

**TEMPERATURE MANAGEMENT PLAN  
AND  
WATER QUALITY CREDIT TRADING  
COMBINED ANNUAL REPORT**

This combined report complies with the reporting requirements summarized above. The report applies to the period commencing on February 26, 2004 and ending on February 28, 2005.

**Reporting Requirements**

Schedule B, Section 3, of Clean Water Services' Watershed-based NPDES Permit requires "an annual report covering its approved Temperature Management Plan (TMP)." The report will describe the activities that Clean Water Services undertook to meet the requirements of the Revised TMP. It will contain an annual summary of Clean Water Services thermal impacts to the Tualatin Basin, including calculations of:

- the average daily thermal loads discharged by the Rock Creek and Durham wastewater treatment facilities;
- the allowed thermal loads for the Rock Creek and Durham wastewater treatment facilities;
- the thermal load credits for flow augmentation;
- the thermal load trading credit for shade.

*(Refer to Table 5 for of the above referenced information.)*

To support these calculations, the following information will be included:

- the average daily effluent flow from the Rock Creek and Durham wastewater treatment facilities for the period July 1 – August 31; *(Refer to Tables 3 & 4 for this information)*
- the average daily temperature of the effluent from the Rock Creek and Durham wastewater treatment facilities for the period July 1 – August 31; *(Refer to Tables 3 & 4 for this information)*
- the average daily Tualatin River flow at the Farmington Bridge (River Mile 33) for the period July 1 – August 31; *(Refer to Tables 3 & 4 for this information)*
- the average daily flow augmentation rate from Scoggins and Barney Reservoirs for the period July 1 to August 31; *(Refer to Tables 3 & 4 for this information)*
- a description of each shade project including the site location, program used to create shade, length, width and acreage of re-vegetated area, and the shade credit expressed in kilocalories per day of thermal energy blocked. *(Refer to Appendix A)*

In addition, the following information will be included if applicable:

- the volume of effluent that was reused rather than discharged directly to the receiving stream; *(Refer to Annual Reclaimed Water Use Report for 2004)*
- a discussion of other temperature management measures, including wastewater treatment facility changes and source control management measures;
- a discussion of proposed program changes, if any, including an explanation of why changes are necessary.

Additionally, Schedule B, Section 3 requires “an annual report summarizing the results of its credit trading activities, as required by Schedule D, Section 7.” Schedule D, Section 7 requires that at a minimum, the report shall include:

- (a) Identification of Trading Baselines;
- (b) Summary of Actual Loads Discharged;
- (c) Summary of Credit Trades, including credits used to meet baselines, as well as credits generated, purchased, or held but not applied to baseline compliance;
- (d) Environmental Benefits Summary, describing how the credit trades supported watershed management objectives; and
- (e) Efficiency Summary, describing how the credit trades supported cost-effective and timely watershed management.

### **Temperature Management Plan (TMP) Related Activities**

Clean Water Services developed a Temperature Management Plan and submitted it to DEQ in May 2004. This submittal was in compliance with requirements of Schedule C, Section 1. DEQ issued CWS’s Temperature Management Plan for a 45-day Public Review on November 1, 2004. Clean Water Services and DEQ are close to finalizing the response to comments to the TMP and finalizing the TMP as of the date of this report.

Since the issuance of the Tualatin TMDL in 2001, Clean Water Services has undertaken numerous projects to generate temperature trading credit for shade planted. Several Urban Stream Enhancement projects were planted during this time totaling 5.49 miles of riparian improvements. These are identified in Appendix A. The District is taking credit for the riparian improvements made since the Tualatin TMDL was finalized in this first reporting period.

Clean Water Services completed the program approval and implementation process for Enhanced CREP and VEGBACC during the reporting period. Program approval by some of the partners had to await the negotiation of contracts that governed partner relationships. This was the case with the Oregon Water Trust, the Tualatin Soil and Water Conservation District, and the U.S. Department of Agriculture (USDA). The USDA did not approve the Enhanced CREP until January of 2005. The delay meant that landowners could not enroll in the Enhanced CREP until January of 2005. The first landowner signup for Enhanced CREP occurred in January 2005, within a week after the USDA approved the program. Site planting is scheduled for early March of 2005. This signup represents approximately 1000 feet of stream shade. Three much larger signups are expected to occur during the spring of 2005. Collectively, these represent approximately three miles of stream shade. All four signups are expected to generate shade credit during the next reporting period. Because of the start-up delays, no shade credits were generated through Enhanced CREP planting projects during the reporting period.

The contract between Clean Water Services and the Tualatin Soil and Water Conservation District (TSWCD) provides incentives for enrolling landowners in Enhanced CREP and VEGBACC, and for completing the various activities, such as planting, maintenance and monitoring, which occur afterward. A portion of the incentive payments will be paid to TSWCD employees, and this should lead to a high level of productivity, which is important because of the ambitious shade credit goal established in the TMP. With the income provided under the contract, TSWCD hired a full-time employee to manage the Enhanced CREP and VEGBACC programs.

