SOUTH FORK PALOUSE RIVER BASIN
CLASS II INSPECTIONS AT PULLMAN AND ALBION
JULY 23-25 & OCTOBER 1-3, 1991

by
Norm Glenn
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Washington State Department of Ecology
Environmental Investigations and Laboratory Services Program
Watershed Assessments Section
Olympia, Washington 98504-7710

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(Segment No. 16-34-02)

ABSTRACT

The Pullman wastewater treatment plant was operating at a high efficiency and being well maintained at the time of the Class II Inspection on July 23-25; and again during a resampling on October 1-3, 1991. Nearly full nitrification was occurring on both occasions. However, past treatment plant records indicate that full nitrification is not predictable. Hydraulic and waste loads to the plant are approaching design criteria.

The Albion wastewater treatment plant was violating permit limits for TSS and pH during the July inspection. There was no discharge in October. There was excessive sludge buildup in the chlorine contact channel. Laboratory results from Albion's influent BOD and TSS samples were dramatically different from Ecology's results.

INTRODUCTION

Class II Inspections were conducted at the City of Pullman and Town of Albion Wastewater Treatment Plants (WWTP) on July 23-25 and again at the Pullman WWTP on October 1-3, 1991. The first inspection was conducted by Norm Glenn and Elissa Ostergaard; the second by Norm Glenn and Paul Pickett, all members of the Watershed Assessments Section (WAS) of the Environmental Investigations and Laboratory Services (EILS) Program. Pat Wiltzius, the

WWTP lead operator, provided on-site assistance at Pullman. A concurrent Total Maximum Daily Load (TMDL) study was conducted in the South Fork Palouse River (SFPR), also by WAS. The trip in October to get a second set of data for the TMDL effort did not include Albion because the WWTP was not discharging.

Objectives of the inspections included:

1. Verify compliance with NPDES permit limits;

2. Determine loadings and WWTP removal efficiencies; and

3. Evaluate permittee's self-monitoring by reviewing sampling and flow measurement procedures, and by using sample splits.

Figure 1 is a location map. Pullman is a college town, with dramatic changes in population and flow due to Washington State University. The permanent population is about 22,500, but this swells to nearly 40,000 in the fall when WSU starts. The City is authorized to discharge treated and chlorinated/dechlorinated wastewater to the SFPR year-round under NPDES Permit No. WA 004465-2 issued July 6, 1990. Albion is a town of 675 people located 7.0 miles downstream. NPDES Permit No. WA-002260-8, issued January 22, 1991 authorizes them to discharge treated and chlorinated wastewater only during the period February 1 through May 31.

Figure 2 is a plant schematic for the Pullman WWTP. The treatment process starts with screening and primary clarification, followed by biological treatment with the biofilter and aeration basins. The treatment process concludes with secondary clarification and disinfection. Grit is removed from primary solids by the degritter and solids are thickened by a gravity thickener. Biological solids are thickened by a dissolved air flotation thickener. Both are mixed and stabilized by two-stage anaerobic digestion. Digested solids are then dewatered by a belt press process and applied to farmland. Flow is measured at the influent structure with a Parshall Flume and Badger ultrasonic meter.

The last plant upgrade in 1984 included the biofilter which serves as a "roughing filter." It is designed to operate at high hydraulic loading rates principally to reduce the organic loading on the downstream aeration basins. However, it also contributes to seasonal nitrification, where the purpose is to reduce the organic load so that the basins will dependably nitrify the wastewater during the critical summer months. Up to 80% of the soluble, carbonaceous BOD_5 can be removed with these filters (Metcalf & Eddy, 1991).

Figure 3 is a plant schematic for the Albion WWTP. The treatment process is a facultative lagoon system, which was originally put into operation in 1972. Each lagoon has a clay bottom and a 10-mm black PVC liner on the wetted perimeter of the dikes. Flow to the lagoons from a lift station/wet well configuration is intermittent. Wastewater is pumped through a 6" pressure main to the diversion box where flow is diverted to either lagoon using wooden stop logs. Flow from lagoon #1 to #2 is controlled by the interconnecting control structure which also has

