CH2MHILL

ES CONSULTANTS, INC.

NORTH MIAMI FLORIDA

Biscayne Landing



Remediation and Progress Update | January 2012

Introductions

- **Honorable Jean Marcellus** - City of North Miami
- **Honorable Joe Celestin** - City of North Miami
- **Aleem Ghany, P.E.** - City of North Miami
- **Tom McSweeney** - CH2M HILL
- **Jeff Lehnen, P.G.** - CH2M HILL
- **Gerrit Bulman, P.G.** - CH2M HILL
- **Eduardo Smith, P.E.** - ES Consultants

Glossary

- **C&D** - Construction and Demolition Debris
- **CLCP -** Comprehensive Landfill Closure Plan
- **CNM –** City of North Miami
- **COD -** Chemical Oxygen Demand
- **CTL –** Cleanup Target Levels
- **DERM –** Miami-Dade County Department of Environmental Resource Management
- **DIW** – Deep Injection Well
- **DZMW** - Dual Zone Monitoring Well
- **FDEP –** Florida Department of Environmental Protection
- **mg/L –** Milligrams per Liter
- **MSW** – Municipal Solid Waste
- **NPL -** National Priorities List
- **PERA –** Miami-Dade County Permitting, Environment and Regulatory Affairs
- **RAP** – Remedial Action Plan
- **TDS** – Total Dissolved Solids
- **UIC** – Underground Injection Control
- **USDW** - Underground Source of Drinking Water

Site History

- **Landfill –** accepted MSW and C&D from 1940's-1981; no liner system
- **~ 6 million cubic yards of waste-in-place**
- **Site added to the NPL in December 1982**
- **EPA water quality testing** in late '80s:
  - No threat to human health
  - Ammonia impacting wetlands
- 1995 outside dike (135th Street) breached to return tidal flow to portion of mangrove – water quality improved in Mangrove Preserve
- **Site de-listed from EPA NPL in September 1999**

Landfill Closure Elements

- Landfill cover/cap system
- Stormwater management system
- Landfill gas management system
- Groundwater assessment and remediation system

Landfill Cover/Cap System

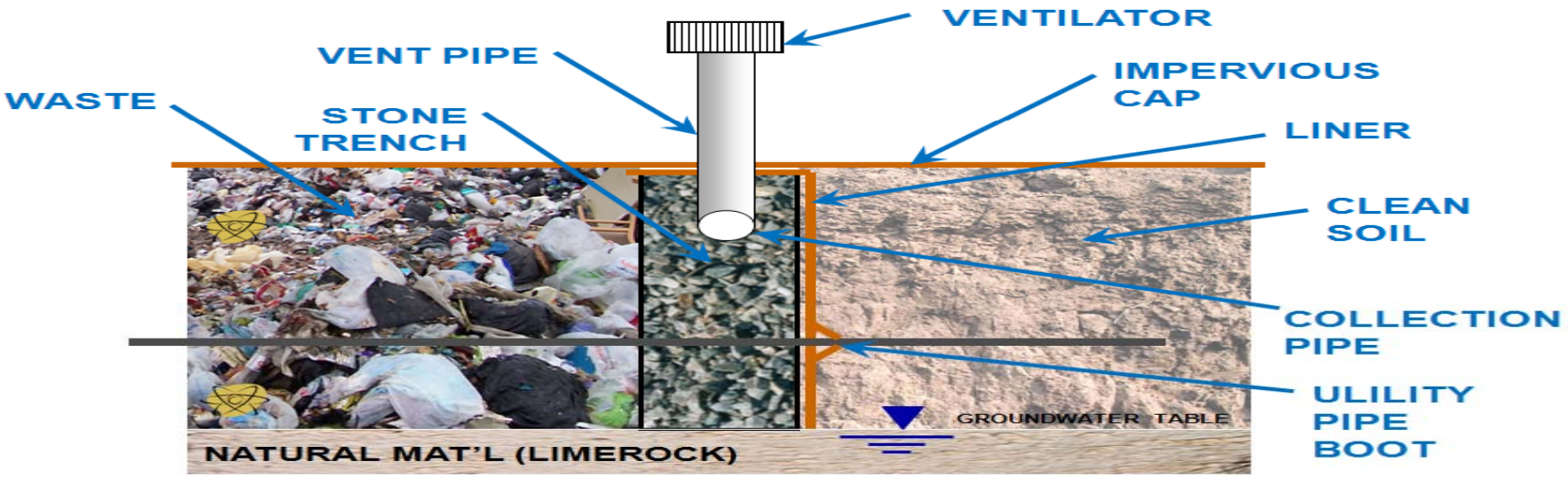
- **Prevents human exposure to waste**
- **Limits stormwater percolation leading to further groundwater contamination**
- **Development will provide impermeable surfaces**
  - Buildings
  - Paving
- **Other areas will have 2-foot soil cap and vegetation**
- **Grading helps shed stormwater**
- **Leads to groundwater quality improvements**