Outreach for Enhanced CREP and VEGBACC started during July 2004, right after TSWCD's new employee was hired, when a marketing brochure was mailed to all the farmers in Washington County. In addition to the brochure, TSWCD staff made presentations and staffed information tables at local events, including the Washington County Fair, the annual luncheon for the Tualatin Valley Irrigation District, Farm Bureau meetings, and meetings between conservation organizations and streamside landowners. As a result, 38 farmers contacted TSWCD and requested additional information. Of these, 15 continue to be interested in the programs. Additional farmer interest is expected to be generated by a change to the local evaluation rules for the Environmental Quality Incentives Program (EQIP). Like CREP, EQIP is a federal farm conservation program. Unlike CREP, enrollment in EQIP is competitive. To provide an additional incentive for farmers to enroll in Enhanced CREP, the local NRCS office will now only consider EQIP applications that provide for the restoration of stream buffer areas. Because farmers may enroll in EQIP and Enhanced CREP simultaneously, farmers selected for EQIP will have an incentive to enroll in Enhanced CREP for the benefits associated with buffer restoration.

While landowner outreach was being conducted, Clean Water Services worked with TSWCD and the Oregon Water Trust on the details of program implementation. Of the 14 program enrollment forms planned for the programs, 12 have been completed and approved, and the last two are expected to be completed within the next month. In addition to the forms, a check list was prepared to document the 70 steps involved in the enrollment process. The check list will be added to each landowner file, and will be used as a tracking tool. To simplify money flows, an escrow account was established at a local bank to handle cost share payments. Finally, TSWCD and local USDA staff attended three days of training concerning CREP program rules.

The Stream Protection Opportunities Technical Advisory Committee (SPOTAC), which is a subcommittee of the Clean Water Services Citizens Advisory Commission, is currently developing a landowner incentive program for forested areas. Because 50% of Washington County consists of forestland, such a program would have great potential to increase stream shade. The first step in the program development process was a written survey of landowner opinion concerning incentive programs. The survey was mailed to 485 forest landowners in the County during November of 2004. The survey results indicated a clear preference for a program that would create riparian forest on land that currently lacks forest cover. Under this program, landowners would be provided with a forest conservation plan developed by the Oregon Department of Forestry, would receive substantial cost sharing assistance, and would be entitled to a tax credit to offset their portion of the cost. Taking heed of the survey results, SPOTAC intends to develop a similar program. The program is expected to be implemented during 2005.

There were no specific changes to the wastewater treatment facilities which would have reduced the thermal load. The District has embarked on a Reclaimed Water Master Plan project which should be completed in the Fall, 2005 which will outline potential uses and sites for reclaimed water usage. There were no industrial source control management changes which would have reduced the thermal load.

**Thermal Credit Trading Activities**  
**a) Identification of Trading Baselines**

Table 1

| <b>THERMAL CREDIT FOR SHADE</b>      |                           |                                  | <b>YEAR:</b>         | <b>2004</b>  |  |                                      |
|--------------------------------------|---------------------------|----------------------------------|----------------------|--|--|--------------------------------------|
| <b>Summary</b>                       |                           |                                  |                      |  |  |                                      |
| Total miles stream:                  | 5.49                      | mi                               |                      |  |  |                                      |
| Thermal load blocked :               | 60.3                      | million kcal/d                   |                      |  |  |                                      |
| Thermal credit this year:            | 30.2                      | million kcal/d                   |                      |  |  |                                      |
| Average load blocked per ft:         | 1060.1                    | kcal/d/ft                        |                      |  |  |                                      |
| <b>Restoration/Protection Record</b> |                           |                                  |                      |  |  |                                      |
| <b>Project</b>                       | <b>Stream Length (ft)</b> | <b>Average Stream Width (ft)</b> | <b>Acres Planted</b> | <b>Thermal Load Blocked in 20 yrs (million kcal/d)</b> | <b>Thermal Credit (million kcal/d)</b> | <b>Credit per Length (kcal/d/ft)</b> |
| Bronson                              | 8100                      | 4.9                              | 7.2                  | 8.78   | 4.39                                   | 542                                  |
| Butternut at Aloha                   | 1400                      | 9.0                              | 1.9                  | 4.81   | 2.41                                   | 1718                                 |
| Butternut at Bales                   | 400                       | 4.4                              | 1.5                  | 0.77   | 0.39                                   | 967                                  |
| Cedar Crk at Stella Olsen            | 1800                      | 15.0                             | 5.2                  | 9.37   | 4.69                                   | 2604                                 |
| Council Creek                        | 1200                      | 15.8                             | 0.4                  | 0.02   | 0.01                                   | 10                                   |
| Fanno Creek at Englewood             | 4400                      | 8.9                              | 8.4                  | 13.70  | 6.85                                   | 1557                                 |
| Fanno Creek at OES                   | 2700                      | 9.3                              | 4.3                  | 2.01   | 1.01                                   | 373                                  |
| Johnson Creek at Summercrest         | 1900                      | 1.9                              | 3.2                  | 1.26   | 0.63                                   | 332                                  |
| Rock Creek at Evergreen              | 2500                      | 20.0                             | 8.6                  | 11.42  | 5.71                                   | 2285                                 |
| Rock Creek at PCC                    | 200                       | 6.4                              | 0.1                  | 0.46   | 0.23                                   | 1139                                 |
| Rock Creek WWTP                      | 700                       | 22.3                             | 1.5                  | 0.29   | 0.15                                   | 209                                  |
| Summer at Fowler                     | 1700                      | 9.9                              | 1.2                  | 3.61   | 1.81                                   | 1062                                 |
| Sylvan Creek                         | 200                       | 6.0                              | 0.7                  | 0.45   | 0.22                                   | 1113                                 |
| Thomas Dairy                         | 1800                      | 210.0                            | 1.6                  | 3.35   | 1.67                                   | 930                                  |