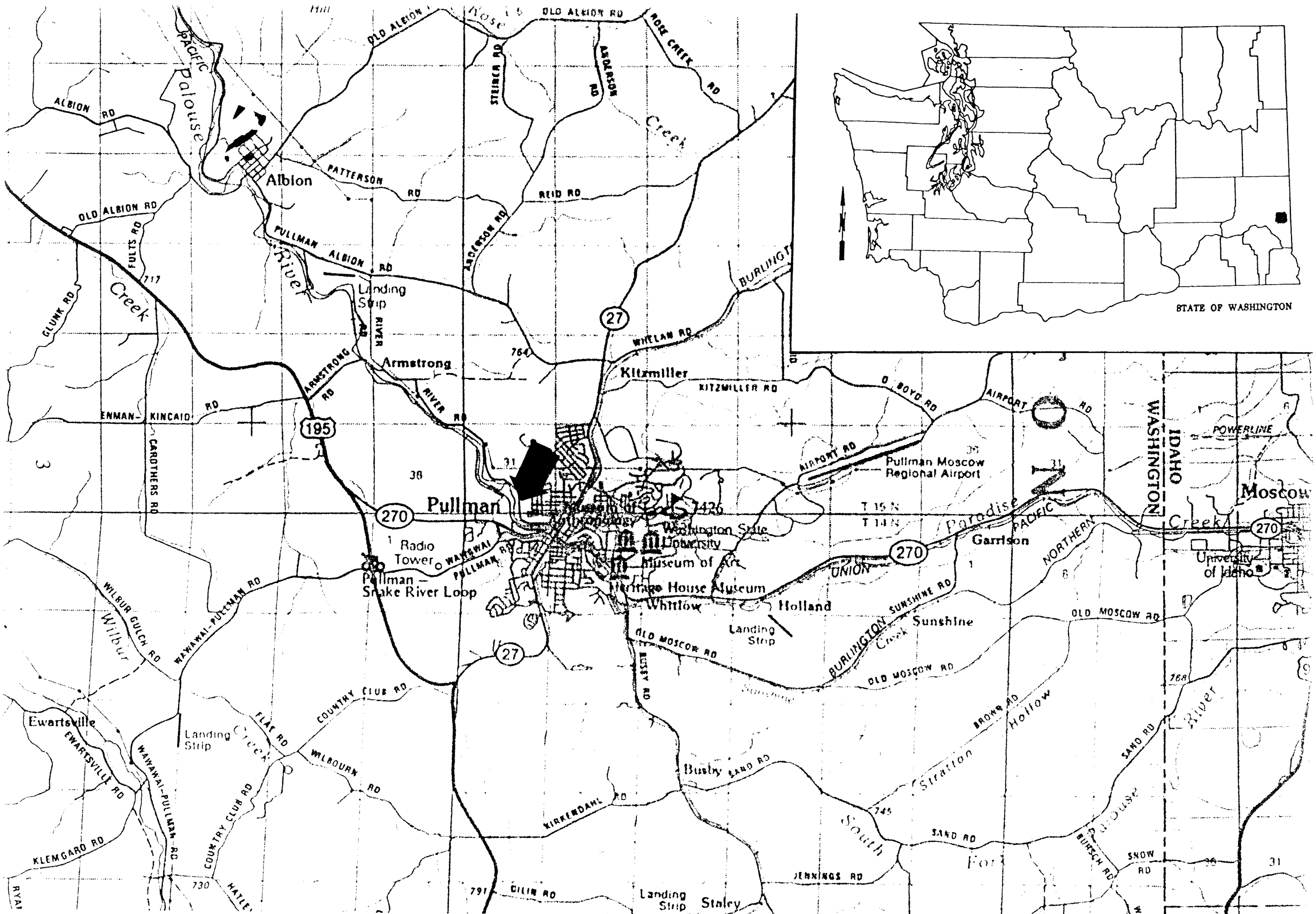

Figure 1. Location Map - Pullman and Albion WWTPs, 10/91.

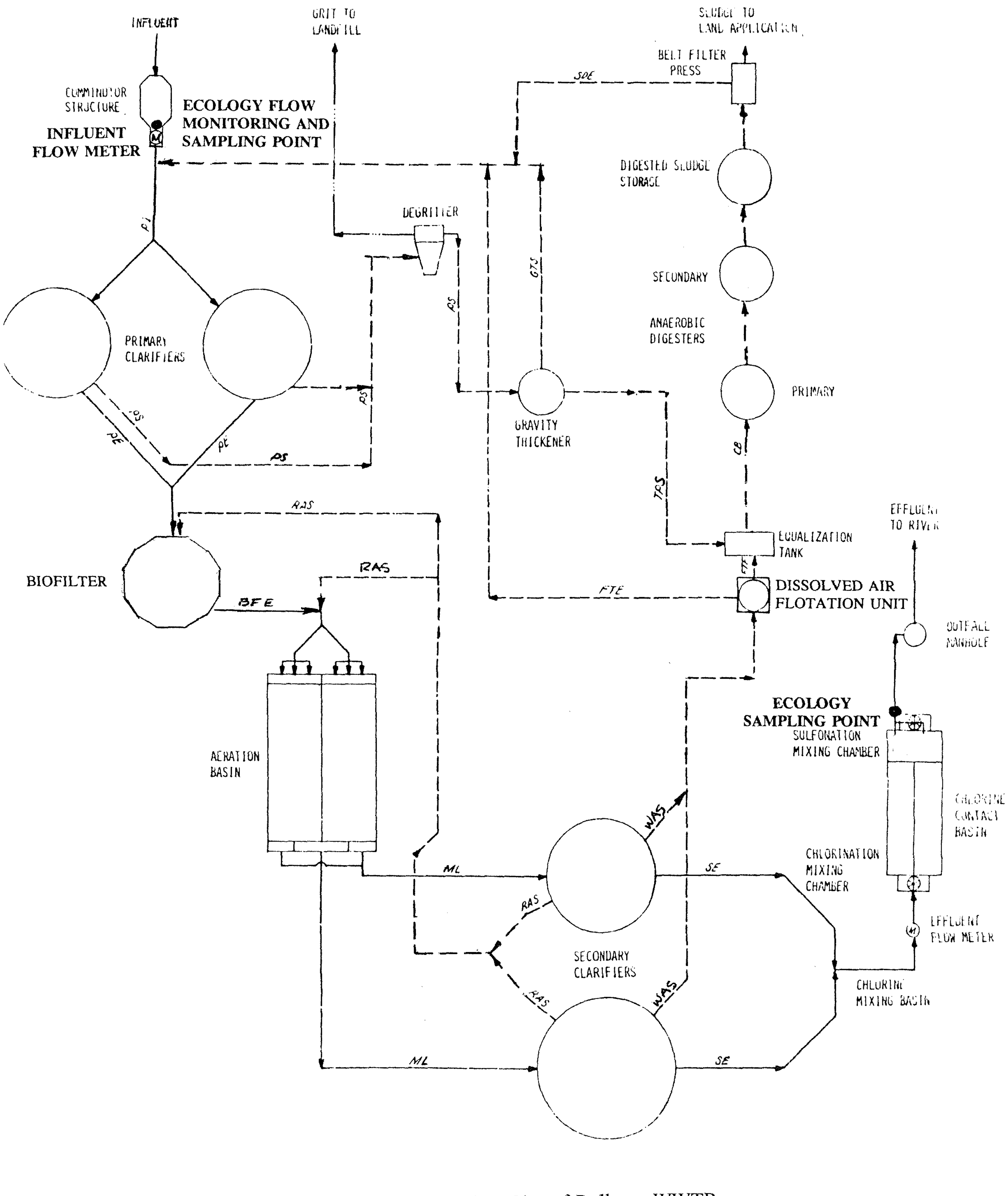

Figure 2. Plant Schematic - City of Pullman WWTP.

