beds.
- Distributed for subsurface infiltration through shallow, buried perforated pipes.
- Wells constructed in the vadose zone.
- Other dispersal methods above the seasonal high water table.

Reclaimed water used for indirect groundwater recharge must meet all of the following requirements:

- WAC 173-219-330 Class A or B reclaimed water requirements (See Chapter 6, Treatment Technologies, in this manual).
- WAC 173-219-390 Table 3, Groundwater Use-Based Performance Standards.
- Monitoring requirements specified within this chapter.

12.1.1 Blended Flows for Groundwater Recharge

The Reclaimed Water Rule does not authorize the conveyance of stormwater. Separation of stormwater in the reclaimed water system is required except for the circumstances described below.

The following are examples of circumstances where a permittee may blend stormwater with reclaimed water for groundwater recharge:

- The commingled stormwater and reclaimed water is jointly treated to meet the reclaimed water standards for recharge prior to percolation.
- The stormwater is from non-pollutant generating impervious surfaces[3] or the stormwater is treated using best management practices in a current Ecology or approved local stormwater manual.
- Stormwater that falls directly on the infiltration site.

Reclaimed water blended with stormwater that indirectly recharges groundwater must meet the same water quality standards and monitoring requirements as those required for Indirect Recharge using reclaimed water only.

[3] Non Pollutant Generating Impervious Surfaces, as defined in the Eastern Washington Phase II Municipal Stormwater Permit, August 1, 2014.

12.2 Water Quality Requirements for Direct Groundwater Recharge

This section applies to direct recharge of reclaimed water into an aquifer using a well completed in the saturated zone. Reclaimed water used for groundwater recharge by direct injection must meet all of the following requirements:

- Class A reclaimed water quality requirements found in WAC 173-219-330
- The use-based performance standards in WAC 173-219-390 Table 3 for direct groundwater recharge (aquifer recharge).
- Sample and test reclaimed water for compliance with the State groundwater quality standards and drinking water standards, at the point of injection in the receiving groundwater or at the end of pipe prior to distribution to the aquifer.

The reclaimed water rule contains all the necessary standards and requirements that must be met for this beneficial use to be permitted under this rule, as 90.46 RCW intended.

For compliance within the aquifer where reclaimed water is stored, evaluate groundwater quality by using groundwater sample analyses results. The groundwater monitoring locations and the sample parameters chosen for analysis are based on the specific project conditions.

For direct recharge of reclaimed water, registration of the recharge facilities with Ecology under the Underground Injection Control Program (chapter 173-218 WAC) is required for any injection facility that meets the definition of an Underground Injection Control well.

12.3 Recovery of Reclaimed Water Stored in an Aquifer

RCW 90.46 provides Ecology with the authority to permit the beneficial use, storage, and recovery from storage of reclaimed water under the reclaimed water rule.

The reclaimed water rule contains the "review standards and standards for mitigation of adverse impacts from storage and recovery of reclaimed water in an aquifer" necessary to meet the legislative intent in 90.46 RCW and RCW 90.03.370(2) and (3), as well as the intent of Chapter 173-157 WAC.

The reclaimed water rule redefines the term aquifer storage and recovery (ASR) with the following terms:

- **Direct groundwater recharge** refers to the releasing of reclaimed water into ground water through direct injection (Aquifer Storage).
- **Recovery of reclaimed water stored in an aquifer** (aquifer recovery) is the recovery of the reclaimed water that has been stored in an aquifer.[4]

[4] Reclaimed water stored in an aquifer remains the property of the person that recharged it to the aquifer.

Because the ASR rule (Chapter 173-157 WAC) exempts "projects storing and recovering reclaimed water in an aquifer", the reclaimed water rule incorporates equivalent technical requirements and standards so that *direct groundwater recharge* and *recovery of reclaimed water stored in an aquifer* do not rely on, or reference, 173-157 WAC.

In addition, because RCW 90.46.120[5] provides an exemption that is dependent upon a permit for recovery of reclaimed water from an aquifer being "reviewed under the standards established under RCW 90.03.370(2)", the reclaimed water rule incorporates those standards, along with relevant requirements from Chapter 173-157 WAC, into the following sections of the reclaimed water rule:

- Engineering report content requirements in WAC 173-219-210.
- Reclaimed water permit terms and conditions in WAC 173-219-270.
- Used-based standards, (24) and (25) on Table 3 in WAC 173-219-390.

By placing equivalent standards and requirements into the reclaimed water rule, Ecology's intent is to address the different statutory requirements and/or exemptions from requirements that have caused confusion in the past.

The amount and schedule of reclaimed water permitted for recovery from groundwater storage will be based on project specific attributes, including: the quantity and timing of reclaimed water injection, the hydrogeologic properties of the storage aquifer, implications for water supply to other water rights holders in the aquifer, among other factors. Chemical fingerprinting may be considered as a factor in establishing the recovery amounts and timing.

