CHAPTER 3

REGULATORY REQUIREMENTS AND BASIS OF PLANNING

Chapter Outline

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3.1. INTRODUCTION

The purpose of this section is to present an overview of the regulatory requirements as used to develop and evaluate the various alternatives. This section presents the common baseline used to evaluate each of the recommended improvements. All of the recommended improvements must meet all applicable regulatory requirements and provide reliable service for a reasonable cost.

3.2. REGULATING AGENCIES

The U.S. Environmental Protection Agency (EPA) regulates disposal and/or reuse of sewage sludge and septage, as well as the discharge of wastewater effluent, whether to surface waters, surface or subsurface disposal. The basis of the regulations imposed or overseen by the EPA is the Federal Water Pollution Control Act of 1972 (Public Law 92-500) often referred to as the Clean Water Act (CWA). The scope of the Clean Water Act has been revised and expanded over the subsequent years. The EPA promulgates regulations to implement the requirements of the CWA and subsequent legislation, and is required to coordinate its requirements with other federal agencies such as the National Oceanic and Atmospheric Administration, the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, and with state agencies such as the Department of Environmental Quality (DEQ), the Department of Fish and Wildlife, and the Oregon Health Authority.

In Oregon, the lead agency in the regulation of sanitary sewerage systems is the Department of Environmental Quality (DEQ). Compliance with state water quality standards is a high priority to the DEQ in terms of how wastewater treatment facilities are regulated. For the sake of clarity, wastewater regulations are often broken into two major categories as follows:

- Wastewater Collection and Pumping
- Wastewater Treatment, Reuse, Discharge, and Disposal

The following is a brief summary of the regulatory requirements and standards that form the basis of the facility planning effort. The requirements for the collection and pumping systems are summarized first, followed by a discussion of issues relating to wastewater treatment and disposal.

In addition to the wastewater regulations outlined above, any work within the floodplain of the Yamhill River or wetlands is also under the jurisdiction of the Oregon Division of State Lands (DSL) and the U.S. Army Corps of Engineers.

3.3. BASIS FOR DESIGN OF WASTEWATER COLLECTION AND PUMPING SYSTEMS

3.3.1 Regulatory Requirements

For the sake of discussion and clarity, the requirements governing gravity wastewater collection and pumping systems are considered separately.

3.3.1.1 Collection Piping

The requirements and regulations covering the design and sizing of the collection piping portion of the wastewater conveyance system include both City design standards and DEQ guidelines. The City has Public Works Design Standards that apply to all public sewer improvements within existing and proposed public right-of-way and public utility easements, as well as to all improvements to be maintained by the City. This includes both gravity collection piping and pump stations.

The City design standards require that the collection system piping be designed to convey all flows projected at the ultimate development of land within the tributary area based on current land use designations. Although this may result in capacities greater than those needed during the 20-year planning period, sewage collection lines are, by their very nature, unsuited for incremental expansion without extensive capital outlays. Under DEQ guidelines, there is one allowable exception to this requirement as it relates to large diameter trunk sewers serving tributary areas that are not expected to develop for 30 or more years. However, none of the proposed new gravity sewers within the study area fall under this exception.

The City Public Works Design Standards and associated details implement and clarify current DEQ standards as contained in OAR-340-052 and DEQ design guidelines. The requirements for minimum allowable slope for various pipeline sizes are listed in Table 3-1.

Table 3-1 | Minimum Mainline Pipe Slopes

Inside Pipe Diameter (inches)	% Slope (ft/100 ft)
8	0.40
10	0.28
12	0.22
15	0.15
18	0.12
21	0.10
24	0.09
27	0.08

3.3.1.2 Pump Stations and Force Mains

Under the authority granted by OAR-340-052, DEQ has established requirements and guidelines for the design of public sanitary sewer pump stations. These design guidelines include Appendix B of OAR-340-052 and various design memoranda issued by DEQ. DEQ has established 20-years as being the proper planning period for pump stations.

In addition to DEQ standards, the City has established a policy that all new sewer pump stations and pump station upgrades are to be standardized to the extent possible. This standardization is based on submersible pump stations with auxiliary power, as well as remote communications and control system (telemetry) conforming to the City's current system. The design criteria assumed for new pump stations or the upgrades of the existing pump stations is listed in Table 3-2.

Table 3-2 | Typical City Pump Station Minimum Design Criteria

Category	Minimum Design Criteria
Design Flows	• 20-year peak instantaneous flow (5 yr, 24 hour storm)
Pump Station Structure	
• Wetwell Type	• Concrete, hatches with integral hatches/fall protection
• Operational Storage	• Based on pump starts or overflow storage as appropriate
• Valve Vault	• Concrete vault adjacent to wetwell
• Overflow	• Provided on a case by case basis.
Pumps	
• Pump Station Capacity	• Convey design flow with largest single unit out of service
• Type	• Flygt Submersible pumps
• Number	• 2 minimum
• Motor Size	• HP as required, 480 volt, 3 phase power preferred
• Min. Pump Cycle Time	• 6 minutes (10 starts per hour total)
• Pump Retrieval	• Jib crane installed on or adjacent to wetwell
Force Mains	
• Minimum Size & Material	• 4-inch, C-900 PVC, Class 52 Ductile Iron or fused HDPE
• Min allowable F.M. Velocity	• 3.5 fps
• Max allowable F.M. Velocity	• ±8 fps
Instrumentation & Control System	
• Location	• Building adjacent to pump station
• Control Building	• CMU block
	• Soft starters or VFDs if required by City or utility company
• Pump Speed Control	• Mag meter in vault downstream of valve vault with instantaneous
• Flow Measurement	and total flow display at the pump station control panel.
Auxiliary Power	
• Type	• Permanent diesel generator w/ATS
• Location	• Control building adjacent to P.S.
• Fuel Supply	• Sub-base tank, 24 hour minimum or as required by City
• Silencer	• Critical grade, insulated
Telemetry	
• Type	• Match City system, programmed per City direction
• Alarms	• Remote alarms as required by City
Hydrogen Sulfide Control (Where Required Based on Forcemain Length and Detention Time)	
Continuously Ascending Force Main	
• Type	• Air Injection (compressor)
• Injection Rate	• 2 scfm/inch diameter of force main
• Control Strategy	• Continuous injection, air flow meter w/pressure gauge
• Injection Point	• Inside valve vault
• Compressor Location	• Inside control building
• Air Piping	• Stainless steel
Ascending & Descending Force Main	
• Type	• Chemical injection system
• Chemical Storage Volume	• 4 months min. @ Avg Annual Flows
• Chemical Feed Agent	• Bioxide by US Filter/Davis or equiv.
• Control Strategy	• On/off control tied to pump motor starters
• Injection Point	• Inside valve vault
• Storage Tank Location	• Inside control building

