

# **City of Colville Sewage Treatment Plant Class II Inspection**

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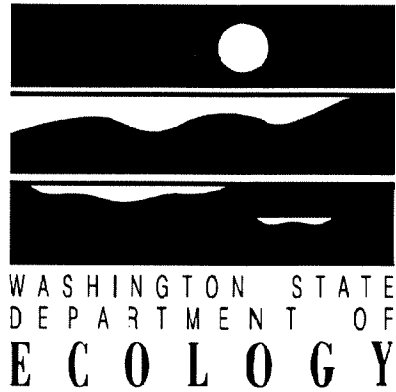
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# **City of Colville Sewage Treatment Plant Class II Inspection**

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by  
Guy Hoyle-Dodson

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

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# Abstract

An announced Class II Inspection was conducted October 3 - 6, 1994 at the Colville City Wastewater Treatment Plant (Colville) in Stevens County, Washington. Analysis of the effluent weir configuration suggests that for most discharge rates drawdown was adequate to determine effluent flows. Colville should improve effluent flow measurements to ensure representative effluent flow. Large to moderate reductions in BOD<sub>5</sub>, TSS, TOC, NH<sub>3</sub>-N, and NO<sub>2</sub>&NO<sub>3</sub>-N occurred across the plant. The effluent ammonia nitrogen and chloride concentrations found at mixing zone boundaries, derived from ambient conditions found during the inspection, exceeded state acute and chronic freshwater quality standards. Colville should investigate techniques for reducing effluent ammonia and chlorine concentrations. Several problems with plant design and operation were identified, and corrective strategies are suggested.

Effluent concentrations and loads of all permitted parameters were below NPDES permit monthly and weekly average limits. The influent BOD<sub>5</sub> load for the October 5 24-hour composite sample exceeded the permit design limit, and Colville should ensure that influent BOD<sub>5</sub> loads conform to permit limits. Ecology and Colville effluent sample results agreed closely, but differences were found in influent results. Colville should conduct 24-hour composite samples for the purpose of NPDES permit reporting. Laboratory influent results also differed, and Colville should review analytic protocols. All whole effluent organic concentrations were within state water quality standards, with the exception of gamma-BHC (Lindane). All metals concentrations were within criteria, with the exception of mercury. Based on inspection conditions lindane and mercury were reduced to below criteria by dilution, but based on projected critical conditions dilution at the chronic boundary would be unlikely to reduce mercury below its water quality criterion. Influent metal concentrations were elevated, and Colville should determine their sources and reduce their discharge to the collection system.

# Summary

## Flow Measurements

Colville uses instantaneous influent flow measurements for the purpose of NPDES permit reporting. The facility does not possess totalizer flow measurement devices. Colville reported instantaneous flows of 0.990 MGD for October 5 and 0.752 MGD for October 6. The effluent weir and discharge control structure was inspected by Ecology during the inspection, and it appeared to be properly configured to obtain accurate flow measurements, at least for flows observed during the inspection. It is possible that higher flows might make accurate measurements unfeasible, but due to the large capacity of the lagoon system large variability in flows would likely not be common.

## Wastewater General Chemistry

The influent Five Day Biochemical Oxygen Demand ( $BOD_5$ ) concentration was above the medium value for typical domestic influent. The Total Organic Carbon (TOC) concentration was less than the weak value for typical influent concentrations. The influent  $BOD_5$ /TOC ratio was higher than typical and may indicate a deficiency of biologically inactive organic carbon. Total Solids (TS) concentration was close to the high value for typical influents and together with the lack of inactive organic carbon suggests the influent contained a higher than typical concentration of non-organic constituents. The strong Total Non-Volatile Solids (TNVS) concentration and the weak Total Non-Volatile Suspended Solids (TNVSS) concentrations indicate that these constituents are non-volatile and dissolved. Influent alkalinity exceeded the strong concentration for typical domestic influent by a factor of two. Influent TNVS concentration is reduced by only 14% across the treatment plant, and it is likely that the dissolved portion is discharged to the Colville River.

$BOD_5$  and TSS showed large reductions across the treatment plant, producing an effluent of generally good quality. Dissolved oxygen concentrations in the lagoons were supersaturated in the first lagoon and became progressively weaker in the remaining lagoons in the series.  $BOD_5$  degradation appears to take place in the first lagoon. Due to inadequately sized aerators, aeration in the last two lagoons appears to have marginal impact on  $BOD_5$  degradation, although settling of  $BOD_5$  constituents undoubtedly does occur.

Moderate nitrification/denitrification occurred across the system, but effluent ammonia concentrations exceeded both acute and chronic state fresh water quality criteria at each

respective mixing zone boundary. Nitrification/denitrification appears to principally take place in the aerated lagoons. Alkalinity reduction across the system is not sufficient to account for the level of nitrification/denitrification observed, and it is likely that nutrient uptake by algae accounts for some of the nitrate & nitrite nitrogen elimination. Higher alkalinity concentrations may have also existed in the influent preceding the inspection or less nitrification/denitrification may have occurred in the past. The second day's effluent composite sample results were similar for most parameters with the exception of ammonia nitrogen. The data suggests that considerable variability in nitrification/denitrification must take place in the system.

Ammonia nitrogen criteria were based upon ambient conditions encountered during the inspection and actual criteria derived from true critical conditions would likely be more stringent. Also, chronic criteria is compared to the average maximum discharge concentrations that might occur over four days once every three years, so the average of the two 24-hour composite samples is only an estimate. It would be expected that the actual maximum excursions would likely be higher than inspection results. The dilution factors were also derived using flow rates measured during the inspection and true 7Q10 flows would undoubtedly produce more restrictive dilutions.

Chlorine concentrations in the effluent exceeded both acute and chronic State water quality criteria. Dilution at the edges of both the acute and chronic boundaries was insufficient to reduce concentrations below criteria.

## **Plant Operation and Design**

Colville's use of influent flow measurements for NPDES permit reporting is questionable, due to the large differences between influent and effluent flows. The use of instantaneous measurements is likely not representative of 24-hour flows. The plant's headworks had several design and maintenance problems. A lack of screening produced accumulations of coarse solids in the headworks that may affect the performance of the influent weir and may produce clogging of the lagoon intake pipe. An additional influent line enters the headworks below the influent weir. Although its flow is intermittent and its contributions are believed to be relatively small, its impact on loading is not accounted for. The first lagoon's intake pipe from the headworks appears to be undersized and during high flows flooding of the headworks has been known to occur. Aerators used in the last two ponds of the series appear to be undersized and not optimally located. Ultimately, their use may not be desirable, since they may interfere with sedimentation in the final lagoons. Chlorine residual concentrations in the effluent were highly inconsistent. Chlorine injection may not be responsive to chlorine demand and excessive amounts of chlorine may be employed. High concentrations of chlorine in the effluent may prove toxic to Colville River biota and may increase the risk of creating chlorinated organics discharged to the Colville River.



## **NPDES Comparisons**

Effluent BOD<sub>5</sub> and TSS concentrations and the corresponding calculated loads were all within the NPDES permit monthly and weekly average limits. The Ecology 24-hour composite sample result and the Colville grab result for effluent BOD<sub>5</sub> met the NPDES permit treatment criteria, which restricts the effluent concentration to no more than 35% of the influent concentration. Effluent pH and fecal coliform densities were also within permit limits. The Ecology influent BOD<sub>5</sub> load result exceeded the permit influent design limit. The influent flow was within design limits. Chlorine concentrations may have been excessive.

## **Split Samples**

Comparisons of Ecology sample results to Colville sample results are only advisory, since the former is a 24-hour composite and the latter is a grab sample. The Ecology lab results showed agreement between Ecology and Colville effluent samples for TSS and BOD<sub>5</sub>. Influent results produced greater differences. It is assumed that the Colville sample is less representative. Comparisons between laboratories showed close agreement for effluent BOD<sub>5</sub> and TSS results. Influent results for the two laboratories showed large difference.

## **Wastewater Organic and Metal Scan Results**

Two VOAs were detected in the effluent, but none exceeded the State or EPA water quality criteria for marine receiving waters. Six BNAs were detected, also at concentrations that did not exceed the state fresh water quality criteria for receiving waters. One pesticide effluent concentration, gamma BHC (Lindane), exceeded water quality criteria, but estimated dilution based on data collected during the inspection projected that concentrations would be reduced to below the criterion. Mercury was detected in the whole effluent at a concentration exceeding the State chronic fresh water quality criteria by a factor of eight (WAC 173-201A). It was projected that the mercury concentration would also be reduced to below the criterion at the edge of each respective dilution zone. Since the dilution factor is contingent on a critical 7Q10 flow and receiving water concentration, the possibility of a more stringent dilution factor exists. Copper and zinc were also detected in the effluent, but neither concentration exceeded the state fresh water quality criteria. Several influent metal concentrations appeared elevated, and may suggest commercial or industrial discharges to the collection system.

# Recommendations

## General Chemistry

- Ammonia nitrogen concentrations in the receiving water should be reduced below state freshwater quality criteria and it is recommended that limits for ammonia be included in the NPDES permit.
- Chlorine concentrations in the receiving water should be reduced below state freshwater quality criteria and it is recommended that limits for chlorine be included in the NPDES permit.
- A dilution zone study should be conducted to determine allowable dilution ratios and plume size.

## Plant Operation and Design

- Colville should install a totalizer flow measurement device to record effluent flows for the purpose of NPDES permit reporting.
- Until an effluent flow totalizer device is installed Colville should employ effluent instantaneous flow measurements for the purpose of NPDES permit reporting.
- Colville should reroute all influent lines to above the weir and include all influent contribution for the purpose of NPDES reporting.
- The headworks and the intake pipe from the headworks to the primary lagoon should be reconfigured to prevent flooding.

## NPDES Comparisons

- Colville should reduce influent BOD<sub>5</sub> loads to meet NPDES influent design limits or reconfigure the treatment system to accommodate higher loads.
- Colville should ensure that chlorine concentrations are maintained at a minimum level required to achieve optimal disinfection.

## **Split Samples**

- Colville should collect 24-hour composite influent samples for the purposes of NPDES reporting and treatment plant evaluation.
- Colville's laboratory should review laboratory protocols to ensure analytical accuracy of influent results.

## **Wastewater Organic and Metal Scans**

- Colville should ensure that effluent concentrations of mercury will not cause the concentration at the edge of the chronic boundary to exceed the state chronic water quality criteria.
- Colville should investigate possible sources of high influent metal concentrations which enter their collection system and control excessive discharges of these metals to the collection system.

# Introduction

A Class II Inspection was conducted at the City of Colville Municipal Wastewater Treatment Plant (WWTP) on October 3 - 6, 1994. Guy Hoyle-Dodson and Steven Golding, environmental engineers for the Washington State Department of Ecology's Toxics Investigations Section, conducted the investigation. Ken Merrill, Ecology Eastern Regional Office permit manager, provided background information. Denis Ferguson, city superintendent, and Ralph Lane Jr., plant lab technician, provided information on facility operation and assistance on site.