Reclaimed water used for groundwater recharge must meet all of the following requirements:

- WAC 173-219-330 Class A reclaimed water requirements (See Chapter 6, Treatment Technologies, in this manual).
- WAC 173-219-390 Table 3, Groundwater Use-Based Performance Standards.
- Monitoring requirements specified within this chapter.

12.4 Groundwater Recharge Criteria

The lead agency will develop enforceable limits within a permit to ensure that the groundwater meets both the groundwater and drinking water quality standards. The groundwater quality standards are established by Ecology in WAC173-200 and contain numeric criteria in Table 1 of the Rule and narrative standards.

Project designers should consider aquifer vulnerability, the background groundwater quality, the reclaimed water source water characteristics, potential geochemical reactions between the reclaimed water and the ambient aquifer water, proposed uses of the water, and previously collected water quality information. As needed, the project proponent must clearly define the

[5] "…Use, distribution, storage, and the recovery from storage of reclaimed water permitted under this chapter is exempt from the permit requirements of RCW 90.03.250 and 90.44.060, provided that a permit for recovery of reclaimed water from aquifer storage shall be reviewed under the standards established under RCW 90.03.370(2) for aquifer storage and recovery projects…".

benefits of the project in demonstrating overriding consideration of public interest (in accordance with Section 3.2 of the *Implementation Guidance for the Groundwater Quality Standards*, #96-02, Ecology). See Guidance for Aquifer Storage and Recovery AKART Analysis and Overriding Consideration of Public Interest Demonstration for information for additional information on OCPI.

The possible risk to people and to aquatic life can only be partially addressed by project compliance with drinking water standards (Chapter 246-290 WAC). Drinking water standards lack criteria for many chemicals and their degradation or breakdown products. In some cases, criteria developed for individual chemicals do not take into account exposure to mixtures or seasonal high pulses in concentrations. In some situations, groundwater supports environmental systems requiring more stringent protection than that provided by the State Board of Health criteria in chapter 246-390 WAC. The lead agency may add additional constituents of concern (not listed in Table 12-3) if there is reason to believe that they are present in the reclaimed water at levels that would not adequately protect the beneficial uses of the water. An example of these could be contaminants of emerging concern.

Those considering the development or permitting of a reclaimed water project with groundwater recharge should review two key documents that will guide Department of Ecology and Department of Health decisions on water quality monitoring. The first is the *Implementation Guidance for the Groundwater Quality Standards*, #96-02, Ecology. This is a comprehensive guide to understanding and implementing the groundwater quality standards required by chapter 173-200 WAC.

Guidance for drinking water standards is presented in the *Water System Design Manual*, #331-123, Health; chapter 12 is devoted to water quality. Numerous Health publications offer guidance for specific drinking water contaminants and are available on their website: https://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/PublicationsandForms. To see the wellhead protection area locations in the project county go to the WA DOH Source Water Assessment Program Maps. This link includes an address query tool.

The minimum horizontal distance between a groundwater recharge site and any potable water supply well (WAC 173-219-360) must comply with restrictions for the sanitary control area established in WAC 246-290-135 for Group A public water supplies and WAC 246-291-125 for all other potable water supplies.

The state groundwater quality standards established by Ecology in chapter 173-200 WAC contain criteria in Table 1 of the WAC and narrative standards that include all other contaminants not listed in Table 1 (the practical quantitation level is used as the enforcement limit). The state drinking water standards established by the State Board of Health are codified in chapter 246-290 WAC. These standards are combined in Table 12-1 below (Health is shaded), with which reclaimed water storage projects must comply.

If a contaminant criteria is listed in both chapter 173-200 WAC and chapter 246-290 WAC but the criteria is not consistent between the two rules, the most stringent criteria must be met.

Table 12-1 Combined Groundwater Criteria and Drinking Water Standards.

(Contaminants without criteria are regulated by WAC 173-200 040 (3). The enforcement limit for constituents without criteria will be equal to the practical quantification limit.)

Standards Source	Contaminant Category	Contaminant	Criteria, Narrative	Criteria, Numeric	Units	CAS
Ecology	Carcinogen	Acrylamide		0.02	ug/L	79-06-1
Health	Synthetic Organic	Acrylamide	Treatment technique (TT)			79-06-1
Ecology	Carcinogen	Acrylonitrile		0.07	ug/L	107-13-1
Health	Synthetic Organic	Alachlor		0.002	mg/L	15972-60-8
Health	Synthetic Organic	Aldicarb		0.003	mg/L	116–06–3
Health	Synthetic Organic	Aldicarb sulfone		0.002	mg/L	1646–87–4
Health	Synthetic Organic	Aldicarb sulfoxide		0.004	mg/L	1646–87–3
Ecology	Carcinogen	Aldrin		0.005	ug/L	309-00-2
Health	Radioactive	Alpha emitters		15	pCi/l	NA
Ecology	Carcinogen	Aniline		14	ug/L	62-53-3
Health	Inorganic	Antimony		0.006	mg/L	7440-36-0
Ecology	Carcinogen	Aramite		3	ug/L	140-57-8
Ecology	Carcinogen	Arsenic	Measured as total metals	0.05	ug/L	7440-38-2
Health	Inorganic	Arsenic		0.01	mg/L	7440-38-2
Health	Inorganic	Asbestos		7	MFL	1332-21-4
Health	Synthetic Organic	Atrazine		0.003	mg/L	1912-24-9
Ecology	Carcinogen	Azobenzene		0.7	ug/L	103-33-3
Ecology	Primary	Barium	Measured as total metals	1	mg/1	7440-39-3
Health	Inorganic	Barium		2	mg/L	7440-39-3
Ecology	Carcinogen	Benzene		1	ug/L	71-43-2
Health	Volatile Organic	Benzene		0.005	mg/L	71-43-2
Ecology	Carcinogen	Benzidine		0.0004	ug/L	92-87-5
Ecology	Carcinogen	Benzo(a)pyrene		0.008	ug/L	50-32-8
Health	Synthetic Organic	Benzo(a)pyrene [PAH]		0.0002	mg/L	50-32-8
Ecology	Carcinogen	Benzotrichloride		0.007	ug/L	98-07-7
Ecology	Carcinogen	Benzyl chloride		0.5	ug/L	100-44-7
Health	Inorganic	Beryllium		0.004	mg/L	7440-41-7