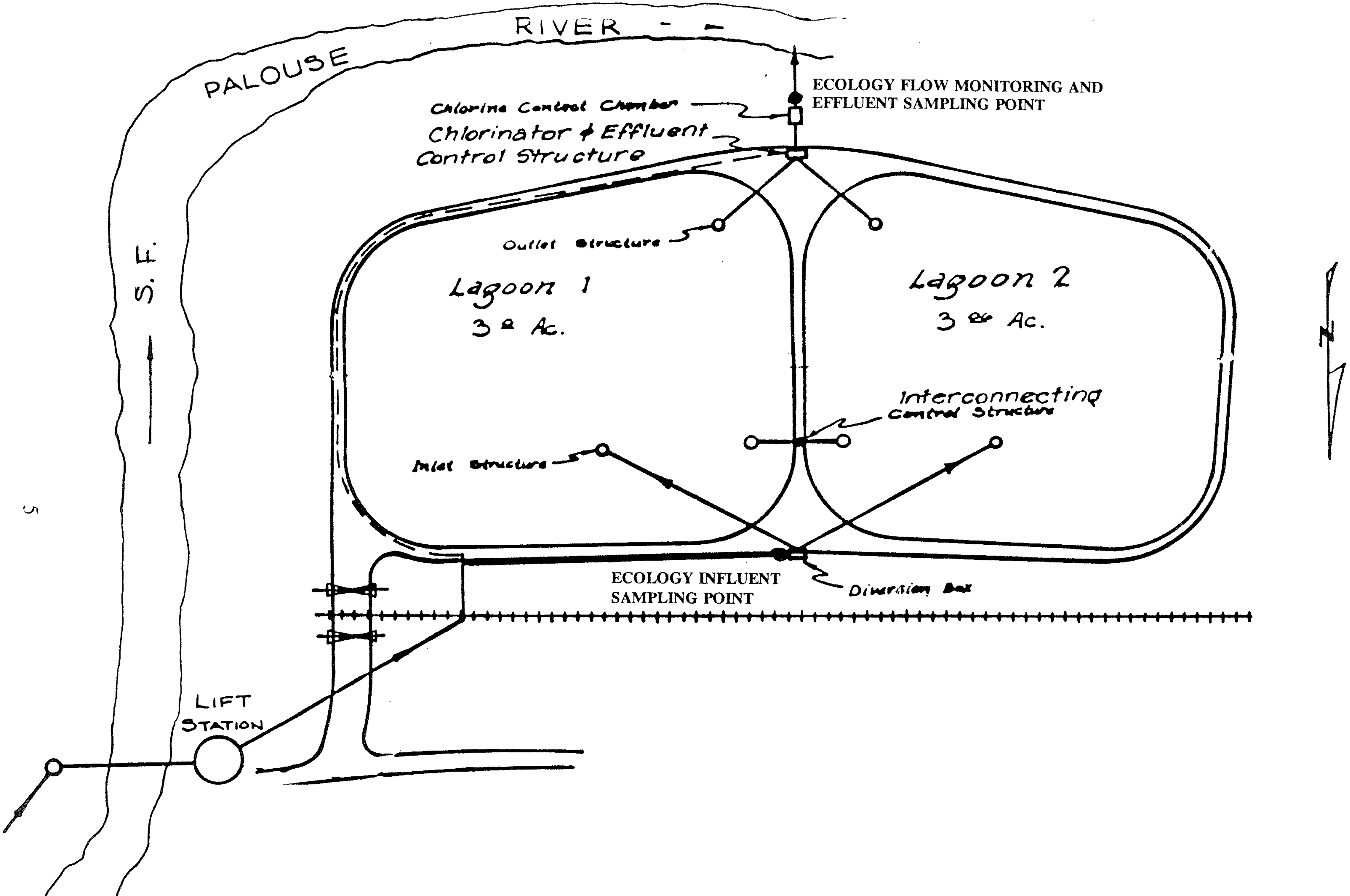

Figure 3. Plant Schematic - Town of Albion WWTP.

wooden stop logs. Operating depth of both lagoons is five feet. After chlorination, effluent flows to the chlorine contact basin which is baffled and has a retention time of about 35 minutes at design flow.

METHODS

Grab and composite samples of influent and effluent wastewater were collected at both plants. Pullman samples were taken downstream of the comminutor (influent) and in the channel exiting the chlorine contact chamber immediately downstream from the point of injection of SO_2 for dechlorination (effluent). Figure 2 shows these sampling points. Albion samples were taken in the standpipe exiting the influent force main and at the weir downstream of the chlorine contact chamber (effluent). Figure 3 shows these sampling points. (Albion was not sampled during the second visit in October as mentioned above because they had just begun to meet the seasonal no discharge stipulation in the recently issued permit.)

Discharger sampling points appeared to be representative and were used by Ecology also. Pullman's influent composite sampler is an N-CON®, designed to collect flow proportional samples. However, it is presently collecting time proportional samples. About 6 liters is collected every 24 hours and kept refrigerated in a separate unit. The effluent compositor is a self-contained ISCO® which takes flow proportional samples. About 250 mL of sample is collected for every 133,000 gallons of effluent. The Albion operator's sampling consisted of 3 grabs at influent and effluent, each composited at the end of the working day. Ecology sampling was time proportional at both plants; our ISCO samplers collected approximately 190 mL sample every 30 minutes.

