

Fact Sheet for NPDES Permit WA0030023

University of Washington Medical Center

Date of Public Notice: November 3, 2020

Purpose of this fact sheet

This fact sheet explains and documents the decisions the Department of Ecology (Ecology) made in drafting the proposed National Pollutant Discharge Elimination System (NPDES) permit for UW Medical Center.

This fact sheet complies with [Section 173-220-060 of the Washington Administrative Code \(WAC\)](#), which requires Ecology to prepare a draft permit and accompanying fact sheet for public evaluation before issuing an NPDES permit.

Ecology makes the draft permit and fact sheet available for public review and comment at least thirty (30) days before issuing the final permit. Copies of the fact sheet and draft permit for UW Medical Center, NPDES permit WA0030023, are available for public review and comment from November 3, 2020 until December 3, 2020. For more details on preparing and filing comments about these documents, please see **Appendix A - Public Involvement Information**.

UW Medical Center reviewed the draft permit and fact sheet for factual accuracy. Ecology corrected any errors or omissions regarding the facility's location, history, discharges, or receiving water prior to publishing this draft fact sheet for public notice.

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

Summary

UW Medical Center discharges non-contact cooling water from its chillers to Portage Bay Lake Union through Outfall 001. Ecology issued the previous permit for this facility on October 17, 2011. The effluent limit for flow has been reduced approximately one-half million gallons per day maximum from the permit issued in 2011.

The Lake Union / Lake Washington Ship Canal is included on the State's 303(d) list of impaired waters for exceeding water quality standards for temperature with emphasis on negative impacts to migrating salmon. This discharge of heated water to a water body that exceeds temperature standards should be eliminated. Opportunities to reduce warm water inputs are limited in this urban setting due to existing development. The permit will require an engineering report to evaluate the cost and feasibility of replacing the current system with an air cooling system for the medical center that will eliminate this discharge to Portage Bay.

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I. Introduction

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

The following regulations apply to industrial NPDES permits:

- Procedures Ecology follows for issuing NPDES permits ([chapter 173-220 WAC](#))
- Water quality criteria for surface waters ([chapter 173-201A WAC](#))
- Water quality criteria for ground waters ([chapter 173-200 WAC](#))
- Whole effluent toxicity testing and limits ([chapter 173-205 WAC](#))
- Sediment management standards ([chapter 173-204 WAC](#))
- Submission of plans and reports for construction of wastewater facilities ([chapter 173-240 WAC](#))

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

Under the NPDES permit program and in response to a complete and accepted permit application, Ecology must prepare a draft permit and accompanying fact sheet, and make them available for public review before final issuance. Ecology must also publish an announcement (public notice) telling people where they can read the draft permit, and where to send their comments, during a period of thirty days ([WAC 173-220-050](#)). (See **Appendix A-Public Involvement Information** for more detail about the public notice and comment procedures). After the public comment period ends, Ecology may make changes to the draft NPDES permit in response to comment(s). Ecology will summarize the responses to comments and any changes to the permit in **Appendix E**.

II. Background Information

Table 1 — Facility Information

Applicant:	University of Washington Medical Center
Facility Name and Address	1959 NE Pacific Street Seattle, WA 98195
Contact at Facility	Name: John Wallace Telephone #: 206-616-5837
Responsible Official	Name: Katia Harb Title: Senior Director, UW Environmental Health and Safety Address: PO Box 354400, Seattle WA 98195 Telephone #: 206-616-4146
Industry Type	Hospital and outpatient medical clinics
Type of Treatment	Cooling in underground concrete stormwater pipe
SIC Codes	8221
NAIC Codes	611310
Facility Location (NAD83/WGS84 reference datum)	Latitude: 47.648957 Longitude: -122.308483
Discharge Waterbody Name and Location (NAD83/WGS84 reference datum)	Portage Bay, Lake Union Latitude: 47.648984 Longitude: -122.311214

Table 2 — Permit Status

Issuance Date of Previous Permit	October 17, 2011
Application for Permit Renewal Submittal Date	April 12, 2016
Date of Ecology Acceptance of Application	October 18, 2016

