COLLIER COUNTY
GROUND WATER QUALITY MONITORING
ANNUAL REPORT
FY11

Prepared by
Collier County Pollution Control

For
South Florida Water Management District
Agreement #OT061098-A01

August 2013

TABLE OF CONTENTS

PAGE

I. Introduction **4**

II. Scope of Work **4**

III. Program Activities **4**

IV. Problems Encountered **5**

V. Data Validity **5**

VI. Results and Discussion **5**
- **A. Land Use** **5**
- **B. Ground Water/Surface Water Interactions** **6**
- **C. Exceedances** **9**
  - **1. Inorganics** **10**
  - **2. Biological** **14**
- **D. Nutrients** **15**
- **E. Dissolved Oxygen** **18**

VII. Conclusions and Recommendations **18**

VIII. References **19**

LIST OF TABLES

Table 1. Number of Wells Being Sampled by Aquifer and Land Use **6**
Table 2. Average concentrations of parameters measured in ground water and surface water during FY11 .... **7**
Table 3. Percent Exceedances **9**
Table 4. Frequently Exceeded Parameters in FY11 .... **9**
Table 5. Average TDS in ground water during FY11 .... **12**
Table 6. Average nitrogen species in ground water and surface water during FY11 .... **15**
Table 7. Average Nitrogen Species in the Water Table Wells by Land Use during FY11 .... **15**

Table 8. Average Total Phosphorus in Water Table Wells and Surface Water during FY11 16
Table 9. Average total phosphorus in the Water Table wells by land use during FY11 17
Table 10. Average Dissolved Oxygen Levels during FY11 17

LIST OF FIGURES

Figure 1. **Monitoring Sites-Eastern Collier** 21
Figure 2. **Monitoring Sites-Western Collier** 22
Figure 3. **Arsenic exceedances in the Water Table aquifer during FY11** 23
Figure 4. **Iron exceedances in the Water Table and Lower Tamiami aquifers during FY11** 24
Figure 5. **Manganese exceedances in the Water Table aquifer during FY11** 25
Figure 6. **Chloride exceedances in the Water Table aquifer during FY11** 26
Figure 7. **Total Dissolved Solids (TDS) exceedances in the Water Table and Lower Tamiami aquifers during FY11** 27
Figure 8. **Sulfate exceedances in the Water Table aquifer during FY11** 28
Figure 9. **Sodium exceedances in the Water Table aquifer during FY11** 29
Figure 10. **Average annual wet and dry season arsenic trend in Water Table aquifer wells located in golf courses** 30
Figure 11. **Average annual wet and dry season arsenic trend in well CCN11** 30

LIST OF APPENDICES

APPENDIX A **Station List** 31
APPENDIX B **Parameter List** 33
APPENDIX C **FY11 Monitoring Effort Summary** 34
APPENDIX D **Exceedances** 40

I. Introduction

This report satisfies the requirements of Agreement #OT061098-A01 between the Collier County Pollution Control (CCPC) and the South Florida Water Management District (SFWMD) for the collection and analyses of ground water quality samples in Collier County.

II. Scope of Work

Sixty-seven ground water wells are monitored semi-annually; once during the wet season (August-October), and once during the dry season (February-April). These sites are listed in Appendix A. An additional three, randomly selected, residential drinking water wells (Surficial aquifer) are also sampled semi-annually. See Figure 1 and Figure 2 for a map of the sampling station locations. All the samples collected are analyzed for the parameters listed in Appendix B.

III. Program Activities

Purging and sampling of wells followed the CCPC Field Sampling Quality Manual; Florida Department of Environmental Protection's (FDEP) Standard Operating Procedures (SOPs) *DEP-SOP-001/01FS 2200 Groundwater Sampling*; and the SOPs referenced therein.

All chemical parameters for this project were analyzed by the Collier County Pollution Control Laboratory (CCPCL) or PACE Analytical, Inc., (PACE) laboratory. All laboratories held current National Environmental Laboratory Accreditation Program (NELAP) certification for all the parameters being analyzed for this project. Physical measurements of pH, dissolved oxygen, specific conductance, and temperature were obtained during well purging and stabilization using a Yellow Springs Instrument (YSI) 600XL multi-probe and flow-through cell. Field turbidity measurements were also obtained as part of the purge stabilization process using a HF Scientific MicroTPW portable field meter. However, the turbidity readings provided in the data reports are those obtained through laboratory analysis.

For the random well monitoring portion of the contract, wells were randomly selected from the County's well permit records. Letters of intent were sent to the property owners requesting their voluntary participation in the project. To be considered for sampling, each well was required to have a spigot at the well-head to prevent any potential sample contamination from the on-site treatment system. Samples were collected directly from the spigot. Copies of the laboratory results and explanation of the results were sent to the well owners.

IV. Problems Encountered

Please see Appendix C for the sampling and laboratory analytical status of each well.

The *Collier County Ground Water Quality Monitoring Third Annual Report FY09* recommended that well C-00495 be further investigated to determine a possible source for the multiple heavy metals exceedances. Land use around the site is minimally impacted and there are no obvious sources of heavy metals that would contaminate the aquifer. In June 2011, a Very Intensive Study Area (VISA) was selected to determine possible sources of this contamination.

Conclusions from this VISA indicated that well C-00495 was constructed of black iron and was leaching metals (due to corrosion) into the samples. Since this well is no longer supported by the owner (United States Geological Survey); has collapsed (original well depth was 70 feet and has collapsed to 26 feet); and is made of a material that contaminates the samples, this well was taken out of the network in June 2011.

V. Data Validity

The data provided in this report have been checked for accuracy and completeness and the CCPC attests to the validity of these results. All data qualifiers follow Florida Administrative Code (FAC) 62-160.700 Table 1. Data used to generate this report are available through FDEP's publically accessible Storage and Retrieval (STORET) data warehouse website (http://storet.dep.state.fl.us/DearSpa/).

All CCPCL and PACE data have been submitted using the ADaPT software and the quality control checks provided in the software were applied. Calibration logs for field instruments were reviewed and all associated data that were outside the quality control criteria were qualified using a "J" flag in the electronic data report.

VI. Results and Discussion

A. Land Use

The surficial aquifer system is recharged through infiltration from overlying surface waters or aquifers. The nature of our sandy soils increases the potential for activities on the land surface to impact the ground water resources below. This makes it necessary to determine if existing land uses are affecting the ground water.

Land use surrounding each well was determined using the SFWMDs 2008 Florida Land Use, Cover and Forms Classification System (FLUCCS). The Wellhead Protection Rule (FAC 62-521) defines a 500 ft radius around a potable water well as the wellhead protection area. Assuming the same setback, a 500 ft radius circle was drawn around each wellhead and the dominant land use within that 500 ft circle was used as the land use for each well.

Table 1 shows the number of wells being monitored during FY11 within each land use. It should be noted that the majority of the wells being monitored are located in the Water Table aquifer within an Urban and Built-Up land use, specifically golf courses. These monitoring wells are required by permit by FDEP because the facilities receive reuse water. These wells were readily available for monitoring and were, therefore, included in the network. The high numbers of monitoring wells located near golf courses tend to skew the results representing the Water Table aquifer as a whole. Conversely, in many cases, there are not enough sample points in each land use to statistically represent the land use and the aquifer. However, without the ability to drill wells in specific land uses and aquifers, inferences are made in this report using existing resources.

Table 1. Number of Wells Being Sampled by Aquifer and Land Use

Aquifer	Water Table	Lower Tamiami	Sandstone	Mid-Hawthorn
AGRICULTURE	**3**	**1**	**1**	**1**
TRANSPORTATION, COMMUNICATION & UTILITIES	**3**			
UPLAND FORESTS			**1**	**1**
UPLAND NONFORESTED	**1**			
URBAN AND BUILT UP	**38**	**9**		**1**
Commercial and Services	1			
Educational Facilities	1			
Fixed Single Family Units	9	4		
Golf Course	19			
Inactive Land with Street Pattern				1
Mobile Home Units	1			
Multiple Dwelling Units, High Rise	2	1		
Multiple Dwelling Units, Low Rise	3	1		
Parks and Zoos	1			
Rural Residential		3		
Shopping Centers	1			
WETLANDS	**9**	**2**	**1**	**1**
Total	**54**	**12**	**3**	**4**

B. Ground Water/Surface Water Interactions

As mentioned above, the County's sandy soils lend themselves to easy interactions between surface water and ground water. The water budget analysis conducted for the Collier County Watershed Management Plan showed that during the dry season, 70% of the water entering the canals comes from ground water, this number decreases to 55% during the wet season, (Atkins 2011). There are variations between seasons and watersheds. Ground water influence on surface water has greater implications when the ground water quality standards and surface water quality standards differ. For example,

Table 2 shows the average concentrations of parameters measured in ground water and surface water during FY11 with the State Standards listed (if one exists) for each. Adverse impacts from ground water interactions can occur where existing ground water concentrations cause exceedances of the surface water standards. Those include ammonia, dissolved oxygen, iron, and nitrogen and phosphorus species.

Table 2. Average concentrations of parameters measured in ground water and surface water during FY11

Parameter	Units	FY11 Ground Water Averages				FY11 Surface Water Averages	[a]Ground Water State Standards: Primary (I) or Secondary (II)	[b]State Surface Water Standards: Class III Fresh Water Criteria
		Water Table	Lower Tamiami	Sandstone	Mid-Hawthorn			
Alkalinity	mg/L	245	291	263	211	200		Not below 20
Ammonia	mg/L	1.74	0.31	0.17	0.29	0.09		0.02
Arsenic	ug/L	10.7	0.217	0.144	0.454	1.91	10 (I)	50
Barium	ug/L	24.9	17.5	19.6	9.4	N/A	2000 (I)	
Bicarbonate	mg/L	228	277	243	210	N/A		
Cadmium	ug/L	0.060	0.040	0.030	0.030	0.083	5 (I)	0.566[c]
Calcium	mg/L	112	117	80	71	93		
Nitrate (N)	mg/L	0.350	0.031	0.050	0.003	0.057	10 (I)	
Chloride	mg/L	154	62	194	669	101	250 (II)	
Chromium	ug/l	1.65	1.16	0.393	0.142	0.659	100 (I)	195[c]
Coliform Fecal	cfu/ 100ml	2	5	3	1	223	0 (I)	not to exceed 400 cfu/100ml in 10% of samples or 800 cfu/100ml in one day
Coliform Total	cfu/ 100ml	1	92	1	1	N/A	0 (I)	not to exceed 400 cfu/100ml in 10% of samples or 800 cfu/100ml in one day
Copper	ug/L	1.622	3.288	3.217	1.446	4.194	1000 (II)	21.87[c]
Dissolved Oxygen	mg/L	0.88	0.59	0.28	0.30	5.62		not less than 5.0
Fluoride	mg/L	0.196	0.167	0.485	2.14	N/A	4.0 (I), 2.0 (II)	10
Hardness-Calculated	mg/L	329	371	309	567	271		
Iron	ug/L	1710	956	10.3	59.6	324	300 (II)	1000
Lead	ug/L	0.52	1.47	1.44	0.511	0.42	15	11.3 [c]
Magnesium	mg/L	12.2	19.1	26.2	94.5	9.5		
Manganese	ug/L	193	6.94	4.93	2.01	N/A	50 (II)	
Nickel	ug/L	2.74	1.78	1.51	1.08	N/A	100 (I)	121 [c]

Table 2. Average concentrations of parameters measured in ground water and surface water during FY11 (cont'd).

Nitrate-Nitrite (N)	mg/L	0.348	0.033	0.053	0.003	0.063	10 (I)	
Nitrite (N)	mg/L	0.018	0.002	0.003	0.001	0.006	1 (I)	
Nitrogen-Total Kjeldahl	mg/L	2.261	0.646	0.347	0.296	0.977		
Total Nitrogen	mg/L	2.279	0.648	0.350	0.297	0.983		0.74*
Orthophosphate (P)	mg/L	0.167	0.016	0.010	0.008	0.030		
Phosphorus-Total	mg/L	0.201	0.068	0.011	0.015	0.075		0.04*
Potassium	mg/L	16.7	3.68	10.9	37.0	N/A		
Residues-Filterable (TDS)	mg/L	668	463	705	1940	822	500 (II)	
Residues-Nonfilterable (TSS)	mg/L	2.5	4.2	1.5	2.1	4.1		
Selenium	ug/L	1.21	0.660	0.867	1.52	N/A	50 (I)	
Silver	ug/L	0.016	0.016	0.016	0.016	N/A	100 (II)	
Sodium	mg/L	109	38.2	155	528	N/A	160 (I)	
Strontium	ug/L	365	509	781	1576	N/A		
Sulfate	mg/L	83.1	28.8	77.4	446	43.3	250 (II)	
Sulfide	mg/L	1.716	2.033	1.540	2.429	N/A		
Turbidity	NTU	8.52	2.85	1.27	0.34	2.90		≤ 29 above natural background conditions
Zinc	ug/l	2.60	8.78	11.04	4.00	3.70	5000 (II)	279 [c]

[a]Ground water standards are from Florida Administrative Code Chapter 62-550

[b]Surface water standards are from Florida Administrative Code Chapter 62-302

[c] Standard is calculated based on the average hardness value.

Parameters that may be having adverse impacts on surface water (shaded)

**FDEP Threshold Levels (Gordon River ExtensionTMDL)*

C. Exceedances

Appendix D provides a list of all results that were in exceedance of the Primary and Secondary Drinking Water Standards, Florida Administrative Code (FAC) Chapter 62-550. These standards were adopted and referenced as the state's ground water quality standards by FAC Chapter 62-520.420. The Collier County Department of Environmental Health and Engineering was notified of all exceedances occurring in private potable wells.

For the purposes of this report, ground water dry season is defined as December-May and wet season is June-November. **Table 3** shows the number of exceedances in each aquifer do not vary significantly between wet and dry season. However, there is a slight variation in the total number of exceedances found in each aquifer. **Table 4** provides the most frequently exceeded parameters in each aquifer during FY11.

Table 3. Percent Exceedances

Aquifer	Percent of samples that exceeded standards*		
	Dry Season	Wet Season	Total
Water Table	10.5%	10.5%	11.4%
Lower Tamiami	4.3%	4.3%	5.3%
Sandstone	8.1%	8.1%	8.9%
Mid-Hawthorn	11.9%	11.9%	11.6%
* only parameters with state drinking water standards were used in this calculation			

Table 4. Frequently Exceeded Parameters in FY11

Aquifer/Parameter	Frequency of Exceedances
Water Table	
Residues- Filterable (TDS)	63.5%
Iron	66.7%
Arsenic	28.6%
Sodium	27.9%
Chloride	21.2%
Manganese	15.2%
Coliform Total	11.0%
Sulfate	6.7%
Coliform Fecal	7.1%
Lower Tamiami	
Iron	37.5%
Residues- Filterable (TDS)	31.6%
Coliform Total	40.0%
Coliform Fecal	15.0%
Sandstone	
Residues- Filterable (TDS)	66.7%
Sodium	50.0%
Chloride	33.3%
Coliform Fecal	25.0%
Coliform Total	33.3%
Mid-Hawthorn	
Sodium	75.0%
Residues- Filterable (TDS)	75.0%
Chloride	50.0%
Sulfate	37.5%
Coliform Total	12.5%

Figures 3 through 9 are graphical representations of the spatial extent and concentrations of those parameters that were in exceedance of state standards during FY11. Also provided in these figures are the proposed wellfield protection zones (WPZ) approved in

FY10. These "wellfield risk management special treatment overlay zones" are determined by computer generated flow and solute transport models as required by the Collier County Land Development Code—Chapter 3, Section 3.06.00. Each WPZ represents the potential time it would take a particle of water to move to the wellhead. Zones are broken down into a one, two, five and twenty year increments. These zones are provided to reference the proximity of exceedances to public water supply wells.

