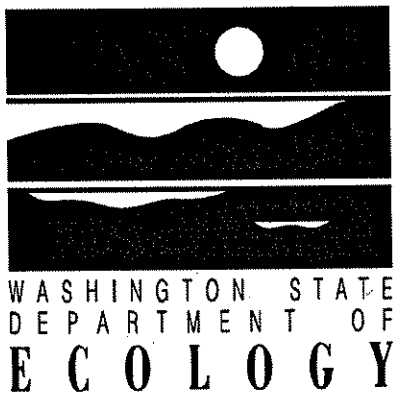

City of Chewelah Wastewater Treatment Plant
Class II Inspection
October 3-6, 1994

October 1995

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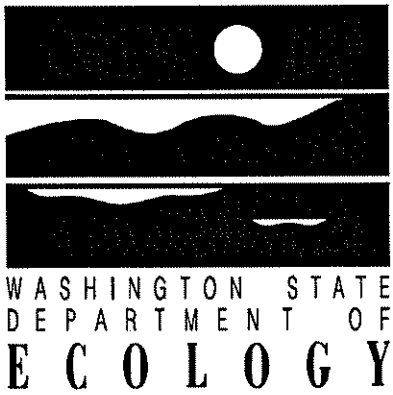

City of Chewelah Wastewater Treatment Plant
Class II Inspection
October 3-6, 1994

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by
Steven Golding

Environmental Investigations and Laboratory Services Program
Olympia, Washington 98504-7710

October 1995

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Abstract

A Class II Inspection was conducted at the City of Chewelah Wastewater Treatment Plant on October 3-6, 1994. The conventional parameters of BOD_5, TSS, and pH indicate an effluent of good quality. The effluent met all permit limits with the exception of fecal coliform. Fecal coliform counts for samples collected on two days exceeded the permit limits for monthly average and weekly average. No chlorine was detected in the effluent throughout the inspection at a detection limit of 0.1 mg/L.

NH_3-N concentrations in the influent (11.0 mg/L) remained essentially unchanged in the effluent (10.2 mg/L), indicating the absence of significant nitrification in the lagoons. For river and effluent conditions at the time of the inspection, it was found that the chronic water quality criterion for ammonia was exceeded assuming maximum mixing of 25% of the river flow.

It was determined that for the conditions during the inspection, effluent chlorine concentrations greater than 0.06 mg/L would result in chronic water quality effluent exceedances. Disinfection would be expected to be inadequate at 0.06 mg/L. This suggests the need for chlorination at higher concentrations followed by dechlorination, or an alternate method of disinfection.

The Ecology influent sample was found to be weaker than the Chewelah influent sample and weaker than typical domestic wastewater. The Chewelah influent sample appears to be more representative. Chewelah BOD_5 analyses results were considerably lower than Ecology's, and as reported in Discharge Monitoring Reports (DMRs), have been low for several years, suggesting a persistent cause of low BOD_5 results. The cause is believed to be the failure to keep samples cool prior to analysis at the Colville laboratory.

Bis(2-ethylhexyl)pthalate in the effluent exceeded the State fresh water chronic criterion by a factor of ten. All other organic compounds and metals found in the effluent were in concentrations lower than State water quality criteria. Mercury effluent concentrations were 88% of the State fresh water criterion.

Summary

Flow Measurements

Influent flow as measured with the plant's ultrasonic meter and an instantaneous measurement of depth in the Parshall flume agreed to within 4%.

NPDES Permit Compliance/General Chemistry

The conventional parameters of 5-day biochemical oxygen demand (BOD_5), total suspended solids (TSS), and pH are characteristic of an effluent of good quality. The effluent met all permit limits with the exception of fecal coliform. Fecal coliform counts, for samples collected on two days, substantially exceeded the permit limits for monthly average and weekly average. No chlorine was detected in the effluent throughout the inspection at a detection limit of 0.1 mg/L.

BOD_5 removal was 88%. This meets the permit requirement of 65% removal. TSS removal was 92%.

NH_3-N concentrations in the influent (11.0 mg/L) remained essentially unchanged in the effluent (10.2 mg/L), indicating the absence of significant nitrification in the lagoons.

Water Quality Criteria for Ammonia

For river and effluent conditions at the time of the inspection, it was found that the chronic water quality criterion for ammonia was exceeded assuming maximum mixing of 25% of the river flow. At critical river and effluent conditions, increased exceedances of both acute and chronic criteria can be expected to occur.

Water Quality Criterion for Chlorine

Based on water quality criteria, a mass balance for a chronic mixing zone not to exceed 25% of river flow results in an allowable effluent chlorine concentration of 0.28 mg/L. For a maximum acute mixing zone of 2.5% of river flow the allowable effluent chlorine concentration is 0.06 mg/L. At critical river flow and wastewater treatment plant flow conditions, the allowable effluent chlorine concentration would be lower than 0.06 mg/L. At an effluent chlorine concentration of 0.06 mg/L fecal coliform limits can be expected to be exceeded.

Lagoon Operation

Lagoon dissolved oxygen measurements taken in the early evening indicated nearly anaerobic conditions for the surface water of Lagoon 1 (0.95 mg/L) and aerobic conditions for the surface water of Lagoon 2 (9.30 mg/L) and Lagoon 3 (3.60 mg/L). At greater depths and during darkness when algae do not photosynthesize, dissolved oxygen concentrations in Lagoons 2 and 3 would be expected to be lower.

Split Sample Comparison

The Ecology influent composite sample was considerably weaker than the Chewelah influent sample with respect to BOD_5, TSS, NH_3-N and total-P. It is likely that rags caught on the Ecology influent strainer filtered the sample, making it unrepresentative.

Chewelah TSS laboratory results were lower than Ecology results for both Ecology and Chewelah influent samples, possibly because the nonhomogeneous nature of influent samples typical of municipal wastewater makes it difficult to obtain representative splits. Chewelah laboratory NH_3-N results were consistently approximately 50% higher than those of Ecology.

Chewelah and Ecology BOD_5 laboratory results were in disagreement, with Chewelah influent and effluent BOD_5 concentrations approximately half of Ecology's. It appears that the cause of the consistently low BOD_5 results is improper sample storage prior to arrival for testing at the Colville WWTP lab. Chewelah BOD_5 analyses results, as reported in DMRs, have been low for several years, suggesting a persistent bias in the Chewelah BOD results.

Priority Pollutant Scans

One VOA compound, carbon disulfide (0.40 µg/L est.), was found in the effluent sample. Sixteen priority pollutant and other target base-neutral acid (BNA) compounds were detected in the influent. Seven of them were detected at concentrations above 10 µg/L.

Bis(2-ethylhexyl)pthalate in the effluent exceeded the State fresh water chronic criterion by a factor of ten (Ecology, 1992). All other VOA and BNA compounds found in the effluent were in concentrations lower than State water quality criteria.

Of the seven priority pollutant metals found in the influent sample, zinc (90.9 µg/L) and copper (44.7 µg/L) were found in the highest concentrations. Four priority pollutant metals were detected in the effluent samples. Mercury (0.0097 µg/L est.; 0.0105 µg/L) in the effluent was 88% of the State fresh water chronic criterion.

Recommendations

- The Chewelah influent compositor intake should be relocated from its location in the Parshall flume. Proper flume operation depends on unimpeded flow through the flume as well as upstream and downstream of it.

- To eliminate bird droppings in the chlorination chamber building, the building should be screened adequately to prevent the entry of birds.

- It appears that improper storage of samples prior to arrival at the Colville WWTP laboratory has been resulting in unacceptable BOD_5 results. Wastewater samples need to be cooled to 4°C as quickly as possible and kept at that temperature until analyzed. The laboratory refrigerator should be checked for temperature control. The ability to cool and maintain samples at 4°C should be ensured.

- NH_3 testing procedures by the Colville WWTP laboratory should be reviewed. The Ecology Quality Assurance Section is available for advice concerning the quality of data for NH_3 analyses, BOD tests and all other analytical processes.

- Fecal coliform tests should be conducted so that a quantified result is reported, rather than an indefinite result such as ">1000".

- Measures should be taken to reduce effluent ammonia concentrations consistent with water quality criteria. A modification of the permit to include ammonia limits should be considered. NH_3-N limits will be addressed in a TMDL report to be published in 1996.

- Adequate disinfection is needed to meet fecal coliform permit limits. Dechlorination or the use of an alternative disinfection method is needed to avoid chlorine toxicity.

- Any determination of mixing zone boundaries and dilution factors will require a mixing zone study. The study would also determine whether a mixing zone would comply with State water quality standards by occupying not more than 25% of the width of the Colville River.

- The source of bis(2-ethylhexyl)pthalate in the effluent, exceeding the State water criterion by a factor of ten, should be investigated and remedied.

Introduction

A Class II Inspection was conducted at the City of Chewelah wastewater treatment plant (WWTP) on October 3-6, 1994. Conducting the inspection were Steven Golding and Guy Hoyle-Dodson of the Ecology Toxics Investigations Section. Gordon Stevenson, City of Chewelah Water and Wastewater Superintendent, assisted during the inspection. Pat Hallinan, Ecology Permit Manager, requested the inspection. The announced inspection was conducted in conjunction with data collection for a Total Maximum Daily Load (TMDL) determination for the Colville River conducted by Greg Pelletier of the Ecology Watershed Assessments Section.

The inspection took place principally on October 3-5 with sampling on October 4 and 5. An additional 24-hour composite effluent sample was taken on October 5-6 to obtain additional effluent data and for the TMDL study. The results from both periods are included in this report.

The City of Chewelah operates a sanitary wastewater collection and treatment system regulated under NPDES Permit No. WA-0023604 (expiration date: December 15, 1995). An administrative order (Order No. DE 91-E359), issued September 1991, recognizes Chewelah's documented inability to meet monthly average BOD removal, due to excessive infiltration and inflow. There was no evidence of inflow or infiltration at the time of this inspection. The order also recognized Chewelah's inability to meet July-September residual chlorine limits. The order requires completion of necessary facilities with construction to begin by March 30, 1994 and to be completed by September 30, 1995. At the time of the inspection there was no evidence of such construction.

The facility (Figure 1) serves a population of approximately 2000 individuals and treats predominantly domestic sewage. The wastestream includes only minor contributions from industrial or commercial sources. Flows vary seasonally, with high flows attributed to inflow and infiltration. Inflow and infiltration sources include pumping from residential basements and roof drains (Ecology, 1990). Historically, high flows have been associated with low percentages of BOD_5 removal.

