

MAY 04 2004 AA/BS

**MEMORANDUM OF UNDERSTANDING BETWEEN  
THE ST. JOHNS RIVER WATER MANAGEMENT DISTRICT  
AND ORANGE COUNTY, FLORIDA**

**FOR  
AQUIFER STORAGE AND RECOVERY CONSTRUCTION AND TESTING**

THIS MEMORANDUM OF UNDERSTANDING (“MOU”) is made and entered into by and between the St. Johns River Water Management District (the “District”), whose mailing address is Post Office Box 1429, Palatka, Florida 32178-1429, and ORANGE COUNTY, FLORIDA, (the “County”), whose address is 201 South Rosalind Avenue, Orlando, Florida 32802.

**WITNESSETH:**

WHEREAS, the parties to this MOU desire to design, permit, and construct an Aquifer Storage and Recovery (“ASR”) system (“Project”);

WHEREAS, the District and the County each have programmatic authority and established funding sources to cost-share this project;

WHEREAS, a goal of the Project is to demonstrate that ASR is a feasible technology for utilities in the east-Central Florida region; and

WHEREAS, the District and the County agree the District shall serve as the lead agency for the design, permitting, construction, and testing of the ASR project. –

NOW THEREFORE, in consideration of the foregoing premises, which are made a part of this Memorandum of Understanding, the District and the County hereby agree to the following:

**I. AUTHORITY:**

This Memorandum of Understanding is entered into by the parties under the following authority:

- A. The District enters into this Memorandum of Understanding under the authority of Section 373.083, Florida Statutes, which authorizes the Governing Board to enter into agreements with other public agencies to accomplish the directives and goals of Chapter 373.
- B. The County enters into this Memorandum of Understanding under the authority of Sections 125.01(1)(k)1, and 125.01(1)(p), Florida Statutes, which authorize the County to enter into agreements with other public agencies to accomplish goals for providing water to its customers.

**II. STATEMENT OF WORK:**

All work shall be performed in accordance with Exhibit "A", Statement of Work. All work shall be performed by the District's Contractor under District Contract #SF410RA.

**III. EFFECTIVE DATE, TERM, AMENDMENTS, TERMINATION:**

- A. This MOU shall commence on the date of full execution as evidenced by the last date this MOU is signed, and shall remain in effect for five (5) years, in accordance with this MOU.
- B. This MOU shall be reviewed annually by the parties and may be amended upon mutual agreement of the parties. Amendments shall be in writing and approved by all parties.

- C. This MOU may be terminated by either party at any time upon thirty (30) days written notice to the other party, provided however, that such termination shall not relieve either party of its obligation to pay, through the date of notice of termination, its respective cost-share amount for ongoing projects or programs for which it has advanced or committed funds. The County's obligation to pay is subject to the approval of the County's annual budget. The District's obligation to pay is subject to the approval of Florida Forever funding and the annual budget by the District's Governing Board.

**IV. FUNDING OF THE AQUIFER STORAGE AND RECOVERY COST-SHARE PROGRAM:**

- A. The District agrees to fund the ASR Project as set forth in Exhibit "A," Statement of Work. The District's contribution is contingent upon and subject to annual budget approval by the District's Governing Board.
- B. The County agrees to contribute to the Aquifer Storage and Recovery project in the manner and the amount described in Exhibit "A," Statement of Work. The County's contribution is contingent upon and subject to annual appropriation by the County's Board of County Commissioners.

**V. LIABILITY AND INSURANCE:**

Both the District and the County:

- A. Are responsible for all personal injury and property damage attributable to the negligent acts or omissions of that party and the officers and employees acting within the scope of their employment. In addition, each party is subject to the provisions of Section 768.28, Florida Statutes. Neither this provision nor any other in this MOU shall be construed as a waiver of sovereign immunity by either party.
- B. Both the District and the County shall acquire and maintain throughout the term of this MOU such general liability insurance, automobile insurance, and workers' compensation insurance as required by their current rules and regulations.

- C. District agrees that all contracts and subcontracts for any construction work described in the Statement of Work shall include hold harmless and indemnification provisions to protect the County and the District in a form acceptable to the County and the District. The District contractor or subcontractor shall provide the County with evidence of said hold harmless and indemnity prior to commencement of work and access to County property.