**b) Summary of Actual Loads Discharged**

Table 2

| <b>WWTP DATA</b>               |  |       |     |  |  | <b>YEAR:</b> |  | <b>2004</b> |
|--------------------------------|--|-------|-----|--|--|--------------|--|-------------|
|                                |  |       |     |  |  |              |  |             |
| <b>Summary</b>                 |  |       |     |  |  |              |  |             |
| Mean RC WWTP flow:             |  | 44.1  | cfs |  |  |              |  |             |
| Mean RC effluent temperature:  |  | 21.8  | C   |  |  |              |  |             |
| Median river flow u/s RC WWTP: |  | 138.8 | cfs |  |  |              |  |             |
|                                |  |       |     |  |  |              |  |             |
| Mean DU WWTP flow:             |  | 24.4  | cfs |  |  |              |  |             |
| Mean DU effluent temperature:  |  | 22.2  | C   |  |  |              |  |             |
| Median river flow u/s DU WWTP: |  | 182.9 | cfs |  |  |              |  |             |
|                                |  |       |     |  |  |              |  |             |
| Median Farmington flow:        |  | 157.5 | cfs |  |  |              |  |             |
| Mean flow augmentation:        |  | 30.1  | cfs |  |  |              |  |             |
|                                |  |       |     |  |  |              |  |             |

