Record of Decision and Statement of Findings for Department of the Army (DA) Permit Application SAJ-2011-01869

Attachment F – Technical Memo for Updates to Groundwater Effects Analysis

Technical Memorandum

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Ben Koplin, Environmental Lead, Mosaic Fertilizer, LLC.

FROM: Joseph D. Haber, P.G., Progressive Water Resources, LLC.
David J. Brown, P.G., Progressive Water Resources, LLC.

SUBJECT: **AEIS Groundwater Modeling Update for Section 404 Clean Water Act Pending Application for the Ona Mine**

DATE: July 30, 2018

1.0 BACKGROUND

Mosaic Fertilizer, LLC (Mosaic) retained Progressive Water Resources, LLC (PWR) to assist Mosaic in preparing a response to the Army Corps of Engineers' (ACOE) June 2, 2017 Request for Additional Information (RAI) regarding a pending Section 404 Clean Water Act (CWA) permit application for the Ona Mine (Ona). Specifically, Question 3a included a request by the ACOE for Mosaic to develop a Groundwater Modeling Update Plan (Plan) for Ona as well as Mosaic's other facilities based on the changes to the mining schedule and operations since the 2011 Ona Mine permit application as analyzed in the Area-Wide Environmental Impact Statement (AEIS). PWR developed an updated Groundwater Flow Modeling Plan regarding Mosaic's planned operational changes in mining facilities which was submitted to the ACOE for review. The Plan was developed and formulated based upon Mosaic-provided updates to "Table 17" of Appendix F of the AEIS and the associated mining schedule changes, considerations and assumptions provided by Mosaic to PWR. The Plan was reviewed and approved by ACOE staff, therefore PWR has performed the groundwater flow modeling as outlined in the Plan. This Technical Memorandum (TM) has been developed to present the results of the updated modeling effort and compare the results to the previous AEIS modeling performed by CH2M Hill and presented in Appendix F of the AEIS.

2.0 UPDATED GROUNDWATER FLOW MODEL DEVELOPMENT

2.1 Previous AEIS Modeling

An extensive suite of groundwater flow modeling scenarios was developed and performed by CH2M Hill for the ACOE's 2013 AEIS on Mining in the Central Florida Phosphate District (CFPD). The groundwater flow modeling for the AEIS was performed to "…evaluate potential changes in the Floridan Aquifer water levels associated with anticipated mining water supply withdrawals from the aquifer…" The modeling consisted of two Alternatives which included: 1) A "No Action Alternative" which equated to none of the proposed mines receiving their permits; and 2) the Applicants' "Preferred Alternatives" which included the authorization of four additional phosphate mine projects including Desoto, Ona, Wingate East and the

South Pasture Extension. It was noted that while the Pine Level/Keys Tract and the Pioneer Tract were significant future mining facilities, they would not be included in the modeling “because their water supplies are expected to be from existing wellfields at the DeSoto and Ona Mines”.

It should be noted that the updated modeling effort included in this TM only includes updates to the Preferred Alternatives scenarios to reflect Mosaic’s most recent planned operational changes in mining facilities as stated in the approved Plan.

2.2 Groundwater Flow Model

The groundwater flow model used for the previous AEIS modeling effort was the Southwest Florida Water Management District (SWFWMD) District-Wide Regulatory Model Version 2 (DWRM2.1), which is a MODFLOW model used by the SWFWMD to evaluate groundwater use in water resource evaluations and water supply permitting. The default grid spacing of the base DWRM 2.1 is 5,000 by 5,000 feet however, by using the telescopic mesh refinement (TMR) process the grid can be refined to provide better resolution to analyze predicted impacts. For this updated modeling effort, PWR also used the DWRM 2.1 model so that the change in groundwater-withdrawal related impacts could be directly compared to those predicted impacts presented in the previous AEIS modeling effort conducted by CH2M Hill.

2.3 Groundwater Flow Modeling Considerations and Modifications

There were several important considerations and assumptions used for the previous AEIS modeling scenario development that were also incorporated into the updated modeling effort. These assumptions represent modifications to the default parameters or well packages that were part of the DWRM 2.1 model. These modifications include the following:

1. The recharge package of the DWRM 2.1 was revised using water budget information for the Preferred Alternative mines. Chapter F in the AEIS presented “*Table 4*” which included recharge multipliers and rates that were developed to change the recharge within the proposed mining boundaries based on anticipated changes to evapotranspiration and runoff caused by activities in the specific mining areas. The default recharge package was similarly modified using the mining facility boundaries and the recharge values presented in *Table 4* for the updated modeling presented in this TM. Both 2010 and 2030 recharge multipliers are specifically denoted in Table 4. However, 2023 recharge rates are not specifically denoted, therefore PWR used the recharge rates for the closest year available year to 2023 in *Table 4* which is 2025.

2. The previous AEIS cumulative modeling scenarios assumed a 50 million gallon per day (MGD) reduction in Upper Floridan Aquifer (UFA) withdrawals within the SWFWMD’s Southern Water Use Caution Area (SWUCA) for Agricultural Users to simulate the anticipated groundwater recovery efforts in the region. Reductions were applied proportionally to all Agricultural Users in the SWUCA. As stated in the Plan, PWR linearly decreased the simulated UFA groundwater withdrawal rates for all Agricultural Users within the SWFWMD’s SWUCA. This served to simulate the 50 million gallons per day (MGD) planned reduction of UFA withdrawals due to the SWUCA

groundwater recovery efforts in the region. PWR proportionally reduced UFA Agricultural withdrawals by -2.5 MGD per year from 2005 to 2025. The following reductions in Agricultural UFA use were simulated based on the updated modeling scenario years as stated below:

a. 2010: - 12.5 MGD

b. 2023: - 45.0 MGD

c. 2030: - 50.0 MGD

3. Since PWR did not have access to CH2M Hill's previous modeling files, the locations of the Mosaic mining facility wells were based on the locations of sealing water and production wells that were evaluated and permitted as part of Mosaic's Integrated Water Use Permit (IWUP) effort. In addition, Mosaic staff updated the locations of existing and proposed sealing wells that were not previously associated with the IWUP modeling effort. All wells associated with Mosaic were removed from the default base model and replaced with the updated Mosaic well package developed by PWR and Mosaic staff. In this way, no duplicate Mosaic wells were included in the simulations.

As noted, during the development, simulation and calculation of results for the groundwater flow models associated with this effort, PWR did not have access to CH2M Hill's final models or well packages used for the previous AEIS document. Therefore, PWR has developed the models and presented the results based solely on PWR's interpretation of CH2M Hill's stated methodology and descriptions within the AEIS Appendix F document. When detailed descriptions of model development including stress period setup and model result calculation were not available, PWR utilized SWFWMD's Water Use Permit (WUP) evaluation modeling guidelines where necessary to ensure results acceptable to the ACOE.

2.4 Updated Mining Schedule and Water Supply Quantities

As stated in the approved Plan, the original AEIS Appendix F, Table 17 included the mining schedule and water supply quantities for each facility based on the future mining plan at the time. The original Table 17 has been provided as **Table 2-1 (attached)**. The yellow highlighted rows indicate scenarios that were included for previous modeling completed as part of the AEIS.

Mosaic staff provided the proposed changes to the original Table 17. Based on these changes, the original Table 17 was revised and has been provided as **Table 2-2 (attached)**. Similar to the AEIS methodology, PWR selected years for proposed modeling that included years where significant changes occurred, either starting or ending of mining at a facility. For the updated modeling plan, these include 2023 and 2030 as highlighted in **Table 2-2** and approved by the ACOE.

Please note that the revised future water supply demands included in **Table 2-2** for the mining facilities incorporate the following changes:

1. The extended operation of Four Corners beneficiation plant by 15 years to 2034 to supply water for the West Ona mining areas while maintaining 15.6 MGD at Four Corners through 2029. The dry condition and flexible quantity for Four Corners will decrease to 12.6 and 17.0 MGD, respectively, from 2030 to 2034 as demands at this facility reduce toward the end of mining operations at the facility.
2. The operation at the Ona Facility will begin 2 years earlier (2018 vs. 2020) and end 7 years earlier (2041 vs 2048), however the Plan now assumes that only sealing wells for pipeline corridors remain for the original Ona allocation. This use starts in 2018 and extends to 2041 to coincide with South Pasture timeline. The maximum quantity at this facility is reduced from 15 MGD to 4.8 MGD.
3. The extended operation of South Pasture beneficiation plant by 4 years (2041 vs. 2037) to supply water for East Ona mining while maintaining 6.39 MGD through 2041.
4. The operation of the Desoto facility will begin two years later (2023 vs. 2021) and end two years later (2037 vs. 2035). The dry condition quantity of 10.7 will be maintained until 2030 when the quantity will decrease to 9.8 MGD.
5. The extended operation of South Fort Meade (SFM) for 2 years (2022 vs. 2020) to account for infill parcels.
6. The operation at the Wingate Facility will terminate 11 years earlier (2035 vs. 2046).

2.5 Updated Groundwater Flow Modeling Scenarios

Based on the updated mining schedule and the updated withdrawal quantities in **Table 2-2**, a total of four (4) groundwater flow models were developed for the updated modeling effort with each containing three (3) stress periods in accordance with SWFWMD groundwater modeling guidelines. The three stress periods represent predevelopment conditions (Stress Period 1); 2010 pumpage conditions (Stress Period 2); and the proposed conditions of 2023A, 2023B, 2030A and 2030B (Stress Period 3). Stress Period 1 and 2 are simulated to steady-state while Stress Period 3 is simulated for 365 days in accordance with SWFWMD modeling guidelines. It should be noted that while Stress Period 3 was not simulated to steady-state due to modeling limitations, SWFWMD has accepted the 365-day period as being essentially the same as steady-state for their Water Use Permit evaluations. The change in water level for each simulation was calculated by comparing the difference in the ending heads in Stress Period 3 to the ending heads in Stress Period 2.

The model grid for the updated AEIS modeling utilized the Focus TMR process to decrease the grid spacing near Mosaic's mining facilities of interest to enhance the drawdown/recovery contour resolution to more accurately assess near-field impacts. The model domain was appropriately sized to minimize boundary condition interactions in accordance with SWFWMD modeling guidelines with a north-south and east-west distance of 600,000 feet (approximately 114 miles) and minimum grid cell size of 500 feet near the mining facilities of interest and a maximum of 5,000 feet throughout the rest of the model.

The modeling scenarios utilized for this effort have been summarized in **Table 2-3 (below).** As stated, the 2010 baseline condition is included in each of the four (4) groundwater flow models as Stress Period 2. Whereas, the 2023A, 2023B, 2030A and 2030B conditions described in **Table 2-3** are represented in their respective groundwater flow simulations as Stress Period 3. These simulations have been developed to represent one year of proposed demands compared to the 2010 baseline condition. The "A" scenarios represent all active facilities pumping at their drought (2-in-10) withdrawal rates. The "B" scenarios represent all active facilities pumping at their drought (2-in-10) withdrawal rates and Four Corners utilizing its permitted "flexible" quantity. The flexible quantity is currently permitted by the SWFWMD and is meant to be used on a short-term basis.

Table 2-3. Summary of Groundwater Flow Modeling Scenarios

Scenario	Reason for Modeling	Description
2010	**Baseline Condition**	Baseline Condition - All proposed scenarios will be compared this simulation
2023A	**Desoto Starts / South Fort Meade Ends**	All Active Facilities at 2-in-10 Withdrawal Rates
2023B	**Desoto Starts / South Fort Meade Ends**	Four Corners Flex Rate of 20 MGD, All Other Facilities at 2-in-10 Withdrawal Rates
2030A	**Ona Sealing Wells on a Max Quantity**	All Active Facilities at 2-in-10 Withdrawal Rates
2030B	**Ona Sealing Wells on a Max Quantity**	Four Corners Flex Rate of 17 MGD, All Other Facilities at 2-in-10 Withdrawal Rates

3.0 GROUNDWATER FLOW MODELING RESULTS AND ANALYSIS

The purpose of the original AEIS groundwater flow modeling was to evaluate the cumulative Surficial Aquifer System (SAS), Intermediate Aquifer System (IAS) Permeable Zones 1 and 2, and upper Floridan Aquifer (UFA) water level changes resulting from various withdrawal-related scenarios to analyze and compare current conditions to the Applicants' Preferred Alternatives. The previous AEIS modeling effort provided results in the form of graphical representations of water level drawdown and recovery as well as tables that summarized the change in water levels at monitor wells and wells in proximity to the mining facilities of interest.

3.1 Groundwater Flow Modeling Results

PWR has developed results in both graphical and tabular format similar to the results supplied by CH2M Hill in Appendix F of the AEIS. The results of the modeling effort have been presented as described below:

1. Contour maps depicting areas of drawdown (decreasing water levels) and areas of recovery (increasing water levels) for each model layer compared to the 2010 baseline for Scenarios 2023A, 2023B, 2030A and 2030B have been provided in **Figures 3-1 to 3-16.** These figures can be

compared to the previous 2025B Scenario *Figures 29 – 32* in Appendix F (**Attachment A**). *Figures 29 – 32* in Appendix F depicted the Ona Mine pumping at its Flexible quantity of 15 MGD with Desoto, Wingate and South Pasture withdrawing 10.7, 5.8 and 6.39 MGD, respectively, with 50 MGD in SWUCA Agricultural Reduction compared to the 2010 baseline condition. However, it should be noted that the updated 2023B scenario includes 5 MGD less in SWUCA agricultural reduction due to the difference in simulation years between the two scenarios (2023 vs. 2025) since the full 50 MGD SWUCA Agricultural reduction is not realized until 2025. Overall, **Figure 3-1 to 3-16** show widespread predicted increases in water levels in Layer 1 – 4 due to the Agricultural reduction, with localized drawdown near Four Corners and Fort Green due to proposed sealing wells at Four Corners and the Fort Green production wells being used to supply the Desoto mine.

2. Tables summarizing the changes in water levels (drawdown or recovery) compared to the 2010 baseline at selected SWFWMD Regional Observation Monitoring Program (ROMP) well sites that represent the SAS, IAS and UFA have been provided in **Tables 3-1 to 3-4**. PWR included the same ROMP monitor wells used by CH2M Hill for this analysis and the updated results can be compared directly to *Tables 22 – 25* in Appendix F (**Attachment B**). *Section 3.2 (below)* includes a more detailed discussion concerning the results in these tables and comparison to the previous 2025B scenario results.

3. Similar to the AEIS groundwater flow modeling results, PWR also developed a table summarizing the number of wells in each model layer that are expected to experience drawdown of greater than 1-foot, 2-feet, 3-feet and 4-feet for each of the four (4) simulated scenarios compared to the 2010 baseline. It should be noted that PWR did not have access to CH2M Hill's models or well packages from which *Table 26* of Appendix F was derived (**Attachment C**). Appendix F states that Table 26 was developed "*by using the well location file in the model and extracting the water level change for each groundwater flow modeling scenario*". PWR interpreted this to mean that wells within the DWRM 2.1 well package were used to create *Table 26*. Therefore, PWR utilized the well locations associated with DWRM 2.1 well package to create **Table 3-5** which can be directly compared to *Table 26*. It should be noted that the DWRM 2.1 default well package shapefile and attribute table contains multiple instances of the same well based on different WUP revisions of the same permit. As part of the development of **Table 3-5**, PWR removed those duplicate wells associated with Mosaic for a more accurate depiction of the number of wells potentially impacted.

3.2 Groundwater Flow Modeling Analysis and Discussion

3.2.1 Simulated SAS, IAS and UFA Water Level Changes

3.2.1.1 2010 to 2023

In Scenario 2023A under the Applicant's updated Preferred Alternatives, it is projected that Four Corners, Wingate and South Pasture mines will continue to operate at their 2010 withdrawal rates of 15.6, 5.8 and 6.39 MGD, respectively. Hooker's Prairie and Hopewell mines will cease operation and the Ona Mine and

Desoto Mine (the Desoto Mine is supplied by Ft. Green production wells) will commence operation at 1.1 and 10.7 MGD, respectively. In Scenario 2023B, the Four Corners Mine will also withdraw its flexible quantity of 20 MGD and Wingate decreases to 5.6 MGD. In 2023A and 2023B, the withdrawal rates for Agricultural Users within the SWUCA were proportionally reduced to yield a 45 MGD reduction in Agricultural groundwater withdrawals in 2023 compared to 2005. It should be noted that the total withdrawal in the 2023B scenario does not exceed the 2010 total withdrawal of 43.79 MGD.

Figures 3-1 to 3-8 (contour maps) and **Tables 3-1 to 3-4** (water level change tables) depict the simulated change in SAS, IAS and UFA water levels for All Users with the SWUCA Agricultural reduction for scenarios 2023A and 2023B compared to the 2010 baseline condition.

In scenario 2023A, the change in monitor well water levels range from 0.00 to 0.24 foot in Layer 1, 0.03 to 1.58 foot in Layer 2, 0.00 to 1.30 foot in Layer 3, and -0.09 to 2.29 foot in Layer 4. The 2023A SWFWMD Saltwater Intrusion Minimum Aquifer Level (SWIMAL) value is predicted to increase by 1.32 foot, as shown in **Table 3-4**.

In scenario 2023B, the change in monitor well water levels range from 0.00 to 0.22 foot in Layer 1, 0.03 to 1.35 foot in Layer 2, 0.00 to 1.20 foot in Layer 3, and -1.53 to 1.96 foot in Layer 4. The 2023B SWIMAL value is predicted to increase by 1.09 foot, as shown in **Table 3-4**.

These updated modeling results may be compared against flexible scenario 2025B from the previous AEIS modeling evaluation that predicted monitor well water level changes ranging from 0 to 1.62 feet in Layer 1, 0.04 to 2.03 feet in Layer 2, 0.15 to 2.05 feet in Layer 3, and -0.97 to 3.40 feet in Layer 4. The previous 2025B All Users with agricultural reduction SWIMAL value was predicted to increase by 1.78 feet. However, it should be noted that an additional SWUCA agricultural reduction of 5 MGD was included in the previous 2025B scenario that is not included in the 2023B scenario due to the difference in modeling year (2023 vs. 2025). In addition, much of the UFA drawdown in 2025B was concentrated near the Ona mine where no District ROMP monitor wells are located, whereas most of the drawdown in the 2023B updated scenario is concentrated near Four Corners and Fort Green near ROMP 40 U FLDN AQ MONITOR.