**VI. PROJECT MANAGEMENT:**

- A. Project Managers - Each party hereby designates the employee set forth below as its respective Project Manager. Project Managers shall assist with project coordination and shall be the party's primary contact person. Notices or reports shall be sent to the attention of the parties' Project Manager by U.S. Mail, postage prepaid, to the parties' addresses as follows:

For the District:  
Douglas Munch, P.G.  
4049 Reid Street  
Palatka, FL 32177  
Tel: (386) 329-4173

For the County:  
Robert Teegarden, P.E.  
Orange County Utilities Engineering  
109 East Church Street, 3<sup>rd</sup> Floor  
Orlando, FL 32802  
Tel: (407) 836-7240

- B. Either party may designate a new Project Manager at its discretion. Written notification of the new Project Manager and effective date shall be provided to the other party.
- C. At a minimum, the District's Project Manager shall consult with the County's Project Manager prior to initiating each task. The District's Project Manager shall provide County's Project Manager a report as to the status of each task on a monthly basis. The District's Project Manager shall notify County's Project Manager of the completion of each task within 30 calendar days of the completion of each task.

**VII. OWNERSHIP OF DOCUMENTS:**

- A. Ownership and copyright to all reports and all accompanying data (in all formats) produced pursuant to work done under this MOU shall be vested in both parties to this MOU. Any source documents or any other documents or materials developed, secured or used in the performance of this MOU shall be considered property of the District and the County.
  
- B. All permits shall be in the name of the District. The District shall provide a copy of all permits, as well as design and construction plans, to the County's Project Manager. At the expiration or termination of the project, at the request of the County, the District shall transfer to the County all permits.

**Remainder of page intentionally left blank**

IN WITNESS WHEREOF, the following authorized representative of the ST. JOHNS RIVER WATER MANAGEMENT DISTRICT and ORANGE COUNTY have executed this Memorandum of Understanding on the date signed by each party.

ST. JOHNS RIVER WATER  
MANAGEMENT DISTRICT

ORANGE COUNTY  
By: Board of County Commissioners

By: Kirby B. Green, III  
Kirby B. Green, III  
Executive Director

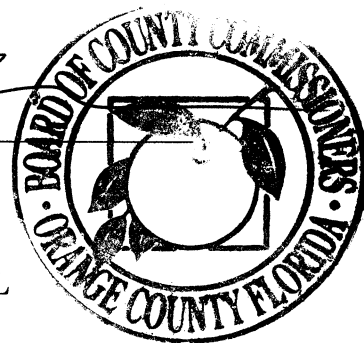
By: Richard T. Crotty  
Richard T. Crotty  
County Chairman

Date: 24 May 04

Date: 5. 4. 2004

ATTEST: Martha O. Haynie, County Comptroller  
As Clerk of the Board of County Commissioners

By: [Signature]  
Deputy Clerk



APPROVED BY THE OFFICE OF GENERAL COUNSEL

Stanley J. Niego, Sr.  
Stanley J. Niego, Sr. Assistant General Counsel

**EXHIBIT A**

**ST JOHNS RIVER WATER MANAGEMENT District / ORANGE COUNTY  
AQUIFER STORAGE AND RECOVERY  
CONSTRUCTION AND TESTING DEMONSTRATION PROGRAM**

**STATEMENT OF WORK**

**INTRODUCTION/BACKGROUND**

**Project Definition** - The St. Johns River Water Management District (the “District”) and Orange County (the “County”) shall jointly endeavor to design, permit, and construct a Floridan Aquifer Storage and Recovery (“ASR”) system, consisting of an exploratory well, monitoring wells, ASR test well, site work, and related pipelines and appurtenances, all defined to be part of the Project.

**Project Need** – Determine the feasibility of ASR for storing and recovering seasonally available large volumes of alternative water supplies to offset the use of potable groundwater in east Central Florida.

**Memorandum of Understanding’s Goals** – Demonstrate the feasibility of ASR technology for utilities in the east Central Florida region. The District seeks to complete this cooperative project with the County and shall require the District’s contractor, Barnes, Ferland and Associates, Inc., to prepare the design of the Project in accordance with the requirements of regulatory agencies, the County, and the District and to permit and construct the system in accordance with such design.

**Consistency With District’s Mission And Goals** – This project is included in the Water Resource Development Work Program, dated November 7, 2002, as required by Section 373.536(6)(a) 4, Florida Statutes. The design shall be consistent with the District’s report entitled “Desktop Assessment of Aquifer Storage Recovery for Orange County, Florida”, prepared by Barnes, Ferland and Associates, Inc, and dated March, 2003.

