Waste Not Want Not: Innovation Leads to Beneficial Use of Nanofiltration Concentrate

WATEREUSE ASSOCIATION

Sustainable Solutions for a Thirsty Planet®

27TH ANNUAL WATEREUSE SYMPOSIUM

WESTIN DIPLOMAT RESORT & SPA

HOLLYWOOD, FL • SEPTEMBER 9–12, 2012

September 11, 2012

WADE TRIM

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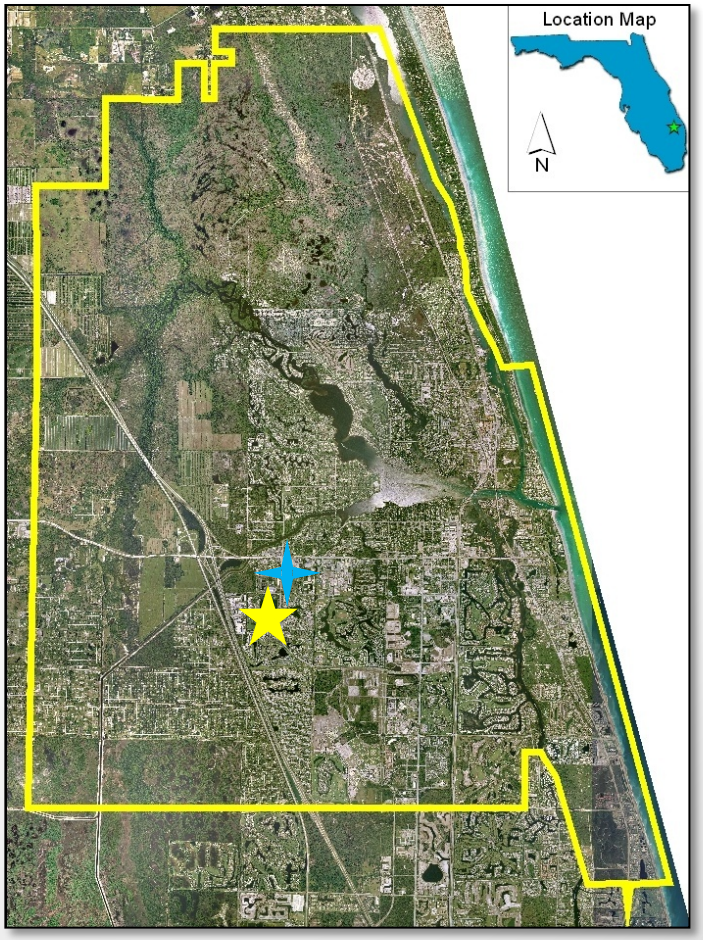
Presentation Outline

- Background
- Problem
- Permitting approach
- Operational solution
- Water quality results
- Summary

Loxahatchee River Watershed

- 260 square mile ecosystem
- Natural area = 63%
- Agricultural & forest upland comprise 25% of the land use
- Northwest fork federally designated as a “Wild & Scenic River” (1985)
- Coastal communities in the watershed – Jupiter, Jupiter Island, Tequesta, Hobe Sound, Juno Beach & Palm Beach Gardens



Loxahatchee River District Reclaimed Water Facility

- 11 mgd capacity (AADF)
- Diffused aeration
- High rate filtration
- High level disinfection
- 90% of treated wastewater sent out for reuse
- Deep injection well for wet weather disposal

