WASHINGTON STATE DEPARTMENT OF ECOLOGY

Selah Ditch Multiparameter Total Maximum Daily Load

Water Quality Improvement Report

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by
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Water Quality Program
Washington State Department of Ecology
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Executive Summary

Selah Ditch was included in the state of Washington's (state's) 2004 303(d) listings of impaired water bodies for the parameters of fecal coliform (FC) bacteria and temperature due to the results of water quality sampling during 1988, 2000 and 2003. In addition to the above parameters, dissolved oxygen (DO) was found to be sub-standard during the same samplings but was unfortunately removed from the 2004 303(d) list, whereas it had been previously included in the 1996 and 1998 303(d) lists. The removal from the 2004 list was based on limited monitoring data even though newer data existed and, therefore, it will be a candidate for the 2006 303(d) list. Accordingly, a discussion of DO (and by extension, BOD_5) is included in this report and will require mitigation.

After the publication of the *Selah Ditch Multiparameter Total Maximum Daily Load – Technical Assessment* (Publication #05-10-020), the city of Selah raised issues related to relocating the POTW outfall from Selah Ditch to the Yakima River, including the benefits of less stringent effluent limitations with a Yakima River outfall and potential detrimental effects of removing flow from Selah Ditch. Such issues include the large mixing zone (and dilution factors) that would be afforded by discharging to the Yakima River, as well as its 21.0°C temperature criterion compared to the 18.0°C criterion applicable to Selah Ditch. Ecology found in a review of scientific literature that reducing streamflows will typically result in increased water temperatures, thus reducing flows within the ditch would not be beneficial to cold water aquatic species.

Historically, Selah Ditch has been considered as valuable warm-water refugia for salmonids during the winter months. The city of Selah, the Washington State Department of Transportation and the Yakima Nation have already spent substantial sums of money in riparian restoration in the ditch's lower reach to improve salmonid habitat. Due to all of the above reasons, Ecology determined that the removal of municipal discharges from Selah Ditch would detrimentally affect the most important beneficial use (salmonid habitat) of the ditch. Therefore, Ecology deemed it imperative to grant an extended mixing zone to the city of Selah so as to maintain the municipal discharges in the effluent-dominated ditch.

The wasteload allocations in the published technical assessment were calculated based on no dilution zone. However, the recently allowed extended mixing zone provides minimal dilution factors of 1.13 and 1.07 for the POTW and stormwater discharges, respectively. The following final WLAs are applicable for the above municipal effluents being discharged to Selah Ditch:

- The revised BOD_5 WLAs are set to a monthly average of 11.3 mg/L and 2.2 mg/L, respectively.
- The revised DO WLAs are set to a daily minimum of 7.4 mg/L and 7.9 mg/L, respectively.
- The revised fecal coliform (FC) bacteria WLAs are set to a monthly average geometric mean density 113 cfu/100 mL and 136 cfu/100 mL, respectively.
- The critical condition (April 1 through October 31) revised temperature WLAs are set to a daily maximum of 20.6°C and 19.5°C, respectively. It is not necessary to revise the non-critical condition (November 1 through March 31) temperature WLAs so they will remain as a daily maximum of 18.0°C and 25.0°C, respectively.

In order to reduce water temperatures (and help increase DO) in the lower reach of Selah Ditch, the most important implementation activity is to reduce the amount of solar radiation entering the water body. Non-point solar radiation pollution is best mitigated by increasing the percentage of effective shade, which is resolved in this report by producing "maximum mature riparian vegetation". Such amount of vegetation may result in a "minimum of 90% effective shade" during the month of July when utilized along a narrow water body such as Selah Ditch. However, the required temperature LAs will only be set to a maximum of 71% effective shade (July), in accordance with the findings of previously published shading studies of small streams and since obtaining 90% shade in the dry, shrub-steppe ecology of eastern Washington may not be reasonable.

The "critical condition" temperature LAs required by the *Selah Ditch Multiparameter TMDL* are given below:

- November – March: ≥ 0 percent effective shade.
- April: ≥ 6 percent effective shade.
- May: ≥ 15 percent effective shade.
- June: ≥ 19 percent effective shade.
- July: ≥ 71 percent effective shade.
- August: ≥ 59 percent effective shade.
- September: ≥ 37 percent effective shade.
- October: ≥ 15 percent effective shade.

There is sufficient reasonable assurance that Selah Ditch will fully comply with state water quality standards by July 1, 2026, due to considerable interest and local involvement toward resolving the water quality problems. Numerous organizations and agencies are already engaged in stream restoration and source correction actions that will help resolve the problems associated with DO, FC and temperature. Additional reasonable assurance occurs as the city of Selah has demonstrated that it has taken and will continue to take the fore-front in conducting TMDL implementation and effectiveness monitoring activities.

The implementation of actions needed to mitigate DO, FC and temperature pollution within Selah Ditch must be a cooperative venture between local government and companies, tribal, state, and federal groups. Although Ecology will maintain overall regulatory authority over the *Selah Ditch Multiparameter TMDL*, the city of Selah has assumed supervisory authority over implementation activities. Individual groups have been instrumental in developing this water quality improvement report: the city of Selah, the Yakama Nation, Ecology, the Washington State Department of Transportation, the Burlington Northern Santa Fe (BNSF) railroad company, the North Yakima Conservation District, and various local businesses including: Tree Top, Inc., Matson Fruit Company and Larson Fruit Company.

Implementation of the *Selah Ditch Multiparameter TMDL – Water Quality Improvement Report* will be adaptively managed such that Selah Ditch will meet state surface water quality standards by July 1, 2026. Effectiveness monitoring throughout the duration of the TMDL will determine if the best management practices (BMPs) being implemented will allow the above deadline to be met.

Adaptive management methods that may be used include, but are not limited to, the following:

- Adjusting the type, intensity or number of BMPs commonly utilized for the pollution parameters of concern.
- Helping develop and fund additional BMPs that would address specific pollution parameters, in the event that pollution mitigation is not progressing satisfactorily toward TMDL goal.
- Conduct additional educational outreach activities to improve awareness and support of the local community.
- Any other actions deemed necessary by the Technical Advisory Workgroup to improve the water quality of Selah Ditch.

Acknowledgements

The author would like to thank all of the members of the Technical Advisory Workgroup for their continued support throughout the lengthy development of the *Selah Ditch Multiparameter TMDL - Technical Assessment* and the *Water Quality Improvement Report*. Without such steadfast support by members of the local community, a TMDL would not be possible.

Special thanks is given to the city of Selah (especially Councilmember Keith Larson, City Supervisor Frank Sweet and Wastewater Lead Operator Todd LaRoche) for its immediate acknowledgement of the pollution problem within Selah Ditch, conducting preliminary water quality sampling, and its taking on the majority of the responsibility for mitigating such pollution. This was done even with the full knowledge that the predominant source of pollution (solar radiation) is not attributable to the city's discharges. The attitude and cooperative nature of the city of Selah is a shining example of a municipality that is forward thinking – not satisfied with just knowing that a problem exists, but actively planning to correct the problem as soon as possible for the benefit of future generations.

Special thanks are also extended to Ted Pooler, P.E. of Huibregtse, Louman Associates, Inc. and Jeff Davis, P.E. of Tree Top, Inc.: both of whom have continually been sources of valuable information and support, without which the *Selah Ditch Multiparameter TMDL* would have most assuredly been more difficult.

My final thanks go to various employees of both the Washington State Department of Ecology and the EPA for their perseverance with my several attempts to produce documents worthy of their acceptance. Such employees consist of Jonathan Merz and Ryan Anderson, my immediate supervisors, and Ron McBride (Ecology HQ), who have shown great patience with the evolution of the *Selah Ditch Multiparameter TMDL*. Also, my sincerest thanks to Laurie Mann (EPA) for her help with the review and approval of the final Water Quality Improvement Report.

What is a Total Maximum Daily Load (TMDL)?

Federal Clean Water Act Requirements

The Clean Water Act established a process to identify and clean up polluted waters. Under the Clean Water Act, every state has its own water quality standards designed to protect, restore and preserve water quality. Water quality standards consist of designated uses for protection, such as cold water biota and drinking water supply, and criteria, usually numeric criteria, to achieve those uses.

Every two years, states are required to prepare a list of water bodies (lakes, rivers, streams and marine waters), which do not meet water quality standards. The list is called the 303(d) list or water quality assessment. To develop the list for the state of Washington (state), the Washington State Department of Ecology (Ecology) compiles its own water quality data along with data submitted by local, state and federal governments, tribes, industries, and citizen monitoring groups. All data are reviewed to ensure that they were collected using appropriate scientific methods before they are used to develop the 303(d) list.

TMDL Process Overview

The Clean Water Act requires that a Total Maximum Daily Load (TMDL) be developed for all water bodies on the 2004 303(d) list. A TMDL is a site-specific process that identifies how much pollution needs to be reduced to meet state water quality standards. Then the local community works with Ecology to develop and implement a strategy to control the pollution as well as a monitoring plan to assess the effectiveness of the water quality improvement activities.

TMDLs describe the type, amount and sources of water pollution in a water body; calculate how much pollution needs to be reduced or eliminated to comply with state water quality standards; detail the implementation activities that will be used to reduce pollution; and, provide targets and timelines of when the pollution will eventually comply with state water quality standards. The basic TMDL process consists of:

- Development of a technical assessment that provides an analysis of water quality data and identifies the extent of pollution.
- Development of a water quality improvement report (WQIR), which will be submitted to EPA for approval, that presents a general strategy for reducing the identified pollution,
- Development of a water quality improvement plan (WQIP), within one year after approval of the WQIR, that presents a detailed implementation strategy for reducing the identified pollution,
- Actual implementation of the actions described in the WQIP,
- Conducting effectiveness monitoring to ensure that pollution is being reduced on a schedule to meet the targets and timelines outlined in the WQIR,
- Using adaptive management to ensure pollution reduction, if prior implementation actions fail to reach the targets and timelines outlined in the WQIR.

Elements Required in a TMDL

The goal of a TMDL is to ensure that the impaired water body will ultimately comply with state water quality standards. A TMDL includes a written, quantitative assessment of water quality problems and of the pollutant sources that cause the problem. The assessment determines the amount of an excessive pollutant that can be discharged to the water body and still meet state water quality standards. The assessment then allocates that load among the various known and potential sources of such pollutant. By definition, a TMDL is the development of all allocations for all pollutants in a water body that exceed state water quality standards.