**Location Of The Work** – The Project shall be located at the County’s Eastern Water Reclamation Facility (EWRF) on 1621 S. Alafaya Trail in Orange County, Florida, or a different site if mutually agreed upon by both parties.

**OBJECTIVES**

**Statements Of The Results To Be Achieved** – The Project shall be implemented with design features approved by the District and the County, in sequential order to provide for maximum benefit of expended funds. Sequential progress shall be based on exploration, permitting, and construction. The ASR test well shall be drilled in accordance with Florida Department of Environmental Protection (“FDEP”) Underground Injection Control (“UIC”) requirements, and successfully cycle-tested with potable water, to demonstrate feasibility for water storage and recovery.

**SCOPE OF WORK**

**Outline Of Work**

Note: Tasks 1 and 2 are included herein as reference only, as these tasks have been completed prior to the issuance of this Agreement. Task 3 will be completed with execution of this Memorandum of Understanding.

- Task 1 Report titled “District Aquifer Storage and Recovery Construction and Testing P Program Plan- FY2002”, April 2002, prepared by Barnes Ferland & Associates, Inc.
- Task 2 Report titled “Desktop Assessment of Aquifer Storage Recovery for Orange County, Florida, Contract #SF410RA”, March 2003, prepared by Barnes Ferland & Associates, Inc.
- Task 3 Preparation and approval of a County Memorandum of Understanding (MOU) and Statement of Work (“SOW”)
- Task 4 Site-Specific Data Collection and Preliminary System Design
- Task 5 ASR Pilot Project Design
- Task 6 Regulatory Permitting
- Task 7 ASR Facilities Construction, Monitoring, and Testing
- Task 8 Startup and Training
- Task 9 Large Cycle Operational Monitoring and Evaluations
- Task 10 Peer Review

### **Overview Of The Steps Of Project**

The District shall prepare a preliminary design plan for the ASR system, including an exploratory well. Based on the results of the exploratory well, final design of the ASR system shall be conducted in compliance with FDEP UIC permitting requirements. Once the design and permit are approved, the District shall begin construction of the ASR Test Well and related appurtenances. After completion of drilling and verification of project requirements, cycle testing shall be performed by the District to measure storage and recovery. If at any time the project is deemed infeasible, the District shall coordinate with the County the salvage of any constructed wells for monitoring or other purposes, or the District shall provide abandonment and decommissioning services, as required. Upon successful demonstration of feasibility, as mutually agreed on by District and County, the completed project shall be transferred to the County for operation and ownership, including any transfer of the existing UIC permit that may be required, at no cost to the County.

### **Description Of The Methodology To Be Used**

The District shall utilize methodologies accepted in the professional practices of engineering and geology. Methodologies shall incorporate FDEP UIC permitting requirements and provide sufficient milestones for review, comment, and approval by the District and the County. Construction methods shall be in accordance with the General Conditions provided for in District Contract #SF410RA, incorporated herein by reference (Attachment "B"), including compliance with County local codes and requirements.

**Location Of Work** - The project shall be located at the County's EWRf located at 1621 S. Alafaya Trail in Orange County, Florida. The exact project location at the EWRf site shall be determined based on preliminary design and coordinated with the location of potable source water and discharge facilities. The proposed potable water supply is the County's 36" water transmission main located in the Curry Ford Road right-of-way. The proposed recovered water discharge is to wetlands located on the EWRf site. The ASR system shall accommodate elements of existing and planned improvements at the EWRf.

### **TASK IDENTIFICATION**

The following Tasks 4 through 10 are summarized from the District's ASR Construction and Testing Demonstration Program Plan. These tasks shall be performed under separate agreements, authorized and approved by work-orders issued by District to its contractor prior to beginning each individual task, or group of tasks.

**Task 4 — Site-Specific Data Collection and Preliminary System Design**

Prepare a data collection plan for the project site based on a review of existing information and coordination with FDEP. In particular, the plan shall address the need for initial exploratory testing as the basis of development of ASR well design.

To the extent possible based on FDEP guidelines, the District proposes to gather hydrogeologic information from the construction and testing of an initial exploratory well at the project site, which would then be converted to an observation well for the ASR well construction and testing program. The data collection plan shall be implemented, the data shall be evaluated, and a preliminary system design shall be developed. The County shall provide a license agreement granting the District access to project site for exploration well drilling and data collection. If the site is deemed to be infeasible for any reason, the District and the County shall endeavor to locate an alternative site for the ASR well construction and testing program, through mutual agreement by both parties.