1. Inorganics

a. Arsenic: All of the arsenic exceedances (>10 µg/l) occurred in the Water Table aquifer. All of these wells are FDEP permitted reclaimed water monitoring wells that are used to monitor the ground water at facilities that receive reclaimed water. However, none of the public water reclamation facilities reported any exceedances of arsenic in the reclaimed water supplied to customers. Figure 3 shows the arsenic exceedances for this fifth year reporting period.

The 2004 and 2005 investigation determined that there was a connection between the use of arsenic based herbicides, specifically MSMA (monosodium methanearsonate), as all of the wells with exceedances were located in managed turf areas and treated with MSMA. There has not been an undisputable link between the use of arsenical based herbicides and the source of ground water contamination in these wells; however, FDEP, FDACS and the Environmental Protection Agency (EPA) investigated the use of these herbicides and their fate and transport in the environment. Based partly on that investigation, EPA had reviewed the registration of organic arsenical herbicides that contain MSMA (USEPA, 2006). All uses of MSMA have been banned, with the exception of cotton in certain counties, since December 31, 2009 (USEPA, 2009).

Eighty-seven (87) percent of the arsenic violations occurred in parks or golf courses. However, the seasonal arsenic concentrations are decreasing over time. Figure 10 shows the wet season and dry season trends for annual average arsenic concentrations in all wells located in golf courses. The wet season trend shows a declining trend with an R^2 value of 0.98, indicating a strong trend, while the dry season trend shows a much weaker increasing trend with an R^2 value of only 0.06. This indicates seasonal effects on arsenic concentrations in shallow water table wells located in golf courses.

Well CCN11 continues to have the highest arsenic levels and is the only well located in a park. This well is located at Collier County Veterans Park near the maintenance facility in an area that receives stormwater runoff from a managed turf area. This facility stopped using arsenic based herbicides, no applications have occurred since May 2004. Figure 11 shows the wet season and dry season trends in annual average arsenic concentrations in well CCN11. Both seasons have decreasing trends in arsenic, perhaps because the facility stopped applying arsenic based herbicides in 2004 before this restriction was required and initiated at golf courses. This may explain why the same decreasing dry season trend is not seen in other wells located in facilities (golf courses) that may still be using arsenical based herbicides.

It should be noted that none of these trends are statistically significant due to the low number of data points.

b. Iron: Almost half the wells sampled in the Water Table aquifer were above the Secondary Drinking Water Standard for iron of 0.3 mg/l (300 µg/l). Iron is naturally occurring and concentrations in the Water Table aquifer are typically higher than the Secondary Drinking Water standard. In a statewide study conducted by the Florida Geological Survey, 75% of the samples collected in Florida from the surficial aquifer system exceeded the 300 µg/l standard. Wells sampling the surficial aquifer system (Water Table and Lower Tamiami) within SFWMD had a median iron concentration of 880 µg/l (Florida Geological Survey, 1992). The median concentration in the surficial aquifer system in Collier County is 1781 µg/l. Since the average iron concentration in surface water is 325 ug/l (Table 2), it is more likely that ground water is impacting surface water iron concentrations. Several watersheds have been found to be impaired for iron. This is likely due to the iron enriched ground water flow into the canals.

Iron is often associated with a rusty color, metallic taste and reddish staining, but is generally not considered a health hazard. Conventional water treatment systems generally remove iron during the treatment cycle. Figure 4 shows the iron exceedances in the surficial aquifer system for this fifth year reporting period.

c. Manganese: Manganese is a naturally occurring metal that is found in many types of rocks. It readily combines with other substances such as oxygen, sulfur, or chlorine, so it does not occur naturally in pure form. Manganese can also be combined with carbon to make organic manganese compounds. Common organic manganese compounds include pesticides, such as the fungicides maneb or mancozeb. Of the two, Mancozeb is the only one authorized for professional and residential turf usage (USEPA 2005). Another possible manmade source, methylcyclopentadienyl manganese tricarbonyl (MMT), is a fuel additive in some gasolines. (ATSDR 2012). Although manganese is an essential nutrient to many living things, including humans, too much manganese in certain forms can cause health problems.

All of the wells that had manganese exceedances during the FY11 monitoring period have been in exceedance in the past. Ninety-four percent of the manganese exceedances, to date, have occurred in the Water Table aquifer. All of these were located in managed turf areas. The overall average for Water Table aquifer wells is 163 ug/L, well above the 50 ug/l state standard. The wet season average (185 ug/L) is only slightly higher than the dry season average (144 ug/L), indicating very little seasonal effects on manganese levels. Figure 5 shows the manganese exceedances during FY11.

d. Chloride: Chloride is the measurement of the Cl^- anion (negatively charged ion). The chloride anion is typically associated with other major cations (positively charged ions) found in ground water—sodium, calcium, magnesium, potassium or strontium (FSG, 1992). The highest chloride levels can be found in the Mid-Hawthorn aquifer (687 mg/L average). The Secondary Drinking Water Standard for chloride is 250 mg/L. All of the exceedances in the Water Table aquifer occurred in monitor wells located along the coast where saltwater intrusion is a likely source. Chlorides can also be higher (than background in the Water Table) in re-use water as a result of the wastewater treatment process and infiltration of salt water into the sanitary sewer lines (Martinez, 2009). The Water Table wells with exceedances are also located in managed turf areas that receive re-use water for irrigation. High chloride was also found in one well in the Sandstone aquifer. Figure 6 shows the chloride exceedances in the Water Table aquifer for this fifth year reporting period.

e. Total Dissolved Solids (TDS): TDS and chlorides measure similar constituents and are directly proportional, but TDS measures all dissolved ions in the water and is typically orders of magnitude higher than chloride. Therefore you would expect wells high in chlorides will also be high in TDS. In fact, all of the wells that had chloride exceedances also exceeded the 500 mg/L Secondary Drinking Water Standard for TDS. However, many more of the Water Table wells were in exceedance of the TDS standard primarily due to their location along the coast and within re-use irrigation areas. **Table 5** shows the average TDS by aquifer for this reporting period.

Table 5. Average TDS in ground water during FY11

Aquifer	Total Dissolved Solids (mg/L)
Water Table	668
Lower Tamiami	463
Sandstone	705
Mid-Hawthorn	1940

The highest levels of TDS were found in the Mid-Hawthorn aquifer, which is known to be higher in chlorides. High TDS was also found in all three wells located in the Sandstone aquifer. Two private potable wells located in the Lower Tamiami aquifer sampled during this reporting period (one wet season, one dry season) were in exceedance. The Lower Tamiami aquifer becomes saltier as depth and proximity to the coast increases. However, there is also an area of higher chlorides in central Collier County that is due to upward leakage of brackish water from underlying aquifers (Schmerge, 2001). In certain areas of central Collier County, the confining layers between the Water Table, Lower Tamiami aquifer and Sandstone aquifers are minimal or non-existent. There is exchange between the aquifers which would allow some brackish water from underlying aquifers to enter the overlying aquifers (Wexler, 2003).

High TDS levels in drinking water may produce an unpleasant salty taste and hard water scale on equipment. Figure 7 shows the TDS exceedances for this fifth year reporting period.

f. Sulfate: Three wells in the Mid-Hawthorn aquifer were above the Secondary Drinking Water Standard of 250 mg/l during FY11. The source of sulfate in this aquifer was found by Sacks and Tihansky (1996) to be from upwelling of dissolved gypsum from the Upper Floridan aquifer. Six wells in the Water Table aquifer were found to be above this standard during FY11. All of these wells are located within urban land use in managed turf areas. Possible sources of sulfate in the Water Table aquifer include rain water, fertilizers, and cycling of sulfur in the soils. (Bates, et. al, 2002).

Sulfur is an important link to the methylation of mercury into toxic methylmercury (Gilmour et al., 1992 and Harvey et al., 2002). Methylmercury is the form of mercury that is most bioavailable and shows up in the food chain. Sulfur increases the solubility of mercury making it more readily available for methylation. Therefore, it becomes important to monitor anthropogenic sources of sulfate in the environment and how sulfate in ground water may interact with surface waters. Figure 8 shows the sulfate exceedances in the Water Table aquifer for this reporting period.

g. Nitrate and Nitrate-Nitrite: There were no exceedances of Nitrate or Nitrate-nitrite during this reporting period. See below for more information on nutrients in ground water.

2. Biological

a. Total and Fecal Coliform: The maximum contaminant level for total and fecal coliforms is zero. However, for this project, this standard is only applicable to the samples collected at the randomly selected residential wells as these are the only wells used as primary drinking water sources, and are sealed from outside contaminants. Many of the trend network monitoring wells are not sealed at the top and frogs and other wildlife have been found inside the well casings. In addition, the purge equipment used to sample the wells is not sterile even though it is chemically cleaned.

Samples collected from the private drinking water systems are taken directly from the permanent pumps installed in the well head. The private well located at 860 Everglades Blvd S, showed the presence of both fecal and total coliforms in November 2010. The well was re-sampled and the presence of coliform bacteria was confirmed. This information was provided to the Collier County Department of Environmental Health and Engineering for further testing and mitigation.

D. Nutrients

1. Nitrogen

There are drinking water standards for some nitrogen species (nitrate, nitrite and nitrate+nitrite). During FY11, there were no exceedances of these drinking water standards. However, if nitrogen at the levels found in the ground water were present at the same levels in the surface water, they would be of concern in the environment.

Nitrogen is a nutrient used by growing plants. The current state surface water standard (FAC 62-302) for nitrogen is a narrative standard that states *"in no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance in natural populations of aquatic flora or fauna."* In south Florida, this imbalance in natural populations is typically seen in the aquatic flora, specifically in the formation of algal blooms and overgrowth of aquatic vegetation. Although nitrogen species in the ground water haven't exceeded any drinking water standards, their interaction with surface water at low levels will be more impactful.

Table 6 provides the average ammonia, total Kjeldahl nitrogen, and nitrate-nitrite for each aquifer during FY11. Also provided for comparison is the countywide average of each constituent for all surface water samples collected during FY11. As noted from this table, the Water Table aquifer is highest in all three nitrogen constituents. Nitrogen species in the Water Table aquifer are also significantly higher when compared to the average surface water concentrations. Atkins (2011) predicted that in some canals in Collier County, over 50% of their flow comes from ground water inputs (baseflow). Given that interaction, ground water will affect nutrient levels in the canals. This impact to surface water will vary by watershed and by season as ground water inputs vary.

Ammonia is the only nitrogen species that currently has a numeric surface water standard. Ninety-five percent of the ammonia levels recorded in all wells during FY11 were in exceedance of the State Class III Surface Water Standard (0.02 mg/L) listed in FAC 62-302. In the Water Table aquifer, the ammonia levels are 87 times higher than the surface water standard. This inorganic form of nitrogen is readily available for use by plants and algae in the surface water. Here again, ground water inflows to surface water could create algae blooms and excessive aquatic macrophyte growth. **Table 6** also shows that average ammonia levels in the surface water during FY11 exceeded the state standard of 0.02 mg/L.

Table 6. Average nitrogen species in ground water and surface water during FY11

Aquifer	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Nitrate-Nitrite (mg/L)	Total Kjeldahl Nitrogen (mg/L)
Water Table	1.74	0.350	0.018	0.348	2.261
Lower Tamiami	0.31	0.031	0.002	0.033	0.646
Sandstone	0.17	0.050	0.003	0.053	0.347
Mid-Hawthorn	0.29	0.003	0.001	0.003	0.296
Surface Water*	0.09	0.057	0.006	0.063	0.977

** Includes only Class III Fresh Water Sites*

Table 7 shows the variation of average nitrogen levels in the Water Table aquifer by land use. Wells with the highest nitrogen species are those located in managed turf areas (golf courses, parks, urban areas).

Table 7. Average Nitrogen Species in the Water Table Wells by Land Use during FY11

Land Use*	Ammonia (mg/L)	Nitrate-Nitrite (mg/L)	Total Kjeldahl Nitrogen (mg/L)
AGRICULTURE	**0.25**	**0.138**	**1.662**
TRANSPORTATION, COMMUNICATION & UTILITIES	**1.59**	**0.006**	**2.101**
UPLAND NONFORESTED	**0.74**	**0.003**	**1.460**
URBAN AND BUILT UP	**2.19**	**0.466**	**2.634**
Commercial and Services	0.09	0.016	1.012
Educational Facilities	0.80	0.009	1.385
Fixed Single Family Units	1.85	0.010	2.451
Golf Course	3.26	0.716	3.175
Mobile Home Units	0.15	2.035	1.620
Multiple Dwelling Units, High Rise	0.88	0.005	1.631
Multiple Dwelling Units, Low Rise	0.84	0.007	1.703
Parks and Zoos	0.43	0.013	3.585
Shopping Centers	0.17	0.002	0.461
WETLANDS	**0.50**	**0.049**	**0.904**

**Land Use based on the 2008 SFWMD FLUCCS*

2. Phosphorus

Phosphorus is another plant nutrient. Currently, there are no state drinking water standards and no state numeric surface water standards for phosphorus. The current state surface water standard is the same narrative standard listed for nitrogen. In the fresh surface water systems in Collier County, phosphorus is typically the limiting nutrient—meaning nitrogen is more prevalent than phosphorus and it's the phosphorus that limits plant growth. Plants need a ratio of nitrogen to phosphorus in order to sustain themselves. In a phosphorus limited system, increasing phosphorus a minute amount in the presence of an abundance nitrogen will cause aquatic plants and algae to thrive. Conversely, in a phosphorus limited system, increasing the nitrogen without increasing the phosphorus will have little impact.

Total phosphorus is also found in the Water Table aquifer in higher amounts (over 2.5 times higher) than the surrounding surface waters (see **Table 8**). These levels could significantly impact surface water as ground water moves into the canals.

Table 8. Average Total Phosphorus in Water Table Wells and Surface Water during FY11

Aquifer	Total Phosphorus (mg/L)
Water Table	0.201
Lower Tamiami	0.068
Sandstone	0.011
Mid-Hawthorn	0.015
Surface Water*	0.075

** Includes only Class III Fresh Water Sites*

Table 9 provides the average total phosphorus levels in the Water Table wells during FY11. Unlike the nitrogen species, the highest phosphorus levels are not specific to urban land uses. Water Table wells surrounded by agricultural land use, on average, show higher total phosphorus than the urban and commercial land uses (with the exception of Parks and Zoos).

Table 9. Average total phosphorus in the Water Table wells by land use during FY11

	Land Use	Total Phosphorus (mg/L)
AGRICULTURE		0.335
TRANSPORTATION, COMMUNICATION & UTILITIES		0.226
UPLAND NONFORESTED		0.079
URBAN AND BUILT UP		0.234
Urban and Built Up	Commercial and Services	0.179
	Educational Facilities	0.247
	Fixed Single Family Units	0.069
	Golf Course	0.307
	Mobile Home Units	0.077
	Multiple Dwelling Units, High Rise	0.082
	Multiple Dwelling Units, Low Rise	0.239
	Parks and Zoos	0.715
	Shopping Centers	0.259
WETLANDS		0.019

**Land Use based on the 2008 SFWMD Florida Land Use and Cover Classification System (FLUCCS)*

E. Dissolved Oxygen

Dissolved oxygen is not typically a parameter that is discussed as part of ground water quality because it is naturally very low or absent due to lack of contact with the atmosphere and sunlight. However, it becomes important when ground water influences surface water. **Table 10** shows the average dissolved oxygen content in each aquifer during FY11. During periods when ground water inflows are the major source of water in canals (Atkins 2011), the dissolved oxygen in the canal could drop below the surface water standard (>5 mg/l).

Table 10. Average Dissolved Oxygen Levels during FY11

Aquifer	Dissolved Oxygen (mg/l)
Water Table	2.70
Lower Tamiami	1.84
Sandstone	0.86
Mid-Hawthorn	0.93

VII. Conclusions and Recommendations

A. There are a number of constituents found in the Water Table aquifer that may be impacting surface water adversely. These include nitrogen, phosphorus, dissolved oxygen, iron and ammonia. Elevated levels in ground water could be causing surface water to exceed state standards. There are surface waters in Collier County that have been found to be impaired for all of these constituents.

