

**FACT SHEET FOR NATIONAL POLLUTANT  
DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT WA0020401  
CITY OF WOODLAND WASTEWATER TREATMENT PLANT  
November 2011**

**PURPOSE OF THIS FACT SHEET**

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

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 30 days before issuing the final permit. Copies of the fact sheet and draft permit for the city of Woodland Wastewater Treatment Plant NPDES Permit WA002040, are available for public review and comment. For more details on preparing and filing comments about these documents, please see **Appendix A - Public Involvement**.

The city of Woodland 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.

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 D - Response to Comments**, and publish it when issuing the final NPDES permit. Ecology will not revise the rest of the fact sheet, but the full document will become part of the legal history contained in the facility's permit file.

David J. Knight P.E. prepared the permit and this fact sheet.

**SUMMARY**

The city of Woodland (City) operates a sequencing batch reactor type wastewater treatment plant that discharges to the Lewis River near Highway I-5 within the city limits of Woodland. Ecology issued the previous permit for this facility on February 11, 2005. Modifications to recognize the flow and loading capacity increase to 2.0 MGD were recognized in the prior NPDES permit (2005).

The proposed permit continues the same effluent limits on Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS), fecal coliform bacteria, and pH reflective of the Publicly Owned Treatment Works' (POTW) 2.0 MGD capacity. The permit includes a narrative requirement to treat ammonia, copper, and zinc as well as possible. It requires the City to maintain their performance because of new ambient and effluent data, increased effluent flows, and more refined estimates of mixing at mixing zone boundaries.

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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 the Department of Ecology (Ecology). The legislature defined Ecology's authority and obligations for the wastewater discharge permit program in 90.48 Revised Code of Washington (RCW).

The following regulations apply to municipal NPDES permits:

- Procedures Ecology follows for issuing NPDES permits [chapter 173-220 Washington Administrative Code (WAC)]
- Technical criteria for discharges from municipal wastewater treatment facilities (chapter 173-221 WAC)
- Water quality criteria for surface waters (chapter 173-201A WAC) and for ground waters (chapter 173-200 WAC)
- Sediment management standards (chapter 173-204 WAC)
- Submission of Plans and Reports for Construction of Wastewater Facilities (Chapter 173-240 WAC)

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

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 30 days (WAC 173-220-050). (See **Appendix A—Public Involvement** 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. Ecology will summarize the responses to comments and any changes to the permit in **Appendix D**.

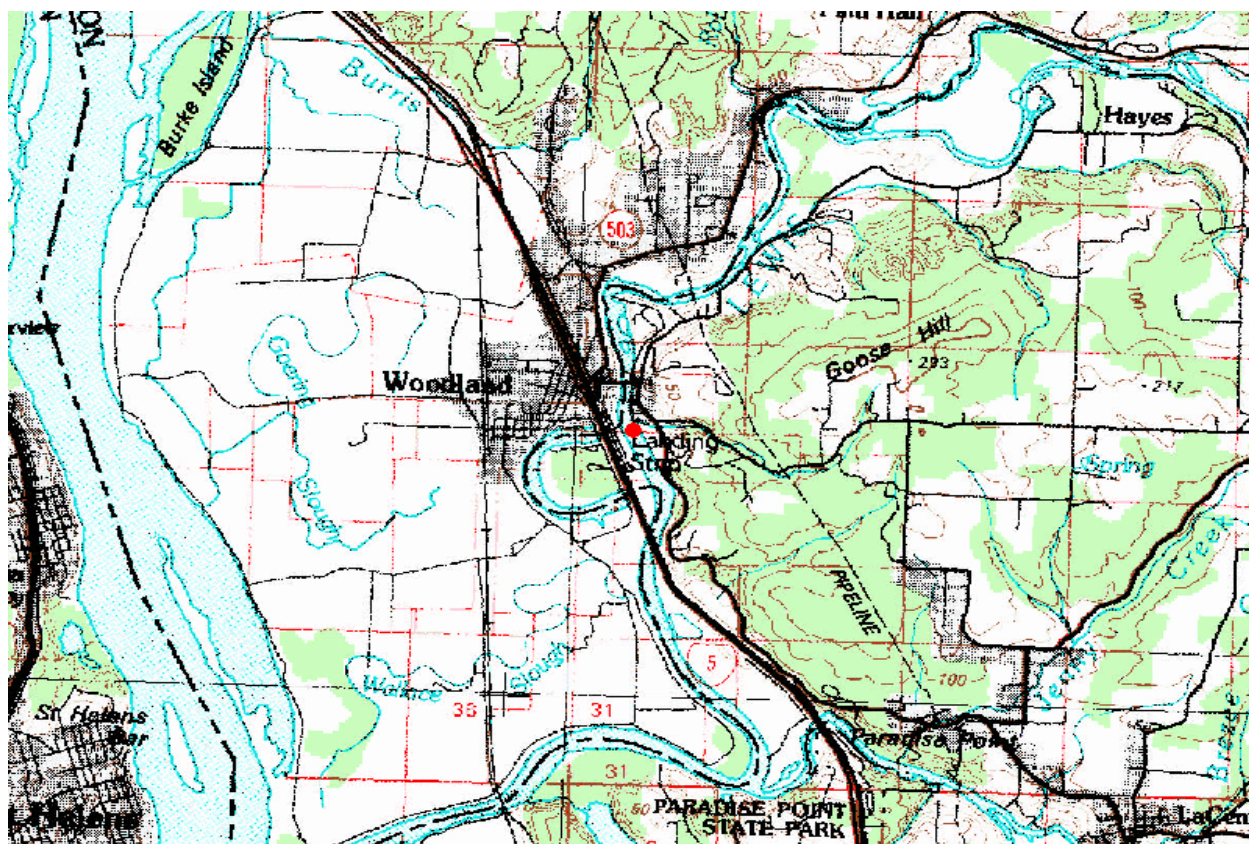
## II. BACKGROUND INFORMATION

**Table 1 - General Facility Information**

Applicant:	City of Woodland
Facility Name and Address:	City of Woodland Wastewater Treatment Plant 100 Treatment Plant Road Woodland, WA 98674
Type of Treatment:	Tertiary Sequencing Batch Reactor
Discharge Location:	Lewis River Latitude: 45.90350 Longitude: -122.73741
Waterbody ID Number:	1225781459549

The city of Woodland (City) discharges to the Lewis River approximately five miles upstream from its confluence with the Columbia River, at the town of Woodland. The Columbia River reverses during tidal exchanges for much of the year where the Lewis River comes in, and the permit asks for a study of whether the Lewis River also reverses at the point of the outfall. The POTW is designed to discharge a batch of effluent for 18 minutes every 2 hours 24 minutes (ten times a day, or five times per reactor when operating two reactors). The last permit did not require a mixing zone study, and failed to account for the fact that the acute WQ standards are based on a one-hour duration, while the design is to discharge 8 times the “average daily” flow for a short duration.

Figure 1. Facility Location Map



A. Facility Description

*History:*

The City began collecting and treating its wastewater in the mid-1950s. The facility was upgraded in 1974 and again in 1993. The 1993 upgrade used a process of Submerged Biological Contactor (SBC) and disinfected with chlorine. The facility experienced numerous violations with the old SBC system which had become overloaded. A moratorium on new connections was placed on the system. In 2002 construction was completed on a new plant which uses Sequencing Batch Reactors (SBR) and used Ultra-Violet (UV) disinfection. The moratorium on new construction was lifted upon completion of the new plant. The community's loadings peaked in 1999, but dropped significantly in 2000. The community has experienced about a 6.8 percent per annum growth rate in sewer loadings and 4.8 percent annual increase in flows between 2000 and 2008.

*Collection System Status:*

The collection system has approximately 97,587 feet of sewer collection pipe and 13,922 feet of force main. The oldest pipe was installed before 1960. There is approximately 21,908 feet of this older non-gasketed concrete pipe that is slated for replacement at a rate of 500 to 1000 feet per year. The Infiltration and Inflow (I/I) from the older pipes can be extensive in systems of this type. The area of the City is relatively flat which results in

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the need to pump the wastewater up to a height so as to gravity flow to the force main pump stations. There are 13 pump stations with a 14th pump station under construction.

*Treatment Processes:*

See appendix E for a flow diagram of the solids and liquids paths, a site schematic, and a map of the vicinity. Flow enters the plant from a force main. The influent is monitored at an influent station prior to being screened by a Heliseive separator and a bar screen and then to a grit chamber. Flow is monitored by a Parshall Flume with an ultrasonic flow meter. The flow is split to enter one of three Sequencing Batch Reactors (SBRs). Due to being well below the plant's design flows and loadings, one SBR is typically in standby status. The rated capacity of the POTW includes this third basin. The sludge is sent to a series of basins where it is aerobically digested and gravity thickened. The water decanted from the SBRs during the clarifying cycle is disinfected with Ultra-Violet light. The final effluent gravity flows to the river from a concrete basin that used to serve as the chlorine contact chamber. During high flows the effluent must be pumped from the basin to the river. The effluent flow is measured at a weir in the basin and there is also an effluent monitoring station in the basin.

Residential flows make up about 80 percent of the flows to the treatment facility. Commercial, industrial, and institutional flows make up the other 20 percent of the wastewater flows. Loadings of BOD and TSS to the POTW are from 50 percent to 100 percent greater than what Ecology typically sees for the flows received.

To put the influent concentrations observed in Woodland in perspective, it helps to compare them to a couple other POTWs that are "tight" in not having excessive dilute flow (Clark Regional and Vancouver Marine Park). The Woodland plant has 39 percent and 64 percent higher BODs and 72 percent and 80 percent higher TSS concentrations. Since any industry discharging more than 5 percent of the BOD loading to a POTW is defined as a Significant Industrial User (SIU) there are likely high strength SIUs that have not been recognized as such in the service area. The City has discussed starting up an oversight program to ensure restaurants are properly servicing grease interceptors.