**Task 5 — ASR Pilot Project Design**

This task includes the design of well and wellhead facilities at the selected site, including supporting infrastructure such as pipelines, electrical service, and incidental site work. The design shall also specify the proposed data collection and monitoring programs. The County shall be provided with design documents for review, comments and approval prior to completion of this task.

**Task 6 — Regulatory Permitting**

The District and the County shall adhere to regulatory permitting requirements, including submittal of permit applications, and responses to requests for information from regulatory agencies. The primary permitting effort shall be through the FDEP UIC program. District shall provide services to support the cost of preparation of: a) Well Construction permit applications, b) local government permit applications, as required, c) FDEP UIC permit application, d) District Consumptive Use Permit application for testing water, e) FDEP Drinking Water System extension permit application, f) NPDES storm water discharge permit application if required, f) other FDEP water system permits, if required, and g) project reports.

The District shall be responsible for site improvements when required for the project, which shall be mutually agreed upon by the parties. The County shall be responsible for processing and resolving any zoning or land use issues that may arise with regard to the Project. The County shall be the Owner for well construction, FDEP UIC, FDEP water main extension construction and any other project-related permit applications. The District shall act as the County's agent, by preparing applications on behalf of the County, for any permit-related issues and pay application fees.

**Task 7 — ASR Facilities Construction, Monitoring, and Testing**

The District shall provide for the construction of an ASR well and monitor wells, associated pipelines, electrical service, incidental site work, and wellhead facilities. Pipeline work by District shall be limited to 1) a connection between the ASR wellhead and the nearest potable water transmission main and 2) a discharge line from the ASR wellhead to nearby wetland or acceptable land area at the project site. The electrical work by District shall be limited to the secondary service line connecting the ASR well pump motor to the point of termination of primary power brought to the project site by the County. The District shall also conduct initial hydraulic and water quality testing, in addition to geophysical logging, geochemical modeling, and evaluation of any additional pretreatment requirements. A series of ASR “small cycle” test cycles shall be conducted to evaluate the project site.

The District shall provide for a survey that shall stake and define the boundaries of construction within the EWRF as it is defined by EWRF boundary survey documents furnished by the County. The District shall be responsible for construction, inspection, testing, and progress reporting for the Project. The County shall allow the District and/or its agents full Project site access to conduct and inspect construction of the Project. The County shall alert the District of any known problems and the District, when appropriate, shall require its Contractor to correct any problems or non-conforming work discovered by District inspection or the County’s observation.

**Task 8 — Startup and Training**

The District shall provide operational training of County staff to ensure a smooth transition from the ASR test program into full ASR operations. The final training plan shall be developed subsequent to analysis of the small cycle testing program results.

**Task 9 — Large Cycle Operational Monitoring and Evaluations**

Conduct operational monitoring and evaluation of ASR system performance during the first two to three years of operations, making any needed adjustments to improve system performance. The County shall operate the system during this period. The District shall conduct periodic site visits and evaluate collected data to monitor large cycle performance and provide technical assistance to County, as necessary. A preliminary plan outline of County responsibilities for conducting large cycle operation and monitoring is provided in Attachment 1. This plan outline shall be developed further, when permit conditions are known, and Task 9 is implemented, for review and approval by the County and the District.

Special note is made for potential interference with monitoring requirements associated with Orange County's Consumptive Use Permit. The County and District do not believe that the five existing monitor wells (OR-664, OR-665, OR-668, OR-676, AND OR-678) on the EWRF site will be partially or fully interfered with by the operation of the proposed ASR pilot well approximately two (2) miles away. However, in the event of partial or full interference with monitored conditions at these five monitor wells on the EWRF, the County and District shall agree to jointly work, within the scope of this MOU, to resolve any interference with the monitor wells.

**Task 10 — Peer Review of District Contractor’s Work**

This task includes the review of work products, produced for this project by the District contractors and the County.

**TIMEFRAMES AND DELIVERABLES**

**Timeframe For Completion Of Entire Project**

Successive task completion without major disruption shall require a minimum of three (3) years, and up to five (5) years for final completion. Specific timeframes shall be established after the District and the County have signed the Memorandum of Understanding (MOU).