3.4. BASIS FOR DESIGN OF WASTEWATER TREATMENT SYSTEMS

The following sections summarize current regulations used to evaluate and develop the treatment and disposal alternatives for wastewater from the City of Dayton. The manner in which the treatment and disposal of wastewater and its byproducts is regulated is by setting minimum standards that must be met by the end product (i.e., treated effluent and biosolids). The minimum treatment standards for effluent are outlined in either a National Pollutant Discharge Elimination System (NPDES) permit for surface water discharges, or a Water Pollutant Control Facility (WPCF) permit for systems that do not directly discharge to surface water, such as land application or subsurface disposal. When determining the minimum treatment standards for a particular NPDES permit, the DEQ must consider the technology based standards for BOD and TSS included in OAR 340-041-0345 for the Willamette Basin. In addition to the technology based standard for the Willamette Basin, the DEQ must also consider the water quality based standards found throughout other sections of OAR 340-041. More detailed discussions of some of the applicable standards are included in the following sections.

The criteria discussed below include general requirements for a surface (i.e., Yamhill River) discharge, general reuse criteria for land application of effluent, general criteria for subsurface disposal of treated effluent, EPA criteria for reliability and redundancy, and a summary of the specific requirements under the City's existing NPDES permit.

3.4.1 NPDES Permit - Specific Standards

The NPDES permit issued by DEQ provides regulations for a specific wastewater collection & treatment system and its associated discharge(s). DEQ regulations require that non-discharging options be considered before discharge to surface water can be approved. An NPDES permit includes wastewater discharge limitations with regard to the concentrations of biochemical oxygen demand (BOD), total suspended solids (TSS), *E. coli* bacteria, as well as the mass loads of BOD and TSS, BOD and TSS percent removal, pH, and applicable toxics (e.g. chlorine), and any other limitations required to maintain in-stream water quality.

The City has an NPDES Permit that was issued by DEQ on December 28, 2011 and is classified as a minor NPDES permit. The permit number is 101742 and the expiration date is November 30, 2015 (see **Appendix B**). In May of 2011, the City submitted an engineering study to DEQ revising the average wet weather flow. Per the conditions of the permit DEQ based the mass loads on the average wet weather flow. The mass load limits were increased slightly based on the average wet weather flow. As a result of this mass load increase the City has to identify and monitor all overflow points, demonstrate that overflows are not occurring up to the 5-yr 24-hr storm event, and identify and remove all inflow sources into the collection system. The new permit limits are illustrated in Table 3-3.

The NPDES permit is divided into five sections as follows:

- Schedule A - Waste Discharge Limitations Not to be Exceeded
- Schedule B - Minimum Monitoring and Reporting Requirements
- Schedule C - Compliance Conditions and Schedules
- Schedule D - Special Conditions
- Schedule F - General Conditions

A short discussion of items of particular interest to this report follows.

3.4.1.1 Schedule A – Waste Discharge Limitations

There are two outfalls identified in the current NPDES permit. Outfall 001 is the treated effluent discharge to the Yamhill River from the WWTP. Outfall 002 is the emergency overflow located northeast of the Main Pump Station.

- Outfall 001 Surface Water Discharge to the Yamhill River. Recently DEQ has provided updated the City's NPDES permit. A summary of the permit limitations for effluent discharge to the Yamhill River at Outfall 001 is presented in Table 3-3. BOD limitations are for 5-day BOD (BOD_5) testing.

Table 3-3 | Current NPDES Permit Discharge Limitations

NPDES Permit Schedule A, Treated Effluent, Outfall 001 Discharge Permitted November 1 – April 30					
	Max. Concentration (mg/L)		Max. Mass Load (lb/day)*		
Constituent	Avg. Monthly	Avg. Weekly	Avg. Monthly	Avg. Weekly	Daily
BOD_5	30	45	150	220	290
TSS	50	80	140	370	490
pH	Range		6.0 – 9.0		
E. coli Bacteria	Monthly Geometric Mean		126 cts/100 ml		
	Maximum Single Sample		406 cts/100 ml		
BOD_5 Removal	Min. Monthly Average Removal		85%		
TSS Removal	Min. Monthly Average Removal		65%		
Total Residual Chlorine	Daily Maximum		0.04 mg/L		
	Monthly Average		0.01 mg/L		

* Based upon average wet weather design flow of 0.587 MGD

- Emergency Overflow Outfall 002. Under the new NPDES permit, emergency overflow outfall 002 was eliminated. The new permit states that all overflows are illegal and the Department may use enforcement discretion depending on the circumstances. Department discretion is allowed under the following circumstances:

  - The permittee can demonstrate that the storm associated with the overflow was greater than the 5-year 24-hour rainfall event during the November 1 through May 21 time period.

