ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF ENFORCEMENT
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Waste Source And Water Quality Investigations Reno-Sparks Joint Water Pollution Control Plant And Truckee River

(MARCH-APRIL 1977)

NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
DENVER, COLORADO
AND
REGION IX - SAN FRANCISCO

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Environmental Protection Agency
Office of Enforcement
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WASTE SOURCE AND WATER QUALITY INVESTIGATIONS
RENO-SPARKS JOINT WATER POLLUTION CONTROL PLANT
AND
TRUCKEE RIVER

(March-April 1977)

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National Enforcement Investigations Center - Denver
Region IX - San Francisco

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I. INTRODUCTION

The Truckee River originates at Lake Tahoe and flows approximately 180 km (110 mi), terminating at Pyramid Lake, Nevada [Figure 1]. Reno and Sparks, Nevada are the only major cities on the river, and operate the Reno-Sparks Joint Water Pollution Control Plant (WPCP), a 76,000 m^3/day (20 mgd) modified activated sludge process. The effluent from the WPCP is provided post aeration to maintain a dissolved oxygen (DO) content of at least 6.0 mg/l, chlorinated and discharged to Steamboat Creek approximately 180 m (200 yd) upstream from the confluence with the Truckee River at about river mile (RM) 59. The only other major tributary (and possible waste source) in the study area is the North Truckee drain, which intercepts the Truckee River immediately upstream of and opposite Steamboat Creek.

On January 10, 1975, Environmental Protection Agency (EPA), Region IX, issued National Pollutant Discharge Elimination System (NPDES)* Permit No. NV0020150 to the Reno-Sparks Joint WPCP to be effective February 10, 1975, and expire May 1, 1977 [Appendix A].

On September 8, 1976, subsequent to finding violations of permit limitations for BOD and toxicity, EPA issued an order to the City of Sparks requiring the development of plans for the achievement of effluent limitations.

On January 28, 1977, after the EPA order was issued, the Director, Enforcement Division, Region IX, requested technical assistance from National Enforcement Investigations Center (NEIC) to:

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* *NPDES - Federal Water Pollution Control Act Amendments of 1972 (PL 92-500).*

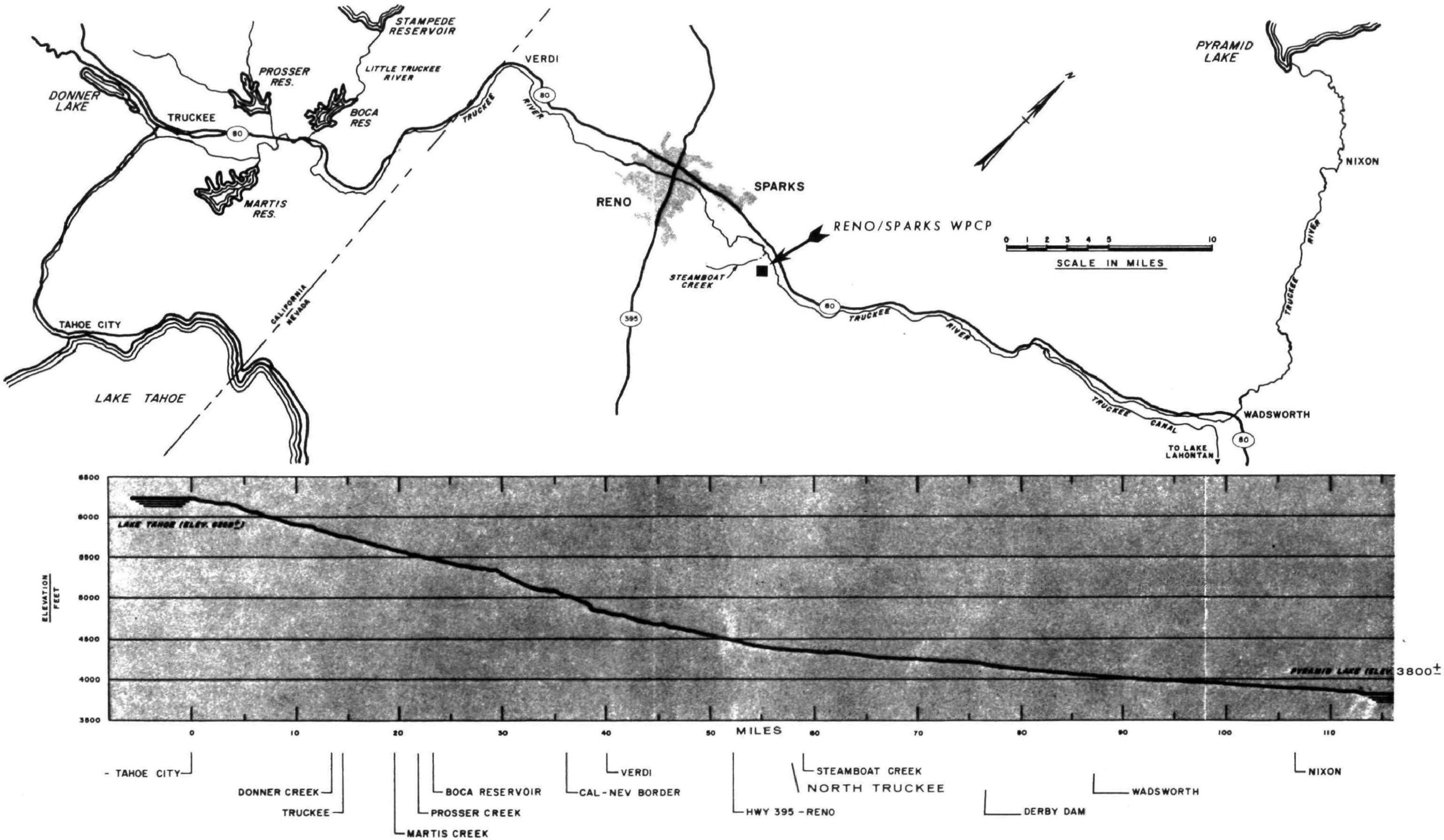

Figure 1. Truckee River, Plan and Profile, Lake Tahoe to Pyramid Lake

1) document continuing violations of permit limits for BOD and toxicity,
2) determine the causative agent of the toxicity,
3) investigate the causes for BOD and toxicity violations and identify remedial actions,
4) document actual adverse environmental effects attributable to the present Reno-Sparks discharge and identify potential adverse effects that could be expected should wastewater flows increase in the future.

In response to this request, NEIC personnel performed a reconnaissance of the study area February 14-17, 1977 to gain input from the affected parties, select sampling sites, and assess logistical requirements. Informal meetings were held with personnel from the Reno-Sparks Joint WPCP, Nevada Environmental Protection Services, U.S. Fish and Wildlife Service, Desert Research Institute, and EPA, Region IX.

During March 24 - April 9, 1977 NEIC conducted an extensive study at the Reno-Sparks Joint WPCP and on the Truckee River. Wastewater and water quality characterizations were performed in conjunction with a biological investigation of the effects the WPCP had on the receiving waters.

II. SUMMARY AND CONCLUSIONS

NPDES COMPLIANCE MONITORING

1. Reno-Sparks Joint WPCP self-monitoring data collected over the past four years show mean monthly total suspended solids (TSS) and biochemical oxygen demand (BOD) values have averaged 14 and 9 mg/l, respectively. This performance record has conclusively documented the ability of the treatment process units to achieve NPDES limits (BOD and TSS 30-day limits of 10 and 20 mg/l, respectively).

2. Despite the overall commendable performance record of the WPCP, based on self-monitoring data, apparent violations of NPDES limits have also occurred.

3. Regression analyses of the past 4 years of monthly average TSS and BOD concentrations versus flows in the range of 16 to 20 mgd yielded no significant relationships (correlation coefficient <0.15). This indicates that, to date, no relationship has developed to link increased wastewater flow in the range observed with diminished plant performance. It is probable that alteration of nearly two-thirds of the plant to accommodate phosphorus removal experiments since early 1976 is the cause of reduced removal efficiencies and increased effluent BOD concentrations, particularly since the plant was previously operating at optimum treatability levels.

4. During the NEIC study, the Reno-Sparks Joint WPCP was not in compliance with its NPDES permit limitations. Effluent data collected during April 1-8, 1977 indicated the plant exceeded its NPDES 7-day average concentration limits for BOD (18 vs. 15 mg/l) and TSS (39 vs. 30 mg/l). The NPDES 7-day loading limits for TSS were also exceeded (2,400

vs. 2,300 kg/day). In addition, the plant failed to meet its $\geq$ 85% removal efficiency requirement for TSS (76%). Fecal coliform bacteria limits for 7-day average were also exceeded (3,900 vs. 400/100 ml). The daily maximum fecal coliform bacteria limit of 2,000/100 ml was exceeded in 9 of 14 samples collected with densities ranging from 2,200 to 49,000/100 ml. Limitations prohibiting the discharge of toxic substances also were violated.

5. Composite and grab samples collected by NEIC were compared to those collected by Reno-Sparks Joint WPCP. Results indicated comparable TSS values. BOD values determined by NEIC were generally lower than WPCP results. There was a significant difference between fecal coliform bacteria results; in no instance was the density determined by the WPCP as great as those determined by NEIC. A probable explanation for this difference is the different analytical technique used by the WPCP and NEIC. The WPCP uses the membrane filter technique which, when used with chlorinated wastewater, yields variable recoveries and consistently lower results than the MPN technique used by NEIC.

WATER QUALITY INVESTIGATION

1. A zone-of-mixing study conducted by NEIC on March 24, 1977 indicated the WPCP effluent was completely mixed in the Truckee River 1,200 m (3,800 ft) downstream from the confluence with Steamboat Creek. Truckee River flow during the study was 12.3 m^3/sec (436 cfs). It is estimated that the geography of the stream, including sharp bends, will greatly influence the mixing distance and, in most instances complete mixing will occur by the time the wastewaters reach the U.S. Geological Survey (USGS) Vista gaging station, 2,100 m (6,900 ft) downstream from Steamboat Creek.

2. The WPCP was the major source of BOD, total phosphorous (P), and total nitrogen (N) loads in the Truckee River immediately downstream from the plant, contributing 69%, 79%, and 77% respectively.

3. No significant DO sag occurred downstream from WPCP discharges. DO concentrations upstream of the plant averaged 10.8 mg/l with a daily average range of 10.3 to 11.2 mg/l. Average DO concentrations 16.6 km (10.3 mi.) downstream from the WPCP were 9.9 mg/l with a daily average range of 9.5 to 10.3 mg/l.

4. Of the total dissolved solids (TDS) loading in the Truckee immediately downstream from the WPCP, 19% was contributed by the WPCP, 20% by Steamboat Creek and 14% by North Truckee Drain. The remaining 48% was already borne by the Truckee River upstream of the tributaries and WPCP.

5. Of the chloride loading in the Truckee immediately downstream from the WPCP, 25% was contributed by the WPCP, 40% by Steamboat Creek and 6.7% by North Truckee Drain. The remaining 28% was carried by the Truckee upstream of the tributaries and WPCP.

6. Total phosphorus (P) concentrations upstream of the WPCP discharge and the two tributaries averaged 0.09 mg/l. Inputs, primarily from the WPCP, caused total phosphorus (P) concentrations to increase to 0.56 mg/l at the Vista gaging station, 2.1 km (1.3 mi) downstream from the WPCP. Concentrations remained nearly constant, equaling 0.56 mg/l at the Southern Pacific Railroad Bridge near Patrick, 16.6 km (10.3 mi) downstream from the WPCP.

7. Nitrogen forms upstream of the tributaries and WPCP included concentrations of organic nitrogen (N), ammonia-N, and nitrite plus nitrate (N) of 0.39, 0.13, and 0.11 mg/l, respectively. Incoming nitrogen loads, primarily from the WPCP, resulted in an increase in

downstream nitrogen forms. Concentrations of organic nitrogen (N), ammonia-N and nitrite plus nitrate (N) at the Vista gaging station were 1.03, 1.02, and 0.66 mg/l, respectively. Nitrogen concentrations downstream from the Vista gage indicated a gradual increase in nitrite plus nitrate to 1.3 mg/l at the Southern Pacific Railroad Bridge (RM 10.3), offset by a gradual decrease in ammonia (N) to 0.85 mg/l. Organic nitrogen (N), on the other hand, remained relatively constant at 1.11 mg/l.

8. Discharge from the WPCP caused Truckee River geometric mean fecal coliform (FC) densities to increase from 13/100 ml upstream of the plant to 90/100 ml at the Vista gage, 2.1 km (1.3 mi) downstream of the plant. No *Salmonella* were detected upstream of the plant. However, *Salmonella enteritidis* were isolated both in the WPCP effluent and at the Vista station downstream from the plant, indicating the plant was the source of these pathogenic organisms.

BIOLOGICAL INVESTIGATIONS

1. Native Lahontan cutthroat trout exhibited 50% mortality in a 96-hour exposure (LC_{50})* to a mixture of 73% unchlorinated Reno-Sparks Joint WPCP effluent and 27% Truckee River water. This mixture contained 12.8 mg/l total ammonia-N or 0.17 mg/l un-ionized ammonia-N. In a second bioassay, the LC_{50} (50% mortality level) was determined to be a mixture of 12% chlorinated effluent and 88% Truckee River water in violation of NPDES permit limitations. This mixture contained 0.05 mg/l residual chlorine and a minor amount (0.02 mg/l) of un-ionized ammonia-N. From the results of these bioassays, it is concluded that residual chlorine was the principal toxic component of the Reno-Sparks Joint WPCP effluent during the NEIC study. To reduce chlorine residuals to non-toxic levels while maintaining adequate disinfection, alternative disinfection practices or dechlorination must be implemented.

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* *LC_{50} indicates the concentration (actual or interpolated) at which 50% of the test organisms died or would be expected to die.*

2. To meet the requirements of the NPDES permit and Nevada Water Quality Standards, total ammonia-N concentrations in the plant effluent should average 7.7 mg/l, a 56% reduction from ammonia-N concentrations measured in bioassays (17.6 mg/l). This limitation was calculated from bioassay data and represents the value which will provide 100% survival of Lahontan cutthroat trout in acute 96-hour exposures in undiluted, unchlorinated effluent. The concentration limit is independent of wastewater flow.

3. Using application factors of 1/20 (24-hour average) and 1/10 (maximum not to be exceeded) of LC_{50} values, it was calculated that the following average and maximum concentrations would guarantee protecting Truckee River biota on a long-term (chronic) basis: 0.6 and 1.3 mg/l total ammonia-N; 0.01 and 0.02 mg/l un-ionized ammonia-N; and, 0.0025 and 0.005 mg/l residual chlorine. Based on wastewater flows observed during the survey and Truckee River flows (177 cfs) projected to be exceeded 99% of the time, chronic toxicity will be prevented if the Reno-Sparks Joint WPCP effluent total ammonia-N concentrations average 3.4 mg/l and do not exceed 6.8 mg/l. This is an average reduction of 81% from bioassay concentrations (17.6 mg/l). If wastewater flows increase to 30 mgd, average effluent concentrations would be 1.8 mg/l, a reduction of 90%. Without ammonia removal facilities and assuming present flows from the plant, and bioassay NH_3-N concentrations, Truckee River flows of 857 and 374 cfs will be necessary to produce 1/20 and 1/10 LC_{50} values. It is projected that 857 cfs will be exceeded 23% of the time during the entire year and 53% during spawning; flows will exceed 374 cfs 75% of the time during all months and 85% during spawning.

4. In violation of NPDES permit limitations, mortalities occurred among caged cutthroat trout in the Truckee River downstream from the Reno-Sparks Joint WPCP discharge. Mortalities were most severe in the effluent mixing zone, and less severe downstream to the Southern Pacific Railroad Bridge near Vista, 1.2 miles downstream from the discharge.

Because ammonia concentrations (0.03 mg/l or 1/8 EC_{50}) were lower than levels determined to be acutely toxic, the Truckee River toxicity is attributed to residual chlorine.

5. Macroinvertebrate distribution was influenced by the presence of the Reno-Sparks Joint WPCP discharge. Abundance, community structure, and variety reflected clean water conditions in areas upstream of the discharge. In the effluent plume and the Truckee River downstream from the mixing zone, community structure was altered and variety decreased. At Patrick, 16.6 km (10.3 mi) downstream from the discharge, complete recovery was evident.

6. Periphyton growth was severely depressed by the toxicity of the Reno-Sparks Joint WPCP discharge. Recovery was detected within 10.3 river miles, and profuse growths occurred. Algal growth potential (AGP) tests showed that the effluent stimulated algal growth. Although both nitrogen and phosphorus were growth-stimulating nutrients, phosphorus is the more sensitive nutrient for effecting reductions in algal growth. Each reduction of 1.0 μg/l of phosphorus will produce a 0.14 to 0.76 mg/l reduction of algal growth.

III. NPDES COMPLIANCE MONITORING

PLANT DESCRIPTION AND PERFORMANCE

The Reno-Sparks Joint Water Pollution Control Plant consists of a modified activated sludge process [Figure 2] with the following design criteria:

Average design flow	20 mgd
Peak design flow	32 mgd
Influent BOD	200 mg/l
Effluent BOD	10 mg/l
Influent TSS	200 mg/l
Effluent TSS	10 mg/l

On June 9, 1976, NEIC conducted a Pilot Compliance Monitoring (PCM) Inspection at the Reno-Sparks Joint WPCP to evaluate self-monitoring practices. With few exceptions, these were found to be acceptable.

Past self-monitoring data indicate the WPCP personnel have done a commendable job in operating the plant. Mean monthly TSS and BOD values, based on daily composite samples collected over the past 4 years [Table 1], were 14 and 9 mg/l, respectively. This performance record has conclusively documented the ability of the treatment process units to achieve NPDES limits (BOD and TSS 30-day limits of 10 and 20 mg/l, respectively). Percent removal efficiencies averaged 95.0 and 96.2%, respectively. It should be noted that these average removal efficiencies may be higher than actual since the WPCP influent sampling site is downstream from the waste activated sludge return flow.

Despite this commendable overall performance record, NPDES violations of monthly average TSS and BOD limitations, as documented by the

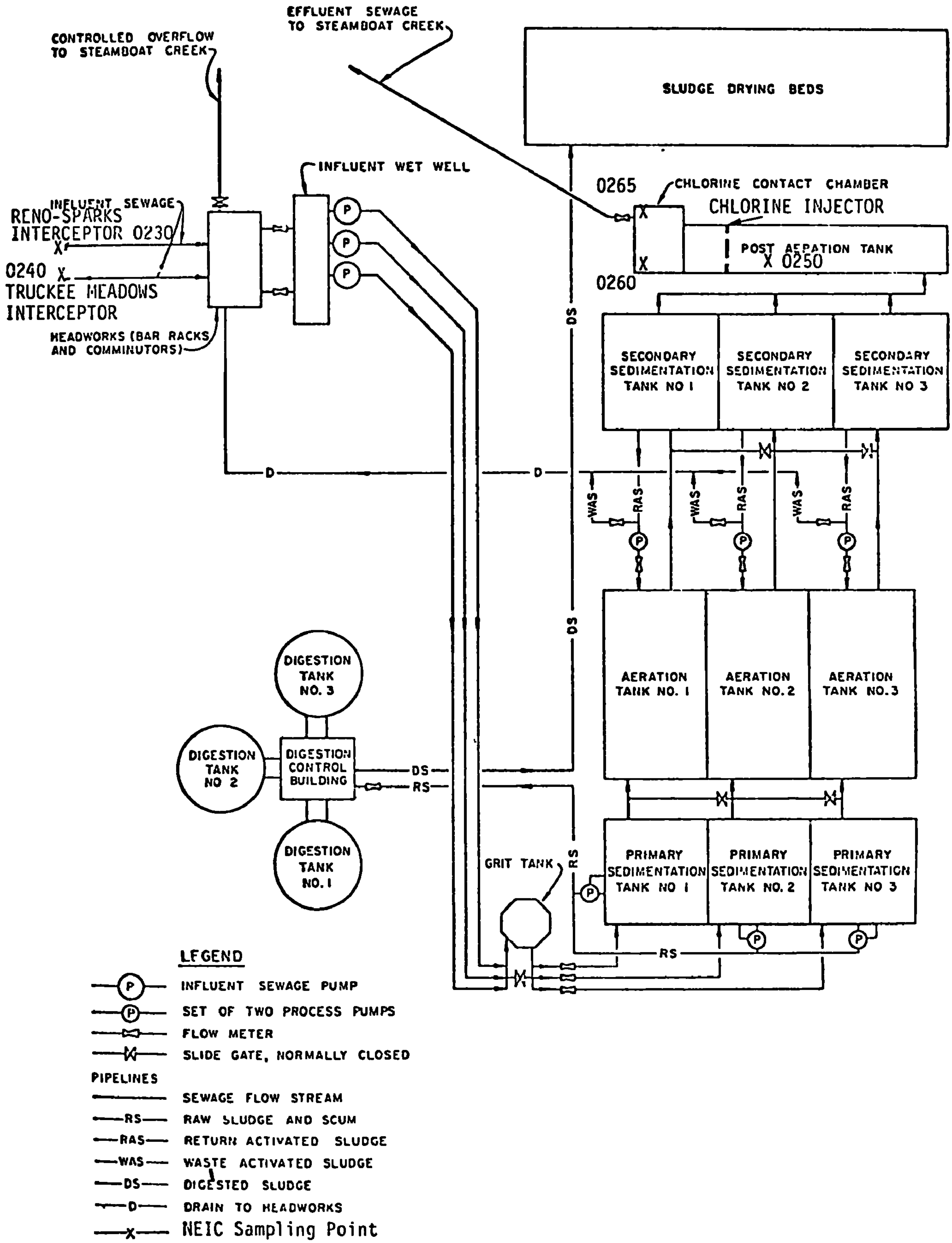

Figure 2. Reno-Sparks Joint Water Pollution Control Plant Schematic Diagram

Table 1

SELF-MONITORING DATA
RENO-SPARKS JOINT WATER POLLUTION CONTROL PLANT

Year/ Month	Flow mgd	BOD Influent mg/l	BOD Effluent mg/l	BOD Removal %	TSS Influent mg/l	TSS Effluent mg/l	TSS Removal %
1973							
Jan.	18.3	211	5	97.6	263	11	95.8
Feb.	18.2	242	4	98.4	284	10	96.5
Mar.	17.6	212	6	97.2	260	20	92.3
Apr.	17.9	158	8	94.9	272	15	94.5
May	17.8	130	4	96.9	259	12	95.4
June	19.2	168	4	97.6	248	11	95.6
July	20.4	124	12	90.3	251	11	95.6
Aug.	19.3	104	3	97.1	260	12	95.4
Sept.	17.4	155	6	96.1	265	11	95.9
Oct.	16.8	196	8	95.9	252	10	96.0
Nov.	16.5	210	9	95.7	267	9	96.6
Dec.	16.3	181	6	96.7	266	14	94.7
1973 Avg.	18.0	174	6	96.6	263	12	95.4
1974							
Jan.	16.9	175	6	96.6	270	14	94.8
Feb.	16.0	259	8	96.8	274	12	95.6
Mar.	16.7	301	11	96.4	303	17	94.4
Apr.	16.8	272	7	97.4	291	17	94.2
May	17.7	272	5	98.2	268	16	94.0
Pho Strip System Experiments, June 1974 - Jan. 1977							
June	18.8	210	10	95.2	259	21	91.9
July	19.2	207	6	97.1	266	15	94.4
Aug.	19.6	-	-	-	239	16	93.3
Sept.	18.8	283	6	97.9	255	12	95.3
Oct.	17.8	274	5	98.2	278	12	95.7
Nov.	17.0	293	9	97.9	288	11	96.2
Dec.	16.8	288	8	97.2	281	12	95.7
1974 Avg.	17.7	258	7	97.3	273	15	94.5
1975							
Jan.	17.8	262	6	97.7	270	12	95.7
Feb.	17.9	187	7	96.3	196	17	91.3
Mar.	17.7	187	6	96.8	233	16	93.1
Apr.	17.7	232	11	95.2	262	16	93.9
May	17.8	203	10	95.1	277	14	94.9
June	18.8	191	9	95.3	248	13	94.8
July	19.32	125	9	93	253	12	95
Aug.	19.52	176	8.6	95	250	11	96
Sept.	19.86	194	9	95	298	13	96
Oct.	18.45	214	11	95	343	13	96
Nov.	17.96	239	8	97	365	14	96
Dec.	17.59	253	8	97	267	15	94
1975 Avg.	18.37	205	9	96	271	14	95
1976							
Jan.	17.74	179	10	94	251	12	95
Feb.	17.34	207	9	96	276	13	95
Mar.	18.18	260	6	98	320	11	97
Apr.	18.04	282	8	97	283	11	96
May	18.78	288	10	97	302	11	96
June	19.49	236	14	94	263	13	95
July	20.52	253	14	94	254	12	95
Aug.	20.3[illegible]	231	20	91	282	17	94
Sept.	19.28	307	16	95	262	15	95
Oct.	18.27	248	14	95	272	18	93
Nov.	17.71	285	14	95	323	21	93
Dec.	17.11	295	20	93	282	17	94
1976 Avg.	18.57	256	13	95	281	14	95
1977							
Jan.	16.99	299	21	93	285	17	94

WPCP self-monitoring program, have occurred [Figure 3]. Apparent violations of BOD occurred in April and October 1975, and every month since May 1976. The only TSS violation occurred in November 1976.

Wastewater flows have steadily increased since 1974 [Table 1], reaching a yearly average of 18.57 mgd in 1976, or 93% of design flow. More importantly, monthly average flows have periodically exceeded the 20 mgd design flow. As flows increase, a point is reached where treatment plant performance must diminish. To determine whether or not such a point has been reached, monthly average TSS, BOD, and flow values, based on daily composite sampling from 1973 through 1976, were subjected to regression analyses. The analyses performed included least squares determinations for linear ($y = ax + b$), power ($y = ax^b$) and exponential ($y = ae^{bx}$ and $y = ab^x$) relationships. All correlation coefficients were less than 0.15, indicating that to date, no relationship has developed to link increased flows with diminished plant performance.

NEIC COMPLIANCE MONITORING

Sampling Techniques

During March 28 to April 8, 1977, the NEIC conducted a study at the Reno-Sparks Joint WPCP to determine NPDES compliance. Influent and effluent flow-proportional composite samples for a wide range of parameters [Table 2] were collected. In addition, a number of grab samples were collected [Table 3] to note diurnal variations. All samples requiring holding were stored at 4°C and preserved by prescribed EPA techniques. NEIC chain-of-custody [Appendix B] and analytical quality control procedures [Appendix C] were followed. All samples were either analyzed on site in an NEIC mobile laboratory or air freighted to the NEIC laboratory in Denver, Colorado for analyses.