**2008 Annual Average Influent Concentrations**

<b>Plant</b>	<b>BOD Influent Concentration</b>	<b>TSS Influent Concentration</b>
Marine Park (Vancouver)	195 mg/L	235 mg/L
Salmon Creek (Clark Co)	229 mg/L	246 mg/L
Woodland	319 mg/L	424 mg/L

Recognized non-domestic sources include a dog food manufacturing facility (Northwest Pet Products), a meat packer (Walt's Meats). There are several restaurants, retail stores, and service stations in collection area. The Oak Tree Restaurant is the largest restaurant, and historically has included a bakery on the premises. By these indications, non-domestic sources are discharging one third of the BOD and nearly half the TSS being treated by the City. The City has pretreatment requirements in Chapter 13.08 of the City of Woodland Municipal Code Title 13 Water and Sewage, 1998. It is important for the City to continue to enforce the pretreatment requirements on the industrial and

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commercial dischargers. Ecology strongly encourages the City to fully and effectively implement the surcharge program described in the City's Ordinance (WMC 13.06.120D - 2 February 1998). This sentiment has been reflected as early as 1998 in Ecology's comments on the City's draft General Sewer Plan. To date, the City has no customers on a surcharge program.

The facility is classified as Class III Treatment Plant based on the design flow of 2.0 mgd and treatment of activated sludge. The facility must have an operator in responsible charge of the plant of at least a Group III certification and any operators in charge of each shift must have at least a Group II certification. The POTW is staffed for an 8 hour shift M-F and weekend checks are made by operations staff. The facility is typically operated from 7:00 a.m. to 3:00 p.m., Monday through Friday, and an operator is at the plant for four hours on weekends and eight hours on non-weekend holidays.

The SBR construction was funded by a variety of sources: PWTF \$3.3 million loan, State Revolving Fund \$1.4 million loan, Centennial Clean Water Fund \$2.3 million grant, Cowlitz County Grant \$500,000, and a Community Development Block Grant \$300,000.

*Discharge Outfall:*

The outfall consists of a 16-inch diameter concrete pipe with a single 16-inch diameter port that ends approximately 60-feet into the river and is embedded in a concrete footing. The Lewis River is shallow and at 7Q10 minimum flow, the water at the discharge point is approximately 6.25-feet deep. This permit will require the Permittee to inspect the outfall, report on the condition, depth, and distance from shore and river flow at the time of the inspection. The Permittee also has the option to use this information, dye, and computer models to perform a mixing zone study to determine more precisely the mixing achieved at critical conditions at the mixing zone boundaries for the acute and chronic mixing zones. The permit describes the information which such a study must obtain, and the date on which it must be accomplished to allow Ecology to use it in writing the next NPDES permit.

*Solid Wastes:*

The treatment facility removes solids during the treatment of the wastewater at the headworks (grit and screenings), and at the SBRs, in addition to incidental solids (rags, scum, and other debris) removed as part of the routine maintenance of the equipment. Grit, rags, scum and screenings are drained and disposed of as solid waste at the local solid waste transfer station. Solids removed from the SBRs are treated in a pair of aerobic digesters and a gravity thickener. The final biosolids in liquid form are hauled away by Fire Mountain Farms in Lewis County which has a permit from Ecology to land apply the biosolids. The Permittee had not been required by NPDES permit conditions to sample its biosolids for 503 metals in the term of the last permit. Therefore there is no data to summarize with respect to whether the biosolids meet the standards of 40 CFR Part 503 for metals. The Permittee will be required to monitor and report biosolids metals concentrations as a condition of this permit.

**B. Permit Status**

Ecology issued the previous permit for this facility on February 11, 2005. The previous permit placed effluent limits on BOD, TSS, Fecal Coliform, and pH. The permit also required the



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Permittee to operate the facility so as to reduce ammonia to the maximum extent practicable with existing equipment

The city of Woodland submitted an application for permit renewal on April 15, 2009. Ecology accepted it as complete.

**Table 2: Wastewater Characterization Based on May 2002 – March 2009 DMRs**

Parameter	Concentration & Loading	Previous Limits
Flow	0.538 mgd MMA, 0.847 max day	2.0 mgd
BOD	5.13 mg/L avg, 19 mg/L max	30 mg/L monthly, 45 weekly
	14.2 lbs/day avg, 30 lbs/day max	466 lbs/day monthly max
	98.8 percent avg removal rate	85 percent minimum
TSS	4.9 mg/L avg, 14 mg/L max	30 mg/L monthly, 45 weekly
	13.6 lbs/day avg, 31 lbs/day max	474 lbs/day monthly max
	98.9 percent avg removal rate	85 percent minimum
Fecal Coliform bacteria	89 org/100 ml (max in permit application)	200 org/100 ml monthly 400 org/100 ml weekly
pH	6.5 minimum 7.8 maximum	6.0 minimum 9.0 maximum
Temperature	24.4° C 7DADM	No limit
Dissolved Oxygen	1.9 mg/L 5 <sup>th</sup> percentile	No limit

C. Summary of Compliance with Previous Permit Issued

Ecology staff last conducted a non-sampling compliance inspection in 2005; however staff conducted an informal walkthrough inspection in 2009.

The city of Woodland has complied with the effluent limits and permit conditions throughout the duration of the permit issued on February 11, 2005. Ecology assessed compliance based on its review of the facility's discharge monitoring reports (DMRs) and on inspections conducted by Ecology.

D. Wastewater Characterization

In fulfillment of the last NPDES permit monitoring requirements, the POTW conducted an effluent and receiving water study. The results of this study for several metals are as follows. Since only three samples were taken, the maximum (representing the upper 1/3 of samples) is shown. The data tabulated below is reported as representative of operations during the term of the prior permit:

**Table 3: Wastewater Characterization**

Parameter	Max Conc	Ave Conc	Ambient Conc
Antimony	.34 µg/L	.267 µg/L	0.05 µg/L
Arsenic	1.5 µg/L	.933 µg/L	0.5 µg/L
Cadmium	.19 µg/L	.12 µg/L	0.13 µg/L
Copper	21.5 µg/L	13.86 µg/L	0.9 µg/L
Lead	.41 µg/L	.32 µg/L	0.24 µg/L
Mercury	.0054 µg/L	.0032 µg/L	0.0011 µg/L
Nickel	2.9 µg/L	1.83 µg/L	0.4 µg/L
Selenium	1.9 µg/L	.97 µg/L	2.0 µg/L
Silver	.13 µg/L	.09 µg/L	0.04µg/L
Thallium	.1 µg/L	.02 µg/L	0.04 µg/L
Zinc	73.7 µg/L	64.9 µg/L	4.1 µg/L
Hardness	108 mg/L	100 mg/L	18 mg/L
Temperature	24.54 C (7DADM)		18.4 C (7DADM)
Ammonia	50 µg/L		20 µg/L (detection limit)
pH	6.8 - 7.5	7.1	8.1 (top of 5 in study)
Salinity	.38 PSU	.33 PSU	0.02 PSU

The only toxic pollutant detected in the NPDES permit application was chloroform at an influent concentration of 16µg/L. Medical facilities (clinics, hospitals, veterinarians, and sometimes dentists) typically would use this chemical. At this concentration it does not pose a threat to the treatment processes, and it was not detected in the effluent.

E. Description of the Receiving Water

The city of Woodland discharges to the Lewis River. Other nearby point source outfalls includes only stormwater discharges. Significant nearby non-point sources of pollutants include a dam upstream of the City, and dairies and agricultural operations between the City and the Columbia River.

The ambient background data used for this permit includes the following from the City's December 14, 2005 monitoring study (cited at end of fact sheet)

**Table 3. Ambient Background Data**

Parameter	Value used
Temperature (highest annual 1-DADMax)	18.44° C
Temperature (highest annual 7-DADMax)	18.40° C
pH (Maximum / Minimum)	7.85 – 8.1
Dissolved Oxygen	9.61 – 14.01 mg/L
Total Ammonia-N	< .02 mg/L (detection limit)
TSS	< 5.0 mg/L
Hardness	15 - 18 mg/L as CaCO <sub>3</sub>
Alkalinity	16 - 20 mg/L as CaCO <sub>3</sub>
Salinity	.02 PSU

F. SEPA Compliance

Regulation exempts reissuance or modification of any wastewater discharge permit from the SEPA process as long as the permit contains conditions are no less stringent than state rules and regulations. 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).
- 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 National Toxics Rule (40 CFR 131.36).
- 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.

Nor does Ecology usually develop limits for pollutants that were not reported in the permit application but that may be present in the discharge. The permit does not authorize discharge of the non-reported

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pollutants. If significant changes occur in any constituent of the effluent discharge, The City of Woodland is required to notify Ecology [40 CFR 122.42(a)]. The City may be in violation of the permit until Ecology modifies the permit to reflect additional discharge of pollutants.

A. Design Criteria

Under WAC 173-220-150 (1)(g), flows and waste loadings must not exceed approved design criteria. Ecology-approved design criteria for this facility's treatment plant were obtained from the City of Woodland General Sewer Plan and Facility Plan prepared by Gibbs & Olson, Inc. 1999, the 2003 Operation & Maintenance Manual, and as built drawings and are as follows:

**Table 4: Design Criteria for the City of Woodland.**

Parameter	Design Quantity
Maximum Month Design Flow (MMDF)	2.0 MGD
Peak Instantaneous Design Flow (PIDF)	3.2 MGD
BOD <sub>5</sub> loading for maximum month	3107 lb/day
TSS loading for maximum month	3160 lb/day
NH <sub>4</sub> -N influent loading	356 lbs/day
Design population equivalent	12,089

B. Technology-Based Effluent Limits

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

Chapter 173-221 WAC lists the following technology-based limits for pH, fecal coliform, BOD<sub>5</sub>, and TSS:

**Table 5: Technology-based Limits.**

Parameter	Limit
pH	The pH must measure within the range of 6 to 9 standard units.
Fecal Coliform Bacteria	Monthly Geometric Mean = 200 organisms/100 mL Weekly Geometric Mean = 400 organisms/100 mL
BOD <sub>5</sub> (concentration)	Average Monthly Limit is the most stringent of the following: - 30 mg/L - may not exceed fifteen percent (15 percent) of the average influent concentration Average Weekly Limit = 45 mg/L

Parameter	Limit
TSS (concentration)	<p>Average Monthly Limit is the most stringent of the following:</p> <ul style="list-style-type: none"> <li>- 30 mg/L</li> <li>- may not exceed fifteen percent (15 percent) of the average influent concentration</li> </ul> <p>Average Weekly Limit = 45 mg/L</p>

The technology-based mass limits are based on WAC 173-220-130(3)(b) and 173-221-030(11)(b).