  - The permittee can demonstrate that the storm associated with the overflow was greater than the 10-year 24-hour rainfall event during the May 22 through October 31 time period.

  - Overflows were unavoidable to prevent an uncontrolled overflow, loss of life, personal injury or severe property damage.

  - There were no feasible alternatives to the overflows, such as the use of auxiliary pumping or conveyance systems, or maximization of conveyance storage.

  Regardless of the reason for utilizing the emergency overflow outfall 002, it is the permittee's responsibility to notify DEQ orally within 24 hours and provide a written submission within 5 days. It is also the responsibility of the permittee to provide any information to DEQ to determine if there was a permit violation for using the emergency outfall.

3.4.1.2 Schedule B – Minimum Monitoring & Reporting Requirements

Table 3-4 summarizes the minimum monitoring requirements imposed by the NPDES permit for influent and effluent flows. The only monitoring requirements that changed from the old permit to the new permit are iron and manganese are no longer required to be monitored.

Table 3-4 | Minimum Monitoring And Reporting Requirements

NPDES Permit Schedule B		
Item or Parameter	Min Frequency	Sample Type
Influent Flows		
Total Flow	Daily	Measurement
Flow Meter Calibration	Annual	Verification
pH	2/week	Grab
BOD_5	1 per 2 weeks	Composite
TSS	1 per 2 weeks	Composite
Effluent Flows (Outfall 001 – Yamhill River)		
Total Flow (MGD)	Daily	Measurement
Flow Meter Calibration	Annual	Verification
BOD_5	Weekly	Composite
TSS	Weekly	Composite
pH	2/week	Grab
E. coli	1 per 2 weeks	Grab
Quantity Chlorine Used (lb)	Daily	Measurement
Total Chlorine Residual	Daily	Grab
Temperature	2/week	Record
Pounds discharged (BOD_5 & TSS)	1 per 2 weeks	Calculation
Avg. % Removal (BOD_5 & TSS)	Monthly	Calculation
Facultative Lagoon		
Sludge Depth	Once during 2014	Measurement
Water Level	Weekly	Measurement
Perimeter Inspection	Weekly	Observation
Effluent Flows (Emergency Outfall 002 – Yamhill River)		
Flow	Daily (during each occurrence)	Estimate duration and volume.

By February 1 of each year, the City must submit a report that details sewer collection maintenance activities during the past year that reduce inflow and infiltration, as well as those activities planned for the following year.

3.4.1.3 Schedule C – Compliance Conditions and Schedules

The City's permit does not include a Schedule C.

3.4.1.4 Schedule D – Special Conditions

Refer to **Appendix B** for permit requirements. Under the new permit, within 180 days the City is required to submit a plan for identifying and reducing inflow. Inflow reduction is required because the City received a higher winter mass load based on AWWF. This plan must have an implementation schedule and contain the following components.

- Identification of all overflow points and verification that sewer system overflows are not occurring up to a 24-hr, 5-yr storm event or equivalent. A 5 year, 24-hour storm event is approximately 3.0 inches;

- Monitoring of all pump station overflow points;

- A program for identifying and removing all inflow sources into the permittee's sewer system over which the permittee has legal control; and

- If the permittee does not have the necessary legal authority for all portions of the sewer system or treatment facility, a program and schedule for gaining legal authority to require inflow reduction and a program and schedule for removing inflow sources.

This plan will require the City to test the storm lines for illegal connections and inflow sources. Depending on the outcome of the tests, this could require the City to perform some repair work. The most common illegal connections or inflow sources will likely be roof drains and other residential storm drain connections to the sanitary sewer. The costs for this work will need to be added into the subsequent budget cycles.

3.4.2 Effluent Quality

Effluent quality is predominately driven by the NPDES permit limits as previously discussed. The following discussion further describes the effluent quality standards that are required to be followed as described in the NPDES permit and OAR's.

3.4.2.1 Surface Water Quality Standards

The standards for surface water in the State of Oregon are established by the DEQ. These rules are reviewed every three years as a basis for setting new or modifying existing standards. Discharging treatment plant effluent to surface water (such as the Yamhill River) requires a National Pollutant Discharge Elimination System (NPDES) Permit from DEQ. The disposal of effluent to surface water is governed by OAR-340-041, 045, 052, 052, and 055.

For surface water discharge, the City of Dayton is required to comply with those sections of OAR-340-041 which pertain to the Willamette Basin since the receiving stream (Yamhill River) is located in the Willamette Basin. General water quality requirements for the Yamhill River the receiving stream in the Willamette Basin are described in the following subsections.

3.4.2.2 Receiving Stream Water Quality Limitations

In addition to the general Willamette Basin Standards, the Yamhill River has been classified by DEQ as being "Water Quality Limited" (WQL) and is listed on the 303(d) list for several parameters. Section 303(d) of the 1972 Clean Water Act requires each state to identify and list all streams, rivers, lakes and estuaries that do not meet current water quality standards. The State of Oregon is required to submit an updated list of these "water quality limited" streams to the EPA every two years.