Ecology sampling equipment was cleaned before use by washing with non-phosphate detergent and rinsing with tap water. Collection equipment was air-dried and then wrapped in aluminum foil until used. Sample containers were iced to keep wastewater at 4°C.

Split sample analyses were performed at the Ecology and Pullman laboratories using aliquots of Pullman's influent and effluent composites. No split sampling was conducted at Albion because the operator was called away on a public works emergency during the survey. All sample containers destined for the Manchester laboratory were placed on ice and shipped within 24 hours.

Sampling location, type, time, and parametric coverage are outlined in Tables 1, 2, and 3. A 60-day BOD (BOD_{60}) analysis was run in lieu of a BOD_5 on the Pullman effluent composite sample from October. An explanation of the analytical protocol for this new parameter can be found in Whittemore (1991).

Flumes and weirs were inspected for proper installation and physical dimensions. Instantaneous flows were determined by measuring depth of flow through the device and reading from tables (ISCO, 1985). Comparisons were made to readings on the plant flow recorder at Pullman; no recorder exists at Albion. Twenty-four hour flows were read from the totalizer at Pullman.

Table 1. General Chemistry Results - Pullman WWTP, 7/91.

Parameter	Field Station:	Pinf-P	Pinf-E	Pinf-1	Peff-P	Peff-E	Peff-1	Pinf-2	Peff-2
	Type:	composite	composite	grab	composite	composite	grab	grab	grab
	Date:	7/24-25	7/24-25	7/24	7/24-25	7/24-25	7/24	7/25	7/25
	Time:	24 hour	24 hour	1600	24 hour	24 hour	1610	1125	1230
	Lab ID #: 3081-	55	61	56	57	73	58	59	60
LABORATORY									
Turbidity (NTU)		45	60		2	1.6	1.6		3.6
Conductivity (µmhos/cm)		635	647	625	575	574	571	614	581
Alkalinity (mg/L CaCO3)		266	310	270	162	162	156	259	164
Chloride (mg/L)					38.8		37.1		35.5
SOLIDS 4 (mg/L)									
TS		608	742	620	462	446	418	625	466
TNVS		358	367	329	330	314	282	297	291
TSS		148	176	112	5	3	2	188	2
TNVSS		48	82	32	1 U	1	2	56	3
BOD5 (mg/L)		129	119	117	3	3	2	206	4
NUTRIENTS 5 (mg/L)									
NH3-N		14.7	16.4	11.6	0.043	0.02	0.027	14.9	0.031
NO2+NO3-N		<0.01	0.12 J	0.024	11.4	11.8	12.6	0.026	12.0
Nitrogen - Total (TPN)		42.8	42.0	13.5	11.4	20.2	12.1	44.5	11.4
Phosphorous - Total		3.94	4.33	4.37	2.96	2.85	3.08	5.78	3.01
Oil and Grease (mg/L)				26.2			1.7	33.5	1.6
F-Coliform MPN							90;50		17;22
Enterococci MPN									11
FIELD OBSERVATIONS									
Temp				22.8			23.2	21.5	21.9
pH		7.97	8.16	7.26	7.86	7.41	6.43	7.86	7.2
Conductivity		620	590	640	580	590	580	620	580
D.O.									
Chlorine									
Free							<0.1		<0.1
Total							<0.1		<0.1

Pinf-1 & -2 Influent grabs by Ecology

Pinf-E Influent composite by Ecology.

Pinf-P Influent composite by Pullman.

Peff-1 & -2 Effluent grabs by Ecology.

Peff-E Effluent composite by Ecology.

Peff-P Effluent composite by Pullman.

Table 2. General Chemistry Results – Pullman WWTP, 10/91.

Parameter						
Field Station:	Pinf–E	Pinf–1	Peff–E	Peff–1	Pinf–2	Peff–2
Type:	composite	grab	composite	grab	grab	grab
Date:	10/01–02	10/01	10/01–02	10/01	10/02	10/02
Time:	24 hour	1855	24 hour	1825	0825	1020
Lab ID #: 4084–	80	81	82	83	84	85
LABORATORY						
Turbidity (NTU)	75		2.7	2.0		1.2
Conductivity (μmhos/cm)	721	736	608	604	697	611
Alkalinity (mg/L CaCO3)	299	316	125	122	327	128
Chloride (mg/L)			43.7	43.2		42.9
SOLIDS 4 (mg/L)						
TS	788 J	739	479	476	622	499
TNVS	304	313	292	245	294	299
TSS	221	215	5	5	259	3
TNVSS	46	42	1	1	63	1
BOD5 (mg/L)	134	170		6	89	5
BOD60 (mg/L)			19.6			
NUTRIENTS 5 (mg/L)						
NH3–N	22.6	20.4	0.087	0.075	26.4	0.064
NO2+NO3–N	0.053	0.060	20.5	20.8	0.06	19.9
Nitrogen – Total (TPN)	35.2	35.3	23.5	24.0	43.7	23.3
Phosphorous – Total	6.43	6.25	4.42	4.45	7.38	4.65
Oil and Grease (mg/L)		77 J		2 J	51 J	<1.0 J
F–Coliform MF				43		37
Enterococci MF				49		29
FIELD OBSERVATIONS						
Temp		22.2		22.1	20.0	20.2
pH	7.78	7.57	7.06	6.89	7.98	6.82
Conductivity	695	700	600	595	615	600
D.O						3.9
Chlorine						
Free				0.06		<0.1
Total				<0.1		<0.1

Pinf–1 & –2 Influent grabs by Ecology.
Pinf–E Influent composite by Ecology.

Peff–1 & –2 Effluent grabs by Ecology.
Peff–E Effluent composite by Ecology.

Table 3. General Chemistry Results – Albion WWTP, 7/91.