The 2023A and 2023B results indicate that impacts will be isolated to the Four Corners area associated with proposed sealing water wells as well as near the Fort Green production wells that are planned to be utilized to supply the Desoto Mine. Previous AEIS modeling anticipated Four Corners ceasing operation by 2020 which provided water level rise in the area that counteracted the drawdown associated with the Fort Green (Desoto Mine Supply) wells. However, the drawdown associated with the Ona mine has decreased significantly due to the proposed elimination of the production wells at that facility. In summary, all the areas of drawdown still remain localized therefore there is little change in regional impact anticipated due to the proposed change in withdrawals. The SWIMAL value for the 2023 scenarios is still predicted to increase by up to 1.32 feet by 2023.

3.2.1.2 2010 to 2030

In Scenario 2030A under the Applicant's updated Preferred Alternatives, it is projected that Four Corners will decrease to 12.6 MGD and Wingate and South Pasture mines will continue to operate at their 2010 rate of 5.8 and 6.39 MGD, respectively. The Ona mine will increase sealing water withdrawals to 4.8 MGD while the Desoto Mine (supplied by the Ft. Green production wells) will decrease to 9.8 MGD. In Scenario 2030B, the Four Corners Mine will withdraw its flexible permitted quantity up to only 17 MGD as demands at this facility reduce toward the end of mining operations. In 2030A and 2030B, the Agricultural Users within the SWUCA were proportionally reduced for a total of a 50 MGD reduction in Agricultural groundwater withdrawals in 2030. It should be noted that the total withdrawal in the 2030B scenario does not exceed the 2010 total withdrawal of 43.79 MGD.

Figures 3-9 to 3-16 and **Tables 3-1 to 3-4** depict the simulated change in SAS, IAS and UFA water levels for All Users with the SWUCA Agricultural reduction for scenarios 2030A and 2030B compared to the 2010 baseline condition.

In scenario 2030A, the change in monitor well water levels range from 0.00 to 0.26 foot in Layer 1, 0.04 to 1.87 foot in Layer 2, 0.00 to 1.43 foot in Layer 3, and 0.12 to 2.69 foot in Layer 4. The 2023A SWIMAL value increases by 1.67 feet, as shown in **Table 3-4**.

In scenario 2030B, the change in monitor well water levels range from 0.00 to 0.24 foot in Layer 1, 0.04 to 1.62 foot in Layer 2, 0.00 to 1.29 foot in Layer 3, and -0.79 to 2.24 foot in Layer 4. The 2023B SWIMAL value increases by 1.42 feet, as shown in **Table 3-4**.

These updated modeling results may also be compared against flexible scenario 2025B from the previous AEIS modeling evaluation that predicted monitor well water level changes ranging from 0 to 1.62 feet in Layer 1, 0.04 to 2.03 feet in Layer 2, 0.15 to 2.05 feet in Layer 3, and -0.97 to 3.40 feet in Layer 4. The previous 2025B All Users with agricultural reduction SWIMAL value was predicted to increase by 1.78 feet. As shown, the updated 2030B scenario predicts increases in water levels for Layers 1, 2 and 3 and very localized drawdown of -0.79 feet at the nearest monitor well, while the previous 2025B scenario predicted -0.97 feet of drawdown at the nearest monitor well. It should be noted that much of the UFA drawdown in the previous 2025B scenario was concentrated near the Ona mine where no District ROMP monitor wells are located, whereas most of the drawdown in the 2030B updated scenario is concentrated near Four Corners and Fort Green near ROMP 40 U FLDN AQ MONITOR.

Similar to the 2023 scenarios, the 2030A and 2030B scenario results indicate that impacts will be isolated to the Four Corners area associated with proposed sealing water wells as well as the Fort Green production wells being utilized to supply the Desoto Mine. Localized drawdown of potentially up to 1-foot is predicted at Ona associated with the projected withdrawal at the Ona mine sealing water wells. However, the previous 2025B scenario modeling results indicated up to 4 or more feet of drawdown at the Ona mine area due to the construction and use of new production wells. Therefore, the 2030 scenarios indicate a significant decrease in new impacts at the Ona facility compared to previous AEIS modeling. In summary, all the areas of drawdown remain localized therefore there is little change in regional impact anticipated due to the proposed change in withdrawals. The SWIMAL value for the 2030 scenarios is still anticipated to increase by up to 1.67 feet by 2030.

3.2.2 Impacts to Other Users

Similar to the AEIS groundwater flow evaluation, the model was used to estimate the number of other wells that may experience lower water levels by using the well location file in the model and extracting the water level change for each groundwater flow modeling scenario. **Table 3-5** presents the quantity of wells from the model identified within each drawdown contour. The wells are listed by water level changes in 1-foot increments. The numbers in the table are cumulative; for example, Column 1 wells will have 1 foot or greater drawdown. Column 2 shows the number of wells listed in Column 1 that may experience greater than 2 feet of drawdown. Columns 3 and 4 are the number of wells from Column 1 that may experience 3 or 4 feet of drawdown.

As shown in **Table 3-5**, very few wells identified within the DWRM 2.1 well location file were identified to experience 1-foot or more of drawdown. These results can be directly compared to *Table 26 of Appendix F* in the AEIS document where the highest number of wells with drawdown greater than 1-foot occurred in the flexible pumping scenarios of 2020B and 2025B, with 69 and 16 wells identified, respectively. In contrast, the highest number of wells with predicted drawdown greater than 1-foot for the updated modeling were identified in the flexible pumping scenarios of 2023B and 2030B where 7 wells were identified for both scenarios. Therefore, the updated modeling indicates the potential for significantly less impact to other users. This is primarily a result of the significant reduction of proposed quantities at the Ona mine due to the elimination of the Ona mine production wells. While there is increased drawdown near Four Corners and Fort Green, there are less existing users in the area since much of the land is owned by Mosaic.

4.0 SUMMARY AND CONCLUSIONS

PWR developed an updated Groundwater Flow Modeling Plan regarding Mosaic's planned operational changes in mining facilities to address Question 3a of the Army Corps of Engineers' (ACOE) June 2, 2017 Request for Additional Information (RAI) regarding a pending Section 404 Clean Water Act (CWA) permit application for the Ona Mine (Ona). The Plan was developed and formulated based upon Mosaic-provided updates to "Table 17" of Appendix F of the AEIS and the associated mining schedule changes, considerations and assumptions provided by Mosaic to PWR. The proposed modification to Table 17 and the associated water supply demands did not include any new facilities and Mosaic is not requesting any facility increases in groundwater withdrawals as compared to those previously modeled in support of the AEIS. The proposed mining changes eliminates the production wells and their associated quantities for the Ona Facility since the ore will be beneficiated using the existing water supply infrastructure at the Four Corners and South Pasture Facilities instead of constructing new production wells for the Ona mine. To accomplish this, the groundwater withdrawal schedules for Four Corners and South Pasture groundwater withdrawals were extended and revised as described above. The Plan was reviewed and ultimately approved by ACOE staff, therefore PWR performed the groundwater flow modeling as outlined in the Plan.

The modeling results indicated that drawdown impacts associated with the proposed changes will be isolated to the Four Corners area associated with proposed sealing water wells as well as the Fort Green production wells being utilized to supply the Desoto Mine. However, the updated modeling also indicates a significant decrease in predicted drawdown at the Ona mine compared to the previous AEIS modeling since new production wells at the Ona mine will not be constructed. In fact, the number of potential users impacted by drawdown in the UFA greater than 1-foot decreased from 69 to only 7 wells due to elimination of the Ona production wells. Similar to the previous modeling, widespread increases in water levels in all layers of the model are a result of the 50 MGD reduction of Agricultural users within the SWUCA associated with SWFWMD's SWUCA Recovery Plan. Overall, all the areas of drawdown remain localized therefore there is little change in regional impact anticipated due to the proposed change in withdrawals. The SWIMAL value for the 2023 and 2030 scenarios is still expected to increase by up to 1.32 and 1.67 feet, respectively.

Mosaic will continue to operate within the permitted annual average and peak month quantities as authorized in the Integrated Water Use Permit (WUP No. 20011400.026) and South Pasture Water Use Permit (WUP No. 20003669.015).

Based on the updated Groundwater Impact Analysis for the Final AEIS on Phosphate Mining in the CFPD, the modeling results indicate insignificant changes to the previously authorized historical impacts with respect to water resources when compared to the 2010 baseline condition and previous ACOE modeling efforts. It should also be noted that due to the proposed changes, all mining operations are scheduled to be completed six years earlier (2042 vs. 2048).

Progressive Water Resources
Integrated Water Resource Consultants

Professional Geologist Certification

The groundwater flow modeling analysis included in this document "AEIS Groundwater Modeling Update for Section 404 Clean Water Act Pending Application for the Ona Mine" was completed based on sound geologic principals and the hydrogeologic data available at the time this modeling analysis was performed. The parameters and discretization of simulated withdrawals from the aquifer systems are considered to be reasonably accurate; therefore the Professional Geologist below certifies the results of the model as they pertain to the predicted groundwater impacts. All the preceding geological analysis and interpretation(s) were evaluated and supervised by Joseph D. Haber, P.G., a Registered Professional Geologist pursuant to Chapter 492, Florida Statutes, (F.S.) and Chapter 61G16, Florida Administrative Code, F.A.C.

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July 30, 2018
Date

TABLES

TABLE 3-1

Simulated ROMP SAS Monitor Well Water Level Change Relative to 2010, Updated Demands (All Users with Agricultural Reduction) Layer 1

	All Users Simulated Water Level Change Relative to 2010 (ft)			
Well	**2023A**	**2023B**	**2030A**	**2030B**
ENGLEWOOD 14 DEEP	0.00	0.00	0.00	0.00
ROMP 10 SURF AQ MONITOR	0.00	0.00	0.00	0.00
ROMP 16 SURF AQ MONITOR	0.00	0.00	0.00	0.00
ROMP 19X SURF AQ MONITOR	0.01	0.01	0.01	0.01
ROMP 28X SURF AQ MONITOR	0.02	0.02	0.02	0.02
ROMP 30 SURF AQ MONITOR	0.01	0.01	0.01	0.01
ROMP 32 HTRN AS MONITOR	0.01	0.01	0.03	0.03
ROMP 35 SURF AQ MONITOR	0.01	0.01	0.02	0.02
ROMP 40 SURF AQ MONITOR	0.01	0.03	0.01	-0.02
ROMP 43 SURF AQ MONITOR REPL	0.24	0.22	0.26	0.24
ROMP 45.5 HTRN CU MONITOR	0.01	0.01	0.01	0.01
ROMP 58 SURF AQ MONITOR	0.07	0.06	0.07	0.07
ROMP 60X (PRIM SC06) SURF AQ MONITOR	0.07	0.05	0.09	0.07
ROMP TR 10-2 SURF AQ MONITOR	0.00	0.00	0.00	0.00
ROMP TR 8-1 SURF AQ MONITOR	0.00	0.00	0.00	0.00
ROMP TR SA-1 SURF	0.00	0.00	0.00	0.00

TABLE 3-2

Simulated ROMP IAS Zone 1 Monitor Well Water Level Change Relative to 2010, Updated Demands (All Users with Agricultural Reduction) Layer 2

	All Users Simulated Water Level Change Relative to 2010 (ft)			
Well	**2023A**	**2023B**	**2030A**	**2030B**
CL-3 HTRN AS MONITOR	0.87	0.81	0.96	0.89
KUSHMER INT	0.14	0.12	0.18	0.16
ROMP 10 U ARCA AQ MONITOR 2	0.13	0.12	0.14	0.14
ROMP 13 U ARCA AQ MONITOR	0.28	0.27	0.30	0.29
ROMP 17 U ARCA AQ MONITOR	0.42	0.40	0.46	0.44
ROMP 20 U ARCA AQ MONITOR	0.29	0.25	0.34	0.30
ROMP 25 U ARCA AQ MONITOR	0.23	0.22	0.24	0.22
ROMP 26 U ARCA AQ MONITOR	0.53	0.50	0.56	0.52
ROMP 30 U ARCA AQ MONITOR	1.02	0.90	0.96	0.84
ROMP 39 HTRN AS MONITOR	0.16	0.14	0.19	0.17
ROMP 41 SURF AQ MONITOR	1.09	0.98	1.33	1.21
ROMP 43 U ARCA AQ MONITOR	1.24	1.14	1.33	1.23
ROMP 5 U ARCA AQ MONITOR	0.14	0.14	0.16	0.15
ROMP 59 HTRN AS MONITOR 1	0.82	0.64	0.98	0.80
ROMP 8 U ARCA AQ MONITOR	0.22	0.20	0.25	0.23
ROMP TR 7-2 U ARCA AQ MONITOR	0.03	0.03	0.04	0.04
VERNA TEST 0-1	1.58	1.35	1.87	1.62

TABLE 3-3

Simulated ROMP IAS Zone 2 Monitor Well Water Level Change Relative to 2010, Updated Demands (All Users with Agricultural Reduction) Layer 3

Well	SWIMAL Weight*	All Users Simulated Water Level Change Relative to 2010 (ft)			
		2023A	**2023B**	**2030A**	**2030B**
CL-2 DEEP SURF AQ MONITOR	N/A	0.64	0.61	0.72	0.68
FORT GREEN SPRINGS INT	N/A	0.79	0.22	1.14	0.55
ROMP 12 U ARCA AQ MONITOR	N/A	0.32	0.31	0.35	0.33
ROMP 14 L ARCA AQ MONITOR	N/A	0.11	0.11	0.12	0.12
ROMP 16 L ARCA AQ MONITOR	N/A	0.43	0.40	0.46	0.43
ROMP 26 L ARCA AQ MONITOR	N/A	0.53	0.50	0.55	0.51
ROMP 28 HTRN	N/A	0.19	0.19	0.21	0.21
ROMP 30 L ARCA AQ MONITOR	N/A	1.08	0.96	1.02	0.89
ROMP 43 L ARCA AQ MONITOR	N/A	1.30	1.20	1.40	1.29
ROMP 5 L ARCA AQ MONITOR	N/A	0.15	0.14	0.16	0.15
ROMP 59 HTRN AS MONITOR 2	N/A	0.98	0.77	1.18	0.96
ROMP 9.5 L ARCA AQ MONITOR (MW-2)	N/A	0.37	0.35	0.41	0.38
ROMP TR 1-2 L ARCA AQ MONITOR	N/A	0.00	0.00	0.00	0.00
ROMP TR 3-1 L ARCA AQ MONITOR 2	N/A	0.14	0.13	0.16	0.15
ROMP TR 5-1 L ARCA AQ MONITOR	N/A	0.29	0.26	0.34	0.31
ROMP TR 7-1 L ARCA AQ INTERFACE MONITOR	8.84%	0.67	0.58	0.81	0.72
ROMP TR 9-2 L ARCA AQ MONITOR	N/A	0.32	0.27	0.40	0.36
SARASOTA 9 DEEP	8.66%	1.20	1.04	1.43	1.26

*If well is used for SWIMAL calculation, the SWIMAL weight is used to calculate simulated change in SWIMAL

TABLE 3-4

Simulated ROMP UFA Monitor Well Water Level Change Relative to 2010, Updated Demands (All Users with Agricultural Reduction) Layer 4

		All Users Simulated Water Level Change Relative to 2010 (ft)			
Well	SWIMAL Weight*	**2023A**	**2023B**	**2030A**	**2030B**
COLEY DEEP	N/A	0.70	0.66	0.78	0.74
FLORIDA POWER FLDN AT PINEY POINT	N/A	0.93	0.82	1.16	1.03
KIBLER DEEP	14.01%	1.94	1.62	2.34	1.98
LAKE ALFRED DEEP AT LAKE ALFRED	N/A	0.14	0.13	0.16	0.15
ROMP 12 AVPK PZ MONITOR	N/A	0.32	0.31	0.35	0.33
ROMP 123 HTRN AS/U FLDN AQ MONITOR	9.55%	1.86	1.35	2.66	2.12
ROMP 13 AVPK PZ MONITOR	N/A	0.29	0.27	0.31	0.29
ROMP 14 U FLDN AQ MONITOR (AVPK)	N/A	0.11	0.11	0.12	0.12
ROMP 15 U FLDN AQ MONITOR MOD	N/A	0.45	0.43	0.48	0.46
ROMP 17 U FLDN AQ MONITOR (AVPK)	N/A	0.40	0.37	0.43	0.40
ROMP 19X U FLDN AQ MONITOR (SWNN)	N/A	0.53	0.48	0.59	0.54
ROMP 20 U FLDN AQ MONITOR (OCAL)	N/A	0.45	0.40	0.54	0.48
ROMP 25 U FLDN AQ MONITOR	N/A	1.42	1.20	1.45	1.21
ROMP 28 AVPK	N/A	0.20	0.19	0.22	0.21
ROMP 30 U FLDN AQ MONITOR	N/A	1.08	0.96	1.02	0.89
ROMP 31 U FLDN AQ MONITOR	N/A	0.94	0.71	0.29	0.04
ROMP 32 U FLDN AQ MONITOR (AVPK)	N/A	1.00	0.46	0.74	0.18
ROMP 39 AVPK PZ MONITOR	N/A	2.10	1.68	2.69	2.24
ROMP 40 U FLDN AQ MONITOR	N/A	-0.09	-1.53	0.70	-0.79
ROMP 41 AVPK PZ MONITOR	N/A	2.11	1.73	2.25	1.86
ROMP 43XX U FLDN AQ MONITOR	N/A	0.53	0.51	0.59	0.57
ROMP 45 U FLDN AQ MONITOR (AVPK)	N/A	2.29	1.96	2.50	2.16
ROMP 5 U FLDN AQ MONITOR (SWNN)	N/A	0.15	0.14	0.16	0.15
ROMP 50 U FLDN AQ MONITOR (SWNN)	13.25%	1.65	1.36	2.18	1.86
ROMP 57 U FLDN AQ MONITOR	N/A	0.48	0.45	0.55	0.51
ROMP 59 U FLDN AQ INTERFACE MONITOR	N/A	1.13	0.89	1.36	1.11