The existing WWTP outfall is located on the Yamhill River at river mile 5. Therefore, the regulatory unit of the Yamhill River that is adjacent to the study area is from river mile 0 to river mile 11.2. Per Oregon's 2004/2006 Integrated Report Database (see **Appendix B**), the parameters of concern include dissolved oxygen (from Jan.1 to May 15), fecal coliform and *E. coli* (fall, winter & spring), iron and manganese (year around), pH and phosphorus (from May 1st to October 31), chlorophyll a, and temperature (year around).

- Dissolved Oxygen. In accordance with OAR-340-041-0016, the Dissolved Oxygen (DO) standard requires that, for water bodies identified as having a salmonid spawning use on the tables and maps set out in OAR-340-041-0101 to 340-041-0340 as well as any active spawning area used by resident trout species, the following criteria apply during the applicable spawning through fry emergence periods set forth in the tables and graphs.

- The dissolved oxygen may not be less than 11.0 mg/l. However, if the minimum intergravel dissolved oxygen, measured as a spatial median, is 8.0 mg/l or greater, then the DO criterion is 9.0 mg/l.

- Where conditions of barometric pressure, altitude, and temperature preclude attainment of the 11.0 mg/l or 9.0 mg/l criteria, dissolved oxygen levels must not be less than 95 percent of saturation.

- The spatial median intergravel dissolved oxygen concentration must not fall below 8.0 mg/l.

For water bodies identified by the Department as providing cold-water aquatic life, the dissolved oxygen may not be less than 8.0 mg/l as an absolute minimum. Where conditions of barometric pressure, altitude, and temperature preclude attainment of the 8.0 mg/l, dissolved oxygen may not be less than 90 percent of saturation.

The Yamhill River is designated as having resident trout spawning use during January 1 to May 15. As such, the minimum dissolved oxygen criteria is 11 mg/L with the exceptions listed above. As previously mentioned the Yamhill River is included on the 303 (d) list for dissolved oxygen from Jan. 1 to May 15, and a TMDL is needed. Per discussions with DEQ staff, since the City is not requesting a discharge mass load increase, the new dissolved oxygen TMDL will likely not affect the City's existing NPDES permit. If the NPDES permit is not modified, the proposed alternatives will not be affected. However, there is always a possibility that the TMDL could decrease the BOD and TSS mass load allowed to be discharged to the river. If this was to occur, DEQ would then modify the NPDES permit to decrease the existing BOD and TSS mass loads. This change could affect the recommended alternative.

Due to the relative sizes of the Yamhill River and the proposed discharge stream, the BOD of the effluent is not expected to significantly reduce in-stream dissolved oxygen concentrations. As part of the permitting process for the new outfall, the Department may require City to model the oxygen sag to validate this assumption.

- Fecal Coliform & *E.coli*. In accordance with OAR-340-041-0009 and the current NPDES permit, the current basin standards for bacteria are a 30-day log mean of 126 *E. coli* organisms per 100 ml (based on a minimum of 5 samples), with no single sample exceeding 406 *E. coli* organisms per 100 ml. As previously discussed the Yamhill River is included on the 303 (d) list for fecal coliform and E.coli. The 303 (d) listing, or NPDES permit limits should not affect the recommended alternative because the existing and the proposed plant include disinfection facilities that reduce effluent fecal coliform and E.Coli concentrations prior to surface water discharge. With properly operated disinfection facilities, the City should not have a problem meeting this standard,

- Iron & Manganese. Currently, the Yamhill River is on the 303 (d) list for iron and manganese, and a TMDL is needed. However, per recent discussions with DEQ staff, iron and manganese will be reevaluated in the future. Since there is no criteria for manganese it will likely be removed from the 303 (d) list. Iron's chronic criteria will only apply if the Yamhill River is above the 1,000 ug/L chronic for freshwater aquatic criteria. Based on the Yamhill River iron data collected in the DEQ Mixing zone study the Yamhill River iron concentration is under the 1,000 ug/L threshold. Therefore, these contaminants should not affect the City or the recommend treatment alternatives.

- Phosphorus & pH. Currently the Yamhill River has a TMDL for phosphorus and pH and from May 1st to October 31st. The recommended improvements do not require discharging to the river during this time frame. Therefore, phosphorus and pH should not be an issue. Per the phosphorus TMDL, the instream phosphorus concentration goal is 70µg/L for the summer months. Therefore, if the City were to propose a year round discharge, phosphorus removal would be required.

  Also, per OAR-340-041-0345, the Willamette Basin Water Quality Standard specifies an allowed pH range of 6.5 to 8.5. While the NPDES permit limits effluent pH to the range of 6.0 to 9.0. This limit is based on Federal wastewater treatment guidelines for sewage treatment facilities, and is applied to the majority of NPDES permittees in the State.

  Within the mixing zone, the in-stream water quality standard for pH (i.e., 6.5 to 8.5) does not have to be met. It is the DEQ's position that mixing with ambient water within the mixing zone will ensure that the pH at the edge of the mixing zone meets the standard, and the Department considers permit limits of 6.0 to 9.0 to be protective of the in-stream water quality standard. The DEQ standards therefore apply to the effluent discharge stream, which is easily monitored, rather than relying on in-stream criteria.

- Chlorophyll a. There is an existing TMDL for chlorophyll a on the Yamhill River that is described in the pH and phosphorus TMDL. Chlorophyll a is the result of algae growth. High algae growth rates can occur in the summer months as the result of high phosphorus levels, the limiting nutrient for algae growth. Therefore, chlorophyll a is a secondary pollutant which is produced by high phosphorus levels during the summer months. Since the City will not be discharging during the summer months, chlorophyll a should not be an issue with the recommended improvements.