B. Iron levels in the Water Table aquifer are elevated countywide. This is likely due to natural geology of the aquifer and not anthropogenic inputs. Land use does not appear to be impacting iron levels in the Water Table aquifer.

C. Dissolved oxygen is also naturally low in ground water. As ground water flows into the canals, dissolved oxygen in the canals could be lowered and exceed the state standard.

D. Arsenic exceedances only occurred in the Water Table aquifer. The source was likely the application of arsenical based herbicides which were banned for all uses in Florida (except for use on cotton crops in specified counties not including Collier County) by December 31, 2009. With this discontinued use of arsenical based herbicide, the overall trend in arsenic levels is going down. Arsenic trends will continue to be tracked in wells with exceedances.

E. Manganese exceedances are limited to Water Table wells located mainly in turf managed areas. Sources of manganese are only speculation at this time. Further investigation into possible sources is warranted.

F. Elevated sodium, total dissolved solids and chloride levels in the Sandstone and Mid-Hawthorn aquifers are due to the naturally brackish nature of the two aquifers. Those same constituents in the Water Table aquifer are elevated in wells located along the coast due to salt water intrusion. In some areas away from the coast, Water Table and Lower Tamiami wells can exhibit elevated levels of “saltiness” due to remnant sea water that is trapped and exchanging between the aquifers.

G. Nutrients in the Water Table aquifer are very elevated when compared to surface water. Currently, nutrient sources are being examined as part of the Gordon River Extension Total Maximum Daily Load. Nutrient source tracking is being conducted by the Florida Department of Environmental Protection. They will be using nitrogen isotopes and sucralose to target specific sources of nutrients. This monitoring will target specific urban land uses to determine the impacts of landuse on nutrients in ground water. Collier County Pollution Control has been and will continue to assist FDEP in their efforts.

H. The County also adopted the State’s model fertilizer ordinance in July 2011. The ordinance is designed to keep nutrients from entering the surface water. However, impacts to ground water have not been assessed. Collier County Pollution Control will continue to monitor the efforts of FDEP, FDACS and peer reviewed research regarding changes to the model ordinance, application rates and ground water impacts.

I. Although not monitored during FY11, organochlorine pesticides should be monitored every five years due to their persistence in the environment. These pesticides are no longer in use, so further contamination is unlikely, but monitoring is needed to detect changes to existing levels that may occur through soil disturbance and transport.

J. Organophosphate, triamine, and carbamate pesticides tend to be more acutely toxic than organochlorine pesticides, but have less sustainability in the environment. New pesticides are developed and new uses for existing approved pesticides change frequently. Although monitoring of these types of pesticides did not occur in FY11, monitoring of these pesticides should be examined to determine an acceptable sampling frequency and, at a minimum, be monitored every five years.

K. Continued monitoring is needed to assess long term trends.

L. The monitoring network will be continually evaluated to determine if other resources are available for monitoring that better represent all land uses and aquifers. This evaluation will take into account the Watershed Management Plans initiatives.

VIII. References

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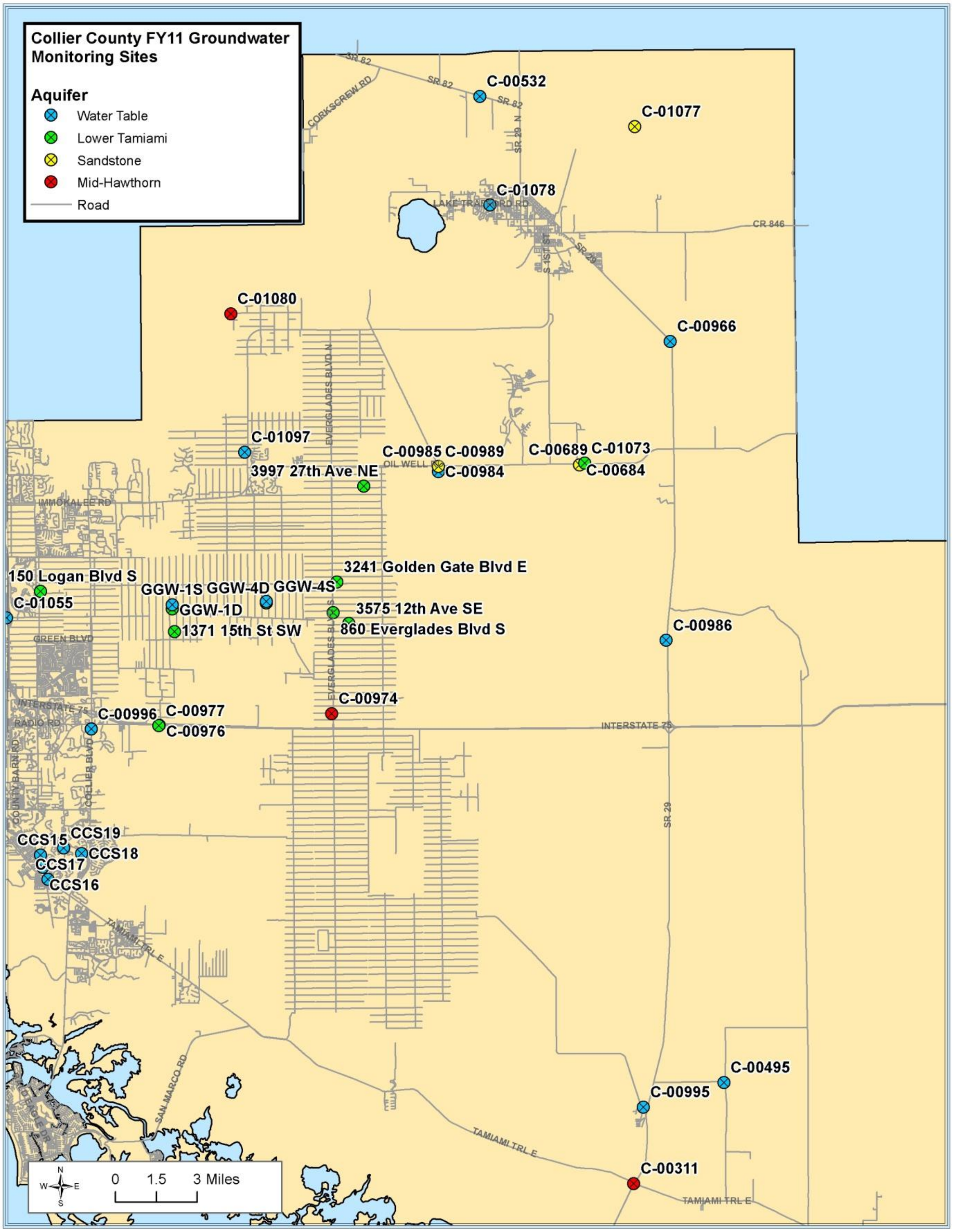