TABLE 3-4

Simulated ROMP UFA Monitor Well Water Level Change Relative to 2010, Updated Demands (All Users with Agricultural Reduction) Layer 4

		All Users Simulated Water Level Change Relative to 2010 (ft)			
Well	SWIMAL Weight*	**2023A**	**2023B**	**2030A**	**2030B**
ROMP 60X U FLDN AQ MONITOR	N/A	0.96	0.72	1.20	0.95
ROMP TR 10-2 L ARCA AQ MONITOR	5.41%	0.55	0.42	0.79	0.64
ROMP TR 4-1 U FLDN AQ INTERFACE MONITOR	N/A	0.29	0.26	0.34	0.31
ROMP TR 7-4 U FLDN AQ MONITOR (SWNN)	13.54%	1.12	0.97	1.35	1.19
ROMP TR 8-1 AVPK PZ MONITOR	14.08%	0.98	0.85	1.20	1.07
ROMP TR 9-3 U FLDN AQ MONITOR (SWNN)	7.17%	1.21	1.02	1.56	1.36
SMITH DEEP	N/A	1.13	1.04	1.21	1.12
VERNA TEST 0-4	5.50%	1.43	1.23	1.70	1.48
Simulated Change in SWIMAL, Feet		**1.32**	**1.09**	**1.67**	**1.42**

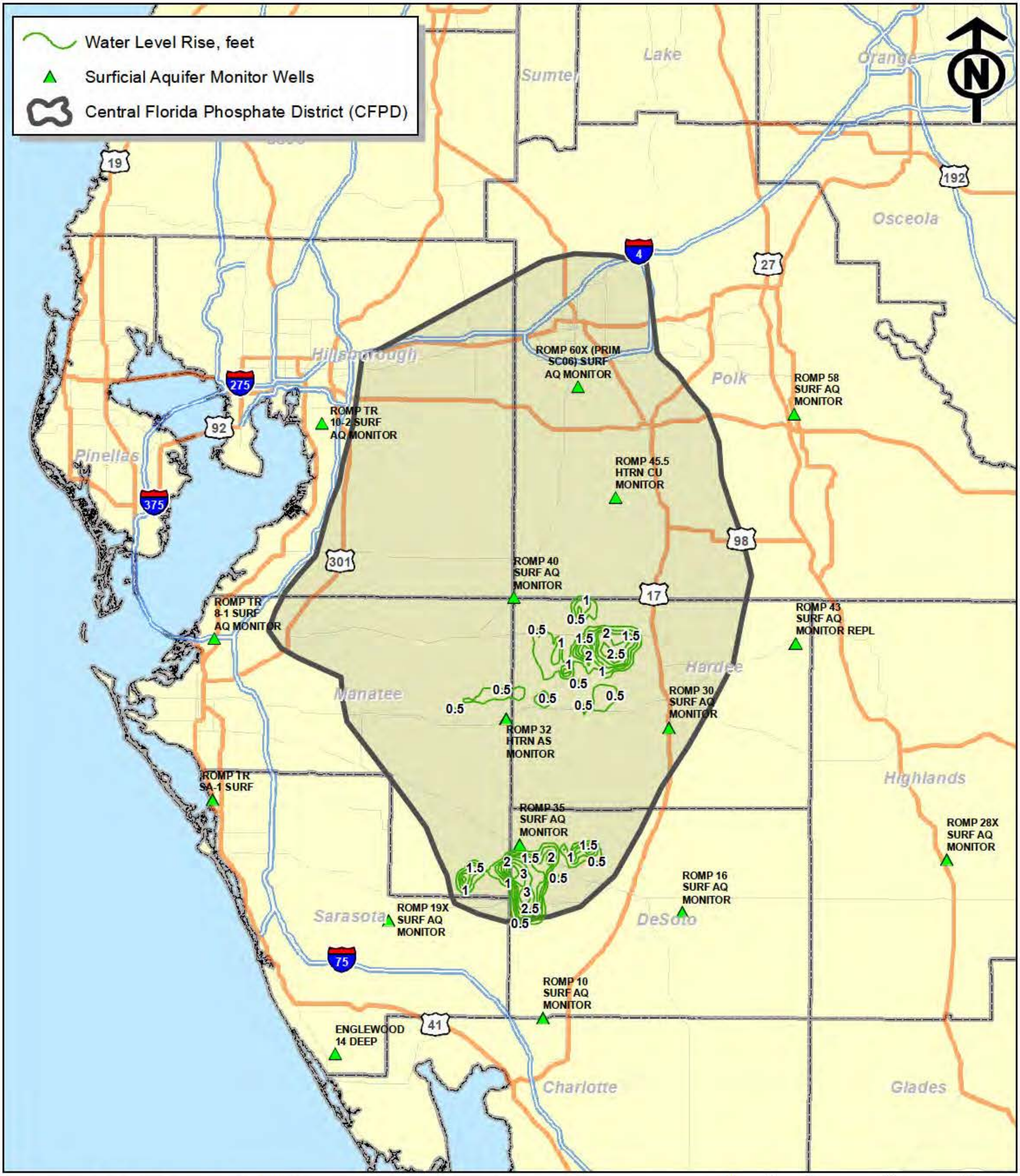
* If well is used for SWIMAL Calculation, the SWIMAL weight is used to calculated the simulated change in SWIMAL

TABLE 3-5

Quantity of Well Within Drawdown Contours for all Scenarios

Scenario	Greater than 1 ft Drawdown				Greater than 2 ft Drawdown				Greater than 3 ft Drawdown				Greater than 4 ft Drawdown			
	No. of wells in Layer:				No. of wells in Layer:				No. of wells in Layer:				No. of wells in Layer:			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
2023A	0	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0
2023B	0	0	0	7	0	0	0	2	0	0	0	2	0	0	0	1
2030A	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
2030B	0	0	0	7	0	0	0	1	0	0	0	1	0	0	0	0

FIGURES



Scale: 1:800,000 11/28/2017 Image: N/A

0 4 8 16 24 Miles

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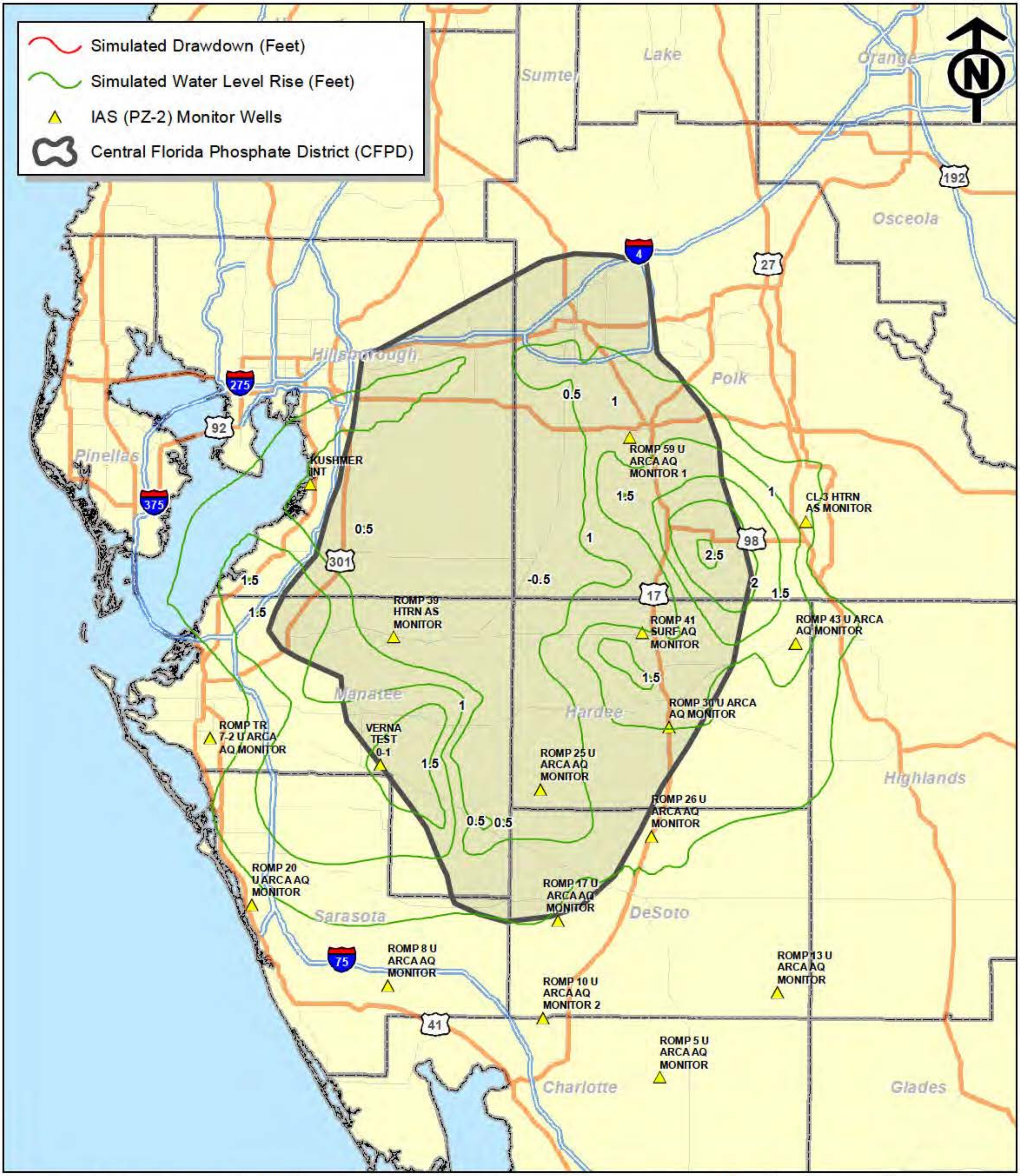
Figure 3-1
Simulated Water Level Change from 2010 to 2023A
SAS (Model Layer 1)

Progressive Water Resources
Integrated Water Resource Consultants



Scale: 1:800,000   11/28/2017   Image: N/A

0 4 8 16 24 Miles

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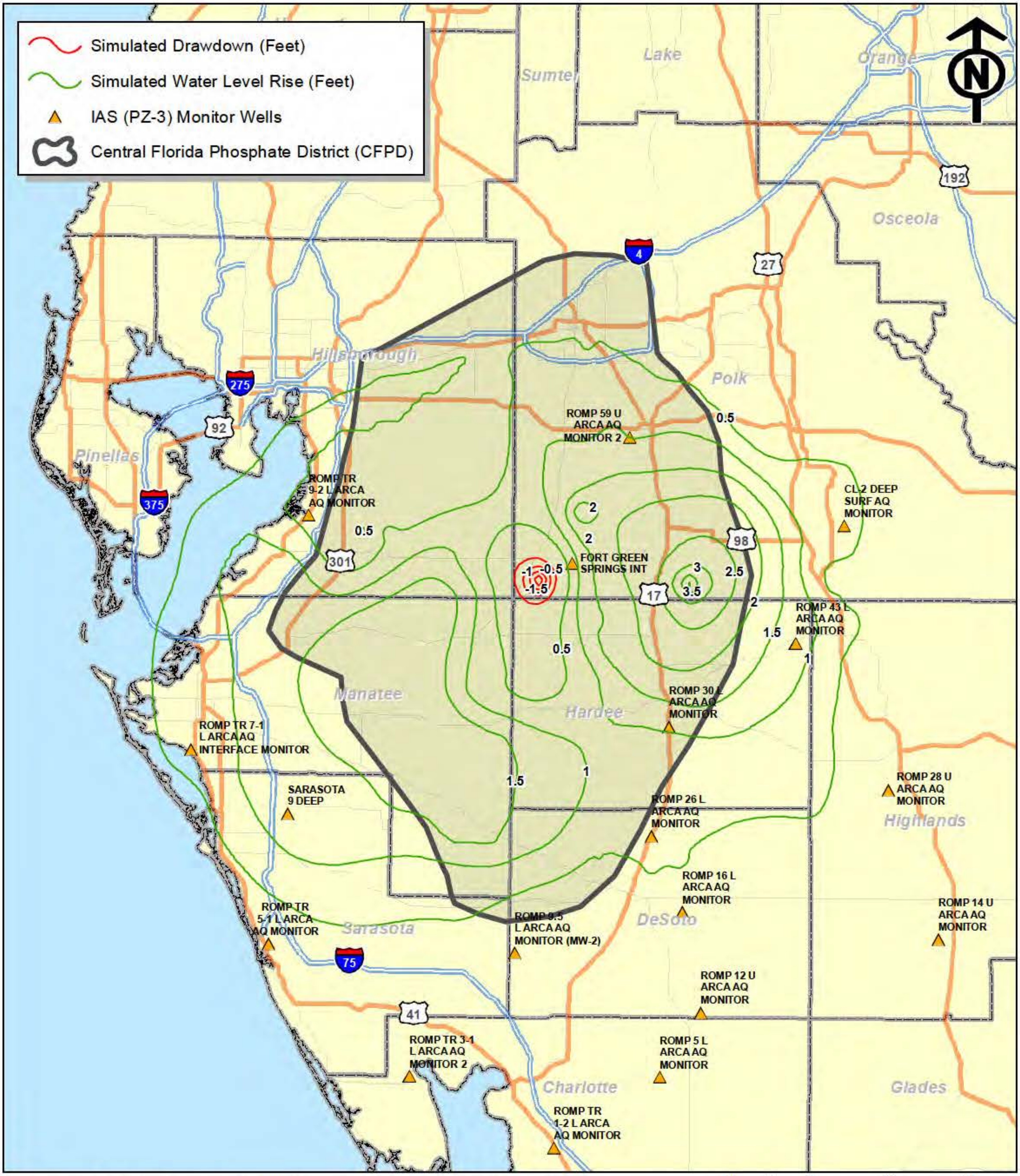
Figure 3-2
Simulated Water Level Change from 2010 to 2023A
IAS PZ-2 (Model Layer 2)

Progressive Water Resources
Integrated Water Resource Consultants



Scale: 1:800,000   11/28/2017   Image: N/A   0 4 8 16 24 Miles

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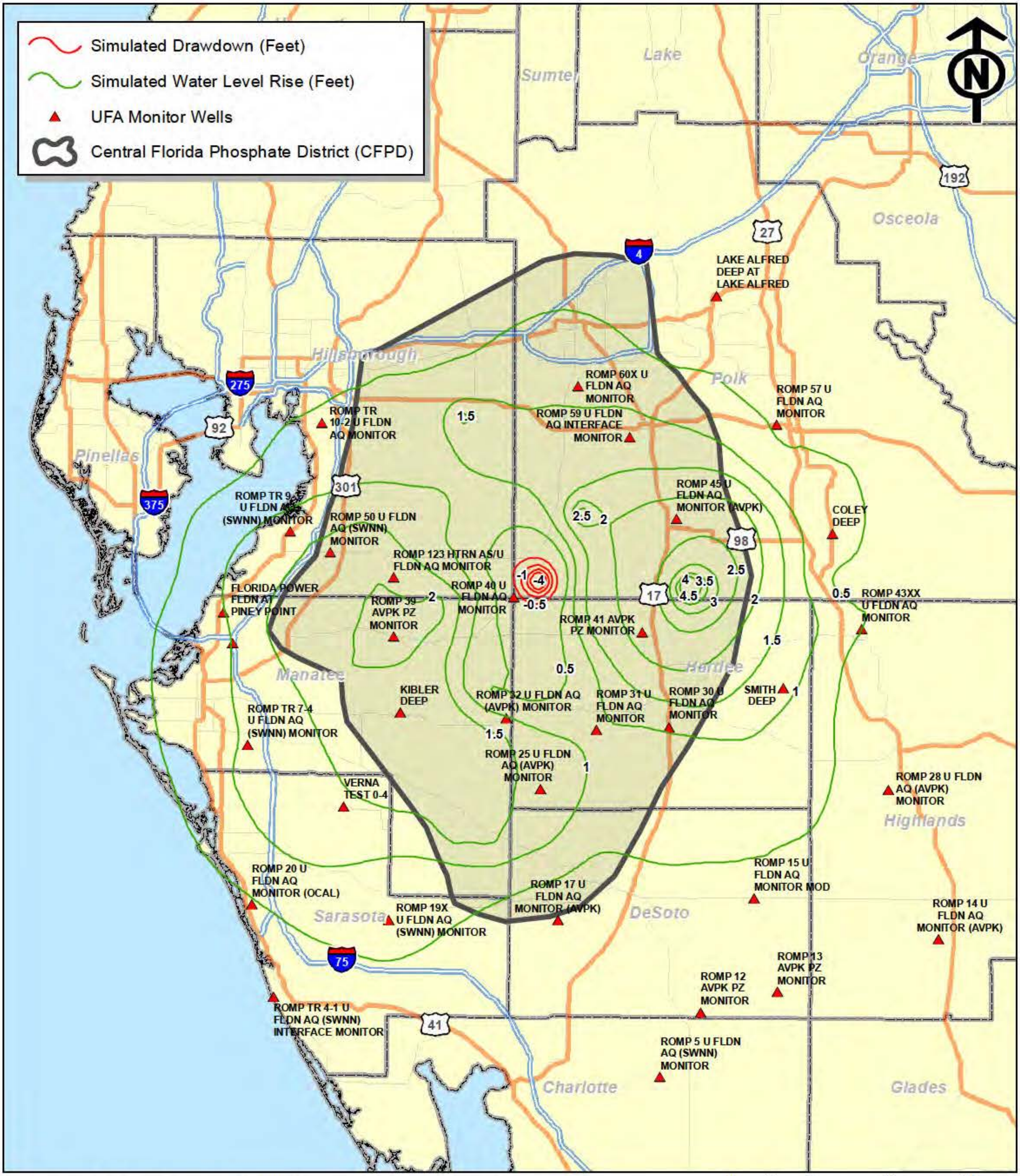
Figure 3-3
Simulated Water Level Change from 2010 to 2023A
IAS PZ-3 (Model Layer 3)