The Chewelah collection and treatment system consists of gravity sewers, an influent headworks with a Parshall flume, two aerated lagoons, one polishing lagoon, and a chlorine contact chamber (Figure 2). The lagoons are connected in series, with the first two lagoons each aerated by two 7.5 horsepower submerged mechanical aerators. Effluent flow is measured at the end of the chlorine contact chamber by a 54-inch rectangular weir. Discharge is via buried pipe to the bank of the Colville River.

The Chewelah influent compositor intake was located in the Parshall flume. The intake may be causing inaccuracies in flow measurements by impeding flow through the flume.

There was evidence of unsanitary conditions inside the chlorine contact chamber building. This appeared to be the result of large numbers of birds frequenting the inside of the building.

Objectives of the inspection included:

1. Assess NPDES permit and Ecology administrative order compliance by analyzing influent and effluent samples.

2. Assess effluent chlorine and ammonia toxicity in the receiving water.

3. Assess effluent toxicity by comparing priority pollutant organics and metals results to State water quality criteria.

4. Assess the Chewelah self-monitoring program through sample splits and independent laboratory analyses.

5. Generate point source data to be used to help determine the need for a Total Maximum Daily Load (TMDL) for the Colville River and to make recommendations for Waste Load Allocations (WLA).

Procedures

Composite and grab samples were collected by Ecology at influent (InfCh) and effluent (EffCh) locations. Ecology conducted field measurements on influent and effluent samples as well as on the outflow from the three lagoons. After the first 24-hour composite sample (EffCh-E) was collected October 4-5 and split, a second 24-hour composite sample (EffCh-E2) was collected October 5-6. Chewelah collected a daily grab influent sample and composite and grab effluent samples.

A more detailed description of sampling procedures appears in Appendix A. Sampling station descriptions appear in Table 1. The sampling schedule, parameters analyzed, and sample splits are included in Appendix B. Ecology analytical methods and laboratories performing the analyses are summarized in Appendix C. Ecology field and laboratory QA/QC are summarized in Appendix D. Quality assurance cleaning procedures are included in Appendix E. A glossary of terms appears in Appendix H.

Results and Discussion

Flow Measurements

Chewelah determines influent flow from wastewater depth in a 12-inch Parshall flume using an ultrasonic meter. Ecology made an instantaneous measurement for comparison with the flow meter measurement. With a depth of flow of 2 7/8", the corresponding flow was 0.2938 MGD. The plant flow meter was reading 0.2834 MGD. This is 4% lower than the Ecology estimated flow, within the potential error of the Ecology measurement and indicating good agreement.

Flow during the 24-hour period of composite sampling was 0.204 MGD as prorated to 24 hours from a measurement period of 1005 on October 4 to 0701 on October 5. Flow during the collection of the second effluent sample was 0.240 MGD as prorated from a measured period of 0701 on October 5 to 1204 on October 6.

NPDES Permit Compliance/General Chemistry

Effluent quality as measured by conventional parameters of 5-day biochemical oxygen demand (BOD_5), total suspended solids (TSS), and pH was good (BOD_5 - 19mg/L, TSS - 16 mg/L, and pH 7.7-8.1) as defined by Metcalf and Eddy in Wastewater Engineering: Treatment, Disposal, Reuse (Metcalf and Eddy, 1991 - Table 2). The effluent met the National Pollutant Discharge Elimination System (NPDES) permit limits for these three parameters applicable at the time of the inspection (Table 3).

Fecal coliform counts for samples collected on two days (3000/100mL, 3200/100mL, 1400/100mL) substantially exceeded the permit limits for monthly average (200/100mL) and weekly average (400/100mL - Table 3). No chlorine was detected in the effluent throughout the inspection at a detection limit of 0.1 mg/L. Chlorine concentrations were not sufficient, as required by permit, to attain fecal coliform limits.

Results from the samples for the two days of sampling (EffCh-E and EffCh-E2) were similar for all parameters. The following discussion applies to the composite effluent sample for the first day (EffCh-E). BOD_5 removal was 88%. This meets the permit requirement that the monthly average effluent concentration of BOD_5 shall not exceed 35% of the influent concentration (removal not be less than 65%). TSS removal was 92%. These percentage removals have been calculated based on the Chewelah influent sample as analyzed by Ecology. The Chewelah influent sample appears to be more representative than the Ecology influent sample, as discussed later in the Split Sample Comparison portion of this report.

NH_3-N concentrations in the influent (11.0 mg/L) remained essentially unchanged in the effluent (10.2 mg/L), indicating the absence of significant nitrification in the lagoons.

Water Quality Criteria for Ammonia

Based upon ambient conditions found in the Colville River at river mile 38.8 during the inspection (Temp = 9.5°C; pH = 8.5; upriver ammonia = 0.00 mg/L - Pelletier, 1995) acute and chronic total ammonia criteria of 1.93 mg/L and 0.44 mg/L respectively were calculated (Ecology, 1992).

A receiving water concentration can be calculated by mass balance for the requirement that a chronic mixing zone not exceed 25% of river flow (Ecology, 1992). For the river flow (30.5 cfs) and effluent flow conditions at the time of the inspection, the concentration for this limiting mixing zone was determined to be 0.41 mg/L. Similarly, an acute mixing zone boundary of 2.5% of river flow corresponds to a mixing zone ammonia concentration of 2.99 mg/L. This exceeds the acute total ammonia criterion of 1.93 mg/L.

For critical river flow and WWTP flow conditions, concentrations at the mixing zones could be lower than those corresponding to conditions during this inspection. An evaluation of critical conditions would be needed in developing permit limits and in a TMDL report to be published in 1996. A mixing zone study would be needed to determine actual mixing zone boundaries as well as to determine whether a mixing zone would comply with State water quality standards by not occupying more than 25% of the width of the Colville River.

Water Quality Criterion for Chlorine

Chlorine criteria are 11 µg/L and 19 µg/L for chronic and acute conditions respectively (EPA, 1985). An effluent concentration can be calculated by mass balance, setting the mixing zone concentration equal to the criteria concentration, allowing the chronic mixing zone not to exceed 25% of river flow (Ecology, 1992). For the river and effluent flow conditions at the time of the inspection, the corresponding effluent chlorine concentration was determined to be 0.28 mg/L. Similarly, an acute mixing zone boundary of 2.5% of river flow corresponds to an effluent chlorine concentration of 0.06 mg/L.

At 0.06 mg/L (the lower effluent chlorine concentration) fecal coliform limits will almost certainly be exceeded. This suggests the need for chlorination at higher concentrations followed by dechlorination, or an alternative method of disinfection.

At critical river flow and WWTP flow conditions the allowable effluent chlorine concentration could be lower than 0.06 mg/L. An evaluation of critical conditions would be needed in

developing permit limits and in the TMDL report. A mixing zone study would be needed to determine whether a mixing zone would comply with the requirement of being not greater than 25% of river width and to determine actual mixing zone boundaries.

A complete review of critical parameters has not been made in this report. Other parameters may also be found to exceed criteria depending on the outcome of the TMDL report and the permit revision process.

Lagoon Operation

Lagoon dissolved oxygen measurements were taken near the exits of the three lagoons between 1725 and 1810 on October 5 (Figure 2). The early evening measurements indicated nearly anaerobic conditions for the surface water of Lagoon 1 (0.95 mg/L) and aerobic conditions for the surface water of Lagoon 2 (9.30 mg/L) and Lagoon 3 (3.60 mg/L). Water at greater depth would be expected to contain a lower concentration of dissolved oxygen. Dissolved oxygen concentrations in Lagoons 2 and 3 are probably influenced by algae in the lagoons. The dissolved oxygen concentrations in these lagoons are probably lower at night when algal respiration and biochemical degradation are not accompanied by oxygen release from photosynthesis.

The final effluent had a pronounced green color indicating the presence of algae. The composite effluent samples for October 5-6 and October 6-7 contained chlorophyll A in concentrations of 143 mg/L and 169 mg/L respectively. Algal concentrations in the effluent were not high enough to create BOD_5 and TSS problems in the effluent.

Split Sample Comparison

Split samples were compared to evaluate Ecology and permittee laboratory results and sampling methods (Table 4). The Ecology influent composite sample (105 mg/L BOD_5; 129 mg/L TSS) was considerably weaker than both the Chewelah influent sample as analyzed by Ecology (156 mg/L BOD_5; 203 m/L TSS) and typical untreated domestic wastewater (220 mg/L BOD_5; 220 mg/L TSS - Metcalf and Eddy, 1991). The concentrations of NH_3-N and total P in the Ecology influent sample were lower than those of the Chewelah sample by a factor of two.

The treatment plant flow at the time of the inspection (0.204 MGD) approximated baseline dry weather conditions (Fig.3), indicative of no significant inflow or infiltration. This flow rate agrees with an estimated 0.2 MGD based on a typical per capita sewage contribution of 100 gal/day (Metcalf and Eddy, 1991) for a service population of 2,000, the approximate population of Chewelah.

Since there was no significant inflow and infiltration at the time of the inspection, the influent would not be expected to be weaker than typical domestic wastewater. Instead, it appears that the Ecology sample was not representative of the influent. The cause is likely the blockage of the 3/8-inch inlet ports of the sampling strainer by rags from the wastestream, effectively filtering out solids from the influent. The Chewelah influent composite sample (InfCh-E) appears to be representative of the WWTP influent. InfCh-E sample results are used in this report to represent WWTP influent.

A comparison of Chewelah and Ecology laboratory analyses showed that effluent TSS results were similar. Chewelah influent TSS results were lower than Ecology results for each of the Ecology and Chewelah samples. Nonhomogeneity of the sample caused by large clumps of solids are typical of municipal influents and may account for the variations in influent results. Fecal coliform and pH results compared well. Fecal coliform tests should be conducted so that a quantified result is reported rather than a result such as ">1000". Chewelah NH_3-N results were consistently approximately 50% above those of Ecology. Chewelah NH_3-N analysis techniques should be reviewed.