Table 3

| Daily Mean Values |                   |                        |                    |                         |                       |                            |                        |                          |                               |
|-------------------|-------------------|------------------------|--------------------|-------------------------|-----------------------|----------------------------|------------------------|--------------------------|-------------------------------|
| Date              | Durham Flow (MGD) | Durham Temperature (C) | Rock Ck Flow (MGD) | Rock Ck Temperature (C) | Farmington Flow (cfs) | Farmington - RC WWTP (cfs) | CWS Hagg Release (cfs) | CWS Barney Release (cfs) | Total Flow Augmentation (cfs) |
| 7/1/2004          | 15.1              | 21.1                   | 27.8               | 20.2                    | 150.0                 | 107.0                      | 9                      | 0                        | 9.0                           |
| 7/2/2004          | 14.4              | 21.3                   | 27.9               | 20.6                    | 152.0                 | 108.8                      | 10                     | 0                        | 10.0                          |
| 7/3/2004          | 13.9              | 21.3                   | 26.6               | 21.4                    | 157.0                 | 115.8                      | 10                     | 0                        | 10.0                          |
| 7/4/2004          | 13.1              | 20.7                   | 25.7               | 21.4                    | 168.0                 | 128.2                      | 10                     | 0                        | 10.0                          |
| 7/5/2004          | 15.9              | 21.2                   | 28.5               | 21.6                    | 183.0                 | 138.9                      | 10                     | 0                        | 10.0                          |
| 7/6/2004          | 14.8              | 21.2                   | 28.1               | 20.6                    | 176.0                 | 132.5                      | 10                     | 0                        | 10.0                          |
| 7/7/2004          | 15.2              | 21.0                   | 27.8               | 20.5                    | 161.0                 | 117.9                      | 10                     | 0                        | 10.0                          |
| 7/8/2004          | 15.2              | 20.8                   | 27.9               | 20.1                    | 151.0                 | 107.9                      | 10                     | 0                        | 10.0                          |
| 7/9/2004          | 15.0              | 20.8                   | 27.4               | 20.6                    | 145.0                 | 102.6                      | 10                     | 0                        | 10.0                          |
| 7/10/2004         | 14.9              | 21.1                   | 27.4               | 21.1                    | 149.0                 | 106.7                      | 10                     | 0                        | 10.0                          |
| 7/11/2004         | 15.4              | 20.9                   | 28.0               | 21.6                    | 152.0                 | 108.7                      | 10                     | 0                        | 10.0                          |
| 7/12/2004         | 15.0              | 21.3                   | 27.9               | 20.7                    | 161.0                 | 117.8                      | 10                     | 0                        | 10.0                          |
| 7/13/2004         | 15.1              | 21.6                   | 27.9               | 21.8                    | 143.0                 | 99.9                       | 10                     | 0                        | 10.0                          |
| 7/14/2004         | 15.0              | 21.9                   | 28.0               | 21.2                    | 136.0                 | 92.8                       | 10                     | 0                        | 10.0                          |
| 7/15/2004         | 15.1              | 22.0                   | 27.1               | 21.5                    | 143.0                 | 101.1                      | 10                     | 0                        | 10.0                          |
| 7/16/2004         | 14.8              | 21.9                   | 27.6               | 21.1                    | 154.0                 | 111.3                      | 10                     | 0                        | 10.0                          |
| 7/17/2004         | 15.8              | 22.2                   | 27.8               | 22.1                    | 148.0                 | 104.9                      | 15                     | 0                        | 15.0                          |
| 7/18/2004         | 15.4              | 22.1                   | 28.3               | 22.6                    | 149.0                 | 105.3                      | 15                     | 0                        | 15.0                          |
| 7/19/2004         | 15.8              | 22.1                   | 28.5               | 22.3                    | 162.0                 | 117.9                      | 15                     | 0                        | 15.0                          |
| 7/20/2004         | 15.2              | 22.1                   | 28.0               | 21.8                    | 153.0                 | 109.7                      | 15                     | 0                        | 15.0                          |
| 7/21/2004         | 15.1              | 22.0                   | 28.1               | 21.5                    | 137.0                 | 93.5                       | 15                     | 0                        | 15.0                          |
| 7/22/2004         | 15.3              | 22.1                   | 27.6               | 21.5                    | 131.0                 | 88.3                       | 15                     | 0                        | 15.0                          |
| 7/23/2004         | 14.6              | 22.4                   | 26.7               | 22.1                    | 130.0                 | 88.6                       | 25                     | 0                        | 25.0                          |
| 7/24/2004         | 14.3              | 22.7                   | 25.6               | 22.5                    | 132.0                 | 92.5                       | 35                     | 0                        | 35.0                          |
| 7/25/2004         | 15.0              | 22.8                   | 27.1               | 23.0                    | 155.0                 | 113.1                      | 35                     | 0                        | 35.0                          |
| 7/26/2004         | 15.3              | 22.5                   | 27.7               | 20.7                    | 176.0                 | 133.2                      | 35                     | 0                        | 35.0                          |
| 7/27/2004         | 15.2              | 22.4                   | 27.7               | 21.5                    | 172.0                 | 129.2                      | 35                     | 0                        | 35.0                          |
| 7/28/2004         | 16.0              | 22.6                   | 27.2               | 21.9                    | 149.0                 | 107.0                      | 35                     | 0                        | 35.0                          |
| 7/29/2004         | 16.4              | 22.6                   | 26.7               | 22.0                    | 146.0                 | 104.8                      | 40                     | 0                        | 40.0                          |
| 7/30/2004         | 14.9              | 22.7                   | 26.9               | 22.1                    | 153.0                 | 111.4                      | 40                     | 0                        | 40.0                          |
| 7/31/2004         | 14.9              | 21.9                   | 27.1               | 22.5                    | 153.0                 | 111.2                      | 40                     | 0                        | 40.0                          |