Stormwater Management System

- Grading and cap shed stormwater to managed areas
- Retention areas strategically located so groundwater quality is not worsened
- 150 ft Class V wells used for stormwater disposal

Landfill Gas Management System

- **Landfill gas is present in fairly low quantities because of age of waste**
  - Requires passive vents only
- **Habitable and closed spaces provided with gas sensors and passive vents**
  - Continuous monitoring since installed and never triggered



Water Quality Program Since 2005

- **Existing groundwater and surface water quality monitoring program**
  - 83 groundwater monitoring wells
  - 30 surface water sampling locations
  - Semi-annual testing and reporting to FDEP and PERA

Water Quality – Groundwater

- **Ammonia concentrations in groundwater > CTL throughout site, nearly every well**
  - Generally from <10 to > 80 mg/l (CTL is 0.5 or 2.8 mg/l)
  - Greatest concentrations near eastern property boundary
- **Iron in groundwater > CTL in about 4 specific locations**
  - Generally from < 0.1 to ~10 mg/l (County background 0.706 mg/l)
- **Other exceedences since 2007 (last 10 sampling events)**
  - Selenium: 1.8% (12 out of 670 samples)
  - Arsenic: 3.43% (23 of 670)
  - Lead: 0.15% (1 of 670)
  - Antimony: 0.45% (3 of 670)
  - Nickel: 0.15% (1 of 670)
  - Nitrate: 0.12% (1 of 830)
  - Vinyl chloride: 0.15% (1 of 670)
  - Other common parameters: TDS, chloride, and sodium

Water Quality – Surface Water

- **Ammonia in surface water > CTL in onsite lakes and frequent detects in wetlands**
- **Other exceedences since 2007 (10 events; 300 samples)**
  - Arsenics: 4% of (12 of 300)
  - Mercury: 0.67% (2)
  - Nickel: 5.6% (17)
  - Selenium: 4.7% (14)
  - Thallium: 0.7% (2)
  - Copper: 2% (6)
  - Nitrate: 0.67% (2)
  - Other commonly reported parameters: TDS, iron, chloride, sodium, Chlorophyll A, fecal coliform, and COD

City-County Grant Agreement

- **County agreed to fund groundwater remediation**
- **Initial payments of about $7M to study site, develop groundwater remedies**
- **2004 Grant Agreement -** *$31M from County for groundwater remediation and closure*
- **Remaining grant funds –** *approx. $10M for closure; $14M for groundwater remediation (includes capital cost and pre-closure O&M)*

Remediation Approaches Considered

	Secor	HSA	Arcadis	ES Consultants and CH2M Hill
Remediation Approach	Pump and Treat	In-situ	Funnel & Gate Pump and Treat	Extraction and Deep Well Injection
Extraction System	Horizontal and vertical wells	Not applicable	Slurry walls with extraction at gaps	Vertical extraction wells
Treatment System	Biological treatment plant	In-situ biological treatment	Biological treatment plant	None required
Capital Cost	$15M to $20M	$9M to $10M	$15M to $20M	$10.5M
Annual O&M Cost	$1M to $3M	$0.8M	$1M	$0.28M
Result	Alternative not selected by prior developer	Disapproved by DERM	Abandoned due to high cost	Concept approved and DIW permitted

SCHEDULE – Major Milestones to Date

Key Date	Activity
12/15/09	Pre-Application meeting with FDEP & CNM for a Class 1 Industrial DIW
6/10/10	Written conceptual approval of Groundwater Remedial Approach from DERM (now PERA) Director
9/8/10	Contract with Receiver(later assigned to the CNM) for the Groundwater Remediation
11/10/10	Application to construct a Class 1 Industrial DIW submitted to FDEP
3/10/11	CLCP amended by the Independent Bond Engineer to reflect revised Scope of Work and approved Schedule of Values
11/23/11	PERA letter confirming approval of the Groundwater Remedial Approach and requiring a phased extraction system to address wetland conditions
12/16/11	RAP submitted to PERA
12/27/11	FDEP Permit to construct a Class 1 DIW and Monitoring Well System issued to the CNM

Where Are We Today?