BOD_5 results from Chewelah and Ecology analyses were in disagreement, with Chewelah reporting influent and effluent BOD_5 concentrations approximately half of those reported by Ecology. Discharge monitoring reports (DMRs) from January 1988 through June 1990 and from the spring of 1994 show consistently low influent and effluent BOD_5 concentrations at all flow conditions (Ecology, 1990 - Figures 3, 4, and 5). The influent TSS has been commonly reported at twice or more the BOD_5 concentration. Influent BOD_5 and TSS concentrations for domestic wastewater are typically approximately equal (Metcalf and Eddy, 1991). The relatively low reported influent BOD_5 concentrations support the Ecology finding of low Chewelah BOD_5 results from the split comparison and suggest that Chewelah may have been reporting unrepresentatively low BOD_5 concentrations over a long period of time.

Chewelah stores its samples and then transports them to the Colville WWTP laboratory for analysis. Allowing samples to remain warm for a period of time before testing rather than keeping the samples properly chilled appears to be the cause of consistently low BOD_5 results. This allows degradation of the sample before the BOD test is begun. When cooled samples were removed from the Chewelah refrigerator, influent and effluent samples were found at temperatures of 14.0°C and 12.6°C respectively, well above the recommended 4°C holding temperature. The Chewelah laboratory refrigerator should be checked for temperature control.

BOD_5 testing procedures at the Chewelah WWTP appear to be good and not a cause of the low Colville BOD_5 test results. Ecology's QA/QC Section reports very good performance by the Chewelah WWTP laboratory in BOD_5 testing. Water pollution (WP) reports indicate good agreement with BOD_5 blind samples (Brake, 1995). WP results from February 10, 1995 were 12.03 mg/L for a true 12.1 mg/L and 43 mg/L for a true 54 mg/L. WP 32 results from August 5, 1994 were 68 mg/L for a true 70 mg/L and 14 mg/L for a true 15 mg/L. The seed was found to be effective and standard deviations were found to be low (Brake, 1995).

Priority Pollutant Scans

The volatile organic analysis (VOA) influent sample was lost during sampling or in the laboratory. One VOA compound, carbon disulfide (0.40 µg/L est.), a non-priority pollutant, was found in the effluent sample (Table 5).

Fourteen priority pollutant and other target base-neutral acid extractable (semi-volatile organic) compounds were detected in the influent. Seven base-neutral acid extractable (BNA) compounds were detected at concentrations above 10 µg/L with 3B-Coprostanol (914 µg/L est.) present at the highest concentration. Coprostanol is produced in the intestine of mammals and is used as a tracer of fecal material. Caffeine (46.9 µg/L), benzoic acid (41.2 µg/L), 4-methylphenol (35.6 µg/L), and bis(2-ethylhexyl)phthalate (19.7 µg/L), in descending order of concentration, were among the other BNA compounds found in the influent.

Four BNA compounds were detected in the effluent. Of these, bis(2-ethylhexyl)phthalate (30.9 µg/L) was found in the highest concentration. Bis(2-ethylhexyl)pthalate in the effluent exceeded the State fresh water chronic criterion by a factor of ten (Ecology, 1992). All other VOA and BNA compounds found in the effluent were in concentrations lower than State water quality criteria. The source of bis(2-ethylhexyl)pthalate should be investigated.

The pesticide gamma-BHC (Lindane) was found in the influent in a concentration of 0.07 µg/L. No pesticide/PCB compounds were found in the effluent.

Of the seven priority pollutant metals found in the influent sample, zinc (90.9 µg/L) and copper (44.7 µg/L) were found in the highest concentrations. Four priority pollutant metals were detected in the effluent samples, all at concentrations below State fresh water criteria. Mercury (0.0097 µg/L est.; 0.0105 µg/L) effluent concentrations came the closest to criteria: 12% below the State fresh water chronic criterion.

A complete list of parameters analyzed and analytical results is included in Appendix F. A number of tentatively identified compounds (TICs) were found from BNA analyses of influent in concentrations up to 2460 µg/L (est.) and in effluent in concentrations up to 65.7 µg/L (Appendix G).

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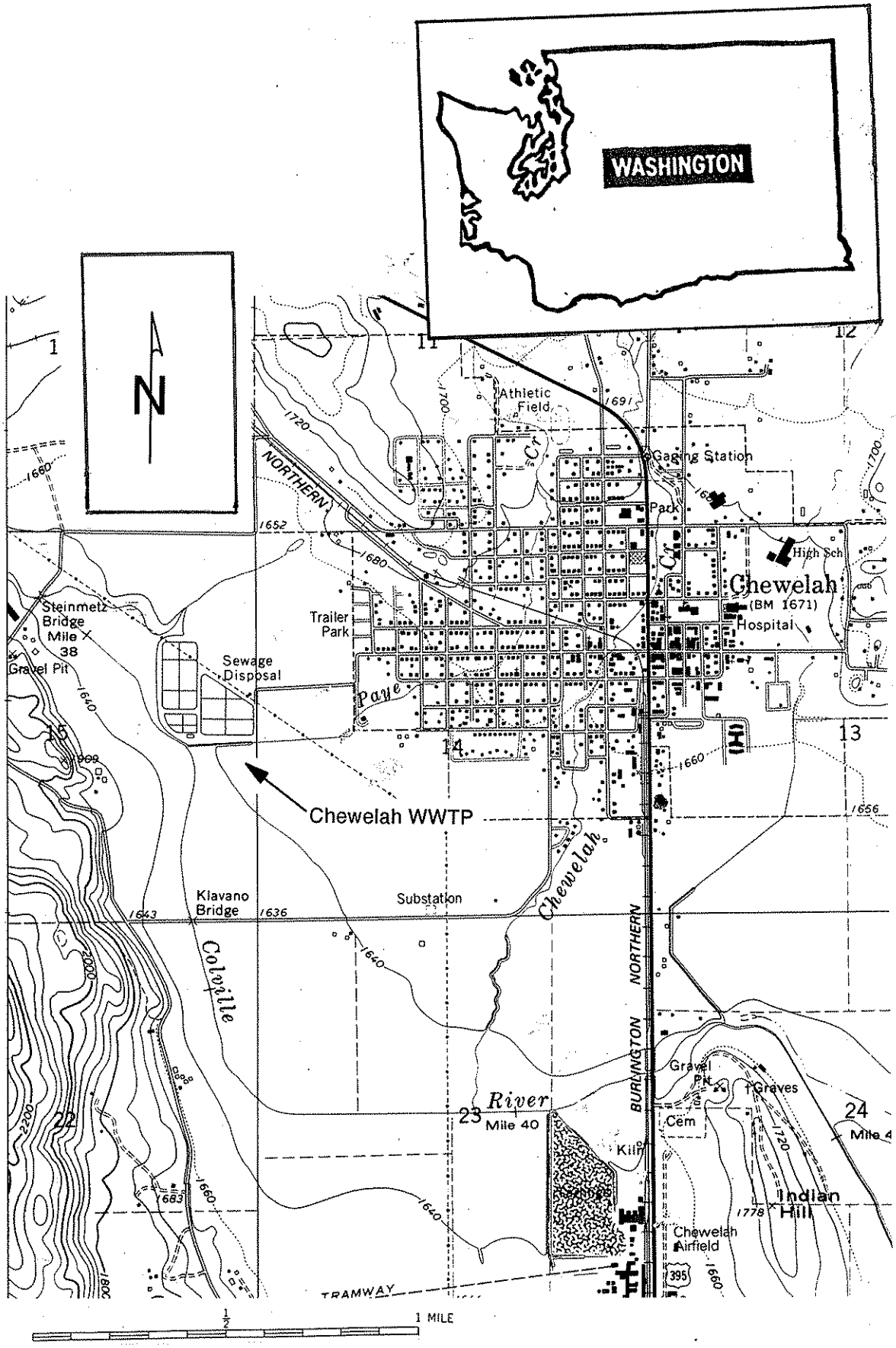


Figure 1 – Location Map – Chewelah, October 1995.

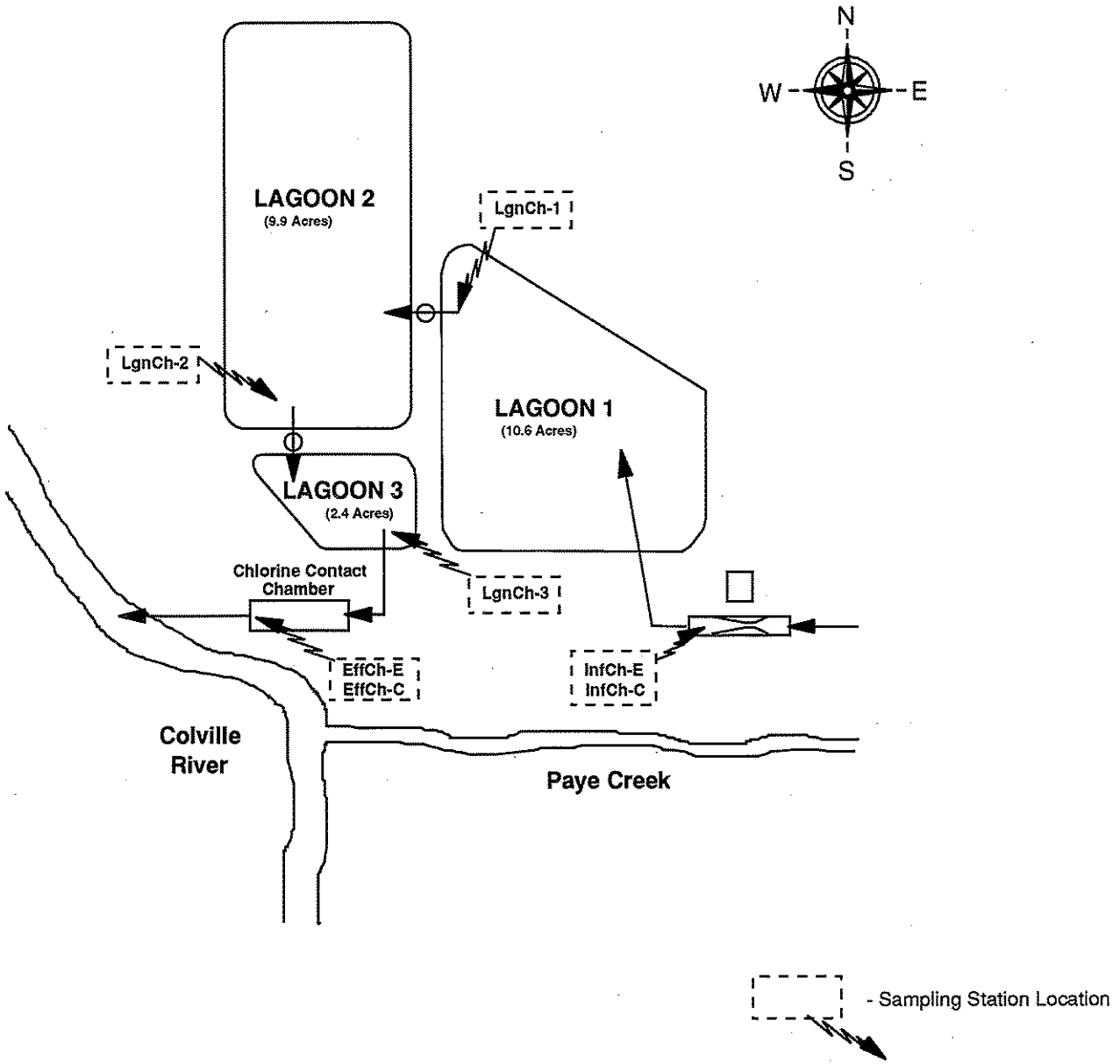


Figure 2 – Flow Schematic – Chewelah, October 1995.