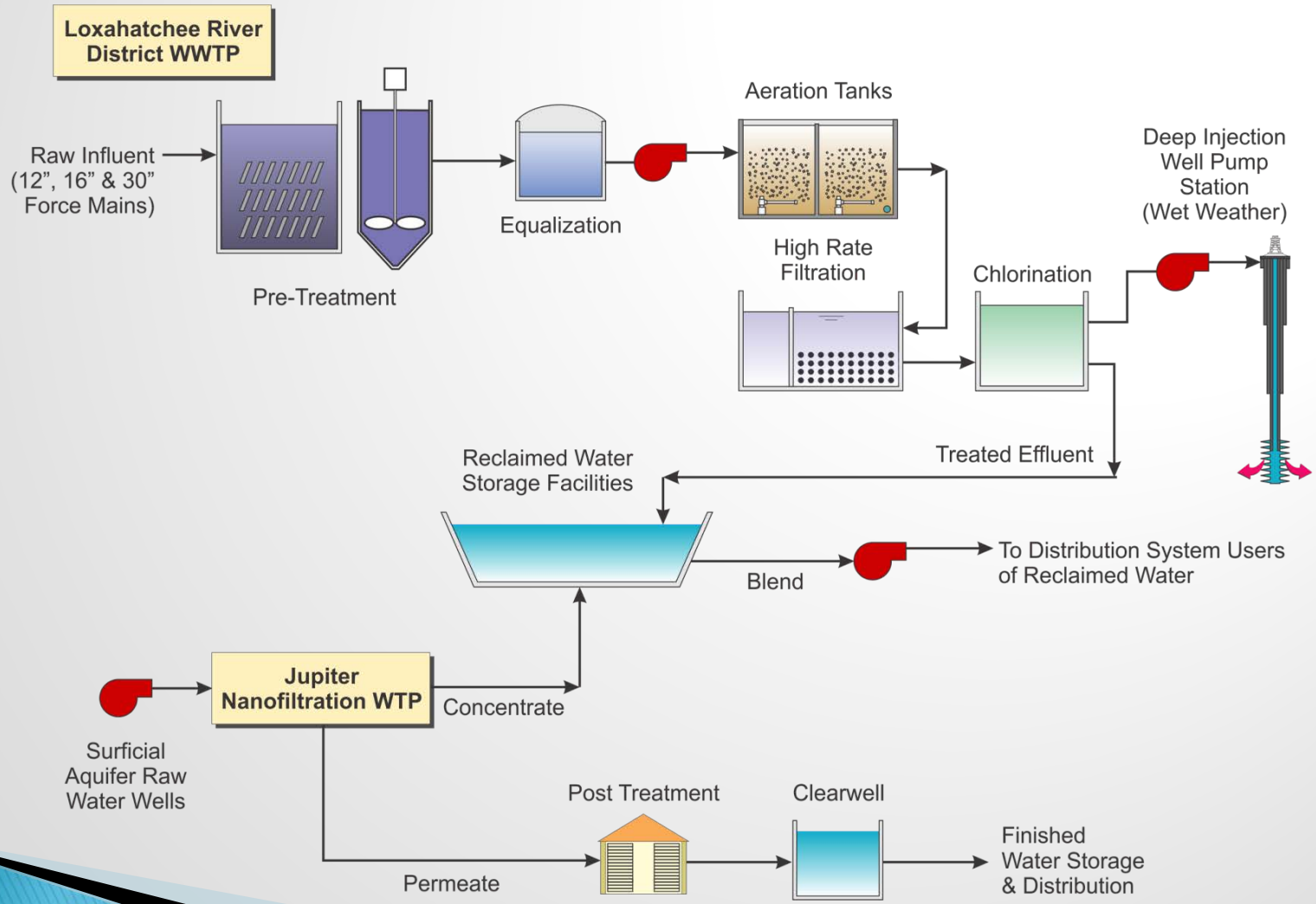
Reclaimed Water Facility

- 50 acres of onsite storage lakes
- +31 billion gals of reuse distributed
- 12.1 mgd – existing reuse contracts
- 2,600 acres in reclaimed service area – golf courses, university campus, baseball facilities, planned community

Identified Need for Reuse

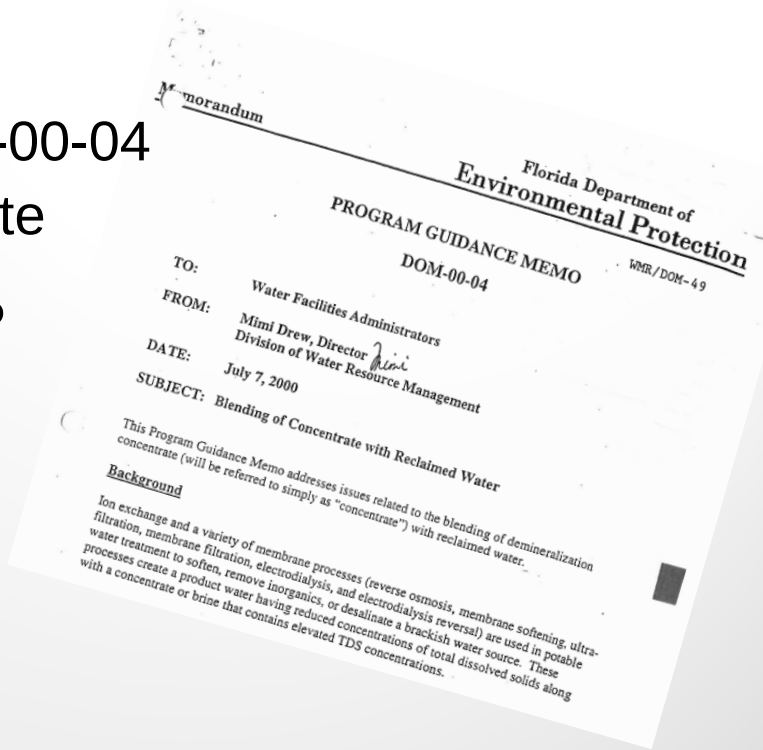
- Jupiter was expanding its regional WTP w/ nanofiltration capacity but needed to dispose of concentrate stream (3.0 mgd)
- LRD was experiencing increased reuse demand
- Concentrate disposal options:
  - Construct a new deep injection well
  - Obtain a surface water discharge permit (C-18 canal)
  - Blend the concentrate with LRD effluent and use for reuse water

Blending Process Flow Diagram



Blend Concept – Initially

- FDEP regulations (1999) provide for disposal of demineralization concentrate if no environmental harm
- FDEP Program Guidance Memo DOM-00-04 - land application of blended concentrate
- Idea well received by SFMWD & FDEP
- Acceptable for reuse, cost-effective, and environmentally beneficial
- First facility permit of this type in south Florida



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Florida Department of
Environmental Protection

PROGRAM GUIDANCE MEMO
DOM-00-04

WMR/DOM-49

TO: Water Facilities Administrators

FROM: Mimi Drew, Director
Division of Water Resource Management

DATE: July 7, 2000

SUBJECT: Blending of Concentrate with Reclaimed Water

This Program Guidance Memo addresses issues related to the blending of demineralization concentrate (will be referred to simply as "concentrate") with reclaimed water.