- Temperature. In accordance with OAR-340-041-0028 and described in the 303 (d) listing, a stream designated as having salmon and trout rearing and migration use, on the tables and maps set out in OAR-340-041-0101 to 340-041-0340, the seven-day-average maximum temperature may not exceed 18.0 degrees Celsius (64.4 degrees Fahrenheit). The purpose of the temperature criteria is to protect designated temperature-sensitive, beneficial uses, including specific salmonid life cycle stages in waters of the State. The temperature standard is a function of the beneficial use designated for a particular receiving listed below.

  Since the proposed improvements include only a winter time discharge, the anticipated effluent temperature from the facility is expected to be below the in-stream temperature requirement. Therefore, the temperature listing should not be a problem. However, if the City proposed a year around discharge, high effluent temperatures during the dry weather months would likely be a problem.

- BOD/TSS. During periods of high stream flows (approximately November through April), a minimum of secondary treatment, or equivalent treatment, must be provided. Secondary treatment is defined as monthly average effluent BOD and TSS concentrations below 30 mg/L and BOD and TSS removal efficiencies of 85%. For lagoon treatment systems, the effluent TSS standard is relaxed to 50 mg/L with a minimum removal efficiency of 65%. During the planning period the City will be required to have a much higher effluent quality in order to comply with the mass load limits in the existing NPDES permit.

- Turbidity. Current DEQ standards require that the discharge may not increase turbidity of the stream by more than 10 percent as measured relative to a control point immediately upstream of the turbidity causing activity (OAR-340-041-0036). Based on the required effluent quality of the treated effluent, this requirement shouldn't be an issue.

3.4.2.3 Mixing Zone

A mixing zone is a designated portion of receiving water that serves as a zone of dilution where wastewater and receiving waters mix thoroughly. The DEQ may suspend all or part of the water quality standards, or set less restrictive standards, within the defined mixing zone under the conditions outlined below.

DEQ typically describes the actual mixing zone limits and requirements in the NPDES discharge permit. The mixing zone is defined by DEQ on the basis of receiving water and effluent characteristics. The mixing zone limits or outfall location may be changed if DEQ determines that the water within the mixing zone adversely affects any existing beneficial uses in the receiving waters. For a particular discharge location the DEQ may establish a regulatory mixing zone (RMZ) within which chronic standards may be exceeded. However, all chronic standards must be met at the edge of the designated RMZ boundary. The DEQ may further partition the RMZ to define the zone of immediate dilution (ZID). The ZID represents the zone within which acute standards must be met.

Dayton's mixing zone for the Outfall 001 is defined as a band extending from a point ten (10) feet upstream of the outfall to a point thirty-five (35) feet perpendicular to flow direction and one-hundred (100) feet downstream from the outfall. The zone of immediate dilution (ZID) is defined as that portion of the mixing zone within ten (10) feet of the discharge point.

In January 2011, DEQ completed a mixing zone study based on conductivity data gathered during October 2009. DEQ utilized the conductivity data to estimate the dilutions in the City's mixing zone and Zone of Initial Dilution. Table 3-5 is a summary of the DEQ mixing zone study (Appendix F).

Table 3-5 | DEQ Mixing Zone Results

Yamhill River Parameter	Value
Assumed 7Q10 Yamhill River Flow (North Yamhill at Yamhill 66 cfs & South Yahmill at McMinnville 73 cfs)	139 cfs
Measured Effluent Flow	0.35 cfs (0.23 mgd)
Dilution Ratio at edge of the zone of initial dilution (ZID)	9.7
Dilution Ratio at the edge of the mixing zone (MZ)	37

Per the mixing zone study field work DEQ staff did not find any critical habitat in the mixing zone. DEQ also contacted the ODFW district biologist, Tom Murtaugh, who verified that there are no active salmon redds in the vicinity of the Dayton WWTP mixing zone.

3.4.3 Effluent Disposal

3.4.3.1 Wastewater Recycling

An alternative to direct discharge to the Yamhill River is to recycle the treated effluent for other uses such as irrigation or industrial process water. Of these uses, irrigation is the most feasible due to the lack of any appropriate industrial user in Dayton.

Reuse of effluent by land application is governed by OAR-340-055, *Recycled Water Use*, and groundwater quality is governed by OAR-340-040, *Groundwater Quality Protection*. Requirements for less than total effluent reuse can be included in an NPDES permit. Therefore, a separate permit is

not always required. Per OAR-340-055 recycled wastewater is characterized in four classes that range in quality from Class A being the most treated to Class D being the least treated. Each wastewater class has different treatment and testing requirements and beneficial purposes, as shown in Table 3-6. In addition to the requirements in Table 3-6, recycled wastewater application is further restricted by public access of the site, and the available buffer areas around the site Therefore, the site must be identified before the actual treatment requirements can be determined.

Table 3-6 | Treatment & Monitoring Requirements & Beneficial Purposes of Recycled Water

