

Bioassays of

Monterey Motel and Marina Wastewater Treatment Facility

Stuart, Martin County, Florida

NPDES #FL0043303

Sampled 5/9/94

July 1994

Biology Section
Division of Administrative and Technical Services

Bioassays of

Monterey Motel and Marina Wastewater Treatment Facility

Stuart, Martin County, Florida

NPDES #FL0043303

Biology Section
Bureau of Laboratories
July 1994

Introduction

Monterey Motel and Marina WWTF, Stuart, Martin County, Florida, NPDES #FL0043303, tests performed on 10 to 12 May, 1994.

The facility is located at 300 SW Monterey Road in Stuart and has a 2600-GPD capacity. Treatment of wastewater consists of aeration, clarification, chlorination, and dechlorination. Treated effluent is discharged to the south fork of the St. Lucie River (facility summary provided by Terry Davis, FDEP Port St. Lucie).

The toxicity tests discussed in this report were performed in accordance with methods described by Weber, 1993, *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms*, 4th Edition, EPA/600/4-90/027F.

Results and Discussion

The FDEP Biology Section performed two 48-hour static acute screening toxicity bioassays on a sample of effluent from this facility. Two additional 48-hour screening bioassays were performed on aliquots of the sample that were dechlorinated in the laboratory using 0.025N sodium thiosulfate at the rate of 1.0 mL/L. The same amount of sodium thiosulfate was added to the control waters as well. The test species used for these bioassays were the water flea, *Ceriodaphnia dubia*, and the bannerfin shiner, *Cyprinella leedsi*.

The chlorinated test results indicated that the sample was toxic to both test species, producing 100% mortality in 24 hours. The dechlorinated tests resulted in one death in the *Ceriodaphnia dubia* test and no deaths in the *Cyprinella leedsi* test.

Total residual chlorine of the sample was 0.9 mg/L in the laboratory and 1.8 mg/L in the field. Total residual chlorine levels as low as 0.028 mg/L have been found to be acutely toxic to some freshwater fish and invertebrates (EPA Quality Criteria for Water, 1986). Total and unionized ammonia concentrations were 0.25 mg/L and 0.006 mg/L, respectively.

Further chemical analyses were performed on the sample and a field duplicate sample. Several metals were identified in each sample (Table 2). The metals do not appear to be present in concentrations known to be acutely toxic to the test species. The copper concentration (14 µg/L) exceeded its Class III Marine surface water criterion of ≤ 2.9 µg/L (FAC 17-302.530). Pesticides and organics were not detected.

Conclusion

The sample of effluent collected from this facility on 9 May, 1994, was toxic to *Ceriodaphnia dubia* and *Cyprinella leedsi*. The cause of toxicity was attributed to the total residual chlorine in the sample.

Table 1. Concentration series and volumes used for the 48-hour static acute screening toxicity bioassays of the Monterey Motel and Marina WWTF effluent performed on 10 to 12 May, 1994.

Ceriodaphnia dubia (water flea)

Concentration	Dilution Water	Sample	Total Volume
Control	20 mL	0 mL	20 mL
100 %	0 mL	20 mL	20 mL

Cyprinella leedsi (bannerfin shiner)

Concentration	Dilution Water	Sample	Total Volume
Control	500 mL	0 mL	500 mL
100 %	0 mL	500 mL	500 mL

Table 2. Results of chemical analyses on the effluent from Monterey Motel and Marina, sampled on 9 May, 1994.

Metals

	Effluent	Duplicate
Cadmium	0.38 µg/L [I]	0.38 µg/L [I]
Calcium	40.2 mg/L [A]	40.7 mg/L
Copper	14 µg/L [A]	14 µg/L
Iron	39 µg/L [A]	48 µg/L
Magnesium	3.6 mg/L [A]	3.7 mg/L
Zinc	36 µg/L [A]	38 µg/L

Pesticides and Herbicides

None Detected

Base-Neutral & Acid Extractables

None Detected

[A] Value reported is the mean of two or more determinations.
[I] Value reported is less than the minimum quantitation limit, and greater than or equal to the minimum detection limit.

