ICR TREATMENT STUDY SUMMARY REPORT

Evaluation of Membrane Technology using a Full Scale Membrane Plant for Compliance with the Information Collection Rule

Conducted during the period of November 1, 1997 through November 1, 1998.

Prepared by:

The City of Boynton Beach
Utilities Department
5469 W. Boynton Beach Blvd.
Boynton Beach, FL, 33437

In July 1999.

For:
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Boynton Beach West Water Plant, ICR # 1085

Attachments : 3 diskettes containing the Data Collection Spreadsheets and Treatment Study Summary Report.

CITY OF BOYNTON BEACH
UTILITIES DEPARTMENT

INFORMATION COLLECTION RULE
SUMMARY REPORT

I. CONCLUSIONS AND RECOMMENDATIONS

II. BACKGROUND INFORMATION

1. The treatment plant was a 4 million gallon membrane softening plant using ground water from wells, sulfuric acid for pH reduction, cartridge filters for sand and silt removal, Nano Filtration (NF-70) membranes followed by polyphosphate additions for corrosion control, degassification for hydrogen sulfide removal and ammonia and chlorine addition for disinfection (see attached process overview and history sheet).

2. See attached plant schematic.

3. The west water treatment plant is planned for the eventual build out capacity of 16 million MGD.

4. The treatment challenge for the west plant remains keeping the membranes clean, so as to work effectively and efficiently; and to keep the chemical and electrical cost as low as possible without effecting the water quality.

III. MATERIALS AND METHODS

1. Please see attached treatment process sheets.

2. Please see attached plant schematics.

3. Please see attached design data sheets.

4. Please see attached plant ICR procedures.

IV. RESULTS AND DISCUSSION

1. Problems the plant encountered were during the data collection period - the plant was under construction, expanding from 4 to 8 MGD which required several plant shut downs. We were concerned that, due to construction, normal maintenance and membrane cleaning, the shut-down hours may exceed the maximum amount allowed; however, that did not happen.

2. Impact of Specific Variables on Performance was not investigated.

3. Cost Information and Analysis was not performed.

CITY OF BOYNTON BEACH
ICR TREATMENT STUDY
CONCLUSIONS AND RECOMMENDATIONS

The City of Boynton Beach Utilities Department has operated its membrane softening plant 24 hours a day, 7 days a week since January, 1994. This plant is one of two plants serving a common distribution grid. Our other plant is a lime softening plant which has been in service since 1963, with a capacity of 19.2 MGD. Over this five year period, the membrane process has proved reliable and cost effective in providing our customers with safe, aesthetically pleasing drinking water that exceeds any existing and proposed EPA Drinking Water Regulations.

The purpose of the ICR Full Scale Membrane Study was to demonstrate that membrane treatment is extremely effective in DBP precursor, TOC, and color removal, resulting in a Finished Water extremely low in THM's and HAA's even when using free chlorine. This study had demonstrated this conclusion.

Removal rates for color, TOC, and DBP precursors were excellent during the study. The average source water (raw) color was 44 C.U.; the average finished water color was 1 C.U., representing a 97.7% removal rate. The average feed TOC was 13.9 mg/l; the average permeate TOC was 2.2 mg/l, representing an 85% reduction rate.

As expected, these high removal rates resulted in a major reduction in THM and HAA precursors and subsequent formation of DBP's in chlorinated water.

The SDS Total THM Formation Potential for the feed water averaged 697 ppb TTHM's. The average SDS TTHM formation potential in the permeate was 28 ppb. This is well below the proposed 40 ppb MCL of the Stage 2 Disinfectant/Disinfectant by Product Rule. The average SDS HAA6 formation potential for the feed water was 381 ppb. The SDS permeate formation averaged 19 ppb HAA6. This is also well below the 30 ppb MCL proposed for HAA5 in Stage 2 of the D/DBP Rule. In summary, our membrane process reduces SDS TTHM Formation by 96% and HAA6 SDS formation by 95%.

Moderate softening was also realized during the study. We noted a 72% removal rate for Total Hardness, a 74% reduction in Calcium Hardness and a 65% reduction in Conductivity.

Our experience is that our current treatment process provides sufficient removal of contaminants to meet current and proposed regulations. The beauty of the technology is that it can be tailored, reasonably and economically, to meet more strict future regulations by replacing the current membranes with tighter ones. Membranes can also be treated chemically (loosened) to meet treatment goals. Another key benefit of membranes is that plant expansions occur in modules of treatment capacity. This makes it extremely easy and economical to increase production without incurring a lot of capital costs.

This treatment study and 5.5 years of successful operation of our plant has proven to us that membrane softening is a viable method of treatment and an excellent process for Disinfectant by Product precursor removal. We intend to expand our membrane capacity to replace lime softened production and to meet new demands. We have recently expanded from 4 MGD membrane capacity to 8 MGD, halfway to our 16 MGD build out at this facility. We highly recommend membrane treatment.

CITY OF BOYNTON BEACH
WEST WATER TREATMENT PLANT

HISTORY AND COST

Design
The plant was designed in 1989 by CH2M Hill.

Engineering
At 90% design, the plant was value engineered in 1990 by Stanley Consultants of Florida, Inc.

Contract No. 2
The general construction contract for building, equipment, and landscaping was signed December, 1991 with Poole and Kent Company. Final amount $ 9,304,468.

Production
Production of drinking water from the plant started January 31, 1994.

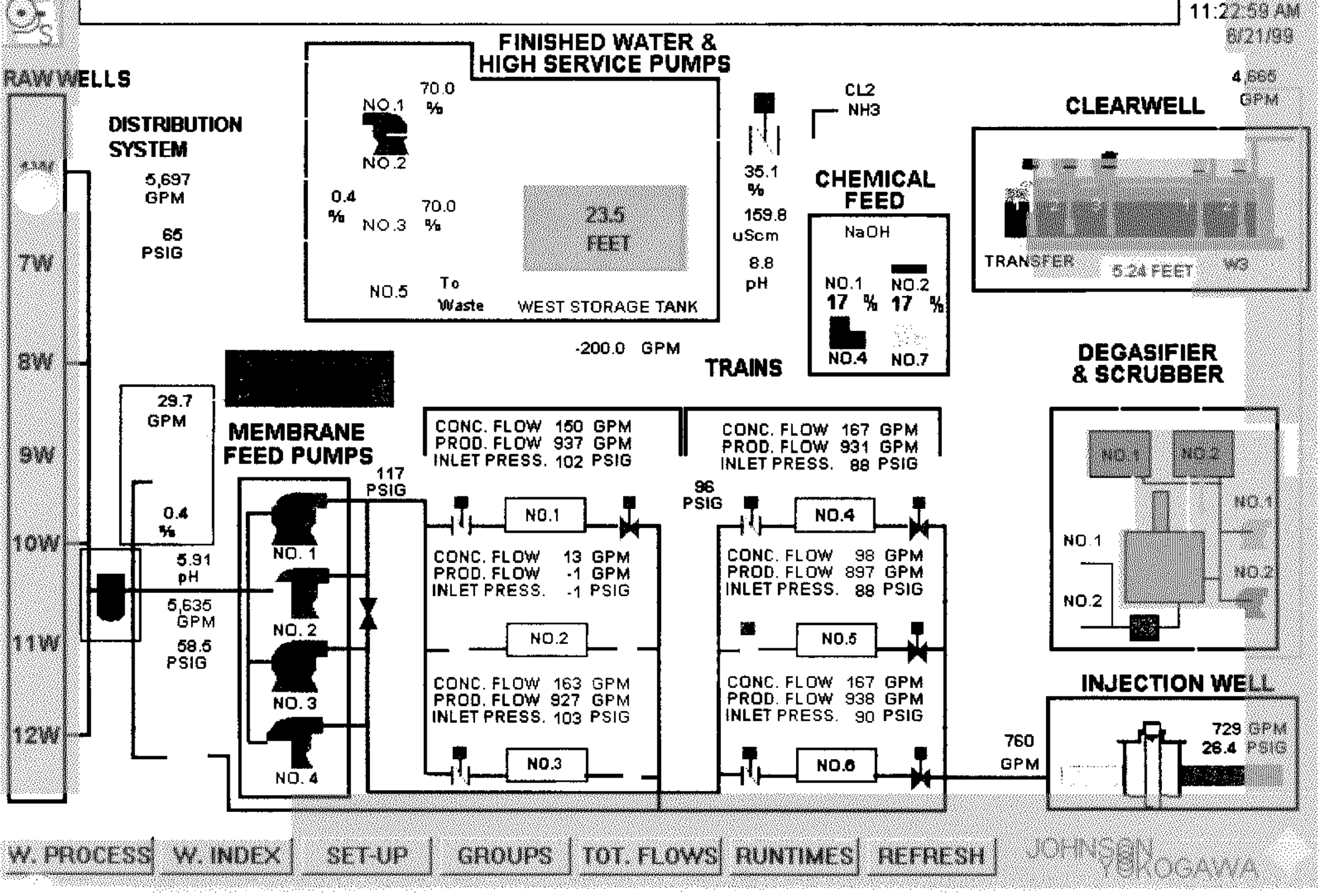
Completion
Final acceptance of the plant facility was September 9, 1994.

Cost
Total cost of the plant including land, wells, pipelines, injection well, and engineering was approximately $ 22,000,000.

Capacity
Current total capacity of the plant is eight million gallons per day.

Build-Out Capacity
Total build-out capacity is sixteen million gallons per day.

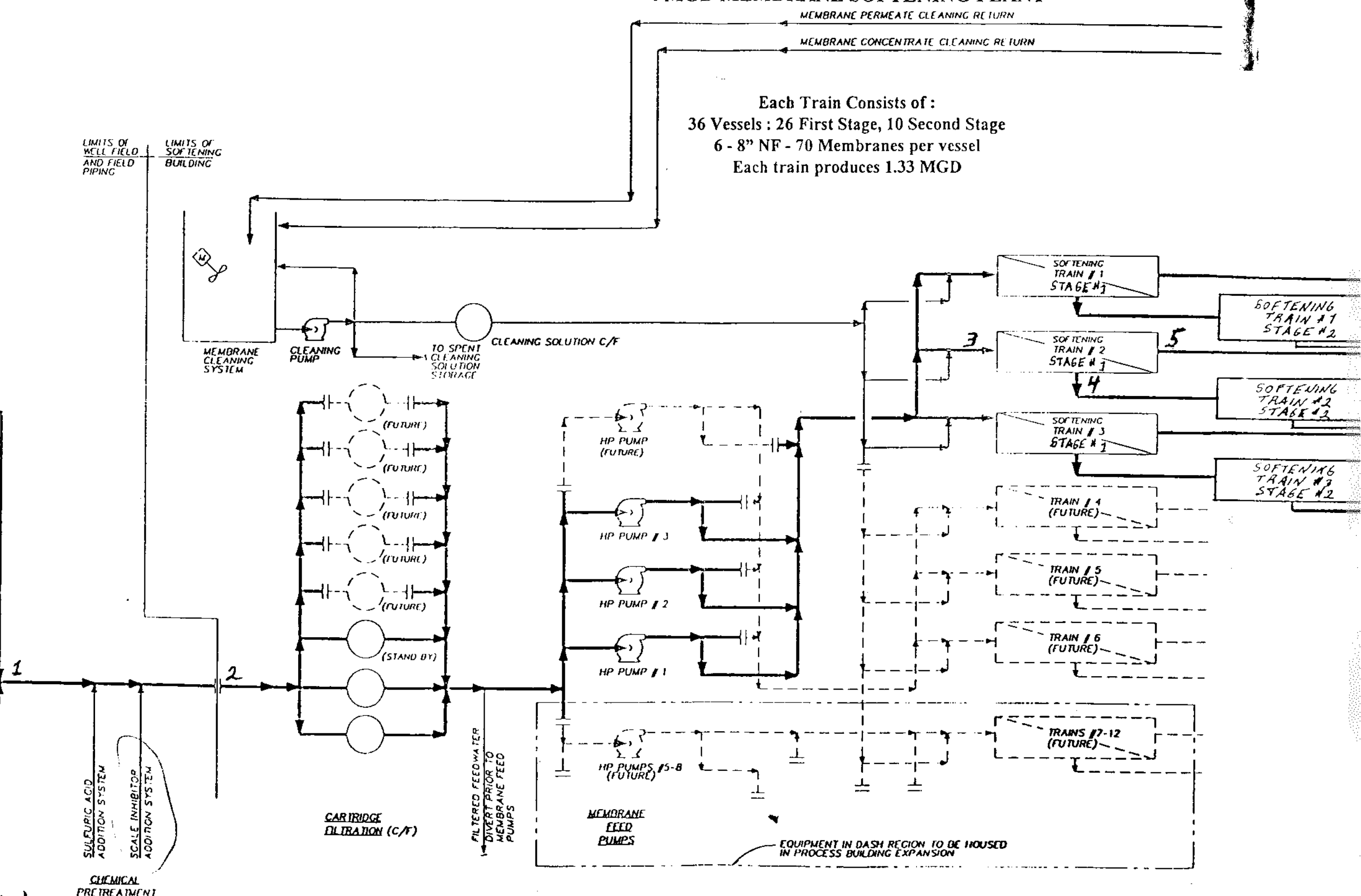
Plant Expansion
Expansion of the plant from four million gallons per day to eight million gallons per day was completed January 15, 1999. Cost of expansion was $3,000,000.