Progressive Water Resources
Integrated Water Resource Consultants



Scale: 1:800,000 11/28/2017 Image: N/A

0 4 8 16 24 Miles

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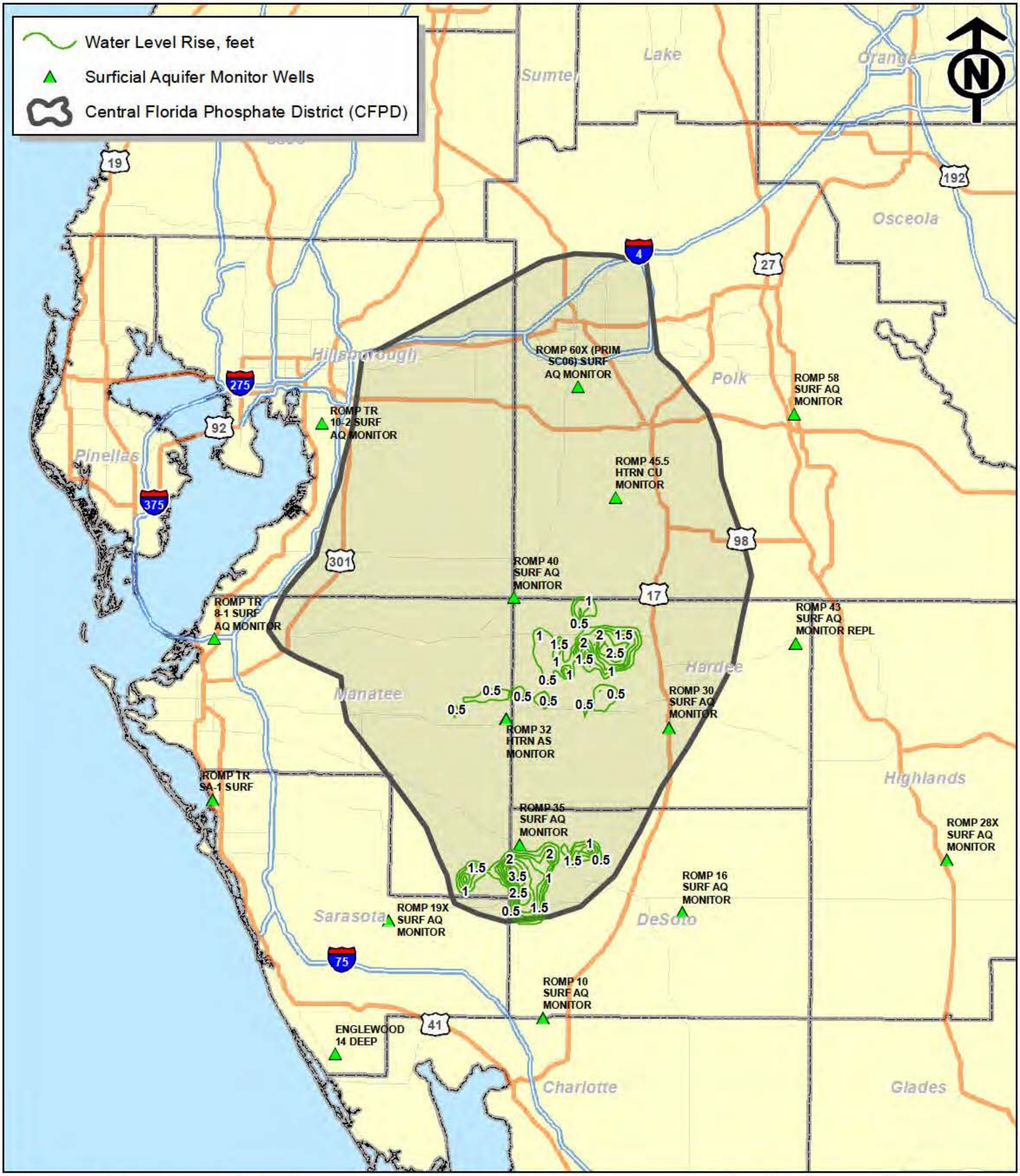
Figure 3-4
Simulated Water Level Change from 2010 to 2023A
UFA (Model Layer 4)

Progressive Water Resources
Integrated Water Resource Consultants



Scale: 1:800,000 11/28/2017 Image: N/A

0 4 8 16 24 Miles

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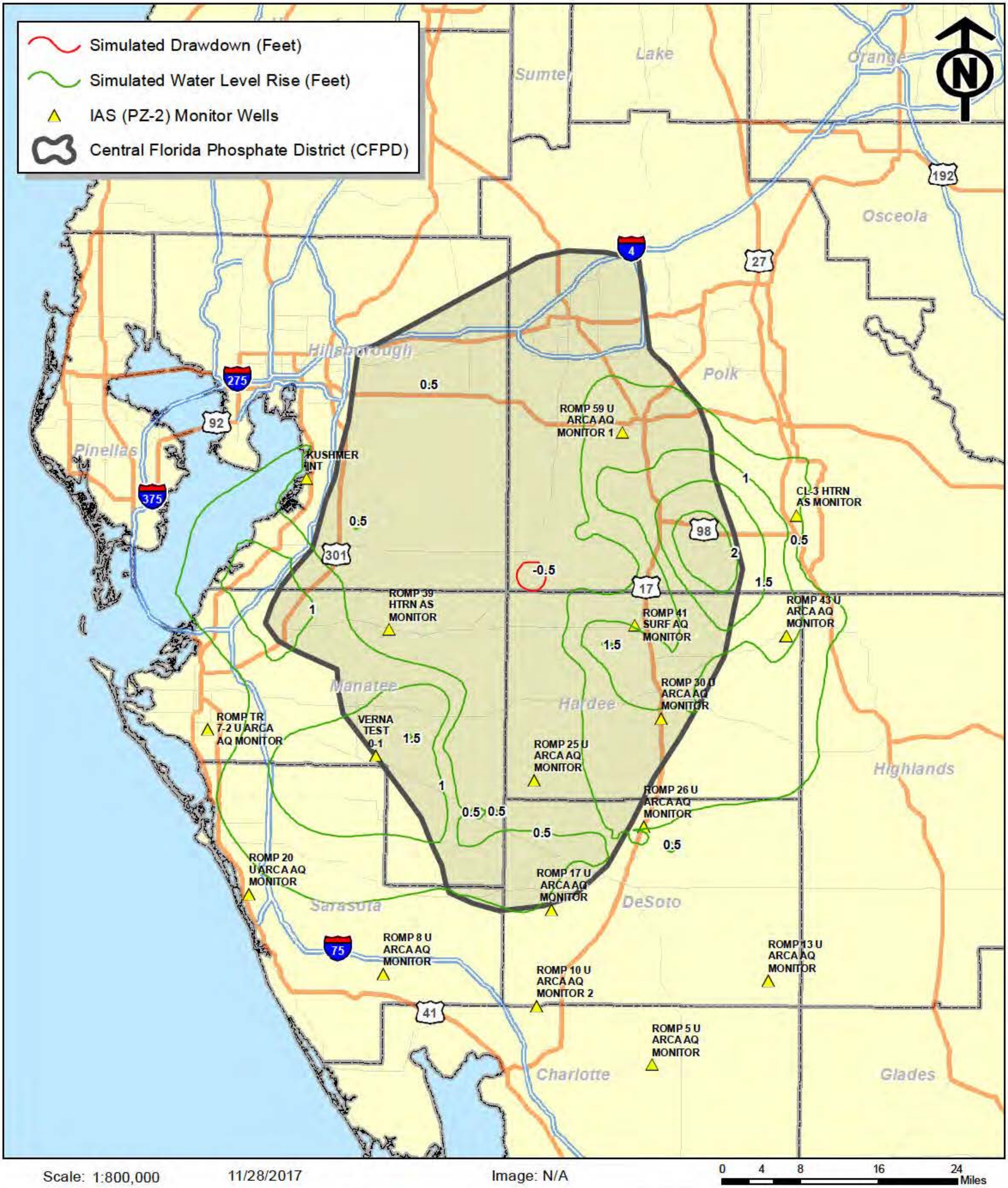
Figure 3-5
Simulated Water Level Change from 2010 to 2023B
SAS (Model Layer 1)

Progressive Water Resources
Integrated Water Resource Consultants



Scale: 1:800,000 11/28/2017 Image: N/A

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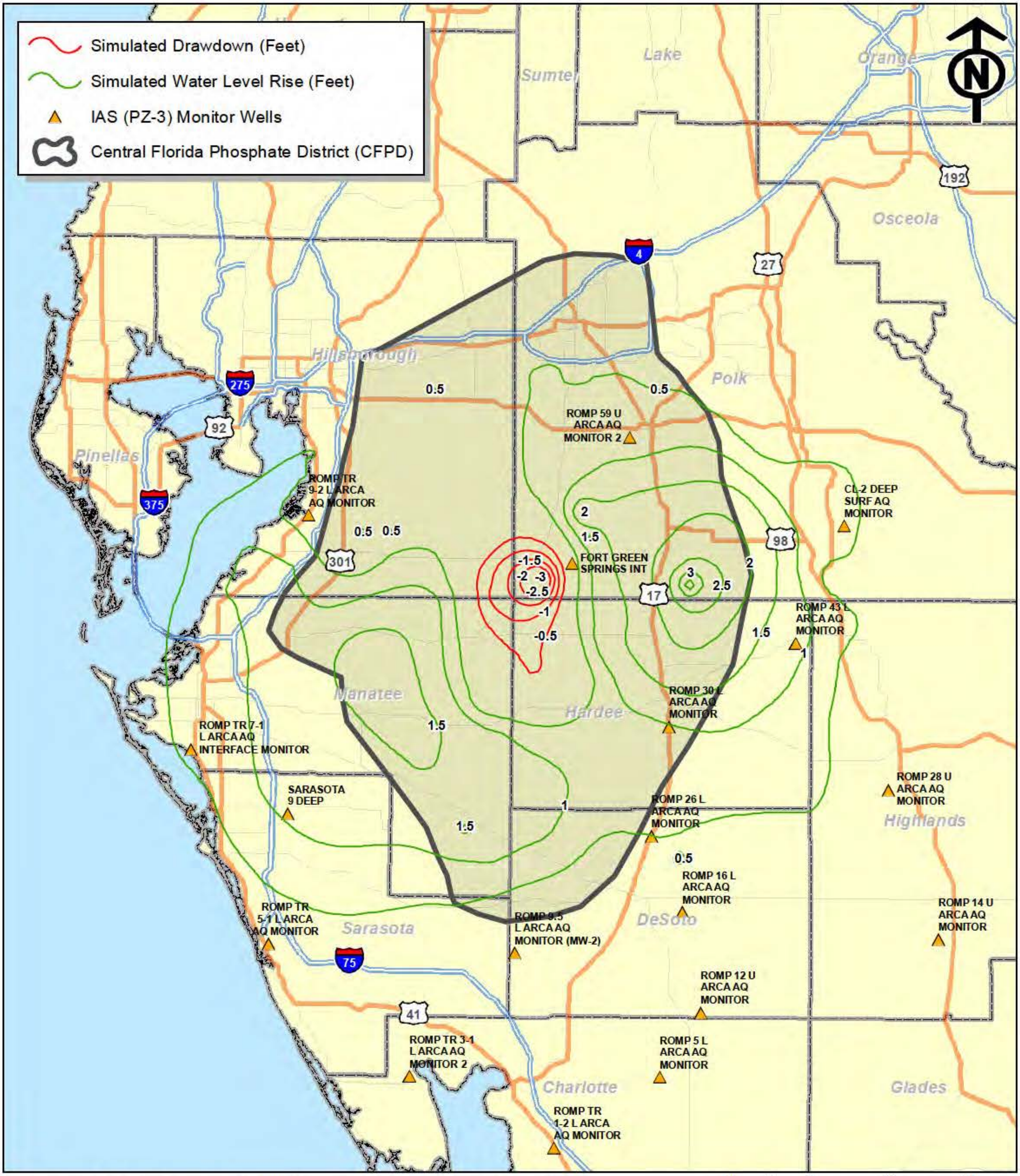
Figure 3-6
Simulated Water Level Change from 2010 to 2023B
IAS PZ-2 (Model Layer 2)

Progressive Water Resources
Integrated Water Resource Consultants



Scale: 1:800,000 11/28/2017 Image: N/A 0 4 8 16 24 Miles

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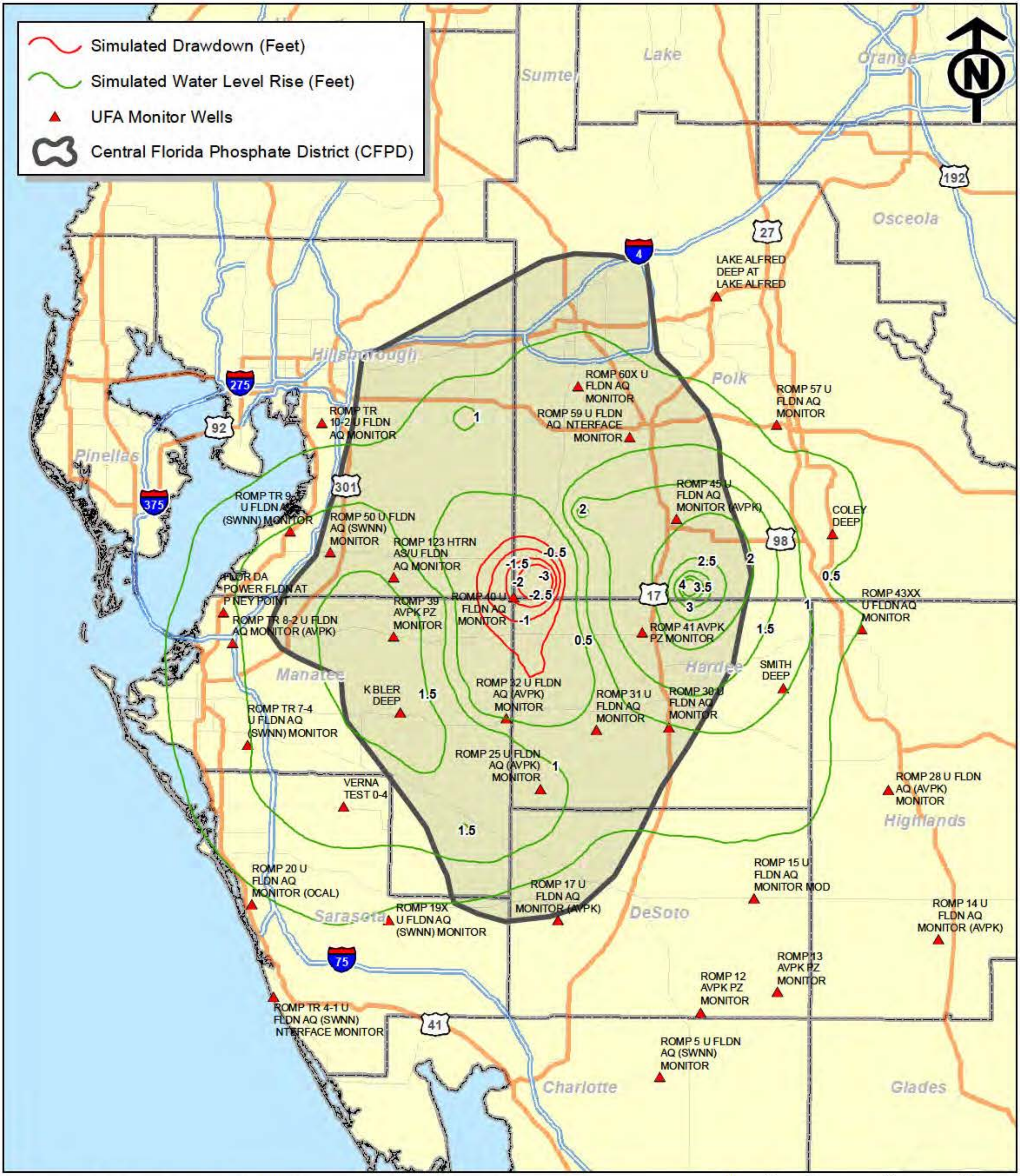
Figure 3-7
Simulated Water Level Change from 2010 to 2023B
IAS PZ-3 (Model Layer 3)

