

TIFA

MAY 30, 2019

AGENDA

TIFA LLC MEETING AGENDA
May 30, 2019
11:00 a.m.
MEETING LOCATION
CITY OF TITUSVILLE
WATER RESOURCES
2836 GARDEN STREET – TITUSVILLE, FLORIDA

Roll Call

Action Items

- I. Approval of the Minutes of the TIFA LLC Meeting of April 30, 2019 (Presenter: James Perry)

- II. Consideration of Proposal for Well Field Calibration Checks (Presenter: Sean Stauffer)

Financial Items and Reports

- III. Ratification of Expenses Paid from Operating Account and Request for Reimbursement (Presenter: James Perry)

Staff Reports / Informational Items

- IV. Discussion of Groundwater Quality Evaluation Report for Area IV Wellfield

Other Business

Public Comment

Next Scheduled Meeting

Open Items

Adjournment

FIRST ORDER OF BUSINESS

Date: May 30, 2019

To: TIFA LLC Management Committee

From: Sarah Sweeting, GMS, LLC

Subject: Approval of Minutes – April 30, 2019 TIFA LLC Meeting

Summary Explanation & Background: The draft minutes of the April 30, 2019 TIFA LLC meeting were previously circulated for review. The minutes of the TIFA LLC meeting are presented for review and approval. Since the draft minutes were circulated, on May 9, 2019, the City of Titusville responded they had no comments and on May 13, 2019 Farmton Water Resources / Miami Corporation indicated they had no comments. No other comments have been received.

Source of Funds: This action requires no funds.

Minutes of TIFA LLC Meeting
April 30, 2019
11:30 a.m.
City of Titusville Water Resources
Mourning Dove Water Plant
2836 Garden Street
Titusville, Florida 32796

Persons in Attendance

Mike Brown, Miami Corporation, TIFA Management Committee Member
Jim Ball, City of Titusville, TIFA Management Committee Member
Sean Stauffer, City of Titusville, Water Resources Director
Richard Broome, City of Titusville, City Attorney
Anna Abreu-Ochoa, City of Titusville
David Fuechtman, Farmton Water Resources (by telephone)
Susan Paddock, Farmton Water Resources (by telephone)
Pat Gagliardi, Farmton Water Resources (by telephone)
Helen Hutchens, Farmton Water Resources
Jim Perry, GMS

Jim Perry conducted the meeting.

Roll Call

Action Items

I. Approval of the Minutes of the TIFA LLC Meeting of March 28, 2019

Member Brown moved to approve the March 28, 2019 meeting minutes as presented. Member Ball concurred and the motion passed.

Financial Items and Reports

II. Ratification of Expenses Paid from Operating Account and Request for Reimbursement (Presenter: James Perry)

Mr. Perry stated, next is ratification of expenses paid from the operating account and request for reimbursement. Those were included in the agenda package and they total \$12,537.11. They are the normal and customary charges that we typically process on a monthly basis.

Member Ball moved to ratify the expenses paid from the operating account in the amount of \$12,537.11 and request for reimbursement. Member Brown concurred and the motion passed.

III. Presentation of First Quarter Financial Statements (Presenter: Pat Gagliardi)

Ms. Gagliardi stated, you can see from the balance sheet there aren't many changes from the end of year to after the first quarter, it is a healthy balance sheet. Water sales are up slightly over the budget, we pumped a little bit higher at the beginning of the year in anticipation of potential well shutdown throughout the year and almost all the expenses are under budget, some of those are due to timing of payments later in the year.

IV. Consideration of Capital Distribution Notice (Presenter: Pat Gagliardi)

Ms. Gagliardi stated, from the earlier balance sheet there is a cash balance of \$528,000, we hold \$300,000 for a maintenance cash balance and any potential improvements that need to be made, we have cash of \$228,000 and we are recommending a distribution of \$220,000; \$110,000 to each of the partners.

Member Brown moved to approve the capital distribution notice in the amount of \$220,000 Member Ball concurred and the motion passed.

Staff Reports/Informational Items

V. Well WR-8 Restoration Status (Presenter Sean Stauffer)

Mr. Stauffer stated, as I have reported over the last few months the chloride values are ranging anywhere from 90 to 110, those were the reads for April and it has been stable for probably the last four or five months. No changes for WR-8.