11:22:59 AM
6/21/99
RAW WELLS
7W
8W
9W
10W
11W
12W
DISTRIBUTION SYSTEM
5,697 GPM
65 PSIG
FINISHED WATER & HIGH SERVICE PUMPS
NO.1
70.0 %
NO.2
0.4 %
NO.3
70.0 %
23.5 FEET
NO.5
To Waste
WEST STORAGE TANK
CL2
NH3
35.1 %
159.8 uScm
8.8 pH
CHEMICAL FEED
NaOH
NO.1 17 %
NO.2 17 %
NO.4
NO.7
4,665 GPM
CLEARWELL
TRANSFER
5.24 FEET
-200.0 GPM
TRAINS
DEGASIFIER & SCRUBBER
29.7 GPM
0.4 %
MEMBRANE FEED PUMPS
117 PSIG
NO. 1
NO. 2
NO. 3
NO. 4
5.91 pH
5,635 GPM
58.5 PSIG
CONC. FLOW 150 GPM
PROD. FLOW 937 GPM
INLET PRESS. 102 PSIG
CONC. FLOW 167 GPM
PROD. FLOW 931 GPM
INLET PRESS. 88 PSIG
96 PSIG
NO.1
NO.4
CONC. FLOW 13 GPM
PROD. FLOW -1 GPM
INLET PRESS. -1 PSIG
CONC. FLOW 98 GPM
PROD. FLOW 897 GPM
INLET PRESS. 88 PSIG
NO.2
NO.5
CONC. FLOW 163 GPM
PROD. FLOW 927 GPM
INLET PRESS. 103 PSIG
CONC. FLOW 167 GPM
PROD. FLOW 938 GPM
INLET PRESS. 90 PSIG
NO.3
NO.6
NO.1
NO.2
INJECTION WELL
760 GPM
729 GPM
26.4 PSIG
W. PROCESS
W. INDEX
SET-UP
GROUPS
TOT. FLOWS
RUNTIMES
REFRESH
JOHNSON YOKOGAWA

CITY OF BOYNTON BEACH
4 MGD MEMBRANE SOFTENING PLANT

Each Train Consists of :
36 Vessels : 26 First Stage, 10 Second Stage
6 - 8" NF - 70 Membranes per vessel
Each train produces 1.33 MGD



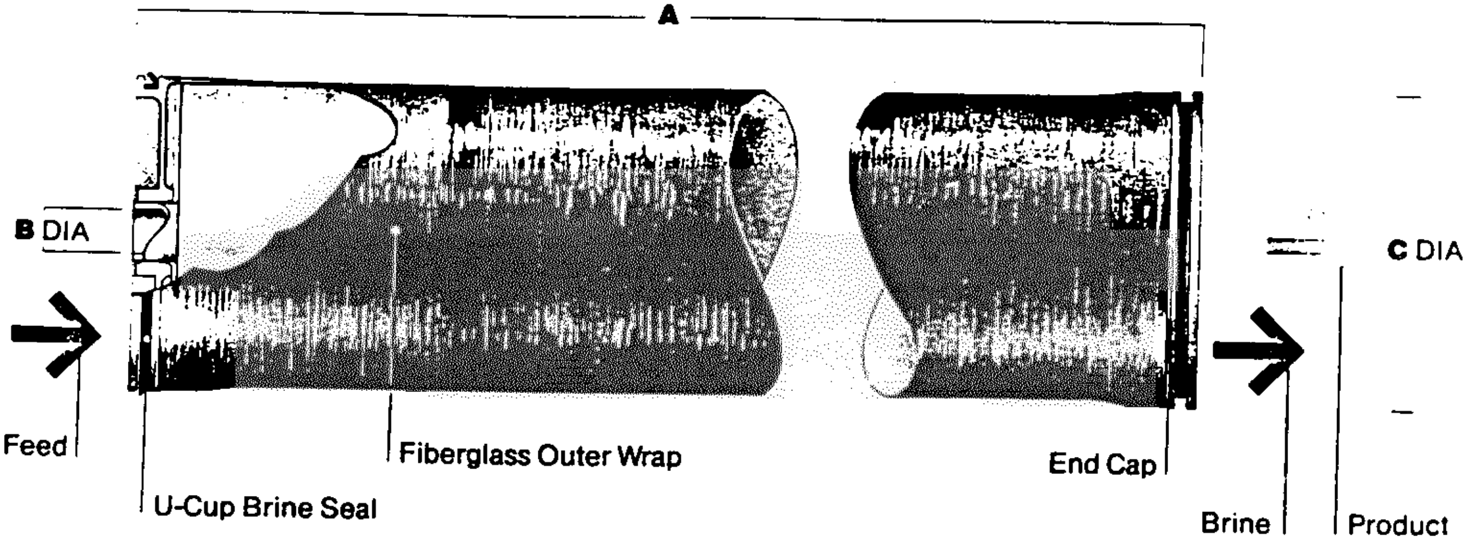
Technical Bulletin

FILMTEC® Membranes

8" NF70 Nanofiltration Element Specifications

	Product Water Flow Rate gpd (m^3/D)	Minimum Magnesium Sulfate Rejection (%)
NF70-8040	7000 (26)	95

1. Permeate flow and salt rejection based on the following conditions: 2000 ppm $MgSO_4$, 70 psi (5.5 MPa), 77°F (25°C). 2. Flow rates for individual elements may vary ±20%.



perating Limits

embrane Type	Thin-Film Composite
aximum Operating Pressure	250 psi (1.7 MPa)
aximum Operating Temperature	95°F (35°C)
aximum Feed Turbidity Free	1 NTU
ee Chlorine Tolerance	<0.1 ppm
Range:	
Continuous operation	3–9
Short-term (30 min.), cleaning	1–11
ximum Feed Flow	60 gpm (230 lpm)
ximum Feed Silt Density Index	SDI 5

'e Element Recovery (Permeate v to Feed Flow):	Recovery	Dimensions (Inches) A	B	C
'0-8040	0.15	40.0	1.125	7.9

nsult most recent DESIGN GUIDELINES for multiple element applications and mended element recovery rates for various feed sources. 4. Element to fit ich I D pressure vessel

SULFURIC ACID SYSTEM

PWT WORLDWIDE
PWT AMERICAS
WATER & WASTEWATER PROJECTS

INTRODUCTION.

The acid feed system is designed to inject sulfuric acid upstream of the membrane softening feed cartridge filters. Sulfuric acid is used to control the raw water pH and helps as an antiscalant by inhibiting mineral scale formation of carbonate in membrane systems.

Changes in the feedwater characteristics, changes in the performance characteristics of chemicals (concentration, purity, type) or modification of system components may require changes in system operation.

Flow rates, times, volumes and other operational parameters should be changed as required to meet changing conditions. These changes should be made only after careful consideration of the consequent changes to other equipment and after consultation with PWT Americas and the membrane manufacturer.

PWT WORLDWIDE
PWT AMERICAS
WATER & WASTEWATER PROJECTS

SULFURIC ACID SYSTEM

VESSEL DATA:

Day Tank:

Number provided	One (1)
Type	Vertical, cylindrical, dished bottom
Diameter	2'-8"
Straight side	5'-6"
Material	Carbon steel
Lining	10-12 mils baked phenolic
Design pressure	Atmospheric

CHEMICAL DATA:

Volume	190 gallons
Chemical	Sulfuric acid 93% solution

CHEMICAL PUMPS:

Number provided	Three (3)
Type	Positive displacement
Material	Teflon/Viton
Capacity	1.5-30 gph
Motor	1/2 hp, 1750 rpm, 115 V/3 Ph/60 Hz, TENV with adjustable speed drive and manual stroke control.

PWT WORLDWIDE
PWT AMERICAS
WATER & WASTEWATER PROJECTS

DESCRIPTION OF OPERATION.

General Description.

The acid feed system is used to inject 93% sulfuric acid into the raw water feed to the R.O. system for pH control. This system consists of one 190 gallon day tank and three positive displacement metering pumps.

Theory of Operation.

93% sulfuric acid from a bulk storage tank is pumped into the day tank in response to the tank level. From the day tank the acid is injected into the raw water feed header upstream of the cartridge filters. The acid feed system is controlled automatically based on raw water pH and flow. The pump speed is automatically adjusted in proportion to the 4-20 ma signal generated by the flow transmitter.

Initial Startup.

Check the solution tank and make sure it has the proper concentration and volume of chemical. Check the chemical feed pumps and make sure they are properly lubricated.

Open the manual isolation valves in the suction line leading to the pumps and allow the solution to flow into the pump suctions. It may be necessary to vent the discharge piping in order to prime the pumps.

PWT WORLDWIDE
PWT AMERICAS
WATER & WASTEWATER PROJECTS

COMPONENT DATA

FEED FLOW CONTROL VALVES.

Number per train	One (1)
Size	4"
Type	Ball
Class	150 lbs.
Body material	316 stainless steel
Wetted parts material	316 stainless steel
Seal	TFE
Manufacturer	Jamesbury
Model Number	6150-31-3600TT
Actuator	AUMA SG.07 with #501 positioner
Signal	4-20 mA

CONCENTRATE FLOW CONTROL VALVES.

Number per train	One (1)
Size	2"
Type	Ball
Class	150 lbs.
Body material	316 stainless steel
Wetted parts material	316 stainless steel
Seal	TFE
Manufacturer	Apollo
Model Number	SS-B28-00
Actuator	AUMA SG.05 with #501 positioner
Signal	4-20 mA

MEMBRANE SOFTENING SYSTEM

PWT WORLDWIDE
PWT AMERICAS
WATER & WASTEWATER PROJECTS

CARTRIDGE FILTER DATA:

Model	408MS04-316-8FOLD-C150
Manufacturer	Filterite
Quantity	Three (3)
Material	316 stainless steel vessel
Number of cartridges	102 (40" length) (34 per unit)
Cartridge type	5 micron polypropylene
Cartridge model number	5P40U
Maximum flow rating	1635 gpm
Maximum pressure rating	150 psig

FEED PUMP DATA:

Number installed	Three (3)
Type	End suction horizontal centrifugal
Material	316 stainless steel
Design flow	2320 gpm at 370 ft. TDH
Manufacturer	Goulds
Model	34105
Motor	300 hp, 3600 rpm, 460/3/60
Motor enclosure	ODP
Motor insulation	F

NOTE: The feed pumps are provided with variable speed drives.

MEMBRANE SOFTENING SYSTEM

PWT WORLDWIDE
L★A
WATER & WASTEWATER PROJECTS

COMPONENT DATA

MEMBRANE ASSEMBLIES.

