

1.0 Performance Measure Title

WS-4 Reduce Saltwater Intrusion of the Biscayne Aquifer - Meet MFL Criteria for Biscayne Aquifer

Last Date Revised: December 11, 2005

2.0 Justification

A CERP goal is to enhance economic values and social well being. One means to accomplish this is through ensuring adequate water supplies for current and future water users by protecting the primary water supply source, the Biscayne aquifer. Saltwater intrusion poses a continuing threat to the Biscayne aquifer. In order to restrict the inland migration of the saline interface, a sufficient freshwater head must be consistently maintained within the aquifer. Inadequate water levels occurred in 1939, when more than 10,000 water supply wells in South Florida were affected by high chloride concentrations, including the partial loss of five major wellfields (Parker et al.1955). Since that time, a number of different actions have been taken to protect public and private wellfields from the threat of saltwater intrusion. One of which was the completion of coastal water control structures in the 1950s. CERP implementation will increase the storage capacity of water in the regional system for delivery to the Lower East Coast Service Area. The increase in regional storage capacity provided by the CERP will supplement regional and local sources used to maintain sufficient water levels behind these coastal water control structures to prevent saltwater intrusion. In addition to public water supply, the Biscayne aquifer also provides base flow to important estuaries such as the Lake Worth Lagoon, Biscayne Bay and Florida Bay during low rainfall years.

Harm to the Biscayne aquifer in terms of saltwater intrusion is considered to be movement of the saltwater interface to a greater distance inland than has occurred historically as a consequence of seasonal water level fluctuations up to and including a 1-in-10 year drought event. In order to prevent harmful movement of the saltwater interface in the Biscayne aquifer, the South Florida Water Management District (SFWMD) manages coastal groundwater levels by operating the primary canal network, regulating surface water control elevations for developments (through surface water management permitting), and by limiting coastal consumptive use withdrawals. Operational criteria for the coastal canals are maintained by the SFWMD to prevent harm. These management levels vary seasonally as the SFWMD works to balance the goals of flood protection (wet season control level) and water supply (drought management control level). The drought management control levels represent target management elevations during the dry season. Water supply releases are made from regional storage sources (currently the Water Conservation Areas and Lake Okeechobee) to achieve these targets whenever possible. These canal levels in turn influence the adjacent dry season groundwater elevations within the Biscayne aquifer.

Groundwater levels within the Biscayne aquifer are controlled by local rainfall and by the canals and structures that are regionally operated by the SFWMD. The aquifer system becomes more rainfall driven and less canal dependent as the distance from the canals increases. However, canal water levels play a major role in determining the elevation of the freshwater levels in the Biscayne aquifer throughout most of South Florida. Because of this relationship, the SFWMD maintains operating levels for the primary coastal canals as a means to protect a major portion of the Biscayne aquifer against further saltwater intrusion. These control levels are listed as the “Minimum Canal Operational Levels Needed to Protect Biscayne Aquifer During Drought Conditions” in the table below. Based on criteria set in the SFWMD’s Minimum Flows and Level (MFL) Rules, Chapter 40E-8 Florida Administrative Code (F.A.C.), the minimum operational canal levels are regional indicators that saltwater intrusion may become a problem if water levels remain below these levels for more than 180 days duration.

3.0 Source of Performance Measure

Chapter 40E-8, F.A.C.

Section 373.042, Florida Statutes

4.0 Restoration Expectation

4.1 Predictive Metric and Target

Chapter 40E-8, F.A.C., specifies that the minimum canal stages to be maintained as part of the MFL prevention strategy for the Biscayne aquifer, as contained in the Lower East Coast Regional Water Supply Plan (SFWMD 2000a) are as follows:

<u>Canal at Structure</u>	<u>Canal Stage (feet NGVD*)</u>
C-51 at S155	7.80
C-16 at S41	7.80
C-15 at S40	7.80
Hillsboro Canal at G56	6.75
C-14 at S37B	6.50
C-13 at S36	4.00
North New River at G54	3.50
C-9 at S29	2.00
C-6 at S26	2.50
C-4 at S25B	2.50
C-2 at S22	2.50

* NGVD = National Geodetic Vertical Datum

The Lower East Coast Regional Water Supply Plan further specifies that “To meet the operational criteria, the canal stage cannot fall below the levels for more than 180 days.”