Standards Source	Contaminant Category	Contaminant	Criteria, Narrative	Criteria, Numeric	Units	CAS
Health	Radioactive	Beta/photon emitters		4	mrem/ yr	NA
Ecology	Carcinogen	Bis(chloroethyl)ether		0.07	ug/L	111-44-4
Ecology	Carcinogen	Bis(chloromethyl)-ether		0.0004	ug/L	542-88-1
Health	Disinfection Byproduct	Bromate		0.01	mg/L	15541-45-4
Ecology	Carcinogen	Bromodichloro-methane		0.3	ug/L	75-27-4
Ecology	Carcinogen	Bromoform		5	ug/L	75-25-2
Ecology	Primary	Cadmium	Measured as total metals	0.01	mg/1	7440-43-9
Health	Inorganic	Cadmium		0.005	mg/L	7440-43-9
Ecology	Carcinogen	Carbazole		5	ug/L	86-74-8
Health	Synthetic Organic	Carbofuran		0.04	mg/L	1563-66-2
Ecology	Carcinogen	Carbon tetrachloride		0.3	ug/L	56-23-5
Health	Volatile Organic	Carbon tetrachloride		0.005	mg/L	56-23-5
Health	Maximum Residual Disinfectant Levels	Chloramines	MRDL = 4; MRDLG = 4	4	mg/L	NA
Ecology	Carcinogen	Chlordane		0.06	ug/L	57-74-9
Health	Synthetic Organic	Chlordane		0.002	mg/L	57-74-9
Ecology	Secondary	Chloride		250	mg/1	16887-00-6
Health	Maximum Residual Disinfectant Levels	Chlorine	MRDL = 4; MRDLG = 4	4	mg/L	7782-50-5
Health	Maximum Residual Disinfectant Levels	Chlorine dioxide	MRDL = .8; MRDLG = 800	0.8	mg/L	10049-04-4
Health	Disinfection Byproduct	Chlorite		1	mg/L	14998-27-7
Ecology	Carcinogen	4 Chloro-2-methyl analine hydrochloride		0.2	ug/L	3165-93-3
Ecology	Carcinogen	4 Chloro-2-methyl aniline		0.1	ug/L	95-69-2
Health	Volatile Organic	Chlorobenzene		0.1	mg/L	108-90-7

Standards Source	Contaminant Category	Contaminant	Criteria, Narrative	Criteria, Numeric	Units	CAS
Ecology	Carcinogen	Chlorodibromo-methane		0.5	ug/L	124-48-1
Ecology	Carcinogen	Chloroform		7	ug/L	67-66-3
Ecology	Carcinogen	o-Chloronitrobenzene		3	ug/L	88-73-3
Ecology	Carcinogen	p-Chloronitrobenzene		5	ug/L	100-00-5
Ecology	Carcinogen	Chlorthalonil		30	ug/L	1897-45-6
Ecology	Primary	Chromium	Measured as total metals	0.05	mg/1	7440-47-3
Health	Inorganic	Chromium		0.1	mg/L	7440-47-3
Ecology	Secondary	Color		15	color units	NA
Health	Radioactive	Combined radium		5	pCi/l	NA
Ecology	Secondary	Copper	Measured as total metals	1	mg/1	7440-50-8
Health	Inorganic	Copper	Action Level = 1.3 ppm	1.3	mg/L	7440-50-8
Ecology	Secondary	Corrosivity	noncorrosive			NA
Health	Inorganic	Cyanide		0.2	mg/L	57-12-5
Ecology	Primary	2-4 D		0.1	mg/1	94-75-7
Health	Synthetic Organic	2,4-D		0.07	mg/L	94-75-7
Health	Synthetic Organic	Dalapon		0.2	mg/L	75-99-0
Ecology	Carcinogen	4,4-DDD		0.3	ug/L	72-54-8
Ecology	Carcinogen	4,4-DDE		0.3	ug/L	72-55-9
Ecology	Carcinogen	DDT (includes DDE and DDD)		0.3	ug/L	50-29-3
Health	Synthetic Organic	Di(2-ethylhexyl) adipate		0.4	mg/L	103-23-1
Ecology	Carcinogen	Diallate		1	ug/L	2303-16-4
Health	Synthetic Organic	Dibromochloroprop ane		0.0002	mg/L	96-12-8
Ecology	Carcinogen	1,2 Dibromoethane		0.001	ug/L	106-93-4
Ecology	Carcinogen	1,4 Dichlorobenzene		4	ug/L	106-46-7
Health	Volatile Organic	o-Dichlorobenzene		0.6	mg/L	95-50-1
Health	Volatile Organic	p-Dichlorobenzene		0.075	mg/L	106-46-7
Ecology	Carcinogen	3,3' Dichlorobenzidine		0.2	ug/L	91-94-1
Ecology	Carcinogen	1,1 Dichloroethane		1	ug/L	75-34-3