Number of trains	Three (3)
Design capacity per train	1,333,333 gpd
Design permeate flow per train	925 gpm
Design recovery	85%
Design concentrate flow per train	163 gpm
Membrane Manufacturer	FilmTec
Membrane Model No.	NF70-8040
Membrane element type	Spiral wound
Membrane type	Thin film composite
Membrane element nominal diameter	7.9"
Membrane element nominal length	40"
Number of elements per pressure tube	6
Number of pressure tubes per train	36
Total number of elements per train	216
Number of concentration stages	2
Pressure tube array	26 / 10

City of Boynton Beach
Tabular Summary of Source (Raw) Water Quality
ICR Study 11/1/97- 11/1/98

Water Quality Parameter	Average Yearly Concentration	Standard Deviation	Maximum Yearly Value	Minimum Yearly Value
Temperature (C)	N.A.	N.A.	N.A.	N.A.
pH	7.31	0.16	8.35	6.8
Turbidity (ntu)	0.53	2.98	43	0.08
Alkalinity	242.1	10.61	267	199
(mg/l as CaCO3)				
Calcium Hardness	246.6	10.50	290	180
(mg/l as CaCO3)				
Total Hardness	251.2	11.22	316	187
(mg/l as CaCO3)				
Iron , (mg/l)	0.03	0.04	0.26	< 0.03
Color (units)	44.2	3.9	65	32
Chloride (mg/l)	38.3	1.3	42	35.8
Conductivity, umhos	578	10	607	549
Sodium, mg/l	22.60	1.02	24.8	18.49
TOC (mg/l)	N.A.	N.A.	N.A.	N.A.
UV 254	N.A.	N.A.	N.A.	N.A.
Bromide (ug/l)	N.A.	N.A.	N.A.	N.A.

City of Boynton Beach
Tabular Summary of Finished Water Quality
ICR Study 11/1/97- 11/1/98

Water Quality Parameter	Average Yearly Concentration	Standard Deviation	Maximum Yearly Value	Minimum Yearly Value
Temperature (C)	25.04	1.20	28.0	21.4
pH	8.59	0.22	9.15	7.27
Turbidity (ntu)	0.16	0.13	1.03	0.017
Alkalinity	67.11	9.89	87	34
(mg/l as CaCO3)				
Calcium Hardness	66.92	11.58	87	36
(mg/l as CaCO3)				
Total Hardness	69.24	10.89	92	46
(mg/l as CaCO3)				
Iron , (mg/l)	0.03	0.02	0.217	<0.03
Color (units)	1.43	3.43	31	0
Chloride (mg/l)	30.23	20.15	34.3	21
Conductivity, umhos	245.52	38.75	574	30.2
Sodium, mg/l	22.40	2.51	29.56	12.75
TOC (mg/l)	N.A.	N.A.	N.A.	N.A.
UV 254	N.A.	N.A.	N.A.	N.A.
Bromide (ug/l)	N.A.	N.A.	N.A.	N.A.
THM4, D.S. (ug/l)	8.63	12.20	38	16

City of Boynton Beach
ICR Analytical Methods Table
11/1/97- 11/1/98

Analyte	Method	Minimum Reporting Level
Alkalinity	SM 2320 B	5 mg/l
Ammonia	SM 4500 NH3 F	0.1 mg/l
Bromide	EPA 300.0	30 ug/l
Calcium Hardness	SM 2340 C	1.0 mg/l
Chlorine Residual	SM 4500 Cl D	0.1 mg/l
Conductivity	EPA 2520 B.	1.0 umhos
BCAA, DBAA, DCAA,MBAA, MCAA, TCAA	EPA 552.2	2.0 ug/l MCAA, 1.0 ug/l for other analytes
pH	EPA 150.1	Not Applicable
Temperature	SM 2550 B	Not Applicable
CHCl3, DBCM, DCBM, CHBr3	EPA 502.2	1.0 ug/l each analyte
Total Hardness	SM 2340 C	1.0 mg/l
TOC	EPA 415.1	1.0 mg/l
TOC	EPA 415.1	0.77 mg/l
TOX	SM 9020 B	40 ug/l
	SM 5320 B	8.2 ug/l
Turbidity	SM 2130 B	0.1 NTU
UV 254	SM 5910	0.005 cm -1

City of Boynton Beach
Laboratories and Analyses Performed
ICR Membrane Study 11/1/97- 11/1/98

Laboratory	Dates of Service	Analyses Performed
City Of Boynton Beach	11/1/97 - 11/1/98	Alkalinity, Ammonia, Calcium Hardness, Conductivity, Chlorine residual, pH, Temperature, THM4, Total Hardness, Turbidity, UV 254
Broward Testing Lab	12/4/97- 10/22/98	Bromide, HAA6
Free-Col Laboratories	3/23/98 - 10/22/98	TOC, TOX
First Coast Laboratory	12/8/97 - 3/5/98	TOC, TOX
Envirodyne Inc.	11/1/97- 11/17/98	Bromide, HAA6, TOC, TOX

City of Boynton Beach
Laboratory Summary List
ICR Membrane Study 11/1/97- 11/1/98

1) City of Boynton Beach
Water Quality Laboratory
5469 W. Boynton Beach Blvd.
Boynton Beach, FL, 33437

Steven Evans, Lab Supervisor
Phone (561) 742- 6464
Fax (561) 731- 0065

2) Broward Testing Laboratory Inc.
4416 N.E. 11 th Ave.
Fort Lauderdale, FL, 33334

Gary Meyer
Lab Director
Phone (954) 776- 7238
Fax (440) 449- 8585

3) Free-Col Laboratories, LTD.
P.O. Box 557
Meadville, PA, 16335

John Paraska
Quality Assurance Supervisor
Phone (814) 724- 6242
Fax (814) 333- 1466

4) First Coast Environmental Laboratory Inc.
8818 Arlington Expressway
Jacksonville, FL, 32211

Barry C. Byrd, Jr.
Technical Director
Phone (904) 725- 4847
Fax (904) 725 -2215

5) Envirodyne Inc.
4805 N.W. 2 nd Ave.
Boca Raton, FL, 33431

Mike Rentoumis
Phone (561) 989 -5225
Fax (561) 989- 5204

CITY OF BOYNTON BEACH
UTILITIES DEPARTMENT
WEST WATER PLANT

INFORMATION COLLECTION RULE
MEMBRANE TRAIN NUMBER TWO
CLEANING INFORMATION

I.C. R. TESTING	STARTED	NOVEMBER 1ST, 1997	FEED (PSI) 113
I.C.R. TESTING	FINSHED	NOVEMBER 3OTH, 1998	FEED (PSI) 104

MEMBRANE TRAIN NUMBER TWO CLEANING DATES (1ST CLEANING):

JANUARY 25TH,1998 - JANUARY 30TH,1998

MEMBRANE TRAIN NUMBER TWO CLEANING DATA (1ST CLEANING):

	BEFORE CLEANING	AFTER CLEANING
FEED PRESSURE	113 PSI	90 PSI

MEMBRANE TRAIN NUMBER TWO CLEANING DATES (2ND CLEANING):

SEPTEMBER 8TH, 1998 - SEPTEMBER 11TH, 1998

MEMBRANE TRAIN NUMBER TWO CLEANING DATA (2ND CLEANING):

	BEFORE CLEANING	AFTER CLEANING
FEED PRESSURE	106 PSI	100 PSI

NOTE - MEMBRANES WERE INSTALLED JANUARY 1994:

City of Boynton Beach
West Water Treatment Plant
Pressures & Flows
Nov-97
Train 2

	Comments	1st Stage Feed (GPM)	2nd Stage Feed (GPM)	1st Stage Perm (GPM)	2nd Stage Perm (GPM)	Total Perm (GPM)	Total Conc (GPM)	1st Stage Recovery	2nd Stage Recovery	Train Recovery	1st Stage Feed (PSI)	2nd Stage Feed (PSI)	2nd Stage Conc (PSI)	1st Stage Perm (PSI)	Total Perm (PSI)	1st Stage (DP)	2nd Stage (DP)	Train (DP)
1		1092	400	692	231	923	169	63.4%	57.8%	84.5%	113	96	81	57	12.7	17	15	32
2		1093	401	692	234	926	167	63.3%	58.4%	84.7%	113	95	80	57	12.8	18	15	33
3		1083	391	692	222	914	169	63.9%	56.8%	84.4%	114	93	79	56	12.9	21	14	35
4		1084	393	691	235	926	158	63.7%	59.8%	85.4%	113	95	80	57	12.8	18	15	33
5		1080	395	685	230	915	165	63.4%	58.2%	84.7%	112	94	80	57	13.0	18	14	32
6		1091	403	688	237	925	166	63.1%	58.8%	84.8%	111	92	77	56	11.0	19	15	34
7		1088	394	694	231	925	163	63.8%	58.6%	85.0%	110	92	78	56	12.8	18	14	32
8		1077	383	694	226	920	157	64.4%	59.0%	85.4%	114	93	81	57	12.8	21	12	33
9		1090	391	699	227	926	164	64.1%	58.1%	85.0%	112	93	80	56	12.8	19	13	32
10		1089	392	697	228	925	164	64.0%	58.2%	84.9%	112	91	80	56	12.4	21	11	32
11		1091	378	713	224	937	154	65.4%	59.3%	85.9%	111	92	77	55	12.6	19	15	34
12		1093	402	691	233	924	169	63.2%	58.0%	84.5%	111	93	76	55	11.2	18	17	35
13		1086	396	690	230	920	166	63.5%	58.1%	84.7%	113	95	80	57	12.8	18	15	33
14		1085	389	696	224	920	165	64.1%	57.6%	84.8%	114	92	80	57	13.0	22	12	34
15		1086	389	697	226	923	163	64.2%	58.1%	85.0%	112	91	80	57	12.7	21	11	32
16		1091	391	700	228	928	163	64.2%	58.3%	85.1%	113	92	82	57	12.8	21	10	31
17		1089	392	697	230	927	162	64.0%	58.7%	85.1%	112	92	80	57	12.9	20	12	32
18		1077	395	682	232	914	163	63.3%	58.7%	84.9%	111	95	78	56	13.0	16	17	33
19		1089	398	691	232	923	166	63.5%	58.3%	84.8%	113	94	80	57	12.8	19	14	33
20		1078	387	691	224	915	163	64.1%	57.9%	84.9%	114	93	80	57	12.4	21	13	34
21		1091	392	699	230	929	162	64.1%	58.7%	85.2%	112	95	78	56	13.0	17	17	34
22		1091	394	697	234	931	160	63.9%	59.4%	85.3%	113	92	80	57	12.8	21	12	33
23		1075	393	682	232	914	161	63.4%	59.0%	85.0%	110	90	80	57	13.0	20	10	30
24		1095	396	699	231	930	165	63.8%	58.3%	84.9%	113	92	80	57	12.5	21	12	33
25		1073	390	683	234	917	156	63.7%	60.0%	85.5%	112	92	80	57	12.8	20	12	32
26		1068	382	686	229	915	153	64.2%	59.9%	85.7%	110	95	82	57	13.0	15	13	28
27		1087	389	698	230	928	159	64.2%	59.1%	85.4%	113	92	80	57	12.6	21	12	33
28		1091	391	700	230	930	161	64.2%	58.8%	85.2%	113	92	80	57	12.8	21	12	33
29		1093	394	699	229	928	165	64.0%	58.1%	84.9%	113	92	80	57	12.8	21	12	33
30		1079	393	686	229	915	164	63.6%	58.3%	84.8%	114	92	80	56	12.8	22	12	34
31																		
High		1095	403	713	237	937	169	65.4%	60.0%	85.9%	114	96	82	57	13.0	22	17	35
Low		1068	378	682	222	914	153	63.1%	56.8%	84.4%	110	90	76	55	11.0	15	10	28
Average		1086	392	693	230	923	163	63.9%	58.5%	85.0%	112	93	80	57	12.7	19	13	33

City Of Bov Beach
West Water nent Plant
Cleaning
1/26/98
Train 2

STAGE 1																			
Operator																			
TD	Rinse	**ACID**		Rinse	**NaOH**		Rinse	**NaOH**		Rinse	**NaOH & EDTA**		Rinse	**NaOH & Soap**		Rinse			Rinse
# of Rinses	1			1			1			1			1			3			
Acid Gal		5 gal																	
NaOH Gal					5 gal			5 gal			5 gal			5 gal					
EDTA Gal											2 gal								
Soap														4 oz					
Chlorine																			
Time		1430	1530		1610	1625		1730	1830		1925	805		925	1045				
pH		1.7	1.8		12	12		12	12		12	12		12	12				
Feed Pressure		30	30		30	30		30	30		30	30		30	30				
Flow GPM		738	763		730	732		722	750		725	780		753	756				
Appearance		Clear	Clear		Clear	Brown		Clear	Tan		Clear	Brown		Clear	Foamy				
				neut							overnight			wash 5 min					
											soak			soak 15 min					
STAGE 2		**ACID**			**NaOH**			**NaOH**			**NaOH & Soap**			**CL2**			**NaOH**		
# of Rinses	1			1			2			2			3			1			3
Acid Gal		5 gal																	
NaOH Gal					5 gal			5 gal			5 gal						5 gal		
EDTA Gal																			
Soap											4 oz								
Chlorine														3 gal					
Time		1340	805		915	930		1035	1135		1300	810		1120	1220		1345	805	
														52	43				
pH		1.6	1.7		12	12		12	12		12	12		7	7		12	12	
Feed Pressure		30	30		30	30		30	30		30	30		30	30		30	30	
Flow GPM		425	425		418	420		425	431		435	435		430	430		432	452	
Appearance		Clear	Clear		Clear	Brown		Clear	Clear		Clear	Light Tan		Clear	Clear		Clear	Light Tan	
		overnight		neut							overnight						overnight		
		soak									soak						soak		

