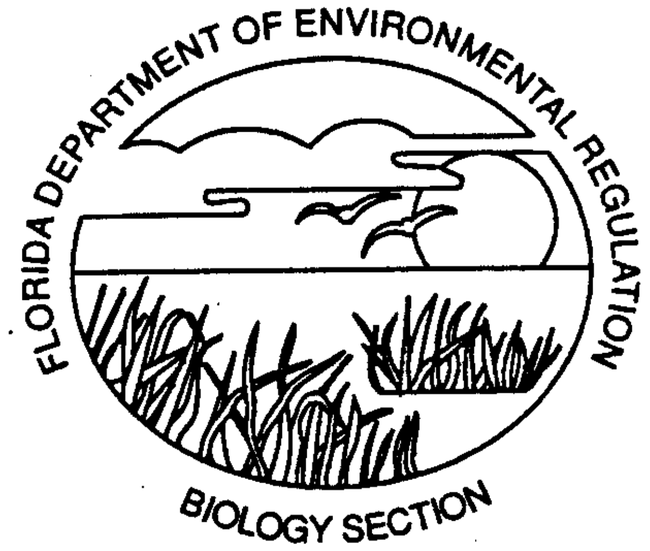


Bioassays of City of

Crestview Wastewater Treatment Plant

Crestview, Okaloosa County, Florida

NPDES #FL0027782

Sampled 4/9/90

July 24, 1990

Biology Section
Division of Administrative and Technical Services

Bioassays of City of

Crestview Wastewater Treatment Plant

Crestview, Okaloosa County, Florida

NPDES #FL0027782

Biology Section
Bureau of Laboratories
July 24, 1990

Introduction

City of Crestview WWTP, Crestview, Okaloosa County, Florida, NPDES #FL0027782, on 10 to 12 April, 1990.

The Crestview Wastewater Treatment Plant is located at 351 North Lloyd Street, Crestview, Okaloosa County, Florida. This 1.0 MGD design capacity municipal facility discharges an average of 0.88 MGD to Trammel Creek, which flows to the Yellow River. Treatment includes initial degritting, primary clarification, trickling filtration, final clarification, chlorination, and dechlorination prior to discharge.

The toxicity tests discussed in this report were performed in accordance with methods described by Peltier and Weber, 1985, *Methods for Measuring the Acute Toxicity of Effluents to Aquatic Organisms*, 3rd Edition, and by the FDER Biology Section, 1985, *Quality Assurance Manual for Performing Acute Toxicity Tests*, 2nd Edition.

Results and Discussion

The Biology Section performed two static definitive bioassays using the bioassay test organisms, the waterflea, *Ceriodaphnia dubia*, and the fish, *Notropis leedsi*, on a sample of discharge from this facility. These tests indicated that the sample was toxic to *C. dubia*, producing an LC_{50} of 39%. The sample was not toxic to *N. leedsi* and proved slightly stimulatory to the Microtox® assay test organism, *Photobacterium phosphoreum*.

The sample was taken at the end of the chlorine contact chamber. A total residual chlorine concentration of 0.05 mg/l (Hach) was measured in the field. Residual chlorine was not detected in the sample by laboratory measurements. The total ammonia and unionized ammonia concentrations were 19.2 mg/l and 0.42 mg/l, respectively.

Further chemical analyses detected several small unidentified peaks in the base neutral portion of the organics analyses. The metals, cadmium (0.2 µg/l), copper (20.0µg/l), lead (4.0 µg/l), silver (0.7 µg/l), and zinc (55.0 µg/l) were also detected in the sample. The cause of toxicity in the *C. dubia* tests was not determined.

Conclusion

The sample of discharge from the City of Crestview WWTP was toxic on 9 April, 1990.

Table 1. Concentration Series and Volumes Used for These Static Bioassays.