Standards Source	Contaminant Category	Contaminant	Criteria, Narrative	Criteria, Numeric	Units	CAS
Ecology	Carcinogen	1,2 Dichloroethane (ethylene chloride)		0.5	ug/L	107-06-2
Health	Volatile Organic	1,2-Dichloroethane		0.005	mg/L	107-06-2
Health	Volatile Organic	1,1-Dichloroethylene		0.007	mg/L	75-35-4
Health	Volatile Organic	cis-1,2-Dichloroethylene		0.07	mg/L	156-59-2
Health	Volatile Organic	trans-1,2-Dichloroethylene		0.1	mg/L	156-60-5
Health	Volatile Organic	Dichloromethane		0.005	mg/L	75-09-2
Ecology	Carcinogen	1,2 Dichloropropane		0.6	ug/L	78-87-5
Health	Volatile Organic	1,2-Dichloropropane		0.005	mg/L	78-87-5
Ecology	Carcinogen	1,3 Dichloropropene		0.2	ug/L	542-75-6
Ecology	Carcinogen	Dichlorvos		0.3	ug/L	62-73-7
Ecology	Carcinogen	Dieldrin		0.005	ug/L	60-57-1
Ecology	Carcinogen	3,3' Dimethoxybenzidine		6	ug/L	119-90-4
Ecology	Carcinogen	3,3 Dimethylbenzidine		0.007	ug/L	119-93-7
Ecology	Carcinogen	1,2 Dimethylhydrazine		60	ug/L	540-73-8
Ecology	Carcinogen	2,4 Dinitrotoluene		0.1	ug/L	121-14-2
Ecology	Carcinogen	2,6 Dinitrotoluene		0.1	ug/L	606-20-2
Health	Synthetic Organic	Dinoseb		0.007	mg/L	88-85-7
Ecology	Carcinogen	1,4 Dioxane		7	ug/L	123-91-1
Health	Synthetic Organic	Dioxin [2,3,7,8-TCDD]		3E-08	mg/L	NA
Ecology	Carcinogen	1,2 Diphenylhydrazine		0.09	ug/L	122-66-7
Health	Synthetic Organic	Diquat		0.02	mg/L	85-00-7
Ecology	Carcinogen	Direct Black 38		0.009	ug/L	1937-37-7
Ecology	Carcinogen	Direct Blue 6		0.009	ug/L	2602-46-2
Ecology	Carcinogen	Direct Brown 95		0.009	ug/L	16071-86-6
Health	Synthetic Organic	Endothall		0.1	mg/L	145-73-3
Ecology	Primary	Endrin		0.0002	mg/1	72-20-8
Health	Synthetic Organic	Endrin		0.002	mg/L	72-20-8
Ecology	Carcinogen	Epichlorohydrin		8	ug/L	106-89-8

Standards Source	Contaminant Category	Contaminant	Criteria, Narrative	Criteria, Numeric	Units	CAS
Health	Synthetic Organic	Epichlorohydrin	Treatment technique (TT)			106-89-8
Ecology	Carcinogen	Ethyl acrylate		2	ug/L	140-88-5
Health	Volatile Organic	Ethylbenzene		0.7	mg/L	100-41-4
Ecology	Carcinogen	Ethylene dibromide		0.001	ug/L	106-93-4
Health	Synthetic Organic	Ethylene dibromide		0.00005	mg/L	106-93-4
Ecology	Carcinogen	Ethylene thiourea		2	ug/L	96-45-7
Health	Microbiological	Fecal coliform and E. coli		0	Not Stated	NA
Health	Microbiological	Fecal indicators (E. coli)	Treatment technique (TT)			68583-22-2
Ecology	Primary	Fluoride		4	mg/1	16984-48-8
Health	Inorganic	Fluoride		4	mg/L	16984-48-8
Ecology	Secondary	Foaming Agents		0.5	mg/1	NA
Ecology	Carcinogen	Folpet		20	ug/L	133-07-3
Ecology	Carcinogen	Furazolidone		0.02	ug/L	67-45-8
Ecology	Carcinogen	Furium		0.002	ug/L	531-82-8
Ecology	Carcinogen	Furmecyclox		3	ug/L	60568-05-0
Health	Microbiological	Giardia lamblia Viruses Cryptosporidium	Treatment technique (TT)			NA
Health	Synthetic Organic	Glyphosate		0.7	mg/L	1071-83-6
Ecology	Radionuclides	Gross Alpha Particle Activity		15	pCi/l	NA
Ecology	Radionuclides	Gross Beta Activity	Gross Beta Particle Radioactivity	50	pCi/l	NA
Health	Treatment Technique Violations	Groundwater Rule TT violations	Treatment technique (TT)			NA
Health	Disinfection Byproduct	Haloacetic Acids (HAA)		0.06	mg/L	NA
Ecology	Carcinogen	Heptachlor		0.02	ug/L	76-44-8
Health	Synthetic Organic	Heptachlor		0.0004	mg/L	76-44-8
Ecology	Carcinogen	Heptachlor Epoxide		0.009	ug/L	1024-57-3
Health	Synthetic Organic	Heptachlor epoxide		0.0002	mg/L	1024-57-3