City Of Boynton Beach

West Water [illegible]ent Plant

Clea[illegible]ing

9/8/98

Train 2

STAGE 1																
Operator																
	Rinse	ACID		Rinse	NaOH		Rinse	NaOH		Rinse	NaOH & EDTA		Rinse	NaOH & SOAP		Rinse
# of Rinses	1			1			3			2			2			3
Acid Gal		5		neut			neut									
NaOH Gal					5			5			5			5		
EDTA Gal											2					
Soap														4 oz		
Chlorine																
Time		900	1000		1130	1140		1310	1410		1605	810		940	1055	
Cl2 ppm																
pH		1.8	2.0		12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Feed Pressure		30	30		30	30		30	30		30	30		30	30	
Flow GPM		731	750		748	740		742	740		748	796		782	793	
Appearance		CLEAR	CLEAR		BROWN	BROWN		CLEAR	TAN		CLEAR	BROWN		CLEAR	LT TAN	
											OVERNIGHT SOAK			Run 5 min	Soak 15 min	
STAGE 2		ACID			NaOH			NaOH			NaOH EDTA			NaOH SOAP		
# of Rinses				1			3			2			2			3
Acid Gal		5		neut												
NaOH Gal					5			5			5			5		
EDTA Gal											2					
Soap														4oz		
Chlorine																
Time		1310	810		930	945		1130	1230		1350	805		930	1050	
Cl2 ppm																
pH		1.9	2.0		12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Feed Pressure		30	30		30	30		30	30		30	30		30	30	
Flow GPM		444	463		442	446		438	447		416	462		455	557	
Appearance		CLEAR	CLEAR		CLEAR	BROWN		CLEAR	LT TAN		CLEAR	BROWN		FOAMY	FOAMY	
											OVERNIGHT SOAK			WASH 5	SOAK 15	

City of Bo[illegible] Beach

West Water Treatment Plant

Pressures & Flows

Jan-98

Train 2

	Comments	1st Stage Feed (GPM)	2nd Stage Feed (GPM)	1st Stage Perm (GPM)	2nd Stage Perm (GPM)	Total Perm (GPM)	Total Conc (GPM)	1st Stage Recovery	2nd Stage Recovery	Train Recovery	1st Stage Feed (PSI)	2nd Stage Feed (PSI)	2nd Stage Conc (PSI)	1st Stage Perm (PSI)	Total Perm (PSI)	1st Stage (DP)	2nd Stage (DP)	Train (DP)
1		1091	392	699	229	928	163	64.1%	58.4%	85.1%	113	92	80	57	13.0	21	12	33
2		1092	395	697	228	925	167	63.8%	57.7%	84.7%	113	92	80	58	12.6	21	12	33
3		1083	387	696	234	930	153	64.3%	60.5%	85.9%	114	93	79	57	12.4	21	14	35
4		1090	398	692	232	924	166	63.5%	58.3%	84.8%	113	94	79	56	12.8	19	15	34
5		1091	393	698	229	927	164	64.0%	58.3%	85.0%	113	92	80	56	13.0	21	12	33
6		1096	397	699	231	930	166	63.8%	58.2%	84.9%	114	92	78	57	12.9	22	14	36
7		1091	392	699	228	927	164	64.1%	58.2%	85.0%	113	95	80	57	12.5	18	15	33
8		1092	385	707	221	928	164	64.7%	57.4%	85.0%	113	92	78	56	12.4	21	14	35
9		1085	388	697	229	926	159	64.2%	59.0%	85.3%	113	92	78	56	12.4	21	14	35
10		1089	399	690	233	923	166	63.4%	58.4%	84.8%	114	97	80	57	12.6	17	17	34
11		1086	381	705	227	932	154	64.9%	59.6%	85.8%	114	92	80	56	13.0	22	12	34
12		1086	396	690	235	925	161	63.5%	59.3%	85.2%	113	94	77	56	11.2	19	17	36
13		1088	397	691	232	923	165	63.5%	58.4%	84.8%	110	93	78	56	11.0	17	15	32
14		1075	382	693	221	914	161	64.5%	57.9%	85.0%	111	93	78	55	11.2	18	15	33
15		1089	396	693	232	925	164	63.6%	58.6%	84.9%	113	92	78	54	11.0	21	14	35
16		1096	398	698	234	932	164	63.7%	58.8%	85.0%	112	92	78	57	11.0	20	14	34
17		1091	391	700	227	927	164	64.2%	58.1%	85.0%	113	92	80	57	12.7	21	12	33
18		1089	398	691	233	924	165	63.5%	58.5%	84.8%	113	94	79	56	12.8	19	15	34
19		1091	399	692	233	925	166	63.4%	58.4%	84.8%	111	94	78	56	12.8	17	16	33
20		1079	389	690	224	914	165	63.9%	57.6%	84.7%	113	95	79	56	13.0	18	16	34
21		1096	391	705	227	932	164	64.3%	58.1%	85.0%	113	94	80	57	12.8	19	14	33
22		1098	395	703	225	928	170	64.0%	57.0%	84.5%	113	92	78	56	12.5	21	14	35
23		1078	383	695	221	916	162	64.5%	57.7%	85.0%	112	91	79	55	12.8	21	12	33
24		1084	382	702	219	921	163	64.8%	57.3%	85.0%	112	91	80	57	12.6	21	11	32
25		1081	391	690	226	916	165	63.8%	57.8%	84.7%	113	94	80	57	12.8	19	14	33
26	O/S																	
27	O/S																	
28	O/S																	
29	O/S																	
30	O/S																	
31		1093	392	701	225	926	167	64.1%	57.4%	84.7%	90	71	62	44	12.6	19	9	28
High		1098	399	707	235	932	170	64.9%	60.5%	85.9%	114	97	80	58	13.0	22	17	36
Low		1075	381	690	219	914	153	63.4%	57.0%	84.5%	90	71	62	44	11.0	17	9	28
Average		1088	392	697	228	925	164	64.0%	58.3%	85.0%	112	92	78	56	12.4	20	14	34

City of Boynton Beach
West Water Treatment Plant
Daily Operations Lab
Train 2
Jan-98

	Conductivity Results								pH Results			Total Hardness							
	Feed Water	Perm #1	Perm #2	Total Perm	Conc #1	Conc #2	Product Water	Finish Water	Feed Water	Total Perm	Conc #2	Feed Water	Perm #1	Perm #2	Total Perm	Conc #1	Conc #2	Product Water	Finish Water
1	593	148	175	158	1090	2410	201	201	6.1	5.9	6.6	252	48	50	50	500	1200	50	50
2	600	148	176	157	1084	2440	200	198	6.1	5.9	6.6	250	44	50	48	560	1520	46	46
3	598	149	178	158	1096	2460	198	198	6.1	5.9	6.6	252	46	50	48	560	1480	48	48
4	596	142	170	151	1088	2430	99	198	6.1	5.7	6.4	248	40	46	42	520	1380	46	48
5	597	146	175	155	1085	2420	200	199	5.9	5.7	6.6	254	50	54	46	500	1360	50	50
6	594	146	174	155	1085	2410	201	200	6.0	5.7	6.5	254	40	48	46	520	1310	48	50
7	611	149	182	160	1126	2500	204	205	5.9	5.7	6.4	252	48	50	54	480	1320	50	50
8	615	152	182	163	1115	2490	209	208	6.0	5.7	6.5	256	46	52	48	590	1540	50	48
9	612	148	180	158	1120	2480	206	205	6.0	5.7	6.5	254	46	52	50	580	1490	50	50
	610	183	153	162	1116	2480	206	206	6.3	5.8	6.6	258	46	50	46	560	1500	50	50
11	612	153	183	164	1109	2470	206	206	6.0	5.8	6.5	254	44	50	46	540	1500	52	50
12	606	151	179	159	1117	2540	205	206	5.9	5.8	6.5	256	44	48	48	530	1500	50	52
13	606	154	183	163	1106	2480			6.0	5.8	6.6	254	46	48	48	530	1480		
14	610	153	183	163	1109	2460	207	206	6.0	5.8	6.5	254	44	50	46	520	1410	56	56
15	609	154	179	163	1107	2420			5.9	5.8	6.5	252	44	48	48	540	1470		
16	592	147	177	155	1095	2400	195	200	6.0	5.8	6.5	250	44	46	46	550	1470	50	52
17	597	155	175	168	1102	2450	224	227	5.9	6.2	6.5	256	46	52	50	580	1460	58	60
18	593	145	173	152	1080	2420	236	233	6.0	5.9	6.5	254	46	48	46	540	1420	62	62
19	O/S																		
20	611	153	183	161	1111	2480	234	238	6.2	5.9	6.4							60	60
21	611	152	180	161	1115	2490	236	238	6.0	5.9	6.6	250	48	50	48	510	1280	60	60
22	616	150	178	159	1116	2470	231	236	5.9	5.7	6.6	258	44	50	46	590	1560	64	66
23	614	151	182	161	1118	2490	233	235	5.9	5.7	6.4	260	44	48	46	580	1520	60	60
24	613	155	182	162	1130	2490	232	233	6.1	5.9	6.7	256	44	50	46	580	1540	62	64
25	606	150	180	163	1108	2495	235	233	6.0	5.8	6.6	254	46	50	46	540	1450	64	64
26	O/S																		
27	O/S																		
28	O/S																		
29	O/S																		
30	O/S																		
31	595	228	305	251	1018	2080	256	257	6.2	6.0	6.4	254	76	102	82	520	1440	78	72
High	616	228	305	251	1130	2540	256	257	6.3	6.2	6.7	260	76	102	82	590	1560	78	72
Low	592	142	153	151	1018	2080	99	198	5.8	5.7	6.4	248	40	46	42	480	1200	46	46
Average	605	154	183	163	1102	2445	211	216	6.0	5.8	6.5	254	46	52	49	543	1442	55	55

