DEPARTMENT OF THE ARMY
US ARMY CORPS OF ENGINEERS
SOUTH ATLANTIC DIVISION
60 FORSYTH STREET SW, ROOM 10M15
ATLANTA, GA 30303-8801

REPLY TO
ATTENTION OF

CESAD-RBT 19 March 2012

MEMORANDUM FOR COMMANDER, JACKSONVILLE DISTRICT (CESAJ-EN-QC/ [redacted])

SUBJECT: Approval of the Review Plan for Lake Okeechobee Aquifer Storage and Recovery (ASR) Pilot Project: Technical Data Report, Lake Okeechobee and Vicinity, Florida

1. References:

a. Memorandum, CESAJ-EN-QC, 9 January 2012, Subject: Approval of the Review Plan for Lake Okeechobee Aquifer Storage and Recovery (ASR) Pilot Project Technical Data Report, Lake Okeechobee and Vicinity, Florida (Enclosure).

b. EC 1165-2-209, Civil Works Review Policy, 31 January 2010.

2. The enclosed Review Plan for Lake Okeechobee Aquifer Storage and Recovery (ASR) Pilot Project: Technical Data Report, dated December 2012, submitted by reference 1.a, has been reviewed by this office. Some minor edits/clarifications were coordinated with [redacted] of your staff. The enclosed Review Plan, with the coordinated edits incorporated and date changed to 16 February, is approved in accordance with reference 1.b above.

3. We concur with the conclusion of the District Chief of Engineering that Type II Independent External Peer Review (Type II IEPR) is not required for this Technical Data Report. The primary basis for the concurrence that a Type II IEPR is not required is that this Technical Data Report does not pose a significant threat to human life.

4. The District should take steps to post the Review Plan to its web site and provide a link to CESAD-RBT. Before posting to the web site, the names of Corps/Army employees should be removed.

5. The SAD point of contact is [redacted].

FOR THE COMMANDER:

Encl

CHRISTOPHER T. SMITH, P.E.
Chief, Business Technical Division

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P.O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

REPLY TO
ATTENTION OF

CESAJ-EN-QC

9 January 2012

MEMORANDUM FOR Commander, South Atlantic Division (CESAD-RBT)

SUBJECT: Approval of Review Plan for Lake Okeechobee Aquifer Storage and Recovery (ASR) Pilot Project: Technical Data Report, Lake Okeechobee and Vicinity, Florida

1. References.

a. EC 1165-2-209, Civil Works Review Policy, 31 January 2010

b. WRDA 2007 H. R. 1495 Public Law 110-114, 08 Nov 07

2. I hereby request approval of the enclosed Review Plan and concurrence with the conclusion that Type II Independent External Peer Review (IEPR) of this project document is not required. The related review activities are defined in EC 1165-2-209, Civil Works Review Policy as review for Other Work Products. The Other Work Products category was selected since the subject project document is neither a decision document nor an implementation document. The Other Works Product, Agency Technical Review and Type II IEPR determinations were based on the EC 1165-2-209 Risk Informed Decision Process as presented in the Review Plan. The Review Plan complies with applicable policy, provides Agency Technical Review and has been coordinated with the Institute for Water Resources. It is my understanding that non-substantive changes to this Review Plan, should they become necessary, are authorized by CESAD.

3. The district will post the CESAD approved Review Plan to its website and provide a link to the CESAD for its use. Names of Corps/Army employees are withheld from the posted version, in accordance with guidance.

FOR THE COMMANDER:

[redacted]

Encl

REVIEW PLAN

For

Lake Okeechobee Aquifer Storage and Recovery (ASR) Pilot Project: Technical Data Report

Jacksonville District

United States Army Corps of Engineers

16 February 2012

THE INFORMATION CONTAINED IN THIS REVIEW PLAN IS DISTRIBUTED SOLELY FOR THE PURPOSE OF PREDISSEMINATION PEER REVIEW UNDER APPLICABLE INFORMATION QUALITY GUIDELINES. IT HAS NOT BEEN FORMALLY DISSEMINATED BY THE US ARMY CORPS OF ENGINEERS, JACKSONVILLE DISTRICT. IT DOES NOT REPRESENT AND SHOULD NOT BE CONSTRUED TO REPRESENT ANY AGENCY DETERMINATION OR POLICY

US Army Corps of Engineers ®

Table of Contents

List of Figures

1. Purpose and Requirements

a. Purpose. This review plan defines the scope of review activities for the Lake Okeechobee Pilot Aquifer Storage and Recovery (ASR) Technical Data Report. Review activities consist of District Quality Control (DQC) and Agency Technical Review (ATR).