- **Status – under FDEP closure Permit**
  - **Landfill Cap System**
    - ✓ Partially complete
  - **Stormwater Management System**
    - ✓ Partially complete
  - **Gas Management System**
    - ✓ Partially complete
  - **Groundwater Remediation System**
    - ✓ Under contract with the CNM
    - ✓ Needs to be operational in order to secure Certificates of Occupancy for any buildings

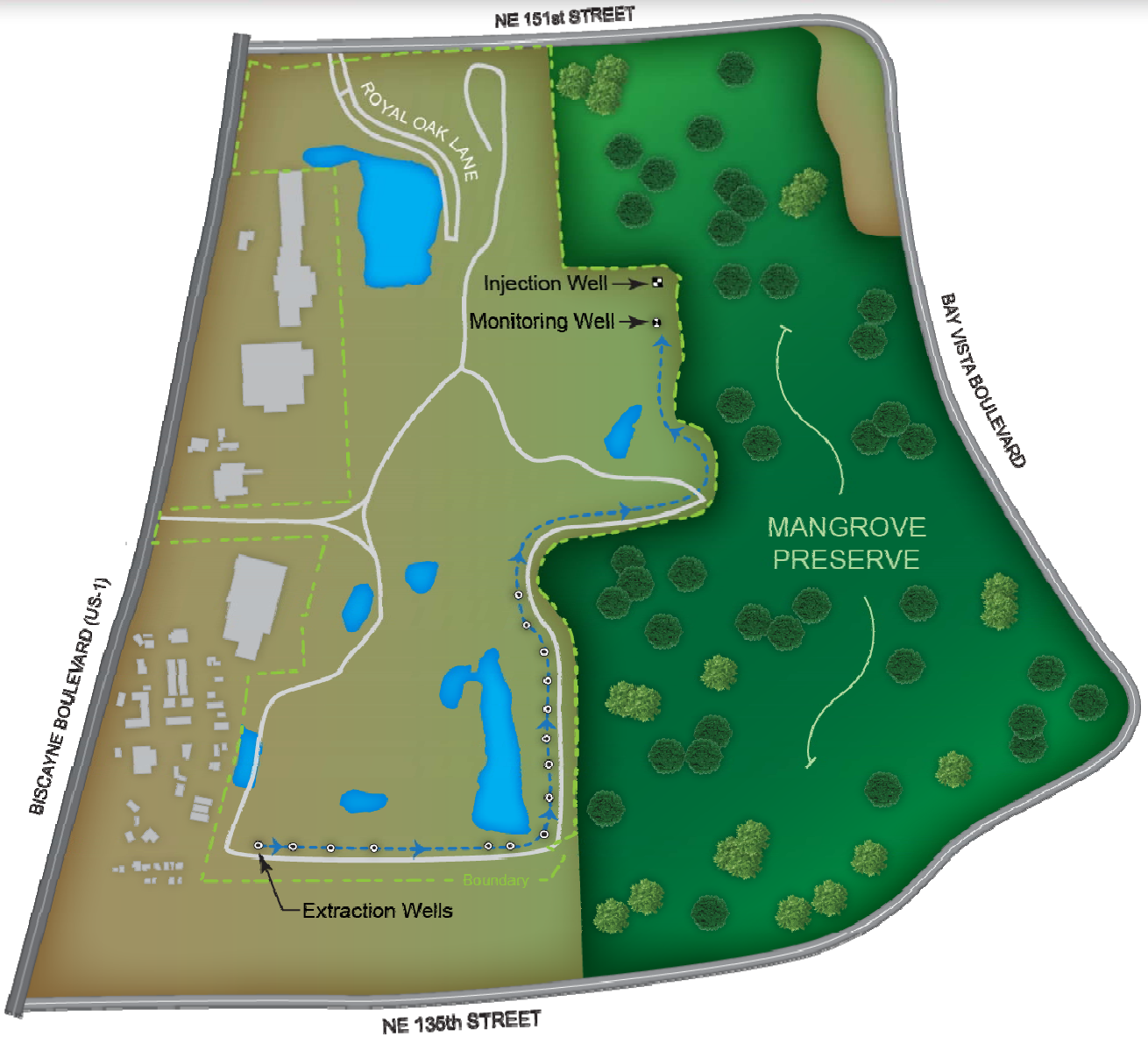
Remediation System Status

- **PERA** *(formerly DERM)* **already given conceptual approval with phased approach**
- **ESC\CH2M HILL contracted with City to deliver working Groundwater Remediation system –** *project bonded*
- **FDEP UIC Final permit received December 2011**
- **Remedial Action Plan (RAP) submitted to PERA December 2011**

SCHEDULE - Major Milestones to Completion

Key Date	Activity
1/29/12	Begin drilling Class 1 DIW
5/1/12	RAP approval from PERA
5/8/12	Start Phase 1 extraction well installation
6/1/12	Start pump station construction
7/15/12	Complete Class 1 DIW construction
7/22/12	Begin drilling DZMW
8/1/12	Complete pump station construction
9/8/12	Complete Phase 1 extraction system installation
9/20/12	Complete DZMW installation
10/1/12	Groundwater System start-up