Other Business

Public Comment

Next Scheduled Meeting

The next meeting will be May 30, 2019 at 11:00 a.m.

Open Items

Adjournment

Member Ball moved to adjourn the meeting at 11:36 a.m. Member Brown concurred and the meeting adjourned.

SECOND ORDER OF BUSINESS

A.W.K. INDUSTRIES, INC

P.O. Box 547872
Orlando, FL. 32854
407-579-2945
awkindustriesinc@bellsouth.net

Proposal

May 17, 2019

TIFA LLC
2836 Garden Street
Titusville, Fl. 32780

Attn: Sean L. Stauffer

We propose the following:

Calibration Checks on 15 Production Wells:

(Phase #1 Wells 407 - 413)

(Phase #2 Wells WR/1- WR/9)

Calibration Test will be done with our Certified Test Meter.

If the Calibration is off more than (+ or - 1%) between Well Flow Meter and Test Meter, we will change K-Factor and Re-test.

We will also check the Flow Rate of the Well Meter to the SCADA System.

A Calibration Certificate will be issued for each Flow Meter.

Our GE Ultrasonic Transit Time Meter was Certified on 04/12/2019 at a NIST Traceable Flow Test Lab.

Price includes all Travel Time and Mileage

Price: \$175.00 each

Total: \$2,625.00

Thank you,



Henry Zielinski

THIRD ORDER OF BUSINESS

**TIFA LLC
INVOICE APPROVAL BY MANAGERS**

WHEREAS, the undersigned are the duly appointed and acting Managers of TIFA LLC, which operates pursuant to that certain Limited Liability Company Operating Agreement of TIFA LLC dated May 24, 2010 (“Operating Agreement”); and,

WHEREAS, at a duly called and noticed public meeting of the Managers as indicated below, the undersigned approved the contract and/or authorized the expenditure as indicated below, and further authorized the managers to execute the Invoice Approval by Managers form reflecting such authorized expenditures in order to process payments.

Previous Authorizations

TIFA Meeting Date	Approved	Total Contract or Expenditure Authorized
05/30/2019	Imprest Account Reimbursement from Depository Account	See Attached

NOW, THEREFORE, the Managers of TIFA LLC, based upon the previous TIFA authorizations, approve the following payments:

Invoice Description	Total Amount	Pursuant to Previous TIFA Authorization Date	Invoice Payment
Transfer to imprest account at Northern Trust ending *8866	\$9,869.86	05/30/19	To be Paid by TIFA upon this approval

Except as otherwise set forth herein, defined terms shall have the meaning set forth in the Operating Agreement. This Action may be executed in several counterparts, and all counterparts so executed shall constitute one Approval binding on all parties.

IN WITNESS WHEREOF, the undersigned represent and warrant that each is the duly authorized and appointed agent of TIFA LLC.