Reuse Class	A	B	C	D
Minimum Treatment Required	Oxidation, filtration & disinfection	Oxidation & disinfection	Oxidation & disinfection	Oxidation and disinfection
Parameter - Total Coliform (number/100 mL)				
7 day median	2.2	2.2	23	No Limit
Maximum single sample	23	23	240	No limit
Parameter – E. coli (number /100 mL)				
30 day LOG mean	Not Required	Not Required	Not Required	126/100ML
Maximum Single Sample	Not Required	Not Required	Not Required	406/100ML
Parameter – Turbidity Prior to Disinfection (NTU)				
24 hour mean	2	No limit	No limit	No limit
5% of the time during any 24 hour period	5	No limit	No limit	No limit
Maximum any sample	10	No limit	No limit	No limit
Parameter - Minimum Monitoring Requirements				
Total Coliform	Daily	3/week	1/week	Per NPDES Permit
Turbidity	Hourly	Not Required	Not Required	Per NPDES Permit
E. Coli	Not Required	Not Required	Not Required	1/week
Beneficial Purposes				
	Same as class B plus irrigation of any agricultural or horticultural use; landscape irrigation of parks, playgrounds, school yards, residential or other landscapes accessible to the public; commercial car washing or fountains when water is not intended for human consumption; artificial recharge, nonresidential recreational impoundments.	Same as class C plus fire suppression systems, non-residential urinal, toilet flushing, floor drain trap priming, and restricted recreational impoundments.	Same as class D, plus irrigation of processed foods, orchards or vineyards (1), golf courses, cemeteries, highway medians, or industrial or business campuses.	Irrigation for growing fodder, fiber, seed crops not intended for beneficial use, commercial timber, firewood, ornamental nursery stock, Christmas trees, sod, or pasture for animals.

(1) If irrigation method applies water directly to the soil.

3.4.3.2 Subsurface (On-Site) Disposal of Wastewater Effluent

Another alternative to direct discharge to the Yamhill River is subsurface disposal of treated effluent using a drainfield or disposal field. Under this alternative, the treated effluent is discharged to a system of buried pipes that distribute the effluent for final treatment and absorption by the soil in the unsaturated zone above any permanent or temporarily perched groundwater levels.

Subsurface disposal of sewage or effluent for a non-discharging facility also requires a Water Pollution Control Facility (WPCF) permit from DEQ, with requirements based on state water quality regulations. Subsurface disposal of effluent is governed by OAR-340-071, *On-Site Wastewater Treatment Systems* and OAR-340-040, *Groundwater Quality Protection.*

Most of the soil types found in the study area are poorly drained alluvial soils with high groundwater tables. These types of soils are not suited for subsurface disposal. Therefore, any alternative that includes subsurface disposal would have to also include a pump station and force main to transport the effluent from the treatment plant to a suitable offsite drain field. The complexity and associated expense of such a system when compared to the alternatives evaluated herein renders subsurface disposal an infeasible disposal method in Dayton. As such, subsurface disposal will be removed from further consideration.

3.4.4 Septage Management Regulations

DEQ mandates that if septic tanks are used to remove solids from the flow, the septage sludge must be disposed of at a facility with an approved point of discharge, such as a wastewater treatment plant which has been designed to accept septage. The 40 CFR 257 regulations outline the rules pertaining to the treatment and disposal of industrial, commercial or domestic septage. Treatment and land application of septage sludge must meet the same pathogen reduction standards as for sewage sludge.

Although the City does not appear to currently have an ordinance covering restrictions to the disposal of septage at the City's WWTP, there is a current City policy in effect to refuse to accept septage at the WWTP. We recommend that the City continue with this policy, and require that it be hauled to a larger community (i.e., McMinnville or Salem) with staffing and facilities which are better equipped to handle septage.

3.4.5 Biosolids Management

A significant amount of biosolids have accumulated in the existing lagoons and the need to remove the biosolids during the planning period is anticipated. All biosolids must be stabilized prior to reuse or disposal. Stabilized biosolids are a mixture of solids and liquids that is one of the end products of the wastewater treatment process. The biosolids in the lagoons have been sufficiently digested so additional treatment is not required. Based on past experience, the most economical method to dispose of the biosolids in the lagoons will be to land apply them on a nearby agriculture filed.

Wastewater biosolids are subject to differing regulations and restrictions based on quality. The Code of Federal Regulations (40 CFR 503) defines standards for three measures of biosolids quality:

- Pathogens.
- Vector attraction (the tendency of the sludge to attract rodents, insects and other organisms that can spread disease).
- Trace elements.

Prior to disposal, biosolids are typically analyzed for several parameters and classified with respect to pathogen reduction, vector attraction, and trace element concentration. There are three basic classifications of biosolids. From the highest quality to the lowest quality these are exceptional quality , Class A, and Class B. Higher quality biosolids have fewer restrictions on disposal whereas lower quality biosolids generally have more restrictions on disposal. Without further processing or treatment, we anticipate that the biosolids in the lagoons can be shown to meet the requirements of Class B biosolids.

Class B biosolids must be treated using one of the EPA's *Processes to Significantly Reduce Pathogens* (PSRP), or an equivalent process. These processes include aerobic digestion, air drying, anaerobic digestion, composting, and lime stabilization. The natural digestion that occurs in the lagoons is believed to qualify as a PSRP.

Biosolids must also meet one of the following requirements for reducing vector attraction if they are to be applied to land without restrictions:

- Volatile solids in the sludge shall be reduced by a minimum of 38 percent.
- The specific oxygen uptake rate for sludge treated by aerobic digestion shall be less than or equal to 1.5 mg oxygen per hour per gram of total solids at a temperature of 20°C.
- Aerobic processes shall treat the sludge for a minimum of 14 days with an average temperature of at least 45°C and a minimum temperature of 40°C.
- Alkali addition shall raise the pH of the sludge to a minimum of 12 for two hours and maintain the pH at a minimum of 11.5 for an additional 22 hours without additional alkali.

In order to land apply the biosolids in the lagoons without further treatment, vector attraction reduction must be achieved by measures such as injecting the biosolids below the surface of the land or disposing of them on the surface and incorporating them into the soil within six hours.