**BOD:** The technology based monthly average effluent mass loading limit is based on the more stringent of two requirements: 1) Meeting the effluent concentration limit at the flow limit based on this formula: Monthly effluent mass loadings (lbs/day) = maximum monthly design flow (2.0 MGD) x Concentration limit (30 mg/L) x 8.34 (conversion factor) = mass limit. This yields a limit of 500 lb/day. 2) The limit reflective of 85 percent removal based on the formula: Monthly effluent mass loadings (lbs/day) = maximum monthly influent design loading (3,107 lb/d) x 0.15 = 466 lbs./day. Ecology is required to place the more stringent limit (**466 lbs/day**) in the permit

The weekly average effluent mass loading = 1.5 x monthly loading = **699 lbs/day**.

**TSS:** The technology based effluent loading limit for TSS is based on the more stringent of the same two requirements: 1) The limit reflective of meeting the effluent concentration limit at the flow limit: 500 lbs/day. (calculated the same way as for BOD) and 2) The limit reflective of 85 percent removal: Monthly effluent mass loadings (lbs/day) = maximum monthly influent design loading (3,160 lbs/day) x 0.15 = 474 lbs/day. Ecology is required to place the more stringent limit (**474 lbs/day**) in the permit.

The weekly average effluent mass loading = 1.5 x monthly loading = **711 lbs/day**.

#### C. Surface Water Quality-Based Effluent Limits

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

#### *Numerical Criteria for the Protection of Aquatic Life and Recreation*

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

*Numerical Criteria for the Protection of Human Health*

The U.S. EPA has published 91 numeric water quality criteria for the protection of human health that are applicable to dischargers in Washington State (EPA 1992). These criteria are designed to protect humans from exposure to pollutants linked to cancer and other disease, 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, 2006) and of all marine waters (WAC 173-201A-210,; 2006) in the state of Washington.

*Antidegradation*

The purpose of Washington's Antidegradation Policy (WAC 173-201A-300-330; 2006) 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.

In this case, the facility is not planning a new or expanded action which is recognized with this permit. The facility's upgrade to 2.0 MGD of capacity will provide ample treatment capacity for the term of this permit and beyond. Therefore a Tier II analysis is not needed.

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.
- The receiving waters (Lewis River) do not meet assigned water quality criteria for temperature of dissolved gas. Listing 37818 for temperature in the Lewis River shows the criterion of 16°C is not met at MSH019 – just upstream of the Swift reservoir. Upstream locations by the spillway are also impaired for total dissolved gas. This impairment is not relevant to the vicinity of the outfall. However, data included in the report of monitoring submitted by the Permittee shows that in the vicinity of the outfall, in September 2005, the 7DADmax temperature was 18.38°C. This exceeds the water quality significantly.
- For waters that do not meet assigned criteria, or protect existing or designated uses, Ecology is charged to take appropriate and definitive steps to bring the water quality back into compliance with the water quality standards.
- Whenever the natural conditions of a water body are of a lower quality than the assigned criteria, the natural conditions constitute the water quality criteria. Where water quality criteria are not met because of natural conditions, human actions are not allowed to further lower the water quality, except where explicitly allowed in chapter 173-201A WAC.

Ecology's analysis finds that the existing and designated uses of the receiving water will be protected under the conditions of the proposed permit. Future work is needed to determine to what extent the criteria assigned to the Lewis River for temperature are not met because of human activities and to what extent natural conditions are responsible for conditions.

### *Mixing Zones*

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

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

The state's water quality standards allow Ecology to authorize mixing zones for the facility's permitted wastewater discharges only if those discharges already receive all known, available, and reasonable methods of prevention, control, and treatment (AKART). Mixing zones typically require compliance with water quality criteria within a specified distance from the point of discharge and use no more than 25 percent of the available width of the water body for dilution. Ecology uses modeling to estimate the amount of mixing within the mixing zone. Through modeling Ecology determines the potential for violating the water quality standards at the edge of the mixing zone and derive any necessary effluent limits. Steady-state models are the most frequently used tools for conducting mixing zone analyses. Ecology chooses values for each effluent and for receiving water variables that correspond to the time period when the most critical condition is likely to occur (see Ecology's *Permit Writer's Manual*). Each critical condition parameter, by itself, has a low probability of occurrence and the resulting dilution factor is conservative. The term "reasonable worst-case" applies to these values.

The mixing zone analysis produces a numerical value called a dilution factor (DF). A dilution factor represents the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. For example, a dilution factor of 10 means the effluent is 10 percent and the receiving water is 90 percent of the total volume of water at the boundary of the mixing zone. Ecology uses dilution factors with the water quality criteria to calculate reasonable potentials and effluent limits. Water quality standards include both aquatic life-based criteria and human health-based criteria. The former are applied at both the acute and chronic mixing zone boundaries; the latter are applied only at the chronic boundary. The concentration of pollutants at the boundaries of any of these mixing zones may not exceed the numerical criteria for that zone.

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.

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



- A 70-year lifetime of daily exposures.
- An ingestion rate for fish or shellfish measured in kg/day.
- An ingestion rate of two liters/day for drinking water
- A one-in-one-million cancer risk for carcinogenic chemicals.

This permit authorizes a small acute mixing zone, surrounded by a chronic mixing zone around the point of discharge (WAC 173-201A-400). The water quality standards impose certain conditions before allowing the discharger a mixing zone:

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

For this discharge, the percent volume restrictions of the water quality standards resulted in a lower dilution factor than the distance and width restrictions. Therefore, the dilution factor calculated at a 10-year low flow was used to determine reasonable potential to exceed water quality standards.

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

Ecology has determined that the treatment provided at the Woodland Sewage Treatment Plant meets the requirements of AKART (see “Technology based Limits”).

**3. Ecology must consider critical discharge conditions.**

Surface water quality-based limits are derived for the waterbody’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: <http://www.ecy.wa.gov/biblio/92109.html>.

Ecology used the following critical conditions to model the discharge:

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- The seven-day-average low river flow with a recurrence interval of ten years (7Q10) of 789 cfs (510 MGD).
- The thirty-day low river flow with a recurrence interval of five years (30Q5) has not been estimated, so the 7Q10 is used for estimating compliance with Human Health criteria (carcinogen).
- River depth is 6.25 ft (centerline at outfall), 2.9 ft avg. at 3,240 cfs. River depth is estimated to be 3.0 ft (centerline at outfall), 2' at port at the 7Q10 flow (789 cfs)
- River velocity of 1.01 ft per second.
- Manning roughness coefficient (slope rather than roughness used in model).
- Slope 5.0E-04 (.0005) degrees.
- Channel width of 281 feet.
- Maximum average monthly effluent flow of 0.66 MGD (1999) + 4.8 percent/annum for five years = .83 MGD. This value was used for estimating compliance with chronic and human health non-carcinogen.
- Annual average flow of .47 MGD + 4.8 percent/annum = .59 MGD for human health carcinogen.
- Maximum daily flow of .896 MGD (December, 2007)
- 7DAD MAX Effluent temperature of 18.46 degrees C.

Ambient data at critical conditions in the vicinity of the outfall was taken from the mixing zone study conducted in 1999 and the receiving water and effluent study conducted in 2005 by the City. Effluent flow data was derived from the monthly Discharge Monitoring Reports (DMR's) submitted by the City.

Implications to Mixing Zone Ratios:

The maximum average monthly effluent flow in the last five years of 0.55 MGD (March 2011) + 4.8 percent/annum for five years = 0.70 MGD. This flow is used to estimate mixing for chronic and human health non-carcinogen. The theoretical maximum chronic mixing zone ratio (using 25 percent of the 7Q10 stream flow or 127 MGD) would be 182:1. However mixing with the present diffuser is not that good. The 1999 mixing zone study showed mixing zone ratios of only 117:1 at .78 MGD, and 74:1 at 1.57 MGD. The chronic criteria are designed to protect for a peak 4-day average flow. The peak 4-day average flow over the last five years has been 0.67 MGD (2007). **However, the CMZR recognized and used for the last NPDES permit was 74:1, presuming flows might be up to 1.57 MGD.** Because the mixing zone ratio of 74:1 does not drive any lower effluent limit (it is not limiting), this mixing

zone ratio is retained in the current permit. It should be understood, however, that this ratio is protective for POTW flows of up to 1.57 MGD as a four-day average.

Maximum daily flow of 0.896 (December, 2007) + 4.8 percent/annum until 2014 (7 years) = 1.244 MGD (max day expected for new permit) \* Peaking factor for batch discharge (2.4) = 2.99 MGD for the peak hourly average flow for compliance with acute WQ criteria at the edge of the acute mixing zone (theoretical maximum mixing zone ratio using 2.5 percent of receiving water = **5.26:1 (AMZR)**). The AMZR presumed in the last permit was 9:1, but was based on a steady state flow from a submerged biological contactor (SBC), and a presumed effluent flow of 1.57 MGD.

**4. Ecology has determined 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 being discharged.

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

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

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

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

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

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

At any given time, the effluent plume uses only a portion of the acute and chronic mixing zone, which minimizes the volume of water involved in mixing. 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 95<sup>th</sup> percentile pollutant concentration, the 90<sup>th</sup> percentile background concentration, the centerline dilution factor, and the lowest flow occurring once in every ten years to perform the reasonable potential analysis.

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

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

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

**8. Acute Mixing Zone.**

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

Ecology determined the acute criteria will be met at 10 percent of the volume fraction of the chronic mixing zone at the ten year low flow (19.73 cfs or alternatively 12.75 MGD).