Table 3. Data recorded during the 48-hour static acute screening bioassays of a sample of chlorinated effluent from the Monterey Motel and Marina WWTF, Stuart, Martin County, Florida, NPDES# FL0043303, performed on 10 to 11 May, 1994.

Facility:	**Monterey Motel and Marina WWTF**	**NPDES #**	**FL0043303**	Facility Type:	**Sewage Treatment Plant**
Location:	300 SW Monterey Road, Stuart	Contact/District:	Terry Davis/Southeast		
County:	Martin	Test type:	static acute screen		
Sample Collection Date:	**5/9/94** Time: 1110	# tests:	2 chlor + 2 dechlor	Receiving Water:	South Fork of
Test Beginning Date:	5/10/94 Time: 1430	Chlorination Type:	**Sample collected**		the St. Lucie River
Test Ending Date:	5/11/94 Time: 1400		**after dechlorination**	**Page 1 of 2**	

Total Residual Cl2	mg/L	Method
Field:	1.8	-
Lab:	0.9	DR-100

Ammonia	Total (mg/L)	Unionized (mg/L)
Control Water (fish):	< 0.017	0.00
20% Dilute Mineral Water (cladocerans):	0.03	0.003
100% Sample:	0.25	0.006

Alk & Hardness	Alkalinity (mg/L)	Hardness (mg/L)
Control Water (fish):	125	120
20% Dilute Mineral Water (cladocerans):	70	80
100% Sample:	140	105

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

Organism: ***Ceriodaphnia dubia*** Life stage: < 24 hours old

	SURVIVAL			pH			Temperature			Dissolved Oxygen			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	24 hour
Control	5	5	-	8.2	8.2	-	23.2	23.9	-	8.3	7.5	-	170	170
Control	5	5	-	-	8.3	-	-	24.0	-	-	7.5	-	-	170
Control	5	5	-	-	8.3	-	-	23.9	-	-	7.6	-	-	175
Control	5	5	-	-	8.3	-	-	23.8	-	-	7.7	-	-	175
100%	5	0	-	7.8	8.5	-	23.1	23.9	-	7.6	7.7	-	700	685
100%	5	0	-	-	8.5	-	-	23.9	-	-	7.6	-	-	700
100%	5	0	-	-	8.5	-	-	23.8	-	-	7.6	-	-	730
100%	5	0	-	-	8.5	-	-	23.8	-	-	7.7	-	-	730

Organism: ***Cyprinella leedsi*** Age: 11 days

	SURVIVAL			pH			Temperature			Dissolved Oxygen			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	24 hour
Control A	5	5	-	7.9	8.2	-	23.0	23.7	-	8.0	8.0	-	240	245
Control B	5	5	-	7.9	8.2	-	-	-	-	8.1	8.0	-	240	245
100% A	5	0	-	7.6	8.1	-	23.4	23.7	-	7.3	8.0	-	725	735
100% B	5	0	-	7.6	8.0	-	-	-	-	7.3	8.0	-	730	730

Table 4. Data recorded during the 48-hour static acute screening bioassays of a sample of effluent, dechlorinated in the laboratory, from the Monterey Motel and Marina WWTF, Stuart, Martin County, Florida, NPDES# FL0043303, performed on 10 to 12 May, 1994.

Facility:	**Monterey Motel and Marina WWTF**		**NPDES #**	**FL0043303**	Facility Type:	**Sewage Treatment**	
Location:	300 SW Monterey Road, Stuart		Contact/District:	Terry Davis/Southeast		**Plant**	
County:	Martin		Test type:	static acute screen			
Sample Collection Date:	**5/9/94**	Time: 1110	# tests:	2 chlor + 2 dechlor	Receiving Water:	South Fork of	
Test Beginning Date:	5/10/94	Time: 1430	Chlorination Type:	**Dechlorinated in lab**		the St. Lucie River	
Test Ending Date:	5/12/94	Time: 1430		**with sodium thiosulfate**	**Page 2 of 2**		