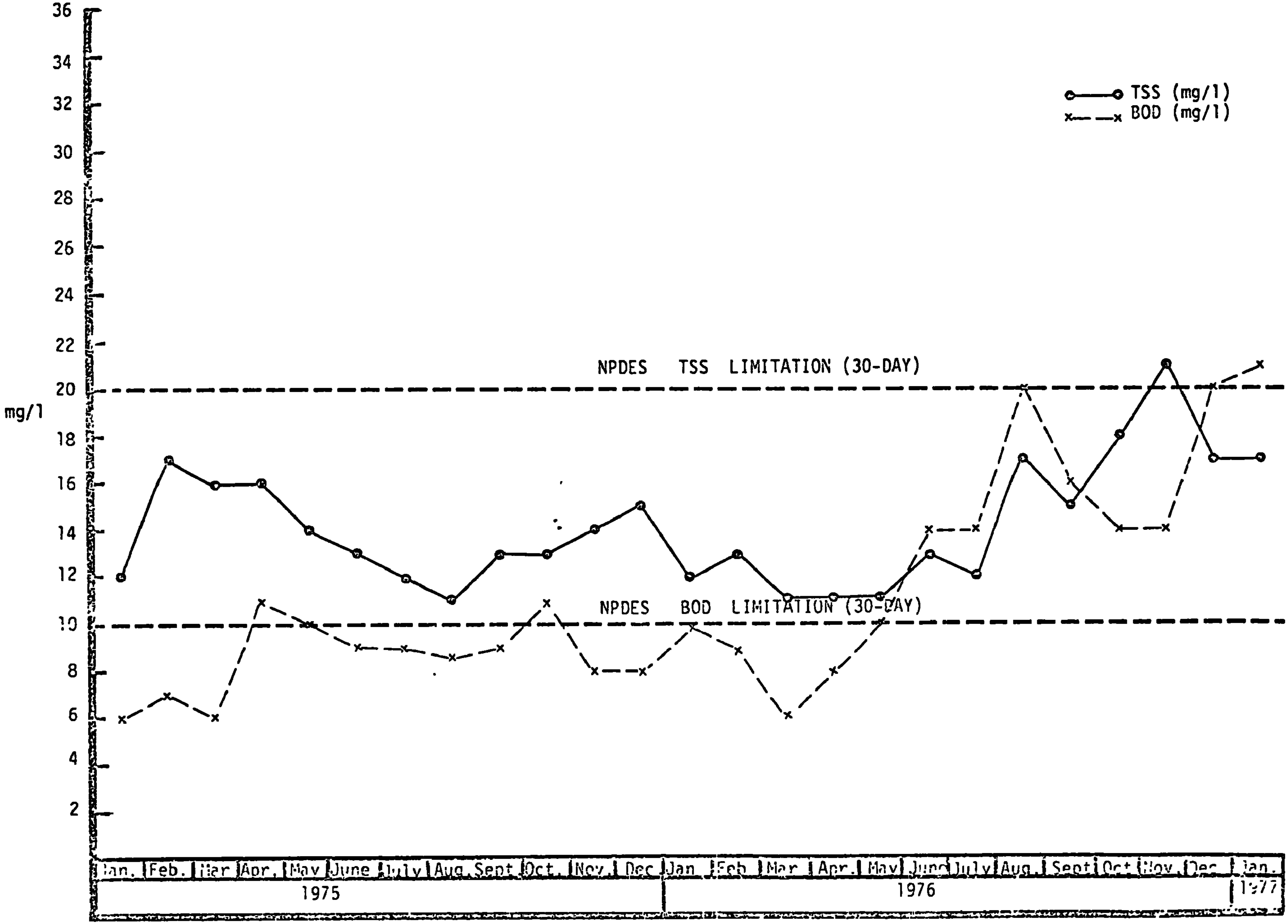

Figure 3. Self-Monitoring Data
Reno-Sparks Joint WPCP

Table 2

COMPOSITE SAMPLING DATA
RENO-SPARKS JOINT WPCP
March 28-April 8, 1977

Sampling Station	Sampling Date†	Flow		BOD			TSS			TDS			Chloride		
		m^3/day x 10^3	mgd	mg/l	kg/day	lb/day	mg/l	kg/day	lb/day	mg/l	kg/day	lb/day	mg/l	kg/day	lb/day
Station 0230	3/29	21	5.5	180	3,700	8,300	210	4,400	9,600	440	9,200	20,000	55	1,100	2,500
Reno-Sparks	3/30	20	5.3	130	2,600	5,700	150	3,000	6,600	400	8,000	18,000	42	840	1,900
Influent	3/31	20	5.3	160	3,200	7,100	320	6,400	14,000	380	7,600	17,000	32	640	1,400
Interceptor	4/1	20	5.3	120	2,400	5,300	200	4,000	8,800	360	7,200	16,000	30	600	1,300
	4/2	23	6.1	120	2,800	6,100	87	2,000	4,400	390	9,000	20,000	30	690	1,500
	4/3	19	5.1	160	3,100	6,800	110	2,100	4,700	320	6,200	14,000	28	540	1,200
	4/4	20	5.3	210	4,200	9,300	360	7,200	16,000	340	6,800	15,000	26	520	1,100
Average 3/29-4/4		20	5.4	150	3,100	6,900	210	4,200	9,200	380	7,700	17,000	35	700	1,600
Average 4/1-4/4		21	5.5	153	3,100	6,900	190	3,800	8,500	350	7,300	16,000	29	600	1,300
Station 0240	3/29	40	10.7	80††	3,200	7,100	98	4,000	8,800	400	16,000	36,000	16	650	1,400
Truckee Meadows	3/30	41	10.8	65††	2,700	5,900	64	2,600	5,900	380	16,000	34,000	28	1,100	2,500
Influent	3/31	41	10.9	98††	4,000	8,900	95	3,900	8,600	380	16,000	35,000	28	1,200	2,500
Interceptor	4/1	40	10.7	88††	3,600	7,900	100	4,000	8,900	370	15,000	33,000	33	1,300	2,900
	4/2	38	10.0	180	6,800	15,000	200	7,600	17,000	400	15,000	33,000	33	1,200	2,800
	4/3	42	11.1	110	4,600	10,000	120	5,000	11,000	370	16,000	34,000	35	1,500	3,200
	4/4	39	10.4	102	4,000	8,900	150	5,900	13,000	390	15,000	34,000	25	1,000	2,200
Average 3/29-4/4		40	10.7	103	4,100	9,100	120	4,700	10,000	380	16,000	34,000	28	1,100	2,500
Average 4/1-4/4		40	10.6	120	4,800	10,000	140	5,600	12,000	380	15,000	34,000	32	1,300	2,800
Station 0260	3/29	61	16.2	39	2,400	5,300	500†††	31,000	68,000	380	23,000	51,000	44	2,700	5,900
Effluent in	3/30	61	16.1	40	2,400	5,400	240†††	15,000	32,000	370	23,000	50,000	40	2,400	5,400
Chlorine Contact	3/31	61	16.2	15††	920	2,000	120†††	7,400	16,000	380	23,000	51,000	41	2,500	5,500
Chamber	4/1	61	16.0	22	1,300	2,900	78†††	4,700	10,000	340	21,000	45,000	35	2,100	4,700
	4/2	61	16.1	23	1,400	3,100	96†††	5,800	13,000	370	23,000	50,000	40	2,400	5,400
	4/3	61	16.2	20	1,200	2,700	50†††	3,100	7,000	310	19,000	42,000	35	2,100	4,700
	4/4	59	15.7	18	1,100	2,400	55	3,300	7,000	300	18,000	39,000	35	2,100	4,600
Average 3/29-4/4		61	16.1	25	1,500	3,400	160	10,000	22,000	350	21,000	47,000	39	2,300	5,200
Station 0265	4/1	61	16.0	10	610	1,300	38	2,300	5,100	330	20,000	45,000	35	2,100	4,700
Effluent at Chlorine	4/2	61	16.1	16	970	2,100	40	2,400	5,400	380	23,000	51,000	40	2,400	5,400
Contact Chamber	4/3	61	16.2	17	1,000	2,300	24	1,500	3,200	320	20,000	43,000	35	2,100	4,700
Weir	4/4	59	15.7	17	1,000	2,200	48	2,900	6,300	320	19,000	42,000	34	2,000	4,500
	4/5	62	16.5	17	1,100	2,300	41	2,600	5,600	400	25,000	55,000	41	2,600	5,600
	4/6	61	16.0	16	970	2,100	44	2,700	5,900	400	24,000	53,000	45	2,700	6,000
	4/7	61	16.0	27	1,600	3,600	33	2,000	4,400	410	25,000	55,000	44	2,700	5,900
	4/8	62	16.3	22	1,400	3,000	42	2,600	5,700	420	26,000	57,000	44	2,700	6,000
Average 4/1-4/8		61	16.1	18	1,100	2,400	39	2,400	5,200	370	23,000	50,000	40	2,400	5,400
Average 4/1-4/4		61	16.0	15	900	2,000	38	2,300	5,000	340	21,000	45,000	36	2,200	4,800
Removal Eff. 4/1-4/4						88			76			10			-17

Table 2 (Continued)

COMPOSITE SAMPLING DATA
RENO-SPARKS JOINT WTCP
March 28-April 8, 1977

Sampling Station	Sampling Date†	Flow $m^3/day \times 10^3$	Flow mgd	Temp. °C	pH	Un-unionized Ammonia mg/l	Ammonia-N mg/l	Ammonia-N kg/day	Ammonia-N lb/day	Organic Nitrogen (N) mg/l	Organic Nitrogen (N) kg/day	Organic Nitrogen (N) lb/day	NO_2 & NO_3(N) mg/l	NO_2 & NO_3(N) kg/day	NO_2 & NO_3(N) lb/day	Total Phosphorus (P) mg/l	Total Phosphorus (P) kg/day	Total Phosphorus (P) lb/day
Station 0230	3/29	21	5.5		8.1		19.6	410	900	28.6	600	1,300	7.0	150	320	5.5	110	250
Reno-Sparks	3/30	20	5.3		8.0		17.4	350	770	12.4	250	550	2.4	48	110	7.0	140	310
Influent	3/31	20	5.3		8.7		16 8	340	740	15.2	300	670	4.6	96	210	5.8	120	260
Interceptor	4/1	20	5.3		8.1		19.8	400	880	20.4	410	900	3.2	64	140	7.8	160	340
	4/2	23	6.1		7.4		18.8	430	960	12.8	300	650	2.4	55	120	6.8	160	350
	4/3	19	5.1		7.2		21.2	410	900	13.4	260	570	1.6	31	68	8.5	160	350
	4/4	20	5.3		7.3		20.4	410	900	18.6	370	820	0.4	8.0	18	9.2	180	410
Average 3/29-4/4		20	5.4		7.2-8.7		19.1	390	860	17.3	360	780	3.1	65	140	7.2	150	330
Average 4/1-4/4		21	5.5		7.2-8.1		20.1	410	910	16.3	340	740	1.9	40	90	8.1	170	360
Station 0240	3/29	40	10.7		7.2		18.0	730	1,600	21.2	860	1,900	1.8	73	160	5.2	210	460
Truckee Meadows	3/30	41	10.8		7.1		16.4	670	1,500	8 6	350	780	2.0	82	180	4.8	200	430
Influent	3/31	41	10.9		7.2		16.4	680	1,500	10.0	410	910	2.0	83	180	5.0	210	450
Interceptor	4/1	40	10.7		7.1		19.2	780	1,700	14.8	600	1,300	0.4	16	36	6.5	260	520
	4/2	38	10.0		8.4		19.8	750	1,700	20.2	760	1,700	2.0	76	170	8.0	300	670
	4/3	42	11.1		7.0		19.2	810	1,800	11 2	470	1,000	0 4	17	37	8 8	370	820
	4/4	39	10.4		7.8		22.4	880	1,900	8.2	320	710	0.4	16	35	7.2	280	620
Average 3/20-4-4		40	10.7		7.0-8.4		18.8	760	1,700	13.5	540	1,200	1.3	52	110	6.5	260	580
Average 4/1-4/4		40	10.6		7.0-8.4		20.2	810	1,800	13.6	540	1,200	0.8	31	70	7.6	300	670
Station 0260	3/29	61	16.2	14.9	7.9	0.41	19.6	1,200	2,600	27.0	1,700	3,700	14.8	910	2,000	3.2	200	430
Effluent in	3/30	61	16 1	15.7	7.2	0.07	15.6	950	2,100	6.4	390	860	9.6	580	1,300	5.0	300	670
Chlorine Contact	3/31	61	16.2	15.3	7.7	0.23	16.4	1,000	2,200	5.2	320	700	6 4	390	870	4.0	250	540
Chamber	4/1	61	16.0	16.0	8.0	0.45	15.6	940	2,100	11 0	670	1,500	2.1	150	320	6.8	410	910
	4/2	61	16.1	15.7	7.3	0.09	16.0	970	2,100	8 2	500	1,100	3.2	190	430	6.5	400	870
	4/3	61	16 2	15.5	7.5	0.12	13.6	830	1,800	12.6	770	1,700	2.0	120	270	6.0	370	810
	4/4	59	15.7	16.1	7.3	0.10	16.6	990	2,200	5.8	340	760	2.0	120	260	6.8	400	890
Average 3/29-4/4		61	16.1	15.6	7.2-8.0	0.21	16.2	980	2,200	10.8	670	1,500	5.8	350	780	5.5	330	730
Station 0265	4/1	61	16.0	16.0	7.2	0.07	14.4	870	1,900	10.8	650	1,400	3 6	220	480	6.8	410	910
Effluent at	4/2	61	16 1	15.7	7.3	0.08	14.4	880	1,900	27.6	1,700	3,700	3.2	190	430	6.8	410	910
Chlorine Contact	4/3	61	16.2	15.5	7.0	0 04	14.2	870	1,900	11.2	690	1,500	2.4	150	320	7.2	440	970
Chamber Weir	4/4	59	15.7	16.1	7.1	0.05	14.8	880	1,900	13.0	770	1,700	2.4	140	310	7.8	460	1,000
	4/5	62	16.5	18.6	7.2	0.08	15.0	940	2,100	12.0	750	1,700	1.6	100	220	8.0	500	1,100
	4/6	61	16.0	18.5	7.5	0.16	14.6	880	1,900	16.4	990	2,200	2.0	120	270	7.2	440	960
	4/7	61	16.0	18.9	7.2	0.09	13.8	840	1,800	16.8	1,000	2,200	2.4	150	320	6.0	350	800
	4/8	62	16.3		7.4		15.6	960	2,100	16.2	1,000	2,200	3.2	200	440	6.2	380	840
Average 4/1-4/8		61	16 1	17.0	7.0-7.5	0.08	14.6	890	1,900	15.5	940	2,100	2.6	160	350	7.0	430	940
Average 4/1-4/4		61	16.0	15.8	7.0-7.3	0.06	14.5	880	1,900	15.7	950	2,100	2.9	180	390	7.2	430	950
Removal Eff. 4/1-4/4									30			-8			-144			8

† *Compositing period was 0700-0700. Date listed is day period ended.*
†† *DO depletions were less than the recommended 2 mg/l.*
††† *Because of a sampling problem these TSS values are not considered representative. See text for explanation.*

Table 3

GRAB SAMPLING DATA
RENO-SPARKS JOINT WPCP
March 28-April 7, 1977

Station Description	Sampling Date & Time†		DO	Temp. °C	pH	Un-ionized Ammonia-N mg/l	Ammonia-N mg/l	NO_2 & NO_3(N) mg/l	Residual Chlorine mg/l
Station 0260 Effluent after chlorination	3/29	0600	9.3	14.0	7.3				
		1145	9.2	16.0	7.4				1.3
		1445	9.1	15.5	7.7				0.33
		1705	8.9	15.5	7.1				0.43
		2020	9.1	16.0	7.9	0.46	20.0	12.0	0.59
		2300	9.0	14.0	7.7	0.22	17.8	11.0	
		0150	9.3	14.0	7.8	0.28	17.9	8.2	
		0525	9.6	14.0	7.9	0.35	17.5	9.6	
	Daily	Avg.	9.2	14.9	7.1-7.9	0.33	18.3	10.2	0.66
	3/30	1110	8.8	16.0	7.5				0.16
		1200		16.6	7.3	0.08	13.4	17.6	
		1410	9.0	16.0	7.7				0.23
		1600		15.1	7.2	0.06	15.0	12.0	
		1710	9.2	16.0	8.0				
		1940	9.2	15.0	7.9	0.37	17.6	6.8	0.50
		2245	9.0	16.0	7.9	0.39	17.0	4.4	0.43
		0145	9.6	15.5	8.2	0.74	17.2	4.8	
		0535	9.5	15.0	7.9	0.34	16.2	4.8	
	Daily	Avg.	9.2	15.7	7.2-8.2	0.33	16.1	8.4	0.33
	3/31	0800		16.0	7.4	0.11	15.6	5.6	
		1103	9.0	16.0	7.4				
		1200		15.8	7.2	0.06	13.8	8.0	
		1400	9.0	15.0	7.8				0.20
		1600		15.5	7.3	0.08	13.6	8.0	
		1637	11.4	15.5	7.9				0.50
		1945	8.6	15.0	7.3	0.10	17.6	4.0	0.20
		2245	7.8	15.0	7.7	0.24	17.6	4.0	0.23
		0145	8.0	14.5	7.3	0.09	16.6	3.2	
		0510	7.8	15.0	7.4	0.11	15.8	3.2	
	Daily	Avg.	8.8	15.3	7.2-7.9	0.11	15.8	5.1	0.28
	4/1	0800		15.8	7.0	0.05	17.2	0.8	
		1055	7.3	16.0	7.4				0.16
		1200		19.9	6.9	0.05	14.2	1.6	
		1405	7.2	16.5	7.4				0.26
		1600		16.5	6.9	0.04	17.6	1.2	
		1645	7.3	16.0	7.3				
		1935	8.5	16.0	7.6	0.23	20.0	0.8	0.66
		2250	7.2	15.0	7.4	0.13	18.6	0.8	0.16
		0150	7.8	15.0	7.4	0.13	19.4	0.8	
		0505	8.5	13.0	8.0	0.44	19.0	0.8	
	Daily	Avg.	7.7	16.0	6.9-8.0	0.15	18.0	1.0	0.31
	4/2	0800		15.5	7.0	0.04	14.4	2.8	
		1055	8.1	16.0	7.5				0.23
		1200		18.0	6.9	0.03	12.8	4.4	
		1415	9.4	15.5	7.1				0.66
		1600		16.0	7.0	0.04	14.2	1.6	
		1650	8.6	16.0	7.4				
		1925	8.7	15.0	7.9	0.39	18.6	0.8	0.43
		2240	6.9	15.0	7.3	0.10	19.0	0.4	0.53
		0125	9.2	15.0	7.4	0.10	14.6	1.2	
		0500	7.2	15.0	7.3	0.08	14.8	1.6	
	Daily	Avg.	8.3	15.7	6.9-7.9	0.11	15.5	1.8	0.46
	4/3	1055	8.8	15.5	7.5				0.89
		1410	8.2	16.0	7.4				0.46
		1645	7.3	16.0	7.2				
		1930	8.2	16.0	7.6	0.21	17.8	1.2	1.0
		2235	6.8	16.0	7.3	0.09	15.6	1.2	0.40
		0135	8.6	15.0	8.2	0.62	15.0	1.6	
		0500	7.6	14.0	7.3	0.07	13.4	1.6	
	Daily	Avg.	7.9	15.5	7.2-8.2	0.25	15.5	1.4	0.69
	4/4	1055	9.0	16.5	7.4				0.82
		1420	7.8	17.5	7.2				0.13
		1650	7.6	17.0	7.7				
		1930	8.5	17.0	7.6	0.23	18.4	1.6	0.63
		2230	7.4	15.0	7.3	0.10	18.4	1.6	0.23
		0130	8.8	15.0	7.0	0.05	16.8	1.6	
		0450	8.4	15.0	7.6	0.17	15.6	1.6	
	Daily	Avg.	8.2	16.1	7.0-7.7	0.14	17.3	1.6	0.45
	4/5	0800		16.7	7.1	0.05	13.8	2.0	
		1200		21.3	7.1	0.06	11.8	2.4	
		1600		20.1	7.1	0.07	14.2	2.4	
		2200		16.5	7.1	0.06	18.0	2.0	
		0200					16.2	2.0	
		0500					14.8	2.4	
	Daily	Avg.		18.6	7.1-7.1	0.06	14.7	2.2	

Table 3 (Continued)

GRAB SAMPLING DATA

Station Description	Sampling Date & Time†		Temp. °C	pH	Un-ionized Ammonia-N mg/l	Ammonia-N mg/l	NO_2 & NO_3 (N) mg/l	Residual Chlorine mg/l
Station 0260 (Continued)	4/6	1200	22.2	7.3	0.11	11.6	4.0	
		1600	20.2	7.3	0.12	15.2	3.2	
		2000	17.3	7.4	0.07	18.4	3.2	
		2400	16.9	7.2	0.08	15.6	1.6	
		0400	16.1	7.3	0.08	14.2	1.6	
	Daily Avg.		18.5	7.2-7.3	0.09	15.0	2.7	
	4/7	0800	18.8	7.4	0.12	13.2	2.4	
		1200	22.8	7.3	0.12	12.2	4.0	
		1600	20.4	6.5	0.02	15.6	2.4	
		2000	17.9	7.1	0.07	17.6	2.0	
		2400	16.8	7.3	0.09	15.4	1.6	
		0400	16.4	7.3	0.08	13.8	2.8	
	Daily Avg.		18.9	6.5-7.4	0.08	14.6	2.5	
Station 0250 Effluent prior to chlorination	3/29	2025	14.5	7.4	0.13	19.4	12.0	
		2300	14.0	7.8	0.32	20.0	11.2	
		0150	14.0	7.9	0.34	17.4	9.0	
		0525	14.0	7.9	0.32	16.6	12.0	
	Daily Avg.		14.1	7.4-7.9	0.28	18.4	11.1	
	3/30	1200	16.6	7.3	0.09	13.4	13.2	
		1600	15.1	7.2	0.07	16.8	9.6	
		1940	15.0	8.0	0.49	18.6	6.0	
		2245	16.0	7.9	0.40	17.6	3.2	
		0145	15.5	8.2	0.77	17.8	2.8	
		0535	15.0	8.2	0.66	16.0	4.8	
	Daily Avg.		15.5	7.2-8.2	0.41	16.7	6.6	
	3/31	0800	16.0	7.4	0.11	15.6	6.8	
		1200	15.8	7.2	0.06	14.2	9.2	
		1600	15.5	7.3	0.09	15.8	6.8	
		1945	15.0	7.8	0.32	19.2	4.4	
		2245	15.0	8.0	0.46	17.4	3.2	
		0145	14.5	7.4	0.11	16.0	2.0	
		0510	15.0	7.4	0.11	15.6	4.0	
	Daily Avg.		15.3	7.2-8.0	0.18	16.3	5.2	
	4/1	0800	15.8	7.0	0.05	18.2	0.8	
		1200	16.0	7.4	0.12	16.0	1.2	
		1600	19.9	6.9	0.06	17.4	0.8	
		1935	16.0	7.7	0.31	21.4	0.4	
		2250	15.0	7.4	0.14	21.2	0.4	
		0150	15.0	7.5	0.16	18.4	0.4	
		0505	13.0	8.1	0.50	17.2	0.8	
	Daily Avg.		15.8	6.9-8.1	0.19	18.5	0.7	
	4/2	0800	15.5	7.0	0.05	17.2	1.2	
		1200				16.0	1.6	
		1600				16.4	0.4	
		1925	15.0	7.1	0.08	22.2	0.4	
		2240	15.0	7.1	0.06	19.0	0.4	
		0135	15.0	7.4	0.12	17.6	0.4	
		0501	15 0	7.2		17.6	0.4	
	Daily Avg.		15.1	7.0-7.4	0.08	18.0	0.7	
	4/3	1930	16.0	7.5	0.20	21.2	0.4	
		2235	16.0	8.1	0.68	19.0	0.4	
		0135	15.0	7.8	0.29	17.2	0.4	
		0500	14.0	7.4	0.10	16.2	0.4	
	Daily Avg.		15.3	7.4-8.1	0.32	18.4	0.4	
	4/4	1930	17.0	8.5	2.1	22.8	0.4	
		2230	15.0	7.9	0.47	22.0	0.4	
		0130	15.0	7.7	0.27	20.0	0.4	
		0450	13.0	7.6	0.17	18.8	0.4	
	Daily Avg.		15.0	7.6-8.5	0.75	20.9	0.4	
	4/5	0800	16.7	7.1	0.07	16.8	0.4	
		1200	21.3	7.1	0.08	15.6	0.4	
		1600	20.1	7.1	0.09	18.0	0.4	
	Daily Avg.		19.4	7.1-7.1	0.08	16.8	0.4	
	4/6	1200	22.2	7.3	0.14	15.0	1.2	
	Daily Avg.							
	4/7	0800	18.8	7.4	0.11	12.4	2.4	
		1200	22.8	7.3	0.12	12.2	4.4	
		1600	20.4	6.5	0.02	16.6	2.0	
	Daily Avg.		20.7	6.5-7.4	0.08	13.7	2.9	

† *Date refers to day composition period ended. Time starts previous morning and continues to morning of date listed.*

NEIC also conducted bioassay studies to determine compliance with NPDES toxicity limitations. These will be covered later in this report under "Biological Investigation."

Sampling Locations

Influent samples were collected hourly with automatic samplers from the two interceptors entering the WPCP [Figure 2 and Table 2]. The first is the Reno-Sparks Interceptor (Station 0230) which receives flow from the Reno, the North Reno and the Sparks Interceptors. The second is the Truckee Meadows Interceptor (Station 0240). With the existing plant configuration it was impossible to collect a representative sample from the interceptors after they combine in the WPCP headworks since waste-activated sludge also enters there.

Initially, effluent composite samples were also collected hourly with an automatic sampler at location 0260A [Figure 4]. When TSS data for March 29, 30 and 31 indicated inordinately high TSS values [Table 2], analytical techniques were checked and verified to be acceptable. The sampling point was assumed to be in an eddy, thereby unrepresentative, and moved on April 1, 1977 to location 0260B. In addition, sampling Station 0265 was established at the siphon adjacent to the effluent weir where the WPCP personnel collect their NPDES samples. Flow-proportional composite samples of Station 0265 were manually collected at three-hour intervals, commencing Thursday, March 31. TSS data collected at Station 0260B approximately 0.6 m (2 ft) below the surface continued to appear unrepresentative when compared to Station 0265 results. A visual comparison between samples from 0260 (A and B) and 0265 revealed numerous tiny grease balls in the former samples.

On April 2, 1977, the sampling station was again relocated to 0260C at the turbulent downstream end of the post-aeration basin. TSS data

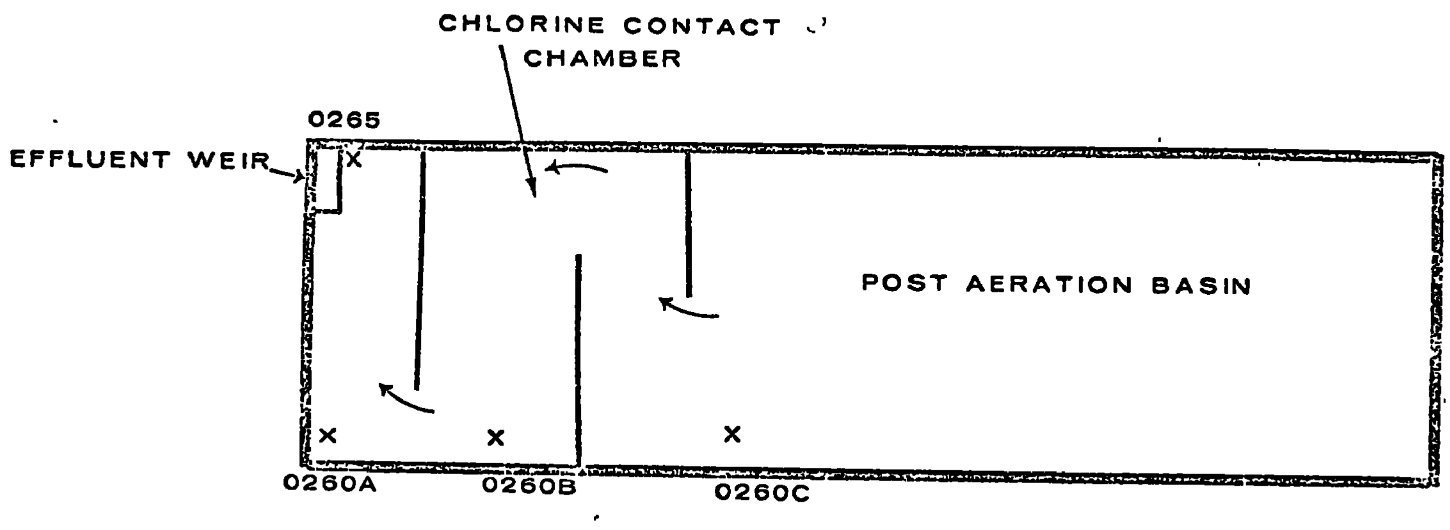

Figure 4. NEIC Sampling Locations - Reno/Sparks Joint WPCP Study
March 28 - April 8, 1977

collected at Station 0260C were comparable to 0265 for April 4. Apparently the combination of the turbulent post-aeration basin and the quiescent chlorine contact chamber act like a dissolved air flotation unit, floating tiny grease balls to the upper layers of the chamber where the automatic sampler probe was located, thereby yielding erroneous TSS results. Wastewater going over the effluent weir, on the other hand, is representative of the entire contents of the chamber, not just the upper portion.

On April 4, 1977, manual sampling of Station 0265 was replaced by hourly sampling with an automatic sampler. Data from Station 0265 were used for NPDES compliance determinations. Data collected at Station 0260 for parameters other than TSS showed no appreciable difference from Station 0265.

Flow Monitoring

Influent flow monitoring devices on the Reno-Sparks Interceptor include individual metering at remote locations on each of the three interceptors which comprise it. Both the Reno STP and North Reno interceptors include Parshall flumes and bubbler gages from which flow measurements are telemetered to the WPCP, recorded and totaled. The Sparks Interceptor includes a Palmer Bowlus flume and bubbler gage from which flow measurements are also telemetered to the WPCP, recorded and totaled. The second interceptor entering the WPCP, Truckee Meadows, also has a Parshall flume and bubbler gauge from which flow measurements are telemetered to the WPCP, recorded and totaled.

The effluent flow monitoring device consists of a 26.3 ft broad-crested weir at the downstream end of the chlorine contact chamber, from which head measurements are telemetered into the WPCP, converted to flow, recorded and totaled.

Flow monitoring accuracy checks are performed by both WPCP and Honeywell Inc.* personnel. Plant personnel make manual head measurements at the effluent weir every two weeks, convert the measurements to flow, and compare them to flow meter readings. Honeywell personnel check the entire influent and effluent sensing, telemetering and recording system every three months. If metering problems are detected by WPCP personnel, Honeywell is contacted for repair service.

Prior to the startup of the NEIC study, the effluent weir installation was checked and found to be acceptable. Flow measurement accuracy was within ± 10% as ascertained by comparing manual measurements to recorded values. On March 28, 1977, at the request of NEIC, a Honeywell employee checked the influent and effluent flow metering systems. All telemetering and recording was found to be accurate. There were, however, two potential problems. The Truckee Meadows flume is periodically innundated by backwater from the WPCP and then gives erroneously high readings. This results from defective flow pacing controls at the headworks. At the time of the NEIC study, one variable-speed and one constant-speed pump were being used to deliver flow from the wet well to the treatment units. These pumps were incapable of evenly pacing the flow into the plant, often resulting in backwater. A second variable-speed pump was on site but inoperable. However, new controls were on order to enable use of the second variable-speed pump. This will reportedly eliminate the backwater and enhance the treatment process through even distribution of the flow to the treatment units.

A second flow monitoring problem existed at the site of the Reno STP Interceptor Parshall flume. According to plant officials, high summer flows cause choppy approach conditions in the converging section of the flume, resulting in erroneously high readings. In the past, Honeywell Inc. was instructed to calibrate the flow meter and then manually reduce the actual reading by 23% of the previous month's

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* *Manufacturer of WPCP flow monitoring equipment.*

average flow. An inspection of the site on March 28, 1977 revealed no unusual approach conditions. On March 29, 1977 the Honeywell employee was instructed by the WPCP superintendent to readjust the metering to give actual readings. If summer flow conditions do indeed cause unacceptable approach conditions, it is doubtful whether any one adjustment would compensate for them. Accurate results would only be assured by eliminating any unacceptable approach conditions.

NPDES Compliance

Beginning approximately the morning of March 26 (Saturday), the WPCP plant began to exhibit a noticeable increase in floc going over the secondary clarifier weirs. As noted in the WPCP monitoring reports for March and a portion of April [Appendix D], this upset was accompanied by a marked increase in effluent TSS concentrations. Plant personnel tried to correct this situation by both altering the amount of air in the aeration basins and building new biomass. Their efforts were unsuccessful and the upset continued for the duration of the NEIC study.