City of Bo, [illegible]n Beach

West Water Treatment Plant

Pressures & Flows

Sep-98

Train 2

	Comments	1st Stage Feed (GPM)	2nd Stage Feed (GPM)	1st Stage Perm (GPM)	2nd Stage Perm (GPM)	Total Perm (GPM)	Total Conc (GPM)	1st Stage Recovery	2nd Stage Recovery	Train Recovery	1st Stage Feed (PSI)	2nd Stage Feed (PSI)	2nd Stage Conc (PSI)	1st Stage Perm (PSI)	Total Perm (PSI)	1st Stage (DP)	2nd Stage (DP)	Train (DP)
1		1101	379	722	214	936	165	65.6%	56.5%	85.0%	104	80	70	50	12.5	24	10	34
2		1090	385	705	223	928	162	64.7%	57.9%	85.1%	106	84	70	49	11.0	22	14	36
3		1090	375	715	217	932	158	65.6%	57.9%	85.5%	105	81	69	48	11.2	24	12	36
4		1088	380	708	218	926	162	65.1%	57.4%	85.1%	105	80	70	48	11.2	25	10	35
5		1085	378	707	216	923	162	65.2%	57.1%	85.1%	108	82	70	50	12.9	26	12	38
6		1092	389	703	223	926	166	64.4%	57.3%	84.8%	108	85	70	50	12.8	23	15	38
7		1080	376	704	214	918	162	65.2%	56.9%	85.0%	106	81	71	50	12.8	25	10	35
8	O/S																	
9	O/S																	
10	O/S																	
11	O/S																	
12		1094	414	680	252	932	162	62.2%	60.9%	85.2%	100	77	64	48	12.6	23	13	36
13		1073	399	674	242	916	157	62.8%	60.7%	85.4%	99	76	66	48	12.6	23	10	33
14		1075	399	676	243	919	156	62.9%	60.9%	85.5%	97	74	64	46	11.0	23	10	33
15		1097	406	691	242	933	164	63.0%	59.6%	85.1%	100	76	64	48	11.0	24	12	36
16		1090	414	676	252	928	162	62.0%	60.9%	85.1%	99	80	62	48	11.2	19	18	37
17		1093	418	675	243	918	175	61.8%	58.1%	84.0%	97	80	64	47	11.4	17	16	33
18	O/S																	
19		1080	396	684	238	922	158	63.3%	60.1%	85.4%	100	78	66	49	12.6	22	12	34
20		1081	399	682	239	921	160	63.1%	59.9%	85.2%	103	80	64	47	13.4	23	16	39
21		1092	404	688	241	929	163	63.0%	59.7%	85.1%	102	79	65	48	12.8	23	14	37
22		1091	405	686	238	924	167	62.9%	58.8%	84.7%	101	79	65	48	13.0	22	14	36
23		1096	415	681	240	921	175	62.1%	57.8%	84.0%	101	82	64	49	12.8	19	18	37
24		1087	395	692	224	916	171	63.7%	56.7%	84.3%	98	76	66	48	12.8	22	10	32
25		1087	407	680	241	921	166	62.6%	59.2%	84.7%	101	81	66	48	12.8	20	15	35
26		1071	387	684	226	910	161	63.9%	58.4%	85.0%	101	79	66	48	12.8	22	13	35
27		1095	407	688	234	922	173	62.8%	57.5%	84.2%	101	78	67	48	12.8	23	11	34
28		1096	406	690	233	923	173	63.0%	57.4%	84.2%	101	78	67	48	12.8	23	11	34
29	O/S																	
30	O/S																	
31																		
High		1101	418	722				65.6%	60.9%	85.5%	108	85	71	50	13.4	26	18	39
Low		1071	375	674	214	910	156	61.8%	56.5%	84.0%	97	74	62	46	11.0	17	10	32
Average		1088	397	691	233	924	164	63.5%	58.6%	84.9%	102	79	67	48	12.3	22	13	35

City of Boynton Beach
West Water Treatment Plant
Daily Operations Lab
Train 2
Sep-98

	Conductivity Results								pH Results			Total Hardness							
	Feed Water	Perm #1	Perm #2	Total Perm	Conc #1	Conc #2	Product Water	Finish Water	Feed Water	Total Perm	Conc #2	Feed Water	Perm #1	Perm #2	Total Perm	Conc #1	Conc #2	Product Water	Finish Water
1	588	192	275	220	1044	1606	260	260	6.6	6.4	7.1	248	64	90	74	500	1240	74	74
2	603	202	291	230	1072	1593	263	269	6.1	6.4	6.6	252	64	90	76	510	1100	74	76
3	606	199	284	227	1073	1603	261	272	6.1	5.9	6.5	254	64	94	72	580	1300	76	76
4	604	200	288	230	1068	1793	255	260	6.1	6.1	6.5	254	66	92	76	560	1280	74	78
5	609	273	191	217	1088	1632	269	272	6.3	6.1	6.6	254	66	94	76	580	1320	76	76
6	604	192	274	217	1084	2240	266	267	6.0	6.0	6.5	260	62	84	72	500	1270	76	78
7	607	191	274	219	1088	2250	265	266	6.0	5.9	6.4	260	64	84	70	560	1420	72	72
8	O/S																		
9	O/S																		
10	O/S																		
11	O/S																		
12	591	208	359	259	1009	2000	268	265	5.9	5.9	6.4	254	70	120	98	560	1300	78	78
13	592	204	359	257	1013	2050	269	268	6.0	5.9	6.4	252	66	124	88	540	1260	78	76
14	590	205	357	256	1006	1970	268	269	6.1	6.0	6.5	250	66	128	86	530	1260	78	74
15	592	199	347	251	1019	1591	262	264	6.1	6.0	6.5	250	64	118	84	530	1290	78	78
16	590	197	350	249	1014	1554	258	259	6.0	5.9	6.4	248	66	120	78	510	1120	78	76
17	605	206	369	261	1045	1532	267	267	6.1	5.9	6.4	252	60	116	84	510	1210	78	80
18	607	206	364	260	1048	2110	296	288	6.0	5.9	6.5	250	66	114	88	600	1260	84	84
19	604	201	359	256	1037	2120	290	291	6.0	5.9	6.5	254	66	122	86	560	1280	84	86
20	610	199	357	254	1070	2140	282	285	6.1	6.1	6.4	254	66	124	86	540	1300	86	86
21	606	197	355	251	1058	2130	285	286	6.0	5.9	6.3	258	62	120	82	550	1320	84	84
22	606	197	351	250	1063	2120	284	288	6.2	6.1	6.4	254	62	114	84	560	1280	80	84
23	585	186	336	235	1030	1445	272	276	6.0	5.9	6.5	250	70	90	80	440	1150	84	82
24	590	187	336	237	1036	1384	270	273	6.1	6.0	6.5	250	66	120	84	540	1240	84	84
25	589	186	335	233	1033	1960	271	270	6.1	6.0	6.4	250	66	122	74	540	1280	84	86
26	591	187	334	234	1076	1960	269	272	6.1	6.0	6.5	250	68	120	84	540	1280	84	86
27	589	186	334	237	1034	1294	269	269	6.1	6.0	6.5	254	62	114	80	540	1180	80	80
28	595	190	337	230	1033	2040	270	270	6.1	5.9	6.4	254	62	114	74	560	1240	78	78
29	O/S																		
30	587	188	334	238	1022	1271	593	561	6.1	6.0	6.5	252	60	118	90	500	1110	82	80
31																			
High	610	273	369	261	1088	2250	593	561	6.6	6.4	7.1	260	70	128	98	600	1420	86	86
Low	585	186	191	217	1006	1271	255	259	5.9	5.9	6.3	248	60	84	70	440	1100	72	72
Average	598	199	326	240	1047	1816	283	283	6	6	6	253	65	110	81	538	1252	79	80

City of L…on Beach
West Water Treatment Plant
Pressures & Flows
Nov-98
Train 2

	Comments	1st Stage Feed (GPM)	2nd Stage Feed (GPM)	1st Stage Perm (GPM)	2nd Stage Perm (GPM)	Total Perm (GPM)	Total Conc (GPM)	1st Stage Recovery	2nd Stage Recovery	Train Recovery	1st Stage Feed (PSI)	2nd Stage Feed (PSI)	2nd Stage Conc (PSI)	1st Stage Perm (PSI)	Total Perm (PSI)	1st Stage (DP)	2nd Stage (DP)	Train (DP)
1		1094	400	694	233	927	167	63.4%	58.3%	84.7%	105	81	67	47	13.5	24	14	38
2		1087	404	683	240	923	164	62.8%	59.4%	84.9%	106	82	68	47	13.4	24	14	38
3		1096	399	697	238	935	161	63.6%	59.6%	85.3%	104	82	68	48	13.2	22	14	36
4		1084	400	684	238	922	162	63.1%	59.5%	85.1%	106	83	66	47	13.6	23	17	40
5		1088	398	690	233	923	165	63.4%	58.5%	84.8%	104	80	68	48	12.3	24	12	36
6	O/S																	
7		1096	403	693	229	922	174	63.2%	56.8%	84.1%	103	80	68	48	13.4	23	12	35
8		1089	395	694	234	928	161	63.7%	59.2%	85.2%	105	81	70	48	13.4	24	11	35
9		1095	388	707	226	933	162	64.6%	58.2%	85.2%	106	82	70	49	13.4	24	12	36
10		1082	391	691	230	921	161	63.9%	58.8%	85.1%	105	79	68	48	13.0	26	11	37
11		1077	399	678	237	915	162	63.0%	59.4%	85.0%	106	82	66	47	12.4	24	16	40
12		1088	394	694	233	927	161	63.8%	59.1%	85.2%	102	79	68	47	13.6	23	11	34
13		1087	395	692	236	928	159	63.7%	59.7%	85.4%	105	81	66	46	13.2	24	15	39
14		1089	396	693	237	930	159	63.6%	59.8%	85.4%	106	82	68	48	13.4	24	14	38
15		1088	395	693	236	929	159	63.7%	59.7%	85.4%	105	81	68	48	13.4	24	13	37
16		1092	401	691	230	921	171	63.3%	57.4%	84.3%	105	79	70	49	13.3	26	9	35
17		1089	394	695	235	930	159	63.8%	59.6%	85.4%	105	81	67	48	13.4	24	14	38
18		1096	409	687	235	922	174	62.7%	57.5%	84.1%	104	84	64	48	13.4	20	20	40
19		1098	401	697	235	932	166	63.5%	58.6%	84.9%	105	80	68	49	13.2	25	12	37
20		1095	400	695	225	920	175	63.5%	56.3%	84.0%	101	78	68	48	13.4	23	10	33
21		1096	399	697	234	931	165	63.6%	58.6%	84.9%	105	82	70	49	13.6	23	12	35
22		1094	390	704	216	920	174	64.4%	55.4%	84.1%	102	78	70	49	14.8	24	8	32
23		1089	402	687	237	924	165	63.1%	59.0%	84.8%	106	84	69	48	13.4	22	15	37
24		1088	395	693	231	924	164	63.7%	58.5%	84.9%	105	81	68	48	13.4	24	13	37
25		1091	405	686	234	920	171	62.9%	57.8%	84.3%	105	82	62	47	11.2	23	20	43
26		1084	400	684	236	920	164	63.1%	59.0%	84.9%	104	83	68	48	12.6	21	15	36
27		1095	397	698	227	925	170	63.7%	57.2%	84.5%	101	78	67	48	12.2	23	11	34
28		1089	395	694	235	929	160	63.7%	59.5%	85.3%	104	81	65	47	12.2	23	16	39
29		1102	402	700	240	940	162	63.5%	59.7%	85.3%	103	80	68	48	12.4	23	12	35
30		1094	398	696	228	924	170	63.6%	57.3%	84.5%	104	80	70	48	12.4	24	10	34
31																		
High		1102	409	707	240	940	175	64.6%	59.8%	85.4%	106	84	70	49	14.8	26	20	43
Low		1077	388	678	216	915	159	62.7%	55.4%	84.0%	101	78	62	46	11.2	20	8	32
Average		1091	398	693	233	926	165	63.5%	58.5%	84.9%	104	81	68	48	13.1	23	13	37

00166 56099
y of Boynton Beach Water Plant

erformance Evaluation Report
;EPA Water Supply Study WS040

Participant ID: FL00166 Type: OTHER Requesting Office: FL

	Sample Number	Reported Value	True Value*	Acceptance Limits	Performance Evaluation
TRACE METALS IN MICROGRAMS PER LITER:					
001-ARSENIC	001	45.33	102	89.3- 113	Not Accept.
002-BARIUM	001	3019	2700	2300- 3110	Accept.
003-CADMIUM	001	5.06	6.31	5.05- 7.57	Accept.
004-CHROMIUM	001	98.94	90.9	77.3- 105	Accept.
005-LEAD	001	76.44	71.0	49.7- 92.3	Accept.
006-MERCURY	001	2.56	1.50	1.05- 1.95	Not Accept.
007-SELENIUM	001	65.18	74.0	59.2- 88.8	Accept.
091-COPPER	001	1763	1700	1530- 1870	Accept.
142-NICKEL	001	26.28	25.0	21.3- 28.8	Accept.
236-MANGANESE	002	34.0	32.0	27.7- 35.2	Accept.
239-ZINC	002	1879	1700	1620- 1850	Not Accept.
NITRATE/NITRITE/FLUORIDE IN MILLIGRAMS PER LITER:					
009-NITRATE AS N	001	8.08	7.10	6.39- 7.81	Not Accept.
092-NITRITE AS N	001	1.46	1.30	1.11- 1.5	Accept.
261-ORTHOPHOSPHATE AS P	001	0.79	0.820	0.745-0.882	Accept.
TRIHALOMETHANES IN MICROGRAMS PER LITER:					
017-CHLOROFORM	001	29.75	27.4	21.9- 32.9	Accept.
018-BROMOFORM	001	14.3	12.7	10.2- 15.2	Accept.
019-BROMODICHLOROMETHANE	001	19.15	19.8	15.8- 23.8	Accept.
020-CHLORODIBROMOMETHANE	001	16.66	15.6	12.5- 18.7	Accept.
021-TOTAL TRIHALOMETHANE	001	79.95	75.5	60.4- 90.6	Accept.
VOLATILE ORGANIC COMPOUNDS IN MICROGRAMS PER LITER:					
032-VINYL CHLORIDE	001	6.66	27.2	16.3- 38.1	Not Accept.

