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DEPARTMENT OF ECOLOGY

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Water Quality Program, NWRO

THROUGH: Will Kendra
EILS Program, Watershed Assessments Section

FROM: Norm Glenn
Watershed Assessments Section

SUBJECT: Lake Stevens Sewer District Basin Class II Inspection Summary

An announced Basin Class II inspection was conducted at the above facility during the week of August 23, 1993. My original intent was to provide the usual inspection report. However, due to the recent reprogramming of Class II activities in EILS, it became necessary to abbreviate the reporting effort on my remaining projects. This transmittal memo summarizes the significant findings from my review of the inspection data (attached):

- The plant was performing well, achieving high removal efficiencies for $BOD_5$ and TSS. An aeration basin and clarifier were out of service. Solids loading was less than 40 percent of design capacity. The site appeared to be well maintained.

- One total residual chlorine reading was unusually high. Undoubtedly there would be toxicity to aquatic life if this level were sustained for a one-hour duration.

- The ammonification and nitrification/denitrification portion of the nitrogen cycle was occurring (decrease in alkalinity, ammonia and total Kjeldahl N; some increase in nitrate/nitrite). Total ammonia in effluent was sufficiently elevated to cause some concern about chronic toxicity, especially if reversing tides and the commensurate background concentrations in the river are considered. A mixing zone study would provide the necessary information about toxicity to aquatic life.

- The permit issued to Lake Stevens Sewer District contains a $CBOD_5$ limitation - in lieu of $BOD_5$. The appropriateness of this limitation should be reviewed carefully when the permit is reissued (Albertson, 1993).

- No explanation can be given for significant differences found in "split" sample results. A closer examination of sampling procedure being used is warranted. Acceptable results were achieved on three standards left for their analysis; the chlorine result was unacceptable.

If you have any questions concerning this memo, please contact me at 407-6683.

NLG:blt
Attachments

**References:**

Albertson, O., 1993. The $CBOD_5$ Test: More Trouble Than It's Worth?, Water Environment & Technology. Water Environment Federation, Alexandria, VA.

APHA-AWWA-WEF, 1992. Standard Methods for the Examination of Water and Wastewater, 18 edition. American Public Health Association, American Water Works Association, Water Environment Federation, Washington D.C.

EPA, 1983. Methods for Chemical Analyses of Water and Waste. EPA-600/4-79-020 (Rev. March, 1983). Washington D.C.

