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STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

7272 Cleanwater Lane, LU-11 • Olympia, Washington 98504

MEMORANDUM

September 30, 1981

To: Howard Steeley

From: Dale Clark

Subject: Chehalis River Survey

On September 24, 1981 the Water Quality Investigations Section of the Department of Ecology conducted a one-day survey to determine dissolved oxygen concentrations in a slow-moving stretch of the Chehalis River. The study was conducted during late summer-early fall when water conditions brought on by high temperatures and low flow are conducive to low dissolved oxygen concentrations.

The location of the study was between Chehalis and Rochester and included the following sampling sites: Highway 12 Bridge at Chehalis; 500 yards above the Chehalis STP; River bank in front of the Centralia STP; Chehalis River at Galvin bridge; and Chehalis River one mile below Rochester. Please refer to Figures 1 and 2 for site location (attached).

Dissolved oxygen samples were analyzed using the Winkler titrimetric method. The results for each station are included in Table 1.

Table 1.

Station Number	Dissolved Oxygen	Temperature	Percent Saturation
1	9.5	12.9	90
2	8.6	15.0	84
3	8.2	15.0	80
4	8.6	15.0	84
5	10.12	15.0	99
DOE Ambient Monitoring (Sept. 14, 1981)	6.7	20.1	73

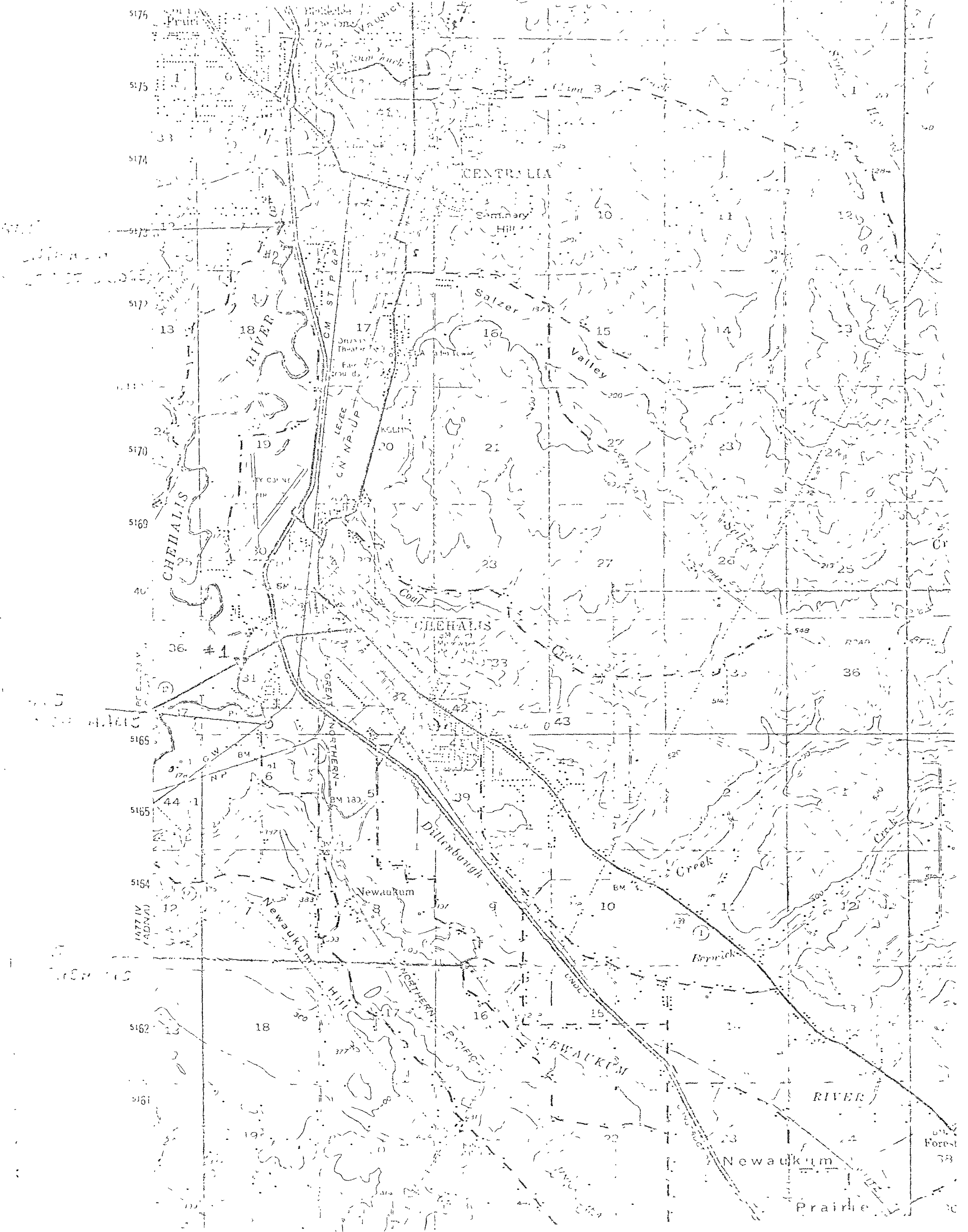
All stations indicate values exceeding the state standard to protect resident and migratory fish populations (DOE, 1979. Laws and Regulations). All values indicate an increase in dissolved oxygen and a lowering of temperature over that found during the September 14 sampling conducted during routine ambient monitoring (refer to Table 1). Increased precipitation and river flow, cloud cover, and resulting temperature drop are the probable cause for the change in concentration. However the low dissolved oxygen associated with the STP at Centralia (Station 3) suggests that during high temperature-low flow conditions a dissolved oxygen sag* may occur below the STP that could result in a barrier to migratory fish.