Each TMDL assessment must discuss at least five aspects of the pollution present in the specific water body being investigated. The report must determine the amount of a given pollutant, called the **loading capacity**, which can be discharged to the water body and still meet water quality standards and, subsequently, must allocate that load among the various known pollution sources. If the pollution comes from a discrete source (point source) such as an industrial facility's discharge pipe, that facility's share of the loading capacity is called a **wasteload allocation**. If the pollution comes from a diffuse source (non-point source), that share is called a **load allocation**. The TMDL assessment must also consider any **seasonal variation** and include a **margin of safety,** which takes into account any lack of knowledge about the causes of the water quality problem or its loading capacity.

Water Quality Assessment / Categories 1-5

The Water Quality Assessment is a state-initiated list that tells a more complete story about the condition of the state's water bodies. The federally-required 303(d) list is now contained within the Water Quality Assessment list as a separate category. EPA approved the state's 2002/2004 303(d) list on November 4, 2005. The assessment list is divided into the five following categories:

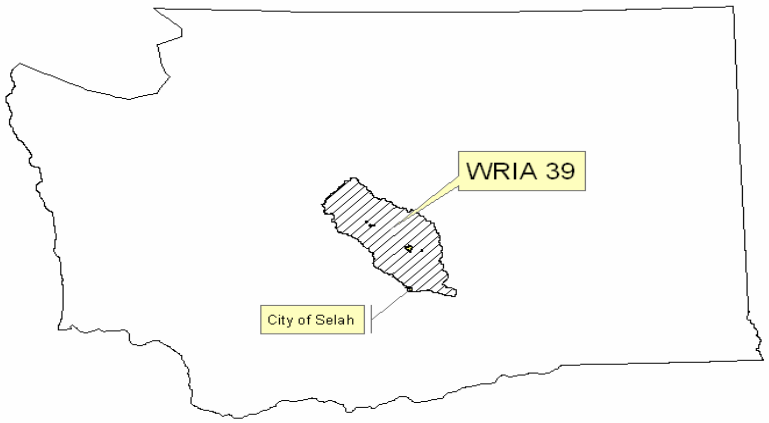
- Category 1 – Meets state surface water quality standards.
- Category 2 – Waters of concern (have shown minor pollution).
- Category 3 – No data available.
- Category 4 – Polluted waters that do not require the development of a TMDL because the problems are being solved in one of three ways:
  - 4a – Has an approved TMDL in place that is being implemented;
  - 4b – Has a pollution control plan in place that should solve the problem; and
  - 4c – The impairment is caused by a non-pollutant such as low water flow, dams, or culverts.
- Category 5 – Polluted waters that require a TMDL (otherwise known as the 303(d) list).

Watershed Description

Selah Ditch (elevation = 1,120 ft.) is located in the southeast corner of the city of Selah, Washington, which itself is located within Water Resource Inventory Area (WRIA) 39. The city of Selah lies on the east side of the Cascade Mountain range within Yakima County, approximately one mile north of the city of Yakima. Figure 1 shows the location of both WRIA 39 and the city of Selah within the state of Washington.

Figure 1

Location of WRIA 39 and the City of Selah within the State of Washington



Selah Ditch is a short (0.83 mile), straight, man-made drainage canal that is classified as a Class A water body. It is actually an extension of the west fork of Taylor Ditch[1], which historically transported irrigation water through the city of Selah and into the limited rural areas located to the south of the city. The ditch ultimately discharges into the east fork of Taylor Ditch. Afterwards, the combined flow of the two ditches continues downstream for another 0.1 mile before discharging into the Yakima River at River Mile 117.1.

1 Taylor Ditch, which begins as an irrigation diversion of the Yakima River located approximately five miles north of Selah, is composed of two forks: east and west. The ditch was built to bring irrigation water to the Selah area. The east fork ultimately drains the Elks Golf Course and low-lying areas between the city and the Yakima River. In that area, Taylor Ditch is commonly referred to as Golf Club Creek. The west fork reenters the east fork after passing through a series of culverts. The irrigation water entering Selah Ditch through the west-side tributary is derived from the Naches-Selah Irrigation District. Taylor Ditch ultimately discharges into the Yakima River.

The study area for the TMDL consists of all areas surrounding Selah Ditch, which include urban, commercial, and rural parcels. Selah Ditch is located just south of the Tree Top, Inc. facility, and immediately east of the municipal wastewater treatment plant (POTW). The majority of the ditch runs from the northeast to the southwest and parallel to the Burlington Northern Santa Fe (BNSF) railroad line, on the latter's west side. The ditch is located on property belonging to the BNSF, with exception its lower (downstream) 300-ft reach. The lower reach of the ditch is identified in Figure 2 by the sinuosity after it turns east and goes under the BNSF railroad tracks.

There are three general sources of water that discharge into Selah Ditch. Two are classified as municipal point sources: the city of Selah's POTW effluent and stormwater, which discharges from 18" and 24" diameter outfalls located at the head of the ditch. The third source is a naturally occurring tributary (west-side) that enters into the ditch approximately 0.65 mile downstream of the POTW outfall and represents a collection of stormwater runoff from lands, irrigation return flows, remnants of the west-side Taylor Ditch, and discharges from a third (36" diameter) stormwater outfall.

During the "critical condition" (April 1 through October 31), the effluent discharged from the POTW represents approximately thirty-three percent (33%) of the flow in the downstream reach of Selah Ditch; while, discharges from the municipal stormwater sewer system represent approximately fifty-five percent (55%) of the flow. The remaining twelve percent (12%) of the flow in Selah Ditch is assigned to the west-side tributary and miscellaneous groundwater inputs. The ditch is considered by Ecology to be municipal discharge-dominated and, as such, highly dependent upon those municipal discharges for protection of its beneficial uses.

Why is a TMDL Needed for this Water Body?

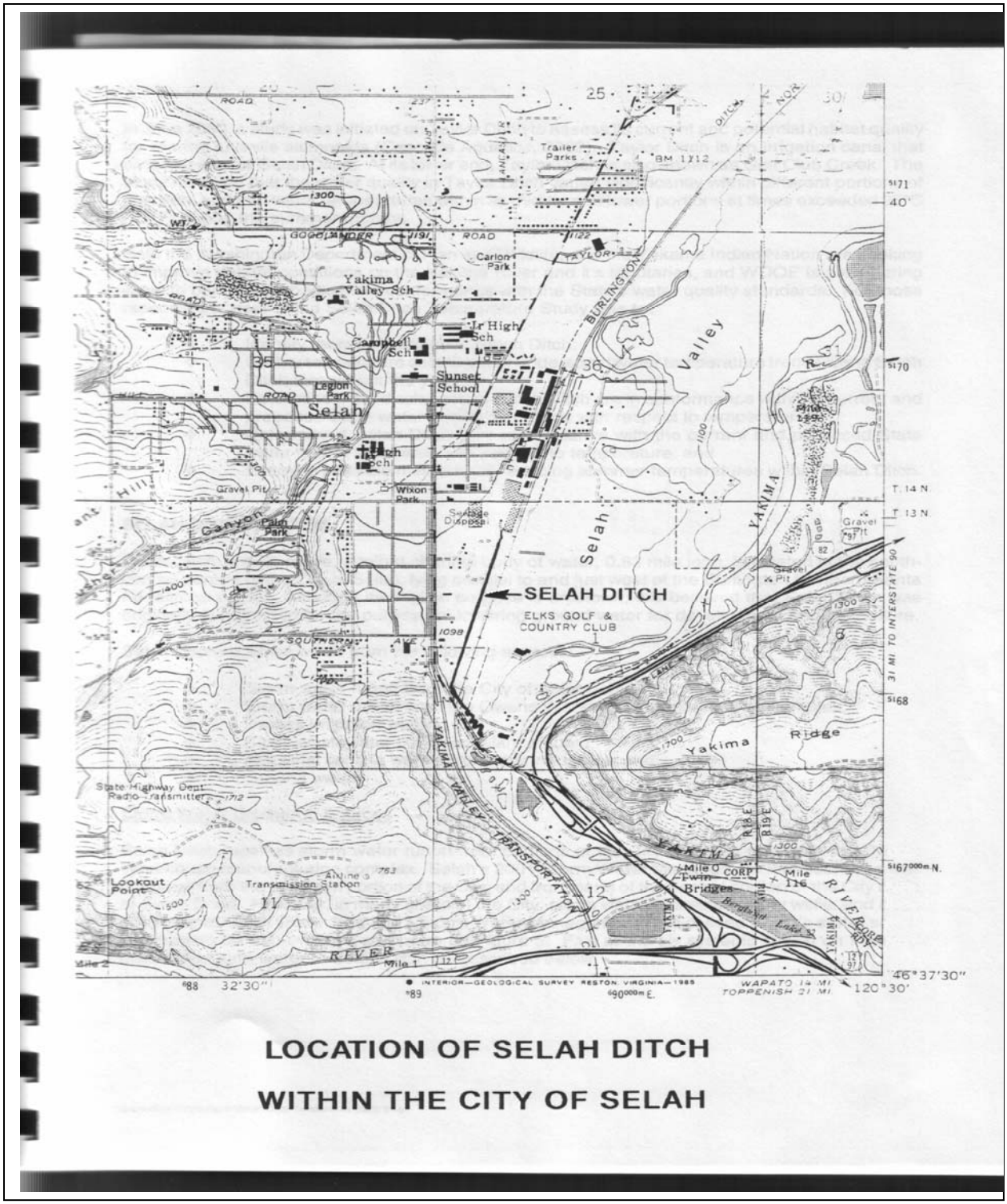
Overview

Ecology is conducting a TMDL study for Selah Ditch because the 2004 303(d) list indicated water quality impairment due to the pollution parameters of fecal coliform (FC) bacteria and temperature. Table 1 shows the 2004 303(d) listings applicable to Selah Ditch.

Table 1: 2004 303(d) listings for Selah Ditch

Waterbody Name	Parameter	T	R	S	2004 List ID
Selah Ditch	Fecal Coliform Bacteria	13N	18E	01	34864
Selah Ditch	Temperature	13N	18E	01	34865

Unfortunately, the parameter of dissolved oxygen (DO) was removed from the 1998 303(d) list and placed into Category 2 (waters of concern) based on limited monitoring data from 1988. Although more recent DO monitoring data has shown continuing impairments, such newer data did not get assessed due to an administrative error. Such data was presented by Ecology in the *Selah Ditch Multiparameter TMDL – Technical Assessment* (Publication #05-10-020), which was published in January, 2005. Table 2 shows that recent DO monitoring data.