Table 4

| Daily Mean Values |                   |                        |                    |                         |                       |                            |                        |                          |                               |
|-------------------|-------------------|------------------------|--------------------|-------------------------|-----------------------|----------------------------|------------------------|--------------------------|-------------------------------|
| Date              | Durham Flow (MGD) | Durham Temperature (C) | Rock Ck Flow (MGD) | Rock Ck Temperature (C) | Farmington Flow (cfs) | Farmington - RC WWTP (cfs) | CWS Hagg Release (cfs) | CWS Barney Release (cfs) | Total Flow Augmentation (cfs) |
| 8/1/2004          | 14.9              | 22.7                   | 27.8               | 22.8                    | 154.0                 | 110.9                      | 40                     | 0                        | 40.0                          |
| 8/2/2004          | 15.8              | 22.7                   | 28.5               | 21.5                    | 167.0                 | 123.0                      | 40                     | 0                        | 40.0                          |
| 8/3/2004          | 15.3              | 22.6                   | 27.8               | 21.6                    | 158.0                 | 114.9                      | 40                     | 0                        | 40.0                          |
| 8/4/2004          | 16.2              | 22.7                   | 28.6               | 22.8                    | 146.0                 | 101.8                      | 40                     | 0                        | 40.0                          |
| 8/5/2004          | 15.9              | 22.4                   | 27.9               | 21.7                    | 153.0                 | 109.9                      | 40                     | 0                        | 40.0                          |
| 8/6/2004          | 16.5              | 22.3                   | 29.2               | 22.1                    | 174.0                 | 128.8                      | 40                     | 0                        | 40.0                          |
| 8/7/2004          | 15.5              | 21.9                   | 27.9               | 21.9                    | 207.0                 | 163.8                      | 45                     | 0                        | 45.0                          |
| 8/8/2004          | 15.0              | 22.1                   | 28.0               | 22.0                    | 218.0                 | 174.6                      | 45                     | 0                        | 45.0                          |
| 8/9/2004          | 15.4              | 22.4                   | 27.1               | 21.5                    | 200.0                 | 158.1                      | 45                     | 0                        | 45.0                          |
| 8/10/2004         | 14.6              | 22.8                   | 27.5               | 22.2                    | 167.0                 | 124.5                      | 45                     | 0                        | 45.0                          |
| 8/11/2004         | 15.1              | 23.0                   | 27.9               | 22.2                    | 154.0                 | 110.9                      | 45                     | 0                        | 45.0                          |
| 8/12/2004         | 15.8              | 23.0                   | 27.3               | 22.3                    | 154.0                 | 111.8                      | 45                     | 0                        | 45.0                          |
| 8/13/2004         | 15.2              | 22.9                   | 27.1               | 21.9                    | 156.0                 | 114.1                      | 45                     | 0                        | 45.0                          |
| 8/14/2004         | 14.9              | 23.1                   | 27.6               | 22.8                    | 159.0                 | 116.3                      | 45                     | 0                        | 45.0                          |
| 8/15/2004         | 15.1              | 23.1                   | 27.7               | 23.3                    | 159.0                 | 116.2                      | 45                     | 0                        | 45.0                          |
| 8/16/2004         | 15.7              | 23.1                   | 28.0               | 22.0                    | 166.0                 | 122.7                      | 45                     | 0                        | 45.0                          |
| 8/17/2004         | 15.1              | 23.1                   | 27.3               | 22.1                    | 162.0                 | 119.8                      | 45                     | 0                        | 45.0                          |
| 8/18/2004         | 15.1              | 23.1                   | 27.9               | 21.9                    | 151.0                 | 107.9                      | 45                     | 0                        | 45.0                          |
| 8/19/2004         | 15.2              | 22.9                   | 27.1               | 21.8                    | 154.0                 | 112.0                      | 45                     | 0                        | 45.0                          |
| 8/20/2004         | 16.4              | 23.1                   | 26.7               | 21.2                    | 161.0                 | 119.7                      | 50                     | 0                        | 50.0                          |
| 8/21/2004         | 15.9              | 23.1                   | 29.9               | 22.9                    | 167.0                 | 120.8                      | 50                     | 0                        | 50.0                          |
| 8/22/2004         | 22.1              | 22.9                   | 39.1               | 23.5                    | 263.0                 | 202.6                      | 50                     | 0                        | 50.0                          |
| 8/23/2004         | 19.2              | 22.3                   | 34.2               | 21.9                    | 494.0                 | 441.1                      | 50                     | 0                        | 50.0                          |
| 8/24/2004         | 19.6              | 22.0                   | 34.6               | 21.9                    | 367.0                 | 313.4                      | 30                     | 0                        | 30.0                          |
| 8/25/2004         | 17.8              | 21.9                   | 35.9               | 22.1                    | 316.0                 | 260.5                      | 35                     | 0                        | 35.0                          |
| 8/26/2004         | 19.9              | 21.6                   | 35.1               | 22.0                    | 402.0                 | 347.7                      | 35                     | 0                        | 35.0                          |
| 8/27/2004         | 19.0              | 21.8                   | 31.3               | 22.0                    | 401.0                 | 352.6                      | 35                     | 0                        | 35.0                          |
| 8/28/2004         | 17.8              | 22.0                   | 30.6               | 22.1                    | 293.0                 | 245.6                      | 35                     | 0                        | 35.0                          |
| 8/29/2004         | 17.6              | 22.2                   | 30.4               | 22.6                    | 221.0                 | 174.0                      | 35                     | 0                        | 35.0                          |
| 8/30/2004         | 17.0              | 22.4                   | 30.0               | 21.6                    | 191.0                 | 144.5                      | 35                     | 0                        | 35.0                          |
| 8/31/2004         | 16.5              | 22.6                   | 29.4               | 22.0                    | 176.0                 | 130.5                      | 35                     | 0                        | 35.0                          |

c) **Summary of Credit Trades**

*Thermal Load Credits*

Table 5 is a reconciliation of all the District's activities and projects for generating thermal load credits, from both release of stored water and shade planting. The District was able to meet the "benchmark" for shade credit creation in Year One of this permit period, as outlined in the TMP.