Parameter / Field Station:	Ainf-E	Ainf-1	Aeff-E	Aeff-1	Ainf-2	Aeff-2
Type:	composite	grab	composite	grab	grab	grab
Date:	7/24-25	7/24	7/24-25	7/24	7/25	7/25
Time:	24 hour	1700	24 hour	1720	0835	0900
Parameter Lab ID #: 3081-	65	66	67	68	69	70
GENERAL CHEMISTRY						
Turbidity (NTU)	35		50	40		45
Conductivity (μmhos/cm)	727	665	483	483	704	488
Alkalinity (mg/L CaCO3)	297	263	185	184	319	185
Chloride (mg/L)			37.2	45.3		36.1
SOLIDS 4 (mg/L)						
TS	549	688	467	483	527	480
TNVS	298	299	254	239	252	251
TSS	100	49	88	76	166	87
TNVSS	13	5	13	2	18	3
BOD5 (mg/L)	134	119	21	20	146	27
NUTRIENTS 5 (mg/L)						
NH3-N	23.2	15.7	1.17	1.18	30.8	1.24
NO2+NO3-N	0.15	0.33	0.01	0.01	0.20	<0.01
Nitrogen - Total (TPN)	79.2	47.6	7.99	9.91	49.	8.53
Phosphorous - Total	5.25	2.88	2.76	2.71	6.55	2.68
Oil and Grease (mg/L)		23.5		2.0	34.9	3.0
F-Coliform MPN				2 U		2 U;2 U
Enterococci MPN				2 U		7
FIELD OBSERVATIONS						
Temp		16.4		23.3	17.9	22.3
pH	8.32	7.30	9.63	8.97	8.39	9.53
Conductivity	700	550	470	460	640	480
D.O.						
Chlorine						
Free				2.0		0.3
Total				2.0		2.5

Ainf-1 & -2 Influent grabs by Ecology.
Ainf-E Influent composite by Ecology.

Aeff-1 & -2 Effluent grabs by Ecology.
Aeff-E Effluent composite by Ecology.

Flow to the WWTP at Albion is measured from the daily operating time and frequency of the influent lift station pump (which pumps 259 gpm), while flows from the WWTP can be measured from the V-notch weir at the chlorine contact chamber.

Appendix A lists the various laboratories and methods used for the analysis of Ecology samples. Laboratory quality assurance and quality control (QA/QC) methods are described by Huntamer and Hyre (1991). Recommended holding times were met for all analyses performed. Matrix spike and spike duplicate recoveries, and relative percent difference (a measure of precision) were within acceptable QC limits. There were no analytical problems with the analysis of samples, thus the data required no qualification.

RESULTS AND DISCUSSION

Flow

Figure 4 shows two weekly charts from the Pullman WWTP continuous flow recording device. Each chart includes the two days during which an inspection was being conducted. The consistent flow pattern from day-to-day is obvious in both charts. Also, the charts clearly show that the University was in full operation during the October inspection, but not during the July inspection. Twenty-four hour totalizer readings for July 24-25 and October 1-2 were 2.72 and 3.41 MGD, respectively. Comparison was good between Ecology's calculated and Pullman's recorded instantaneous flows.

From 0800 on July 24 to 0800 on July 25 the lift station pump at Albion WWTP delivered 0.037 MGD (Smith, 1992). The calculated instantaneous flow of effluent on July 25 at 0930 was 0.003 MGD. The dramatic difference between influent and effluent flows (0.034 MGD) is attributable to evaporation and seepage to groundwater. An estimated loss for this geographic region, time of year, and lagoon design is 0.033 MGD--70 percent to evaporation and 30 percent to seepage (Ecology, 1990). This means that about 10,000 gallons per day is lost to ground water year-round. The town will install a continuous flow recorder with totalizer at the effluent, to be operational by April 1992.

Albion's collection system does experience some infiltration during high rain periods, especially during the time of spring runoff. For example, a flow value of 0.297 MGD was recorded during a day in early March 1990. This is almost 2.5 times the plant's design value (Ecology, 1990), and may be due, in part, to the collection system being constructed of PVC pipe. The annual average monthly flow to the plant is approximately 50% of the plant's design flow.

General Chemistry Results

Pullman WWTP daily discharges routinely exceed the mean monthly SFPR flow for the months of July through October (Joy, 1987). Taken in light of Ecology's current 100:1 dilution ratio guideline, it is easy to understand public concern about the potential effect of the plant on this waterbody. Organic loading, nutrients, and fecal coliform are the parameters of concern.