LOCATION OF SELAH DITCH

WITHIN THE CITY OF SELAH

Figure 2: Location of Selah Ditch within the City of Selah

Table 2: Recent DO Monitoring Data for Selah Ditch

Parameter	Year	Month	Concentration (mg/L)
Dissolved Oxygen	2000	November	4.9
"	"	"	6.8
"	2003	April	8.8
"	"	"	10.1
"	"	"	8.5
"	"	"	10.0
"	"	July	4.6
"	"	"	6.1
"	"	"	5.4
"	"	"	6.8
"	"	October	4.4
"	"	"	7.2
"	"	"	6.1
"	"	"	7.7

Shaded cells indicate violations of the state's Class A dissolved oxygen criterion of 8.0 mg/L.

Table 3 shows the unlisted but impaired parameter of DO, which is also applicable to Selah Ditch.

Table 3: Unlisted but impaired parameter for Selah Ditch

Waterbody Name	Parameter	T	R	S	1996 and 1998 303(d) Listing ID
Selah Ditch	Dissolved Oxygen	13N	18E	01	7316

The characteristic (beneficial) use of Selah Ditch that is not receiving full protection because of water pollution is salmonid habitat. The ditch is considered vital habitat during the entire year, but even more so during the winter when warm water flows produce an important refugia for salmonids migrating through the watershed. Selah Ditch has historically exceeded state water quality standards for various parameters and is included in the state's 2004 303(d) list (Table 1, above). Therefore, the waterbody pollution must be mitigated through the TMDL process.

Pollutant Parameters of Concern

Dissolved Oxygen (DO)

Aquatic organisms are very sensitive to reductions in the concentration of DO contained in a water body. The health of fish and other aquatic species depends upon maintaining an adequate supply of DO in the water. Growth rates, swimming ability, susceptibility to disease, and the relative ability to endure other environmental stressors and pollutants are all negatively affected by low DO concentrations. The state's Class A criterion of a minimum of 8.0 mg/L was specifically selected to support healthy populations of fish and other aquatic life.

DO concentrations typically demonstrate diurnal fluctuations (over the day and night) in response to changes in climatic conditions and respiratory requirements of aquatic plants. Since the health of aquatic species is tied predominantly to daily minimum DO concentrations, the state's Class A DO criterion is expressed as the lowest allowable DO concentration during any single day. However, state water quality standards recognize that different water body classes require different DO criteria in order to be fully protective of fish and other aquatic life.

The DO criteria are not intended to apply to discretely anomalous areas such as in shallow stagnant eddy pools where natural features unrelated to human influences are the cause of not meeting the criteria. For this reason the state water quality standards direct that measurements be taken from well-mixed portions of rivers and streams. For similar reasons, samples should not be taken from anomalously oxygen-rich nor oxygen-poor areas. For example, in a slow moving stream such as Selah Ditch, collection of samples from a uniquely turbulent area would provide data (abnormally high DO) that is erroneous for comparing to the respective water quality criterion.

Fecal Coliform (FC) Bacteria

Bacteria criteria are set to protect people who work and play in and on the water from waterborne illnesses. In the state water quality standards, FC is used as an "indicator bacteria" for the state's freshwaters (e.g., lakes and streams). FC in water "indicates" the presence of waste from humans and other warm-blooded animals. Waste from warm-blooded animals is more likely to contain pathogens that will cause illness in humans than waste from cold-blooded animals. The FC criteria are set at levels that have been shown to maintain low rates of serious intestinal illness (gastroenteritis) in people.

The *Primary Contact Recreation* use is intended for waters "where a person would have direct contact with water to the point of complete submergence including, but not limited to, skin diving, swimming, and waterskiing." More to the point, however, the use is to be designated to any waters where human exposure is likely to include exposure of the eyes, ears, nose, and throat. Since children are also the most sensitive group for many of the waterborne pathogens of concern, even shallow waters may warrant primary contact protection. To protect this use category: "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 mL".

Compliance with the recreational use is, therefore, based on meeting both the geometric mean criterion and the 10% of samples (or single sample if less than ten total samples) limitation. The two measures, used in combination, ensure that bacterial pollution in a waterbody will be maintained at levels that will not cause a greater risk to human health than intended. While some discretion exists for selecting sample averaging periods, compliance will be evaluated for both monthly (if five or more samples exist) and seasonal (summer versus winter) data sets.

The criteria for FC are based on allowing no more than the pre-determined risk of illness to humans that work or recreate in a water body. The criteria used in state water quality standards are designed to allow seven or fewer illnesses out of every 1,000 people engaged in

primary contact activities. Once the density of FC in the water reaches the numeric criterion, human activities that would increase the concentration above the criteria are not allowed. If the criterion is exceeded, the state will require that human activities be conducted in a manner that will bring FC densities back into compliance with state water quality standards.

If natural levels of FC (from wildlife) cause criteria to be exceeded, no allowance exists for human sources to measurably increase bacterial pollution further. While the specific level of illness rates caused by animal versus human sources has not been quantitatively determined, warm-blooded animals (particularly those that are managed by humans and thus exposed to human derived pathogens as well as those of animal origin) are a common source of serious waterborne illness for humans.

Temperature

Temperature affects the physiology and behavior of fish and other aquatic life. Temperature levels normally fluctuate diurnally and, as well, in response to changes associated with climatic conditions and river flows. However, it may also be the most influential factor limiting the distribution and health of fish and other aquatic life, since it can be greatly and rapidly altered by human activities. Since the health of aquatic species is most affected by maximum water temperatures, the state's Class A temperature criterion (18.0°C) is expressed as the maximum allowable daily temperature occurring in a water body.

State water quality standards recognize, however, that not all waters are naturally capable of staying below their protective temperature criteria. When a water body is naturally warmer than its temperature criterion, an additional allowance is provided for additional warming due to human activities. In such case, the combined effects of all human activities must also not cause more than a 0.3°C (0.54°F) increase above the criterion.

While a temperature criterion generally applies throughout the length of a water body, it is not intended to apply to discretely anomalous areas such as in shallow stagnant eddy pools where natural features unrelated to human influences are the cause of not meeting the criteria. For this reason the state surface water quality standards stipulate that measurements must be taken from well-mixed portions of rivers and streams. For similar reasons, samples should not be taken from anomalously cold areas such as at discrete points where cold ground waters flow into the waterbody.

Applicable Water Quality Standards

Within the state of Washington, water quality standards are published pursuant to Chapter 90.48 of the Revised Code of Washington (RCW) and documented in Chapter 173-201A of the Washington Administrative Code (WAC). Authority to adopt rules, regulations, and standards as necessary to protect the environment is vested with Ecology. Under the federal Clean Water Act, the EPA Regional Administrator must approve the water quality standards adopted by the state (Section 303(c) (3)). Through adoption of the surface water quality standards, the state has designated certain characteristic uses to be protected and the applicable necessary criteria. State water quality standards were last adopted on July 1, 2003 and are composed of:

- The designated and beneficial uses assigned to water bodies (*e.g.*, fishing, swimming, boating, aquatic life and wildlife habitat, and water supply);
- The numerical and narrative criteria set to protect those uses; and
- An anti-degradation policy that provides added protection for water quality and designated uses.

According to the EPA-approved portions of the latest state water quality standards, Selah Ditch is classified for the following:

- Recreational use of "Primary Contact Recreation" pertaining to FC bacteria;
- Water supply uses (domestic, agricultural, industrial, and stock watering);
- Miscellaneous uses (wildlife habitat, harvesting, commerce and navigation, boating, and aesthetics;
- Radioactive Substances; and
- Toxics and Aesthetics.

As not all portions of the latest state water quality standards have been approved by EPA, Selah Ditch will remain categorized as a Class A water body for the following parameters: temperature, dissolved oxygen, turbidity, total dissolved gas, and pH. Table 4, below, details all of the state's water quality standards that are applicable to Selah Ditch.

State law does not establish a ranking or priority among the beneficial uses, but individual waters are expected to support all uses within a specific classification. However, salmonid habitat protection is considered a very high priority within Selah Ditch. The *Selah Ditch Multiparameter TMDL* is designed to address all impairments of beneficial (characteristic) uses in the waterbody caused by impairments of DO, FC and temperature.

Total Maximum Daily Load Analysis

Critical Condition Discussion

A statistical analysis of the water quality sampling data collected by the city of Selah during April, July and October of 2003, as well as an extensive set of temperature data (15-minute readings) collected continuously from August 2001 through November 2002 resulted in the determination of the following critical conditions:

- DO: A seasonal critical condition period was identified of April through October.
- FC: No seasonal critical condition period was identified.

Table 4: Water Quality Standards applicable to Selah Ditch

Characteristic Uses:	Freshwater Aquatic Life uses are: water supply (domestic, agricultural, industrial, and stock watering); wildlife habitat; harvesting, commerce and navigation, boating, and aesthetics. Shall include, but not be limited to, the following: water supply (domestic, industrial, agricultural); stock watering; salmonid migration, rearing, spawning and harvesting; other fish migration, rearing, spawning and harvesting; wildlife habitat; recreation (primary contact recreation, sport fishing, boating and aesthetic enjoyment); commerce and navigation.
Fecal Coliform:	Primary Contact Recreation: Must not exceed a geometric mean value of 100 cfu/100mL, with not more than 10% of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 200 cfu/100mL.
Dissolved Oxygen:	Class A: Shall exceed 8.0 mg/L.
Total Dissolved Gas:	Class A: Shall not exceed 110% of saturation at any point of sample collection.
Temperature:	Class A: Shall not exceed 18°C due to human activities. When natural conditions exceed 18°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C. Incremental temperature increases resulting from non-point activities shall not exceed 2.8°C. Incremental increases from point source activities shall not, at any time, exceed t=28/(T+7). ("T" represents the background temperature as measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge. "t" represents the maximum permissible temperature increase measured at a mixing zone boundary.)
pH:	Class A: Shall be within the range of 6.5 to 8.5 with a human–caused variation within the above range of less than 0.5 units.
Turbidity:	Class A: Shall not exceed 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10% increase in turbidity when the background turbidity is more then 50 NTU.
Toxic, radioactive, or deleterious material:	Must be below those which have the potential, either singularly or cumulatively, to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon the those waters, or adversely affect public health, as determined by Ecology.
Aesthetic Values:	Must not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.