Performance Evaluation Report
USEPA Water Supply Study WS040

Participant ID: FL00166 Type: OTHER Requesting Office: FL

	Sample Number	Reported Value	True Value*	Acceptance Limits	Performance Evaluation
090-TOTAL XYLENES					
	001	24.93	30.3	24.2- 36.4	Accept.
152-C 1,3 DICHLOROPROPENE					
	002	5.77	7.42	4.15- 7.53	Accept.
153-T 1,3 DICHLOROPROPENE					
	002	6.45	8.60	4.49- 8.92	Accept.
MISCELLANEOUS ANALYTES:					
022-RESIDUAL FREE CHLORINE(MILLIGRAMS PER LITER)					
	001	0.14	0.240	0.0199-0.364	Accept.
023-TURBIDITY(NTU'S)					
	001	8.67	7.80	7- 9.67	Accept.
024-TOTAL FILTERABLE RESIDUE(MILLIGRAMS PER LITER)					
	001	216	232	147- 380	Accept.
025-CALCIUM HARDNESS(MG. CACO3/L)					
	001	94.5	95.0	88- 104	Accept.
026-PH-UNITS					
	001	9.25	9.13	8.93- 9.33	Accept.
027-ALKALINITY(MG. CACO3/L)					
	001	35.9	34.4	32.8- 39.6	Accept.
029-SODIUM(MILLIGRAMS PER LITER)					
	001	16.9	15.8	14.4- 17.8	Accept.
145-SULFATE(MILLIGRAMS PER LITER)					
	001	184.8	225	202- 247	Not Accept.
264-LOW-LEVEL TURBIDITY(BY BENCH-TOP, PORTABLE, OR IR INSTR.)					
	002		Not Evaluated in this Study		
	003		Not Evaluated in this Study		

********** END OF DATA FOR FL00166 **********
NOTE: FOR LIMITS AND TRUE VALUES, ASSUME THREE SIGNIFICANT DIGITS.
********** END OF REPORT FOR FL00166 **********

* Based on gravimetric calculations, or a reference value when necessary.

City of Boynton Beach
Water Quality Laboratory
FL 00166, ICR 1085

ICR DUPLICATE DATA

DATE	ANALYTE	DUPLICATES		RPD
11/4/97 *	PH	5.93	5.86	1.2
*	ALKALINITY	40.0	39.0	2.5
*	TOTAL HARDNESS	259.0	256.0	1.2
*	TURBIDITY	0.25	0.24	4.1
11/10/97	PH	6.81	5.94	13.6
	ALKALINITY	35.2	34.6	1.72
	CA HARDNESS	47.4	47.2	0.42
*	TURBIDITY	0.23	0.21	9.09
11/24/97	PH	5.97	5.94	0.50
	ALKALINITY	36.4	35.4	2.79
11/25/98 *	TOTAL HARDNESS	63.0	63.0	0.00
	CA HARDNESS	42.6	42.0	1.42
11/25/97 *	TURBIDITY	0.10	0.08	22.2
12/2/97 *	PH	6.49	6.47	0.31
*	ALKALINITY	58.0	57.0	1.74
*	TOTAL HARDNESS	62.0	62.0	0.00
*	TURBIDITY	0.17	0.12	34.5
12/9/97 *	PH	6.24	6.20	0.6
*	ALKALINITY	97.0	95.0	2.1
*	TOTAL HARDNESS	249.0	249.0	0.0
*	TURBIDITY	0.14	0.12	15.4
12/30/97 *	PH	5.88	5.87	0.2
*	ALKALINITY	42.0	42.0	0.0
*	TOTAL HARDNESS	95.0	94.0	1.1
*	TURBIDITY	0.18	0.18	0.0
1/6/98 *	PH	6.62	6.56	0.9
*	ALKALINITY	244.0	244.0	0.0
*	TOTAL HARDNESS	50.0	50.0	0.0
*	TURBIDITY	0.12	0.11	8.7
1/20/98 *	PH	7.29	7.27	0.3
*	ALKALINITY	241.0	240.0	0.4
1/13/98 *	TOTAL HARDNESS	260.0	259.0	0.4
*	TURBIDITY	0.29	0.28	3.5
2/3/98 *	PH	6.13	6.11	0.3
*	ALKALINITY	78.5	76.5	2.6
*	CA HARDNESS	68.0	68.0	0.0
2/10/98 *	TURBIDITY	0.12	0.10	18.2

DATE	ANALYTE	DUPLICATES		RPD
2/17/98 *	PH	8.63	8.62	0.1
*	ALKALINITY	64.0	63.0	1.6
*	TOTAL HARDNESS	252.0	252.0	0.0
*	TURBIDITY	0.22	0.22	0.0
2/24/98 *	PH	7.64	7.62	0.3
*	ALKALINITY	49.0	48.7	0.6
*	TOTAL HARDNESS	258.0	257.0	0.4
*	TURBIDITY	0.14	0.12	15.4
3/10/98 *	PH	7.24	7.24	0.0
*	ALKALINITY	245.0	245.0	0.0
	TOTAL HARDNESS	73.6	73.4	0.27
	TURBIDITY	0.48	0.45	6.45
3/23/98	PH	7.63	7.62	0.13
	ALKALINITY	246.2	239.8	2.63
	TOTAL HARDNESS	246.4	245.6	0.33
	CA HARDNESS	240.2	237.0	1.34
	TURBIDITY	2.84	2.75	3.22
4/6/98	PH	6.21	6.19	0.32
	ALKALINITY	71.7	70.8	1.26
	TOTAL HARDNESS	256.0	242.4	5.46
	CA HARDNESS	255.2	250.8	1.74
	TURBIDITY			
4/20/98	PH	6.14	6.13	0.16
	ALKALINITY	84.0	84.0	0.00
4/21/98 *	CA HARDNESS	116.0	112.0	3.51
4/24/98 *	TURBIDITY	2.58	2.56	0.78
5/5/98	PH	6.03	6.02	0.17
	ALKALINITY	52.6	52.2	0.76
	TOTAL HARDNESS	256.6	255.0	0.63
	CA HARDNESS	254.0	253.8	0.08
*	TURBIDITY	1.11	1.08	2.74
5/19/98 *	PH	8.21	8.2	0.12
5/19/98 *	ALKALINITY	40.0	38.0	5.13
5/19/98 *	CA HARDNESS	234.0	230.0	1.72
5/18/98	TURBIDITY	0.16	0.15	6.45
5/26/98 *	PH	6.03	6.00	0.50
*	ALKALINITY	52.0	51.0	1.94
*	TOTAL HARDNESS	251.0	249.0	0.80
6/3/98 *	TURBIDITY	0.07	0.07	0.00

DATE	ANALYTE	DUPLICATES		RPD
6/8/98	PH	7.54	7.54	0.00
	ALKALINITY	253.7	253.5	0.08
	TOTAL HARDNESS	273.4	272.6	0.29
	CA HARDNESS	219.8	219.6	0.09
	TURBIDITY	0.82	0.75	8.92
7/10/98	PH	6.07	6.06	0.16
	ALKALINITY	52.0	52.0	0.00
	TOTAL HARDNESS	82.0	81.0	1.23
7/7/98 *	CA HARDNESS	246.0	244.0	0.82
	TURBIDITY	0.37	0.34	8.45
7/21/98	PH	6.25	6.19	0.96
	ALKALINITY	95.0	93.9	1.16
	CA HARDNESS	73.0	72.0	1.38
*	TURBIDITY	5.40	5.29	2.06
8/3/98	PH	6.20	6.19	0.16
	ALKALINITY	65.3	64.7	0.92
	TOTAL HARDNESS	66.0	65.0	1.53
	TURBIDITY	0.44	0.43	2.30
8/17/98	PH	6.31	6.31	0.00
	ALKALINITY	95.6	95.0	0.63
	TOTAL HARDNESS	250.0	249.6	0.16
	CA HARDNESS	246.0	245.0	0.41
	TURBIDITY	0.15	0.12	22.2
8/31/98	PH	6.26	6.25	0.16
	ALKALINITY	63.0	62.8	0.32
	TOTAL HARDNESS	70.4	70.0	0.57
*	CA HARDNESS	79.0	79.0	0.00
	TURBIDITY	0.12	0.10	18.2
9/18/98 *	PH	6.32	6.30	0.32
	ALKALINITY	90.0	89.5	0.56
	CA HARDNESS	82.0	81.6	0.49
	TURBIDITY	0.21	0.19	10.00
9/28/98	PH	6.53	6.51	0.31
	ALKALINITY	134.2	133.7	0.37
	TOTAL HARDNESS	64.0	61.6	3.82
	CA HARDNESS	78.4	75.0	4.43
*	TURBIDITY	0.08	0.08	0.00
10/12/98	PH	6.26	6.24	0.32
	ALKALINITY	91.0	90.7	0.33
	CA HARDNESS	76.2	75.8	0.53
	TURBIDITY	0.13	0.12	8.00

DATE	ANALYTE	DUPLICATES		RPD
10/26/98	PH	6.06	6.00	1.00
	ALKALINITY	50.9	50.7	0.39
	TOTAL HARDNESS	246.0	245.0	0.41
	CA HARDNESS	242.0	239.0	1.25
	TURBIDITY	0.23	0.23	0.00
11/3/98	PH	8.76	8.74	0.23
	ALKALINITY	61.0	61.0	0.00
	TOTAL HARDNESS	53.0	48.0	9.90
	TURBIDITY	0.10	0.08	22.2
11/9/98	PH	6.21	6.19	0.32
	ALKALINITY	99.0	99.0	0.00
	TOTAL HARDNESS	62.6	61.4	1.94
	CA HARDNESS	59.2	57.6	2.74

City of Boynton Beach, FL
Membrane Study
ICR #1085

ICR THM -Q.C. DUPLICATE'S

CPD:CHLOROFORM

BIWEEKLY #	STD. CONC.	R-1	R-2	AVERAGE	RPD
2	20	19.21	18.6	18.905	3.22666
4	20	19.62	19.54	19.58	0.40858
6	10	10.18	10.02	10.1	1.584158
8	10	10.52	10.33	10.425	1.822542
10	20	21.87	21.37	21.62	2.312673
12	15	17.02	15.84	16.43	7.181984
16	20	19.85	19.33	19.59	2.654416
18	20	20.47	20.33	20.4	0.686275
20	20	20.47	19.69	20.08	3.884462
22	20	18.08	17.73	17.905	1.954761
24	20	19.22	19.18	19.2	0.208333
26	20	20.6	20.1	20.35	2.457002
28	20	18.4	18.25	18.325	0.818554
30	20	22.4	21.6	22	3.636364
32	20	19.95	19.59	19.77	1.820941
34	20	22.73	22.07	22.4	2.946429
36	20	21.93	21.29	21.61	2.961592
38	10	10.84	10.24	10.54	5.6926
40	20	21.51	21.23	21.37	1.310248
42	20	19.78	19.5	19.64	1.425662
44	20	21.17	19.96	20.565	5.883783
46	20	21.81	19.97	20.89	8.808042
48	20	19.95	19.65	19.8	1.515152
50	20	17.84	17.35	17.595	2.784882
52	20	17.84	17.35	17.595	2.784882
54	20	20.95	20.22	20.585	3.546272

ICR THM -Q.C. DUPLICATE'S

CPD: BROMODICHLOROMETHANE

BIWEEKLY #	STD. CON	R-1	R-2	AVERAGE	RPD
2	20	18.03	17.99	18.01	0.222099
4	20	19.1	18.74	18.92	1.902748
6	10	9.97	9.83	9.9	1.414141
8	10	10.85	10.64	10.745	1.954397
10	20	21.61	20.7	21.155	4.301584
12	15	17.03	15.66	16.345	8.381768
16	20	19.77	19.17	19.47	3.081664
18	20	20.85	18.58	19.715	11.51408
20	20	20.58	18.8	19.69	9.040122
22	20	17.04	16.91	16.975	0.765832
24	20	17.6	16.61	17.105	5.787781
26	20	20.69	20.4	20.545	1.411536
28	20	18.07	17.22	17.645	4.817229
30	20	21.1	20.75	20.925	1.67264
32	20	19.3	19.23	19.265	0.363353
34	20	22.92	21.74	22.33	5.284371
36	20	21.18	20.07	20.625	5.381818
38	10	10.77	10.54	10.655	2.158611
40	20	19.91	18.96	19.435	4.888089
42	20	18.6	17.16	17.88	8.053691
44	20	18.35	18.2	18.275	0.820793
46	20	19.81	19.26	19.535	2.815459
48	20	20.56	20.5	20.53	0.292255
50	20	18.96	18.03	18.495	5.028386
52	20	18.96	18.03	18.495	5.028386
54	20	20.56	20.02	20.29	2.66141

