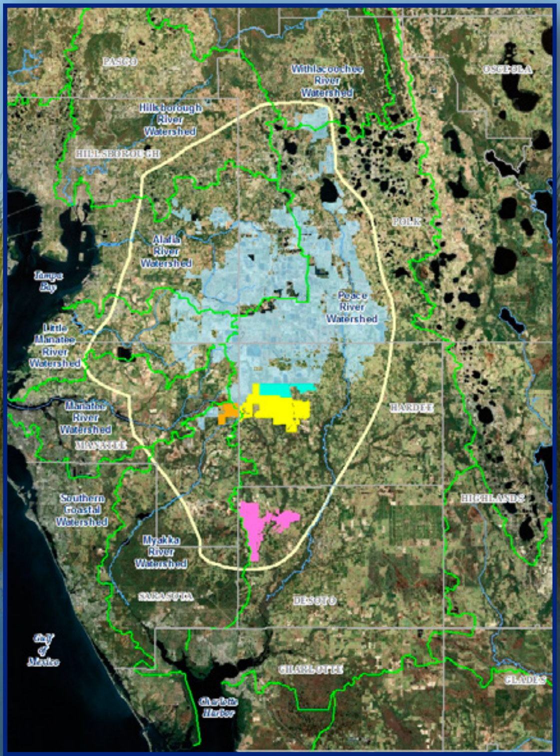
Appendix F
Groundwater Impact Analysis for the Final AEIS on Phosphate Mining in the CFPD



Groundwater Impact Analysis for the Final AEIS on Phosphate Mining in the CFPD

PREPARED FOR: U.S. Army Corps of Engineers, Jacksonville District

COPY TO: U.S. Environmental Protection Agency
Florida Department of Environmental Protection

PREPARED BY: CH2M HILL

DATE: March 1, 2013

PROJECT NUMBER: 418237.07.01

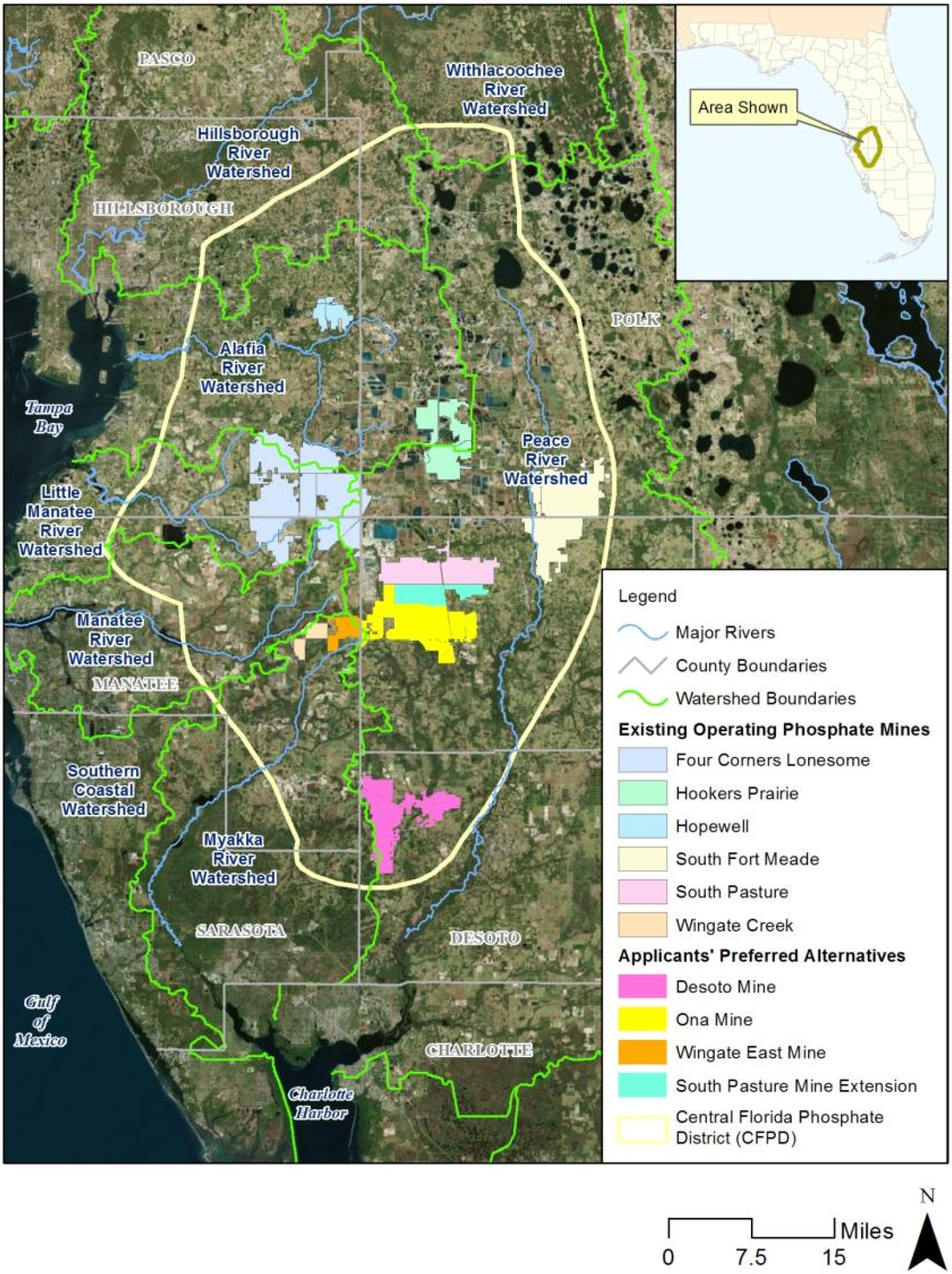
1.0 Introduction

This technical memorandum (TM) documents the development and application of a groundwater flow model to evaluate potential changes in Floridan aquifer water levels associated with anticipated mining water supply withdrawals from the aquifer to support the No Action Alternative, as defined in Chapter 2, and each of the Applicants' Preferred Alternatives, which if all were permitted would add four phosphate mine projects (Desoto [Alternative 2], Ona [Alternative 3], Wingate East [Alternative 4], and South Pasture Mine Extension [Alternative 5]) that would progressively begin operations after the currently operating mines are closed. Figure 1 shows the location of the study area, the six currently operating mines, and the four proposed mine projects that comprise the Applicants' Preferred Alternatives. Two Offsite Alternatives (Pine Level/Keys Tract [Alternative 6] and Pioneer Tract [Alternative 7]) which are considered reasonably foreseeable future mines for cumulative impacts analysis, were not modeled because their water supplies are expected to be from existing wellfields at the Desoto and Ona Mines. Drawdown impacts are expected to remain the same as those of the existing wellfields except the pumping will extent further into the future. The other Offsite Alternatives (A-2 [Alternative 8] and W-2 [Alternative 9]) were not modeled since no water supply plans were available to model. The magnitude of drawdown for each of these would be expected to be similar to the existing mines and gives a general perspective of any new wellfield impacts.

The purpose of the modeling discussed in this TM is 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 the past events as evaluated to include current conditions and the Applicants' Preferred Alternatives. In the process of the modeling analyses, CH2M HILL evaluated a No Action Alternative—equating to none of the proposed mines receiving their requested Clean Water Act (CWA) Section 404 permits from the U.S. Army Corps of Engineers (USACE)—along with the potential effects of the Applicants' Preferred Alternatives.

The groundwater flow model developed to support the USACE Areawide Environmental Impact Statement (AEIS) evaluations was designed to evaluate the impact of the Applicants' Preferred Alternatives on groundwater levels in the Floridan Aquifer System (FAS). The model was based on the Southwest Florida Water Management District (SWFWMD) District-Wide Regulatory Model Version 2 (DWRM2.1), which is a MODFLOW (Harbaugh et al., 2000) model used by SWFWMD to evaluate groundwater use in the District for water resource evaluation and water supply permitting. Additional information on the development and calibration of the DWRM2.1 model can be found in its documentation (Environmental Simulations Inc. [ESI], 2007). The horizontal grid spacing of the DWRM2.1 is 5,000 by 5,000 feet; using the telescopic mesh refinement (TMR) process, the user can build smaller-scale and more refined-mesh models if doing so meets the project requirements. The modeling done for the draft AEIS used a TMR extraction; however, during the review process it was found that the model boundaries were influencing the drawdown contour lines (boundary effects), primarily along the east side of the model. For the final AEIS and this TM, the entire model domain was used; not a TMR extraction.

FIGURE 1
Location of the AEIS Study Area and the Six Existing Mines (No Action Alternative) and the Applicants' Preferred Alternatives 2, 3, 4, and 5)
Central Florida Phosphate District, Florida



Groundwater withdrawals associated with each of these mines have been evaluated by Mosaic Fertilizer LLC and CF Industries, Inc. (collectively, the "Applicants") using DWRM2.1 as part of the SWFWMD consumptive use permitting process. The groundwater modeling discussed herein is different than groundwater modeling previously conducted by the Applicants in that the modeling performed by each Applicant evaluated the impact associated with only that Applicant's proposed allocation relative to its current allocation. For the purposes of the modeling done for this TM, both Applicants' groundwater withdrawals were simulated for existing conditions (2010 explained later in this TM) and modified to reflect future conditions through the life of the existing and Applicants' Preferred Alternative mines. In accordance with how SWFWMD evaluates proposed changes to water use permit (WUP) water allocations, no changes were made to groundwater withdrawals of other water users with the exception of agricultural use. Agricultural uses were left unchanged for the mining only model scenarios so only the mining withdrawals changed over time. Agricultural uses were reduced for the cumulative model scenarios to account for the reductions anticipated by the Southern Water Use Caution Area (SWUCA) Recovery Strategy (SWFWMD, 2006b).

It is acknowledged that the above-mentioned groundwater modeling previously performed by each Applicant was consistent with the SWFWMD WUP process and Florida Statutes. Through that process, SWFWMD determined that the Applicants' future withdrawals will not cause adverse impacts to existing legal users, minimum flows and levels (MFLs), and other water resources. The simulations discussed herein should not be compared directly with those previously performed to support the WUP process, as the model domains, components, and objectives were different. While the simulations discussed herein are not identical to those performed to support the SWFWMD WUP process, the conclusions of the groundwater modeling conducted herein are similar to, and generally consistent with the WUP related findings of the SWFWMD.

2.0 Conceptual Model

2.1 Aquifer Systems

The hydrogeology of the Central Florida Phosphate District (CFPD) and the surrounding area consists of three primary aquifer systems: the SAS, the IAS, and the FAS.

2.1.1 Surficial Aquifer System

The top of the SAS is found at the top of the water table, and has a thickness of 25 to 50 feet over most of the study area (Florida Geological Survey, 2008, Plate 55). The SAS is composed of sand, silt, and carbonate sediments. It is generally unconfined, except for localized areas with lower permeability sediments that may be semi-confined or confined (Florida Geological Survey , 2008). The SAS is recharged through infiltration and percolation of rainfall and water from surface water bodies.

2.1.2 Intermediate Aquifer System

The IAS is composed of lower-permeability sediments between the SAS and the UFA. The sediments are primarily sand, silt, and clay in which laterally continuous higher-permeability intervals serve as local aquifers that are considered the IAS. The IAS is represented by two layers in the model; Layer 2 is Permeable Zone 1, and Layer 3 is Permeable Zone 2.

2.1.3 Floridan Aquifer System

The FAS is a regional carbonate aquifer system that is present throughout peninsular Florida, southern Georgia, and Alabama. The carbonates include interbedded limestone, dolostone, and dolomite with well developed permeability in distinct horizontal beds that are divided into the upper and lower intervals of the FAS. The FAS is recharged through infiltration and percolation of rainfall and water from surface water bodies in north-central Florida, where it is exposed at land surface and unconfined. Further south, the FAS is overlain by the IAS and surficial sediments, and it becomes a confined aquifer. In these areas, recharge and discharge to and from the FAS are at rates lower than in areas where the FAS is unconfined.

2.2 Conceptual Model of Groundwater Flow

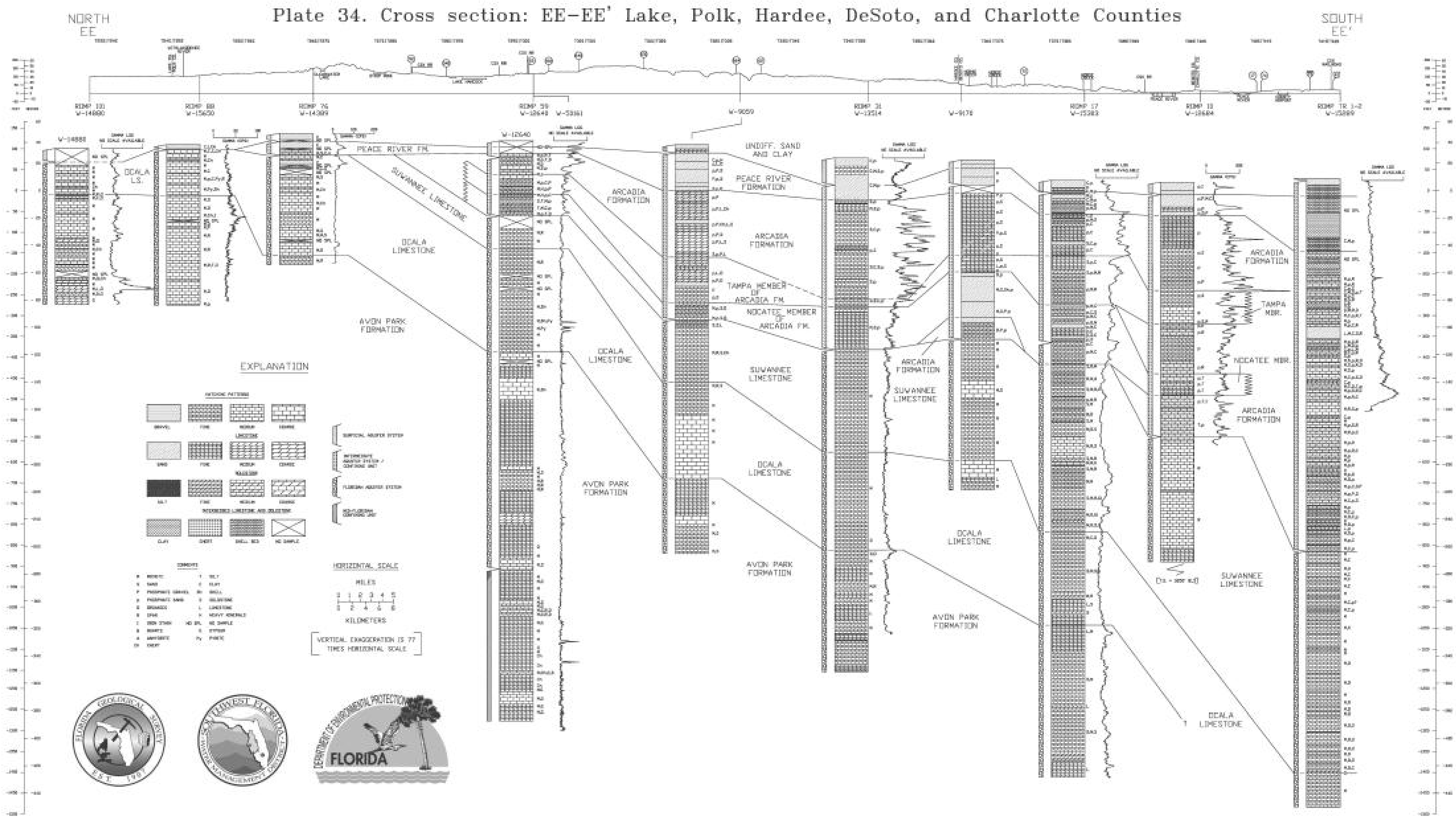
The formations comprising the IAS and FAS dip to the south in the study area. A cross section of the geologic formations extending from north to south through the study area is shown in Figure 2 (Florida Geological Survey, 2008). The figure shows the formations associated with the IAS and FAS getting deeper from Polk to Charlotte Counties. The formations correspond to the aquifers so the aquifers are also getting deeper. The deeper IAS and UFA result in increasing differences between water levels in the SAS and UFA from north to south. Figure 3 depicts a hydrogeologic cross section from Bartow to Homeland that shows the formations and water levels of the SAS, IAS, and UFA (Metz and Lewelling, 2009). This figure shows the downward gradient in the aquifers that is present in approximately the northern one-third of the study area. Moving south of this area, the groundwater water levels continue to decline and only in the southern one-third of the study area do the IAS and UFA water levels approach the level of the SAS. Therefore, interaction between the groundwater and surface water systems is primarily from the SAS throughout the study area. The line of the geologic cross section is shown in Figure 3 (Metz and Lewelling, 2009).

The difference in SAS/UFA water levels is shown in hydrographs from monitoring well clusters in the study area. Figure 4 shows the locations of six well clusters that monitor the SAS, IAS, and UFA. Details of the well clusters follow:

- In Regional Observation Monitoring-Well Program (ROMP) 85, the northernmost well cluster, the SAS and UFA water levels have approximately 15 feet of water level difference. ROMP 70, approximately 25 miles to the southeast of ROMP 85, exhibits approximately 80 feet of water level difference between the SAS and UFA.
- At ROMP 40, approximately 30 miles to the south of ROMP 70, the water levels in the two aquifers are separated by approximately 100 feet. The IAS Zone 1 aquifer level is approximately 10 feet less than the SAS at ROMP 40.
- At ROMP 25, approximately 20 miles to the south of ROMP 40, the water level in the IAS Zone 1 monitor well is about 20 feet less than the SAS and shows increased fluctuations as compared to the SAS. The water level in the UFA is approximately another 40 feet below the IAS Zone 1 and shows additional increased fluctuation.
- ROMP 30 is approximately 15 miles northeast of ROMP 25. The IAS Zone 1, IAS Zone 2, and UFA monitor well water levels are all virtually identical and the fluctuations consistently track one another. These water levels are about 30 feet lower than the SAS and have much greater variation in water level.
- ROMP 13, about 30 miles southeast of ROMP 30, shows a similar pattern. The IAS Zone 1, IAS Zone 2, and UFA monitor wells track one another with water levels about 15 feet below the SAS. All of the wells in the ROMP 13 have similar variation in the water level.

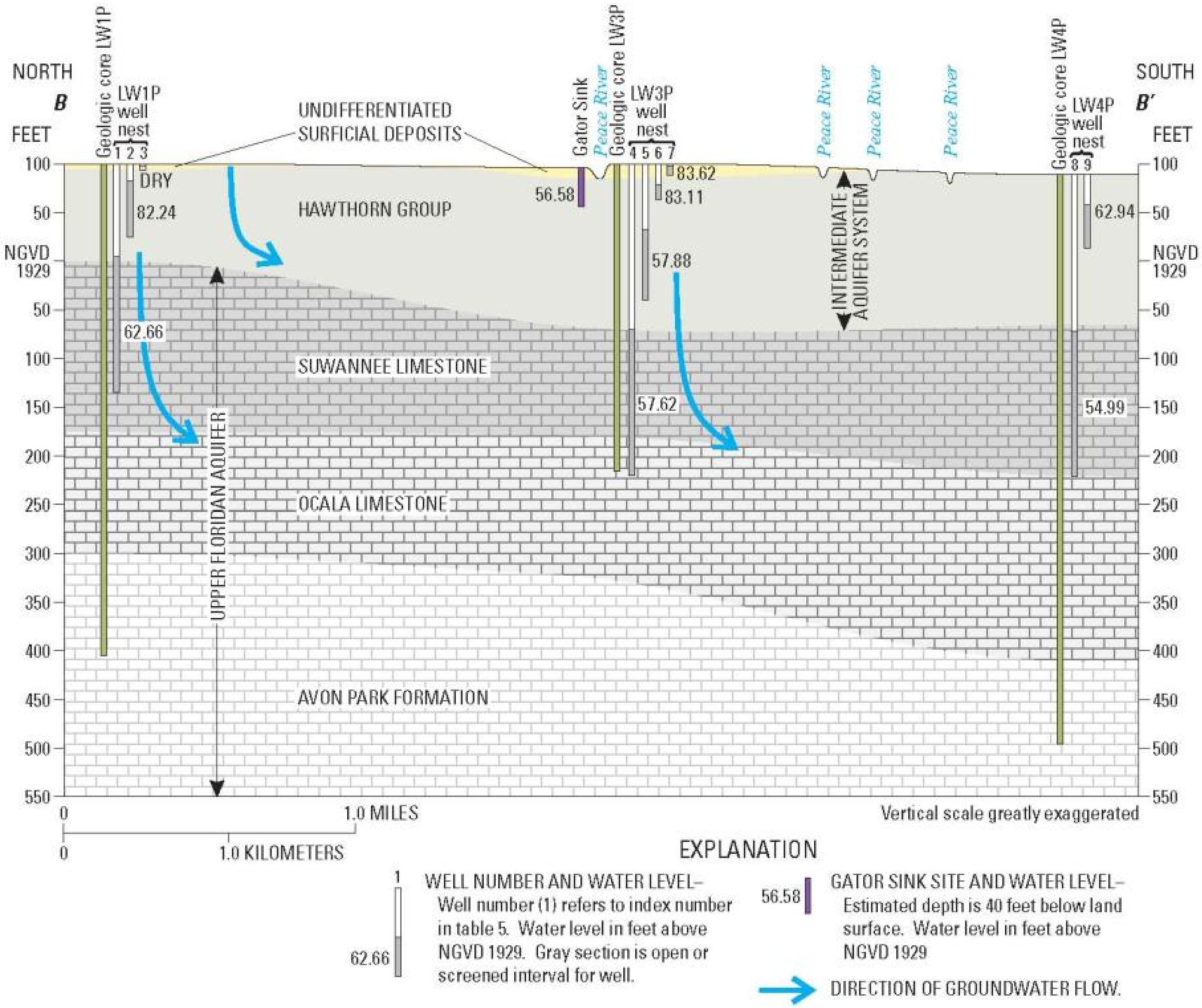
Figures 5 through 10 depict hydrographs from the six well pair clusters. Two additional wells in the IAS Zone 2, ROMP 14 and ROMP TR-9, were included because only two of the six well clusters included data for the IAS Zone 2 aquifer. The ranges in water levels for these monitor wells are presented in Table 1.