Effluent data collected during April 1-8, 1977 [Table 4] indicated the plant was in violation of its NPDES 7-day concentration limits for BOD (18 vs. 15 mg/l) and TSS (39 vs. 30 mg/l). NPDES 7-day loading limits for TSS were also violated (2,400 vs. 2,300 kg/day). In addition, the plant failed to meet its $\geq$85% removal efficiency requirement for TSS (76%). The effluent was also found to be toxic to cutthroat trout. Fecal coliform bacteria limits for 7-day average were also violated (3,900 vs. 400/100 ml). The daily maximum fecal coliform bacteria limit of 2,000/100 ml was exceeded in 9 of 14 samples collected with densities ranging from 2,200 to 49,000/100 ml [Table 5].

Self-Monitoring by Reno-Sparks Joint WPCP vs. NEIC Results

Composite and grab samples collected by NEIC were compared to those

Table 4

NPDES COMPLIANCE MONITORING
RENO-SPARKS JOINT WPCP
April 1-8, 1977

Parameter	NPDES Permit 30-day Average	NPDES Permit 7-day Average	NPDES Permit Daily Maximum	NEIC Results (April 1-8, 1977) Average	NEIC Results (April 1-8, 1977) Maximum
BOD	10 mg/l 760 Kg (1700 lb/day)	15 mg/l 1200 Kg (2500 lb/day)	2300 Kg/day (5000 lb/day)	18 mg/l 1100 Kg/day (2400 lb/day)	1600 Kg/day (3600 lb/day)
TSS	20 mg/l 1500 Kg (3400 lb/day)	30 mg/l 2300 Kg (5000 lb/day)	4600 Kg/day (10,000 lb/day)	39 mg/l 2400 Kg/day (5200 lb/day)	2900 Kg/day (6300 lb/day)
Fecal Coliform Bacteria	200/100 ml	400/100 ml	2000/100 ml	3,900/100 ml†	49,000/100 ml
Dissolved Oxygen	Shall be greater than 6.0 mg/l at all times			Avg = 8.5 Range = 6.8- 11.4 mg/l	
pH	Shall not be less than 6.5 nor greater than 8.5 at any time				
BOD Removals	Removal efficiency ≥ 85%			88%††	
TSS Removals	Removal efficiency ≥ 85%			76%††	
Toxicity	No discharge of toxic materials			Toxic within 3 hours	

† *Geometric Mean density, MPN/100 ml*
†† *Removal efficiencies were calculated for period 4/1-4/4/77 since influent sampling ceased on 4/4/77*

Table 5

FECAL COLIFORM (MPN[†]/100 ML)
RENO-SPARKS WPCP AND TRUCKEE RIVER

March 28-April 4, 1977

Date	Station 0200 Truckee River Upstream of North Truckee Drain	Time	Station 0260 Effluent after Chlorination	Time	Station 0270 Truckee River at USGS Vista Gauge	Time
3/28	5	1215	7,900	1445	11	1535
3/29	33	0305	2,200	0525	110	0345
3/29	2	1130	3,300	1400	110	1230
3/30	79	0315	790	0535	220	0350
3/30	17	1135	33,000	1400	130	1240
3/31	33	0335	49,000	0510	4,900	0305
3/31	<2	1130	4,900	1405	11	1155
4/1	23	0305	400	0505	170	0330
4/1	8	1120	1,300	1415	20	1250
4/2	79	0305	800	0500	80	0325
4/2	<2	1140	13,000	1410	20	1250
4/3	33	0300	2,300	0500	170	0325
4/3	4	1135	33,000	1420	23	1350
4/4	33	0305	1,300	0450	490	0325
Geometric Mean	13/100 ml		3,900/100 ml		90/100ml	

† *Most Probable Number.*

collected by Reno-Sparks Joint WPCP personnel [Table 6]. For the composite days April 1-4, both WPCP and NEIC aliquot samples were collected every 3 hours, 8 times per day. From April 5-8, aliquots were collected every hour. The data indicate comparable TSS results. NEIC's BOD values were generally lower than WPCP results. NEIC and WPCP fecal coliform bacteria samples were collected at different times and with varying chlorine residuals. Although this could cause some differences in results, in no instance was the density determined by the WPCP as great as some of the densities determined by NEIC. A probable explanation is the difference in analytical techniques used by the WPCP and NEIC. The WPCP uses the membrane filter technique which, when used with chlorinated wastewaters, yields variable recoveries and consistently lower results than the most probable number (MPN) technique used by NEIC.

Analysis of Plant Performance

In the original permit [Appendix A], the plant was required to make necessary plans to meet 30-day and 7-day limits for total phosphorus (as PO_4) of 3.0 and 4.5 mg/l, respectively. From May 1974 to February 1977, experiments were conducted at the Reno-Sparks Joint WPCP to determine the most effective and economical means of meeting these limits. It was concluded that a PhoStrip system marketed by Union Carbide Company, employing the luxury uptake of phosphorus, would be used. Experiments with up to two-thirds of the plant flow were conducted until February 1977, when the State of Nevada ordered the project terminated. It was alleged that the alteration of the activated sludge process to accommodate the PhoStrip experiments was causing NPDES BOD violations. Results of the PhoStrip experiments indicated the proposed phosphorus (PO_4) limits of 3.0 and 4.5 mg/l could be achieved.

The cause of the continuing BOD increases in the effluent since the spring of 1976 [Figure 3] is apparently not a function of increased flow in the range of approximately 16 to 20 mgd, as discussed previously,

Table 6

COMPARISON BETWEEN RENO-SPARKS JOINT WPCP EFFLUENT SELF-MONITORING DATA AND NEIC STUDY DATA
March 29, 1977

Date†	TSS		BOD		FC††		
	WPCP mg/l	NEIC mg/l	WPCP mg/l	NEIC mg/l	WPCP MF	NEIC††† MPN	
3/29					130	7,900	2,200
3/30					610	3,300	790
3/31					860	33,000	49,000
4/1	42	38	22	10	750	4,900	400
4/2	24	40	28	16	180	1,300	800
4/3	30	24	26	17	290	13,000	2,300
4/4	49	48	16	17	210	33,000	1,300
4/5	37	41	33	17			
4/6	30	44	30	16			
4/7	33	33	30	27			
4/8	37	42	27	22			

† *Dates refer to day compositing period ended.*
†† *Fecal Coliform - density/100 ml.*
††† *Two grab samples collected per day.*

with respect to the statistical regression analysis. A more probable cause is the alteration of the treatment process to accommodate the experiments to develop a prototype phosphorus removal system to attain the phosphorus effluent limitations discussed above. These experiments began in May 1974 and required the use of one primary clarifier, one aeration basin, and one final clarifier. Beginning in early 1976, the experiments were expanded to include nearly two-thirds of the plant capacity. It is a reasonably probable that alteration of this much plant capacity for the phosphorus removal experimental testing would cause diminished plant performance, decreased removal efficiencies, and consequent increasing BOD effluent concentrations, particularly since the plant had been previously performing near the limits of optimal operation for the activated sludge process.

IV. WATER QUALITY - TRUCKEE RIVER

In conjunction with the WPCP evaluation, NEIC conducted studies on the Truckee River to define the zone of mixing of WPCP discharges and assess the effects of these discharges on the Truckee River.

EFFLUENT MIXING STUDY

On March 24, 1977, a study was conducted to define the zone of mixing of the WPCP effluent in the Truckee River. A series of stakes were set out at 150 m (500 ft) intervals on the Truckee River from Steamboat Creek to the Southern Pacific Railroad Bridge, 1,885 m (6,183 ft) downstream [Figure 5]. Beginning at 0930, fluorescent dye of known concentration was injected into the WPCP effluent at a constant rate of 14.3 ml/min. This rate was checked several times during the day and ascertained to remain constant.

A dye injection period of approximately 6 hours was allowed before sampling to assure a steady state in the study area. Surface samples were then collected at each 20% increment of the stream width, beginning at the Southern Pacific Railroad Bridge and moving upstream along the aforementioned grid system toward Steamboat Creek. All samples were returned to the WPCP where temperatures were recorded prior to injection into a high-sensitivity fluorometer for determination of dye concentrations. The fluorometer had previously been calibrated with dye standards to provide a direct readout of dye concentration. Samples collected on the Truckee River upstream of Steamboat Creek indicated there was no background fluorescence.

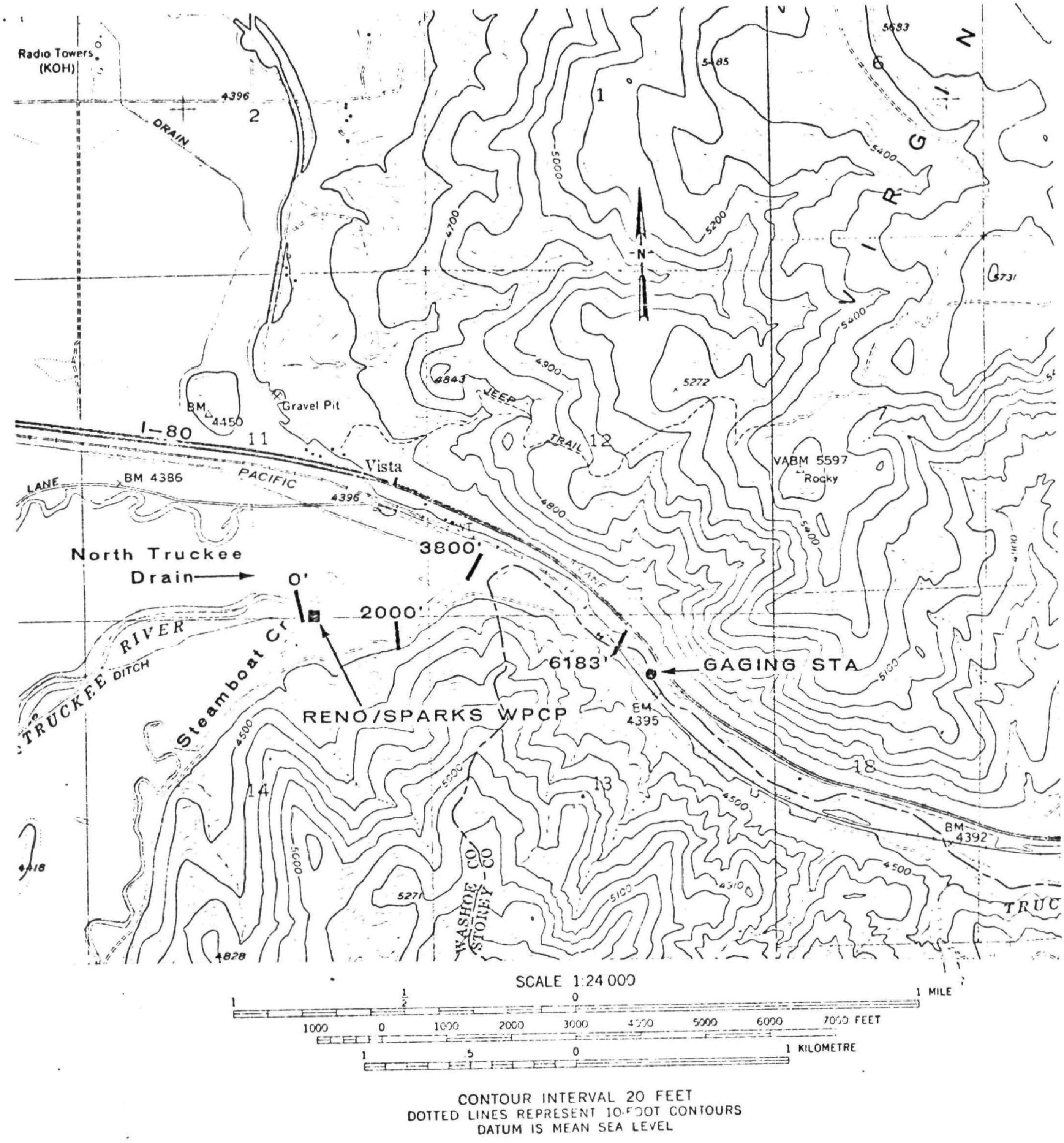

Figure 5. Effluent Mixing in the Truckee River, Reno/Sparks Study

March 24, 1977

The dye concentration data indicated the effluent was completely mixed at approximately 1,200 m (3,800 ft) downstream from Steamboat Creek [Table 7], which corresponds to just downstream from the third major bend in the stream. The effluent undergoes substantial mixing as it passes the second bend, as evidenced by the difference in concentration uniformity between the 550 m (1,800 ft) station and the 700 m (2,300 ft) station.

Using the average dye concentration found at the Southern Pacific Railroad Bridge, the flow in the Truckee River was calculated using the following equation:

$$Q = \frac{Kq}{C_Q}$$

K is a constant dependent on the concentration and specific gravity of the injected dye.

q is the dye injection rate in ml/min.

C_Q is the adjusted dye concentration (mg/l) at the sample point.

$$Q = \frac{86.64}{4.4}(14.3) = 282 \text{ MGD} = 436 \text{ cfs}$$

This value is considered accurate within ± 3%.

Relating the zone of mixing defined above to other flow conditions, the critical factor is most likely the geography of the stream rather than the flow. The three sharp bends in the stream [Figure 5] prior to the 1,200 m (3,800 ft) mark will afford mixing by this point for most flows. To be conservative, a sampling point at the USGS Vista Gage at approximately 2,100 m (6,900 ft) downstream from Steamboat Creek would probably assure complete mixing.

WATER QUALITY STUDY

During March 28 to April 4, 1977, water quality sampling was conducted at five locations on the Truckee River from approximately 2.9 km

Table 7

EFFLUENT MIXING IN TRUCKEE RIVER
RENO-SPARKS JOINT WPCP
March 24, 1977

Station†	Sampling Point†† (All Dye Concentrations in ppb) 1	2	3	4	Avg	Ratio of Value Farthest from Average to Average
6183†††	4.5	4.5	4.4	4.1	4.4	0.93
5800	4.4	4.5	4.2	3.9	4.3	.91
5300	4.3	4.3	4.1	3.8	4.1	.93
4800	4.4	4.2	4.2	3.9	4.2	.93
4300	4.3	4.4	4.2	4.2	4.3	.98
3800	4.2	4.3	4.1	4.0	4.2	.95
3300	5.0	5.3	5.2	4.4	5.0	.88
2800	4.6	4.9	4.4	3.6	4.4	.82
2300	4.8	4.8	4.3	3.9	4.5	.87
1800	5.4	3.4	1.2	1.1	2.8	1.93
1300	6.9	5.1	1.6	0.9	3.6	1.92
800	13.9	12.3	7.7	2.6	9.1	.29
200	9.4	2.6	0.04	0.04	3.0	3.13

† *Station locations are numbers of feet downstream on Truckee River from confluence with Steamboat Creek.*

†† *Sampling points are at 20% increments moving from left to right while facing upstream.*

††† *6183 = Southern Pacific Railroad Bridge.*

(1.8 mi) upstream of the Reno-Sparks WPCP discharge to 16.6 km (10.3 mi) downstream [Figure 6 and Table 8]. In addition, the two tributaries in this stretch, North Truckee Drain and Steamboat Creek, were sampled. The sampling schedule included:

TDS - 1 per 24-hr period at selected locations
Chloride - 1 per 24-hr at selected locations
BOD - 2 per 24-hr at all stations
Nutrient (N & P) - 4 per 24-hr at all stations
DO - 7 per 24-hr at all stations
Fecal coliform bacteria - 2 per 24-hr at selected locations
Salmonella - Selected locations

Flows in the Truckee River, North Truckee Drain, and Steamboat Creek were determined each time a sample was collected. Flow was measured on the Truckee River using the existing USGS gaging station at Vista, Nevada (NEIC Station 0270). At North Truckee Drain and Steamboat Creek, stage-height gages were established then stage-flow relationships were developed by measuring flows with a magnetic flow meter at varying stage heights. During the study, flows in North Truckee Drain, Steamboat Creek and the Truckee River downstream from the WPCP averaged 60,000 m^3/day (24 cfs), 49,000 m^3/day (20 cfs) and 808,000 m^3/day (330 cfs), respectively. WPCP flows averaged 61,000 m^3/day (16.1 mgd or 25 cfs).

An interpretation of the study results follows.

Biochemical Oxygen Demand

Upstream of WPCP discharge and the two tributaries, BOD averaged 0.6 mg/l [Table 9 and Figure 7]. The BOD load in the Truckee River immediately downstream from the WPCP averaged 2,200 kg (4,900 lb)/day [Table 10], of which 69% was contributed by the WPCP, 4.5% by North Truckee Drain and 6.9% by Steamboat Creek. The remaining 19% was already borne by the Truckee River upstream. These added loads,

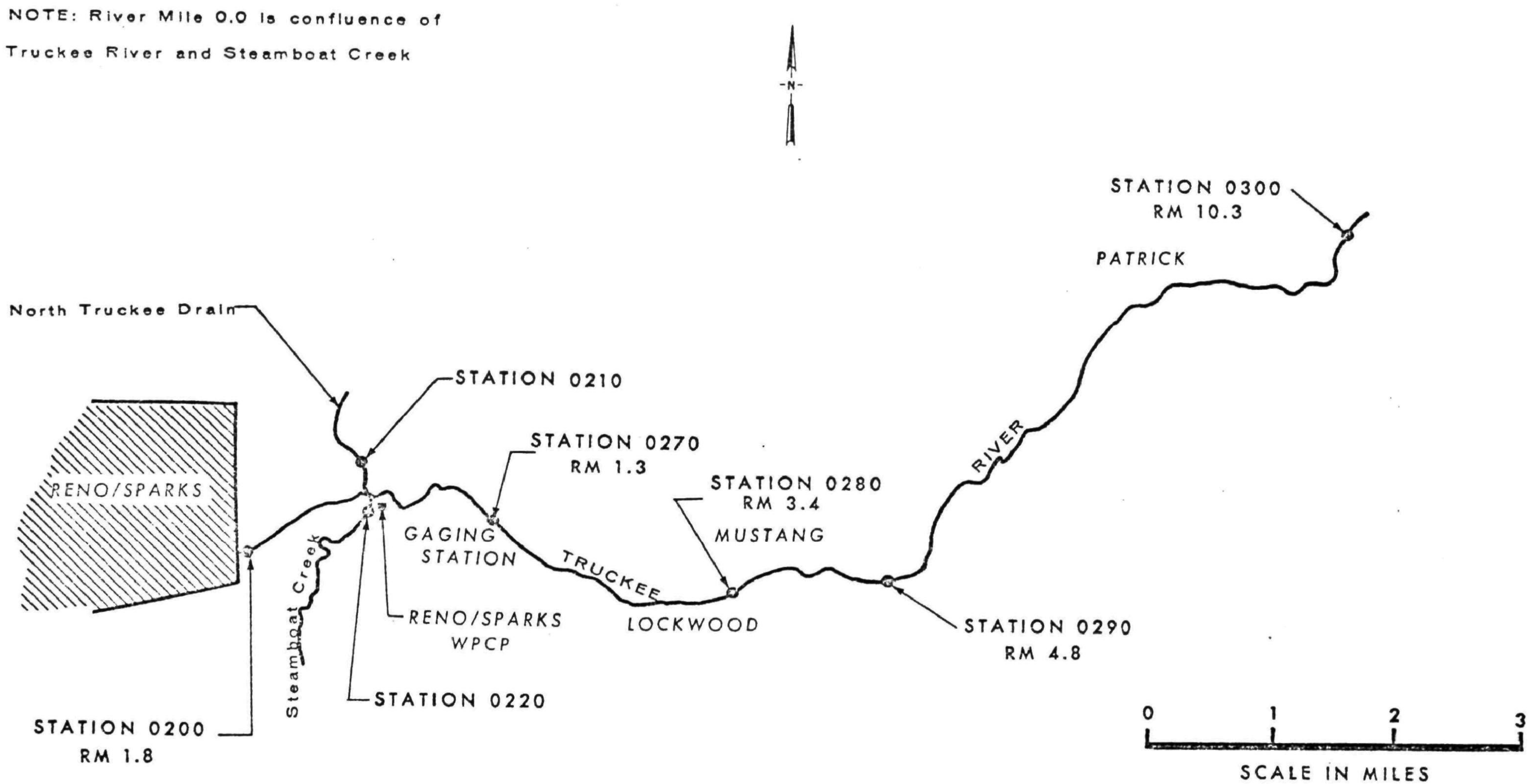

Figure 6. Water Quality Sampling Stations, Reno/Sparks Study, March 28 – April 4, 1977

Table 8

SAMPLING LOCATIONS
RENO-SPARKS JOINT WPCP
March 28-April 4, 1977

Station No.	Station Description
0200	Truckee River off Kimlick Lane, 2.9 km (1.8 mi) upstream of Steamboat Creek and Reno/Sparks WPCP
0210	North Truckee Drain at Kleppe Lane, 0.3 (0.2 mi) upstream from confluence with Truckee River. Confluence is 0.16 km (0.1 mi) upstream of Steamboat Creek.
0220	Steamboat Creek approximately 0.16 Km (0.1 mi) upstream of confluence with Truckee River and immediately upstream of Reno-Sparks WPCP discharge to Steamboat Creek.
0230	Reno-Sparks influent interceptor.
0240	Truckee Meadows influent interceptor.
0250	Reno-Sparks WPCP effluent prior to chlorination at head end of post aeration basin.
0260	Reno-Sparks WPCP effluent in chlorine contact chamber.
0265	Reno-Sparks effluent siphoned from site of chlorine contact chamber weir.
0270	Truckee River at USGS Gage Station, 2.1 km (1.3 mi) downstream from Steamboat Creek.
0280	Truckee River at Lockwood Bridge, 5.5 km (3.4 mi) downstream from Steamboat Creek.
0290	Truckee River at old Mustang Bridge, 7.7 km (4.8 mi) downstream from Steamboat Creek.
0300	Truckee River at Southern Pacific Railroad Bridge near Patrick, 16.6 km (10.3 mi) downstream from Steamtoat Creek.

Table 9

WATER QUALITY - TRUCKEE RIVER
March 28-April 4, 1977

Station Description	Date	Time[†]	Flow[††] m³/day x 10³	Flow[††] CFS	Temp. °C	pH	Un-ionized Ammonia -N (mg/l)	Ammonia -N (mg/l)	Organic Nitrogen (N) (mg/l)	NO_2 & NO_3 (N) (mg/l)	Total Phosphorus (P) (mg/l)	DO (mg/l)	BOD (mg/l)	TDS (mg/l)	Chloride (mg/l)
Station 0200	3/28	0737			4.0	8.5						11.2			
Truckee River		0940			5.5	7.9	0.00	0.12	0.17	0.20	0.03	12.4			
Upstream of		1215			8.0	7.9						12.3	0.8†††	27	4.3
North Truckee		1508			9.0	8.7	0.01	0.15	0.45	0.22	0.06	11.8			
Drain		1815			7.5	8.6						10.5			
		2105			6.0	8.6	0.00	0.02	0.17	0.08	0.02	9.4			
	Daily	Avg.	582	238	6.7	7.9-8.7	0.00	0.10	0.26	0.17	0.04	11.2			
	3/29	0005			5.0	8.9						9.9			
		0305			3.0	7.0	0.00	0.17	0.44	0.12	0.06	10.1	1.2†††		
		0908			4.5	7.7	0.00	0.11	0.41	0.08	0.02	12.1			
		1130			7.0	7.9						12.6	0.5†††	100	3.9
		1500			8.5	9.2	0.01	0.07	0.48	0.10	0.01	11.9			
		1805			7.0	8.0						10.8			
		2100			5.0	8.6	0.01	0.21	0.50	0.16	0.05	9.6			
	Daily	Avg.	619	253	5.7	7.0-9.2	0.01	0.14	0.46	0.12	0.04	11.0	0.9		
	3/30	0000			5.0	7.9						10.1			
		0315			3.0	6.5	0.00	0.15	0.14	0.10	0.05	10.4	0.6†††		
		0845			3.5	7.5	0.00	0.14	0.14	0.06	0.07	11.9			
		1135			5.5	8.1						12.1	0.5†††	78	4.1
		1455			6.0	8.2	0.00	0.18	0.16	0.12	0.02	11.7			
		1815			6.0	9.1						10.9			
		2105			5.0	8.9	0.01	0.16	0.19	0.08	0.33	10.3			
	Daily	Avg.	646	264	4.9	6.5-9.1	0.00	0.16	0.16	0.09	0.12	11.0	0.6		
	3/31	0005			5.0	7.2						10.3			
		0305			4.0	7.0	0.00	0.13	0.22	0.08	0.08	10.7	0.1†††		
		0835			3.5	7.4	0.00	0.09	0.42	0.10	0.05	12.1			
		1130			6.5	8.0						12.4	0.6†††	100	4.3
		1430			8.5	8.5	0.01	0.16	0.53	0.12	0.05	11.9			
		1800			8.0	8.8						10.5			
		2110			6.0	8.3	0.00	0.12	0.57	0.10	0.43	9.6			
	Daily	Avg.	639	261	5.9	7.0-8.8	0.00	0.12	0.44	0.10	0.15	11.0	0.4		
	4/1	0001			5.0	7.8						9.5			
		0305			6.0	8.4	0.00	0.14	0.44	0.12	0.06	9.7	0.5†††		
		0845			5.5	7.2	0.00	0.09	0.44	0.08	0.04	11.1			
		1120			8.5	8.0						11.8	0.6†††	84	4.3
		1440			9.0	8.6	0.01	0.14	0.43	0.12	0.06	11.6			
		1800			9.0	8.8						10.3			
		2105			7.0	8.4	0.00	0.11	0.49	0.10	0.26	9.1			
	Daily	Avg.	670	274	7.1	7.2-8.8	0.00	0.12	0.45	0.10	0.10	10.4	0.6		

Table 9 (Continued)

WATER QUALITY DATA - TRUCKEE RIVER

Station Description	Date and Time†	Flow†† m^3/day x 10^3	Flow†† CFS	Temp. °C	pH	Un-ionized Ammonia -N (mg/l)	Ammonia -N (mg/l)	Organic Nitrogen (N) (mg/l)	NO_2 & NO_3 (N) (mg/l)	Total Phosphorus (P) (mg/l)	DO (mg/l)	BOD (mg/l)	TDS (mg/l)	Chloride (mg/l)
Station 0200 (Cont.)	4/2 0005			6.5	8.9						9.6			
	0305			4.0	8.4	0.00	0.13	0.45	0.10	0.06	9.8	0.4†††		
	0850			6.5	7.5	0.00	0.06	0.45	0.08	0.07	11.8			
	1140			8.5	8.1						12.0	0.8†††	120	3.8
	1440			10.5	8.7	0.02	0.19	0.39	0.12	0.28	11.3			
	1800			9.0	8.4						10.7			
	2105			8.0	8.3	0.00	0.16	0.59	0.10	0.05	9.3			
	Daily Avg.	722	295	7.5	7.5-8.9	0.01	0.14	0.47	0.10	0.12	10.6	0.6		
	4/3 0001			7.0	7.8						9.6			
	0300			5.0	8.2	0.00	0.22	0.50	0.10	0.11	9.9	0.9†††		
	0835			6.0	7.2	0.00	0.11	0.38	0.08	0.07	11.4			
	1135			9.0	8.3						10.8	0.5	48	3.9
	1500			11.0	8.0	0.00	0.07	0.43	0.08	0.04	11.5			
	1800			10.0	9.2						10.3			
	2105			10.0	8.7	0.01	0.16	0.61	0.12	0.05	8.9			
	Daily Avg.	742	303	8.3	7.2-9.2	0.00	0.14	0.48	0.10	0.07	10.3	0.7		
	4/4 0001			7.5	8.1						9.1			
	0305			7.5	7.2	0.00	0.15	0.52	0.08	0.07	9.2	0.5		
	Daily Avg.			7.5	7.2-8.1									
	7-Day Avg. 3/28-4/4	660	270											
	Avg.			6.6		0.00	0.13	0.39	0.11	0.09	10.8	0.6	80	4.1

† *Times are based on a calendar day*

†† *Flows at Station 0200 were calculated as follows:*

$$Flow_{0200} = Flow\ at\ Vista\ Gage_{0270} - (Flow\ Steamboat\ Creek_{0220} + Flow\ No.\ Truckee\ Drain_{0210} + Reno\text{-}Sparks\ WPCP_{0265})$$

††† *Because of the low BODs experienced, DO depletions were less than the recommended 2.0 mg/l.*

Table 9 (Continued)