**District Deliverables and Responsibilities**

Deliverables associated with the tasks outlined below shall be furnished by both hard copy and electronic versions. All deliverables shall be provided to the District and the County Project Managers and shall generally include the following items, by task. Other elements of the project may be added as mutually agreed upon by both parties in writing.

*Task 4, Site-Specific Data Collection and Preliminary System Design:* As defined in the work(s) order, to include the following.

- Data Collection Plan
- Preliminary Design Report
  - Exploratory Well Construction Plan
  - Exploratory Well Construction Specifications
  - Exploratory Well Contractor’s Safety Plan
  - Exploratory Well Construction Schedule
  - Exploratory Well Sampling and Testing Plan
- Exploratory Well Construction Permit Application
- Well Salvage Plans for Monitoring, or Abandonment if Site is Infeasible
- Completed Exploratory Well
- Water Quality Sampling and Testing
- Exploratory Well Project Report
- Construction security plan, including access provisions, work hours and construction site security facilities. Plan must be approved by the County prior to any construction activities commencing.
- Project Schedule

**Task 5, ASR Pilot Project Design:** As defined in the work order(s), to include the following.

- ASR System Construction Plans
- ASR System Construction Specifications
- ASR System Construction Cost Estimate
- ASR System Construction Phase Services Plan
- ASR System Contractor's Safety Plan
- ASR System Construction Schedule
- ASR System Final Project Report

**Task 6, Regulatory Permitting:** District to pay for all permit application fees. One or more of the following deliverables shall apply to the project, as required:

- Well Construction Permit Application(s)
- Local Government Permit Application(s)
- FDEP Underground Injection Control (UIC) Permit Application
- Consumptive Use Permit (CUP) Application For Testing Water
- FDEP Drinking Water System Extension Permit Application
- NPDES Storm Water Discharge Permit Application
- Other FDEP Water System Permit(s)
- Permitting Condition Progress Report(s)
- Permitting Condition Sampling And Testing Report(s)

**Task 7, ASR Facilities Construction, Monitoring, and Testing:** As defined in the work order(s), to include the following.

- Payment and Performance Bond
- Construction Survey Layout and Control
- Shop Drawings
- Updated ASR System Contractor's Safety Plan
- Updated ASR System Construction Schedule
- Monthly ASR System Project Progress Reports
- Laboratory Reports
- Well Testing Discharge Plan
- Initial (start-up) cycle testing
- Construction Inspection and Testing Records
- Completed ASR System
- Site Restoration
- Construction Record Drawings
- Certifications of Completion
- Releases for Final Payment
- Final Construction Report
- Startup and Training Plan

**Task 8, Startup and Training:** As defined in the work order(s), to include the following.

- Operation and Maintenance Manuals
- Training Instruction
- Operating Guidelines
- Large Cycle Operation and Monitoring Plan  
(Preliminary plan provided as Attachment A)

**Task 9, Large Cycle Operational Monitoring and Evaluations:** Large Cycle Evaluation Reports as defined in the work order(s). The District shall provide technical oversight and assistance as required during this task.

**Task 10, Peer Review:** As defined in the work order(s).

### **COUNTY Deliverables and Responsibilities**

The County shall deliver the following items and “like kind services” through staff and ongoing operations, according to the time they are needed as jointly determined by the County and the District during the course of the work:

1. Provide project site and associated access for the Project. As necessary, provide evidence of ownership or easements providing access and control of facilities expected to be installed on the property.
2. Timely review and provide comments on District submittals.
3. Execution of permit applications, as property owner.
4. Provide relevant records pertaining to, or affecting, the Project which may consist of, but not be limited to, survey data and legal descriptions, easement documents, soils data, water facilities record drawings, site plans, right of way use requirements, and other technical information pertaining to the planning, design, and construction of the ASR facility at the proposed Project site.
5. Unique construction requirements not covered under local permits or codes, such as site lighting requirements, site access constraints, other, and any limitations on construction activities.
6. Electrical power service to the site, as required during Task 7 described above, including offsite extensions, material purchases, new equipment, lighting, metering, and individual well service connections, in accordance with local power company requirements. Shall also provide SCADA equipment (i.e., SCADA programmed panel, antenna) to be installed by District at Project site. The not-to-exceed capital cost to the County is \$120,000 for the furnishing of labor, equipment, and materials to install the electrical service and provision of the SCADA equipment.

