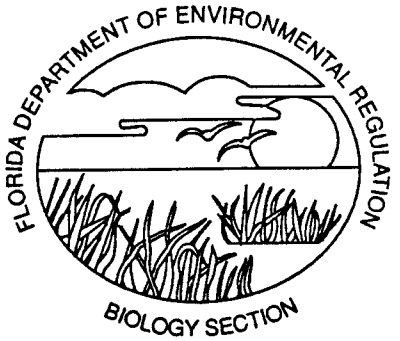


Bioassays of the

Jacksonville Naval Air Station Sewage Treatment Plant

Jacksonville, Duval County, Florida

NPDES #FL0000957

2/27/89

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September 18, 1989

Biology Section
Division of Administrative and Technical Services

Bioassays of the

Jacksonville Naval Air Station Sewage Treatment Plant

Jacksonville, Duval County, Florida

NPDES #FL0000957

Biology Section
Bureau of Laboratories
September 18, 1989

Introduction

Jacksonville Naval Air Station STP, NPDES #FL0000957, Jacksonville, Duval County, Florida, on 28 February to 2 March, 1989.

The Jacksonville Naval Air Station is a U.S. Government facility located in Jacksonville, Duval County, Florida. The associated sewage treatment plant treats waste from the air station, including domestic waste, water from industrial cooling systems, boiler wash, vehicle and equipment cleaning operations, and other miscellaneous sources. The plant has a design capacity of 3.0 MGD and is currently operating near this level, 2.6 MGD. Discharge is to the St. Johns River through outfall #001.

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, 1989, *Quality Assurance Manual for Performing Acute Toxicity Tests*, 2nd Edition.

Results and Discussion

The sample of discharge from outfall #001 of the Jacksonville Naval Air Station STP was not toxic to the bioassay test organisms, *Ceriodaphnia dubia*, *Daphnia pulex*, and *Notropis leedsi*. The sample was stimulatory to the Microtox® assay organism, *Photobacterium phosphoreum*.

Chemical analyses were performed on the sample. The metals, cadmium (3.0 µg/l), chromium (370.0 µg/l), copper (37.0 µg/l), iron (834 µg/l), nickel (43 µg/l), and silver (4.7 µg/l) were detected in the sample. In the organics analyses, small amounts of unidentified organic esters and numerous unidentified pesticide components sensitive to electron capture detection were detected. Total residual chlorine was less than 0.01 mg/l. Ammonia was not detected in the sample.

Conclusion

The sample of discharge from the Jacksonville Naval Air Station STP was not toxic on 27 February, 1989.

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

Daphnia pulex (water flea)

Concentration	Dilution Water	Sample	Total Volume
Control	15.0 ml	0.0ml	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 48-hour acute static definitive bioassay of a sample of discharge from outfall #001 of the Jacksonville Naval Air Station, Jacksonville, Duval County, Florida, NPDES #FL0000957, on 28 February to 2 March, 1989.

Facility:	**Jacksonville Naval Air Station**		**NPDES #**	**FL0000957**	Facility Type: **Sewage Treatment**
Location:	Jacksonville		Contact/District:	L. Marchman	
County:	Duval		Test type:	static definitive	
Sample Collection Date:	**2/27/89**	Time: 0915	# tests:	3	Receiving Water: St. Johns River
Test Beginning Date:	2/28/89	Time: 1100	Chlorination Type:	**chlorinated**	
Test Ending Date:	3/2/89	Time: 1130			**Page 1 of 2**