*Oxygen Demanding Substances Credits*

The District did not accomplish any inter- or intra-facility trading for oxygen demanding substances as allowed for by the permit in this reporting period. The figure below (Figure 1) shows the actual discharge loads for oxygen demanding parameters. The District anticipates that in the future, water quality trading for these parameters will occur.

Figure 1

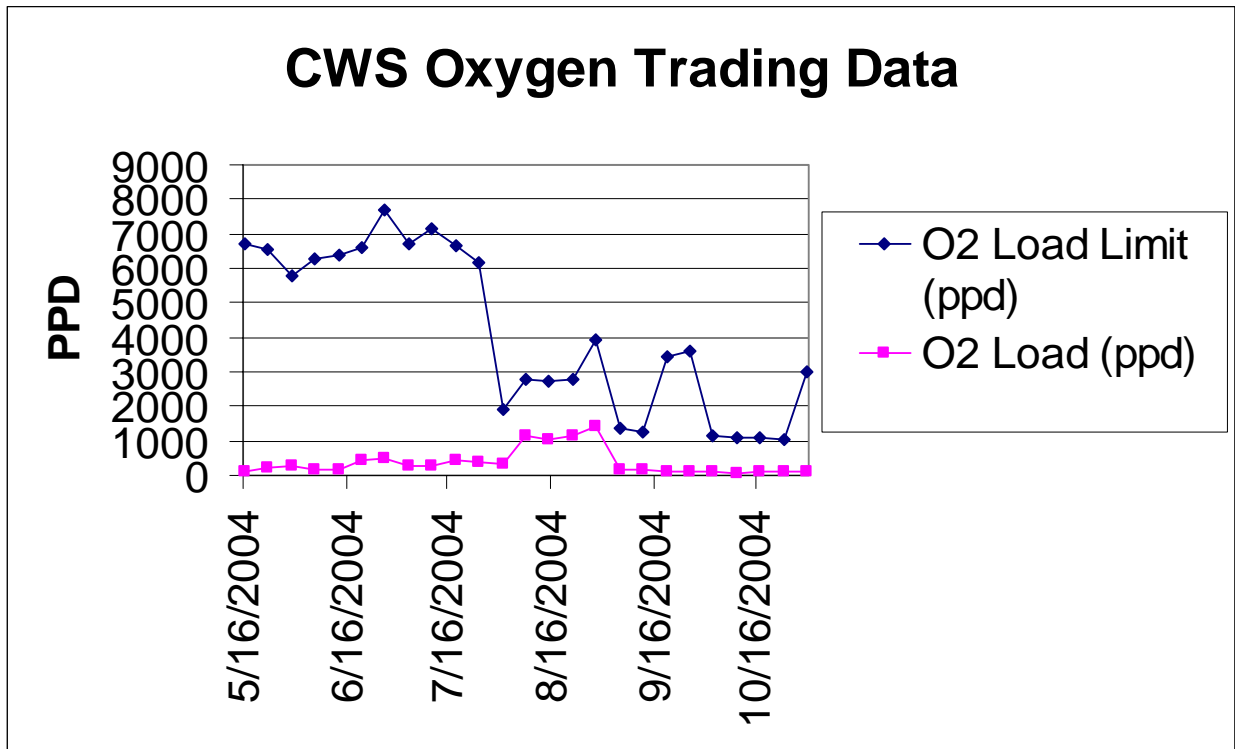


Table 5 - ANNUAL CWS THERMAL BUDGET

YEAR: 2004  
Year number of permit: 1

MEDIAN FARMINGTON FLOW: 157.5 cfs

**Rock Creek WWTP**

|   |           |  |   |  |
|---|-----------|--|---|--|
| <b>Loading from WWTP Effluent</b>         |           |  | Thermal load from WWTP: 765 million kcal/d                | Annual Thermal Load after Flow Augmentation Credit<br>312 million kcal/d |
| Mean effluent flow:                       | 44.1 cfs  |  |   |  |
| Mean effluent temperature:                | 21.8 °C   |  |   |  |
| Median river flow at outfall:             | 113.4 cfs |  |   |  |
| Mixing zone flow:                         | 28.3 cfs  |  |   |  |
| System potential temperature:             | 14.7 °C   |  |   |  |
| Mixing zone temperature change            | +4.3 °C   |  |   |  |
| <b>Allowed Loading from WWTP Effluent</b> |           |  | Allowed thermal load: -25 million kcal/d                  |  |
| Median river flow at outfall:             | 113.4 cfs |  |   |  |
| Mixing zone flow:                         | 28.3 cfs  |  |   |  |
| Allowed temperature increase              | 0.25 °F   |  |   |  |
| System potential temperature:             | 14.7 °C   |  |   |  |
| <b>Credit for Flow Augmentation</b>       |           |  | Thermal credit for flow augmentation: -429 million kcal/d |  |
| Median river flow at outfall:             | 113.4 cfs |  |   |  |
| Mean flow augmentation:                   | 30.1 cfs  |  |   |  |
| Temperature change u/s outfall:           | -1.5 C    |  |   |  |