Extraction Well and Injection Well Layout



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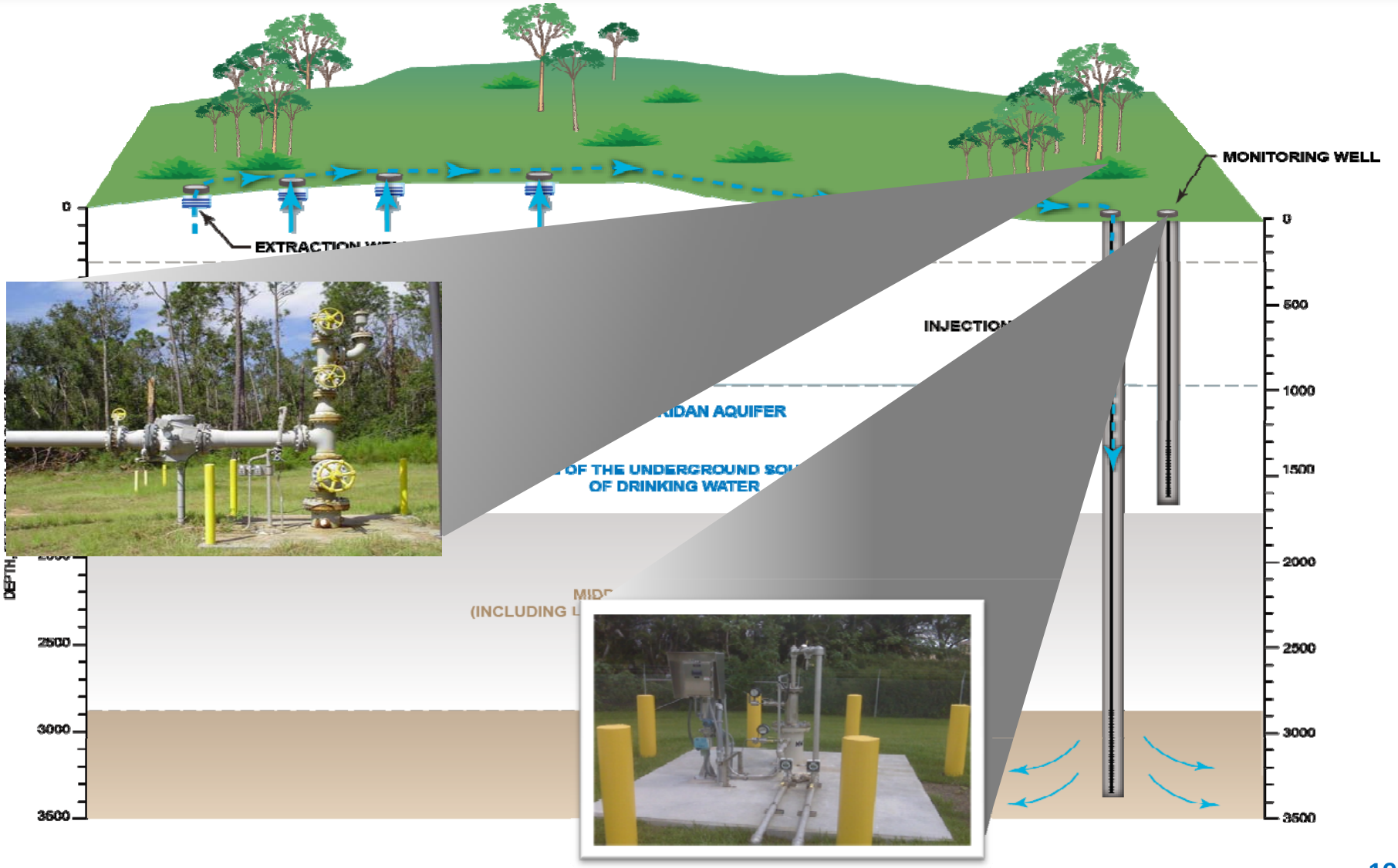