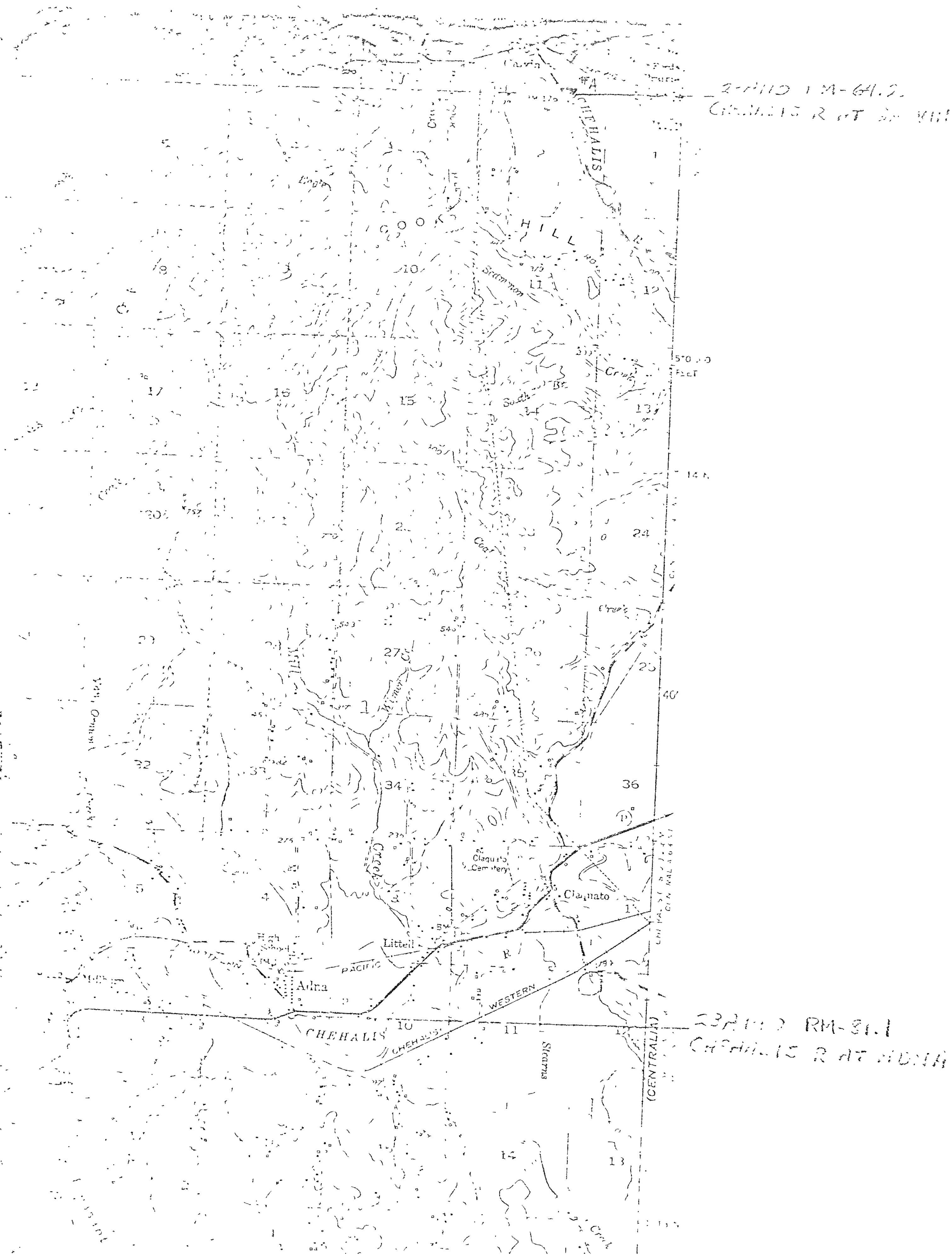
DC

DC:cp

Attachments

*The use of the term "sag" implies a real phenomenon that has been verified. This work is probably not sufficient to verify it.


CENTRALIA
Seminary Hill
Salzer Valley
CHEHALIS RIVER
LEVEE
CHEHALIS
Coal
Dillenbaugh Creek
GREAT NORTHERN
Newaukum
Newaukum Hill
NORTHERN PACIFIC
Berwick
NEWAUKUM RIVER
Newaukum Prairie


COOK HILL
CHEHALIS
Creek
Coal
Claquato
Claquato Cemetery
Littell
Adna
High School
PACIFIC
WESTERN
Stearns
(CENTRALIA)
RM-31.1

