

Biological Assessment of

Ormond Beach Sewage Treatment Plant

Volusia County

NPDES #FL0020532

Sampled 29 January 1991

September 1991

Biology Section
Division of Technical Services

Department of Environmental Regulation
Results of Fifth Year Inspections

Discharger:	Ormond Beach Sewage Treatment Plant
County:	Volusia
NPDES Number:	FL0020532
State Permit Expiration Date:	30 September 1991

Toxics Sampling Inspection (**XSI**)	
Date Sampled:	29 January 1991
Results:	Silver (0.2 µg/L), cadmium (2.1 µg/L), mercury (0.3 µg/L), lead (1.4 µg/L), and iron (100 µg/L). Concentrations of silver and mercury were in violation of Class III Standards for marine waters (FAC 17-302.560). No organic priority pollutants were detected.

Compliance Biomonitoring Inspection (**CBI**)	
Date Sampled:	29 January 1991
Results:	Toxic to *Ceriodaphnia dubia* , causing 70% mortality with de-chlorinated effluent, and 100% mortality with chlorinated. Not toxic to *Notropis leedsi.*

Impact Bioassessment Inspection (**IBI**)	
Date Sampled:	29 January 1991
Results:	Algal Growth Potential of the effluent indicated eutrophication potential, although growth inhibition/toxicity was also observed.

Water Quality Inspection (**WQI**)	
Date Sampled:	29 January 1991
Results:	Total nitrogen and total phosphorus concentrations were in excess of monthly average permit limits. Total residual chlorine exceeded the minimum permit limit.

These fifth year inspections provide the necessary information to evaluate the facility's impact on its receiving waters and to provide the basis for specific condition recommendations for permit renewal.

Introduction

The City of Ormond Beach Sewage Treatment Plant is a 4.0 MGD design capacity activated sludge wastewater treatment facility located in Volusia County, Florida. Effluent is discharged to the Halifax River north of the Ponce de Leon Inlet (see map in Appendix). The outfall is located 1000 ft east of the river, where tidal influence from the Intracoastal Waterway provides ample mixing.

State effluent limits in effect on January 29, 1991, require secondary treatment (BOD and TSS less than 20 mg/l as an annual average, pH range of 6.0 to 8.5) and basic disinfection (chlorination of 0.5 mg/l for 15 minutes). Federal effluent limits are as follows: CBOD5 (10 mg/L monthly average), Total N as N (3 mg/L mo. avg.), Total P as P (1 mg/L mo. avg.), dissolved oxygen (2 mg/L min.), and total residual chlorine must not exceed 0.01 mg/L.

The permit also requires that the facility be in compliance with water quality based effluent limits (WQBEL's, derived from a wasteload allocation conducted in 1987) by July 30, 1991. A construction permit (# DC64-141350) was issued by FDER on May 27, 1988, authorizing modifications to the plant to achieve WQBEL's. Construction was still ongoing during the present survey.

This facility has been in violation of Federal permit limits in January 1989, and again in March of 1990. EPA and DER resolved the January 1989 violation by requiring compliance with Federal effluent limits by July 30, 1991.

Methods

The focus of this investigation was to assess the toxicity and nutrient status of the discharger. Acute screening toxicity bioassays, using *Ceriodaphnia dubia* and *Notropis leedsi* as test organisms, were performed on an effluent sample (Peltier and Weber 1985, FDER 1985). A Microtox® test, using the bacterium, *Photobacterium phosphoreum*, to evaluate toxicity, was also performed. The effluent was analyzed for organic constituents (base neutrals, acid extractables, and pesticide extractables) and metals. Additionally, nutrient analyses were performed. Methods used for all chemical analyses are on file at the Tallahassee DER Chemistry Laboratory. Algal Growth Potential tests, using *Selenastrum capricornutum* as the test organism, followed Miller *et al.* (1978).

The following personnel were involved in this investigation: Philip Kane (DER Central District) and Lyn Burton, Russel Frydenborg, Kathleen Lurding, and Sandy McClure (Tallahassee Biology Laboratory).