Groundwater Modeling Simulates Capture Zone

Layer 4: -8 ft NGVD to -11 ft NGVD

Particles Captured by Wells after 1 year at 1.75 mgd

0 2,000

Feet

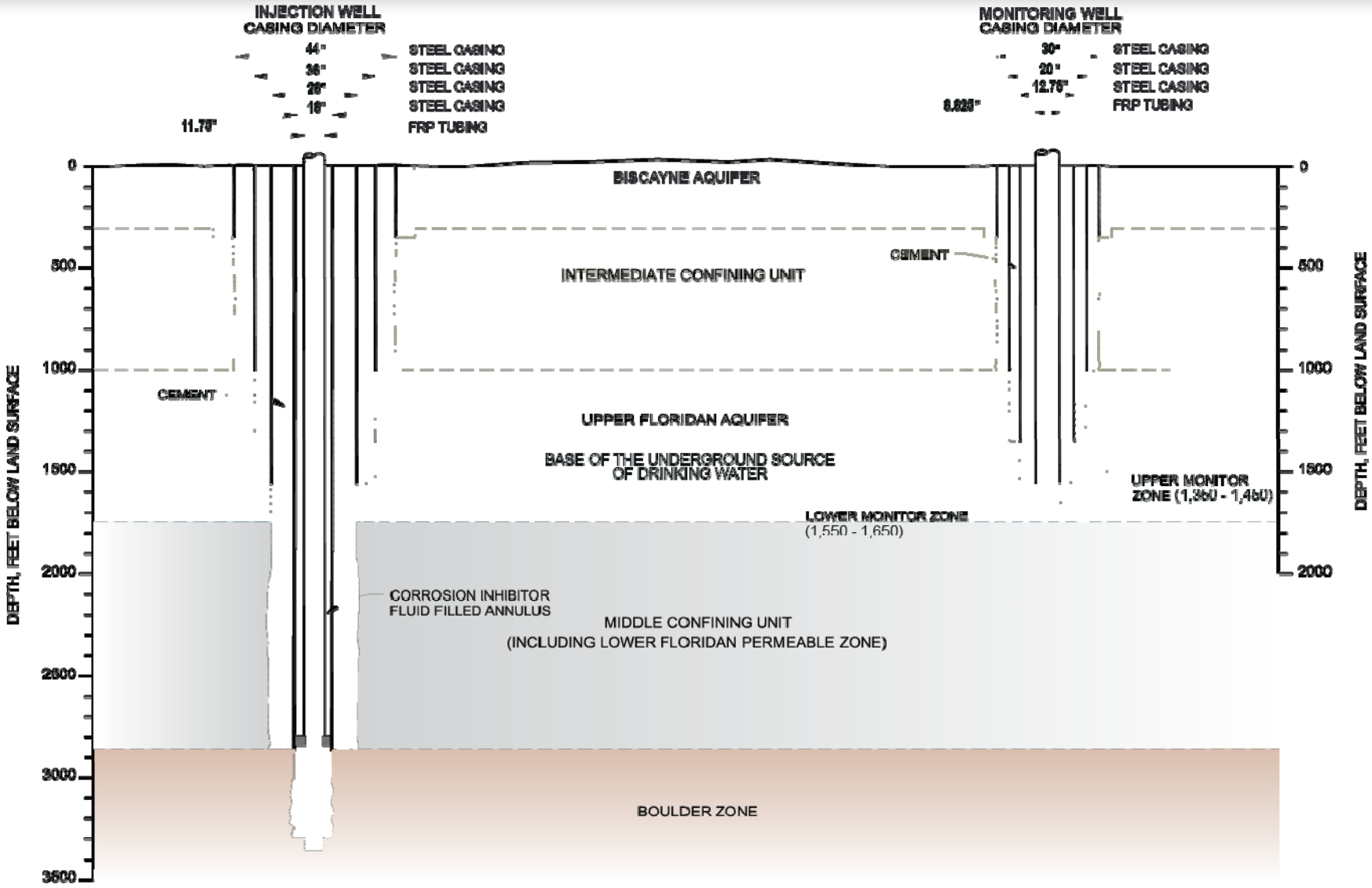
Injection Wells are a Safe and Reliable Alternative for Wastewater Disposal

- Provide a proven disposal method in highly populated areas
- Facility “footprint” is small and requires very little land when completed
- Allows for elimination of groundwater seepage to surface water and associated ecological impacts
- Remediation costs and public health protection benefits of injection wells are reasonably balanced