4.2 Assessment Parameter and Target

Chapter 40E-8, F.A.C., specifies that the minimum canal stages to be maintained as part of the MFL prevention strategy for the Biscayne aquifer, as contained in the Lower East Coast Regional Water Supply Plan (SFWMD 2000a) are as follows:

Canal at Structure	Canal Stage (feet NGVD*)
C-51 at S155	7.80
C-16 at S41	7.80
C-15 at S40	7.80
Hillsboro Canal at G56	6.75
C-14 at S37B	6.50
C-13 at S36	4.00
North New River at G54	3.50
C-9 at S29	2.00
C-6 at S26	2.50
C-4 at S25B	2.50
C-2 at S22	2.50

* NGVD = National Geodetic Vertical Datum

The Lower East Coast Regional Water Supply Plan further specifies that “To meet the operational criteria, the canal stage cannot fall below the levels for more than 180 days.”

5.0 Evaluation Application

5.1 Evaluation Protocol

A table from the South Florida Water Management Model (SFWMM), titled ‘Minimum Flow and Level Criteria for the Biscayne Aquifer’, specifies the number of times the MFL stage criteria were not met for 180 days or more at each of the structures specified above.

5.2 Normalized Performance Output

5.3 Model Output (example attached)

MFL Criteria for Biscayne Aquifer

Location	MFL Stage (ft)	Duration (days)	Number of Times Criteria Not Met		
			2000B3	2050B3	CERPA
C-15@S-40	7.80	180	0	0	0
Hillsboro@G-56	6.75	180	0	0	0
C-14@S-37B	6.50	180	0	0	0
C-13@S-36	4.00	180	0	0	0
MNRiver@G-54	3.50	180	0	0	0
C-9@S-29	2.00	180	1	0	0
C-6@S-26	2.50	180	0	0	0
C-4@S-25B	2.50	180	1	0	0

Note: MFL Criteria is not met when stages fall below ground for longer than the number of specified days (duration) with the additional condition that stages fall below the MFL value at least once during the interval.

Location	Criteria Stage (ft)	Target	Percent of Time Below Criteria		
			2000B3	2050B3	CERPA
C-15@S-40	7.80	NA	0%	0%	3%
Hillsboro@G-56	6.75	NA	0%	0%	0%
C-14@S-37B	6.50	NA	2%	3%	2%
C-13@S-36	4.00	NA	1%	1%	2%
MNRiver@G-54	3.50	NA	0%	0%	0%
C-9@S-29	2.00	NA	15%	7%	20%
C-6@S-26	2.50	NA	20%	1%	29%
C-4@S-25B	2.50	NA	14%	8%	13%

Note: Percent of time below the criteria elevation is calculated relative to a 36 year period of simulation. Short-term lowering of canal stages due to operational changes associated with local rainfall are not included in the calculation of percent of time below criteria.

For Planning Purposes Only
 Run date: 06/06/05 16:59:51
 SFWMM V5.4.3
 SFWMM P.O.S. 1965 - 2000
 Script used: mfl.scr V1.10

5.4 Uncertainty

Future updates of this performance measure should address affects of sea level rise in accordance with CERP Guidance Memorandum 16.0 "Sea Level Rise Considerations for Formulation and Evaluation of CERP Projects".

6.0 Monitoring and Assessment Approach

See *CERP Monitoring and Assessment Plan: Part 1 Monitoring and Supporting Research - South Florida Hydrology Monitoring Network Module* section 3.5.3.5 (RECOVER 2004a).

7.0 Future Tool Development Needed to Support Performance Measure

7.1 Evaluation Tools Needed

7.2 Assessment Tools Needed

8.0 Notes

9.0 Working Group Members	
Linda McCarthy, FDACS Brenda Mills, SFWMD Carl Woehlcke, SFWMD	
10.0 Acceptance Status	
WS Working Group	December 11, 2005
ET	
AT	
Public Review	
Final Acceptance Date	
11.0 References	
<p>Parker, G.G., Ferguson, G.E., and Love, S.K. 1955. Water Resources of Southeastern Florida, with Special Reference to the Geology and Ground Water of the Miami Area. Water Supply Paper 1255, United States Geological Survey, Washington, D.C.</p> <p>RECOVER. 2004a. CERP Monitoring and Assessment Plan: Part 1 Monitoring and Supporting Research. Restoration Coordination and Verification Program, c/o United States Army Corps of Engineers, Jacksonville District, Jacksonville, Florida, and South Florida Water Management District, West Palm Beach, Florida.</p> <p>SFWMD. 2000a. Lower East Coast Regional Water Supply Plan. South Florida Water Management District, West Palm Beach, Florida.</p>	