Table 3 — Inspection Status

Date of Last Non-sampling Inspection Date	October 25, 2017
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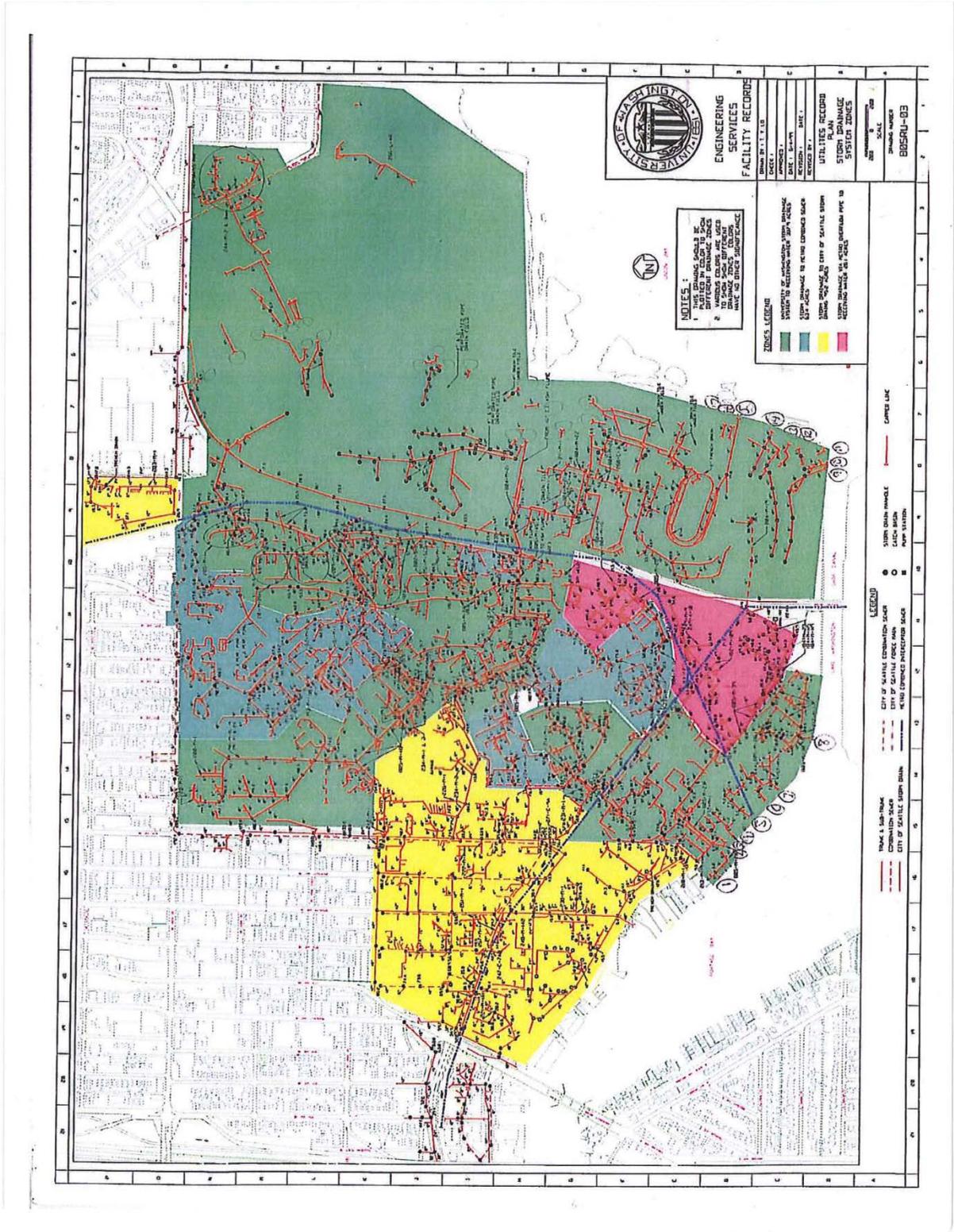


Figure 1 — Facility Location Map

DRAFT

A. Facility description

Location

The University of Washington Medical Center (UWMC) is located at the intersection of Mountlake Boulevard and Pacific Avenue on the University of Washington campus in Seattle, Washington. The facility provides health care instruction and conducts health care and medical research.

Noncontact Cooling Water Discharge

Water is withdrawn from Portage Bay, Lake Union, utilized as noncontact cooling water in hospital chiller condensers. No treatment chemicals are added. The cooling water circulates between the two 700-ton Carrier brand centrifugal chillers (installed 1999) located in the northeast corner of the S-1 parking garage. It picks up heat and returns the water to the bay. The 400-ton York Chiller and the 50-ton Carrier reciprocating compressor are seldom run. They are located in room SW 010 of the medical center. The large chiller provides cool air to the Pacific Tower building and the computer room for the UWMC.

Water flow is monitored by a flow meter located in the utility tunnel between the S-1 machine room and the fisheries building where the pipe goes underground and connects to the 84-inch city storm sewer outfall line and discharges to Lake Union.

In 2013, the University replaced the old chart recorder with a Temp Track System, which records the flow rate and temperature data via the UWMC website for electronic data submittal. This also allows the non-contact chiller water to be monitored by the same system currently used throughout the UWMC for refrigeration and patient care. Maintenance issues and equipment failures can be managed in “real time”. Alarms can be sent via text messages to staff or email to supervisors.

Two thermocouples are located nearby the outfall, in the receiving water. One is located at five meters (16.5 feet) from the outfall, and one is at ten meters (33 feet) from the outfall.