Mike Brown, Manager

Jim Ball, Manager

Date: _____, 2019

Date: _____, 2019

TIFA LLC
Check Detail
 April 24 through May 23, 2019

Type	Num	Date	Name	Item	Account	Paid Amount	Original Amount
Bill Pmt -Check	1292	05/22/2019	The City of Titusville		103.00 · Cash- Nort...		-3,904.50
Bill	34-2019	04/01/2019			501.00 · O&M Oper...	-203.99	203.99
Bill	35-2019	04/01/2019			501.00 · O&M Oper...	-399.33	399.33
Bill	27-2019	04/03/2019			501.00 · O&M Oper...	-363.81	363.81
Bill	28-2019	04/04/2019			501.00 · O&M Oper...	-132.96	132.96
Bill	36-2019	04/08/2019			501.00 · O&M Oper...	-825.52	825.52
Bill	29-2019	04/10/2019			501.00 · O&M Oper...	-346.05	346.05
Bill	30-2019	04/12/2019			501.00 · O&M Oper...	-328.30	328.30
Bill	31-2019	04/15/2019			501.00 · O&M Oper...	-221.75	221.75
Bill	32-2019	04/17/2019			501.00 · O&M Oper...	-594.67	594.67
Bill	33-2019	04/24/2019			501.00 · O&M Oper...	-488.12	488.12
TOTAL						-3,904.50	3,904.50
Bill Pmt -Check	ACH0...	05/22/2019	Florida Power & Li...		103.00 · Cash- Nort...		-5,965.36
Bill	18790...	05/01/2019			511.00 · Utilities	-658.07	658.07
Bill	32610...	05/01/2019			511.00 · Utilities	-663.33	663.33
Bill	74008...	05/01/2019			511.00 · Utilities	-530.77	530.77
Bill	47893...	05/01/2019			511.00 · Utilities	-497.44	497.44
Bill	76646...	05/01/2019			511.00 · Utilities	-475.02	475.02
Bill	75317...	05/01/2019			511.00 · Utilities	-518.70	518.70
Bill	54996...	05/01/2019			511.00 · Utilities	-440.34	440.34
Bill	24869...	05/01/2019			511.00 · Utilities	-288.29	288.29
Bill	11526...	05/01/2019			511.00 · Utilities	-272.51	272.51
Bill	09060...	05/01/2019			511.00 · Utilities	-263.31	263.31
Bill	54213...	05/01/2019			511.00 · Utilities	-293.81	293.81
Bill	83665...	05/01/2019			511.00 · Utilities	-261.05	261.05
Bill	62400...	05/01/2019			511.00 · Utilities	-268.51	268.51
Bill	73681...	05/01/2019			511.00 · Utilities	-272.07	272.07
Bill	40983...	05/01/2019			511.00 · Utilities	-262.14	262.14
TOTAL						-5,965.36	5,965.36

FOURTH ORDER OF BUSINESS

THE COLINAS GROUP, INC.
GROUNDWATER & ENGINEERING CONSULTANTS

**GROUNDWATER QUALITY EVALUATION
TIFA AREA IV WELL FIELD
BREVARD COUNTY, FLORIDA**

May 17, 2019

Submitted to:

TIFA LLC
2836 Garden Street
Titusville, FL 32796

Prepared by:

The Colinas Group, Inc.
P.O. Box 1268
Winter Park, Florida 32790

Project No. O-869

THE COLINAS GROUP, INC.
GROUNDWATER & ENGINEERING CONSULTANTS

May 11, 2019

TIFA LLC
2836 Garden Street
Titusville, FL 32796

Attention: Sean Stauffer
Manager

Subject: Groundwater Quality Evaluation
TIFA Area IV Well Field, Brevard County, Florida
for TIFA LLC
TCG Project No. O-869

Dear Mr. Stauffer:

In response to a request by Mr. Jim Boyd with Boyd Environmental Engineering, Inc. (BEE), The Colinas Group, Inc. (TCG) has conducted an evaluation of groundwater data for the TIFA Area IV well field (Phase 1 & Phase 2 wells) located in northern Brevard County, Florida. BEE conducted a preliminary analyses of groundwater quality data collected at the Phase 1 and Phase 2 production well fields and the saltwater monitoring wells in the vicinity of these well fields (Figure 1). The results of the BEE preliminary analyses concluded that there does not “appear to be any statistically significant deleterious water quality trends for any of the Area IV production wells”. At the Phase 1 well field, salt water monitoring well SWMW-3 (Figure 2) has shown a slight, gradual increase in chloride concentration over time (Figure 3). However, over the last 5 years, from January 2014 through April 2019, the trend is relatively level. Based on these data, there is not a serious concern with respect to production well water quality trends at this well field at this time.

At the Phase 2 well field (Figure 4), the chloride data for salt water monitoring wells SWMW-1 and SWMW-7 show spikes in the concentrations for recent monitoring data as illustrated in Figures 5 and 6, respectively. As can be seen in Figure 5, the chloride concentrations at well SWMW-1 increased from 726 mg/L on 1-29-19 to over 1100 mg/L in February 2019. The most recent chloride concentration at this well was 967 mg/L from a sample collected on April 10, 2019. Similarly, chloride concentrations at well SWMW-7 (Figure 6) increased from 304 mg/L on 1-2-19 to 896 mg/L on 2-6-19. The most recent chloride concentration at this well was 767 mg/L from a sample collected on April 10, 2019. These are significant concentration increases at both wells which are intended to serve as early warning indicators of negative water quality trends that could impact the production wells.