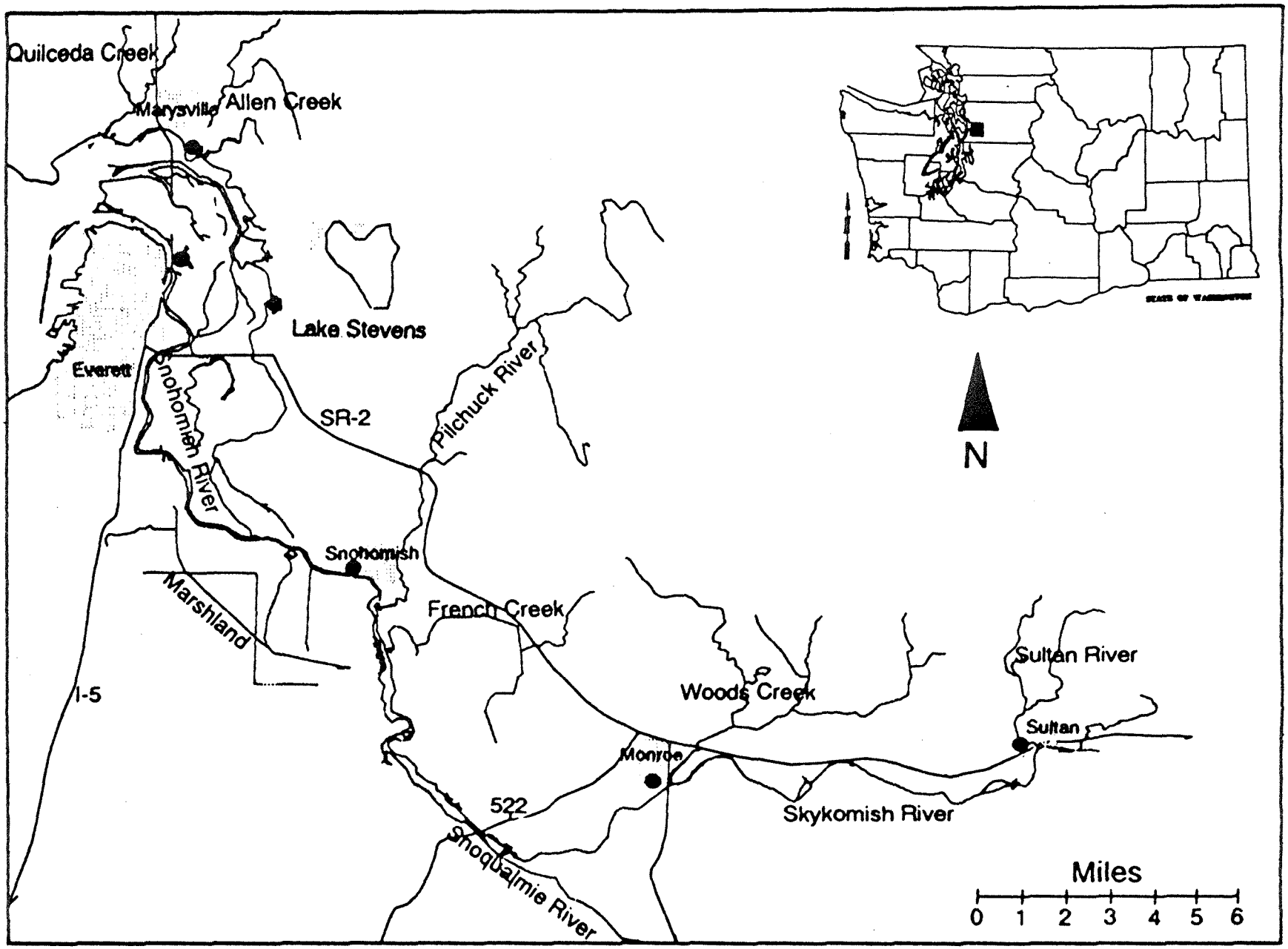


**Figure 1. Location Map for WWTPs in Lower Snohomish TMDL Study Area, 8/93.**

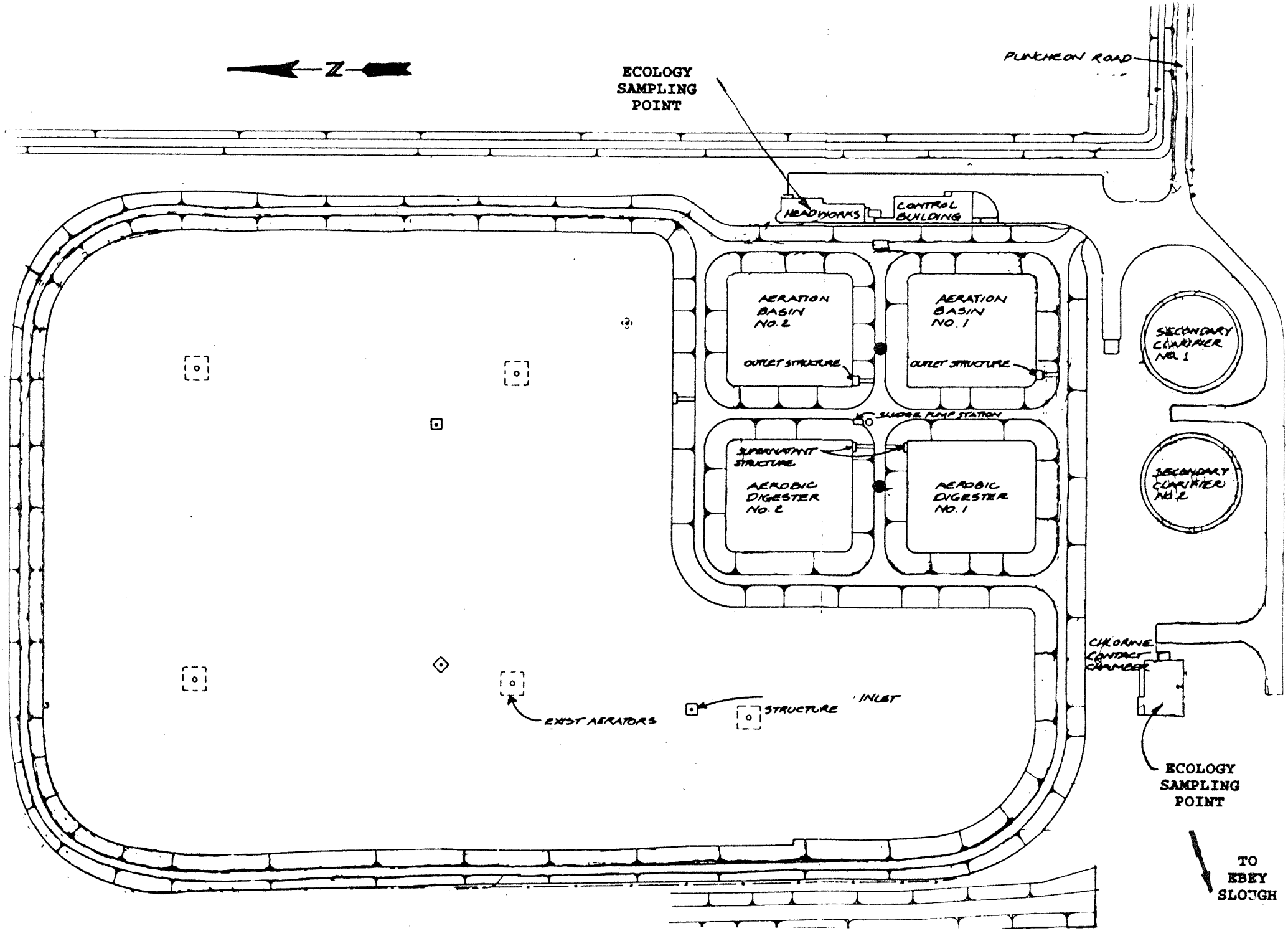


Figure 2. Plant Schematic - Lake Stevens Sewer District WWTP, 8/93.

Table 1. Chemical Analytical Methods and Laboratories – Lake Stevens S. D. – L. Snohomish River Basin Class II Inspections, 8/93.

| Parameter | Method | Lab used |
|---|---|---|
| Alkalinity | EPA, 1983: 310.1 | Ecology; Manchester WA |
| Chloride | EPA, 1983: 330.0 | Ecology; Manchester WA |
| SOLIDS | | |
| Total solids (TS) | EPA, 1983: 160.3 | Ecology; Manchester WA |
| Total non-volatile solids (TNVS) | EPA, 1983: 160.4 | Ecology; Manchester WA |
| Total suspended solids (TSS) | EPA, 1983: 160.2 | Ecology; Manchester WA |
| Total non-volatile suspended solids (TNVSS) | EPA, 1983: 160.4 | Ecology; Manchester WA |
| Five-day biochemical oxygen demand (BOD5) | APHA, 1992; 5210 | Sound Analytical Svcs.; Tacoma WA |