- Temperature: A seasonal critical condition period was identified of April 1 through October 31, which is similar to that associated with DO. This is not unexpected since a close negative relationship exists between water temperatures and saturation concentrations for DO.

Loading Capacity

Calculation of the loading capacity for a water body is an important step in developing a TMDL. EPA defines loading capacity as: "the greatest amount of a pollutant that a water body can receive without violating water quality standards" (EPA, 2001). It provides a reference point for determining the amount of pollution reduction needed to bring a waterbody into compliance with state water quality standards. The *Selah Ditch Multiparameter TMDL* uses a variety of different measures of "daily loads" to fulfill the requirements of Section 303(d) of the federal Clean Water Act.

The loading capacities and allocations for the *Selah Ditch Multiparameter TMDL* are expressed in units of lbs/day and mg/L, respectively, for BOD_5 and DO; while FC loading capacities and allocations are expressed in units of cfu/day and cfu/100 mL, respectively. Temperature is expressed in degrees Celsius (°C) for a loading capacity and a WLA; while, for an LA it is expressed as the surrogate of "percent effective shade". A surrogate measurement is allowed under EPA regulations [defined as "other appropriate measures" in 40 CFR §130.2(i)]. Table 5 details the loading capacities for BOD_5, DO, FC and temperature as established in the Ecology document, *Selah Ditch Multiparameter TMDL - Technical Assessment* (Publication #05-10-020).

Table 5: Selah Ditch - Loading Capacities for BOD_5, DO, FC and Temperature

Parameter	Loading Capacity
BOD_5	51.4 lbs/day
DO	205.5 lbs/day*
FC	116.6×10^{10} cfu/day
Temperature	18.3°C

* Minimum value rather than a maximum value.

The loading capacities in Table 5, above, were based on the critical condition (summer) flow of Selah Ditch, which was determined to be 3.08 mgd (July 2003), and on the water quality criteria for the respective parameters. After calculation, each loading capacity is then divided into a load allocation (LA) and a wasteload allocation (WLA), which represent the portions of the loading capacity assigned to non-point and point sources, respectively.

Load Allocations

The only significant non-point source of pollution (other than solar radiation and air temperature) to Selah Ditch is the west-side tributary, which contains a mix of stormwater runoff from lands, irrigation return flows, remnants of the west-side Taylor Ditch, and discharges from a third stormwater (36" diameter) outfall. The critical condition flow in the tributary was found to be 0.38 mgd.

Water temperatures increase as a result of increased heat flux loads. If there is less heat energy entering the water than there is leaving, the temperature will correspondingly decrease. A load allocation for radiant heat energy is easiest to manage if it can be based upon regulating the input of solar radiation. Therefore, heat energy is ultimately best managed via "percent

effective shade", which is defined as the fraction of the solar shortwave radiation that is blocked by vegetation and topography before it reaches the stream surface.

For any specific site, the greatest amount of effective shade will be created once the "maximum mature riparian vegetation" has been allowed to establish itself. Sridhar et al. (2004) indicated that solar radiation is almost completely attenuated by a fairly mature growth of vegetation. In a study of streams located in Oregon, Risley et al. (2003) determined that "maximum shade" of a low elevation, previously minimally-shaded stream decreased the average summer temperature by 4.15°C. Such average temperature reduction corresponds to a decrease in maximum summer temperatures of 5.22°C when applied to the data collected from Selah Ditch, and is well within the typical range of maximum temperature decreases (3 – 8°C) as found by Bartholow (2000) from a literature search for a variety of geographic locations.

The majority of the LAs in Tables 6 and 8, below, are given in typical loading units. However, those for temperature are given in terms of a surrogate measurement: "percent effective shade". Utilizing effective shade for describing temperature loadings is an EPA approved method. The *Report of the Federal Advisory Committee on the Total Maximum Daily Load Program* (EPA, 1998) includes the following guidance on the use of surrogate measures for TMDL development:

> *When the impairment is tied to a pollutant for which a numeric criterion is not possible, or where the impairment is identified but cannot be attributed to a single traditional "pollutant," the state should try to identify another (surrogate) environmental indicator that can be used to develop a quantified TMDL, using numeric analytical techniques where they are available, and best professional judgment (BPJ) where they are not.*

Table 6 details the original LAs established for Selah Ditch as presented in the *Selah Ditch Multiparameter TMDL - Technical Assessment* (Publication #05-10-020).

Table 6: Selah Ditch – Original LAs for BOD_5, DO, FC and Temperature

Parameter	LA
BOD_5	6.3 lbs/day
DO	25.4 lbs/day*
FC	$3.5x10^{10}$ cfu/day
Temperature	Minimum of 90% effective shade

* Minimum value rather than a maximum value.

The single temperature LA presented in Table 6, above, was established for the worst-case month of maximum water temperatures (July). However, the requirement of a single LA for use throughout the entire year without accounting for seasonal changes in vegetation growth patterns or for only the "critical condition" is unreasonable. Ecology presently acknowledges that the amount of shade produced by "maximum mature riparian vegetation" at any site is not constant but rather increases and decreases as the annual growing season comes and goes. Similarly, the monthly maximum temperatures also vary within Selah Ditch due to the seasonal increase and decrease in the amount of solar radiation entering the waterbody.

Table 7 presents the monthly maximum temperatures that were obtained during the intensive *Selah Ditch Temperature Study* conducted by the city's consultants (Huibregtse, Louman Associates, Inc.) during August 2001 through November 2002.

Table 7: Selah Ditch – Monthly Maximum Temperatures in Lower Reach

Month	Maximum Temperature °C)	Maximum Temperature (F)	# Degrees Exceeding Class A Criterion (F)	Needed Effective Shade
January	14.7	58.7	-	-
February	16.6	61.9	-	-
March	17.5	63.5	-	-
April	18.5	65.3	0.9	6%
May	19.3	66.7	2.3	15%
June	19.6	67.3	2.9	19%
July	23.9	75.0	10.6	71%
August	22.9	73.2	8.8	59%
September	21.1	70.0	5.6	37%
October	19.3	66.7	2.3	15%
November	16.4	61.5	-	-
December	14.3	57.7	-	-

Shaded cells represent exceedances of the Class A temperature criterion of 18.0°C (64.4°F).

Table 8, below, presents the revised set of LAs for the *Selah Ditch Multiparameter TMDL.* The table includes a set of variable temperature LAs for the individual months of the critical condition (April – October). The temperature LAs for the non-critical condition months (November – March) are equal to zero percent (0%) effective shade. The LAs for BOD_5, DO and FC are applicable year-round.

Table 8: Selah Ditch – Revised LAs for BOD_5, DO, FC and Temperature

Parameter	LA							
BOD_5	6.3 lbs/day (year-round)							
DO	25.4 lbs/day* (year-round)							
FC	$3.5x10^{10}$ cfu/day (year-round)							
Temperature	November - March: ≥ 0% effective shade	April: ≥ 6% effective shade	May: ≥ 15% effective shade	June: ≥ 19% effective shade	July: ≥ 71% effective shade	August: ≥ 59% effective shade	September: ≥ 37% effective shade	October: ≥ 15% effective shade

* Minimum value rather than a maximum value.

The originally-published single temperature LA of a "minimum of 90% effective shade" was later considered too stringent a requirement and possibly unattainable in the non-forested, dry, shrub-steppe ecosystem of eastern Washington without installation of special irrigation during the summer "critical condition" months. This assumption is supported by Bonoff (2006), who found that even in the forested lands in dry, eastern Washington have only attained an average of 86 percent effective shade.

Additional information in support of lowering the "minimum of 90% effective shade" requirement comes from a report published by the U.S. Forest Service and the U.S. Bureau of Land Management (2005), which indicated that "an insignificant change in [water] temperature would result as a function of increasing effective shade beyond 80%" with regard to the Pacific Northwest. 80 percent effective shade was also regarded as all that was needed by the *Tillamook Bay Temperature TMDL* (ODEQ, 2001) in order to comply with that state's water quality criterion of 17.8°C. Finally, Boyd (1996) determined that effective shade levels in excess of 80 percent did not result in any further stream temperature reductions in Oregon waters.

The temperature LAs presented in Table 8, above, were based on an average 0.15°F reduction in stream temperature per each one percent increase in effective shade as found by Tate et al. (2005a) in northeastern California (calculated in last column of Table 7). Ecology determined that during the month of July, at least 71 percent effective shade would be required to decrease the maximum temperatures in the Selah Ditch lower reach sufficiently to comply with the state's Class A temperature criterion of 18.0°C. Such amount of shade is considered reasonable as 70 percent effective shade was assumed as necessary for narrow streams (< 8m) in dry, shrub-steppe areas of north-eastern Oregon (ODEQ, 2001) and of south-eastern Washington (Raines et al., 1999).

Further reasonableness for lowering the prior published LA of ≥ 90 percent effective shade to ≥ 71 percent comes from Ecology's own *Little Klickitat River Watershed Temperature TMDL* (Brock et al., 2002), which determined that the average effective shade for the dry, eastern Washington county of Klickitat was calculated to be 73 percent in order to comply with the Class A temperature criterion of 18.0°C. Additionally, the *Teanaway Temperature Total Maximum Daily Load – Submittal Report* (Irle, 2001) determined that the maximum site potential shade along streams in that eastern Washington watershed would only be 71 percent. Based on the above two eastern Washington watershed analyses, it is quite reasonable to assume that the *Selah Ditch Multiparameter TMDL* would similarly need at least 71 percent effective shade during the critical condition (summer) months to comply with the Class A temperature criterion of 18.0°C.

Solar radiation is the most important non-point source of heat for increasing water temperatures in small streams (Maloney et al., 1999; Bartholow, 2000; Ice, 2001; Johnson, 2004; Moore et al., 2005; Thompson, 2005). Solar radiation is mitigated through the use of effective shade, which can be easily increased by restoring riparian vegetation. Tate et al. (2005a) even determined that increasing shade is more effective at reducing water temperatures as air temperatures increase (quadratic relationship between air temperature and water temperature). The implication of such correlation is that, in hotter climates such as the summers in eastern Washington, riparian vegetation would have a much greater cooling effect on stream temperature than in western Washington. Therefore, ≥ 71 percent effective shade during July is considered adequate to allow eastern Washington waterbodies to comply with state water quality standards, whereas 90 percent effective shade may be necessary in western Washington.