SCOPE-OF-SERVICES

Because of the potential harm to the water quality of the Area IV well fields, BEE requested that TCG also evaluate both the recent and longer term hydrogeologic and geochemical monitoring data for these well fields. Therefore, the following work scope has been conducted to-date:

- Conduct a peer review of BEE’s evaluation of water quality conditions at the Phase 1 and Phase 2 well fields.
- Review the well construction data of the production wells and associated saline water monitoring wells at the Phase 1 and Phase 2 well fields.
- Review recent and historical withdrawal amounts for production wells at the Phase 1 and Phase 2 well fields.
- Review recent and historical rainfall amounts at the Scottsmeer rain gage located south of the Volusia County/Brevard County line and east of I-95.
- Review recent and historical groundwater quality data for selected production wells and saline water monitoring wells at the Phase 1 and Phase 2 well fields.
- Conduct Geochemical Pattern Analyses for production wells WR-3, WR-5A, and WR-6 located at the Phase 2 well field. Using these analyses, determine the origin of the groundwater being produced from those wells and determine if the wells are currently being impacted by lateral saline water intrusion or vertical, upward movement of saline water from below the well field.
- Provide a written report summarizing TCG’s evaluation with recommendations for additional actions to monitor the Area IV well fields.

HYDROLOGIC INFORMATION

Well Construction

The well fields at the Farmton site produce potable quality groundwater by essentially skimming freshwater off the top of the aquifer using relatively shallow wells drilled into the upper limestone stratum comprising the top of the regional Floridan aquifer. Groundwater quality degrades rapidly with depth where more mineralized water is encountered. The following table lists well construction characteristics at the Phase 1 well field:

TIFA Area IV
Phase 1 Well Field

Well No.	Well Diam. (inches)	Casing Depth (ft-bls)	Well Depth (ft-bls)	Chloride (mg/L)	Date
407	12	115	200	57.8	4/10/2019
408	12	115	220	58.5	4/10/2019
409	12	115	220	57	4/10/2019
411	12	115	210	53.9	4/10/2019
412	12	115	230	60.7	4/10/2019
413	12	108	210	51.2	4/10/2019
SWMW-3	4	390	400	299	4/3/2019

The following table lists well construction characteristics at the Phase 2 well field:

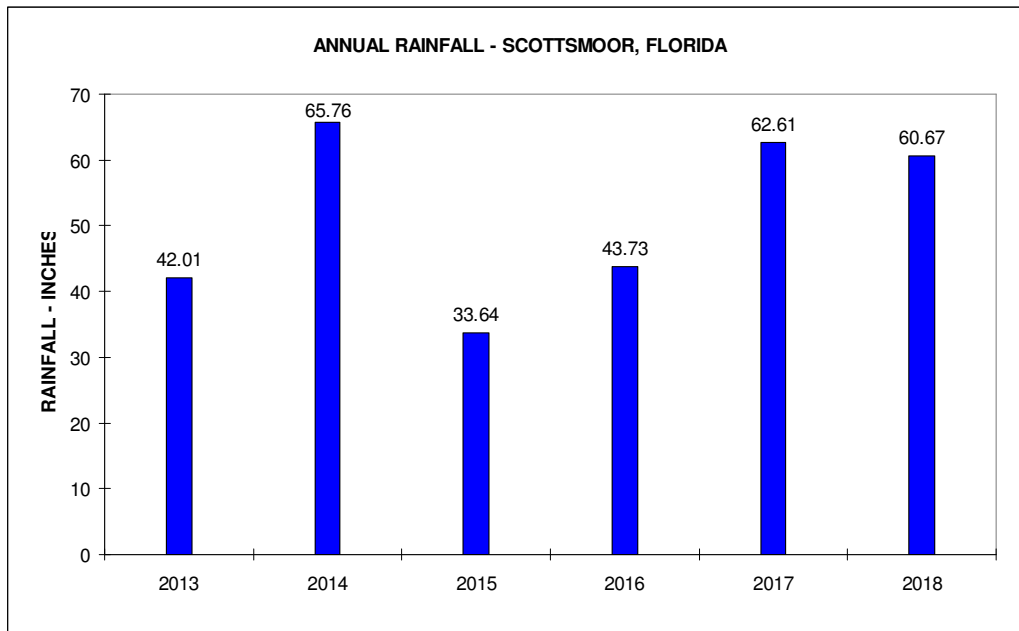
TIFA Area IV
Phase 2 Well Field

Well No.	Well Diam. (inches)	Casing Depth (ft-bls)	Well Depth (ft-bls)	Chloride	Date
WR-1	12	105	200	39.9	4/10/2019
WR-2	12	105	230	27.1	4/10/2019
WR-3	12	106	200	30.2	4/10/2019
WR-4	12	103	200	43.3	4/10/2019
WR-5A	12	130	200	29.4	4/10/2019
WR-6	12	100	200	27.8	4/10/2019
WR-7	12	100	200	33.1	4/10/2019
WR-8	12	109	170	105	4/10/2019
WR-9	12	96	197	70.9	4/10/2019
SWMW-1	4	380	397	967	4/10/2019
SWMW-7	4	298	313	767	4/10/2019

Rainfall

In order to evaluate whether or not there was a rainfall deficit preceding the spike in chloride concentrations observed at wells SWMW-1 and SWMW-7 (see Figures 5 and Figure 6, respectively), TCG obtained and graphed annual rainfall amounts from 2013 through 2018 as follows

:



This graph shows that rainfall amounts for 2017 and 2018 exceeded 60 inches per year. The average annual rainfall amount is approximately 51 inches per year, therefore, rainfall was not in deficit preceding the observed water quality spikes.

Well Field Production

TCG evaluated recent and historical well field production (Figure 7) to see if there was any relationship between increased withdrawal rates and spikes in water quality at wells SWMW-1 and SWMW-7. As can be seen in Figure 7, from 2013 through 2015 the Phase 1 well field was in production at a fairly even rate of about 750,000 gpd. In 2016 the Phase 2 well field was put on line and the average withdrawal rate increased to about 2,750,000. There was a fairly steady rate from 2016 through the first of 2019. Again, there does not appear to be any correlation between pumping withdrawals and rapid increases in chloride concentrations.

GEOCHEMICAL PATTERN ANALYSIS DESCRIPTION & METHODOLOGY

TCG conducted a geochemical pattern analyses (GPA) for datasets collected at Phase 2 well field production wells WR-3, WR-5A and WR-6 for data collected on 5-23-16, 11-8-16, 5-15-17, 11-8-17, 5-23-18, and 10-3-18. For those collection dates, groundwater samples were analyzed for the major anion and cations. Anion and cation analyses are required to conduct GPA. Geochemical pattern analysis, referenced in Frazee (1982), is a method to identify the source of groundwater being produced from a well and evaluate the potential stability of the water with regard to its viability as a long term source of potable water. It is known that highly mineralized groundwater lies below the well field production wells. Reduction in the artesian pressure of the aquifer in response to well field pumping may cause this mineralized water to move upward toward the production wells. Sometimes, slight shifts in water quality may or may not provide the level of certainty needed to change well field operations to protect the water supply. The GPA analysis provides a scientific method to evaluate water quality in such a way that a determination can be made as to whether or not observed changes (increases) in water quality indicators are an early warning that mineralized groundwater below the production zone is being drawn upward and is being detected in a monitoring well.