| NUTRIENTS | | |
| Total ammonia, as nitrogen (NH3-N) | EPA, 1983: 350.1 | Sound Analytical Svcs.; Tacoma WA |
| Nitrate-nitrite, as nitrogen (NO2+NO3-N) | EPA, 1983: 353.2 | Sound Analytical Svcs.; Tacoma WA |
| Total Kjeldahl nitrogen | EPA, 1983: 351.2 | Sound Analytical Svcs.; Tacoma WA |
| Ortho phosphate | EPA, 1983: 365.3 | Ecology; Manchester WA |
| Total phosphorus | EPA, 1983: 365.3 | Sound Analytical Svcs.; Tacoma WA |
| Fecal Coliform, by membrane filter technique | APHA, 1992:9222D | Ecology; Manchester WA |
| METALS | | |
| Cadmium | EPA, 1983;213.2 | Ecology; Manchester WA |
| Copper | EPA, 1983;220.2 | Ecology; Manchester WA |
| Lead | EPA, 1983;239.2 | Ecology; Manchester WA |
| Mercury | EPA, 1983;245.1 | Ecology; Manchester WA |
| Silver | EPA, 1983;272.2 | Ecology; Manchester WA |
| Zinc | EPA, 1983;200.7 | Ecology; Manchester WA |