Ceriodaphnia dubia (water flea)

Concentration	Dilution Water	Sample	Total Volume
Control	15.0 ml	0.0 ml	15 ml
10.0%	13.5 ml	1.5 ml	15 ml
30.0%	10.5 ml	4.5 ml	15 ml
50.0%	7.5 ml	7.5 ml	15 ml
70.0%	4.5 ml	10.5 ml	15 ml
85.0%	2.25 ml	12.75 ml	15 ml
100.0%	0.0 ml	15.0 ml	15 ml

Notropis leedsi (bannerfin shiner)

Concentration	Dilution Water	Sample	Total Volume
Control	500 ml	0 ml	500 ml
10.0%	450 ml	50 ml	500 ml
30.0%	350 ml	150 ml	500 ml
50.0%	250 ml	250 ml	500 ml
70.0%	150 ml	350 ml	500 ml
85.0%	75 ml	425 ml	500 ml
100.0%	0 ml	500 ml	500 ml

Table 2. Data recorded during the static definitive bioassay of a sample of discharge from the City of Crestview WWTP, Crestview, Okaloosa County, Florida, NPDES #FL0027782, on 10 to 12 April, 1990.

Facility:	**City of Crestview Wastewater Treatment Plant**	NPDES #	**FL0027782**	Facility Type:	**Wastewater Treatment Plant**
Location:	351 N. Lloyd Street, Crestview	Contact/District:	F. Moore		
County:	Okaloosa	Test type:	static definitive		
Sample Collection Date:	**4/9/90** Time: 1300	# tests:	2	Receiving Water:	Trammel Creek to
Test Beginning Date:	4/10/90 Time: 1110	Chlorination Type:	**chlorinated**		Yellow River
Test Ending Date:	4/12/90 Time: 1115	no measureable total residual chlorine		**Page 1 of 2**	

Organism: ***Ceriodaphnia dubia*** Life stage: neonate
LC50: 39.0% Binomial: 39.0% Moving Average: - Probit: -

	SURVIVAL			Dissolved Oxygen			pH			Temperature			Conductivity	
Concentrations	# at 0 hr	Live at 24 hr	Live at 48 hr	0 hour	24 hour	48 hour	0 hour	24 hour	48 hour	0 hour	24 hour	48 hour	0 hour	48 hour
Control	5	5	5	8.1	-	8.7	7.9	-	8.2	21.3	-	20.1	-	-
Control	5	5	5	8.1	-	8.7	7.9	-	8.3	-	-	-	-	-
Control	5	5	5	8.1	-	8.7	7.9	-	8.3	-	-	-	-	-
Control	5	4	4	8.1	-	8.7	7.9	-	8.3	-	-	-	190	185
10%	5	5	5	8.2	-	8.7	7.9	-	8.3	21.5	-	20.0	-	-
10%	5	4	4	8.2	-	8.7	7.9	-	8.3	-	-	-	-	-
10%	5	5	5	8.2	-	8.8	7.9	-	8.3	-	-	-	-	-
10%	5	5	5	8.2	-	8.7	7.9	-	8.3	-	-	-	220	215
30%	5	5	5	8.3	-	8.6	7.9	-	8.3	22.0	-	19.9	-	-
30%	5	5	5	8.3	-	8.6	7.9	-	8.3	-	-	-	-	-
30%	5	5	5	8.3	-	8.6	7.9	-	8.3	-	-	-	-	-
30%	5	5	5	8.3	-	8.6	7.9	-	8.3	-	-	-	280	275
50%	5	5	0	8.2	-	8.5	7.8	-	8.3	22.0	-	20.0	-	-
50%	5	5	0	8.3	-	8.5	7.8	-	8.3	-	-	-	-	-
50%	5	5	0	8.3	-	8.5	7.8	-	8.3	-	-	-	-	-
50%	5	5	0	8.3	-	8.5	7.8	-	8.3	-	-	-	340	330
70%	5	3	0	8.3	-	8.5	7.8	-	8.3	22.0	-	20.0	-	-
70%	5	2	0	8.3	-	8.5	7.8	-	8.3	-	-	-	-	-
70%	5	2	0	8.3	-	8.5	7.8	-	8.3	-	-	-	-	-
70%	5	2	0	8.3	-	8.5	7.8	-	8.3	-	-	-	410	385
85%	5	0	0	8.2	-	8.2	7.8	-	8.4	22.0	-	20.0	-	-
85%	5	0	0	8.3	-	8.2	7.8	-	8.3	-	-	-	-	-
85%	5	0	0	8.3	-	8.2	7.8	-	8.3	-	-	-	-	-
85%	5	1	0	8.3	-	8.3	7.8	-	8.3	-	-	-	450	370
100%	5	0	-	8.3	8.3	-	7.6	8.3	-	22.1	21.0	-	-	-
100%	5	0	-	8.3	8.3	-	7.6	8.3	-	-	-	-	-	-
100%	5	0	-	8.3	8.3	-	7.6	8.3	-	-	-	-	-	-
100%	5	0	-	8.3	8.3	-	7.6	8.3	-	-	-	-	480	460*