Organism: ***Ceriodaphnia dubia*** Life stage: neonate
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	-	8.8	8.1	-	8.3	20.2	-	22.0	-	-
Control	5	5	5	8.4	-	8.8	8.1	-	8.4	-	-	-	-	-
Control	5	5	5	8.4	-	8.8	8.1	-	8.4	-	-	-	-	-
Control	5	5	5	8.5	-	8.8	7.1	-	8.5	-	-	-	245	265
10%	5	5	5	8.5	-	8.7	8.1	-	8.4	19.9	-	22.0	-	-
10%	5	5	5	8.5	-	8.7	8.1	-	8.4	-	-	-	-	-
10%	5	5	5	8.5	-	8.7	8.1	-	8.4	-	-	-	-	-
10%	5	5	5	8.5	-	8.7	8.1	-	8.4	-	-	-	290	305
30%	5	5	5	8.5	-	8.7	8.0	-	8.3	19.9	-	22.0	-	-
30%	5	5	5	8.5	-	8.7	8.0	-	8.3	-	-	-	-	-
30%	5	5	5	8.5	-	8.7	8.0	-	8.3	-	-	-	-	-
30%	5	5	5	8.6	-	8.7	8.0	-	8.3	-	-	-	370	400
50%	5	5	5	8.6	-	8.6	7.9	-	8.2	20.0	-	22.1	-	-
50%	5	5	5	8.6	-	8.6	7.9	-	8.2	-	-	-	-	-
50%	5	5	5	8.6	-	8.6	7.9	-	8.2	-	-	-	-	-
50%	5	5	5	8.6	-	8.7	7.9	-	8.2	-	-	-	450	485
70%	5	5	5	8.6	-	8.6	7.7	-	8.1	20.1	-	22.0	-	-
70%	5	5	5	8.6	-	8.6	7.7	-	8.1	-	-	-	-	-
70%	5	5	5	8.6	-	8.6	7.7	-	8.1	-	-	-	-	-
70%	5	5	5	8.6	-	8.6	7.7	-	8.1	-	-	-	540	585
85%	5	5	5	8.6	-	8.6	7.6	-	7.9	20.0	-	22.1	-	-
85%	5	5	4	8.7	-	8.6	7.6	-	7.9	-	-	-	-	-
85%	5	5	5	8.7	-	8.6	7.6	-	7.9	-	-	-	-	-
85%	5	5	5	8.6	-	8.6	7.6	-	7.9	-	-	-	600	660
100%	5	5	5	8.7	-	8.5	7.4	-	7.7	20.1	-	22.1	-	-
100%	5	5	5	8.7	-	8.5	7.4	-	7.7	-	-	-	-	700
100%	5	5	3	8.7	-	8.5	7.4	-	7.7	-	-	-	-	-
100%	5	5	4	8.8	-	8.6	7.4	-	7.5	-	-	-	660	870*

*deaths may have resulted from possible contamination indicated by large increase in conductivity of 100% sample.

Total Residual Cl2	mg/l	Method
Field:	0.008	Hach
Lab:	<0.01	Hach
Lab:	-	-

Ammonia	Total (mg/l)	Unionized (mg/l)
Control Water (fish):	0.00	0.00
Cond. Control Water (daphnids):	0.27	0.02
100% Sample:	0.00	0.00

Alk & Hardness	Alkalinity (mg/l)	Hardness (mg/l)
Control Water (fish):	122	120
Cond. Control Water (daphnids):	130	135
100% Sample:	40	200

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

Table 2. Continued.

Facility:	**Jacksonville Naval Air Station**		**NPDES #**	**FL0000957**	Facility Type: **Sewage Treatment**
Location:	Jacksonville		Contact/District:	L. Marchman	
County:	Duval		Test type:	static definitive	
Sample Collection Date:	**2/27/89**	Time: 0915	# tests:	3	Receiving Water: St. Johns River
Test Beginning Date:	2/28/89	Time: 1100	Chlorination Type:	**chlorinated**	
Test Ending Date:	3/2/89	Time: 1130			**Page 2 of 2**

Total Residual Cl2	mg/l	Method
Field:	0.008	Hach
Lab:	<0.01	Hach
Lab:	-	-

Ammonia	Total (mg/l)	Unionized (mg/l)
Control Water (fish):	0.00	0.00
Cond. Control Water (daphnids):	0.27	0.02
100% Sample:	0.00	0.00

Alk & Hardness	Alkalinity (mg/l)	Hardness (mg/l)
Control Water (fish):	122	120
Cond. Control Water (daphnids):	130	135
100% Sample:	40	200