The facility conducted a cooling water study in late 1998 to explore an alternative cooling system to replace the existing system which utilizes a large volume of water for cooling and consequently results in a high temperature in the discharge to Portage Bay. The study contained the conclusion that it would not be cost effective for the facility to replace the existing system with a cooling tower system. As a result, the facility upgraded the existing chilled water system by replacing one of the two old 400-ton chillers with two new 700-ton chillers. This upgrade was necessary due to the growth of the medical center over the years, and it also reduces the temperature in the effluent discharge to Portage Bay. The facility’s goal is to replace the remaining 400-ton chiller with an 800-ton chiller in the near future.

CSO/Stormwater Outfall Pipe Temperature Probes

The facility's chiller effluent is connected to the City combined sewer overflow (CSO) & stormwater pipe at a point approximately 780 feet from Portage Bay. The discharge receives some cooling from 1) contacting the underground pipe, 2) mixing with the stormwater that flows through the pipe before it enters Portage Bay, and 3) mixing with backwatered lake water in the underground pipe before it reaches the outfall. The approximate center of the outfall is at an elevation of 17.5 feet. The outfall pipe is about halfway submerged all year where it meets the lake. The outfall pipe is seven feet in diameter, and the bottom of the pipe is at an elevation of 14 feet. Currently the effluent temperature probe is positioned at the same depth as the outfall pipe approximately 16.5 feet from the outfall, and the background or ambient temperature probe is at the same depth of the outfall pipe approximately 33 feet away from the outfall.

Stormwater Discharge

Stormwater discharges from University of Washington are covered under WAR044700 as a Secondary Permittee of the Phase I Municipal Stormwater Permit. Combined Sewer Overflows (CSOs) from the University Regulator (DSN #015) are covered under the King County West Point WWTP NPDES permit WA0029181.

B. Description of the receiving water

UWMC discharges to Portage Bay, Lake Union/ Lake Washington Ship Canal, at the outfall of the CSO University Regulator. CSOs occur during heavy rains when stormwater inflows exceed the capacity of the sewer system, averaging 10 events per year (48 total events) over the period 2014 – 2018. The average CSO event had a duration of 4.38 hours and a discharge of 7.3 million gallons, with considerable variation from storm to storm.

Water temperature is monitored by King County at station Lake Union-0540. The station is located in the Montlake Cut, just upstream of the University outfall. Over the last ten years (2010 to 2019), 0540 recorded an average winter (Jan-Mar) temperature of 46.1°F (7.8°C), an average spring (Apr-Jun) temperature of 58.7°F (14.8°C), an average summer (Jul-Sep) temperature of 69.7°F (21°C) and an average autumn (Oct-Dec) temperature of 54.7°F (12.6°C). The average summer temperatures of Portage Bay exceeds the water quality standard of 60.8°F (16°C). Temperatures in Portage Bay typically exceed the 16°C standard starting in May and extending into October. Temperatures typically exceed 22.0°C every summer for several days or weeks during July and August. The maximum temperature recorded at Lake Union-0540 during this period was 24°C, on July 30, 2018.

The Montlake Cut was constructed to allow ship passage from Lake Union to Lake Washington and was completed in 1916. The construction dropped the level of Lake Washington by 8.8 feet. It disconnected Lake Washington from the Black River and permanently changed the historical flow and fish migration patterns into Lake Washington and its tributaries.

<https://www.historylink.org/File/10221>.

C. Wastewater characterization

UWMC reported the flow and temperature of their discharge in the permit application and in discharge monitoring reports. Beginning in July 2013, daily temperature data became available. Due to drift in the temperature thermistors, the discharge temperature and background temperature data drifted away from each other, and away from Lake Union-0540 as well. In July 2019 the thermistors were replaced, calibrated, and now agree with each other and with King County monitoring station 0540. Daily data since the July 2019 thermistor calibration show the discharge temperature is routinely within 0.3°C of background lake temperature, except during CSO events.

Because the thermistors drifted slowly apart, analysis of the difference between the two data sets show significant temperature anomalies only during large CSO events. Only during CSO events are differences apparent between the background thermistor and the outfall thermistor. This indicates that the background thermistor is located in a proper location to record background conditions uninfluenced by the discharge, and the outfall thermistor is recording the discharge temperature.

UWMC discharge flow has averaged just under 500,000 gallons per day, with an average maximum day per monitoring quarter just under 1.5 MGD. Due to a software calibration error, flows reported on DMRs prior to April 6, 2020, were underreported by a factor of 100. Starting April 6th, accurate flow volumes have been reported.

D. Summary of compliance with previous permit Issued

The previous permit placed effluent limits on flow. UWMC has complied with the effluent limits. However, review of their temperature monitoring data clearly shows that the Permittee failed to maintain temperature monitoring equipment installed near the outfall. Proper maintenance of monitoring equipment is required. The previous permit had no temperature limits, so the data was faulty but not related to compliance with a permit limit. Ecology assessed compliance based on its review of the facility's information in the Ecology Permitting and Reporting Information System (PARIS), discharge monitoring reports (DMRs), King County ambient temperature data, and inspections.