WATER QUALITY DATA - TRUCKEE RIVER

Station Description	Date	Time[+]	Flow[++] m^3/day x 10^3	Flow[++] CFS	Temp. °C	pH	Un-ionized Ammonia -N (mg/l)	Ammonia -N (mg/l)	Organic Nitrogen (N) (mg/l)	NO_2 & NO_3 (N) (mg/l)	Total Phosphorus (P) (mg/l)	DO (mg/l)	BOD (mg/l)	TDS (mg/l)	Chloride (mg/l)
Station 0210 North Truckee Drain at Kleppe Lane	3/28	0745	76	31	3.5	8.2						9.4			
		1010	73	30	7.0	8.4	0.00	0.04	0.40	0.50	0.14	10.0			
		1300	71	29	10.5	7.8						10.0	1.8	250	19
		1525	39	16	11.5	7.8	0.00	0.04	0.40	0.60	0.11	10.0			
		1825	88	36	8.0	7.8						8.8			
		2115	71	29	7.0	8.5	0.01	0.24	1.17	0.72	0.09	8.5			
	Daily Avg.		71	29	7.9	7.8-8.5	0.00	0.11	0.66	0.61	0.11	9.4			
	3/29	0015	73	30	6.0	7.1						8.9			
		0325	81	33	3.0	7.6	0.00	0.03	0.52	0.60	0.05	8.8	1.7[+++]		
		0935	81	33	6.5	7.8	0.00	0.04	0.28	0.56	0.13	9.8			
		1215	71	29	9.0	8.0						10.4	1.5[+++]	210	8.3
		1315	73	30	11.0	8.3	0.00	0.06	0.48	0.54	0.15	10.2			
		1815	54	22	9.5	8.0						9.0			
		2110	71	29	7.0	8.3	0.02	0.05	0.57	0.50	0.06	8.3			
	Daily Avg.		71	29	7.4	7.1-8.3	0.01	0.4	0.46	0.55	0.10	9.3	1.6		
	3/30	0010	71	29	8.0	7.6						8.2			
		0330	66	27	5.0	7.5	0.00	0.08	0.65	0.44	0.09	8.5	2.7		
		0930	61	25	5.5	7.7	0.00	0.05	0.46	0.48	0.11	10.0			
		1230	73	30	7.0	7.7						10.1	1.6[+++]	230	8.8
		1505	61	25	7.0	8.0	0.00	0.08	0.44	0.46	0.12	10.3			
		1825	73	30	7.0	7.4						9.7			
		2115	64	26	6.0	8.8	0.04	0.04	0.51	0.52	0.11	9.1			
	Daily Avg.		66	27	6.5	7.4-8.8	0.01	0.06	0.52	0.48	0.11	9.4	2.2		
	3/31	0015	73	30	5.0	7.6						9.4			
		0315	73	30	5.0	7.6	0.00	0.04	0.41	0.52	0.10	9.0	0.8[+++]		
		0920	71	29	6.5	7.7	0.00	0.04	0.53	0.60	0.08	10.0			
		1140	54	22	9.0	7.7						10.4	1.3[+++]	250	8.6
		1500	51	21	12.0	7.9	0.00	0.06	0.54	0.66	0.11	10.4			
		1810	34	14	11.0	7.4						8.9			
		2120	34	14	9.5	8.2	0.03	0.06	0.85	0.74	0.17	7.9			
	Daily Avg.		36	23	8.3	7.4-8.2	0.01	0.05	0.58	0.63	0.12	9.4	1.0		
Station 0210 North Truckee Drain at Kleppe Lane	4/1	0020	34	14	8.0	8.5						7.7			
		0315	34	14	8.0	7.7	0.00	0.06	0.86	0.64	0.13	5.9	2.3[+++]		
		0920	29	12	8.5	7.6	0.00	0.04	0.72	0.72	0.15	9.2			
		1235	42	17	12.0	8.0						10.3	1.5[+++]	350	12
		1510	34	14	11.0	7.5	0.00	0.05	0.97	0.70	0.17	10.3			
		1810	51	21	9.0	7.8						9.3			
		2120	29	12	8.0	7.6	0.01	0.04	1.69	0.68	0.18	8.5			
	Daily Avg.		37	15	9.2	7.5-8.5	0.00	0.05	1.06	0.68	0.16	8.7			

Table 9 (Continued)

WATER QUALITY DATA - TRUCKEE RIVER

Station Description	Date and Time†		Flow†† m³/day x 10³	Flow†† CFS	Temp. °C	pH	Un-ionized Ammonia -N	Ammonia -N	Organic Nitrogen (N)	(NO_3 & NO_2 N)	Total Phosphorus (P)	DO	BOD	TDS	Chloride
							(mg/l)								
Station 0210 (Cont.)	4/2	0010	47	19	8.0	8.5						8.3			
		0315	37	15	7.0	7.6	0.00	0.08	0.78	0.72	0.17	6.3	1.6†††		
		0920	61	25	7.5	7.6	0.00	0.04	0.85	0.66	0.13	9.5			
		1230	66	27	10.0	7.5						10.6	2.6	270	8.8
		1455	71	29	12.5	8.0	0.00	0.04	0.82	0.68	0.12	10.2			
		1805	51	21	10.0	7.8						9.1			
		2115	56	23	9.0	8.0	0.01	0.05	0.77	0.74	0.11	8.0			
	Daily	Avg.	56	23	9.1	7.5-8.5	0.00	0.05	0.80	0.70	0.13	8.8	2.1		
	4/3	0010	44	18	8.0	7.8						8.1			
		0315	61	25	6.5	7.2	0.00	0.06	0.91	0.46	0.11	8.5	1.3†††		
		0925	64	26	6.0	7.6	0.00	0.05	0.97	0.68	0.12	10.3			
		1237	71	29	12.0	8.0						10.5	1.4†††	280	13
		1515	56	23	14.0	7.9	0.00	0.07	0.87	0.72	0.11	10.5			
		1815	71	29	12.0	8.1						8.3			
		2115	66	27	12.0	6.9	0.00	0.09	1.11	1.00	0.14	7.4			
	Daily	Avg.	62	25	10.1	6.9-8.1	0.00	0.07	0.97	0.72	0.12	9.1	1.4		
	4/4	0010	71	29	9.0	8.2						7.3			
		0315	81	33	7.0	7.4	0.00	0.05	1.09	0.92	C.10	7.3	2.0†††		
	Daily	Avg.	76	31	8.0	7.4-8.2						7.3			
	3/28-4/4 Avg.		60	24	8.4		0.00	0.11	0.72	0.62	0.12	9.2	1.8	260	11

† *Times are based on a calendar day*

††† *Because of the low BODs experienced, DO depletions were less than the recommended 2.0 mg/l.*

Table 9 (Continued)

WATER QUALITY DATA - TRUCKEE RIVER

Station Description	Date	Time†	Flow†† m^3/day x 10^3	Flow†† CFS	Temp. °C	pH	Un-ionized Ammonia -N (mg/l)	Ammonia -N (mg/l)	Organic Nitrogen (N) (mg/l)	NO_3 & NO_3 (N) (mg/l)	Total Phosphorus (P) (mg/l)	DO (mg/l)	BOD (mg/l)	TDS (mg/l)	Chloride (mg/l)
Station 0220 Steamboat Creek Upstream of WPCP Effluent	3/28	0915	44	18	2.5	7.9						10.2			
		1135	32	13	7.0	7.4	0.00	0.26	1.29	0.62	0.29	11.1			
		1435	34	14	10.0	7.7						11.3	5.4	450	88
		1650	32	13	10.5	7.7	0.00	0.22	1.31	0.56	0.33	10.6			
		2010	49	20	9.5	8.2						9.0			
		2250	49'	20	6.0	8.1	0.00	0.16	1.12	0.46	0.31	9.0			
	Daily	Avg.	40	16	7.6	7.4-8.2	0.00	0.21	1.24	0.55	0.31	10.2			
	3/29	0140	47	19	4.0	8.1						9.4			
		0510	47	19	1.0	8.2	0.00	0.14	0.80	0.48	0.22	9.8	1.9†††		
		1100	69	28	5.0	7.2	0.00	0.25	1.04	0.48	0.28	11.0			
		1355	61	25	9.0	8.1						11.0	3.7	500	75
		1655	56	23	9.5	8.0	0.00	0.23	1.04	0.52	0.37	10.9			
		1930	59	24	8.0	8.4						9.5			
		2235	59	24	8.0	8.7	0.01	0.20	1.03	0.52	0.38	8.8			
	Daily	Avg.	57	23	6.4	7.2-8.7	0.00	0.21	0.98	0.50	0.31	10.0			
	3/30	0130	49	20	6.0	8.5						8.4			
		0520	44	18	3.0	8.2	0.00	0.12	0.56	0.44	0.25	9.1	1.7†††		
		1100	66	27	5.0	8.0	0.00	0.23	1.20	0.52	0.34	10.7			
		1350	59	24	7.0	8.2						12.0	3.2	410	79
		1630	54	22	8.0	8.5	0.01	0.23	0.74	0.44	0.33	8.9			
		1940	47	19	7.0	8.2						10.6			
		2235	51	21	6.0	9.1	0.04	0.32	1.47	0.50	0.50	9.5			
	Daily	Avg.	53	22	6.0	8.0-9.1	0.01	0.22	0.99	0.48	0.36	9.9	2.5		
	3/31	0140	47	19	5.0	7.9						9.7			
		0455	49	20	3.0	8.2	0.00	0.17	0.82	0.44	0.21	9.7	1.8†††		
		1045	61	25	5.5	8.2	0.01	0.27	1.04	0.58	0.31	11.0			
		1350	56	23	10.5	8.2	0.01					12.9	2.7	490	91
		1630	29	12	11.5	8.2	0.00	0.12	1.23	0.62	0.31	12.0			
		1925	34	14	11.0	8.5						10.3			
		2240	34	14	9.5	8.6	0.01	0.10	0.96	0.56	0.83	9.0			
	Daily	Avg.	44	18	8.0	7.9-8.6	0.01	0.16	1.01	0.55	0.42	10.6	2.3		
	4/1	0140	34	14	8.0	8.4						8.6			
		0505	42	17	5.0	8.4	0.00	0.10	1.23	0.64	0.40	8.2	4.0		
		1040	64	26	7.5	8.4	0.01	0.26	1.41	0.82	0.48	10.5			
		1400	59	24	9.0	8.1						11.3	3.9	440	84
		1640	46	19	10.0	8.2	0.00	0.14	1.08	0.70	0.33	11.1			
		1920	54	22	8.0	8.1						9.7			
		2230	46	19	7.0	8.4	0.00	0.10	1.02	0.56	0.51	9.4			
	Daily	Avg.	49	20	7.8	8.1-8.4	0.00	0.15	1.18	0.68	0.43	9.8	4.0		

Table 9 (Continued)

WATER QUALITY DATA - TRUCKEE RIVER

Station Description	Date and Time[†]		Flow[††] m³/day x 10³	Flow[††] CFS	Temp. °C	pH	Un-ionized Ammonia -N (mg/l)	Ammonia -N (mg/l)	Organic Nitrogen (N) (mg/l)	NO_3 & NO_2 (N) (mg/l)	Total Phosphorus (P) (mg/l)	DO (mg/l)	BOD (mg/l)	TDS (mg/l)	Chloride (mg/l)
Station 0220 (Cont.)	4/2	0125	51	21	6.0	8.2						9.6			
		0445	49	20	5.0	8.0	0.00	0.12	1.13	0.60	0.35	9.4	2.6		
		1045	64	26	6.0	7.8	0.00	0.19	1.19	0.72	0.33	10.9			
		1405	68	28	9.5	8.2						11.6	2.6	440	67
		1637	61	25	11.0	8.5	0.01	0.13	0.76	0.60	0.28	11.6			
		1920	42	17	10.0	8.6						10.6			
		2230	51	21	9.0	8.5	0.01	0.16	1.35	0.60	0.34	10.0			
	Daily	Avg.	56	23	8.1	7.8-8.6	0.01	0.15	1.11	0.63	0.32	10.5	2.6		
	4/3	0125	44	18	8.5	8.1						8.8			
		0455	42	17	5.0	8.4	0.01	0.27	1.21	1.00	0.40	8.7	2.0		
		1050	46	19	8.5	7.8	0.00	0.22	0.99	0.56	0.30	9.8			
		1412	56	23	12.5	7.9						10.8	3.4	390	68
		1640	44	18	12.5	8.2	0.01	0.26	1.04	0.56	0.35	10.9			
		1925	51	21	13.0	8.5						9.6			
		2225	51	21	11.0	8.3	0.01	0.27	1.69	1.08	0.57	7.9			
	Daily	Avg.	49	20	10.1	7.8-8.5	0.01	0.26	1.23	0.80	0.40	9.5	2.7		
	4/4	0120	44	18	10.0	8.2						7.4			
		0445	39	16	8.0	7.8	0.00	0.32	2.00	0.74	0.63	6.7	4.8		
	Daily	Avg.	42	17	9.0	7.8-8.2						7.0			
	3/28-4/4 Avg.		49	20	7.7		0.01	0.19	1.10	0.60	0.36	10.1	3.9	450	79

† *Times are based on a calendar day*

††† *Because of the low BODs experienced, DO depletions were less than the recommended 2.0 mg/l.*

Table 9 (Continued)

WATER QUALITY DATA - TRUCKEE RIVER

Station Description	Date and Time†		Flow†† m^3/day x 10^3	Flow†† CFS	Temp. °C	pH	Un-ionized Ammonia -N	Ammonia -N	Organic Nitrogen (N)	NO_3 & NO_3 (N)	Total Phosphorus (P)	DO	BOD
							(mg/l)						
Station 0270 Truckee River at USGS Vista Gage	3/28	0800	707	289	5.0	7.9						9.8	
		1025	734	300	6.0	7.7	0.00	0.65	0.50	0.85	0.16	10.6	
		1315	769	314	8.5	8.1						11.4	2.4
		1535	759	310	10.0	7.8	0.02	1.53	1.23	2.68	0.69	11.3	
		1645	752	307	9.0	7.4						10.8	
		2135	769	314	7.5	8.4	0.05	1.38	1.16	1.20	0.54	9.7	
	Daily	Avg.	749	306 (315)††††	7.7	7.4-8.4	0.02	1.19	0.96	1.58	0.46	10.6	
	3/29	0030	700	286	7.0	7.9						9.1	
		0345	707	289	3.0	7.5	0.00	1.19	2.69	1.00	0.59	9.4	4.2
		0950	786	321	5.0	7.8	0.00	0.49	0.50	0.62	0.25	10.5	
		1230	845	345	7.5	7.9						11.2	2.7
		1525	854	349	9.5	8.6	0.07	1.12	0.75	2.00	0.63	11.5	
		1825	810	331	7.0	8.8						11.2	
		2125	845	345	5.0	8.7	0.06	1.07	0.75	0.82	0.54	10.0	
	Daily	Avg.	793	324 (335)††††	6.3	7.5-8.8	0.03	0.97	1.17	1.11	0.50	10.4	3.5
	3/30	0030	803	328	6.5	8.4						9.0	
		0350	776	317	3.0	7.8	0.01	1.18	0.49	0.54	0.57	9.3	2.6
		0945	786	321	5.0	7.6	0.00	0.60	0.45	0.42	0.32	10.5	
		1240	889	363	6.0	7.8						11.2	3.6
		1520	862	352	7.0	8.4	0.04	1.24	0.34	1.08	0.48	10.9	
		1830	786	321	6.0	8.4						11.2	
		2130	793	324	6.0	8.8	0.09	1.13	0.46	0.58	0.86	10.4	
	Daily	Avg.	813	332 (340)††††	5.6	7.6-8.8	0.04	1.04	0.44	0.66	0.56	10.3	3.1
	3/31	0030	737	301	4.0	7.6						9.5	
		0335	717	293	2.0	7.6	0.01	1.26	0.47	0.48	0.61	9.7	4.4
		0930	776	317	5.0	7.5	0.00	0.58	1.01	0.20	0.39	11.2	
		1155	845	345	6.5	7.6						11.4	1.8†††
		1320	810	331	9.0	8.0	0.02	1.05	1.20	0.50	0.62	11.7	
		1820	734	300	9.0	8.1						10.9	
		2135	717	293	8.0	8.3	0.03	0.95	1.73	0.34	0.92	10.1	
	Daily	Avg.	762	311 (325)††††	6.2	7.5-8.3	0.02	0.96	1.10	0.38	0.64	10.6	3.1
	4/1	0030	759	310	6.0	7.9						8.9	
		0330	717	293	7.0	8.6	0.06	1.13	1.29	0.30	0.71	9.3	2.3†††
		0935	803	328	7.0	7.3	0.00	0.60	1.16	0.26	0.40	10.1	
		1250	879	359	9.0	7.7						10.7	3.0
		1525	815	333	9.5	8.1	0.03	1.23	1.10	0.52	0.63	11.2	
		1820	793	324	8.0	8.2						10.5	
		2125	827	338	8.0	8.5	0.09	1.85	1.56	0.34	1.02	9.3	
	Daily	Avg.	798	326 (341)††††	7.8	7.3-8.6	0.05	1.20	1.28	0.36	0.69	10.0	2.7

Table 9 (Continued)

WATER QUALITY DATA - TRUCKEE RIVER

Station Description	Date and Time[†]	Flow[††] m^3/day x 10^3	Flow[††] CFS	Temp. °C	pH	Un-ionized Ammonia -N (mg/l)	Ammonia -N (mg/l)	Organic Nitrogen (N) (mg/l)	NO_3 & NO_3 (N) (mg/l)	Total Phosphorus (P) (mg/l)	DO (mg/l)	BOD (mg/l)
Station 0270 (Continued)	4/2 0020	820	335	7.0	8.0						8.9	
	0325	854	349	7.0	8.2	0.02	0.93	0.51	0.22	0.64	9.2	2.4[†††]
	0935	862	352	7.5	7.3	0.00	0.57	1.04	0.18	0.46	9.9	
	1250	901	368	9.0	7.2						11.2	1.5[†††]
	1520	940	384	10.5	8.2	0.03	1.04	1.53	0.38	0.55	11.3	
	1815	879	359	10.0	8.5						10.9	
	2120	862	352	9.0	8.5	0.04	0.81	1.73	0.22	0.51	9.1	
	Daily Avg.	874	357 (371)[††††]	8.6	7.2-8.5	0.02	0.84	1.20	0.25	0.54	10.1	2.0
	4/3 0020	999	408	8.0	8.0						8.9	
	0325	810	331	5.0	8.5	0.04	0.98	1.79	0.20	0.60	9.0	3.7
	0940	793	324	7.0	7.0	0.00	0.56	0.93	0.18	0.39	10.0	
	1350	854	349	11.0	7.5						11.4	1.9[†††]
	1525	896	366	12.5	7.5	0.01	1.20	1.08	0.36	0.65	11.0	
	1820	862	352	12.0	8.2						10.2	
	2120	862	352	10.0	8.5	0.06	1.08	0.36	0.28	0.61	9.3	
	Daily Avg.	867	354 (365)[††††]	9.4	7.0-8.5	0.03	0.96	1.04	0.26	0.56	9.9	2.8
	4/4 0020	845	345	8.5	7.9						8.3	
	0325	845	345	7.0	7.6	0.01	1.10	0.40	0.24	0.72	8.4	4.0
	Daily Avg.	845	345 (366)[††††]	7.8	7.6-7.9							
	3/28-4/4 Avg.	808	330 (342)[††††]	7.4		0.03	1.02	1.03	0.66	0.56	10.3	3.0

† *Times are based on a calendar day*

††† *Because of the low BODs experienced, DO depletions were less than the recommended 2.0 mg/l*

†††† *Flows in parentheses are 24-hour integrated values recorded by USGS.*

Table 9 (Continued)

WATER QUALITY DATA - TRUCKEE RIVER

Station Description	Date and Time[+]		Flow m³/day x 10³	CFS	Temp. °C	pH	Un-ionized Ammonia -N	Ammonia -N	Organic Nitrogen (N)	NO_3 & NO_3 (N)	Total Phosphorus (P)	DO	BOD
							(mg/l)						
Station 0280	3/28	0815			5.0	7.7						10.2	
Truckee River		1025			6.0	8.5	0.03	0.62	0.79	1.04	0.37	12.0	
at Lockwood		1330			8.0	7.5						11.1	1.3[+++]
Bridge		1550	(Daily average		9.0	7.5	0.01	1.21	1.15	2.64	0.8	10.5	
		1900	flows would be		8.0	7.5						9.7	
		2145	approximately		8.0	8.4	0.07	1.73	1.35	2.00	0.74	9.6	
	Daily	Avg.	the same as		7.3	7.5-8.5	0.04	1.19	1.10	1.89	0.64	10.5	
	3/29	0045	those for		7.0	8.5						9.3	
		0400	station 0270		4.0	7.2	0.00	1.53	1.41	1.74	0.52	9.1	3.8
		1000	at Vista Gage)		5.5	7.8	0.01	0.69	0.55	0.84	0.32	10.8	
		1300			7.0	7.2						11.3	1.4[+++]
		1540			8.5	8.1	0.02	1.13	0.68	2.26	0.63	11.0	
		1835			7.0	8.2						9.9	
		2140			8.0	8.5	0.05	0.95	0.58	1.38	0.34	9.8	
	Daily	Avg.			6.7	7.2-8.5	0.02	1.08	0.81	1.56	0.45	10.2	2.6
	3/30	0040			7.0	8.3						9.3	
		0400			4.0	7.6	0.01	1.32	0.50	1.00	0.59	8.9	3.2
		0955			5.5	7.8	0.01	0.68	0.50	0.58	0.35	10.9	
		1250			6.0	7.7						11.0	1.9[+++]
		1530			7.0	8.7	0.08	1.15	0.53	1.04	0.60	10.6	
		1840			7.0	7.9						10.4	
		2140			6.0	8.9	0.10	1.0	0.44	0.86	0.55	10.2	
	Daily	Avg.			6.1	7.6-8.9	0.05	1.04	0.49	0.87	0.52	10.2	2.6
	3/31	0040			5.5	7.8						9.8	
		0345			5.0	7.7	0.01	1.84	0.40	0.84	0.59	9.4	5.0
		0945			5.0	7.8	0.01	0.79	0.68	0.24	0.54	11.2	
		1215			6.5	7.7						11.4	1.1[+++]
		1530			8.5	7.7	0.01	1.12	1.77	0.50	0.71	11.1	
		1825			7.5	9.0						10.3	
		2145			8.0	8.3	0.03	1.0	1.14	0.50	1.19	9.6	
	Daily	Avg.			6.6	7.7-9.0	0.02	1.19	1.00	0.52	0.76	10.4	3.1
	4/1	0045			8.0	8.5						9.2	
		0345			7.5	7.7	0.01	1.57	0.45	0.52	0.90	8.8	4.3
		0945			7.5	7.5	0.00	0.67	1.01	0.32	0.44	10.4	
		1305			8.5	7.4						10.6	2.2[+++]
		1535			8.5	7.6	0.01	1.06	1.61	0.56	0.68	10.6	
		1825			8.0	7.8						10.1	
		2135			8.0	8.4	0.04	0.95	1.92	0.56	0.58	9.5	
	Daily	Avg.			8.0	7.4-8.5	0.02	1.06	1.25	0.49	0.65	9.9	3.3

Table 9 (Continued)

WATER QUALITY DATA - TRUCKEE RIVER

Station Description	Date and Time†		Flow†† m³/day x 10³	Flow†† CFS	Temp. °C	pH	Un-ionized Ammonia -N	Ammonia -N	Organic Nitrogen (N)	NO_3 & NO_3 (N)	Total Phosphorus (P)	DO	BOD
							(mg/l)						
Station 0280	4/2	0030			8.5	8.4						9.0	
(Cont.)		0335			7.0	6.3	0.00	1.07	0.04	0.42	0.73	8.8	4.6
		0945			7.5	7.5	0.00	0.67	1.24	0.28	0.47	10.4	
		1308			8.5	7.4						11.2	6.2
		1535			10.5	7.7	0.01	0.88	1.46	0.44	0.63	10.8	
		1825			10.0	7.5						9.7	
		2130			9.0	8.2	0.02	0.90	1.44	0.44	0.51	9.2	
	Daily	Avg.			8.7	6.3-8.4	0.01	0.88	1.05	0.40	0.59	9.9	5.4
	4/3	0030			7.0	7.4						8.9	
		0340			8.0	8.2	0.04	1.44	2.29	0.42	0.87	8.8	4.1
		0950			8.0	7.7	0.00	0.59	1.49	0.30	0.63	10.4	
		1315			10.0	8.0						10.7	2.0†††
		1535			11.5	7.9	0.01	0.79	1.10	0.38	0.62	10.8	
		1830			12.0	7.6						9.4	
		2130			11.0	7.0	0.00	1.18	1.21	0.54	0.56	8.9	
	Daily	Avg.			9.6	7.0-8.2	0.01	1.0	1.52	0.41	0.67	9.7	3.1
	4/4	0025			8.0	8.3						8.5	
		0335			8.0	7.5	0.01	1.28	1.02	0.48	0.72	8.1	4.4
	Daily	Avg.			8.0	7.5-8.3							
	3/28-4/4 Avg.				7.6		0.02	1.06	1.03	0.88	0.61	10.1	3.2

† *Times are based on a calendar day*
††† *Because of the low BODs experienced, DO depletions were less than the recommended 2.0 mg/l*

Table 9 (Continued)

WATER QUALITY DATA - TRUCKEE RIVER

Station Description	Date and Time[†]		Flow $m^3/day \times 10^3$ CFS	Temp. °C	pH	Un-ionized Ammonia -N (mg/l)	Ammonia -N (mg/l)	Organic Nitrogen (N) (mg/l)	NO_3 & NO_2 (N) (mg/l)	Total Phosphorus (P) (mg/l)	DO (mg/l)	BOD (mg/l)
Station 0290 Truckee River at Old Mustang Bridge	3/28	0830	Daily average flows would be approximately the same as those at Station 0270 at Vista Gage	5.5	7.6						10.7	
		1050		7.5	8.3	0.02	0.69	0.92	1.20	0.18	11.4	
		1340		8.0	7.6						11.1	1.2[†††]
		1600		8.5	7.5	0.00	0.90	1.04	2.04	0.60	10.6	
		1915		7.5	7.9						9.3	
		2200		7.0	8.5	0.07	1.51	2.57	2.82	0.69	8.8	
	Daily Avg.			7.3	7.5-8.5	0.03	1.03	1.51	2.02	0.49	10.3	
	3/29	0055		6.0	8.2						9.2	
		0410		4.0	7.4	0.01	1.83	1.52	2.28	0.85	9.2	5.0
		1015		6.5	7.9	0.01	0.80	0.43	1.08	0.46	11.1	
		1310		7.5	7.8						11.2	1.5[†††]
		1555		8.0	8.2	0.02	0.77	0.52	1.50	0.51	11.0	
		1845		8.0	8.2						9.8	
		2150		6.0	8.4	0.03	1.01	0.20	1.88	0.57	9.3	
	Daily Avg.			6.6	7.4-8.4	0.02	1.10	0.67	1.69	0.60	10.1	3.3
	3/30	0050		7.0	8.4						9.2	
		0415		5.0	8.0	0.02	1.30	0.26	1.50	0.72	9.1	4.6
		1005		5.5	7.2	0.00	0.89	0.54	0.60	0.44	10.9	
		1300		6.5	7.8						11.2	1.8[†††]
		1545		7.0	8.0	0.02	1.11	0.49	0.96	0.55	10.8	
		1850		6.5	8.0						10.0	
		2150		6.0	7.7	0.01	1.13	0.57	1.28	0.52	9.9	
	Daily Avg.			6.2	7.2-8.4	0.01	1.11	0.46	1.08	0.56	10.2	3.2
	3/31	0050		5.0	7.8						10.0	
		0400		5.0	7.7	0.01	1.72	0.53	1.16	0.61	9.6	4.2
		1000		6.0	7.6	0.01	0.96	0.26	0.44	0.57	11.1	
		1300		7.0	7.9						11.6	2.0[†††]
		1540		8.5	7.5	0.00	0.94	1.26	0.48	0.66	10.9	
		1835		8.5	7.6						9.7	
		2155		8.5	7.9	0.01	0.97	1.07	0.70	0.97	9.2	
	Daily Avg.			6.9	7.5-7.9	0.01	1.15	0.78	0.70	0.70	10.3	3.1
	4/1	0055		7.0	7.9						9.2	
		0355		8.0	7.9	0.02	1.51	1.91	0.68	0.98	8.8	4.3
		0955		8.0	7.5	0.00	0.74	1.16	0.48	0.46	10.5	
		1320		9.0	7.7						11.1	2.2[†††]
		1545		9.5	7.6	0.01	0.82	1.32	0.56	0.57	10.3	
		1835		8.0	7.5						9.5	
		2145		7.0	7.7	0.01	0.99	1.38	0.74	0.72	9.0	
	Daily Avg.			8.1	7.5-7.9	0.01	1.02	1.44	0.62	0.68	9.8	3.3

Table 9 (Continued)

WATER QUALITY DATA - TRUCKEE RIVER

Station Description	Date and Time†		Flow†† m³/day x 10³	Flow†† CFS	Temp. °C	pH	Un-ionized Ammonia -N (mg/l)	Ammonia -N (mg/l)	Organic Nitrogen (N) (mg/l)	NO_3 & NO_2 (N) (mg/l)	Total Phosphorus (P) (mg/l)	DO	BOD
Station 0290 (Cont.)	4/2	0035			7.0	7.9						8.9	
		0350			7.0	6.5	0.00	1.18	1.53	0.62	0.82	8.6	4.4
		0955			8.0	7.1	0.00	0.68	1.12	0.42	0.49	10.7	
		1320			8.5	7.7						11.2	2.1†††
		1545			10.0	7.6	0.00	0.61	1.77	0.62	0.45	10.7	
		1835			9.0	8.0						9.1	
		2140			8.0	6.5	0.00	0.95	1.33	0.70	0.53	8.9	
	Daily Avg.				8.2	6.5-8.0	0.00	0.86	1.44	0.59	0.57	9.7	3.3
	4/3	0040			8.0	8.2						8.9	
		0350			6.0	7.8	0.01	1.48	1.87	0.64	0.80	8.7	5.6
		1000			8.5	7.2	0.00	0.62	1.27	0.42	0.55	10.6	
		1325			11.0	7.7						10.5	2.1†††
		1545			11.0	7.1	0.00	0.59	1.11	0.44	0.47	10.6	
		1840			10.0	7.9						9.3	
		2140			10.0	8.0	0.02	1.20	1.53	0.88	0.58	8.5	
	Daily Avg.				9.2	7.1-8.2	0.01	0.97	1.45	0.60	0.60	9.6	3.9
	4/4	0035			9.0	8.0						8.9	
		0345			9.0	7.6	0.00	0.53	2.88	0.78	0.84	8.1	5.5
	Daily Avg.				9.0	7.6-8.0							
	3/28-4/4 Avg.				7.5		0.01	1.03	1.11	1.04	0.60	10.0	3.4

† *Times are based on a calendar day*

††† *Because of the low BODs experienced, DO depletions were less than the recommended 2.0 mg/l.*

Table 9 (Continued)