FIGURE 2
North to South Geologic Cross Section of the Study Area
Central Florida Phosphate District, Florida



Source: Florida Geological Survey, 2008

FIGURE 3
Hydrogeologic Cross Section from Bartow to Homeland
Central Florida Phosphate District, Florida



Source: Metz and Lewelling, 2009

FIGURE 4
Locations of Monitoring Well Clusters
Central Florida Phosphate District, Florida

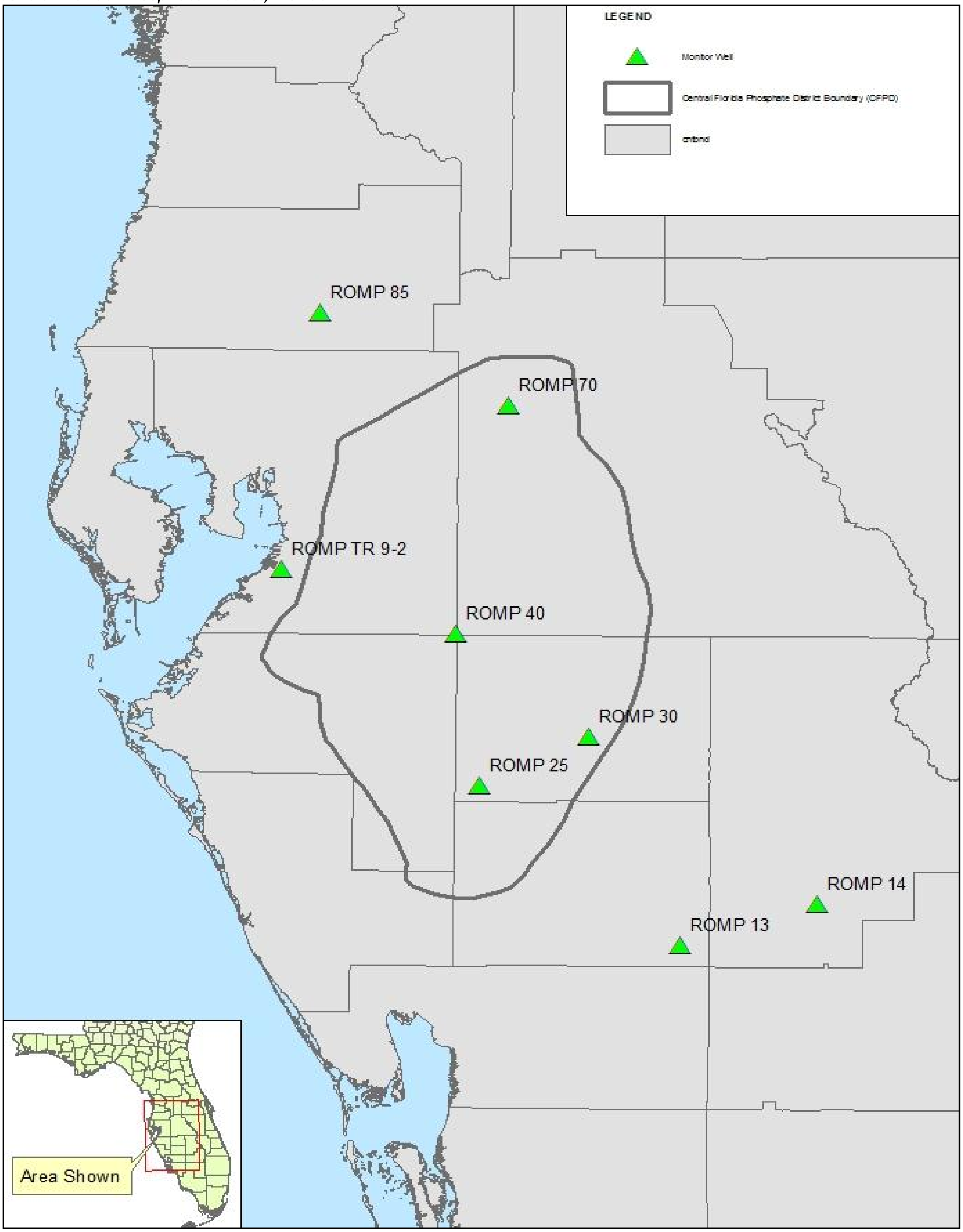


FIGURE 5
UFA, IAS and SAS Monitoring Well Clusters, ROMP 85
Central Florida Phosphate District, Florida

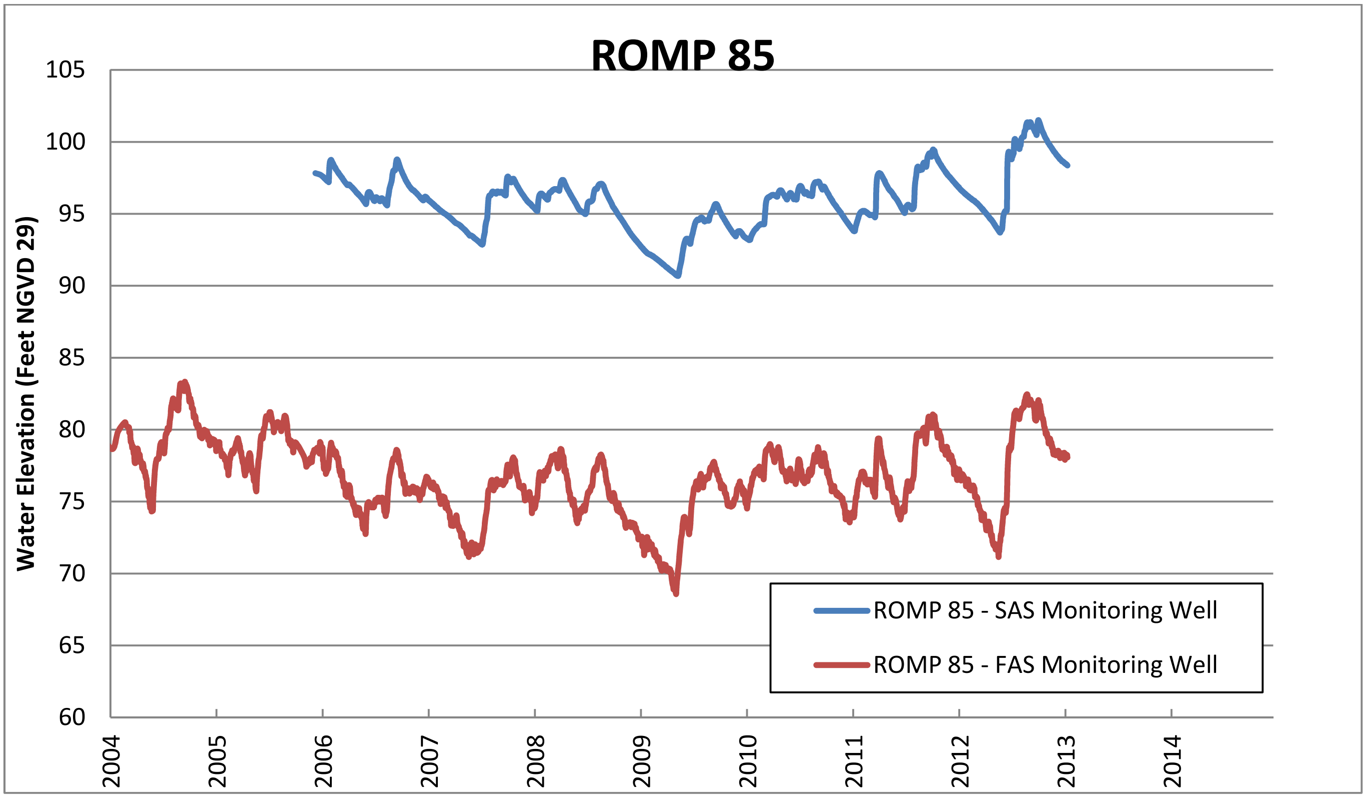


FIGURE 6
UFA, IAS and SAS Monitoring Well Clusters, ROMP 70
Central Florida Phosphate District, Florida

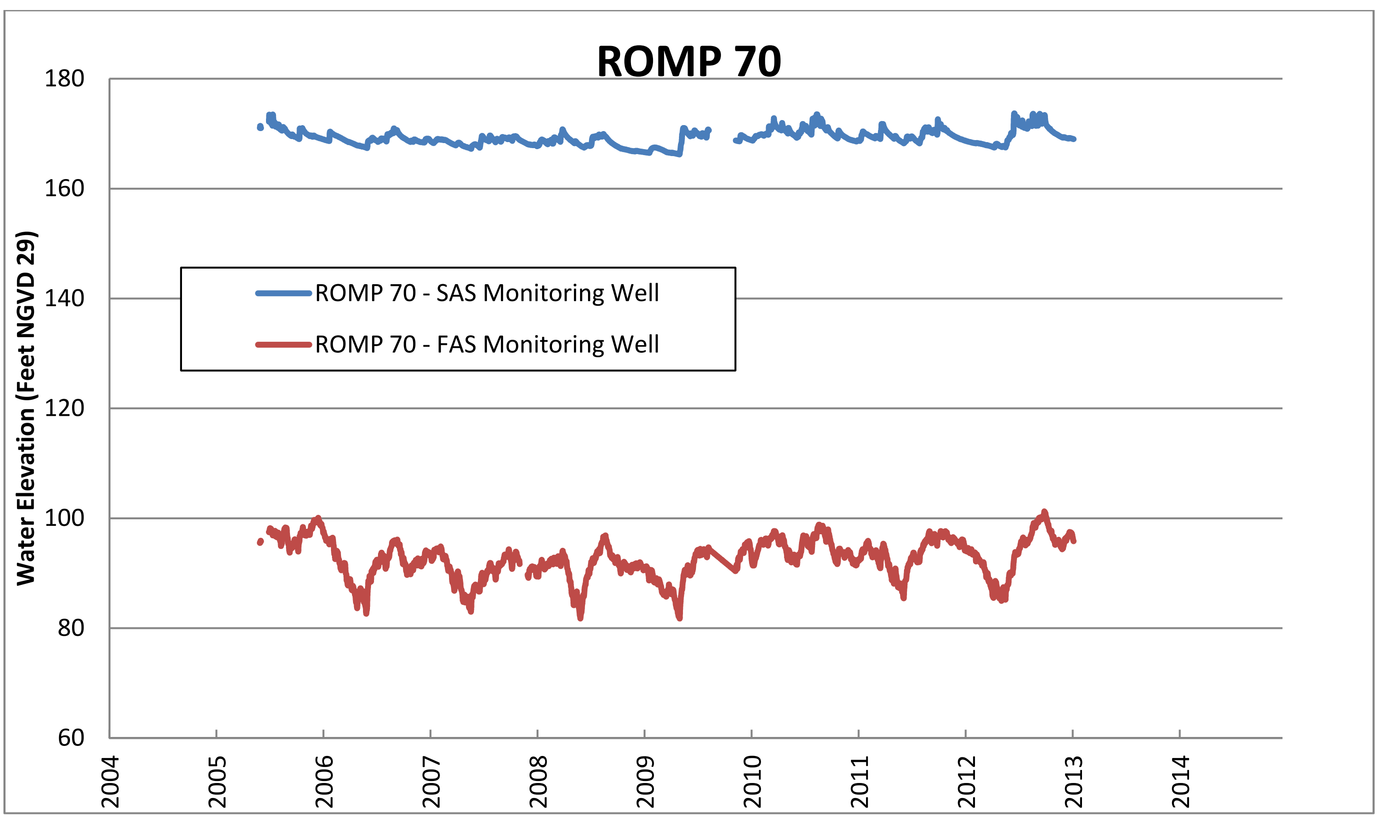


FIGURE 7
UFA, IAS and SAS Monitoring Well Clusters, ROMP 40
Central Florida Phosphate District, Florida

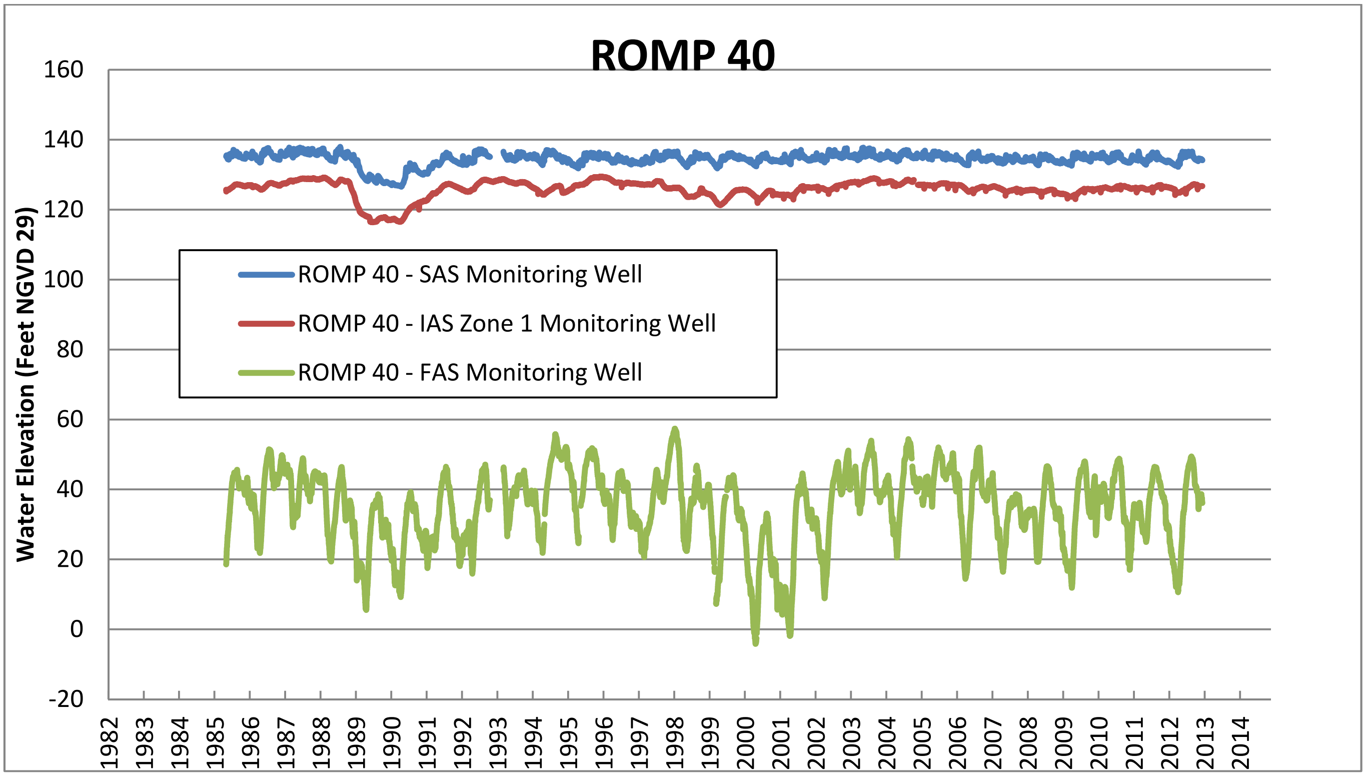


FIGURE 8
UFA, IAS and SAS Monitoring Well Clusters, ROMP 25
Central Florida Phosphate District, Florida

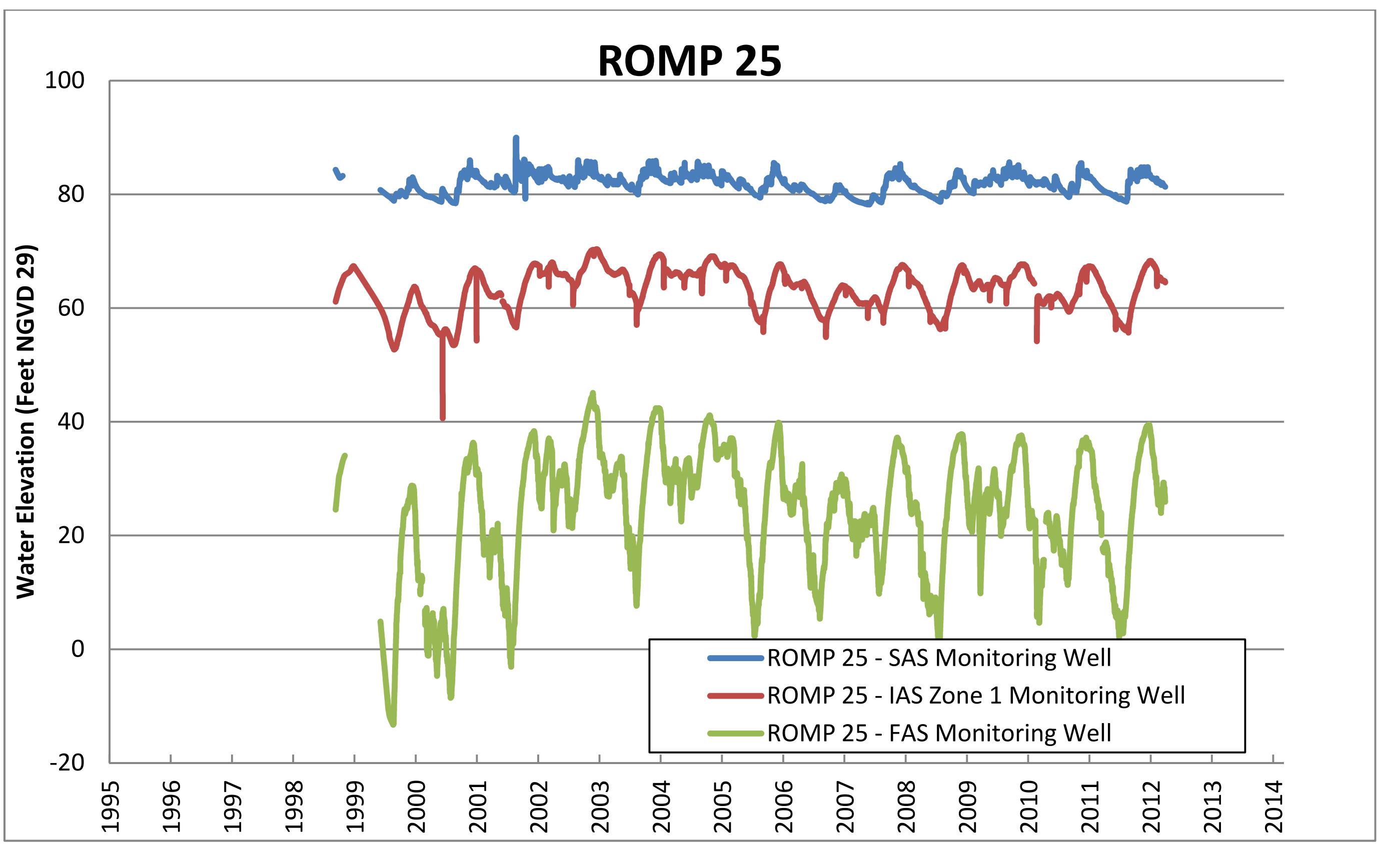


FIGURE 9
UFA, IAS and SAS Monitoring Well Clusters, ROMP 30
Central Florida Phosphate District, Florida

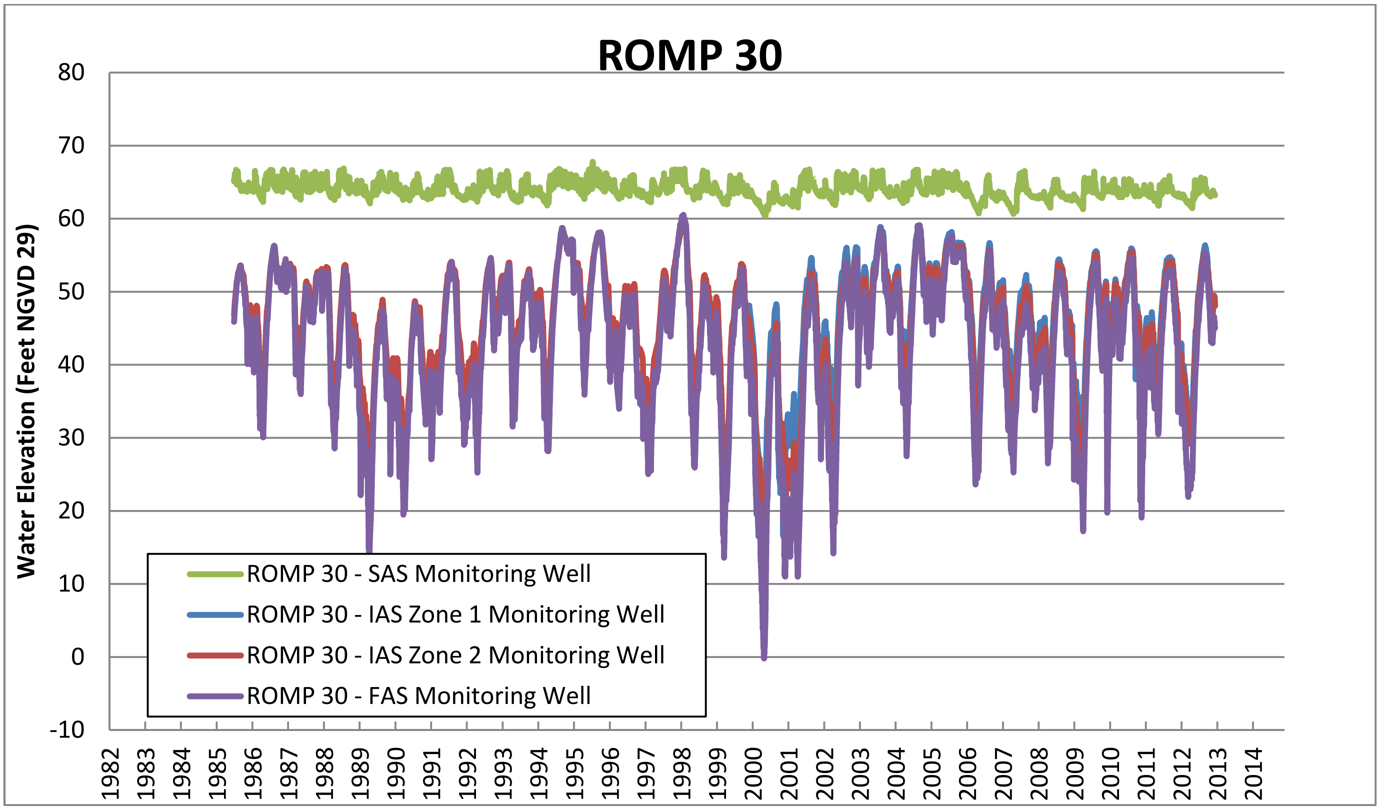


FIGURE 10
UFA, IAS and SAS Monitoring Well Clusters, ROMP 13
Central Florida Phosphate District, Florida