Figure 1. Monitoring Sites-Eastern Collier

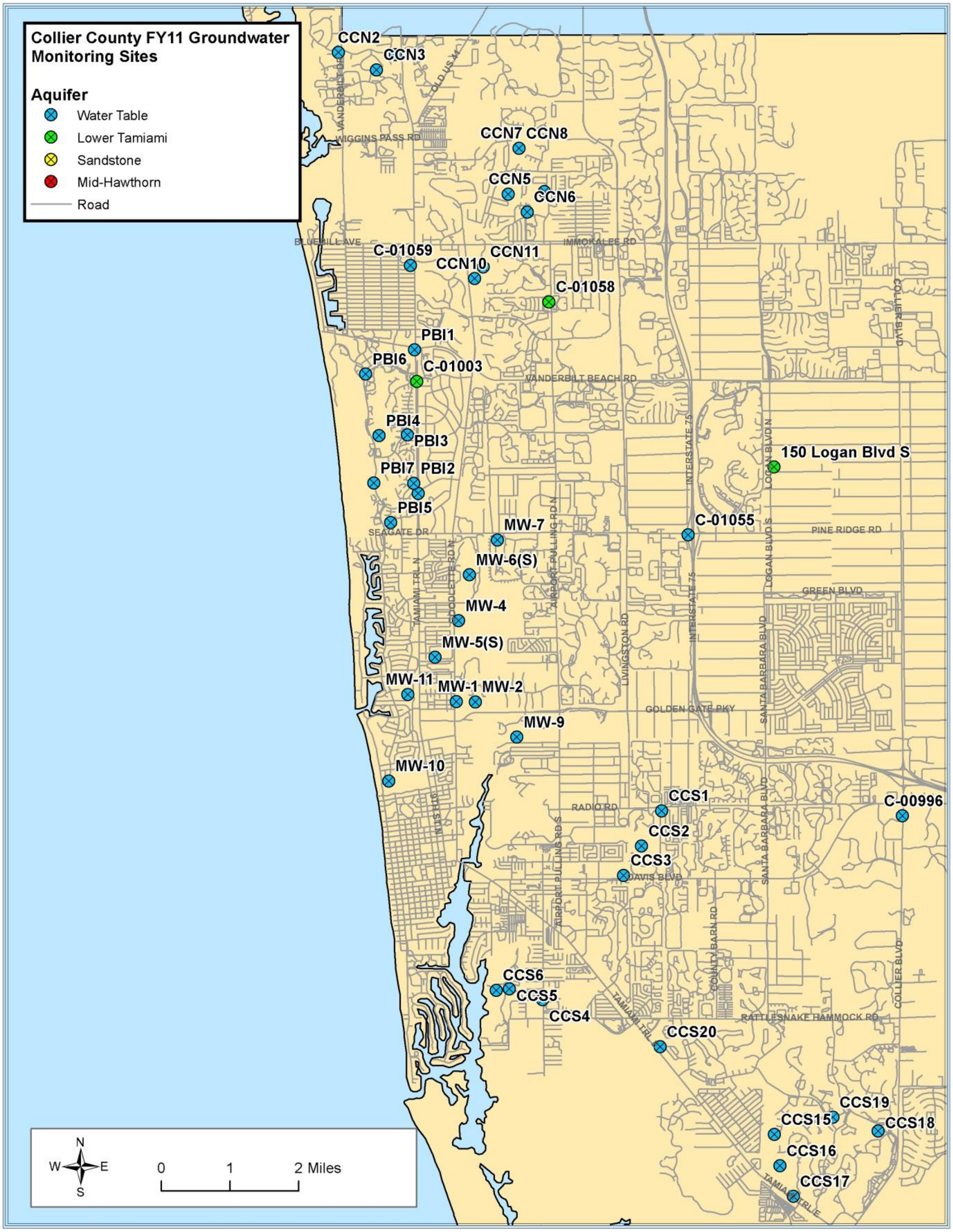

Figure 2. Monitoring Sites-Western Collier

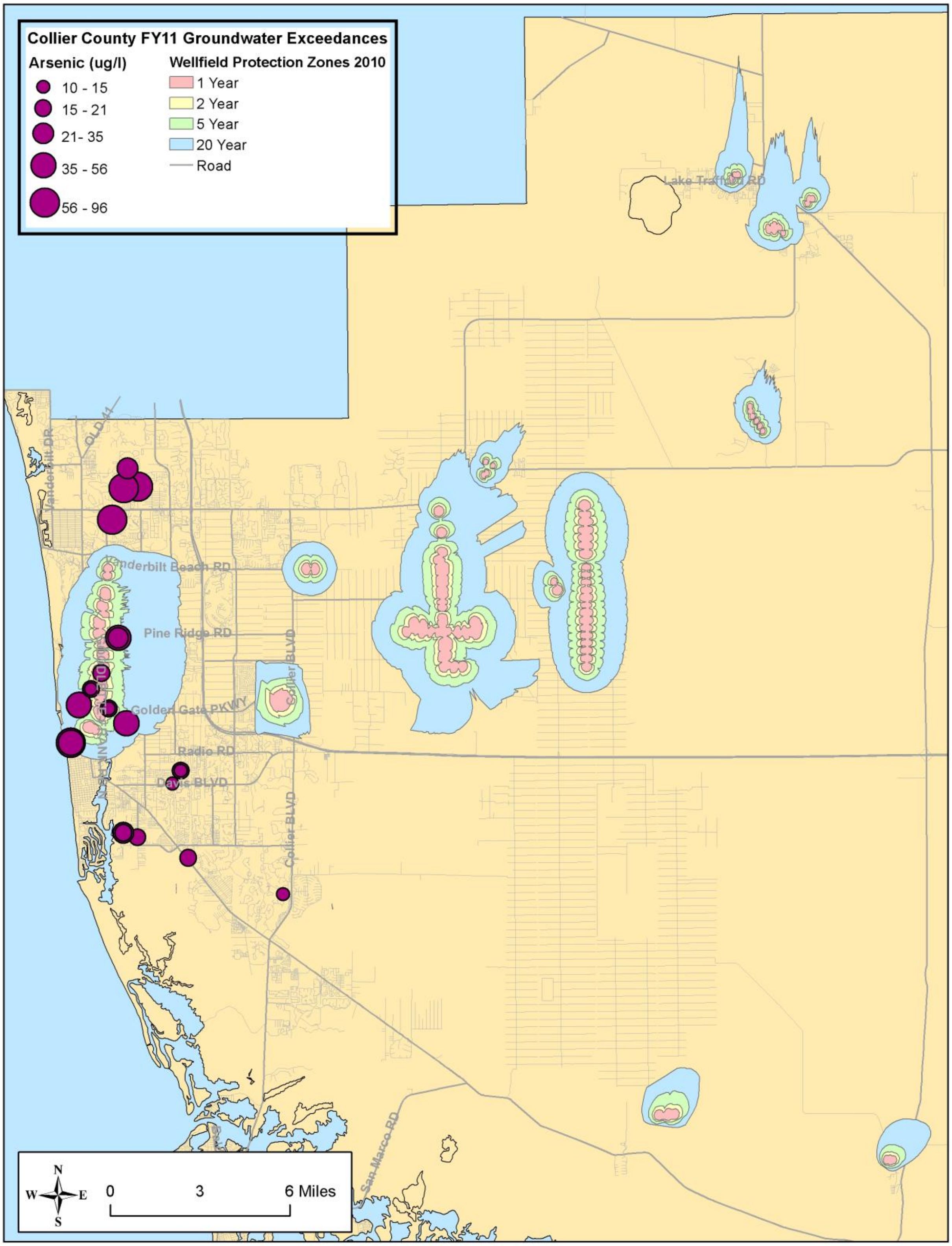

Figure 3. Arsenic exceedances in the Water Table aquifer during FY11

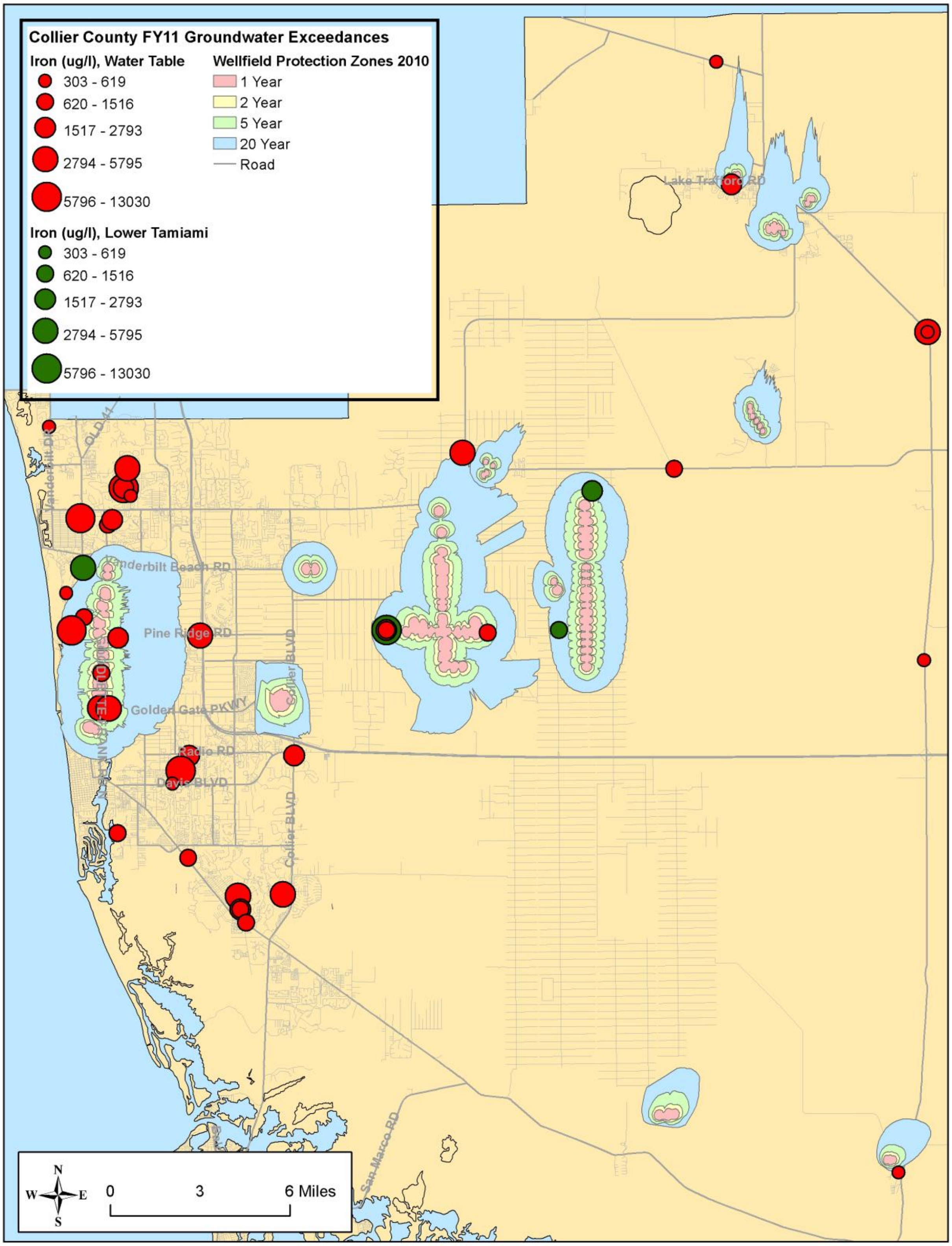

Figure 4. Iron exceedances in ground water during FY11

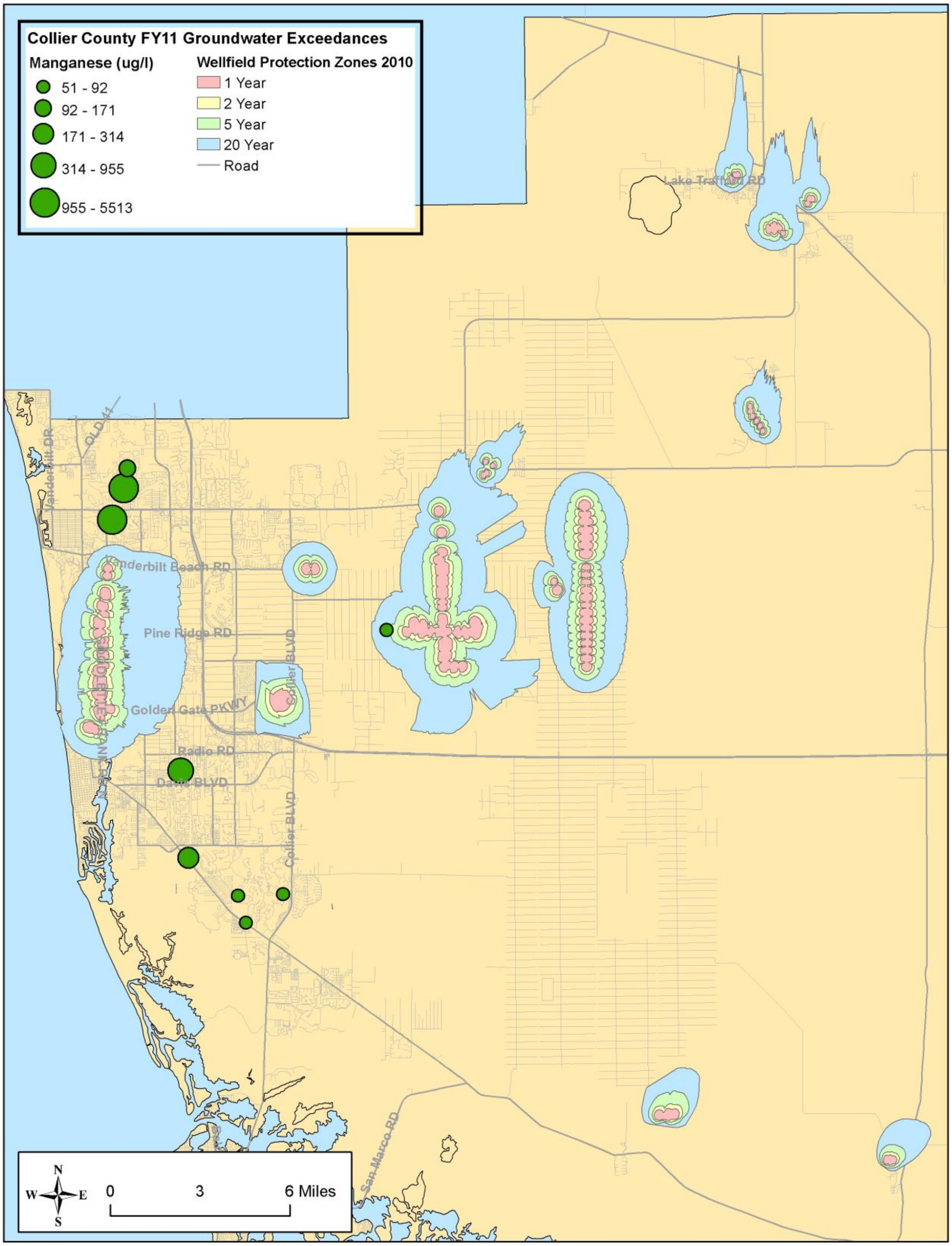

Figure 5. Manganese exceedances in the Water Table aquifer during FY11

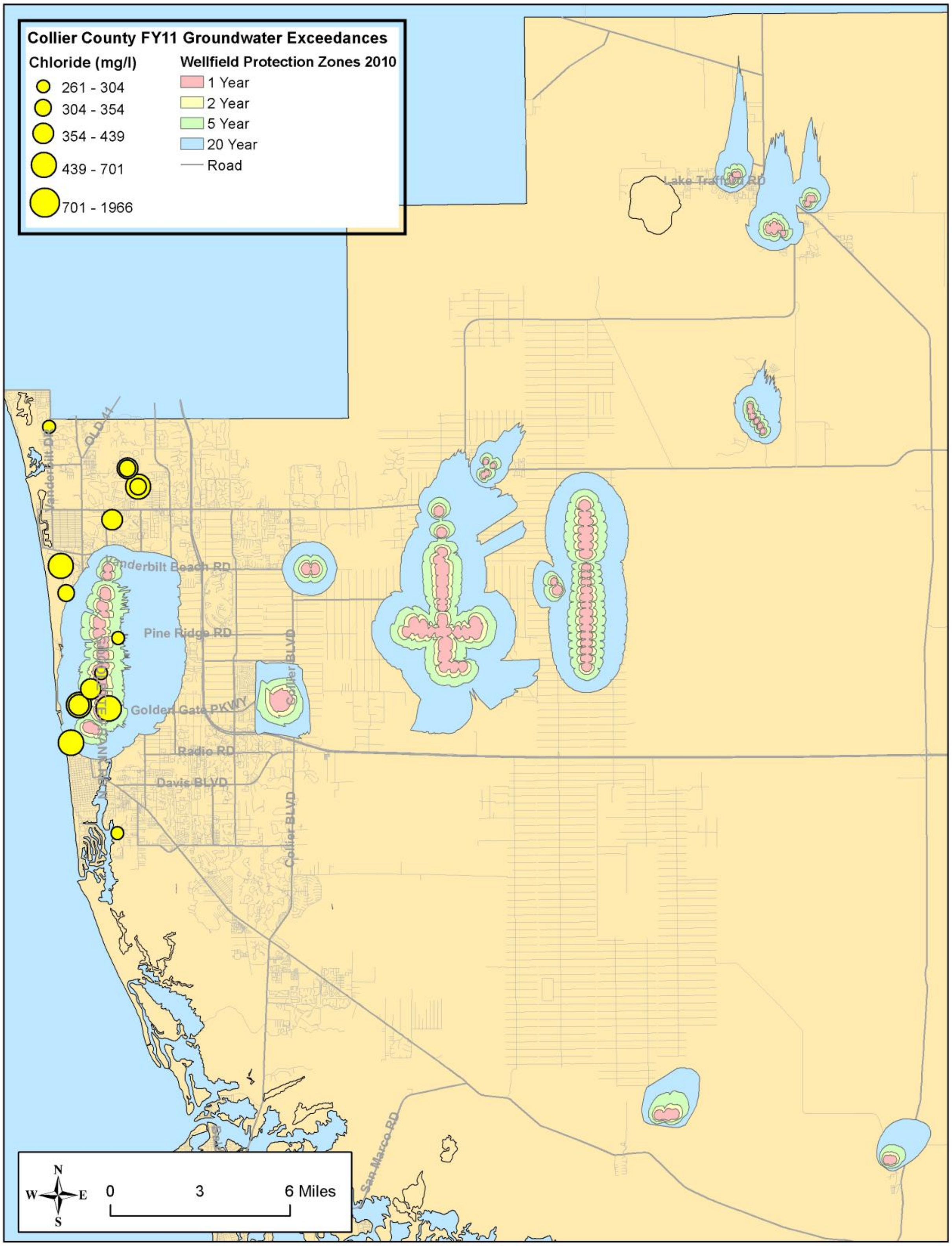

Figure 6. Chloride exceedances in the Water Table aquifer during FY11

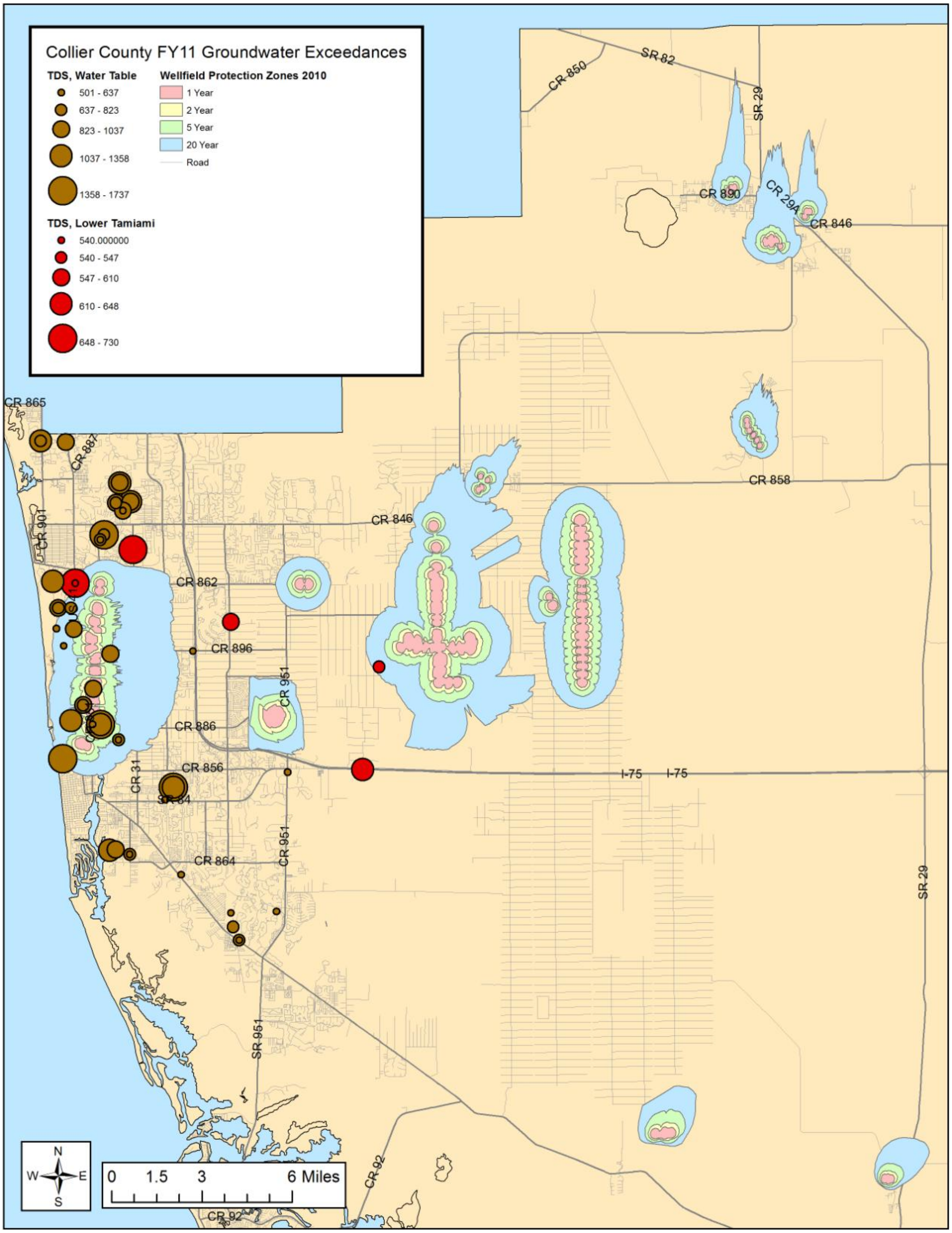

Figure 7. Total Dissolved Solids (TDS) exceedances in the Water Table and Lower Tamiami aquifers during FY11