* recorded at 24 hours

Total Residual Cl2	mg/l	Method
Field:	<0.05	DR100
Lab:	0.0	Hach
Lab:	-	-

Ammonia	Total (mg/l)	Unionized (mg/l)
Control Water (fish):	0.00	0.00
Cond. Control		
Water (daphnids):	1.21	0.05
100% Sample:	19.20	0.42

Alk & Hardness	Alkalinity (mg/l)	Hardness (mg/l)
Control Water (fish):	90	120
Cond. Control		
Water (daphnids):	60	85
100% Sample:	150	105

Salinity (ppt)	
Control Water:	0
100% Sample:	0

-continued-

Table 2. Continued.

Facility:	**City of Crestview Wastewater Treatment Plant**		**NPDES #**	**FL0027782**	Facility Type:	**Wastewater Treatment**	
Location:	351 N. Lloyd Street, Crestview		Contact/District:	F. Moore		**Plant**	
County:	Okaloosa		Test type:	static definitive			
Sample Collection Date:	**4/9/90**	Time: 1300	# tests:	2	Receiving Water:	Trammel Creek to	
Test Beginning Date:	4/10/90	Time: 1110	Chlorination Type:	**chlorinated**		Yellow River	
Test Ending Date:	4/12/90	Time: 1115	no measureable total residual chlorine		**Page 2 of 2**		

Total Residual Cl2	mg/l	Method
Field:	<0.05	DR100
Lab:	0.0	Hach
Lab:	-	-

Ammonia	Total (mg/l)	Unionized (mg/l)
Control Water (fish):	0.00	0.00
Cond. Control Water (daphnids):	1.21	0.05
100% Sample:	19.20	0.42

Alk & Hardness	Alkalinity (mg/l)	Hardness (mg/l)
Control Water (fish):	90	120
Cond. Control Water (daphnids):	60	85
100% Sample:	150	105

Salinity (ppt)	
Control Water:	0
100% Sample:	0

Organism: ***Notropis leedsi*** Age: 17 days
LC50: - Binomial: - Moving Average: - Probit: -