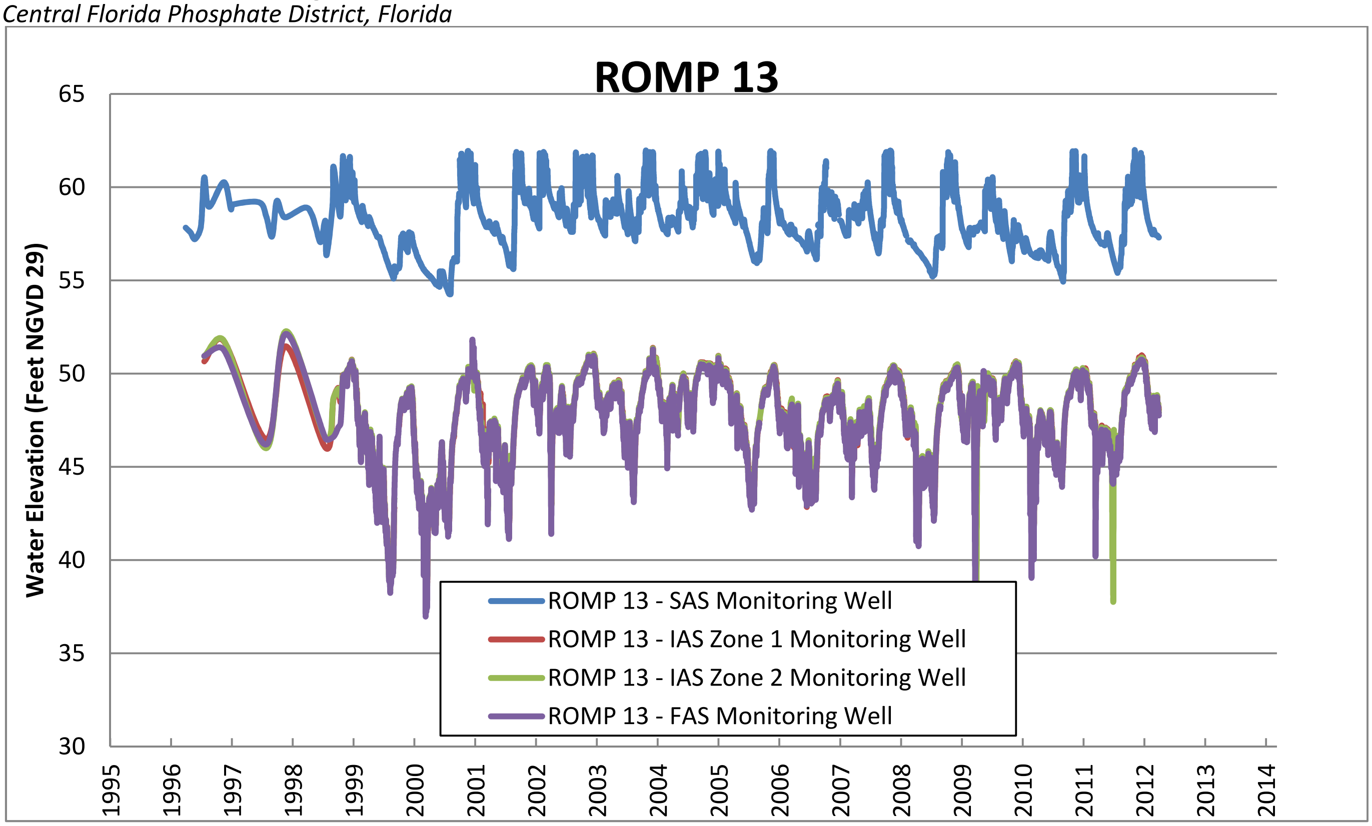


TABLE 1
Historical Groundwater Elevation [1]
Central Florida Phosphate District, Florida

Monitor Well		Maximum Water Elevation (ft)	Minimum Water Elevation (ft)	Change in Water Elevation (ft)	Dates of Monitor Data
ROMP 13 - SAS Monitoring Well		61.99	54.26	7.73	1/23/1997 to 1/18/2013
ROMP 25 - SAS Monitoring Well		89.93	78.22	11.71	7/7/1999 to 1/18/2013
ROMP 30 - SAS Monitoring Well		67.8	60.37	7.43	8/14/1995 to 1/18/2013
ROMP 40 - SAS Monitoring Well		137.93	126.62	11.31	6/18/1995 to 1/18/2013
ROMP 70 - SAS Monitoring Well		173.68	166.24	7.44	6/10/2005 to 1/14/2013
ROMP 85 - SAS Monitoring Well		101.51	90.68	10.83	12/19/2005 to 1/18/2013
ROMP 13 - IAS Zone 1 Monitoring Well		51.73	38.79	12.94	5/15/1997 to 1/18/2013
ROMP 25 - IAS Zone 1 Monitoring Well		70.35	40.6	29.75	7/7/1999 to 1/18/2013
ROMP 30 - IAS Zone 1 Monitoring Well		59.06	16.71	42.35	1/10/2000 to 1/18/2013
ROMP 40 - IAS Zone 1 Monitoring Well		93.89	80.57	13.32	9/19/2006 to 1/17/2013
ROMP 13 - IAS Zone 2 Monitoring Well		52.27	34.99	17.28	5/14/1997 to 1/18/2013
ROMP 14 - IAS Zone 2 Monitoring Well		117.09	104.17	12.92	9/12/1995 to 1/18/2013
ROMP 30 - IAS Zone 2 Monitoring Well		58.98	9.27	49.71	8/14/1985 to 1/18/2013
ROMP TR 9-2 - IAS Zone 2 Monitoring Well		14.79	-5.28	20.07	4/2/1992 to 1/18/2013
ROMP 13 - UFA Monitoring Well		52.13	36.97	15.16	5/14/1997 to 1/18/2013
ROMP 25 - UFA Monitoring Well	UFA	45.06	-13.28	58.34	7/7/1999 to 1/18/2013
ROMP 30 - UFA Monitoring Well	UFA	60.52	-0.2	60.72	8/14/1985 to 1/18/2013
ROMP 40 - UFA Monitoring Well	UFA	57.37	-4.15	61.52	6/18/1995 to 1/18/2013
ROMP 70 - UFA Monitoring Well	UFA	101.24	81.75	19.49	6/10/2005 to 1/14/2013
ROMP 85 - UFA Monitoring Well	UFA	83.78	66.98	16.8	7/1/1985 to 1/18/2013

[1] In feet National Geodetic Vertical Datum of 1929 (ft NGVD 29)

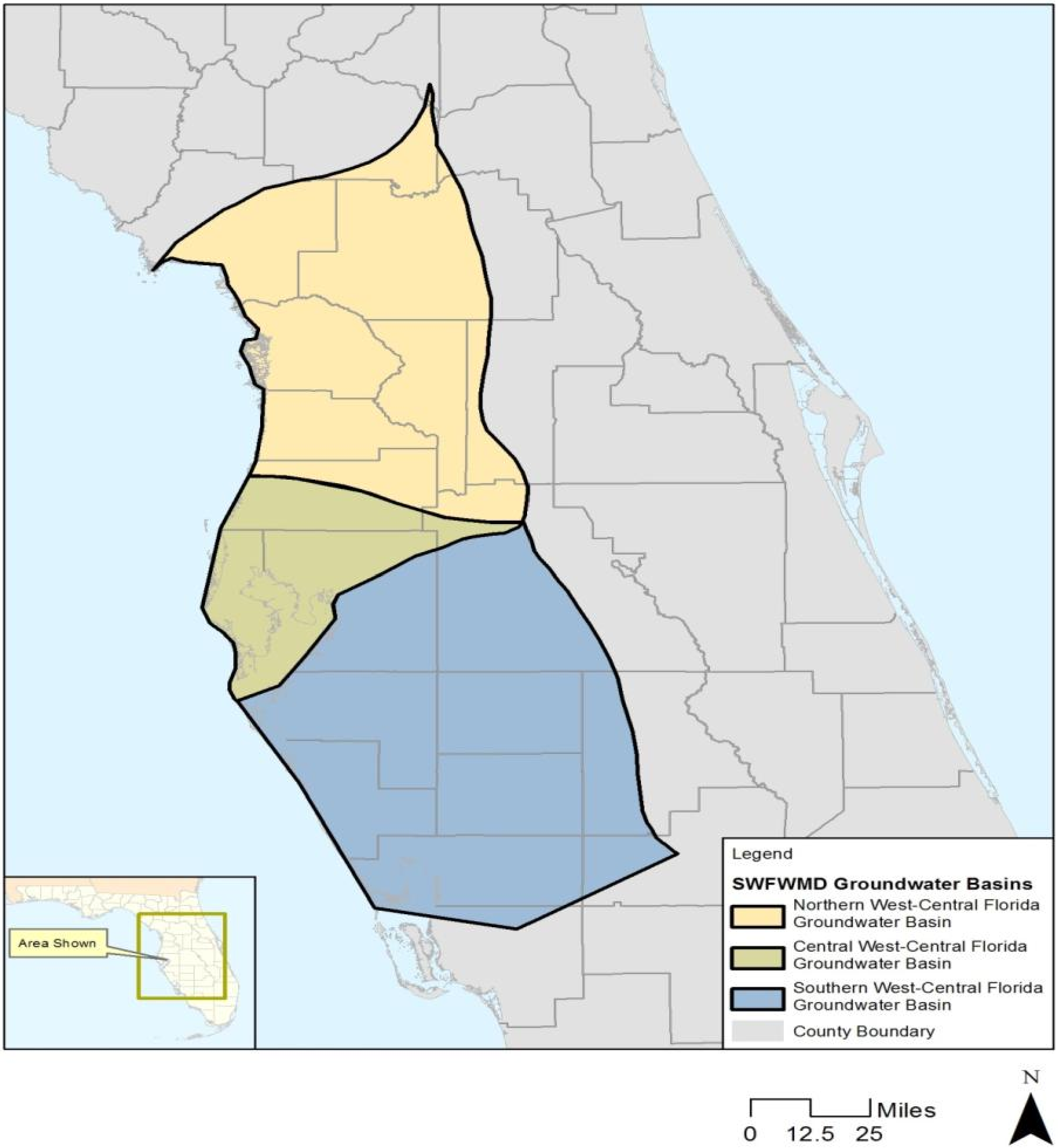
The SAS monitor well water levels range from 7.43 to 11.71 feet. The IAS Zone 1 monitor well water levels range from 12.94 to 42.35 feet. The IAS Zone 2 monitor well water levels range from 12.92 to 49.71 feet. The UFA monitor well water levels range from 15.16 to 61.52 feet. Generally, the deeper the aquifer, the greater the variation is in its water level. The water level variations shown are over a 10- to 25-year duration. Annual seasonal water level variation is expected to be somewhat smaller.

2.3 Hydrologic Boundaries

With the exception of offshore submarine discharge into the Gulf of Mexico and the Atlantic Ocean, the FAS does not contain lateral physical hydrologic boundaries. Groundwater divides that occur in areas where the water table or potentiometric surface is elevated, and are analogous to topographic ridges acting as surface water drainage basin divides, serve as local hydrologic flow boundaries. The area encompassed by one or more groundwater divides is referred to as a groundwater basin. Figure 11 depicts the groundwater basins identified by SWFWMD.

The boundaries of the model cover the counties within the SWFWMD. The model includes the Southern West-Central Florida Groundwater Basin which covers virtually all of the CFPD and the Southern Water Use Caution Area (SWUCA). It also includes the Most Impacted Area (MIA) within the SWUCA where the greatest risk of saltwater intrusion into the UFA exists per SWFWMD analyses. The technical criteria in these regulatory programs were incorporated into the AEIS evaluation, and regulatory program guidance for analyzing groundwater level impacts from mining was used in the modeling to evaluate potential groundwater use by the Applicants.

FIGURE 11
Groundwater Basins
Central Florida Phosphate District, Florida



3.0 Computer Code Selection

The DWRM2.1 (ESI, 2011) model was selected because it uses the industry standard MODFLOW code, which was developed (and is supported) by the U.S. Geological Survey (USGS). The model covers the entire study area and is used by SWFWMD for water use permitting and water supply planning. The model has sufficient layers (including the SAS, Zones 1 and 2 of the IAS, UFA, and lower Floridan aquifer [LFA]) to serve the purposes of the AEIS. The model was calibrated in 2008 in steady-state and transient mode for the years 1998 to 2006. The following models were considered, but none met all of the criteria required for the AEIS evaluation:

- **Northern Tampa Bay** – Hancock and Basso (1993)
- **Charlie Creek Basin and Peace River Watershed** – Lee et al. (2010)
- **Horse Creek Watershed** – SDI Environmental Services, 2003 (Charlotte County and Peace River/Manasota Regional Water Supply Authority)
- **Peace River Basin Integrated Modeling Project, PRIM** – BCI, HydroGeoLogic, Janicki, DHI (SWFWMD, 2010a)
- **Myakka River Watershed Initiative** – Interflow Engineering, LLC in association with Singhofen and Associates, Inc. (Interflow Engineering, LLC, 2008a)
- **Citrus Irrigation Hardee and DeSoto County** – Metz (1995)
- **Lake Wales Ridge and Adjacent Areas** – Yobbi (1996)
- **Eastern Tampa Bay Model** – Barcelo and Basso (1993)
- **SWUCA Model** – HydroGeoLogic (2002)
- **Southern District Model** – Beach and Chan (2003)
- **Peninsular Model** – Sepulveda (2002)

The Peace River and Myakka River integrated models were not readily available to the AEIS team or the public in general. It is understood that an integrated model of the entire Peace River watershed (PRIM) was never finalized. The Myakka River Watershed Initiative only looked at a portion of the watershed (Upper Myakka River), and would require extensive reconfiguration to incorporate more area. Detailed modeling also requires detailed input data for speculative future conditions. These data do not exist and a more complicated model will not provide more reliable results than its inputs. Table 2 includes a summary of the models and the selection criteria.

4.0 Model Construction

The DWRM2.1 model was run using Groundwater Vistas (ESI, 2011). Groundwater Vistas is a commercial groundwater model pre- and post-processor.

The DWRM2.1 model simulates the SAS, IAS, UFA, and the lower Floridan aquifer (LFA). The DWRM2.1 simulates this system with five layers. Table 3 summarizes the model layers and corresponding hydrostratigraphic units of the DWRM2.1 model.

Although the model includes the SAS and the IAS, the regional scale of the model limits the accuracy for evaluating regional water level changes to the SAS for the following reasons:

- The first difficulty in using DWRM2.1 to evaluate SAS water level changes in the CFPD is one of **spatial scale**. Many surface water features of interest to the AEIS (such as wetlands, streams, and small lakes) are essentially surface expressions of the SAS water table. While the size of these features varies, most are significantly smaller than the DWRM2.1 model's grid size. A finite-difference model grid that represented each individual surface water feature would result in a model that would be difficult to manage in terms of file size and run time. Additionally, refining the model grid without changing the underlying model coefficients would only increase the resolution of the model-calculated water levels and would not improve the accuracy of the simulation. The additional effort that would be required to collect detailed model coefficients necessary to provide the additional data is beyond the scope of the AEIS.
- Another issue with using the DWRM2.1 model to evaluate SAS impacts is one of **temporal scale**. The SAS quickly responds to rainfall events, and seasonal variations in precipitation and evapotranspiration can be seen in monitoring well and wetland hydrographs. Adding the temporal level of detail necessary to accurately represent these processes to simulate wetland and surface water levels over the entire CFPD would also result in a difficult to manage model, with no corresponding increase in predictive capability.

TABLE 2
Groundwater Model Selection Criteria
Central Florida Phosphate District, Florida

Description	Grid Spacing	Aquifers	Steady-State Period	Transient Simulation Period	Simulation Code	Adequate Coverage of Region	Relevant Calibration Period?	Adequate Model Layering?	Strength	Weakness	Comments
Northern Tampa Bay	1,320 to 5,280 ft	Surficial and Upper Floridan	May 1989	June 1989 to May 1990	MODFLOW	no	no	no		Model only covers Pasco and Hillsborough County.	
Charlie Creek Basin and Peace River Watershed	300 by 300 ft	Surficial		streamflow data only 2003 to 2005	MIKE-SHE	no	yes	no	Model integrates surface water and surficial aquifer	Only covers peace river basin, Does not simulate upper or lower Floridan aquifer	The exchange of groundwater between the surficial and Upper Floridan aquifers was represented in the model using a linear head-dependent flux boundary with a constant leakance value of 8.64 × 10-6 (ft/d)/ft, representing the vertical hydraulic properties of the Hawthorn Group based on data in Knochenmus (2006). This leakance value results in a net vertical flux of approximately 1 in/yr from the surficial aquifer to the Upper Floridan aquifer.
Peace River Watershed		3 layer groundwater model		streamflow data	MIKE-SHE and MIKE-11	no	yes	no	Model integrates surface water and surficial aquifer	Only covers Peace River basin	
Peace River Basin Integrated Modeling Project, PRIM	2,500 by 2,500 ft	Surficial, Intermediate, and Upper Floridan		1998 to 2002		no	yes	no	Model integrates surface water and surficial aquifer	Model only covers Peace River Basin	

TABLE 2
Groundwater Model Selection Criteria
Central Florida Phosphate District, Florida

Description	Grid Spacing	Aquifers	Steady-State Period	Transient Simulation Period	Simulation Code	Adequate Coverage of Region	Relevant Calibration Period?	Adequate Model Layering?	Strength	Weakness	Comments
Myakka River Watershed Initiative	410.1 by 410.1 ft	Surficial		1994 to 2006	MIKE-SHE and MIKE-11	no	yes	no	Model integrates surface water and surficial aquifer	Model only covers Myakka River Basin, Does not simulate upper or lower Floridan aquifer	The heads in the UFA are specified with an effective leakance between the SAS and UFA which represents multiple aquifers and confining units of the Intermediate aquifer. The UFA is represented by a time-varying series of specified heads developed from the USGS potentiometric surface maps.
Citrus Irrigation Hardee and DeSoto County	5,390 by 6,050 ft	Surficial, Intermediate, and Upper Floridan	September 1988	September 1988 to September 1989	MODFLOW	no	no	no		Model only cover DeSoto County, Calibrated prior to 1990 and does not simulate lower Floridan aquifer	
Lake Wales Ridge and Adjacent Areas	5,280 by 5,280 ft	Surficial, Intermediate, and Upper Floridan	September 1989	October 1989 to October 1990	MODFLOW	no	no	no		Model only covers Polk, Hardee and DeSoto County, Calibrated prior to 1990 and does not simulate lower Floridan aquifer	
Eastern Tampa Bay Model	2 miles	Surficial, Intermediate, and Upper Floridan	1989	October 1988 to September 1989	MODFLOW	yes	no	no		2-mile grid spacing and does not simulate lower Floridan aquifer	Southern District Model is based on this model

TABLE 2
Groundwater Model Selection Criteria
Central Florida Phosphate District, Florida

Description	Grid Spacing	Aquifers	Steady-State Period	Transient Simulation Period	Simulation Code	Adequate Coverage of Region	Relevant Calibration Period?	Adequate Model Layering?	Strength	Weakness	Comments
SWUCA Model	Variable, 2,500 to 5,000 ft	Surficial, Intermediate, and Upper Floridan		1990 to 2000	MODHMS	yes	yes	no		Does not simulate lower Floridan aquifer	Also includes variable-density flow, which may be useful for evaluating impacts associated with saltwater intrusion
DWRM2	5,000 by 5,000 ft	Surficial, Intermediate, Upper and Lower Floridan	Pre-Development and 2006	1995 to 2003	MODFLOW -2000	yes	yes	yes	Most recent model and is used by St. Johns River Water Management District (SJRWMD) to regulate water use and water supply planning		DWRM2 is based on the USGS Peninsular model but with an active water table and recalibrated to additional data.
Southern District Model	5,000 by 5,000 ft	Surficial, Intermediate, and Upper Floridan	1993	1993	MODFLOW	yes	yes	no		Does not simulate lower Floridan aquifer	
Peninsula Model	5,000 by 5,000 ft	Surficial (inactive), Intermediate, Upper and Lower Floridan	Average 1993-1994	N/A	MODFLOW	yes	yes	yes	Considered the benchmark Florida regional model	Does not include an active surficial aquifer	

TABLE 3
DWRM2.1 Model Layers
Central Florida Phosphate District, Florida

Model Layer	Hydrogeologic Unit
1	Surficial aquifer system (SAS)
2	Intermediate Aquifer System (IAS) – Permeable Zone 1
3	IAS – Permeable Zone 2
4	Upper Floridan Aquifer (UFA)
5	Lower Floridan Aquifer (LFA)

For these reasons, using the DWRM2.1 model to support the AEIS evaluations is appropriate for the UFA and the IAS, which both lack the small-scale changes in hydraulic properties and do not exhibit the same degree of temporal variation as the SAS. The SAS simulations do not reflect the rapid response of the SAS to rainfall events, local drainage patterns, and interaction with surface water bodies therefore the model very likely over-predicts the water level changes (up or down) within in the SAS.

4.1 Model Domain

As mentioned previously, the entire DWRM2.1 model was used for these simulations and the model boundaries contain the Southern West-Central Groundwater Basin. Figure 12 depicts the active cells in Layer 4 (UFA) of the model domain. The model consists of 222 rows and 144 columns. Cell dimensions are a uniform 5,000 feet by 5,000 feet.

4.2 Model Parameters

With the exception of the recharge package, no changes were made to any of the DWRM2.1 model properties. The changes made to the simulated pumping rates are described in Section 5. The recharge package of the DWRM2.1 model was revised using water budget information for the Preferred Alternative mines. Table 4 presents the multipliers developed to change the recharge for those alternatives within the mine boundaries, based on changes in evapotranspiration and runoff caused by activities in the specific mining areas, such as tree removal and new ditch and berm construction. The net recharge rate changes as each mine creates a unique change in evapotranspiration and runoff. These changes in net recharge are summarized as a multiplier applied to the base model recharge rate for the model cells comprising the Preferred Alternative mine footprint.