Standards Source	Contaminant Category	Contaminant	Criteria, Narrative	Criteria, Numeric	Units	CAS
Health	Microbiological	Heterotrophic plate count (HPC) bacteria	Treatment technique (TT)			NA
Ecology	Carcinogen	Hexachlorobenzene		0.05	ug/L	118-74-1
Health	Synthetic Organic	Hexachlorobenzene		0.001	mg/L	118-74-1
Ecology	Carcinogen	Hexachlorocyclohexane (alpha)		0.001	ug/L	319-84-6
Ecology	Carcinogen	Hexachlorocyclohexane (technical)		0.05	ug/L	608-73-1
Health	Synthetic Organic	Hexachlorocyclo-pentadiene		0.05	mg/L	77-47-4
Ecology	Carcinogen	Hexachlorodibenzo-p-dioxin, mix		0.00001	ug/L	19408-74-3
Ecology	Carcinogen	Hydrazine		0.03	ug/L	302-01-2
Ecology	Carcinogen	Hydrazine sulfate		0.3	ug/L	10034-93-2
Ecology	Secondary	Iron	Measured as total metals	0.3	mg/1	7439-89-6
Ecology	Primary	Lead	Measured as total metals	0.05	mg/1	7439-92-1
Health	Inorganic	Lead	Action Level = 0.15 ppb	0.015	mg/L	7439-92-1
Health	Microbiological	Legionella	Treatment technique (TT)			NA
Ecology	Carcinogen	Lindane		0.06	ug/L	58-89-9
Health	Synthetic Organic	Lindane		0.0002	mg/L	58-89-9
Ecology	Secondary	Manganese	Measured as total metals	0.05	mg/1	7439-96-5
Ecology	Primary	Mercury	Measured as total metals	0.002	mg/1	7439-97-6
Health	Inorganic	Mercury [inorganic]		0.002	mg/L	7439-97-6
Ecology	Carcinogen	2 Methoxy-5-nitroaniline		2	ug/L	99-59-2
Ecology	Primary	Methoxychlor		0.1	mg/1	72-43-5
Health	Synthetic Organic	Methoxychlor		0.04	mg/L	72-43-5
Ecology	Carcinogen	2 Methylaniline		0.2	ug/L	95-53-4
Ecology	Carcinogen	2 Methylaniline hydrochloride		0.5	ug/L	636-21-5

Standards Source	Contaminant Category	Contaminant	Criteria, Narrative	Criteria, Numeric	Units	CAS
Ecology	Carcinogen	4,4' Methylene bis(N,N'-dimethyl) aniline		2	ug/L	101-61-1
Ecology	Carcinogen	Methylene chloride (dichloromethane)		5	ug/L	75-09-2
Ecology	Carcinogen	Mirex		0.05	ug/L	2385-85-5
Health	Inorganic	Nitrate		10	mg/L	14797-55-8
Ecology	Primary	Nitrate (as N)		10	mg/1	14797-55-8
Health	Inorganic	Nitrite		1	mg/L	14797-65-0
Ecology	Carcinogen	Nitrofurazone		0.06	ug/L	59-87-0
Ecology	Carcinogen	N-Nitrosodiethanolamine		0.03	ug/L	1116-54-7
Ecology	Carcinogen	N-Nitrosodiethylamine		0.0005	ug/L	55-18-5
Ecology	Carcinogen	N-Nitrosodimethylamine		0.002	ug/L	62-75-9
Ecology	Carcinogen	N-Nitroso-di-n-butylamine		0.02	ug/L	924-16-3
Ecology	Carcinogen	N-Nitroso-di-n-propylamine		0.01	ug/L	621-64-7
Ecology	Carcinogen	N-Nitrosodiphenylamine		17	ug/L	86-30-6
Ecology	Carcinogen	N-Nitroso-N-methylethylamine		0.004	ug/L	10595-95-6
Ecology	Carcinogen	N-Nitrosopyrrolidine		0.04	ug/L	930-55-2
Ecology	Secondary	Odor		3	threshold odor units	NA
Health	Synthetic Organic	Oxamyl [Vydate]		0.2	mg/L	23135-22-0
Ecology	Carcinogen	PAH		0.01	ug/L	130498-29-2
Ecology	Carcinogen	PBBs		0.01	ug/L	NA
Ecology	Carcinogen	PCBs		0.01	ug/L	1336-36-3
Health	Synthetic Organic	PCBs [Polychlorinated biphenyls]		0.0005	mg/L	1336-36-3
Health	Synthetic Organic	Pentachlorophenol		0.001	mg/L	87-86-5
Ecology	Secondary	pH	6.5-8.5		pH units	NA