The Colville WWTP serves the City of Colville and surrounding area. The plant provides secondary treatment for a population of approximately 5,000, consisting mainly of private residences and light commercial businesses. The plant discharges treated effluent to the Colville River, which is a tributary of the Columbia River with a confluence into the Columbia's Lake Roosevelt reservoir. An NPDES Permit (No. WA-002261-6) was issued April 30, 1990 with an expiration date of April 30, 1995.

The Class II inspection was initiated by the Department of Ecology to evaluate permit compliance and to provide information about facility loading and performance. A portion of the data will be incorporated into a study of the Total Maximum Daily Load (TMDL) of the Colville River being conducted by the Ecology's Watershed Assessments Section (WAS). Specific objectives of the inspection included:

1. Assess NPDES permit compliance by a determination of influent and effluent permit parameter loads and concentrations.
2. Evaluate plant performance by analysis of plant configuration in conjunction with parameter reductions across the plant.
3. Assess wastewater toxicity by comparing priority pollutant organics and metals scan results to State water quality criteria.
4. Assess the Colville self-monitoring program through sample splits and independent laboratory analyses.
5. Generate point source data for a receiving water basin TMDL, and to make recommendations for Waste Load Allocations (WLA).

## Setting

The Colville wastewater treatment facility is located in Stevens County, Washington, southwest of the City of Colville on the Colville River (*Figure 1*). The facility uses a conventional and mechanically aerated lagoon treatment system followed by chlorine disinfection. The system consists of: headworks with a rectangular weir, a facultative lagoon, two aerated lagoons, a chlorine contact pond, a v-notched effluent weir, and an effluent ditch discharging to the Colville River. (*Figure 2* ).

A continuous flow of raw wastewater enters the headworks above the weir via a single line. A second smaller line from a nearby trailer park enters just downstream of the weir and contributes intermittent flow to the treatment system. Only the instantaneous flow rate is measured at the influent.

The plant's three lagoons are operated in series. The first and largest of the three lagoons is intended to provide primary sedimentation and some facultative treatment. The last two lagoons each has a single 5 HP aerator mounted on one bank. These lagoons are intended to provide aerated treatment near the aerators and secondary sedimentation in the more quiescent portions of the basin. A fourth, much smaller pond acts as a chlorine contact chamber. Discharge from the chlorine contact ponds is through a control structure with a V-notched weir. Only instantaneous effluent flow is measured. Discharge is via an open channel to the Colville River.

## Procedure

Ecology collected both grab and composite samples at the WWTP. Composite samples were collected from wastewater at two stations (*Figure 2 & Appendix A*): the headworks just upstream of the influent weir and the disinfected effluent just above the final weir. The influent strainer was suspended from a bamboo pole spanning the pool above the weir and was submerged just below the surface of the pool. The strainer was positioned to prevent entrainment of sediments from the bottom of the pool. Separate composite samples of the final effluent were collected in two consecutive 24-hour periods (10/4-5/94 & 10/5-6/94). All composite samples were collected using Ecology ISCO composite samplers with equal volumes of the sample collected every 30 minutes over a 24-hour period. One transfer blank was collected on October 3 by running deionized (DI) water through the effluent compositor prior to sampling.

Grab samples were collected at the same locations as the composite stations, both in the morning and the afternoon of October 4. Additional grab samples were taken October 5 from each of the three lagoons, specifically for dissolved oxygen, conductivity, and field parameters. A final effluent grab was taken October 6 for fecal coliform.

Colville personnel collected grab samples at the influent headworks and the final effluent weir. The Colville influent sample was taken October 5 and the effluent sample October 6. The Colville grab sample locations were similar to the location of Ecology's composite samplers.

Ecology composite samples and Colville grab samples were split for analysis by both Ecology and Colville laboratories. Parameters analyzed, samples collected, and the sampling schedule appear in Appendix B.

Samples for Ecology analysis were put in appropriate containers and preserved as necessary. Samples were packed in ice for delivery to the Ecology Manchester Laboratory. Due to holding time limitations BOD<sub>5</sub>, BOD ultimate, ortho-phosphate, fecal coliform, and chlorophyll were shipped by air freight the day of collection. All other samples were held on ice and delivered to Ecology headquarters for laboratory pickup at the end of the inspection. Analytical procedures and laboratories performing the analyses are summarized in Appendix C. Sampling quality assurance included priority pollutant cleaning of sampling equipment (*Appendix D*). Specific QA/QC discussions are also noted in Appendix D.

## **Results and Discussion**

### **Flow Measurements**

Colville determined plant flows for NPDES permit reporting purposes by instantaneous flow measurements at the influent weir. At the time of the inspection Colville did not have a totalizing flow meter. During the month of the inspection Colville reporting frequency was usually five flow readings a week, all taken during weekdays. Daily instantaneous influent flows reported by Colville were 0.990 MGD for October 5 and 0.752 MGD for October 6. Due to the inherent variability of the influent flows, Ecology did not attempt to replicate Colville's measurements.

To assess their suitability for flow measurements, Ecology visually inspected influent and effluent weirs and determined them to be properly configured. The minimum distance from the edge of the control structure to the crest of the triangular effluent weir (20 inches) was close to three times the depth of the maximum head (6.5 inches). For flows

observed during the inspection, this distance should be sufficient to obtain accurate head depth readings (ISCO, 1989). During periods of higher flow, accurate effluent flow measurements may not be obtainable, but the large volumes of the lagoon system would tend to mitigate effluent flow variability. If necessary Colville should reconfigure the effluent weir to accommodate higher flows.

Relative percent difference between Ecology's instantaneous effluent flow measurements (0.346 MGD) and Colville's daily effluent reports (0.432 MGD) for October 3, 1994 was greater than 22%. Ecology's measurement was taken within ten minutes of Colville's measurement and it is assumed they should reflect approximately the same flow rates. It is recommended that Colville improve measurement of head depth to obtain representative effluent instantaneous flow rates.

## Wastewater General Chemistry

### Influent

General chemistry results are presented in Table 1. The Five Day Biochemical Oxygen Demand (BOD<sub>5</sub>) influent concentration (257 mg/L) was slightly higher than the typical medium concentration for untreated domestic wastewater (*Metcalf & Eddy, 1991*). The Total Organic Carbon (TOC) influent concentration (69.4 mg/L) was less than the typical weak concentration and BOD<sub>5</sub>/TOC ratio (3.70) was more than two times greater than typical highest value (*Metcalf & Eddy, 1991*). BOD<sub>5</sub> measures biologically active organic carbon, while TOC analysis measures biologically inactive as well as biologically active organic carbon (*APHA, 1992*). The higher ratio indicates a relatively smaller biologically inactive organic carbon load than would typically be expected for domestic sanitary sewage.

Influent total solids (TS - 992 mg/L) was more than 80% of the typical highest concentration and the Total Non-Volatile Solids (TNVS - 617mg/L) was greater than the highest combined concentrations of both dissolved and suspended TNVS found in typical domestic influent (*Metcalf & Eddy, 1991*). The high TS and low biologically inactive carbon concentration indicates that the influent contained a larger proportion of inorganic constituents than typical. The corresponding strong TNVS concentration in the influent suggests that these constituents are non-volatile solids, and the relatively weak Total Non-Volatile Suspended Solids (TNVSS) concentration (77 mg/L) indicates that the greatest part is dissolved. Approximately 86% of the influent TNVS concentration is discharged to the Colville River (Table 2).

Alkalinity concentration (1200 mg/L CaCO<sub>3</sub>) exceeded the strong concentration for typical domestic influent by a factor of two, and likely accounts for a portion of the

dissolved solid. The moderate pH (7.98) would support bicarbonate as the major component of alkalinity (*McCarty & Sawyer, 1967*), although the salts of other weak inorganic acids may also contribute.

## Effluent

The effluent quality from the treatment system was generally good. Ecology results from the inspection's first day of composite sampling showed a BOD<sub>5</sub> reduction from 257 mg/L in the influent to 7 mg/L in the effluent (97% removal) (*Tables 1&2*). Total suspended solids (TSS) decreased from 305 mg/L to 5 mg/L with a removal efficiency of approximately 98% across the system. Removal efficiencies across the plant for TOC and total phosphorous were 73% and 25%. Ammonia nitrogen decreased from 13.2 mg/L to 7.95 mg/L, a decrease of 40%. Nitrate & nitrite showed only moderate change.

Dissolve oxygen (DO) collected from the lagoon surface was 32.5 mg/L, 7.4 mg/L, and 2 mg/L for lagoons #1, #2, and #3 respectively. Surface DO concentration in lagoon #1 was supersaturated (*Metcalf & Eddy, 1991*), and this indicates that the first lagoon provided an excellent aerobic treatment environment. This high oxygen concentration in the first lagoon was probably due to algae growth, an assumption supported by the elevated pH (8.85). The DO concentrations in the remaining lagoons in the series became progressively lower than saturation. Calculations project that mechanical aeration in the last two lagoons of the series is inadequate to maintain viable aerobic microorganism populations necessary for BOD<sub>5</sub> degradation. It is believed that the first lagoon probably provides the majority of BOD<sub>5</sub> degradation across the system, and acts as an aerobic or a facultative (aerobic-anaerobic) stabilization pond. It is likely that the final two aerated lagoons contributed to the settling of BOD<sub>5</sub> constituents.

The nutrient data suggests that nitrification-denitrification was taking place, although nutrient uptake by the algae must also account for some of the near complete absence of nitrate & nitrite nitrogen in the effluent. The remaining nitrate & nitrite nitrogen would have been assimilated by anoxic denitrifying microorganisms, evolving nitrogen gas which then escaped to the atmosphere. Since elevated DO concentrations will inhibit the enzyme system needed for denitrification (*Metcalf & Eddy, 1991*), it is likely the denitrification occurs in the aerated lagoons, although some may have occurred in the lower depths of the first lagoon. Alkalinity displayed less than 1% reduction across the plant, and this reduction in alkalinity was insufficient to account for the estimated mass balance requirements of the nitrification-denitrification reactions. It is possible that prior to the inspection the influent contributed even greater concentrations of alkalinity to the lagoon system than observed during the inspection, or that previous nitrification/denitrification in the lagoons may have been substantially lower.

The second day of composite sampling produced similar effluent results for most parameters with the exception of ammonia nitrogen. The second day of sampling



produced an effluent ammonia concentration that was 30% greater than the first day's results, with a comparison reduction from the previous day's influent ammonia nitrogen concentration of less than 22%. This indicates some variability in nitrification/denitrification over fairly short periods of time. Since the microorganisms responsible for nitrification-denitrification are sensitive to changes in temperature, pH, and several other factors, ammonia nitrogen discharge concentrations in the effluent may at times vary from inspection results.