Background

Ion exchange and a variety of membrane processes (reverse osmosis, membrane softening, ultrafiltration, membrane filtration, electrodialysis, and electrodialysis reversal) are used in potable water treatment to soften, remove inorganics, or desalinate a brackish water source. These processes create a product water having reduced concentrations of total dissolved solids along with a concentrate or brine that contains elevated TDS concentrations.

Permitting Challenges w/ Blended Reuse

- Provide technical data showing that the **Blend** would not affect landscape vegetation
- Demonstrate that the **Blend** would not impair groundwater supplies or soils
- Request alternative design for deep injection well to allow disposal of the **Blend** during wet weather events

Challenge No. 1 – Vegetation Water Quality Goals

Selected Water Quality Parameters	Quality Acceptable for Bermuda Grass	Predicted Water Quality (Reuse/ Nano Blend)
TDS (mg/L)	1,000 – 1,500	955
Calcium (mg/L)	40 -120	209
Magnesium (mg/L)	6 - 20	11
Sodium (mg/L)	0 - 50	81
Alkalinity (mg/L)	0 - 100	505
Chloride (mg/L)	177 - 355	152
pH	7.6	7.1
Sodium Adsorption Ratio (SAR)	3 - 7	1.5

Challenge No. 2 – Groundwater Concerns with Blend

- Land application of reclaimed water must meet primary and secondary drinking water standards
- Drinking water standards must be met at the edge of the zone of discharge (i.e., 100-ft from edge of land application area)

Parameter (mg/L)	LRD Effluent (7.75 mgd)	NF Concentrate (3.63 mgd)	Reuse/Nano Blend (11.38 mgd)	Ground-water Quality
TDS	352	2,241	955	500
Sulfate	42	334	135	250
Iron	0.19	2.3	0.9	3.0

Challenge No. 3 – Injection Well Disposal

- Blended effluent disposal option needed:
  - During wet weather events and/or
  - When onsite reuse water storage facilities reach capacity
- Existing surface water discharge was not rated or permitted to receive any additional waste streams
- The nano-concentrate was classified as an “industrial discharge” stream thereby requiring a deep well with a tubing and packer design (by rule)

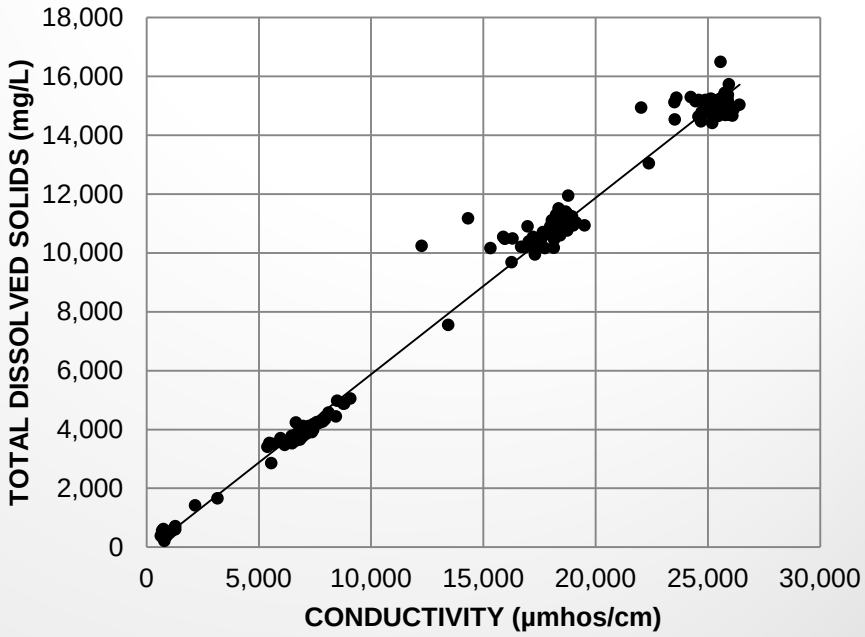
Permit Approach – Alternative Design Request for Deep Injection Well

- Demonstrated that the nano-concentrate lost its identity once blended with the LRD effluent stream
- The **Reuse/Nano Blend** resembles a typical wastewater effluent, except for slightly elevated TDS levels
- Alternative casing materials (e.g. tubing and packer design) should not be required for the existing deep injection well since the **Blend** no longer fit the definition of an “industrial discharge”