Anion and cation data from groundwater testing are used for plotting on a trilinear graph according to a method modified after Piper (1944). More than 90% of the dissolved solids in groundwater can be attributed to nine ions: Ca, Mg, Na, K, Fe, Cl, SO₄, HCO₃, and CO₃. This method as modified by Frazee can be used to characterize the water type in the Floridan aquifer since Frazee's modifications are tailored specifically to the Floridan aquifer system in southern Georgia and Florida. The pattern analysis requires that first, the major cations (Ca, Mg, Na, Fe, and K) are converted from concentrations in milligrams per liter (mg/L) to milliequivalent per liter (meq/L). This is also done for the major anions (Cl, SO₄, HCO₃, and CO₃) which are also converted to meq/L units. After these conversions, the anion and cation balance is checked and the % error is calculated according to the following equation:

$$\% \text{ Error} = \frac{\sum \text{ cations} - \sum \text{ anions}}{\sum \text{ cations} + \sum \text{ anions}} \times 100$$

Errors of 5% or less are desirable. Errors of greater than 5% may indicate some problem with the lab analysis or that unaccounted anions or cations are biasing the calculations. All of the anion/cation balance calculations using the TIFA data had errors of less than 5%. Theoretically, the concentrations of anions expressed in units of milliequivalent per liter should be exactly equal to the concentrations of cations expressed in units of milliequivalent per liter.

After the anion and cation calculations are complete, the milliequivalent % of Calcium and Magnesium (cations) are plotted on a trilinear diagram along with the milliequivalent % of Chloride and Sulfate (anions) and compared to geochemical patterns of known water types. These water types include fresh recharge water, fresh water, connate, transition, and lateral intrusion. Comparing the position of the plots over time allows a determination of whether the water quality is becoming more mineralized, less mineralized or is relatively stable and can be used as a well field management tool.

GEOCHEMICAL PATTERN ANALYSIS RESULTS

Trilinear plots with water type diagrams (geochemical patterns) of water quality data collected by TIFA on 5-23-16, 11-8-16, 5-15-17, 11-8-17, 5-23-18, and 10-3-18 are illustrated in the following figures:

- Figure 8 - GPA Plot / Well WR-3
- Figure 9 - GPA Plot / Well WR-5A
- Figure 10 - GPA Plot / Well WR-6

The worksheets used as the basis for the above plots were prepared by TCG. Trilinear diagrams and the worksheets used by TCG to convert chemical concentrations of anions and cations in mg/L to units of milliequivalent per liter and calculate the % of anions and cations are included in Appendix A for well WR-3, Appendix B for well WR-5A, and Appendix C for well WR-6.

The results of the GPA analyses indicate that the positions of the GPA plots for wells WR-3, WR-5A and WR-6 are consistent and indicate that the type of groundwater being produced is a Type I/Type II, Calcium Bicarbonate water and represents the purest and youngest form of limestone water. The primary recharge mechanism is vertical downward movement of recent rain water infiltrating from dominant sand ridges into the uppermost limestone stratum.

CONCLUSIONS & RECOMMENDATIONS

There are no concerns, at this time, concerning the groundwater quality of the Phase 1 production wells. There is no indication, at this time, that the water being produced by the Phase 2 well field is deriving a portion of the production water from deeper, more mineralized groundwater known to exist below the well field production zone. Figure 11 illustrates north-south cross section **A-A**¹ of westernmost wells at the Phase 2 well field with details of the open hole depths and corresponding recent chloride concentrations at each well. Figure 4 shows the

location of cross section **A-A'**. As can be seen in Figure 11, there is a significant difference in the chloride concentrations of the production wells ranging in depths of 200-230 feet below land surface (bls) and the deeper saline water monitoring wells which range in depth between 313-397 feet bls. The average chloride concentration of the westernmost Phase 2 production wells is 33 mg/L for samples collected on 4/10/2019. The most recent chloride concentrations for samples collected on 4/10/2019 at the saline water monitoring wells was 967 at well SWMW-1 and 767 mg/L at SWMW-7.

Because of the sharp difference in the concentration gradient between the relatively shallow production wells and the deeper saline water monitoring wells, TCG recommends that chloride and TDS samples should continue to be collected monthly at all of the westernmost Phase 2 production wells (WR-1, WR-2, WR-3, WR-4, WR-5A, WR-6, and WR-7). It is understood that monitoring wells SWMW-1 and SWMW-7 are currently being sampled weekly for chloride and TDS. These schedules should be maintained. In addition, production well WR-5A and saline water monitoring wells SWMW-1 & SWMW-7 should be initially sampled monthly for the major anions and cations. Geochemical Pattern Analysis should be used to process and evaluate these data. If there are no discernible shifts in the evaluated water type after three months of sampling, then the major anion and cation sampling can be reduced to a quarterly frequency.