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

Organism: ***Daphnia pulex*** Life stage: neonate
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	8.3	-	8.7	8.1	-	8.2	20.1	-	22.0	-	-
Control	5	5	5	8.3	-	8.7	8.1	-	8.2	-	-	-	-	-
Control	5	5	5	8.3	-	8.7	8.1	-	8.2	-	-	-	-	-
Control	5	5	5	8.3	-	8.7	8.1	-	8.2	-	-	-	245	270
100.0%	5	5	5	8.4	-	8.5	7.4	-	7.8	20.0	-	22.1	-	-
100.0%	5	5	5	8.4	-	8.5	7.4	-	7.8	-	-	-	-	-
100.0%	6	6	6	8.4	-	8.6	7.4	-	7.8	-	-	-	-	-
100.0%	5	5	5	8.4	-	8.6	7.4	-	7.8	-	-	-	655	740

Organism: ***Notropis leedsi*** Age: 18 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	8.1	8.8	8.5	7.6	8.0	8.0	21.2	21.0	20.9	-	-
Control	5	4	4	8.2	8.9	8.5	7.6	8.0	8.0	-	-	-	225	230
10%	5	5	5	8.4	8.6	8.6	7.6	7.9	8.0	21.2	20.9	20.8	-	-
10%	5	5	5	8.4	8.6	8.6	7.6	7.9	8.0	-	-	-	275	275
30%	5	5	5	8.4	8.6	8.6	7.6	7.8	7.9	21.1	20.9	20.8	-	-
30%	5	5	5	8.4	8.5	8.6	7.6	7.8	7.9	-	-	-	370	370
50%	5	5	5	8.5	8.4	8.5	7.5	7.7	7.8	21.0	20.8	20.8	-	-
50%	5	5	5	8.5	8.4	8.5	7.5	7.7	7.8	-	-	-	465	470
70%	5	5	5	8.7	8.4	8.4	7.4	7.6	7.7	21.0	20.8	20.7	-	-
70%	5	5	5	8.8	8.3	8.4	7.3	7.6	7.7	-	-	-	555	560
85%	5	5	5	8.9	8.3	8.4	7.2	7.5	7.6	20.9	21.0	20.6	-	-
85%	5	5	5	8.9	8.4	8.4	7.2	7.5	7.6	-	-	-	620	630
100%	5	5	5	9.0	8.1	8.3	7.1	7.4	7.5	21.0	21.0	20.7	-	-
100%	5	5	5	9.1	8.2	8.3	7.1	7.4	7.5	-	-	-	695	705

Table 3. Microtox test results,Jacksonville Naval Air Station, Duval County, NPDES #FL0000957, on 28 February, 1989.

Microtox Test — Culture Lot # M-606

% Sample	Final Reclaimed Water chlorinated	
	5-min	15-min
0	52	43
0	54	44
0	59	48
12.38	61	51
12.38	60	50
12.38	62	52
24.75	61	51
24.75	60	50
24.75	62	52
49.5	64	54
49.5	65	54
49.5	64	55
99	72	60
99	71	59
99	67	56

EC_{50} Nonchlorinated (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.*

Table 4. Results of chemical analyses on the sample of discharge from the Jacksonville Naval Air Station, Duval County, Florida.

Organics

Acid Extractables	Small amounts of unidentified organic esters
Base Neutral Extractables	None detected
Pesticide Extractables	Numerous unidentified components sensitive to ECD

Metals

Cadmium	0.3 µg/l
Chromium	0.2 µg/l
Copper	11.0 µg/l
Iron	834.0 µg/l
Mercury	*
Nickel	43.0 µg/l
Silver	4.7 µg/l
Zinc	*

*Analyses for Mercury and Zinc invalidated because of blank contamination.

DER Biology Section — Acute-bioassay Bench Sheet

Sample Source: Jacksonville NAS
Address/City:
County: Duval
Contact/District:
NPDES Permit #: FL0000957 Outfall #: 001

Sample Collection: Date 2-27-89 Time 0915
Test Beginning: Date 2-28-89 Time 1100
Test Ending: Date 3-2-89 Time 1130
Test Organism: Ceriodaphnia dubia
Life Stage/Age: neonate

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

Remarks: No Residual Chlorine
higher cond. in 27 +28 may have caused mortalities
noted - contamination?