Based upon ambient conditions found in the Colville River at river mile 15.9 during the inspection (Temp=10°, pH= 8.5, & NH<sub>3</sub>-N=0.0 - *Pelletier, 1995*) an acute and chronic total ammonia criteria of 1.93 mg/L and 0.439 mg/L respectively were calculated (*EPA, 1992*). The EPA intended these criteria to be based on critical conditions of temperature and pH in the receiving water at the edge of respective dilution zone boundaries. Because the criteria established during the inspection only apply to conditions at the time of inspection, the actual criteria would likely be more stringent. The criteria refer to maximum excursions of a one-hour average concentration for the acute criteria and a four-day average concentration for the chronic criteria which may occur once every three years on the average. Since the effluent ammonia concentration derived from the inspection is an average of only two 24-hour composites, for the chronic comparison it was assumed that discharge concentrations remain fairly consistent and are representative of a four-day period. It is probable that the actual maximum four-day and one-hour average ammonia nitrogen discharge concentrations found over a three-year period would be higher than those discovered during the inspection.

A mass balance incorporating Washington State Water Quality Standards mixing zone specifications was calculated to project maximum end-of-pipe concentrations which would not produce violations of total ammonia criteria at the acute and chronic dilution zone boundaries as outlined in the Ecology Permit Writers Manual (*Ecology, 1994*). Based upon river flow (50.35 cfs) and plant discharge rates taken during the inspection, and assuming that 2.5% and 25% of river flow would produce the most restrictive dilution at the edge of the acute and chronic dilution zones, the maximum allowable whole effluent ammonia nitrogen concentration was 3.50 mg/L and 3.96 mg/L for the acute and chronic criteria respectively. The average two-day effluent ammonia nitrogen concentrations (9.18 mg/L) determined during the inspection exceeded the former by a factor of 2.6 and the latter by a factor of 2.3. Since the chronic dilution is to be based on a 7Q10 (maximum 7-day average every 10 years), variations in the Colville River's flow rate may require even more conservative estimates of allowable dilution. Also since plume size must be held to no more than 25% of the river's width it is uncertain whether a dilution zone would be permitted at all. It is recommended that Colville conduct a dilution zone study to resolve this issue and determine acceptable dilution ratios and plume sizes. Colville should also investigate techniques for improving nitrification/denitrification within their treatment system. Since ammonia nitrogen is not presently limited by permit, it is recommended that ammonia nitrogen limits be included in future permits.

Chlorine residual in one effluent grab sample (1.5 mg/L) exceeded both the acute and chronic water quality criteria, the former by a factor of 79 and the latter by a factor of 136. Composite samples, where it is anticipated that chlorine concentrations would be reduced due to volatilization, also displayed concentrations well above criteria. The dilution factors at the edge of the acute and chronic dilution zones were 3.4 and 11 respectively. Chlorine concentration exceeded standards by a factor of 40 at the edge of the acute zone and by a factor greater than 12 at the edge of the chronic zone. Colville should ensure that chlorine concentrations discharged to the receiving water do not exceed criteria. It is recommended that a specific chlorine limit be included in the permit update.

## **Plant Operation, Design, and Reporting**

The possibility of inaccurate flow measurements by the facility is emphasized by the difference between Ecology and Colville effluent measurements and the large deviation between the influent and effluent flows recorded during the inspection. The October 3 influent flow reported by Colville exceeded the effluent flow recorded by Ecology for the same date by more than a factor of two. Discharge Monitoring Reports (DMRs) submitted by the facility also show large differences between influent and effluent instantaneous flow rates. The use of instantaneous measurements to determine compliance with NPDES load limits are also questionable, since there is typically considerable variation in influent flows rates throughout the day. It is suggested that Colville install an effluent totalizer flow measurement device to more accurately determine facility effluent flow rates. In the interim, Colville should use composite effluent flow measurements as the basis for permit compliance monitoring.

Another area of concern is the plant's headworks. The influent enters the headworks without screening, which allows coarse solids to accumulate in various sections of the headworks. Large solids affect influent flow measurements by obstructing flow through the influent weir, changing the effective weir configuration. Without regular cleaning these solids could potentially clog the lagoon intake pipe, contributing to flooding of the headworks. These solids may also interfere with compliance monitoring by partially clogging compositor intake strainers.

A separate influent line from a holding tank serving an adjacent trailer court entered the headworks downstream of the influent weir. Although the contribution from this line was intermittent and volumes small compared to the main line, Colville does not include this contribution to either influent sample concentrations or to hydraulic load. This influent line should be routed upstream of the influent weir.

The lagoon intake pipe also appeared to be undersized, since it was related by the city superintendent that during heavy precipitation the headworks has been known to flood (Ferguson, 1994). Such flooding may allow contamination of groundwater, and could conceivably spread to adjacent property posing a health risk. Immediate steps should be taken to prevent future flooding.

Aerators in the final two lagoons are undersized for wastewater volumes and influent BOD<sub>5</sub> loads. Based on an analysis of surface aerator power requirements for the three-lagoon system, calculations indicate that the two combined 5 Hp aerators in lagoons #2 and #3 were from 13% to 37% of the theoretical requirements. The location of the aerator on the perimeter of the lagoons also appears to inhibit thorough aeration. If aeration is considered desirable then larger horsepower aerators and a strategic location will be required if it is to be effective. For any aeration of the final lagoons, provisions for an acquiescent zone to allow sediment settling should also be included.

The use of aeration in the final two lagoons in the series may be of questionable value, since typically the first lagoon in a series provides optimal biological treatment, while succeeding lagoons provide sedimentation and polishing. In fact, aeration may act to impede sedimentation. It is possible that the aeration is superfluous. It is recommended that Colville investigate whether aeration in the final lagoons is needed to maintain current plant performance.

Chlorine residual in the effluent was highly irregular, ranging from less than 0.1 mg/L to 1.5 mg/L in an eight-hour period with coinciding swings in fecal coliform densities (Table 1). This suggests that chlorine injection was not responsive to explicit measures of chlorine demand. Discharges of high chlorine concentrations may produce toxic conditions in the Colville River. Also, such wide swings in chlorine additions may reduce the effectiveness of disinfection or create the potential for the formation of chlorinated organic compounds. Colville should ensure proper chlorine concentrations in both the contact chamber and in the effluent.

## **NPDES Permit Comparisons**

Table 3 compares inspection results to NPDES permit limits. Effluent 24-hour composite BOD<sub>5</sub> and TSS concentrations collected October 5 and 6 were all well within NPDES permit monthly and weekly average limits. Calculated effluent BOD<sub>5</sub> loads from sample results of 58 lb/day and 25 lbs/day by Ecology and 31 lb/day by Colville were within NPDES permit monthly and weekly average effluent load limits. Effluent TSS loads from sample results of 42 lbs/day and 31 lbs/day by Ecology and 22 lbs/day by Colville were also within permit load limits. The Ecology and Colville effluent sample results were less than 35% of the influent concentration as required by the permit. The calculated influent

BOD<sub>5</sub> load for the Ecology composite sample result of 2,141 lbs/day exceeded the influent design criteria by 78%. Colville should reduce influent BOD<sub>5</sub> loads to conform to NPDES design limits, or reconfigure the treatment system to accommodate higher influent BOD<sub>5</sub> loads.

The reported influent instantaneous flows of 0.990 MGD and 0.752 were well below the NPDES permit design limit of 1.2 MGD (Table 3). Effluent pH results were within the range limits stipulated by the permit. Both Ecology effluent fecal coliform grab sample results (120 colonies/100ml and 1 colony/100ml) were below the monthly and weekly average limits. The total chlorine residual concentration in several effluent grab and composite samples (1.5 mg/L, 0.6 mg/L, and 1.0 mg/L) appeared to be elevated, and it is advised that Colville evaluate the amount actually required to maintain fecal coliform below monthly and weekly limits.

## **Split Samples**

### **Sample Comparisons**

Comparisons between Ecology and Colville sample results were of limited value, since Ecology samples were 24-hour composites and Colville samples were single grabs. It is assumed for effluent samples that flows and concentrations were relatively uniform. A Wilcoxon analysis of the two Ecology effluent composite samples collected on October 5 and 6 found no significant difference among 13 sets of paired data at a critical level of 0.05. This analysis indicates the absence of bias between the two sample results. The geometric mean of the relative percent differences among ten pairs of data for the two days was less than the geometric mean of the interlaboratory precision determined by the EPA (EPA, 1983) for those same parameters. This supports a relatively consistent effluent discharge composition. One notable exception was ammonia nitrogen. Uniform influent characteristics between the two days would not be as likely.

Ecology laboratory results for effluent samples collected by Ecology and Colville were close (*Table 4*), with a relative percent difference (RPD) between samples of 18% for TSS and 22% for BOD<sub>5</sub>. A Wilcoxon nonparametric signed ranks test across all paired parameters found no significant difference between effluent sample results at a critical level of 0.05, indicating an absence of bias. Results for Ecology and Colville influent samples were more divergent, with an RPD of 47% for BOD<sub>5</sub> and 43% for TSS. It is assumed that the single Colville grab sample was less representative than the Ecology 24-hour composite sample, and it is recommended that Colville collect 24-hour composites for the purpose of NPDES permit reporting.

## Laboratory Comparisons

Agreement between Ecology and Colville analytical results for the effluent were generally good, but less so for influent results (*Table 5*). Relative percent differences between Ecology and Colville analyses for effluent TSS (5 mg/L and 4 mg/L) and BOD<sub>5</sub> (4 mg/L and 4.95 mg/L) were 22% and 21% respectively. Influent analyses results produced RPDs of 34% for BOD<sub>5</sub> and 48% for TSS. It is recommended that the Colville laboratory review analytical protocols. If needed, the Ecology Laboratory Accreditation Section can be contacted for assistance.

## Wastewater Organic and Metal Scans

Wastewater was analyzed for volatile compounds (VOA), semi-volatile compounds (BNA), pesticides/PCB, and metals. Table 5 summarizes the concentrations of compounds detected during the inspection. Appendix E contains the results of all targeted compounds, including detection limits. Tentatively identified compounds are presented in Appendix F.

Two VOAs, chloroform (0.94 µg/L) and carbon disulfide (1.6 µg/L), were detected in the effluent; but neither exceeded the state freshwater quality criteria (*Table 5*). Six BNA were detected in the effluent, also at concentrations less than the state freshwater quality criteria. One pesticide, gamma-BHC (Lindane), was detected at 0.09 µg/L, and its whole effluent concentration exceeded the state chronic freshwater quality criteria (0.08 µg/L) (*WAC 173-201A*). It is estimated that, if a dilution zone is permitted, dilution at the edge of the chronic boundary would reduce the concentration below state criteria.