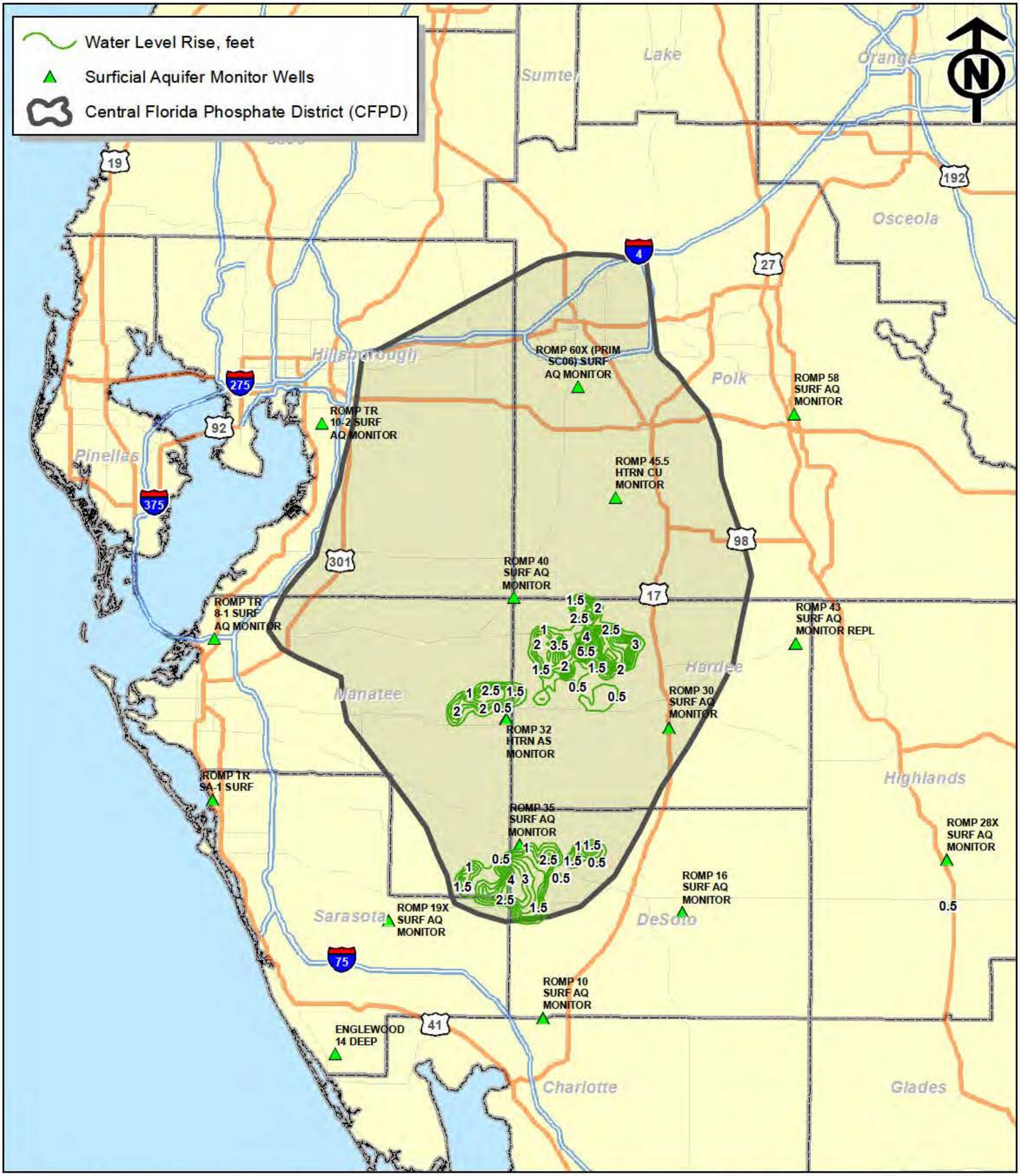
Progressive Water Resources
Integrated Water Resource Consultants



Scale: 1:800,000 11/28/2017 Image: N/A 0 4 8 16 24 Miles

Figure 3-8
Simulated Water Level Change from 2010 to 2023B
UFA (Model Layer 4)

Progressive Water Resources
Integrated Water Resource Consultants



Scale: 1:800,000 11/28/2017 Image: N/A

0 4 8 16 24 Miles

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Figure 3-9
Simulated Water Level Change from 2010 to 2030A
SAS (Model Layer 1)

Progressive Water Resources
Integrated Water Resource Consultants

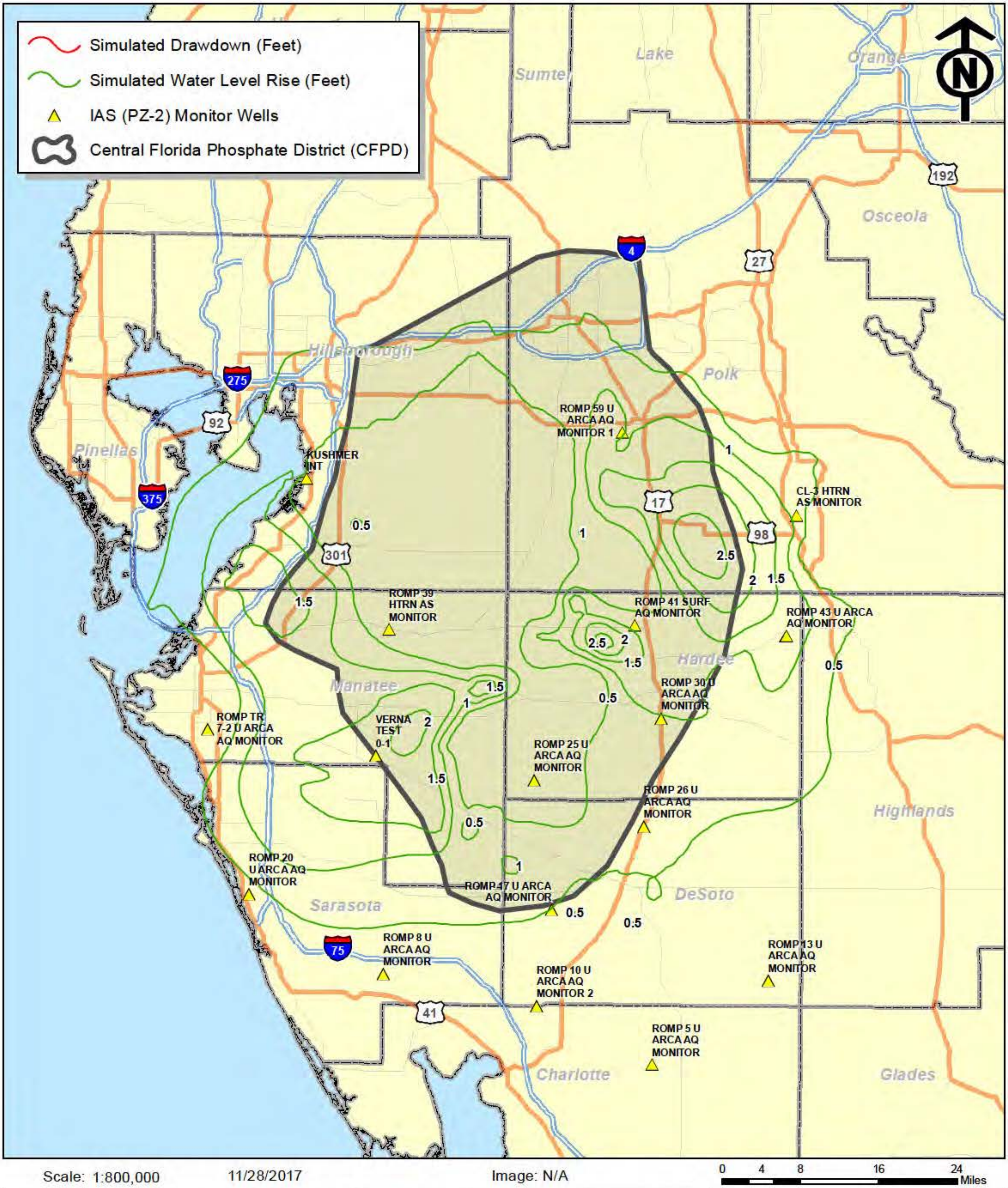

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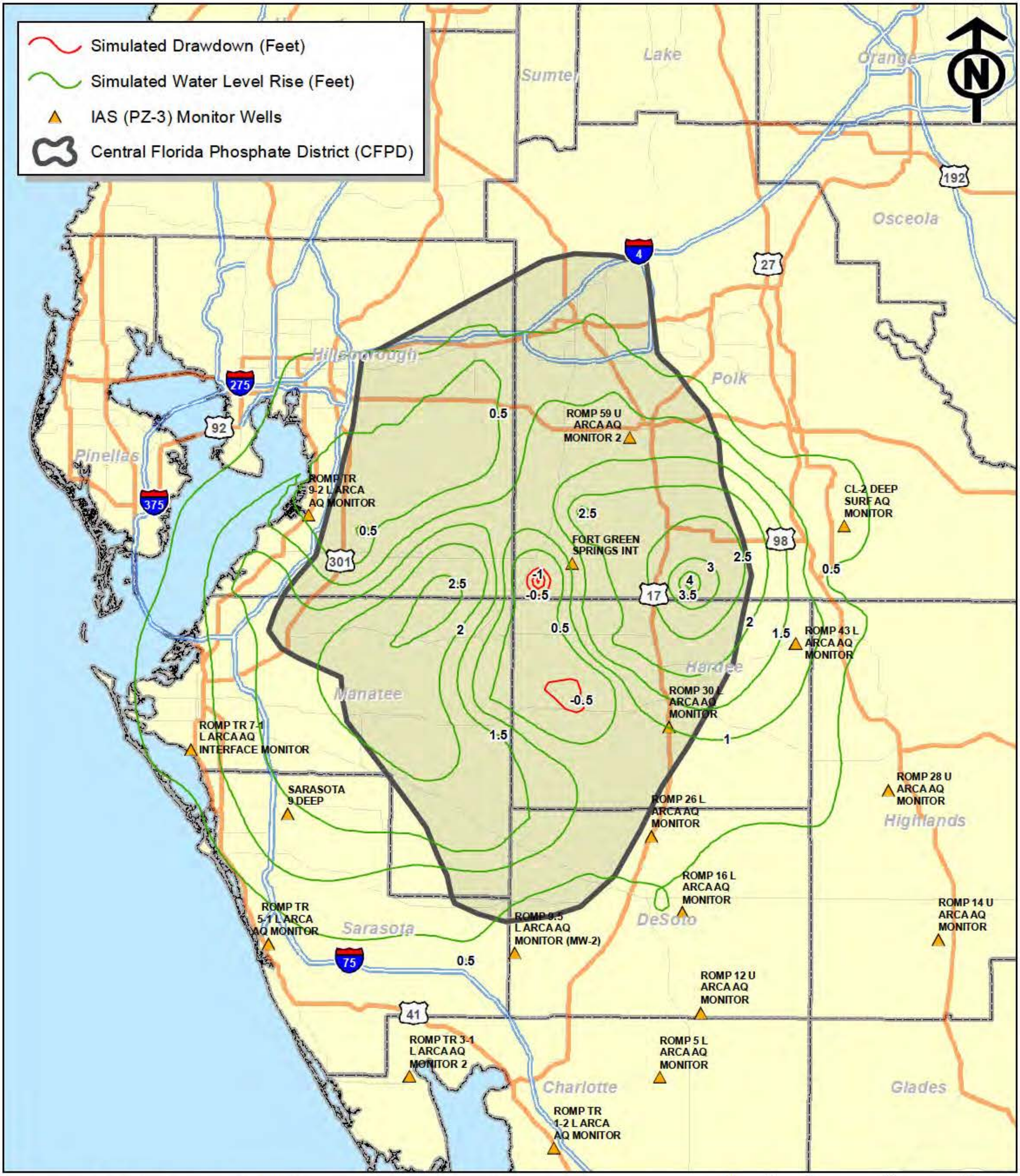
Figure 3-10
Simulated Water Level Change from 2010 to 2030A
IAS PZ-2 (Model Layer 2)

Progressive Water Resources
Integrated Water Resource Consultants



Scale: 1:800,000 11/28/2017 Image: N/A

0 4 8 16 24 Miles

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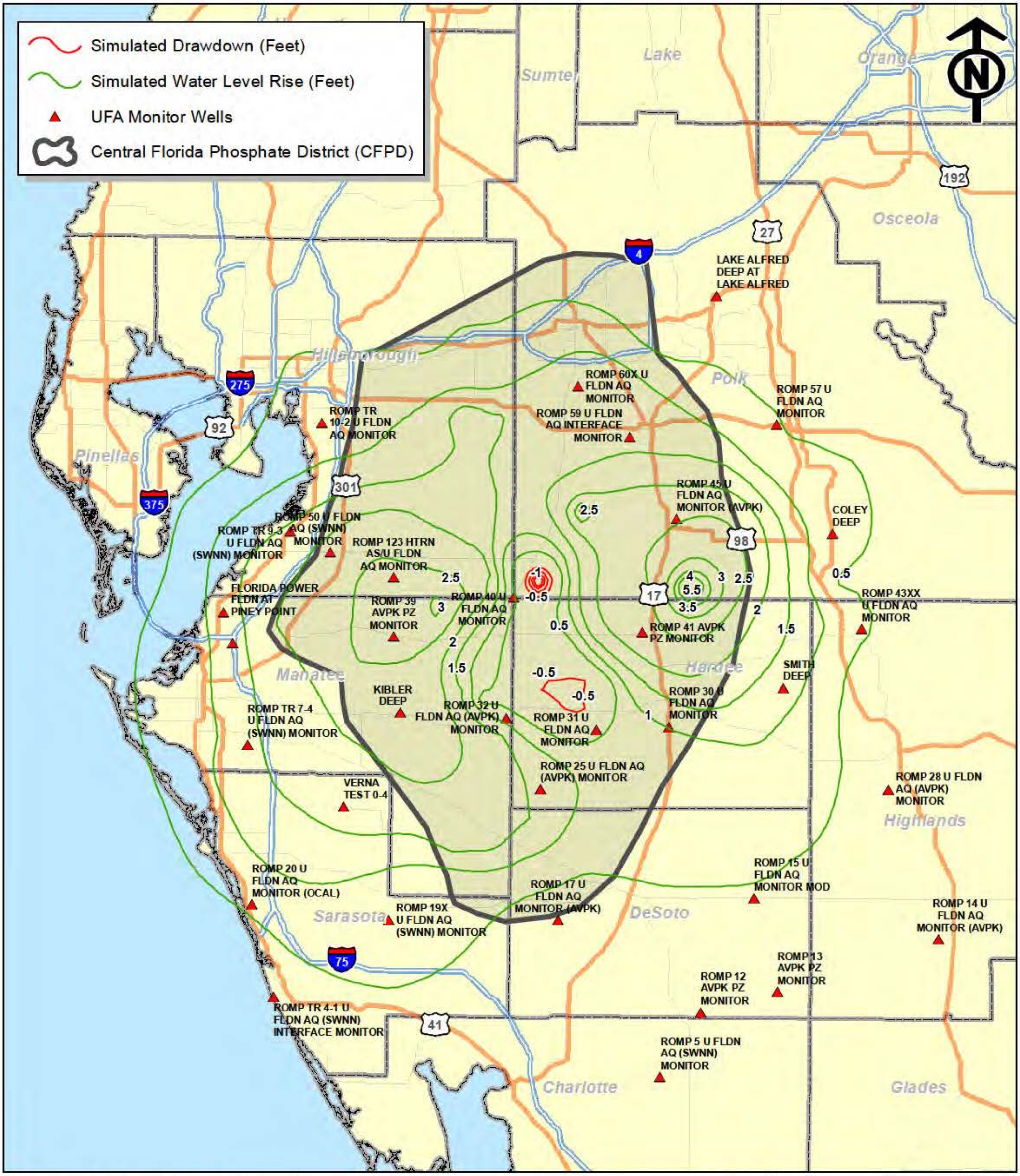
Figure 3-11
Simulated Water Level Change from 2010 to 2030A
IAS PZ-3 (Model Layer 3)

Progressive Water Resources
Integrated Water Resource Consultants



Scale: 1:800,000 11/28/2017 Image: N/A

0 4 8 16 24 Miles

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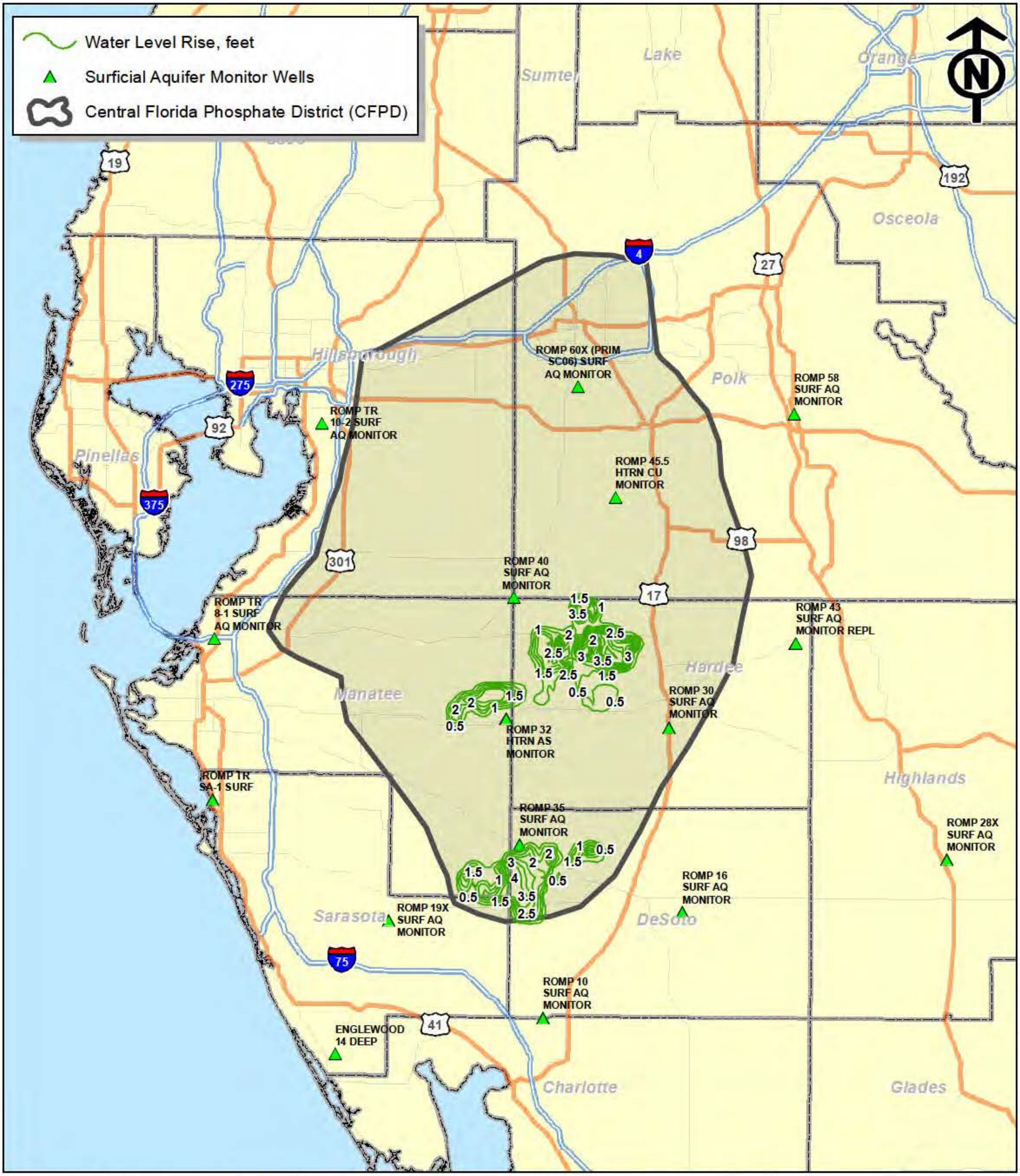
Figure 3-12
Simulated Water Level Change from 2010 to 2030A
UFA (Model Layer 4)