Total Residual Cl2	mg/L	Method
Field:	1.8	-
Lab:	0.04	DR-100

Ammonia	Total (mg/L)	Unionized (mg/L)
Control Water (fish):	< 0.017	0.00
20% Dilute Mineral Water (cladocerans):	0.03	0.003
100% Sample:	0.25	0.006

Organism: ***Ceriodaphnia dubia*** Life stage: < 24 hours old

	SURVIVAL			pH			Temperature			Dissolved Oxygen			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	8.3	-	8.2	23.2	-	23.7	8.3	-	8.3	170	180
Control	5	5	5	-	-	8.2	-	-	23.6	-	-	8.4	-	180
Control	5	5	5	-	-	8.2	-	-	23.6	-	-	8.4	-	180
Control	5	5	5	-	-	8.3	-	-	23.6	-	-	8.6	-	185
100%	5	5	5	7.9	-	8.5	23.2	-	23.6	7.9	-	8.9	705	705
100%	5	4	4	-	-	8.6	-	-	23.7	-	-	8.8	-	730
100%	5	5	5	-	-	8.6	-	-	23.7	-	-	8.8	-	730
100%	5	5	5	-	-	8.6	-	-	23.8	-	-	8.7	-	750

Alk & Hardness	Alkalinity (mg/L)	Hardness (mg/L)
Control Water (fish):	125	120
20% Dilute Mineral Water (cladocerans):	70	80
100% Sample:	140	105

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

Organism: ***Cyprinella leedsi*** Age: 11 days

	SURVIVAL			pH			Temperature			Dissolved Oxygen			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 A	5	5	5	7.9	8.2	8.3	23.2	23.7	23.7	8.2	8.4	8.6	240	250
Control B	5	5	5	7.9	8.2	8.3	-	-	23.7	8.3	8.4	8.6	240	250
100% A	5	5	5	7.8	8.0	8.1	23.4	23.7	23.6	8.1	8.0	8.6	740	740
100% B	5	5	5	7.8	8.0	8.1	-	-	23.7	8.1	7.9	8.6	740	745

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Monterey Metal + Marina
Location:
County: Martin
Contact/District: Terry Davis / SE
NPDES Permit #: FL00 43303 Outfall #:
94-May-10-10 79378

Sample Collection: Date 5/9/94 Time 1110
Test Beginning: Date 5/10/94 Time 1430
Test Ending: Date 5/11/94 Time 1420
Organism Batch #: 17 Diluent Batch #: 17
Organism Age: <24hrs
Test Organism: Ceriodaphnia dubia

Test Type: (Screening) | Definitive
(Static) | Static Renewal | Flow-through

Test Number: 1 of 4

Remarks: Cl-

Test Terminated @24 hours

Instrument Calibrations:

	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0 9.0 @ 9.0	23.9 @ 24.0	8.3 @ 24.3	980 @ 1,000 9780 @ 10,000 @ 24.0 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	24.0 @ 24.1	8.5 @ 23.4	980 @ 1,000 9780 @ 10,000 @ 24.3 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	24.0 @ 24.1	8.3 @ 24.1	980 @ 1,000 9780 @ 10,000 @ 24.1 °C

Conc.	Chamber #	Number Live 0 hr	Number Live 24 h	Number Live 48 h	pH 0 hr	pH 24 h	pH 48 h	Temperature (°C) 0 hr	Temperature (°C) 24 h	Temperature (°C) 48 h	D.O. (mg/L) 0 hr	D.O. (mg/L) 24 h	D.O. (mg/L) 48 h	UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm) 0 hr	24 h	48 h
Control	A	5	5		8.2	8.2		23.2	23.9		8.3	7.5		170	170	
Control	B	5	5			8.3			24.0			7.5			170	
Control	C	5	5			8.3			23.9			7.6			175	
Control	D	5	5			8.3			23.8			7.7			175	
100%	A	5	0		7.8	8.5		23.1	23.9		7.6	7.7		700	685	
100%	B	5	0			8.5			23.9			7.6			700	
100%	C	5	0			8.5			23.8			7.6			730	
100%	D	5	0			8.5			23.8			7.7			730	
Measured/Loaded by:		TR	TM		TM	TM		TM	TM		TM	TM		TM	TM	
Recorded by:		TR	TM		TR	KP		TR	KP		TR	KP		TR	KP	