Instrument Calibrations:

	pH	DO	Cond	Temp
0 hr	7.9 @ 7.9	8.8 @ 22	1300 @ 215 @ 313	21.2 @ 21.1
24 hr	7.9 @ 7.9	8.8 @ 21.9		
48 hr	7.9 @ 7.9	8.8 @ 22.4	1329 @ 22.4 @ 335	20.3 @ 20.2

Conc.	Chamber #	Number Live 0	24	48	DO (mg/l) 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	Cond. (µmhos/cm) 0	24	48
Control	1	5	5	5	8.4	8.5	8.8	8.1		8.3	20.2		22.0			
"	2	5	5	5	8.4		8.8	8.1		8.4						
"	3	5	5	5	8.4		8.8	8.1		8.4						
"	4	5	5	5	8.5		8.3	8.1		8.5				245		265
10%	5	5	5	5	8.5		8.7	8.1		8.4	19.9		22.0			
"	6	5	5	5	8.5		8.7	8.1		8.4						
"	7	5	5	5	8.5		8.7	8.1		8.4						
"	8	5	5	5	8.5		8.7	8.1		8.4				290		365
30%	9	5	5	5	8.5		8.7	8.0		8.3	19.9		22.0			
"	10	5	5	5	8.5		8.7	8.0		8.3						
"	11	5	5	5	8.5		8.7	8.0		8.3						
"	12	5	5	5	8.6		8.7	8.0		8.3				370		405
50%	13	5	5	5	8.6		8.6	7.9		8.2	20.0		22.1			
"	14	5	5	5	8.6		8.6	7.9		8.2						
"	15	5	5	5	8.6		8.6	7.9		8.2						
"	16	5	5	5	8.6		8.7	7.9		8.2				450		485
70%	17	5	5	5	8.6		8.6	7.7		8.1	20.1		22.0			
"	18	5	5	5	8.6		8.6	7.7		8.1						
"	19	5	5	5	8.6		8.6	7.7		8.1						
"	20	5	5	5	8.6		8.6	7.7		8.1						
85%	21	5	5	5	8.6		8.6	7.6		7.9	20.0		22.1	540		585
"	22	5	5	4	8.7		8.6	7.6		7.9						
"	23	5	5	5	8.7		8.6	7.6		7.9						
"	24	5	5	5	8.6		8.6	7.6		7.9						
100%	25	5	5	5	8.7		8.5	7.4		7.7	20.1		22.1	600		660
"	26	5	5	5	8.7		8.5	7.4		7.7						
"	27	5	5	3	8.7		8.5	7.4		7.7						700
"	28	5	5	4	8.7		8.6	7.4		7.5				660		570
Initials		SHW	MF	MF	SHW		JMF	SHW	JMF →		JHW		JMF	SHW		JMF
Recorded by:		MF	MF	MF	KML		SHW	KML	SHW →		KML		SHW	KML		SHW

Investigators' Signatures

Steven H. Wolf
K M Lardung
M Farrell

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:	—	—	0.005	Hach	
Lab Tot. Resid. Cl2:	—	—	<0.01	Hach	MF
Alkalinity:	122	130	40	Hach	mf
Hardness:	120	135	200	Hach	mf
Total Ammonia:	0.0	0.27	0.0	Orion	MF

Slope = 58.3

DER Biology Section — Acute-bioassay Bench Sheet

Sample Source: Jacksonville NAS
Address/City:
County: Duval
Contact/District:
NPDES Permit #: FL0000957 Outfall #: 001

Sample Collection: Date 2-27-89 Time 0915
Test Beginning: Date 2-28-89 Time 1100
Test Ending: Date 3-2-89 Time 1130
Test Organism: Daphnia pulex
Life Stage/Age: neonate

Test Number: 2 of 3 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. (umhos/cm)		
Conc.	Chamber #	0	24	48	0	24	48	0	24	48	0	24	48	0	24	48
Control	29	5	5	5	8.3	8.7		8.1		8.2	20.1		22.0			
"	30	5	5	5	8.3	8.7		8.1		8.2						
"	31	5	5	5	8.3	8.7		8.1		8.2						
"	32	5	5	5	8.3	8.7		8.1		8.2				245		270
100%	33	5	5	5	8.4	8.5		7.4		7.8	20.0		22.1			
"	34	5	5	5	8.4	8.5		7.4		7.8						
"	35	6	6	6	8.4	8.6		7.4		7.8						
"	36	5	5	4	8.4	8.6		7.4		7.8				655		740
Measured by:		SHW	MF	MF	SHW	JMF		SHW		JMF	SHW		JMF	SHW		
Recorded by:		MR	MF	MF	KML	SHW		KML		SHW	KML		SHW	KML		

Investigators' Signatures

Stephen H. Ward
K M Harding
M Faucett

Reviewer

Water-quality Parameters

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

DER Biology Section — Acute-bioassay ben...

