



CHAPTER 4

Performance & Design Criteria

Chapter 4 – Performance and Design Criteria

4.1 City Standard Specifications and Standard Drawings

The City of Richland Public Works Department has developed standards which provide minimum construction criteria for Public Works within the City or for which the City will take ownership. The City maintains a set of Standard Provisions based upon the WSDOT Standard Specifications which define the minimum Sanitary Sewer construction standards, and is supplemented by the Standard Drawings. A copy of the City of Richland Standard Specifications and Standard Drawings for Sanitary Sewer Construction is included in **Appendix N**.

The City has also developed standard specifications and design drawings for submersible sewage lift stations. The Guidelines and Standard Specifications and Details for Sewage Pump Stations is provided in **Appendix N**.

4.2 Collection System Design Criteria for Master Planning

The design criteria listed in **Table 4-1** is to be used for future system planning. The design criteria is based on the City's water meter data that was collected and grouped by land use, between the months of December 2012 and March 2013. Water usage during the months of December-March is a good indication of sewer use because little to no water is used for irrigation. The usage was averaged over these three months to provide an average daily flow based on land use. Additional design criteria and assumptions can be found in **Appendix C**.

Table 4-1 – Collection System Planning Criteria

Parameter	Value
Residential Unit Flows ^(a)	160 GPDU ^(b)
Commercial Unit Flows	625 GPAD ^(c)
Industrial Unit Flows	1,250 GPAD ^(d)
Manning Pipe Roughness Coefficient	0.012
Minimum sewer velocity	2 feet per second

^(a) Based on 2.42 people per dwelling

^(b) Gallons per dwelling unit

^(c) Gallons per acre per day

^(d) Note that the City of Richland unit flow analysis identified 60 GPAD as average flow for small, dry industries, and 3,000 GPAD as the average flow for large, permitted industries. It was determined that with a large range of industry types and resulting flows, a gross area flow for areas zoned industrial was based on a reference value of 1,250 GPAD, from *Wastewater Engineering: Treatment and Reuse*, by Metcalf & Eddy.

4.3 Discharge Standards

4.3.1 Federal Water Quality Standards

The principal authority for the water pollution control programs is the Clean Water Act (33 U.S.C. 1251 et seq.). The aim of the act is to "restore and maintain the chemical, physical, and biological integrity of the nation's waters." This act set forth the following national goals:

- Eliminate the discharge of pollutants into navigable waters by 1985.
- Set interim goals of water quality which will protect fish and wildlife and will provide for recreation by July 1, 1983.
- Prohibit the discharge of pollutants in quantities that might adversely affect the environment.
- Construct publicly owned waste treatment facilities with federal financial assistance.
- Establish waste treatment management plans within each state.
- Establish the technology necessary to eliminate the discharge of pollutants.
- Develop and implement programs for the control of non-point sources of pollution to enable the goals of the act to be met.

These goals were to be achieved by a legislative program which includes permits under the National Pollutant Discharge Elimination System (NPDES). Key provisions of the act include the development of such permit systems and effluent standards as well as state and local responsibilities.

The Clean Water Act emphasizes that state governments are to use the minimum federal standards, guidelines, and goals, and establish individual pollution control programs and enforcement procedures. When the state has completed its programs for waste treatment management, its implementation plans for preserving or restoring water quality, and the Environmental Protection Agency (EPA) has approved those programs, the state assumes enforcement responsibilities. The Washington Department of Ecology (WDOE) has been delegated with these responsibilities by EPA.

4.3.2 Washington State Surface Water Quality Standards (WQS)

The State of Washington's surface water quality standards are given in the Washington Administrative Code (WAC) Chapter 173-201A, the Water Quality Standards for Surface Waters of the State of Washington, and WAC Chapter 173-204, Sediment Management Standards.

WAC 173-201A strives to establish surface water quality criteria which are consistent with public health and public enjoyment, and the propagation and protection of fish, shellfish, and wildlife, pursuant to the provisions of chapter 90.48 of the Revised Code of Washington (RCW). The surface water quality standards establish specific water quality criteria based on the Aquatic Life and Recreational Use designations. Use designations for the Columbia River (river mile 309.3 to 596.6), the reach in which Richland's outfall is located, are defined in WAC 173-201A Table 602 as follows:

- Aquatic Life Uses: Non-Core Salmon/Trout
- Recreational Uses: Primary Contact
- Water Supply Uses: Domestic Water, Industrial Water, Agricultural Water, and Stock Water
- Miscellaneous Uses: Wildlife Habitat, Harvesting, Commerce/Navigation, Boating, and Aesthetics



In accordance with the direction of EPA, WDOE has pursued compliance with surface quality standards based on a watershed management approach. The emphasis of watershed management is to monitor, analyze, and protect water quality on a geographic basis. The watershed management strategy was implemented as a means to:

- Identify and address high priority water quality issues.
- Tie NPDES permit conditions more closely to localized water quality conditions.
- Improve coordination among state, tribal and local environmental programs.
- Target activities to attain state water quality standards.