Investigators' Signatures

Tricia C. Rader

Tina M. Kubsh

Kim Pearce

Mark Sandlin

Reviewer

form updated 7/8/93

Water Quality Parameters	Salt Water/ Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2:			1.5	—	TD
Lab Total Residual Cl2:	<0.03	<0.03	0.9	DR-100	TR/TM
Alkalinity:	125	70	140	Hach	TR
Hardness:	120	80	105	Hach	TR
Total Ammonia:	<0.017	0.03	0.25	~~MF~~	MF

Ammonia Meter #98136 Ammonia Meter Slope: -57.8 Ammonia Blank: 20.07 Control Salinity: 0 ppt Sample Salinity: 0 ppt

Wrong pH-a for initial

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Monterey Motel + Marina
Location:
County: Martin
Contact/District: Terry Davis/SE
NPDES Permit #: FL00 43303 Outfall #:
94-May-10-10 79398

Sample Collection: Date 5/9/94 Time 1110
Test Beginning: Date 5/10/94 Time 1430
Test Ending: Date 5/11/94 Time 1400
Organism Batch #: 18 Diluent Batch #: Well
Organism Age: 11 days
Test Organism: Cyprinella leedsi

Test Type: Screening | Definitive
Static | Static Renewal | Flow-through

Test Number: 2 of 4

Remarks:
Cl⁻

Test Terminated at 24 hours

Instrument Calibrations:

	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0 9.0 @ 9.0	23.9 @ 24.0	8.3 @ 24.3	980 @ 1,000 9790 @ 10,000 @ 24.0 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	24.0 @ 24.1	8.5 @ 23.4	980 @ 1,000 9790 @ 10,000 @ 24.3 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	24.0 @ 24.1	8.3 @ 24.1	980 @ 1,000 9780 @ 10,000 @ 24.1 °C

Conc.	Chamber #	Number Live 0 hr	Number Live 24 h	Number Live 48 h	pH 0 hr	pH 24 h	pH 48 h	Temperature (°C) 0 hr	Temperature (°C) 24 h	Temperature (°C) 48 h	D.O. (mg/L) 0 hr	D.O. (mg/L) 24 h	D.O. (mg/L) 48 h	UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm) 0 hr	24 h	48 h
Control A	77	5	5		7.9	8.2		23.0	23.7		8.0	8.0		240	245	
Control B	1	5	5		7.9	8.2					8.1	8.0		240	245	
100% A	74	5	0		7.6	8.1		23.4	23.7		7.3	8.0		725	735	
100% B	630	5	0		7.6	8.0					7.3	8.0		730	730	
Measured/Loaded by:		TM	TM		TM	TM		TM	TM		TM	TM		TM	TM	
Recorded by:		TM	TM		TR	KP		TR	KP		TR	KP		TR	KP	

Investigators' Signatures

Reviewer

Water Quality Parameters	Salt Water/ Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2:			1.8	TD	TD
Lab Total Residual Cl2:	<0.03	<0.03	0.9	DR 1-0	TR ITM
Alkalinity:	125	70	140	Hach	TR
Hardness:	120	850	105	Hach	TR
Total Ammonia:	<0.01	0.03	0.25	orion	MF

Ammonia Meter #98136 Ammonia Meter Slope: -57.8 Ammonia Blank: <0.01 Control Salinity: 0 ppt Sample Salinity: 0 ppt

form updated 7/8/93

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Monterey Motel + Marina
Location:
County: Martin
Contact/District: Terry Dennis / SE
NPDES Permit #: FL0043303 Outfall #:
94-111 cy-10-10 79378