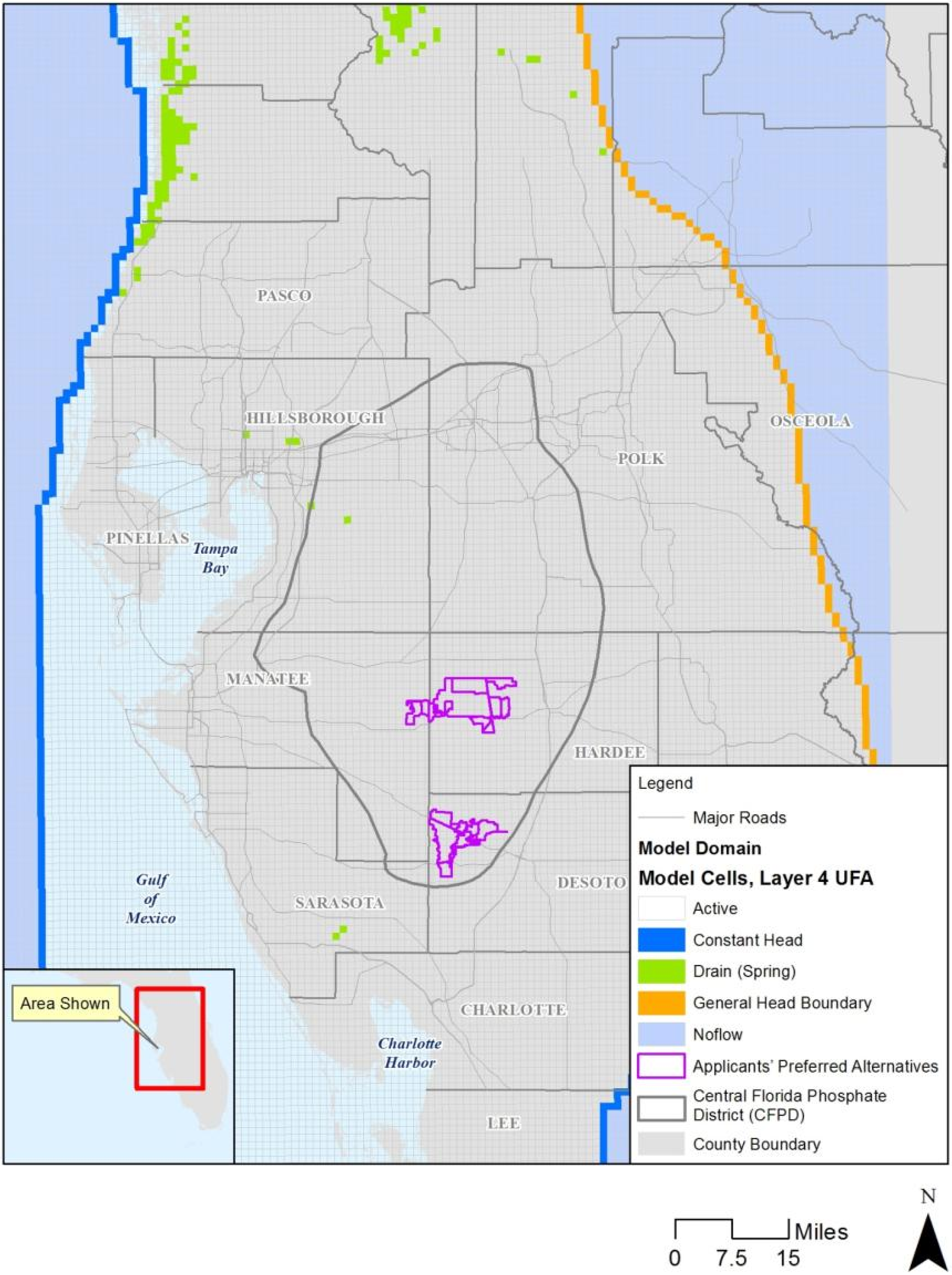
TABLE 4
Recharge Summary (Preferred Alternatives 2, 3, 4, and 5)
Central Florida Phosphate District, Florida

	Multiplier at Mine				Net Recharge at Mine (in/year)			
Year	Ona	Desoto	Wingate East	South Pasture	Ona	Desoto	Wingate East	South Pasture
2010	1.00	1.00	1.00	1.00	6.9	7.0	1.8	7.1
2019	1.00	1.00	0.68	0.92	6.9	7.0	1.2	6.5
2020	1.03	1.00	2.28	1.06	7.1	7.0	4.1	7.5
2025	1.28	1.98	1.64	1.70	8.8	13.9	3.0	12.1
2030	1.31	2.03	4.22	2.60	9.0	14.2	7.6	18.5
2036	1.68	2.60	4.63	0.65	11.6	18.2	8.3	4.6
2047	1.96	1.00	5.54	1.00	13.5	7.0	10.0	7.1
2049	1.82	1.00	3.62	1.00	12.6	7.0	6.5	7.1

4.3 Boundary Conditions

The full DWRM2.1 model was used with no changes to the boundary conditions.

FIGURE 12
DWRM2.1 Upper Floridan Aquifer (Layer 4) Model Cells
Central Florida Phosphate District, Florida



4.4 Model Calibration Targets and Goals

The DWRM2.1 model was revised from version 2.0 and the model remains consistent with the model development documentation. No additional calibration efforts were included as part of the modeling conducted for the AEIS. Table 5 summarizes the DWRM2.0 model steady-state calibration results.

TABLE 5
DWRM2.0 Calibration Statistics
Central Florida Phosphate District, Florida

Statistic	All Model	Layer 1 (SAS)	Layer 2 (IAS)	Layer 3 (IAS)	Layer 4 (UFA)
Number of Targets	10039	315	69	46	609
Range in Observed Values, ft	165.93	160.76	129.91	83.81	133.59
Minimum Residual, ft	-14.12	-14.12	-7.68	-7.65	-10.85
Maximum Residual, ft	19.77	19.77	8.40	11.08	15.12
Residual Mean, ft	0.23	0.62	-0.15	1.80	-0.04
Absolute Residual Mean, ft	3.03	3.33	2.30	3.21	2.95
Standard Deviation, ft	4.05	4.53	3.13	3.86	3.85
Residual Mean over Range, ft	0.1%	0.4%	-0.1%	2.2%	0.0%
Absolute Residual Mean over Range, ft	1.8%	2.1%	1.8%	3.8%	2.2%
Standard Deviation over Range, ft	2.4%	2.8%	2.4%	4.6%	2.9%

Notes:
Data from DWRM2.0 documentation (ESI, 2007), Table 3.5
No calibration statistics available for Layer 5 (LFA)
Source: ESI, 2007

Although there is no definitive standard for model calibration, ESI (2007) used the following criteria when calibrating the DWRM2.0 model and remain consistent for version 2.1:

- The residual standard deviation divided by the range in head targets should be less than 10 percent.
- The absolute residual mean divided by the range in head targets should be less than 10 percent.
- The residual mean divided by the range in head targets should be less than 5 percent.

All three criteria are met; the model is considered well-calibrated for all layers in the model except the LFA Layer 5. While the SAS has good steady state calibration statistics, the spatial and temporal factors described previously make any transient simulation of the SAS suspect. While the model achieves reasonable calibration to target water levels under steady state model conditions, the rapid response of the SAS to rainfall events, local drainage patterns, and interaction with surface water bodies are not reflected in the steady state calibration statistics. The IAS and UFA more reliably simulate actual conditions since changes that occur to those aquifers typically require months or years to develop, a timeframe more in line with steady-state conditions.

It should also be noted that the objectives of this groundwater modeling effort do not include accurately predicting the water level of the Floridan aquifer at some point in the future. Rather, the groundwater model described herein was used to evaluate the relative differences among potential alternative mining scenarios and to evaluate the water level change from those alternative mines in conjunction with other Floridan aquifer water use changes in the area.

In developing the DWRM2.1 model, ESI also performed a 7-year calibration to determine storage properties of the aquifers. The model used 125 calibration targets in the IAS and UFA. Transient calibration of the SAS was not attempted. Also, the River and Drain Cell elevations were not modified from steady state. As a result, the DWRM2.1 cannot simulate the SAS under transient conditions.

Any model is a simplification of real-world conditions. Simplification is necessary to develop an efficient predictive tool that can be applied to evaluate potential future conditions such as those considered here. The DWRM2.1 documentation discusses the simplifications, assumptions, and uncertainty associated with the model. Overall the DWRM2.1 model is considered well-calibrated, and its continued use for regulatory purposes by SWFWMD demonstrates that it is an acceptable tool for predicting and evaluating water level changes associated with groundwater withdrawals from the Floridan aquifer.

The following additional assumptions were made in developing the model scenarios discussed in this report:

- Future groundwater withdrawals in the model area will be consistent with the SWUCA recovery strategy. Should the SWUCA recovery strategy be revised at some point in the future, FAS allocations may be different than those simulated in this evaluation.
- It is assumed that the 50-million-gallon-per-day (mgd) reduction in UFA withdrawals from the SWUCA will come from agriculture, and that the reductions will be proportionally applied to all existing agricultural wells. It is acknowledged that it is more likely that agricultural allocations will be reduced as individual permits come up for renewal and/or agricultural land converts to other uses as land-use patterns change. For the AEIS simulations, a uniform approach was applied because there was no feasible way to identify which specific agricultural withdrawals would be involved in future reductions in allocations.
- The Applicants' withdrawal rates, presented in Table 6, are very conservative in that:
  - The mines would probably not be pumping at the maximum permitted drought rate for an entire year. This would be most likely for only a few months or during the dry season.
  - All of the mines would not be pumping at the maximum drought rate at the same time, given the rainfall variation in the area encompassed by the Applicants' Preferred Alternative mines.
  - The requirement for groundwater augmentation of the mine recirculation system depends on many factors, such as:
    a. Production rate of the beneficiation plant
    b. Available storage in the mine, which depends on the time within the life of the mine because:
       (1) Mine startup will require more pumping to fill (charge) the initial clay settling area.
       (2) The mine available storage depends on the clay settling areas (CSAs) available, open mine pits, and reclamation storage in wetlands and open water bodies.
    c. Rainfall within the mine capture area
    d. Number of draglines in operation and number of dredge ponds

TABLE 6
Mine Withdrawal Rate Comparison (mgd) No Action and Preferred Alternatives
Central Florida Phosphate District, Florida

Withdrawal Type	Four Corners	Hookers Prairie	Hopewell	Ona	Desoto	South Fort Meade	Wingate/ Wingate East	South Pasture	TOTAL
Average Conditions	11.2	3.2	0.5	7.9	7.1	8.7	5.8	3.52	47.92
Wet Conditions	6.5	1.8	0.5	4.3	4.2	5.9	5.8	0.70	29.70
Dry Conditions (used in "A" model scenarios)	15.6	4.2	0.5	11.9	10.7	11.3	5.8	6.39	66.39
Peak Month	19.5	5.3	0.6	14.9	13.4	14.1	7.3	7.5	
Flexible (used in "B" and "C" model scenarios)	20	5.8	N/A	15	N/A	15.4	N/A	N/A	N/A
2008 Actual	6.16	4.75	0.89	N/A	N/A	5.57	4.84	4.67	26.88
2009 Actual	6.28	3.71	1.01	N/A	N/A	3.37	5.16	2.14	21.67
2010 Actual	6.96	4.49	0.54	N/A	N/A	0.29	3.89	0.21	16.38
2011 Actual	5.54	3.65	0.06	N/A	N/A	0.21	3.79	0.41	13.66

Each mine has three withdrawal scenarios in its WUP, representing an average, wet, and dry condition. These are estimated from water budgets using average, above average, and below average precipitation. In addition, four of the mines have a flexible withdrawal rate that is meant only for short time periods. The actual withdrawal rates from 2008 to 2011 are presented in Table 6 to show that the actual withdrawal is usually less than the permitted average conditions withdrawal rate. The permitted two-in-ten drought year withdrawal rate is shown as the dry conditions withdrawal type in the table. This rate is used in all modeling scenarios (including the “A” scenarios), which is highly conservative. The model scenarios labeled “B” and “C” use the flexible pumping rates and are intended to evaluate the extreme worst-case scenarios for those particular mines. All model scenarios were run under steady state conditions.

4.5 Numerical Parameters

DWRM2.1 was run using the Pre-Conditioned Conjugate Gradient (PCG) solver, with head and residual closure tolerances of 0.001 foot and 1 foot, respectively.

5.0 Simulation Approach

5.1 Simulated Water Level Change in the SAS, IAS, and UFA

DWRM2.1 was used to evaluate drawdown in the SAS, IAS, and UFA relative to current conditions for the following alternatives:

- No Action Alternative
  - This alternative assumes that currently operating phosphate mines will continue to operate and that no new mines involving USACE issuance of CWA Section 404 permits will be constructed.
- Applicants’ Preferred Alternatives 2, 3, 4, and 5
  - Applicants’ Preferred Alternatives 2, 3, 4, and 5 assume that the Ona, Wingate East, and Desoto Mines and the South Pasture Mine Extension will operate for the time periods defined in their §404 applications, as modified by information provided in the respective WUPs issued by SWFWMD.

For the predictive simulations, groundwater pumpage for the Applicants was based on information provided by the Applicants or allocated quantities in the Applicants’ SWFWMD WUPs, and are described in greater detail in the discussions below for each alternative. The SWFWMD 2010 Regional Water Supply Plan (RWSP) (SWFWMD, 2010a) indicates that additional groundwater demands in the region for 2010 and the future will be met by sources other than fresh groundwater. Therefore, simulated groundwater withdrawals for other users in the model domain, with the exception of agriculture, were maintained at the 2006 withdrawal rates included in the DWRM2.1 model. It was assumed that withdrawal rates in the base year conditions of 2010 were the same as those in 2006, as there was very little growth in demand between 2006 and 2010. The total withdrawals by water use category for each aquifer and model layer in the SWUCA are shown in Table 7.

TABLE 7
Total Withdrawals by Use Category from DWRM2.1 Model Files (2006 actual and 2010 assumed) in the SWUCA, mgd
Central Florida Phosphate District, Florida

Water Use Category	SAS (Layer 1)	IAS Zone 1 (Layer 2)	IAS Zone 2 (Layer 3)	UFA (Layer 4)	LFA (Layer 5)	Total
Agriculture	10.74	6.46	14.29	351.16	1.64	384.30
Industrial/Commercial	0.04	0.23	0.10	31.94	1.16	33.46
Mining/Dewatering	0.00	0.04	0.29	27.69	0.01	28.03
Power	0.02	1.25	15.95	134.27	0.27	151.75
Recreation	0.32	1.60	2.87	23.57	0.26	28.62
Total	**11.12**	**9.57**	**33.50**	**568.63**	**3.34**	**626.16**

The SWUCA recovery strategy (SWFWMD, 2006b) assumes that groundwater use by agriculture will decrease by 50 mgd between 2005 and 2025. This reduction will meet the goal of limiting all FAS withdrawal allocations in the SWUCA to a total of an annual average rate of 600 mgd. For this analysis, a linear rate of decrease (-2.5 mgd/year) in agricultural withdrawal allocations was assumed to occur between 2005 and 2025.

This reduction was simulated as follows:

- 2010 12.5-mgd reduction
- 2020 37.5-mgd reduction
- 2030–2060 50-mgd reduction

These reductions were applied proportionally to each agricultural well in the SWUCA, based on the well's simulated withdrawals. While it is recognized that agricultural use reductions will not be uniform throughout the region, there is no reasonable methodology available to predict the future pattern of change; therefore, the uniform assumption is the best available method for incorporating the changes in agricultural use in the model.

Demands are presented in terms of conservative permitted drought year annual averages of water used for mineral extraction and transport to the beneficiation plants. The quantities include minor withdrawals of make-up water by pump sealing wells. The actual pumping rates vary depending on precipitation. Over the past decade, phosphate mines have used substantially less than their annual average water supply allocations because of modified water management practices, including a greater reliance on surface waters contained within their recirculation systems. For the AEIS evaluation, however, the conservative approach was taken toward analysis of potential effects of these proposed mine projects on the UFA. Model simulations were conducted using the permitted drought year annual average allocation rates rather than any projected actual UFA pumpages. The drought year pumping rate is determined using the 2 in 10-year drought event, as defined by SWFWMD. This is a drought level that statistically occurs on the average of twice in a given 10-year period. It also should be noted that the actual mining schedule may vary from that analyzed through these DWRM2.1 simulations because of market drivers or regulatory factors. Because such conservative input assumptions have been applied, the simulation results present a very conservative estimate of water level changes and are therefore worst-case scenarios.

Each model run consisted of a steady-state simulation for which drawdown was calculated and compared relative to 2010 conditions. While water demand projections were developed for every mine for the years 2010 through 2050, model runs were only conducted for years in which there were significant changes in withdrawals relative to adjacent years (for example, a new mine might begin operating, or a mine might have shut down). Many years have the same pumpage as the preceding and following years. In these situations no additional information would be gained by running annual simulations, as the results would be identical.

5.2 Simulated Water Level Changes on the SWFWMD's Saltwater Intrusion Metric

SWFWMD has established a Saltwater Intrusion Minimum Aquifer Level (SWIMAL) for the SWUCA (SWFWMD, 2002b). This level is the "*minimum aquifer level necessary to prevent significant harm caused by saltwater intrusion in the UFA in the SWUCA*." Progress meeting the SWIMAL water level targets is calculated each year based on the 10-year average water level in 10 specific SWFWMD monitoring wells in the SWUCA. Each well is assigned a weight based on a geographic information system (GIS) analysis performed by SWFWMD. The individual well averages and weights are used to develop a single SWIMAL value for the aquifer to assess progress toward attaining the target water level.

As this study evaluated simulated drawdown rather than aquifer levels, the simulated water level change at each observation well was multiplied by the adjusted SWIMAL weight to obtain a weighted water level change for the well. Individual weighted water level changes were summed to quantify the simulated change in the SWIMAL for each model run.

5.3 Simulated Water Level Changes on Regional ROMP Monitoring Wells

The simulated water level change is presented in ROMP 85 monitor wells that are within the model domain: 16 wells in Layer 1, 17 wells in Layer 2, 18 wells in Layer 3, and 34 wells in Layer 4. The locations of all of these SWFWMD reference wells are depicted in Figures 13 through 16. Unlike the SWIMAL, the water level change at each of these wells is assessed separately. The monitor wells were selected from a database of 1,304 wells in the SWFWMD. The 85 wells were selected because they comprised the network of wells within the SWUCA, were not located close to one another, represented a good distribution across the study area, and were completed in each of the aquifer zones of interest (SAS, IAS, and UFA).

FIGURE 13
Locations of SAS ROMP Wells – Layer 1
Central Florida Phosphate District, Florida

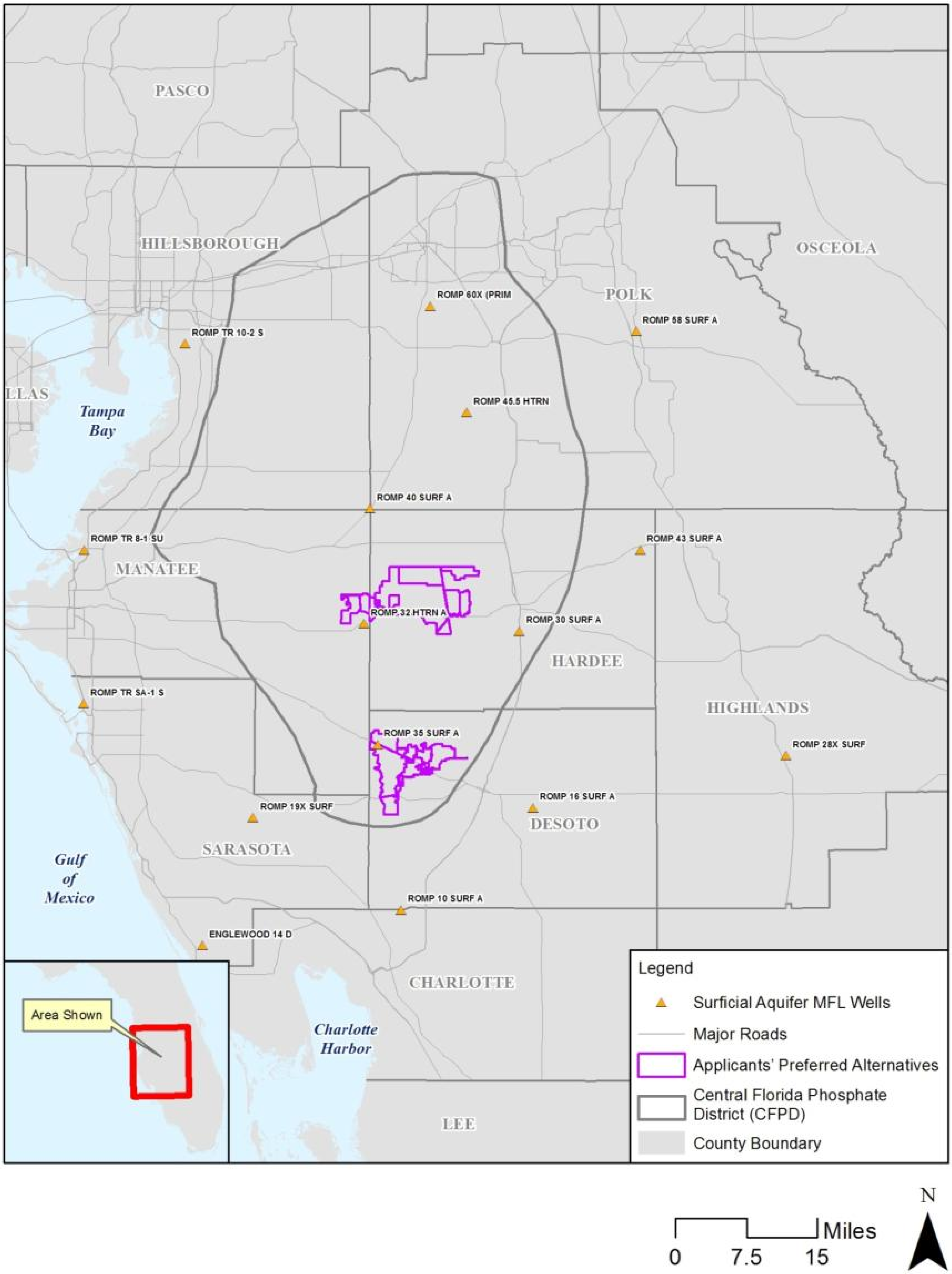


FIGURE 14
Locations of IAS Zone 1 ROMP Wells – Layer 2
Central Florida Phosphate District, Florida

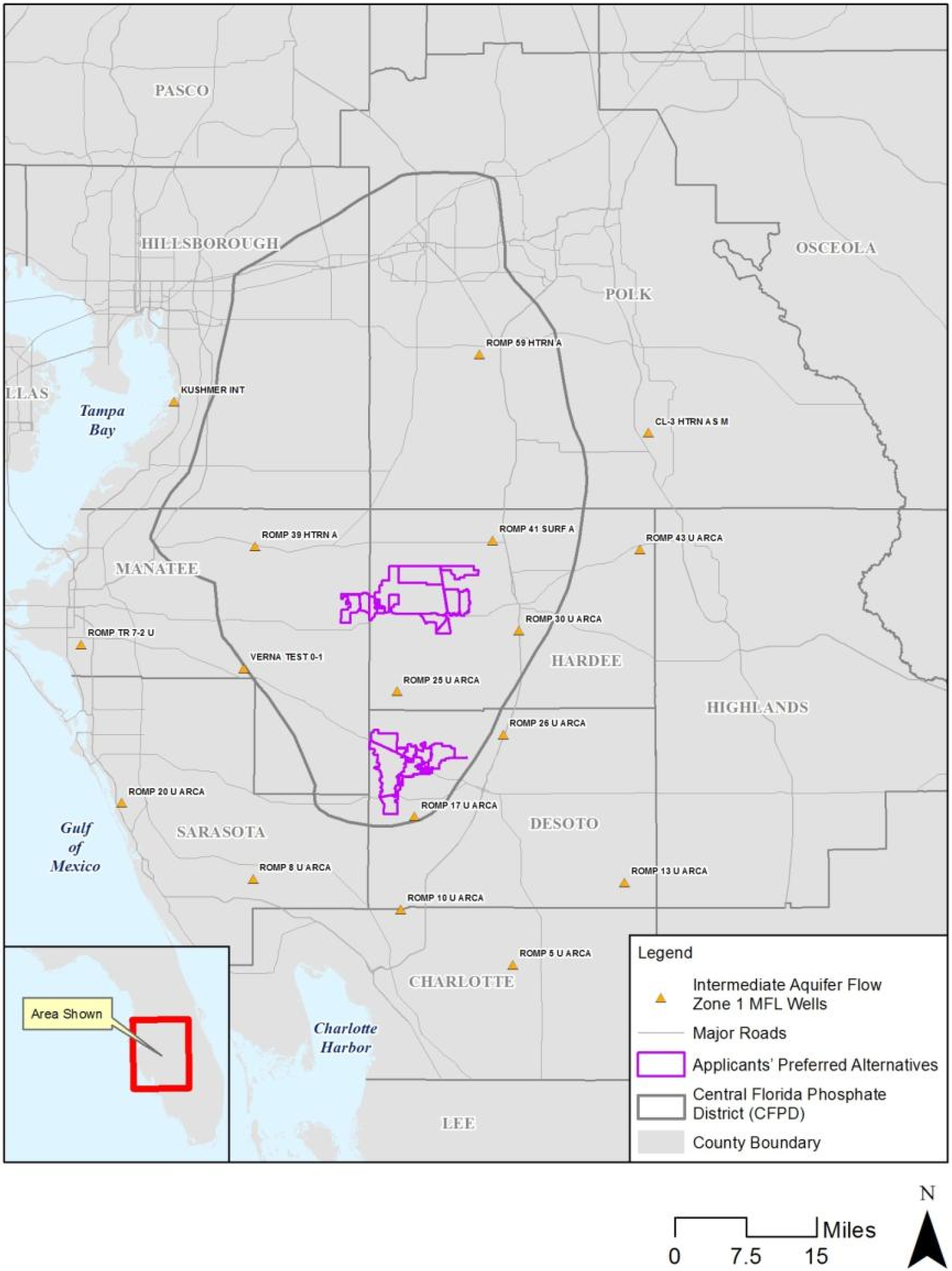


FIGURE 15
Locations of IAS Zone 2 ROMP Wells – Layer 3
Central Florida Phosphate District, Florida