**DURHAM WWTP**

|   |           |  |   |  |
|---|-----------|--|---|--|
| <b>Loading from WWTP Effluent</b>         |           |  | Thermal load from WWTP: 244 million kcal/d                | Annual Thermal Load after Flow Augmentation Credit<br>0 million kcal/d |
| Mean effluent flow:                       | 24.4 cfs  |  |   |  |
| Mean effluent temperature:                | 22.2 °C   |  |   |  |
| Median river flow at outfall:             | 157.5 cfs |  |   |  |
| Mixing zone flow:                         | 39.4 cfs  |  |   |  |
| System potential temperature:             | 18.1 °C   |  |   |  |
| Mixing zone temperature change            | +1.6 °C   |  |   |  |
| <b>Allowed Loading from WWTP Effluent</b> |           |  | Allowed thermal load: -22 million kcal/d                  |  |
| Median river flow at outfall:             | 157.5 cfs |  |   |  |
| Mixing zone flow:                         | 39.4 cfs  |  |   |  |
| Allowed temperature increase              | 0.25 °F   |  |   |  |
| System potential temperature:             | 18.1 °C   |  |   |  |
| <b>Credit for Flow Augmentation</b>       |           |  | Thermal credit for flow augmentation: -282 million kcal/d |  |
| Median Farmington flow:                   | 157.5 cfs |  |   |  |
| Mean flow augmentation:                   | 30.1 cfs  |  |   |  |
| Temperature change u/s outfall:           | -0.5 °C   |  |   |  |

**CREDIT FOR RIPARIAN SHADE RESTORATION/PRESERVATION**

|                              |           |                           |                    |
|------------------------------|-----------|---------------------------|--------------------|
| Total stream miles this year | 5.5 miles | Thermal credit for shade: | -30 million kcal/d |
|------------------------------|-----------|---------------------------|--------------------|

**CUMULATIVE THERMAL BUDGET FOR CWS ACTIVITIES IN THE TUALATIN BASIN**

|        | Thermal Load after FA Credit |                    | Thermal Credit for Shade |                    | Net Thermal Input to Tualatin Basin |
|--------|------------------------------|--------------------|--------------------------|--------------------|-------------------------------------|
|        | Annual                       | Cumulative Average | Annual                   | Cumulative         |                                     |
| Year 1 | 312 million kcal/d           | 311 million kcal/d | -30 million kcal/d       | -30 million kcal/d | 282 million kcal/d                  |
| Year 2 |                              |                    |                          |                    |                                     |
| Year 3 |                              |                    |                          |                    |                                     |
| Year 4 |                              |                    |                          |                    |                                     |
| Year 5 |                              |                    |                          |                    |                                     |

#### **d) Environmental Benefits Summary**

The environmental benefits of the credit trades in supporting watershed management objectives are numerous. The ability to enhance riparian areas both within and outside the service area of Clean Water Services promotes a watershed-based approach to improving and enhancing the overall health of the Tualatin Watershed. The activities, which are covered by the District's numerous programs and initiatives, work to form the basis of a collaborative and cost-effective watershed-based management strategy.

The riparian shading activities, which generate a portion of the Districts thermal load credits, produces many ancillary environmental benefits. These include bank stabilization, habitat creation for aquatic and terrestrial species, buffers for stormwater runoff, to mention a few.

The District's release of stored water provides multiple environmental benefits, not to mention other socio-economic benefits to the residents of the watershed. This release of flow augmentation water, along with the discharge of the highly treated effluents from the District's advanced wastewater treatment facilities, provides a sustainable base flow to the main stem of the Tualatin River in the otherwise low flow periods of the summer months. Additionally, it provides assimilative capacity to the river. The augmentation water provides cooling effects for the river as well as assimilative capacity for oxygen demanding substances during the critical period for the river. The cooling effects also increases the assimilative capacity of the river for oxygen demanding substances.

#### **e) Efficiency Summary**

The activities that comprise the District's thermal load credit trading program support a cost-effective and timely approach to improving and restoring the overall health of the Tualatin watershed. It focuses limited resources on addressing a systematic approach to integrated watershed management. By evaluating and considering the multiple objective nature of the District's water quality trading program, the benefits to the entire watershed are substantial and widespread.

Additionally, the shade generation activities support and generate numerous opportunities for collaboration of various organizations, as well as serving as a great mechanism to "reconnect" the citizens of Washington County to their watershed.