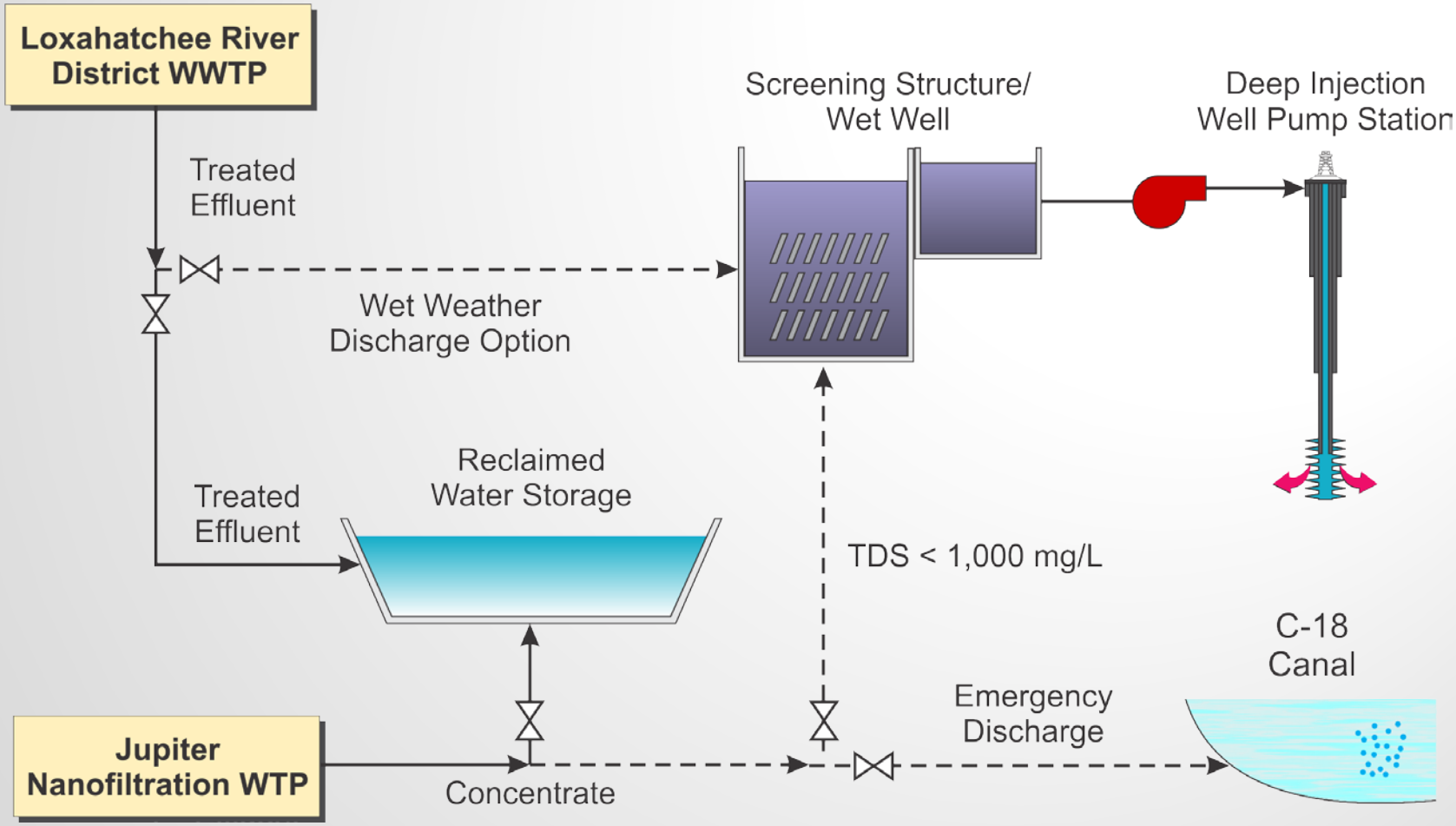
Reuse/Nano Blend Operating Protocol

- No Reuse of **Blend** if TDS > 1,500 mg/L
- No Deep Well Disposal of **Blend** if Chlorides > 355 mg/L
- No Deep Well Disposal of **Blend** if TDS > 1,000 mg/L
  - TDS of **Blend** will be lower than effluent TDS at several South Florida WWTPs in operation
  - Based on regression analysis equating TDS to conductivity (R^2 = 0.9944)

Loxahatchee River District
TDS-Conductivity (2004-2009)



Permitted Blend Disposal Option



Permit Issued in 2009

- FDEP-UIC issued the permit for an alternative design in November 2009
- Blending of concentrate allowed at the screening structure of the deep injection well
- Required interim pressure test midway between the standard 5-yr mechanical integrity test
- Construction projects completed in 2009 and 2010

Department of Environmental Protection

Southeast District
400 North Congress Avenue, Suite 200
West Palm Beach, Florida 33401

Charlie Crist
Governor
Jeff Kottkamp
Lt. Governor
Michael W. Sole
Secretary

ELECTRONIC CORRESPONDENCE

D. Albrey Arrington, Ph.D
Executive Director
Loxahatchee River Environmental Control District
2500 Jupiter Park Drive
Jupiter, FL 33468

NOTICE OF PERMIT

November 2 ,2009

PALM BEACH COUNTY
UIC: Loxahatchee River Environmental Control District (Encon)
FILE: 0136774-187-UO
Class I Injection Well IW-1 and monitor wells MW-1 and MW-2

Dear Dr. Arrington:

Enclosed is Permit Number 0136774-187-UO to operate the ENCON wastewater treatment plant Class I injection well, IW-1, and associated monitor wells MW-1 and MW-2, permitted as an alternative design, since the injectate will consist of blended non-hazardous secondary treated domestic wastewater effluent with reject concentrate (industrial wastewater, surficial aquifer water reject from a nanofiltration process) from the Town of Jupiter water treatment plant. This permit is issued pursuant to Section(s) 403.087, Florida Statutes (FS) and Florida Administrative Codes (FAC) 62-4, 62-520, 62-522, 62-528, 62-550, 62-600, 62-601 and 62-660. The system is located at the Loxahatchee River Environmental control District Wastewater Treatment Plant.

Any party to this Order (permit) has the right to seek judicial review of the permit pursuant to Section 120.68, Florida Statutes, by the filing of a Notice of Appeal pursuant to Rule 9.110, Florida Rules of Appellate Procedure, with the Clerk of the Department in the Office of General Counsel, Mail Stop 35, 3900 Commonwealth Blvd., Tallahassee, Florida 32399-3000, and by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate District Court of Appeal. The Notice of Appeal must be filed within 30 days from the date this Notice is filed with the Clerk of the Department.