As noted schedule D of the City's current NPDES permit, the City must prepare a Biosolids Management Plan and obtain DEQ approval prior to removal and/or reuse of biosolids. All biosolids application sites must be approved by DEQ prior to use. The City will need to identify sites prior to preparing the management plan. Site criteria for land applying biosolids includes geological formation, flood plain proximity, groundwater and surface water proximity, topography, and soils, as well as method of application. Table 3-7 contains an overview of some of the general criteria contained in OAR-340-050.

Table 3-7 | General DEQ Site Criteria for Biosolids Application

Parameter	Criteria
Geology	Must have a stable formation
Within Flood Plain	Restricted period of application and incorporation of biosolids
Groundwater	At time of application; 4-foot minimum depth to permanent groundwater; 1-foot minimum depth to temporary groundwater
Topography	Must have appropriate management to eliminate surface runoff
Slope less than or equal to 12%	• Surface application of liquid dewatered or dried biosolids
Slope greater than 12% but less than 20%	• Direct incorporation of liquid biosolids into the soil, surface application of dewatered or dried biosolids
Soils	• Minimum rooting depth of 24 inches • No rapid leaching • Avoid saline or alkali soil • pH of 6.5 to 8.2 for heavy metal accumulator crops, or pH can be raised by adding lime to the soil.
Method of Application & Proximity to Water Bodies	Buffer strips may be required to protect water bodies. Size depends on method of application and proximity to sensitive area (determined at discretion of DEQ), generally as follows: • Direct injection: no limit required • Truck spreading: less than 50 foot buffer strip • Spray irrigation: 300 to 500 foot buffer strip • Near ditch, pond, channel, or waterway: greater than 50 foot buffer strip • Near domestic water source or well; greater than 200 foot buffer strip

Land application of biosolids at sites used for agricultural purposes requires special management considerations. These relate to access to the site, types of crops grown, plant nutrient rates, timing and duration of biosolids application (i.e., site life and seasonal constraints), and grazing restrictions. A brief discussion of each of these issues follows.

- Access - Controlled access must be provided for municipal biosolids application sites for 12 months following surface application of biosolids. Controlled access is defined as public entry or traffic being unlikely. Privately owned rural land is typically assumed to have controlled access, while public lands such as parks may require fencing to ensure access control.

- Crops - Biosolids or biosolids derived products are not to be used directly on fruits or vegetables which may be eaten raw. As a general rule, crops grown for human consumption should not be planted within 18 months of application of municipal biosolids. If the edible parts will not be in contact with the biosolid amended soil, or if the crop will be processed or treated prior to marketing in such a manner to ensure that pathogen contamination is not a concern, this requirement may be waived by DEQ. There are no restrictions on planting times for crops not grown for direct human consumption.

- Nutrient Loading - Biosolids application to agricultural land should not exceed the annual nitrogen loading required for maximum crop yield. Biosolids are, therefore, typically managed according to their fertilizer value. Biosolids may be applied above agronomic rates on a onetime basis or less than once per year so long as runoff, nuisance conditions, and groundwater concerns are adequately addressed. In cases of higher than agronomic application rates, the acceptable loading rate and application frequency is typically based on nitrogen accumulation and annual nitrogen use.

- Site Life - Sites generally have a limited application life, which may be determined by the chemistry of the soil and the metals loading from the biosolids. Site life is determined by dividing lifetime biosolids loading limits (based on the most limiting constituent) by the annual application rate.

- Seasonal Constraints - The main consideration in land applying on sloping ground is to avoid surface runoff and soil erosion. Additionally, biosolids application should be restricted to the dry season to prevent soil damage that may occur from equipment traffic in during the wet season.

- Grazing Restrictions - Grazing animals should not be allowed on pasture or forage for 30 days after application of stabilized biosolids, 180 days after application of non-stabilized biosolids, and 7 days after application of air-dried biosolids.

- Site Monitoring and Reporting - As previously noted, site monitoring is typically not required where "EQ" biosolids are applied at or below agronomic rates based on crop nitrogen requirements. However, if the biosolids contain high concentrations of heavy metals or other toxic elements, or if crop nitrogen requirements are exceeded on a regular basis, soil monitoring and special management practices may be required. At the discretion of DEQ, monitoring wells and groundwater background characterization and/or monitoring may be required on any site on a case by case basis.

3.4.6 Reliability and Redundancy Criteria

The EPA has established minimum standards for mechanical, electrical, fluid systems, and component reliability for all new or expanding sewerage facilities, including treatment plants. These reliability standards establish minimum levels of reliability for three classes of sewerage facilities. Pump stations associated with, but physically removed from the actual treatment works may have a different classification than the treatment works itself.

The purpose of these reliability standards is to ensure that the treatment facilities will operate effectively on a day-to-day basis and that provisions are made for operation during power failures, flooding, peak loads, equipment failures, and maintenance shutdowns. These reliability and redundancy standards are designed to ensure that unacceptable degradation of the receiving water will not occur due to the interrupted operation of specific treatment process or unit operation.

The reliability classification will be based on the water quality and public health consequences of a component or system failure. Specific requirements pertaining to treatment plant unit processes for each reliability class are described in EPA's technical bulletin, *Design Criteria for Mechanical, Electric, and Fluid System and Component Reliability*, EPA 430-99-74-001. EPA and DEQ guidelines for classifying sewerage works are summarized as follows:

- Reliability Class I. These are works whose discharge, or potential discharge, (1) is into public water supply, shellfish, or primary contact recreation waters, or (2) as a result of its volume and/or character, could permanently or unacceptably damage or affect the receiving waters or public health if normal operations were interrupted.