Figure 3 – Treatment Plant Flow, 1/88 – 6/90 – Chewelah, October 1994.

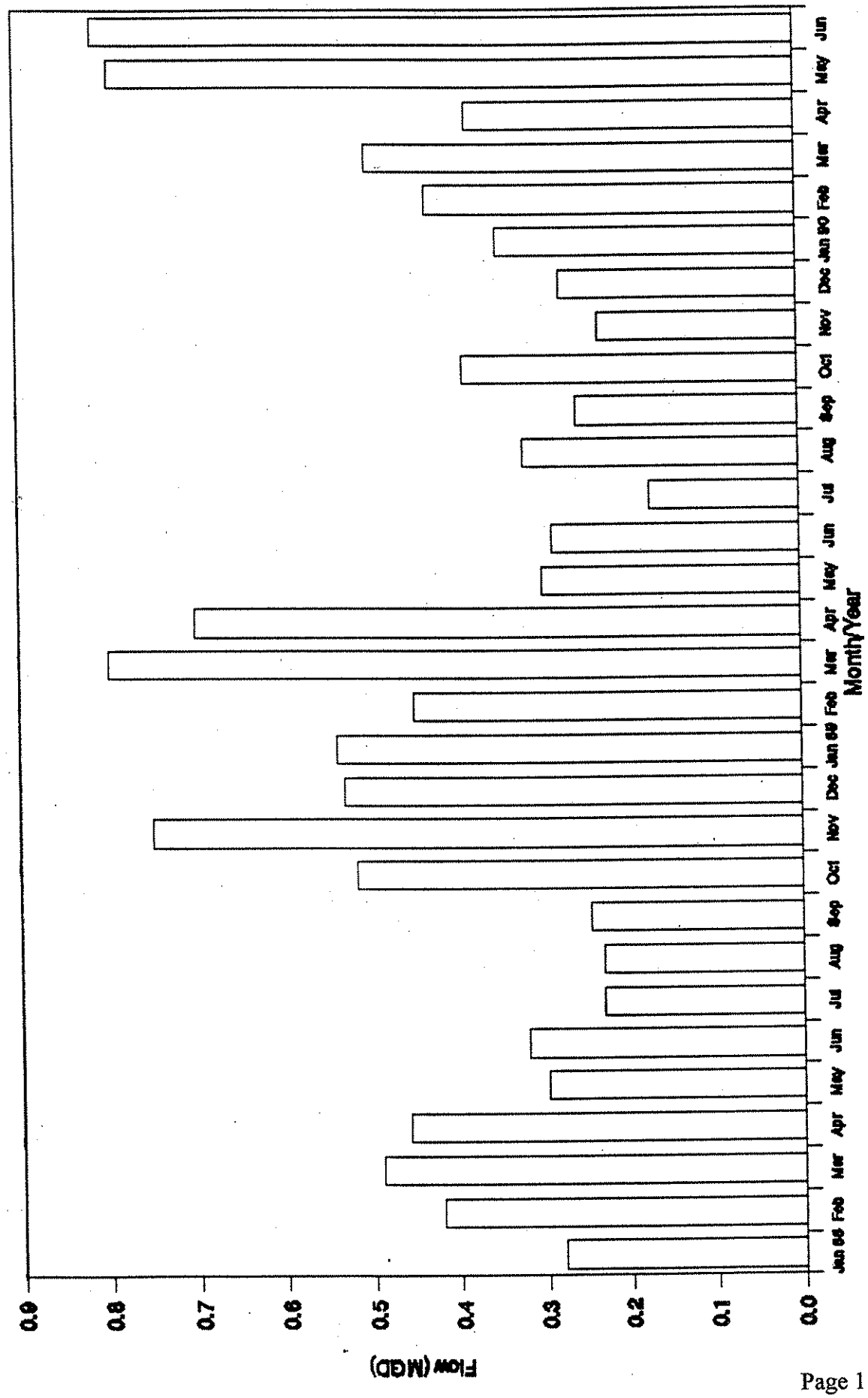
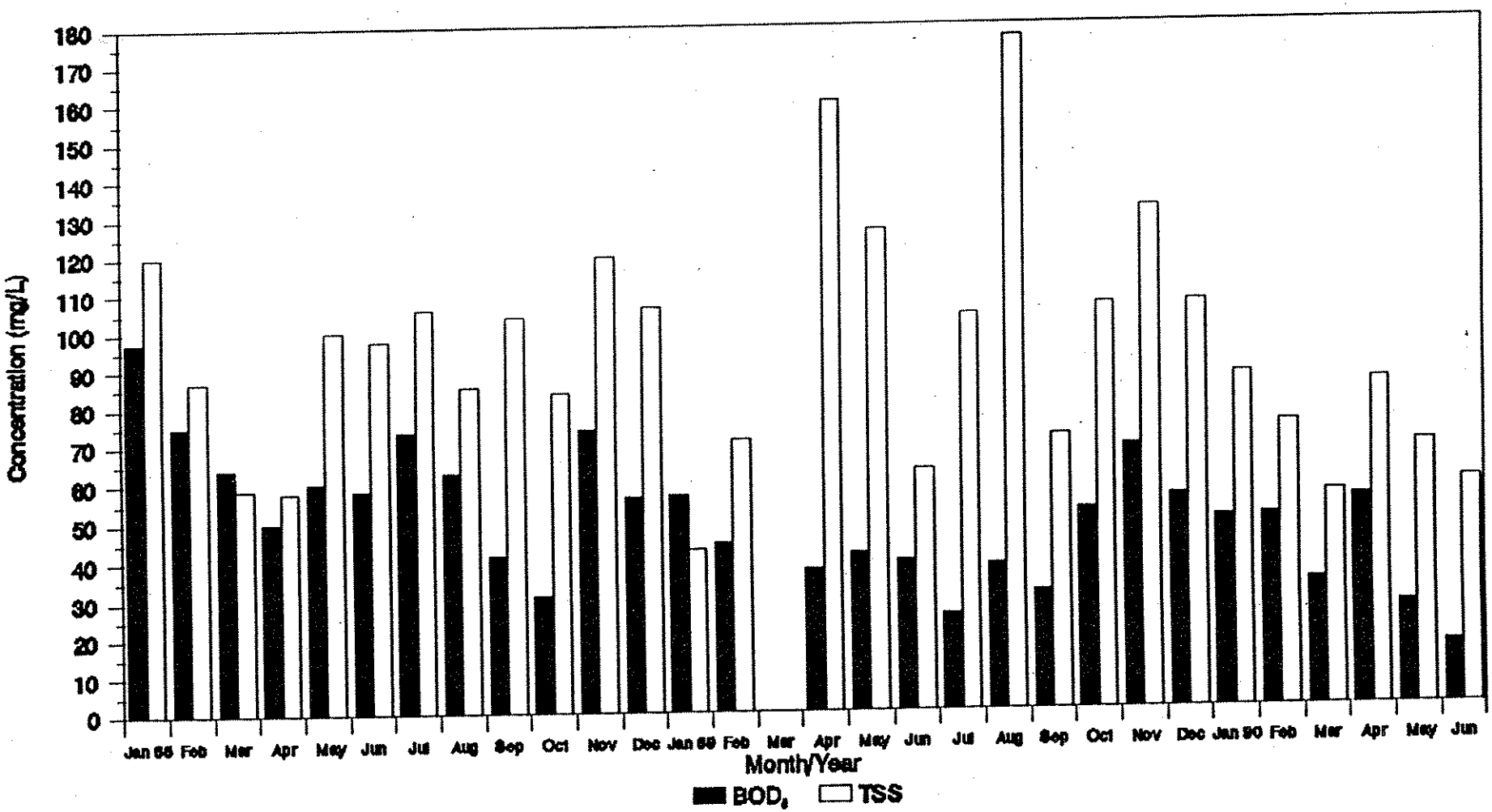
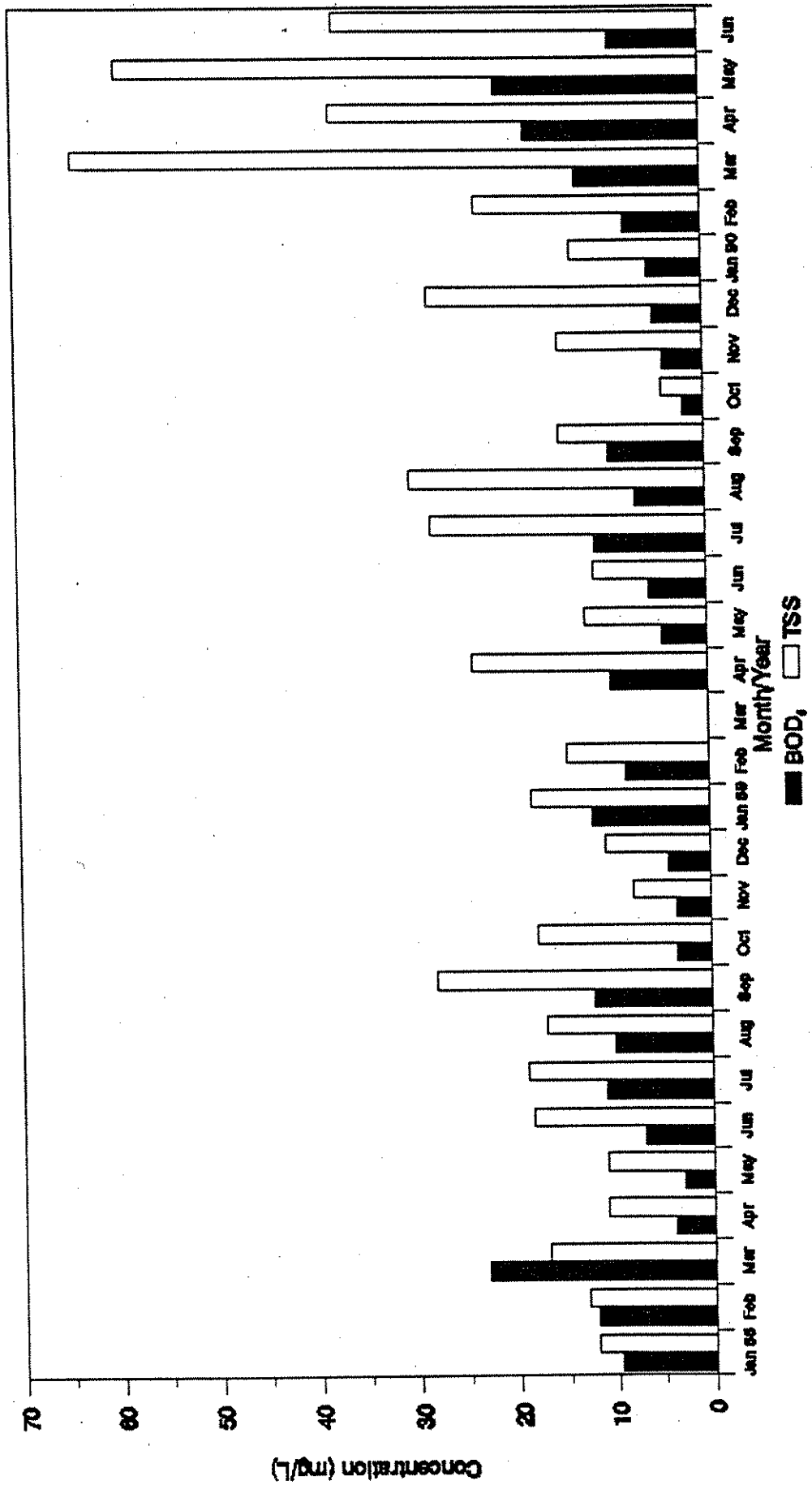