Table 2. General Chemistry and Metals Results, Lake Stevens Sewer District - L. Snohomish River Basin Class II Inspections, 8/93.

| | Location: | Blank-E | InfLS-E | InfLS-LS | EffLS-E | EffLS-LS | EffLS-1 | EffLS-2 |
|---|---|---|---|---|---|---|---|---|
| | Type: | Equip | Comp | Comp | Comp | Comp | Grab | Grab |
| | Date: | 8/24 | 8/25-26 | 8/25-26 | 8/25-26 | 8/25-26 | 8/25 | 8/26 |
| | Time: | 1445 | 0800-0800 | 0800-0800 | 0900-0900 | 0800-0800 | 1400 | 1445 |
| Parameter | Lab Log #: 3582 | -50 | -51 | -52 | -53 | -54 | -55 | -56 |
| GENERAL CHEMISTRY | | | | | | | | |
| Alkalinity (mg/L) | | | 153 | | 137 | | 135 | 137 |
| Chloride (mg/L) | | | 26 | | 30 | | 30 | 28 |
| SOLIDS 4 (mg/L) | | | | | | | | |
| TS | | | 429 | 520 | 238 | 244 | 235 | 232 |
| TNVS | | | 177 | 186 | 146 | 158 | 158 | 147 |
| TSS | | | 143 | 318 | 6 | 6 | 5 | 7 |
| TNVSS | | | 23 | 50 | 1 | 1U | 3 | 1 |
| BOD5 (mg/L) | | | 160 | 220 | 12 | 20 | 8 | 7 |
| NH3-N (mg/L) | | | 18 | | 14 | | 14 | 14 |
| NO2+NO3-N (mg/L) | | | 0.06J | | 0.17 | | 0.14 | 0.26 |
| Total Kjeldahl N (mg/L) | | | 34 | | 18 | | 15 | 18 |
| Phosphate - Ortho (mg/L) | | | | | 2.17 | | 1.16 | 1.79 |
| Phosphate - Total (mg/L) | | | 4.6 | | 2.4 | | 1.3 | 2.1 |
| F-Coliform MF (#/100mL) | | | | | | | | 1 |
| METALS (µg/L) | | | | | | | | |
| Cadmium | | 0.17P | | | 0.10U | | | 0.10U |
| Copper | | 2.7P | | | 4.3P | | | 4.0P |
| Lead | | 1.0U | | | 1.0U | | | 1.0U |
| Mercury | | 0.05U | | | 0.05U | | | 0.05U |
| Silver | | 0.50U | | | 0.50U | | | 0.50U |
| Zinc | | 4U | | | 25.P | | | 19P |
| FIELD OBSERVATIONS | | | | | | | | |
| Flow (MGD) | | | 1.21 | | | | | |
| Temperature (°C.) | | | 8.0* | | 2.8* | | 17.6 | 17.5 |
| pH (s.u.) | | | 7.2* | | 7.6* | | 7.4 | 7.4 |
| Conductivity (µmho/cm) | | | 480 | | 445 | | 430 | 415 |
| Chlorine, free (mg/L) | | | | | | | 0.02 | 0.40 |
| total residual (mg/L) | | | | | | | 0.02 | 2.00 |