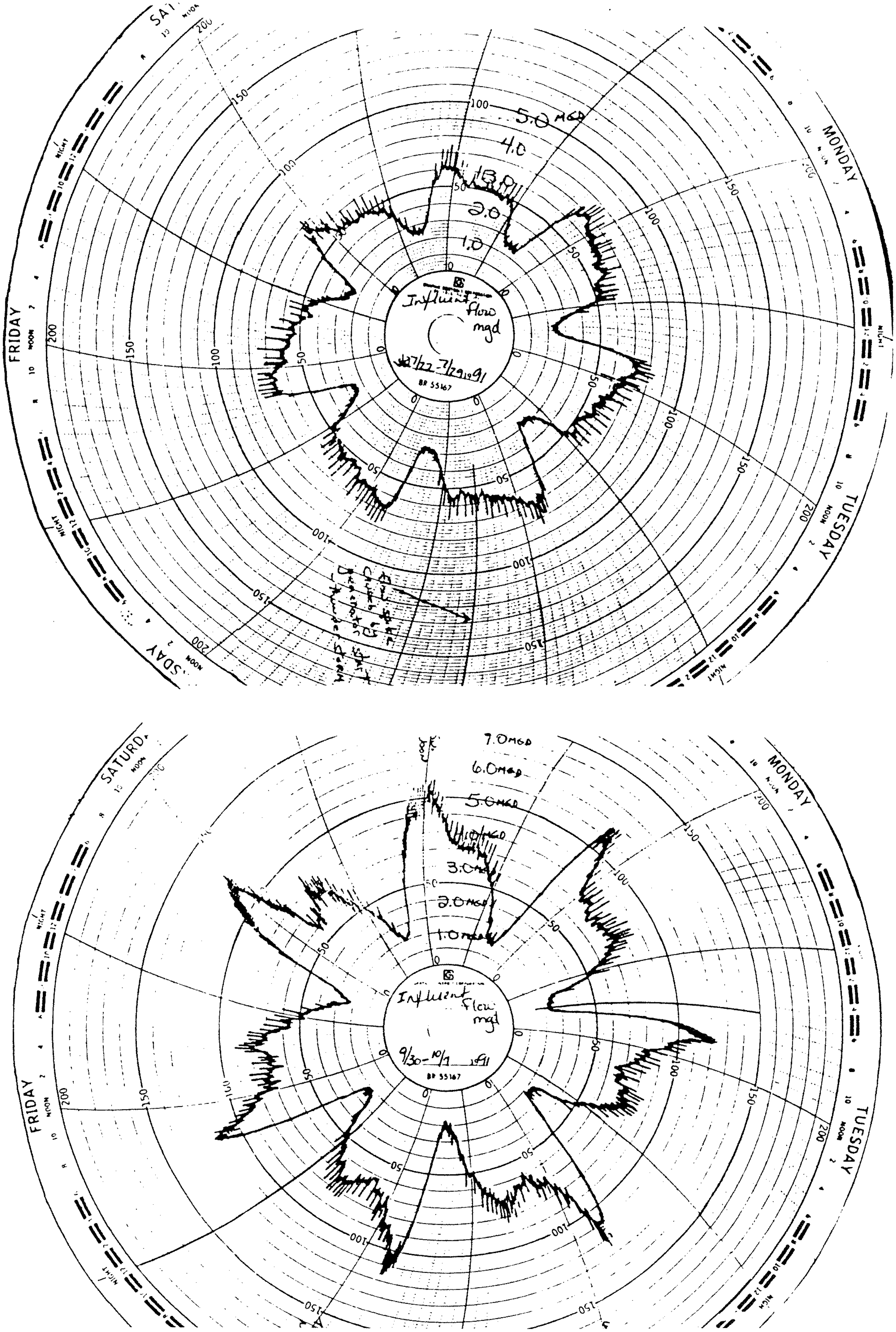

Figure 4. Continuous Flow Recordings for Two-Seven Day Periods, July 22-29 and September 30-October 7, 1991 - Pullman WWTP.

Tables 1 and 2 show general chemistry results from the July and October surveys, respectively.

The Pullman plant was operating exceedingly well during both inspections. Nutrient data indicated nearly full nitrification was occurring. The biofilter is an important component in the effective integration of nutrient removal with the main biological treatment system. Another key ingredient was the unusually high alkalinity. Tables 1 and 2 show concentrations above 250 mg/L; 100 mg/L is considered a medium strength (Metcalf & Eddy, 1991). This high alkalinity is probably due to ground water as the source of the city's water supply.

Efficiency in BOD and TSS removal was unusually high in spite of the relatively weak influent, particularly for BOD. Ultimate BOD of the October effluent was as low as could be expected with the unusually low effluent BOD_5, TSS and ammonia/organic (Kjeldahl) nitrogen. The lab result for BOD_{60} was 19.6 mg/L (Thomson, 1992), all in the carbonaceous BOD (CBOD) form. The 3 mg/L of organic N must have been in a refractory form, such as animal or plant tissue, since the lab analysis didn't detect a nitrogenous oxygen demand. A computer model was used to generate a statistical fit to the observed data and calculate an ultimate CBOD (NCASI, 1987). The result was an average of 19.1 mg/L with a BOD reaction-rate constant, k (base e) of 0.092.

Coliform and residual chlorine removal were acceptable. The SO_2 dechlorination system was performing well. Other parameters were not noteworthy. The plant site and equipment appeared to be well maintained.

There are two overriding considerations concerning the effect of the Albion discharge on the SFPR: 1) the flow was two orders of magnitude smaller than the Pullman discharge, and there will be no discharge during future May - October periods; 2) the river channel has migrated since the outfall line was installed; effluent now flows through a marshy area for approximately 15 yards and no direct discharge was visible.

Table 3 shows the results from the inspection at Albion. The WWTP was experiencing robust algae growth during daylight hours. This was evident from the green color of the lagoon water, high effluent TSS values, and jump in effluent pH (due to uptake of CO_2). Significant drops in NH_3-N, NO_2+NO_3-N, TPN and alkalinity indicate that nitrification and denitrification were taking place. A portion of the drop in TPN and the drop in total phosphorus are attributable to sedimentation of the algae, a sign of adequate detention time in the lagoons.

Fecal coliform results were quite low, but field measurements indicated that chlorine residuals were high (Table 3). Significant sludge build-up was observed in the chlorine contact chamber to within one inch of the water surface. Actual contact time is probably much less than the one-hour design time.

Other parameters were not noteworthy. Aquatic macrophytes were under control, and the general appearance of the plant site was good.

Possible effects on the receiving environment due to these and other dischargers are being explored in a companion document (Joy, in preparation).

Comparison to NPDES Permit Limits

Tables 4 and 5 show a comparison of inspection results to permit limits for the July and October Pullman inspections, respectively. All parameters were meeting the specified effluent limits. It is the City's stated intention to revert the influent compositor to flow proportional sampling mode shortly. This should be done. The permit also specifies that when the actual flow or waste load reaches 85 percent of design capacity, the permittee shall submit to the department a plan and schedule for continuing to maintain adequate capacity. Flow in July exceeded this 85 percent threshold limit. (It is not clear why a dry weather flow limit was incorporated into the issued permit in addition to the standard design capacity.) TSS loading in October also exceeded the 85 percent capacity limitation.