Figure 4 – Influent BOD5 and TSS, 1/88 – 6/90* – Chewelah, October 1994.



* Monthly averages - once per week sampling; no values reported for March, 1989.

Figure 5 – Effluent BOD5 and TSS, 1/88 – 6/90* – Chewelah, October 1994.



* Monthly Averages - once per week sampling; no values reported for March, 1990.

Table 1 - Sampling Station Descriptions - Chewelah, October 1994.

Ecology influent grab and composite samples (InfCh-1,2; InfCh-E)

The Ecology influent compositor intake was placed in the exit portion of the Parshall flume with rapid flow and good mixing. Shallow flow downstream of the flume prohibited placement of the sampler intake there and potential sampling locations upstream of the flume were not readily accessible. Grab samples were obtained from the flume.

Chewelah influent composite samples (InfCh-C)

The Chewelah influent sampler intake rests on bottom of Parshall flume in the exit portion of flume. The Chewelah sampler takes one subsample of equal volume once per hour.

Ecology effluent grab and composite samples (EffCh-1,2,3,4,5,6; EffCh-E; EffCh-E2)

The Ecology effluent compositor intake was placed in the chlorination chamber just upstream of the effluent weir below the surface. Grab samples were taken just upstream of the effluent weir.

Chewelah effluent grab sample (EffCh-C)

The Chewelah effluent grab sample was collected as the effluent falls from the weir of the chlorine contact chamber.

Ecology Lagoon 1 effluent (LgnCh-1)

A grab sample was collected several feet upstream of the outfall to Lagoon 2, upstream of the turbulent area near the outfall.

Ecology Lagoon 2 effluent (LgnCh-2)

A grab sample was collected several feet upstream of the outfall to Lagoon 3, upstream of the turbulent area near the outfall.

Ecology Lagoon 3 effluent (LgnCh-3)

A grab sample was collected several feet upstream of the Lagoon 3 outfall, upstream of the turbulent area near the outfall.

Table 2 – General Chemistry Results – Chewelah, October 1994.

Parameter	Location:	InfCh–1	InfCh–2	InfCh–E	InfCh–C	LgnCh–1	LgnCh–2	LgnCh–3	EffCh–1	EffCh–2	EffCh–3	EffCh–4	EffCh–5
	Type:	grab	grab	comp	comp	grab	grab	grab	grab	grab	grab	grab	grab
	Date:	10/4	10/4	10/4–5	10/4	10/5	10/5	10/5	10/4	10/4	10/5	10/5	10/6
	Time:	1035	1715	00–0900	0900–0900	1725	1740	1810	1135	1645	0655	1750	0720
	Lab Log #:	408230	408231	408235	408236				408240	408241			408475
LABORATORY RESULTS													
Conductivity (umhos/cm)		760	849	881	919				1020	1020			
Alkalinity (mg/L CaCO3)				357									
Hardness (mg/L CaCO3)				250									
TS (mg/L)				637									
TNVS (mg/L)				376									
TSS (mg/L)		155	175	129	203				18	15			
TNVSS (mg/L)				29									
BOD5 (mg/L)				105	156				18				
BODU (mg/L)													
TOC (water mg/L)				60.2									
Total Kjeldahl Nitrogen (TKN) (mg/L)													
NH3–N (mg/L)				11.0	20.1								
NO2+NO3–N (mg/L)				0.065	0.026								
Total–P (mg/L)				2.51	5.92								
Ortho–PO4–P (mg/L)													
F–Coliform MF (#/100mL)		31,000,000 J	2,000,000						3000	3200			
Chlorophyll A													
FIELD OBSERVATIONS													
Temperature (C)		17.5	18.0			12.9	13.9	12.2	11.3	14.6	10.4	12.4	9.7
Temp–cooled (C)				5.3	14.0								
pH		7.8	7.8	8.0	8.2	7.8	8.4	8.0	7.8	7.7	8.1	8.0	8.0
Conductivity (umhos/cm)		743	859	948	904	887	1012	1065	1057	1048		1044	1075
Chlorine (mg/L)													
Free									<0.1	<0.1			
Total									<0.1	<0.1			
D.O. (mg/L)						0.95	9.30	3.60		4.25	2.85	4.40	2.30

InfCh – Chewelah influent
EffCh – Chewelah effluent
LgnCh – Chewelah lagoon
grab – grab sample
comp – composite sample

E – Ecology sample
C – Chewelah sample

J – The analyte was positively identified. The associated numerical result is an estimate.

Table 2 – (cont'd) – Chewelah, October 1994.

Parameter II	Locatn:	EffCh–6	EffCh–E	EffCh–E2	EffCh–C
	Type:	grab	comp	comp	grab
	Date:	10/6	10/4–5	10/5–6	10/5
	Time:	0720	0900–0900	1115–1115	0900
	Lab Log #:	408475	408244	408473	408245
LABORATORY RESULTS					
Conductivity			1010	1010	1010
Alkalinity			423	423	
Hardness			310	314	
TS (mg/L)			633		
TNVS (mg/L)			438		
TSS (mg/L)			16	17	20
TNVSS (mg/L)			3		
BOD5			19	21	20
BODU			32	36	
TOC (water)			32.3	31.9	
Total Kjeldahl Nitrogen (TKN)			22	24	
NH3–N			10.2	13.1	10.6
NO2+NO3–N			0.100	0.100	0.070
Total–P			3.86	4.14	4.09
Ortho–PO4–P			3.35	3.32	
F–Coliform MF		1400			
Chlorophyll A			143	169	
FIELD OBSERVATIONS					
Temperature					
Temp–cooled			1.5	3.5	12.6
pH			8.3	8.0	8.0
Conductivity			1104	1082	987
Chlorine					
Free			<0.1		
Total			<0.1		
D.O.					

InfCh – Chewelah influent
EffCh – Chewelah effluent
LgnCh – Chewelah lagoon
grab – grab sample
comp – composite sample

E – Ecology sample
C – Chewelah sample

Table 3 – NPDES Permit Limits and Inspection Results – Chewelah, October 1994.

	NPDES Limits		Inspection Results	
Parameter	Monthly Average	Weekly Average	Composite Samples	Grab Samples
BOD5 (mg/L)*	30	45	19	
lbs/day	113	169	32	
TSS (mg/L)	65	98	16	
lbs/day	244	368	27	
Fecal Coliform (#/100mL)	200	400		3000; 3200; 1400
pH	6.5 to 8.5			7.8; 7.7; 8.1; 8.0; 8.0
Total Residual Chlorine (mg/L)	0.02**			<0.1
Flow (MGD)	0.45	--	0.204***	

* The monthly average effluent concentration for BOD5 shall not exceed 30 mg/L or 35% of the influent concentration, whichever is more stringent.

** Daily maximum concentration shall not exceed 0.08 mg/L. These limits shall be in effect during July-September. During the remainder of the year, total residual chlorine shall be maintained at a level which is sufficient to attain the fecal coliform limits specified above. Chlorine concentrations in excess of that necessary to reliably achieve these limits shall be avoided.

*** based on Ecology readings from Chewelah flow totalizer from 1005 on 10/4 to 0701 on 10/5, prorated to 24 hours.

Table 4 – Split Sample Results Comparison – Chewelah, October 1994.

Parameter	Analysis by:	InfCh-E	InfCh-C	EffCh-1	EffCh-2	EffCh-6	EffCh-E	EffCh-E2	EffCh-C	EffCh-C2
Location:		InfCh-E	InfCh-C	EffCh-1	EffCh-2	EffCh-6	EffCh-E	EffCh-E2	EffCh-C	EffCh-C2
Type:		comp	comp	grab	grab	grab	comp	comp	grab	grab
Date:		10/4-5	10/4-5	10/4	10/4	10/6	10/4-5	10/5-6	10/5	10/6
Time:		0900-0900	0900-0900	1135	1645	0720	0900-0900	1115-1115	0900	0900
Lab Log #:		408235	408236	408240	408241	408475	408244	408473	408245	
Sampled by:										
BOD5 (mg/L)										
	Ecology	105	156	18			19	21	20	
	Chewelah	80	55				10.5		9	10
TSS (mg/L)										
	Ecology	129	203	18	15		16	17	20	
	Chewelah	118	116				14		16	14
NH3-N (mg/L)										
	Ecology						10.2	13.1	10.6	
	Chewelah						15.6		16.1	15.6
Fecal Coliform MF (#/100 mL)										
	Ecology			3000	3200	1400				
	Chewelah								>1000	
pH										
	Ecology			7.8	7.7					
	Chewelah		7.4							

E – Ecology sample
Ch – Chewelah sample
EffCh – Chewelah effluent
InfCh – Chewelah influent

comp – composite sample
grab – grab sample
J – estimated value
> – actual value is greater than stated value. The dilutions used in the test did not allow for an actual result.