Operational History of Injection Wells has Demonstrated Few Problems

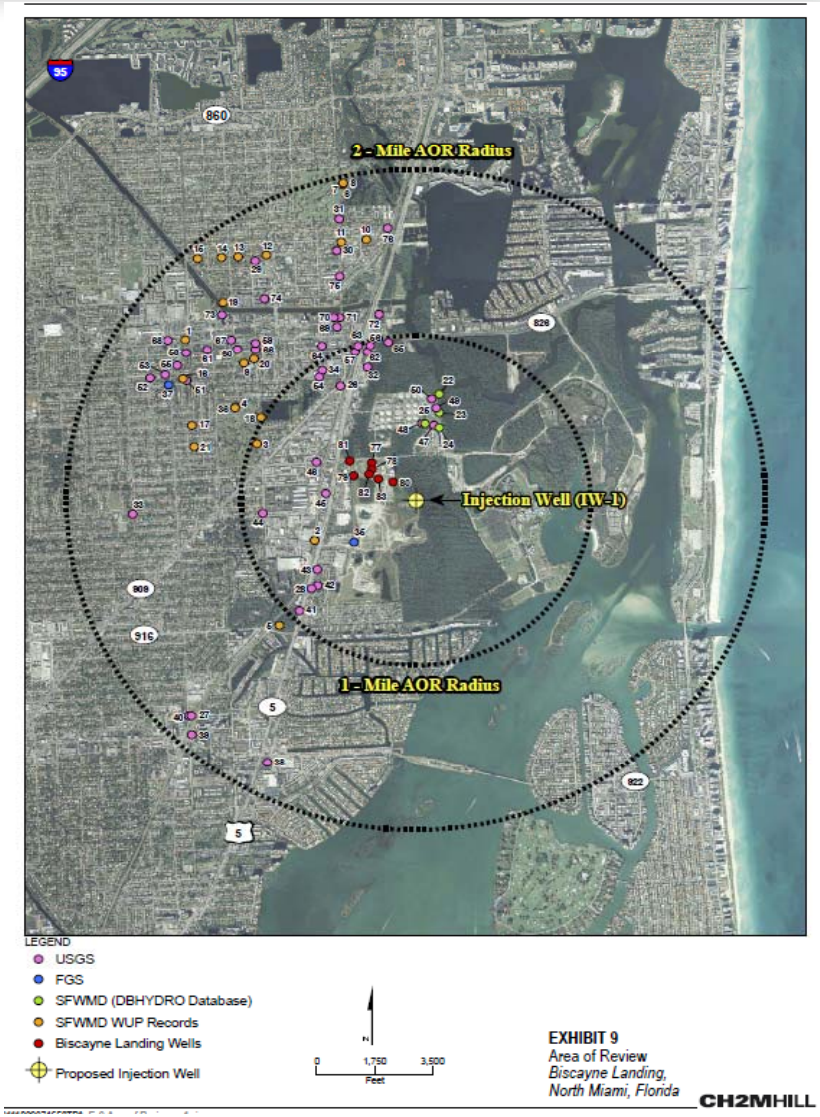
- Over 40 billion gallons of municipal and industrial wastewater injected in the last 40 years
- Over 125 large capacity injection wells at over 100 facilities
- No public contact with injected water has occurred in the past 40+ years of operation in FL
- No potable drinking water supply has been affected or threatened

Injection and Monitoring Well Diagram



Detailed Evaluation of Permitted Wells within a 2-mile Radius

Agency	Well Type	# of Wells
United States Geologic Survey	Monitoring	39
Florida Geological Survey	Monitoring	2
South Florida Water Management District	Monitoring & Supply	13
South Florida Water Management District	Supply	21
Biscayne Landing	Stormwater Injection	7



Key Criteria Required for Class I Injection Wells

- Inject below base of the underground source of drinking water (USDW)
- Injection flow must be non-hazardous
- Confinement above the injection zone must be demonstrated
- Specific well construction standards are specified by regulations
- Extensive testing requirements