ICR THM -Q.C. DUPLICATE'S

CPD: CHLORODIBROMOMETHANE

BIWEEKLY #	STD. CON	R-1	R-2	AVERAGE	RPD
2	20	19.69	18	18.845	8.967896
4	20	19.59	19.52	19.555	0.357965
6	10	11.93	11.8	11.865	1.09566
8	10	12.57	12.37	12.47	1.603849
10	20	22.36	20.97	21.665	6.415878
12	15	16.73	15.42	16.075	8.1493
16	20	20.58	20.35	20.465	1.12387
18	20	20.58	19.95	20.265	3.108808
20	20	20.68	19.59	20.135	5.413459
22	20	17.77	17.49	17.63	1.588202
24	20	18.59	17.91	18.25	3.726027
26	20	20.19	19.72	19.955	2.355299
28	20	17.08	16.2	16.64	5.288462
30	20	20.23	19.99	20.11	1.193436
32	20	19.78	19.32	19.55	2.352941
34	20	21.89	21.61	21.75	1.287356
36	20	21.23	20.68	20.955	2.624672
38	10	10.73	10.01	10.37	6.943105
40	20	20.36	19.95	20.155	2.034235
42	20	19.07	18.86	18.965	1.107303
44	20	19.58	19.06	19.32	2.691511
46	20	22.92	22.66	22.79	1.140851
48	20	20.32	18.78	19.55	7.877238
50	20	18.85	17.41	18.13	7.942637
52	20	18.85	17.41	18.13	7.942637
54	20	20.33	19.98	20.155	1.736542

ICR THM -Q.C. DUPLICATE'S

CPD: BROMOFORM

BIWEEKLY #	STD. CON	R-1	R-2	AVERAGE	RPD
2	20	17.79	17.4	17.595	2.216539
4	20	19.32	18.8	19.06	2.728227
6	10	12.8	12.74	12.77	0.469851
8	10	14.14	13.34	13.74	5.822416
10	20	20.64	19.73	20.185	4.508298
12	15	16.29	14.97	15.63	8.445298
16	20	19.74	19.62	19.68	0.609756
18	20	20.61	19.25	19.93	6.823884
20	20	20.61	19.4	20.005	6.048488
22	20	17.25	16.21	16.73	6.216378
24	20	18.41	17.66	18.035	4.158581
26	20	20.71	19.16	19.935	7.77527
28	20	16.65	16.15	16.4	3.04878
30	20	18.97	18.55	18.76	2.238806
32	20	19.37	18.99	19.18	1.98123
34	20	20.61	19.63	20.12	4.870775
36	20	20.78	19.17	19.975	8.060075
38	10	10.66	9.87	10.265	7.696055
40	20	19.28	19.09	19.185	0.990357
42	20	18.9	17.18	18.04	9.534368
44	20	18.67	18.35	18.51	1.728795
46	20	22.23	21.61	21.92	2.828467
48	20	19.43	17.66	18.545	9.544352
50	20	16.86	16.5	16.68	2.158273
52	20	16.86	16.5	16.68	2.158273
54	20	19.44	19.25	19.345	0.982166

City of Boynton Beach, FL
Membrane Study
ICR 1085

CHLOROFORM

ICR THM SPIKE RECOVERY

CPD:CHLOROFORM					2/25/99
BIWEEKLY #		STD. CONC.	SPK REC		% REC.
2		20	18.6		93.00
4		20	19.62		98.10
6		10	10.02		100.20
8		10	10.33		103.30
10		20	21.37		106.85
12		15	15.84		105.60
16		20	19.85		99.25
18		20	20.47		102.35
20		20	19.39		96.95
22		20	17.73		88.65
24		20	19.18		95.90
26		20	20.6		103.00
28		20	18.4		92.00
30		20	22.4		112.00
32		20	19.95		99.75
34		20	22.07		110.35
36		20	21.29		106.45
38		10	10.24		102.40
40		20	21.23		106.15
42		20	19.78		98.90
44		20	21.17		105.85
46		20	21.81		109.05
48		20	17.41		87.05
50		20	17.84		89.20
52		20	17.84		89.20
54		20	20		100.00
		AVERAGE			100.06

ICR THM SPIKE RECOVERY

CPD: BROMODICHLOROMETHANE				2/25/99
BIWEEKLY #		STD. CONC.	SPK REC	% REC.
2		20	18.03	90.15
4		20	18.74	93.70
6		10	9.83	98.30
8		10	10.85	108.50
10		20	20.7	103.50
12		15	15.66	104.40
16		20	19.77	98.85
18		20	20.58	102.90
20		20	18.8	94.00
22		20	17.04	85.20
24		20	17.6	88.00
26		20	20.69	103.45
28		20	18.07	90.35
30		20	21.1	105.50
32		20	19.23	96.15
34		20	21.74	108.70
36		20	20.77	103.85
38		10	10.54	105.40
40		20	19.91	99.55
42		20	18.6	93.00
44		20	18.35	91.75
46		20	19.81	99.05
48		20	17.42	87.10
50		20	18.96	94.80
52		20	18.96	94.80
54		20	20.56	102.80
		AVERAGE		97.84

ICR THM SPIKE RECOVERY

CPD: CHLORODIBROMOMETHANE				2/25/99
BIWEEKLY #		STD. CONC.	SPK REC	% REC.
2		20	19.69	98.45
4		20	19.52	97.60
6		10	11.8	118.00
8		10	12.37	123.70
10		20	20.97	104.85
12		15	15.22	101.47
16		20	20.35	101.75
18		20	21.68	108.40
20		20	19.59	97.95
22		20	17.49	87.45
24		20	18.59	92.95
26		20	19.72	98.60
28		20	17.08	85.40
30		20	20.23	101.15
32		20	19.32	96.60
34		20	21.61	108.05
36		20	20.68	103.40
38		10	10.01	100.10
40		20	20.36	101.80
42		20	19.07	95.35
44		20	19.58	97.90
46		20	22.66	113.30
48		20	19.03	95.15
50		20	18.85	94.25
52		20	18.85	94.25
54		20	20.33	101.65
		AVERAGE		100.75

ICR THM SPIKE RECOVERY

CPD: BROMOFORM					2/25/99
BIWEEKLY #		STD. CONC.	SPK REC		% REC.
2		20	17.79		88.95
4		20	19.32		96.60
6		10	12.74		127.40
8		10	13.34		133.40
10		20	19.73		98.65
12		15	14.97		99.80
16		20	19.62		98.10
18		20	20.61		103.05
20		20	18.4		92.00
22		20	16.21		81.05
24		20	18.41		92.05
26		20	19.16		95.80
28		20	16.15		80.75
30		20	18.97		94.85
32		20	19.37		96.85
34		20	19.63		98.15
36		20	19.17		95.85
38		10	10.66		106.60
40		80	80.6		100.75
42		20	18.9		94.50
44		20	18.67		93.35
46		20	22.23		111.15
48		20	20.22		101.10
50		20	16.86		84.30
52		20	16.86		84.30
54		20	19.44		97.20
		AVERAGE			97.94

	ICR THM SPIKE RECOVERY					
	CPD: TOTAL THMS					2/25/99
	BIWEEKLY #		STD. CONC.	SPK REC		% REC.
	2		80	74.11		92.64
	4		80	77.02		96.28
	6		40	44.4		111.00
	8		40	46.89		117.23
	10		80	80.29		100.36
	12		60	61.69		102.82
	16		80	79.6		99.50
	18		80	83.33		104.16
	20		80	76.17		95.21
	22		80	68.47		85.59
	24		80	73.78		92.23
	26		80	80.16		100.20
	28		80	69.7		87.13
	30		80	82.97		103.71
	32		80	77.87		97.34
	34		80	85.05		106.31
	36		80	81.17		101.46
	38		40	41.66		104.15
	40		80	80.59		100.74
	42		80	76.35		95.44
	44		80	77.77		97.21
	46		80	86.5		108.13
	48		80	74.08		92.60
	50		80	70.5		88.13
	52		80	70.51		88.14
	54		80	80.32		100.40
			AVERAGE			98.77

BROWARD TESTING LAB
Raw QC Data
City of Boynton Beach
ICR Membrane Study

		DUPLICATES		SPIKE RECOVERY	
DATE	ANALYTE	METHOD	RPD OF DUPES	SPIKE REC.	MDRL
11/24/97	TOC	415.1	2.5	99.95	1.54
	HAA 6	552.2	NA	NA	1.00
	TOX	SM5320B	0.91	98.75	8.20
12/4/97	HAA6	552.2	NA	NA	1.00
	DCAA		1.00	77.6	1.00
	BCAA		4.00	64.1	1.00
	DBAA		2.60	40	1.00
	BAA		0.90	139	1.00
	BROMIDE	N.A.	0.57	96.4	300.00
12/18/97	HAA6	552.2	N.A.	N.A.	1.00
	BROMIDE	N.A.	N.A.	N.A.	0.03
1/2/98	HAA6	552.2			1.00
	DCAA			110	6.00
	BCAA			100	7.90
	DBAA			113	7.00
	BAA			242	13.00
	BROMIDE	N.A.	1.82	93.9	300.00
1/16/99	HAA6	552.2			1.00
	DCAA		0	101	1.00
	BCAA		0.3	99.2	1.00
	DBAA		2.7	117	1.00
	BAA		1.4	5.84	1.00
	BROMIDE	N.A.	1.82	93.9	0.30
2/5/98	HAA6	552.2			1.00
	DCAA		4.6	90	1.00
	BCAA		3.3	80.3	1.00
	DBAA		2.9	81.6	1.00
	BAA		3.2	94	1.00
	BROMIDE	N.A.			0.30
2/19/98	HAA6	552.2			1.00
	DCAA		N.A.	N.A.	1.00
	BCAA		N.A.	N.A.	1.00
	DBAA		N.A.	N.A.	1.00
	BAA		N.A.	N.A.	1.00
	BROMIDE		N.A.	N.A.	0.30
3/5/98	HAA6	552.2			
	DCAA		4.2	109	1.00
	BCAA		5.3	108	1.00
	DBAA		7.5	111	1.00
	BAA		5.6	110	1.00
	BROMIDE	N.A.	0	95	0.30
3/19/98	HAA6	552.2			
	DCAA		3.7	107	1.00
	BCAA		28.3	124	1.00
	DBAA		3.5	112	1.00
	BAA		0	106	1.00
	BROMIDE	N.A.	0.9	83	0.30
4/2/98	HAA6	552.2			
	DCAA		N.A.	N.A.	1.00
	BCAA		N.A.	N.A.	1.00
	DBAA		N.A.	N.A.	1.00
	BAA		N.A.	N.A.	1.00