CENTRALIA POWER PLANT SURVEILLANCE

	STA	3/7/72	3/21/72	4/4/72	4/17/72	5/1/72	5/16/72	6/1/72
TEMP. °C	1	4.5	8.5	8.3	5.6	6.8	12.3	13.2
	2A	4.6	8.9	8.6	6.4	7.8	12.8	14.5
	2B	7.2	12.0	12.2	9.4	13.2	17.9	21.7
	2	5.4	9.6	---	7.1	8.7	13.5	16.1
	3	5.8	11.5	---	7.7	12.8	16.3	
	10	9.0	---	---	19.0	24.3	17.5	
	10A	5.9	---	---	6.9	8.3	13.0	15.1
	5	6.0	---	---	7.2	9.4	13.3	15.4
D.O. mg/l	1	12.1	10.9	10.9	11.7	11.2	9.5	
	2A	11.7	10.2	10.3	11.3	10.8	8.6	
	2B	10.4	10.6	11.1	10.8	9.3	5.9	
	2	11.4	10.4	10.5	11.5	10.7	8.0	
	3	11.9	10.5	10.7	11.3	9.9	10.2	
	10	12.3	10.3	10.3	10.5	7.9	9.3	
	10A	11.7	9.3	10.3	11.6	11.1	9.1	
	5	9.8	9.9	9.8	11.1	10.8	8.3	
COND. µmhos	1	35	44	49	43	45	65	63
	2A	52	66	81	64	65	90	92
	2B	59	75	115	90	99	117	125
	2	53	68	85	65	70	95	107
	3	200	298	416	253	221	493	
	10	269	566	626	561	629	1020	
	10A	62	74	89	64	68	94	81
	5	50	77	96	68	71	109	99
pH	1	6.4	6.7	7.0	6.7	6.8	7.0	7.0
	2A	6.4	6.6	7.0	6.7	6.8	6.8	6.8
	2B	6.3	6.6	7.1	6.8	6.9	6.9	7.7
	2	6.4	6.6	7.0	6.8	6.8	6.6	6.7
	3	6.5	6.7	7.1	7.1	6.9	6.9	
	10	6.5	7.0	7.2	7.1	7.0	7.0	
	10A	6.8	6.8	6.8	6.8	6.8	6.7	6.9
	5	6.5	6.6	6.7	6.8	6.8	6.6	6.8
IRON mg/l	1	1.7	1.0	0.7	0.7	0.7	0.9	0.6
	2A	0.9	0.9	0.8	0.7	0.9	1.8	1.8
	2B	2.2	0.5	0.5	0.5	1.0	2.0	1.5
	2	1.3	1.2	1.0	1.1	1.1	3.0	3.8
	3	0.5	1.3	0.5	0.5	0.9	2.8	
	10	0.4	0.6	0.4	2.7	0.9	0.3	
	10A	1.1	1.0	0.9	0.9	0.9	1.4	1.3
	5	1.3	1.5	1.2	1.2	1.1	1.7	2.0
TURB. JTU	1	30	10	8	9	8	6	4
	2A	15	9	6	9	9	8	6
	2B	50	8	4	5	7	8	6
	2	25	10	6	15	10	15	15
	3	7	20	3	6	10	30	
	10	25	20	5	8	9	7	
	10A	20	15	7	8	8	7	7
	5	25	15	10	9	10	10	9
ALK. mg/l	1	9	16	20.0	16.0	16.0	22	23.0
	2A	9	17	18.9	18.5	18.5	26	30.5
	2B	6	13	17.8	15.0	22.2	30	36.5
	2	6	17	18.9	16.0	18.5	28	35.0
	3	13	17	22.0	20.0	16.5	32	
	10	6	22	20.0	15.0	18.0	28	
	10A	9	17	24.2	26.5	17.0	24	25.0
	5	7	18	20.0	17.0	22.5	25	27.5
TOTAL COLIF.	1	400	400	250	200	400	1000	300
	5	600	500	300	150	150	2500	140
FECAL COLIF.	1	>40	<20	<20	<20	<20	45	140
	5	>40	<20	<20	<20	<20	>60	94