In 1970, under WAC 173-500-040 and the Water Resources Act of 1971 (RCW 90.54), WDOE partitioned the state into 62 Water Resource Inventory Areas (WRIAs). These WRIAs are the administrative underpinning of WDOE's business activities and provide the framework for the watershed approach which is embodied in the Section 303(d) process. The Columbia River at Richland is located between WRIA 31 (Rock/Glade) and WRIA 36 (Esquatzel Coulee). However, due to its size, the Columbia River Basin is managed as its own watershed area.

In addition, in July 1993, WDOE designated 23 Water Quality Management Areas (WQMAs). The City of Richland is located within WQMA 31 (Horseheaven/Klickitat). These WQMAs are water quality management basins for which coordinated and integrated science, permitting and water pollution control, and prevention measures are implemented to meet State water quality standards.

The WDOE program undertakes the following five activities in each WQMA over a five year, rotating cycle period:

- Year 1 Scope water quality.
- Year 2 Conduct water quality monitoring and special studies.
- Year 3 Analyze water quality and the effects of pollution.
- Year 4 Develop technical reports that record water quality, areas of concern, and strategies to respond to these concerns.
- Year 5 Issue wastewater discharge permits and implement other pollution prevention and pollution control actions that respond to priority water quality issues.

4.3.2.1 303(d) List

The Federal Clean Water Act (Section 303(d)) and federal regulation 40 CFR Part 130.7 require states to develop a 303(d) list. The primary purpose of the 303(d) listing is to describe the health of rivers, coastal waters, estuaries and lakes. In Washington, WDOE submits this listing of "troubled waters" to EPA for approval and uses it to monitor water quality trends and establish priorities for protection. Water bodies must meet two criteria to be placed on the 303(d) list:

- Current water quality does not meet the state water quality requirements.
- Technology-based controls are not sufficient to achieve water quality requirements.

Monitoring data to determine which water bodies should be identified on the 303(d) list are gathered from several sources, including WDOE's own monitoring, and project-specific monitoring conducted by resource agencies, tribes, and other sources. Monitoring information submitted to the WDOE is evaluated to ensure that the data was collected and analyzed using quality assurance/quality control methods and that data was tested by a state accredited laboratory.

Water body protection involves the setting of Total Maximum Daily Load (TMDL) limits. The TMDL assignment process, as described in the Federal Clean Water Act, is used to establish allowable pollutant concentrations to be

apportioned to both point and non-point sources of pollutants that may discharge to a water body while still supporting beneficial use and meeting water quality standards. TMDLs are often referred to as Water Cleanup Plans.

WDOE's current listing process is much more comprehensive than the early 303(d) lists that were developed in 1996 and 1998. The current process assigns Water Quality Assessment Categories to water bodies ranging from Category 1 (clean waters) to Category 5 (polluted waters that require a TMDL). Since the categories are pollutant-specific, a single water body may be listed in multiple categories.

Most of the Columbia River Mainstem fails to meet state and/or tribal Water Quality Standards for critical periods of time, mainly in the spring and summer months, for both water temperature and total dissolved gas. Therefore, this water body has been "303(d) listed" for these two pollutants. The status of the TMDLs for these pollutants and the potential for future TMDLs for other pollutants are discussed below.

4.3.2.2 Temperature TMDL

Development of the temperature TMDL for the Columbia River from the Canadian border to its mouth at the Pacific Ocean was initiated by EPA in 2002 and was expected to be finalized by May 2003. However, due to public concerns regarding the EPA's conclusions regarding the impacts of hydroelectric dams and other technical issues, the TMDL has been delayed indefinitely. According to conversations with WDOE staff, no schedule for completing the TMDL has been established. However, if this TMDL is finalized, it may have a significant impact on the City's discharge, especially during the warmer months.

4.3.2.3 Dissolved Gas TMDL

EPA approved WDOE's submittal of the Total Dissolved Gas (TDG) TMDL for the Mid-Columbia River and Lake Roosevelt on July 27, 2004. The area covered by this TMDL includes the Columbia River Mainstem from the Canadian border to the Oregon/Washington border. Since the primary source of TDG pollution is hydroelectric dams, this TMDL is expected to have minimal impact on municipal wastewater discharges such as the City of Richland's.