The Technical Data Report was prepared in accordance with the requirements of EC 1165-2-209, Civil Works Review Policy. The related review activities are further defined in ER 1110-1-12, Engineering and Design Quality Management. The *Other Work Products* category was selected since the Technical Data Report is neither a decision document nor an implementation document. The EC 1165-2-209 Risk Informed Decision process was used to determine the appropriate level of review for this report. Upon approval, the review plan will be included in the Project Management Plan as an appendix to the Quality Management Plan as stipulated in Para. 7.a of EC 1165-2-209.

The Lake Okeechobee Pilot ASR Technical Data Report is an engineering document that has several purposes. Operational testing resulted in acquisition of large datasets that document system operation, performance, and cost. These datasets and interpretations provide a significant basis to evaluate operational feasibility at representative locations for Comprehensive Everglades Restoration Plan ASR. The Technical Data Report serves as the repository for these datasets and interpretations. This report will serve as a sound basis for evaluation of future ASR applications. However, no decisions on ASR implementation will be issued in this report

b. References.

1. EC 1165-2-209, Civil Works Review Policy, 31 January 2010
2. ER 1110-1-12, Engineering and Design Quality Management, 21 July 2006
3. Water Resources Development Act of 1999
4. Final Aquifer Storage and Recovery Pilot Project Design Report/Final Environmental Impact Statement, September 2004
5. Aquifer Storage and Recovery in the Comprehensive Everglades Restoration Plan, National Academy of Sciences, 2001
6. ASR Issue Team Assessment and Comprehensive Strategy: A Report to the South Florida Ecosystem Restoration Working Group, July 1999

c. Requirements. This review plan was developed in accordance with EC 1165-2-209, which establishes an accountable, comprehensive, life-cycle review strategy for Civil Works products by providing a seamless process for review of all Civil Works projects from initial planning through design, construction, operation, maintenance, repair, replacement, and rehabilitation. The EC provides the procedures for ensuring the quality and credibility of U.S. Army Corps of Engineers (USACE) decision, implementation, and operations and maintenance documents and other work products. The EC outlines three levels of review: District Quality Control, Agency Technical Review, and Independent

External Peer Review. Refer to the EC for the definitions and procedures for the three levels of review.

d. Review Management Organization (RMO). The South Atlantic Division is designated as the RMO.

2. Project Information and Background

a. ASR as a Component of the Comprehensive Everglades Restoration Plan.

The Lake Okeechobee Aquifer Storage and Recovery Pilot Project was authorized as a design study under the Comprehensive Everglades Restoration Plan (CERP), initially authorized in WRDA 1999, Section 101(a)(16). It was further described in the CERP authorizing legislation, Title VI of WRDA 2000, which authorized an initial suite of projects plus design studies for many CERP components. From the 2004 Pilot Project Design Report:

> *CERP was authorized as a framework for improving the restoration of the Everglades. A number of technologies proposed for the Comprehensive Plan have technical uncertainties associated with design for the proposed features—either in the technology itself, its application, or in the scale of the application. While none of the proposed technologies are untested, it is unknown whether actual performance will measure up to that anticipated in the CERP.*

The necessity of ASR as a component of the CERP is outlined in the Comprehensive Plan, stating:

> *The purpose of this feature is to: (1) provide additional regional storage while reducing both evaporation losses and the amount of land removed from current land use (e.g. agriculture) that would normally be associated with construction and operation of above-ground storage reservoirs; (2) increase the Lake's water storage capability to better meet regional water supply demands for agriculture, lower East Coast urban areas, and the Everglades; (3) manage a portion of regulatory releases for the Lake primarily to improve Everglades hydropatterns and to meet regulatory discharges to the St. Lucie and Caloosahatchee Estuaries; and (4) maintain and enhance the existing level of flood protection.*