The estimated effluent mercury concentration (0.102 µg/L) exceeded the state chronic freshwater quality standards (0.012 µg/L) by greater than a factor of eight. An estimated chronic dilution factor greater than nine was calculated using 25% of the receiving water two-day flow (*Ecology, 1994*), ambient conditions (*Pelletier, 1995*), and plant discharge recorded on October 5 during the inspection. The estimated chronic boundary mercury concentration (0.011 µg/L) just meets the criteria; but it should be noted that this concentration was calculated at inspection conditions, not critical conditions. Freshwater dilution factors are required to be the most stringent that can result from mixing at the boundary of the assigned mixing zone at critical condition. It is highly likely that the actual dilution factor would be less than the one derived using inspection data. Copper and zinc were also detected, but these concentrations remained well within state criteria. For zinc an accompanying transfer blank indicates the sample may have been contaminated in the field.

Influent metal concentrations also appeared elevated with arsenic at 1.8 µg/L, lead at 20.2 µg/L, mercury at 1.82 µg/L, and silver at 7.01 µg/L. The nature and concentrations of these contaminants suggest that they may originate from commercial or industrial sources. It is recommended that Colville investigate the source of these contributions to its collection system, and if feasible control their discharge. Particular caution may be necessary in the disposal of accumulated sludge that is dredged from lagoon bottoms. The sludge should be characterized prior to disposal to evaluate its toxicity.

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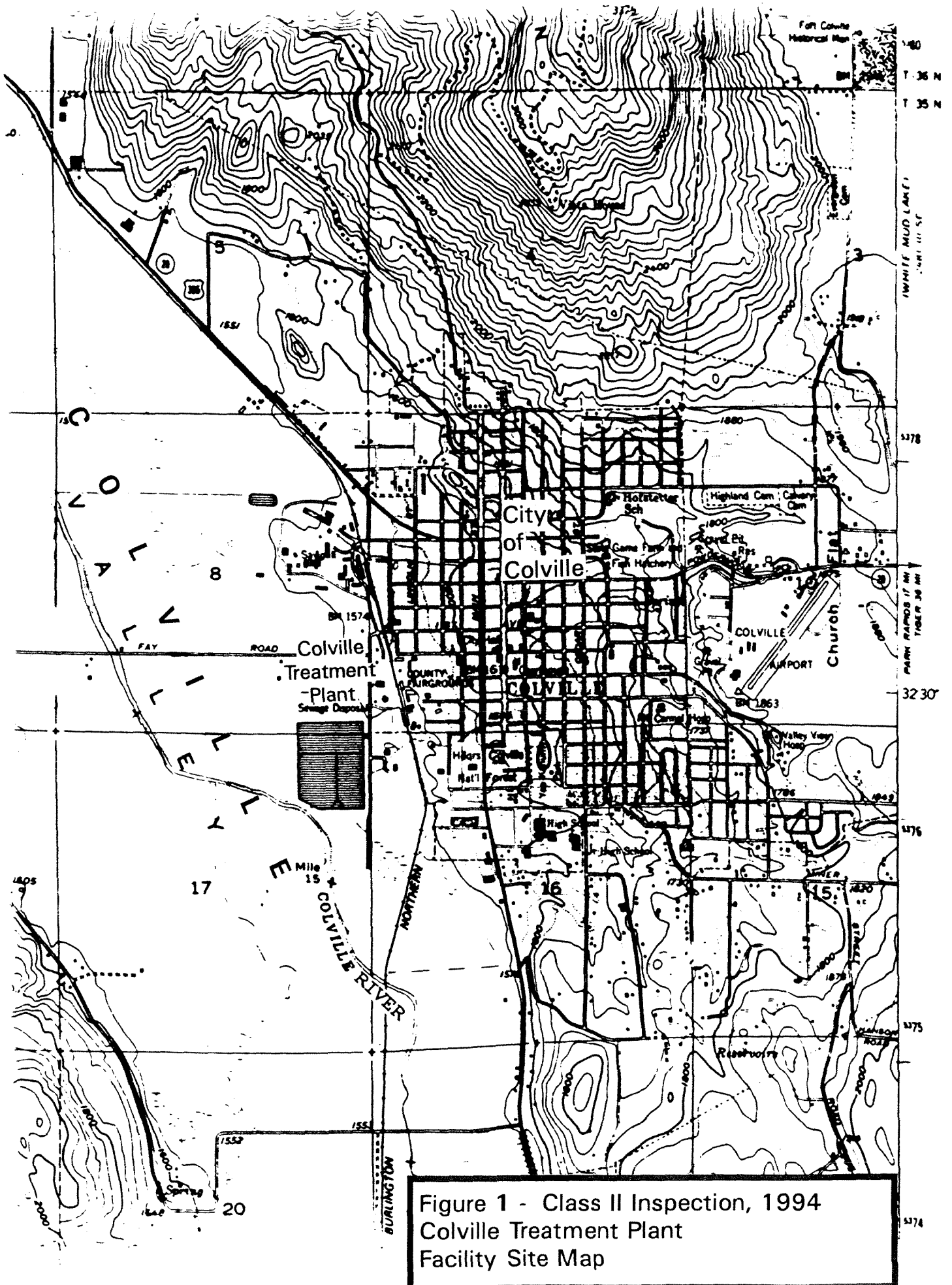


Figure 1 - Class II Inspection, 1994  
Colville Treatment Plant  
Facility Site Map



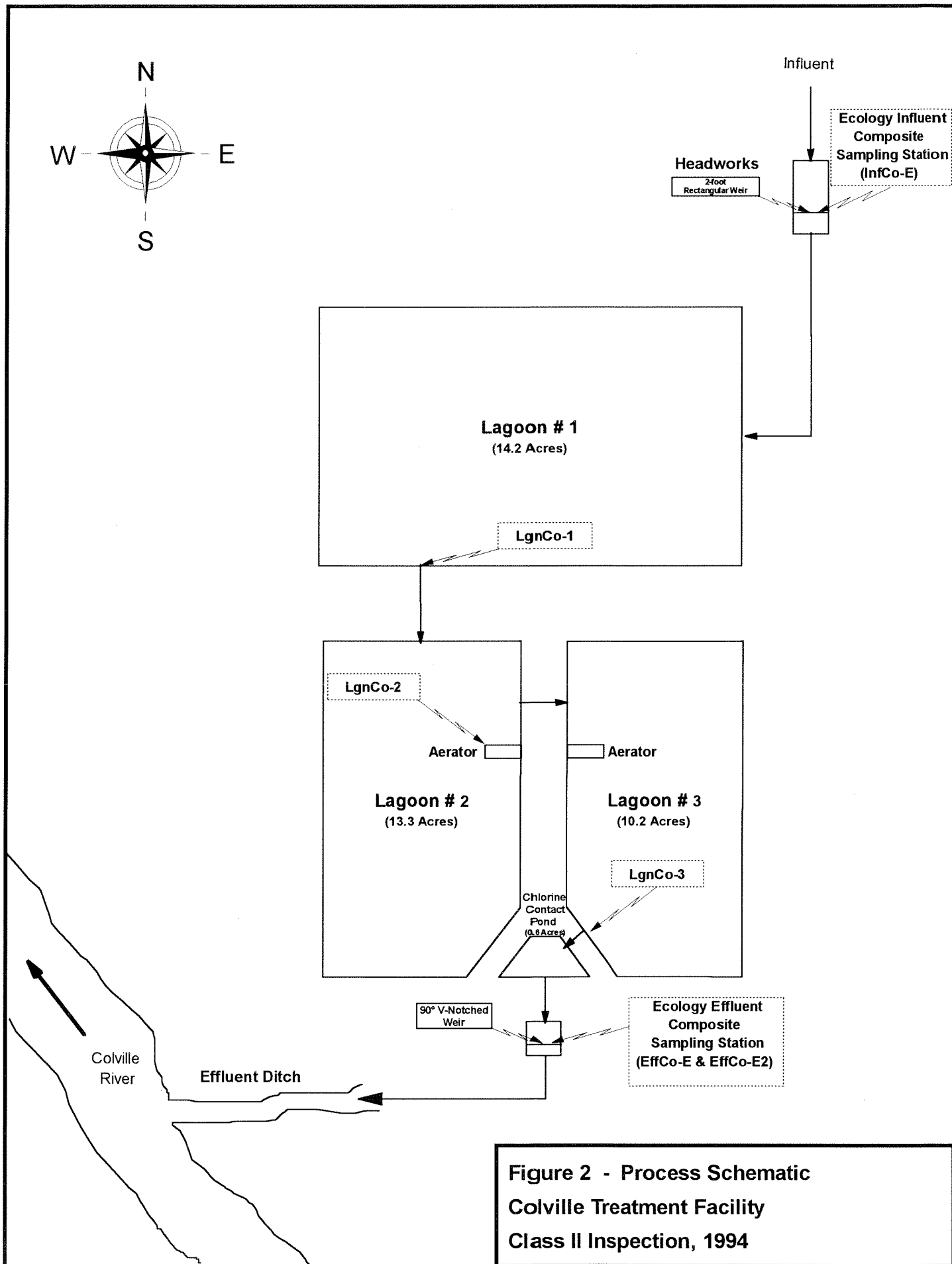


Figure 2 - Process Schematic  
Colville Treatment Facility  
Class II Inspection, 1994

Table 1 - General Chemistry Results - City of Colville, October 1994.

Page 1

Parameter	Location:	InfCo-1	InfCo-2	InfCo-E	InfCo-C	LgnCo-1	LgnCo-2	LgnCo-3
Type:		grab	grab	comp	grab	grab	grab	grab
Date:		10/4	10/4	10/4-5	10/6	10/5	10/5	10/5
Time:		0820	1540	@	0930	1529	1515	1500
Lab Log #:		408250	408251	408255	408256	408257	408258	408259
<b>GENERAL CHEMISTRY</b>								
Conductivity (umhos/cm)		1290	1040	1200	1140	1160	1150	1190
Alkalinity (mg/L CaCO <sub>3</sub> )				391				
Hardness (mg/L CaCO <sub>3</sub> )				345 E				
<b>SOLIDS</b>								
TS (mg/L)				992				
TNVS (mg/L)				617				
TSS (mg/L)		288	150	305	198			
TNVSS (mg/L)				77				
<b>OXYGEN DEMAND PARAMETERS</b>								
BOD <sub>5</sub> (mg/L)				257	160			
BOD Ultimate (mg/L)								
TOC (water mg/L)				69.4				
<b>NUTRIENTS</b>								
Total Kjeldahl Nitrogen (TKN) (mg/L)								
NH <sub>3</sub> -N (mg/L)				13.2				
NO <sub>2</sub> +NO <sub>3</sub> -N (mg/L)				0.232				
Total-P (mg/L)				4				
Ortho-PO <sub>4</sub> -P (mg/L)								
<b>MISCELLANEOUS</b>								
F-Coliform MF (#/100mL)		3,100,000 J	1,800,000					
Chlorophyll (µg/L)								
<b>FIELD OBSERVATIONS</b>								
Temperature (°C)		19.3	20			18.5	16.6	15.9
Temp-cooled (°C)				4	10.4			
pH		8.04	7.8	7.98	7.88	8.85	8.14	7.64
Conductivity (umhos/cm)		1200	1031	1289	1186	1108	1163	1221
Chlorine (mg/L)								<0.1
D.O. (mg/L)						32.5	7.4	2

InfCo Influent sample from Colville facility  
LgnCo Lagoon sample from Colville facility  
E Ecology took sample  
C Colville took sample  
J The analyte was positively identified. The associated numerical result is an estimate.  
E The reported result is an estimate because of the presence of interference.

grab sample  
composite sample  
24-hour composite sampling period:  
Approximately 08:00-08:00

Table 1 - General Chemistry Results - City of Colville, October 1994.