Standards Source	Contaminant Category	Contaminant	Criteria, Narrative	Criteria, Numeric	Units	CAS
Ecology	Carcinogen	o-Phenylenediamine		0.005	ug/L	95-54-5
Health	Synthetic Organic	Di(2-ethylhexyl) phthalate		0.006	mg/L	117-81-7
Ecology	Carcinogen	Bis(2-ethylhexyl) phthalate		6	ug/L	117-81-7
Health	Synthetic Organic	Picloram		0.5	mg/L	1918-02-1
Ecology	Carcinogen	Propylene oxide		0.01	ug/L	75-56-9
Ecology	Radionuclides	Radium -226		3	pCi/1	13982-63-3
Ecology	Radionuclides	Radium 226 & 228		5	pCi/1	13982-63-3 & 15262-20-1
Ecology	Primary	Selenium	Measured as total metals	0.01	mg/1	7782-49-2
Health	Inorganic	Selenium		0.05	mg/L	7782-49-2
Ecology	Primary	Silver	Measured as total metals	0.05	mg/1	7440-22-4
Health	Synthetic Organic	Simazine		0.004	mg/L	122-34-9
Ecology	Radionuclides	Strontium-90	Gross Beta Particle Radioactivity	8	pCi/l	10098-97-2
Health	Volatile Organic	Styrene		0.1	mg/L	100-42-5
Ecology	Secondary	Sulfate		250	mg/1	14808-79-8
Ecology	Carcinogen	2,3,7,8-Tetrachlorodibenzo-p-dioxin		0.0000006	ug/L	1746-01-6
Health	Volatile Organic	Tetrachloroethylene		0.005	mg/L	127-18-4
Ecology	Carcinogen	Tetrachloroethylene (perchloroethylene)		0.8	ug/L	127-18-4
Ecology	Carcinogen	p,α,α,α-Tetrachlorotoluene		0.004	ug/L	5216-25-1
Health	Inorganic	Thallium		0.002	mg/L	7440-28-0
Health	Volatile Organic	Toluene		1	mg/L	108-88-3
Ecology	Carcinogen	2,4 Toluenediamine		0.002	ug/L	95-80-7
Ecology	Carcinogen	o-Toluidine		0.2	ug/L	95-53-4
Ecology	Primary	Total Coliform Bacteria	1/100 mL	1	1/100 mL	NA

Standards Source	Contaminant Category	Contaminant	Criteria, Narrative	Criteria, Numeric	Units	CAS
Health	Microbiological	Total Coliform Bacteria	MCL: (systems that collect ≥ 40 samples/ month) more than 5% of monthly samples are positive; (systems that collect < 40 samples/ month) 2 or more positive samples per monthly sampling period			NA
Ecology	Secondary	Total Dissolved Solids		500	mg/1	NA
Health	Microbiological	Total organic carbon	Treatment technique (TT)			NA
Ecology	Carcinogen	Toxaphene		0.08	ug/L	8001-35-2
Health	Synthetic Organic	Toxaphene		0.003	mg/L	8001-35-2
Health	Synthetic Organic	2,4,5-TP [Silvex]		0.05	mg/L	93-72-1
Ecology	Primary	2,4,5-TP Silvex		0.01	mg/1	93-72-1
Health	Volatile Organic	1,2,4-Trichlorobenzene		0.07	mg/L	120-82-1
Ecology	Primary	1,1,1-Trichloroethane		0.2	mg/1	71-55-6
Health	Volatile Organic	1,1,1-Trichloroethane		0.2	mg/L	71-55-6
Health	Volatile Organic	1,1,2-Trichloroethane		0.005	mg/L	79-00-5
Ecology	Carcinogen	Trichloroethylene		3	ug/L	79-01-6
Health	Volatile Organic	Trichloroethylene		0.005	mg/L	79-01-6
Ecology	Carcinogen	2,4,6-Trichlorophenol		4	ug/L	88-06-2
Ecology	Carcinogen	Trimethyl phosphate		2	ug/L	512-56-1
Ecology	Radionuclides	Tritium	Gross Beta Particle Radioactivity	20000	pCi/l	10028-17-8