ASR would be implemented in the CERP to recharge, store, and recover up to 1.66 billion gallons per day (bgd) of treated surface water that otherwise would be lost to tide. Recharge and recovery would occur through approximately 330 wells (Figure 1).

b. The Lake Okeechobee ASR Pilot Project Purpose

ASR technology has been implemented in Florida for over 20 years. However, the unprecedented scale of ASR implementation proposed in the CERP was a source of concern by various stakeholder agencies (National Academy of Sciences, 2001). As a result, two large studies were developed and funded to address these concerns related to regional ASR implementation: Lake Okeechobee ASR Pilot Project ("ASR Pilot Project"), and the ASR Regional Study. The ASR Pilot Project would result in construction of up to five ASR systems located around Lake Okeechobee. The primary objective of

each ASR system would be to evaluate operational feasibility of ASR technology at a representative geographic location.

Five ASR systems were proposed in the ASR Pilot Project: Kissimmee River ASR (Okeechobee County); Port Mayaca ASR (Martin County); Hillsboro Canal ASR (Palm Beach County); Caloosahatchee ASR (Hendry County); and Moore Haven ASR (Glades County). Due to resource limitations, only two of these ASR systems were constructed and tested: Kissimmee River ASR and Hillsboro Canal ASR systems. The USACE served as the lead organization for the design, construction, and operational testing of the Kissimmee River ASR system. The South Florida Water Management District, as a CERP partner, served as the lead organization for the design, construction, and operational testing of the Hillsboro Canal ASR system. Results from both ASR systems will be included in this technical data report.

c. Related Projects: The ASR Regional Study

The ASR Regional Study was developed to address other hydrologic, geotechnical, and environmental concerns defined by the ASR Issue Team (1999). The ASR Regional Study, broadly defined, consists of three major focus areas: 1) a regional groundwater flow and solute transport model to simulate hydrologic effects during regional-scale ASR implementation; 2) an extensive groundwater monitoring program to evaluate water-quality and hydrogeologic changes during ASR system operations; and 3) studies and additional modeling efforts to predict ecological and ecotoxicological effects that occur when recovered water is distributed into the surface water system. The results of these model simulations and studies will be compiled in a separate Technical Data Report that will be completed and reviewed in 2013-2014.

d. Purpose of the Technical Data Report

The Lake Okeechobee ASR Pilot Project Technical Data Report is an engineering document that has several purposes. Operational testing (also called cycle testing) at both ASR systems resulted in acquisition of large datasets that document system operation, performance, and cost. These datasets and interpretations provide a significant basis to evaluate operational feasibility at representative locations for CERP ASR. The Technical Data Report serves as the repository for these datasets and interpretations. This report will serve as a sound basis for evaluation of future ASR applications. However, no decisions on ASR implementation will be issued in this report.