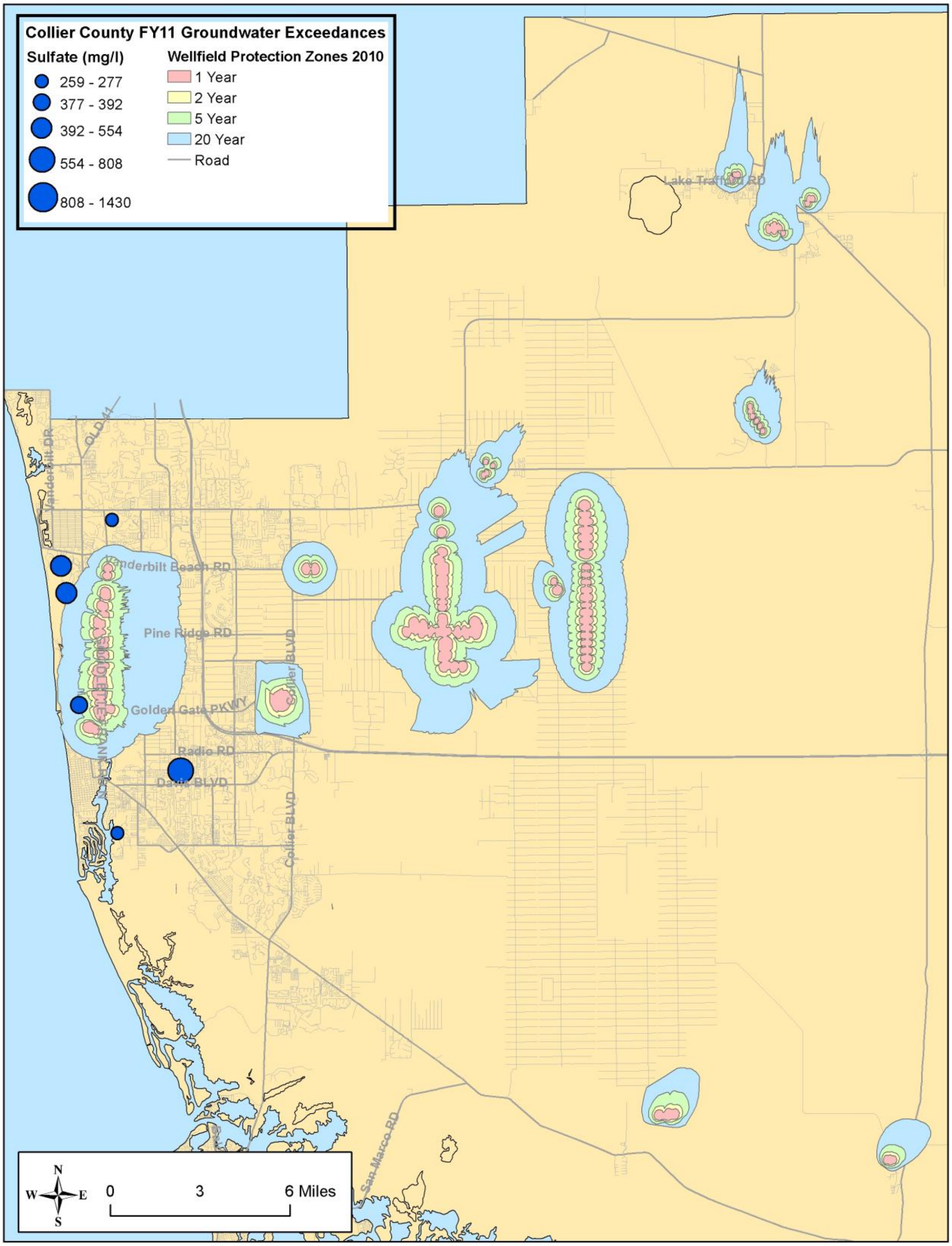

Figure 8. Sulfate exceedances in the Water Table aquifer during FY11

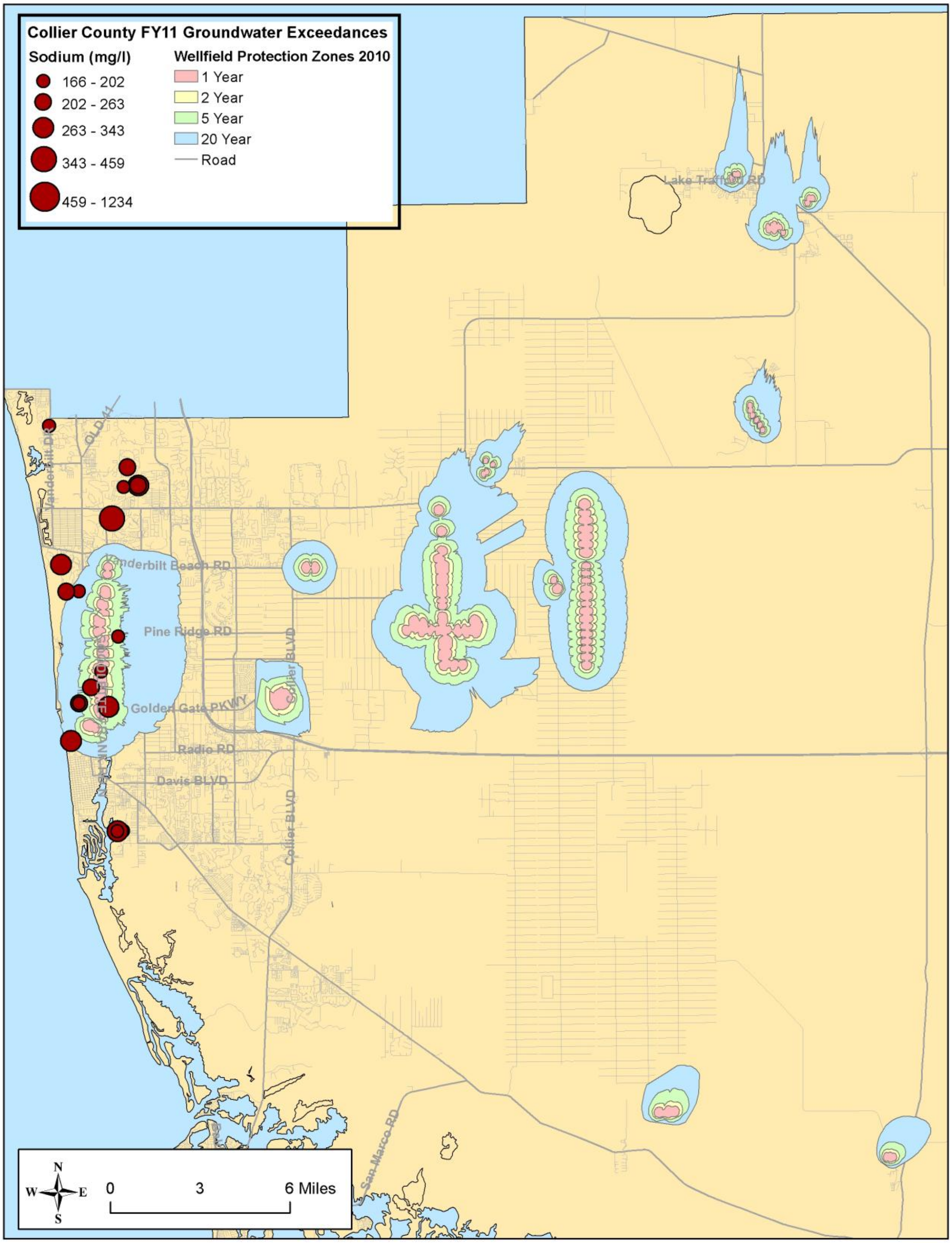

Figure 9. Sodium exceedances in the Water Table aquifer during FY11

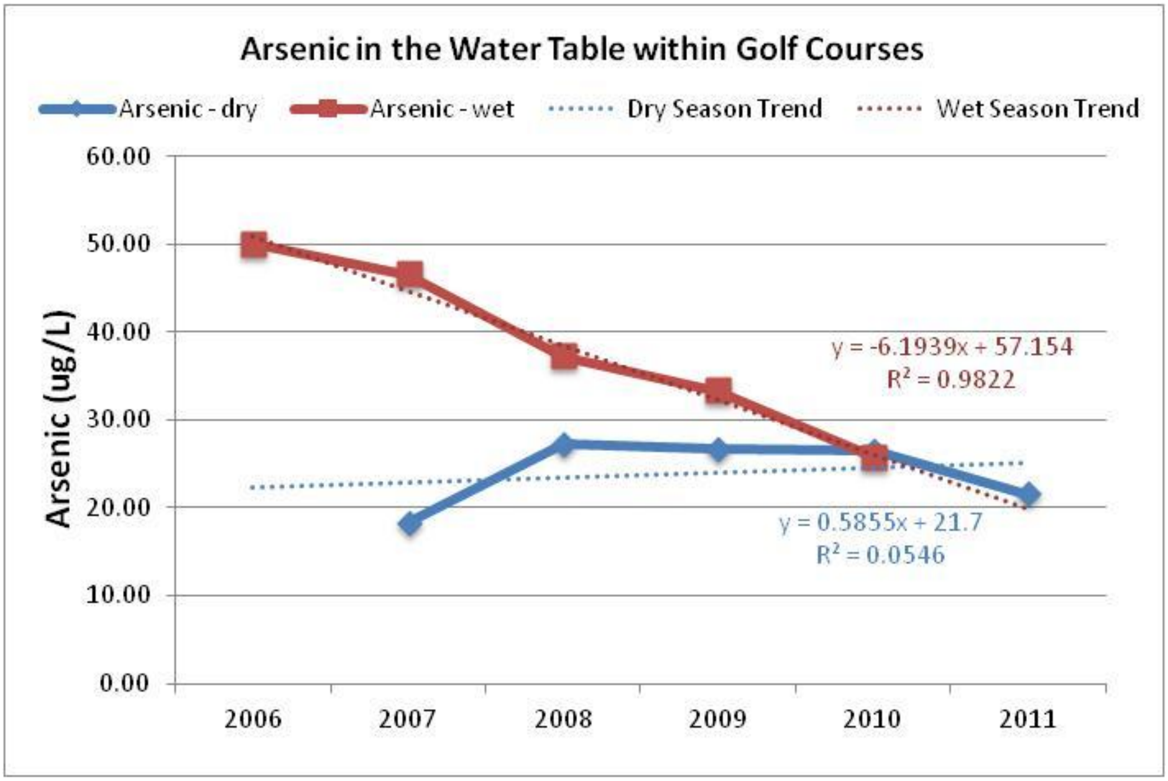

Figure 10. Average annual wet and dry season arsenic trends in Water Table aquifer wells located in golf courses

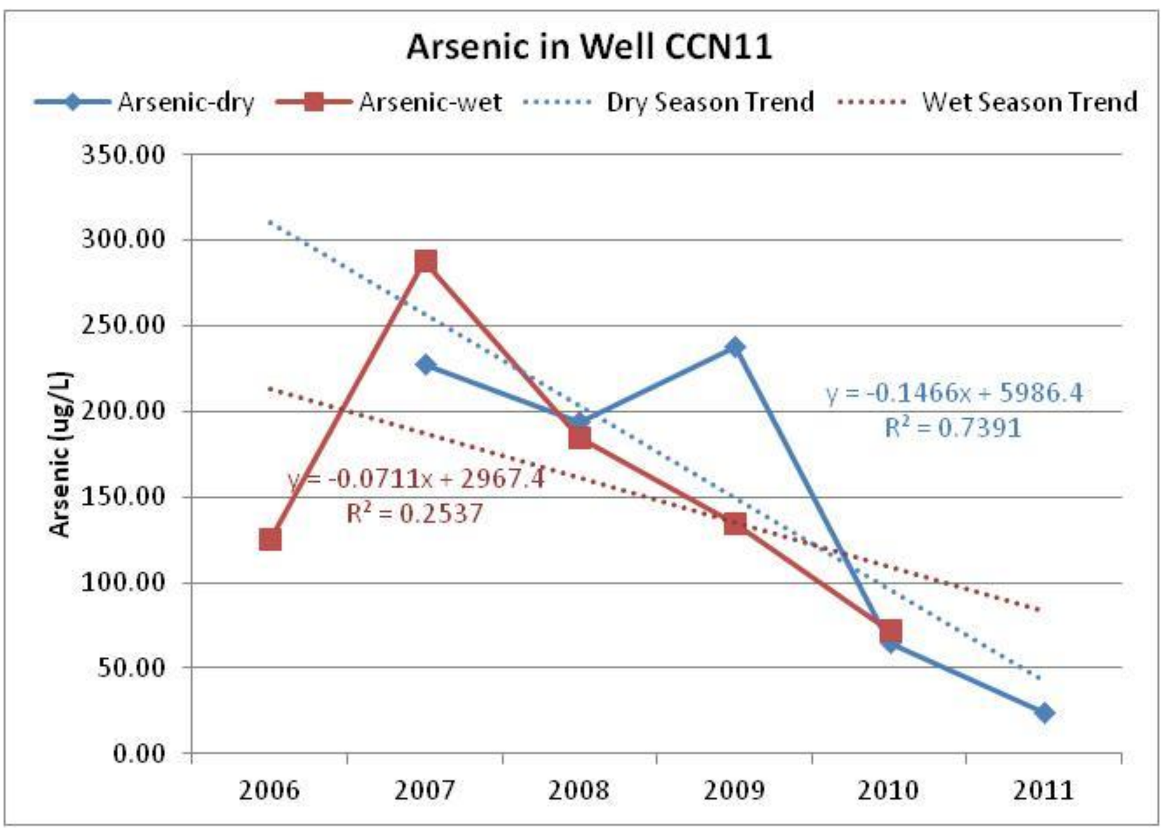

Figure 11. Average annual wet and dry season arsenic trends in well CCN11

APPENDIX A—STATION LIST

Well #	Aquifer	Latitude	Longitude
C-00311	Mid-Hawthorn	25.91056	-81.36500
C-00495	Water Table	25.96472	-81.31194
C-00532	Water Table	26.49111	-81.45806
C-00684	Mid-Hawthorn	26.29444	-81.39833
C-00689	Sandstone	26.29444	-81.39833
C-00966	Water Table	26.36056	-81.34472
C-00974	Mid-Hawthorn	26.16111	-81.54444
C-00976	Water Table	26.15444	-81.64639
C-00977	Lower Tamiami	26.15417	-81.64667
C-00984	Water Table	26.29056	-81.48194
C-00985	Lower Tamiami	26.29333	-81.48194
C-00986	Water Table	26.20083	-81.34667
C-00989	Sandstone	26.29333	-81.48194
C-00995	Water Table	25.95139	-81.35944
C-00996	Water Table	26.15222	-81.68667
C-01003	Lower Tamiami	26.24333	-81.80083
C-01055	Water Table	26.21128	-81.73711
C-01058	Lower Tamiami	26.26028	-81.77000
C-01059	Water Table	26.26778	-81.80250
C-01061	Water Table	26.21972	-81.80028
C-01073	Lower Tamiami	26.29540	-81.39528
C-01077	Sandstone	26.47528	-81.36611
C-01078	Water Table	26.43306	-81.45194
C-01080	Mid-Hawthorn	26.37444	-81.60528
C-01097	Water Table	26.30056	-81.59667
CCN1	Water Table	26.31223	-81.80630
CCN10	Water Table	26.26508	-81.78745
CCN11	Water Table	26.26758	-81.78540
CCN2	Water Table	26.31263	-81.81968
CCN3	Water Table	26.30903	-81.81068
CCN4	Water Table	26.28355	-81.77125
CCN5	Water Table	26.28295	-81.77970
CCN6	Water Table	26.27922	-81.77523
CCN7	Water Table	26.29268	-81.77723
CCN8	Water Table	26.29263	-81.77722
CCS1	Water Table	26.15300	-81.74293
CCS15	Water Table	26.08482	-81.71622
CCS16	Water Table	26.07822	-81.71490
CCS17	Water Table	26.07178	-81.71172

APPENDIX A—STATION LIST

Well #	Aquifer	Latitude	Longitude
CCS18	Water Table	26.08570	-81.69195
CCS19	Water Table	26.08853	-81.70257
CCS2	Water Table	26.14553	-81.74760
CCS20	Water Table	26.10322	-81.74302
CCS3	Water Table	26.13935	-81.75177
CCS4	Water Table	26.11302	-81.77055
CCS5	Water Table	26.11523	-81.77828
CCS6	Water Table	26.11492	-81.78137
GGW-1D	Lower Tamiami	26.21667	-81.63900
GGW-1S	Water Table	26.21889	-81.63900
GGW-4D	Lower Tamiami	26.22000	-81.58333
GGW-4S	Water Table	26.22083	-81.58333
MW-1	Water Table	26.17582	-81.79115
MW-10	Water Table	26.15898	-81.80683
MW-11	Water Table	26.17727	-81.80243
MW-2	Water Table	26.17575	-81.78667
MW-4	Water Table	26.19288	-81.79068
MW-5(S)	Water Table	26.18513	-81.79613
MW-6(S)	Water Table	26.20258	-81.78825
MW-7	Water Table	26.20997	-81.78177
MW-9	Water Table	26.16838	-81.77692
PBI1	Water Table	26.24997	-81.80142
PBI2	Water Table	26.22177	-81.80133
PBI3	Water Table	26.23207	-81.80295
PBI4	Water Table	26.23183	-81.80952
PBI5	Water Table	26.21350	-81.80672
PBI6	Water Table	26.24478	-81.81278
PBI7	Water Table	26.22183	-81.81072
150 Logan Blvd S	Lower Tamiami	26.22571	-81.71714
3241 Golden Gate Blvd E	Lower Tamiami	26.23144	-81.54173
3575 12th Ave SE	Lower Tamiami	26.20923	-81.53455
1371 15th Street	Lower Tamiami	26.20440	-81.63761
860 Everglades Blvd S	Lower Tamiami	26.21507	-81.54379
3997 27th Ave NE	Lower Tamiami	26.28270	-81.52596