Sample Collection: Date 5/9/94 Time 1110
Test Beginning: Date 5/10/94 Time 1430
Test Ending: Date 5/12/94 Time 1430
Organism Batch #: 17 Diluent Batch #: 17
Organism Age: <24 hrs
Test Organism: Ceriodaphnia dubia

Test Type: Screening | Definitive
Static | Static Renewal | Flow-through

Test Number: 3 of 4

Remarks:
ALIQUOT of (DeCl⁻) SAMPLE DECHLOR'D IN LAB W/SODIUM THIOSULFATE. CONTROLS TREATED W/ Na THIOSULFATE ALSO. used 1 mL 0.025N Na thiosulfate per liter of sample and control water

Instrument Calibrations:

	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0 9.0 @ 9.0	23.9 @ 24.0	8.3 @ 24.3	980 @ 1,000 9750 @ 10,000 @ 24.0 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	24.0 @ 24.1	8.5 @ 23.4	980 @ 1,000 9790 @ 10,000 @ 24.3 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	24.0 @ 24.1	8.3 @ 24.1	980 @ 1,000 9780 @ 10,000 @ 24.1 °C

		Number Live			pH			Temperature (°C)			D.O. (mg/L)			UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm)		
Conc.	Chamber #	0 hr	24 h	48 h	0 hr	24 h	48 h	0 hr	24 h	48 h	0 hr	24 h	48 h	0 hr	24 h	48 h
Control	A	5	5	5	8.3		8.2	23.2		23.7	8.3		8.3	170		180
Control	B	5	5	5			8.2			23.6			8.4			180
Control	C	5	5	5			8.2			23.6			8.4			180
Control	D	5	5	5			8.3			23.6			8.6			185
100% A	A	5	5	5	7.9		8.5	23.2		23.6	7.9		8.9	705		705
100%	B	5	4	4			8.6			23.7			8.8			730
100%	C	5	5	5			8.6			23.7			8.8			730
100%	D	5	5	5			8.6			23.8			8.7			750
Measured/Loaded by:		TR	TM	TM	TM		TM	TM		TM	TM		TM	TM		TM
Recorded by:		TR	TM	TM	TR		TR	TR		TR	TR		TR	TR		TR

Investigators' Signatures
Tobin G. Rader
Tina Mikulsky
Kim Pearce
Marshall Faircloth
Reviewer

	Salt Water/ Well Water	20% Min Water	Water Quality Parameters Sample	Method	Measured by
Field Total Residual Cl2:		—	1.8	—	TD
Lab Total Residual Cl2:	<0.03	<0.03	0.04	DR-100	TR / TM
Alkalinity:	125	70	140	Hach	TR
Hardness:	120	80	105	Hach	TR
Total Ammonia:	<0.07	0.03	0.25	Orion	MF

Ammonia Meter #98136 Ammonia Meter Slope: -57.8 Ammonia Blank: <0.07 Control Salinity: 0 ppt Sample Salinity: 0 ppt

form updated 7/8/93

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Monterey Motel & Marina
Location:
County: Martin
Contact/District: Terry Davis / SE
NPDES Permit #: FL00 43303 94-May-10-10 Outfall #: 79398

Sample Collection: Date 5/9/94 Time 1110
Test Beginning: Date 5/10/94 Time 1430
Test Ending: Date 5/12/94 Time 1430
Organism Batch #: 18 Diluent Batch #: well
Organism Age: 11 days
Test Organism: Cyprinella leedsi

Test Type: (Screening) | Definitive
Static | (Static Renewal) | Flow-through

Test Number: 4 of 4

Instrument Calibrations:

	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0 9.0 @ 9.0	23.9 @ 24.0	8.3 @ 24.3	950 @ 1,000 9790 @ 10,000 @ 24.0 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	24.0 @ 24.1	5.5 @ 23.4	980 @ 1,000 9790 @ 10,000 @ 24.3 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	24.0 @ 24.1	8.3 @ 24.1	980 @ 1,000 9780 @ 10,000 @ 24.1 °C

Remarks:

DeCl⁻
ALIQUOT OF SAMPLE DECHLOR'D IN LAB PRIOR TO TEST W/ SODIUM THIOSULFATE. CONTROLS TREATED W/ Na THIOSULFATE ALSO. Used 1ml 0.025N Na thiosulfate per liter of sample + control water.