E. State environmental policy act (SEPA) compliance

State law exempts the issuance, reissuance or modification of any wastewater discharge permit from the SEPA process as long as the permit contains conditions that are no less stringent than federal and state rules and regulations ([RCW 43.21C.0383](#)). The exemption applies only to existing discharges, not to new discharges.

III. Proposed Permit Limits

Federal and state regulations require that effluent limits in an NPDES permit must be either technology- or water quality-based.

- Technology-based limits are based upon the treatment methods available to treat specific pollutants. Technology-based limits are set by the EPA and published as a regulation, or Ecology develops the limit on a case-by-case basis ([40 CFR 125.3](#), and [chapter 173-220 WAC](#)). All known, available, and reasonable methods of treatment (AKART) are required under RCW [90.48](#).
- Water quality-based limits are calculated so that the effluent will comply with the Surface Water Quality Standards ([chapter 173-201A WAC](#)), Ground Water Standards ([chapter 173-200 WAC](#)), Sediment Quality Standards ([chapter 173-204 WAC](#)), or the Federal Water Quality Criteria Applicable to Washington ([40 CFR 131.45](#)).
- Ecology must apply the most stringent of these limits to each parameter of concern. These limits are described below.

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

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

A. Technology-based effluent limits

Ecology may base effluent limits on the technology available to treat the pollutants at a reasonable cost (technology-based) or it may base them on the effect of the pollutants in the receiving water (water quality-based), whichever is most stringent. The flow limit has been reduced from the previous permit, both maximum daily and average monthly, to better coincide with actual water use.

Cooling water discharges depend on dilution and cooling in the receiving water rather than actual treatment. AKART considerations for this use include alternative technologies for building cooling such as heat pumps and closed loop cooling systems.

B. Surface water quality-based effluent limits

The Washington State surface water quality standards ([chapter 173-201A WAC](#)) are designed to protect existing water quality and preserve the beneficial uses of Washington's surface waters. Waste discharge permits must include conditions that ensure the discharge will meet the surface water quality standards ([WAC 173-201A-510](#)). Water quality-based effluent limits may

be based on an individual waste load allocation or on a waste load allocation developed during a basin wide total maximum daily load study (TMDL).

Numerical criteria for the protection of aquatic life and recreation

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

Numerical criteria for the protection of human health

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

Narrative criteria

Narrative water quality criteria (e.g., [WAC 173-201A-240\(1\); 2006](#)) limit the toxic, radioactive, or other deleterious material concentrations that the facility may discharge to levels below those which have the potential to:

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

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

Antidegradation

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

- Restore and maintain the highest possible quality of the surface waters of Washington.
- Describe situations under which water quality may be lowered from its current condition.

- Apply to human activities that are likely to have an impact on the water quality of surface water.
- Ensure that all human activities likely to contribute to a lowering of water quality, at a minimum, apply all known, available, and reasonable methods of prevention, control, and treatment (AKART).
- Apply three tiers of protection (described below) for surface waters of the state.

Tier I: ensures existing and designated uses are maintained and protected and applies to all waters and all sources of pollutions.

Tier II: ensures that waters of a higher quality than the criteria assigned are not degraded unless such lowering of water quality is necessary and in the overriding public interest. Tier II applies only to a specific list of polluting activities.

Tier III: prevents the degradation of waters formally listed as "outstanding resource waters," and applies to all sources of pollution.

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

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

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

- Dischargers must maintain and protect existing and designated uses. Ecology must not allow any degradation that will interfere with, or become injurious to, existing or designated uses, except as provided for in chapter [173-201A WAC](#).
- Whenever the natural conditions of a water body are of a lower quality than the assigned criteria, the natural conditions constitute the water quality criteria. Where water quality criteria are not met because of natural conditions, human actions are not allowed to further lower the water quality, except where explicitly allowed in chapter [173-201A WAC](#).

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

Mixing zones

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

outside of the mixing zones must meet water quality numeric standards. The regulation is written for mixing zones in the receiving water; in this case mixing occurs inside a large, partially submerged concrete pipe. This configuration was not envisioned in the water quality rules for mixing zones.

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

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

The mixing zone for this discharge is based on temperature measurements near the outfall pipe to show that the discharge does not increase the Portage Bay water temperature (when the sensors are operating correctly). Mixing occurs inside the municipal stormwater system pipe.

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

A mixing zone was granted to the facility in previous permit cycles for temperature as follows:

The mixing zone for this outfall shall extend to a radius of 16.5 feet from the end of the discharge pipe, where measurements shall be made at a depth of 3 feet. Background temperature shall be measured at a point at least 33 feet from the edge of the mixing zone.