Sample Source: Jacksonville NAS
Address/City: _____
County: _____
Contact/District: _____
NPDES Permit #: _____ Outfall #: _____

Sample Collection: Date 2-27-89 Time 0915
Test Beginning: Date 2-28-89 Time 1130
Test Ending: Date 3-2-89 Time 1130
Test Organism: Nitrogen leadsi
Life Stage/Age: 18 days

Test Number: 3 of 3 Test Type: Screening (Definitive) (Static) Static Renewal | Flow-through

Remarks:

Instrument Calibrations:

	pH	DO	Cond	Temp
0 hr				
24 hr				
48 hr				

Conc.	Chamber #	Number Live 0	24	48	DO (mg/l) 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	Cond. (µmhos/cm) 0	24	48
Control	68	5	5	5	8.1	8.0	8.5	7.6	8.0	8.0	21.2	21.0	20.9			
"	113	5	4	4	8.2	8.0	8.5	7.6	8.0	8.0				225		230
10%	21	5	5	5	8.4	7.9	8.6	7.6	7.9	8.0	21.2	20.9	20.8			
"	271	5	5	5	8.4	7.9	8.6	7.6	7.9	8.0				275		275
30%	10	5	5	5	8.4	7.8	8.6	7.6	7.8	7.9	21.1	20.9	20.8			
"	12	5	5	5	8.4	7.8	8.6	7.6	7.8	7.9				370		370
50%	33	5	5	5	8.5	7.7	8.5	7.5	7.7	7.8	21.0	20.8	20.8			
"	19	5	5	5	8.5	7.7	8.5	7.5	7.7	7.8				465		470
70%	18	5	5	5	8.7	7.6	8.4	7.4	7.6	7.7	21.0	20.8	20.7			
"	14	5	5	5	8.8	7.5	8.4	7.3	7.6	7.7				555		560
85%	16	5	5	5	8.9	7.5	8.4	7.2	7.5	7.6	20.9	21.0	20.6			
"	38	5	5	5	8.9	7.5	8.4	7.2	7.5	7.6				620		630
100%	99	5	5	5	9.0	7.4	8.3	7.1	7.4	7.5	21.0	21.0	20.7			
"	64	5	5	5	9.1	7.4	8.3	7.1	7.4	7.5				695		705
C						8.8										
C						8.9										
10						8.4										
10						8.6										
30						8.6										
30						8.5										
50						8.4										
50						8.4										
70						8.4										
70						8.3										
85						8.3										
85						8.4										
100						8.1										
100						8.2										
Measured by:		KMF	MF	MF	SHW	SHW	JMF	SHW	SHW	JMF	SHW	SHW	JMF	SHW		JMF
Recorded by:		MF	MF	MF	KML	MF	SHW	KML	MF	SHW	KML	MF	SHW	KML		SHW

Investigators' Signatures

Reviewer

Water-quality Parameters

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

MICROTOX™ Data Reduction Sheet

SOURCE: NAS

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

SAMPLE DATA:

SAMPLE TYPE (EFFLUENT, LEACHATE, ETC.): effluent

DATE ASSAYED: 2-28-89 TIME: 9:50 AM

VISUAL COLOR: none 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: Leslie Williams REAGENT VIAL LOT NO. M-606

REMARKS:

MICROTOX™ 99% TEST

SAMPLE CUVETTE	% SAMPLE	READINGS 10 MIN	READINGS 15 MIN	Γ5	Γ15	NOTES
A1	0	52	43	X	X	
B1		54	44			
C1		59	48			
A2	12.38	61	51	-.10	-.12	
B2		60	50			
C2		62	52			
A3	24.75	61	51	-.10	-.12	
B3		60	50			
C3		62	52			
A4	49.5	64	54	-.15	-.17	
B4		65	54			
C4		64	55			
A5	99	72	60	-.21	-.23	
B5		71	59			
C5		67	56			
EC_{50} (MIN, °C)					stimulatory	

REVIEWED BY:

DATE: 9/14/89