APPENDIX B
Parameter List

Parameter	Analytical Method	Minimum Method Detection Limit*	Frequency
Temperature	FDEP SOP FT1400	± 0.2 mg/L °C	Semi-annually
pH	FDEP SOP FT 1100	± 0.2 standard units	Semi-annually
Specific conductance	FDEP SOP FT1200	± 5% of the true value of the KCl standard	Semi-annually
Dissolved Oxygen	FDEP SOP FT1500	± 0.3 mg/L of saturation chart at	Semi-annually
Depth to water level	FDEP SOP FS2200	± 0.01 feet	Semi-annually
Alkalinity	SM18 2320 B	1.0 mg/L	Semi-annually
Ammonia (N)	EPA 350.1	0.01 mg/L	Semi-annually
Arsenic	EPA 200.8 (As)	1.0 ug/L	Semi-annually
Barium	EPA 200.8 (Ba)	2.6 ug/L	Semi-annually
Bicarbonate Alkalinity	SM20 4500-CO2 D	2.0 mg/L	Semi-annually
Cadmium	EPA 200.8 (Cd)	0.1 ug/L	Semi-annually
Calcium	SM18 3111 B (Ca)	0.5 mg/L	Semi-annually
Chloride	SM18 4500-Cl - E	1.0 mg/L	Semi-annually
Chromium	EPA 200.8 (Cr)	2.0 ug/L	Semi-annually
Copper	EPA 200.8 (Cu)	1.0 ug/L	Semi-annually
Fecal coliform	SM18 9222 D (MF)	1 cfu/100ml	Semi-annually
Fluoride	SM18 4500-F C	0.05 mg/L	Semi-annually
Hardness- Calculated	SM18 2340 B	1.0 mg/L	Semi-annually
Iron	SM18 3111 B (Fe)	120 ug/L	Semi-annually
Lead	EPA 200.8 (Pb)	1.0 ug/L	Semi-annually
Magnesium	SM18 3111 B (Mg)	0.07 mg/L	Semi-annually
Manganese	EPA 200.8 (Mn)	0.2 mg/L	Semi-annually
Nickel	EPA 200.8 (Ni)	2.4 ug/L	Semi-annually
Nitrate (N)	NOX-NO2	0.01 mg/L	Semi-annually
Nitrate/Nitrite (NOX)	EPA 353.2 (Nitrate-Nitrite (N))	0.01 mg/L	Semi-annually
Nitrite (N)	SM18 4500-NO2 B	0.002 mg/L	Semi-annually
Orthophosphate	SM18 4500-P E (Orthophosphate)	0.004 mg/L	Semi-annually
Potassium	SM18 3111 B (K)	190 ug/L	Semi-annually
Selenium	EPA 200.8 (Se)	7.5 ug/L	Semi-annually
Silver	EPA 200.8 (Ag)	4.9 ug/L	Semi-annually
Sodium	SM18 3111 B (Na)	1.7 mg/L	Semi-annually
Strontium	EPA 6010 (Sr)	3.6 ug/L	Semi-annually
Sulfate	EPA 375.4	1.0 mg/L	Semi-annually
Sulfide	SM18 4500-S E	0.8 mg/L	Semi-annually
Total coliform	SM18 9222 B (MF)	1 cfu/100ml	Semi-annually
Total dissolved solids (TDS)	SM18 2540 C	2 mg/L	Semi-annually
Total Kjeldahl Nitrogen (TKN)	SM20 4500-Norg D	0.076 mg/L	Semi-annually
Total phosphorus (P)	SM18 4500-P E (Phosphorus -Total)	0.004 mg/L	Semi-annually
Total suspended solids (TSS)	SM18 2540 D	2 mg/L	Semi-annually
Turbidity	SM18 2130 B	0.10 NTU	Semi-annually
Zinc	EPA 200.8 (Zn)	0.96 ug/L	Semi-annually

APPENDIX C—FY11 Monitoring Effort Summary

Well #	Aquifer	Latitude	Longitude	Wet Season 2010 Sampling Date	Dry Season 2011 Sampling Date	Comments
C-00311	Mid-Hawthorn	25.91056	-81.36500	11/16/2010	03/16/2011	Wet and dry season sampling and lab analysis complete
C-00495	Water Table	25.96472	-81.31194	11/17/2010	03/16/2011	Wet and dry season sampling and lab analysis complete
C-00532	Water Table	26.49111	-81.45806	11/2/2010	02/16/2011	Wet and dry season sampling and lab analysis complete
C-00684	Mid-Hawthorn	26.29444	-81.39833	10/26/2010	04/12/2011	Wet and dry season sampling and lab analysis complete
C-00689	Sandstone	26.29444	-81.39833	10/27/2010	04/13/2011	Wet and dry season sampling and lab analysis complete
C-00966	Water Table	26.36056	-81.34472	11/1/2010	04/04/2011	Wet and dry season sampling and lab analysis complete
C-00974	Mid-Hawthorn	26.16111	-81.54444	11/17/2010	04/21/2011	Wet and dry season sampling and lab analysis complete
C-00976	Water Table	26.15444	-81.64639	11/4/2010	03/15/2011	Wet and dry season sampling and lab analysis complete
C-00977	Lower Tamiami	26.15417	-81.64667	11/4/2010	03/15/2011	Wet and dry season sampling and lab analysis complete
C-00984	Water Table	26.29056	-81.48194	10/28/2010	04/19/2011	Wet and dry season sampling and lab analysis complete
C-00985	Lower Tamiami	26.29333	-81.48194	10/28/2010	04/19/2011	Wet and dry season sampling and lab analysis complete
C-00986	Water Table	26.20083	-81.34667	11/1/2010	04/21/2011	Wet and dry season sampling and lab analysis complete
C-00989	Sandstone	26.29333	-81.48194	10/27/2010	04/13/2011	Wet and dry season sampling and lab analysis complete
C-00995	Water Table	25.95139	-81.35944	10/21/2010	02/28/2011	Wet and dry season sampling and lab analysis complete

APPENDIX C—FY11 Monitoring Effort Summary

Well #	Aquifer	Latitude	Longitude	Wet Season 2010 Sampling Date	Dry Season 2011 Sampling Date	Comments
C-00996	Water Table	26.15222	-81.68667	10/25/2010	03/22/2011	Wet and dry season sampling and lab analysis complete
C-01003	Lower Tamiami	26.24333	-81.80083	10/13/2010	03/21/2011	Wet and dry season sampling and lab analysis complete
C-01055	Water Table	26.21128	-81.73711	10/7/2010	03/01/2011	Wet and dry season sampling and lab analysis complete
C-01058	Lower Tamiami	26.26028	-81.77000	10/13/2010	03/01/2011	Wet and dry season sampling and lab analysis complete
C-01059	Water Table	26.26778	-81.80250	9/22/2010	02/15/2011	Wet and dry season sampling and lab analysis complete
C-01061	Water Table	26.21972	-81.80028	9/22/2010	02/15/2011	Wet and dry season sampling and lab analysis complete
C-01073	Lower Tamiami	26.29540	-81.39528	10/26/2010	04/12/2011	Wet and dry season sampling and lab analysis complete
C-01077	Sandstone	26.47528	-81.36611	11/3/2010	02/16/2011	Wet and dry season sampling and lab analysis complete
C-01078	Water Table	26.43306	-81.45194	11/2/2010	04/05/2011	Wet and dry season sampling and lab analysis complete
C-01080	Mid-Hawthorn	26.37444	-81.60528	10/25/2010	04/11/2011	Wet and dry season sampling and lab analysis complete
C-01097	Water Table	26.30056	-81.59667	10/14/2010	03/23/2011	Wet and dry season sampling and lab analysis complete
CCN1	Water Table	26.31223	-81.80630	9/20/2010	02/10/2011	Wet and dry season sampling and lab analysis complete
CCN10	Water Table	26.26508	-81.78745	9/22/2010	04/11/2011	Wet and dry season sampling and lab analysis complete
CCN11	Water Table	26.26758	-81.78540	9/16/2010	02/10/2011	Wet and dry season sampling and lab analysis complete

APPENDIX C—FY11 Monitoring Effort Summary

Well #	Aquifer	Latitude	Longitude	Wet Season 2010 Sampling Date	Dry Season 2011 Sampling Date	Comments
CCN2	Water Table	26.31263	-81.81968	9/20/2010	02/10/2011	Wet and dry season sampling and lab analysis complete
CCN3	Water Table	26.30903	-81.81068	9/20/2010	02/23/2011	Wet and dry season sampling and lab analysis complete
CCN4	Water Table	26.28355	-81.77125	9/21/2010	03/24/2011	Wet and dry season sampling and lab analysis complete
CCN5	Water Table	26.28295	-81.77970	9/21/2010	03/28/2011	Wet and dry season sampling and lab analysis complete
CCN6	Water Table	26.27922	-81.77523	9/21/2010	02/23/2011	Wet and dry season sampling and lab analysis complete
CCN7	Water Table	26.29268	-81.77723	9/16/2010	03/08/2011	Wet and dry season sampling and lab analysis complete
CCN8	Water Table	26.29263	-81.77722	9/16/2010	03/09/2011	Wet and dry season sampling and lab analysis complete
CCS1	Water Table	26.15300	-81.74293	10/12/2010	03/09/2011	Wet and dry season sampling and lab analysis complete
CCS15	Water Table	26.08482	-81.71622	10/19/2010	02/14/2011	Wet and dry season sampling and lab analysis complete
CCS16	Water Table	26.07822	-81.71490	10/18/2010	03/22/2011	Wet and dry season sampling and lab analysis complete
CCS17	Water Table	26.07178	-81.71172	10/18/2010	03/23/2011	Wet and dry season sampling and lab analysis complete
CCS18	Water Table	26.08570	-81.69195	10/20/2010	03/15/2011	Wet and dry season sampling and lab analysis complete
CCS19	Water Table	26.08853	-81.70257	10/19/2010	04/04/2011	Wet and dry season sampling and lab analysis complete
CCS2	Water Table	26.14553	-81.74760	10/14/2010	03/24/2011	Wet and dry season sampling and lab analysis complete

APPENDIX C—FY11 Monitoring Effort Summary

Well #	Aquifer	Latitude	Longitude	Wet Season 2010 Sampling Date	Dry Season 2011 Sampling Date	Comments
CCS20	Water Table	26.10322	-81.74302	10/13/2010	02/14/2011	Wet and dry season sampling and lab analysis complete
CCS3	Water Table	26.13935	-81.75177	10/14/2010	03/24/2011	Wet and dry season sampling and lab analysis complete
CCS4	Water Table	26.11302	-81.77055	10/20/2010	03/30/2011	Wet and dry season sampling and lab analysis complete
CCS5	Water Table	26.11523	-81.77828	10/21/2010	04/06/2011	Wet and dry season sampling and lab analysis complete
CCS6	Water Table	26.11492	-81.78137	10/21/2010	04/06/2011	Wet and dry season sampling and lab analysis complete
GGW-1D	Lower Tamiami	26.21667	-81.63900	11/8/2010	04/20/2011	Wet and dry season sampling and lab analysis complete
GGW-1S	Water Table	26.21889	-81.63900	11/8/2010	04/20/2011	Wet and dry season sampling and lab analysis complete
GGW-4D	Lower Tamiami	26.22000	-81.58333	11/15/2010	04/21/2011	Wet and dry season sampling and lab analysis complete
GGW-4S	Water Table	26.22083	-81.58333	11/15/2010	04/20/2011	Wet and dry season sampling and lab analysis complete
MW-1	Water Table	26.17582	-81.79115	10/5/2010	03/17/2011	Wet and dry season sampling and lab analysis complete
MW-10	Water Table	26.15898	-81.80683	10/6/2010	03/21/2011	Wet and dry season sampling and lab analysis complete
MW-11	Water Table	26.17727	-81.80243	10/6/2010	03/28/2011	Wet and dry season sampling and lab analysis complete
MW-2	Water Table	26.17575	-81.78667	10/5/2010	03/24/2011	Wet and dry season sampling and lab analysis complete
MW-4	Water Table	26.19288	-81.79068	9/30/2010	04/06/2011	Wet and dry season sampling and lab analysis complete

APPENDIX C—FY11 Monitoring Effort Summary

Well #	Aquifer	Latitude	Longitude	Wet Season 2010 Sampling Date	Dry Season 2011 Sampling Date	Comments
MW-5(S)	Water Table	26.18513	-81.79613	10/5/2010	03/17/2011	Wet and dry season sampling and lab analysis complete
MW-6(S)	Water Table	26.20258	-81.78825	10/7/2010	03/02/2011	Wet and dry season sampling and lab analysis complete
MW-7	Water Table	26.20997	-81.78177	10/7/2010	02/23/2011	Wet and dry season sampling and lab analysis complete
MW-9	Water Table	26.16838	-81.77692	10/12/2010	03/30/2011	Wet and dry season sampling and lab analysis complete
PBI1	Water Table	26.24997	-81.80142	9/28/2010	02/10/2011	Wet and dry season sampling and lab analysis complete
PBI2	Water Table	26.22177	-81.80133	9/30/2010	02/22/2011	Wet and dry season sampling and lab analysis complete
PBI3	Water Table	26.23207	-81.80295	10/4/2010	03/21/2011	Wet and dry season sampling and lab analysis complete
PBI4	Water Table	26.23183	-81.80952	10/4/2010	03/02/2011	Wet and dry season sampling and lab analysis complete
PBI5	Water Table	26.21350	-81.80672	9/30/2010	02/22/2011	Wet and dry season sampling and lab analysis complete
PBI6	Water Table	26.24478	-81.81278	10/4/2010	03/02/2011	Wet and dry season sampling and lab analysis complete
PBI7	Water Table	26.22183	-81.81072	9/30/2010	02/22/2011	Wet and dry season sampling and lab analysis complete
1371 15th St SW	Lower Tamiami	26.20440	-81.63761	11/23/2010		Wet and dry season sampling and lab analysis complete
860 Everglades Blvd S	Lower Tamiami	26.21507	-81.54379	11/23/2010		Wet and dry season sampling and lab analysis complete
3997 27th Ave NE	Lower Tamiami	26.28270	-81.52596	11/23/2010		Wet and dry season sampling and lab analysis complete

APPENDIX C—FY11 Monitoring Effort Summary

Well #	Aquifer	Latitude	Longitude	Wet Season 2010 Sampling Date	Dry Season 2011 Sampling Date	Comments
150 Logan Blvd S	Lower Tamiami	26.22571	-81.71714		04/07/2011	Wet and dry season sampling and lab analysis complete
3241 Golden Gate Blvd E	Lower Tamiami	26.23144	-81.54173		04/07/2011	Wet and dry season sampling and lab analysis complete
3575 12th Ave SE	Lower Tamiami	26.20923	-81.53455		04/07/2011	Wet and dry season sampling and lab analysis complete