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

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

- **Comply with size restrictions.**

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

#### 9. **Overlap of Mixing Zones.**

This mixing zone does not overlap another mixing zone.

#### D. Designated Uses and Surface Water Quality Criteria

Applicable designated uses and surface water quality criteria are defined in chapter 173-201A WAC. In addition, the U.S. EPA set human health criteria for toxic pollutants (EPA 1992). Criteria applicable to this facility's discharge are summarized below in Table 5. The receiving stream name in table 602 of Chapter 173-201A is: "Lewis River, East Fork, from and including Mason Creek to Multon Falls (river mile 24.6) including tributaries"

- 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.

**Table 6. Aquatic Life Uses & Associated Criteria**

Core Summer Salmonid Habitat	
Temperature Criteria – Highest 7DAD MAX	16°C (60.8°F)
Dissolved Oxygen Criteria	9.5 mg/L
Turbidity Criteria	<ul style="list-style-type: none"> <li>• 5 NTU over background when the background is 50 NTU or less; or</li> <li>• A 10 percent increase in turbidity when the background turbidity is more than 50 NTU</li> </ul>
Total Dissolved Gas Criteria	Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection

Core Summer Salmonid Habitat	
pH Criteria	pH shall be 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 are extraordinary primary contact recreation, primary contact recreation, and secondary contact recreation. The recreational uses for this receiving water are identified below.

**Table 6. Recreational Uses and Associated Criteria**

Recreational Use	Criteria
Primary Contact Recreation	Fecal coliform organism levels must not exceed a geometric mean value of 100 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 200 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.

E. 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.

The diffuser at Outfall 001 extends into the river bed a distance of approximately 120' as recorded during the mixing zone study on October 24, 1991 (3,240 cfs), but at 7Q10 flows (789 cfs), it is estimated to be only 50' from the bank. The outfall pipe is 16" in diameter, but the outfall port is reduced to 10". The diffuser has only one 10" port and it effectively rests on the bottom. At 7Q10 flows, the diffuser is in approximately 2' of water depth. During the mixing zone study, the outfall was at about 4' of depth. Ecology obtained this information from the dilution study report contained in Chapter 3 of the October, 1999 city of Woodland General Sewer and Facility Plan.

### *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 percent** of the flow, and not occupy greater than **25 percent** of the width of the water body.

The horizontal distance of the chronic mixing zone is 302 feet downstream and 100 feet upstream. The mixing zone extends from the river bottom to the top of the water surface.

The approved General Sewer and Facility Plan estimated the chronic mixing zone ratio for the 2.0 MGD capacity SBR to be 27.5:1 (see page III-14, second paragraph). This is based on the flow volume restriction resulting from a discharge during peak decant rate (2.0 MGD times a peaking factor of 2.4 = 4.8 MGD). However, the chronic mixing zone ratio is designed to be protective of the highest 4-day average concentration anticipated during the term of the permit. It does not have to protect for the 1-hour maximum concentration as the acute mixing zone ratio does. For this facility, the flows are not anticipated to exceed .83 MGD over the maximum month. Therefore, the estimated chronic mixing zone ratio of 27.5:1 for the chronic mixing zone is rejected, and instead the program “rivplume” was used to estimate the chronic mixing zone at a flow of 0.84 MGD (maximum anticipated monthly flow average for the next permit cycle). **The resulting CMZR = 78:1, however the CMZR of the prior permit – 74:1 will be retained as it does not drive any lower limit.** For purposes of following permits (with higher flows) note that this program estimates the chronic mixing zone ratio at the design flow (2.0 MGD) to be 32.8:1

### *Acute Mixing Zone*

WAC 173-201A-400(8)(a) specifies that in rivers and streams a zone where acute toxics criteria may be exceeded must not extend beyond 10 percent of the distance towards the upstream and downstream boundaries of the chronic zone, not use greater than **2.5 percent** of the flow and not occupy greater than **25 percent** of the width of the water body.

The flow volume restriction resulted in a smaller chronic dilution factor than the distance downstream. The dilution factor below results from the volume restriction at the critical conditions. For acute WQ criteria, the critical condition for the river is the 7Q10 flow, and the critical condition for the POTW is the one-hour maximum flow.

The approved General Sewer Plan and Facility Plan estimates that the acute mixing zone for the future SBR will be 3.7:1. This value is rejected as overly conservative because the POTW is not close enough to its design capacity to use the maximum rated flow capacity for calculating the AMZR. Please see Appendix C for a tabulation of the mixing zone projections included in the approved plan.

The maximum daily flow during the last permit was 0.896 MGD (December, 2007). When increased by the annual flow increase of 4.8 percent/annum from the date of occurrence until 2014 (7 years), we estimate a peak day flow of 1.244 MGD. Multiplying this by the peaking factor for batch discharge (2.4) = 2.99 MGD for the peak hourly average flow. This is used to assess compliance with acute WQ criteria at the

edge of the acute mixing zone (theoretical maximum mixing zone ratio using 2.5 percent of 7Q10 receiving water flows (789 cfs) = **5.26:1 (AMZR)**). The AMZR presumed in the last permit was 9:1, but was based on a steady state flow from a submerged biological contactor (SBC). The model “rivplume” predicted mixing at the Acute boundary of 6.9:1, and thus the statutory limit of 2.5 percent of receiving water flow was the more limiting (and therefore the applicable) criterion.

Ecology determined the dilution factors that occur within these zones at the critical condition using rivplume6 and the City of Woodland General Sewer Plan (October 1999) information about the flows and outfall geometry. The dilution factors are listed in Table 7:

**Table 7. Dilution Factors (DF)**

Criteria	Acute	Chronic
Aquatic Life	5.26:1	74:1
Human Health, Carcinogen		74:1
Human Health, Non-carcinogen		140:1

Ecology determined the impacts of temperature, pH, ammonia, and metals, as described below, using the dilution factors in the above table. The derivation of surface water quality-based limits also takes into account the variability of pollutant concentrations in both the effluent and the receiving water.

The city of Ridgefield conducted a study of the effluent and ambient water quality as part of the prior permit and submitted the results of that study in 2005. That study was important to Ecology’s analysis of whether potential toxic substances posed a reasonable potential to harm the receiving waters.

**BOD<sub>5</sub>**—Ecology predicted no violation of the surface water quality standards for biochemical oxygen demand (BOD) under critical conditions. Therefore, the proposed permit contains the technology-based effluent limit for BOD<sub>5</sub>.

The proximity of the outfall to the Columbia River (~3 miles) at the low river velocity of 1.0 fps allows only 4.4 hours from the discharge until it mixes with the Columbia River. During this length of time, only immediate Dissolved Oxygen Demand would be experienced in the receiving waters. Given the effluent has a high residual dissolved oxygen concentration, the IDOD would be negligible.

**Temperature**--The state temperature standards (WAC 173-201A-200-210 and 600-612) include multiple elements:

- Annual summer maximum threshold criteria (June 15 to September 15)
- Supplemental spawning and rearing season criteria (September 15 to June 15)
- Incremental warming restrictions
- Protections against acute effects



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

- Annual summer maximum and supplementary spawning/rearing criteria

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

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

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

- Incremental warming criteria

The water quality standards limit the amount of warming human sources can cause under specific situations [WAC 173-201A-200(1)(c)(i)-(ii), 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. Allowing a 0.3°C warming for each point source is reasonable and protective where the dilution factor is based on 25 percent or less of the critical flow. This is because the fully mixed effect on temperature will only be a fraction of the 0.3°C cumulative allowance (0.075°C or less) for all human sources combined.

- 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 2-seconds after discharge.

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

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

Annual summer maximum, supplementary spawning criterion and incremental warming criteria: Ecology calculated the reasonable potential for the discharge to exceed the annual summer maximum, the supplementary spawning criterion, and the incremental warming criteria at the edge of the chronic mixing zone during critical condition(s). No reasonable potential exists to exceed the temperature criterion where:

$$(\text{Criterion} + 0.3) > (\text{Criterion} + (T_{\text{effluent}95} - \text{Criterion}))/\text{DF}.$$

$$(16 + 0.3) > (16 + (24.5 - 16))/74).$$

$$16.3 > 16.11$$

Therefore, the proposed permit does not include a temperature limit.

**pH**--Ecology modeled the impact of the effluent pH on the receiving water using the calculations from EPA, 1988, and the chronic dilution factor of 74:1. The receiving water input variables used are listed above in Table 4. The effluent input variables used are included in Table 2.

Ecology predicts no violation of the pH criteria under critical conditions. Therefore, the proposed permit includes technology-based effluent limits for pH.

**Fecal Coliform**--Ecology modeled the numbers of fecal coliform by simple mixing analysis using the technology-based limit of 400 organisms per 100 ml and a dilution factor of 74:1.

Under critical conditions, modeling predicts no violation of the water quality criterion for fecal coliform. Therefore, the proposed permit includes the technology-based effluent limit for fecal coliform bacteria.

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

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The following toxic pollutants are present in the discharge: ammonia and heavy metals. Ecology conducted a reasonable potential analysis (See Appendix C) on these parameters to determine whether it would require effluent limits in this permit.

Ammonia's toxicity depends on that portion which is available in the unionized form. The amount of unionized ammonia depends on the temperature and pH in the receiving freshwater. To evaluate ammonia toxicity, Ecology used the available receiving water information from the City's 2005 effluent and receiving water study. See NH3Fresh3 spreadsheet included at appendix C. The resulting ammonia criteria were significantly lower than were estimated in table III-2 of the approved GSP/FP from 1999. The estimated acute criteria were 10.818 mg/L then versus 4.641 mg/L (total ammonia) in the revised analysis based on contemporary data. The chronic criteria were 2.13 mg/L then versus 0.82 mg/L in the more recent analysis.

Valid ambient background data was available for eleven priority pollutant metals (See Table 2). Ecology used all applicable data to evaluate reasonable potential for this discharge to cause a violation of water quality standards.