	STA	11/3/71	11/16/71	11/29/71	12/14/71	12/28/71	1/11/72	2/8/72	2/22/72
TEMP.	1	7.3	7.8	7.8	5.3	3.1	5.5	4.5	5.8
°C	2A	7.1	7.8	7.7	4.7	2.6	5.0	2.5	5.2
	2B	7.3	8.2	7.5	3.4	2.6	4.0	1.7	6.2
	2	7.3	8.0	7.7	4.5	2.6	4.8	3.0	5.5
	3	7.3	8.0	7.6	3.8	2.0	4.6	3.5	5.9
	10	9.3	8.8	8.2	3.7	1.2	4.8	5.1	6.3
	5	7.4	8.1	7.8	3.9	2.4	5.1	4.2	6.9
D.O.	1	10.9	10.7	10.4	11.1	12.5	10.9	11.9	11.4
mg/l	2A	9.9	9.4	9.3	10.4	11.8	10.5	11.8	10.8
	2B	10.4	8.4	8.6	10.3	10.8	11.6	11.2	9.5
	2	10.5	9.8	9.4	10.9	11.9	11.0	11.9	11.0
	3	11.2	8.1	10.1	12.1	13.4	11.8	12.2	11.1
	10	11.3	11.1	11.0	12.1	12.8	11.0	11.9	12.0
	5	9.9	9.3	8.6	10.3	11.3	10.7	11.0	10.2
COND.	1	52	48	45	44	45	33	46	38
µmhos	2A	81	72	63	51	61	46	58	63
	2B	190	166	140	97	81	113	78	66
	2	83	91	82	65	65	61	63	62
	3	530	450	380	505	300	455	290	430
	10	680	78	415	155	450	310	295	310
	5	90	125	74	100	77	115	88	80
pH	1	7.2	7.8	7.2	6.4	7.0	6.5	7.3	6.6
	2A	6.9	7.6	7.1	6.4	6.6	6.5	7.6	6.7
	2B	6.8	7.2	6.9	6.3	6.4	6.9	7.4	6.4
	2	6.9	7.2	6.8	6.4	6.4	6.5	7.4	6.5
	3	7.0	6.4	6.7	6.0	6.2	6.5	7.1	6.5
	10	7.0	6.4	6.7	6.1	6.3	5.5	7.1	6.7
	5	7.0	6.6	6.9	6.3	6.5	5.1	6.9	6.7
IRON	1	0.9	0.9	1.4	3.5	1.0	6.1	1.7	1.1
mg/l	2A	1.6	1.2	1.3	3.5	0.7	3.9	0.9	0.7
	2B	0.6	0.4	0.8	0.6	2.1	0.9	0.2	1.1
	2	1.8	1.1	1.2	3.3	1.1	4.1	1.3	---
	3	0.2	1.6	0.9	2.1	0.9	2.2	1.8	---
	10	0.5	0.1	0.1	2.3	0.3	2.1	0.6	0.3
	5	1.0	0.9	1.2	2.3	0.9	2.4	1.4	1.1
TURB.	1	15	15	25	40	15	100	30	25
JTU	2A	30	15	20	60	9	75	15	15
	2B	15	8	15	10	35	20	3	25
	2	30	15	15	50	15	80	25	15
	3	6	30	15	25	8	35	25	35
	10	15	5	6	60	5	50	25	8
	5	20	10	15	35	10	40	20	15
ALK.	1	16	17	14	8	12	8	12	6
mg/l	2A	17	18	14	8	10	9	12	6
	2B	13	35	18	8	10	15	10	5
	2	16	17	14	9	11	10	11	7
	3	19	11	13	5	8	10	13	7
	10	8	6	5	3	11	7	5	5
	5	16	17	15	9	12	5	12	6
TOTAL	1	800	600	700	1600	600	>16,000	1400	600
COLIF.	5	900	350	900	1000	600	4,000	800	600
FECAL	1	--	<20	40	140	--	--	70	>40
COLIF.	5	--	21	20	230	25	--	60	>40