Results and Discussion

The effluent sample was toxic to the cladoceran, *Ceriodaphnia dubia*. Within 48 hours, 70% of the water fleas were dead in the dechlorinated effluent. The chlorinated sample (0.4 and 0.88 mg/L total residual chlorine measured with the Hach and Iodometric methods, respectively) killed all of the organisms within 24 hours. However, neither the chlorinated nor the dechlorinated sample caused any mortality to the fish in 48 hours (Appendix). The effluent was also somewhat deleterious to the bacterium in the Microtox® test, with an EC_{50} (15 min., 15° C) of 156.02% (Appendix).

The following metals were detected in the effluent sample: silver (0.2 µg/L), cadmium (2.1 µg/L), mercury (0.3 µg/L), lead (1.4 µg/L), and iron (100 µg/L) (Appendix). The silver and mercury concentrations were in violation of Class III Standards for marine waters (FAC 17-302.560). Organisms exposed to one of these metals at a time would probably not suffer from acute toxicity, but this does not preclude the possibility of synergistic or additive effects due to exposure to several metals at once. No organic priority pollutants or pesticides were found in this grab sample (Appendix).

Nutrients in the effluent sample were elevated (Appendix). Total phosphorus was detected at 5.7 mg/L, while the total nitrogen concentration was 4.9 mg/L (3.5 mg/L TKN + 1.4 mg/L NO_2NO_3). Algal growth potential (AGP) measured on a sample of discharge was found to be 21.9 mg dry wt/L (Appendix). Although this AGP result suggests that the facility is contributing to eutrophication of the Halifax River, a much higher AGP would have been expected based on nutrient concentrations. It is possible that the metals found in the sample caused some inhibition/toxicity to the test algae. The 1990 305(b) Water Quality Assessment gave a poor rating to the Halifax River from Ormond Beach to Daytona Beach, citing elevated metals, nutrients, and turbidity as among the system's problems (Hand *et al.*, 1990).

Conclusions

The dechlorinated effluent sample from the Ormond Beach Sewage Treatment Plant was toxic to the cladoceran, *Ceriodaphnia dubia*. Seventy percent of the organisms died within 48 hours, indicating an LC_{50} of < 100%. The metals silver and mercury were detected at levels in violation of Class III Standards, which could have contributed to the observed toxicity. The chlorinated effluent was also toxic to the water flea. No organic priority pollutants were found above detection limits.

The algal growth potential, although indicative of enrichment, was not as high as would be expected given the elevated nutrient levels found in the discharge. This suggests that some type of inhibition/toxicity was occurring, possibly from the metals detected in the sample.