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

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

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

Ecology determined that the treatment provided at UWMC meets the requirements of AKART in previous permits. This permit will require an update of that AKART analysis.

3. Ecology must consider critical discharge conditions.

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

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

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

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

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

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

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

seconds after discharge; and that the temperature of the water will not create lethal conditions or blockages to fish migration.

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

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

The receiving water is included on the 303d list and is impaired due to temperatures that exceed standards at nearby monitoring stations.

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

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

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

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

6. Maximum size of mixing zone.

The authorized mixing zone does not exceed the maximum size restriction. It is limited to 16.5 feet from the outfall pipe.

7. Acute mixing zone.

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

Ecology determined that an acute mixing zone is not required for this discharge since it does not contain toxic chemicals.

8. Overlap of Mixing Zones.

This mixing zone does not overlap another mixing zone.

C. Designated uses and surface water quality criteria

Applicable designated uses and surface water quality criteria are defined in [chapter 173-201A WAC](#). In addition, the U.S. EPA set human health criteria for toxic pollutants (EPA 1992). The table included below summarizes the criteria applicable to this facility’s discharge.

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

Freshwater Aquatic Life Uses and Associated Criteria

Table 5 — Core Summer Salmonid Habitat

Criteria	Value
Temperature Criteria – Highest 7-DAD MAX	16°C (60.8°F)
Dissolved Oxygen Criteria	9.5 mg/L
Turbidity Criteria	<ul style="list-style-type: none"> • 5 NTU over background when the background is 50 NTU or less; or • A 10 percent increase in turbidity when the background turbidity is more than 50 NTU.
Total Dissolved Gas Criteria	Total dissolved gas must not exceed 110 percent of saturation at any point of sample collection.
pH Criteria	The pH must measure within the range of 6.5 to 8.5, with a human-caused variation within the above range of less than 0.2 units.

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

Table 6 — Recreational Uses and Associated Criteria

Recreational Use	Criteria
Primary Contact Recreation (effective 1/1/2021)	<i>E.coli</i> organism levels must not exceed a geometric mean value of 100 CFU or MPN per 100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained within the averaging period exceeding 320 CFU or MPN per 100 mL.
Secondary Contact Recreation (expires 12/31/2020)	Fecal coliform organism levels must not exceed a geometric mean value of 200 colonies/100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 400 colonies /100 mL.

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

D. Water quality impairments

Lake Union / Lake Washington Ship Canal is listed on the current 303(d) and is impaired for temperature and bacteria. Ecology is not currently conducting a Total Maximum Daily Load (TMDL) Analysis in this area, nor is one currently planned. Listing ID 79039 emphasizes the impact of high water temperatures to fish in the receiving water:

The lake and canal system forming the Lake Washington Ship Canal constitute the only route for anadromous salmonids migrating between the saltwater of Puget Sound and the Lake Washington Basin (including the Cedar and Sammamish sub-basins). During the summer months, water temperatures in the Ship Canal likely create a thermal barrier that impedes the migration of adult Chinook salmon (*Oncorhynchus tshawytscha*) and sockeye salmon (*O. nerka*) and late-migrating Chinook smolts. Water temperatures taken in July and August in Portage Bay (2007-2011) at a monitoring station located near the downstream end of the Montlake Cut have been measured at or above 22 degrees C. throughout the entire water column... Prolonged exposure to elevated temperatures in both areas likely causes sub-lethal and potential lethal effects to adult salmon.

Typically a TMDL would set wasteload allocations to nonpoint and point sources in response to the high water temperatures in Portage Bay and the Montlake Cut; the wasteload for point sources of no discharge is likely in this situation.

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

Ecology must consider the narrative criteria described in WAC 173-201A-260 when it determines permit limits and conditions. Narrative water quality criteria limit the toxic, radioactive, or other deleterious material concentrations that the facility may discharge which

have the potential to adversely affect designated uses, cause acute or chronic toxicity to biota, impair aesthetic values, or adversely affect human health.

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

In addition, Ecology considers the toxicity of the wastewater discharge by requiring whole effluent toxicity (WET) testing when there is a reasonable potential for the discharge to contain toxics. Ecology's analysis of the need for WET testing for this discharge is described later in the fact sheet.

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

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

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

There is no diffuser at Outfall 001, however the facility's heated discharge to the 84" diameter CSO pipe is 780 feet from the outfall into Portage Bay. The heated water has ample time to mix with the cool water inside the underground pipe before discharging into Portage Bay.

Chronic Mixing Zone — [WAC 173-201A-400\(7\)\(a\)](#) specifies that mixing zones must not extend in a downstream direction from the discharge ports for a distance greater than 300 feet plus the depth of water over the discharge ports or extend upstream for a distance of over 100 feet, not utilize greater than 25% of the flow, and not occupy greater than 25% of the width of the water body.