	BROMIDE	N.A.	0	97	0.30
4/16/98	HAA6	552.2			
	DCAA		1.5	106	1.00
	BCAA		0.97	136	1.00
	DBAA		0.96	109	1.00
	BAA		0.68	110	1.00
	BROMIDE	N.A.	0	103	0.30
4/30/98	HAA6	552.2			
	DCAA		1.8	104	1.00
	BCAA		1.1	106	1.00
	DBAA		1.1	105	1.00
	BAA		2.4	103	1.00
	BROMIDE	N.A.	4.5	106	0.30
5/18/98	HAA6	552.2			
	DCAA		N.A.	N.A.	1.00
	BCAA		N.A.	N.A.	1.00
	DBAA		N.A.	N.A.	1.00
	BAA		N.A.	N.A.	1.00
	BROMIDE	N.A.	0	99.9	0.30
6/4/98	HAA6	552.2			
	DCAA		23.6	94.7	1.00
	BCAA		14.2	114	1.00
	DBAA		0.7	116	1.00
	BAA		5.7	118	1.00
	BROMIDE	N.A.	0	103	0.30
6/18/98	HAA6	552.2			
	DCAA		2	105	1.00
	BCAA		1.8	100	1.00
	DBAA		2.6	106	1.00
	BAA		2.3	110	1.00
	BROMIDE	N.A.	0.85	96	0.30
7/6/98	HAA6	552.2			
	DCAA		1.8	103	1.00
	BCAA		3.2	99.6	1.00
	DBAA		3	101	1.00
	BAA		0.9	101	1.00
	BROMIDE	N.A.	0.65	93	0.03
7/16/98	HAA6	552.2			
	DCAA		2.6	109	1.00
	BCAA		2.3	107	1.00
	DBAA		1.5	111	1.00
	BAA		3.5	111	1.00
	BROMIDE	N.A.	3.8	84	0.03
7/30/98	HAA6	552.2			
	DCAA		5.5	107	1.00
	BCAA		6.7	102	1.00
	DBAA		6.9	108	1.00
	BAA		3.6	107	1.00
	BROMIDE	N.A.	2.7	98	0.03
8/13/98	HAA6	552.2			
	DCAA		2.7	103	1.00
	BCAA		2.2	98.4	1.00
	DBAA		2	97.6	1.00
	BAA		3.2	104	1.00
	BROMIDE	N.A.	1	93	0.03
8/31/98	HAA6	552.2			
	DCAA		2.3	106	1.00
	BCAA		1.4	106	1.00
	DBAA		2.7	108	1.00
	BAA		1.6	105	1.00
	BROMIDE	N.A.			0.03

9/18/98	HAA6	552.2			
	DCAA		0.5	106	1.00
	BCAA		0.5	121	1.00
	DBAA		2.1	130	1.00
	BAA		18	120	1.00
	BROMIDE	N.A.	N.A.	N.A.	0.03
9/28/98	HAA6	552.2			
	DCAA		1.2	113	1.00
	BCAA		2.9	124	1.00
	DBAA		2.9	125	1.00
	BAA		0.4	112	1.00
	BROMIDE	N.A.	1.3	96	0.03
10/12/98	HAA6	552.2			
	DCAA		0.11	118	1.00
	BCAA		4.6	118	1.00
	DBAA		4.9	115	1.00
	BAA		2.2	109	1.00
	BROMIDE	N.A.	7.1	105	0.03
	HAA6	552.2			
	DCAA		0.38	105	1.00
10/22/98	BCAA		0.56	107	1.00
	DBAA		0.36	110	1.00
	BAA		1.11	108	1.00
	BROMIDE	N.A.	1.1	90	0.03

This is the calibration summary information provided
National Testing Labs for HAA6, Bromide, TOC. These analyses
performed by Broward Testing, Free Col and First Coast.

6. Meters with PIDs must be calibrated against a meter with a FID if headspace samples are being performed for assessing "gross contamination" as defined in the Tanks rule, Chapter 17-770, FAC.

7.5.8 Automatic Wastewater Samplers

These pieces of equipment are invaluable for remote sampling or for sophisticated time- or flow-dependent sampling regimes. Since loading calculations of industrial and domestic wastewater are dependent upon the sampling accuracy, these devices must be volume calibrated by checking the constant pumping volume at least twice with a graduated cylinder or other calibrated container.

7.6 LABORATORY INSTRUMENTS

7.6.1 Initial Calibration

1. Instruments must be initially calibrated each time the instrument is set up or upon failure of any quality control calibration checks.

2. The number of standards to be used for initial calibration must conform to method protocol or general requirements in Section 7.6.3.

3. Correlation coefficients for photometric analyses must be calculated and documented and should be greater than or equal to 0.995.

4. A minimum of one quality control check standard at a mid-range concentration shall be analyzed prior to sample analyses to verify initial calibration. This quality control check standard shall be prepared independently of the calibration standards. Recoveries for this check standard should be between 90 and 110%, or as specified by the method.

7.6.2 Continuing Calibration

1. One mid-range continuing calibration standard must be analyzed for each group of 20 samples analyzed. The check standard used for initial calibration verification will verify acceptable calibration for the first set of 20 samples. Subsequent sample sets of 20 or portions thereof (if a complete set of 20 is not available), must have a continuing calibration check standard analyzed at the beginning of each sample set.

2. Recovery for the continuing calibration check standard shall be between 80 and 120%, the range specified by the analytical method or the documented acceptance range that is determined by internal historical data (see 9.2.3.4).

7.6.3 General Calibration Recommendations by Specific Analysis or Analysis Type**

1. Titrimetric Analyses - Standardize all titrants just prior to use.

2. Residue or Solids Analyses
   a. Analyze Quality Control Check Samples on a quarterly basis.***
   b. See calibration requirements for analytical balances and ovens (Section 7.7.1 and 7.7.3).

3. Conductivity
   a. A minimum of 2 KCL standards must be analyzed bracketing the expected concentration of the samples to be analyzed.
   b. The readings for the calibration standards must be within 1% of the expected value.
   c. Continuing calibration checks must be within 1% of the true value.

4. Turbidity
   a. Calibration must be checked for each instrument testing range applicable to the levels of turbidity to be measured.
   b. If formazin standards are not used for the daily calibrations, then formazin standards must be prepared on a quarterly basis and compared with daily standards.
   c. Calibration must be checked every 20 samples with 1 standard in each applicable testing range.
   d. Acceptance criteria for all calibration and standard checks must be established per instrument accuracy specifications.

5. Dissolved Oxygen
   a. Probe - Calibrate against Winkler Titration on an annual basis. Results should agree within 0.2 mg/l.
   b. Winkler Titration - see titration section (7.6.3.1).

6. Color and Chlorine
   Final determination made by comparison against Nessler Tubes or sealed color standards.
   a. Confirm results against an approved alternate test procedure on a quarterly basis.
   b. Results should be within 10% of the original value.

7. Temperature
   a. Laboratory thermometers must be checked against an NIST certified thermometer on an annual basis. Results must be within the manufacturer's specifications.
   b. Other devices used to record temperature must be checked on a monthly basis against a thermometer that has been calibrated against an NIST certified thermometer.

8. BOD
   a. Analyze a glucose/glutamic acid check sample each day BODs are analyzed.
   b. Check standard recovery must satisfy method criteria.
   c. See Dissolved Oxygen calibration protocols (7.5.4).

9. Oil and Grease
   a. See calibration criteria for the analytical balance (7.7.3).
   b. Analyze a QC check sample on a quarterly basis (all applicable matrices).

10. Flash Point
   a. Analyze a solution of known flash point each day of operation.
   b. The flash point temperature should be within 5% of the literature flash point value.

11. Salinity
   a. Electrical Conductivity Method - follow protocols for conductivity calibration and standardize instrument for seawater analyses according to method protocol on a semiannual basis.
   b. Argentometric Method - standardize titrant daily and check method against a known seawater sample or alternate method quarterly.
   c. Hydrometric Method - check method against the argentometric method or with a QC check sample quarterly.
   d. Alternate method comparisons should agree within 10%.

12. Chlorophyll - analyze a QC check sample quarterly (if available).

13. Sulfate
   a. Gravimetric - analyze a QC check sample quarterly and follow calibration requirements for the analytical balance (Section 7.7.3).
   b. Turbidimetric - see requirements for calibration of turbidity (Section 7.6.3.4).
   c. If sulfuric acid is used for standard preparation, then it must be standardized with each preparation.

7.7 SUPPORT EQUIPMENT CALIBRATION

7.7.1 Temperature Monitoring

1. Ovens - temperature recorded daily. Temperatures must be within acceptable method range.
2. Incubators and water baths - monitor temperature twice daily for microbiological work and once for other applications. Temperatures must be within acceptable method ranges.

7.7.2 Autoclaves - must document that sterilization temperature and pressure has been achieved by the use of sterilization indicators with every autoclave run.

7.7.3 Analytical Balances - monthly monitoring of Class S Weights. Results must fall within the suppliers acceptance criteria.

7.8 CALIBRATION DOCUMENTATION

Records must be maintained to document and verify acceptable instrument or measuring system calibration for each analysis.

7.8.1 Records must be maintained for all standard preparations and working standards must be easily traced to intermediate and primary standards used for preparation.

7.8.2 Acceptable calibration verification (% recoveries, correlation coefficients) must be recorded and easily identified with applicable daily calibrations.

7.8.3 If calibration acceptance criteria are based on manufacturer's instrument specifications or acceptable recoveries specified by QC check sample suppliers, then records of such activities must be maintained. Such records must be easily accessible and must establish verification of acceptance criteria.

7.8.4 Laboratories must have available for inspection a table specifying calibration acceptance criteria for all parameters.

7.9 DEFINITIONS

7.9.1 Mid-Range Standard - a standard in the middle of the linear range of the established calibration curve or a standard concentration in the middle of the expected sample concentration range depending on the type of determination to be performed.

7.9.2 Intermediate Standard - a standard prepared from the primary stock standard which is diluted to prepare the working calibration standards.

7.9.3 <u>Working Standards</u> - the standards that are actually analyzed to perform the instrument or measuring system calibration.

* Acceptance criteria presented in this guidance document are general advisory limits. Variances to the listed criteria must be supported with documentation. If the method stipulates different criteria, then the method criteria must be used to verify acceptable calibration.

** If analysis or analysis type is not mentioned in this SOP then method calibration protocol and general requirements as presented in this guidance document must be followed.

*** Recoveries for QC Check Samples should be between 90 and 110% or within acceptable ranges specified by the supplier.

FREE COL Laboratories Inc.
Raw QC Data
City of Boynton Beach
ICR Membrane Study

DATE	ANALYTE	METHOD	RPD OF DUPES	SPIKE REC.	MDRL
3/23/98	TOC	415.1	1.2	95	N.A.
	TOX	9020B	17.4	105	N.A.
4/2/98	TOX	9020B	3.5	112	
	TOC	415.1	1.5	95	
4/16/98	TOX	9020B	N.A.	N.A.	
	TOC	415.1	20	100	1
4/30/98	TOX	9020B	0	90	
	TOC	415.1	0	90	1
5/5/99	TOX	9020B			
	TOC	415.1	0	100	1
5/18/98	TOX	9020B	11.8	111	
	TOC	415.1	0	110	1
6/4/98	TOX	9020B	8.8	102	
	TOC	415.1	1.3	85	1
6/18/98	TOX	9020B	N.A.	N.A.	
	TOC	415.1	3.5	85	1
7/9/98	TOX	9020B	2.9	94	
	TOC	415.1	0	100	1
7/16/98	TOX	9020B	9.5	110	
	TOC	415.1	0	100	1
7/30/98	TOX	9020B	N.A.	N.A.	
	TOC	415.1	0	105	
8/13/98	TOX	9020B	2.7	111	
	TOC	415.1	1.4	105	
8/27/98	TOX	9020B	2.6	90	
	TOC	415.1	3.5	105	
9/13/98	TOX	9020B	4.5	78	
	TOC	415.1	0	95	
9/28/98	TOX	9020B	35	76	
	TOC	415.1	3.8	90	
10/13/98	TOX	9020B	3.7	110	
	TOC	415.1	0	105	
			0	95	
			0		
10/22/98	TOX	9020B	1	94	
	TOC	415.1	N.A.	N.A.	

FIRST COAST ANALYTICAL
Raw QC Data
City of Boynton Beach
ICR Membrane Study

DATE	ANALYTE	METHOD (DUPLICATES)	RPD OF DUPES	SPIKE REC. (SPIKE RECOVERIES)	MDRL
12/8/97	TOC	415.1	1.11	99.15	0.77
12/4/97	TOX	SM5320B	1.94	103	8.2
12/22/97	TOC	415.1	3.73	99.15	0.77
	TOX	SM5320B	1.94	103	8.2
1/2/98	TOX	SM5320B	2.93	102.5	8.2
1/5/98	TOC	415.1	1.51	86.35	0.77
1/16/99	TOC	415.1	2.7	90.5	0.77
	TOX	SM5320B	2.6	100	8.2
2/5/98	TOC	415.1	4.5	90.35	0.77
	TOX	SM5320B	2.66	90.1	8.2
2/23/98	TOC	415.1	N.A.	N.A.	0.77
	TOX	SM5320B	11.3	91.45	8.2
3/5/98	TOC	415.1	1.48	81	0.77
	TOX	SM5320B	2.72	84.55	8.2