WATER QUALITY DATA - TRUCKEE RIVER

Station Description	Date	Time[†]	Flow m^3/day x 10^3	Flow CFS	Temp. °C	pH	Un-ionized Ammonia -N (mg/l)	Ammonia -N (mg/l)	Organic Nitrogen (N) (mg/l)	NO_3 & NO_3 (N) (mg/l)	Total Phosphorus (P) (mg/l)	DO	BOD
Station 0300	3/28	0840			7.0	7.6						10.0	
Truckee River		1100			8.0	8.1	0.02	1.19	1.78	2.08	0.64	10.8	
at S.P.		1350			9.5	7.8						11.2	2.3
Railroad Bridge		1615			9.0	7.6	0.00	0.55	0.80	1.44	0.44	10.4	
Near Patrick		1935			7.5	8.1						10.3	
		2215			6.0	8.3	0.03	1.00	1.01	2.82	0.70	9.2	
	Daily Avg.				7.8	7.6-8.3	0.02	0.91	1.20	2.11	0.59	10.3	
	3/29	0110			6.5	8.0						9.1	
		0430			4.0	7.6	0.01	1.25	1.00	2.56	0.38	9.1	4.3
		1030			7.0	7.8	0.01	1.28	0.72	2.10	0.72	10.5	
		1325			9.0	8.0						11.1	2.0[†††]
		1610			8.5	8.0	0.01	0.56	0.47	1.18	0.39	10.8	
		1900			7.0	8.0						10.1	
		2205			5.0	8.0	0.01	0.94	0.53	2.44	0.66	9.1	
	Daily Avg.				6.7	7.6-8.0	0.01	1.01	0.68	2.07	0.54	10.0	3.2
	3/30	0105			7.0	8.0						8.9	
		0435			6.0	7.8	0.01	0.83	0.49	1.76	0.41	9.0	4.0
		1025			6.5	7.7	0.01	0.98	0.53	1.44	0.62	10.4	
		1315			7.5	8.0						11.0	2.3
		1555			7.5	8.1	0.01	0.56	0.50	0.98	0.37	10.8	
		1905			6.5	7.9						10.0	
		2205			7.0	7.8	0.01	0.95	0.59	1.48	0.56	9.6	
	Daily Avg.				6.9	7.7-8.1	0.01	0.83	0.53	1.42	0.49	10.0	3.2
	3/31	0105			5.0	7.5						9.6	
		0415			5.0	7.5	0.00	0.81	0.64	1.30	0.46	9.8	2.7
		1015			6.5	7.9	0.01	1.28	2.05	0.84	0.70	10.8	
		1315			8.5	8.0						11.4	1.8
		1555			9.0	7.7	0.01	0.62	1.01	0.68	0.48	10.7	
		1855			8.0	8.0						10.1	
		2210			7.0	7.5	0.00	0.86	1.33	0.92	1.19	9.3	
	Daily Avg.				7.0	7.5-8.0	0.01	0.89	1.26	0.94	0.71	10.2	2.3
	4/1	0110			7.0	7.8						8.7	
		0415			7.0	8.1	0.02	0.84	1.37	0.98	0.47	8.6	3.8
		1010			8.0	7.5	0.01	1.14	1.87	1.00	0.77	10.1	
		1330			10.0	7.9						10.6	3.2
		1600			10.0	7.8	0.01	0.48	1.00	0.68	0.45	10.5	
		1850			8.5	8.1						9.7	
		2200			7.0	7.8	0.01	0.82	1.61	0.98	0.75	8.8	
	Daily Avg.				8.2	7.5-8.1	0.01	0.82	1.46	0.91	0.61	9.6	3.5

Table 9 (Continued)

WATER QUALITY DATA - TRUCKEE RIVER

Station Description	Date and Time†		Flow m^3/day x 10^3	Flow CFS	Temp. °C	pH	Un-ionized Ammonia -N (mg/l)	Ammonia -N (mg/l)	Organic Nitrogen (N) (mg/l)	NO_3 & NO_3' (N) (mg/l)	Total Phosphorus (P) (mg/l)	DO	BOD
Station 0300 (Cont.)	4/2	0050			7.5	8.1						8.9	
		0405			7.0	6.7	0.00	0.76	1.70	0.92	0.48	8.9	4.6
		1010			8.0	7.6	0.01	0.80	1.30	0.80	0.53	10.4	
		1350			10.0	8.0						10.9	2.7
		1600			10.5	7.6	0.00	0.46	1.08	0.66	0.40	10.4	
		1850			9.0	7.9						9.6	
		2155			8.0	7.5	0.00	0.73	1.50	0.90	0.54	8.7	
	Daily Avg.				8.6	6.7-8.1	0.00	0.79	1.40	0.81	0.49	9.7	3.7
	4/3	0100			8.0	7.8						8.8	
		0405			7.0	7.6	0.00	0.75	1.19	0.92	0.38	8.5	4.6
		1020			9.0	7.1	0.00	0.96	1.39	0.92	0.70	10.4	
		1345			11.5	7.2						10.6	3.1
		1600			12.0	7.6	0.00	0.48	1.19	0.70	0.42	10.4	
		1850			11.0	7.9						9.2	
		2150			9.0	7.6	0.00	0.67	1.12	0.88	0.43	8.6	
	Daily Avg.				9.6	7.1-7.9	0.00	0.72	1.22	0.86	0.48	9.5	3.9
	4/4	0050			8.0	7.8						8.0	
		0400			8.0	7.4	0.00	0.82	1.37	1.04	0.41	8.1	4.8
	Daily Avg.				8.0	7.4-7.8							
	3/28-4/4 Avg.				7.8		0.01	0.85	1.11	1.30	0.56	9.9	3.4

† *Times are based on a calendar day*

††† *Because of the low BODs experienced, DO depletions were less than the recommended 2.0 mg/l.*

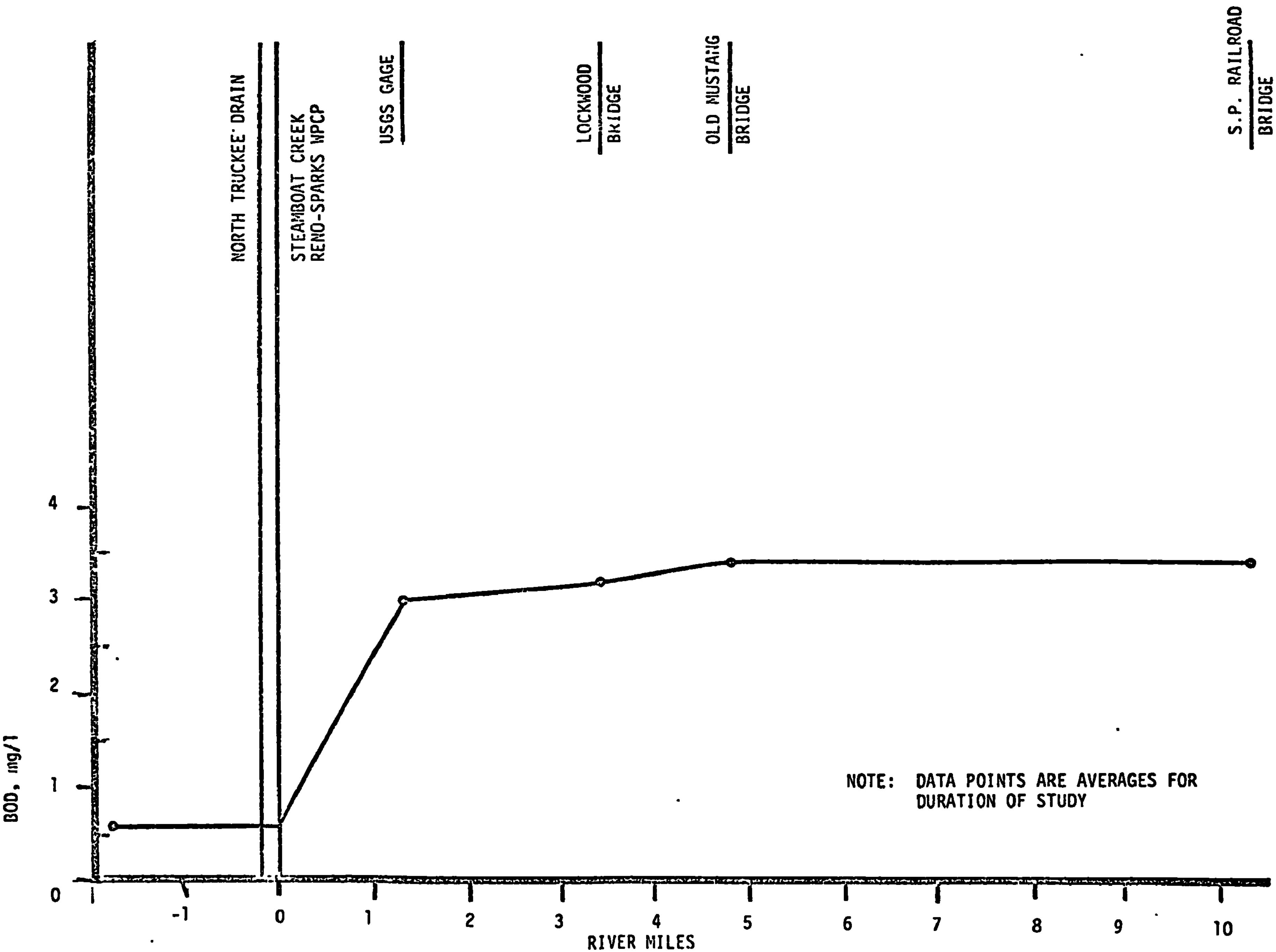

Figure 7. BOD Profile, Truckee River, March 28-April 4, 1977

Table 10

POLLUTANT LOADINGS - WATER QUALITY STUDY, TRUCKEE RIVER

March 28-April 4, 1977

Station	BOD			Phosphorus (P)			Nitrogen (N)			Total Dissolved Solids			Chloride		
	kg/day	lb/day	% Tot.	kg/day	lb/day	% Tot.	kg/day	lb/day	% Tot.	kg/day	lb/day	% Tot.	kg/day	lb/day	% tot.
Station 0200 - Truckee River Upstream of North Truckee Drain	420	930	19	59	130	14	420	920	16	54,000	120,000	48	2,600	5,800	28
Station 0210 - North Truckee Drain at Kleppe Lane	100	220	4.5	7.3	16	1.7	86	190	3.3	15,000	34,000	14	640	1,400	6.7
Station 0220 - Steamboat Creek Upstream of WPCP Effluent	150	340	6.9	18	40	4.2	95	210	3.7	22,000	49,000	20	3,900	8,500	40
WPCP Effluent	1,500	3,400	69	330	730	78	2,000	4,400	77	21,000	47,000	19	2,400	5,200	25
Total	2,200	4,900	100†	420	920	100†	2,600	5,700	100†	110,000	250,000	100†	9,500	21,000	100†
Station 0300 - Truckee River at S.P. Railroad Bridge near Patrick	2,500	5,600		450	990		2,600	5,800	–	–	–	–	–	–	–
Recovery Ratio = Station 0300 / Total					1.08		1.02								

† Because of rounding of numbers, percentage may not total exactly 100%.

primarily from the WPCP, caused stream BOD concentrations to increase to 3.0 mg/l at the USGS Vista gaging station, 2.1 km (1.3 mi) downstream of the plant. Values downstream from this point stayed relatively constant, averaging 3.4 mg/l 16.6 km (10.3 mi) downstream from the WPCP.

Dissolved Oxygen

Despite the increase in BOD downstream from the WPCP, stream DO concentrations showed no significant sag [Table 10 and Figure 8]. Upstream concentrations averaged 10.8 mg/l with a daily average range of 10.3 to 11.2 mg/l. Average DO concentrations 16.6 km (10.3 mi) downstream from the WPCP and the two tributaries were 9.9 mg/l with a range in daily average concentrations of 9.5 to 10.3 mg/l.

Total Dissolved Solids and Chloride

A limited number of total dissolved solids (TDS) and chloride samples were collected to characterize the receiving waters into which the WPCP effluent mixes [Table 9]. Total dissolved solids loading in the Truckee immediately downstream from the WPCP was 110,000 kg (250,000 lb)/day [Table 10] of which 19% was contributed by the WPCP (340 mg/l), 20% by Steamboat Creek (450 mg/l), and 14% by North Truckee Drain (260 mg/l). The remaining 48% was already borne by the Truckee (80 mg/l) upstream of the tributaries and WPCP.

Chloride loading was 9,500 kg (21,000 lb)/day, of which the WPCP (36 mg/l) contributed 25%, Steamboat Creek (79 mg/l) 40%, and North Truckee Drain (11 mg/l) 6.7%. The remaining 28% was carried in the Truckee (4.1 mg/l) upstream of the tributaries and WPCP.

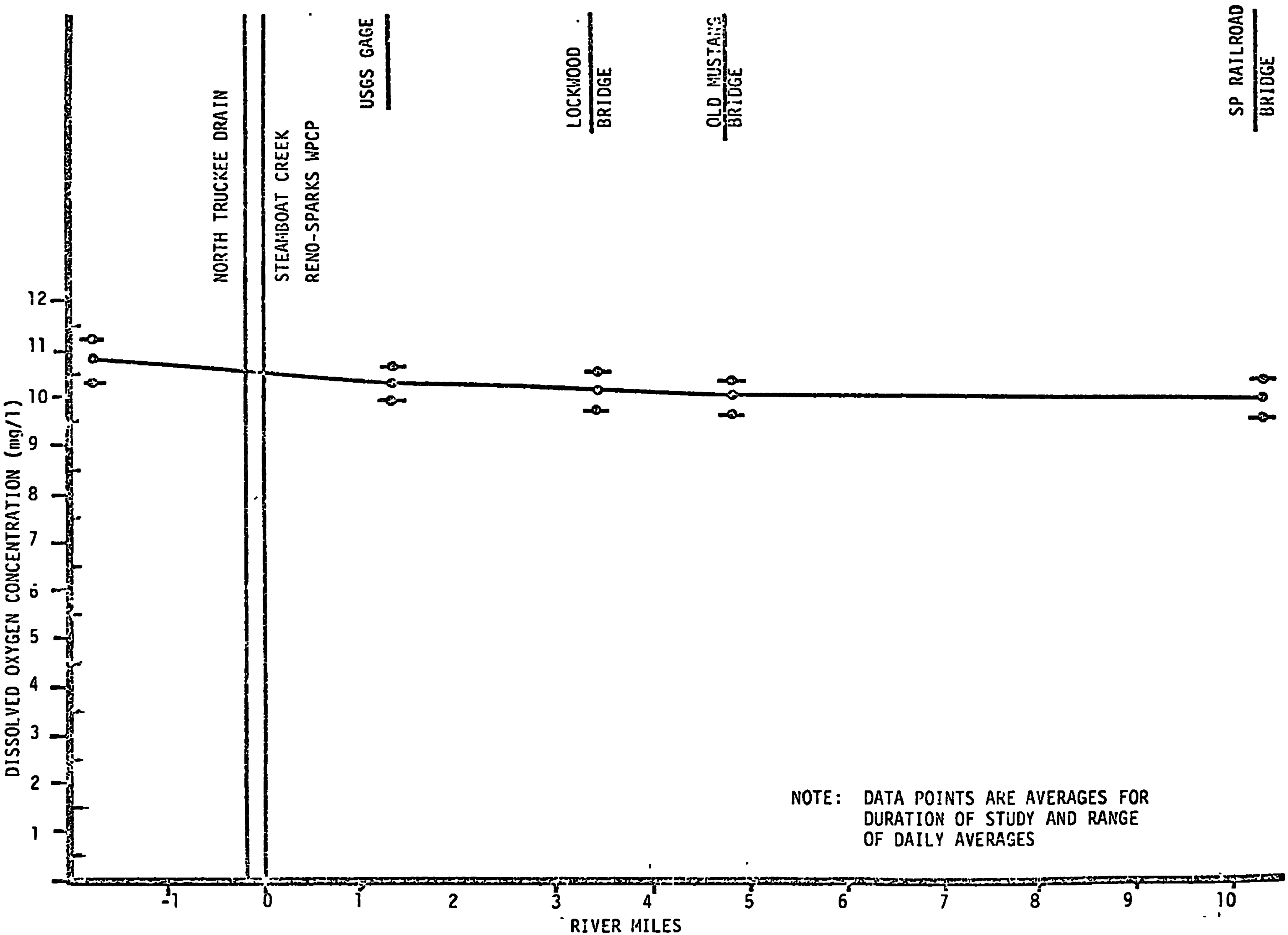

Figure 8. Dissolved Oxygen Profile, Truckee River, March 28-April 4, 1977

Nitrogen

The nitrogen forms upstream of the tributaries and WPCP included concentrations of organic nitrogen (N), ammonia-N, and nitrite plus nitrate (N) of 0.39, 0.13, and 0.11 mg/l, respectively [Table 9 and Figure 9]. This constituted a total nitrogen loading of 420 kg (920 lb)/day [Table 10]. The total nitrogen loadings in the Truckee River immediately downstream from the WPCP abruptly increased to 2,600 kg (5,700 lb)/day, of which 77% was contributed by the WPCP, 3.3% by North Truckee Drain and 3.7% by Steamboat Creek. This resulted in an increase in downstream nitrogen concentrations. Concentrations of organic nitrogen (N), ammonia-N and nitrite plus nitrate (N) at the Vista Gaging Station were 1.03, 1.02 and 0.66 mg/l, respectively.

Nitrogen concentrations downstream from the Vista gage indicated a gradual increase in nitrite plus nitrate (N) to 1.3 mg/l at the Southern Pacific Railroad Bridge near Patrick (RM 10.3), offset by a gradual decrease in ammonia-N to 0.85 mg/l. Organic nitrogen (N), on the other hand, remained relatively constant at 1.11 mg/l.

Mass balance determinations were also performed to determine what percentage of the nitrogen calculated as being in the Truckee River immediately downstream from the WPCP was also detected at the Southern Pacific Railroad Bridge near Patrick, 16.6 km (10.3 mi) downstream [Table 10]. The calculated recovery ratio for total nitrogen was 1.02 which is excellent, particularly since the determination is based on the summation of three nitrogen forms.

Phosphorus

Total phosphorus (P) concentrations upstream of the WPCP discharge and the two tributaries averaged 0.09 mg/l [Table 9 and Figure 10].

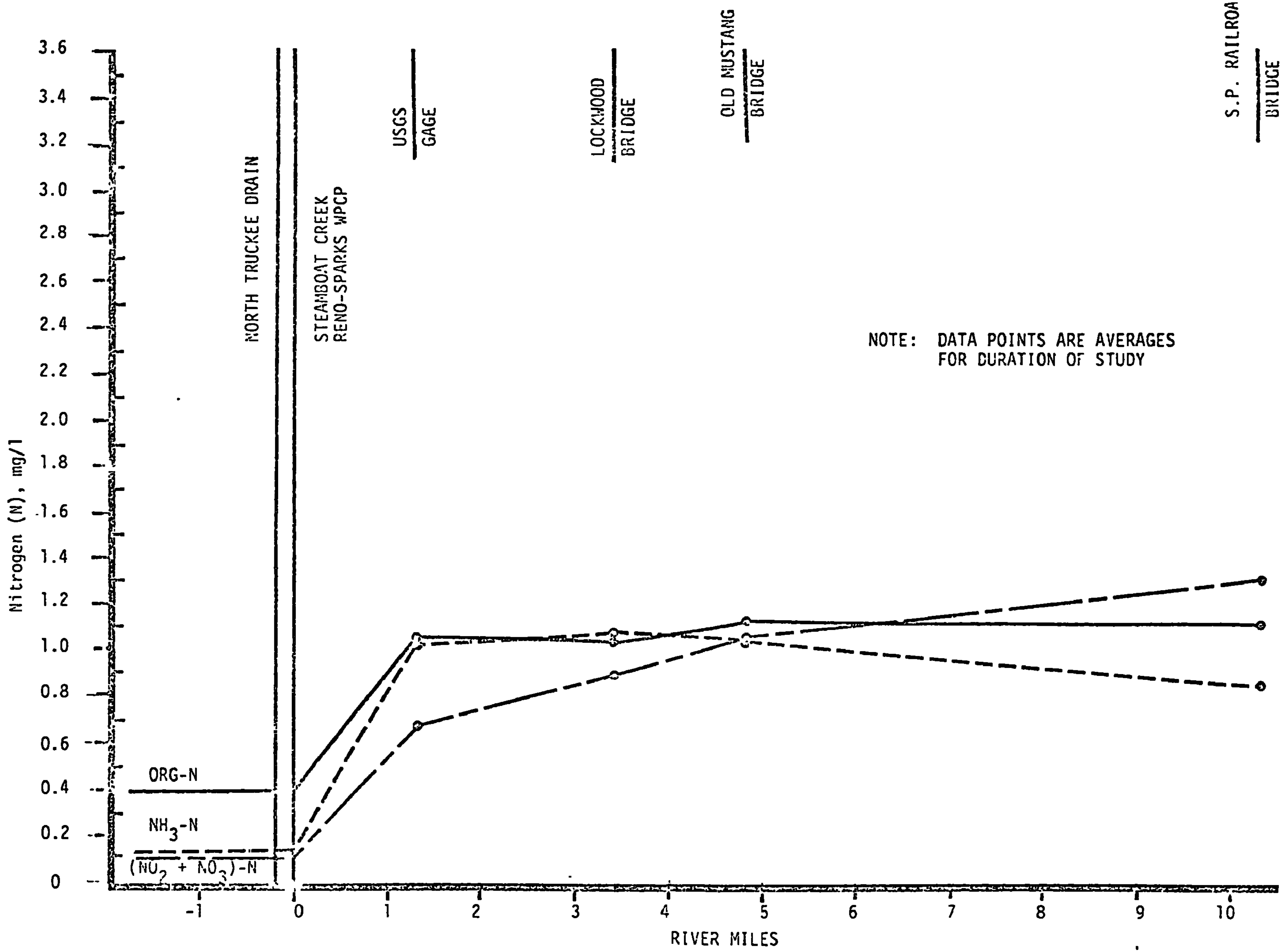

Figure 9. Nitrogen Profile, Truckee Piver, March 28-April 4, 1977

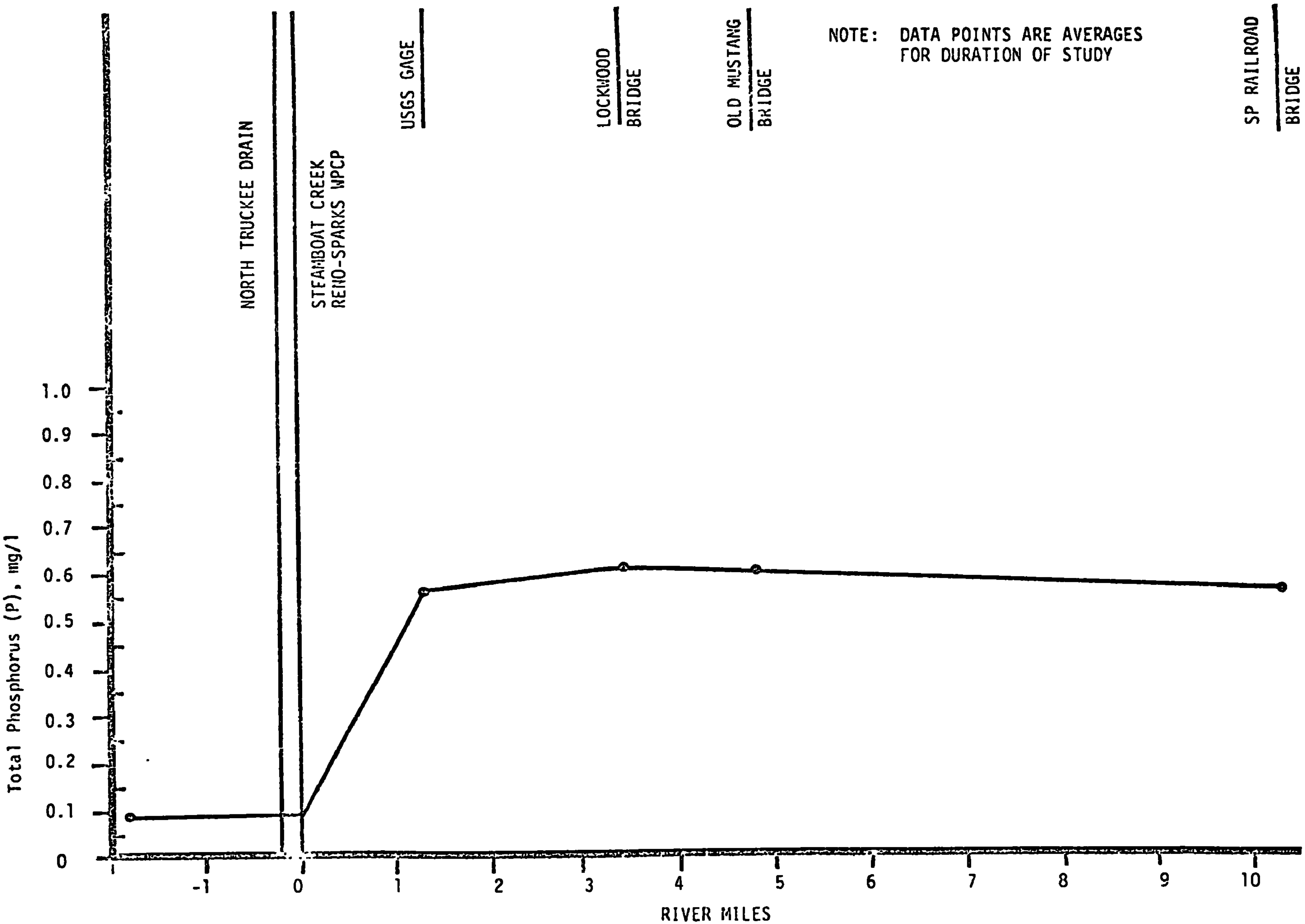

Figure 10. Total Phosphorus (P) Profile, Truckee River, March 28-April 4, 1977

The total phosphorus (P) load in the Truckee River immediately downstream from the WPCP averaged 430 kg (940 lb)/day, of which 79% was contributed by the WPCP, 1.7% by North Truckee Drain and 4.3% by Steamboat Creek [Table 10]. These added loads, primarily from the WPCP, caused total phosphorus (P) concentrations to increase to 0.56 mg/l at the Vista gaging station. Downstream from this station, concentrations remained nearly constant, equaling 0.56 mg/l at the Southern Pacific Railroad Bridge near Patrick, RM 10.3.

The recovery ratio calculated for total phosphorus was 1.08 which is excellent.

Bacteriology

Grab surface samples for fecal coliform bacteria were collected twice daily from the chlorinated WPCP effluent, as well as from the Truckee River, both upstream of (Station 0200) and downstream from (Station 0270) the plant [Table 5].

The chlorinated effluent samples contained fecal coliform bacteria densities ranging from an MPN of 400 to 49,000 FC/100 ml, with a geometric mean of 3,900 FC/100 ml [Table 5]. In addition, pathogenic *Salmonella enteritidis* ser Typhimurium were isolated in the WPCP discharge.

Upstream of the WPCP discharge at Station 0200, Truckee River water was of good bacteriological quality. Fecal coliform densities ranged from <2 to 79 FC/100 ml, with a geometric mean of 13 FC/100 ml. *Salmonella* were not detected from swabs collected at this station.

Water quality 2.1 km (1.3 mi) downstream from the WPCP discharge at the Vista Gage (Station 0270) was degraded as a result of bacterial pollution from the WPCP discharge. Fecal coliform densities ranged from a minimum of 11 FC/100 ml to a maximum of 4,900 FC/100 ml, with a geometric mean of 90 FC/100 ml. *Salmonella enteritidis* ser Typhimurium were isolated from swabs exposed in the stream at the same time as those in the WPCP effluent. Isolation of identical *Salmonella* serotypes indicates that the discharge was the source of the pathogen. The presence of *Salmonella* constitutes a potential hazard to the health of individuals in contact with Truckee River water downstream from the Reno-Sparks Joint Water Pollution Control Plant.

V. BIOLOGICAL INVESTIGATIONS

EFFLUENT TOXICITY

The NPDES Permit for the Reno-Sparks Joint WPCP prohibits the discharge of toxic substances that cause violation of provisions of Water Quality Standards for the State of Nevada. A series of 96-hour, continuous-flow bioassays, was conducted beginning at 0900 on March 28, 1977 to determine the potential toxicity of the Reno-Sparks Joint WPCP discharge on the aquatic biota of the Truckee River. Native Lahontan cutthroat trout (*Salmo clarki henshawi* Gill and Jordan) were selected as the test organisms.

The major toxic components normally present in treated, domestic wastewater are residual chlorine and un-ionized ammonia. To identify the principal contributing toxicant, bioassays were conducted using chlorinated (Station 260) and unchlorinated (Station 250) treated wastewater diluted with Truckee River water from upstream of Steamboat Creek (Station 200).

Ammonia

Ammonia is normally present in two states: ionized ammonia (NH_4+) and un-ionized ammonia (NH_3). The un-ionized fraction is the toxic agent; ionized ammonia has little or no toxic effect. The percentage of total ammonia (NH_4 + NH_3) that exists as un-ionized ammonia is a function of pH and temperature, i.e., more un-ionized ammonia exists under higher pH and temperature conditions. The generally accepted maximum concentration of un-ionized ammonia-N not to be exceeded in natural waters classified for fisheries is 0.02 mg/l.[1]

The bioassay using unchlorinated effluent showed that the wastewater was toxic. Ninety percent of the test fish survived the first 24-hour exposure in undiluted effluent and 55% survived 48 hours [Table 11]. By the end of 72-hours' exposure, 100% mortality had occurred in the undiluted effluent. The 96-hour LC_{50}^{*} for Lahontan cutthroat trout was calculated to be a mixture of 73% unchlorinated effluent and 27% Truckee River water, the mixture containing 12.8 mg/l total ammonia-N or 0.17 mg/l un-ionized ammonia-N. This concentration of un-ionized ammonia is in the range of values reported to be acutely toxic to trout;[2,3] therefore, it appears that ammonia was the principal toxicant in the unchlorinated effluent, and the bioassay results were not influenced significantly by other toxicants that may have been present.