Page 2

Parameter II	Location:	EffCo-1	EffCo-2	EffCo-E	EffCo-E2	EffCo-C	EffCo-6
Type:	grab	grab	grab	comp	comp	grab	grab
Date:	10/4	10/4	10/4	10/4-5	10/5-6	10/6	10/6
Time:	0800	1405	@	@	@	1024	0850
Lab Log #:	408260	408261	408264	408470	408265	408272	
<b>GENERAL CHEMISTRY</b>							
Conductivity (umhos/cm)	1190	1190	1190	1190	1190	1200	
Alkalinity (mg/L CaCO <sub>3</sub> )			388	386			
Hardness (mg/L CaCO <sub>3</sub> )			354	361			
<b>SOLIDS</b>							
TS (mg/L)			718				
TNVS (mg/L)			528				
TSS (mg/L)	5	6	5	5	6		
TNVS (mg/L)			2				
<b>OXYGEN DEMAND PARAMETERS</b>							
BOD <sub>5</sub> (mg/L)	7	7	7	4	U	5	
BOD Ultimate (mg/L)			18.6	16.8			
TOC (water mg/L)			18.8	18.5			
<b>NUTRIENTS</b>							
Total Kjeldahl Nitrogen (TKN) (mg/L)			12	14			
NH <sub>3</sub> -N (mg/L)			7.95	10.4		9.79	
NO <sub>2</sub> +NO <sub>3</sub> -N (mg/L)			0.06	0.039		0.031	
Total-P (mg/L)			3.02	3.23		3.29	
Ortho-P (mg/L)			2.96	2.98			
<b>MISCELLANEOUS</b>							
F-Coliform MF (#/100mL)	120	J	1				2
Chlorophyll (µg/L)			10.5	14.4			
<b>FIELD OBSERVATIONS</b>							
Temperature (°C)	8.5		14.9				
Temp-cooled (°C)			2.6	2.5		12.6	
pH	7.82		7.64	8.02	7.9	7.85	
Conductivity (umhos/cm)	1258		1247	1237	1300	1259	
Chlorine (mg/L)	<0.1		1.5	0.6	1		<0.1
D.O. (mg/L)	1.4		2.25				1.4
EffCo	Effluent sample from the Colville facility						
E	Ecology took sample						grab sample
C	Colville took sample						composite sample
J	The analyte was positively identified. The associated numerical result is an estimate.						24-hour composited sampling period:
U	The analyte was not detected at or above the reported result.						Approximately 08:00-08:00

Table 2 - General Chemistry Percent Change Results - City of Colville, October 1994.

Parameter	Location:	InfCo-E	EffCo-E	Ecology Percent Decrease In Concentration Across Treatment System For Concurrent Influent and Effluent *	EffCo-E2	Ecology Percent Decrease In Concentration Across Treatment System Averaged 10/4-5 & 10/5-6 Effluent Composites **	InfCo-C	EffCo-C	Colville Percent Decrease In Concentration Across Treatment System For Concurrent Influent and Effluent *
<b>GENERAL CHEMISTRY</b>									
Conductivity (umhos/cm)	Type: comp	10/4-5	10/4-5	1%	comp 10/5-6	0.8%	grab 10/6	grab 10/6	-5%
Alkalinity (mg/L CaCO <sub>3</sub> )	Date: 10/4-5	391	388	1%	386	1%	0930	1024	
Hardness (mg/L CaCO <sub>3</sub> )	Time: @	345	354	-3%	361	-4%	408256	408265	
<b>SOLIDS</b>									
TS (mg/L)	Lab Log #: 408255	992	718	28%	408470				
TNVS (mg/L)	###	617	528	14%	1190		1140	1200	
TSS (mg/L)		303	5	98%					
TNVSS (mg/L)		77	2	97%	5		198	6	97%
<b>OXYGEN DEMAND PARAMETERS</b>									
BOD <sub>5</sub> (mg/L)		257	7	97%	4		160	5	97%
TOC (water mg/L)		69	18.8	73%	18.5				
<b>NUTRIENTS</b>									
NH <sub>3</sub> -N (mg/L)		13	7.95	40%	10.4	28%		9.79	26% #
NO <sub>2</sub> +NO <sub>3</sub> -N (mg/L)		0.2	0.06	74%	0.039	80%		0.031	87% #
Total-P (mg/L)		4.00	3.02	25%	3.23	21%		3.29	18% #
<b>FIELD OBSERVATIONS</b>									
Temperature (°C)									
Conductivity (umhos/cm)	###		1237	4%	1300	1%	1186	1259	-6%

\* Influent and effluent composite samples collected during the same 24-hour period. Different Inf & Eff flow rates.

\*\* Average of composite effluent samples collected 10/4-5 & 10/5-6.

InfCo Influent sample from Colville facility

EffCo Effluent sample from the Colville facility

E Ecology took sample

C Colville took sample

comp Composite sample

# Ecology Influent sample used in calculation

E The reported result is an estimate because of the presence of interference.

U The analyte was not detected at or above the reported result.

@ 24-hour composite sampling period:

Approximately 08:00-08:00

grab Grab sample

**Table 3 - NPDES Limits Inspection Results - City of Colville, 1994**

Parameter		NPDES Permit Limits	Inspection Data						
			Ecology Composite			STP Composite		Grab Samples	
	Monthly Average		InfCo-E comp 10/4-5 @ 488255	EffCo-E comp 10/4-5 @ 488264	EffCo-E2 comp 10/5-6 @ 488270	InfCo-C grab 10/06 0930 488266	EffCo-C grab 10/06 1048 488265	EffCo-1 grab 10/04 0800 1405 408260	EffCo-2 grab 10/04 10/04 1405 408261
	Weekly Average								

**Table 4 - Split Sample Result Comparison - City of Colville, 1994**

Parameter	Location:	InfCo-E	InfCo-C	EffCo-E	EffCo-E2	EffCo-C
	Type:	comp	grab	comp	comp	grab
	Date:	10/4-5	10/6	10/4-5	10/5-6	10/6
	Time:	@	0930	@	@	1024
	Lab Log #:	408255	408256	408264	408470	408265
General Chemistry						
	Laboratory					
BOD5 (mg/L)	Ecology Colville	257 182.5	160	7	4 4.95	5
BOD Ultimate (mg/L)	Ecology			18.6	16.6	
Total Organic Carbon (mg/L)	Ecology	69.4		18.8	18.5	
Total Suspended Solids (mg/L)	Ecology Colville	305 495	198	5	5 4	6
Total Kjeldahl Nitrogen (mg/L)	Ecology			12	14	
Ammonia Nitrogen (mg/L)	Ecology	13.2		7.95	10.4	9.79
NO2 + NO3-N Nitrogen (mg/L)	Ecology	0.232		0.06	0.039	0.031
Total Phosphorus (mg/L)	Ecology	4		3.02	3.23	3.29
Ortho-PO4-P (mg/L)	Ecology			2.96	2.98	
pH	Ecology		7.88	8.02	7.90	7.85
Metals						
Copper ( µg/L)	Ecology			6.6 P	6 P	
Mercury ( µg/L)	Ecology			0.102 J	0.009 J	
Zinc ( µg/L)	Ecology			6.1 P	5.9 P	
InfCo	Influent sample from Colville facility			grab	grab sample	
EffCo	Effluent sample from Colville facility			comp	composite sample	
E	Ecology took sample			@	24-hour composit sampling period:	
C	Colville took sample				Approximately 08:00-08:00	
J	The analyte was positively identified. The associated numerical result is an estimate.					
P	The analyte was detected above the instrument detection limit, but below the established minimum quantitation limit.					

Table 5 - Detected VOA, BNA, Pesticide/PCB and Metals Scan Results - Colville, 1994.

Table 5 - Detected VOA, BNA, Pesticide/PCB and Metals Scan Results - Colville, 1994.									
Parameter		Location:		EffCo-1		State Water			
Type:		grab		10/4		Quality Criteria Summary			
Date:		10/4		0800		Acute			
Time:		0800		408260		Fresh			
Lab Log#:						Chronic			
						Fresh			
VOA Compounds									
				µg/L		(ug/L)			
				1.6 J		28900 *			
				0.94 J		1240 *			
Parameter						State Water			
Location:		InfCo-E		EffCo-E		Quality Criteria Summary			
Type:		comp		comp		Acute			
Date:		10/4-5		10/4-5		Fresh			
Time:		@		@		Chronic			
Lab Log#:		408255		408264		Fresh			
						BW4283			
BNA Compounds									
		µg/L		µg/L		(ug/L)			
Benzo(a)Pyrene		0.15 J							
Caffeine		46.5							
Dimethylnitrosamine		1.2		0.61 J					
Benzoic Acid						980 *			
Hexachloroethane		0.45 J				540 *			
Diethyl Phthalate						940 *(i)			
Di-n-Butyl Phthalate				0.17 J		940 *(i)			
Phenanthrene		0.47 J		0.17 J		3 *(i)			
Butylbenzyl Phthalate		4.8				940 *(i)			
Fluorene		0.14 J				3 *(i)			
Naphthalene		0.43 J		0.088 J		940 *(i)			
2-Methylnaphthalene		0.83 J		0.066 J		3 *(i)			
Benzyl Alcohol		5.8		1.5		2300 *			
4-Methylphenol		19.6				620 *			
1,4-Dichlorobenzene		1.7							
Phenol		2.4		0.81					
Bis(2-Ethylhexyl)Phthalate		27.8				1120 *(h)			
Anthracene		0.11 J		0.25 J		763 *(h)			
Pyrene		0.37 J				10200 *			
Benzo(g,h,i)Perylene		0.13 J				2,560 *			
Fluoranthene		0.39 J				940 *(i)			
Chrysene		0.23 J				3 *(i)			
3B-Coprostanol		863 EJ		2.8 J		3980 *			
Influent sample from Colville facility		@		24-hour composite sampling period: Approximately 8:00-8:00					
Effluent sample from the Colville facility		J		The analyte was positively identified. The associated numerical result is an estimate					
Laboratory blank		E		Reported result is an estimate because of the presence of interference.					
Ecology took sample									
Total dichlorobenzenes									
Total phthalate esters									
Insufficient data to develop criteria. Value presented is the LOEL - Lowest Observed Effect Level.									