InfLS - Influent; EffLS - Effluent; -E - Ecology sampler; -LS - Lake Stevens' sampler; -1 - Grab sample taken on 8/25; -2 - Grab sample taken on 8/26.
U means the analyte was not detected at or above the reported result.
J means the analyte was positively identified. The associated numerical result is an estimate.
P means the analyte was detected above the instrument detection limit but below the established minimum quantitation limit.
* - Iced composite sample.

Table 3. Comparison of Inspection Results to NPDES Permit Limits, Lake Stevens S. D. – L. Snohomish River Basin Class II Inspections, 8/93.

| | NPDES Permit Limits | | Inspection Data | | Loading and Performance | | | |
|---|---|---|---|---|---|---|---|---|
| Parameter | Monthly Average | Weekly Average | Ecology Composite | Grab Samples | Design Criteria (DC) | Derived Results | Plant Loading (% of DC) | Planning to begin (% of DC) |
| Influent CBOD5 | | | | | | | | |
| (mg/L) | | | 147* | | | | | |
| (lbs/d)** | | | | | 4,096 | 1,610 | 39 | 85 |
| Effluent CBOD5 | | | | | | | | |
| (mg/L) | 25 | 40 | 7*** | | | | | |
| (lbs/d) | 500 | 801 | | | | | | |
| (% removal) | 85 | | | | | 95 | | |
| Influent TSS | | | | | | | | |
| (mg/L) | | | 143 | | | | | |
| (lbs/d) | | | | | 4,324 | 1,440 | 33 | 85 |
| Effluent TSS | | | | | | | | |
| (mg/L) | 30 | 45 | 6 | | | | | |
| (lbs/d) | 600 | 901 | | | | | | |
| (% removal) | | | | | | 96 | | |
| Fecal Coliform (#/100 mL) | 200 | 400 | | 1 | | | | |
| pH (s.u.) | 6.0 ≤ pH ≤ 9.0 | | | 7.4;7.4 | | | | |
| Flow (MGD) | | | | | 2.4 | 1.21 | 50 | 85 |

* - This number is the result of adjusting the BOD5 result from Table 1 by the ratio of influent CBOD5:BOD5 (245:267) for 8/26 as provided by plant personnel.

** - Lbs/d BOD5 (not CBOD5). Refer to "Comprehensive Plan and Engineering Report for Lake Stevens S.D.", 1983, for design criteria.

*** - This number is the result of adjusting the BOD5 result from Table 1 by the ratio of effluent CBOD5:BOD5 (10.3:17.3) for 8/26 as provided by plant personnel.

Table 4. Comparison of Laboratory Results of Sample Splits, Lake Stevens Sewer District – L. Snohomish River Basin Class II Inspections, 8/93.

| Location: | InfLS-E | | InfLS-LS | | EffLS-E | | EffLS-LS | |
|---|---|---|---|---|---|---|---|---|
| Lab Log #: | 358251 | | 358252 | | 358253 | | 358254 | |
| Date: | 8/25-26 | | 8/25-26 | | 8/25-26 | | 8/25-26 | |
| Sampler: | Ecology | | Lake Stevens | | Ecology | | Lake Stevens | |
| Laboratory: | Ecology | Lake Stevens | Ecology | Lake Stevens | Ecology | Lake Stevens | Ecology | Lake Stevens |
| BOD5 (mg/L) | 160 | 188 | 220 | 267 | 12 | 14 | 20 | 17 |
| TSS (mg/L) | 143 | 176 | 318 | 309 | 6 | 6 | 6 | 6 |

U – Not detected at or above the reported result.