From the bioassay data [Table 11], it is calculated that the maximum concentration of total ammonia-N that would be expected to provide complete (100%) survival of cutthroat trout in a 96-hour exposure is 7.7 mg/l. This concentration is the maximum which would satisfy specific provisions of the NPDES permit and Nevada Water Quality Standards probibiting the discharge of toxic materials as measured in a 96-hour (acute) bioassay, and is independent of flow. To achieve this limitation and prevent toxicity in the effluent, ammonia removal facilities would have to be installed which would consistently attain a removal efficiency of 56%, based on the average ammonia concentration in grab samples measured during the bioassay. To protect aquatic life in the receiving water on a long-term (chronic) basis, factors of 1/10 (maximum not to be exceeded at any time) and 1/20 (24-hour average) are generally applied to LC_{50} values derived from effluent bioassay data for degradeable or nonpersistent toxicants such as chlorine and ammonia.[1] Thus, to prevent chronic toxicity, Truckee River total ammonia-N and un-ionized ammonia-N maximum and average concentrations would have to be 1.3 and 0.6, and 0.02 and 0.01 mg/l, respectively. The daily low flow at the Truckee River

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* *LC_{50} indicates the concentration (actual or interpolated) at which 50% of the test organisms died, or would be expected to die.*

Table 11

BIOASSAY SURVIVAL DATA
RENO-SPARKS WPCP

March 28-April 1, 1977

Parameter	Effluent Concentration 100%	75%	56%	32%	18%	10%	Control (Truckee River Water)
Chlorinated % Survival							
24 hours	0	0	0	65	100	100	100
48 hours	0	0	0	0	100	100	100
72 hours	0	0	0	0	85	100	100
96 hours	0	0	0	0	25	60	95
Unchlorinated % Survival							
24 hours	90	95	100	100	100	100	100
48 hours	55	95	100	100	100	100	100
72 hours	0	70	95	100	100	100	100
96 hours	0	45	95	100	100	100	100

Vista gage that is projected to be exceeded 99% of the time, based on the period of record 1939-1976, is 177 cfs. During spawning periods, selected as April 1 to June 30, 177 cfs will be exceeded 99.9% of the time. During the NEIC study, the average concentration of ammonia upstream of the Reno-Sparks discharge was 0.14 mg/l (Stations 0200, 0210, and 0220) for a background mass loading of approximately 115 lb/day. To maintain an average concentration of 0.6 mg/l (1/20 LC_{50}) downstream from the plant at a flow of 177 cfs, the mass loading should average 570 lb/day. Therefore, the Reno-Sparks effluent could contain 455 lb/day of ammonia-N (570 - 115 = 455 lb/day). Based on the flow of 16.1 mgd observed during the NEIC survey, the ammonia-N concentration should average 3.4 mg/l, or a removal efficiency of 81% from bioassay levels. If the effluent flow is increased to 30 mgd, the total ammonia-N concentration in the effluent should average 1.8 mg/l. Assuming a concentration of 17.6 mg/l (from bioassay grab samples) that remains constant with increased flow, the necessary removal efficiency would be approximately 90%.

Calculations were performed to determine the Truckee River flows necessary to achieve concentrations of NH_3-N corresponsing to 1/20 and 1/10 LC_{50} without ammonia removal at the plant. These calculated stream flows are 24.3 and 10.6 m^3/sec (857 and 374 cfs), respectively. In other words, with present WPCP flows and effluent NH_3-N characteristics measured during the bioassay (17.6 mg/l), a downstream flow of 24.3 m^3/sec (857 cfs) would be necessary to attain an NH_3-N concentration of 1/20 LC_{50} or 0.64 mg/l.

Knowing the flows that would assure sufficient dilution for long-term protection, it was determined how often they occur. A USGS computer program was used to retrieve flow data from the downstream gage at Vista. Although data were available from 1899 to present, records were retrieved since 1939 corresponding to the first major reservoir, Boca, becoming operational in December 1938. Major reservoirs which followed included Prosser in January 1963 and Stampede in August 1969. By retrieving flow duration data it was possible to determine the percentage of time the calculated critical flows could be expected to be exceeded (i.e., the percentage of time conditions in the stream would be noncritical).

Duration periods were selected to correspond to the addition of each major reservoir, a process which would be expected to augment previous low flows. As noted in Table 12, the percentage of time a given flow was exceeded has increased with the addition of each reservoir. However, since the periods of record associated with the addition of Prosser and Stampede reservoirs are shorter and therefore potentially less statistically sound, this discussion will only relate to statistics for the overall period of record 1939-1976. This assures conservative results.

If an application factor of 1/20 LC_{50} is considered, the data indicate inadequate protection for long-term survival in the completely mixed zone beginning approximately 1,200 m (3,800 ft) downstream from the plant in the absence of ammonia removal. Flows will be in excess of 24.3 m^3/sec (857 cfs) only 23% of the time. However, if only the most critical period is considered, approximately April 1 - June 30 during spawning, it can be expected that flows will exceed the 1/20 LC_{50} flow 53% of the time. Flows can be expected to exceed the critical 1/10 LC_{50} flow of 10.6 m^3/sec (374 cfs) 75% of the time. During the spawning period, flows will exceed 10.6 m^3/sec (374 cfs) 85% of the time.

A note of caution is in order concerning absolute reliance upon flow projections statistically derived from past records. It is recognized that 1977 drought conditions may produce unpredictably low Truckee River flows of less than the projected 100-year, 7-day low flow of 76 cfs. Under these conditions, an adequate margin of safety to protect

Table 12

FLOW DURATION STATISTICS
TRUCKEE RIVER AT USGS GAGE NEAR VISTA, NEVADA

Period of Record in Period	Major Reservoirs on System	% of Time Flow Exceeded					
		$1/20\ EC_{50}$ Flow = 857 cfs		$1/10\ EC_{50}$ Flow = 374 cfs		Flow = 177 cfs	
		All values in Period of Record	4/1-6/30 Values	All values in Period of Record	4/1-6/30 Values	All values in Period of Record	4/1-6/30 Values
1939-62	BOCA (12/38)	18	45	68	78	97	99.8
1963-69	BOCA (12/38), PROSSER (1/63)	26	58	75	88	99.9	100
1970-76	BOCA (12/38), PROSSER (1/63), STAMPEDE (8/69)	31	68	95	98	100	100
1939-76		23	53	75	85	99	99.9

aquatic life may not exist. However, the computer program used to formulate flow projections is considered to be reasonably conservative because it evaluated a period (1961-1962) in which 7-day flows as low as 63 cfs were recorded.

Chlorine

Chlorine, when used as a disinfectant, may be present in water as free available chlorine in the form of hypochlorous acid or hypochlorite ion, or both. In municipal wastewater where an abundance of ammonia is available, chlorine will also be present as combined available chlorine in the form of chloramines (mono-, di-, and tri-). The toxicity of free available chlorine is similar to that of chloramines; therefore, for bioassay purposes a measure of residual chlorine (free available + combined chlorine) is adequate to define chlorine toxicity.[4] Studies conducted on other species of trout (rainbow and brook trout) established 7-day LC_{50} values of 0.08 mg/l residual chlorine.[5] An intensive fish-diversity study of the receiving water downstream from 156 sewage treatment plants showed brook trout and brown trout to be totally absent in waters having residual chlorine levels greater than approximately 0.02 mg/l.[6]

NEIC conducted a second bioassay using chlorinated Reno-Sparks Joint WPCP effluent. The undiluted effluent proved extremely toxic and resulted in 100% mortality to test fish within three hours of exposure, a violation of NPDES permit limitations. During the first 24 hours of this test, residual chlorine concentrations averaged 0.66 mg/l and total ammonia-N averaged 18.3 mg/l or 0.33 mg/l un-ionized ammonia [Table 3]. The 96-hr LC_{50} was calculated to be a mixture of 12% chlorinated effluent diluted with 88% Truckee River water. This mixture contained averages of 0.05 mg/l chlorine and 0.02 mg/l un-ionized ammonia-N.

The bioassay performed on the chlorinated wastewater determined that chlorine was the major toxic component of the Reno-Sparks Joint WPCP discharge. Applying the factors 1/20 and 1/10 to the LC_{50} value of 0.05 mg/l for chlorine indicates in-stream concentrations would have to be extremely low, averaging 0.0025 and not exceeding 0.005 mg/l. The WPCP cannot merely lower chlorine residuals and allow stream mixing to dissipate this toxicity since lowering the residual also drastically reduces the disinfecting properties for which the chlorination is intended. As noted in the "NPDES Compliance" section, maintaining an average chlorine residual of only 0.45 mg/l during the study resulted in violation of NPDES fecal coliform bacteria limits. It is essential that both adequate disinfection be accomplished and stream biota be protected. The only viable alternatives to accomplish both are to either change to a less persistent disinfectant (e.g., ultraviolet light, ozone, bromine chloride), or dechlorinate the effluent prior to discharge (e.g., sulfur dioxide or sodium bisulfite).

FISH SURVIVAL

Juvenile Lahontan cutthroat trout,.approximately 10 to 13 cm total length, were exposed in cages in the Truckee River and Steamboat Creek for various periods [Table 13]. In violation of NPDES Permit limitations, patterns of survival were influenced by the discharge of toxic substances from the Reno-Sparks WPCP into Steamboat Creek.

All caged trout in Truckee River reaches and Steamboat Creek upstream of the discharge survived the entire exposure [Figure 11]. Trout held at Station 261 in the Truckee River 30 m (100 ft) downstream from Steamboat Creek (but on the north bank upstream of the area in which Reno-Sparks effluent mixed) also survived the exposure. Total mortality occurred within 3 hours among fish placed near the south bank of the river 30 m (100 ft) downstream from Steamboat Creek. Downstream 700 m

Table 13

SURVIVAL OF CAGED LAHONTAN CUTTHROAT TROUT
TRUCKEE RIVER AND STEAMBOAT CREEK
MARCH AND APRIL 1977

STATION NUMBER	DESCRIPTION	DATE IN	DATE OUT	REMARKS
0200	Truckee R. 1.8 mi. upstream of Steamboat Cr., south bank	3/26	4/1	All fish survived 6 days, then cage lost.
0200	Truckee R.,1.8 mi. upstream of Steamboat Cr., north bank	3/26	4/7	All fish survived 12 days.
0211	Truckee R. downstream from North Truckee Drain, 0.1 mi. upstream from Steamboat Cr., north bank	3/26	3/31	All fish survived 5 days.
0220	Steamboat Cr. 0.1 mi. upstream from WPCF discharge	3/26	4/7	All fish survived 12 days.
0261	Truckee R. 30 m (90 ft) downstream from Steamboat Cr., north bank	3/26	3/31	All fish survived 5 days.
0261	Truckee R. 30 m (90 ft) downstream from Steamboat Cr., south bank	3/26	3/26	Total mortality within 3 hours.
0262	Truckee R. 700 m (2300 ft) downstream from Steamboat Cr., south bank	3/26	3/27	Total mortality within 24 hours.
0262	Truckee R. 700 m (2300 ft) downstream from Steamboat Cr., north bank	3/26	3/28	60% mortality within 24 hours, 100% mortality within 48 hours.
0263	Truckee R. 975 m (3200 ft) downstream from Steamboat Cr., mid-channel	3/28	3/31	10% mortality at 24 hours, 60% mortality at 48 hours, 100% mortality within 72 hours.
0264	Truckee R. 1 mi. (1600 m) downstream from Steamboat Cr., mid-channel	3/28	4/1	Total survival 24 hours, 80% mortality 48 hours, 90% mortality 72 hours, 100% mortality within 96 hours.
0270	Truckee R. 1.2 mi. (1930 m) downstream from Steamboat Cr. at SPRR bridge, mid-channel	3/28	4/1	100% survival 24 hours, 30% mortality 48 hours, 60% mortality at 72 hours.
0280	Truckee R. 3.4 mi. downstream from Steamboat Cr. at Lockwood, mid-channel	3/31	4/7	All fish survived 7 days.
0290	Truckee R. 4.8 mi. downstream from Steamboat Cr. at Mustang, mid-channel	3/31	4/7	All fish survived 7 days.

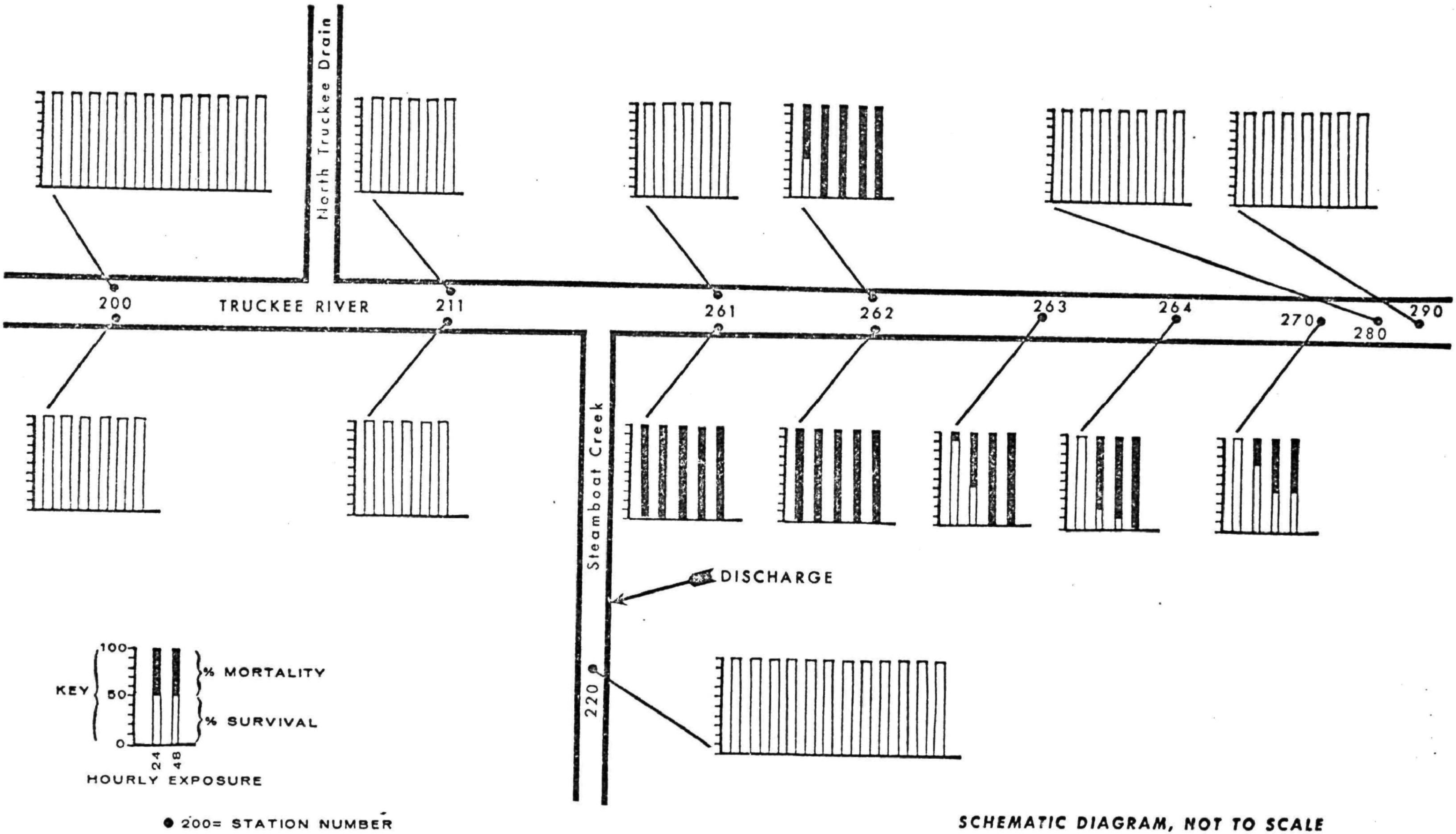

Figure 11. Survival at 24 Hour Intervals of Caged Lahontan Cutthroat Trout
March 26 to April 7, 1977

(2,300 ft) from Steamboat Creek at Station 262 all fish exposed near the south bank were dead within 24 hours. Fish exposed near the north bank at this location died within 48 hours. Midchannel at Station 263 (975 m or 3,200 ft downstream), 10% mortality occurred the first day and all fish were dead within 72 hours. All fish survived the first 24 hours at Station 264, 1,600 m (1.0 mi) downstream from the discharge; conversely, all of these fish were dead within 96 hours. At the Southern Pacific Railroad Bridge (1.9 km or 1.2 mi from Steamboat Creek), no mortality occurred the first day, but 60% mortality occurred within 72 hours. Downstream at Lockwood (RM 3.4) and Mustang (RM 4.8), all fish survived 7-day exposures in the Truckee River.

These results demonstrate that toxic materials discharged from the Reno-Sparks Joint WPCP were harmful to native cutthroat trout in the Truckee River, especially in the zone where complete mixing had not occurred. As previously discussed, the flow conditions at the time of the survey caused complete mixing to occur within 1,200 m (3,800 ft) of Steamboat Creek. Heavy mortalities occurred within the mixing zone, and lesser degrees of toxicity were detected in the next 770 m (2,500 ft) downstream to Station 270. Bioassays conducted during this study showed that the toxicity of the Reno-Sparks Joint WPCP discharge was caused primarily by chlorine or chlorinated compounds, and stream sampling revealed ammonia concentrations which would not be acutely toxic to cutthroat trout. Un-ionized ammonia-N concentrations at Station 270 averaged 0.03 mg/l, or about 1/8 of the 96-hr LC_{50}. Therefore, it was concluded that the high degree of toxicity in the mixing area was caused by residual chlorine, and that this residual chlorine was dissipated or assimilated in the reach between the Southern Pacific Railroad Bridge (RM 1.2) and Lockwood (RM 3.4).

MACROINVERTEBRATE DISTRIBUTION

Macroinvertebrate communities were sampled at ten locations along a 12-mile stretch of the Truckee River extending from 2.9 km (1.8 mi) upstream of the confluence with Steamboat Creek to 16.6 km (10.3 mi downstream from the confluence, and at two locations in Steamboat Creek upstream from the Reno-Sparks WPCP discharge [Table 14]. Moderate to fast currents flowing over gravel-cobble bottoms (riffles) were predominant at the most upstream Truckee River locations, at the five farthest downstream locations, and at the two locations in Steamboat Creek. Slow moving, relatively deep water overlying softer sediments (pool) was encountered in the Truckee River near the Steamboat Creek confluence.

Riffle communities were most abundant at the farthest upstream location on the Truckee River ranging from 7,638 to 13,275 organisms/m^2 [Table 15]. Abundance was also large at the most upstream riffle location on Steamboat Creek (10,769/m^2). A pronounced depletion of organisms was observed at the first riffle location downstream from the discharge, ranging from 2,884 to 4,592 organisms/m^2. Abundance then returned to near upstream levels at the Southern Pacific Railroad Bridge, 1.9 km (1.2 mi) downstream from the discharge, with numbers ranging from 11,265 to 15,575 organisms/m^2. At subsequent downstream stations abundance fluctuated between 3,317 and 12,247/m^2, generally larger than the riffle community samples just downstream from the discharge but somewhat smaller than the upstream reference community.

With the exception of one location just upstream of Steamboat Creek along the south bank, macroinvertebrates in pool areas numbered 61 to 1,919/m^2 [Table 16]. At the noted locality, abundance was the highest of any station sampled during the survey, 15,791/m^2. Unlike other pool areas, this station contained coarse sand and cobbles that may have provided an enhanced habitat for benthos. A notable drop in abundance occurred a few meters downstream in the mouth of Steamboat Creek (1,205/m^2), followed by a further decrease at the next station 50 m downstream on the south bank (123/m^2), and a subsequent increase 300 m farther downstream (711/m^2). Community abundance at midchannel and along the north bank downstream from the discharge also reflected the impoverished conditions found along the south bank.

Table 14

MACROINVERTEBRATE SAMPLING LOCATIONS
TRUCKEE RIVER
March 1977

Station Location	Description	Samples
-1.80 TR	Streamwide riffle 1.8 miles upstream from Steamboat Creek confluence	1 ea., south, north banks, midstream (Surber sampler).
-0.11 TR	Pool area 100 m upstream from N. Truckee Drain confluence	1 ea., south, north banks, midstream (Petersen dredge).
-0.01 TR	Pool area just upstream from Steamboat Creek confluence	1 ea., south, north banks, midstream (Petersen dredge).
0.00 TR	Mouth of Steamboat Creek	1 @ midstream (Petersen dredge).
-0.50 SC	Streamwide riffle on Steamboat Creek upstream from WPCP discharge	1 @ midstream (Surber sampler).
-0.10 SC	Streamwide riffle on Steamboat Creek upstream from WPCP discharge	1 @ midstream (Surber sampler).
0.01 TR	Pool area just downstream from Steamboat Creek confluence	1 ea., south, north banks, midstream (Petersen dredge).
0.20 TR	Pool area downstream from Steamboat Creek confluence	1 ea., south, north banks, midstream (Petersen dredge).
0.25 TR	Steamwide riffle	1 ea., south, north banks, midstream (Surber sampler).
1.20 TR	Riffle areas along north and south banks at Southern Pacific RR bridge upstream of USGS gage	1 ea., south, north banks (Surber sampler).
3.40 TR	Riffle areas along north and south banks at bridge at Mustang	1 ea., south, north banks (Surber sampler).
10.30 TR	Riffle area along north and south banks at railroad bridge at Patrick.	(Surber sampler).

* *Negative numbers indicate distances (river miles) upstream of Steamboat Creek - Truckee River confluence.*

Table 15

RIFFLE COMMUNITIES
BENTHIC MACROINVERTEBRATES
TRUCKEE RIVER, NEVADA
March 1977

Classification	-1.80TR† SB††	-1.80TR† M	-1.80TR† NB	-0.50SC M	-0.10SC M	0.25 TR SB	0.25 TR M	0.25 TR NB	1.30TR SB	1.30TR NB	3.40TR SB	3.40TR NB	4.80TR SB	4.80TR NB	10.30TR SB	10.30TR NB
	Number of Macroinvertebrates/m^2															
Annelida																
Oligochaeta																
Enchytraeidae	54															
Earthworms	508		108		22	11				11						
Naididae	11															
Tubificidae	22															
Limnodrilus claparedianus			270												11	54
L. hoffmeisteri			540		11	454				32	1210	22	11	11	151	194
Psammoryctides californianus															32	
Tubifex tubifex			270													
immature without capilliform chaetae					32	896	11	54	22	11	1296	11		22	248	432
immature with capilliform chaetae							22	32			11		108		11	
Nematoda	11		11						11							
Platyhelminthes	11															
Crustacea																
Amphipoda																
Hyalella azteca	11															
Gammarus			184	11						11	11		43			108
Decopoda																
Astacus (?)										11						11
Acari																
Hydracarina		11														
Insecta																
Ephemeroptera																
Baetidae																
Baetis	2290	1102	205	3175	32	22	443	421	324						529	713
Heptageniidae																
Cinygmula											22		292			
Ephemerellidae																
Ephemerella	205	43	464			22	140						11			32
Tricorythidae																
Tricorythodes	119	475	3413	22			637	227	194	97	11	529	292	162		292
Caenis									11							
Trichoptera																
Hydropsychidae																
Hydropsyche	7614	4050	464	821			227	886	43		907	76	335	1156	1901	378
Cheumatopsyche	259	508	76	518	22		130	248			443		216	378	2462	1706
Hydroptilidae																
Agraylea	11	97	1944	184	11		11									11
Ochrotrichia								11								

Table 15 (cont'd)

RIFFLE COMMUNITY

BENTHIC MACROINVERTEBRATES

TRUCKEE RIVER, NEVADA

March 1977

	Number of Macroinvertebrates/m²															
	-1.80TR[1]			-0.50SC	-0.10SC	0.25 TR			1.30TR		3.40TR		4.80TR		10.30TR	
	SB††	M	NB	M	M	SB	M	NB	SB	NB	SB	NB	SB	NB	SB	NB
Leucotrichia		11	54				410		119	54	400	11	3402	54	11	5194
Glossosomatidae																
Agapetus		11												43	11	140
Glossosoma																
Protoptila	11		11													
Rhyacophilidae																
Rhyacophila	11	11		11												
Plecoptera																
Chloroperlidae																
Isogenus	108	65	65				108	108							11	
Isoperla	518	205	130					22							108	43
Coleoptera																
Elmidae																
Zaitzevia	32	11	11								11					
Microcylloepus				54												
Lepidoptera																
Pyralidae																
Paragyractis	86	173	1,901	119	43	2614	1231	22	1588	756	853	11	583			86
Diptera		54	292											464		
Empididae					54											
Hemerodromia			22				22	22								
Tipulidae								32								
Antocha	227	130	270	54	32		454	572	65	1080	259	43	626	108	173	184
Hexatoma			11								22					
Simuliidae				983								11	43	43		
Chironomidae										508	97	205	896			
Tanypodinae		11	11	11		11	11			11						
Chironominae				11				22								
Chironomus																
Cryptochironomus																
Dicrotendipes					11											
Pseudochironomus			302							11						
Einfeldia																
Paracladopelma																
Polypedilum				32	11											
Tanytarsini				22	11	11	11		248							11
Diamesinae																
Potthastia				11												
Orthocladinae																
Brillia										11						
Cricotopus	1598	454	1944	4687	2365	367	259	205	8640	12960	2333	2398	5389	5152	227	324
Eukiefferiella		54														
Orthocladius		162	302							11						11
Trichocladius						184										
Trissocladius																
Psectrocladius					11											
Cardiocladius				43												
Total Number of Kinds	20	19	24	17	12	9	16	15	13	11	13	8	12	10	12	18
Total Number/m²	13717	7638	13275	10769	2668	4592	4127	2884	11265	15575	7886	3317	12247	7593	5886	9924

-1.80 TR† -River miles from Steamboat Creek Confluence (0.00)

SB†† ††SB=South Bank, M=Midstream, NB=North Bank

Table 16

POOL COMMUNITIES
BENTHIC MACROINVERTEBRATES
TRUCKEE RIVER, NEVADA
March 1977

Classification	Number of Macroinvertebrates/m^2												
	-0.11TR			-0.01TR			0.00TR	0.03TR			0.20TR		
	SB	M	NB	SB	M	NB	M	SB	M	NB	SB	M	NB
Annelida													
Oligochaeta													
Enchytraeidae													
Earthworms													
Naididae				46		31							
Tubificidae													
Limnodrilus claparedianus							15			93			
L. hoffmeisteri	46		31	77		31	31			356	46		
Psammoryctides californianus							15						
Tubifex tubifex										93			
immature without capilliform chaetae	232	15	868	496		279	46		31	356	77	62	
immature with capilliform chaetae	46		93	15		62				93			124
Nematoda								15		15		31	
Platyhelminthes													
Crustacea													
Amphipoda													
Hyalella azteca				15									
Gammarus													
Decopoda													
Astacus (?)													
Acari													
Hydracarina													
Insecta													
Ephemeroptera													
Baetidae													
Baetis										93			15
Heptageniidae													
Cinygmula													
Ephemerellidae													
Ephemerella	15			542									
Tricorythidae													
Tricorythodes				8571	15		15			15			
Caenis													
Trichoptera													
Hydropsychidae													
Hydropsyche				186									
Cheumatopsyche	15			15									
Hydroptilidae													
Agraylea				483									
Ochrotrichia										31	108		

POOL COMMUNITIES
BENTHIC MACROINVERTEBRATES
TRUCKEE RIVER, NEVADA
March 1977

Classification	-0.11TR				-0.01TR		0.00TR		0.03TR			0.20TR	
	Number of Macroinvertebrates/m^2												
	SB	M	NB	SB	M	NB	M	SB	M	NB	B	M	NB
Leucotrichia													
Glossosomatidae													
Agapetus													
Glossosoma													
Protoptila													
Rhyacophilidae													
Rhyacophila													
Plecoptera													
Chloroperlidae													
Isogenus				108									
Isoperla				31									
Coleoptera													
Elmidae													
Zaitzevia													
Hexacylloepus													
Lepidoptera													
Pyralidae													
Paragyractis	15			15									
Diptera		31	15	806									
Empidae													
Hemerodromia	15			62								15	
Tipulidae											15	31	15
Antocha				77		15							
Hexatoma													
Simuliidae													31
Chironomidae													
Tanypodinae													
Chironominae			365										
Chironomus	93		31			15							
Cryptochironomus						15							
Dicrotendipes										15			
Endochironomus						15							
Einfeldia								62		15	31		15
Paracladopelma				31			201			31		46	15
Polypedilum	15			15			15						
Tanytarsini													
Diamesinae													
Potthastia				15									
Orthocladinae		93											
Brillia	31	77	170	4185	46	496	852	108	15	651	186	124	93
Cricotopus							15		77				
Eukiefferiella										62	248		46
Orthocladius													
Trichocladius													
Trissocladius	15												
Psectrocladius								31					
Cardiocladius													
Total Number of Kinds	10	3	5	18	2	8	8	4	3	12	6	6	6
Total Number/m^2	538	216	1573	15791	61	959	1205	216	123	1919	711	309	339

Community structure in the study reach of the Truckee River reflected a more extensive impact of the WPCP discharge than did abundance. At the upstream riffle station, total types of organisms ranged from 19 to 24, the largest variety encountered in the entire reach. These were comprised of typically clean water invertebrates including Plecoptera, Ephemeroptera, Coleoptera, and Trichoptera which made up from 52 to 86% of the total abundance.

At the first riffle 400 m (1,300 ft) downstream from the discharge, a marked change was observed in the community along the south bank which was not reflected in the midstream or north bank populations. Trichoptera, Plecoptera, and Coleoptera were absent from this sample and Ephemeroptera were reduced to a relatively small number ($44/m^2$ or 1%). The remaining groups included the tolerant Diptera and Oligochaeta, and one species of Lepidoptera (*Paragyractis sp.*). Only 9 types of macroinvertebrates were collected from this area. At the midstream and north bank sampling sites, community structures resembled those found in reference riffle areas, although variety was reduced somewhat to 16 and 15 types, respectively. Trichoptera, Plecoptera and Ephemeroptera accounted for 52 and 68% of the respective abundances, similar to reference communities.