Should you have any questions, please contact Heidi Vandor, PG at (561) 681-6687 or Joseph R. May, PG, at (561) 681-6891 of this office.

Executed in the City of West Palm Beach, Florida.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

10-30-09

Jack Long
District Director
Southeast District

Date

JLL/ABURA/MV
Copies furnished to:
Joe Haberfeld, FDEP/TLH
Steve Anderson, SFWMD/WPB
Tom Lefevre, PBCHD
Cathy McCarty, FDEP/TLH
Heidi Vandor, FDEP/WPB
Nancy Marsh, USEPA
Albert Muniz, H&S

CERTIFICATE OF SERVICE

This is to certify that this NOTICE OF PERMIT and all copies were mailed before the close of business on 11-2-09 to the listed persons.

Clerk Stamp

FILING AND ACKNOWLEDGMENT FILED, on this date, pursuant to the §120.52, Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Clerk

11-02-09

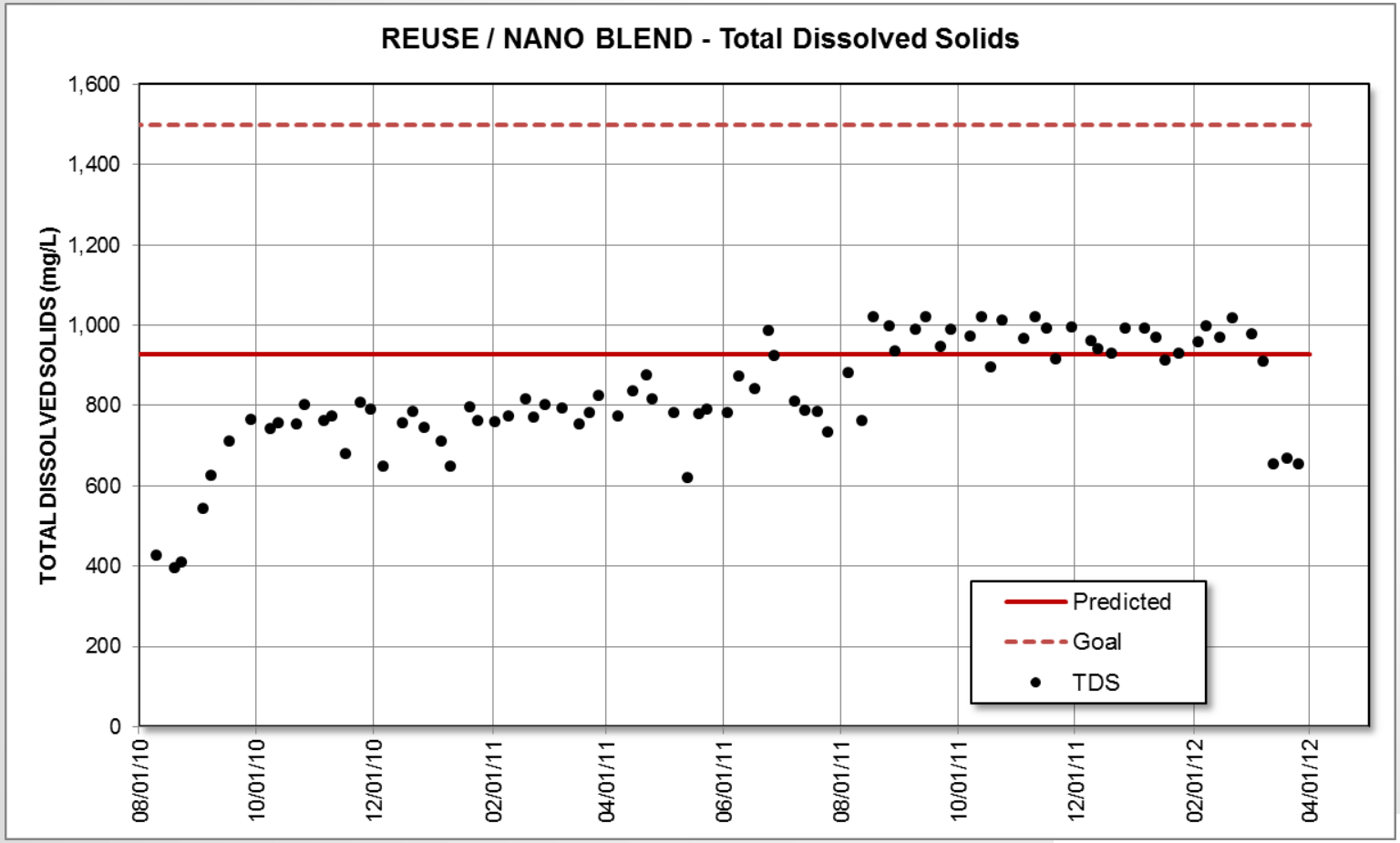
Date

Blending Operation Data: August 2010 – April 2012

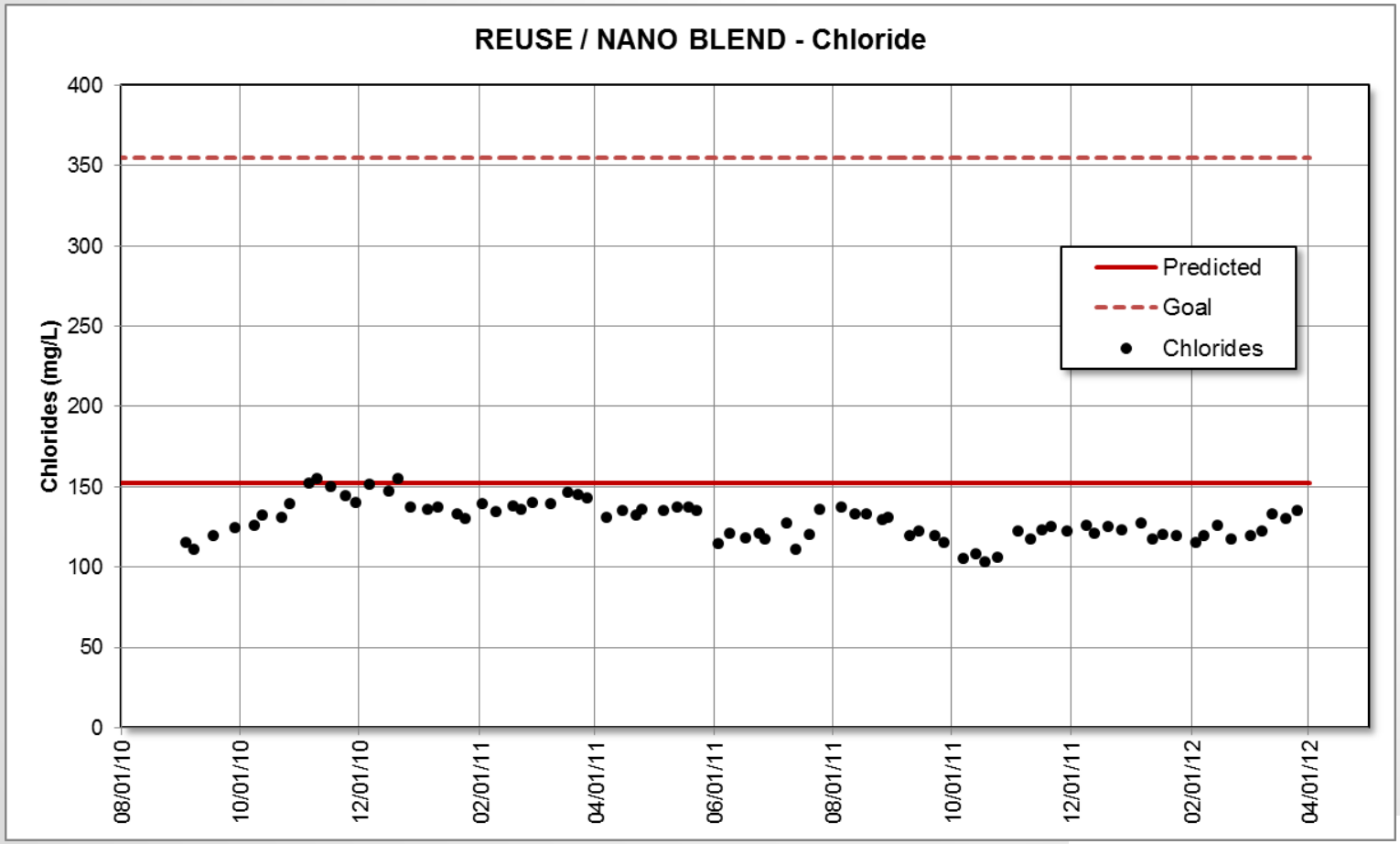
- 579-day Data Analysis (Reuse/Nano Blend)
- Total rainfall = 78 inches (0.14 inches/day)

Water Flows	Reuse Flow (mgd)	Nano-Concentrate Flow (mgd)	Reuse/Nano Blend Total (mgd)
Average	6.78	1.34	8.12
Minimum	5.57	0.42	5.99
Maximum	7.80	1.98	9.78