MF – membrane filter method

Table 5 – Comparison of Organic Compounds and Metals Detected with Water Quality Criteria – Chewelah, October 1994.

	Location:			EffCh–1	State Water Quality Criteria Summary	
	Type:			grab		
	Date:			10/4	Acute	Chronic
	Time:			1135	Fresh	Fresh
	Lab Log#:			408240		
				(µg/L)		
	VOA Compounds				(µg/L)	(µg/L)
(Group)[1]						
	Carbon Disulfide			0.40 J		
	Location:	InfCh–E	EffCh–E			
	Type:	comp	comp			
	Date:	10/4–5	10/4–5			
	Time:	0900–0900	0900–0900			
	Lab Log#:	408235	408244			
		(µg/L)	(µg/L)			
	BNA Compounds					
	Caffeine	46.9				
	Aniline	0.40 J				
	Benzoic Acid	41.2	0.14 J			
	Isophorone		0.21 J		117,000 *	
i	Diethyl Phthalate	12.4			940 *(i)	3 *(i)
i	Di–n–Butyl Phthalate	4.3			940 *(i)	3 *(i)
n	Phenanthrene	0.21 J				
i	Butylbenzyl Phthalate	3.3			940 *(i)	3 *(i)
n	Naphthalene	0.23 J			2,300 *	620 *
	2–Methylnaphthalene	0.17 J				
	Benzyl Alcohol	10.2				
	4–Methylphenol	35.6				
	Phenol	5.5			10,200 *	2,560 *
i	Bis(2–Ethylhexyl)Phthalate	19.7	30.9		940 *(i)	3 *(i)
	3B–Coprostanol	914 EJ	4.3 J			
	Location:	InfCh–E	EffCh–E			
	Type:	comp	comp			
	Date:	10/4–5	10/4–5			
	Time:	0900–0900	0900–0900			
	Lab Log#:	408235	408244			
		(µg/L)	(µg/L)			
	Pesticide/PCB Compounds					
q	gamma–BHC (Lindane)	0.07			2.0	0.08
	Location:	InfCh–E	EffCh–E	EffCh–E2		
	Type:	comp	comp	comp		
	Date:	10/4–5	10/4–5	10/5–6		
	Time:	0900–0900	0900–0900	1115		
	Lab Log#:	408235	408244	408473		
		(µg/L)	(µg/L)	(µg/L)		
	Metals ++					
	Arsenic v	5.4 P	5.3 P	3.9 P		
	Pentavalent				850 *	48 *
	Trivalent				360	190
	Cadmium	0.40 P			6.7 +	1.6 +
	Chromium					
	Total					
	Hexavalent				16	11
	Trivalent				2,849 +	340 +
	Copper	44.7	5.9 P	5.8 P	27 +	17 +
	Lead	4.6 P			121 +	4.7 +
	Mercury (total)	0.228	0.0097 P	0.0105	2.4	0.012
	Silver	1.7 P			6.1 +	0.12
	Zinc	90.9	7 P	9.8 P	174 +	158 +

[1]NOTE: SOME INDIVIDUAL COMPOUND CRITERIA OR LOELS MAY NOT AGREE WITH GROUP CRITERIA OR LOELS. REFER TO APPROPRIATE EPA DOCUMENT ON AMBIENT WATER QUALITY CRITERIA FOR FULL DISCUSSION.

J The analyte was positively identified. The associated numerical result is an estimate.
E Reported result is an estimate because of the presence of interference.
B Analyte was found in the analytical method blank, indicating the sample may have been contaminated.
P The analyte was detected above the instrument detection limit but below the established minimum quantitation limit.

* Insufficient data to develop criteria. Value presented is the LOEL – Lowest Observed Effect Level.
\+ Hardness dependent criteria (183 mg/L used, Colville River sample upstream of the Chewelah outfall at R.M. 138.8, 10/5/94 by Greg Pelletier).
++ Metals are total recoverable unless otherwise noted.

InfCh – Chewelah influent
EffCh – Chewelah effluent
E, E2 – Ecology sample

i Total Phthalate Esters
n Total Polynuclear Aromatic Hydrocarbons
q Total BHCs

☐ – receiving water criterion exceeded

Appendices

Appendix A - Sampling Procedures - Chewelah, October 1995.

Ecology Isco composite samplers were set up to collect equal volumes of sample every 30 minutes for 24 hours. The samples were then divided into subsamples for analysis and a second 24-hour effluent sample was collected. The compositors were iced to keep samples cooled.

Chewelah's composite influent sampler was set to collect equal volumes of sample every 60 minutes for 24 hours. The influent intake and intake line were resting in the Parshall flume. Chewelah sampled effluent as a single grab sample once per day.

All Ecology composite samples and Chewelah composite samples were split for both Ecology and Chewelah laboratory analysis. Sampler configurations and locations are summarized in Figure 2 and Table 1.

Appendix B – Sampling Schedule – Chewelah, October 1994.

Parameter	Location:	InfCh–1	InfCh–2	InfCh–E	InfCh–C	LgnCh–1	LgnCh–2	LgnCh–3	EffCh–1	EffCh–2	EffCh–3	EffCh–4	EffCh–5
	Type:	grab	grab	comp	comp	grab	grab	grab	grab	grab	grab	grab	grab
	Date:	10/4	10/4	10/4–5	10/4	10/5	10/5	10/5	10/4	10/4	10/5	10/5	10/6
	Time:	1035	1715	00–0900	0900–0900	1725	1740	1810	1135	1645	0655	1750	0720
	Lab Log #:	408230	408231	408235	408236				408240	408241			408475
Conductivity (umhos/cm)		E	E	E	E				1020	1020			
Alkalinity (mg/L CaCO3)				E									
Hardness (mg/L CaCO3)				E									
TS (mg/L)				E									
TNVS (mg/L)				E									
TSS (mg/L)		E	E	E	E				E	E			
TNVSS (mg/L)				E									
BOD5 (mg/L)				E	E				E				
BODU (mg/L)													
TOC (water mg/L)				E									
Total Kjeldahl Nitrogen (TKN) (mg/L)													
NH3–N (mg/L)				E	E								
NO2+NO3–N (mg/L)				E	E								
Total–P (mg/L)				E	E								
Ortho–PO4–P (mg/L)													
F–Coliform MF (#/100mL)		E	E						E	E			
Chlorophyll A													
FIELD OBSERVATIONS													
Temperature (C)		E	E			E	E	E	E	E	E	E	E
Temp–cooled (C)				E	E								
pH		E	E	E	E	E	E	E	E	E	E	E	E
Conductivity (umhos/cm)		E	E	E	E	E	E	E	E	E		E	E
Chlorine (mg/L)													
Free									E	E			
Total									E	E			
D.O. (mg/L)						E	E	E		E	E	E	E

InfCh–E – Ecology sample of influent
InfCh–C – Chewelah sample of influent
EffCh–E – Ecology sample of effluent
EffCh–C – Chewelah sample of effluent
LgnCh – Chewelah lagoon
grab – grab sample
comp – composite sample

E – Ecology analysis
C – Chewelah analysis

Appendix B – (cont'd) – Chewelah, October 1994.

Parameter II	Locatn:	EffCh–6	EffCh–E	EffCh–E2	EffCh–C
	Type:	grab	comp	comp	grab
	Date:	10/6	10/4–5	10/5–6	10/5
	Time:	0720	0900–0900	1115–1115	0900
	Lab Log #:	408475	408244	408473	408245
Conductivity			E	E	E
Alkalinity			E	E	
Hardness			E	E	
TS (mg/L)			E		
TNVS (mg/L)			E		
TSS (mg/L)			EC	E	EC
TNVSS (mg/L)			E		
BOD5			EC	E	EC
BODU			E	E	
TOC (water)			E	E	
Total Kjeldahl Nitrogen (TKN)			E	E	
NH3–N			EC	E	EC
NO2+NO3–N			E	E	E
Total–P			E	E	E
Ortho–PO4–P			E	E	
F–Coliform MF		E			C
Chlorophyll A			E	E	
FIELD OBSERVATIONS					
Temperature					
Temp–cooled			E		E
pH			E		E
Conductivity			E		E
Chlorine					
Free			E		
Total			E		
D.O.					

InfCh–E – Ecology sample of influent
InfCh–C – Chewelah sample of influent
EffCh–E – Ecology sample of effluent
EffCh–C – Chewelah sample of effluent
LgnCh – Chewelah lagoon
grab – grab sample
comp – composite sample

E – Ecology analysis
C – Chewelah analysis

Appendix C – Ecology Analytical Methods – Chewelah, October 1994.

Laboratory Analysis	Method Used for Ecology Analysis	Laboratory Performing Analysis
Conductivity	EPA, Revised 1983: 120.1	Ecology Manchester Laboratory
Alkalinity	EPA, Revised 1983: 310.1	Ecology Manchester Laboratory
Hardness	EPA, Revised 1983: 130.2	Ecology Manchester Laboratory
TS	EPA, Revised 1983: 160.3	Ecology Manchester Laboratory
TNVS	EPA, Revised 1983: 160.3	Ecology Manchester Laboratory
TSS	EPA, Revised 1983: 160.2	Ecology Manchester Laboratory
TNVSS	EPA, Revised 1983: 160.2	Ecology Manchester Laboratory
BOD5	EPA, Revised 1983: 405.1	Ecology Manchester Laboratory
BOD Ultimate	APHA, 1992b: 5210C.	Ecology Manchester Laboratory
TOC (water)	EPA, Revised 1983: 160.2	Ecology Manchester Laboratory
Total Kjeldahl Nitrogen (TKN)	EPA, Revised 1983: 351.3	Ecology Manchester Laboratory
NH3-N	EPA, Revised 1983: 350.1	Ecology Manchester Laboratory
NO2+NO3-N	EPA, Revised 1983: 353.2	Ecology Manchester Laboratory
Total-P	EPA, Revised 1983: 365.3	Ecology Manchester Laboratory
Ortho-PO4-P	EPA, Revised 1983: 365.3	Ecology Manchester Laboratory
F-Coliform MF	APHA, 1989: 9222D.	Ecology Manchester Laboratory
Chlorophyll	APHA, 1992a: 10200H(3).	Ecology Manchester Laboratory
VOC (water) - Extensive TICs	EPA, 1986: 8260	Ecology Manchester Laboratory
BNAs (water) - Extensive TICs	EPA, 1986: 8270	Ecology Manchester Laboratory
Pest/PCB (water) - Chlorinated	EPA, 1986: 8080	Ecology Manchester Laboratory
PP Metals (water)	EPA, Revised 1983: 200-299	Ecology Manchester Laboratory

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Appendix D - Quality Assurance/Quality Control (QA/QC) - Chewelah, October 1994.