Past treatment plant records indicate that full nitrification is not predictable. Records for the period June through October, 1990 show a number of excursions above the permit limit of 1 mg/L. The ability to nitrify is strongly dependent on the organic loading, as the faster growing heterotrophs will displace the slower growing nitrifiers at increased loadings (Stensel, 1991).

Future designs should include a safety factor to account for the need to have a greater inventory of nitrifying bacteria available to handle peak ammonia loads. Poduska (1973) has established a guideline that the safety factor should be equal to the ratio of peak to average ammonia loads in order to maintain the effluent ammonia concentration at or below the selected design value (in this case, the effluent limit). Since excursions are happening, it would be advisable for the permittee to address this safety factor issue further.

Table 6 shows the comparison for the Albion WWTP. The plant was in violation of effluent limitations for TSS and pH. It is common for lagoon systems to experience high TSS and pH during summer months, as explained above. Effluent will not be discharged to surface water during summer months in the future. Some fraction of the 10,000 gallons/day contribution to ground water probably enters the river eventually. However, it was beyond the scope of this inspection to determine the significance of the contribution.

Comparison of Sample Results

Sample splits at Pullman were only conducted during the July inspection and only on the composites collected by Pullman. Under proper circumstances, four-way splits can produce revealing information on both sample representativeness and laboratory analytical techniques; in this case only analytical techniques were examined. Table 7 shows the comparison of results. On the influent sample, the difference in results for TSS between the Pullman lab (122 mg/L) and the Ecology lab (148 mg/L) was significant. No explanation was apparent.

Table 4. Comparison of Inspection Results to NPDES Permit Limits - Pullman WWTP, 7/91.

Parameter	NPDES Permit Limit: Monthly Average	NPDES Permit Limit: Weekly Average	Inspection Data: Ecology Composite	Inspection Data: Grab Samples	Plant Loading: Design Criteria^	Plant Loading: 85% of DC	Plant Loading: Inspection Results	Plant Loading: %of DC
Influent BOD5								
(mg/L)			119	117;206				
(lbs/d)					6000	5100	2700	45
Effluent BOD5								
(mg/L)	30*	45	3	2;4				
(lbs/d)	900	1350					68	
(% removal)	85						97	
Influent TSS								
(mg/L)			176	112;188				
(lbs/d)					6100	5185	3993	65
Effluent TSS								
(mg/L)	30*	45	3	2;2				
(lbs/d)	915	1373					68	
(% removal)	85						98	
Total Ammonia Nitrogen								
(mg/L) (May1-Oct30)	1		0.02	0.027;0.031				
Fecal Coliform (#/100 ml)		100		90;50; 17;22				
Chlorine Residual	No detectable residual**			<0.1;<0.1				
pH (S.U.)	6.0≤pH≤9.0		7.41	6.43;7.2				
Flow (MGD)	2.7				2.7***	2.3	2.72****	101

^ (Parametrix, 1985.) Based on influent flow.

* or 15% of the respective influent concentrations, whichever is more stringent.

** no detectable residual shall mean less than .02 mg/L.

*** monthly average dry weather flow (from NPDES permit); design criterion is actually 4.3 MGD.

**** WWTP influent totalizer result; readings taken at 1200 on 7/24 and 7/25.

Table 5. Comparison of Inspection Results to NPDES Permit Limits - Pullman WWTP, 10/91.

	NPDES Permit Limit		Inspection Data		Plant Loading			
Parameter	Monthly Average	Weekly Average	Ecology Composite	Grab Samples	Design Criteria^	85% of DC	Inspection Results	%of DC
Influent BOD5								
(mg/L)			134	170;89				
(lbs/d)					6000	5100	3811	64
Effluent BOD5								
(mg/L)	30*	45	7**	6;5				
(lbs/d)	900	1350					156	
(% removal)	85						95	
Influent TSS								
(mg/L)			221	215;259				
(lbs/d)					6100	5185	6285	103
Effluent TSS								
(mg/L)	30*	45	5	5;3				
(lbs/d)	915	1373					142	
(% removal)	85						98	
Total Ammonia Nitrogen								
(mg/L) (May1-Oct30)	1		0.087	0.075;0.064				
Fecal Coliform								
(#/100 ml)		100		43;37				
Chlorine Residual	No detectable residual			<0.1;<0.1				
pH (S.U.)	6.0≤pH≤9.0		7.06	6.89;6.82				
Flow (MGD)	4.3				4.3***	3.66	3.41****	80

^ (Parametrix, 1985) based on influent.

* or 15% of the respective influent concentrations, whichever is more stringent.

** calculated from BOD60 result.

*** monthly average wet weather flow (from NPDES permit).

**** WWTP influent totalizer result; readings taken at 1200 on 10/1 and 10/2.

Table 6. Comparison of Inspection Results to NPDES Permit Limits - Albion WWTP, 7/91.

Parameter	NPDES Permit Limit Monthly Average	NPDES Permit Limit Weekly Average	Inspection Data Ecology Composite	Inspection Data Grab Samples	Plant Loading Design Criteria^	Plant Loading 85% of DC	Plant Loading Inspection Results^^	Plant Loading %of DC
Influent BOD5								
(mg/L)			134	119;146				
(lbs/d)					212	180	41	20
Effluent BOD5								
(mg/L)	45**	65	21	20;27				
(lbs/d)	56	81					6.5	
(% removal)	80						84	
Influent TSS								
(mg/L)			100	49;166				
(lbs/d)								
Effluent TSS								
(mg/L)	45	65	88	76;87				
(lbs/d)	56	81						
(% removal)								
Fecal Coliform				<2 U;<2				
(#/100 ml)	200	400		<2 U;<2				
pH (S.U.)	6.0≤pH≤9.0		9.63	8.97;9.53				
Flow (MGD)	0.12				0.12	0.10	0.037	31

* permittee is authorized to discharge only during the period February 1 through May 31 each year, effective fall of 1991.