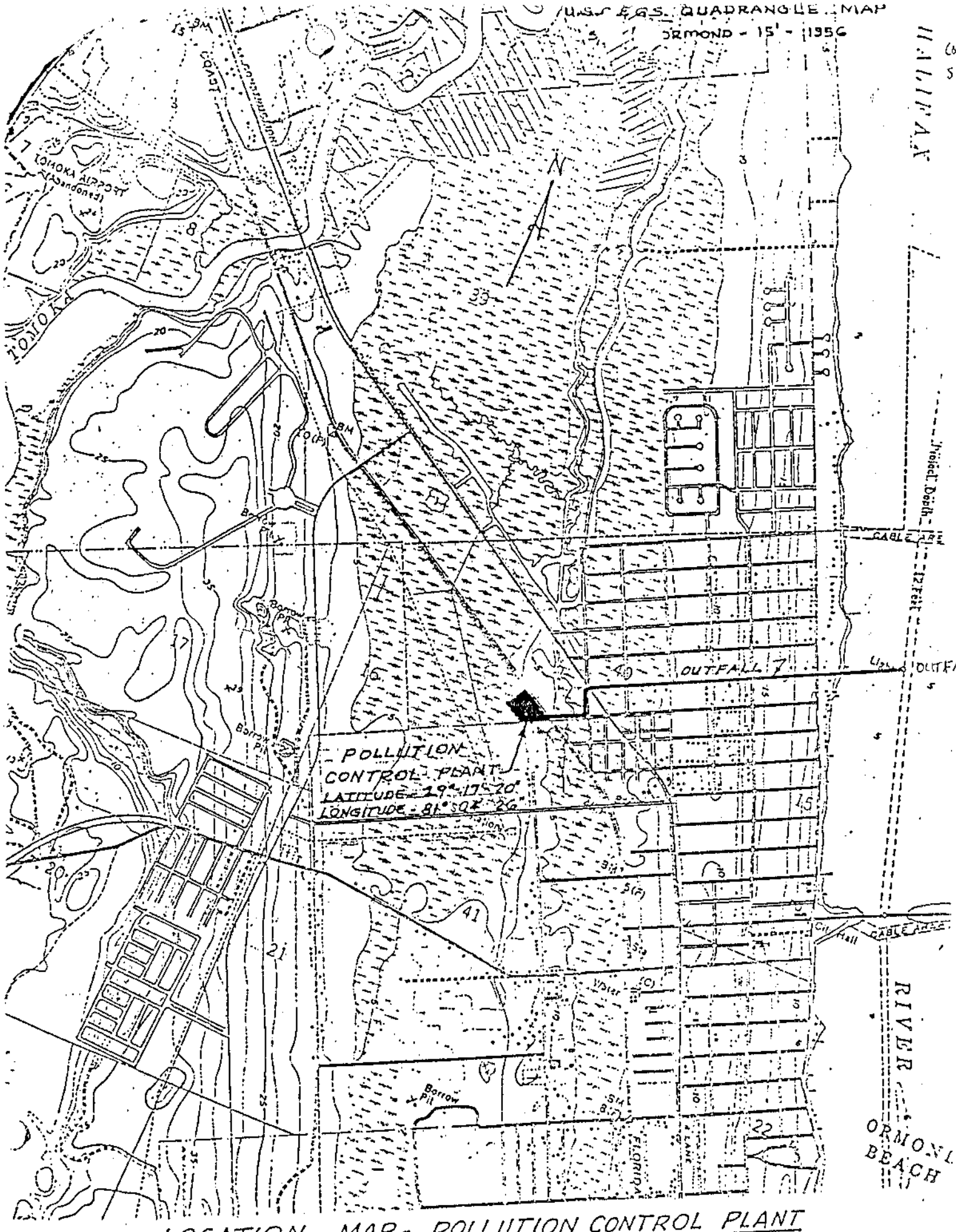
Literature Cited

Florida Department of Environmental Regulation. 1985. Quality assurance manual for performing acute toxicity tests. 2nd edition. Fla. Dept. Environmental Regulation, Biology Section, Tallahassee. 53 pp.

Hand, J., V. Tauxe, M. Friedemann, and L. Smith. 1990. Water quality assessment for the State of Florida. Standards and Monitoring Section, Department of Environmental Regulation. 321 pp.

Miller, W. E., T. E. Maloney, and J. C. Greene. 1978. The *Selenastrum capricornutum* Printz algal assay bottle test. U. S. Environ. Prot. Agency, EPA-600/9-78-018. 126 p.

Peltier, W. H. and C. I. Weber. 1985. Methods for measuring the acute toxicity of effluents to freshwater and marine organisms. 3rd edition. EPA/600/4-85/013. U. S. EPA, Cincinnati, Ohio. 216 pp.



LOCATION MAP - POLLUTION CONTROL PLANT
ORMOND BEACH, FLORIDA

SCALE: 1" = 200'

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: ORMOND BEACH WWTP
Address/City: 550 N. ORCHARD ST, ORMOND BEACH
County: VOLUSIA
Contact/District: PHIL KANE / CENTRAL
NPDES Permit #: FDER # DO64-173832 **Outfall #:** 001
Test Number: ____ of ____ **Test Type:** (Screening) | Definitive
(Static) | Static Renewal | Flow-through

Remarks:

Sample Collection: Date 1-29-91 Time 1020
Test Beginning: Date 1-30-91 Time 1330
Test Ending: Date 2-1-91 Time ____
Test Organism: N. LEEPSI C. DUBIA
Life Stage/Age: 2-2 DAYS <24 HRS

Instrument Calibrations:

	pH	DO	Cond	Temp
0 hr	7@7, 9@9	8.8@22	1357@23.7	21@23.5
24 hr	7@7, 9@9	8.8@22	-	22@23.8
48 hr	7@7, 9@9	9.2@19.5	1312@22	19.5@21.6