**Table 5 (cont.) - Detected VOA, BNA, Pesticide/PCB and Metals Scan Results - Colville, 1994.**

Page 2									
Parameter	Location:					State Water			
	Type:	InfCo-E	comp	10/4-5	@	Acute	Fresh	Chronic	Fresh
Pesticide/PCB Compounds									
gamma-BHC (Lindane)									
µg/L									
0.09									
0.08									
Parameter	Location:					State Water			
	Type:	InfCo-E	comp	10/4-5	@	Acute	Fresh	Chronic	Fresh
TransBlank									
grab									
10/03									
1727									
408254									
Metals (Total Recoverable)	Location:					State Water			
	Type:	InfCo-E	comp	10/4-5	@	Acute	Fresh	Chronic	Fresh
µg/L									
170									
Hardness* -									
1.8 P									
0.79 P									
110									
20.2									
1.82 J									
7.01									
234									
6.1 P									
5.9 P									
11 P									
148.1 +									
360.0									
6.2 +									
1.5 +									
25.2 +									
16.0 +									
110.2 +									
4.3 +									
2.4									
0.012									
5.4 +									
163.5 +									
J									
P									
@									
*									
The analyte was positively identified. The associated numerical result is an estimate									
The analyte was detected above the instrument detection limit, but below the established minimum									
quantitation limit.									
24-hour composit sampling period:									
Approximately 8:00-8:00									
Hardness in the Colville River									
Influent sample from Colville facility									
Effluent sample from the Colville facility									
Laboratory blank									
Field Transfer blank									
Ecology took sample									
Hardness dependent criteria (170 mg/L used).									
+ *									



## **Appendices**

## Appendix A - Sampling Stations Descriptions - City of Colville, 1994

<b>InfCo-#</b>	Ecology grab sample of influent wastewater collected at the headwork just above the weir. Collected in both A.M. and P.M.
<b>Trnsf-Blk</b>	Ecology transfer blank taken from the influent compositor. Collected 10/3/94 at 17:27.
<b>InfCo-E</b>	Ecology 24-hour composite sample of Colville influent wastewater collected at the headworks just above the weir. Collected 10/4-5/94
<b>InfCo-C</b>	Colville grab sample of influent wastewater collected at the headworks. Collected 10/6/94 at 09:30
<b>LgnCo-1</b>	Ecology grab sample of Lagoon #1 effluent taken in a quiescent area upstream of the control structure to lagoon #2. Collected 10/5/94 at 15:29.
<b>LgnCo-2</b>	Ecology grab sample of Lagoon #2 effluent taken off a dock from a quiescent area upstream of the control structure to lagoon #3. Collected 10/5/94 at 15:15.
<b>LgnCo-3</b>	Ecology grab sample of Lagoon #3 effluent taken from a quiescent area 10 feet to the right and upstream of the control structure to the chlorine contact chamber. Collected 10/5/94 at 15:00.
<b>EffCo-#</b>	Ecology grab sample of final effluent collected above the effluent weir in the control structure out of the chlorine contact chamber. - Collected in both A.M. and P.M.
<b>EffCo-E</b>	Ecology 24-hour composite sample of final effluent collected above the effluent weir in the control structure out of the chlorine contact chamber. - Collected 10/4-5/94.
<b>EffCo-E2</b>	Ecology 24-hour composite sample of final effluent collected above the effluent weir in the control structure out of the chlorine contact chamber. - Collected 10/5-6/94.
<b>EffCo-C</b>	Colville grab sample of final effluent collected above the effluent weir in the control structure out of the chlorine contact chamber. - Collected 10/6/94.
<b>EffCo-6</b>	Ecology fecal coliform grab sample of final effluent collected above the effluent weir in the control structure out of the chlorine contact chamber. - Collected 10/6/94.

# Appendix B - Sample Schedule - City of Colville, October 1994.

Page 1

Parameter	Location:	InfCo-1	InfCo-2	Trnst-Blk	InfCo-E	InfCo-C	LgnCo-1	LgnCo-2
Type:	grab		grab	grab	comp	comp	grab	grab
Date:	10/4		10/4	10/3	10/4-5	10/6	10/5	10/5
Time:	0820		1540	1727	1545	0930	1529	1515
Lab Log #:	408250		408251	408254	408255	408256	408257	408258
<b>GENERAL CHEMISTRY</b>								
Conductivity		E	E		E	E	E	E
Alkalinity					E			
Hardness					E			
<b>SOLIDS</b>								
TS (mg/L)					E			
TNVS (mg/L)					E			
TSS (mg/L)		E	E		EC	E		
TNVSS (mg/L)					E			
<b>OXYGEN DEMAND PARAMETERS</b>								
BOD5					EC	E		
BOD Ultimate								
TOC (water)					E			
<b>NUTRIENTS</b>								
Total Kjeldahl Nitrogen (TKN)								
NH3-N					E			
NO2+NO3-N					E			
Total-P					E			
Ortho-PO4-P								
<b>MISCELLANEOUS</b>								
F-Coliform MF		E	E					
Chlorophyll								
<b>ORGANICS</b>								
VOC (water)								
BNAs (water)					E			
Pest/PCB (water) - Chlorinated					E			
<b>METALS</b>								
PP Metals (water)				E	E			
PP Metals (water - spike, dupe)								
<b>FIELD OBSERVATIONS</b>								
Temperature		E	E					
Temp-cooled					E	E		
pH		E	E		E	E		
Conductivity		E	E		E	E		
Chlorine								
D.O.							E	E
InfCo	Influent sample from Colville facility.							
LgnCo	Lagoon sample from Colville facility.							
E	Ecology took sample or performed analysis.							
C	Colville took sample or performed analysis.							
					grab sample	grab sample		
					comp	composite sample		
					@	24-hour composit		
						sampling period:		
						Approximately 08:00-08:00		

# Appendix B - Sample Schedule (cont.) - City of Colville, October 1994.

Page 2

Parameter II	Location: Type: Date: Time: Lab Log #:	LgnCo-3 grab 10/5 1500 408259	EffCo-1 grab 10/4 0800 408260	EffCo-2 grab 10/4 1405 408261	EffCo-E comp 10/4-5 0845 408264	EffCo-E2 comp 10/5-6 0855 408470	EffCo-C grab-comp 10/6 1024 408265	EffCo-6 grab 10/6 0850 408261
<b>GENERAL CHEMISTRY</b>								
Conductivity		E	E	E	E	E	E	
Alkalinity					E	E		
Hardness					E	E		
<b>SOLIDS</b>								
TS (mg/L)					E			
TNVS (mg/L)					E			
TSS (mg/L)			E	E	E	EC	E	
TNVSS (mg/L)					E			
<b>OXYGEN DEMAND PARAMETERS</b>								
BOD5			E		E	EC	E	
BOD Ultimate					E	E		
TOC (water)					E	E		
<b>NUTRIENTS</b>								
Total Kjeldahl Nitrogen (TKN)					E	E		
NH3-N					E	E	E	
NO2+NO3-N					E	E	E	
Total-P					E	E	E	
Ortho-P					E	E		
<b>MISCELLANEOUS</b>								
F-Coliform MF			E	E				E
Chlorophyll					E		E	
<b>ORGANICS</b>								
VOC (water)			E					
BNAs (water)					E			
Pest/PCB (water) - Chlorinated					E			
<b>METALS</b>								
PP Metals (water)					E	E		
PP Metals (water - spike, dupe)								
<b>FIELD OBSERVATIONS</b>								
Temperature			E	E				
Temp-cooled					E	E	E	
pH			E	E	E	E	E	
Conductivity			E	E	E	E	E	
Chlorine			E	E				
D.O.		E	E	E		E		
EffCo	Effluent sample from the Colville facility.							
LgnCo	Lagoon sample from Colville facility							
E	Ecology took sample or performed analysis.							
C	Colville took sample or performed analysis.							
					grab comp @	grab sample composite sample 24-hour composit sampling period: Approximately 08:00-08:00		

**Appendix C - Laboratory Methods - City of Colville, 1994**

Parameter IV	MANCHESTER METHODS	APHA METHODS	LAB USED
<b><u>GENERAL CHEMISTRY</u></b>			
Conductivity	EPA, Revised 1983: 120.1	APHA, 1992: 2510A.	Ecology
Alkalinity	EPA, Revised 1983: 310.1	APHA, 1992: 2320B.	Ecology
Hardness	EPA, Revised 1983: 130.2	APHA, 1992: 2340C.	Ecology
<b><u>SOLIDS</u></b>			
TS (mg/L)	EPA, Revised 1983: 160.3	APHA, 1992: 2540E.	Ecology
TNVS (mg/L)	EPA, Revised 1983: 160.3	APHA, 1992: 2540D.	Ecology
TSS (mg/L)	EPA, Revised 1983: 160.2	APHA, 1992: 2540D&E.	Ecology
TNVSS (mg/L)	EPA, Revised 1983: 160.2	APHA, 1992: 2540G.	Ecology
<b><u>OXYGEN DEMAND PARAMETERS</u></b>			
BOD5	EPA, Revised 1983: 405.1	APHA, 1992: 5210B.	Ecology
BOD Ultimate	EPA, Revised 1983: 405.1	APHA, 1992: 5210B.	Ecology
TOC (water)	EPA, Revised 1983: 415.1	APHA, 1992: 5310B.	Ecology
<b><u>NUTRIENTS</u></b>			
Total Kjeldahl Nitrogen (TKN)	EPA, Revised 1983: 350.3	APHA, 1992: 4500-N <sub>org</sub> C.	Sound Analytical Services, Inc.
NH3-N	EPA, Revised 1983: 350.1	APHA, 1992: 4500-NH3D.	Ecology
NO2+NO3-N	EPA, Revised 1983: 353.2	APHA, 1992: 4500-NO3F.	Ecology
Total-P	EPA, Revised 1983: 365.3	APHA, 1992: 4500-PF.	Ecology
Ortho-PO4-P	EPA, Revised 1983: 365.3	APHA, 1992: 4500-PF.	Ecology
<b><u>MISCELLANEOUS</u></b>			
F-Coliform MF	APHA, 1992: 9222D.	APHA, 1992: 9222D.	Ecology
Chlorophyll	APHA, 1992: 10200H.	APHA, 1992: 10200H.	Ecology
<b><u>ORGANICS</u></b>			
VOC (water)	EPA, 1988: 8260	APHA, 1992: 6210D.	Ecology
BNAs (water)	EPA, 1986: 8270	APHA, 1992: 6410B.	Ecology
Pest/PCB (water) - Chlorinated	EPA, 1986: 8080	APHA, 1992: 6630C.	Ecology
<b><u>METALS</u></b>			
PP Metals (water)	EPA, Revised 1983: 200-299	APHA, 1992: 3000-3500*.	Ecology

**METHOD BIBLIOGRAPHY**

APHA-AWWA-WPCF, 1992. Standard Methods for the Examination of Water and Wastewater, 18th Edition.