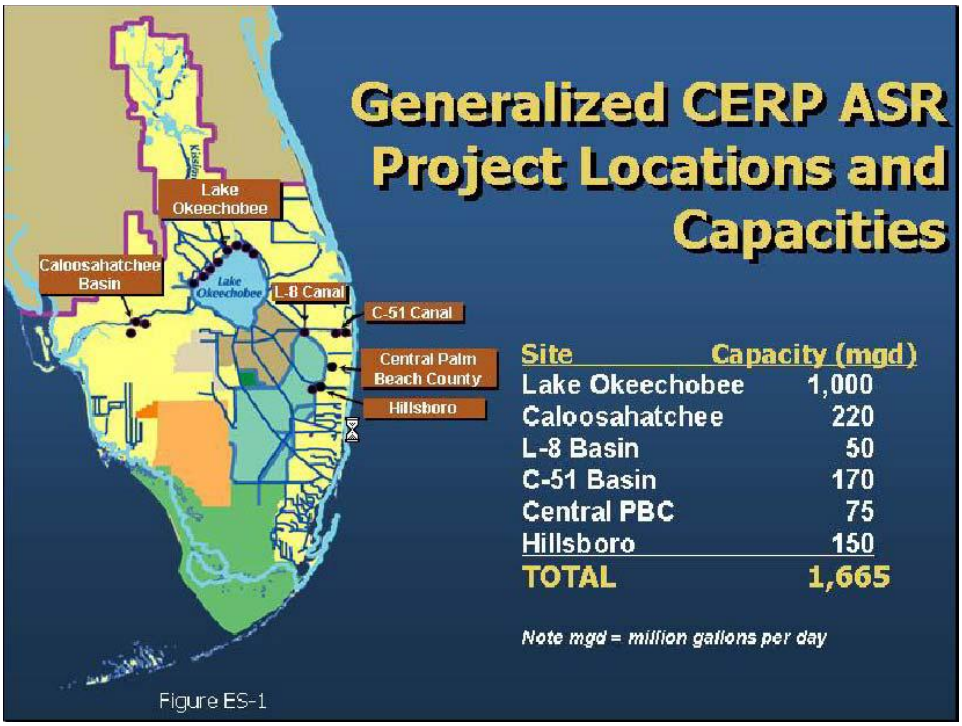

Figure 1. Schematic of projected ASR well sites. SOURCE: Final ASR Pilot Project Design Report, 2004.

e. Geography and Hydrology

Lake Okeechobee lies 30 miles west of the Atlantic Ocean and 60 miles east of the Gulf of Mexico, in the central part of the Florida peninsula. The Lake itself covers approximately 730 square miles, and is the principal natural reservoir in South Florida. Portions of Palm Beach, Martin, Okeechobee, Glades and Hendry Counties surround it. Water flows into the Lake primarily from the Kissimmee River, Fisheating Creek and Taylor Creek. Outlets to the Lake include the Caloosahatchee River toward the west, the St. Lucie and West Palm Beach Canals toward the east, and the Hillsboro, North New River, and Miami Canals toward the south.

f. What is an ASR System?

An ASR system consists of components that enable recharge and recovery of water through one or more wells, into subsurface permeable zones (aquifers). Successful operation requires that recharge and recovery occur in compliance with all State and Federal laws and permits. Components of an ASR system surface facility include an intake structure, a pump to transfer water from the source into the ASR system, pre-treatment components such as filtration and disinfection, a pump to recover water from the aquifer, ponds to manage water prior to environmental distribution, and a structure to distribute recovered water back into the receiving water body. An example of an ASR system is shown in Figure 2.

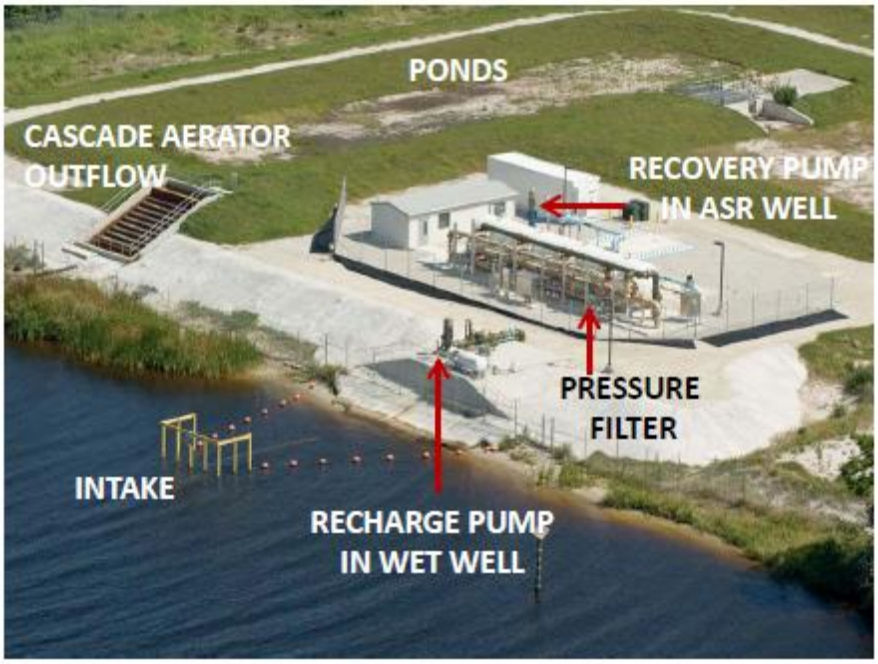

Figure 2. Diagram showing Kissimmee River ASR system components. SOURCE: USACE.