	SURVIVAL			Dissolved Oxygen			pH			Temperature			Conductivity	
Concentrations	# at 0 hr	Live at 24 hr	Live at 48 hr	0 hour	24 hour	48 hour	0 hour	24 hour	48 hour	0 hour	24 hour	48 hour	0 hour	48 hour
Control	5	5	5	8.4	8.5	8.4	7.8	8.1	8.3	22.1	19.5	19.0	-	-
Control	5	5	5	8.4	8.5	8.4	7.8	8.1	8.3	-	-	-	230	225
10%	5	5	5	8.4	8.0	8.2	7.8	8.0	8.2	22.1	19.3	18.7	-	-
10%	5	5	5	8.4	7.8	8.2	7.8	8.1	8.2	-	-	-	260	245
30%	5	5	5	8.3	7.5	7.8	7.7	8.0	8.1	21.5	19.1	18.5	-	-
30%	5	5	5	8.3	7.5	7.8	7.7	8.0	8.1	-	-	-	315	295
50%	5	5	5	8.2	7.0	7.2	7.6	8.0	8.1	22.0	19.2	18.6	-	-
50%	5	5	5	8.2	7.0	7.3	7.6	7.9	8.1	-	-	-	375	350
70%	5	5	5	8.1	6.5	6.9	7.5	7.9	8.0	22.2	19.2	18.5	-	-
70%	5	5	5	8.2	6.6	6.9	7.5	7.9	8.0	-	-	-	435	400
85%	5	5	5	8.1	6.3	7.0	7.5	7.9	8.0	22.3	19.2	18.5	-	-
85%	5	5	5	8.1	6.5	7.1	7.5	7.9	8.0	-	-	-	480	440
100%	5	5	5	8.0	6.0	6.6	7.4	7.9	8.0	22.7	19.5	18.8	-	-
100%	5	5	5	8.0	6.1	6.6	7.4	7.9	7.9	-	-	-	520	485

Table 3. Microtox test results, City of Crestview WWTP, Okaloosa County, NPDES #FL0027782, on 10 April, 1990.

% Sample	Final Reclaimed Water	
	5-min	15-min
0	71	48
0	73	47
0	69	44
12.38	74	50
12.38	81	53
12.38	74	50
24.75	68	47
24.75	73	50
24.75	61	42
49.5	69	49
49.5	72	53
49.5	64	43
99	79	50
99	68	47
99	69	48

EC_{50} sample (15 minute, 15 °C) = stimulatory

EC_{50} (15 minute, 15 °C) is calculated using the Data Reduction Computer Program developed by Microbics Corporation for the Sharp Model EL-5100 calculator (*Microbics Systems Operating Manual,* 1982, Microbics Corporation, Carlsbad, CA).

Table 4. LC_{50} Data for Bioassay of City of Crestview Wastewater Treatment Plant

Organism	Method of Data Analysis	48 Hour LC_{50} (95% Confidence Intervals)
Chlorinated discharge		
Ceriodaphnia dubia	Binomial	39% (30%, 50%)
	Moving Average	b
	Probit	b

a This LC_{50} is reported in the text since it is the most statistically conservative value of the data set.

b Due to an insufficient number of dead organisms, or to the irregular distribution of mortality, an LC_{50} value cannot be calculated using this method of statistical analysis.

Table 5. Results of chemical analyses on the sample of discharge from the City of Crestview WWTP, Okaloosa County, Florida.

Organics

Acid Extractables	None detected
Base Neutral Extractables	Several small unidentified peaks
Pesticide Extractables	None detected
PCB	None detected

Metals

Cadmium	0.2 µg/l
Copper	20.0 µg/l
Lead	4.0 µg/l
Silver	0.7 µg/l
Zinc	55.0 µg/l

DER Biology Section — Acute-bioassay Bench Sheet

Sample Source: CRESTVIEW WWTP
Address/City: CRESTVIEW
County: OKALOOSA
Contact/District: J. MOORE / NW
NPDES Permit #: FL0027782 **Outfall #:** 001

Sample Collection: Date 4/9/90 Time 1300
Test Beginning: Date 4/10/90 Time 1110
Test Ending: Date 4/12/90 Time 1115
Test Organism: Ceriodaphnia dubia
Life Stage/Age: <24 hr

Test Number: 1 of 2 **Test Type:** Screening (Definitive)
(Static) | Static Renewal | Flow-through

Remarks: No residual chlorine
* on bottom growing

Instrument Calibrations:

	pH	DO	Cond	Temp
0 hr	7.0, 7.9	8.7 @ 23°C	1368 @ 1350 1367	22.5 @ 22.9
24 hr	7.0, 7.9	8.7 @ 23°C	1390 @ 1395	22.6 @ 23.2
48 hr	7.0, 7.9	8.7 @ 23°C	1372 @ 1371 @ 1346	22.3 @ 22.6