Ecology determined that antimony, arsenic, cadmium, lead, mercury, nickel, selenium, silver, and thallium pose no reasonable potential to exceed the water quality criteria at the critical condition using procedures given in EPA, 1991 (Appendix C) and as described above. Ecology's determination assumes that this facility meets the other effluent limits of this permit.

Ecology derived effluent limits for the toxic pollutants ammonia, copper, and zinc, determined to have a reasonable potential to cause a violation of the water quality standards if not properly treated. Ecology calculated effluent limits using methods from EPA, 1991 as shown in Appendix C.

Analysis of the effluent found that there was a low potential for the Permittee to violate the effluent limits necessary to protect water quality (below) if present performance was maintained. Therefore, narrative requirements to continue to nitrify to the maximum extent possible were determined to be more useful than numerical limits in protecting water quality.

	<b>Average Monthly Limit (AML)</b>	<b>Maximum Daily Limit (MDL)</b>	<b>Comments</b>
Ammonia	<b>10.8 mg/L</b>	<b>24.3 mg/L</b>	<b>8 samples/mo</b>
Copper	<b>29.4 µg/L</b>	<b>42.9 µg/L</b>	<b>1 sample/mo</b>
Zinc	<b>93.9 µg/L</b>	<b>137 µg/L</b>	<b>1 sample/mo</b>

Similarly, effluent concentrations of copper and zinc (which the POTW does not specifically treat for) strongly correlate to effluent concentrations of TSS and the degree of oxidation of the effluent (as indicated by the level of nitrification). Therefore the permit will require the Permittee to continue to monitor for metals, and to maintain good treatment of TSS and ammonia to ensure compliance with Water Quality criteria.

Water quality criteria for most metals published in chapter 173-201A WAC are based on the dissolved fraction of the metal (see footnotes to table WAC 173-201A-240(3); 2006). The City of Woodland may provide data clearly demonstrating the seasonal partitioning of the dissolved metal in the ambient water in relation to an effluent discharge. Ecology may adjust metals criteria on a site-specific basis when data is available clearly demonstrating the seasonal partitioning in the ambient water in relation to an effluent discharge.

F. Whole Effluent Toxicity

The water quality standards for surface waters forbid discharge of effluent that causes 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.

- *Acute toxicity tests measure mortality as the significant response to the toxicity of the effluent.* Dischargers who monitor their wastewater with acute toxicity tests find early indications of any potential lethal effect of the effluent on organisms in the receiving water.
- *Chronic toxicity tests measure various sublethal toxic responses,* such as retarded growth or reduced reproduction. Chronic toxicity tests often involve either a complete life cycle test on an organism with an extremely short life cycle, or a partial life cycle test during a critical stage of a test organism's life. Some chronic toxicity tests also measure organism survival.

Ecology-accredited WET testing laboratories use the proper WET testing protocols, fulfill the data requirements, and submit results in the correct reporting format. Accredited laboratory staff knows about WET testing and how to calculate an NOEC, LC<sub>50</sub>, EC<sub>50</sub>, IC<sub>25</sub>, etc. Ecology gives all accredited labs the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria* (<http://www.ecy.wa.gov/biblio/9580.html>), which is referenced in the permit. Ecology recommends that the city of Woodland send a copy of the acute or chronic toxicity sections(s) of its NPDES permit to the laboratory.

WET testing conducted during effluent characterization showed no reasonable potential for effluent discharges to cause receiving water acute toxicity. The proposed permit will not impose an acute WET limit. The city of Woodland must retest the effluent before submitting an application for permit renewal.

- If this facility makes process or material changes which, in Ecology's opinion, increase the potential for effluent toxicity, then Ecology may (in a regulatory order, by permit modification, or in the permit renewal) require the facility to conduct additional effluent characterization.
- If WET testing conducted for submittal with a permit application fails to meet the performance standards in WAC 173-205-020, Ecology will assume that effluent toxicity has increased. The City of Woodland may demonstrate to Ecology that effluent toxicity

has not increased, by performing additional WET testing after the process or material changes have been made.

WET testing conducted during effluent characterization showed no reasonable potential for effluent discharges to cause receiving water chronic toxicity. The proposed permit will not impose a chronic WET limit. The city of Woodland must retest the effluent before submitting an application for permit renewal.

- If this facility makes process or material changes which, in Ecology's opinion, increase the potential for effluent toxicity, then Ecology may (in a regulatory order, by permit modification, or in the permit renewal) require the facility to conduct additional effluent characterization
- If WET testing conducted for submittal with a permit application fails to meet the performance standards in WAC 173-205-020, Ecology will assume that effluent toxicity has increased. The city of Woodland may demonstrate to Ecology that effluent toxicity has not increased by performing additional WET testing after the process or material changes have been made.

G. Human Health

Washington's water quality standards include 91 numeric human health-based criteria that Ecology must consider when writing NPDES permits. These criteria were established in 1992 by the U.S. EPA in its National Toxics Rule (40 CFR 131.36). The National Toxics Rule allows states to use mixing zones to evaluate whether discharges comply with human health criteria.

Ecology determined the applicant's discharge does not contain chemicals of concern based on existing effluent data. Ecology will reevaluate this discharge for impacts to human health at the next permit reissuance.

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 website. <http://www.ecy.wa.gov/programs/tcp/smu/sediment.html>

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. Ground Water Quality Limits

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

The city of Woodland does not discharge wastewater to the ground. No permit limits are required to protect ground water.

J. Comparison of Effluent Limits With the Previous Permit Issued on February 11, 2005

**Table 8. Comparison of Effluent Limits**

Parameter	Basis of Limit	Previous Effluent Limits: Outfall # 001		Proposed Effluent Limits: Outfall # 001	
		Average Monthly	Average Weekly	Average Monthly	Average Weekly
Biochemical Oxygen Demand (5-day)	Technology	30 mg/L, 466 lbs/day 85 percent removal	45 mg/L, 700 lbs/day	30 mg/L, 466 lbs/day 85 percent removal	45 mg/L, 700 lbs/day
Total Suspended Solids	Technology	30 mg/L, 475 lbs/day 85 percent removal	45 mg/L, 711 lbs/day	30 mg/L, 475 lbs/day 85 percent removal	45 mg/L, 711 lbs/day
Fecal Coliform Bacteria	Technology	200 org./100 ml	400 org./100 ml	200 org./100 ml	400 org./100 ml
pH	Technology	Within range of 6-9 SU daily		Within range of 6-9 SU daily	
Ammonia	Water Quality	The Permittee must operate the facility so as to reduce ammonia to the maximum extent practicable with existing equipment		Similar	Similar
Copper	Water Quality	None	None	Optimize for TSS and ammonia removal	Optimize for TSS and ammonia removal
Zinc	Water Quality	None	None	Optimize for TSS and ammonia removal	Optimize for TSS and ammonia removal

#### 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.

The monitoring schedule is detailed in the proposed permit under Condition S.2. Specified monitoring frequencies take into account the quantity and variability of the discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring. The required monitoring frequency is consistent with agency guidance given in the current version of Ecology's *Permit Writer's Manual* (Publication Number 92-09) for a sequence batch reactor.

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

As a publicly owned treatment works (POTW) with significant industrial users, the city of Woodland is required to periodically sample the influent, final effluent, and sludge for toxic pollutants in order to characterize the industrial input. Sampling is also done to determine if pollutants interfere with the treatment process or pass-through the plant to the sludge or the receiving water. The city of Woodland will use the monitoring data to develop local limits which commercial and industrial users must meet.

A. 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). Ecology has accredited the laboratory at this facility for: Ammonia, Dissolved Oxygen, Biochemical Oxygen Demand, Total Suspended Solids, Fecal Coliform, and pH. (As of the writing, the accreditation expires on 5/31/2010.)

B. Effluent Limits Which are Near Detection or Quantitation Levels

The water quality-based effluent concentration limits for copper and zinc are near the limits of current analytical methods to detect or accurately quantify. The method detection level (MDL) is the minimum concentration of a pollutant that can be measured and reported with a 99 percent confidence that its concentration is greater than zero (as determined by a specific laboratory method). The quantitation level is the level at which concentrations can be reliably reported with a specified level of error. Estimated concentrations are the values between the MDL and the QL. Ecology requires estimated concentrations to be reported. When reporting maximum daily effluent concentrations, Ecology requires the facility to report "less than X" where X is the required detection level if the measured effluent concentration falls below the detection level. When calculating average monthly concentrations, the facility must use all the effluent concentrations measured below the quantitation level but above the method detection Level.

V. OTHER PERMIT CONDITIONS

A. Reporting and Record Keeping

Ecology based permit condition S3 on our authority to specify any appropriate reporting and record keeping requirements to prevent and control waste discharges (WAC 173-220-210).

B. Prevention of Facility Overloading

Overloading of the treatment plant is a violation of the terms and conditions of the permit. To prevent this from occurring, RCW 90.48.110 and WAC 173-220-150 require the City of Woodland to take the actions detailed in proposed permit requirement S.4 to plan expansions or modifications before existing capacity is reached and to report and correct conditions that could result in new or increased discharges of pollutants. Condition S.4 restricts the amount of flow.

C. Operation and Maintenance (O&M)

The proposed permit contains Condition S.5 as authorized under RCW 90.48.110, WAC 173-220-150, chapter 173-230 WAC, and WAC 173-240-080. Ecology included it to ensure proper

operation and regular maintenance of equipment, and to ensure that the city of Woodland takes adequate safeguards so that it uses constructed facilities to their optimum potential in terms of pollutant capture and treatment.

The proposed permit requires submission of an annual certification that the O&M manual is updated for the entire sewage system.