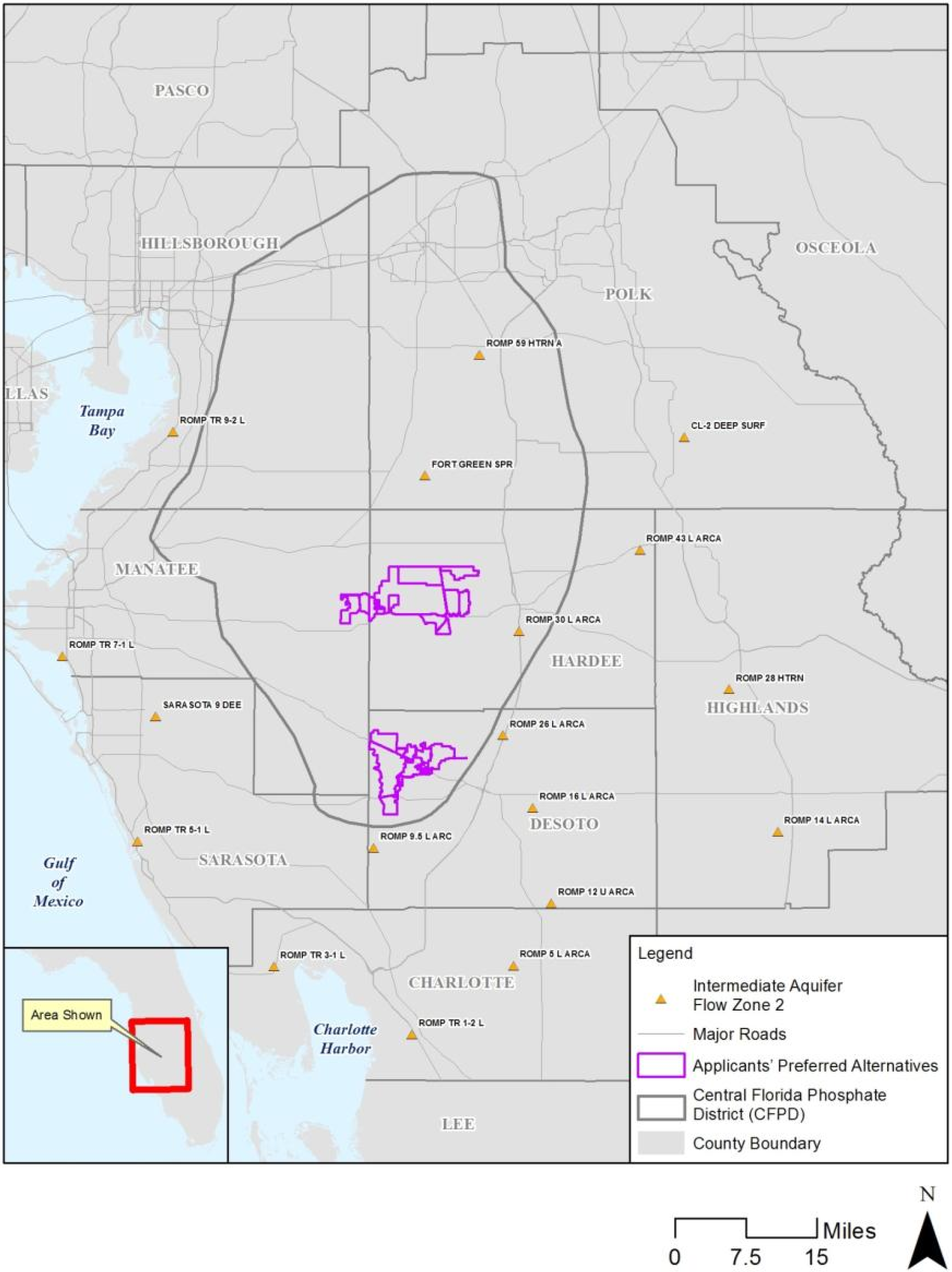
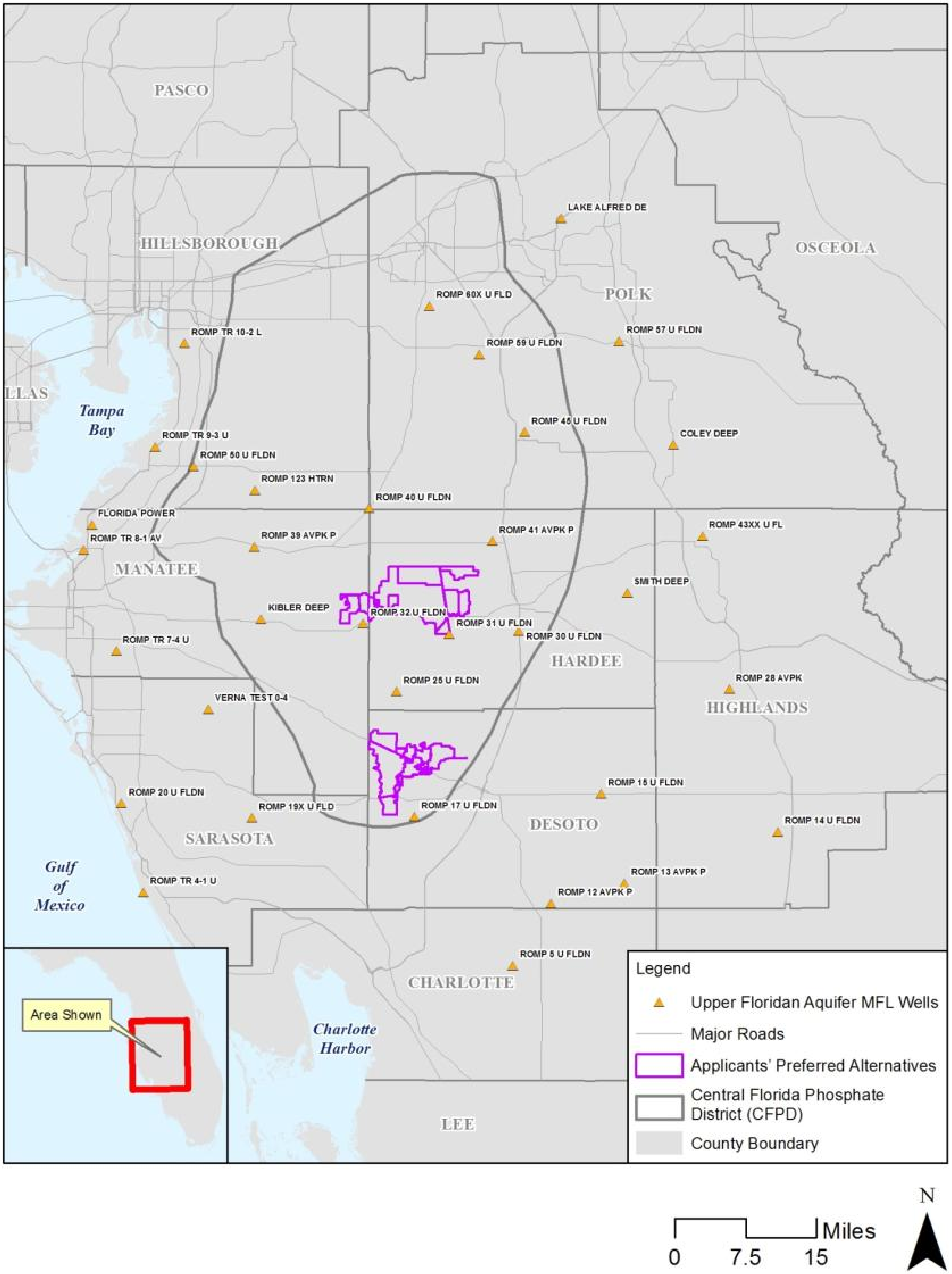


FIGURE 16
Locations of UFA ROMP Wells – Layer 4
Central Florida Phosphate District, Florida



6.0 Results

6.1 Alternative 1 – No Action

The No Action Alternative assumes that the Applicants' Preferred Alternative mines are not permitted by the USACE with regard to the CWA Section 404 applications currently under agency review. Existing permitted mines would continue operations through their currently permitted acreages; no additional infill projects are included in this analysis. The projected operational periods summarized in this TM are based on the best available information derived from the existing Mosaic and CF Industries WUPs, with operational projections beyond the current WUP periods based on information provided by the Applicants to support the AEIS.

Under the No Action Alternative scenario, there are no additional Floridan aquifer withdrawals for phosphate mining for any new mines. Table 8 summarizes the projected permitted drought year withdrawal rates for the currently operating mines that will operate through 2025. Highlighted rows indicate years for which steady-state model simulations were conducted and output was generated. In the No Action Alternative modeling results (Figures 17 through 20), the areas within which changes in drawdown or rebound of each aquifer layer of 0.5 foot or greater are shaded to reflect the areas within the study area influenced by the indicated simulation conditions. The magnitude of these zones of drawdown or rebound should be reviewed in relation to the water level variations historically experienced within the study area, as reflected in the ROMP well water level records summarized in Figures 5 through 10 and Table 1. For these wells, the records reflect seasonal variations of 20 to 40 feet, suggesting that the simulation results indicate only localized and relatively minor influence of phosphate mining withdrawals on the overall water levels within the AEIS study area.

TABLE 8
Projected Floridan Aquifer Groundwater Withdrawal Rates (mgd) - Alternative 1
Central Florida Phosphate District, Florida

Year	Four Corners	Hookers Prairie	Hopewell	Ona	Desoto	South Fort Meade	Wingate	South Pasture	Total
2010	15.6	4.2	0.5	0	0	11.3	5.8	6.39	43.79
2011	15.6	4.2	0.5	0	0	11.3	5.8	6.39	43.79
2012	15.6	4.2	0.5	0	0	11.3	5.8	6.39	43.79
2013	15.6	4.2	0.5	0	0	11.3	5.8	6.39	43.79
2014	15.6	4.2	0.5	0	0	11.3	5.8	6.39	43.79
2015	15.6	0	0.5	0	0	11.3	5.8	6.39	39.59
2016	15.6	0	0	0	0	11.3	5.8	6.39	39.09
2017	15.6	0	0	0	0	11.3	5.8	6.39	39.09
2018	15.6	0	0	0	0	11.3	5.8	6.39	39.09
2019	15.6	0	0	0	0	11.3	5.8	6.39	39.09
2020	0	0	0	0	0	11.3		6.39	17.69
2021	0	0	0	0	0	0	0	6.39	6.39
2022	0	0	0	0	0	0	0	6.39	6.39
2023	0	0	0	0	0	0	0	6.39	6.39
2024	0	0	0	0	0	0	0	6.39	6.39
2025	0	0	0	0	0	0	0	6.39	6.39
2026	0	0	0	0	0	0	0	0.00	0.00
2027	0	0	0	0	0	0	0	0.00	0.00
2028	0	0	0	0	0	0	0	0.00	0.00
2029	0	0	0	0	0	0	0	0.00	0.00
2030	0	0	0	0	0	0	0	0.00	0.00

FIGURE 17
Simulated Water Change in SAS (Model Layer 1) Water Level (ft) 2010 to 2025
Alternative 1 (Existing Mining Only with no Agicultural Reduction)
Central Florida Phosphate District, Florida

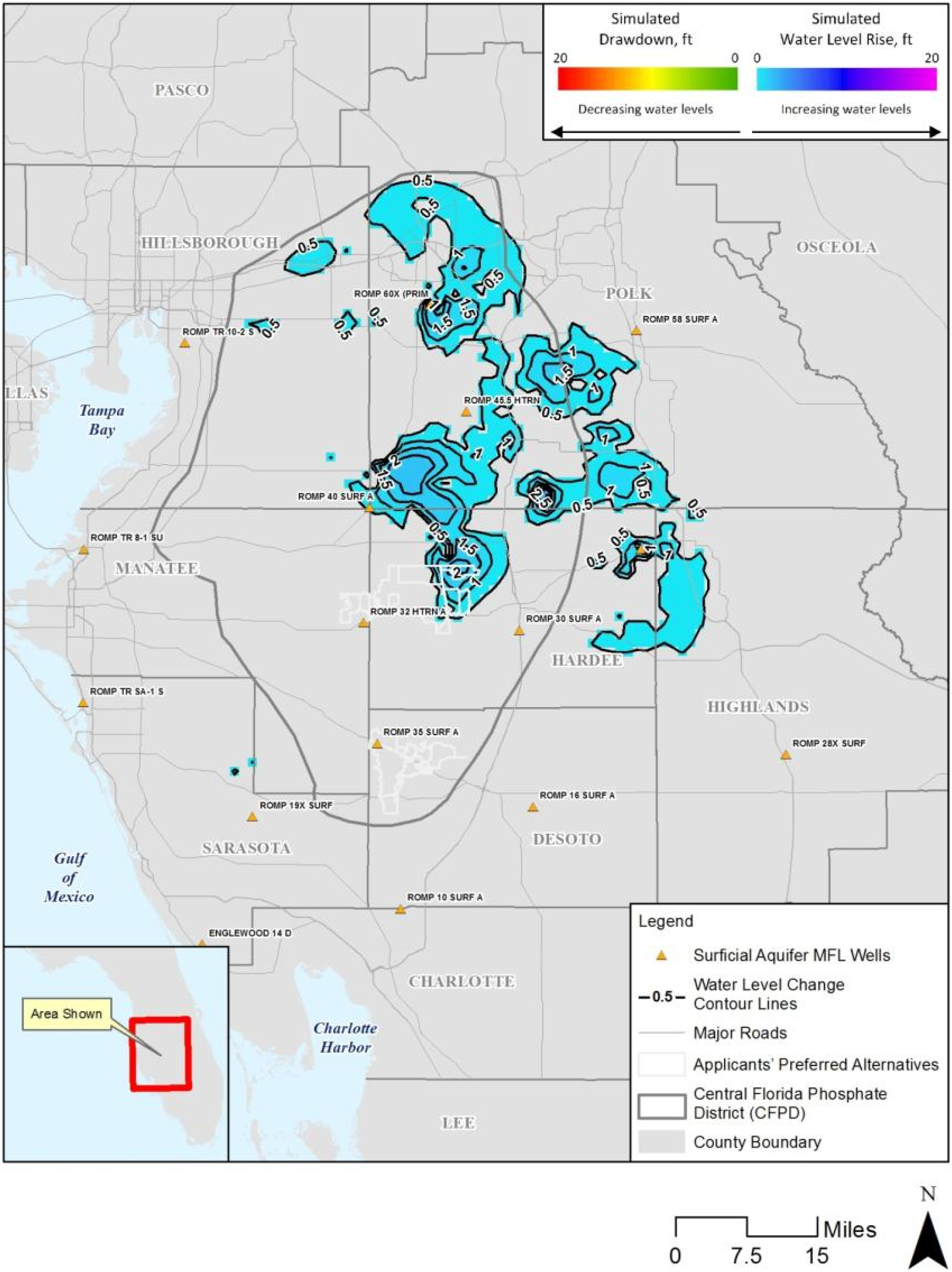


FIGURE 18
Simulated Water Change in IAS Zone 1 (Model Layer 2) Water Level (ft) 2010 to 2025
Alternative 1 (Existing Mining Only with no Agicultural Reduction)
Central Florida Phosphate District, Florida

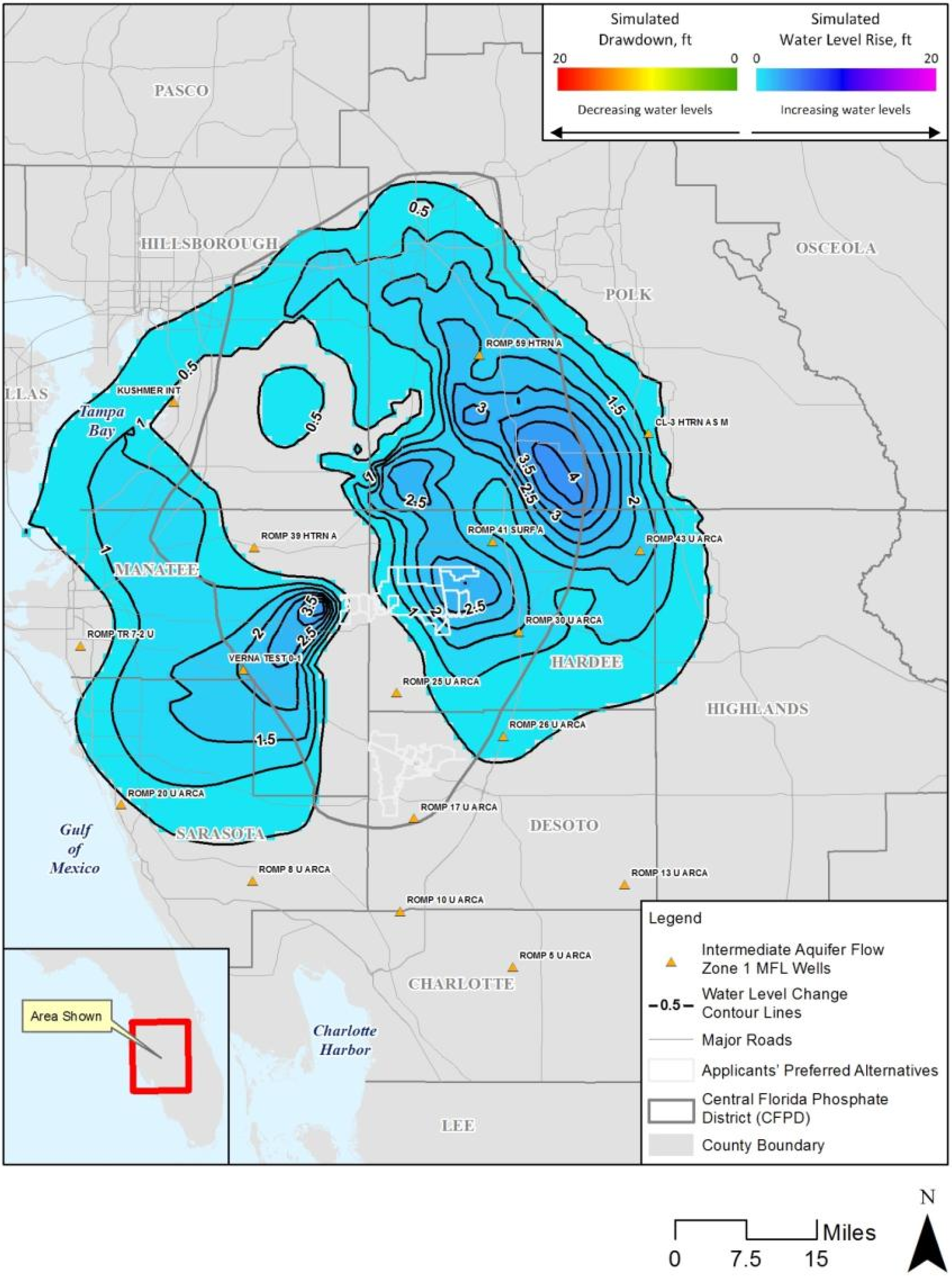


FIGURE 19
Simulated Water Change in IAS Zone2 (Model Layer 3) Water Level (ft) 2010 to 2025
Alternative 1 (Existing Mining Only with no Agicultural Reduction)
Central Florida Phosphate District, Florida