g. ASR Pilot Project Sites

Approximately 80 ASR systems are in some phase of construction, testing, or operation in the state of Florida (see http://www.dep.state.fl.us/water/uic/docs/asr_map.pdf). Most of these ASR systems are associated with municipal drinking water or reclaimed water treatment plants. In this context, ASR systems are permitted components that increase plant storage capacity when demands are low, and increased water supply when demands are great. Existing ASR systems are permitted under the following programs: Underground Injection Control (UIC; FAC 62-528; *http://www.dep.state.fl.us/water/uic/index.htm*); National Pollution Discharge Elimination System (NPDES; FS Title XXIX, Section 403.0885; http://www.dep.state.fl.us/water/stormwater/npdes/index.htm); and the Comprehensive Everglades Restoration Plan Regulation Act (CERPRA; FS Title XXVIII, Section 373.1502; http://www.dep.state.fl.us/water/wqssp/everglades/cerp.htm). The ASR Pilot Project facility locations are as follows:

Kissimmee River ASR System. The Kissimmee River ASR system, part of the Lake Okeechobee group of sites, is located in the northwest corner of Section 19, Township 38 South, Range 35 East, near the confluence of the Kissimmee River and Lake Okeechobee near Okeechobee, Florida. It is located on a five-acre parcel of land owned by SFWMD, on the east bank of the Kissimmee River, and is shown in Figure 3. The site is approximately 8,000 feet upstream from the river's confluence with Lake Okeechobee and north of Route 78, at latitude N 27°09'18.7", longitude W 80°52'29.7". The system contains one well.

Hillsboro Canal ASR System. The Hillsboro Canal ASR system is located in the southwestern corner of Section 19, Township 47 South, Range 41 East, along the Hillsboro Canal in southern Palm Beach County.

It is located at the southern end of Loxahatchee National Wildlife Refuge, also known as Water Conservation Area (WCA) 1, where it intersects with the northeastern corner of WCA 2A. Coordinates of the site are latitude 26°21'07"N and longitude 80° 17'42"W (ASR PPDR, 2004). The system contains one well.

Figure 3. Kissimmee River ASR site map. SOURCE: USACE.

3. District Quality Control

District Quality Control (DQC) activities for engineering products are stipulated in ER 1110-1-12, Engineering & Design Quality Management and EC 1165-2-209. DQC will be performed on the P&S and DDR in accordance CESAJ Engineering Division Quality Management System (EN QMS). The EN QMS defines DQC as the sum of two reviews, Discipline Quality Control Review and Product Quality Control Review. Product Quality Control Review is the DQC Certification that will precede ATR.`

4. Risk Informed Decision on Appropriate Level of Review and Other Work Product Determination

EC 1165-2-209, Civil Works Review Policy, directs the project delivery team to make a risk informed decision regarding the classification of a document and the appropriate level of review. Review of the following Risk Informed Process from Para. 15.b indicates that the subject report is an Other Work Product and that **ATR is deemed appropriate**.