D. Pretreatment

*Duty to Enforce Discharge Prohibitions*

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

- The first section of the pretreatment requirements prohibits the POTW from accepting pollutants which causes “Pass-through” or “Interference”. This general prohibition is from 40 CFR §403.5(a). Appendix B of this fact sheet defines these terms.
  - The second section reinforces a number of specific State and Federal pretreatment prohibitions found in WAC 173-216-060 and 40 CFR §403.5(b). These reinforce that the POTW may not accept certain wastes, which:
    - Are prohibited due to dangerous waste rules.
    - Are explosive or flammable.
    - Have too high or low of a pH (too corrosive, acidic or basic).
    - May cause a blockage such as grease, sand, rocks, or viscous materials.
    - Are hot enough to cause a problem.
    - Are of sufficient strength or volume to interfere with treatment.
    - Contain too much petroleum-based oils, mineral oil, or cutting fluid.
    - Create noxious or toxic gases at any point.
- 40 CFR Part 403 contains the regulatory basis for these prohibitions, with the exception of the pH provisions which are based on WAC 173-216-060.
- The third section of pretreatment conditions reflects state prohibitions on the POTW accepting certain types of discharges unless the discharge has received prior written authorization from Ecology. These discharges include:
    - Cooling water in significant volumes.
    - Stormwater and other direct inflow sources.



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

#### *Federal and State Pretreatment Program Requirements*

Ecology administers the Pretreatment Program under the terms of the addendum to the “Memorandum of Understanding between Washington Department of Ecology and the United States Environmental Protection Agency, Region 10” (1986) and 40 CFR, part 403. Under this delegation of authority, Ecology issues wastewater discharge permits for significant industrial users (SIUs) discharging to POTWs which have not been delegated authority to issue wastewater discharge permits. Ecology must approve, condition, or deny new discharges or a significant increase in the discharge for existing significant industrial users (SIUs) [40 CFR 403.8 (f)(1)(i) and(iii)].

Industrial dischargers must obtain a permit from Ecology before discharging waste to the City of Woodland POTW [WAC 173-216-110(5)]. Industries discharging wastewater that is similar in character to domestic wastewater do not require a permit unless they otherwise meet the definition of a “Significant Industrial User” per 40 CFR Part 403.3.

#### *Routine Identification and Reporting of Industrial Users*

The permit requires non-delegated POTWs to take “continuous, routine measures to identify all existing, new, and proposed significant industrial users (SIUs) and potential significant industrial users (PSIUs)” discharging to their sewer system. Examples of such routine measures include regular review of water and sewer billing records; business license and building permit applications, advertisements, and personal reconnaissance. System maintenance personnel should be trained on what to look for so they can identify and report new industrial dischargers in the course of performing their jobs. The POTW may not allow SIUs to discharge prior to receiving a permit, and must notify all industrial dischargers (significant or not) in writing of their responsibility to apply for a State Waste Discharge Permit. The POTW must send a copy of this notification to Ecology.

#### *Requirements for Performing an Industrial User Survey*

This POTW has the potential to serve significant industrial or commercial users and must periodically conduct an Industrial User (IU) Survey to determine the extent of compliance of all industrial users of the sanitary sewer and wastewater treatment facility with federal pretreatment regulations (40 CFR Part 403 and Sections 307(b) and 308 of the Clean Water Act), with state regulations (chapter 90.48 RCW and chapter 173-216 WAC), and with local ordinances.

The purpose of the IU Survey is to identify all facilities that may be subject to pretreatment standards or requirements so that Ecology can take appropriate measures to control these discharges. The POTW should identify each such user, and require them to apply for a permit before allowing their discharge to the POTW to commence. For SIUs, the POTW must require they actually are issued a permit prior to accepting their discharge. The steps the POTW must document in their IU Survey submittal include:

1. The POTW must develop a master list of businesses that may be subject to pretreatment standards and requirements and show their disposition. This list

must be based on several sources of information including business licenses, and water and sewer billing records.

2. The POTW must canvas all the potential sources, having them either complete a survey form or ruling them out by confirming they only generate domestic wastewater.
3. The POTW must develop a list of the SIUs and potential SIUs in all areas served by the POTW. The list must contain sufficient information on each to allow Ecology to decide which discharges merit further controls such as a state waste discharge permit.

Ecology describes the information needed in IU Survey submittals to allow Ecology to make permitting decision in the manual “Performing an Industrial User Survey”. Properly completing an Industrial User Survey helps Ecology control discharges that may otherwise harm the POTW including its collection system, processes, and receiving waters. Where surveys are incomplete, Ecology may take such enforcement as appropriate and/or require the POTW to develop a fully delegated pretreatment program.

*Support by Ecology for Developing Partial Pretreatment Programs*

Ecology recognizes that the city of Woodland would significantly benefit from developing a program for food service establishments and high strength users to provide more direct and effective control of pollutants discharged to the sanitary sewer. Because of the proportion of capacity that monitoring data shows is consumed by high strength users, this program is required under 40 CFR Part 403 and for good management of the sewer capacity. The program must detect and enforce against violations of categorical pretreatment standards promulgated under the federal Clean Water Act.

Ecology will provide technical assistance to the city of Woodland in fulfilling these joint obligations. In particular, it will assist with developing an adequate sewer use ordinance, notification procedures, enforcement guidelines, and developing local limits and inspection procedures.

E. Solid Waste Control

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

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

Requirements for monitoring sewage sludge and record keeping are included in this permit. This information will be used by Ecology to develop or update local limits and is also required under 40 CFR 503.

F. Effluent Mixing Study

Ecology estimated the amount of mixing of the discharge with receiving water and the potential for the mixture to violate the water quality standards for surface waters at the edge of the mixing zone (chapter 173-201A WAC). Ecology used the smaller of the results obtained by the “Rivplume6” spreadsheet in the “pwsread07” workbook, and the proportion of the receiving water at 7Q10 conditions as allowed by rule. The proposed permit requires the city of Woodland to more accurately determine the mixing characteristics of the discharge if it makes improvements to increase mixing zone ratios. The effluent mixing study must measure the concentration of effluent at the mixing zone boundary (dye study) and use a computer model to project the mixing to the critical conditions. The study must assess the mixing zone ratios appropriate to any new outfall or discharge scheme prior to making changes to the discharge.

G. Outfall Evaluation

The proposed permit requires the city of Woodland to conduct an outfall inspection and submit a report detailing the findings of that inspection. The inspection must evaluate the physical condition of the discharge pipe and diffusers, and evaluate the extent of sediment accumulations in the vicinity of the outfall.

H. General Conditions

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

## VI. PERMIT ISSUANCE PROCEDURES

A. Permit Modifications

Ecology may modify this permit to impose numerical limits, if necessary to comply with water quality standards for surface waters, with sediment quality standards, or with water quality standards for ground waters, based on 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 meets 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 five years.

VII. REFERENCES FOR TEXT AND APPENDICES

Environmental Protection Agency (EPA)

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Maul, Foster & Elongi, Inc,

2005. *Receiving Water and Effluent Study Results, City of Woodland Wastewater Treatment Plant, Woodland, Washington*, Project # 0113.02.01, December 14, 2005.

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

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

APPENDIX A—PUBLIC INVOLVEMENT INFORMATION

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

Ecology placed a Public Notice of Application on June 4, 2009; June 11, 2009; June 16, 2010; and June 23, 2010; in *Longview Daily New* to inform the public about the submitted application and to invite comment on the reissuance of this permit.

Ecology will place a Public Notice of Draft on \_\_\_\_\_ in the *Longview Daily News* to inform the public and to invite comment on the proposed draft National Pollutant Discharge Elimination System permit and fact sheet.

The notice –

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

Ecology has published a document entitled *Frequently Asked Questions about Effective Public Commenting* which is available on our website at <http://www.ecy.wa.gov/biblio/0307023.html>.

You may obtain further information from Ecology by telephone, (360) 407-6277 or by writing to the address listed below.

Water Quality Permit Coordinator  
Department of Ecology  
Southwest Regional Office  
P.O. Box 47775  
Olympia, WA 98504-7775

The primary author of this permit and fact sheet is David J. Knight.

## APPENDIX B—GLOSSARY

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

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

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

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

**Alternate Point of Compliance** -- An alternative location in the ground water from the point of compliance where compliance with the ground water standards is measured. It may be established in the ground water 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 Discharge Limit** -- The average of the measured values obtained over a calendar month's time.

**Background Water Quality** -- The concentrations of chemical, physical, biological or radiological constituents or other characteristics in or of ground water 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 percent upper tolerance interval with a 95 percent confidence based on at least eight hydraulically upgradient water quality samples. The eight samples are collected over a period of at least one year, with no more than one sample collected during any month in a single calendar year.

**Best Management Practices (BMPs)** -- Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the

pollution of waters of the state. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

**BOD5** -- Determining the five-day Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD5 is used in modeling to measure the reduction of dissolved oxygen in receiving waters after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD<sub>5</sub> 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 45 days from the date of mailing.

**Detection Limit** -- See Method Detection Level.

**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 percent by volume and the receiving water 90 percent.

**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, ground water, 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 ground water at the point of compliance for the purpose of regulation, [WAC 173-200-020(11)]. This limit assures that a ground water criterion will not be exceeded and that background water quality will be protected.

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

**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.



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**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 storm water 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 seven-day period, expressed as a daily average.

**Method Detection Level (MDL)** -- 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.

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**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 7.0 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 ground water 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 ground water 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 percent 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  $(1, 2, \text{ or } 5) \times 10^n$ , where  $n$  is an integer (64 FR 30417). ALSO GIVEN AS: The smallest detectable concentration of analyte greater than the Detection Limit (DL) where the accuracy (precision & bias) achieves the objectives of the intended purpose. (Report of the Federal Advisory Committee on Detection and Quantitation Approaches and Uses in Clean Water Act Programs Submitted to the US Environmental Protection Agency December 2007).

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

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

**Significant Industrial User (SIU)** --

- a. All industrial users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N; and
- b. 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

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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 five, three, or one years, respectively, of professional experience working in the area of agronomy, crops, or soils.

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

**Soluble BOD<sub>5</sub>** -- Determining the soluble fraction of Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of soluble organic material present in an effluent that is utilized by bacteria. Although the soluble BOD<sub>5</sub> test is not specifically described in Standard Methods, filtering the raw sample through at least a 1.2 um filter prior to running the standard BOD<sub>5</sub> 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 storm water 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 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 C—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 on Ecology's homepage at <http://www.ecy.wa.gov/programs/eap/pwspread/pwspread.html>.