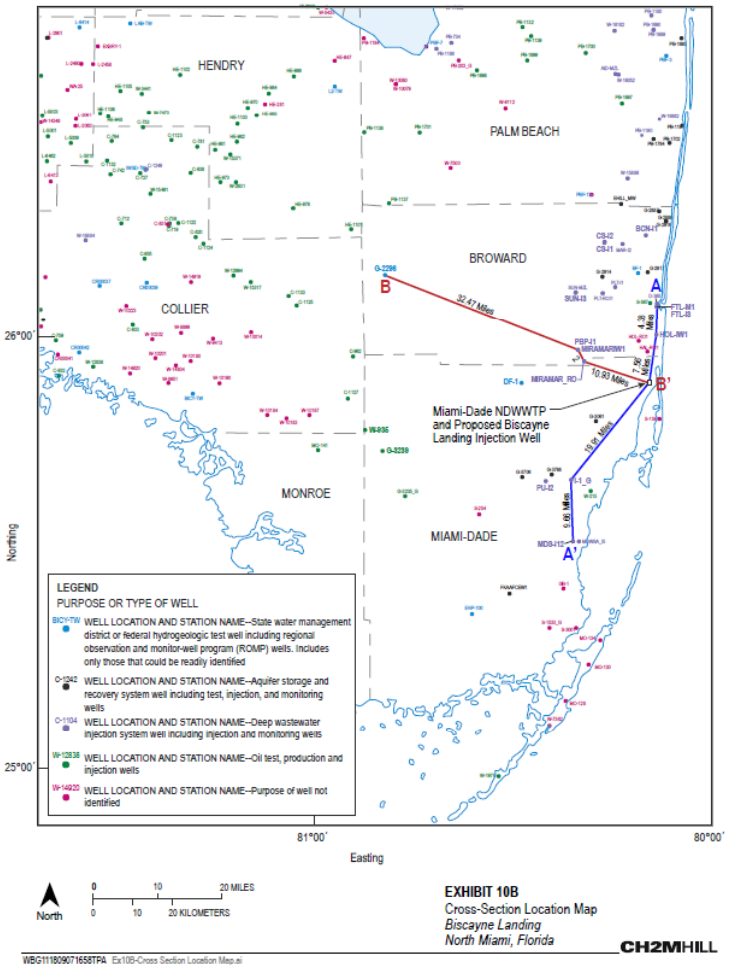
Protection of Drinking Water Supplies

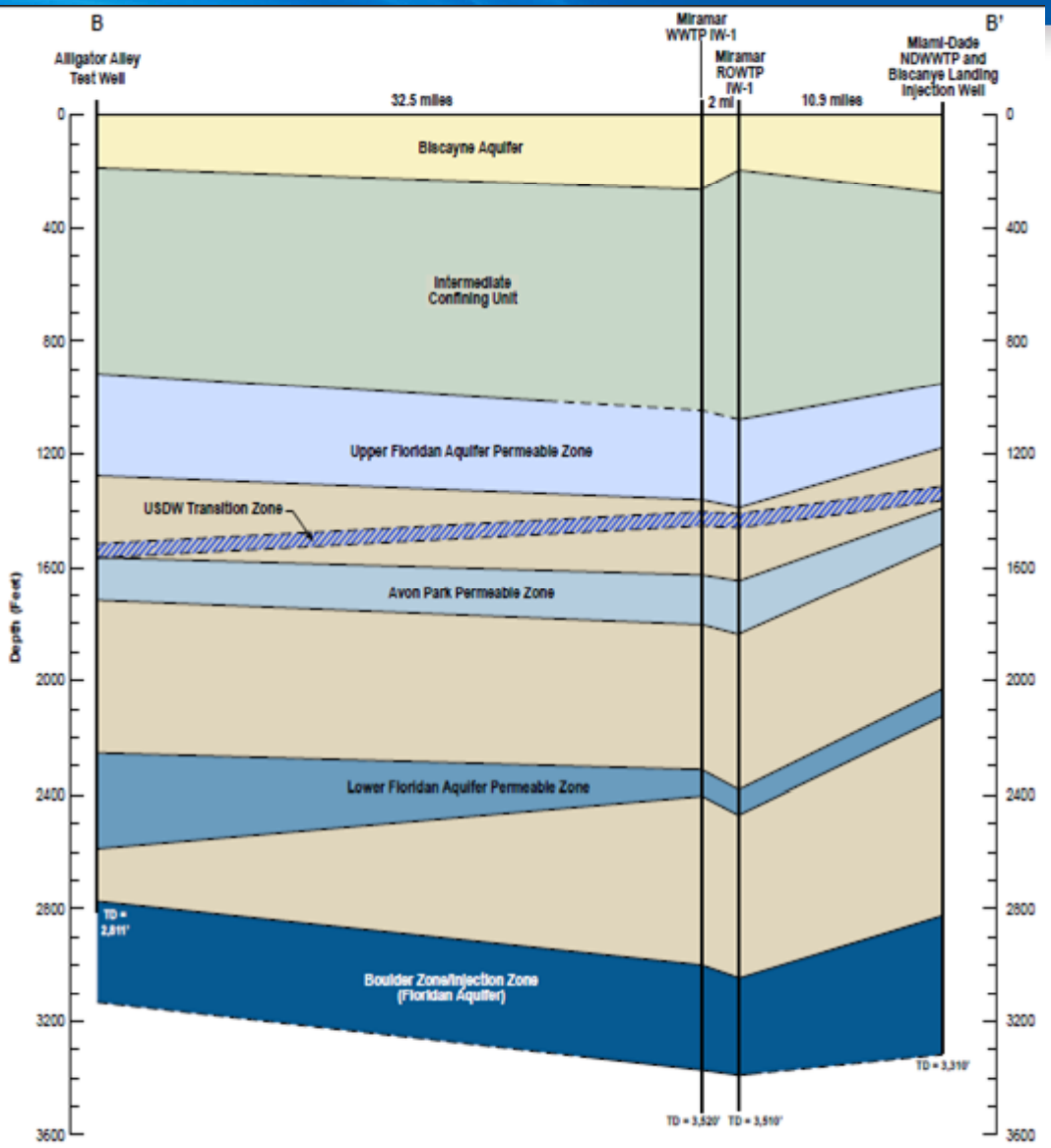
- FDEP Regulations are designed to protect present and future sources of drinking water (less than 10,000 mg/L TDS)
- Confinement of the injection zone is thoroughly tested during injection well construction
- Florida has the most stringent groundwater monitoring program of any other state
- Mechanical Integrity Testing regularly checks the well for potential leaks or migration of injected fluid

Injection System Monitoring Requirements Protect Drinking Water Supplies

- Injection flow and pressure monitored continuously
- 5 year integrity testing including casing pressure test, tracer logging, and TV inspection
- A two zone Floridan monitoring well (1,600 ft deep) demonstrates compliance and confinement
- Continuous water level monitoring and monthly water sampling