The horizontal distance of the chronic mixing zone is approximately 16.5 feet. The mixing zone extends from the bottom to the top of the water column.

Temperature--The state temperature standards ([WAC 173-201A](#), [WAC 173-201A-200](#), [WAC 173-201A-600](#), and [WAC 173-201A-602](#)) include multiple elements:

- Annual summer maximum threshold criteria (June 15 to September 15)

- Supplemental spawning and rearing season criteria (September 15 to June 15)
- Incremental warming restrictions
- Protections against acute effects
- Ecology evaluates each criterion independently to determine reasonable potential and derive permit limits.
- Annual summer maximum and supplementary spawning/rearing criteria

Each water body has an annual maximum temperature criterion [WAC 173-201A-200(1)(c), WAC 173-201A-210(1)(c), and WAC 173-201A-602, Table 602]. These threshold criteria (e.g., 12, 16, 17.5, 20°C) protect specific categories of aquatic life by controlling the effect of human actions on summer temperatures.

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

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

- Incremental warming criteria

The water quality standards limit the amount of warming human sources can cause under specific situations [[WAC 173-201A-200\(1\)\(c\)\(i\)-\(ii\)](#), [WAC 173-201A-210\(1\)\(c\)\(i\)-\(ii\)](#)]. The incremental warming criteria apply at the edge of the chronic mixing zone.

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

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

When Ecology has not yet completed a TMDL, our policy allows each point source to warm water at the edge of the chronic mixing zone by 0.3°C. This is true regardless of the background temperature and even if doing so would cause the temperature at the edge of a standard mixing zone to exceed the numeric threshold criteria. In this case the high temperatures in a greatly modified lake, canal, and lock system designed primarily for shipping warrants evaluating all point sources to evaluate if known alternatives to discharging heat to an overheated waterbody is reasonable. The fully mixed effect on temperature will only be a fraction of the 0.3°C cumulative allowance (0.075°C or less) for

all human sources combined, but reducing the water temperature by increasing shade, augmenting flow, or other measures to reduce heat from nonpoint sources are not available along Lake Washington Ship Canal system.

- Protections for temperature acute effects

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

General lethality and migration blockage: Measurable (0.3°C) increases in temperature at the edge of a chronic mixing zone are not allowed when the receiving water temperature exceeds either a 1DMax of 23°C or a 7DADMax of 22°C. However, temperatures recorded at the outfall and nearby ambient monitoring station have exceeded both of these temperature standards.

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

The permit requires continued monitoring of effluent and ambient temperatures. The permit includes a compliance schedule to permanently remove this discharge from Portage Bay.

G. Human health

Washington's water quality standards include numeric human health-based criteria for 97 priority pollutants that Ecology must consider when writing NPDES permits.

Ecology determined the applicant's discharge is unlikely to contain chemicals regulated to protect human health.

Ecology evaluated the discharge's potential to violate the water quality standards as required by [40 CFR 122.44\(d\)](#) by following the procedures published in the [Technical Support Document for Water Quality-Based Toxics Control \(EPA/505/2-90-001\)](#) and Ecology's [Permit Writer's Manual](#) to make a reasonable potential determination. The evaluation showed that the discharge has no reasonable potential to cause a violation of water quality standards, and an effluent limit for chemicals is not needed.

H. Sediment quality

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

Through a review of the discharger characteristics and of the effluent characteristics, Ecology determined that this discharge has no reasonable potential to violate the sediment management standards.

I. Groundwater quality limits

The groundwater quality standards ([chapter 173-200 WAC](#)) protect beneficial uses of groundwater. Permits issued by Ecology must not allow violations of those standards ([WAC 173-200-100](#)).

UWMC does not discharge wastewater to the ground. No permit limits are required to protect groundwater.

J. Whole effluent toxicity

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

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

K. Comparison of effluent limits with the previous permit issued on October 17, 2011.

Table 7 Comparison of Previous and Proposed Effluent Limits

Parameter	Previous Effluent Limits: Outfall # 001		Proposed Effluent Limits: Outfall # 001	
	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily
Flow	2.4 MGD	3 MGD	2.1 MGD	2.45 MGD

IV. Monitoring Requirements

Ecology requires monitoring, recording, and reporting ([WAC 173-220-210](#) and [40 CFR 122.41](#)) to verify that the treatment process is functioning correctly and that the discharge complies with the permit’s effluent limits.

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

A. Wastewater monitoring

UWMC monitors for flow and temperature to further characterize the effluent. This/These pollutant(s) could have a significant impact on the quality of the surface water.

The monitoring schedule is detailed in the proposed permit under Special Condition S.2. Specified monitoring frequencies take into account the quantity and variability of the discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring.

B. Lab accreditation

Ecology requires that facilities must use a laboratory registered or accredited under the provisions of [chapter 173-50 WAC](#), Accreditation of Environmental Laboratories, to prepare all monitoring data (with the exception of certain parameters).