4.3.3 Future TMDLs

The WDOE Surface Water Quality Standards website includes Current Rule Activities with the recent update on 'Human Health Criteria and Implementation Tools Rulemaking.' This rulemaking is focusing on water quality standards for toxics. Ecology issued a draft rule for public comment in February 2016 and has committed to a final Rule adopted in August 2016. This Rule could reduce allowable concentrations of toxins in the effluent primarily due to an increase in fish consumption rates. Most toxins accumulate in the fatty portions of edible fish. For example, the current Washington WQS for Polychlorinated Biphenyls (PCBs) is 170 pg/l. This concentration is difficult to consistently meet at a conventional wastewater treatment plant with advanced secondary treatment. There is not currently any data on Richland's influent concentrations, but typical influent concentrations range from 1,000 – 10,000 pg/l. There is also limited to no data on the concentration of toxics in the Columbia River. If the new rule requires extensive treatment to remove toxics, it could trigger advanced oxidation processes after secondary treatment with filtration – which could double or triple the cost of treatment.

If the new rules are adopted, TMDLs must be prepared to allocate loading. WDOE does not appear to have immediate plans to develop these TMDLs, but this process could be completed in the next five years. After the TMDL is established, it typically takes two permit cycles to gather effluent data, update facilities plans, obtain necessary financing authority, design, and construct new treatment facilities to meet the TMDL allocated effluent limits for the



wastewater treatment plants. Although the entire process could take three or more permit cycles before it is realized as an effluent limit, it would have dramatic effects on the City’s WWTP and would require a significant increase in the cost of treatment. This proposed toxics rulemaking is one the City should follow closely.

Once the new rules are finalized, there are compliance strategies that the City should consider. For example, the Spokane River dischargers are developing source control programs in addition to membrane treatment at the end of the pipe. WDOE has been encouraging this form of pollution reduction which may help with permit compliance only if the dischargers that provide the source control get credit for the cleanup.

4.3.4 Existing Discharge Standards

The City of Richland WWTP operates under NPDES Waste Discharge Permit No. WA-002041-9. A copy of both the current permit and fact sheet are included in **Appendix O**. The permit was effective on August 1, 2009 and expired on July 31, 2014. The City has applied for renewal of the permit and has been following the terms and conditions of the existing permit in the interim. A draft version of the new permit was submitted to the City in fall 2015. The City has an excellent track record of meeting permit requirements – with no violations in recent history. In fact, in 2014 the City received its 4th consecutive “Outstanding Performance Award” from WDOE.

The permit requires the City to submit a plan and a schedule for continuing to maintain capacity whenever actual flow or load reaches 85% of any one of the design criteria for three consecutive months. The flows and loads for the permitted facility are based upon the design criteria as listed in the permit and included in **Table 4-2**:

Table 4-2 – Design Criteria – 2009 NPDES Permit

Parameter	Design Criteria	85% of Design
Average flow for maximum month	11.4 mgd	9.7 mgd
BOD ₅ loading for maximum month	17,250 lbs/day	14,663 lbs/day
TSS loading for maximum month	21,200 lbs/day	18,020 lbs/day
NH ₃ -N loading for maximum month	2,750 lbs/day	2,338 lbs/day

The only effluent limitations in the permit relate to BOD₅, TSS, fecal coliform, pH, residual chlorine, and ammonia. The existing effluent limits are presented in **Table 4-2**.



Table 4-3 – Effluent Limits – 2009 NPDES Permit

Parameter	Average Monthly	Maximum Average Weekly
BOD ₅	30 mg/L, 2,588 lbs/day, 85% removal of influent BOD ₅	45 mg/L, 3,882 lbs/day
TSS	30 mg/L, 2,852 lbs/day, 85% removal of influent TSS	45 mg/L, 4,278 lbs/day
Fecal Coliform Bacteria	200/100 mL	400/100 mL
Parameter	Average Monthly	Maximum Daily
NH ₃ -N	18.5 mg/L, 1,759 lbs/day, 85% removal of influent NH ₃ -N	27.7 mg/L, 2,634 lbs/day
Residual Chlorine	N/A	0.5mg/L, 48 lbs/day
Parameter	Daily	
pH	6.0 ≤ pH ≤ 9.0	

4.4 Expected Future Discharge Standards

Based upon inquiries made to the WDOE Staff, the new discharge permit is expected to be issued in 2016. A draft was submitted to the City in fall of 2015 and it appears that the permit will remain largely unchanged. There are some minor clarifications to the mixing zone and there is a requirement for an Outfall Evaluation. It should be noted that statewide trending for discharge permits includes various levels of water quality and source control testing beyond what existing permit holders have experienced in the past. For example, Walla Walla and College Place are now required to conduct PCB testing and develop toxic management control plans. The City should review the existing pretreatment program and source control programs with an eye towards reducing the compliance effort to meet future discharge limits for toxics. While the permit conditions that will result from current rule-making efforts are far from clear, the evidence points toward more stringent standards. Involvement with the rule-making is critical to provide as much compliance flexibility as possible plus reasonable compliance schedules for any required upgrades.