Progressive Water Resources
Integrated Water Resource Consultants



Scale: 1:800,000 11/28/2017 Image: N/A

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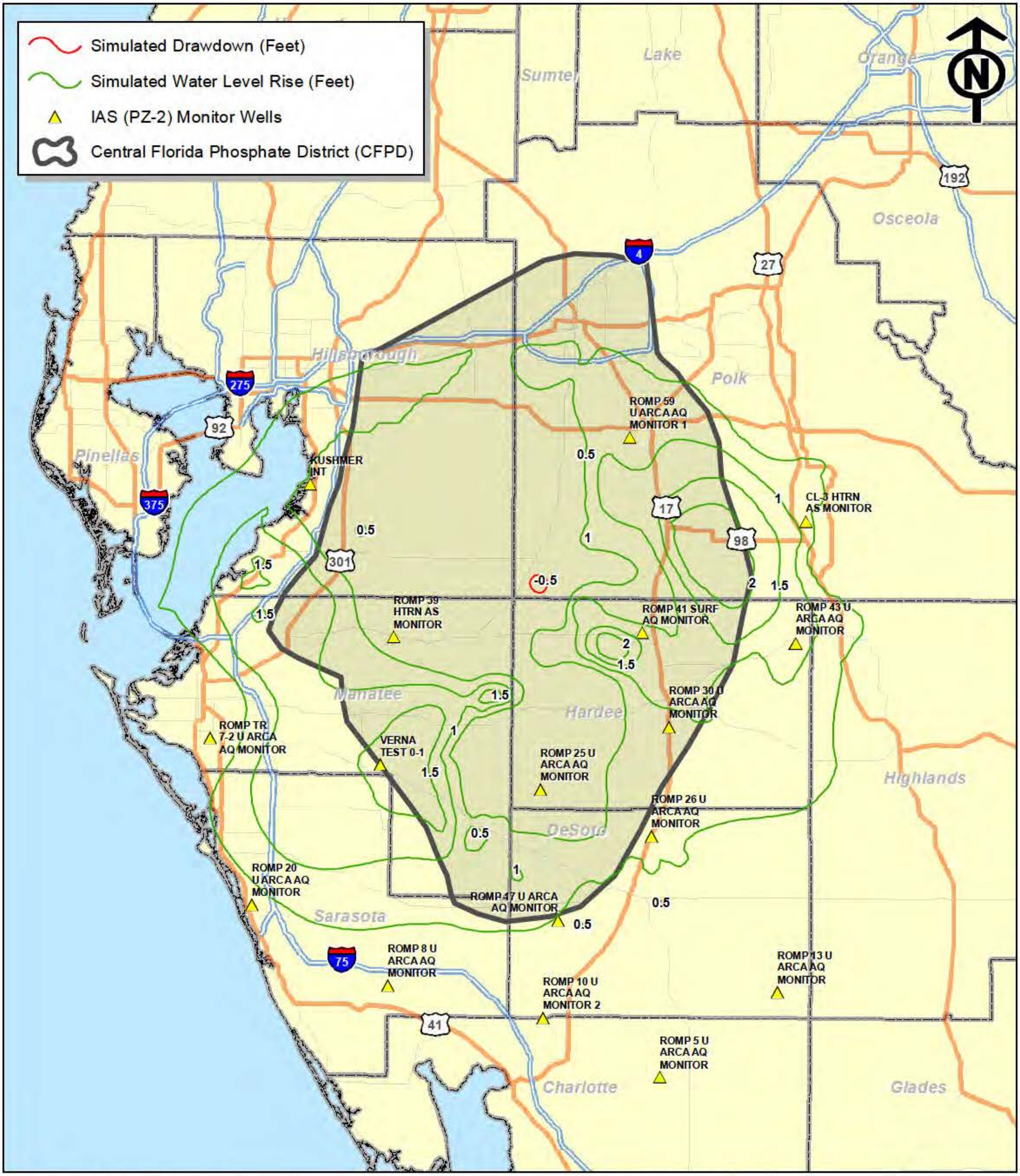
Figure 3-13
Simulated Water Level Change from 2010 to 2030B
SAS (Model Layer 1)

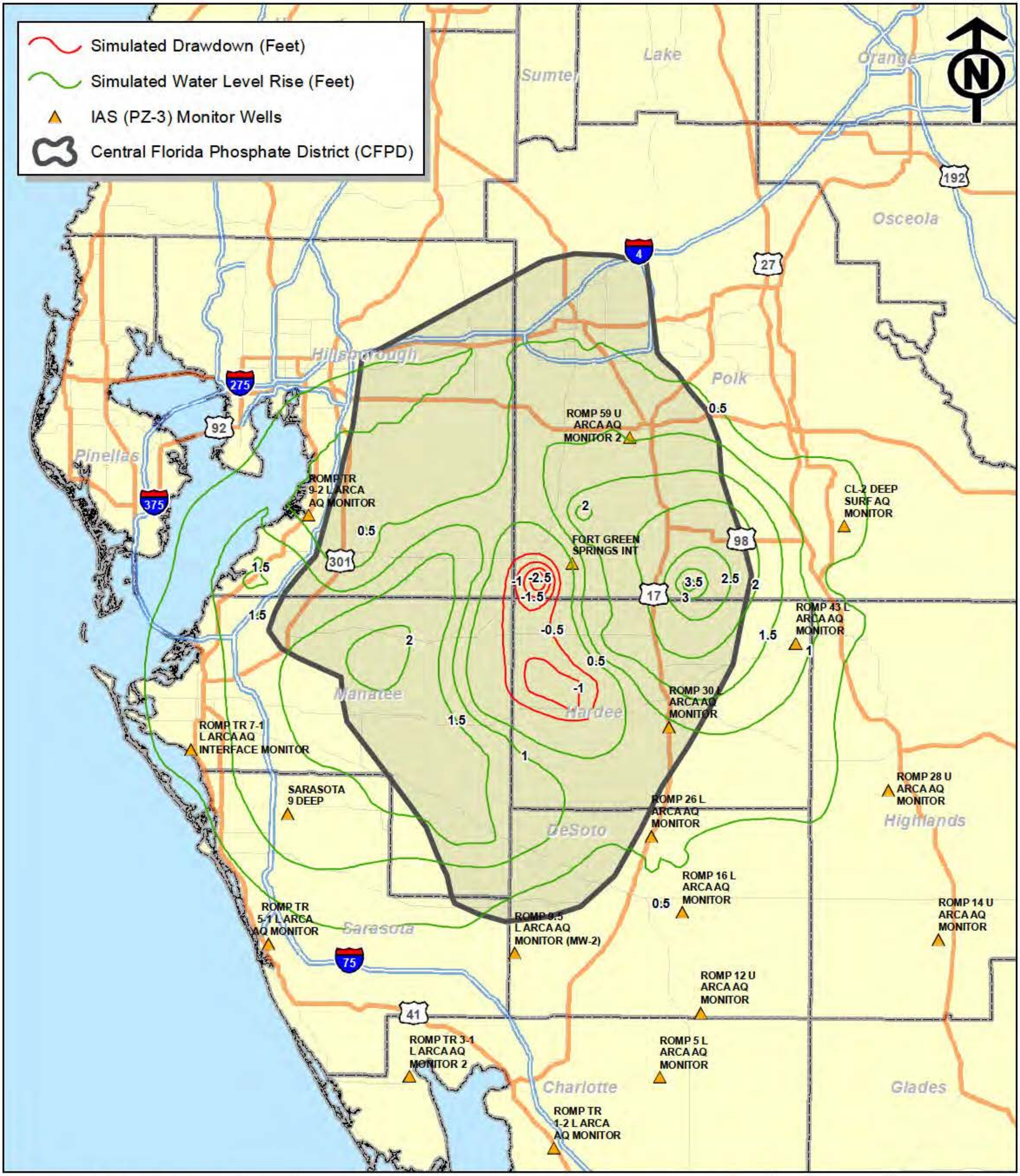
Progressive Water Resources
Integrated Water Resource Consultants



Scale: 1:800,000 | 11/28/2017 | Image: N/A | 0 4 8 16 24 Miles

Figure 3-14
Simulated Water Level Change from 2010 to 2030B
IAS PZ-2 (Model Layer 2)

Progressive Water Resources
Integrated Water Resource Consultants



Scale: 1:800,000 11/28/2017 Image: N/A

0 4 8 16 24 Miles

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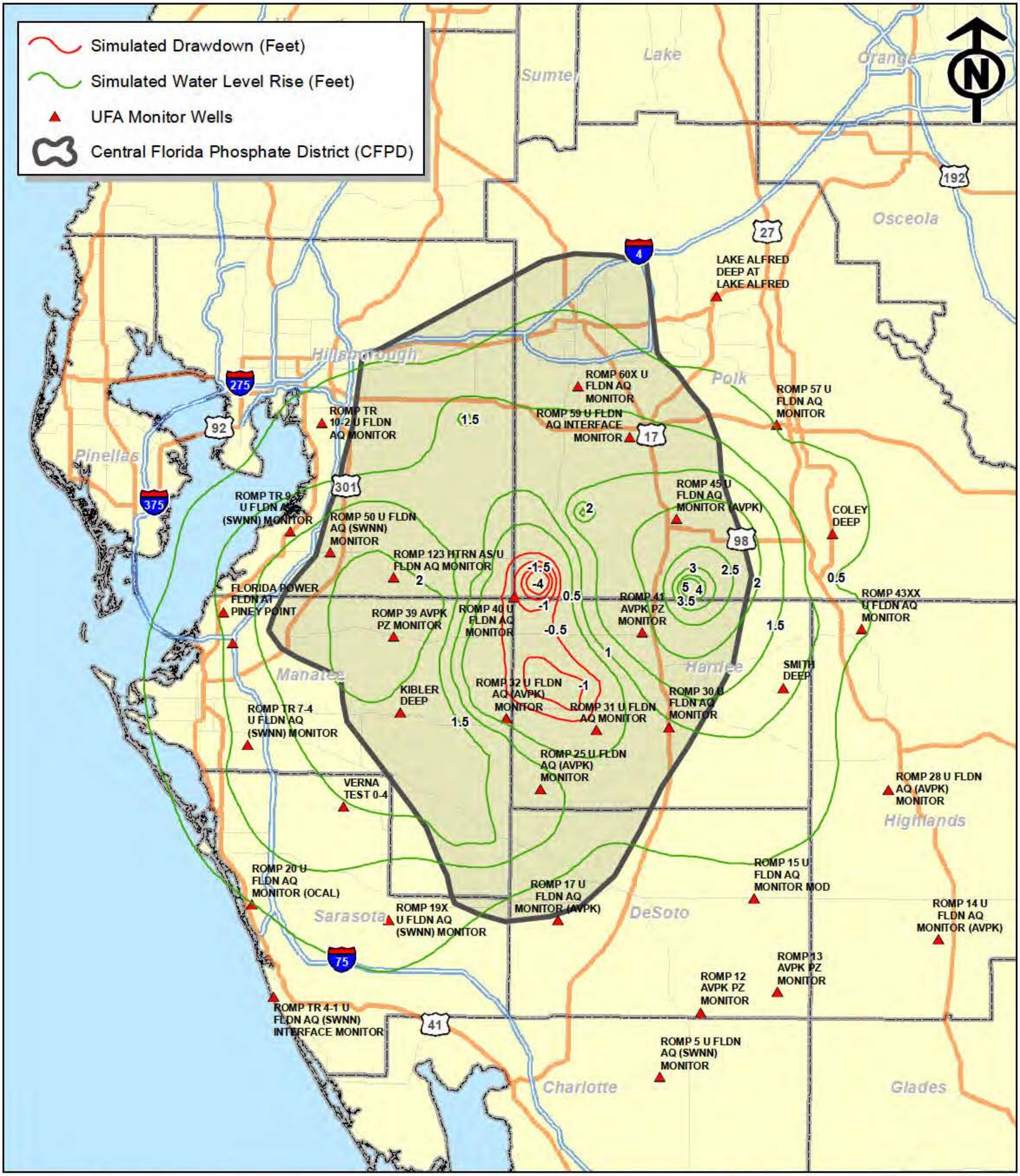
Figure 3-15
Simulated Water Level Change from 2010 to 2030B
IAS PZ-3 (Model Layer 3)

Progressive Water Resources
Integrated Water Resource Consultants



Scale: 1:800,000 11/28/2017 Image: N/A

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Figure 3-16
Simulated Water Level Change from 2010 to 2030B
UFA (Model Layer 4)

Progressive Water Resources
Integrated Water Resource Consultants

Attachment A

AEIS Appendix F

Figure 29 - 32

FIGURE 29
Simulated Water Change in SAS (Model Layer 1) Water Level (ft) 2010 to 2025B
Alternative 2, 3, 4, and 5 Mines with All Users with Agricultural Reductions
Central Florida Phosphate District, Florida

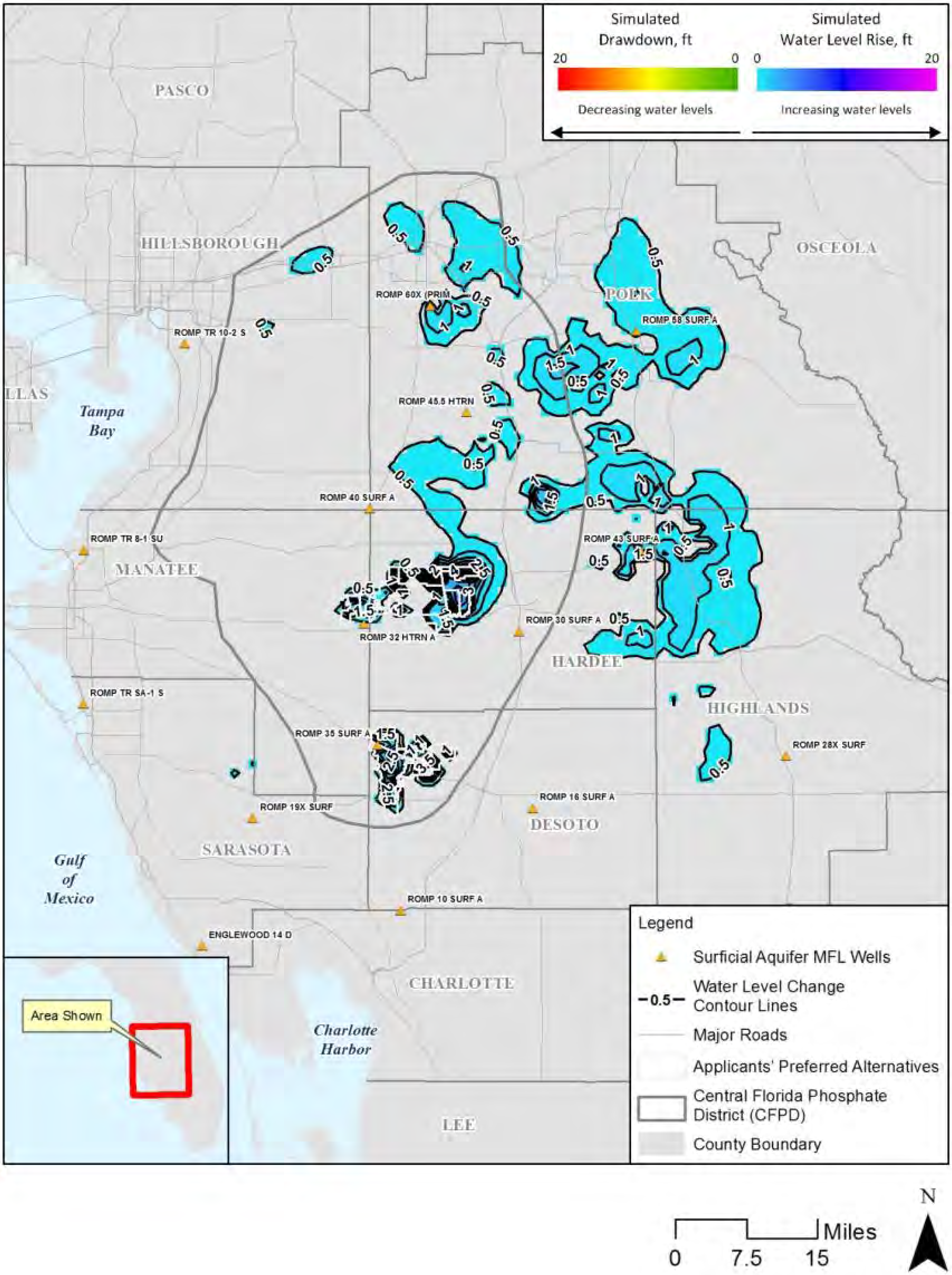


FIGURE 30
Simulated Water Change in IAS Zone 1 (Model Layer 2) Water Level (ft) 2010 to 2025B
Alternative 2, 3, 4 and 5 Mines with All Users with Agricultural Reductions
Central Florida Phosphate District, Florida