Standards Source	Contaminant Category	Contaminant	Criteria, Narrative	Criteria, Numeric	Units	CAS
Health	Disinfection Byproduct	TTHMs [Total trihalomethanes]		0.08	mg/L	NA
Health	Microbiological	Turbidity	Treatment technique (TT)		NTU	NA
Health	Radioactive	Uranium		30	ug/L	7440-61-1
Ecology	Carcinogen	Vinyl chloride		0.02	ug/L	75-01-4
Health	Volatile Organic	Vinyl Chloride		0.002	mg/L	75-01-4
Health	Volatile Organic	Xylenes		10	mg/L	1330-20-7
Ecology	Secondary	Zinc	Measured as total metals	5	mg/1	7440-66-6

12.5 Groundwater Monitoring

The reclaimed water permit issued by the lead agency will establish the point of compliance for the enforceable limits. The following are the monitoring point options for the point of compliance (WAC 173-219-270(5)):

- End of pipe in the reclaimed water prior to recharge.
- Within the receiving groundwater, as close to the recharge location as is technically, hydrogeologically, and geographically feasible.
- An alternate location in the groundwater within the project property boundaries.
- In surface water in continuity with the groundwater at a point beyond the project property boundaries, when needed to verify compliance with the surface water quality standards, chapter 173-201A WAC.

Applicants planning to recover reclaimed water from their direct groundwater recharge projects should refer to Section 12.4, Groundwater Recharge Criteria, for more information.

12.5.1 Monitoring of the Receiving Groundwater Body

If the lead agency determines that groundwater monitoring is necessary to protect groundwater quality, a groundwater monitoring plan will be prepared by the permittee, approved by the lead agency, and incorporated into the reclaimed water permit.

- Monitoring at end-of-pipe verifies that the reclaimed water treatment facility is in compliance with permitted discharge constituent concentrations. That end-of-pipe monitoring can also be used to assess whether the reclaimed water quality is satisfactory to meet the groundwater quality criteria requirements (including nitrate concentrations) when it is recharged to groundwater.
- Monitoring should be based on reclaimed water quality and quantity, site-specific soil and hydrogeologic characteristics.

- Baseline concentrations in groundwater for parameters in reclaimed water must be established prior to initiation of groundwater recharge operations.
- Once reclaimed water is recharged to groundwater (either directly or indirectly) monitoring is required from at least two down gradient monitoring wells. The minimum groundwater monitoring frequency is quarterly. Analytes measured in groundwater will be defined based on the specific project, and listed in the facility permit.
- Monitoring wells should assess reclaimed water quality along the groundwater flow path, and establish the groundwater gradient and flow direction. The number and location of proposed monitoring wells, and the frequency of monitoring, should be described in the Hydrogeologic System Conceptual Model and the Project Monitoring Plan, or a quality assurance project plan, or an engineering report.
- Constituents recommended for monitoring in projects that directly recharge groundwater are listed shown in Table 12-2.

An example of a groundwater monitoring schedule and list of parameters, for groundwater recharge by indirect injection, is listed in Table 12-3.

Table 12-2 Recommended constituents for Monitoring of Direct Groundwater Recharge

General Parameters	**Nutrients**
Alkalinity and bicarbonate	Total nitrogen
Boron	Ammonia
Calcium	Nitrate
Chloride	Total phosphorus
Dissolved oxygen	Orthophosphate
Fluoride	Total kjeldahl nitrogen
Hardness	
Magnesium	**Metals**
pH	Arsenic
Potassium	Barium
Sodium	Cadmium
Sulfate	Copper
total dissolved solids (TDS)	Iron
Temperature	Lead
total organic carbon (TOC)	Mercury
turbidity	Selenium
redox potential	Boron
	Calcium
Industrial pollutants	Magnesium
Perchlorate	Sodium
Chlorate	
Bromate	**Pathogens**
Iodate	Total coliform
PBDEs	E coli or enterococci bacteria
PCBs	Coliphage
PFOS	Cryptosporidium

Pesticides	Giardia
Aldrin	HPC
Atrazine	Disinfection Byproducts
Diazinon	Cyanide
Dieldrin	Individual and Total trihalomethanes
Chlorpyrifos	Individual and Total Halo-acetic acids
Lindane	NDMA

Table 12-3 Example Groundwater Monitoring Schedule for Indirect Groundwater Recharge

Parameter	Units	Minimum Sampling Frequency	Sample Type
Static well water elevation	Feet above sea level	Quarterly(1)	Measurement
pH	Standard Units	Quarterly(1)	Measurement
Nitrate NO_3 (as N)	mg/L	Quarterly(1)	Grab
TKN (as N)	mg/L	Quarterly(1)	Grab
Total Dissolved Solids	mg/L	Quarterly(1)	Grab
Total Coliform Bacteria	MPN/100 mL	Quarterly(1)	Grab
Chloride	mg/L	Quarterly(1)	Grab
TOC	Mg/L	Quarterly	Grab
Cations/Anions: Calcium, Magnesium, Potassium, Sodium, Bicarbonate, Carbonate, Fluoride, sulfate	mg/L	Yearly(2)	Grab
Total Metals: Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Silver, Zinc(3)	μg/L	Yearly(2)	Grab
Total Trihalomethanes (TTHM)	mg/L	Quarterly(1)	Grab

1 Quarterly is defined as every three months.

2 Yearly is defined as once within twelve consecutive months.

3 Analytical method: Arsenic, USEPA 206.3 or 206.2; Cadmium, USEPA 2007.7 or 213.2; Chromium, USEPA 200.7 or 218.2; Copper, USEPA 200.7 or 220.2; Lead, USEPA 239.2; Mercury, USEPA 245.1 or 245.2; Nickel, USEPA 249.2; Silver, USEPA 272.2; Zinc, USEPA 200.7 or 289.1.