Community structures at the next three downstream sampling sites differed from reference communities primarily by the predominance of tolerant Diptera, which comprised 57 to 90% of the invertebrates at all except the south bank station at the Lockwood bridge (34%). At this latter station, another tolerant group, Oligochaeta, was equally as abundant as Diptera (32%). Plecoptera were absent at all stations and Trichoptera, Ephemeroptera, and Coleoptera were reduced considerably from reference levels (1 to 37% combined percentages). Variety at these stations varied from 8 to 13 types, below reference levels.

A return of community structure to near reference levels occurred at the last sampling site, 16.6 km (10.3 mi) downstream from the discharge at Patrick. Here, variety was 12 and 18 on the south and north banks, respectively. Again, Trichoptera, Ephemeroptera and Plecoptera made up the majority of organisms collected (85% on both banks). Diptera were reduced to 5 and 7% on the south and north banks respectively, comparable to reference levels.

Community structures on Steamboat Creek, upstream from the discharge, reflected changing conditions as the point of discharge was approached. At the farthest upstream sampling point (800 m upstream of the discharge), the riffle community contained Trichoptera, Ephemeroptera, and Coleoptera (45% of organisms) and a majority of Diptera (54%). At the riffle station 200 m upstream of the discharge, Diptera comprised 94% of the community abundance while Trichoptera and Ephemeroptera contributed only 2%. Plecoptera and Coleoptera were not found. The community structure here is similar to riffle stations encountered at the second, third and fourth sampling locations on the Truckee River downstream from the discharge. Due to its proximity to the discharge, the community structure at this station may be attributed to a backing up of the effluent during periods of high water.

In the pool reach encompassing the Steamboat Creek discharge, community variety was generally lower than riffle station samples along the Truckee River and in Steamboat Creek. Total types of organisms ranged from 2 to 12 at all except the station immediately upstream of and adjacent to Steamboat Creek confluence. This latter station, previously sited for its abundance of macroinvertebrates, supported 18 types. The atypical bottom type (i.e. coarse sand and cobbles) may have accounted for this large variety, which included clean water forms (Trichoptera, Ephemeroptera and Plecoptera) noted at the reference riffle site. These made up 62% of the total abundance. Elsewhere in the pool, 74 to 100% of the macroinvertebrates were tolerant Diptera and Oligochaeta.

In terms of variety, a depletion of total types occurred along the south bank (discharge side) of the Truckee River. At the farthest upstream station, across and upstream of North Truckee Drain, 10 types were collected; 18 types were found at the station immediately upstream from the discharge; 8 types were found in the confluence; 4 types were found 50 m downstream; and a slight recovery to 6 types was found 250 m farther downstream. Variety along the north bank and mid-channel did not indicate a response to plume influence as it did along the south bank ("Effluent Mixing Study" sub-section). Total types actually increased for some distance along the north bank, from 5 types at the station immediately upstream from north Truckee Drain, to 8 types just across and upstream from the discharge and then to 12 types 50 m downstream and across from the discharge. Types were reduced to six 250 m downstream, indicating the influence of the effluent plume.

ALGAL GROWTH

The Truckee River at reference Station 200 contained low concentrations of nitrogen and phosphorus [Table 9]. Periphyton populations consisted of diverse assemblies of diatoms as well as a few filamentous green algae. Periphytic chlorophyll a concentrations averaged 20.8 $\mu g/cm^2$ [Table 17]. The algal growth potential (AGP) test using this water stimulated 11.2 mg/l dry weight of algae [Table 18].

Downstream from the Reno-Sparks discharge, nutrient concentrations in the Truckee River increased dramatically [Table 9]. Periphyton populations and periphytic chlorophyll a concentrations were greatly reduced, probably by the toxicity of the effluent. An *in-situ* AGP test produced no growth. This AGP test appeared to be limited by light and temperature, because similar laboratory tests produced profuse algal growths.

From Steamboat Creek 2.1 km (1.3 mi.) downstream to the gaging station, the nutrient load was not being assimilated by algae. This was

Table 17

PERIPHYTIC CHLOROPHYLL a CONCENTRATIONS
TRUCKEE RIVER - RENO, NEVADA
March 25 - April 7, 1977

Station	Location	Chlorophyll a (μg/cm²)
0200	Truckee River off Kimlick Lane	20.8
0211	Truckee River Downstream from North Truckee Drain 0.1 km	3.8†
0220	Steamboat Creek Upstream of Reno-Sparks WPCP Discharge	3.5
0261	Truckee River Downstream from Steamboat Creek 0.1 km	0.3
0270	Truckee River at USGS Gage Station	2.3
0300	Truckee River at SPRR Bridge Near Patrick	34.5

† *Short Exposure (March 25 - April 1, 1977)*

Table 18

ALGAL GROWTH POTENTIAL TESTS - EFFLUENT ADDITIONS
TRUCKEE RIVER - RENO, NEVADA
March - April, 1977

Addition (%)	Inorganic N (mg/l)		Total P (mg/l)		*Selenastrum* Maximum Yield (mg/l dry weight)	
	Reno-Sparks WPCP	Treated† R/S WPCP	Reno-Sparks WPCP	Treated R/S WPCP	Reno-Sparks WPCP	Treated R/S WPCP
Reference (100% Truckee River Water)	0.09		0.03		11.2	
5	1.0	0.7	0.25	0.05	38.9	27.1
10	1.9	1.2	0.5	0.08	69.8	38.2
25	4.7	2.9	1.2	0.15	333.2	129.9
50	9.2	5.7	2.3	0.26	431.1	145.9

† *Treated with 400 mg/l* $Ca(OH)_2$

evidenced by low periphyton densities, low periphytic chlorophyll a concentrations, absence of *in-situ* AGP results, and high nutrient concentrations.

Algal growth recovered at the station farthest downstream at Patrick (Station 300). The periphytic chlorophyll a concentration was 34.5 µg/cm^2. The diatom population was diverse and no evidence of toxicity remained. The nutrient concentrations remained high, 0.56 mg/l total phosphorus and 2.15 mg/l inorganic nitrogen.

Laboratory AGP tests showed that the addition of Reno-Sparks effluent to the receiving water stimulated algal blooms. Additions of effluent (5 to 50%) stimulated 3 to 39 times more growth than occurred without effluent additions [Table 18].

The treatment of Reno-Sparks effluent with hydrated lime reduced the phosphorus concentrations from 5.0 to 0.5 mg/l (as P). The AGP tests using treated effluent produced up to 66% reduction of *Selenastrum* growth compared to tests using untreated effluent [Table 18].

Additions of nitrogen stimulated algal growth in the laboratory using *Selenastrum*. Laboratory tests conducted by the NEIC in the summer of 1976 using *Cladophora* (indigenous to the Truckee River) showed both nitrogen and phosphorus stimulated growth. Because phosphorus is more easily removed from wastewaters than nitrogen, it is the nutrient usually chosen for control. The AGP tests indicate that each reduction of 1.0 µg/l of phosphorus will produce a 0.14 mg/l reduction in *Selenastrum* or a 0.76 mg/l reduction in *Cladophora* growths.

REFERENCES

1. National Academy of Sciences, National Academy of Engineering, 1973. "Water Quality Criteria 1972," EPA - R3.73.033, p. 187.

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4. P. Doudoroff, and M. Katz, 1950. *Critical Review of Literature on the Toxicity of Industrial Wastes and Their Components to Fish.* Sewage and Industrial Wastes, 22:1432.

5. J. C. Merkens, 1958. *Studies on the Toxicity of Chlorine and Chloramines to the Rainbow Trout.* Water & Waste Trt. Jour., (G.B.), 7:150.

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APPENDIX A

RENO-SPARKS NPDES PERMIT NV0020150

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
100 CALIFORNIA STREET
SAN FRANCISCO, CALIFORNIA 94111

Certified Mail No. 704718

January 10, 1975

Calvin J. Dodson
Director of Public Works
431 Prater Way
Sparks NV 89431

Dear Mr. Dodson:

In accordance with the provisions of the Federal Water Pollution Control Act (33 USC 1251 et.seq.), the Environmental Protection Agency has reviewed the following application for a National Pollutant Discharge Elimination System (NPDES) permit to discharge wastewaters:

Discharger	Application No./ NPDES No.
Reno-Sparks Joint WPC Plant	NV0020150

This Agency has published a public notice of tentative determinations regarding the above application. After consideration of the expressed views of all interested persons and agencies, pertinent Federal statutes and regulations, and State action regarding comments or certification of the discharge, the Regional Administrator has made his final determinations.

Pursuant to 40 CFR 125.35, the Regional Administrator is issuing a permit on this application, including certain terms and conditions which he has determined are necessary to carry out the guidelines and requirements of the Act. The final determinations have been significantly changed from the tentative determinations. The Regional Administrator is giving public notice of such determinations.

RECEIVED
JAN 20 1975
Bureau of Environmental Health

Exhibit "A"

Enclosed you will find a copy of the notice and the Regional Administrator's final determinations, or permit, signed and dated. The permit shall take effect thirty (30) days from the date of signature. The permit shall be considered issued thirty (30) days from the date of signature unless there is a written request for an adjudicatory hearing pursuant to 40 CFR 125.36(b).

Any request for an adjudicatory hearing must be submitted within ten (10) days following the receipt of the Regional Administrator's final determinations and in the manner described in Federal regulations governing the NPDES program [40 CFR 125.36(b)].

Sincerely,

Frank M. Covington

Frank M. Covington
Director, Enforcement Division

Enclosures

cc: Nevada Bureau of Environmental Health
U.S. Fish and Wildlife Service, Portland
COE, Sacramento District
12th Coast Guard District
Mr. Warren Meacham, Public Works Director, Reno

Permit No. NV0020150
Application No.

AUTHORIZATION TO DISCHARGE UNDER THE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

'n compliance with the provisions of the Federal Water Pollution Control Act, as amended, U.S.C. 1251 et. seq; the "Act"),

The City of Sparks
Public Works Department
431 Prater Way
Sparks NV 89431

ıthorized to discharge from Discharge Serial No. 001, the Reno-Sparks Joint ıter Pollution Control Plant, located at 8500 Kimlick Lane near Sparks, Nevada

eceiving waters named Steamboat Creek (Latitude 39°31'8.7"N; Longitude 119°42'10.0"W)

ıccordance with effluent limitations, monitoring requirements and other conditions set forth 'arts I, II, and III hereof.

This permit shall become effective on

This permit and the authorization to discharge shall expire at midnight, May 1, 1977

ned this day of JAN 10 1975

For the Regional Administrator

Director, Enforcement Division

rm 3320-4 (10-73)

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS (based upon a design treatment capacity of 0.88m^3/sec, or 20 mgd)

During the period beginning the effective date of this permit and lasting through May 1, 1977 the permittee is authorized to discharge from outfall(s) serial number(s) 001 to Steamboat Creek.

Such discharges shall be limited and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITATIONS kg/day (lbs/day) Average 30-Day	kg/day (lbs/day) Average 7-Day	kg/day (lbs/day) Daily Max	Other Units (Specify) Average 30-Day	Other Units (Specify) Average 7-Day	Other Units (Specify) Daily Max	MONITORING REQUIREMENTS Measurement Frequency	Sample Type
Flow m3/Day (MGD)	---	---	---	---	---	---	Continuous	--
D (5-day)*	760 (1700)	1200 (2500)	2300 5000 ~~1200 (2500)~~	10mg/l	15mg/l	---	Daily	Composite
spended Solids*	1500 (3400)	2300 (5000)	4600 (10,000)	20mg/l	30mg/l	---	Daily	Composite
ttleable Solids	--	--	--	0.1ml/l	--	0.2ml/l	Daily	Discrete
tal Residual chlorine	--	--	--	--	--	---	Daily	Discrete
cal Coliform Bacteria	--	--	--	200/100ml	400/100ml	2000/100ml	Daily	Discrete
ssolved Oxygen	Shall be greater than or equal to 6.0 mg/l at all times						Daily	Discrete
I	Shall not be less than 6.5 nor greater than 8.5 at any time						Monthly	Composite
tal Dissolved Solids**	--	--	--	--	--	--	Weekly	Composite
tal Phosphates	--	--	--	--	--	--		

oth the influent and effluent shall be sampled.

e shall be no discharge of toxic substances that cause violation of the provisions of Water Quality Standards for State of Nevada.

** The total dissolved solids data shall be reported for both the water supply and the effluent.

c. The discharge shall not cause objectionable odors at the surface of the receiving waters.

d. There shall be no discharge of floating solids or visible foam in other than trace amounts.

e. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s):
In ient samples shall be taken downstream from any additions to the trunk sewer and prior to treatment.
[illegible] from any additions from the treatment works and prior

SCHEDULE OF COMPLIANCE

-- The permittee shall achieve compliance with the effluent limitations specified for discharges in accordance with the following schedule:

a. January 1, 1976 complete a facilities plan; and by

b. January 1, 1977 complete engineering plans and specifications for facilities necessary to assure compliance with the effluent limitations specified in conditions I.B.4 and I.A.2.

c. Reports of progress with respect to achievement of the above scheduled events shall be submitted to the Regional Administrator no later than July 1, 1975 and July 1, 1976.

No later than 14 calendar days following a date identified in the above schedule of compliance, the permittee shall submit either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

A "schedule of compliance" means a program composed of two integral parts: (a) plan - description of new or modified facilities to treat and dispose of the effluent; and (b) schedule - a timetable setting forth the date by which all wastewaters will be in compliance with the effluent limitations of this permit. The schedule shall include (if appropriate) dates by which the permittee will accomplish:

a. Completion of a preliminary engineering plan report;

b. Completion of construction plans and specifications;

c. Initiation of construction;

d. Completion of construction;

e. Demonstration of compliance with effluent limitations.

(based upon a design treatment capacity of 1.8 m^3/sec, or 40 mgd)

Such discharges shall be limited by the permittee as specified below:

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITATIONS kg/day (lbs/day) Average 30-Day	7-Day	Daily Max	Other Units (Specify) Average 30-Day	7-Day	Daily Max
Flow--m^3/Day (MGD)	---	---	---	---	---	---
Biochemical Oxygen Demand (5-day, 20°C)	1500 (3300)	2300 (5000)	4500 (10,000)	10 mg/l	15 mg/l	---
Suspended Solids	3000 (6700)	4500 (10,000)	9100 (20,000)	20 mg/l	30 mg/l	---
Total Phosphate	450 (1000)	680 (1500)	1400 (3000)	3.0mg/l	4.5mg/l	---
Fecal Coliform Bacteria	---	---	---	200/100ml	400/100ml	2000/100ml
Settleable Solids	---	---	---	0.1 ml/l	---	0.2 ml/l
Dissolved Oxygen	Shall be greater than 6.0 mg/l at all times					
pH	Shall not be less than 6.5 nor greater than 8.5 at any time					

The discharge shall not cause objectionable odors at the surface of the receiving waters.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

MONITORING AND REPORTING

1. *Representative Sampling*

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

2. *Reporting*

Monitoring results obtained during the previous 3 months shall be summarized for each month and submitted on forms to be supplied by the Regional Administrator, to the extent that the information reported may be entered on the forms. The results of all monitoring required by this permit shall be submitted in such a format as to allow direct comparison with the limitations and requirements of this permit. Unless otherwise specified, discharge flows shall be reported in terms of the average flow over each 30-day period and the maximum daily flow over that 30-day period. Monitoring reports shall be postmarked no later than the 28th day of the month following the completed reporting period. The first report is due on March 28, 1975. Duplicate signed copies of these, and all other reports required herein, shall be submitted to the Regional Administrator and the State at the following addresses:

Regional Administrator
Environmental Protection Agency
Region IX, ATTN: ENCMR
100 California Street
San Francisco CA 94111

State of Nevada
Department of Human Resources
Bureau of Environmental Health
1209 Johnson Street
Carson City NV 89701

3. *Definitions*

See Part III.

4. *Test Procedures*

Test procedures for the analysis of pollutants shall conform to regulations published pursuant to Section 304(g) of the Act, under which such procedures may be required.

5. *Recording of Results*

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

a. The exact place, date, and time of sampling;

b. The dates the analyses were performed;

c. The person(s) who performed the analyses.

d. The analytical techniques or methods used; and

e. The results of all required analyses.

Additional Monitoring by Permittee

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report Form. Such increased frequency shall also be indicated.

Records Retention

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed and calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation shall be retained for a minimum of three (3) years, or longer if requested by the Regional Administrator or the State water pollution control agency.

ANAGEMENT REQUIREMENTS

. *Change in Discharge*

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit. Any anticipated facility expansions, or treatment modifications which will result in new, different, or increased discharges of pollutants must be reported by submission of a new NPDES application or, if such changes will not violate the effluent limitations specified in this permit, by notice to the permit issuing authority of such changes. Following such notice, the permit may be modified to specify and limit any pollutants not previously limited.

2. *Noncompliance Notification*

If, for any reason, the permittee does not comply with or will be unable to comply with any daily maximum effluent limitation specified in this permit, the permittee shall provide the Regional Administrator and the State with the following information, in writing, within five (5) days of becoming aware of such condition:

a. A description of the discharge and cause of noncompliance; and

b. The period of noncompliance, including exact dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate and prevent recurrence of the noncomplying discharge.

3. *Facilities Operation*

The permittee shall at all times maintain in good working order and operate as efficiently as possible all treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit.

4. *Adverse Impact*

The permittee shall take all reasonable steps to minimize any adverse impact to receiving waters resulting from noncompliance with any effluent limitations specified in this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

5. *Bypassing*

Any diversion from or bypass of facilities necessary to maintain compliance with the terms and conditions of this permit is prohibited, except (i) where unavoidable to prevent loss of life or severe property damage, or (ii) where excessive storm drainage or runoff would damage any facilities necessary for compliance with the effluent limitations and prohibitions of this permit. The permittee shall promptly notify the Regional Administrator and the State in writing of each such diversion or bypass, in accordance with the procedure specified in Part II.A.2. above.

Removed Substances

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering navigable waters.

Safeguards to Electric Power Failure

See Part III.

RESPONSIBILITIES

1. *Right of Entry*

The permittee shall allow the head of the State water pollution control agency, the Regional Administrator, and/or their authorized representatives, upon the presentation of credentials:

a. To enter upon the permittee's premises where an effluent source is located or in which any records are required to be kept under the terms and conditions of this permit; and

b. At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect any monitoring equipment or monitoring method required in this permit; and to sample any discharge of pollutants.

2. *Transfer of Ownership or Control*

In the event of any change in control or ownership of facilities from which the authorized discharges emanate, the permittee shall notify the succeeding owner or controller of the existence of this permit by letter, a copy of which shall be forwarded to the Regional Administrator and the State water pollution control agency.

3. *Availability of Reports*

Except for data determined to be confidential under Section 308 of the Act, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the State water pollution control agency and the Regional Administrator. As required by the Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the Act.

4. *Permit Modification*

After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to, the following:

a. Violation of any terms or conditions of this permit;

b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or

c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

5. *Toxic Pollutants*

Notwithstanding Part II, B-4 above, if a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Act for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition and the permittee so notified.

6. *Civil and Criminal Liability*

Except as provided in permit conditions on "Bypassing" (Part II, A-5) and "Power Failures" (Part II, A-7), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

7. *Oil and Hazardous Substance Liability*

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Act.

8. *State Laws*

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority preserved by Section 510 of the Act.

Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

PART III

.R REQUIREMENTS

'art I.A.1.f

The permittee shall collect discrete samples on a weekly basis from the midpoint of Steamboat Creek at the bridge located approximately 100 yards upstream from the confluence of Steamboat Creek and the Truckee River. The samples shall be analyzed for Total Residual Chlorine. The results shall be submitted to the Regional Administrator and the State together with the results of influent and effluent monitoring.

PART III

OTHER REQUIREMENTS

Part I.A.2. 85 Percent Removal

After the effective date of this permit the arithmetic mean of the Biochemical Oxygen Demand (5-day) and Suspended Solids values, by weight, for effluent samples collected in a period of 30 consecutive calendar days shall not exceed 15 percent of the arithmetic mean of the values, by weight, for influent samples collected at approximately the same times during the same period. If fewer than four measurements are made during the 30 consecutive calendar day period, then compliance or non-compliance with this condition shall not be determined.

Part I.B.5.

The Regional Administrator may, upon request of the permittee, and after public notice, revise or modify a schedule of compliance in an issued permit if he determines good and valid cause (such as an act of God, strike, flood, materials shortage, or other event over which the permittee has little or no control) exists for such revision.

Part I.C.3. Definitions

a. The "30-day, or 7-day, average" discharge means the total discharge by weight during a 30, or 7, consecutive calendar day period, respectively, divided by the number of days in the period that the facility was discharging. Where less than daily sampling is required by this permit, the 30-day, or 7-day, average discharge shall be determined by the summation of all the measured discharges by weight divided by the number of days during the 30, or 7, consecutive calendar day period when the measurements were made.

If fewer than four measurements are made during a 30, or 7, consecutive calendar day period, then compliance or non-compliance with the 30, or 7, day average discharge limitation shall not be determined.

b. The "daily maximum" discharge means the total discharge by weight during any calendar day.

c. The "30-day, or 7-day, average" concentration, other than for fecal or total coliform bacteria, means the arithmetic mean of measurements made during a 30, or 7, consecutive calendar day period, respectively. The "30-day, or 7-day, average" concentration for fecal or total coliform bacteria means the geometric mean of measurements made during a 30, or 7, consecutive calendar day period, respectively. The geometric mean is the n^{th} root of the product of n numbers.

If fewer than four measurements are made during a 30, or 7, consecutive calendar day period, then compliance or non-compliance with the 30, or 7, day average concentration limitation shall not be determined.

d. The "daily maximum" concentration means the measurement made on any single discrete sample or composite sample.

e. A "discrete" sample means any individual sample collected in less than 15 minutes.

f. [illegible] A "composite" sample means, for other than flow rate measurements, a combination of no fewer than 8 individual samples obtained at equal time intervals for 24 hour(s), or for the duration of discharge, whichever is shorter. The volume of each individual sample shall be proportional to the discharge flow rate at the time of sampling.

Part I.C.8. <u>Intermittent Discharge Monitoring</u>

If the discharge is intermittent rather than continuous, then on the first day of each such intermittent discharge, the permittee shall monitor and record data for all of the characteristics listed in the monitoring requirements, after which the frequencies of analysis listed in the monitoring requirements shall apply for the duration of each such intermittent discharge. In no event shall the permittee be required to monitor and record data more often than twice the frequencies listed in the monitoring requirements.

Part I.C.9. Monitoring Modification

Monitoring, analytical, and reporting requirements may be modified by the Regional Administrator upon due notice.

Part II.A.2. Non-compliance Notification

Non-compliance with the conditions of this permit due to causes outside the reasonable control of the permittee shall not be deemed by the Regional Administrator to be violations of the terms and conditions of this permit.

Part II.A.6. Removed Substances

The return of screenings, sludges, and other solids into the waste treatment facility is permitted if the effluent limitations prescribed by this permit are not violated thereby.

Part II.A.7. Safeguards to Electric Power Failure

a. The permittee shall, within ninety (90) days of the effective date of this permit, submit to the Regional Administrator a description of the existing safeguards provided to assure that, should there be reduction, loss, or failure of electric power, the permittee shall comply with the terms and conditions of this permit. Such safeguards may include alternate power sources, standby generators, retention capacity, operating procedures or other means. A description of the safeguards provided shall include an analysis of the frequency, duration, and impact of power failures, experienced over the past five years, on effluent quality and on the capability of the permittee to comply with the terms and conditions of the permit. The adequacy of the safeguards is subject to the approval of the Regional Administrator.

b. Should the treatment works not include safeguards against reduction, loss, or failure of electric power, or, should the Regional Administrator not approve the existing safeguards, the permittee shall, within ninety (90) days of the effective date of this permit, or within ninety (90) days of having been advised by the Regional Administrator that the existing safeguards are inadequate, provide to the Regional Administrator a schedule of compliance for providing, not later than July 1, 1977, safeguards such that in the event of reduction, loss, or failure of electric power, the permittee shall comply with the terms and conditions of this permit. The schedule of compliance shall, upon approval of the Regional Administrator, become a condition of this permit.

Part II.A.8. Flow Rate Notification

The permittee shall notify the Regional Administrator and State Agency by letter not later than 90 days after the 30-day average daily dry-weather discharge flow rate first equals or exceeds 85% of the design treatment capacity of the permittee's facility given in Part I.A. above. The letter shall include:

a. The 30-day average daily discharge flow rate; the date on which the instantaneous peak discharge flow occurred; the rate of that peak flow; and the total flow for that day;

b. The permittee's estimate of when the 30-day average dry-weather discharge flow rate will equal or exceed the design treatment capacity of the permittee's facility;

c. The permittee's schedule of compliance to provide additional treatment capacity before the 30-day average daily dry-weather discharge flow rate equals the present design treatment capacity of the permittee's facility.

The permittee shall implement and comply with the provisions of the schedule of compliance after approval by the Regional Administrator, including in said implementation and compliance any additions or modifications which the Regional Administrator may make in approving the schedule of compliance.

Part II.A.9. Pretreatment of Industrial Wastewaters

a. Submittal of Information

The permittee shall submit to the Regional Administrator:

1. Not later than one year from the effective date of this permit, the information described in Section IV of EPA Form 7550-22 for each major contributing industry;

2. At least thirty days prior to its initiation, notification of any new introduction of pollutants from sources which, if they were to discharge to the waters of the United States, including the territorial seas, would be (a) a new source as defined in Section 306 of the Act, or (b) a major contributing industry subject to Section 301 of the Act. The notification in (a) & (b) above shall include the information described in Section IV of EPA Form 7550-22;

3. Notification of any substantial change in volume or character of pollutants discharged by an existing source. Such notice shall include the information described in Section IV of EPA Form 7550-22 and the anticipated impact, if any, on the quality or quantity of effluent discharged from the permittee's facilities.

After receipt and review of such information, the Regional Administrator may revise or modify the conditions of this permit, including any necessary effluent limitations for any pollutants not identified and limited herein.

b. Control of Industrial Pollutants

1. The permittee shall require all industrial users of its treatment works to comply with the requirements of Sections 204(b), if applicable, and 307 of the Act. All existing major contributing industries shall be required to comply with pretreatment standards for prohibited wastes and incompatible pollutants within the shortest reasonable time but not later than three

years from the date of their promulgation. New industrial sources shall be required to comply with pretreatment standards promulgated pursuant to Section 307(c) of the Act upon initiation of their discharge to the permittee's facilities.

2. The permittee shall within 12 months of the effective date of this permit, submit to the Regional Administrator for each major contributing industry either (a) evidence of compliance with pretreatment standards promulgated pursuant to Section 307(b) of the Act, or (b) a report, or a form to be furnished by the Administrator which shall set forth the effluent limits to be achieved and a schedule of compliance for the achievement of the limits by the required date. Such compliance schedules shall in every case provide for the initiation of any needed construction of pretreatment facilities within 18 months of the date of promulgation of applicable pretreatment standards.

c. Compliance Monitoring

1. The permittee shall monitor the compliance of all affected sources with the provisions of this condition and shall submit quarterly reports on the status of such compliance to the Regional Administrator. These quarterly compliance reports shall cover the same periods and shall be submitted on the same schedule as the monitoring reports required by condition I.C.2 of this permit, beginning one year after the effective date of this permit.

2. The permittee shall report quarterly to the Regional Administrator each instance of compliance or non-compliance by an affected source with the provisions of compliance schedules submitted as required by subparagraph b. of this condition.

3. The wastewater flow of each affected source that is not covered by a current compliance schedule shall be monitored by the permittee or at the direction of the permittee, by

the source, or by both, in such a manner and frequency so as to produce information that will demonstrate to the satisfaction of the Regional Administrator compliance or non-compliance with the pretreatment standards applicable to such source. Such monitoring shall comply with Parts 1, 3, 4, 5, 6, 7, and 8 of Condition I.C. The results of such monitoring shall be reported by the permittee on the Discharge Monitoring Report Form and shall be included in the quarterly compliance report described in 1. above.

d. Definitions

1. An "industry" means any facility identified in the Standard Industrial Classification Manual, 1972, Office of Management and Budget, as amended and supplemented, under the following divisions:

   (a) Division A - Agriculture, Forestry, and Fishing;

   (b) Division B - Mining;

   (c) Division D - Manufacturing;

   (d) Division E - Transportation, Communications, Electric, Gas, and Sanitary Services;

   (e) Division I - Services.

   A facility in the Divisions listed may be excluded if it is determined by the Regional Administrator that it introduces primarily domestic wastes or wastes from sanitary conveniences.

2. A "major contributing industry" means one that: (1) has a flow of 50,000 gallons or more per average work day; (2) has a flow greater than five percent of the flow carried by the municipal system receiving the waste; (3) has in its waste a toxic pollutant in toxic amounts as defined in standards issued under Section 307(a) of the Act; or (4) is found by the Regional Administrator to have significant impact, either singly or in

combination with other contributing industries, on the treatment works or the quality of its effluent.

3. A "treatment works" means any facility, method or system for the storage, treatment, recycling, or reclamation of municipal sewage or industrial wastes of a liquid nature, including waste in combined storm water and sanitary sewer systems.

4. "Prohibited wastes" means any of the following wastes, which shall not be introduced into the treatment works:

   (a) Wastes which create a fire or explosion hazard in the treatment works;

   (b) Wastes which will cause corrosive structural damage to treatment works, but in no case wastes with a pH lower than 5.0 unless the works is designed to accommodate such wastes;

   (c) Solid or viscous wastes in amounts which would cause obstruction to the flow in sewers, or other interference with the proper operation of the treatment works; or

   (d) Wastes at a flow rate and/or pollutant discharge rate which is excessive over relatively short time periods so that there is a treatment process upset and subsequent loss of treatment efficiency.