All these benefits indicate that Clean Water Services thermal load credit trading program results in a cost-effective and timely approach to watershed management.

## Appendix A

### Project Descriptions for Temperature Management

#### **Bronson Creek: West Union to Laidlaw**

Location: Mainstem Bronson creek between West union and Laidlaw/Saltzman Road in Unincorporated Washington County

Activities: Removal of invasive species (blackberry, nightshade, and English hawthorne)  
Riparian forest and shrub-scrub planting (approx 14,000 plants) fall 2004  
35 large woody debris structures (110 pieces of wood) to reduce stream incision  
Unstable portions of bank reshaped, covered in biodegradable fabric and planted

Construction: 2004-2005

#### **Butternut Creek at Aloha**

Location: Mainstem Butternut creek between 192<sup>nd</sup> Ave/Butternut Park and Aloha HS in Unincorporated Washington County

Activities: Removal of invasive species (blackberry, nightshade)  
Riparian forest and shrub-scrub planting (approx 2,000 plants)

Construction: 2003-2005

#### **Butternut Creek at Bales**

Location: Mainstem Butternut creek just downstream of Farmington Road in Unincorporated Washington County

Activities: Removal of invasive species (blackberry)  
Shrub-scrub planting (approx 1500 plants)  
Installed coir logs to separate pond and creek to increase shading of creek

Construction: 2003-2004

#### **Cedar Creek at Stella Oleson**

Location: Cedar Creek in Stella Oleson Park in Sherwood

Activities: Invasive species including English ivy and blackberry  
Riparian forest planting (6000 plants)

Construction Started spring of 2004

#### **Council Creek**

Location: Mainstem Council creek on Metro property in Cornelius

Activities: Removal of invasive species (blackberry, English ivy)  
Riparian forest planting (approx 1,500 plants)

Construction: 2003-2004

#### **Fanno Creek at Englewood Phase I**

Location: Mainstem Fanno creek between Scholls Ferry Road and N Dakota

Activities: Removal of invasive species (blackberry, nightshade)  
Riparian forest and shrub-scrub planting (approx 14,000 plants)

Construction: Planting in 2001-2005 for Phase I

**Fanno Creek at OES**

Location: Mainstem Fanno creek between Vermont Tributary and Nicol Road in Unincorporated Washington County

Activities: Removal of invasive species (blackberry, nightshade, and English hawthorne)  
Riparian forest and shrub-scrub planting (10,000 plants)  
5 large woody debris structures (392 pieces of wood) to reduce stream incision  
Unstable portions of bank reshaped, covered in biodegradable fabric and planted

Construction: 2003-2004

**Johnson Creek at Summercrest**

Location: Mainstem Johnson Creek South between 170<sup>th</sup> and 165<sup>th</sup> Ave in Unincorporated Washington County

Activities: Removal of invasive species (blackberry)  
Riparian forest planting (4000 plants)  
20 pieces of wood to reduce stream incision  
Unstable portions of bank reshaped, covered in biodegradable fabric and planted

Construction: 2003-2004

**Rock Creek at Evergreen**

Location: Mainstem Rock creek between Evergreen and Cornell Road in Hillsboro

Activities: Removal of invasive species (blackberry and English hawthorne)  
Riparian forest and shrub-scrub planting (approx 6000 plants)  
4 large woody debris structures (32 pieces of wood) to reduce stream incision  
Floodplain regraded in select locations in encourage overbank flooding

Construction: 2002-2003

**Rock Creek at PCC**

Location: Tributary to Rock Creek / Abbey Creek just upstream of 18<sup>th</sup> Ave in Unincorporated Washington County

Activities: Removal of invasive species (blackberry and English hawthorne)  
Riparian forest and shrub-scrub planting (2590 plants)

Construction: 2003-2004

**Rock Creek at WWTP**

Location: Mainstem Rock creek downstream of River Road

Activities: Removal of invasive species (blackberry)  
Riparian forest and shrub-scrub planting (1800 plants)

Construction: 2004-2005

**Summer Creek at Fowler Middle School**

Location: Mainstem Summer creek at Fowler Middle School in Tigard

Activities: Removal of invasive species (blackberry and English hawthorne)  
Riparian forest and shrub-scrub planting (625 plants)

Construction: 2001- 2005

**Sylvan Creek at Raab Rd**

Location: Sylvan creek tributary headwaters between Schools Ferry Road and Raab Road in Unincorporated Washington County

Activities: Removal of invasive species (blackberry, scots broom)  
Riparian forest (approx 1800 plants)

Construction: 2004-date

**Tualatin River at Thomas Dairy / Durham**

Location: Mainstem Tualatin River just downstream of Cook Park, below Durham wastewater treatment plant

Activities: Riparian forest planting (approx 3000 plants) and maintenance

Construction: 2001-2005

Total Approximate Plant Count for Projects listed: **68,815**

# Appendix B