EPA, Revised 1983. Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020 (Rev. March, 1983).

EPA, 1986: SW846. Test Methods for Evaluating Solid Waste Physical/Chemical Methods, SW-846, 3rd. ed., November, 1986.

## **Appendix D - Quality Assurance/Quality Control - City of Colville, 1994**

### **Priority Pollutant Metal Cleaning Procedures for Wastewater Collection Equipment.**

1. Wash with laboratory detergent
2. Rinse several times with tap water
3. Rinse with 10% HNO<sub>3</sub> 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

### **Specific QA/QC Discussions**

A transfer blank was submitted for metals analysis to establish baseline sample conditions. Sampling in the field followed all protocols for holding times, preservation, and chain-of-custody set forth in the Manchester Environmental Laboratory Lab Users Manual (Ecology, 1994).

Laboratory QA/QC, including holding times, check standards, matrix spike and duplicate spike sample analyses, surrogate recoveries, and precision data were, with a few exceptions, within appropriate ranges. Initial calibration verification standards and continuing calibration standards were within relevant control limits. Procedural blanks were predominantly free from contamination. Two compounds, caffeine and 3B-Coprostanol were detected in the sample. These compounds are indicators of sewage effluent. Qualifiers are included in the data table where appropriate. The following are specific concerns:

1. Low levels of common laboratory solvents were detected in laboratory blanks for the volatile organic analysis. The EPA five times rule was applied, where compounds found in both the sample and the blank were considered real and not the result of contamination if the level for a particular compound in the sample was greater than or equal to five times the amount of the same compound found in the associated method blank.
2. The matrix spike and matrix spike duplicate for semi-volatile organics were extracted using Chewelah Class II Inspection samples at the sample time as the Colville analysis and used for Colville QA/QC. The matrix spike recoveries were unacceptable for several compounds, which were qualified with a "J" if above detect limits. Four compounds had very low or no recovery and were rejected with the "REJ" qualifier.
3. The normal Manchester Laboratory surrogates were added to the semi-volatile and pesticide/PCB samples prior to extraction. One surrogate was low, but since the remaining surrogates were acceptable no qualifiers were added to the results.
4. The spike recoveries for thallium and mercury were outside of the CLP acceptance limits. Thallium results have been qualified with a "N" to indicate unacceptable spike recoveries. Mercury results have been qualified with a "J" as estimates due to erratic spike recovery results.
5. Caffeine and 3B-coprostanol were outside the normal quantitation range of the method. These results were qualified with the "EJ" qualifier to indicate that it is an estimate.

Appendix E - VOA, BNA, Pesticide/PCB and Metals Scan Results - City of Colville, 1994. Page 1

Parameters	Location:	EffCo-1
	Type:	grab
	Date:	10/4
	Time:	0800
	Lab Log#:	408260
VOA Compounds		µg/L
Chloromethane	1	U
Bromomethane	1	U
Methylene Chloride	2	U
Chloroform	0.94	J
Carbon Tetrachloride	1	U
Bromodichloromethane	1	U
Dibromochloromethane	1	U
Bromoform	1	U
Bromochloromethane	1	U
Dibromomethane	1	U
Dichlorodifluoromethane	2	U
Trichlorofluoromethane	5	UJ
Chloroethane	1	U
Vinyl Chloride	1	U
1,1-Dichloroethane	1	UJ
1,2-Dichloroethane	1	U
1,1-Dichloroethene	1	U
Cis-1,2-Dichloroethene	1	U
Trans-1,2-Dichloroethene	1	U
1,1,1-Trichloroethane	1	U
1,1,2-Trichloroethane	1	U
Trichloroethene	1	U
Ethane, 1,1,1,2-Tetrachloro-	1	U
Ethane, 1,1,2,2-Tetrachloro-	1	U
Tetrachloroethene	1	U
1,2-Dibromoethane (EDB)	1	U
1,2-Dichloropropane	1	U
1,3-Dichloropropane	1	U
2,2-Dichloropropane	1	UJ
1,2,3-Trichloropropane	1	U
1,2-Dibromo-3-Chloropropane	2	U
1,1-Dichloropropene	1	U
Cis-1,3-Dichloropropene	1.1	U
Trans-1,3-Dichloropropene	0.94	U
Hexachlorobutadiene	2	U
Acetone	2.6	UJ
2-Butanone	1	UJ
4-Methyl-2-Pentanone	1	U
2-Hexanone	1	U
Carbon Disulfide	1.6	J
Benzene	1	U
Toluene	1	U
Ethylbenzene	1	U
n-Propylbenzene	1	U
Isopropylbenzene (Cumene)	1	U
Butylbenzene	1	U
Sec-Butylbenzene	1	U
Tert-Butylbenzene	1	U

EffCo-1 Sample of Colville effluent.

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

U The analyte was not detected at or above the reported result

UJ The analyte was not detected at or above the reported estimated result

Parameters	Location:	EffCo-1				
	Type:	grab				
	Date:	10/4				
	Time:	0800				
	Lab Log#:	408260				
VOA Compounds		µg/L				
Total Xylenes	3		U			
p-Isopropyltoluene	1		U			
1,3,5-Trimethylbenzene	1		U			
1,2,4-Trimethylbenzene	1		U			
Chlorobenzene	1		U			
Bromobenzene	1		U			
1,2-Dichlorobenzene	1		U			
1,3-Dichlorobenzene	1		U			
1,4-Dichlorobenzene	1		U			
1,2,3-Trichlorobenzene	10		UJ			
1,2,4-Trichlorobenzene	4.8		UJ			
2-Chlorotoluene	1		U			
4-Chlorotoluene	1		U			
Naphthalene	10		UJ			
m & p-Xylene	2		U			
o-Xylene	1		U			
Benzene, Ethenyl-(Styrene)	1		U			
Parameters	Location:	InfCo-E	EffCo-E	LabBlank		
	Type:	comp	comp			
	Date:	10/4-5	10/4-5			
	Time:	@	@			
	Lab Log#:	408255	408264	BW4283		
BNA Compounds		µg/L	µg/L	µg/L		
Benzo(a)Pyrene	0.15	J	0.44	U	0.80	U
2,4-Dinitrophenol	12.1	U	4.4	U	8.0	U
Dibenzo(a,h)Anthracene	1.2	U	0.44	U	0.80	U
Benzo(a)Anthracene	1.2	U	0.44	U	0.80	U
Caffeine	46.5		0.44	U	0.80	U
4-Chloro-3-Methylphenol	1.2	U	0.44	U	0.80	U
Aniline	1.2	U	0.44	U	0.80	U
Dimethylnitrosamine	1.2		0.44	U	0.80	U
Benzoic Acid	12.4	U	0.61	J	8.0	U
Hexachloroethane	0.45	J	0.44	U	0.80	U
Hexachlorocyclopentadiene	2.4	U	0.89	U	1.6	U
Isophorone	1.2	U	0.17	J	0.80	U
Acenaphthene	1.2	U	0.44	U	0.80	U
Diethyl Phthalate	9.0	U	0.44	UJ	0.17	J
Di-n-Butyl Phthalate	2.6	U	0.44	U	0.17	J
Phenanthrene	0.5	J	0.44	U	0.80	U
Butylbenzyl Phthalate	4.8		0.44	U	0.80	U
N-Nitrosodiphenylamine	1.2	U	0.44	U	0.80	U
Fluorene	0.1	J	0.44	U	0.80	U
Carbazole	1.2	U	0.44	U	0.80	U
Hexachlorobutadiene	1.2	U	0.44	U	0.80	U
Pentachlorophenol	1.2	U	0.44	U	0.80	U
2,4,6-Trichlorophenol	1.2	U	0.44	U	0.80	U
2-Nitroaniline	1.2	U	0.44	U	0.80	U
2-Nitrophenol	1.2	U	0.44	U	0.80	U

InfCo Sample of Colville influent.

J

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

EffCo Sample of Colville effluent.

U

The analyte was not detected at or above the reported result

LabBlank Laboratory procedural blank.

UJ

The analyte was not detected at or above the reported estimated result

@ Composite sampling period:  
approximately 08:00-08:00.



## Appendix E - (Cont.) - City of Colville, 1994.

Page 3

Parameters	Location:	InfCo-E	EffCo-E	LabBlank
	Type:	comp	comp	
	Date:	10/4-5	10/4-5	
	Time:	@	@	
	Lab Log#:	408255	408264	BW4283
BNA Compounds	µg/L	µg/L	µg/L	
Naphthalene	0.43 J	0.088 J	0.80 U	
2-Methylnaphthalene	0.83 J	0.066 J	0.80 U	
2-Chloronaphthalene	1.2 U	0.44 U	0.80 U	
3,3'-Dichlorobenzidine	2.4 U	0.89 U	1.6 U	
Benzidine	26.2 U	0.89 U	1.6 U	
2-Methylphenol	1.2 U	0.11 J	0.80 U	
1,2-Dichlorobenzene	1.2 U	0.44 U	0.80 U	
o-Chlorophenol	1.2 U	0.44 U	0.80 U	
2,4,5-Trichlorophenol	1.2 U	0.44 U	0.80 U	
Nitrobenzene	1.2 U	0.44 U	0.80 U	
3-Nitroaniline	1.2 U	0.44 U	0.80 U	
4-Nitroaniline	1.2 U	0.44 U	0.80 U	
4-Nitrophenol	6.1 U	2.2 U	4.0 U	
Benzyl Alcohol	5.8	0.44 U	0.80 U	
4-Bromophenyl Phenylether	1.2 U	0.44 U	0.80 U	
2,4-Dimethylphenol	1.2 U	0.44 U	0.80 U	
4-Methylphenol	19.6	1.5	0.80 U	
1,4-Dichlorobenzene	1.7	0.44 U	0.80 U	
4-Chloroaniline	1.2 U	0.44 U	0.80 U	
Phenol	2.4	0.81	0.20 J	
Pyridine	6.1 U	2.2 U	4.0 U	
Bis(2-Chloroethyl)Ether	1.2 U	0.44 U	0.80 U	
Bis(2-Chloroethoxy)Methane	1.2 U	0.44 U	0.80 U	
Bis(2-Ethylhexyl)Phthalate	27.8	0.44 UJ	0.25 J	
Di-n-Octyl Phthalate	2.9 UJ	0.44 U	0.80 U	
Hexachlorobenzene	1.2 U	0.44 U	0.80 U	
Anthracene	0.11 J	0.44 U	0.80 U	
1,2,4-Trichlorobenzene	1.2 U	0.44 U	0.80 U	
2,4-Dichlorophenol	1.2 U	0.44 U	0.80 U	
2,4-Dinitrotoluene	1.2 U	0.44 U	0.80 U	
1,2-Diphenylhydrazine	1.2 U	0.44 U	0.80 U	
Pyrene	0.37 J	0.44 U	0.80 U	
Dimethyl Phthalate	1.2 U	0.44 U	0.80 U	
Dibenzofuran	1.2 U	0.44 U	0.80 U	
Benzo(g,h,i)Perylene	0.13 J	0.44 U	0.80 U	
Indeno(1,2,3-cd)Pyrene	1.2 U	0.44 U	0.80 U	
Benzo(b)Fluoranthene	1.2 U	0.44 U	0.80 U	
Fluoranthene	0.39 J	0.44 U	0.80 U	
Benzo(k)Fluoranthene	1.2 U	0.44 U	0.80 U	
Acenaphthylene	1.2 U	0.44 U	0.80 U	
Chrysene	0.23 J	0.44 U	0.80 U	
3B-Coprostanol	863 EJ	2.8 J	8.0 UJ	
Retene	1.2 U	0.44 U	0.80 U	
4,6-Dinitro-2-Methylphenol	12.1 U	4.4 U	8.0 U	
1,3-Dichlorobenzene	1.2 U	0.44 U	0.80 U	
2,6-Dinitrotoluene	1.2 U	0.44 U	0.80 U	
N-Nitroso-di-n-Propylamine	1.2 U	0.44 U	0.80 U	
4-Chlorophenyl Phenylether	1.2 U	0.44 U	0.80 U	
Bis(2-Chloroisopropyl)Ether	1.2 U	0.44 U	0.80 U	