CENTRALIA POWER PLANT SURVEILLANCE

	Sta.	12/11/70	12/22/70	1/6/71	1/27/71	2/10/71	2/25/71	3/10/71	3/24/71	4/7/71	4/21/71
TEMP °C	1	5.9	3.1	2.2	6.5	7.0	5.5	5.8	7.1	7.1	8.1
	2	5.6	2.9	2.0	6.6	5.9	5.5	5.8	7.8	8.5	8.7
	3	5.3	2.5	2.9	7.2	7.3	5.3	5.9	9.4	10.4	12.0
	4	5.4	2.6	2.2	--	7.8	5.0	5.9	7.6	7.8	8.5
	5	5.4	2.8	2.0	7.3	6.6	4.9	5.9	7.6	8.1	8.5
	6	5.2	2.9	1.8	7.4	6.4	5.0	6.0	7.9	8.8	9.1
	7	6.4	5.7	4.8	7.2	7.4	7.4	6.5	8.0	8.3	9.0
	8	6.0	4.0	3.6	--	7.3	5.3	5.6	6.6	7.3	8.0
	9	5.8	3.7	3.3	6.4	7.2	5.3	5.7	7.1	7.8	8.7
	10				--	--	---	---	---	---	---
D.O. ppm	1	11.2	12.5	13.3	11.2	11.4	11.8	11.4	11.3	11.3	12.7
	2	10.3	11.9	12.8	10.4	11.3	11.3	10.8	10.9	11.0	12.0
	3	11.2	12.1	12.3	11.3	11.3	12.0	11.6	10.7	10.5	10.2
	4	9.6	11.8	12.3	--	11.3	11.7	10.5	10.8	10.7	11.2
	5	9.3	11.5	12.2	9.1	10.9	11.3	10.6	10.6	10.6	10.9
	6	8.3	10.6	11.3	8.8	10.0	10.8	9.7	9.8	10.6	11.2
	7	9.3	9.6	8.3	8.4	7.6	9.3	9.8	8.6	8.9	9.7
	8	11.4	12.2	12.6	--	11.4	11.9	11.7	11.7	11.5	11.7
	9	10.4	11.9	12.5	11.2	11.3	11.7	11.2	11.5	11.2	11.2
	10				--	--	---	---	---	----	----
COND.	1	39	42	49	30	39	40	40	37	42	45
	2	57	62	64	48	62	57	52	61	63	68
	3	135	134	97	64	125	160	426	150	200	110
	4	58	61	59	--	59	55	73	56	59	61
	5	56	60	59	41	61	56	72	55	58	62
	6	79	81	89	55	83	67	63	71	80	87
	7	156	197	271	201	373	223	164	266	274	275
	8	55	52	56	--	50	46	46	42	48	52
	9	60	61	65	44	62	52	57	47	54	59
	10				--	--	---	---	---	---	---
pH	1	6.9	6.8	6.7	6.1	6.8	6.6	6.8	6.9	7.2	6.8
	2	6.6	6.6	6.5	6.1	6.6	6.5	6.6	6.7	7.0	6.7