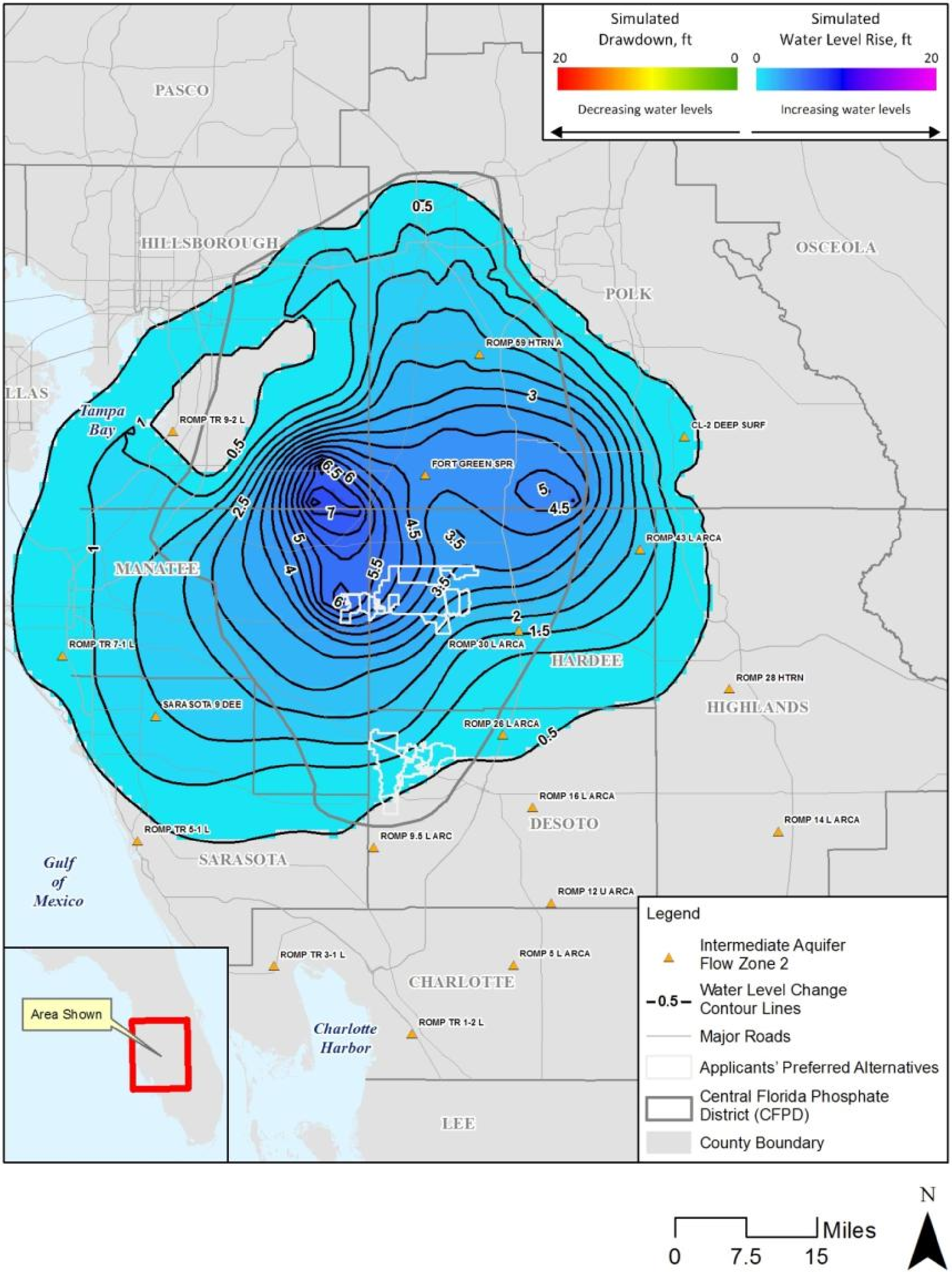
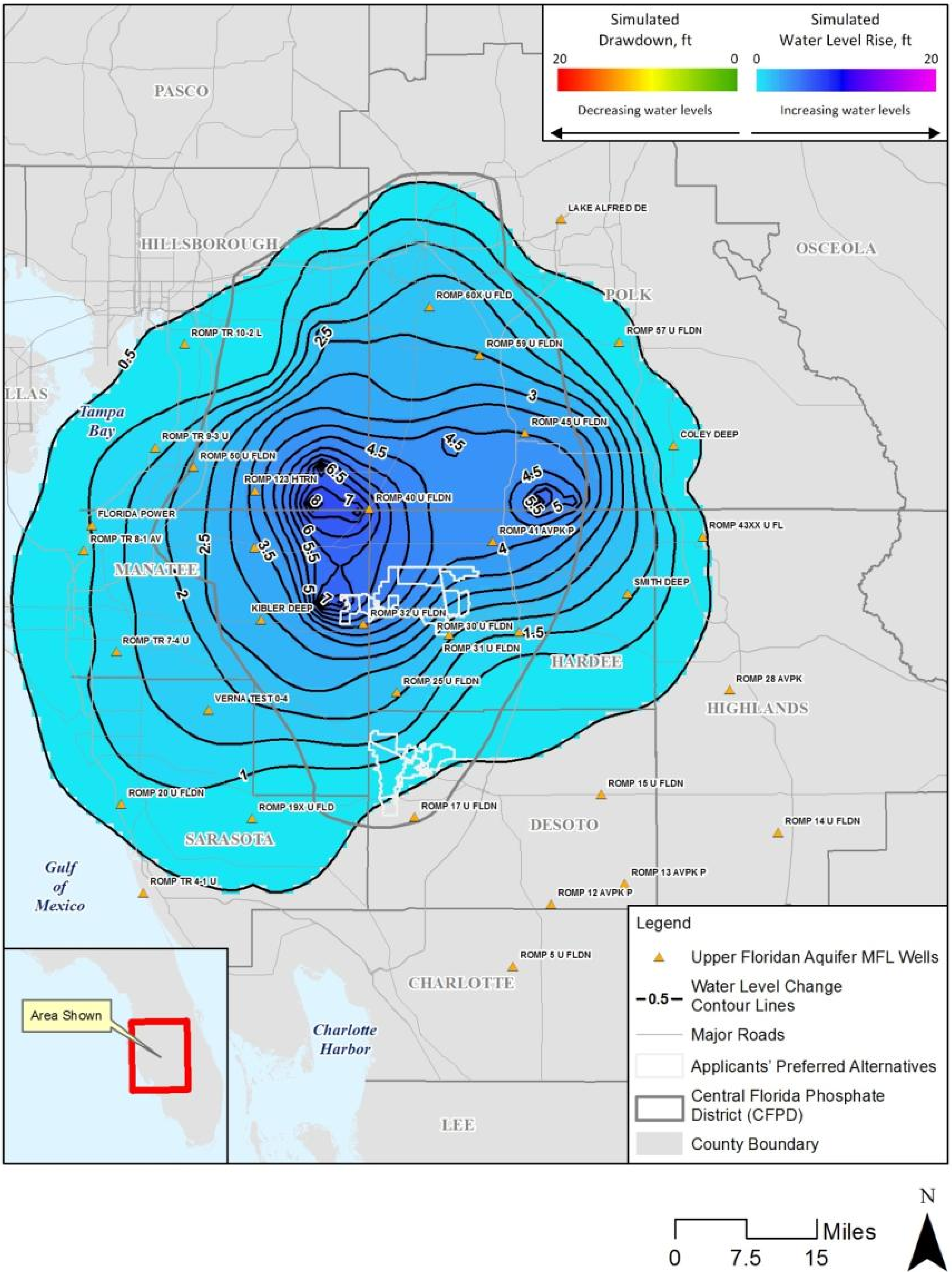


FIGURE 20
Simulated Water Change in Upper Floridan Aquifer (Model Layer 4) Water Level (ft) 2010 to 2025
Alternative 1 (Existing Mining Only with no Agicultural Reduction)
Central Florida Phosphate District, Florida



6.1.1 Simulated Aquifer Water Level Changes

Too many figures would be required to graphically represent every scenario for four aquifer layers (166 figures); therefore, only representative figures are presented for the year 2025. Tables 9 through 12 provide representative monitor well coverage of the CFPD for all four aquifer layers and show the changes in water level.

6.1.1.1 2010 to 2015

Tables 9 through 12 depict the simulated change in aquifer water levels from existing mining in 2015 relative to 2010 (other users at 2010 rates, no agricultural withdrawal reduction), assuming that the Applicants' Preferred Alternative mines are not permitted by the USACE with regard to the CWA Section 404 applications currently under agency review. By 2015, it is assumed that Four Corners will be withdrawing 15.6 mgd (unchanged from 2010) and Hookers Prairie will have ceased operating. Hopewell, South Fort Meade, Wingate, and South Pasture are assumed to continue operating at their 2010 withdrawal rates of 0.5 mgd, 11.3 mgd, 5.8 mgd, and 6.39 mgd, respectively. The simulated water level increases (indicated by positive values) in all monitor wells in every layer, with the greatest increases of 0.71 foot in Layer 3 at Fort Green Springs (Table 11) and 0.69 foot in Layer 4 at ROMP 45 (Table 12). The SWIMAL value increases by 0.09 foot relative to 2010 as shown on Table 12.

TABLE 9
Simulated SAS ROMP Monitor Well Water Level Change Relative to 2010, Alternative 1 (Existing Mining Only with no Agricultural Reduction) Layer 1
Central Florida Phosphate District, Florida

Well	SWIMAL Weight*	Existing Mining Only Simulated Water Level Change Relative to 2010 (ft)			
		2015	2020	2025	2030
ENGLEWOOD 14 DEEP	NA	0.00	0.00	0.00	0.00
ROMP 10 SURF AQ MONITOR	NA	0.00	0.00	0.00	0.00
ROMP 16 SURF AQ MONITOR	NA	0.00	0.01	0.01	0.01
ROMP 19X SURF AQ MONITOR	NA	0.00	0.03	0.04	0.04
ROMP 28X SURF AQ MONITOR	NA	0.00	0.01	0.01	0.02
ROMP 30 SURF AQ MONITOR	NA	0.01	0.04	0.07	0.08
ROMP 32 HTRN AS MONITOR	NA	0.00	0.05	0.06	0.08
ROMP 35 SURF AQ MONITOR	NA	0.00	0.00	0.00	0.00
ROMP 40 SURF AQ MONITOR	NA	0.05	0.52	0.61	0.72
ROMP 43 SURF AQ MONITOR REPL	NA	0.17	0.58	1.45	1.69
ROMP 45.5 HTRN CU MONITOR	NA	0.06	0.18	0.29	0.35
ROMP 58 SURF AQ MONITOR	NA	0.05	0.17	0.30	0.36
ROMP 60X (PRIM SC06) SURF AQ MONITOR	NA	0.25	0.96	1.34	1.54
ROMP TR 10-2 SURF AQ MONITOR	NA	0.00	0.00	0.00	0.00
ROMP TR 8-1 SURF AQ MONITOR	NA	0.00	0.00	0.00	0.00
ROMP TR SA-1 SURF	NA	0.00	0.01	0.01	0.01

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

TABLE 10
Simulated IAS Zone 1 ROMP Monitor Well Water Level Change Relative to 2010, Alternative 1 (Existing Mining Only with no Agricultural Reduction) Layer 2
Central Florida Phosphate District, Florida

Well	SWIMAL Weight*	Existing Mining Only Simulated Water Level Change Relative to 2010 (ft)			
		2015	**2020**	**2025**	**2030**
CL-3 HTRN AS MONITOR	NA	0.10	0.34	0.80	0.93
KUSHMER INT	NA	0.02	0.23	0.26	0.29
ROMP 10 U ARCA AQ MONITOR 2	NA	0.01	0.09	0.12	0.14
ROMP 13 U ARCA AQ MONITOR	NA	0.02	0.19	0.26	0.32
ROMP 17 U ARCA AQ MONITOR	NA	0.03	0.25	0.34	0.40
ROMP 20 U ARCA AQ MONITOR	NA	0.02	0.37	0.42	0.48
ROMP 25 U ARCA AQ MONITOR	NA	0.02	0.15	0.20	0.25
ROMP 26 U ARCA AQ MONITOR	NA	0.05	0.38	0.54	0.66
ROMP 30 U ARCA AQ MONITOR	NA	0.16	0.84	1.45	1.82
ROMP 39 HTRN AS MONITOR	NA	0.01	0.19	0.21	0.24
ROMP 41 SURF AQ MONITOR	NA	0.23	0.91	1.62	2.11
ROMP 43 U ARCA AQ MONITOR	NA	0.21	0.72	1.83	2.13
ROMP 5 U ARCA AQ MONITOR	NA	0.03	0.23	0.31	0.38
ROMP 59 HTRN AS MONITOR 1	NA	0.37	1.32	1.98	2.32
ROMP 8 U ARCA AQ MONITOR	NA	0.02	0.23	0.28	0.33
ROMP TR 7-2 U ARCA AQ MONITOR	NA	0.00	0.04	0.04	0.05
VERNA TEST 0-1	NA	0.10	1.85	2.08	2.34

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

TABLE 11
Simulated IAS Zone 2 ROMP Monitor Well Water Level Change Relative to 2010, Alternative 1 (Existing Mining Only with no Agricultural Reduction) Layer 3
Central Florida Phosphate District, Florida

Well	SWIMAL Weight*	Existing Mining Only Simulated Water Level Change Relative to 2010 (ft)			
		2015	2020	2025	2030
CL-2 DEEP SURF AQ MONITOR	NA	0.08	0.25	0.59	0.68
FORT GREEN SPRINGS INT	NA	0.71	2.86	4.19	5.12
ROMP 12 U ARCA AQ MONITOR	NA	0.03	0.26	0.36	0.44
ROMP 14 L ARCA AQ MONITOR	NA	0.01	0.05	0.07	0.08
ROMP 16 L ARCA AQ MONITOR	NA	0.03	0.30	0.42	0.50
ROMP 26 L ARCA AQ MONITOR	NA	0.05	0.38	0.54	0.66
ROMP 28 HTRN	NA	0.01	0.08	0.14	0.16
ROMP 30 L ARCA AQ MONITOR	NA	0.18	0.91	1.59	1.98
ROMP 43 L ARCA AQ MONITOR	NA	0.21	0.73	1.85	2.16
ROMP 5 L ARCA AQ MONITOR	NA	0.03	0.23	0.32	0.38
ROMP 59 HTRN AS MONITOR 2	NA	0.41	1.49	2.24	2.63
ROMP 9.5 L ARCA AQ MONITOR (MW-2)	NA	0.03	0.34	0.44	0.53
ROMP TR 1-2 L ARCA AQ MONITOR	NA	0.01	0.06	0.09	0.10
ROMP TR 3-1 L ARCA AQ MONITOR 2	NA	0.02	0.27	0.34	0.41
ROMP TR 5-1 L ARCA AQ MONITOR	NA	0.02	0.32	0.37	0.42
ROMP TR 7-1 L ARCA AQ INTERFACE MONITOR	8.84%	0.04	0.68	0.76	0.86
ROMP TR 9-2 L ARCA AQ MONITOR	NA	0.02	0.27	0.31	0.34
SARASOTA 9 DEEP	8.66%	0.07	1.28	1.44	1.63

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

TABLE 12

Simulated ROMP UFA Monitor Well Water Level Change Relative to 2010, Alternative 1 (Existing Mining Only with no Agricultural Reduction) Layer 4

Central Florida Phosphate District, Florida

Well	SWIMAL Weight*	Existing Mining Only Simulated Water Level Change Relative to 2010 (ft)			
		2015	2020	2025	2030
COLEY DEEP	NA	0.09	0.30	0.71	0.83
FLORIDA POWER FLDN AT PINEY POINT	NA	0.05	0.91	1.03	1.15
KIBLER DEEP	14.01%	0.14	2.61	2.92	3.28
LAKE ALFRED DEEP AT LAKE ALFRED	NA	0.03	0.12	0.18	0.21
ROMP 12 AVPK PZ MONITOR	NA	0.03	0.26	0.36	0.44
ROMP 123 HTRN AS/U FLDN AQ MONITOR	9.55%	0.19	3.34	3.72	4.11
ROMP 13 AVPK PZ MONITOR	NA	0.02	0.19	0.27	0.33
ROMP 14 U FLDN AQ MONITOR (AVPK)	NA	0.01	0.05	0.07	0.08
ROMP 15 U FLDN AQ MONITOR MOD	NA	0.03	0.28	0.39	0.48
ROMP 17 U FLDN AQ MONITOR (AVPK)	NA	0.04	0.34	0.45	0.54
ROMP 19X U FLDN AQ MONITOR (SWNN)	NA	0.04	0.51	0.62	0.72
ROMP 20 U FLDN AQ MONITOR (OCAL)	NA	0.03	0.55	0.62	0.71
ROMP 25 U FLDN AQ MONITOR	NA	0.12	1.73	2.04	2.41
ROMP 28 AVPK	NA	0.02	0.08	0.14	0.17
ROMP 30 U FLDN AQ MONITOR	NA	0.18	0.91	1.59	1.98
ROMP 31 U FLDN AQ MONITOR	NA	0.19	1.56	2.11	2.73
ROMP 32 U FLDN AQ MONITOR (AVPK)	NA	0.24	4.00	4.56	5.38
ROMP 39 AVPK PZ MONITOR	NA	0.16	3.03	3.37	3.75
ROMP 40 U FLDN AQ MONITOR	NA	0.44	5.66	6.55	7.53
ROMP 41 AVPK PZ MONITOR	NA	0.62	2.26	4.16	5.29
ROMP 43XX U FLDN AQ MONITOR	NA	0.06	0.23	0.54	0.63
ROMP 45 U FLDN AQ MONITOR (AVPK)	NA	0.69	2.08	3.98	4.75
ROMP 5 U FLDN AQ MONITOR (SWNN)	NA	0.03	0.23	0.32	0.38
ROMP 50 U FLDN AQ MONITOR (SWNN)	13.25%	0.12	1.94	2.17	2.41
ROMP 57 U FLDN AQ MONITOR	NA	0.12	0.38	0.70	0.83
ROMP 59 U FLDN AQ INTERFACE MONITOR	NA	0.47	1.68	2.52	2.95
ROMP 60X U FLDN AQ MONITOR	NA	0.41	1.61	2.32	2.70
ROMP TR 10-2 L ARCA AQ MONITOR	5.41%	0.05	0.55	0.64	0.71
ROMP TR 4-1 U FLDN AQ INTERFACE MONITOR	NA	0.02	0.36	0.42	0.48
ROMP TR 7-4 U FLDN AQ MONITOR (SWNN)	13.54%	0.06	1.14	1.28	1.44
ROMP TR 8-1 AVPK PZ MONITOR	14.08%	0.05	0.81	0.91	1.02
ROMP TR 9-3 U FLDN AQ MONITOR (SWNN)	7.17%	0.08	1.22	1.37	1.53
SMITH DEEP	NA	0.18	0.66	1.59	1.88
VERNA TEST 0-4	5.50%	0.08	1.55	1.74	1.97
Simulated Change in SWIMAL, ft		0.09	1.58	1.77	1.98

Note:

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

Tables 13 through 16 depict the No Action Alternative Existing Mining and All Users and are similar to the previous tables; however, they include the impacts from the reduction in agricultural pumpage. The simulated reduction in agricultural use of 50 mgd results in a simulated water level rise in all monitor wells in every layer, with the greatest increases of 1.14 at Fort Green Springs (Table 15) and 1.13 at ROMP 45 (Table 16). The SWIMAL value increases by 0.58 foot, as shown in Table 16.

TABLE 13
Simulated SAS ROMP Monitor Well Water Level Change Relative to 2010, Alternative 1 (Existing Mining and All Users with Agricultural Reduction) Layer 1
Central Florida Phosphate District, Florida

		Existing Mining and All Users Simulated Water Level Change Relative to 2010 (ft)			
Well	**SWIMAL Weight***	**2015**	**2020**	**2025**	**2030**
ENGLEWOOD 14 DEEP	NA	0.00	0.00	0.00	0.00
ROMP 10 SURF AQ MONITOR	NA	0.00	0.00	0.00	0.00
ROMP 16 SURF AQ MONITOR	NA	0.01	0.02	0.03	0.03
ROMP 19X SURF AQ MONITOR	NA	0.02	0.06	0.08	0.09
ROMP 28X SURF AQ MONITOR	NA	0.03	0.06	0.09	0.09
ROMP 30 SURF AQ MONITOR	NA	0.03	0.08	0.13	0.15
ROMP 32 HTRN AS MONITOR	NA	0.01	0.71	0.73	0.74
ROMP 35 SURF AQ MONITOR	NA	0.00	0.00	0.01	0.01
ROMP 40 SURF AQ MONITOR	NA	0.11	0.63	0.79	0.89
ROMP 43 SURF AQ MONITOR REPL	NA	0.49	1.24	2.43	2.67
ROMP 45.5 HTRN CU MONITOR	NA	0.09	0.25	0.39	0.45
ROMP 58 SURF AQ MONITOR	NA	0.23	0.52	0.83	0.88
ROMP 60X (PRIM SC06) SURF AQ MONITOR	NA	0.43	1.27	1.77	1.95
ROMP TR 10-2 SURF AQ MONITOR	NA	0.00	0.00	0.00	0.00
ROMP TR 8-1 SURF AQ MONITOR	NA	0.00	0.00	0.00	0.00
ROMP TR SA-1 SURF	NA	0.00	0.01	0.02	0.02

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

TABLE 14
Simulated IAS Zone 1 ROMP Monitor Well Water Level Change Relative to 2010, Alternative 1 (Existing Mining and All Users with Agricultural Reduction) Layer 2
Central Florida Phosphate District, Florida

		Existing Mining and All Users Simulated Water Level Change Relative to 2010 (ft)			
Well	**SWIMAL Weight***	**2015**	**2020**	**2025**	**2030**
CL-3 HTRN AS MONITOR	NA	0.36	0.85	1.56	1.69
KUSHMER INT	NA	0.09	0.37	0.47	0.50
ROMP 10 U ARCA AQ MONITOR 2	NA	0.09	0.24	0.35	0.37
ROMP 13 U ARCA AQ MONITOR	NA	0.23	0.60	0.88	0.94
ROMP 17 U ARCA AQ MONITOR	NA	0.25	0.71	1.02	1.08
ROMP 20 U ARCA AQ MONITOR	NA	0.18	0.69	0.90	0.96
ROMP 25 U ARCA AQ MONITOR	NA	0.10	0.35	0.48	0.53
ROMP 26 U ARCA AQ MONITOR	NA	0.40	1.10	1.61	1.73
ROMP 30 U ARCA AQ MONITOR	NA	0.60	1.77	2.81	3.18
ROMP 39 HTRN AS MONITOR	NA	0.07	0.32	0.40	0.43
ROMP 41 SURF AQ MONITOR	NA	0.44	1.42	2.33	2.81
ROMP 43 U ARCA AQ MONITOR	NA	0.62	1.56	3.06	3.36
ROMP 5 U ARCA AQ MONITOR	NA	0.25	0.69	1.00	1.06
ROMP 59 HTRN AS MONITOR 1	NA	0.61	1.82	2.71	3.05
ROMP 8 U ARCA AQ MONITOR	NA	0.16	0.52	0.70	0.75
ROMP TR 7-2 U ARCA AQ MONITOR	NA	0.02	0.06	0.08	0.09
VERNA TEST 0-1	NA	0.73	3.13	3.98	4.25

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

TABLE 15

Simulated IAS Zone 2 ROMP Monitor Well Water Level Change Relative to 2010, Alternative 1 (Existing Mining and All Users with Agricultural Reduction) Layer 3

Central Florida Phosphate District, Florida

Well	SWIMAL Weight*	Existing Mining and All Users Simulated Water Level Change Relative to 2010 (ft)			
		2015	2020	2025	2030
CL-2 DEEP SURF AQ MONITOR	NA	0.38	0.86	1.49	1.58
FORT GREEN SPRINGS INT	NA	1.14	3.76	5.49	6.42
ROMP 12 U ARCA AQ MONITOR	NA	0.30	0.81	1.18	1.25
ROMP 14 L ARCA AQ MONITOR	NA	0.07	0.19	0.27	0.29
ROMP 16 L ARCA AQ MONITOR	NA	0.33	0.91	1.33	1.41
ROMP 26 L ARCA AQ MONITOR	NA	0.40	1.10	1.60	1.72
ROMP 28 HTRN	NA	0.13	0.30	0.47	0.50
ROMP 30 L ARCA AQ MONITOR	NA	0.65	1.92	3.06	3.45
ROMP 43 L ARCA AQ MONITOR	NA	0.62	1.58	3.09	3.40
ROMP 5 L ARCA AQ MONITOR	NA	0.25	0.70	1.01	1.07
ROMP 59 HTRN AS MONITOR 2	NA	0.69	2.06	3.07	3.46
ROMP 9.5 L ARCA AQ MONITOR (MW-2)	NA	0.32	0.93	1.33	1.41
ROMP TR 1-2 L ARCA AQ MONITOR	NA	0.06	0.18	0.26	0.28
ROMP TR 3-1 L ARCA AQ MONITOR 2	NA	0.23	0.69	0.97	1.03
ROMP TR 5-1 L ARCA AQ MONITOR	NA	0.17	0.62	0.81	0.86
ROMP TR 7-1 L ARCA AQ INTERFACE MONITOR	8.84%	0.29	1.20	1.53	1.63
ROMP TR 9-2 L ARCA AQ MONITOR	NA	0.11	0.46	0.59	0.63
SARASOTA 9 DEEP	8.66%	0.55	2.26	2.89	3.08

Note:

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

TABLE 16
Simulated UFA ROMP Monitor Well Water Level Change Relative to 2010, Alternative 1 (Existing Mining and All Users with Agricultural Reduction) Layer 4
Central Florida Phosphate District, Florida