APPENDIX D--FY11 Exceedances

Station	Date Collected	Aquifer	Analyte	Result	Units	Lab Qualifiers	Detection Limit	FAC 62-550 Primary Drinking Water Standard	FAC 62-550 Secondary Drinking Water Standard
CCN11	2/10/2011	Water Table	Arsenic	23.79	ug/L		0.23	10	
CCN11	9/16/2010	Water Table	Arsenic	71.75	ug/L		0.23	10	
CCN4	3/24/2011	Water Table	Arsenic	62.03	ug/L		0.23	10	
CCN4	9/21/2010	Water Table	Arsenic	61.86	ug/L		0.23	10	
CCN5	3/28/2011	Water Table	Arsenic	64.27	ug/L		0.23	10	
CCN5	9/21/2010	Water Table	Arsenic	95.63	ug/L		0.23	10	
CCN7	3/8/2011	Water Table	Arsenic	14.29	ug/L		0.23	10	
CCN7	9/16/2010	Water Table	Arsenic	22.46	ug/L		0.23	10	
CCS18	3/15/2011	Water Table	Arsenic	10.09	ug/L		0.23	10	
CCS2	3/24/2011	Water Table	Arsenic	20.09	ug/L		0.23	10	
CCS2	10/14/2010	Water Table	Arsenic	13.69	ug/L		0.23	10	
CCS20	10/13/2010	Water Table	Arsenic	18.71	ug/L		0.23	10	
CCS3	10/14/2010	Water Table	Arsenic	10.35	ug/L		0.23	10	
CCS4	3/30/2011	Water Table	Arsenic	15.21	ug/L		0.23	10	
CCS4	10/20/2010	Water Table	Arsenic	16.53	ug/L		0.23	10	
CCS5	4/6/2011	Water Table	Arsenic	28.22	ug/L		0.23	10	
CCS5	10/21/2010	Water Table	Arsenic	19.42	ug/L		0.23	10	
MW-10	3/21/2011	Water Table	Arsenic	59.62	ug/L		0.23	10	
MW-10	10/6/2010	Water Table	Arsenic	55.67	ug/L		0.23	10	
MW-11	3/28/2011	Water Table	Arsenic	23.77	ug/L		0.23	10	
MW-11	10/6/2010	Water Table	Arsenic	41.27	ug/L		0.23	10	
MW-4	9/30/2010	Water Table	Arsenic	17.9	ug/L		0.23	10	
MW-5(S)	3/17/2011	Water Table	Arsenic	15.85	ug/L		0.23	10	
MW-5(S)	10/5/2010	Water Table	Arsenic	13.95	ug/L		0.23	10	
MW-6(S)	3/2/2011	Water Table	Arsenic	16.13	ug/L		0.23	10	
MW-6(S)	10/7/2010	Water Table	Arsenic	11.18	ug/L		0.23	10	
MW-7	2/23/2011	Water Table	Arsenic	37.68	ug/L		0.23	10	
MW-7	10/7/2010	Water Table	Arsenic	34.3	ug/L		0.23	10	
MW-9	3/30/2011	Water Table	Arsenic	40.68	ug/L		0.23	10	

APPENDIX D--FY11 Exceedances

Station	Date Collected	Aquifer	Analyte	Result	Units	Lab Qualifiers	Detection Limit	FAC 62-550 Primary Drinking Water Standard	FAC 62-550 Secondary Drinking Water Standard
MW-9	10/12/2010	Water Table	Arsenic	54.2	ug/L		0.23	10	
C-00311	3/16/2011	Mid-Hawthorn	Chloride	659	mg/L		1		250
C-00311	11/16/2010	Mid-Hawthorn	Chloride	439	mg/L		2		250
C-00974	4/21/2011	Mid-Hawthorn	Chloride	1920	mg/L		8		250
C-00974	11/17/2010	Mid-Hawthorn	Chloride	1966	mg/L		11		250
C-01077	2/16/2011	Sandstone	Chloride	319	mg/L		1		250
C-01077	11/3/2010	Sandstone	Chloride	286	mg/L		1		250
CCN11	9/16/2010	Water Table	Chloride	364.3	mg/L		1		250
CCN2	2/10/2011	Water Table	Chloride	261	mg/L		1		250
CCN4	3/24/2011	Water Table	Chloride	490	mg/L		1		250
CCN4	9/21/2010	Water Table	Chloride	314.2	mg/L		1		250
CCN8	3/9/2011	Water Table	Chloride	374	mg/L		1		250
CCN8	9/16/2010	Water Table	Chloride	328	mg/L		1		250
CCS6	4/6/2011	Water Table	Chloride	304	mg/L		1		250
MW-10	3/21/2011	Water Table	Chloride	580	mg/L		5		250
MW-10	10/6/2010	Water Table	Chloride	701	mg/L		1		250
MW-11	3/28/2011	Water Table	Chloride	480	mg/L		1		250
MW-11	10/6/2010	Water Table	Chloride	407	mg/L		1		250
MW-4	4/6/2011	Water Table	Chloride	287	mg/L		1		250
MW-4	9/30/2010	Water Table	Chloride	291	mg/L		1		250
MW-5(S)	10/5/2010	Water Table	Chloride	370	mg/L		1		250
MW-6(S)	3/2/2011	Water Table	Chloride	498	mg/L		1		250
MW-6(S)	10/7/2010	Water Table	Chloride	518	mg/L		1		250
MW-7	2/23/2011	Water Table	Chloride	285	mg/L		1		250
MW-7	10/7/2010	Water Table	Chloride	277	mg/L		1		250
PBI4	10/4/2010	Water Table	Chloride	321	mg/L		1		250
PBI6	3/2/2011	Water Table	Chloride	354	mg/L		1		250
PBI6	10/4/2010	Water Table	Chloride	498	mg/L		1		250
860	11/23/2010	Lower Tamiami	Coliform Fecal	2	cfu/100ml	B	1	0	

APPENDIX D--FY11 Exceedances

Station	Date Collected	Aquifer	Analyte	Result	Units	Lab Qualifiers	Detection Limit	FAC 62-550 Primary Drinking Water Standard	FAC 62-550 Secondary Drinking Water Standard
Everglades Blvd S									
C-00966	4/4/2011	Water Table	Coliform Fecal	100	cfu/100ml	Z	1	0	
C-00984	4/19/2011	Water Table	Coliform Fecal	2	cfu/100ml	B	1	0	
C-01003	10/13/2010	Lower Tamiami	Coliform Fecal	4	cfu/100ml	B	1	0	
C-01058	10/13/2010	Lower Tamiami	Coliform Fecal	90	cfu/100ml	B	1	0	
C-01077	11/3/2010	Sandstone	Coliform Fecal	9	cfu/100ml	B	1	0	
CCN11	9/16/2010	Water Table	Coliform Fecal	9	cfu/100ml	B	1	0	
CCN8	9/16/2010	Water Table	Coliform Fecal	6	cfu/100ml	B	1	0	
CCS20	10/13/2010	Water Table	Coliform Fecal	4	cfu/100ml	B	1	0	
MW-4	9/30/2010	Water Table	Coliform Fecal	4	cfu/100ml	B	1	0	
MW-9	10/12/2010	Water Table	Coliform Fecal	45	cfu/100ml		1	0	
860 Everglades Blvd S	11/29/2010	Lower Tamiami	Coliform Total	1325	cfu/100ml	B	1	0	
C-00684	4/12/2011	Mid-Hawthorn	Coliform Total	2	cfu/100ml	B	1	0	
C-01003	10/13/2010	Lower Tamiami	Coliform Total	34	cfu/100ml	J	1	0	
C-01058	3/1/2011	Lower Tamiami	Coliform Total	100	cfu/100ml	Z	1	0	
C-01073	4/12/2011	Lower Tamiami	Coliform Total	100	cfu/100ml	Z	1	0	
C-01077	11/3/2010	Sandstone	Coliform Total	8	cfu/100ml	BJ	1	0	
CCN11	9/16/2010	Water Table	Coliform Total	6	cfu/100ml	B	1	0	
CCN2	9/20/2010	Water Table	Coliform Total	10	cfu/100ml	B	1	0	
CCN3	9/20/2010	Water Table	Coliform Total	4	cfu/100ml	BJ	1	0	
CCN8	9/16/2010	Water Table	Coliform Total	5	cfu/100ml	B	1	0	
CCS19	10/19/2010	Water Table	Coliform Total	2	cfu/100ml	B	1	0	
GGW-1D	11/8/2010	Lower Tamiami	Coliform Total	15	cfu/100ml	BJ	1	0	
GGW-4D	4/21/2011	Lower Tamiami	Coliform Total	39	cfu/100ml		1	0	
MW-4	9/30/2010	Water Table	Coliform Total	19	cfu/100ml	B	1	0	
MW-6(S)	3/2/2011	Water Table	Coliform Total	3	cfu/100ml	B	1	0	

APPENDIX D--FY11 Exceedances

Station	Date Collected	Aquifer	Analyte	Result	Units	Lab Qualifiers	Detection Limit	FAC 62-550 Primary Drinking Water Standard	FAC 62-550 Secondary Drinking Water Standard
MW-9	10/12/2010	Water Table	Coliform Total	13	cfu/100ml	B	1	0	
PBI2	2/22/2011	Water Table	Coliform Total	14	cfu/100ml	BJ	1	0	
PBI6	3/2/2011	Water Table	Coliform Total	2	cfu/100ml	B	1	0	
3997 27th Ave NE	11/23/2010	Lower Tamiami	Iron	2783	ug/L		3.96		300
860 Everglades Blvd S	11/23/2010	Lower Tamiami	Iron	784	ug/L		1.98		300
C-00532	11/2/2010	Water Table	Iron	396.5	ug/L		1.98		300
C-00966	4/4/2011	Water Table	Iron	5298	ug/L		9.9		300
C-00966	11/1/2010	Water Table	Iron	348	ug/L		1.98		300
C-00984	4/19/2011	Water Table	Iron	888.6	ug/L		1.98		300
C-00984	10/28/2010	Water Table	Iron	1007	ug/L		1.98		300
C-00986	4/21/2011	Water Table	Iron	519.6	ug/L		1.98		300
C-00995	2/28/2011	Water Table	Iron	367.6	ug/L		1.98		300
C-00995	10/21/2010	Water Table	Iron	303.6	ug/L		1.98		300
C-00996	3/22/2011	Water Table	Iron	2015	ug/L		3.96		300
C-00996	10/25/2010	Water Table	Iron	2608	ug/L		3.96		300
C-01003	3/21/2011	Lower Tamiami	Iron	3396	ug/L		3.96		300
C-01003	10/13/2010	Lower Tamiami	Iron	5390	ug/L		9.9		300
C-01055	3/1/2011	Water Table	Iron	3905	ug/L	J	9.9		300
C-01055	10/7/2010	Water Table	Iron	3702	ug/L		9.9		300
C-01059	2/15/2011	Water Table	Iron	12050	ug/L		19.8		300
C-01059	9/22/2010	Water Table	Iron	7184	ug/L		9.9		300
C-01061	2/15/2011	Water Table	Iron	578.8	ug/L		1.98		300
C-01061	9/22/2010	Water Table	Iron	862.7	ug/L		1.98		300
C-01078	4/5/2011	Water Table	Iron	1726	ug/L		1.98		300
C-01078	11/2/2010	Water Table	Iron	1655	ug/L		1.98		300
C-01097	3/23/2011	Water Table	Iron	2669	ug/L		1.98		300

APPENDIX D--FY11 Exceedances

Station	Date Collected	Aquifer	Analyte	Result	Units	Lab Qualifiers	Detection Limit	FAC 62-550 Primary Drinking Water Standard	FAC 62-550 Secondary Drinking Water Standard
C-01097	10/14/2010	Water Table	Iron	3397	ug/L		9.9		300
CCN10	4/11/2011	Water Table	Iron	1114	ug/L		1.98		300
CCN10	9/22/2010	Water Table	Iron	1248	ug/L		1.98		300
CCN11	2/10/2011	Water Table	Iron	2386	ug/L		3.96		300
CCN11	9/16/2010	Water Table	Iron	2197	ug/L		3.96		300
CCN2	9/20/2010	Water Table	Iron	382.2	ug/L		1.98		300
CCN5	3/28/2011	Water Table	Iron	7572	ug/L	J	1.98		300
CCN5	9/21/2010	Water Table	Iron	2111	ug/L		9.9		300
CCN6	2/23/2011	Water Table	Iron	494.9	ug/L		1.98		300
CCN6	9/21/2010	Water Table	Iron	432.6	ug/L		1.98		300
CCN8	3/9/2011	Water Table	Iron	4671	ug/L		9.9		300
CCN8	9/16/2010	Water Table	Iron	5688	ug/L		9.9		300
CCS1	3/9/2011	Water Table	Iron	1626	ug/L		1.98		300
CCS1	10/12/2010	Water Table	Iron	2282	ug/L		3.96		300
CCS15	2/14/2011	Water Table	Iron	4592	ug/L		9.9		300
CCS15	10/19/2010	Water Table	Iron	5795	ug/L		9.9		300
CCS16	3/22/2011	Water Table	Iron	1611	ug/L		1.98		300
CCS16	10/18/2010	Water Table	Iron	1516	ug/L		1.98		300
CCS17	3/23/2011	Water Table	Iron	618.1	ug/L		1.98		300
CCS17	10/18/2010	Water Table	Iron	939.1	ug/L		1.98		300
CCS18	3/15/2011	Water Table	Iron	4135	ug/L		9.9		300
CCS2	3/24/2011	Water Table	Iron	13030	ug/L		19.8		300
CCS2	10/14/2010	Water Table	Iron	7293	ug/L		9.9		300
CCS20	2/14/2011	Water Table	Iron	337.6	ug/L		1.98		300
CCS20	10/13/2010	Water Table	Iron	959.1	ug/L		1.98		300
CCS3	3/24/2011	Water Table	Iron	412.2	ug/L		1.98		300
CCS3	10/14/2010	Water Table	Iron	395.6	ug/L		1.98		300
CCS6	4/6/2011	Water Table	Iron	756.3	ug/L		1.98		300
CCS6	10/21/2010	Water Table	Iron	1039	ug/L		1.98		300

APPENDIX D--FY11 Exceedances

Station	Date Collected	Aquifer	Analyte	Result	Units	Lab Qualifiers	Detection Limit	FAC 62-550 Primary Drinking Water Standard	FAC 62-550 Secondary Drinking Water Standard
GGW-1D	4/20/2011	Lower Tamiami	Iron	11990	ug/L	!	19.8		300
GGW-1D	11/8/2010	Lower Tamiami	Iron	2793	ug/L		9.9		300
GGW-1S	4/20/2011	Water Table	Iron	1789	ug/L		1.98		300
GGW-1S	11/8/2010	Water Table	Iron	1015	ug/L		1.98		300
GGW-4S	4/20/2011	Water Table	Iron	895.5	ug/L		1.98		300
GGW-4S	11/15/2010	Water Table	Iron	806.6	ug/L		1.98		300
MW-1	3/17/2011	Water Table	Iron	3444	ug/L		3.96		300
MW-1	10/5/2010	Water Table	Iron	3280	ug/L		9.9		300
MW-2	3/24/2011	Water Table	Iron	772.2	ug/L		1.98		300
MW-4	4/6/2011	Water Table	Iron	1007	ug/L		1.98		300
MW-4	9/30/2010	Water Table	Iron	1104	ug/L		1.98		300
MW-6(S)	3/2/2011	Water Table	Iron	4005	ug/L		9.9		300
MW-6(S)	10/7/2010	Water Table	Iron	3941	ug/L		9.9		300
MW-7	2/23/2011	Water Table	Iron	1877	ug/L		3.96		300
MW-7	10/7/2010	Water Table	Iron	1810	ug/L		1.98		300
PBI4	10/4/2010	Water Table	Iron	427.2	ug/L		1.98		300
PBI5	2/22/2011	Water Table	Iron	9869	ug/L		19.8		300
PBI5	9/30/2010	Water Table	Iron	9273	ug/L		19.8		300
CCN11	2/10/2011	Water Table	Manganese	170.7	ug/L		0.12		50
CCN11	9/16/2010	Water Table	Manganese	5513	ug/L		0.24		50
CCN5	3/28/2011	Water Table	Manganese	5163	ug/L		4.8		50
CCN5	9/21/2010	Water Table	Manganese	5513	ug/L		4.8		50
CCN8	3/9/2011	Water Table	Manganese	74.34	ug/L		0.12		50
CCN8	9/16/2010	Water Table	Manganese	113.8	ug/L		0.117		50
CCS15	2/14/2011	Water Table	Manganese	76.55	ug/L		0.12		50
CCS15	10/19/2010	Water Table	Manganese	91.91	ug/L		0.117		50
CCS17	10/18/2010	Water Table	Manganese	56.63	ug/L		0.117		50
CCS18	3/15/2011	Water Table	Manganese	61.36	ug/L		0.12		50
CCS18	10/20/2010	Water Table	Manganese	55.87	ug/L		0.117		50