Selah Ditch will be assumed to be in full compliance with all of the temperature LAs given in Table 8, above, when "maximum mature riparian vegetation" has been grown. Such assumption is considered appropriate, as the ditch's width is minimal and such an amount of vegetation should actually result in > 80 percent effective shade, according to a search of the available scientific literature.

Wasteload Allocations

The flow in Selah Ditch's upper reach is essentially formed by two point sources of effluent that discharge into the ditch. Both sources are municipal (city of Selah) discharges specifically attributed to the POTW and the stormwater sewer system. Table 9 details the original WLAs established for Selah Ditch that were originally presented in the *Selah Ditch Multiparameter TMDL - Technical Assessment* (Publication #05-10-020). Such WLAs represent the remainder loading of each pollutant parameter after the subtraction of the previously-discussed LAs from the applicable loading capacities. This complies with the intent of any TMDL, which stipulates that the sum of the WLA, LA and the MOS (margin of safety) for each pollution parameter must equal its respective loading capacity.

Table 9: Selah Ditch – Original WLAs for BOD_5, DO, FC and Temperature

Parameter	WLA – POTW Effluent	WLA – Stormwater Effluent
BOD_5	10.0 mg/L	2.0 mg/L
DO	8.4 mg/L	8.4 mg/L
FC	10 cfu/100 mL	186 cfu/100 mL (98% reduction)
Temperature	18.3°C: April 1 – Oct. 31; 18.0°C: Nov. 1– Mar. 31	18.3°C: April 1 – Oct. 31; 25.0°C: Nov. 1– Mar. 31

After publication of the *Selah Ditch Multiparameter Total Maximum Daily Load – Technical Assessment* in January 2005, the City of Selah raised issues related to relocating the POTW outfall from Selah Ditch to the Yakima River, including the benefits of less stringent effluent limitations with a Yakima River outfall and potential detrimental effects of removing flow from Selah Ditch. The benefits would be due to the very large dilution factor that would be afforded to the municipal discharges by entering the Yakima River, as well as, the latter's temperature criterion of 21.0°C when compared to the more stringent 18.0°C criterion applicable to Selah Ditch.

However, as the ditch is an effluent-dominated water body any further reduction in stream flows would probably result in higher stream temperatures (Tate, et al., 2005b; Tate, et al., 2005c) thereby further negatively affecting the ditch's value as salmonid habitat. The city of Selah, the Washington State Department of Transportation and the Yakima Nation have already spent substantial resources on riparian restoration in the ditch's lower reach for improving salmonid habitat through the construction of sinuosity, addition of large woody debris (LWD), and planting of some vegetation for shade.

Due to all of the above reasons, Ecology deemed it imperative to keep the municipal discharges in the effluent-dominated Selah Ditch and, therefore, grant an extended mixing zone to the city of Selah in order to protect the ditch's over-riding beneficial use as salmonid habitat. This situation does not eliminate the city's responsibility to investigate and implement pollution mitigation, as even with the slightly less stringent revised WLAs afforded by minimal dilution factors associated with such mixing zone the municipal discharges will still need to substantially improve in order for the ditch to ultimately comply with state water quality standards.

The WLAs that were published in the *Selah Ditch Multiparameter TMDL – Technical Assessment* (Table 9, above) were calculated without the benefit of any mixing zone dilution factors. Table 10, below, details a revised set of WLAs that were calculated incorporating Ecology's recently approved minimal dilution factors of 1.13 and 1.07 for the POTW effluent and stormwater sewer discharges, respectively. The FC WLAs are considerably different than the originally published WLAs (Table 9, above) because the original POTW WLA was incorrectly set to 10 cfu/100mL. It should have been set to 100 cfu/100mL, as the latter is the engineering documents' target for the recently constructed ultraviolet disinfection system. The revised FC WLAs in Table 10 are based on the corrected densities of 100 cfu/100mL and 127 cfu/100mL, respectively, which should have been included in the original *Selah Ditch Multiparameter TMDL – Technical Assessment* (Publication #05-10-020).

Table 10: Selah Ditch – Revised WLAs for BOD_5, DO, FC and Temperature

Parameter	WLA – POTW Effluent	WLA – Stormwater Effluent
BOD_5	11.3 mg/L[1]	2.2 mg/L[1]
DO	7.4 mg/L[2]	7.9 mg/L[2]
FC	113 cfu/100 mL[3]	136 cfu/100 mL[3] (95% reduction)
Temperature	20.6°C[4]: April 1 – Oct. 31; 18.0°C[4]: Nov. 1– Mar. 31	19.5°C[4]: April 1 – Oct. 31; 25.0°C[4]: Nov. 1– Mar. 31

1 To be imposed as a monthly average limitation, if so required after the DO Effectiveness Evaluation.
2 To be imposed as a daily minimum limitation.
3 To be imposed as a monthly geometric mean limitation.
4 To be imposed as a daily maximum limitation.

It is estimated that the *Selah Ditch Multiparameter TMDL* will need to have a maximum 20-year timeline in order to achieve complete compliance with state water quality standards due to that length of time generally realized as necessary to establish "maximum mature riparian vegetation" (Teti, 2000). General milestones and goals for the TMDL will be the following:

- Complete survey of illicit storm water connections by January 1, 2008.
- Complete planting of trees along Selah Ditch by January 1, 2009.
- Complete repairs to illicit storm water connections by January 1, 2010.
- Increase DO concentrations to meet the DO WLAs by January 1, 2010.
- Complete a DO Effectiveness Evaluation by January 1, 2012.
- The DO, FC and temperature WLAs detailed in Table 10 will be imposed as effluent limitations in the municipality's POTW NPDES permit that will become effective in September 2011. The BOD_5 WLA, however, is dependent on compliance with the state's Class A DO criterion and if the DO Effectiveness Evaluation determines that the DO concentrations after January 1, 2010 in Selah Ditch comply with such criterion, then the BOD_5 WLA will not be imposed as an NPDES effluent limitation. On the other hand, if the DO Effectiveness Evaluation determines that DO concentrations still do not comply with the Class A criterion, then the city of Selah will be required to meet the BOD_5 WLA in Table 10 by January 1, 2016 and such WLA will be imposed as an NPDES effluent limitation.

- The storm water WLAs in Table 10 will not be imposed as numerical effluent limitations in the municipality's stormwater permit, as the EPA requires such permits to only contain a set of required BMPs.

Margin of Safety

A description of the applicable margin of safety (MOS) utilized in all TMDLs is required by federal and state regulations. The MOS is identified to account for uncertainty during the development of the TMDL process. The MOS can be explicit in the form of an allocation, or implicit in the use of conservative assumptions in the analysis. The following implicit assumptions were used in the analysis contained in the *Selah Ditch Multiparameter TMDL – Technical Assessment* (Publication #05-10-020) and, therefore, provide an inherent MOS over uncertainty:

- Analysis of each targeted pollution parameter has been based on the critical condition (April 1 through October 31) historical water quality monitoring data. This represents a substantial amount of MOS.
- The annual critical condition period for temperature for the TMDL was selected as April 1 through October 31, even though the actual data indicated a slightly shorter time period (April 7 – October 22). This represents a slight amount of MOS.
- The application of the temperature WLA and the DO WLA as a daily maximum effluent limitation and a daily minimum effluent limitation, respectively, rather than as weekly or monthly effluent limitations represents a substantial amount of MOS.
- The application of the DO WLA as a future NPDES effluent limitation for DO, where no such limitation had previously existed, provides substantial MOS for that parameter.
- The LAs for BOD_5 and FC bacteria were calculated from the maximum values of those parameters found in the westside tributary. This represents a slight amount of MOS.
- The use of a temperature LA for the hottest month (July) of "≥ 71percent effective shade" gives a substantial amount of MOS since narrow waterbodies, such as Selah Ditch, should easily attain > 80 percent effective shade once the establishment of "maximum mature riparian vegetation" is achieved.
- Even though an extended mixing zone has been allowed by Ecology with its downstream boundary located just upstream of the lower reach of Selah Ditch, the LAs are required to apply to the length of the ditch, beginning just downstream of the upper reach. This provides a substantial amount of MOS.

What Will be Done?

Implementation Strategy and Reasonable Assurances

Selah Ditch has historically been impaired by three water quality pollutant parameters: dissolved oxygen (DO), fecal coliform (FC) bacteria and temperature. The goals and objectives of the *Selah Ditch Multiparameter TMDL* are to reduce such pollution in the ditch, so that it ultimately complies with state surface water quality standards (Chapter 173-201A WAC). When establishing a TMDL, reductions of a particular pollutant parameter are allocated among the various sources of pollution in the watershed. The sources of pollution applicable to the *Selah Ditch Multiparameter TMDL* consist of both point and non-point sources.

The pollution in the upper reach of Selah Ditch is caused by municipal (POTW and stormwater) discharges that account for all of ditch's flow in that reach. Therefore, the reduction of pollution in the upper reach will be reasonably assured by the setting of WLAs and implementing them as numerical effluent limitations into the municipality's POTW NPDES permit and as required BMPs into the municipality's NPDES stormwater permit.

The pollution (predominantly high water temperatures) in the lower reach of Selah Ditch, however, is due exclusively to non-point source pollution: solar radiation. The reduction of such pollution in the lower reach will be reasonably assured by setting variable LAs of minimum percent effective shade for the individual months of the critical condition (April 1 through October 31). Such LAs will be mitigated through the implementation of the specific best management practice (BMP) of "maximum mature riparian vegetation". The physical narrowness of Selah Ditch (≈ 2m) and a 20-year TMDL compliance deadline should give additional reasonable assurance that the temperature LAs contained in this WQIP can be met.

Selah Ditch is expected to fully comply with state surface water quality standards by July 1, 2026. Ecology believes that the following ongoing activities provide additional reasonable assurance that the DO, FC and temperature impairments in Selah Ditch will be mitigated by the above time limit:

- There is considerable local interest and involvement toward resolving the water quality problems in Selah Ditch, as seen by the excellent attendance and conversations at the Technical Advisory Workgroup meetings.
- Members of the city of Selah management and the local community are active participants in salmon recovery organizations and are actively vying for Salmon Recovery Funds and other grants/loans for implementation activities.
- The city of Selah, the Washington State Department of Transportation, and the Yakama National have already spent considerable resources on salmonid habitat restoration efforts in the lower reach of Selah Ditch.
- The North Yakima Conservation District has indicated their support to improving the ditch's water quality through whatever means they have available, principally technical and implementation assistance and as a source of plantings.