1. *Does it include any design (Structural, mechanical, hydraulic, etc)?* The Technical Data Report does not include new designs, but evaluates the performance of two ASR systems. No new project designs will be implemented as a result of the TDR.
2. *Does it evaluate alternatives?* No. The TDR evaluates the use of ASR at the respective pilot sites, but does not discuss or review alternatives to ASR such as surface storage or no action.
3. *Does it include recommendations*? No. The TDR does not explicitly recommend any course of action.
4. *Does it have a formal cost estimate?* The TDR evaluates the construction and operational testing costs of the pilot ASR systems, but does not estimate future costs of any new system or project.
5. *Does it have or will it require a formal NEPA document?* The original Pilot Project Design Report included an appended Environmental Impact Statement (EIS). The TDR under review does not have a stand-alone Environmental Assessment or EIS.
6. *Does it impact a structure or feature of a structure whose performance involves potential life safety risks?* No.
7. *What are the consequences of non-performance?* Non-performance of the Lake Okeechobee Pilot Project ASR systems, to the extent that this reflects aquifer medium and fluid properties, would result in potential inability to use aquifer storage and recovery in the area in the future. This could lead to no improvement in water quality and seasonal availability; however, non-performance will not decrease any existing baseline of water quality or availability. It would negatively impact the performance of the overall system envisioned in the CERP because ASR technologies are a major storage component of the Plan. .
8. *Does it include significant investment of public monies?* The Lake Okeechobee ASR Pilot Project at Kissimmee River ASR Pilot cost approximately $8.4 M to construct (surface facility $5.9M, 6 wells $2.5M); $4M to operate (2009 through 2011), and $1.8M to monitor (2009 through 2011). The TDR does not propose the further expenditure of funds beyond those already invested or programmed for the ASR review process.
9. *Does it support a budget request?* No.
10. *Does it change the operation of the project?* The TDR does not seek to change existing operations, but to lay out methods by which similar projects at a larger scale might operate in the future and to test the effects of the system on local water quality and hydraulics.
11. *Does it involve ground disturbances?* Yes. Construction of the surface facility and monitoring well network involved moderate ground disturbances over ~5 acres at each of the Kissimmee and Hillsboro Canal sites.
12. *Does it affect any special features such as cultural resources, historic properties, survey markers, etc. that should be protected or avoided?* No.
13. *Does it involve activities that trigger regulatory permitting such as Sec. 404 or NPDES related actions?* Yes. Several permits were required to initiate and complete ASR system construction and testing. These permits are as follows:
    UIC: No. 200917-003-UC (Kissimmee River); No. 153872-002-UC (Hillsboro Canal)

    NPDES: No. FL0569071 (Kissimmee River); No. FL0484890 (Hillsboro Canal)

CERPRA: No. 0236494-003-GL (Kissimmee River); No. 01543872-003-GL (Hillsboro)

14. *Does it involve activities that could potentially generate hazardous waste and/or disposal of materials such as lead based paints or asbestos?* No. Well construction and ASR system operations were conducted in a manner consistent with standards set forth in FAC62-528. The distribution of ASR recovered water back into the Kissimmee River and Hillsboro Canal were monitored and reported consistent with standards set forth in NPDES; FS Title XXIX, Section 403.0885.
15. *Does it reference use of or reliance on manufacturers' engineers or specifications for items such as prefab buildings, playground equipment, etc?* Yes. The pressure media filter, UV disinfection system, and systems control software will be referenced in this document.
16. *Does it reference reliance on local authorities for inspection/certification of utility systems like wastewater, storm water, electrical, etc*? Yes. The facility has been inspected by the Florida Department of Environmental Protection to ensure NPDES compliance.
17. *Is there or is there expected to be any controversy surrounding the Federal action associated with the work product?* No.

5. Agency Technical Review

a. Scope. Agency Technical Review (ATR) is undertaken to "ensure the quality and credibility of the government's scientific information" in accordance with EC 1165-2-209 and ER 1110-1-12. An ATR will be performed on the P&S pre-final submittals.

ATR will be conducted by individuals and organizations that are external to the Jacksonville District. The ATR Team Leader is a Corps of Engineers employee outside the South Atlantic Division. The required disciplines and experience are described below.

ATR comments are documented in the DrChecks[sm] model review documentation database. DrChecks[sm] is a module in the ProjNet[sm] suite of tools developed and operated at ERDC-CERL (www.projnet.org).