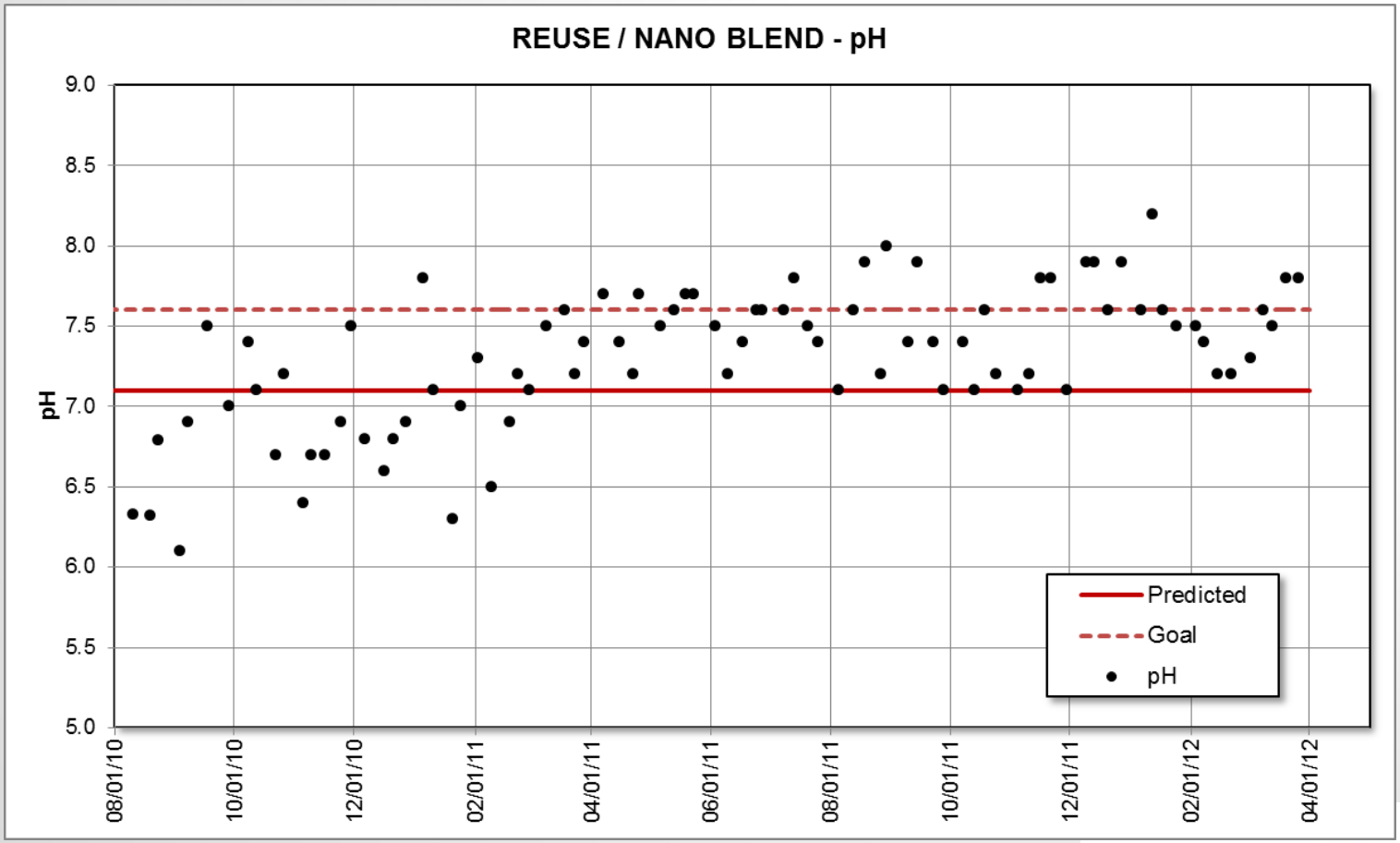
TDS – Reuse/Nano Blend August 2010 through April 2012



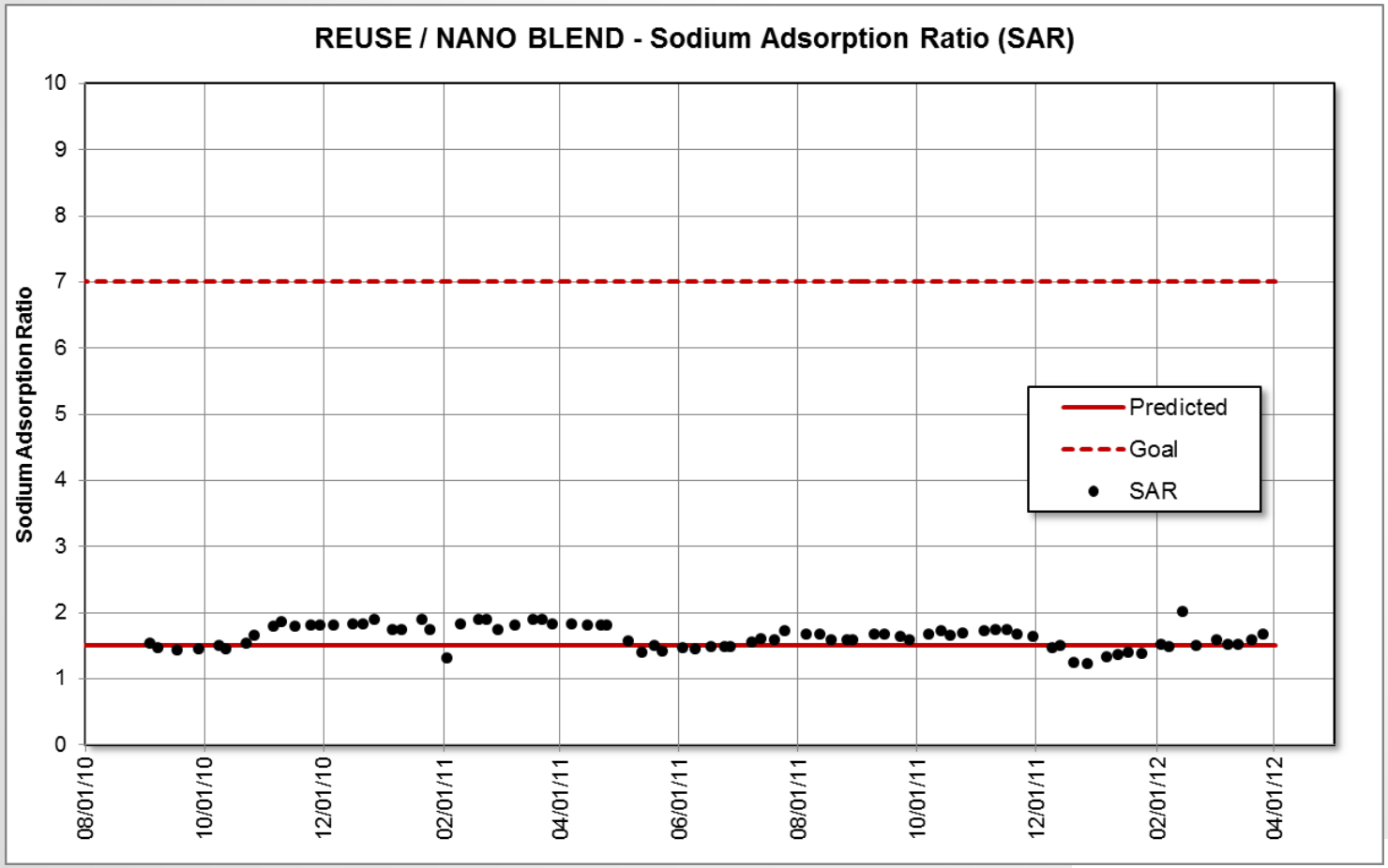
Chlorides – Reuse/Nano Blend September 2010 through April 2012