Education, outreach, technical and financial assistance, permit administration, and enforcement will be used to ensure reasonable assurance that Selah Ditch will fully comply with state water quality standards by July 1, 2026. There is also considerable interest and local involvement toward resolving the water quality problems found associated with the ditch. Numerous organizations and agencies are already engaged in stream restoration and source correction actions that will help resolve the problems associated with DO, FC and temperature. Additional reasonable assurance is derived from the fact that the city of Selah has demonstrated its willingness to take the fore-front in supervising and conducting TMDL implementation as well as effectiveness monitoring activities.

While Ecology is authorized under Chapter 90.48 RCW to impose strict requirements or issue enforcement actions to achieve compliance with state water quality standards, it is the goal of the *Selah Ditch Multiparameter TMDL* process are to achieve clean water through NPDES permit requirements as well as voluntary BMP implementation for non-point pollution sources. Ecology will consider and issue notices of noncompliance in accordance with the Regulatory Reform Act in situations where the cause or contribution of cause of noncompliance with wasteload and load allocations can be established, and no progress has been made toward mitigation in those situations.

Organizational Actions, Goals, and Schedules

The implementation of actions needed to mitigate DO, FC and temperature pollution within Selah Ditch must be a cooperative venture between local government and companies, tribal, state, and federal groups. Although Ecology will maintain overall regulatory authority over the *Selah Ditch Multiparameter TMDL*, the city of Selah has assumed supervisory authority over implementation activities. Individual groups that have been instrumental in developing this Water Quality Improvement Report are the city of Selah, the Yakama Nation, Ecology, the Washington State Department of Transportation, the Burlington Northern Santa Fe (BNSF) railroad company, the North Yakima Conservation District, and various local businesses (Tree Top, Inc., Matson Fruit Company and Larson Fruit Company).

Regarding future TMDL implementation actions, the city of Selah has indicated that it will:

- Complete, by January 1, 2008, a survey of illicit connections within its stormwater sewers for reducing concentrated sources of FC bacteria. All illicit sanitary connections that are found will be repaired by January 1, 2010.
- Plant trees all along Selah Ditch in order help mitigate high water temperatures caused by solar radiation input. Such activity will be completed by January 1, 2009
- Reduce water temperatures within both its POTW and its stormwater sewer system through the application of AKART and BMPs, respectively. Such activity will occur throughout the duration of the TMDL.
- Increase DO in its municipal discharges to meet the DO WLAs by January 1, 2010 and potentially reduce BOD_5, if needed, after the completion of a DO Effectiveness Evaluation, which will be completed by January 1, 2012.

- Conduct effectiveness monitoring of the TMDL at the edge of the mixing zone, every five years after EPA approval of this WQIP.
- Provide community awareness of the TMDL by helping to disseminate information concerning Selah Ditch and its pollution.

The Yakama Nation and the Washington Department of Transportation will continue to assist in the maintenance of the riparian restoration work that they previously had completed in the lower reach of Selah Ditch.

The BNSF railroad company has given its verbal permission to allow the planting of riparian vegetation on BNSF property, as long as such plantings do not interfere with train visibility of its railroad tracks.

The North Yakima Conservation District has offered to help with technical assistance, BMP implementation, and possibly as a source of planting material.

Tree Top, Inc., Matson Fruit Company and Larson Fruit Company have all indicated their desire to help the *Selah Ditch Multiparameter TMDL* be successful in whatever way possible.

Ecology will:

- Maintain an overall regulatory authority of the TMDL.
- Help to locate and obtain financial assistance for implementation activities.
- Evaluate all effectiveness monitoring data in order to determine if the TMDL is progressing at a rate suitable for meeting state surface water quality standards.

Adaptive Management

Implementation of the *Selah Ditch Multiparameter TMDL* will be adaptively managed such that Selah Ditch will fully comply with state surface water quality standards by July 1, 2026. Adaptive management methods that may be used include, but are not limited to, the following:

- Adjusting the type, intensity or number of BMPs commonly utilized for the pollution parameters of concern.
- Helping develop and fund additional BMPs that would address specific pollution parameters, in the event that pollution mitigation is not progressing satisfactorily toward the TMDL's goal.
- Conduct additional educational outreach activities to improve awareness and support of the local community.
- Any other actions deemed necessary by the Technical Advisory Workgroup to improve the water quality of Selah Ditch.

The *Selah Ditch Multiparameter TMDL* goal will be considered met when, on July 1, 2006, Selah Ditch meets state surface water quality standards after successful implementation of BMPs for non-point sources and NPDES requirements for point sources. If state water quality standards are met prior to complete implementation of the LAs and WLAs specified by the TMDL, then the TMDL objectives will be considered achieved and no further BMP implementation will be required. Under this same scenario, the WLAs may need to be adjusted so as to not overly limit the point sources discharging into Selah Ditch. However, if the LAs and WLAs specified in the TMDL have been completely implemented, but yet the water body still does not comply with state water quality standards, then adaptive management methods shall be employed to further try to meet the objectives of the TMDL.

TMDLs are "living" documents, which are intended to be: revisited periodically to evaluate whether the measures to implement the needed reductions are achieving targets, and revised as conditions change and understanding of the pollution in the water body is broadened. The TAW and other interested entities will work together to monitor progress toward the TMDL goals, evaluate successes, identify obstacles and changing needs, and make adjustments to the water quality improvement plan strategy as needed. However, it is ultimately Ecology's responsibility to assure that cleanup of the pollution in Selah Ditch is being actively pursued and state water quality standards are achieved.

Funding Opportunities

Multiple sources of financial assistance for water cleanup activities are available through Ecology's grant and loan programs, local conservation districts, and other sources. Centennial Clean Water Fund, Section 319 grants under the federal Clean Water Act, and state Revolving Fund loans are available to fund activities by jurisdictions to help implementation of the TMDL. Non-governmental organizations can also apply for 319 grant funding. Should additional funding be necessary to reach standards, Ecology will work with the local organizations to prepare appropriate scopes of work, to implement the *Selah Ditch Multiparameter TMDL – Water Quality Improvement Report*, and to assist with applying for grant opportunities as they arise.

The federal Natural Resources Conservation Service provides some technical assistance and also administers the Environmental Quality Incentive Program (EQIP), which provides cost share funds for BMPs on agricultural sites. Stream restoration activities are eligible for salmon restoration grants through various sources, including the Salmon Recovery Funding (SRF) Board. Refer to the website www.iac.wa.gov/iac/grants/riparian_habitat.htm for a new type of grants established by the state.

Measuring Progress toward Goal

The goal of the *Selah Ditch Multiparameter TMDL* is to have Selah Ditch fully comply with state surface water quality standards by July 1, 2026.

Performance Measures and Targets

After each five-year period, commencing from the date of EPA approval of this report, Ecology will convene a Technical Advisory Workgroup (TAW) meeting in which the completed implementation projects and the results of effectiveness monitoring will be reviewed and a decision made as to what further actions are necessary concerning the TMDL's goal. After each such TAW meeting, Ecology will make the results of such discussions available to the public. If local interest groups would like to have an informational presentation concerning those results, then the city of Selah and Ecology will cooperatively work together to make such presentations available at a reasonable time and location.

Effectiveness Monitoring Plan

Effectiveness monitoring is an element of adaptive management and provides a feedback process to determine the effectiveness of pollution reduction activities, thereby supporting adaptive management decisions. Such monitoring is necessary to determine if the goals of the *Selah Ditch Multiparameter TMDL* have been reached. The city of Selah will be the lead entity for conducting all effectiveness monitoring related to the *Selah Ditch Multiparameter TMDL*. Effectiveness monitoring will be conducted every five years, beginning with the critical condition (April 1 – October 31) of 2011. Subsequent monitoring will also be collected during the critical condition. The actual sampling days (events) and methodology shall be determined by the city of Selah, in conjunction with Ecology, in order to best coincide with its normal activities. The monitoring will consist of, at a minimum, BOD_5, DO, FC, and temperature.

Effectiveness monitoring samples will be collected at the downstream edge of the Ecology-approved mixing zone in order to verify if TMDL implementation activities are demonstrating the desired effect (reducing pollution) and on schedule for compliance with state water quality standards by July 1, 2026. The downstream edge of the mixing zone is located at the site where the BNSF railroad tracks cross Selah Ditch, and represents the beginning of the lower reach of the ditch. Additional sampling may need to be collected from throughout the length of the ditch in order to document specific source reductions of pollution.

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Appendices

Appendix A – Acronyms and Glossary

303(d) List: Section 303(d) of the federal Clean Water Act requires Washington State periodically to prepare a list of all surface waters in the state for which beneficial uses of the water – such as for drinking, recreation, aquatic habitat, and industrial use – are impaired by pollutants. These are water quality-limited estuaries, lakes, and streams that fall short of state surface water quality standards, and are not expected to improve within the next two years.

All Known, Available, and Reasonable Methods of Prevention, Control and Treatment (AKART): Physical, structural, and/or managerial practices that represent the most current methodologies that can be reasonably required for preventing, controlling, or abating the pollutants associated with a discharge. The concept of AKART applies to both point and non-point sources of pollution.

Beneficial Uses: Those uses specified in Chapter 173-201A WAC (Water Quality Standards for Surface Waters of the state of Washington) for a water body that are currently being attained or desired to be attained. They can include fish and shellfish rearing; spawning and harvesting; swimming; boating; navigation; irrigation; wildlife habitat; and domestic, industrial, and agricultural water supply.

Best Management Practices (BMPs): Physical, structural, and/or managerial practices that, when used singularly or in combination, prevent or reduce pollutant discharges. BMPs apply to non-point source pollution and are considered a subset of AKART.

Biochemical Oxygen Demand, Five-day: The amount of oxygen required by aerobic microorganisms to decompose the organic material in a sample of water during a period of five days.

Clean Water Act (CWA): Federal Act passed in 1972 that contains provisions to restore and maintain the quality of the nation's waters. Section 303(d) of the CWA establishes the TMDL program.

Concentration: The amount or mass of a substance or material contained within a given volume or mass of sample.

Critical Condition: That period of time when the physical, chemical, and biological characteristics of the receiving water environment interact with the effluent to produce the greatest potential adverse impact on aquatic biota and existing or designated water uses.