APPENDIX D--FY11 Exceedances

Station	Date Collected	Aquifer	Analyte	Result	Units	Lab Qualifiers	Detection Limit	FAC 62-550 Primary Drinking Water Standard	FAC 62-550 Secondary Drinking Water Standard
CCS2	3/24/2011	Water Table	Manganese	955	ug/L		1.2		50
CCS2	10/14/2010	Water Table	Manganese	748	ug/L		0.6		50
CCS20	2/14/2011	Water Table	Manganese	132	ug/L		0.12		50
CCS20	10/13/2010	Water Table	Manganese	314	ug/L		0.24		50
GGW-1S	4/20/2011	Water Table	Manganese	51.75	ug/L		0.12		50
1371 15th St SW	11/23/2010	Lower Tamiami	Residues-Filterable (TDS)	547	mg/L		2		500
150 Logan Blvd S	4/7/2011	Water Table	Residues-Filterable (TDS)	610	mg/L		2		500
C-00311	3/16/2011	Mid-Hawthorn	Residues-Filterable (TDS)	1269	mg/L		2		500
C-00311	11/16/2010	Mid-Hawthorn	Residues-Filterable (TDS)	1284	mg/L		2		500
C-00684	4/12/2011	Mid-Hawthorn	Residues-Filterable (TDS)	2350	mg/L		2		500
C-00684	10/26/2010	Mid-Hawthorn	Residues-Filterable (TDS)	855	mg/L		2		500
C-00689	10/27/2010	Sandstone	Residues-Filterable (TDS)	806	mg/L		2		500
C-00974	4/21/2011	Mid-Hawthorn	Residues-Filterable (TDS)	4956	mg/L		2		500
C-00974	11/17/2010	Mid-Hawthorn	Residues-	4328	mg/L		2		500

APPENDIX D--FY11 Exceedances

Station	Date Collected	Aquifer	Analyte	Result	Units	Lab Qualifiers	Detection Limit	FAC 62-550 Primary Drinking Water Standard	FAC 62-550 Secondary Drinking Water Standard
			Filterable (TDS)						
C-00977	3/15/2011	Lower Tamiami	Residues-Filterable (TDS)	640	mg/L		2		500
C-00977	11/4/2010	Lower Tamiami	Residues-Filterable (TDS)	648	mg/L		2		500
C-00989	4/13/2011	Sandstone	Residues-Filterable (TDS)	727	mg/L		2		500
C-00996	3/22/2011	Water Table	Residues-Filterable (TDS)	538	mg/L		2		500
C-00996	10/25/2010	Water Table	Residues-Filterable (TDS)	504	mg/L		2		500
C-01003	3/21/2011	Lower Tamiami	Residues-Filterable (TDS)	540	mg/L		2		500
C-01003	10/13/2010	Lower Tamiami	Residues-Filterable (TDS)	730	mg/L		2		500
C-01055	3/1/2011	Water Table	Residues-Filterable (TDS)	501	mg/L		2		500
C-01055	10/7/2010	Water Table	Residues-Filterable (TDS)	575	mg/L		2		500
C-01058	3/1/2011	Lower Tamiami	Residues-	696	mg/L		2		500

APPENDIX D--FY11 Exceedances

Station	Date Collected	Aquifer	Analyte	Result	Units	Lab Qualifiers	Detection Limit	FAC 62-550 Primary Drinking Water Standard	FAC 62-550 Secondary Drinking Water Standard
			Filterable (TDS)						
C-01077	2/16/2011	Sandstone	Residues-Filterable (TDS)	937	mg/L		2		500
C-01077	11/3/2010	Sandstone	Residues-Filterable (TDS)	953	mg/L		2		500
CCN1	2/10/2011	Water Table	Residues-Filterable (TDS)	913	mg/L		2		500
CCN10	4/11/2011	Water Table	Residues-Filterable (TDS)	652	mg/L		2		500
CCN10	9/22/2010	Water Table	Residues-Filterable (TDS)	593	mg/L		2		500
CCN11	2/10/2011	Water Table	Residues-Filterable (TDS)	801	mg/L		2		500
CCN11	9/16/2010	Water Table	Residues-Filterable (TDS)	1541	mg/L		2		500
CCN2	2/10/2011	Water Table	Residues-Filterable (TDS)	707	mg/L		2		500
CCN2	9/20/2010	Water Table	Residues-Filterable (TDS)	1116	mg/L		2		500
CCN4	3/24/2011	Water Table	Residues-	1358	mg/L		2		500

APPENDIX D--FY11 Exceedances

Station	Date Collected	Aquifer	Analyte	Result	Units	Lab Qualifiers	Detection Limit	FAC 62-550 Primary Drinking Water Standard	FAC 62-550 Secondary Drinking Water Standard
			Filterable (TDS)						
CCN4	9/21/2010	Water Table	Residues-Filterable (TDS)	994	mg/L		2		500
CCN5	3/28/2011	Water Table	Residues-Filterable (TDS)	1012	mg/L		2		500
CCN5	9/21/2010	Water Table	Residues-Filterable (TDS)	823	mg/L		2		500
CCN6	2/23/2011	Water Table	Residues-Filterable (TDS)	929	mg/L		2		500
CCN6	9/21/2010	Water Table	Residues-Filterable (TDS)	589	mg/L		2		500
CCN7	9/16/2010	Water Table	Residues-Filterable (TDS)	996	mg/L		2		500
CCN8	3/9/2011	Water Table	Residues-Filterable (TDS)	1159	mg/L		2		500
CCN8	9/16/2010	Water Table	Residues-Filterable (TDS)	1142	mg/L		2		500
CCS15	2/14/2011	Water Table	Residues-Filterable (TDS)	637	mg/L		2		500
CCS15	10/19/2010	Water Table	Residues-	601	mg/L		2		500

APPENDIX D--FY11 Exceedances

Station	Date Collected	Aquifer	Analyte	Result	Units	Lab Qualifiers	Detection Limit	FAC 62-550 Primary Drinking Water Standard	FAC 62-550 Secondary Drinking Water Standard
			Filterable (TDS)						
CCS16	3/22/2011	Water Table	Residues-Filterable (TDS)	650	mg/L		2		500
CCS16	10/18/2010	Water Table	Residues-Filterable (TDS)	751	mg/L		2		500
CCS17	3/23/2011	Water Table	Residues-Filterable (TDS)	534	mg/L		2		500
CCS17	10/18/2010	Water Table	Residues-Filterable (TDS)	654	mg/L		2		500
CCS18	3/15/2011	Water Table	Residues-Filterable (TDS)	552	mg/L		2		500
CCS18	10/20/2010	Water Table	Residues-Filterable (TDS)	572	mg/L		2		500
CCS2	3/24/2011	Water Table	Residues-Filterable (TDS)	1709	mg/L		2		500
CCS2	10/14/2010	Water Table	Residues-Filterable (TDS)	1106	mg/L		2		500
CCS20	2/14/2011	Water Table	Residues-Filterable (TDS)	530	mg/L		2		500
CCS20	10/13/2010	Water Table	Residues-	538	mg/L	U	2		500

APPENDIX D--FY11 Exceedances

Station	Date Collected	Aquifer	Analyte	Result	Units	Lab Qualifiers	Detection Limit	FAC 62-550 Primary Drinking Water Standard	FAC 62-550 Secondary Drinking Water Standard
			Filterable (TDS)						
CCS3	3/24/2011	Water Table	Residues-Filterable (TDS)	565	mg/L		2		500
CCS3	10/14/2010	Water Table	Residues-Filterable (TDS)	552	mg/L		2		500
CCS4	3/30/2011	Water Table	Residues-Filterable (TDS)	662	mg/L		2		500
CCS4	10/20/2010	Water Table	Residues-Filterable (TDS)	630	mg/L		2		500
CCS5	4/6/2011	Water Table	Residues-Filterable (TDS)	961	mg/L		2		500
CCS5	10/21/2010	Water Table	Residues-Filterable (TDS)	949	mg/L		2		500
CCS6	4/6/2011	Water Table	Residues-Filterable (TDS)	1196	mg/L		2		500
CCS6	10/21/2010	Water Table	Residues-Filterable (TDS)	1349	mg/L		2		500
MW-1	3/17/2011	Water Table	Residues-Filterable (TDS)	523	mg/L		2		500
MW-10	3/21/2011	Water Table	Residues-	1720	mg/L		2		500

APPENDIX D--FY11 Exceedances

Station	Date Collected	Aquifer	Analyte	Result	Units	Lab Qualifiers	Detection Limit	FAC 62-550 Primary Drinking Water Standard	FAC 62-550 Secondary Drinking Water Standard
			Filterable (TDS)						
MW-10	10/6/2010	Water Table	Residues-Filterable (TDS)	1737	mg/L		2		500
MW-11	3/28/2011	Water Table	Residues-Filterable (TDS)	1148	mg/L		2		500
MW-11	10/6/2010	Water Table	Residues-Filterable (TDS)	1329	mg/L		2		500
MW-4	4/6/2011	Water Table	Residues-Filterable (TDS)	988	mg/L		2		500
MW-5(S)	3/17/2011	Water Table	Residues-Filterable (TDS)	805	mg/L		2		500
MW-5(S)	10/5/2010	Water Table	Residues-Filterable (TDS)	1033	mg/L		2		500
MW-6(S)	3/2/2011	Water Table	Residues-Filterable (TDS)	1344	mg/L		2		500
MW-6(S)	10/7/2010	Water Table	Residues-Filterable (TDS)	1517	mg/L		2		500
MW-7	2/23/2011	Water Table	Residues-Filterable (TDS)	946	mg/L		2		500
MW-7	10/7/2010	Water Table	Residues-	941	mg/L		2		500

APPENDIX D--FY11 Exceedances

Station	Date Collected	Aquifer	Analyte	Result	Units	Lab Qualifiers	Detection Limit	FAC 62-550 Primary Drinking Water Standard	FAC 62-550 Secondary Drinking Water Standard
			Filterable (TDS)						
MW-9	3/30/2011	Water Table	Residues-Filterable (TDS)	689	mg/L		2		500
MW-9	10/12/2010	Water Table	Residues-Filterable (TDS)	513	mg/L		2		500
PBI2	9/30/2010	Water Table	Residues-Filterable (TDS)	1037	mg/L		2		500
PBI3	3/21/2011	Water Table	Residues-Filterable (TDS)	747	mg/L		2		500
PBI3	10/4/2010	Water Table	Residues-Filterable (TDS)	683	mg/L		2		500
PBI4	3/2/2011	Water Table	Residues-Filterable (TDS)	718	mg/L		2		500
PBI4	10/4/2010	Water Table	Residues-Filterable (TDS)	922	mg/L		2		500
PBI5	2/22/2011	Water Table	Residues-Filterable (TDS)	624	mg/L		2		500
PBI5	9/30/2010	Water Table	Residues-Filterable (TDS)	516	mg/L		2		500
PBI6	3/2/2011	Water Table	Residues-	1147	mg/L		2		500

APPENDIX D--FY11 Exceedances

Station	Date Collected	Aquifer	Analyte	Result	Units	Lab Qualifiers	Detection Limit	FAC 62-550 Primary Drinking Water Standard	FAC 62-550 Secondary Drinking Water Standard
			Filterable (TDS)						
PBI6	10/4/2010	Water Table	Residues-Filterable (TDS)	1357	mg/L		2		500
PBI7	2/22/2011	Water Table	Residues-Filterable (TDS)	624	mg/L		2		500
PBI7	9/30/2010	Water Table	Residues-Filterable (TDS)	603	mg/L		2		500
C-00311	3/16/2011	Mid-Hawthorn	Sodium	448.1	mg/L		0.76	160	
C-00311	11/16/2010	Mid-Hawthorn	Sodium	458.6	mg/L		1.9	160	
C-00684	4/12/2011	Mid-Hawthorn	Sodium	387.2	mg/L		0.38	160	
C-00684	10/26/2010	Mid-Hawthorn	Sodium	379.8	mg/L		0.76	160	
C-00974	4/21/2011	Mid-Hawthorn	Sodium	1194	mg/L		1.9	160	
C-00974	11/17/2010	Mid-Hawthorn	Sodium	1234	mg/L		3.8	160	
C-00989	4/13/2011	Sandstone	Sodium	242.9	mg/L		0.38	160	
C-00989	10/27/2010	Sandstone	Sodium	232.7	mg/L		0.76	160	
C-01077	2/16/2011	Sandstone	Sodium	179	mg/L		0.38	160	
CCN11	2/10/2011	Water Table	Sodium	201.7	mg/L		0.38	160	
CCN11	9/16/2010	Water Table	Sodium	371.3	mg/L		1.9	160	
CCN2	9/20/2010	Water Table	Sodium	171.6	mg/L		0.38	160	
CCN4	3/24/2011	Water Table	Sodium	342.3	mg/L		0.38	160	
CCN4	9/21/2010	Water Table	Sodium	250.8	mg/L		0.76	160	
CCN5	3/28/2011	Water Table	Sodium	177.1	mg/L		0.38	160	
CCN5	9/21/2010	Water Table	Sodium	185.6	mg/L		0.38	160	
CCN8	3/9/2011	Water Table	Sodium	221	mg/L		0.38	160	
CCN8	9/16/2010	Water Table	Sodium	227.2	mg/L		0.76	160	

APPENDIX D--FY11 Exceedances

Station	Date Collected	Aquifer	Analyte	Result	Units	Lab Qualifiers	Detection Limit	FAC 62-550 Primary Drinking Water Standard	FAC 62-550 Secondary Drinking Water Standard
CCS5	4/6/2011	Water Table	Sodium	201.7	mg/L		0.38	160	
CCS5	10/21/2010	Water Table	Sodium	200.4	mg/L		0.38	160	
CCS6	4/6/2011	Water Table	Sodium	292.5	mg/L		0.38	160	
CCS6	10/21/2010	Water Table	Sodium	178.1	mg/L		1.9	160	
MW-10	3/21/2011	Water Table	Sodium	337.1	mg/L		0.76	160	
MW-10	10/6/2010	Water Table	Sodium	311	mg/L		0.38	160	
MW-11	3/28/2011	Water Table	Sodium	226.4	mg/L		0.38	160	
MW-11	10/6/2010	Water Table	Sodium	201.3	mg/L		0.76	160	
MW-4	9/30/2010	Water Table	Sodium	171.5	mg/L		0.38	160	
MW-5(S)	3/17/2011	Water Table	Sodium	166.2	mg/L		0.38	160	
MW-5(S)	10/5/2010	Water Table	Sodium	228	mg/L		0.38	160	
MW-6(S)	3/2/2011	Water Table	Sodium	295.4	mg/L		0.38	160	
MW-6(S)	10/7/2010	Water Table	Sodium	309.5	mg/L		0.76	160	
MW-7	2/23/2011	Water Table	Sodium	178.8	mg/L		0.38	160	
MW-7	10/7/2010	Water Table	Sodium	167.7	mg/L		0.76	160	
PBI3	3/21/2011	Water Table	Sodium	193.7	mg/L		0.38	160	
PBI3	10/4/2010	Water Table	Sodium	182.8	mg/L		0.38	160	
PBI4	10/4/2010	Water Table	Sodium	226.3	mg/L		0.76	160	
PBI6	3/2/2011	Water Table	Sodium	262.4	mg/L		0.38	160	
PBI6	10/4/2010	Water Table	Sodium	335.8	mg/L		1.9	160	
C-00684	4/12/2011	Mid-Hawthorn	Sulfate	1430	mg/L		100		250
C-00684	10/26/2010	Mid-Hawthorn	Sulfate	1315	mg/L		50		250
C-00974	11/17/2010	Mid-Hawthorn	Sulfate	392	mg/L		1		250
CCN11	9/16/2010	Water Table	Sulfate	277	mg/L		1		250
CCS2	3/24/2011	Water Table	Sulfate	808	mg/L		20		250
CCS6	10/21/2010	Water Table	Sulfate	259	mg/L		1		250
MW-11	10/6/2010	Water Table	Sulfate	385	mg/L		1		250
PBI4	3/2/2011	Water Table	Sulfate	374	mg/L		20		250
PBI4	10/4/2010	Water Table	Sulfate	554	mg/L		20		250

APPENDIX D--FY11 Exceedances

Station	Date Collected	Aquifer	Analyte	Result	Units	Lab Qualifiers	Detection Limit	FAC 62-550 Primary Drinking Water Standard	FAC 62-550 Secondary Drinking Water Standard
PBI6	10/4/2010	Water Table	Sulfate	514	mg/L		20		250