Mixing Zones recognized in prior permit fact sheet

Phase	Effluent Flow	Acute DF	Chronic DF
Pre-1999 conditions	0.46 mgd	13.00	157.00
Phase I (submerged biological contactor)	0.78 mgd	10.00	117.00
Phase II (submerged biological contactor)	1.57 mgd	9.00	<b>74.00</b>
Phase III (sequencing batch reactor – 2.0 MGD w/o post equalization)	4.8 mgd	4.00	28.00

Analysis of Peak Flow Situation

Duration of peak flow	<b>18.00</b>	<b>Minutes</b>
Number of peak flow events	10.00	per day
Peaking factor during discharge	8.00	times PDF
<b>Peaking factor during 1-hour ave period</b>	<b>2.40</b>	<b>times PDF</b>

$8 \times / (60/18)$

\*Note – What the City constructed was the Phase III facility as referenced above. The analysis done for the “Phase I,” “Phase II,” and “Phase III” mixing zone ratios (see approved GSP/FP) was done prior to the decision to simply start with the Phase III sequencing batch reactor. However, at the beginning of the previous permit term, flows were so much lower than the design flows for Phase III that it was not appropriate to use the “design” dilution factors. Therefore the peak 1-hour flow situation (4.8 MGD) was not used in the prior permit for evaluating compliance at the acute boundary. Indeed in the text of this fact sheet you will find an analysis of why it is not appropriate to use this flow for the chronic boundary (since chronic standards are based on a 4-day average concentration, not a 1-hour concentration).

Spreadsheet rivplume6 – Chronic MZR Evaluation - Revised 17-Oct-2008

**INPUT**

1. Effluent Discharge Rate (cfs):	1.30
2. Receiving Water Characteristics Downstream From Waste Input	
Stream Depth (ft):	2.00
Stream Velocity (fps):	1.00
Channel Width (ft):	210.00
Stream Slope (ft/ft) or Manning roughness "n":	0.005
0 if slope or 1 if Manning "n" in previous cell:	0
3. Discharge Distance From Nearest Shoreline (ft):	40
4. Location of Point of Interest to Estimate Dilution	
Distance Downstream to Point of Interest (ft):	302
Distance From Nearest Shoreline (ft):	40
5. Transverse Mixing Coefficient Constant (usually 0.6):	0.6
6. Original Fischer Method (enter 0) or <i>Effective Origin</i> Modification (enter 1)	0

**OUTPUT**

1. Source Conservative Mass Input Rate	
Concentration of Conservative Substance ( percent):	100.00
Source Conservative Mass Input Rate (cfs* percent):	130.00
2. Shear Velocity	
Shear Velocity based on slope (ft/sec):	0.567
Selected Shear Velocity for next step (ft/sec):	0.567
3. Transverse Mixing Coefficient (ft <sup>2</sup> /sec):	0.681
4. Plume Characteristics Accounting for Shoreline Effect (Fischer <i>et al.</i> , 1979)	
Co	3.10E-01
x'	4.66E-03
y'o	1.90E-01
y' at point of interest	1.90E-01
Solution using superposition equation (Fischer eqn 5.9)	
Term for n= -2	0.00E+00
Term for n= -1	7.35E-94
Term for n= 0	1.00E+00
Term for n= 1	9.26E-62
Term for n= 2	1.11E-305
	#N/A

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Upstream Distance from Outfall to <i>Effective Origin</i> of Effluent Source (ft)	
Effective Distance Downstream from Effluent to Point of Interest (ft)	302.00
x' Adjusted for <i>Effective Origin</i>	4.66E-03
C/Co (dimensionless)	4.13E+00
Concentration at Point of Interest (Fischer Eqn 5.9)	1.28E+00
Unbounded Plume Width at Point of Interest (ft)	81.121
Unbounded Plume half-width (ft)	40.560
Distance from near shore to discharge point (ft)	40.00
Distance from far shore to discharge point (ft)	170.00
Plume width bounded by shoreline (ft)	80.56
Approximate Downstream Distance to Complete Mix (ft):	16,977
Theoretical Dilution Factor at Complete Mix:	323.077
Calculated Flux-Average Dilution Factor Across Entire Plume Width:	123.939
Calculated Dilution Factor at Point of Interest:	78.175

Spread of a plume from a point source in a river with boundary effects from the shoreline based on the method of Fischer *et al.* (1979) with correction for the effective origin of effluent.

Revised 17-Oct-2007

Spreadsheet rivplume6 - Revised 17-Oct-2008

### INPUT

- |  |        |
|--|--------|
| 1. Effluent Discharge Rate (cfs): (ACUTE MIXING CONDITION)                             | 4.64   |
| 2. Receiving Water Characteristics Downstream From Waste Input                         |        |
| Stream Depth (ft):   | 2.00   |
| Stream Velocity (fps):   | 1.00   |
| Channel Width (ft):  | 210.00 |
| Stream Slope (ft/ft) or Manning roughness "n":   | 0.005  |
| 0 if slope or 1 if Manning "n" in previous cell:                                       | 0      |
| 3. Discharge Distance From Nearest Shoreline (ft):                                     | 40     |
| 4. Location of Point of Interest to Estimate Dilution                                  |        |
| Distance Downstream to Point of Interest (ft):   | 30.2   |
| Distance From Nearest Shoreline (ft):  | 40     |
| 5. Transverse Mixing Coefficient Constant (usually 0.6):                               | 0.6    |
| 6. Original Fischer Method (enter 0) or <i>Effective Origin</i> Modification (enter 1) | 0      |

### OUTPUT

- |   |        |
|---|--------|
| 1. Source Conservative Mass Input Rate              |        |
| Concentration of Conservative Substance ( percent): | 100.00 |
| Source Conservative Mass Input Rate (cfs* percent): | 464.00 |
| 2. Shear Velocity                                   |        |
| Shear Velocity based on slope (ft/sec):             | 0.567  |
| Shear Velocity based on Manning "n":                |        |
| using Prasuahn equations 8-26 and 8-54 assuming     |        |
| hydraulic radius equals depth for wide channel      |        |
| Darcy-Weisbach friction factor "f":                 | #N/A   |
| Shear Velocity from Darcy-Weisbach "f" (ft/sec):    | #N/A   |
| Selected Shear Velocity for next step (ft/sec):     | 0.567  |



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3. Transverse Mixing Coefficient (ft <sup>2</sup> /sec):	0.681
4. Plume Characteristics Accounting for Shoreline Effect (Fischer <i>et al.</i> , 1979)	
Co	1.10E+00
x'	4.66E-04
y'o	1.90E-01
y' at point of interest	1.90E-01
Solution using superposition equation (Fischer eqn 5.9)	
Term for n= -2	0.00E+00
Term for n= -1	0.00E+00
Term for n= 0	1.00E+00
Term for n= 1	0.00E+00
Term for n= 2	0.00E+00
Upstream Distance from Outfall to <i>Effective Origin</i> of Effluent Source (ft)	#N/A
Effective Distance Downstream from Effluent to Point of Interest (ft)	30.20
x' Adjusted for <i>Effective Origin</i>	4.66E-04
C/Co (dimensionless)	1.31E+01
Concentration at Point of Interest (Fischer Eqn 5.9)	1.44E+01
Unbounded Plume Width at Point of Interest (ft)	25.653
Unbounded Plume half-width (ft)	12.826
Distance from near shore to discharge point (ft)	40.00
Distance from far shore to discharge point (ft)	170.00
Plume width bounded by shoreline (ft)	25.65
Approximate Downstream Distance to Complete Mix (ft):	16,977
Theoretical Dilution Factor at Complete Mix:	90.517
Calculated Flux-Average Dilution Factor Across Entire Plume Width:	11.057
Calculated Dilution Factor at Point of Interest:	6.929

NOTE: This mixing zone ratio (6.9:1) was compared against the mixing zone estimated for the one-hour critical period of discharge, and since that mixing zone ratio was smaller, it drove the limits in this permit. The above analysis just confirms that the diffusion was not even lower.

AMMONIA CRITERIA:

Freshwater un-ionized ammonia criteria based on Chapter 173-201A  
WAC

Amended November 20, 2006

Woodland NPDES Permit - Updated May 2009

INPUT	
1. Temperature (deg C):	18.4
2. pH:	8.10
3. Is salmonid habitat an existing or designated use?	Yes
4. Are non-salmonid early life stages present or absent?	Present
OUTPUT	
1. Unionized ammonia NH3 criteria (mgNH3/L)	
Acute:	0.239
Chronic:	0.042
2. Total ammonia nitrogen criteria (mgN/L):	
Acute:	4.641
Chronic:	0.822

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Pollutant, CAS No. & Application Ref. No.	Water Quality Criteria		Human Health Fresh	Taste	Metals Translators	
	acute	chronic			Freshwater Acute	Chronic
ANTIMONY (INORGANIC) 7440360 1M			14		1.00	1.00
ARSENIC (dissolved) 7440382 2M	360	190			1.00	1.00
COPPER - 744058 6M Hardness dependent	8.86	6.28		1000.00	0.996	0.996
CADMIUM - 7440439 4M Hardness dep.	0.65	0.31			0.94	0.94
LEAD - 7439921 7M Dependent on hardness	30.14	1.17			0.47	0.47
MERCURY 7439976 8M	2.10	0.012	0.14		0.85	1.00
NICKEL - 7440020 9M - Hardness dep	362.70	40.28	610		0.998	0.997
SELENIUM 7782492 10M	20	5	170.00		1.00	1.00
SILVER - 7740224 11M Hardness dep.	1.05	NA			0.85	NA
THALLIUM 7440280 12M		2	1.70		1.00	1.00
ZINC- 7440666 13M Hardness dep.	29.27	26.72		5000.00	0.996	0.996

Receiving water studies found that the hardness was below 20 at the 10<sup>th</sup> percentile value. Therefore, a value of 20 was used  
The WQ criteria formulas are not to be extrapolated beyond the hardnesses for which they were developed (20-300 mg/L)

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NOTE: Below find two analyses for ammonia “reasonable potential”. The first uses effluent ammonia concentrations currently reported. This (50 µg/L) does not trigger a reasonable potential to violate WQ criteria. The next value, 27 mg/L, shows that limits are needed if ammonia is poorly treated. The POTW will increase its loading rate over time. Presently its annual loading rate has increased by 8 percent per year over the last five years. Because the POTW is at 60 percent of its loading for BOD now, the POTW may be at its BOD capacity within the term of the permit. This would diminish the POTW's ability to nitrify ammonia, and is cause for monitoring.