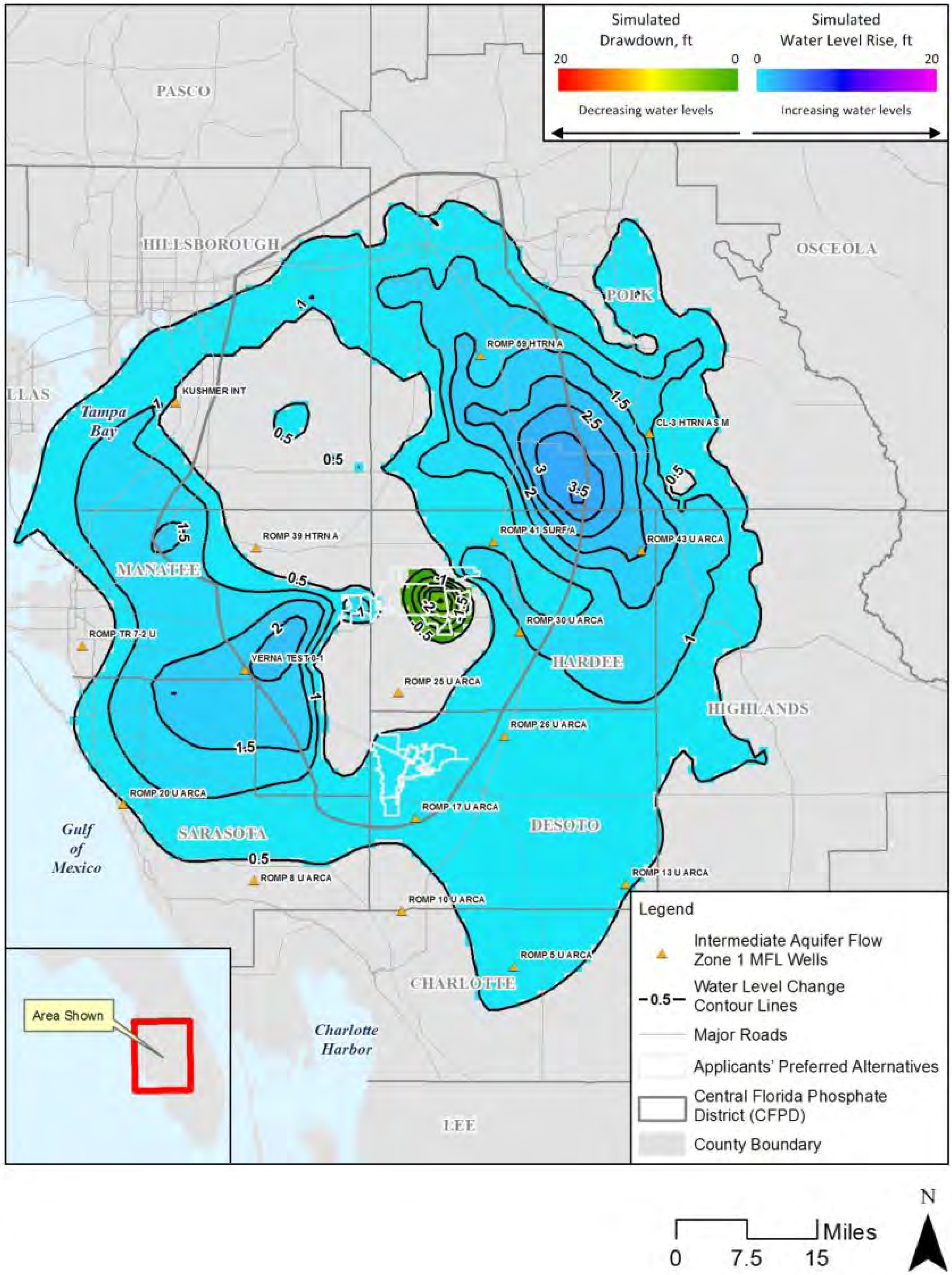


FIGURE 31
Simulated Water Change in IAS Zone 2 (Model Layer 3) Water Level (ft) 2010 to 2025B
Alternative 2, 3, 4, and 5 Mines with All Users with Agricultural Reductions
Central Florida Phosphate District, Florida

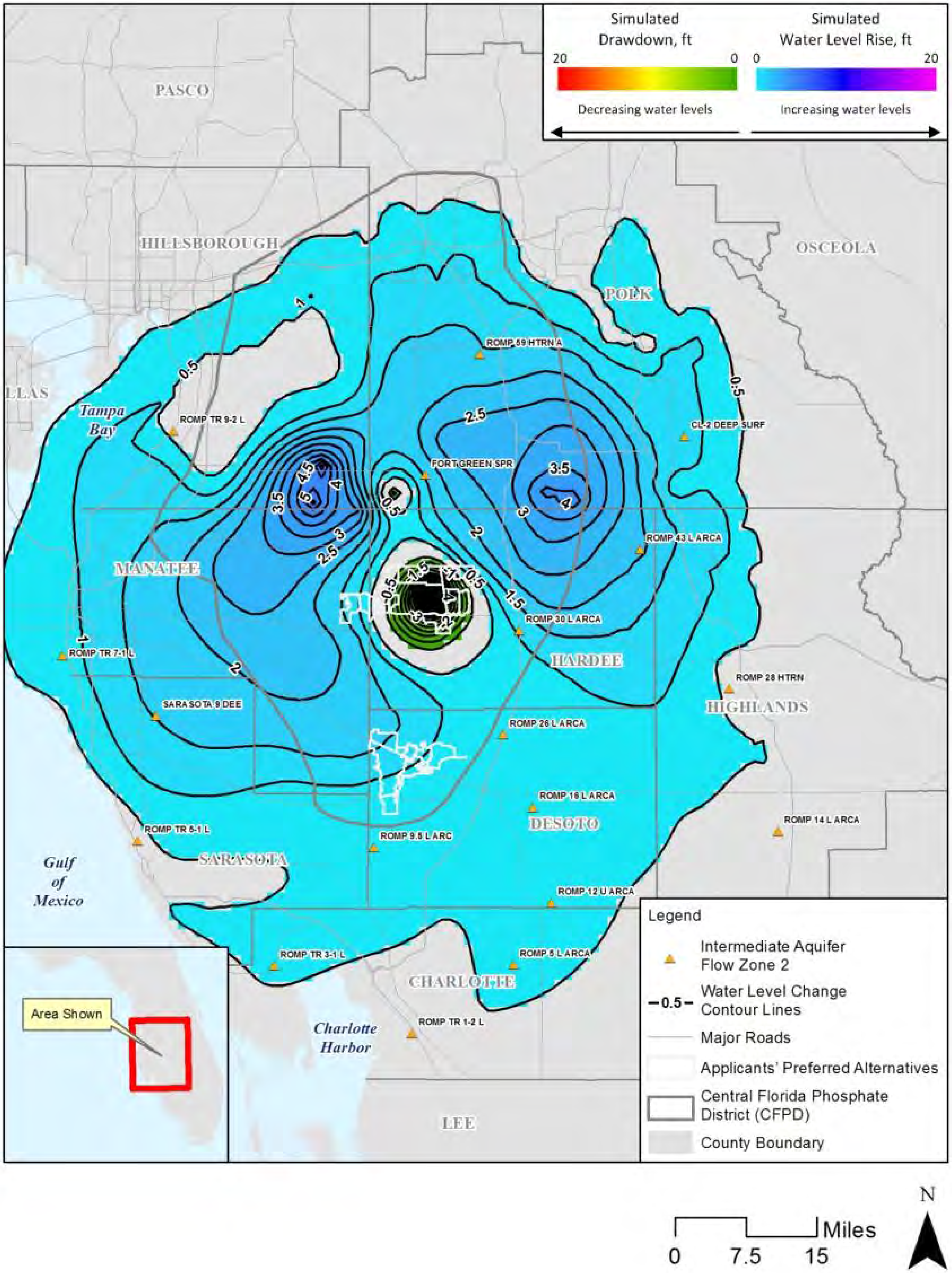
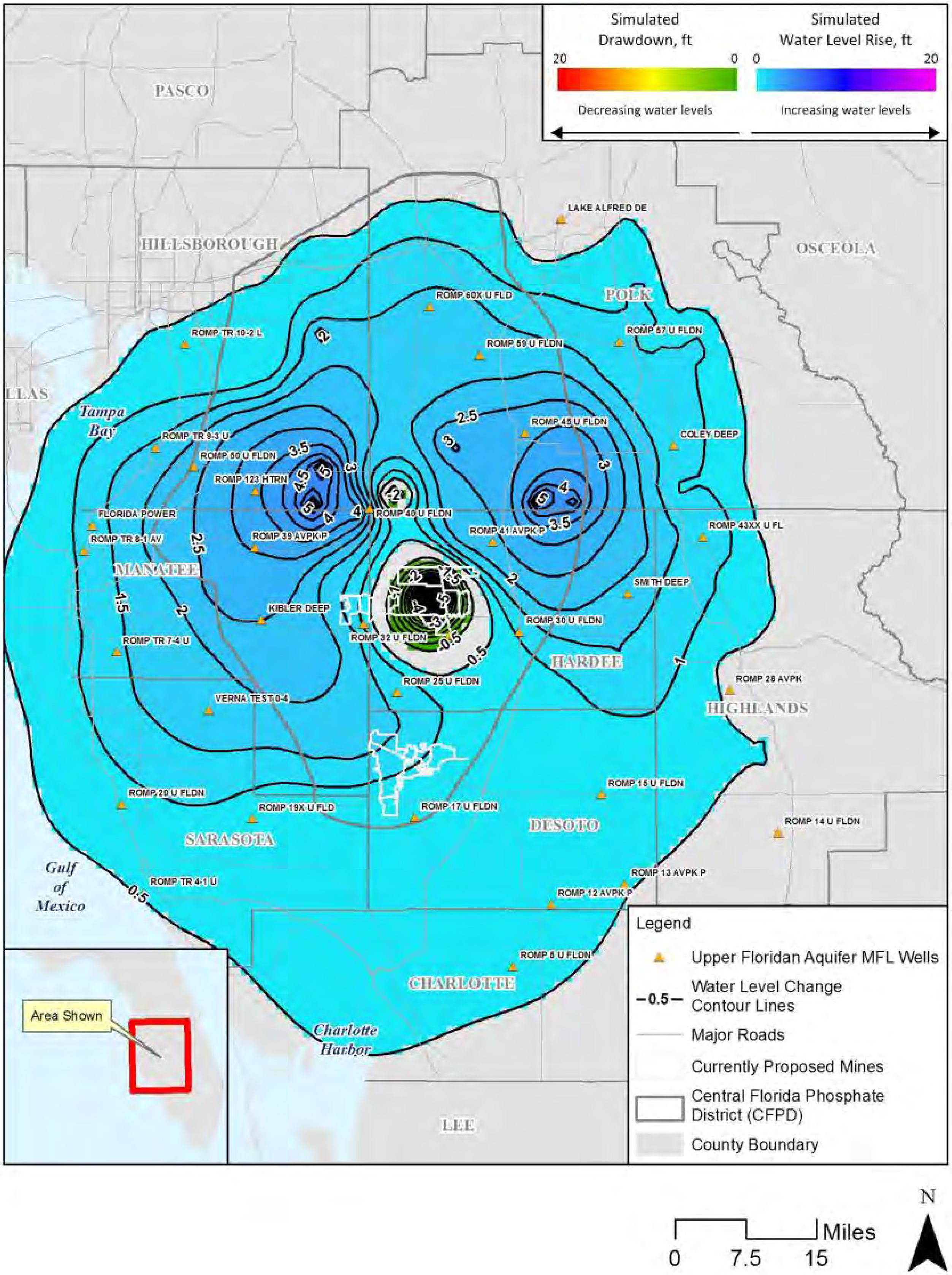


FIGURE 32
Simulated Water Change in Upper Floridan Aquifer (Model Layer 4) Water Level (ft) 2010 to 2025B
Alternative 2, 3, 4, and 5 Mines with All Users with Agricultural Reductions
Central Florida Phosphate District, Florida



Attachment B

AEIS Appendix F

Tables 22 - 25

TABLE 22

Simulated ROMP SAS Monitor Well Water Level Change Relative to 2010, Alternatives 2, 3, 4, and 5 (All Users with Agricultural Reduction) Layer 1

Central Florida Phosphate District, FL

		All Users Simulated Water Level Change Relative to 2010 (ft)														
Well	**SWIMAL Weight***	**2015A**	**2015B**	**2015C**	**2019A**	**2019B**	**2019C**	**2020A**	**2020B**	**2025A**	**2025B**	**2036A**	**2036B**	**2047A**	**2047B**	**2049**
ENGLEWOOD 14 DEEP	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ROMP 10 SURF AQ MONITOR	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ROMP 16 SURF AQ MONITOR	NA	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.03
ROMP 19X SURF AQ MONITOR	NA	0.02	0.01	0.02	0.03	0.02	0.03	0.03	0.03	0.05	0.04	0.06	0.05	0.07	0.07	0.09
ROMP 28X SURF AQ MONITOR	NA	0.03	0.02	0.02	0.05	0.04	0.04	0.05	0.04	0.07	0.07	0.08	0.08	0.08	0.08	0.09
ROMP 30 SURF AQ MONITOR	NA	0.03	0.02	0.02	0.05	0.04	0.04	0.03	0.00	0.06	0.05	0.08	0.07	0.11	0.10	0.15
ROMP 32 HTRN AS MONITOR	NA	0.01	0.01	0.01	0.16	0.17	0.16	0.55	0.53	0.37	0.36	1.45	1.44	1.78	1.77	1.27
ROMP 35 SURF AQ MONITOR	NA	0.00	0.00	0.00 -	0.00 -	0.00 -	0.00	0.00	0.00	0.20	0.20	0.31	0.31	0.00	0.00	0.01
ROMP 40 SURF AQ MONITOR	NA	0.11	0.00	0.07	0.15	0.05	0.10	0.38	0.30	0.20	0.16	0.54	0.50	0.74	0.70	0.89
ROMP 43 SURF AQ MONITOR REPL	NA	0.49	0.42	0.17	0.75	0.65	0.42	0.79	0.38	1.70	1.62	1.99	1.91	2.35	2.27	2.68
ROMP 45.5 HTRN CU MONITOR	NA	0.09	0.07	0.05	0.12	0.09	0.08	0.16	0.10	0.21	0.20	0.30	0.29	0.38	0.37	0.45
ROMP 58 SURF AQ MONITOR	NA	0.23	0.21	0.18	0.38	0.35	0.33	0.44	0.37	0.66	0.65	0.74	0.73	0.82	0.80	0.88
ROMP 60X (PRIM SC06) SURF AQ MONITOR	NA	0.43	0.27	0.26	0.59	0.41	0.41	0.89	0.67	1.02	0.95	1.43	1.36	1.73	1.67	1.96
ROMP TR 10-2 SURF AQ MONITOR	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ROMP TR 8-1 SURF AQ MONITOR	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ROMP TR SA-1 SURF	NA	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02

Note:

* If well is used for SWIMAL calculation, the SWIMAL weight is used to calculate simulated change in SWIMAL

TABLE 23

Simulated ROMP IAS Zone 1 Target Water Level Change Relative to 2010, Alternatives 2, 3, 4, and 5 (All Users with Agricultural Reduction) Layer 2

Central Florida Phosphate District, FL

Well	SWIMAL Weight*	All Users Simulated Water Level Change Relative to 2010 (ft)														
		2015A	2015B	2015C	2019A	2019B	2019C	2020A	2020B	2025A	2025B	2036A	2036B	2047A	2047B	2049
CL-3 HTRN AS MONITOR	NA	0.36	0.31	0.19	0.56	0.50	0.39	0.63	0.42	1.18	1.14	1.35	1.31	1.54	1.50	1.70
KUSHMER INT	NA	0.09	0.04	0.07	0.15	0.10	0.13	0.26	0.24	0.30	0.29	0.37	0.35	0.44	0.43	0.50
ROMP 10 U ARCA AQ MONITOR 2	NA	0.09	0.07	0.07	0.15	0.13	0.14	0.14	0.11	0.22	0.20	0.25	0.24	0.30	0.29	0.37
ROMP 13 U ARCA AQ MONITOR	NA	0.23	0.20	0.20	0.39	0.36	0.36	0.36	0.29	0.58	0.54	0.65	0.60	0.77	0.73	0.94
ROMP 17 U ARCA AQ MONITOR	NA	0.25	0.21	0.22	0.43	0.39	0.39	0.40	0.31	0.73	0.67	0.84	0.79	0.88	0.83	1.09
ROMP 20 U ARCA AQ MONITOR	NA	0.18	0.12	0.16	0.31	0.25	0.28	0.41	0.35	0.52	0.49	0.62	0.58	0.82	0.78	0.96
ROMP 25 U ARCA AQ MONITOR	NA	0.10	0.08	0.08	0.17	0.14	0.15	0.07	0.00	0.24	0.19	0.34	0.29	0.35	0.30	0.54
ROMP 26 U ARCA AQ MONITOR	NA	0.40	0.34	0.33	0.67	0.61	0.61	0.56	0.40	0.95	0.85	1.10	0.99	1.35	1.25	1.74
ROMP 30 U ARCA AQ MONITOR	NA	0.60	0.48	0.37	0.95	0.80	0.71	0.51	0.03	1.24	0.98	1.62	1.36	2.24	1.99	3.20
ROMP 39 HTRN AS MONITOR	NA	0.07	0.04	0.06	0.12	0.09	0.11	0.19	0.17	0.23	0.21	0.28	0.26	0.37	0.35	0.43
ROMP 41 SURF AQ MONITOR	NA	0.44	0.31	0.17	0.58	0.42	0.30	0.46	0.00	1.09	0.91	1.34	1.15	2.14	1.96	2.81
ROMP 43 U ARCA AQ MONITOR	NA	0.62	0.52	0.21	0.95	0.81	0.53	0.99	0.48	2.14	2.03	2.51	2.40	2.96	2.85	3.37
ROMP 5 U ARCA AQ MONITOR	NA	0.25	0.22	0.22	0.43	0.39	0.40	0.40	0.31	0.64	0.59	0.72	0.67	0.87	0.82	1.07
ROMP 59 HTRN AS MONITOR 1	NA	0.61	0.41	0.36	0.83	0.60	0.56	1.21	0.86	1.49	1.38	2.13	2.02	2.65	2.55	3.06
ROMP 8 U ARCA AQ MONITOR	NA	0.16	0.12	0.14	0.27	0.23	0.25	0.29	0.24	0.42	0.39	0.49	0.46	0.62	0.59	0.75
ROMP TR 7-2 U ARCA AQ MONITOR	NA	0.02	0.01	0.01	0.03	0.02	0.02	0.04	0.03	0.05	0.04	0.06	0.05	0.07	0.07	0.09
VERNA TEST 0-1	NA	0.73	0.45	0.64	1.24	0.95	1.12	1.72	1.47	2.12	1.95	2.60	2.42	3.61	3.44	4.26