Density: The amount or quantity of an organism contained within a given volume or mass of sample.

Dissolved Oxygen: Oxygen that is dissolved within water and is thereby available for respiration by aquatic organisms and for chemical reactions.

Effective Shade: The fraction of incoming solar shortwave radiation that is blocked from reaching the surface of a stream or other defined area by any combination of vegetation and topography.

Fecal Coliform (FC): That portion of the coliform group of bacteria which is present in intestinal tracts and feces of warm-blooded animals as detected by the product of acid or gas from lactose in a suitable culture medium within twenty-four hours at 44.5 plus or minus 0.2 degrees Celsius. FC bacteria are "indicator" organisms that suggest the possible presence of disease-causing organisms. Densities are measured in colony forming units per 100 milliliters of water (cfu/100mL).

Geometric Mean: A mathematical expression of the central tendency (an average) of multiple sample values. A geometric mean, unlike an arithmetic mean, tends to dampen the effect of very high or low values, which might bias the mean if a straight average (arithmetic mean) were calculated. This is helpful when analyzing bacteria densities, because levels may vary anywhere from ten to 10,000 fold over a given period. The calculation is performed by either: (1) taking the n^{th} root of a product of n factors, or (2) taking the antilogarithm of the arithmetic mean of the logarithms of the individual values.

Load Allocation (LA): The portion of a receiving waters' loading capacity attributed (allocated) to one or more of its existing or future sources of non-point pollution and to natural background sources.

Loading Capacity: The maximum amount of a pollutant parameter that a water body can receive (absorb) and still comply with state water quality standards.

Margin of Safety (MOS): A required component of TMDLs that accounts for uncertainty about the relationship between pollutant loads and quality of the receiving water body. The size of MOS is inversely proportional to the confidence in the data utilized in the calculations of load allocations.

Mixing Zone: That portion of a water body adjacent to an effluent outfall where mixing results in the dilution of the effluent with the receiving water. Water quality criteria may be exceeded in a mixing zone as conditioned and provided for in WAC 173-201A-400.

National Pollutant Discharge Elimination System (NPDES): The national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements under the Clean Water Act. The NPDES program regulates discharges from point sources such as: wastewater treatment plants, large factories, and other facilities that use, process, and discharge water back into lakes, streams, rivers, bays, and oceans.

Non-point Source: Pollution that enters any waters of the state from any dispersed land-based or water-based activities, including but not limited to atmospheric deposition, surface water runoff from agricultural lands, urban areas, or forest lands, subsurface or underground sources, or discharges from boats or marine vessels not otherwise regulated under the NPDES Program. Generally, it means any unconfined and diffuse source of contamination. Legally, it means any source of water pollution that does not meet the legal definition of "point source" in section 502(14) of the Clean Water Act.

pH: The negative logarithm of the hydrogen ion concentration.

Phase II Stormwater Permit: The second phase of stormwater regulation required under the federal Clean Water Act covering smaller municipal separate storm sewer systems (MS4s) and construction sites over one acre.

Point Source: Sources of pollution that discharge at a specific location from pipes, outfalls, and conveyance channels to a surface water. Examples of point source discharges include municipal wastewater treatment plants, municipal stormwater systems, industrial waste treatment facilities, and construction sites that clear more than five acres of land.

Pollution: Such contamination, or other alteration of the physical, chemical, or biological properties, of any waters of the state, including change in temperature, taste, color, turbidity, or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive, or other substance into any waters of the state as will or is likely to create a nuisance or render such waters harmful, detrimental, or injurious to the public health, safety, or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or to livestock, wild animals, birds, fish, or other aquatic life.

Primary Contact Recreation: Activities where a person would have direct contact with water to the point of complete submergence including, but not limited to, skin diving, swimming, and water skiing.

Seasonal Variation: Substantial differences in pollution amounts that occur throughout the different seasons of the year.

Stormwater: The portion of precipitation that does not naturally percolate into the ground or evaporate but instead runs off roads, pavement, and roofs during rainfall or snow melt. Stormwater can also come from hard or saturated grass surfaces such as lawns, pastures, playfields, and from gravel roads and parking lots.

Surface Waters of the State: Lakes, rivers, ponds, streams, inland waters, saltwaters, wetlands and all other surface waters and water courses within the jurisdiction of the state of Washington.

Temperature: Water temperature expressed in degrees Celsius or Fahrenheit.

Total Maximum Daily Load (TMDL): A distribution of a substance in a water body designed to protect it from exceeding water quality standards. A TMDL is equal to the sum of all of the following: (1) individual wasteload allocations (WLAs) for point sources, (2) the load allocations (LAs) for non-point sources, (3) the contribution of natural sources, and (4) a MOS to allow for uncertainty in the wasteload determination. A reserve for future growth is also generally provided.

Wasteload Allocation (WLA): The portion of a receiving water's loading capacity attributed (allocated) to existing or future point sources of pollution. WLAs constitute one type of water quality-based effluent limitation.

Watershed: A drainage area or basin in which all land and water areas drain or flow toward a central collector such as a stream, river, or lake at a lower elevation.

Appendix B – Public Participation

Public participation during development of the *Selah Ditch Multiparameter TMDL* can be classified under two categories: the Technical Advisory Workgroup and the Public Meeting.

A technical advisory workgroup (TAW) was formed on March 3, 2003 to guide development of the *Selah Ditch Multiparameter TMDL - Technical Report* and *Water Quality Implementation Report*. Entities represented in the workgroup included the city of Selah, the Yakama Nation, Washington State Department of Fish and Wildlife, local industrial dischargers, and Ecology. The Technical Advisory Workgroup (TAW) held five meetings:

1. March 3, 2003 at the city of Selah City Council Chambers
2. April 7, 2005 at the city of Selah Fire Station
3. August 30, 2005 at the Ecology offices (Borealis Room)
4. November 15, 2005 at the city of Selah Fire Station
5. April 21, 2006 at the city of Selah Fire Station

The following is a copy of the Ecology news release concerning the public meeting that was held concerning the draft *Selah Ditch Multiparameter TMDL – Water Quality Improvement Report*:

Department of Ecology News Release - April 17, 2006

06-059

Plan to clean up Selah Ditch available for review

YAKIMA - A draft plan outlining ways to clean up Selah Ditch is available for review and comment from the Washington Department of Ecology.

Ammonia, chlorine, dissolved oxygen, fecal coliform bacteria and temperature are water-quality concerns that have been identified in the waterway. The plan recommends actions to improve water quality in order to meet state water quality standards and protect aquatic habitat.

People can learn more about the cleanup plan during a public meeting scheduled for 7-9 p.m., May 4, at the Selah Fire Station, 206 W. Fremont Ave., in Selah.

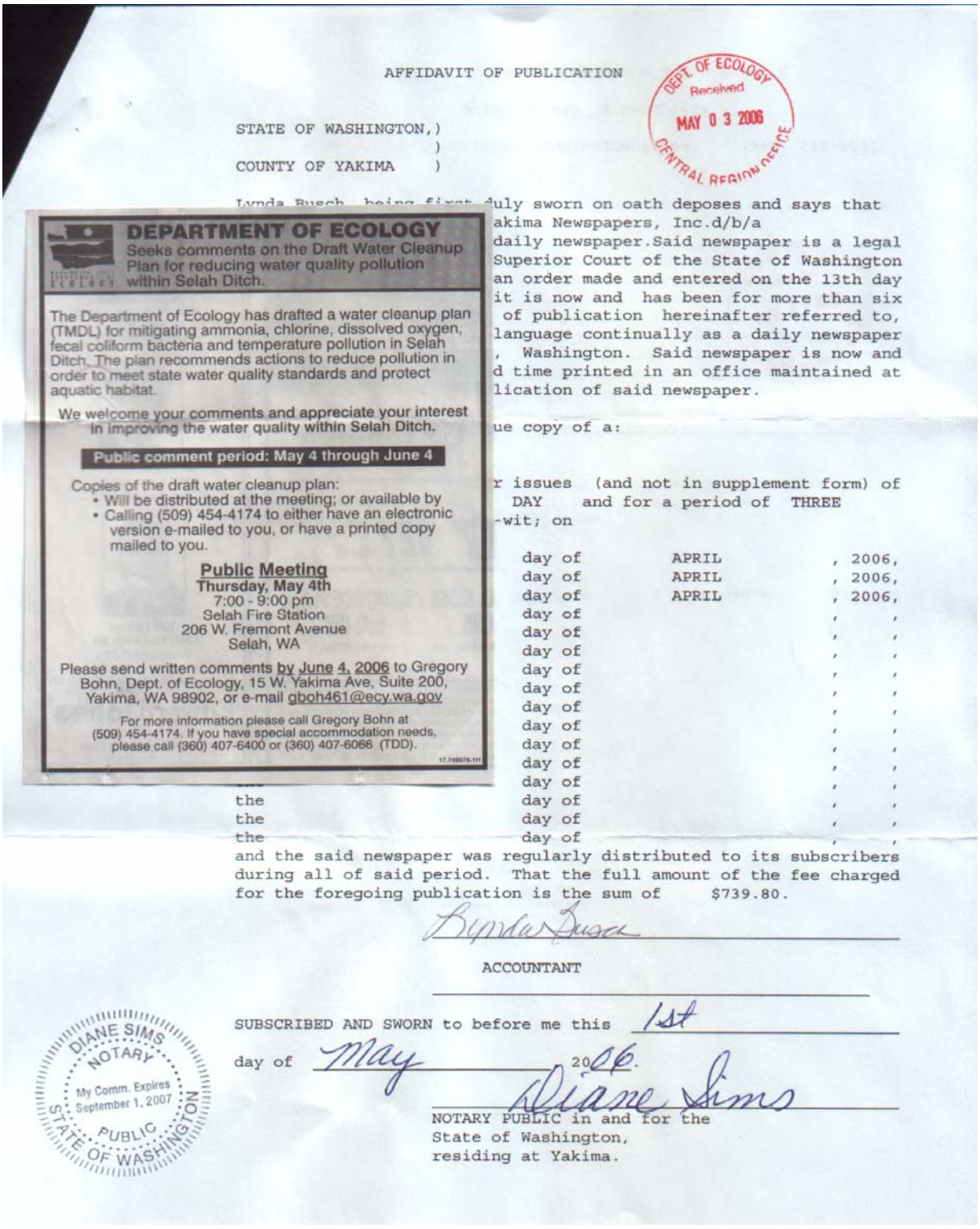
A copy of the plan will be provided at the meeting or may be obtained earlier by calling (509) 454-4174.