7. Water quality sampling and testing during large cycle operation phase of Project, as required during Task 9 described above, after the County assumes ownership of project. The not-to-exceed cost to the County is \$100,000 for this water quality sampling and testing. This analytical work shall be consistent with regulatory agency permitting and monitoring requirements. For estimated testing parameters, see Table 1 ASR Large Cycle Water Quality Testing Plan in Attachment 1.
8. Information regarding features and items that are required to comply with zoning and land development codes.
9. Necessary testing water, permission to use recovered water discharge purposes, and appurtenant operational requirements for the Project, including necessary coordination and related services from the County's staff. If the County does not have an adequate allocation of water under existing consumptive use permits for the cycle testing, then the District shall be responsible for preparing the permit application necessary for the District review and approval of a separate (or additional) allocation of water sufficient for this purpose.
10. Accept responsibility for operation and maintenance of completed project. Agrees to assume total responsibility of ownership for continued operation, maintenance, and data collection for the ASR facilities following completion of the project, in perpetuity, but reserves the right to re-permit, modify, abandon, or decommission the Project in accordance with applicable rules and regulations.

#### **Comment And Review Time**

Major milestone submittals defined in the work orders shall generally include four (4) weeks for review and comment by the District and the County. Review and comment for lesser submittals may be reduced to three (3) weeks, as mutually agreed.

Construction-phase data that must be reviewed and approved in a shorter timeframe to facilitate construction activities shall be specified in the work order or determined by the District's Project Manager, and agreed to by the County.

District shall compile all review comments for mutual resolution and action within the Scope of Work.

**CONTRACT BUDGET**

The District shall be responsible for all costs of the Project with the exception of capital costs listed below and in-kind services as described in this Statement of Work. The estimated cost for the District’s Contractor to implement the Project is within the cost range estimated in District report entitled “Desktop Assessment of Aquifer Storage Recovery for Orange County, Florida”, prepared by Barnes, Ferland and Associates, Inc., and dated March, 2003.

The County shall be responsible for its portion of the costs for the Project, as defined in the County Deliverables and Responsibilities section of this Statement of Work.

The District and the County estimated project capital costs are as follows:

District Work for Task 4 - 10	
Using Current Florida Forever Funding	\$ 2,384,000
County Capital-related Cost Items:	
Task 7, Electrical Service and SCADA equipment	\$ 120,000
Task 9, Water Quality Sampling and Analysis	<u>\$ 100,000</u>
Sub Total County	\$ 220,000
TOTAL DISTRICT AND COUNTY	\$ 2,604,000

**ATTACHMENT 1**

**District / ORANGE COUNTY  
AQUIFER STORAGE AND RECOVERY  
CONSTRUCTION AND TESTING DEMONSTRATION PROGRAM  
PRELIMINARY OUTLINE FOR LARGE CYCLE TESTING PLAN**

**BASIS OF PLAN:**

ASR Well: 1 to 5MGD Capacity

Monitoring Wells: 1 Background, 2 Down Gradient

Cycle: 90 Days Storage  
90 Days Dormant  
90 Days Recovery  
2 Cycles to be tested (270 Days/ Cycle)

**COUNTY OPERATIONAL REQUIREMENTS:**

1. During well operation (Storage & Recovery Phases):
    - a. Daily inspections and routine maintenance of mechanical equipment and instrumentation.
    - b. Daily Recording of:
      - Well Head Pressure \*
      - Water Level at ASR and Monitoring Wells \*
      - Flow (Storage or Recovery)\*
      - Operation of Valves and Well Pump as necessary for storage or recovery
- \*These functions may be performed with continuous read instrumentation.
2. Flow meter annual calibration
  3. Instrument calibration, as required (i.e. water level monitors, pressure monitors, etc)
  4. Collection and analysis of water quality samples. See Table 1.

CYCLE OPERATIONAL PLAN:

1. Storage
  - a. Open ASR well inlet valve to allow 1-5 MG volume into aquifer over 16-24-hour period.
  - b. Shut / throttle inlet valve as required during distribution system peak demand periods.
  - c. Record flow, pressure and water levels on daily basis (or continuously, if equipped with instrumentation) for ASR and monitoring wells
  - d. Collect water quality samples from storage source water, ASR well, and monitoring wells in accordance with frequency and chemical parameters shown in Table 1.
  - e. Back flush ASR well to waste, as necessary, based on storage rate and well head pressure.
2. Dormant Phase
  - a. Collect water quality samples and water levels from ASR well and monitoring wells – See Table 1 for frequency and chemical Parameters.
  - b. Periodic inspection of well equipment.
3. Recovery
  - a. Open ASR discharge valve; Operate pump to discharge 1- 5MGD on daily basis.
  - b. Record flow, pressure and water levels from ASR and monitoring wells.
  - c. Collect water quality samples from ASR well and monitoring wells – See Table 1.
  - d. Close ASR well on daily basis when target recovery volumes achieved.