		Number Live			DO (mg/l)			pH			Temp. (°C)			Cond. (µmhos/cm)		
Conc.	Chamber #	0	24	48	0	24	48	0	24	48	0	24	48	0	24	48
Control		5	5	5	8.1		8.7	7.9		8.2	21.3		20.1			
Control		5	5	5	8.1		8.7	7.9		8.3						
Control		5	5	5	8.1		8.7	7.9		8.3						
Control		5	4	4	8.1		8.7	7.9		8.3				190		185
10%		5	5	5	8.2		8.7	7.9		8.3	21.5		20.0			
10%		5	4	4	8.2		8.7	7.9		8.3						
10%		5	5	5	8.2		8.8	7.9		8.3						
10%		5	5	5	8.2		8.7	7.9		8.3				220		215
30%		5	5	5	8.3		8.6	7.9		8.3	22.0		19.9			
30%		5	5	5	8.3		8.6	7.9		8.3						
30%		5	5	5	8.3		8.6	7.9		8.3						
30%		5	5	5	8.3		8.6	7.9		8.3				280		275
50%		5	5	0	8.2		8.5	7.8		8.3	22.0		20.0			
50%		5	5	0	8.3		8.5	7.8		8.3						
50%		5	5	0	8.3		8.5	7.8		8.3						
50%		5	5	0	8.3		8.5	7.8		8.3				340		320
70%		5	3*	0	8.3		8.5	7.8		8.3	22.0		20.0			
70%		5	2*	0	8.3		8.5	7.8		8.3						
70%		5	2*	0	8.3		8.5	7.8		8.3						
70%		5	2	0	8.3		8.5	7.8		8.3				410		385
85%		5	0	0	8.2		8.2	7.8		8.4	22.0		20.0			
85%		5	0	0	8.3		8.2	7.8		8.3						
85%		5	0	0	8.3		8.2	7.8		8.3						
85%		5	1	0	8.3		8.3	7.8		8.3				450		370
100%		5	0	—	8.9	8.3	—	7.6	8.3	—	22.1	21.0	—			
100%		5	0	—	8.3	8.3	—	7.6	8.3	—						
100%		5	0	—	8.3	8.3	—	7.6	8.3	—						
100%		5	0	—	8.3	8.3	—	7.6	8.3	—				480	460	445
Measured by:		SW	MF	MF	MF	MF	SW	JMF	MF	SW	MF	MF	SW	MF	MF	SW
Recorded by:		JW	MF	MF	SW	SW	MF	SW	MF	MF	SW	SW	MF	SW	SW	MF

Investigators' Signatures

Steven H Wolfe
Marshall Faircloth

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:			<0.05	DR100	
Lab Tot. Resid. Cl2:			0	Hach DPD	SHW
Alkalinity:	90	1.0	150	Hach	MF
Hardness:	170	55	105	Hach	MF
Total Ammonia:	0.0	1.21	17.2	Orion	MF

Algae - 38.4

DER Biology Section — Acute-bioassa, ...ch Sheet

Sample Source: CRESTVIEW
Address/City:
County:
Contact/District:
NPDES Permit #: _____ **Outfall #:** _____

Sample Collection: Date 4/9/90 Time 1300
Test Beginning: Date 4/10/90 Time 1045
Test Ending: Date 4/12/90 Time 1115
Test Organism: Notropis leedsi
Life Stage/Age: 17 days

Test Number: 2 of 2 **Test Type:** Screening (Definitive)
(Static) Static Renewal | Flow-through

Remarks:

Instrument Calibrations:

	pH	DO	Cond	Temp
0 hr				
24 hr				
48 hr				

		Number Live			DO (mg/l)			pH			Temp. (°C)			Cond. (µmhos/cm)		
Conc.	Chamber #	0	24	48	0	24	48	0	24	48	0	24	48	0	24	48
control	416	5	5	5	8.4	8.5	8.4	7.8	8.1	8.3	22.1	19.5	19.0			
control	94	5	5	5	8.4	8.5	8.4	7.8	8.1	8.3				230		225
10%	39	5	5	5	8.4	8.0	8.2	7.8	8.0	8.2	22.1	19.3	18.7			
10%	186	5	5	5	8.4	7.8	8.2	7.8	8.1	8.2				260		245
30%	17	5	5	5	8.3	7.5	7.8	7.7	8.0	8.1	21.5	19.1	18.5			
30%	190	5	5	5	8.3	7.5	7.8	7.7	8.0	8.1				315		295
50%	83	5	5	5	8.2	7.0	7.2	7.6	8.0	8.1	22.0	19.2	18.6			
50%	142	5	5	5	8.2	7.0	7.3	7.6	7.9	8.1				375		350
70%	183	5	5	5	8.1	6.5	6.9	7.5	7.9	8.0	22.2	19.2	18.5			
70%	63	5	5	5	8.2	6.6	6.9	7.5	7.9	8.0				435		400
85%	113	5	5	5	8.1	6.3	7.0	7.5	7.9	8.0	22.3	19.2	18.5			
85%	118	5	5	5	8.1	6.5	7.1	7.5	7.9	8.0				480		440
100%	14	5	5	5	8.0	6.0	6.6	7.4	7.9	8.0	22.7	19.5	18.8			
100%	50	5	5	5	8.0	6.1	6.6	7.4	7.9	7.9				520		485
Measured by:		MF	MF	MF	MF	MF	SW	SMF	MF	SW	MF	MF	SW	MF		SW
Recorded by:		MF	MF	MF	SW	SW	MF	SHW	MF	MF	SW	SW	MF	SW		MF

Investigators' Signatures

Steven H Wolfe
Marshall Faircloth

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:					
Lab Tot. Resid. Cl2:					
Alkalinity:					
Hardness:					
Total Ammonia:					

Requestor: Terrell Reeves
County: Okaloosa
NW

MICROTOX™ Data Reduction Sheet

SOURCE: Crestview City WWTP (Transmad Creek)

GRAPH CALC · EC _____ (_____ MIN, _____ °C) = _____ %SAMPLE , mg/L

SAMPLE DATA:

SAMPLE TYPE (EFFLUENT, LEACHATE, ETC.):

DATE ASSAYED: 4/19/90 TIME: 9:00 AM

VISUAL COLOR: CORRECTION REQUIRED: YES NO

VISUAL TURBIDITY: SEPARATION REQUIRED: YES NO

INITIAL pH: pH ADJUSTED TO: WITH:

OSMOTICALLY ADJUSTED WITH; MOAS (DRY NaCl) OTHER

PRIMARY DILUTION OF SAMPLE:

OPERATOR: MS Campos REAGENT VIAL LOT NO. M- N LN

REMARKS:

MICROTOX™ TEST

SAMPLE CUVETTE	% SAMPLE	READINGS 5 MIN	READINGS 15 MIN	Γ5	Γ15	NOTES
A1	0	71	48			92
B1		73	47 46			91 88
C1		69	44			92
A2	12.38	69 74	50	.07	-.09	94 88 -.03
B2		74 81	53 51			98
C2		74	50			95
A3	24.75	68	47	.05	00	83 79 .09
B3		77	46 50			90
C3		61	42			81
A4	49.5	69	49	.04	-.04	84 81 .08
B4		72	48 53			86
C4		64	43			55
A5	99	79	50	-.01	-.01	87 88 .04
B5		68	49 47			85
C5		69	48			88
EC_{50} (MIN, °C)				2059.05		0.93

(deleted Standard Toxicity 99%)

REVIEWED BY:

DATE: 7/24/90