SAMPLING QA/QC

Ecology quality assurance procedures for sampling included cleaning sampling equipment for priority pollutants prior to the inspection to prevent sample contamination (Appendix E). Chain-of-custody procedures were followed to assure the security of the samples (Ecology, 1994).

LABORATORY QA/QC

General Chemistry Analyses

Insufficient air space in the InfCh-1 fecal coliform sample bottle prevented proper shaking of the sample prior to analysis. The result is an estimate and is qualified "J". All other general chemistry analyses are acceptable and appear without qualifiers.

Temperatures of Ecology composite samples were 5.3°C and 1.5°C for InfCh-E and EffCh-E respectively, within 1.3°C of the 4°C criterion. Temperatures of Chewelah composite samples InfCh-C and EffCh-C were found to be 14.0°C and 12.6°C respectively, well above the 4°C criterion. As a result, the reliability of Chewelah general chemistry results may be reduced. Ecology, however, placed all Chewelah samples in ice immediately after splitting.

VOA, BNA, and Pesticide/PCB Priority Pollutant Organics Analysis

Samples were analyzed within the recommended holding times. Low levels of the common laboratory solvents acetone and methylene chloride were detected in the VOA laboratory blanks and are likely not representative of the sample. Low levels of some target compounds were detected in the BNA laboratory blanks. The five times rule was applied: results are reported if they are greater than or equal to five times the measured concentration of the laboratory blanks. VOA surrogate recoveries were within acceptable limits. BNA and chlorinated pesticide/PCB each had one low surrogate recovery, but no qualifiers were added to the results. Matrix spikes were acceptable except for VOA compounds qualified "J" in sample 408240 and BNA compounds qualified "J" in sample 408244. Four other BNA compounds: aniline, 4-chloroaniline, hexachlorocyclopentadiene and 3-nitroaniline had very low or no recovery and the data were rejected, "REJ". See Colville Class II Inspection report for chorinated pesticides/PCB matrix spikes.

Metals Analyses

Samples were analyzed within the recommended holding times. Instrument calibration was acceptable. The procedural blanks showed no analytically significant levels of analytes. All spike recoveries were within the CLP acceptance limits of +/- 25%. The relative percent difference for all analytes were acceptable. Laboratory control sample analyses were within the windows established for each parameter.

LABORATORY AUDIT

The Chewelah laboratory was on April 4, 1994 to perform pH and residual chlorine analyses. The accreditation has been renewed and expires on April 3, 1996. Other analyses including BOD_5 and TSS are performed by the Colville WWTP laboratory.

Appendix E - Priority Pollutant Cleaning Procedures - Chewelah, October 1994.

PRIORITY POLLUTANT SAMPLING EQUIPMENT CLEANING PROCEDURES

1. Wash with laboratory detergent
2. Rinse several times with tap water
3. Rinse with 10% HNO3 solution
4. Rinse three (3) times with distilled/deionized water
5. Rinse with high purity acetone
6. Rinse with high purity hexane
7. Allow to dry and seal with aluminum foil

Appendix F – VOA, BNA, Pesticide/PCB and Metals Scan Results – Chewelah, October 1995.

	Location:	EffCh–1	
	Type:	grab	
	Date:	10/4	
	Time:	1135	
	Lab Log#:	408240	
VOA Compounds		(µg/L)	
Carbon Tetrachloride		1.0	U
Acetone		2.0	UJ
Chloroform		1.0	U
Benzene		1.0	U
1,1,1–Trichloroethane		1.0	U
Bromomethane		1.0	U
Chloromethane		1.0	U
Dibromomethane		1.0	U
Bromochloromethane		1.0	U
Chloroethane		1.0	U
Vinyl Chloride		1.0	U
Methylene Chloride		2.0	U
Carbon Disulfide		0.40	J
Bromoform		1.0	U
Bromodichloromethane		1.0	U
1,1–Dichloroethane		1.0	U
1,1–Dichloroethene		1.0	U
Trichlorofluoromethane		5.0	UJ
Dichlorodifluoromethane		2.0	U
1,2–Dichloropropane		1.0	U
2–Butanone (MEK)		1.0	UJ
1,1,2–Trichloroethane		1.0	U
Trichloroethene		1.0	U
1,1,2,2–Tetrachloroethane		1.0	U
1,2,3–Trichlorobenzene		10.0	UJ
Hexachlorobutadiene		2.0	UJ
Naphthalene		10.0	UJ
o–Xylene		1.0	U
2–Chlorotoluene		1.0	U
1,2–Dichlorobenzene		1.0	U
1,2,4–Trimethylbenzene		1.0	U
1,2–Dibromo–3–Chloropropan		2.0	U
1,2,3–Trichloropropane		1.0	U
tert–Butylbenzene		1.0	U
Isopropylbenzene		1.0	U
p–Isopropyltoluene		1.0	U
Ethylbenzene		1.0	U
Styrene (Ethenylbenzene)		1.0	U
n–Propylbenzene		1.0	U
Butylbenzene		1.0	U
4–Chlorotoluene		1.0	U
1,4–Dichlorobenzene		1.0	U
1,2–Dibromoethane (EDB)		1.0	U
1,2–Dichloroethane		1.0	U
4–Methyl–2–Pentanone (MIBK		1.0	U
1,3,5–Trimethylbenzene		1.0	U
Bromobenzene		1.0	U
Toluene		1.0	U
Chlorobenzene		1.0	U
1,2,4–Trichlorobenzene		4.8	UJ
Dibromochloromethane		1.0	U
Tetrachloroethene		1.0	U
sec–Butylbenzene		1.0	U
1,3–Dichloropropane		1.0	U
cis–1,2–Dichloroethene		1.0	U
trans–1,2–Dichloroethene		1.0	U
1,3–Dichlorobenzene		1.0	U
1,1–Dichloropropene		1.0	U
2–Hexanone		1.0	U
2,2–Dichloropropane		1.0	UJ
1,1,1,2–Tetrachloroethane		1.0	U
Total Xylenes		3.0	U
m&p–Xylene		2.0	U
cis–1,3–Dichloropropene		1.1	U
trans–1,3–Dichloropropene		0.94	U

	Location:	InfCh–E	EffCh–E
	Type:	comp	comp
	Date:	10/4–5	10/4–5
	Time:	0900–0900	0900–0900
	Lab Log#:	408235	408244
BNA Compounds		(µg/L)	(µg/L)
Benzo(a)Pyrene		0.48 U	0.39 U
2,4–Dinitrophenol		4.8 U	3.9 U
Dibenzo(a,h)Anthracen		0.48 U	0.39 U
Benzo(a)Anthracene		0.48 U	0.39 U
Caffeine		46.9	0.39 U
4–Chloro–3–Methylphe		0.48 U	0.39 U
Aniline		0.40 J	0.39 U
Dimethylnitrosamine		0.48 U	0.39 UJ
Benzoic Acid		41.2	0.14 J
Hexachloroethane		0.48 U	0.39 UJ
Hexachlorocyclopenta		0.97 U	REJ
Isophorone		0.48 U	0.21 J
Acenaphthene		0.48 U	0.39 U
Diethyl Phthalate		12.4	0.39 U
Di–n–Butyl Phthalate		4.3	0.39 U
Phenanthrene		0.21 J	0.39 U
Butylbenzyl Phthalate		3.3	0.39 U
N–Nitrosodiphenylami		0.48 U	0.39 UJ
Fluorene		0.48 U	0.39 U
Carbazole		0.48 U	0.39 U
Hexachlorobutadiene		0.48 U	0.39 UJ
Pentachlorophenol		0.48 U	0.39 U
2,4,6–Trichlorophenol		0.48 U	0.39 U
2–Nitroaniline		0.48 U	0.39 UJ
2–Nitrophenol		0.48 U	0.39 U
Naphthalene		0.23 J	0.39 UJ
2–Methylnaphthalene		0.17 J	0.39 UJ
2–Chloronaphthalene		0.48 U	0.39 UJ
3,3'–Dichlorobenzidine		0.97 U	0.78 U
Benzidine		62.6 U	0.78 U
2–Methylphenol		0.48 U	0.39 U
1,2–Dichlorobenzene		0.48 U	0.39 UJ
o–Chlorophenol		0.48 U	0.39 U
2,4,5–Trichlorophenol		0.48 U	0.39 U
Nitrobenzene		0.48 U	0.39 U
3–Nitroaniline		0.48 U	REJ
4–Nitroaniline		0.48 U	0.39 UJ
4–Nitrophenol		2.4 U	2.0 U
Benzyl Alcohol		10.2	0.39 U
4–Bromophenyl Phenyl		0.48 U	0.39 U
2,4–Dimethylphenol		0.48 U	0.39 U
4–Methylphenol		35.6	0.39 U
1,4–Dichlorobenzene		0.97 UJ	0.39 UJ
4–Chloroaniline		0.48 U	REJ
Phenol		5.5	0.39 U
Pyridine		2.4 U	REJ
Bis(2–Chloroethyl)Ethe		0.48 U	0.39 U
Bis(2–Chloroethoxy)Me		0.48 U	0.39 U
Bis(2–Ethylhexyl)Phtha		19.7	30.9
Di–n–Octyl Phthalate		2.1 UJ	0.39 U
Hexachlorobenzene		0.48 U	0.39 U
Anthracene		0.48 U	0.39 U
1,2,4–Trichlorobenzen		0.48 U	0.39 UJ
2,4–Dichlorophenol		0.48 U	0.39 U
2,4–Dinitrotoluene		0.48 U	0.39 U
1,2–Diphenylhydrazine		0.48 U	0.39 U
Pyrene		0.48 U	0.39 U
Dimethyl Phthalate		0.48 U	0.39 U
Dibenzofuran		0.48 U	0.39 U
Benzo(g,h,i)Perylene		0.48 U	0.39 U
Indeno(1,2,3–cd)Pyren		0.48 U	0.39 U
Benzo(b)Fluoranthene		0.48 U	0.39 U
Fluoranthene		0.48 U	0.39 U
Benzo(k)Fluoranthene		0.48 U	0.39 U
Acenaphthylene		0.48 U	0.39 U

U The analyte was not detected at or above the detected result.
J The analyte was positively identified. The associated numerical value is an estimate.
REJ The data are unusable for all purposes.
[ ] – detected analyte

InfCh – Chewelah influent
EffCh – Chewelah effluent
E – Ecology sample
grab – grab sample
comp – composite sample

Appendix F – (cont'd) – Chewelah, October 1994.