** or 20% of the influent concentration, whichever is more stringent.

^ defined as daily average for maximum month in NPDES permit.

^^ calculated from influent pump operating records for 7/24/91.

Table 7. Comparison of Sample Splits – Pullman WWTP, 7/91.

Sample	Sampler	Laboratory	BOD (mg/L)	TSS (mg/L)	Ammonia (mg/L)
Pinf–E (308161)	Ecology	Pullman	–	–	–
		Ecology	119	176	16.4
Pinf–P (308155)	Pullman	Pullman	134	122	13.8
		Ecology	129	148	14.7
Peff–E (308173)	Ecology	Pullman	–	–	–
		Ecology	3	3	0.02
Peff–P (308157)	Pullman	Pullman	3	2	<0.1
		Ecology	3	5	0.043

Table 8. Comparison of Sample Splits – Albion WWTP, 7/91.

Sample	Sampler	Laboratory	BOD (mg/L)	TSS (mg/L)	pH
Ainf–E (308165)	Ecology	–	–	–	–
		Ecology	134	100	8.32*
influent	Albion	Colfax	238	334	8.1
Aeff–E (308167)	Ecology	–	–	–	–
		Ecology	21	88	9.63*
effluent	Albion	Colfax	34	102	9.4

* field measurements.

No splits were conducted at Albion as explained earlier. Table 8 compares the data from their routine compliance monitoring on the day of the inspection to Ecology's inspection data. Albion's influent BOD and TSS data were dramatically higher than Ecology's results; effluent data were somewhat higher. Their samples are analyzed at the Colfax Laboratory, which has experienced difficulties passing the performance evaluations that EPA requires using known standards (EPA, 1991). The discrepancy may also be partly attributable to sample representativeness, *i.e.*, Albion's grab-composites are collected only during daylight hours when solids concentrations are typically higher. The reason(s) for this disparity cannot be assessed accurately without splitting samples, and asking each lab to run performance evaluation standards.

CONCLUSIONS AND RECOMMENDATIONS

1. The Pullman plant was operating exceedingly well at the times of both inspections. Plant site and equipment appeared to be well maintained.

2. Nearly full nitrification was occurring at the Pullman plant during both the July and October inspections. Effluent total ammonia concentrations were below .01 mg/L. However, past treatment plant records indicate that full nitrification is not predictable. There have been a number of excursions above the permit limit of 1 mg/L. Future planning for upgrade should include the concept of a safety factor to provide a greater inventory of nitrifying bacteria available to handle peak ammonia loads.

3. The Albion WWTP was experiencing robust algae growth during daylight hours. TSS and pH exceeded permit limits. Repeated violations may be less of a problem in the future since Albion will not be discharging to surface water during dry weather. However, about 10,000 gallons per day is lost to ground water through seepage.

4. Significant sludge build up was observed in the chlorine contact chamber at the Albion plant. Routine maintenance is needed to prevent this.

5. Aquatic macrophytes were under control around the Albion lagoons, and the general appearance of the site was good.

6. The Pullman and Ecology laboratories got significantly different results for influent TSS. Pullman's lab has been accredited, but a review of their use of the analytical protocol for TSS would be advisable. The results of DMR-QA standards analyses are due in early spring; they could be helpful.

7. BOD and TSS results from Albion's influent samples were dramatically higher than Ecology results. The Colfax Laboratory, which analyzes Albion's samples, has been experiencing quality assurance problems. Also, representative samples probably are not being collected under their present grab-composite sampling procedure. Consideration should be given to using a lab which has been certified under the State of Washington Lab Accreditation Program, and to the purchase and use of automatic composite samplers.

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APPENDIX A

Appendix A. Chemical Analytical Methods and Laboratories - SFPR, 7/91 & 10/91.

Parameters	Method	Lab Used
GENERAL CHEMISTRY		
Turbidity	EPA, 1979: 180.1	Ecology; Manchester, WA
Conductivity	EPA, 1979: 120.1	Ecology; Manchester, WA
Alkalinity	EPA, 1979: 310.1	Ecology; Manchester, WA
Chloride	EPA, 1979: 330.0	Ecology; Manchester, WA
SOLIDS 4		
TS	EPA, 1979: 160.3	Ecology; Manchester, WA
TNVS	EPA, 1979: 106.4	Ecology; Manchester, WA
TSS	EPA, 1979: 160.2	Ecology; Manchester, WA
TNVSS	EPA, 1979: 106.4	Ecology; Manchester, WA
BOD5	EPA, 1979: 405.1	Water Mgmt. Lab, Inc.; Tacoma, WA
BOD60	Whittemore, 1991	Ecology; Manchester, WA
TOC (water)	EPA, 1979: 415.2	Ecology; Manchester, WA
NUTRIENTS		
NH3-N	EPA, 1979: 350.1	AmTest, Inc., Redmond, WA
NO2+NO3-N	EPA, 1979: 353.2	AmTest, Inc., Redmond, WA
Nitrogen-Total (TPN)	Valderrama, 1981	AmTest, Inc., Redmond, WA
Phosphorus - Total	EPA, 1979: 365.1	AmTest, Inc., Redmond, WA
Oil and Grease	EPA, 1979: 413.1	Sound Anal. Svcs.; Tacoma, WA
F-Coliform MF	APHA, 1989: 9222D	Ecology; Manchester, WA
Enterococci MPN	APHA, 1989: 9230B	Ecology; Manchester, WA