V. Other Permit Conditions

A. Reporting and record keeping

Ecology based Special Condition S3 on its authority to specify any appropriate reporting and record keeping requirements to prevent and control waste discharges ([WAC 173-220-210](#)).

B. General conditions

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

C. Compliance schedule

The proposed permit includes a compliance schedule to evaluate the costs and feasibility of ceasing to discharge cooling water by using a different system for air conditioning and other building cooling needs

VI. Permit Issuance Procedures

A. Permit modifications

Ecology may modify this permit to impose numerical limits, if necessary to comply with water quality standards for surface waters, with sediment quality standards, or with water quality

standards for groundwaters, after obtaining new information from sources such as inspections, effluent monitoring, outfall studies, and effluent mixing studies.

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

B. Proposed permit Issuance

This proposed permit includes all statutory requirements for Ecology to authorize a wastewater discharge. The permit includes limits and conditions to protect human health and aquatic life, and the beneficial uses of waters of the state of Washington. Ecology proposes to issue this permit for a term of 5 years.

VII. References for Text and Appendices

Environmental Protection Agency (EPA)

- 1992. National Toxics Rule. Federal Register, V. 57, No. 246, Tuesday, December 22, 1992.
- 1991. *Technical Support Document for Water Quality-based Toxics Control*. EPA/505/2-90-001.
- 1988. *Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling*. USEPA Office of Water, Washington, D.C.
- 1985. *Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water*. EPA/600/6-85/002a.
- 1983. *Water Quality Standards Handbook*. USEPA Office of Water, Washington, D.C. Tzivoglou, E.C., and J.R. Wallace.
- 1972. *Characterization of Stream Reaeration Capacity*. EPA-R3-72-012. (Cited in EPA 1985 op.cit.)
- 1979. *In-stream Deoxygenation Rate Prediction*. Journal Environmental Engineering Division, ASCE. 105(E2). (Cited in EPA 1985 op.cit.)

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- July 2018. [Permit Writer's Manual. Publication Number 92-109](https://fortress.wa.gov/ecy/publications/documents/92109.pdf)
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- September 2011. [Water Quality Program Guidance Manual – Supplemental Guidance on Implementing Tier II Antidegradation. Publication Number 11-10-073](https://fortress.wa.gov/ecy/publications/summarypages/1110073.html)
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February 2007. [*Focus Sheet on Solid Waste Control Plan, Developing a Solid Waste Control Plan for Industrial Wastewater Discharge Permittees*](#), Publication Number 07-10-024.
(<https://fortress.wa.gov/ecy/publications/documents/0710024.pdf>) Wright, R.M., and A.J. McDonnell.

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

[Permit and Wastewater Related Information](https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Water-quality-permits-guidance) (<https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Water-quality-permits-guidance>)

Appendix A — Public Involvement Information

Ecology proposes to reissue a permit to University of Washington Medical Center. The permit includes wastewater discharge limits and other conditions. This fact sheet describes the facility and Ecology's reasons for requiring permit conditions.

Ecology will place a Public Notice of Draft on November 3, 2020 in the Seattle Times to inform the public and to invite comment on the proposed draft National Pollutant Discharge Elimination System permit and fact sheet.

The notice:

- Tells where copies of the draft Permit and Fact Sheet are available for public evaluation (a local public library, the closest Regional or Field Office, posted on our website).
- Offers to provide the documents in an alternate format to accommodate special needs.
- Urges people to submit their comments, in writing, before the end of the Comment Period
- Tells how to request a public hearing of comments about the proposed NPDES permit.
- Explains the next step(s) in the permitting process.

Ecology has published a document entitled [Frequently Asked Questions about Effective Public Commenting](https://fortress.wa.gov/ecy/publications/SummaryPages/0307023.html) which is available on our website at <https://fortress.wa.gov/ecy/publications/SummaryPages/0307023.html>

You may obtain further information from Ecology by telephone, 425-649-7201, or by writing to the address listed below.

Water Quality Permit Coordinator
Department of Ecology
Northwest Regional Office
3190 160th Avenue SE
Bellevue, WA 98008-5452

The primary author of this permit and fact sheet is Robert Nolan.

Appendix B — Your Right to Appeal

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

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

File your appeal and a copy of this permit with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.

Serve a copy of your appeal and this permit on Ecology in paper form - by mail or in person. (See addresses below.) E-mail is not accepted.

You must also comply with other applicable requirements in [chapter 43.21B RCW](#) and [chapter 371-08 WAC](#).

Table 8 Address and Location Information

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

Appendix C — Glossary

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

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

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

AKART – The acronym for “all known, available, and reasonable methods of prevention, control and treatment.” AKART is a technology-based approach to limiting pollutants from wastewater discharges, which requires an engineering judgment and an economic judgment. AKART must be applied to all wastes and contaminants prior to entry into waters of the state in accordance with [RCW 90.48.010](#) and [RCW 90.48.520](#), [WAC 173-200-030\(2\)\(c\)\(ii\)](#), and [WAC 173-216-110\(1\)\(a\)](#).