		Existing Mining and All Users Simulated Water Level Change Relative to 2010 (ft)			
Well	**SWIMAL Weight***	**2015**	**2020**	**2025**	**2030**
COLEY DEEP	NA	0.41	0.94	1.66	1.78
FLORIDA POWER FLDN AT PINEY POINT	NA	0.40	1.62	2.08	2.20
KIBLER DEEP	14.01%	0.92	4.21	5.29	5.66
LAKE ALFRED DEEP AT LAKE ALFRED	NA	0.12	0.30	0.45	0.48
ROMP 12 AVPK PZ MONITOR	NA	0.30	0.81	1.18	1.25
ROMP 123 HTRN AS/U FLDN AQ MONITOR	9.55%	0.90	4.78	5.87	6.26
ROMP 13 AVPK PZ MONITOR	NA	0.23	0.62	0.91	0.97
ROMP 14 U FLDN AQ MONITOR (AVPK)	NA	0.07	0.19	0.27	0.29
ROMP 15 U FLDN AQ MONITOR MOD	NA	0.34	0.89	1.31	1.40
ROMP 17 U FLDN AQ MONITOR (AVPK)	NA	0.34	0.96	1.38	1.47
ROMP 19X U FLDN AQ MONITOR (SWNN)	NA	0.35	1.15	1.58	1.68
ROMP 20 U FLDN AQ MONITOR (OCAL)	NA	0.27	1.02	1.33	1.42
ROMP 25 U FLDN AQ MONITOR	NA	0.84	3.21	4.23	4.61
ROMP 28 AVPK	NA	0.13	0.31	0.49	0.52
ROMP 30 U FLDN AQ MONITOR	NA	0.65	1.92	3.06	3.46
ROMP 31 U FLDN AQ MONITOR	NA	0.73	2.79	3.88	4.50
ROMP 32 U FLDN AQ MONITOR (AVPK)	NA	1.01	5.60	6.93	7.74
ROMP 39 AVPK PZ MONITOR	NA	0.95	4.62	5.74	6.12
ROMP 40 U FLDN AQ MONITOR	NA	1.01	6.86	8.31	9.30
ROMP 41 AVPK PZ MONITOR	NA	1.11	3.30	5.69	6.81
ROMP 43XX U FLDN AQ MONITOR	NA	0.43	0.96	1.64	1.73
ROMP 45 U FLDN AQ MONITOR (AVPK)	NA	1.13	3.00	5.33	6.10
ROMP 5 U FLDN AQ MONITOR (SWNN)	NA	0.25	0.70	1.01	1.07
ROMP 50 U FLDN AQ MONITOR (SWNN)	13.25%	0.70	3.11	3.92	4.16
ROMP 57 U FLDN AQ MONITOR	NA	0.40	0.95	1.54	1.67
ROMP 59 U FLDN AQ INTERFACE MONITOR	NA	0.77	2.31	3.45	3.88
ROMP 60X U FLDN AQ MONITOR	NA	0.70	2.19	3.18	3.56
ROMP TR 10-2 L ARCA AQ MONITOR	5.41%	0.18	0.82	1.04	1.11
ROMP TR 4-1 U FLDN AQ INTERFACE MONITOR	NA	0.20	0.71	0.94	1.00
ROMP TR 7-4 U FLDN AQ MONITOR (SWNN)	13.54%	0.48	1.99	2.55	2.71
ROMP TR 8-1 AVPK PZ MONITOR	14.08%	0.35	1.43	1.84	1.95
ROMP TR 9-3 U FLDN AQ MONITOR (SWNN)	7.17%	0.50	2.07	2.64	2.79
SMITH DEEP	NA	0.58	1.49	2.80	3.08
VERNA TEST 0-4	5.50%	0.65	2.71	3.47	3.70
Simulated Change in SWIMAL, ft		0.58	2.57	3.25	3.46

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

6.1.1.2 2010 to 2020

Tables 9 through 12 depict the simulated change in aquifer water levels from 2010 to 2020 from mining only, assuming that no new mines are permitted. By 2020, the Four Corners Mine is no longer operating and the South Fort Meade and South Pasture Mines are projected to pump 11.3 mgd and 6.39 mgd, respectively (unchanged from 2010). The simulated water level increases in all monitor wells in every layer, with the greatest increases of 2.86 feet in Layer 3 at Fort Green Springs (Table 11) and 5.66 feet in Layer 4 at ROMP 40 (Table 12). The SWIMAL value increases by 1.58 feet relative to 2010, as shown on Table 12.

Tables 12 through 16 include the effect of the reduction in agricultural withdrawals between 2010 and 2020. The simulated reduction in agricultural use (37.5 mgd reduction for year 2020 of the baseline 2010 agricultural use) results in a simulated water level rise in all monitor wells in every layer, with the greatest increases of 3.76 at Fort Green Springs (Table 15) and 6.86 at ROMP 40 (Table 16). The SWIMAL value increases by 2.57 feet, as shown in Table 16.

6.1.1.3 2010 to 2025

Tables 9 through 12 depict the simulated change in aquifer water levels from 2010 to 2025 from mining only. By 2025, all mines except South Pasture are projected to have ceased operations. South Pasture’s 2025 pumping rate is unchanged from its 2010 pumping rate. The simulated water level increases in all monitor wells in every layer, with the greatest increases of 4.19 feet in Layer 3 at Fort Green Springs (Table 11) and 6.55 feet in Layer 4 at ROMP 40 (Table 12). The SWIMAL value increases by 1.77 feet relative to 2010, as shown on Table 12. The 2025 Mining Only scenarios are also presented graphically in Figures 17 through 20.

Tables 13 through 16 include the effect of the agricultural withdrawal reduction between 2010 and 2025. By 2025, the SWUCA recovery strategy assumes that agricultural withdrawals have been reduced by 50 mgd. The implementation of these additional reductions in agricultural withdrawals results in a simulated water level rise in all monitor wells in every layer, with the greatest increases of 5.49 at Fort Green Springs (Table 15) and 8.31 at ROMP 40 (Table 16). The SWIMAL value increases by 3.25 feet, as shown in Table 16. The 2025 All Users scenarios are also presented graphically in Figures 21 through 24.

6.1.1.4 2010 to 2030

Tables 9 through 12 depict the simulated change in aquifer water levels between 2010 and 2030. In this scenario, it is projected that all of the mines operating in 2010 will have ceased pumping. No agriculture demand reduction is included. The simulated water level increases in all monitor wells in every layer, with the greatest increases of 5.12 feet in Layer 3 at Fort Green Springs (Table 11) and 7.53 feet in Layer 4 at ROMP 40 (Table 12). The SWIMAL value increases by 1.98 feet relative to 2010, as shown on Table 12.

Tables 13 through 16 include the effect of the agricultural withdrawal reduction between 2010 and 2030. Agriculture demands are maintained at their 2025 levels, per the SWUCA recovery strategy. The implementation of these additional reductions in agricultural withdrawals results in a simulated water level rise in all monitor wells in every layer, with the greatest increases of 6.42 at Fort Green Springs (Table 15) and 9.30 at ROMP 40 (Table 16). The SWIMAL value increases by 3.46 feet, as shown in Table 16.

6.1.2 Summary

The model results for No Action Alternative Existing Mining indicate that the simulated water level in all aquifer layers will increase throughout the model domain as existing mines cease operations and overall water use in the SWUCA decreases. If only water level changes from phosphate mining are considered, the 2030 simulated water level rise at ROMP targets of interest is up to 1.69 feet in the SAS, 2.34 feet in the IAS (Zone 1), 5.12 feet in the IAS (Zone 2), and 7.53 feet in the UFA. Factoring in the effects of all other users, the simulated water level increase by 2030 is up to 2.67 feet in the SAS, 3.36 feet in the IAS (Zone 1), 6.42 feet in the IAS (Zone 2), and 9.30 feet in the UFA. The difference in water level due to the Agriculture withdrawal by itself is 0.98 foot in the SAS, 1.02 feet in the IAS (Zone 1), 1.30 feet in the IAS (Zone 2), and 1.77 feet in the UFA.

FIGURE 21
Simulated Water Change in SAS (Model Layer 1) Water Level (ft) 2010 to 2025
Alternative 1 (Existing Mining with Agicultural Reduction)
Central Florida Phosphate District, Florida

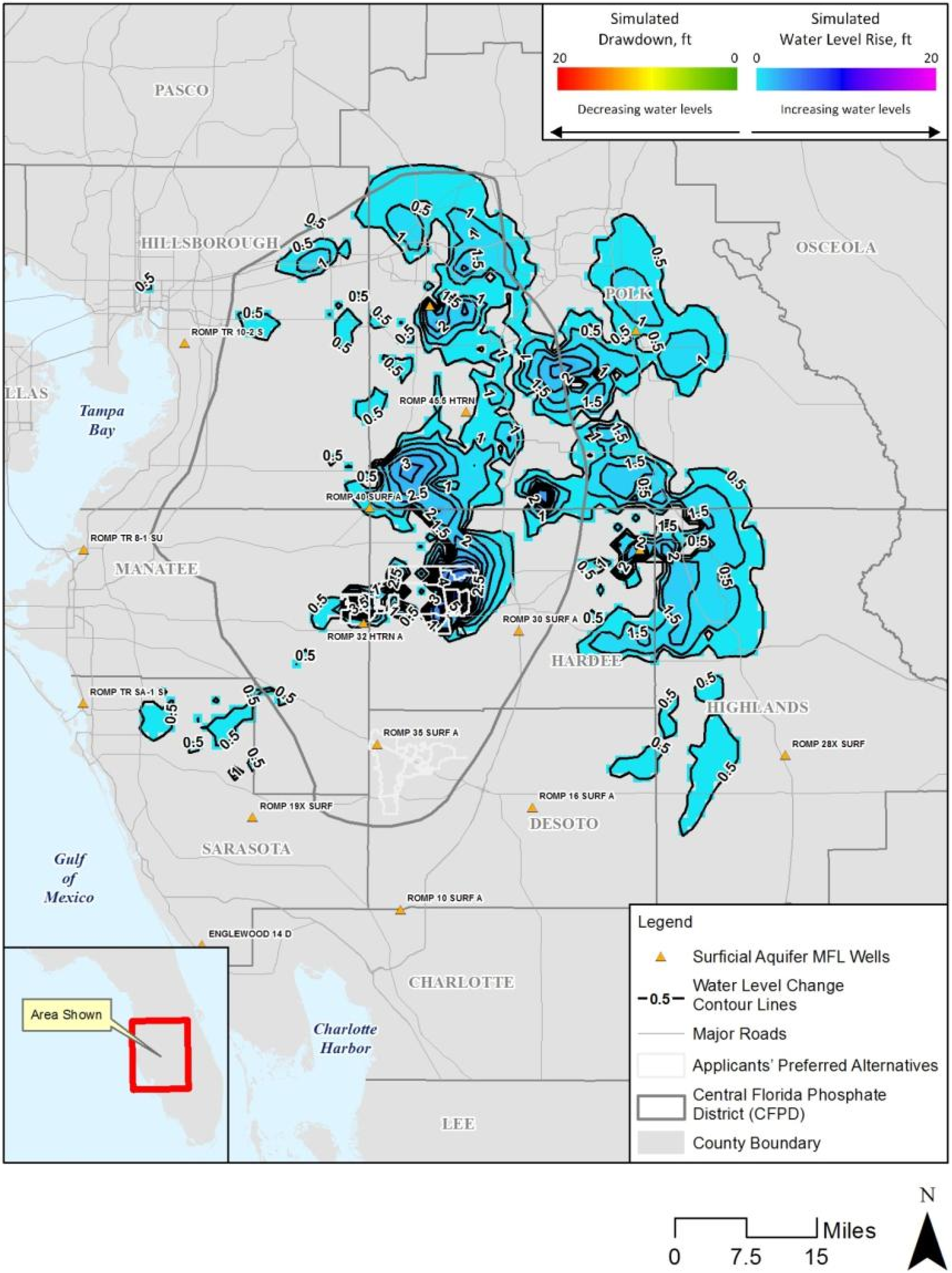


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FIGURE 22
Simulated Water Change in IAS Zone 1 (Model Layer 2) Water Level (ft) 2010 to 2025
Alternative 1 (Existing Mining with Agricultural Reduction)
Central Florida Phosphate District, Florida

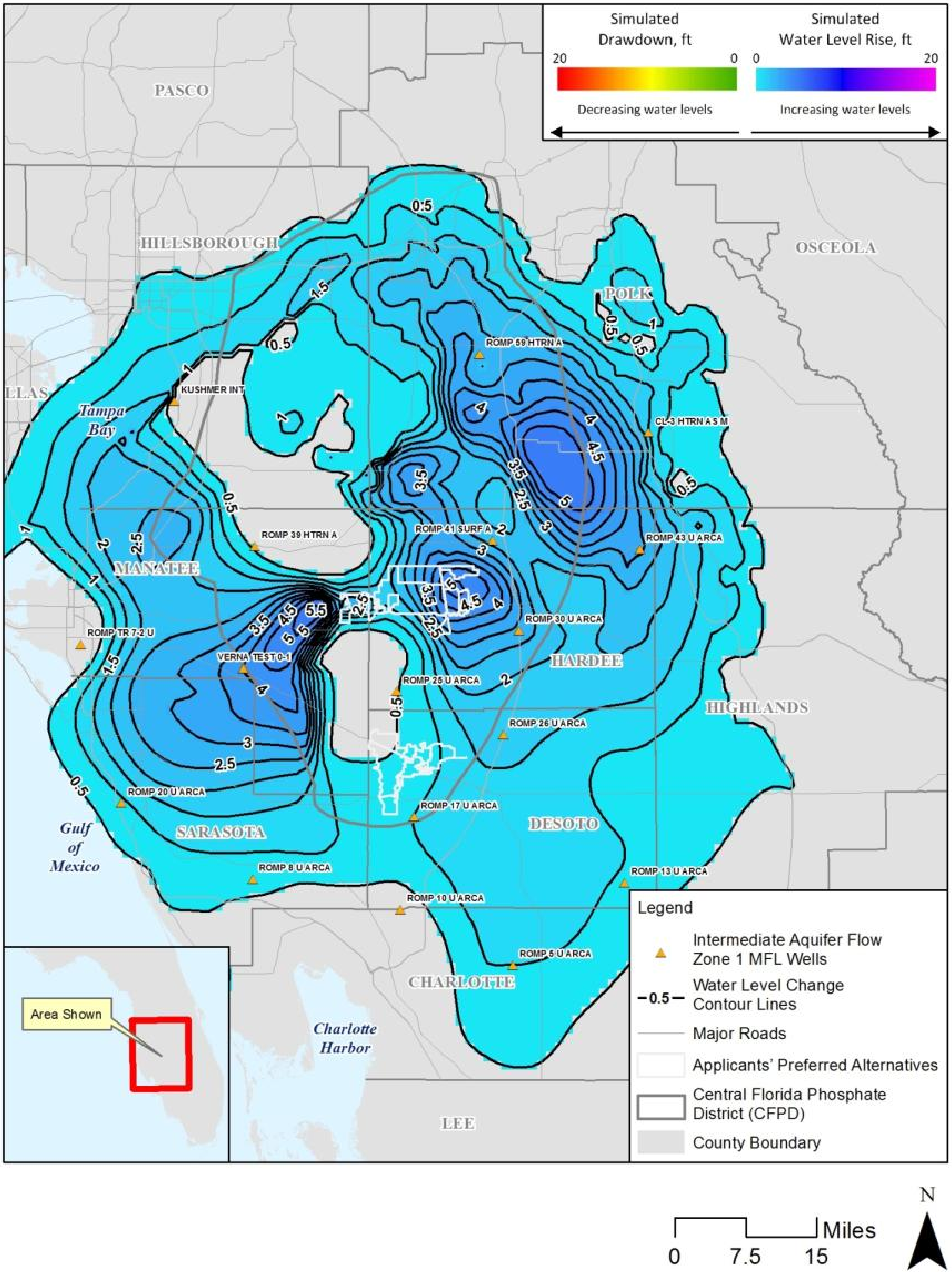


FIGURE 23
Simulated Water Change in IAS Zone 2 (Model Layer 3) Water Level (ft) 2010 to 2025
Alternative 1 (Existing Mining with Agicultural Reduction)
Central Florida Phosphate District, Florida

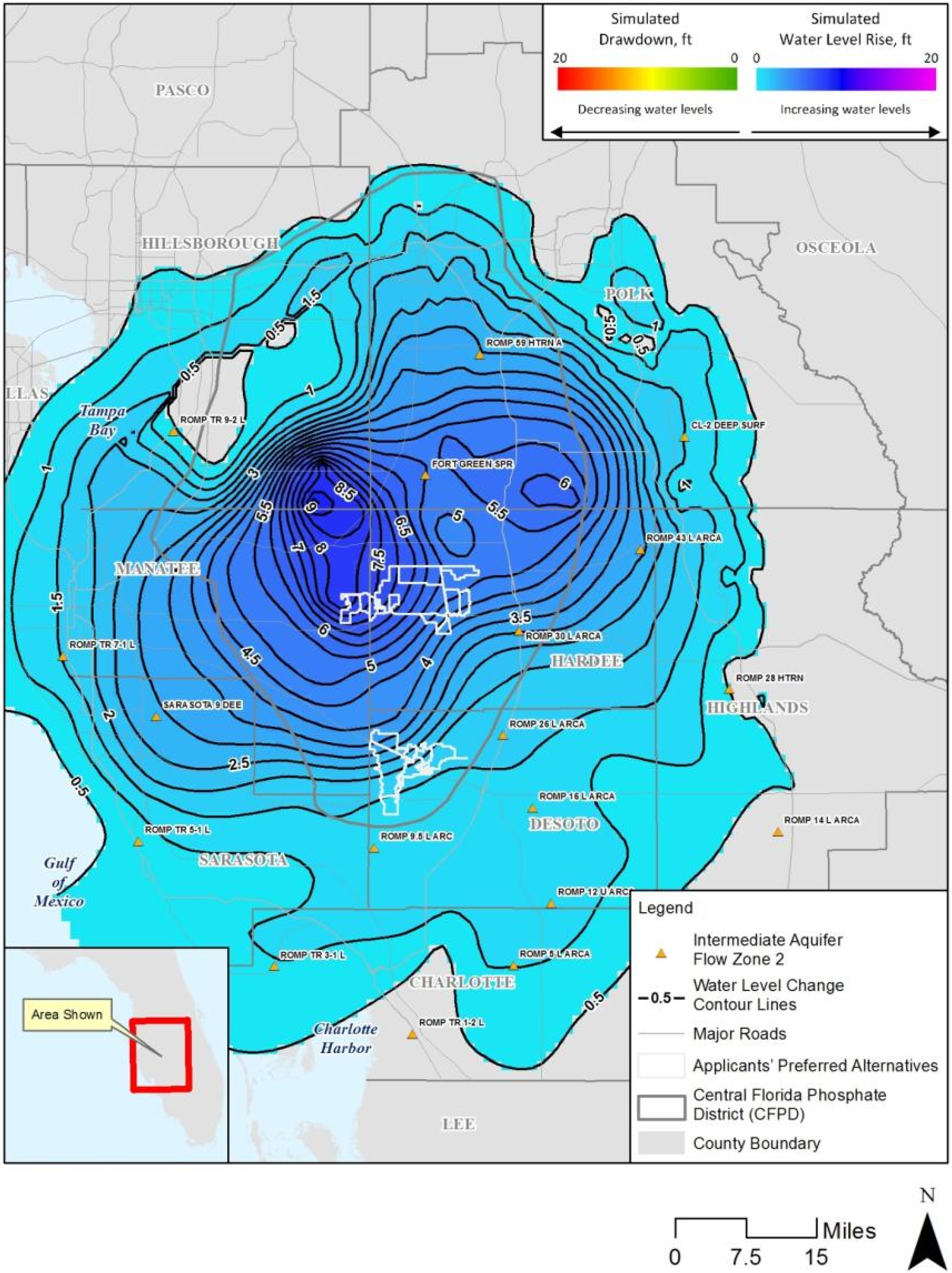
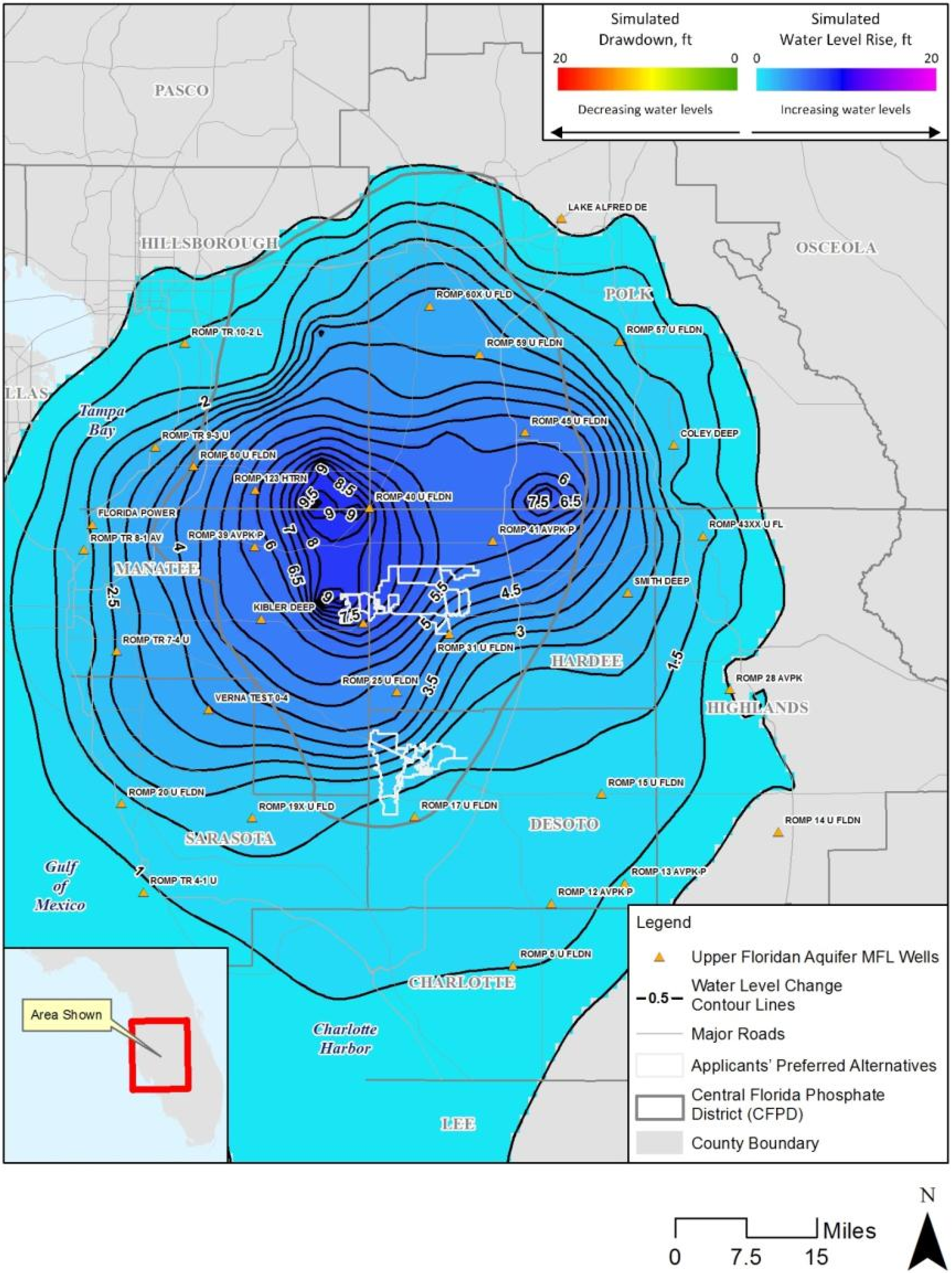