  Examples of Reliability Class I works are those with a discharge or potential discharge near drinking water intakes, into shellfish waters, near areas used for water contact sports, or in dense residential areas.

- Reliability Class II. These are works whose discharge, or potential discharge, as a result of its volume and/or character, would not permanently or unacceptably damage or affect the receiving waters or public health during periods of short-term operations interruptions, but could be damaging if continued interruption of normal operations were to occur (on the order of several days).

  Examples of a Reliability Class II works are works with a discharge or potential discharge moderately distant from shellfish areas, drinking water intakes, areas used for water contact sports, and residential areas.

- Reliability Class III. These are works not otherwise classified as Reliability Class I or Class II.

Table 3-8 contains the typical redundancy requirements for treatment plant and pump station components that are designed in accordance with the EPA Reliability Class I standards. In addition to the standards listed in the table, unit operations must be designed to pass the peak hydraulic flow with one unit out of service. Mechanical components in the facility must also be designed to enable repair or replacement without violating the effluent limitations or causing diversion of untreated sewage. The information in this table is not specific to the proposed alternative, and some of the plant components shown are not necessarily included in the existing or future facilities. Some of the items listed below apply regardless of the Reliability classification of the treatment facility.

Table 3-8 | Typical EPA Reliability Class I Requirements

System Component	Capacity/Redundancy Requirements
Raw Sewage Pumps	Handle peak flow with largest unit out of service. As a minimum, the Peak flow is defined as the flow associated with a 5-year, 24-hour storm.
Mechanical Bar Screens	Provide one backup with either manual or mechanical cleaning (manual cleaning acceptable if only two screens)
Grit Removal	Provide a minimum of two units.
Primary Sedimentation	Handle 50% of design flow capacity with largest unit out of service. Design flow is defined as the flow used as the design basis of the component.
Activated Sludge Process	A minimum of two equal size basins. No backup basin required.
Aeration Blowers	Supply the design air capacity with the largest unit out of service. Provide a minimum of two units.
Air Diffusers	Allow for the isolation of largest section of diffusers (within a basin) without measurably impairing oxygen transfer.
Secondary Sedimentation	Handle 75% of design flow capacity with largest unit out of service. Design flow is defined as the flow used as the design basis of the component.
Disinfection Contact Basin	Handle 50% of the design flow with largest unit out of service. Design flow is defined as the flow used as the design basis of the component.
Effluent Pumps	Handle peak flow with largest unit out of service. Peak flow is defined as the maximum wastewater flow expected during the design period of the treatment works.
Electrical Power	Two separate and independent sources of electrical power shall be provided, either from two separate utility substations or from a single substation and a plant based generator. Designated backup source shall have sufficient capacity to operate all vital components, critical lighting, and ventilation during peak flow conditions, except that components used to support the secondary processes need not be included as long as treatment equivalent to sedimentation and disinfection is provided.

3.4.7 Design Considerations & Constraints

The design must take into account existing and projected flows and loadings, as well as the regulatory requirements as outlined previously. General design considerations incorporated in the alternatives are discussed below.

3.4.7.1 Design Period

The design period must be long enough to ensure the new facilities will be adequate for future needs, but short enough to ensure effective use within their economic and useful life span. The alternatives evaluated will be based on the effluent quality criteria discussed in the previous paragraphs. The design period will be twenty years for pump stations and treatment/disposal facilities, and buildout to City zoning for the gravity collection system components.

3.4.7.2 Treatment Efficacy

For alternatives involving wastewater treatment, a primary consideration will be the degree of treatment required to meet the discharge requirements and sufficient sizing of the facility to handle future projected peak hydraulic and organic loads.

3.4.7.3 Reliability

Although reliability can be enhanced by redundancy, conservative selection of the proper equipment helps ensure long life and minimize maintenance costs. Each unit process should be selected based on its ability to effectively treat the waste stream directed to it. Capabilities of the treatment plant operator and the community should also be considered. Processes that require a high degree of manual labor, special schooling, and unique instrumentation should generally be avoided where possible.

3.4.7.4 Durability

Conveyance and treatment systems should consist of materials and equipment that are capable of satisfactory performance over the entire design life/period of the system components. The selection of wastewater system components is a matter of engineering judgement based on such factors as the type and intensity of use, type and quality of materials used in construction, the quality of workmanship during installation, manufacturer's reputation, and the expected maintenance that must be performed during life of the component.

3.4.7.5 Flexibility

The design of the conveyance and treatment system should allow for flexibility in operation and maintenance. For alternatives involving wastewater treatment, the operator should have the ability to route flows around the individual process units as required for repairs without significantly degrading effluent quality. This can be achieved by providing redundant units for critical processes and having multiple interconnections between units. In other cases, units can be oversized to assure flexibility. Such design flexibility will also help ensure that discharge requirements can be met under changing influent conditions, and should allow for the construction and connection of new process units as needed.

3.4.7.6 Operability

Operation of wastewater systems entails considerable responsibility and cost, especially since it directly impacts public health. The personnel assigned to operate and maintain a treatment facility must be appropriately trained. The more sophisticated the process or equipment, the greater the level of expertise required. Qualified individuals are usually more readily available in metropolitan areas, as is financial support for continued education and advanced training. However, small communities or service districts can have more difficulty in securing and retaining personnel with the required qualifications, as well as budgeting the money required to pay them. Consequently, the selection of a treatment process or equipment should reflect the regional and local training level of operations and maintenance personnel.

3.4.7.7 Miscellaneous

Consideration of site location, operational tasks, public perception, aesthetics, health and safety concerns, noise, odors, access to equipment, and hazards all must be considered when assessing treatment alternatives.