2. LEEPSI

Conc.	Chamber #	Number Live 0	24	48	DO (mg/l) 0	24	48	pH 0	24	48	A Temp. (°C) 0	24	48	Cond. (µmhos/cm) B 0	24	43
CONTROL	18	5	5	5	9.6	8.5	8.8	7.8	8.2	8.0	20.7	21.3	19.5			
CONTROL	41	5	5	5	8.6	8.5	8.8	7.8	8.2	8.0				237		246
100%	17	5	5	5	9.1	8.4	8.6	7.4	8.0	7.9	20.8	21.3	19.5			
100%	16	5	5	5	9.2	8.4	8.6	7.4	8.0	7.9				895		896
DeCl 100%	62	5	5	5	9.2	7.9	8.4	7.4	7.9	7.8	20.3	21.3	17.8			
DeCl 100%	38	5	5	5	9.2	8.0	8.4	7.4	7.9	7.8				900		910
CONTROL	A	5	5	5	8.3	8.3	9.0	8.3	8.4	8.1	21.5	21.8	19.5	373		383
CONTROL	B	5	5	5												
CONTROL	C	5	5	5												
CONTROL	D	5	5	5												
100%	A	5	0	1	9.8	8.6	9.0	7.6	8.4	8.1	21.0	21.8	19.7	871		844
100%	B	5	0	1												
100%	C	5	0	1												
100%	D	5	0	1												
DeCl 100%	A	5	5	2	9.8	8.6	9.0	7.6	8.4	8.1	20.7	21.1	19.2	885		893
DeCl 100%	B	5	5	1												
DeCl 100%	C	5	5	2												
DeCl 100%	D	5	4	1												
Measured/Loaded by:		MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF	MF		MF
Recorded by:		MF	SMC	MF	KP	SMC	KP	KP	SMC	KP	KP	SMC	KP	KP		KP

C. DUBIA

Investigators' Signatures

Kelly McAree
Marshall Faircloth
Lady McClure

Reviewer

Water-quality Parameters Cl_2 BLANK = 0

	Well Water	Cond Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:					
Lab Tot. Resid. Cl2:			0.4	Hach IODO	MF 0.5 HACH 0.99 ICSO
Alkalinity:					
Hardness:					
Total Ammonia:					

Ammonia meter slope: ____

MICROTOX™ Data Reduction Sheet

SOURCE: City of Council Bluffs

GRAPH CALC EC 50 (15 MIN, 15 °C) = 156.07 %SAMPLE mg/L

SAMPLE DATA:

SAMPLE TYPE (EFFLUENT, LEACHATE, ETC.):

DATE ASSAYED: 2/24/91 TIME:

VISUAL COLOR: clear CORRECTION REQUIRED: YES NO

VISUAL TURBIDITY: none SEPARATION REQUIRED: YES NO

INITIAL pH: pH ADJUSTED TO: WITH:

OSMOTICALLY ADJUSTED WITH: MOAS (DRY NaCl) OTHER

PRIMARY DILUTION OF SAMPLE:

OPERATOR: MS Cameron REAGENT VIAL LOT NO. M- NLN

REMARKS:

MICROTOX™ TEST

SAMPLE CUVETTE	% SAMPLE	READINGS 5 MIN	READINGS 15 MIN	Γ5	Γ15	NOTES - 0 min
A1	0	[illegible]	133	X	X	142
B1		144	133			182
C1		151	137			189
A2	12.38	155	141		-0.01	189
B2		147	133			191
C2		151	134			187
A3	24.75	148	131		0.01	189
B3		152	135			189
C3		[illegible]	[illegible]			184
A4	49.5	156	138		0.07	183
B4		162	141			191
C4		138	116			178
A5	99	117	94		0.32	167
B5		125	107			190
C5		121	100			175
EC_{50} (MIN, °C)					0.13	

156.07

REVIEWED BY:

DATE: 7/25/91

Sample ID: 12329/91-JAN-31-25-01 Matrix: W-EFFLUENT
Location: City of Ormond Bch, STP
Field ID: PT#001
Collected: 29-JAN-1991 10:20 By: Philip N Kane
Authorized: 10-APR-1991 By: Tim Fitzpatrick
Type: Grab Sample
Lab Comments:
Field Comments: Chlorianted effl. @ plant. discharge pt 1/