	3	6.4	6.6	6.4	5.8	6.8	6.6	6.8	6.8	6.8	6.5
	4	6.5	6.6	6.4	--	6.6	6.7	6.5	6.8	6.7	6.4
	5	6.4	6.5	6.4	6.0	6.5	6.5	6.6	6.7	6.7	6.4
	6	6.3	6.4	6.2	6.1	6.5	6.5	6.7	6.5	6.5	6.3
	7	6.8	6.8	6.7	6.5	6.7	6.6	7.0	6.7	6.8	6.5
	8	6.9	7.0	6.9	--	6.9	6.8	6.5	7.0	7.0	6.7
	9	6.8	6.8	6.8	6.5	6.8	6.8	6.9	6.9	6.9	6.7
	10				--	--	---	---	---	---	---
IRON ppm	1	2.5	1.0	1.0	2.5	1.8	1.7	1.6	1.9	1.1	0.7
	2	4.6	7.7	1.4	1.9	2.5	3.4	2.5	0.5	2.8	1.1
	3	7.8	1.7	5.1	15.9	2.4	0.9	2.1	1.5	1.6	2.4
	4	2.8	4.8	1.5	--	2.5	2.4	1.5	1.9	1.5	1.1
	5	2.7	4.4	1.2	5.3	2.2	2.4	1.5	1.8	1.5	1.1
	6	0.8	0.7	0.6	1.5	1.0	1.2	0.9	1.2	1.3	1.1
	7	1.3	1.1	1.2	1.6	1.2	0.9	0.7	0.8	0.5	0.7
	8	2.4	1.5	0.9	--	0.9	1.2	0.7	1.8	0.6	0.4
	9	2.5	1.5	1.0	2.5	1.1	1.8	0.9	1.5	0.7	0.6
	10				--	--	---	---	---	---	---
TURB. JTU	1	55	10	10	40	30	20	20	20	10	6
	2	60	70	20	30	35	45	40	30	30	9
	3	110	20	65	220	60	10	25	20	10	30
	4	35	45	20	--	40	30	20	25	15	10
	5	35	45	15	70	35	30	25	25	15	8
	6	15	7	8	20	15	10	10	10	6	6
	7	15	10	15	20	15	10	9	10	7	7
	8	30	20	15	--	20	20	15	20	8	6
	9	30	20	15	40	20	20	15	20	8	7
	10				--	--	--	---	---	--	---
ALK. ppm	1	18	16	--	--	11	17	12	14	15	---
	2	8	11	--	--	12	17	11	14	17	18
	3	10	14	13	--	18	15	10	13	15	19
	4	10	17	13	--	12	13	11	16	15	17
	5	8	11	12	--	12	13	11	13	16	18
	6	13	16	13	--	20	14	15	16	17	19
	7	47	54	52	--	95	56	43	8	79	75
	8	17	17	12	--	17	17	20	16	18	20
	9	16	16	13	--	16	16	16	16	18	21
	10				--	--	--	---	---	--	---
FLOW cfs	5	279	114	70	858	88	158	198	126	74	52
	8	710	464	390	3580	375	693	710	940	465	300