At the conclusion of each ATR effort, the ATR team will prepare a Review Report summarizing the review. Review Reports will be considered an integral part of the ATR documentation and shall:

- Identify the document(s) reviewed and the purpose of the review;
- Disclose the names of the reviewers, their organization affiliations, and include a short paragraph on both the credentials and relevant expertise of each reviewer;
- Include the charge to the reviewer;
- Describe the nature of their review and their findings and conclusions;
- Identify and summarize each unresolved issues (if any); and
- Include a verbatim copy of each reviewer's comments (either with or without specific attributions), or represent the views of the group as a whole, including any disparate and dissenting views.

b. ATR Disciplines. As stated in ER 1110-1-12, ATR members will be sought from the following sources: regional technical specialists; appointed subject matter experts from other districts; senior level experts from other districts; Center of Expertise staff; experts from other USACE commands; contractors; academic or other technical experts; or a combination of the above. The more recent ER 1165-2-209 confirms the acceptable sources for team members, including non-USACE subject matter experts as required. The ATR team will be comprised of the following disciplines, knowledge, skills and abilities, and experience levels. One of these people will need to be designated the team lead, and as such have prior ATR team experience.

- Hydrogeology – The reviewer should be a senior hydrogeologist with extensive experience in ASR including the major technical issues raised in South Florida.
- Geochemistry – The reviewer should be a senior aqueous geochemist with both extensive experience in the field and at least a working knowledge of ASR.
- Environmental Engineer – The reviewer should be a senior chemist or engineer with extensive experience in the water treatment systems used in the ASR pilot well sites.
- Permitting – The reviewer should be a senior engineer with extensive experience in regulatory compliance and State of Florida UIC ASR permitting
- ATR Team Leader. The ATR Team Leader will be from outside SAD and should have experience with similar projects. ATR Team Leader may be a co-duty to one of the review disciplines.

c. ATR Review Manager. The Institute for Water Resources is designated as the ATR Review Manager for Lake Okeechobee Aquifer Storage and Recovery (ASR) Pilot Project, Technical Data Report. The IWR will maintain the technical aspects of this review plan. The IWR will also assemble the ATR Team, serve as ATR Team Leader and complete the ATR Report and Certification.

6. Independent External Peer Review

a. General. EC 1165-2-209 provides implementation guidance for both Sections 2034 and 2035 of the Water Resources Development Act (WRDA) of 2007. The EC addresses review procedures for both the Planning and the Design and Construction Phases. The EC defines Section 2035 Safety Assurance Review, Type II IEPR. The EC also requires Type II IEPR to be managed and conducted outside the Corps of Engineers.

b. Type I Independent External Peer Review Determination (Section 2034). No decision documents are addressed by this Review Plan and the TDR itself is not a decision document. As outlined by the Risk Informed Decision process in Para. 11.a, Para. 15.d, and Appendix D.b.1-8 of EC 1165-2-209, the **TDR does not require Type I IEPR**.

c. Type II Independent External Peer Review Determination (Section 2035). This project does not trigger WRDA 2007 Sec. 2035 factors for Safety Assurance Review. Paragraph 12.a of EC 1165-2-209

stipulates Type II IEPR for only Hurricane and Storm Damage Reduction (HSDR) and Flood Risk Management (FRM) projects and for projects where potential hazards pose significant threat to human life, which the ASR Pilot Project does not. Therefore, a **Type II IEPR is not required for this TDR.**

7. Model Certification and Approval

The TDR summarizes operational testing results obtained from two ASR systems. The TDR does not use any models that have not been approved for use by USACE or by the IMC.

8. Budget and Schedule

a. Project Milestones

Completion Submittal – pending
District Quality Control – pending
Agency Technical Review – FY12 Q3-Q4

b. ATR Schedule and Cost. It is envisioned that each reviewer will be afforded 24-32 hours. The ATR Team Leader will be afforded 8 hours for team leader duties, to include a post-review summary memo for DrChecks℠ and the coordination of the orientation meeting and the review team.

9. Points of Contact

Per guidance, the names of the following individuals will not be posted on the Internet with the Review Plan. Their titles and responsibilities are listed below:

Review Plan Coordination, ATR

Jacksonville Review Coordination

Project Information and Technical POC

[redacted]

Project Manager

[redacted]

South Atlantic Division,

[redacted]