Analysis ID: AG-G-W
Silver in water by furnace AA
Analyzed: 4-APR-1991 By: Jack Merritt
Authorized: 10-APR-1991 By: Tim Fitzpatrick

Storet#	Analyte	Value	Units
01077	Silver	0.2	ug/L

Analysis ID: AS-G-W
arsenic by graphite furnace for water samples
Analyzed: 21-MAR-1991 By: Jack Merritt
Authorized: 26-MAR-1991 By: Yuh-Hsu Pan

Storet#	Analyte	Value	Units
01002	Arsenic	10 U	ug/L

Analysis ID: CD-G-W
Cadmium by graphite furnace for water samples
Analyzed: 10-MAR-1991 By: Kate Brackett
Authorized: 27-MAR-1991 By: Yuh-Hsu Pan

Storet#	Analyte	Value	Units
01027	Cadmium	2.1	ug/L

Analysis ID: HG-H-W
Mercury by cold vapor using hydride sys.-water
Analyzed: 26-FEB-1991 By: Metals Section
Authorized: 1-MAR-1991 By: Tim Fitzpatrick
Sample exceeded holding time prior to analysis.

Storet#	Analyte	Value	Units
71900	Mercury	0.3	ug/L

12329/91-JAN-31-25-01 Continued from Page 2

Analysis ID: PB-G-W
Lead by furnace AA in water
Analyzed: 11-MAR-1991 By: Kate Brackett
Authorized: 27-MAR-1991 By: Yuh-Hsu Pan

Storet#	Analyte	Value	Units
01051	Lead	1.4	ug/L

Analysis ID: SE-G-W
Selenium in water by furnace AA
Analyzed: 5-MAR-1991 By: Jack Merritt
Authorized: 26-MAR-1991 By: Yuh-Hsu Pan

Storet#	Analyte	Value	Units
01147	Selenium	5 U	ug/L

Analysis ID: W-ICP-23
ICP multielement analysis for water samples
Analyzed: 6-MAR-1991 By: Kate Brackett
Authorized: 10-APR-1991 By: Tim Fitzpatrick

Storet#	Analyte	Value	Units
01106	Aluminum	26 T	ug/L
01002	Arsenic	20 U	ug/L
01097	Antimony	NR	ug/L
01007	Barium	NR	ug/L
01012	Beryllium	NR	ug/L
01027	Cadmium	NR	ug/L
00916	Calcium	NR	mg/L
01034	Chromium	10 U	ug/L
01037	Cobalt	NR	ug/L
01042	Copper	7 T	ug/L
01045	Iron	100	ug/L
01051	Lead	15 U	ug/L
00927	Magnesium	NR	mg/L
01055	Manganese	NR	ug/L
01067	Nickel	5 U	ug/L
00937	Potassium	NR	mg/L
01147	Selenium	NR	ug/L
01077	Silver	NR	ug/L
00929	Sodium	NR	mg/L
01082	Strontium	NR	ug/L
01059	Thallium	NR	ug/L

12329/91-JAN-31-25-01/W-ICP-23 Continued on Page 4

12329/91-JAN-31-25-01/W-ICP-23 Continued from Page 3

Storet#	Analyte	Value	Units
01087	Vanadium	NR	ug/L
01092	Zinc	43	ug/L
Comment	NONE		

Sample ID: 12330/91-JAN-31-25-02 Matrix: W-FIELD-BK
Location: City of Ormond Bch, STP
Field ID: Blank
Collected: 29-JAN-1991 10:20 By: Philip N Kane
Authorized: 10-APR-1991 By: Tim Fitzpatrick
Type: Grab Sample
Lab Comments:
Field Comments:

Analysis ID: AG-G-W
Silver in water by furnace AA
Analyzed: 4-APR-1991 By: Jack Merritt
Authorized: 10-APR-1991 By: Tim Fitzpatrick

Storet#	Analyte	Value	Units
01077	Silver	0.1 U	ug/L

Analysis ID: AS-G-W
arsenic by graphite furnace for water samples
Analyzed: 21-MAR-1991 By: Jack Merritt
Authorized: 26-MAR-1991 By: Yuh-Hsu Pan