Parameter	Metal Criteria Translat or as decimal Acute	Metal Criteria Translat or as decimal Chronic	Ambient Concentration (metals as dissolved) µg/L	WQ Criteria - Acute µg/L	WQ Criteria - Chronic µg/L	Acute Mixing Zone µg/L	Chronic Mixing Zone µg/L	LIMIT REQ'D?	Max effluent conc. measured (metals as total recoverable) µg/L	# of samples	Acute Dil'n Factor	Chronic Dil'n Factor
<b>Ammonia</b>	0.95	0.95	20.00	4641.00	822.00	25.56	20.40	<b>NO</b>	50.00	51	5.26	74
Ammonia	0.95	0.95	20.00	4641.00	822.00	5071.46	379.06	<b>YES</b>	27000	51	5.26	74
ANTIMONY (INORGANIC) 7440360 1M	1.00	1.00	0.05	1000.00	14.00	0.23	0.06	NO	0.34	3	5.26	74
ARSENIC (dissolved) 7440382 2M	1.00	1.00	0.50	360.00	190.00	1.26	0.55	NO	1.50	3	5.26	74
COPPER - 744058 6M Hardness dependent	0.996	0.996	0.90	8.86	6.28	12.94	1.76	<b>YES</b>	21.50	3	5.26	74
CADMIUM - 7440439 4M Hardness dependent	0.94	0.94	0.13	0.65	0.31	0.21	0.14	NO	0.19	3	5.26	74
LEAD - 7439921 7M Dependent on hardness	0.47	0.47	0.24	30.14	1.17	0.30	0.24	NO	0.41	3	5.26	74
MERCURY 7439976 8M	0.85	1.00	0.0011	2.10	0.012	0.00	0.00	NO	0.01	3	5.26	74
NICKEL - 7440020 9M - Dependent on hardness	0.998	0.997	0.40	362.70	40.28	1.97	0.51	NO	2.90	3	5.26	74
SELENIUM 7782492 10M	1.00	1.00	2.00	20.00	5.00	2.70	2.05	NO	1.90	3	5.26	74
SILVER - 7740224 11M dependent on hardness.	0.85	NA	0.04	1.05	1000.00	0.10	0.04	NO	0.13	3	5.26	74
THALLIUM 7440280 12M	1.00	1.00	0.04	1000.00	1.70	0.09	0.04	NO	0.10	3	5.26	74
ZINC- 7440666 13M hardness dependent	0.996	0.996	4.10	29.27	26.72	45.18	7.02	<b>YES</b>	73.70	3	5.26	74

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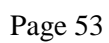
Dilution (Dil'n) factor is the inverse of the percent effluent concentration at the edge of the acute or chronic mixing zone.

**Permit Limit Calculation Summary**

PARAMETER	Acute Dil'n Factor	Chronic Dil'n Factor	Metal Criteria Translator Acute	Metal Criteria Translator Chronic	Ambient Concentration $\mu\text{g/L}$	Water Quality Standard Acute $\mu\text{g/L}$	Water Quality Standard Chronic $\mu\text{g/L}$	Average Monthly Limit (AML) $\mu\text{g/L}$	Maximum Daily Limit (MDL) $\mu\text{g/L}$	Comments
Ammonia	5.26	74.00	1.00	1.00	20.0000	4641.	822.	<b>10790.1</b>	<b>24326.5</b>	<b>8 sam/mo</b>
COPPER - 744058 Hardness	5.26	74.00	0.996	0.996	0.90	8.86	6.28	<b>29.4</b>	<b>42.9</b>	<b>1 sam/mo</b>
ZINC- 7440666 Hardness	5.26	74.00	0.996	0.996	4.10	29.27	26.72	<b>93.9</b>	<b>137.0</b>	<b>1 sam/mo</b>

	Core Summer	Supplemental
	Criteria	Criteria
<b>INPUT</b>	July 1-Sept 14	Sept 15-July 1
1. Chronic Dilution Factor at Mixing Zone Boundary	74.0	74.0
2. 7DADMax Ambient Temperature (T) (Upstream Background 90th percentile)	18.38°C	18.0 °C
3. 7DADMax Effluent Temperature (95th percentile)	24.4 °C	24.0 °C
4. Aquatic Life Temperature WQ Criterion in Fresh Water	16.0 °C	13.0 °C
<b>OUTPUT</b>		
5. Temperature at Chronic Mixing Zone Boundary:	18.48 °C	18.1 °C
6. Incremental Temperature Increase or decrease:	0.1 °C	0.1 °C
7. Incremental Temperature Increase $28/(T+7)$ if $T \leq$ criteria:	---	---
8. Maximum Allowable Temperature at Mixing Zone Boundary:	18.3 °C	18.3 °C
<b>A. If ambient temp is warmer than WQ criterion</b>		
9. Does temp fall within this warmer temp range?	YES	YES
10. Temp increase allowed at mixing zone boundary, if required:	NO LIMIT	NO LIMIT
<b>B. If ambient temp is cooler than WQ criterion but within <math>28/(T_{amb}+7)</math> and within 0.3 °C of the criterion</b>		
11. Does temp fall within this incremental temp. range?	---	---
12. Temp increase allowed at mixing zone boundary, if required:	---	---
<b>C. If ambient temp is cooler than (WQ criterion-0.3) but within <math>28/(T_{amb}+7)</math> of the criterion</b>		
13. Does temp fall within this Incremental temp. range?	---	---
14. Temp increase allowed at mixing zone boundary, if required:	---	---
<b>D. If ambient temp is cooler than (WQ criterion - <math>28/(T_{amb}+7)</math>)</b>		
15. Does temp fall within this Incremental temp. range?	---	---
16. Temp increase allowed at mixing zone boundary, if required:	---	---
17. Do any of the above cells show a temp increase?	<b>NO</b>	<b>NO</b>
18. Temperature Limit if Required?	<b>NO LIMIT</b>	<b>NO LIMIT</b>

APPENDIX D—RESPONSE TO COMMENTS

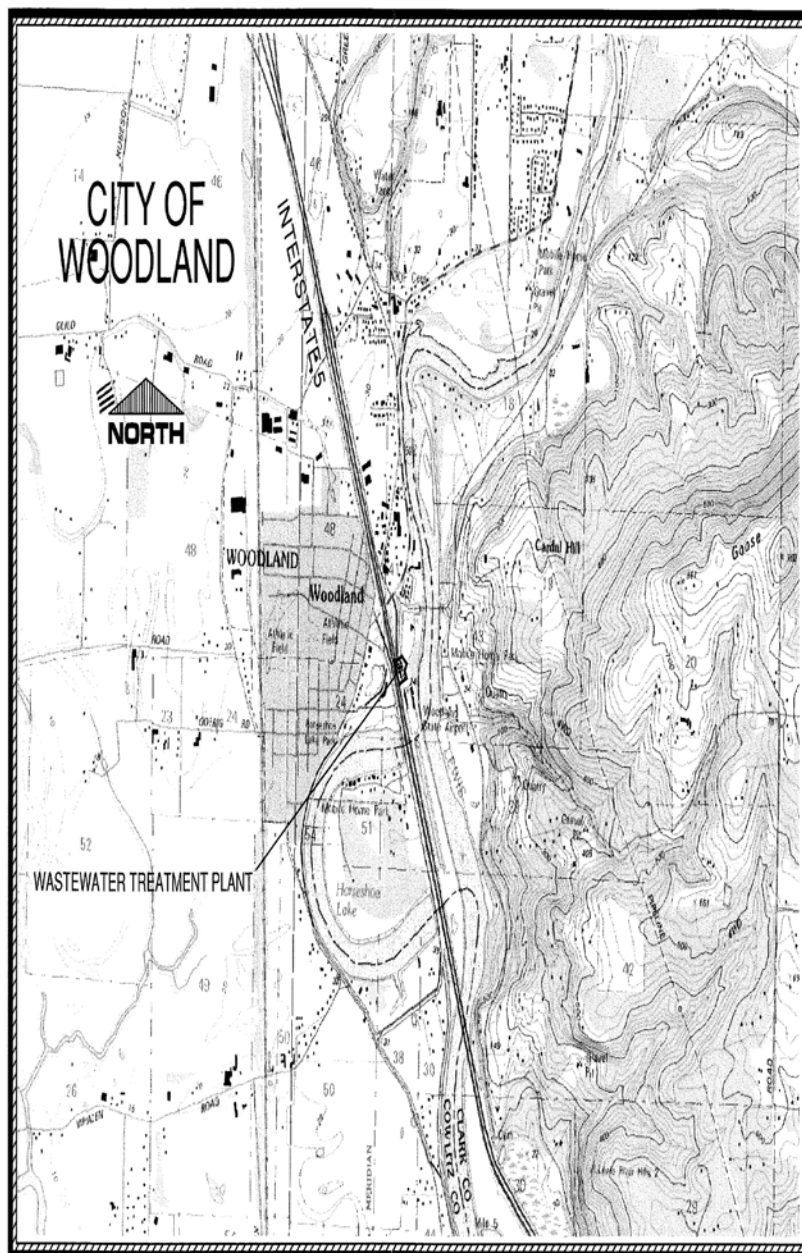




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**Contour Map**

Scale: 1" = 2000'

 **GIBBS & OLSON INC.**  
Engineers • Planners • Surveyors  
LONGVIEW • OLYMPIA  
WASHINGTON

City of Woodland  
Topographic Map  
NPDES Permit Application