Location:	InfCh–E	EffCh–E
Type:	comp	comp
Date:	10/4–5	10/4–5
Time:	0900–0900	0900–0900
Lab Log#:	408235	408244
	(µg/L)	(µg/L)
BNA Compounds (cont'd)		
Chrysene	0.48 U	0.39 U
3B-Coprostanol	914 EJ	4.3 J
4,6-Dinitro-2-Methylphenol	4.8 U	3.9 U
1,3-Dichlorobenzene	0.48 U	0.39 UJ
2,6-Dinitrotoluene	0.48 U	0.39 U
N-Nitroso-di-n-Propylamine	0.48 U	0.39 U
4-Chlorophenyl Phenylether	0.48 U	0.39 U
Retene	0.48 U	0.39 U
Bis(2-Chloroisopropyl)Ether	0.48 U	0.39 U

Location:	InfCh–E	EffCh–E
Type:	comp	comp
Date:	10/4–5	10/4–5
Time:	0900–0900	0900–0900
Lab Log#:	408235	408244
	(µg/L)	(µg/L)
Pesticide/PCB Compounds		
alpha-BHC	0.09 U	0.01 U
beta-BHC	0.09 U	0.01 U
delta-BHC	0.09 U	0.01 U
gamma-BHC (Lindane)	0.07	0.01 U
Heptachlor	0.09 U	0.01 U
Aldrin	0.09 U	0.01 U
Heptachlor Epoxide	0.09 U	0.01 U
Endosulfan I	0.09 U	0.01 U
Dieldrin	0.09 U	0.01 U
4,4'-DDE	0.09 U	0.01 U
Endrin	0.09 U	0.01 U
Endosulfan II	0.09 U	0.01 U
4,4'-DDD	0.09 U	0.01 U
Endosulfan Sulfate	0.09 U	0.01 U
4,4'-DDT	0.09 U	0.01 U
Methoxychlor	0.09 U	0.01 U
Endrin Ketone	0.09 U	0.01 U
Toxaphene	0.18 U	0.29 U
Aroclor-1016	0.06 U	0.10 U
Aroclor-1221	0.06 U	0.10 U
Aroclor-1232	0.12 U	0.20 U
Aroclor-1242	0.06 U	0.10 U
Aroclor-1248	0.06 U	0.10 U
Aroclor-1254	0.06 U	0.10 U
Aroclor-1260	0.06 U	0.10 U
Endrin Aldehyde	REJ	REJ
Chlordane	0.06 U	0.10 U

Location:	InfCh–E	EffCh–E	EffCh–E2
Type:	comp	comp	comp
Date:	10/4–5	10/4–5	10/5–6
Time:	0900–0900	0900–0900	1115
Lab Log#:	408235	408244	408473
	(µg/L)	(µg/L)	(µg/L)
Metals ++			
Antimony	30 U	30 U	30 U
Arsenic	5.4 P	5.3 P	3.9 P
Pentavalent			
Trivalent			
Beryllium	1 U	1 U	1 U
Cadmium	0.40 P	0.10 U	0.10 U
Chromium			
Total recoverable	5 U	5 U	5 U
Total			
Hexavalent			
Trivalent			
Copper	44.7	5.9 P	5.8 P
Lead	4.6 P	1.0 U	1.0 U
Mercury (total)	0.228	0.0097 P	0.0105
Nickel	10 U	10 U	10 U
Selenium (total)	2.0 U	2.0 U	2.0 U
Silver	1.7 P	0.50 U	0.50 U
Thallium	2.5 U	2.5 U	2.5 U
Zinc	90.9	7 P	9.8 P

U The analyte was not detected at or above the reported result.
REJ The data are unusable for all purposes.
J The analyte was positively identified. The associated numerical value is an estimate.
E Reported result is an estimate because of the presence of interference.
P The analyte was detected above the instrument detection limit but below the established minimum quantitation limit.

* Insufficient data to develop criteria. Value presented is the LOEL – Lowest Observed Effect Level.

\+ Hardness dependent criteria (310 mg/L used).
++ Metals are total recoverable unless otherwise noted.

InfCh – Chewelah influent
EffCh – Chewelah effluent
E – Ecology sample
grab – grab sample
comp – composite sample

[ ] – detected analyte

Appendix G – BNA Scan Tentatively Identified Compounds (TICs)– Chewelah, October 1994.

TIC data are presented on the laboratory report sheets that follow. Volatile organic acid (VOA) TICs were analyzed for but none were detected. TICs found were for semi-volatile organics (BNAs). Locations corresponding to the Lab Log # (called Sample No. on the laboratory report sheet) and data qualifiers are summarized on this page.

Location:	InfCh–E	EffCh–E
Type:	comp	comp
Date:	10/4–5	10/4–5
Time:	0900–0900	0900–0900
Lab Log #:	408235	408244

InfCh – influent sample
EffCh – effluent sample

comp – composite sample
E – Ecology sample

J – The analyte was positively identified. The associated numerical result is an estimate.
NJ – There is evidence that the analyte is present. The associated numerical result is an estimate.

Project: DOE-230X CHEWELAH CLASS II INSPECTION

Laboratory: Ecology, Manchester

Sample No: 94 408235 Description: INFCH-E

Begin Date: 94/10/05

Tent Ident - B/N/Aci	Water-Total Result	Units
Decanoic Acid, Hexa-	2460NJ*	ug/l
OCTADECANOIC ACID	1960NJ*	ug/l
CHOLESTEROL	155NJ*	ug/l
Oleic acid	2010NJ*	ug/l
ETHANOL, 2-(2-BUTOXYET+	123NJ*	ug/l
Decanoic Acid, Di-	173NJ*	ug/l
Heptadecanoic acid	67.2NJ*	ug/l
Decanoic Acid, Tetra-	257NJ*	ug/l
1-Pentadecanol	63.0NJ*	ug/l
Decanoic Acid, Penta-	66.8NJ*	ug/l
3,6,9,12-TETRAOXAHEXAD+	20.5NJ*	ug/l
UNKNOWN COMPOUND 1	92.0J*	ug/l
UNKNOWN COMPOUND 2	21.5J*	ug/l
UNKNOWN COMPOUND 3	80.6J*	ug/l
UNKNOWN COMPOUND 4	27.1J*	ug/l
UNKNOWN COMPOUND 5	60.3J*	ug/l
UNKNOWN COMPOUND 6	78.6J*	ug/l
UNKNOWN COMPOUND 7	87.1J*	ug/l
UNKNOWN COMPOUND 8	13.4J*	ug/l
UNKNOWN COMPOUND 9	22.6J*	ug/l
UNKNOWN COMPOUND 10	77.8J*	ug/l
UNKNOWN COMPOUND 11	93.4J*	ug/l
UNKNOWN COMPOUND 12	32.6J*	ug/l
3-Cyclohexene-1-methan+	35.4NJ*	ug/l
BENZENE, METHYL(1-METH+	23.8NJ*	ug/l
1-HEXADECANOL	71.4NJ*	ug/l
CYCLOPROPANE, NONYL-	29.7NJ*	ug/l

Project: DOE-230X CHEWELAH CLASS II INSPECTION

Laboratory: Ecology, Manchester

Sample No: 94 408244 Description: EFFCH-E

Begin Date: 94/10/05

Tent Ident - B/N/Aci	Water-Total Result	Units
Hexanoic Acid, 2-Ethyl-	1.1NJ*	ug/l
CYCLOPENTASILOXANE, DE+	0.65NJ*	ug/l
Decanoic Acid, Tetra-	5.1NJ*	ug/l
Decanoic Acid, Penta-	0.64NJ*	ug/l
UNKNOWN HYDROCARBON 1	0.62J*	ug/l
UNKNOWN COMPOUND 1	1.0J*	ug/l
UNKNOWN COMPOUND 2	1.5J*	ug/l
UNKNOWN COMPOUND 3	0.59J*	ug/l
UNKNOWN COMPOUND 4	65.7J*	ug/l
UNKNOWN COMPOUND 5	1.1J*	ug/l
UNKNOWN COMPOUND 6	1.0J*	ug/l
UNKNOWN COMPOUND 7	1.3J*	ug/l
UNKNOWN COMPOUND 8	1.6J*	ug/l
UNKNOWN COMPOUND 9	2.8J*	ug/l
UNKNOWN COMPOUND 10	2.0J*	ug/l
UNKNOWN COMPOUND 11	11.1NJ*	ug/l

Appendix H - Glossary of Terms - Chewelah, October 1994.

BOD_5 - five day biochemical oxygen demand
BOD_U - ultimate biochemical oxygen demand
BNA - base-neutral acid extractables (semivolatile organics)
C - Chewelah
Ch - Chewelah
comp - composite sample
D.O. - dissolved oxygen
est. - estimated concentration
E - Department of Ecology
Eff - effluent
EPA - United States Environmental Protection Agency
F-coli - fecal coliform bacteria
g - gram
grab - grab sample
Inf - influent
Lgn - treatment lagoon
MF - membrane filter
mg - milligram
mg/L - milligram per liter
NPDES - National Pollutant Discharge Elimination System
P - phosphorus
pH - $-\log_{10}$ (hydrogen ion concentration)
QA - quality assurance
QC - quality control
TIC - tentatively identified compound
TNVS - total nonvolatile solids
TNVSS - total nonvolatile suspended solids
TOC - total organic carbon
TS - total solids
TSS - total suspended solids
μg - microgram
VOA - volatile organic analysis