Storet#	Analyte	Value	Units
01002	Arsenic	5 U	ug/L

Analysis ID: CD-G-W
Cadmium by graphite furnace for water samples
Analyzed: 10-MAR-1991 By: Kate Brackett
Authorized: 27-MAR-1991 By: Yuh-Hsu Pan

Storet#	Analyte	Value	Units
01027	Cadmium	0.1 U	ug/L

12330/91-JAN-31-25-02 Continued on Page 5

Sample ID: 12331/91-JAN-31-26-01 Matrix: W-EFFLUENT
Location: City of Ormond Bch, STP
Field ID: PT#001
Collected: 29-JAN-1991 10:20 By: Philip N Kane
Authorized: 21-FEB-1991 By: Liang T. Lin
Type: Grab Sample
Lab Comments:
Field Comments: Chlorianted effl. @ plant. discharge pt 1/

Analysis ID: W-BNA
base-neutral-acid water analysis
Analyzed: 12-FEB-1991 By: Laura Harrison
Authorized: 12-FEB-1991 By: Laura Harrison

Storet#	Analyte	Value	Units
34205	Acenaphthene	2 U	ug/L
34200	Acenaphthylene	2 U	ug/L
39330	Aldrin	8 U	ug/L
34220	Anthracene	2 U	ug/L
34526	Benzo(a)anthracene	2 U	ug/L
34230	Benzo(b)fluoranthene	2 U	ug/L
34242	Benzo(k)fluoranthene	2 U	ug/L
34247	Benzo(a)pyrene	4 U	ug/L
34521	Benzo(g,h,i)perylene	5 U	ug/L
34292	Benzyl butyl phthalate	2 U	ug/L
	a-BHC	8 U	ug/L
39337	b-BHC	8 U	ug/L
39340	d-BHC	8 U	ug/L
	g-BHC	8 U	ug/L
39120	Benzidine	25 U	ug/L
34273	Bis(2-chloroethyl)ether	2 U	ug/L
34278	Bis(2-chloroethoxy)methane	2 U	ug/L
34283	Bis(2-chloroisopropyl)ether	2 U	ug/L
39100	Bis(2-ethylhexyl)phthalate	2 U	ug/L
34636	4-Bromophenyl phenyl ether	2 U	ug/L
34581	2-Chloronaphthalene	2 U	ug/L
34641	4-Chlorophenyl phenyl ether	2 U	ug/L
34320	Chrysene	2 U	ug/L
39310	4,4'-DDD	8 U	ug/L
39320	4,4'-DDE	8 U	ug/L
39300	4,4'-DDT	8 U	ug/L
34556	Dibenzo(a,h)anthracene	5 U	ug/L
39110	Di-n-butyl phthalate	2 U	ug/L
34536	1,2-Dichlorobenzene	2 U	ug/L
34566	1,3-Dichlorobenzene	2 U	ug/L
34571	1,4-Dichlorobenzene	2 U	ug/L
34631	3,3'-Dichlorobenzidine	5 U	ug/L
39380	Dieldrin	8 U	ug/L
34336	Diethylphthalate	2 U	ug/L
34341	Dimethylphthalate	2 U	ug/L
34611	2,4-Dinitrotoluene	2 U	ug/L
34626	2,6-Dinitrotoluene	2 U	ug/L