12.5.2 End-of Pipe Monitoring for Groundwater Quality Protection

For any parameters detected in the reclaimed water prior to recharge, the lead agency will require groundwater data collection to establish background groundwater conditions for those parameters prior to initiation of the groundwater recharge operations.

Groundwater monitoring can be discontinued for specific parameters or constituents if it can be determined that the recharged reclaimed water does not:

- Result in groundwater quality trends toward higher contaminant concentrations, or
- Impact the suitability of the groundwater for beneficial use.

12.6 Hydrogeologic Evaluation for Reclaimed Water used to Recharge Groundwater

The hydrogeologic evaluation for an aquifer recharge project will conform to the requirements established in the *Criteria for Sewage Works Design*, Section E3-4 Groundwater Quality Standards Checklist (Ecology Publication no. 98-37).

The hydrogeologic evaluation is intended to establish a conceptual hydrogeologic model that is used to guide the development of the project design, identify data gaps and to define additional data collection needs. With subsequent characterization work, the hydrogeologic evaluation assesses the potential impact of the project operations on groundwater quality, defines protective measures to minimize or mitigate those impacts, and defines the monitoring needed to assess facility compliance with the permit conditions.

> Understanding of the groundwater system will increase in specificity and accuracy as the project proceeds.

The following are the steps to characterize the hydrogeologic system for groundwater recharge and recovery of reclaimed water stored in an aquifer:

- Feasibility Analysis
  - Existing data on the proposed receiving aquifer system is assembled into a conceptual model that includes: regional geology (stratigraphy and structure); geology of target reservoir unit(s); hydrogeology: recharge and discharge locations, annual estimates; water level variations; reservoir areal extent and thickness, confined conditions, water levels; reservoir transmissivity, permeability, porosity; location(s) of nearby surface water, wetlands, floodplains, and groundwater wells; locations of existing documented natural hazards potentially impacted by project.
- Conceptual Model Framework
  - Model framework that is flexible enough to guide and incorporate the various data collected for characterization and design of project components (i.e. variations in recharge rates and volumes, agricultural drain interactions, physio-chemical aquifer modeling).
  - Model framework allows for iteration between conceptual model, data collection, and numerical model development, and leads to iterations that reduce uncertainty.
  - Data gaps are clearly identified, such as well locations, construction and depth of wells needed to address specific data needs.
  - Allows for incorporation of new data and identification of QA/QC criteria for generation of that data.
  - Facilitates GIS analyses and 3D visualization of model framework and updates to model.
  - Supports the understanding and decision making of technical staff (engineers, hydrogeologists, managers) on the hydrogeologic system response and management of aquifer recharge and recovery operations.

- Pilot Test
  - Test well drilled to receiving aquifer, which collects the following hydrogeologic information: direction and rate of water movement, changes to aquifer properties due to testing; reservoir suitability for injection and storage; estimated areal extent of project impacts. For the target aquifer the potential impact to any nearby waterbody, water users, and mounding, is evaluated, potentially using numerical simulations to estimate travel times. Data addressing existing data gaps is collected and a report submitted with results of testing and refinements to the conceptual model.
- Engineering Design
  - Incorporate the pilot test aquifer characterization and performance results into the reclaimed water system design. Aquifer storage system design should account for existing water quality in proposed storage geologic unit(s) and water quality of the injected reclaimed water, and the predicted mixing between native and recharged water. Specifically, the following processes should be considered in the design and operation of the aquifer storage system: geochemical changes anticipated; reactions of injected water with aquifer minerals; measures to control metals mobilized during injection; uncertainties in predicted performance.
  - Additional data needed for effective system design and operation should be identified and collected as part of final Engineering Design Report approval and project permitting.

Hydrogeologic information characterizing the following aspects of the site hydrogeology will be used in establishing permit conditions that are protective of groundwater quality:

- Lateral and vertical extent of storage aquifer
- Confined or unconfined aquifer
- Permeability
- Total storage volume available
- Effective hydraulic conductivity
- Transmissivity
- Potential for physio-chemical changes in the aquifer or vadose zone as a consequence of recharge
- Estimated flow direction and rate of movement
- Anticipated changes to the groundwater system due to the proposed project
- Estimated area that could be affected by the project
- General geology, stratigraphy and structure
- Locations of existing documented natural hazards that could be affected
- Locations of surface waters
- Locations of all wells or other sources of groundwater of record within the area affected
- The chemical and physical composition of the reclaimed water and its compatibility with the naturally occurring waters of the receiving aquifer