Note:
* If well is used for SWIMAL calculation, the SWIMAL weight is used to calculate simulated change in SWIMAL

TABLE 24

Simulated ROMP IAS Zone 2 Target Water Level Change Relative to 2010, Alternatives 2, 3, 4, and 5 (All Users with Agricultural Reduction) Layer 3

Central Florida Phosphate District, FL

		All Users Simulated Water Level Change Relative to 2010 (ft)														
Well	**SWIMAL Weight***	**2015A**	**2015B**	**2015C**	**2019A**	**2019B**	**2019C**	**2020A**	**2020B**	**2025A**	**2025B**	**2036A**	**2036B**	**2047A**	**2047B**	**2049**
CL-2 DEEP SURF AQ MONITOR	NA	0.38	0.34	0.25	0.62	0.57	0.49	0.69	0.54	1.20	1.17	1.33	1.30	1.47	1.44	1.58
FORT GREEN SPRINGS INT	NA	1.14	0.68	0.64	1.50	0.99	0.95	2.17	1.40	1.86	1.58	3.95	3.67	5.37	5.09	6.44
ROMP 12 U ARCA AQ MONITOR	NA	0.30	0.26	0.26	0.51	0.47	0.47	0.47	0.37	0.76	0.70	0.85	0.79	1.02	0.96	1.26
ROMP 14 L ARCA AQ MONITOR	NA	0.07	0.07	0.07	0.13	0.12	0.12	0.12	0.10	0.20	0.19	0.21	0.20	0.25	0.24	0.29
ROMP 16 L ARCA AQ MONITOR	NA	0.33	0.29	0.29	0.57	0.53	0.52	0.51	0.40	0.84	0.77	0.95	0.88	1.14	1.07	1.42
ROMP 26 L ARCA AQ MONITOR	NA	0.40	0.34	0.33	0.67	0.61	0.61	0.56	0.40	0.95	0.85	1.10	0.99	1.35	1.25	1.73
ROMP 28 HTRN	NA	0.13	0.12	0.10	0.22	0.20	0.19	0.22	0.18	0.37	0.35	0.40	0.38	0.45	0.43	0.50
ROMP 30 L ARCA AQ MONITOR	NA	0.65	0.52	0.40	1.03	0.87	0.76	0.58	0.06	1.37	1.10	1.79	1.52	2.46	2.19	3.48
ROMP 43 L ARCA AQ MONITOR	NA	0.62	0.53	0.21	0.96	0.82	0.54	1.00	0.48	2.16	2.05	2.54	2.43	2.99	2.88	3.41
ROMP 5 L ARCA AQ MONITOR	NA	0.25	0.22	0.22	0.43	0.40	0.40	0.40	0.32	0.64	0.59	0.73	0.67	0.88	0.82	1.08
ROMP 59 HTRN AS MONITOR 2	NA	0.69	0.46	0.41	0.94	0.68	0.63	1.37	0.98	1.68	1.56	2.41	2.29	3.00	2.88	3.46
ROMP 9.5 L ARCA AQ MONITOR (MW-2)	NA	0.32	0.28	0.28	0.56	0.50	0.51	0.53	0.42	0.83	0.76	0.94	0.87	1.15	1.09	1.42
ROMP TR 1-2 L ARCA AQ MONITOR	NA	0.06	0.05	0.06	0.11	0.10	0.10	0.10	0.08	0.16	0.15	0.19	0.17	0.23	0.21	0.28
ROMP TR 3-1 L ARCA AQ MONITOR 2	NA	0.23	0.19	0.20	0.40	0.35	0.36	0.39	0.32	0.60	0.55	0.69	0.64	0.85	0.80	1.03
ROMP TR 5-1 L ARCA AQ MONITOR	NA	0.17	0.12	0.15	0.28	0.23	0.26	0.36	0.31	0.47	0.44	0.56	0.53	0.73	0.70	0.87
ROMP TR 7-1 L ARCA AQ INTERFACE MONITOR	8.84%	0.29	0.18	0.26	0.50	0.38	0.45	0.74	0.66	0.91	0.86	1.09	1.03	1.42	1.36	1.63
ROMP TR 9-2 L ARCA AQ MONITOR	NA	0.11	0.06	0.10	0.19	0.13	0.17	0.33	0.30	0.38	0.36	0.46	0.44	0.56	0.54	0.63
SARASOTA 9 DEEP	8.66%	0.55	0.35	0.49	0.94	0.73	0.85	1.31	1.13	1.63	1.51	1.96	1.85	2.64	2.52	3.09

Note:

* If well is used for SWIMAL calculation, the SWIMAL weight is used to calculate simulated change in SWIMAL

TABLE 25

Simulated ROMP UFA Target Water Level Change Relative to 2010, Alternatives 2, 3, 4, and 5 (All Users with Agricultural Reduction) Layer 4

Central Florida Phosphate District, FL

		All Users Simulated Water Level Change Relative to 2010 (ft)														
Well	**SWIMAL Weight***	**2015A**	**2015B**	**2015C**	**2019A**	**2019B**	**2019C**	**2020A**	**2020B**	**2025A**	**2025B**	**2036A**	**2036B**	**2047A**	**2047B**	**2049**
COLEY DEEP	NA	0.41	0.37	0.26	0.66	0.61	0.51	0.74	0.56	1.32	1.28	1.47	1.44	1.64	1.60	1.78
FLORIDA POWER FLDN AT PINEY POINT	NA	0.40	0.24	0.36	0.69	0.52	0.62	1.08	0.98	1.31	1.24	1.55	1.48	1.95	1.88	2.21
KIBLER DEEP	14.01%	0.92	0.53	0.80	1.56	1.14	1.39	2.28	1.94	2.73	2.50	3.39	3.16	4.81	4.58	5.68
LAKE ALFRED DEEP AT LAKE ALFRED	NA	0.12	0.11	0.10	0.20	0.18	0.17	0.25	0.21	0.34	0.33	0.40	0.39	0.44	0.43	0.48
ROMP 12 AVPK PZ MONITOR	NA	0.30	0.26	0.26	0.51	0.47	0.47	0.47	0.37	0.76	0.70	0.85	0.79	1.03	0.96	1.26
ROMP 123 HTRN AS/U FLDN AQ MONITOR	9.55%	0.90	0.22	0.75	1.49	0.78	1.25	3.38	3.05	3.59	3.40	4.49	4.30	5.54	5.35	6.27
ROMP 13 AVPK PZ MONITOR	NA	0.23	0.21	0.20	0.40	0.37	0.37	0.37	0.29	0.60	0.55	0.67	0.62	0.80	0.75	0.97
ROMP 14 U FLDN AQ MONITOR (AVPK)	NA	0.07	0.07	0.07	0.13	0.12	0.12	0.12	0.10	0.20	0.19	0.21	0.20	0.25	0.24	0.29
ROMP 15 U FLDN AQ MONITOR MOD	NA	0.34	0.30	0.29	0.58	0.54	0.53	0.52	0.41	0.86	0.79	0.96	0.89	1.14	1.08	1.40
ROMP 17 U FLDN AQ MONITOR (AVPK)	NA	0.34	0.29	0.30	0.59	0.53	0.54	0.54	0.42	0.86	0.79	0.98	0.91	1.19	1.12	1.48
ROMP 19X U FLDN AQ MONITOR (SWNN)	NA	0.35	0.28	0.31	0.61	0.53	0.56	0.65	0.53	0.94	0.86	1.09	1.01	1.39	1.32	1.68
ROMP 20 U FLDN AQ MONITOR (OCAL)	NA	0.27	0.18	0.24	0.46	0.37	0.42	0.60	0.52	0.77	0.72	0.92	0.86	1.21	1.16	1.42
ROMP 25 U FLDN AQ MONITOR	NA	0.84	0.60	0.72	1.41	1.16	1.27	1.15	0.70	1.72	1.39	2.23	1.89	3.36	3.02	4.63
ROMP 28 AVPK	NA	0.13	0.12	0.11	0.22	0.21	0.20	0.23	0.19	0.38	0.36	0.41	0.40	0.46	0.45	0.52
ROMP 30 U FLDN AQ MONITOR	NA	0.65	0.52	0.40	1.03	0.87	0.76	0.58	0.06	1.38	1.11	1.79	1.52	2.46	2.19	3.49
ROMP 31 U FLDN AQ MONITOR	NA	0.73	0.51	0.52	1.16	0.91	0.93	0.82	1.79	0.20	0.97	0.44	0.32	1.68	0.91	4.58
ROMP 32 U FLDN AQ MONITOR (AVPK)	NA	1.01	0.50	0.78	1.63	1.07	1.35	1.31	0.47	1.57	0.94	2.70	2.08	5.41	4.79	7.78
ROMP 39 AVPK PZ MONITOR	NA	0.95	0.40	0.81	1.58	1.01	1.38	2.91	2.57	3.25	3.04	4.05	3.84	5.32	5.11	6.14
ROMP 40 U FLDN AQ MONITOR	NA	1.01	0.17	0.66	1.49	0.27	1.00	4.26	3.51	2.80	2.39	5.76	5.34	7.74	7.32	9.32
ROMP 41 AVPK PZ MONITOR	NA	1.11	0.80	0.41	1.52	1.12	0.78	1.52	0.48	2.72	2.37	3.95	3.60	5.53	5.19	6.83
ROMP 43XX U FLDN AQ MONITOR	NA	0.43	0.40	0.31	0.72	0.68	0.60	0.79	0.64	1.35	1.32	1.47	1.43	1.60	1.57	1.73
ROMP 45 U FLDN AQ MONITOR (AVPK)	NA	1.13	0.86	0.43	1.50	1.15	0.76	1.78	0.86	3.08	2.86	4.15	3.92	5.25	5.03	6.11
ROMP 5 U FLDN AQ MONITOR (SWNN)	NA	0.25	0.22	0.22	0.43	0.40	0.40	0.40	0.32	0.65	0.59	0.73	0.67	0.88	0.82	1.08
ROMP 50 U FLDN AQ MONITOR (SWNN)	13.25%	0.70	0.32	0.60	1.18	0.79	1.04	2.19	1.98	2.48	2.36	3.01	2.89	3.71	3.58	4.17

TABLE 25

Simulated ROMP UFA Target Water Level Change Relative to 2010, Alternatives 2, 3, 4, and 5 (All Users with Agricultural Reduction) Layer 4

Central Florida Phosphate District, FL

		All Users Simulated Water Level Change Relative to 2010 (ft)														
Well	**SWIMAL Weight***	**2015A**	**2015B**	**2015C**	**2019A**	**2019B**	**2019C**	**2020A**	**2020B**	**2025A**	**2025B**	**2036A**	**2036B**	**2047A**	**2047B**	**2049**
ROMP 57 U FLDN AQ MONITOR	NA	0.40	0.35	0.28	0.63	0.56	0.51	0.75	0.59	1.16	1.12	1.34	1.31	1.53	1.49	1.67
ROMP 59 U FLDN AQ INTERFACE MONITOR	NA	0.77	0.52	0.46	1.05	0.76	0.71	1.54	1.10	1.89	1.75	2.70	2.57	3.37	3.24	3.89
ROMP 60X U FLDN AQ MONITOR	NA	0.70	0.44	0.43	0.96	0.68	0.66	1.49	1.10	1.71	1.59	2.49	2.37	3.10	2.98	3.57
ROMP TR 10-2 L ARCA AQ MONITOR	5.41%	0.18	0.07	0.15	0.30	0.19	0.25	0.60	0.54	0.65	0.62	0.83	0.79	0.99	0.96	1.11
ROMP TR 4-1 U FLDN AQ INTERFACE MONITOR	NA	0.20	0.14	0.17	0.33	0.28	0.31	0.42	0.35	0.55	0.51	0.65	0.61	0.85	0.81	1.00
ROMP TR 7-4 U FLDN AQ MONITOR (SWNN)	13.54%	0.48	0.30	0.43	0.82	0.63	0.75	1.21	1.06	1.48	1.38	1.77	1.68	2.34	2.25	2.71
ROMP TR 8-1 AVPK PZ MONITOR	14.08%	0.35	0.21	0.31	0.60	0.46	0.55	0.94	0.84	1.14	1.07	1.35	1.29	1.71	1.65	1.95
ROMP TR 9-3 U FLDN AQ MONITOR (SWNN)	7.17%	0.50	0.26	0.43	0.84	0.60	0.75	1.46	1.32	1.70	1.62	2.04	1.96	2.49	2.41	2.80
SMITH DEEP	NA	0.58	0.50	0.24	0.91	0.78	0.56	0.92	0.47	1.92	1.81	2.25	2.14	2.68	2.57	3.09
VERNA TEST 0-4	5.50%	0.65	0.42	0.58	1.12	0.87	1.01	1.54	1.33	1.92	1.78	2.32	2.18	3.16	3.01	3.71
Simulated Change in SWIMAL, ft		0.58	0.30	0.50	0.98	0.69	0.87	1.63	1.44	1.90	1.78	2.32	2.20	3.01	2.89	3.46

Note:

* If well is used for SWIMAL calculation, the SWIMAL weight is used to calculate simulated change in SWIMAL

Attachment C

AEIS Appendix F

Table 26

change under steady-state conditions. Table 26 presents the quantity of wells from the model wellfield found within each drawdown contour. The wells are listed by water level changes in 1-foot increments. The numbers in the table are cumulative; for example, Column 1 wells will have 1 foot or greater drawdown. Column 2 shows the number of wells listed in Column 1 that may experience greater than 2 feet of drawdown. Columns 3 and 4 are the number of wells from Column 1 that may experience 3 or 4 feet of drawdown.

Table 26 shows that very few wells are likely to experience more than several feet of drawdown, and then only under certain modeling scenarios. With all users and with mining withdrawals included, the number of wells experiencing drawdown of more than 3 feet is highest in scenario 2020B, which is one of the flexible pumping scenarios. Because the flexible pumping amounts can only be pumped for short periods of time, these water level changes are not likely to occur because it takes weeks or months for water level changes in the UFA to expand outward from the pumping wells. With the mines pumping and all other users at 2010 rates, the two scenarios with the highest number of wells with drawdown of more than 3 feet occur in 2020B and 2025B, both of which are flexible pumping scenarios.

TABLE 26
Quantity of Wells Within Drawdown Contours[1]
Central Florida Phosphate District, Florida

	Greater than 1 ft Drawdown				Greater than 2 ft Drawdown				Greater than 3 ft Drawdown				Greater than 4 ft Drawdown			
	No. of wells in Layer:				No. of wells in Layer:				No. of wells in Layer:				No. of wells in Layer:			
Scenario	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
2015Alt1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2020Alt1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2025Alt1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2030Atl1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2015MonlyAlt1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2020MonlyAlt1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2025MonlyAlt1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2030MonlyAlt1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2015Alt2A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2015Alt2B[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2015Alt2C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2019Alt2A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2019Alt2B[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2019Alt2C[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2020Alt2A	0	2	3	10	0	0	0	5	0	0	0	2	0	0	0	0
2020Alt2B[1]	0	11	14	69	0	3	3	13	0	0	1	6	0	0	0	2
2025Alt2A	0	0	0	5	0	0	0	2	0	0	0	0	0	0	0	0
2025Alt2B[1]	0	2	3	16	0	0	0	7	0	0	0	2	0	0	0	0
2036Alt2A[1]	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
2036Alt2B[1]	0	0	0	6	0	0	0	2	0	0	0	0	0	0	0	0

TABLE 26
Quantity of Wells Within Drawdown Contours[1]
Central Florida Phosphate District, Florida

	Greater than 1 ft Drawdown				Greater than 2 ft Drawdown				Greater than 3 ft Drawdown				Greater than 4 ft Drawdown			
	No. of wells in Layer:				No. of wells in Layer:				No. of wells in Layer:				No. of wells in Layer:			
Scenario	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
2047Alt2A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2047Alt2B[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2049Alt2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2015Alt2AMonly	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2015Alt2BMonly[1]	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0
2015Alt2CMonly	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2019Alt2AMonly	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2019Alt2BMonly[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2019Alt2CMonly[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2020Alt2AMonly	0	11	17	107	0	2	3	13	0	0	0	5	0	0	0	2
2020Alt2BMonly[1]	0	23	32	245	0	11	15	93	0	3	3	16	0	0	1	6
2025Alt2AMonly	0	5	13	76	0	0	1	15	0	0	0	5	0	0	0	2
2025Alt2BMonly[1]	0	10	22	185	0	2	5	35	0	0	1	15	0	0	0	5
2036Alt2AMonly	0	0	1	14	0	0	0	5	0	0	0	2	0	0	0	0
2036Alt2BMonly[1]	0	8	14	65	0	0	1	14	0	0	0	5	0	0	0	2
2047Alt2AMonly	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2047Alt2BMonly[1]	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0
2049Alt2Monly	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Layer 1 = SAS, Layer 2 = IAS Zone 1, Layer 3 = IAS Zone 2, and Layer 4 = UFA

[1] Because the flexible pumping amounts can only be pumped for short periods of time, these water level changes in nearby ROMP wells are not likely to occur.

6.4 Impact to Surface Waters Used for Public Water Supply

The 2010 SWFWMD Water Supply Plan summarizes the surface water available to help meet public supply demand for each watershed (SWFWMD, 2010). An evaluation of the changes in available surface water was performed using permitted withdrawals from surface waters and the estimated available quantities; both are provided by SWFWMD in the 2010 Water Supply Plan. SWFWMD estimates that there is approximately an additional 80 mgd available from the Peace River, 18 mgd from the Alafia River, 41 mgd from the Myakka River, and 93 mgd from the Withlacoochee River. Table 27 shows the river flow, permitted withdrawals, actual use, and potentially available withdrawals obtained from the SWFWMD.