In summary, TCG has evaluated a considerable amount of data at TIFA's Phase 2 well field in order to pinpoint the reason for abrupt increases in chloride concentrations at saline water monitoring wells SWMW-1 and SWMW-7 which began to occur in February 2019. The data that was reviewed included the following:

- Historical/recent rainfall data at the Scottsmoor gaging station
- Historical/recent pumping records for both the Phase 1 and Phase 2 well fields
- Well construction records for both the production wells and saline water monitoring wells
- Historical and current groundwater quality monitoring data for selected production wells and saline water monitoring wells at the Phase 1 and Phase 2 well fields
- Geochemical patterns of major anions and cations at selected production wells at the center of the Phase 2 well field

After these data were analyzed, TCG could not pinpoint the exact mechanism that caused the chloride concentration spikes observed at saline water monitoring wells SWMW-1 and SWMW-7. However, since these spikes occurred at the same points in time in tandem, it is likely that the increases in chloride are related to the freshwater/saline water interface moving upward as the result of slightly lowering of the potentiometric surface or pressure level of the aquifer. The timing of these water quality spikes typically coincide with "dry" season conditions or that period of time when rainfall is less. For this reason, the fresh water lens overlying the deeper more mineralized water is thinner and, therefore, the more mineralized groundwater will tend to rise up. The position of the freshwater/salt water interface is balanced by the amount of freshwater

overlying the saline water. Therefore, if the freshwater level is diminished by pumping and/or reduced rainfall conditions, the saline water boundary rises, resulting in increased chloride levels in the monitoring wells.

It appears that the chloride concentrations may have stabilized at monitoring wells SWMW-1 and SWMW-7 based on the most recent monitoring data. TCG is recommending a more intensified monitoring program, however, should these wells begin to show an upward trend in groundwater quality concentrations, then TCG believes it will be necessary to install another saline water monitoring well to safeguard the well field.

Should another saline water monitoring well be necessary, TCG recommends installation of another monitoring well next to existing saline monitoring well SWMW-1. The new well should be constructed with a 10-inch diameter steel casing, with a re-inforced steel drive shoe, driven into the top of rock (115-120 ft-bls) with a 10-inch diameter borehole drilled to a depth of approximately 290 ft-bls. A 4-inch diameter casing would then be set and grouted with a depth of 290 ft-bls. The well would be completed by drilling an open borehole to a depth of 310 feet-bls. The open hole depth (290-310 feet-bls) sets the monitoring interval in the proposed well about half way between between the depth of production well WR-5A and the top of the open hole at SWMW-1 (see Figure 11).

Consequently, by virtue of this new "intermediate" monitoring well, if the saline water interface continues to rise within the wellfield area, it will be possible to detect this prior to the interface reaching the wellfield production zone, thus providing time for the implementation of necessary remedial measures such as reduced wellfield pumpage and/or altered well operating schedules.

Preliminary well construction details listed above are based on known field conditions such as the position of top of rock, water quality characteristics at the proposed well location, SJRWMD well construction criteria and drill rig capabilities required to drill an open hole well to a depth of over 300 feet-bls. A 4-inch diameter open hole is considered to be the smallest practical hole size that can be drilled with a drill rig capable of drilling to a depth of 300 feet-bls. It is TCG's opinion that this well can be constructed without a surface casing provided that the 10-inch casing is installed with a rig equipped with a pneumatic drive hammer. Using this method requires that drilling will need to be conducted in advance of the casing when limestone stratum is encountered before reaching the design casing depth. Based on these general construction guidelines, the estimated well construction costs including a 4x4 concrete well pad with an above grade protective cover will be \$45,000 - \$55,000. This cost includes well design, permitting, and on-site oversight during critical parts of construction.

* * *

The Colinas Group appreciates the opportunity to provide our evaluations on this project. Should you have any questions regarding the content of this report, please contact me at (407) 620-1793 or boboros@cfl.rr.com.

Yours very truly,

THE COLINAS GROUP, INC.
Groundwater & Engineering Consultants



Robert Oros, P.G.

Principal Consultant