Geologic Cross Section B - B' Shows Consistent Layers Across the Region





Comprehensive Testing Plan Fully Characterizes Subsurface

TABLE 2A
IW-1 Summary of Testing
Biscayne Landing, North Miami, Florida

No.	Activity	Mech. Deviation Surveys	Litho Log	Reverse-Air Samples and Analyses	Geophysical Logging	Rock Cores	Straddle Packer APTs	Injection Test	Mech. Integrity Testing
1	Pit Casing	--	--	--	--	--	--	--	--
2	12" Pilot Hole to 375'	±30' interval	10' Sample Interval	--	CAL, DIL, SP, NGR	--	--	--	--
3	±54"Reamed Hole to ±350'	±30' interval	--	--	CAL	--	--	--	--
4	44" Casing	--	--	--	--	--	--	--	--
5	12" Pilot Hole to 1,100'	±30' interval	10' Sample Interval	--	CAL, DIL, SP, NGR	--	--	--	--
6	Pilot Hole Back Plug ±1,100' to ±1,000'	--	--	--	--	--	--	--	--
7	Nom. 44" Reamed Hole to ±1,000'	±30' interval	--	--	CAL	--	--	--	--
8	36" Casing to ±1,000'	--	--	--	Primary Cement Stage[1]: TEMP, NGR	--	--	--	--
9	12"Pilot Hole ±1,000' to ±1,550'	±30' interval	10' Sample Interval	±30' interval	Static Logs: CAL, DIL, NGR, BHCS, TEMP, FR, FM Dynamic Logs: TEMP, FR, FM, TV or BHTV	Three (3) ±1,300' to ±1,550'	Four (4) ±1,300' to ±1,550'	--	--
10	12"Pilot Hole ±1,550' to ±2,150'	±30' interval	10' Sample Interval	±30' interval	Static Logs: CAL, DIL, BHCS, SP, NGR, TEMP, FR, FM Dynamic Logs[2]: TEMP, FR, FM, TV or BHTV	Three (3) ±1,550'to ±2,150'	Three (3) ±1,550'to ±2,150'	--	--
11	Pilot Hole Back Plug ±2,150' to ±2,100'	--	--	--	--	--	--	--	--
12	Nom. 36" Reamed Hole to ±2,100'	±30' interval	--	--	CAL	--	--	--	--
13	26" Casing to ±2,100'	--	--	--	Each stage[1]: TEMP, NGR	--	--	--	--
14	12" Pilot Hole to ±2,800'	±30' interval	10' Sample Interval	±30' interval	Static Logs:: CAL, DIL, BHCS, SP, NGR, TEMP, FR, FM Dynamic Logs: TEMP, FR, FM, TV or BHTV	Three (3) Cores ±2,150' to ±2,800'	Four (4) ±2,150'to ±2,800'	--	--
15	Pilot Hole Back Plug to ±2,800' (as needed)	--	--	--	--	--	--	--	--
16	Nom. 26 Reamed Hole to ±2,800'	±30' interval	--	--	CAL	--	--	--	--
17	16"Casing to ±2,800'	--	--	--	Each Stage[1]: TEMP, NGR w/ CBL once cement is ±200' from surface	--	--	--	Casing Pressure Test
18	Nom. 16" Hole to ±3,300'	±30' interval	10' Sample Interval Background Injection Zone Water Sample[3]	±30' interval	Static Logs: CAL, DIL, BHCS, SP, NGR, TEMP, FR, FM Dynamic Logs: TV (Part of MI demonstration)	--	--	--	TV w/ Dynamic Logs
19	11.75" FRP Casing to ±2,800'	--	--	--	TV, TEMP, NGR (Part of MI demonstration following injection test)	--	--	4Hr Step[4] 12 Hr Constant Rate[5]	Annular Press. Test RTS

Notes:

1- Cement top confirmation by TEMP and NGR logging will be conducted within casing

2- Dynamic logging will be conducted through a single-element packer set at ±1,550 feet and pumped at about 500 gpm; see technical specifications 02990-Inflatible Packer Testing for packer and pump configuration.

3- Injection zone water sample will be collected following dynamic geophysical logging or well backflow (±60,000 gallons).

4- Step injection test will be approximately 4 hours in duration; injection rates will be approximately 875 gpm, 1,750, gpm, 2,625 gpm and 3,500 gpm; water source is stormwater pond.

5- The constant rate injection test will be conducted at 3,500 gpm for 12 hours; injection testing will precede the RTS; water source is stormwater pond.

Geophysical Logging Legend:

CAL	- Caliper	DIL	- Dual Induction
TEMP	- Temperature	BHCS	- Borehole compensated sonic with variable density display
NGR	- Natural Gamma Ray	CBL	- Cement Bond Log
FR	- Fluid Resistivity	SP	- Spontaneous Potential
FM	- Flowmeter	DIL	- Dual Induction
TV	- Color Video Survey	BHTV	- Borehole Televiewer

Injection Well Drilling Rig and Steel Casing

Rig and Drilling Fluid System

Large Diameter Reamers and Casings

High Resolution Geophysics for Formation, Permeability, and Hydrologic Data

Typical Injection Wellhead Requires Small Area

Typical Injection Wellhead

Typical Injection Wellhead

Typical Injection Wellhead

Questions?