Conc.	Chamber #	Number Live 0 hr	24 h	48 h	pH 0 hr	24 h	48 h	Temperature (°C) 0 hr	24 h	48 h	D.O. (mg/L) 0 hr	24 h	48 h	UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm) 0 hr	24 h	48 h
Control A	13	5	5	5	7.9	8.2	8.3	23.2	23.7	23.7	8.2	8.4	8.6	240	250	250
Control B	28	5	5	5	7.9	8.2	8.3			23.7	8.3	8.4	8.6	240	250	250
100% A	20	5	5	5	7.8	8.0	8.1	23.4	23.7	23.6	8.1	8.0	8.6	740	740	740
100% B	10	5	5	5	7.8	8.0	8.1			23.7	8.1	7.9	8.6	740	740	745
Measured/Loaded by:		TM	TM	TM	TM	TM	TM	TM	TM	TM	TM	TM	TM	TM	TM	TM
Recorded by:		TM	TM	TM	TR	KP	TR	TR	KP	TR	TR	KP	TR	TR	KP	TR

Investigators' Signatures

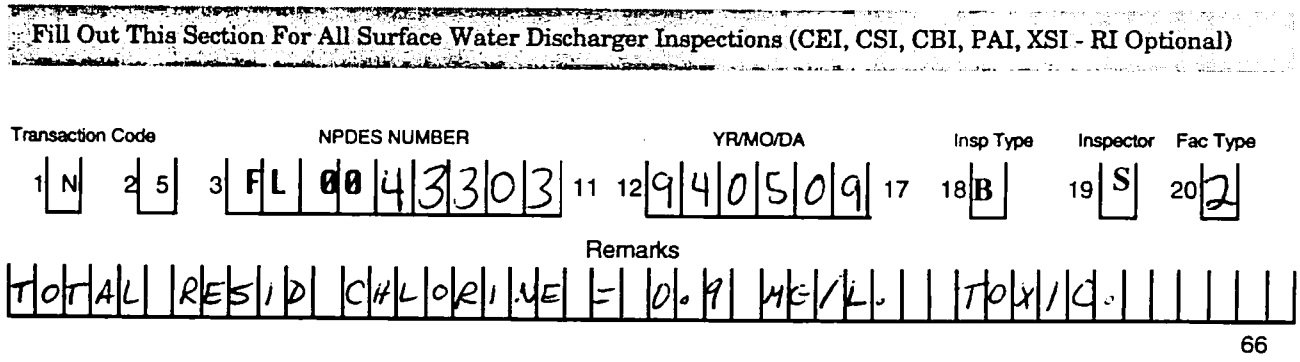
Robin C. Rader
Tina Mikulski
Kim Pearce
Reviewer

form updated 7/8/93

Water Quality Parameters	Salt Water/ Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2:			1.8	—	TD
Lab Total Residual Cl2:	<0.03	<0.03	0.04	DR-100	~~TR~~ TM
Alkalinity:	125	70	140	Hach	TR
Hardness:	120	80	105	Hach	TR
Total Ammonia:	<0.01	0.03	0.25	Orion	MP

Ammonia Meter #98136 Ammonia Meter Slope: -57.8 Ammonia Blank: <0.01 Control Salinity: 0 ppt Sample Salinity: 0 ppt

The Bioassay of the Monterey Motel and Marina WWTF effluent sampled on May 9, 1994, NPDES #FL0043303.



The Priority Pollutants Analysis for the Bioassay of the Monterey Motel and Marina WWTF effluent sampled on May 9, 1994, NPDES #FL0043303.