5. An "incompatible pollutant" means any pollutant which is not a compatible pollutant.

6. A "compatible pollutant" means biochemical oxygen demand, suspended solids, pH and fecal coliform bacteria, plus additional pollutants identified as compatible in this permit if the treatment works was designed to treat such pollutants, and in fact does remove such pollutants to a substantial degree.

Part III.A. Reapplication

If the permittee desires to continue to discharge, he shall reapply not later than 180 days before this permit expires, on the application forms then in use.

APPENDIX B

NEIC CHAIN OF CUSTODY PROCEDURES

ENVIRONMENTAL PROTECTION AGENCY
NATIONAL ENFORCEMENT INVESTIGATIONS CENTER

CHAIN OF CUSTODY PROCEDURES
June 1, 1975

GENERAL

The evidence gathering portion of a survey should be characterized by the minimum number of samples required to give a fair representation of the effluent or water body from which taken. To the extent possible, the quantity of samples and sample locations will be determined prior to the survey.

Chain of Custody procedures must be followed to maintain the documentation necessary to trace sample possession from the time taken until the evidence is introduced into court. A sample is in your "custody" if:

1. It is in your actual physical possession, or
2. It is in your view, after being in your physical possession, or
3. It was in your physical possession and then you locked it up in a manner so that no one could tamper with it.

All survey participants will receive a copy of the survey study plan and will be knowledgeable of its contents prior to the survey. A pre-survey briefing will be held to re-appraise all participants of the survey objectives, sample locations and Chain of Custody procedures. After all Chain of Custody samples are collected, a de-briefing will be held in the field to determine adherence to Chain of Custody procedures and whether additional evidence type samples are required.

SAMPLE COLLECTION

1. To the maximum extent achievable, as few people as possible should handle the sample.
2. Stream and effluent samples shall be obtained, using standard field sampling techniques.
3. Sample tags (Exhibit I) shall be securely attached to the sample container at the time the complete sample is collected and shall contain, at a minimum, the following information: station number, station location, data taken, time taken, type of sample, sequence number (first sample of the day - sequence No. 1, second sample - sequence No. 2, etc.), analyses required and samplers. The tags must be legibly filled out in ballpoint (waterproof ink).
4. Blank samples shall also be taken with preservatives which will be analyzed by the laboratory to exclude the possibility of container or preservative contamination.
5. A pre-printed, bound Field Data Record logbook shall be maintained to record field measurements and other pertinent information necessary to refresh the sampler's memory in the event he later takes the stand to testify regarding his actions during the evidence gathering activity. A separate set of field notebooks shall be maintained for each survey and stored in a safe place where they could be protected and accounted for at all times. Standard formats (Exhibits II and III) have been established to minimize field entries and include the date, time, survey, type of samples taken, volume of each sample, type of analysis, sample numbers, preservatives, sample location and field measurements such as temperature, conductivity,

DO, pH, flow and any other pertinent information or observations. The entries shall be signed by the field sampler. The preparation and conservation of the field logbooks during the survey will be the responsibility of the survey coordinator. Once the survey is complete, field logs will be retained by the survey coordinator, or his designated representative, as a part of the permanent record.

6. The field sampler is responsible for the care and custody of the samples collected until properly dispatched to the receiving laboratory or turned over to an assigned custodian. He must assure that each container is in his physical possession or in his view at all times, or locked in such a place and manner that no one can tamper with it.

7. Colored slides or photographs should be taken which would visually show the outfall sample location and any water pollution to substantiate any conclusions of the investigation. Written documentation on the back of the photo should include the signature of the photographer, time, date and site location. Photographs of this nature, which may be used as evidence, shall be handled recognizing Chain of Custody procedures to prevent alteration.

TRANSFER OF CUSTODY AND SHIPMENT

1. Samples will be accompanied by a Chain of Custody Record which includes the name of the survey, samplers' signatures, station number, station location, date, time, type of sample, sequence number, number of containers and analyses required (Fig. IV). When turning over the possession of samples, the transferor and transferee will sign, date and time the sheet. This record sheet allows transfer of custody of a group of samples in the field, to the mobile laboratory or when samples are dispatched to the NEIC - Denver laboratory. When transferring a portion of the samples identified on the sheet to the field mobile laboratory, the individual samples must be noted in the column with the signature of the person relinquishing the samples. The field laboratory person receiving the samples will acknowledge receipt by signing in the appropriate column.

2. The field custodian or field sampler, if a custodian has not been assigned, will have the responsibility of properly packaging and dispatching samples to the proper laboratory for analysis. The "Dispatch" portion of the "Chain of Custody Record shall be properly filled out, dated, and signed.

3. Samples will be properly packed in shipment containers such as ice chests, to avoid breakage. The shipping containers will be padlocked for shipment to the receiving laboratory.

4. All packages will be accompanied by the Chain of Custody Record showing identification of the contents. The original will accompany the shipment, and a copy will be retained by the survey coordinator.

5. If sent by mail, register the package with return receipt requested. If sent by common carrier, a Government Bill of Lading should be obtained. Receipts from post offices, and bills of lading will be retained as part of the permanent Chain of Custody documentation.

6. If samples are delivered to the laboratory when appropriate personnel are not there to receive them, the samples must be locked in a designated area within the laboratory in a manner so that no one can tamper with them. The same person must then return to the laboratory and unlock the samples and deliver custody to the appropriate custodian.

3

LABORATORY CUSTODY PROCEDURES

1. The laboratory shall designate a "sample custodian." An alternate will be designated in his absence. In addition, the laboratory shall set aside a "sample storage security area." This should be a clean, dry, isolated room which can be securely locked from the outside.

2. All samples should be handled by the minimum possible number of persons.

3. All incoming samples shall be received only by the custodian, who will indicate receipt by signing the Chain of Custody Sheet accompanying the samples and retaining the sheet as permanent records. Couriers picking up samples at the airport, post office, etc. shall sign jointly with the laboratory custodian.

4. Immediately upon receipt, the custodian will place the sample in the sample room, which will be locked at all times except when samples are removed or replaced by the custodian. To the maximum extent possible, only the custodian should be permitted in the sample room.

5. The custodian shall ensure that heat-sensitive or light-sensitive samples, or other sample materials having unusual physical characteristics, or requiring special handling, are properly stored and maintained.

6. Only the custodian will distribute samples to personnel who are to perform tests.

7. The analyst will record in his laboratory notebook or analytical worksheet, identifying information describing the sample, the procedures performed and the results of the testing. The notes shall be dated and indicate who performed the tests. The notes shall be retained as a permanent record in the laboratory and should note any abnormalties which occurred during the testing procedure. In the event that the person who performed the tests is not available as a witness at time of trial, the government may be able to introduce the notes in evidence under the Federal Business Records Act.

8. Standard methods of laboratory analyses shall be used as described in the "Guidelines Establishing Test Procedures for Analysis of Pollutants," 38 F.R. 28758, October 16, 1973. If laboratory personnel deviate from standard procedures, they should be prepared to justify their decision during cross-examination.

9. Laboratory personnel are responsible for the care and custody of the sample once it is handed over to them and should be prepared to testify that the sample was in their possession and view or secured in the laboratory at all times from the moment it was received from the custodian until the tests were run.

10. Once the sample testing is completed, the unused portion of the sample together with all identifying tags and laboratory records, should be returned to the custodian. The returned tagged sample will be retained in the sample room until it is required for trial. Strip charts and other documentation of work will also be turned over to the custodian.

11. Samples, tags and laboratory records of tests may be destroyed only upon the order of the laboratory director, who will first confer with the Chief, Enforcement Specialist Office, to make certain that the information is no longer required or the samples have deteriorated.

EXHIBIT I

EPA, NATIONAL ENFORCEMENT INVESTIGATIONS CENTER

★GPO IMPRINT

Station No.	Date	Time	Sequence No.

Station Location ______Grab ______Comp.

______BOD	______Metals	Remarks/Preservative:
______Solids	______Oil and Grease	
______COD	______D.O.	
______Nutrients	______Bact.	
	______Other	

Samplers:

Front

ENVIRONMENTAL PROTECTION AGENCY

OFFICE OF ENFORCEMENT

NATIONAL ENFORCEMENT INVESTIGATIONS CENTER

BUILDING 53, BOX 25227, DENVER FEDERAL CENTER

DENVER, COLORADO 80225

Back

EXHIBIT II

____________________ SURVEY, PHASE ______, DATE ______________

OF SAMPLE ____________________

ANALYSES REQUIRED

ATION IMBER	STATION DESCRIPTION	TOTAL VOLUME	TYPE CONTAINER	PRESERVATIVE	NUTRIENTS	BOD	COD	TOC	TOTAL SOLIDS	SUSPENDED SOLIDS	ALKALINITY	DO	pH*	CONDUCTIVITY*	TEMPERATURE*	TOTAL COLIFORM	FECAL COLIFORM	TURBIDITY	OIL AND GREASE	METALS	BACTI	PESTICIDES	HERB	TRACE ORGANICS	PHENOL

ARKS

Samplers: ______________________________

____

____

____

FIELD DATA RECORD

STATION	NUMBER	DATE	TIME	TEMPERATURE °C	CONDUCTIVITY µmhos/cm	pH S.U..	D.O. mg/l	Gage Ht. or Flow Ft. or CFS

ENVIRONMENTAL PROTECTION AGENCY
Office Of Enforcement
NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
Building 53, Box 25227, Denver Federal Center
Denver, Colorado 80225

CHAIN OF CUSTODY RECORD

SURVEY	SAMPLERS: *(Signature)*

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE			SEQ NO	NO OF CONTAINERS	ANALYSIS REQUIRED
				Water		Air			
				Comp	Grab				

Relinquished by: *(Signature)*	Received by: *(Signature)*	Date/Time
Relinquished by: *(Signature)*	Received by: *(Signature)*	Date/Time
Relinquished by: *(Signature)*	Received by: *(Signature)*	Date/Time
Relinquished by: *(Signature)*	Received by Mobile Laboratory for field analysis: *(Signature)*	Date/Time

Dispatched by: *(Signature)*	Date/Time	Received for Laboratory by:	Date/Time
Method of Shipment:			

Distribution: Orig.— Accompany Shipment

APPENDIX C

METHODS, ANALYTICAL PROCEDURES AND QUALITY CONTROL

BACTERIOLOGICAL

Bacteriological analyses of fecal coliform bacteria were performed according to standard procedures using the Most Probable Number technique.* Using aseptic techniques, all samples were collected in sterile bottles prepared by the accepted procedure.

Salmonella sampling involved placement of sterile gauze pads at the sampling sites for 3-day periods. The pads were retrieved aseptically, placed in sterile plastic bags, chilled, and transported to the laboratory within one hour for analyses. There is no standard procedure for detection of *Salmonella* in surface waters. The method employed by NEIC is the elevated temperature technique of Spino,** with modifications. Selective enrichment media consisted of dulcitol-selenite broth. Incubation temperature was 41.5°C (107°F). On each of four successive days, growth in each of the enrichment media containing the pads was streaked onto selective plating media that consisted of xylose-lysine-deoxychlolate agar. After 24 hours incubation at 35°C, colonies with characteristics typical of *Salmonella* were picked from the plates and subjected to biochemical and serological identification.

BIOASSAY

All 96-hour bioassays were performed according to standardized methods. A continuous-flow proportional diluter provided a series of six effluent concentrations plus a 100% dilution water control.

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* *Rand, M. et al., 1975. Standard Methods for Examination of Water and Wastewater, 14th Ed., Amer. Public Health Assn., New York, N. Y.*

** *Spino, D. F. July, 1966. Elevated Temperature Technique for the Isolation of Salmonella from Streams. Applied Microbiology, 14, 4; American Society for Microbiology.*

Dilution water was obtained from the Truckee River 2.9 km (1.8 mi.) upstream from the Reno-Sparks WPCP. Effluent water was siphoned directly from the plant source, flowed continuously through 120 liter stainless steel reservoirs and then pumped directly into the diluter system. A continuous flow was maintained to reduce the possibility of toxicant loss between the effluent discharge and the diluter system.

Test chambers were immersed in a constant temperature water bath to minimize temperature variation throughout the 96-hour test. Water flow through the system provided a minimum of nine volumetric turnovers for each test chamber for a 24-hour period.

Each test chamber was monitored daily for pH, temperature, and dissolved oxygen. Temperature variation of the test water was maintained at $\pm$ 1°C for the 96-hour duration of the bioassays. Dissolved oxygen levels ranged from 5.0 to 10.5 mg/l and were never below 60% of saturation. In addition, chlorinated effluent was monitored for temperature, dissolved oxygen, and pH at 30-minute intervals using a recording instrument.

Bioassays were conducted for 96 hours and mortalities were recorded at 24-hour intervals. EC_{50} values were estimated by using a straight line graphical interpolation method.

BENTHOS

Benthic macroinvertebrates were quantitatively sampled, using a Peterson dredge or Surber sampler at one to three sites (cross-stream transects) per station. In addition, qualitative samples were taken at each location by sampling available habitats, including the screening of sediments and manual removal of organisms from beneath submerged rocks, logs and debris. In the laboratory, the 70% alcohol-preserved samples were separated from the debris, identified and counted. Results of quantitative sampling were expressed as numbers of organisms per square meter of stream bed.

ALGAL GROWTH POTENTIAL

Algal growth potential (AGP) tests were performed as outlined in Algal Assay Procedure-Bottle Test, August, 1971.* Water samples from the Reno-Sparks WPCP effluent and the Truckee River were used for AGP tests and related nutrient analyses. Samples for AGP tests were autoclaved to kill indigenous algae. An inoculum of the green alga *Selenastrum capricornutum* (standard test organisms) was added to each test container. Receiving water was collected from the Truckee River near Kimlick Lane (Station 0200). Effluent from the Reno-Sparks WPCP was treated to remove phosphorus and duplicate serial additions of treated and untreated effluent were made to receiving water. Nitrogen and phosphorus additions were also made to receiving water. Standard test conditions (volume, light, temperature, shaking, incubation period) remained constant in each test. Algal growth was measured by *in vivo* fluorescence, and gravimetrically. Tests were performed *in situ* and in the laboratory. *In situ* tests were conducted using one-liter plastic containers in the river under ambient light and temperature conditions. Laboratory tests were done using 250 ml Erlenmeyer flasks under 24-hour light and constant temperature conditions.

Phosphorus removal was attempted on Reno-Sparks WPCP effluent samples. Phosphorus was precipitated by adding hydrated lime (400 mg/l

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* *Environmental Protection Agency, Algal Assay Procedure-Bottle Test, Pacific Northwest Water Laboratory, Corvallis, Ore., 1971, 82 p.*

$Ca(OH)_2$) to the sample and shaking it vigorously for two minutes. The effluent was allowed to settle and the supernatant was drawn off. Nutrient analyses were performed at NEIC.

PERIPHYTON

Attached algal growths were sampled using artificial substrates, 1 x 3-in. glass microscope slides. The substrate assemblies consisted of floating wooden racks that exposed the slides horizontally under 2 to 4 centimeters of water. After a 13-day exposure in the stream, two slides from each substrate were placed in acetone, refrigerated, and held in the dark for subsequent chlorophyll analyses. The other two slides were placed in formalin to determine periphyton density and to identify prevalent algal types.

In the laboratory, the slides preserved in acetone were scraped and rinsed into the acetone solution. Periphytic chlorophyll a was determined fluorometrically, as outlined in Standard Methods - 14th Edition, 1975.*

Slides preserved in formalin were scraped and rinsed into the formalin solution. Aliquots of the formalin solution were examined microscopically to determine density and types of periphyton.

CHEMICAL

Samples collected during this survey were analyzed according to

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* *Rand, M. C., et al, Standard Methods for the Examination of Water and Wastewater, 14th ed., American Public Health Association, New York, 1975, 1193 p.*

procedures approved by EPA for the monitoring of industrial effluents.*
The procedures used are listed in the following table.

Parameter	Method	Reference
BOD	Serial Dilution, DO Probe, & Winkler-Azide	EPA Methods for chemical Analysis of Water and Wastewater, 1974, page 11
TDS	Glass Fiber Filtration, 180°C	IBID, page 266
TSS	Glass Fiber Filtration, 103°C to 105°C	IBID, page 268
DO	Modified Winkler, with full bottle	IBID, page 51
Chloride	Mercuric Nitrate, low level	IBID, page 29
Total Residual Chlorine	Iodometric Filtration	IBID, page 35
Total P	Automated ascorbic acid reduction	IBID, page 256
Ortho P	Automated ascorbic acid reduction	IBID, page 256
NH_3-N	Automated Colorimetric phenate	IBID, page 168
TKN	Automated phenate	IBID, page 182
NO_2-NO_3	Automated Cadmium reduction	IBID, page 207

Reliability of the analytical results was documented through an active Analytical Quality Control Program. As part of this program, replicate analyses were normally performed with every tenth sample to ascertain the reproducibility of the results. In addition, where appropriate, every tenth sample was spiked with an known amount of

* *Federal Register, vol. 41, No. 232, Dec. 1, 1976.*

the constituents to be measured and reanalyzed to determine the percent recovery. These results were evaluated in regard to past AQC data on the precision, accuracy and detection limits of each test. On the basis of these findings, all analytical results reported for the survey were found to be acceptable with respect to the precision and accuracy control of this laboratory.

APPENDIX D

RENO-SPARKS WPCP SELF-MONITORING DATA
March-April, 1977

RENO-SPARKS JOINT WATER POLLUTION CONTROL PLANT
PLANT MONITORING REPORT

Month of MARCH 19[illegible]

DATE	DAILY FLOW — MGD: TELEMETERED FLOW SPARKS STP	RENO STP	S. RENO INCPTR	N RENO INCPTR	TOTAL	PLANT INF.	WASTE SLUDGE	INF LESS WASTE SLUDGE	PLANT EFF.	SUSPENDED SOLIDS mg/L INF.	EFF.	KG/DAY	% REM	BOD 5 mg/L INF.	EFF.	KG/DAY	% REM	SETTLEABLE SOLIDS mg/L INF.	EFF.	% REM	DISSOLVED OXYGEN mg/L INF.	EFF	pH INF	EFF.	COLIFORM FECAL No/100 ml	LOG VALUE	TEMPERATURE °F INF	AIR HI	AIR LO	RAIN IN.
1	[illegible]	[illegible]	[illegible]	2.43	19.280		0.40		16.38	360	23	[illegible]	94	285	19	1178	93	20	T		0.2	7.2	7.7	7.6	140	2.23	56	31	26	0
2	7.57	5.75	6.24	2.41	17.970		0.40		16.61	305	21	[illegible]	[illegible]	185	18	1171	[illegible]	7	"		0.2	7.4	7.6	[illegible]	165	2.20	57	51	27	0
3	[illegible]	5.75	[illegible]	2.29	19.220		0.50		15.58	203	21	[illegible]	[illegible]	275	21	[illegible]	90	7	"		[illegible]	[illegible]	[illegible]	[illegible]	110	2.04	58	[illegible]	28	0
4	[illegible]	[illegible]	[illegible]	[illegible]	17.610		0.44	[illegible]	16.45	[illegible]	[illegible]	1432	92	450	21	[illegible]	95	9	"		2.6	[illegible]	[illegible]	7.5		[illegible]	[illegible]	47	[illegible]	[illegible]
5	[illegible]	[illegible]	[illegible]	[illegible]	—	[illegible]	0.45	[illegible]	[illegible]	[illegible]	43	[illegible]	88	490	27	1681	95	15	"		[illegible]		7.4	7.7	170	2.57	57	59	25	[illegible]
6	[illegible]	[illegible]	[illegible]	[illegible]	—	[illegible]	0.39	[illegible]	15.82	240	27	2215	85	210	20	1197	73	11	"		3.2	[illegible]	8.1	7.9	140	2.29	57	[illegible]	32	—
7	[illegible]	[illegible]	[illegible]	[illegible]	16.140	[illegible]	0.38	[illegible]	11.33	198	60	[illegible]	75	[illegible]	24	1473	93	7	"		10	[illegible]	7.2	[illegible]	[illegible]	2.80	58	[illegible]	[illegible]	0
8	[illegible]	[illegible]	[illegible]	[illegible]	17.410	[illegible]	0.55	[illegible]	11.22	241	42	2576	83	210	27	1657	97	6	"		2.9	[illegible]	7.7	7.8	270	2.43	58	[illegible]	[illegible]	-
9	[illegible]	[illegible]	[illegible]	[illegible]	19.720	[illegible]	0.11	[illegible]	14.51	233	37	2284	84	450	20	1230	[illegible]	7	"		[illegible]	8.9	7.8	7.9	270	[illegible]	56	[illegible]	[illegible]	T
10	[illegible]	5.70	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	15.94	227	30	1409	97	490	22	1327	96	10	"		1.0	[illegible]	[illegible]	[illegible]	145	2.15	53	39	[illegible]	[illegible]
11	2.63	1.21	[illegible]	2.44	[illegible]	[illegible]	0.20		15.47	214	15	[illegible]	93	285	14	820	95	4	"		[illegible]	8.2	9.4	7.0	113	[illegible]	57	51	26	0
12	3.25	[illegible]	[illegible]	[illegible]	19.030	[illegible]	0.34	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	95	315	16	[illegible]	95	[illegible]	"		1.6	[illegible]	7.2	7.4	[illegible]	1.95	57	[illegible]	25	T
13	3.61	5.75	1.16	2.55	16.310	[illegible]	0.30	[illegible]	15.56	228	14	824	95	170	14	823	92	19	"		[illegible]	[illegible]	[illegible]	[illegible]	90	1.95	57	[illegible]	14	T
14	[illegible]	5.91	1.05	2.31	16.960	[illegible]	0.39		16.38	270	22	1563	92	[illegible]	13	856	95	5	"		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.73	56	[illegible]	11	0
15	3.39	5.74	6.47	2.39	17.940	[illegible]	0.36	[illegible]	14.91	271	26	1565	[illegible]	290	10	602	[illegible]	[illegible]	"		[illegible]	9.4	7.8	7.6	560	2.75	56	57	[illegible]	0
16	[illegible]	5.70	[illegible]	2.34	[illegible]	[illegible]	0.34	[illegible]	15.79	246	8	1476	97	315	10	[illegible]	97	11	"		[illegible]	[illegible]	7.9	[illegible]	140	1.72	56	40	[illegible]	T
17	[illegible]	5.55	[illegible]	2.37	[illegible]	[illegible]	0.35	[illegible]	15.43	295	16	[illegible]	95	240	12	701	95	15	"		[illegible]	93	7.1	8.0	70	1.35	56	44	23	T
18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.35	[illegible]	[illegible]	219	17	[illegible]	[illegible]	230	11	[illegible]	[illegible]	19	"		16	90	[illegible]	7.9	[illegible]	2.56	57	[illegible]	[illegible]	—
19	[illegible]	[illegible]	[illegible]	[illegible]	17.780	[illegible]	0.32	[illegible]	[illegible]	[illegible]	14	[illegible]	75	285	13	804	[illegible]	15	"		[illegible]	[illegible]	7.7	8.3	[illegible]	2.40	59	54	30	—
20	3.73	6.23	[illegible]	2.28	[illegible]	[illegible]	0.33	[illegible]	15.51	245	20	[illegible]	92	275	19	1115	93	18	"		[illegible]	[illegible]	7.2	8.4	120	2.11	60	61	22	0
21	3.66	6.48	[illegible]	2.01	[illegible]	[illegible]	0.24	[illegible]	16.39	251	11	[illegible]	[illegible]	185	13	806	93	[illegible]	"		6	[illegible]	[illegible]	8.4	40	1.75	58	67	27	0
22	2.53	6.24	[illegible]	1.86	20.470	[illegible]	0.26	[illegible]	16.09	317	18	[illegible]	[illegible]	320	12	730	96	16	"		6	78	[illegible]	8.5	110	[illegible]	60	67	29	0
23	[illegible]	5.95	5.55	1.97	16.810	[illegible]	0.32	[illegible]	16.29	[illegible]	15	[illegible]	[illegible]	185	12	743	91	15	"		11	7.9	[illegible]	7.4	40	1.35	[illegible]	52	23	T
24	3.50	6.15	[illegible]	1.91	17.310	[illegible]	0.32		16.27	294	14	[illegible]	[illegible]	[illegible]	19	[illegible]	92	14	"		[illegible]	82	7.0	7.6	[illegible]	[illegible]	57	49	21	T
25	3.46	6.19	[illegible]	1.87	17.070		0.37		16.17	251	11	[illegible]	96	460	15	918	71	24	"		3.3	9.1	7.2	7.8	140	2.15	59	48	[illegible]	0
26	3.70	6.56	[illegible]	1.71	17.510		[illegible]		16.40	[illegible]	22	[illegible]	[illegible]	260	—	—	—	28	"		[illegible]	7.1	7.1	7.7	270	2.43	[illegible]	[illegible]	[illegible]	0
27	3.61	5.94	[illegible]	1.79	16.620		0.37		15.30	344	[illegible]	[illegible]	91	300	—	—	—	15	"		14	[illegible]	[illegible]	7.5	120	[illegible]	58	64	11	0
28	2.56	5.57	5.66	1.88	16.690		0.31		16.00	281	16	[illegible]	94	[illegible]	[illegible]	1794	93	13	"		6	8.1	7.6	7.8	130	2.11	58	[illegible]	12	0
29	[illegible]	6.38	5.59	1.77	17.070		0.36		15.47	232	27	[illegible]	[illegible]	[illegible]	14	911	[illegible]	6	"		[illegible]	[illegible]	7.7	7.7	610	[illegible]	57	[illegible]	18	0
30	3.36	6.63	5.75	1.61	17.350		0.26		15.45	236	28	[illegible]	88	[illegible]	23	[illegible]	73	10	"		16	8.2	[illegible]	[illegible]	[illegible]	2.33	57	[illegible]	17	0
31	3.74	6.72	5.71	1.37	17.260				16.01	[illegible]	42	2515	82	[illegible]	22	[illegible]	85	[illegible]	"		12	7.0	[illegible]	[illegible]	[illegible]	[illegible]	57	53	14	T
TOT	111.15	185.71	124.51	67.17	371.160		10.03		500.75	3428	731	—	—	[illegible]	516	—	—	458	—		307	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	741	
AVE	3.57	6.05	5.93	2.17	17.674		0.33	16.22	16.06	272	24	1454	91	237	18	1941	94	15	[illegible]	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	57	52	24	
MAX	3.59	6.72	7.58	2.55	19.220		0.50	17.40	17.23	360	50	3090	—	493	33	1998	—	30			3.2	9.0	[illegible]	8.5	[illegible]	—	60	[illegible]	40	[illegible]
MIN	3.33	5.55	4.51	1.39	16.620		0.15	15.15	15.00	198	8	673	—	150	10	576	—	5			0.2	7.0	7.6	7.5	[illegible]	—	56	[illegible]	11	

REMARKS: [illegible]
(2) Flow data inaccurate due to [illegible] of measuring flume.
[illegible] of [illegible] waste [illegible]

Submitted by [illegible]

Month of *April* 19*77*

RENO-SPARKS JOINT WATER POLLUTION CONTROL PLANT
PLANT MONITORING REPORT

DATE	DAILY FLOW — MGD: TELEMETERED FLOW: SPARKS STP.	RENO STP.	S RENO INCPTR	N RENO INCPTR	TOTAL	PLANT INF.	WASTE SLUDGE	INF. LESS WASTE SLUDGE	PLANT EFF.	TEMPERATURE °F: INF.	AIR HI	AIR LO	RAIN IN.	SUSPENDED SOLIDS: INF. mg/L	EFF. mg/L	KG/DAY EFF.	% REM	SETTLEABLE SOLIDS mg/L: INF.	EFF.	% REM	BOD 5: INF. mg/L	EFF. mg/L	KG/DAY EFF.	% REM	DISSOLVED OXYGEN mg/L: INF.	EFF.	pH: INF.	EFF.	COLI: /100 ml	LOG
1	[illegible]8	*4.12	5.10	1.55	14.65		.590		15.86	57	[illegible]	26	0	271	24			12	Tr.		353	28			0.4	[illegible]	7.9	8.5	140	
2	3.56	7.10	5.48	1.53	17.66		.281		16.11	58	50	35	0	171	30			10	Tr		325	26			1.3	8.7	7.4	8.0	110	
3	3.44	6.48	5.51	1.47	17.27		.27		15.23	59	56	24	0	215	49			10	"		365	16			1.3	8.9	7.6	7.7	10	
4	3.52	7.61	5.84	1.67	18.05		.15		16.18	60	69	33	0	191	37			16	T		390	33			.1	[illegible]	7.6	7.6	—	
5	3.27	7.09	5.75	1.79	17.19		.14		16.00	61	78	39	0	210	30			10	T		245	30			.2	7.4	7.6	7.6	[illegible]	
6	3.37	7.65	6.15	1.53	[illegible]		.19		16.17	61	80	32	0	237	[illegible]			10	T		130	30			.3	8.5	7.4	7.6	290	
7	3.37	7.12	6.03	1.96	18.01		.18		16.16	61	81	[illegible]	0	183	37			10	T		215	27			.5	[illegible]	[illegible]	7.6	140	
8	3.22	6.65	5.71	1.76	17.40		.19		15.67		70	[illegible]	0	244	[illegible]			11	T						.4	7.0	[illegible]	7.5	10	
9	3.33	6.68	6.29	1.64	17.95		.18		15.15	60	59	18	-0-	256	31			1.2	T						.6		[illegible]	7.6	55	
10	3.37	6.28	7.17	1.59	18.23		.17		14.37	58	62	28	0	214	23			13	T						.6	7.5	[illegible]	7.5	130	
11	3.41	6.49	6.64	1.95	18.110		.18		15.45	60	61	27	0	201	22			9	T						.6	9.0	[illegible]	7.	130	
12	3.22	6.65	6.95	1.96	18.59		.38		15.44	61				339	31			20	T						.3	8.6	7.4	7.9		
13										62															.3	8.0	7.4	8.1		

REMARKS: * Reno STP. Tele. out of order 6 Hrs.

Submitted by