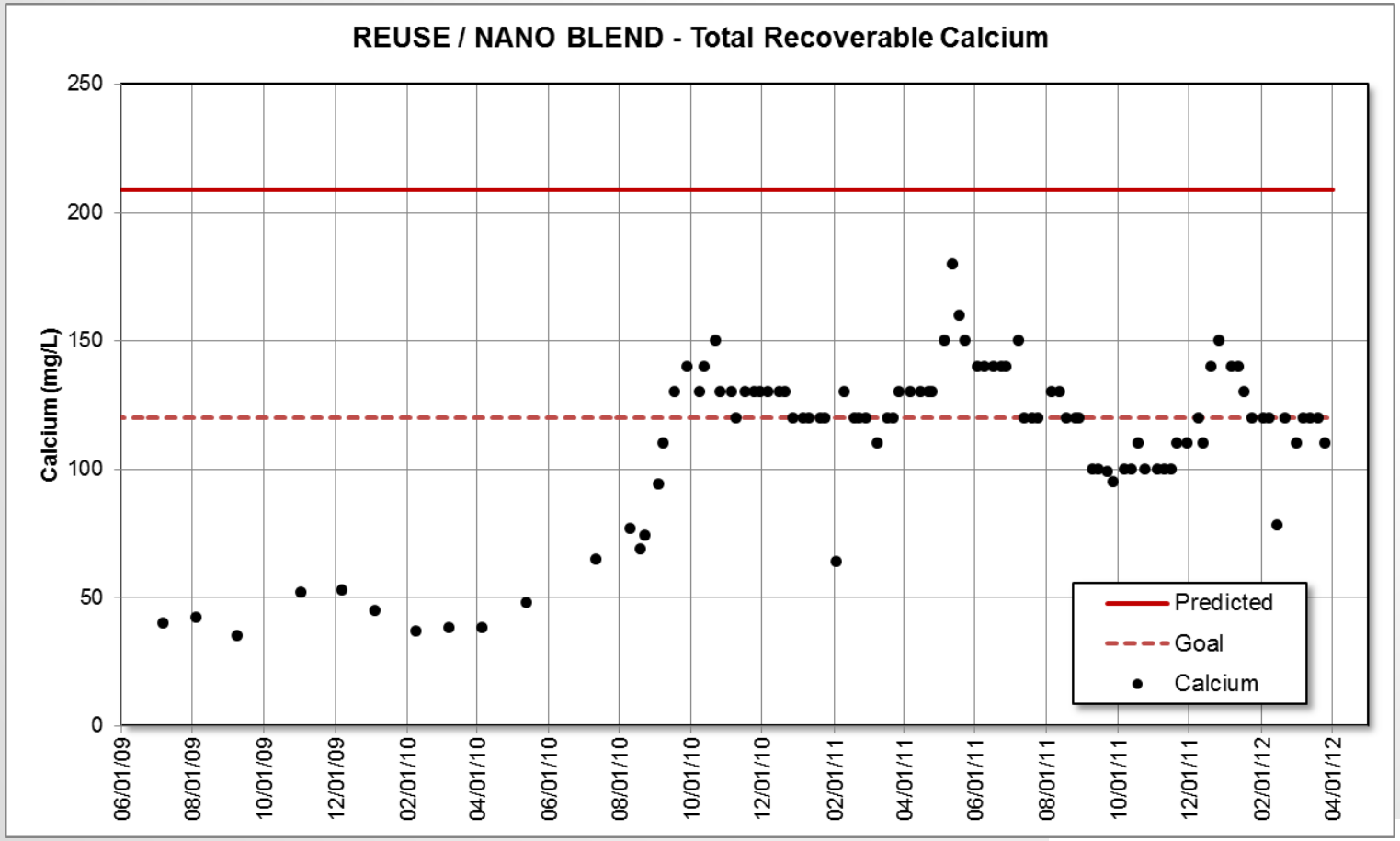
pH - Reuse/Nano Blend September 2010 through April 2012



SAR – Reuse/Nano Blend September 2010 through April 2012



Calcium – Reuse/Nano Blend June 2009 through April 2012



Summary

- Data indicates blended water quality lies within acceptable goals for Bermuda grass
- LRD gained 2 - 3 mgd of additional reuse supply
- Annual revenues ~ $400K
- Cost avoidance ($6.5M to construct a new injection well)
- Environmentally beneficial solution
- A “win-win” for both utilities

Questions?