**Table 1. ASR Large Cycle Water Quality Testing Plan**

Cycle Phase	No. of Samples	Frequency	Parameters for Storage Source Water	Parameters for ASR Well Ground Water	Monitoring Wells (3)
<b>Storage</b>	2	At start of phase, before storage begins	Primary & Secondary Drinking Water Standards, pH, temp,D.O., Eh, Specific Conductance, Ca, Mg, K, Si, HCO <sub>3</sub> , Total/non-carbonate/calcium hardness, Phosphate, Ammonia, H <sub>2</sub> S, TOC, U.	Primary & Secondary Drinking Water Standards, pH, temp,D.O., Eh, Specific Conductance, Ca, Mg, K, Si, HCO <sub>3</sub> , Total/non-carbonate/calcium hardness, Phosphate, Ammonia, H <sub>2</sub> S, TOC, U.	
	60	Storage source water and ASR ground water-Daily for 1st 30 Days.	Cl, F, SO <sub>4</sub> , TDS,pH, Temp., D.O., Eh, Specific Conductance	Cl, F, SO <sub>4</sub> , TDS,pH, Temp., D.O., Eh, Specific Conductance	
	20	Every 3 Days for Days 31-60			
	8	Weekly for Days 61-90			
	4	Monthly	Na, Ca, Mn, Fe, Mg, Sr, K, Al, Si, Cu, Zn, Cd, Se, As, HCO <sub>3</sub> , Total/non-carbonate/calcium hardness, Phosphate, Ammonia, H <sub>2</sub> S, TOC, THM Species.	Na, Ca, Mn, Fe, Mg, Sr, K, Al, Si, Cu, Zn, Cd, Se, As, HCO <sub>3</sub> , Total/non-carbonate/calcium hardness, Phosphate, Ammonia, H <sub>2</sub> S, TOC, THM Species.	
	39	Weekly			Cl, F, SO <sub>4</sub> , TDS,pH, Temp., D.O., Eh, Specific Conductance
<b>Dormant</b>	1	At Day 45 of Dormant Phase		Primary & Secondary Drinking Water Standards, temp,D.O., Eh, Specific Conductance, Ca, Mg, K, Si, HCO <sub>3</sub> , Total/non-carbonate/calcium hardness, Phosphate, Ammonia, H <sub>2</sub> S, TOC, U.	
	2	Monthly		Cl, F, SO <sub>4</sub> , TDS,pH, Temp., D.O., Eh, Specific Conductance	
	6	Monthly			Cl, F, SO <sub>4</sub> , TDS,pH, Temp., D.O., Eh, Specific Conductance

Cycle Phase	No. of Samples	Frequency	Parameters for Storage Source Water	Parameters for ASR Well Ground Water	Monitoring Wells (3)
<b>Recovery</b>	1	At start of phase, before recovery begins		Primary & Secondary Drinking Water Standards, pH, temp,D.O., Eh, Specific Conductance, Ca, Mg, K, Si, HCO <sub>3</sub> , Total/non-carbonate/calcium hardness, Phosphate, Ammonia, H <sub>2</sub> S, TOC, U.	Cl, F, SO <sub>4</sub> , TDS,pH, Temp., D.O., Eh, Specific Conductance
	30	ASR ground water- Daily for 1st 30 Days.		Cl, F, SO <sub>4</sub> , TDS,pH, Temp., D.O., Eh, Specific Conductance	
	10	Every 3 Days for Days 31-60			
	4	Weekly for Days 61-90			
	2	Monthly		Na, Ca, Mn, Fe, Mg, Sr, K, Al, Si, Cu, Zn, Cd, Se, As, HCO <sub>3</sub> , Total/non-carbonate/calcium hardness, Phosphate, Ammonia, H <sub>2</sub> S, TOC, THM Species.	
	39	Weekly			Cl, F, SO <sub>4</sub> , TDS,pH, Temp., D.O., Eh, Specific Conductance