InfCo Sample of Colville influent.

J

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

EffCo Sample of Colville effluent.

U

The analyte was not detected at or above the reported result.

LabBlank Laboratory procedural blank.

UJ

The analyte was not detected at or above the reported estimated result.

@ Composite sampling period:  
approximately 08:00-08:00.

E

Reported result is an estimate because of the presence of interference.

Parameters	Location:	InfCo-E	EffCo-E			
	Type:	comp	comp			
	Date:	10/4-5	10/4-5			
	Time:	@	@			
	Lab Log#:	408255	408264			
Pesticide/PCB Compounds		µg/L	µg/L			
alpha-BHC		0.09 U	0.01 U			
beta-BHC		0.01 U	0.01 U			
gamma-BHC (Lindane)		0.09	0.01 U			
delta-BHC		0.09 U	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			
4,4'-DDE		0.09 U	0.01 U			
Dieldrin		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			
Endrin Aldehyde		REJ	REJ			
4,4'-DDT		0.09 U	0.01 U			
Endosulfan Sulfate		0.09 U	0.01 U			
Endrin Ketone		0.09 U	0.01 U			
Methoxychlor		0.09 U	0.01 U			
Chlordane		0.06 U	0.11 U			
Toxaphene		0.18 U	0.33 U			
Aroclor-1016		0.06 U	0.11 U			
Aroclor-1221		0.06 U	0.11 U			
Aroclor-1232		0.12 U	0.22 U			
Aroclor-1242		0.06 U	0.11 U			
Aroclor-1248		0.06 U	0.11 U			
Aroclor-1254		0.06 U	0.11 U			
Aroclor-1260		0.06 U	0.11 U			
Parameters	Location:	InfCo-E	EffCo-E	EffCo-E2	TransBlank	LabBlank
	Type:	comp	comp	comp	grab	
	Date:	10/4-5	10/4-5	10/5-6	10/03	
	Time:	@	@	@	1727	
	Lab Log#:	408255	408264	408470	408254	BW4283
Metals (Total Recoverable)		µg/L	µg/L	µg/L	µg/L	µg/L
Hardness =	100					
Antimony		30 U	30 U	30 U	30 U	30 U
Arsenic		1.8 P	1.5 U	1.5 U	1.5 U	1.5 U
Beryllium		1 U	1 U	1 U	1 U	1 U
Cadmium		0.79 P	0.10 U	0.10 U	0.33 P	0.10 U
Chromium		5 U	5.0 U	5 U	5 U	5 U
Copper		110	6.6 P	6 P	3.7 P	3 U
Lead		20.2	1.0 U	1.0 U	1.0 U	1.0 U
Mercury		1.82 J	0.102 J	0.009 J	0.0010 UJ	U
Nickel		10 U	10 U	10 U	10 U	10 U
Selenium		2.3 P	2.0 U	2.0 U	2.0 U	2.0 U
Silver		7.01	0.50 U	0.50 U	0.50 U	0.50 U
Thallium		2.5 UN	2.5 U	2.5 U	2.5 UN	2.5 U
Zinc		234	6.1 P	5.9 P	11 P	4 U
InfCo	Sample of Colville influent.		E	Ecology sample		
EffCo	Sample of Colville effluent.		@	Composite sampling period:		
Transblank	Transfer blank from Colville effluent compositor.			approximately 08:00-08:00.		
LabBlank	Laboratory procedural blank.					
J	The analyte was positively identified. The associated numerical result is an estimate					
P	The analyte was detected above the instrument detection limit, but below the established minimum quantitation limit.					
U	The analyte was not detected at or above the reported result					
UJ	The analyte was not detected at or above the reported estimated result					
UN	For metals analytes the spike sample recovery is not within control limits.					

## Appendix F - Tentatively Identified Compounds - City of Colville, 1994

---

**Sample Location:** InfCo-E  
**Type:** comp  
**Date:** 10/4-5  
**Time:** 08:00-08:00  
**Sample ID:** 408255

### Acids, Neutrals, & Bases (BNA):

Compound Name	Estimated Concentration (µg/L)	Qualifier
1. Hexadecanoic Acid	1810	NJ
2. Octadecanoic Acid	1480	NJ
3. Cholesterol	372	NJ
4. Linoleic Acid	1190	NJ
5. 3 - Cyclohexene - 1 - Methan +	61.8	NJ
6. 2-Butoxyethanol	64	NJ
7. Oleic Acid	2580	NJ
8. Decane	24.7	NJ
9. Didecanoic Acid	182	NJ
10. Cyclododecane (8CI9CI)	27.7	NJ
11. Cyclotetradecane	69.5	NJ
12. Cyclotetradecane	58.4	NJ
13. Heptadecanoic Acid	55.7	NJ
14. Tetradecanoic Acid	249	NJ
15. Pentadecanoic Acid	68.1	NJ
16. Pentadecanoic Acid	20.8	NJ
17. Undecane	33.6	NJ
18. 9 - Hexadecenoic Acid	119	NJ
19. Unknown Compound 1	188	J
20. Unknown Compound 2	48.5	J
21. Unknown Compound 3	64.0	J
22. Unknown Compound 4	96.2	J
23. Unknown Compound 5	116	J
24. Unknown Compound 6	159	J
25. Unknown Compound 3	43.6	NJ
26. 4 - Methyl - 2 - Decene (+	88.5	NJ

---

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

## Appendix F - Tentatively Identified Compounds (cont.) - City of Colville, 1994

---

**Sample Location:** EffCo-E  
**Type:** comp  
**Date:** 10/4-5/94  
**Time:** 08:00-08:00  
**Log Number:** 408264

### Bases/Neutrals/Acids (BNA):

Compound Name	Estimated Concentration (µg/L)	Qualifier
1. Octadecanoic Acid	2.2	NJ
2. Cholesterol	4.2	NJ
3. Phenylacetic Acid	2.2	NJ
4. Toluene	25.2	NJ
5. 2 - (2 - Butoxyet + )Ethanol	3.3	NJ
6. 2 - (2 - Butoxyet + )Ethanol	7.3	NJ
7. 9,12,15 - Octadecatrieno +	2.8	NJ
8. Tetradecanoic Acid	1.6	NJ
9. Sulfur Mol (S6???)	18.2	NJ
10. Pentadecanoic Acid	1.6	NJ
11. 4 - Methyl - + - 3 -Pyridinol	1.3	NJ
12. 9 - Hexadecenoic Acid	3.9	NJ
13. 2 - Bromo - + Cyclohexanol	4.12	NJ
14. Unkown Compound 1	1.9	J
15. Unkown Compound 2	2.1	J
16. Unkown Compound 3	3.9	J
17. Unkown Compound 4	2.5	J
18. Unkown Compound 5	3.9	J
19. Sulfur Mol (S8)	87.4	NJ
20. 3,3' - Oxybis - 2 - Butanol	2.0	NJ

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

## Appendix G - GLOSSARY - City of Colville, 1994

BOD <sub>5</sub>	Five Day Biological Oxygen Demand
CaCO <sub>3</sub>	Calcium Carbonate
CLP	Contract Laboratory Program
CVAA	Cold Vapor Atomic Absorption
D.O.	Dissolved Oxygen
EPA	Environmental Protection Agency
Hp	Horse Power
kg	kilogram (1 X 10 <sup>3</sup> grams)
L	Liter (1 X 10 <sup>3</sup> milliliters)
lbs/day	Pounds per Day
LOD	Limit of Detection
m <sup>3</sup>	Cubic meter (1 X 10 <sup>3</sup> liters)
MF	Membrane Filter
mg	milligram (1 X 10 <sup>-3</sup> grams)
MGD	Million Gallons per Day
mL	Milliliter (1 X 10 <sup>-3</sup> liters)
NH <sub>3</sub>	Ammonia
MPN	Most Probable Number
NPDES	National Pollutant Discharge Elimination System
pH	Hydrogen Ion Concentration
PO <sub>4</sub>	Phosphate
PP	Priority Pollutant
ppm	Parts per million (1 X 10 <sup>-6</sup> kg/L, mg/L, or mg/kg)
ppt	Parts per thousand (1 X 10 <sup>-3</sup> kg/L, g/L, or g/kg)
QA/QC	Quality Assurance/Quality Control
RPD	Relative Percent Difference
STP	Sewage Treatment Plant
TIC	Total Inorganic Carbon or for GCMS Tentatively Identified Compound
TKN	Total Kjeldahl Nitrogen
TMDL	Total maximum daily Load
TNVS	Total Non-Volatile Solids
TNVSS	Total Non-Volatile Suspended Solids
TOC	Total Organic Carbon
TP	Total Phosphorous
TS	Total Solids
TSS	Total Suspended Solids
TVS	Total Volatile Solids
ug	Microgram (1 X 10 <sup>-6</sup> grams)
ug/L	Micrograms per Liter
ug/m <sup>3</sup>	Microgram per cubic meter
VOA	Volatile Organic Analysis

WLA  
VOC

Waste Load Allocation  
Volatile Organic Carbon