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

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

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

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

Average monthly (intermittent) discharge limit – The average of the measured values obtained over a calendar months’ time taking into account zero discharge days.

Average monthly discharge limit – The average of the measured values obtained over a calendar months’ time.

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

samples are collected over a period of at least one year, with no more than one sample collected during any month in a single calendar year.

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

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

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

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

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

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

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

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

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

Composite sample – A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing discrete samples. May be "time-composite" (collected at constant time intervals) or "flow-proportional" (collected either as a constant sample

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

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

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

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

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

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

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

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

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

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

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

Enterococci – A subgroup of fecal streptococci that includes *S. faecalis*, *S. faecium*, *S. gallinarum*, and *S. avium*. The enterococci are differentiated from other streptococci by their ability to grow in 6.5% sodium chloride, at pH 9.6, and at 10°C and 45°C.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Method detection level (MDL) – See Detection Limit.

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

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

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

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

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

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

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

Point of compliance – The location in the groundwater where the enforcement limit must not be exceeded and a facility must comply with the Ground Water Quality Standards. Ecology determines this limit on a site-specific basis. Ecology locates the point of compliance in the groundwater as near and directly downgradient from the pollutant source as technically, hydrogeologically, and geographically feasible, unless it approves an alternative point of compliance.

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

- a. Exceeds 0.5 % of treatment plant design capacity criteria and discharges <25,000 gallons per day or;
- b. Is a member of a group of similar industrial users which, taken together, have the potential to cause pass through or interference at the POTW (e.g. facilities which develop photographic film or paper, and car washes).

Ecology may determine that a discharger initially classified as a potential significant industrial user should be managed as a significant industrial user.

Quantitation level (QL) – Also known as Minimum Level of Quantitation (ML) – The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration standard, assuming that the lab has used all method-specified sample weights, volumes, and cleanup procedures. The QL is calculated by multiplying the MDL by 3.18 and rounding the result to the number nearest to (1, 2, or 5) x 10ⁿ, where n is an integer. ([64 FR 30417](#)).

ALSO GIVEN AS:

The smallest detectable concentration of analyte greater than the Detection Limit (DL) where the accuracy (precision & bias) achieves the objectives of the intended purpose. (Report of the Federal Advisory Committee on Detection and Quantitation Approaches and Uses in Clean Water Act Programs Submitted to the US Environmental Protection Agency December 2007).

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

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

Sample Maximum – No sample may exceed this value.

Significant industrial user (SIU) –

- 1) All industrial users subject to Categorical Pretreatment Standards under [40 CFR 403.6](#) and [40 CFR Chapter I, Subchapter N](#) and;
- 2) Any other industrial user that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling, and boiler blow-down wastewater); contributes a process wastestream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated

as such by the Control Authority* on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement [in accordance with [40 CFR 403.8\(f\)\(6\)](#)].

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

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

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

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

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

Soluble BOD₅ – Determining the soluble fraction of Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of soluble organic material present in an effluent that is utilized by bacteria. Although the soluble BOD₅ test is not specifically described in Standard Methods, filtering the raw sample through at least a 1.2 um filter prior to running the standard BOD₅ test is sufficient to remove the particulate organic fraction.

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

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

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

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

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

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

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

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

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

Appendix D — Technical Calculations

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

Simple Mixing:

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

$$C_{mz} = C_a + \frac{(C_e - C_a)}{DF}$$

where: C_e = Effluent Concentration
 C_a = Ambient Concentration
 DF = Dilution Factor

Reasonable Potential Analysis:

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

Calculation of Water Quality-Based Effluent Limits:

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

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

$$WLA_a = (\text{acute criteria} \times DF_a) - [(\text{background conc.} \times (DF_a - 1))]$$

$$WLA_c = (\text{chronic criteria} \times DF_c) - [(\text{background conc.} \times (DF_c - 1))]$$

where: DF_a = Acute Dilution Factor
 DF_c = Chronic Dilution Factor

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

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

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

$z = 2.326$

CV = coefficient of variation = std.
 dev/mean

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

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

$z = 2.326$

- Use the smallest LTA of the LTA_a or LTA_c to calculate the maximum daily effluent limit and the monthly average effluent limit.

MDL=Maximum Daily Limit

$$MDL = LTA \times e^{(z\sigma - 0.5\sigma^2)}$$

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

$z = 2.326$ (99th percentile occurrence)

LTA = Limiting long term average

AML = Average Monthly Limit

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

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

n = number of samples/month

$z = 1.645$ (95th % occurrence probability)

LTA = Limiting long term average

Appendix E — Response to Comments

[Ecology will complete this section after the public notice of draft period.]