Comments should be mailed to Gregory Bohn, Dept. of Ecology, 15 W. Yakima Ave., Suite 200, Yakima, WA 98902; or by email to gboh461@ecy.wa.gov . Comments will be accepted through June 4.

# # #

Media contact: Joye Redfield-Wilder, public information manager, (509) 575-2610

A Public Meeting concerning the *Selah Ditch Multiparameter TMDL – Water Quality Improvement Report* was held on May 4, 2006 from 7-9 pm at the city of Selah Fire Station located at 206 W. Freemont Ave. A scanned image of the affidavit of publication (Yakima Herald-Republic) of the display ad concerning the public meeting follows:



AFFIDAVIT OF PUBLICATION

DEPT. OF ECOLOGY Received MAY 0 3 2006 CENTRAL REGION OFFICE

STATE OF WASHINGTON,)
)
COUNTY OF YAKIMA)

Lynda Busch being first duly sworn on oath deposes and says that
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daily newspaper.Said newspaper is a legal
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and the said newspaper was regularly distributed to its subscribers during all of said period. That the full amount of the fee charged for the foregoing publication is the sum of $739.80.

Lynda Busch

ACCOUNTANT

SUBSCRIBED AND SWORN to before me this 1st day of May 2006.

Diane Sims

NOTARY PUBLIC in and for the State of Washington, residing at Yakima.

DIANE SIMS NOTARY PUBLIC STATE OF WASHINGTON My Comm. Expires September 1, 2007

DEPARTMENT OF ECOLOGY
Seeks comments on the Draft Water Cleanup Plan for reducing water quality pollution within Selah Ditch.

The Department of Ecology has drafted a water cleanup plan (TMDL) for mitigating ammonia, chlorine, dissolved oxygen, fecal coliform bacteria and temperature pollution in Selah Ditch. The plan recommends actions to reduce pollution in order to meet state water quality standards and protect aquatic habitat.

We welcome your comments and appreciate your interest in improving the water quality within Selah Ditch.

Public comment period: May 4 through June 4

Copies of the draft water cleanup plan:
- Will be distributed at the meeting; or available by
- Calling (509) 454-4174 to either have an electronic version e-mailed to you, or have a printed copy mailed to you.

Public Meeting
Thursday, May 4th
7:00 - 9:00 pm
Selah Fire Station
206 W. Fremont Avenue
Selah, WA

Please send written comments by June 4, 2006 to Gregory Bohn, Dept. of Ecology, 15 W. Yakima Ave, Suite 200, Yakima, WA 98902, or e-mail gboh461@ecy.wa.gov

For more information please call Gregory Bohn at (509) 454-4174. If you have special accommodation needs, please call (360) 407-6400 or (360) 407-6066 (TDD).

Copies of the draft *Selah Ditch Multiparameter TMDL – Water Quality Implementation Report* were distributed to nine (9) attendees of the public meeting. The start of the TMDL's public comment period coincided with the above Public Meeting and will last through June 4, 2006. Received public comments and Ecology's answers are presented in Appendix C of this report.

The *Selah Ditch Multiparameter TMDL - Technical Assessment* (Publication #05-10-020) was published in January 2005 and is available to interested persons via the following internet site: www.ecy.wa.gov/biblio/0510020.html.

Appendix C – Response to Comments

The following specific comments were submitted to Ecology concerning the *Selah Ditch Multiparameter TMDL – Water Quality Improvement Report*. The comments are followed by Ecology's answers.

1. Glenda Phillips (resident of Selah): **After reading the Selah Ditch Multiparameter TMDL** [draft water quality improvement report] **the following thoughts came to mind:**

   - **The City of Selah controls "The actual sampling days (events) and methodology shall be determined by the city of Selah in order to best correspond with its normal activities." Would this monitoring method cause biased results?**
   - **On page 15 "Regarding future TMDL implementation actions, the city of Selah has indicated that it will: . . . . " I thought this list of actions was well thought out and would serve well to improve Selah Ditch water quality.**

   Over all I found the report concise and well written. Thank you for the opportunity to review and comment.

   Answer: Ecology and the city of Selah have yet to work out exactly what will be the sampling schedule and methodology. Sampling will be performed during the critical condition, which prevents the greatest amount of bias. The final sampling program will be approved by Ecology so as to prevent any additional bias and will be detailed in the Water Quality Improvement Plan, to be published within the next year. This water quality improvement report was reworded to clarify the sampling program.

2. Mike Tobin (North Yakima Conservation District): **The North Yakima Conservation District will also offer assistance in the implementation of TMDL elements.**

   Answer: Ecology appreciates the extra effort extended by the North Yakima Conservation District. The "Organizational, Goals and Schedules" section of this water quality improvement report was changed to include the offer of implementation.

3. Theodore Pooler (Huibregtse, Louman Associates, Inc. on behalf of the city of Selah):

   A. In the executive summary (page iii) and in the wasteload allocation discussion (page 11), the following comment is made, "the City of Selah determined that it would be more economical to construct a new outfall to the Yakima River than to keep discharging to the Selah Ditch." We agree that constructing a new outfall to the Yakima River was considered and the effects of removing the flow from the Selah Ditch were discussed, but no formal evaluation was done. Such an evaluation is appropriate for an engineering report or facility plan when examining the treatment process alternatives available to address effluent discharge limits. Given some of the effluent limits included in the Water Quality Improvement Report, Selah must keep the option of discharging to the

Yakima River open. The wording in the report also implies that the Selah wastewater treatment plant will always discharge to the Selah Ditch. Therefore, we believe the wording in these sections of the report should be revised to read, "the City of Selah raised issues related to relocating the treatment plant outfall from the Selah Ditch to the Yakima River, including the benefits of less stringent discharge limits with a Yakima River outfall and potential detrimental effects of removing flow from the Selah Ditch."

Answer: Ecology appreciates the clarification of the circumstances and has changed the wording of the Water Quality Improvement Report to reflect your suggestions.

B. The milestones listed on page 12, and the Organizational Actions, Goals and Schedules listed on page 15, include increasing DO and reducing BOD_5 in the treatment plant effluent by January 1, 2010. The BOD_5 effluent limit is imposed because the DO in the Selah Ditch does not meet water quality standards. Efforts proposed to increase the DO, and efforts to decrease temperature with the related benefits to DO, may be sufficient to allow Selah Ditch to meet water quality criteria for DO. If water quality DO criteria are met in Selah Ditch, then imposing BOD_5 limits would be unnecessary. Furthermore, the BOD_5 may not exert a significant DO demand in Selah Ditch because of the short detention time, so reducing effluent BOD_5 may have no effect on the DO. Consequently, DO and BOD_5 effluent limits should not be simultaneously implemented. To meet the requirements of the TMDL, we believe the DO limits should be implemented first, followed by BOD_5 limits. An implementation schedule is presented below.

Answer: Ecology agrees and has changed the wording of the TMDL to reflect your suggestions.

C. The survey of illicit storm water connections will be done as part of Selah's storm water management program as outlined in the upcoming Phase II NPDES Municipal Stormwater Permit. The timing of this study will depend on the storm water permit requirements. We also do not know the number of connections, the effort needed to make corrections, and the cost of the improvements. Therefore, we have adjusted the implementation schedule as presented below to provide time to complete the survey, assess costs, and budget for and make the corrections.

Answer: Ecology agrees and has changed the wording of the TMDL to reflect your suggestions.

D. To be consistent with the terms used in the Phase II Municipal Stormwater Program, all references in the report to "illegal" storm water connections should be changed to "illicit" storm water connections.

Answer: Ecology agrees and has changed the wording of the TMDL to reflect your suggestions.

E. Selah's current NPDES Permit No. WA-002103-2 expires on August 31, 2006. Since permit applications are due one year before the expiration date, the next permit application will be due in August 31, 2010, and the permit would be effective September 1, 2011. Based on these permit dates, and the revised activities discussed above, we adjusted the implementation schedule as listed below. Other dates proposed in the report would remain unchanged.

- **Complete planting of trees along Selah Ditch – January 1, 2009**
- **Complete survey of illicit storm water connections – January 1, 2008**
- **Complete repairs to illicit storm water connections – January 1, 2010**
- **Increase DO to meet waste load allocations – June 1, 2010**
- **Complete evaluation of the effectiveness of increased DO – January 1, 2012**
- **If required, reduce BOD_5 to meet waste load allocations – January 1, 2016**

Answer: Ecology agrees and has changed the wording of the TMDL to reflect your suggestions.

F. In the footnote at the bottom of page 3, the description of the west fork of the Taylor Ditch is not entirely correct. Originally, the west fork did past through the low-lying areas of Selah, crossing through the downtown area, then heading southwest to west of Third Street, and eventually draining back into Selah Ditch just upstream of the crossing of the BNSF railroad tracks. At that time, Selah Ditch headed south, parallel to the railroad tracks, and discharged directly into the Yakima River. The west fork of Taylor Ditch has since been intercepted at Home Avenue. The piped ditch now travels south from Carlon Park, crosses the Junior High playground, then turns east on Home Avenue. The pipeline crosses North Wenas Avenue and passes through the Matson Fruit property. The water daylights at a culvert at the BNSF tracks, passes through the culvert, then rejoins the east fork of Taylor Ditch. Irrigation water now entering the Selah Ditch just upstream from the railroad crossing is Naches Selah Irrigation District return flows.

Answer: Ecology agrees and has changed the wording of the TMDL to reflect your suggestions.

G. We noted the following minor typographical errors: Page 2, under the listing for Category 4 waters, item 4a should be revised to read, "Has an approved TMDL in place and it is being implemented." Page 17, in the first sentence under Performance Measures and Targets, the time period should be revised to be a "five-year period."

Answer: Ecology agrees and has changed the wording of the TMDL to reflect your suggestions.

Appendix D- Selah Ditch Multiparameter TMDL Technical Assessment

The *Selah Ditch Multiparameter TMDL – Technical Assessment* was published by Ecology in January 2005 (Publication #05-10-020). The document can be viewed as a PDF file at www.ecy.wa.gov/biblio/0510020.html or may be ordered from Ecology in the form of a hardcopy from that agency's publications site, or by contacting Gregory Bohn at (509) 454-4174.