Continued on Page 3

12331/91-JAN-31-26-01/W-BNA Continued from Page 2

Storet#	Analyte	Value	Units
34596	Di-n-octyl phthalate	2 U	ug/L
34361	Endosulfan-I	8 U	ug/L
34356	Endosulfan-II	8 U	ug/L
34351	Endosulfan-sulfate	8 U	ug/L
39390	Endrin	8 U	ug/L
34366	Endrin-aldehyde	8 U	ug/L
34376	Fluoranthene	2 U	ug/L
34381	Fluorene	2 U	ug/L
39410	Heptachlor	8 U	ug/L
39420	Heptachlor-epoxide	8 U	ug/L
39700	Hexachlorobenzene	2 U	ug/L
34391	Hexachlorobutadiene	2 U	ug/L
34396	Hexachloroethane	2 U	ug/L
34386	Hexachlorocyclypentadiene	5 U	ug/L
34403	Indeno(1,2,3-cd)pyrene	5 U	ug/L
34408	Isophorone	2 U	ug/L
34696	Naphthalene	2 U	ug/L
34447	Nitrobenzene	2 U	ug/L
34438	N-Nitrosodimethylamine	2 U	ug/L
34428	N-Nitrosodi-n-propylamine	2 U	ug/L
34433	N-Nitrosodiphenylamine	2 U	ug/L
34671	PCB-1016	1.0E+03 U	ug/L
39488	PCB-1221	1.0E+03 U	ug/L
39492	PCB-1232	1.0E+03 U	ug/L
39496	PCB-1242	1.0E+03 U	ug/L
39500	PCB-1248	1.0E+03 U	ug/L
39504	PCB-1254	1.0E+03 U	ug/L
39508	PCB-1260	1.0E+03 U	ug/L
	PCB-1262	1.0E+03 U	ug/L
34461	Phenanthrene	2 U	ug/L
34469	Pyrene	2 U	ug/L
39400	Toxaphene	1.0E+03 U	ug/L
34551	1,2,4-Trichlorobenzene	2 U	ug/L
34462	4-Chloro-3-methyl phenol	2 U	ug/L
34586	2-Chlorophenol	2 U	ug/L
34601	2,4-Dichlorophenol	2 U	ug/L
34606	2,4-Dimethylphenol	2 U	ug/L
34616	2,4-Dinitrophenol	15 U	ug/L
34657	2-Methyl-4,6-dinitrophenol	15 U	ug/L
34591	2-Nitrophenol	2 U	ug/L
34646	4-Nitrophenol	15 U	ug/L
39032	Pentachlorophenol	5 U	ug/L
34694	Phenol	2 U	ug/L
34621	2,4,6-Trichlorophenol	2 U	ug/L

Comments (1)
(2)
(3)
(4)
(5)
(6)

9A Jan - 31-24

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& ENVIRONMENTAL SERVICES, INC.

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LOG NO: T1-00270

Received: 01 FEB 91

Dr. Yuh-Hsu Pan
DER-Chemistry Section
2600 Blairstone Road
Tallahassee, Florida 32399-2400

Project: T137/District 0201

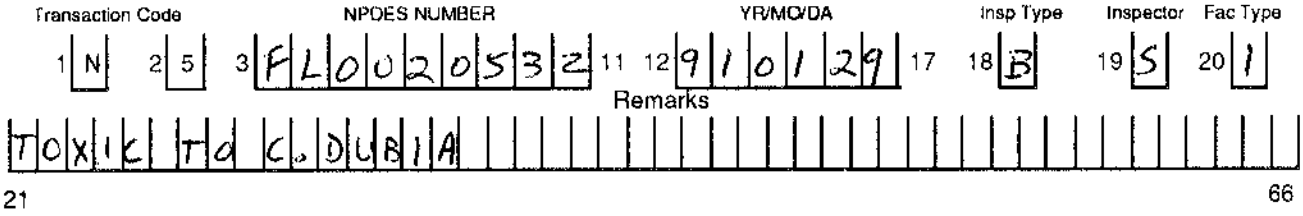
REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	SAMPLED BY
00270-11	12059	Client
00270-12	12060	
00270-13	12327 ✓	
00270-14	12328 ✓	
00270-15	12359	

ORMOND BEACH STP

PARAMETER	00270-11	00270-12	00270-13	00270-14	00270-15
Ammonia-N, mg/l	0.59	<0.030	1.8	<0.030	0.045
Total Kjeldahl Nitrogen-N, mg/l	2.2	0.13	3.5	<0.10	1.8
Total Phosphorus, mg/l	0.10	<0.10	5.7	<0.10	0.17
Nitrate + Nitrite-N, mg/l	0.45	<0.050	1.4	<0.050	<0.050

Fill Out This Section For All Surface Water Discharger Inspections (CEI, CSI, CBI, PAI, XSI - RI Optional)



Fill Out This Section For All Surface Water Discharger Inspections (CEI, CSI, CBI, PAI, XSI - RI Optional)