FIGURE 24
Simulated Water Change in Upper Floridan Aquifer (Model Layer 4) Water Level (ft) 2010 to 2025
Alternative 1 (Existing Mining with Agicultural Reduction)
Central Florida Phosphate District, Florida



6.2 Alternatives 2 through 5 – The Applicants' Preferred Alternatives

Projected Floridan drought year aquifer demands were provided annually by the Applicants for the Preferred Alternative mines as shown in Table 6. It is highly conservative to use the drought year withdrawal rates for steady-state modeling; therefore, these model scenarios represent worst-case conditions and are highly unlikely to actually occur. It is more likely that these rates would only be used for a few months during the dry season, with withdrawals returning to a more average annual rate thereafter. Four of the mines (Four Corners, Hookers Prairie, Ona, and South Fort Meade) also have permitted flexible quantities that exceed the drought year aquifer demand, but are intended to be pumped for short time periods, most likely for periods of only days or weeks. A mine may pump the flexible permit quantities, but the other mines included in the WUP (Mosaic) have to reduce their pumping so that the total pumping of all mines does not exceed the sum of their drought year annual average. Because of this complexity, alternative scenarios were developed for many of the scenario years to represent these specialized cases. The Floridan aquifer water allocations associated with each currently operating mine and the Applicants' Preferred Alternatives are summarized as follows:

- Four Corners Mine – Floridan aquifer water use at the existing Four Corners Mine is projected to be up to a drought year annual average of 15.6 mgd through the end of active mining in 2019. Four Corners Mine also has a flexible permit withdrawal limit of 20 mgd. The 2015B and 2019B scenarios show the impacts of Four Corners Mine using its flexible permit withdrawal, and the other operating mines adjusting their pumpage so that the total withdrawal does not exceed the sum of the drought year withdrawal for all operating mines.
- Hookers Prairie Mine – The Hookers Prairie Mine is an existing mine that is projected to withdraw a drought year annual average of 4.2 mgd through the end of mining in 2014.
- Hopewell Mine – The existing Hopewell Mine is projected to use a drought year annual average of up to 0.5 mgd through 2015.
- Ona Mine – The proposed Ona Mine is expected to withdraw up to a drought year annual average of 11.9 mgd beginning in 2020 from a new wellfield. It is assumed that active mining and reclamation will continue through approximately 2048. Only the Ona Mine includes new UFA withdrawal locations and allocations beyond the current levels of water supply allocation for phosphate mining within the CFPD. The Ona Mine has a flexible permit withdrawal limit of 15 mgd. The 2020B, 2025B, 2036B, and 2047B scenarios show the impacts of Ona Mine using its flexible permit withdrawal limit, and the other operating Mosaic mines adjusting their pumpage so that the total withdrawal does not exceed the sum of the drought year withdrawal for all operating mines.
- Desoto Mine – The proposed Desoto Mine is expected to operate for 15 years (including reclamation) beginning in 2021, and withdraw groundwater from the Floridan aquifer at a drought year annual average rate of up to 10.7 mgd. It was assumed for this analysis that water demands during reclamation would be equivalent to that during active mining. Floridan groundwater for the Desoto Mine will be provided by pumpage of existing wells at the Fort Green facility and conveyance via pipeline to the Desoto Mine location. No new supply wells will be constructed to support this new mine.
- South Fort Meade Mine – The existing South Fort Meade Mine is projected to withdraw groundwater from the existing Floridan aquifer wells located at the South Fort Meade Mine at a drought year annual average rate of 11.3 mgd through 2020. The South Fort Meade Mine also has a flexible permit withdrawal limit of 15.4 mgd. The 2015C, 2019C, and 2020B scenarios show the impacts of South Fort Meade Mine using its flexible permit withdrawal, and the other Mosaic mines adjusting their pumpage so that the total withdrawal does not exceed the sum of the drought year withdrawal for all operating mines.
- Wingate Creek/Wingate East Mine – The existing Wingate Creek Mine and the proposed Wingate East Mine would withdraw from existing Floridan aquifer wells at the existing mine at a rate of up to a drought year annual average of 5.8 mgd for 36 years, through 2046.

- South Pasture Mine/South Pasture Mine Extension – The South Pasture Mine/South Pasture Mine Extension combined would withdraw from existing Floridan aquifer wells up to its SWFWMD-permitted drought year annual average rate of 6.39 mgd through 2037.

Table 17 summarizes the simulated withdrawal rates for the currently operating and Applicants' Preferred Alternative mines that will operate through 2050. Highlighted rows indicate years for which model simulations were run and output was generated. The monthly peaking factors used in transient modeling (described later in this TM) are provided at the bottom of Table 17. On the basis of these annual average allocations and the projected operational periods of all of the existing and projected phosphate mines, the maximal usage of the Floridan aquifer by mining would occur in the period ranging from approximately 2010 to 2019. Thus, from a worst-case (most conservative) perspective, the simulations for the 2015 and 2019 periods represent the maximal cumulative effects analyses. By 2025, only Alternatives 2, 3, 4 and 5 mine projects would be operating. By 2036, only three of these mine projects would remain in operation. By 2047, only one of the four mines would remain in operation. These simulations provide perspectives on the relative influence of each of these proposed mine projects on SAS, IAS, and UFA drawdowns.

TABLE 17

Projected Floridan Aquifer Groundwater Withdrawal Rates, mgd – Applicants' Preferred Alternatives 2, 3, 4, and 5 using Drought Year and Flexible Withdrawals

Central Florida Phosphate District, Florida

Year	Four Corners	Hookers Prairie	Hopewell	Ona	Desoto	South Fort Meade	Wingate/Wingate East	South Pasture	Total
2010*	15.6	4.2	0.5	0	0	11.3	5.8	6.39	43.79
2011	15.6	4.2	0.5	0	0	11.3	5.8	6.39	43.79
2012	15.6	4.2	0.5	0	0	11.3	5.8	6.39	43.79
2013	15.6	4.2	0.5	0	0	11.3	5.8	6.39	43.79
2014	15.6	4.2	0.5	0	0	11.3	5.8	6.39	43.79
2015A	15.6	0	0.5	0	0	11.3	5.8	6.39	39.59
2015B	20	0	0.5	0	0	11.2	5.7	6.39	43.79
2015C	15.7	0	0.5	0	0	15.4	5.8	6.39	43.79
2016	15.6	0	0	0	0	11.3	5.8	6.39	39.09
2017	15.6	0	0	0	0	11.3	5.8	6.39	39.09
2018	15.6	0	0	0	0	11.3	5.8	6.39	39.09
2019A	15.6	0	0	0	0	11.3	5.8	6.39	39.09
2019B	20	0	0	0	0	11.6	5.8	6.39	43.79
2019C	16.2	0	0	0	0	15.4	5.8	6.39	43.79
2020A	0	0	0	11.9	0	11.3	5.8	6.39	35.39
2020B	0	0	0	15.0	0	15.4	5.8	6.39	42.59
2021	0	0	0	11.9	10.7	0	5.8	6.39	34.79
2022	0	0	0	11.9	10.7	0	5.8	6.39	34.79
2023	0	0	0	11.9	10.7	0	5.8	6.39	34.79
2024	0	0	0	11.9	10.7	0	5.8	6.39	34.79
2025A	0	0	0	11.9	10.7	0	5.8	6.39	34.79
2025B*	0	0	0	15	10.7	0	5.8	6.39	37.89
2026	0	0	0	11.9	10.7	0	5.8	6.39	34.79
2027	0	0	0	11.9	10.7	0	5.8	6.39	34.79
2028	0	0	0	11.9	10.7	0	5.8	6.39	34.79
2029	0	0	0	11.9	10.7	0	5.8	6.39	34.79
2030	0	0	0	11.9	10.7	0	5.8	6.39	34.79

TABLE 17

Projected Floridan Aquifer Groundwater Withdrawal Rates, mgd – Applicants' Preferred Alternatives 2, 3, 4, and 5 using Drought Year and Flexible Withdrawals

Central Florida Phosphate District, Florida

Year	Four Corners	Hookers Prairie	Hopewell	Ona	Desoto	South Fort Meade	Wingate/Wingate East	South Pasture	Total
2031	0	0	0	11.9	10.7	0	5.8	6.39	34.79
2032	0	0	0	11.9	10.7	0	5.8	6.39	34.79
2033	0	0	0	11.9	10.7	0	5.8	6.39	34.79
2034	0	0	0	11.9	10.7	0	5.8	6.39	34.79
2035	0	0	0	11.9	10.7	0	5.8	6.39	34.79
2036A	0	0	0	11.9	0	0	5.8	6.39	24.09
2036B	0	0	0	15	0	0	5.8	6.39	27.19
2037	0	0	0	11.9		0	5.8	6.39	24.09
2038	0	0	0	11.9		0	5.8		17.70
2039	0	0	0	11.9		0	5.8		17.70
2040	0	0	0	11.9		0	5.8		17.70
2041	0	0	0	11.9		0	5.8		17.70
2042	0	0	0	11.9		0	5.8		17.70
2043	0	0	0	11.9		0	5.8		17.70
2044	0	0	0	11.9		0	5.8		17.70
2045	0	0	0	11.9		0	5.8		17.70
2046	0	0	0	11.9		0	5.8		17.70
2047A	0	0	0	11.9		0	0		11.90
2047B	0	0	0	15		0	0		15.00
2048	0	0	0	11.9		0	0		11.90
2049	0	0	0	0		0	0		0.00
2050	0	0	0	0		0	0		0.00
Transient Model Peaking Factor	1.74	1.64	1.25	1.88	1.88	1.62	1.25	2.12	

Note:

*Transient Models also developed for these scenarios.

Minor Quantities May be used for reclamation activities as facilities close down, South Pasture withdrawal in years 2036 and 2037 are for reclamation and infill parcels.

Yellow-shaded rows indicate years for which steady-state model simulations were conducted and output was generated.

6.2.1 Simulated SAS, IAS and UFA Water Table Changes

As noted previously, too many figures would be required to graphically represent every scenario for four aquifer layers; therefore, only representative figures are presented for the year 2025 (Alternative B). Tables 18 through 21 provide representative monitor well coverage of the CFPD for all four aquifer layers and show the changes in water level. In the Alternative 2, 3, 4, and 5 modeling results, the areas within which changes in drawdown or rebound of each aquifer layer of 0.5 foot or greater are shaded to reflect the areas within the study area influenced by the indicated simulation conditions. As noted under the Alternative 1 set of simulation results, the magnitude of these zones of drawdown or rebound should be reviewed in relation to the water level variations historically experienced within the study area, as reflected in the example ROMP well water level records summarized in Figures 5 through 10 and Table 1. Specifically for these ROMP wells, the records reflect seasonal variations of 7 to 10 feet in the SAS, 13 to 42 feet in the IAS Zone 1, 13 to 49 feet in IAS Zone 2, and 16 to 61 feet in the Floridan aquifer, suggesting that the simulation results indicate only localized and relatively minor influence of phosphate mining withdrawals on the overall aquifer water levels within the AEIS study area.

6.2.1.1 2010 to 2015

In scenario 2015A under the Applicants’ Preferred Alternatives 2, 3, 4 and 5, it is projected that: the Four Corners Mine will continue to operate at its 2010 rate of 15.6 mgd; the Hookers Prairie Mine will cease operating; and that the Hopewell, South Fort Meade, Wingate, and South Pasture Mines will continue pumping at their 2010 rates of 0.5, 11.3, 5.8, and 6.39 mgd, respectively. In scenario 2015B, the Four Corners Mine will withdraw its flexible permit limit of 20 mgd, and South Fort Meade and Wingate Mines will withdraw slightly less, so that the sum of the Mosaic mine withdrawals does not exceed the total drought year annual permit capacity of 37.4 mgd. In scenario 2015C, the South Fort Meade Mine will withdraw its flexible permit limit of 15.4 mgd and the Four Corners Mine will withdraw slightly more (15.7 mgd), so that the sum of the Mosaic mines does not exceed the total drought year annual permit capacity of 37.4 mgd. In the 2015 scenarios, agricultural withdrawals were reduced to 93 percent of their 2010 rates, in line with the SWUCA recovery strategy.

Tables 18 through 21 depict the simulated change in Floridan aquifer water levels from 2010 to 2015 from Mining Only with other users at 2010 rates and no agricultural reduction for scenarios 2015A, 2015B, and 2015C. In scenario 2015A Mining Only with no agricultural reduction, the monitor well water level changes range from 0 to 0.25 foot in Layer 1, 0 to 0.37 foot in Layer 2, 0.01 to 0.71 foot in Layer 3, and 0.01 to 0.69 foot in Layer 4. The 2015A Mining Only SWIMAL value increases by 0.09 foot, as shown in Table 21. In scenario 2015B Mining Only with no agricultural reduction, the monitor well water level changes range from -0.05 to 0.09 foot in Layer 1, -0.18 to 0.16 foot in Layer 2, -0.13 to 0.26 foot in Layer 3, and -0.74 to 0.41 foot in Layer 4. The 2015B Mining Only with no agricultural reduction SWIMAL value decreases by 0.19 foot, as shown in Table 21. In scenario 2015C Mining Only with no agricultural reduction, the monitor well water level changes range from -0.19 to 0.09 foot in Layer 1, -0.19 to 0.17 foot in Layer 2, -0.13 to 0.23 foot in Layer 3, and -0.76 to 0.36 foot in Layer 4. The 2015C Mining Only with no agricultural reduction SWIMAL value decreases by 0.19 foot, as shown in Table 21.

Tables 22 through 25 depict the simulated change in Floridan aquifer water levels from 2010 to 2015 considering withdrawal by All Users with agricultural reduction for scenarios 2015A, 2015B, and 2015C. In scenario 2015A, the monitor well water levels range from 0 to 0.49 foot in Layer 1, 0.02 to 0.62 foot in Layer 2, 0.06 to 1.14 foot in Layer 3, and 0.07 to 1.13 foot in Layer 4. The 2015A All Users with agricultural reduction SWIMAL value increases by 0.58 foot, as shown in Table 25. In scenario 2015B All Users with agricultural reduction, the monitor well water levels range from 0 to 0.42 foot in Layer 1, 0.01 to 0.52 foot in Layer 2, 0.05 to 0.68 foot in Layer 3, and -0.17 to 0.86 foot in Layer 4. The 2015B All Users with agricultural reduction SWIMAL value increases by 0.30 foot, as shown in Table 25. In scenario 2015C All Users with agricultural reduction, the monitor well water levels range from 0 to 0.26 foot in Layer 1, 0.01 to 0.64 foot in Layer 2, 0.06 to 0.64 foot in Layer 3, and 0.07 to 0.81 foot in Layer 4. The 2015C All Users SWIMAL value increases by 0.50 foot, as shown in Table 25.

6.2.1.2 2010 to 2019

In 2019A under Alternative 2, 3, 4, and 5 it is projected that: the Four Corners Mine will continue to operate at its 2010 rate of 15.6 mgd; Hookers Prairie and Hopewell Mines will cease operating; and that the South Fort Meade, Wingate, and South Pasture Mines will continue pumping at their 2010 rates of 11.3, 5.8, and 6.39 mgd, respectively. In 2019B, it is assumed that Four Corners Mine is withdrawing its flexible permit limit of 20 mgd and the South Fort Meade Mine will withdraw slightly more, so that the sum of the Mosaic mine withdrawals does not exceed the total drought year annual permit capacity of 37.4 mgd. In scenario 2019C, the South Fort Meade Mine is withdrawing its flexible permit limit of 15.4 mgd and the Four Corners Mine is withdrawing some of its flexible permit capacity, so that the sum of the Mosaic mine withdrawals does not exceed the total drought year annual permit capacity of 37.4 mgd. In the 2019 All Users scenarios, agricultural withdrawals were reduced to 90 percent of their 2010 rates, in line with the SWUCA recovery strategy.

TABLE 18

Simulated ROMP SAS Monitor Well Water Level Change Relative to 2010, Alternatives 2, 3, 4, and 5 (Mining Only without Agricultural Reduction) Layer 1

Central Florida Phosphate District, FL

		Mining Only 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	0.00	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	0.01
ROMP 19X SURF AQ MONITOR	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.03	0.02	0.04
ROMP 28X 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	0.01	0.01	0.02
ROMP 30 SURF AQ MONITOR	NA	0.01	0.00	0.00	0.01	0.00	0.00	-0.02	-0.04	0.00	-0.02	0.01	0.00	0.04	0.03	0.09
ROMP 32 HTRN AS MONITOR	NA	0.00	0.00	-0.19	-0.18	-0.19	-0.19	0.53	0.52	0.35	0.34	1.43	1.42	1.76	1.75	1.25
ROMP 35 SURF AQ MONITOR	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.19	0.31	0.31	0.00	0.00	0.00
ROMP 40 SURF AQ MONITOR	NA	0.05	-0.05	-0.06	0.05	-0.06	0.00	0.27	0.19	0.03	-0.01	0.37	0.33	0.57	0.53	0.73
ROMP 43 SURF AQ MONITOR REPL	NA	0.17	0.09	0.06	0.17	0.06	-0.17	0.14	-0.28	0.74	0.65	1.03	0.94	1.39	1.30	1.72
ROMP 45.5 HTRN CU MONITOR	NA	0.06	0.04	0.04	0.06	0.03	0.02	0.09	0.03	0.12	0.10	0.21	0.19	0.29	0.27	0.35
ROMP 58 SURF AQ MONITOR	NA	0.05	0.03	0.02	0.05	0.02	0.00	0.08	0.01	0.14	0.12	0.22	0.20	0.30	0.28	0.36
ROMP 60X (PRIM SC06) SURF AQ MONITOR	NA	0.25	0.08	0.09	0.27	0.09	0.08	0.56	0.32	0.53	0.46	0.98	0.91	1.31	1.25	1.55
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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01

Note:

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

TABLE 19

Simulated ROMP IAS Zone 1 Monitor Well Water Level Change Relative to 2010, Alternatives 2, 3, 4, and 5 (Mining Only without Agricultural Reduction) Layer 2

Central Florida Phosphate District, FL

		Mining Only 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-3 HTRN AS MONITOR	NA	0.10	0.06	0.05	0.11	0.04	-0.07	0.13	-0.08	0.42	0.38	0.60	0.55	0.79	0.75	0.95
KUSHMER INT	NA	0.02	-0.03	-0.03	0.02	-0.03	0.00	0.12	0.10	0.09	0.08	0.16	0.14	0.24	0.22	0.29
ROMP 10 U ARCA AQ MONITOR 2	NA	0.01	0.00	0.00	0.01	-0.01	0.00	-0.01	-0.04	-0.01	-0.03	0.02	0.00	0.07	0.06	0.14
ROMP 13 U ARCA AQ MONITOR	NA	0.02	0.00	-0.01	0.02	-0.01	-0.01	-0.05	-0.12	-0.03	-0.08	0.04	-0.01	0.16	0.11	0.33
ROMP 17 U ARCA AQ MONITOR	NA	0.03	-0.01	-0.01	0.03	-0.01	-0.01	-0.05	-0.14	0.06	0.00	0.17	0.12	0.21	0.16	0.42
ROMP 20 U ARCA AQ MONITOR	NA	0.02	-0.03	-0.04	0.02	-0.04	0.00	0.09	0.03	0.05	0.01	0.15	0.11	0.35	0.31	0.49
ROMP 25 U ARCA AQ MONITOR	NA	0.02	-0.01	-0.01	0.02	-0.01	-0.01	-0.10	-0.17	-0.01	-0.07	0.08	0.03	0.10	0.05	0.29
ROMP 26 U ARCA AQ MONITOR	NA	0.05	-0.01	-0.01	0.05	-0.01	-0.02	-0.14	-0.30	-0.09	-0.19	0.05	-0.05	0.31	0.21	0.70
ROMP 30 U ARCA AQ MONITOR	NA	0.16	0.04	0.02	0.16	0.02	-0.08	-0.36	-0.84	-0.07	-0.32	0.31	0.06	0.94	0.69	1.91
ROMP 39 HTRN AS MONITOR	NA	0.01	-0.02	-0.02	0.01	-0.02	0.00	0.06	0.04	0.04	0.02	0.09	0.07	0.18	0.17	0.24
ROMP 41 SURF AQ MONITOR	NA	0.23	0.10	0.08	0.21	0.05	-0.07	0.04	-0.42	0.48	0.30	0.72	0.53	1.53	1.35	2.21
ROMP 43 U ARCA AQ MONITOR	NA	0.21	0.11	0.08	0.21	0.07	-0.21	0.17	-0.35	0.92	0.81	1.29	1.18	1.75	1.64	2.16
ROMP 5 U ARCA AQ MONITOR	NA	0.03	-0.01	-0.01	0.03	-0.01	-0.01	-0.05	-0.14	-0.04	-0.09	0.05	-0.01	0.20	0.14	0.39
ROMP 59 HTRN AS MONITOR 1	NA	0.37	0.16	0.17	0.39	0.16	0.12	0.73	0.38	0.76	0.66	1.41	1.30	1.94	1.83	2.34
ROMP 8 U ARCA AQ MONITOR	NA	0.02	-0.02	-0.02	0.02	-0.02	0.00	0.01	-0.04	0.00	-0.03	0.07	0.04	0.21	0.17	0.33
ROMP TR 7-2 U ARCA AQ MONITOR	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.02	0.01	0.03	0.03	0.05
VERNA TEST 0-1	NA	0.10	-0.18	-0.19	0.10	-0.19	-0.02	0.47	0.21	0.24	0.07	0.71	0.54	1.73	1.56	2.38

Note:

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

TABLE 20
Simulated ROMP IAS Zone 2 Target Water Level Change Relative to 2010, Alternatives 2, 3, 4, and 5 (Mining Only without Agricultural Reduction) Layer 3
Central Florida Phosphate District, FL

		Mining Only Simulated Water Level Relative to 2010 (ft)														
Well	SWIMAL Weight*	2015 A	2015B	2015C	2019A	2019B	2019C	2020A	2020B	2025A	2025B	2036A	2036B	2047A	2047B	2049
CL-2 DEEP SURF AQ MONITOR	NA	0.08	0.04	0.03	0.08	0.03	-0.05	0.09	-0.06	0.30	0.27	0.43	0.40	0.57	0.54	0.69
FORT GREEN SPRINGS INT	NA	0.71	0.26	0.23	0.73	0.22	0.18	1.33	0.55	0.59	0.31	2.69	2.40	4.11	3.83	5.19
ROMP 12 U ARCA AQ MONITOR	NA	0.03	-0.01	-0.01	0.03	-0.01	-0.01	-0.07	-0.17	-0.04	-0.11	0.05	-0.01	0.22	0.16	0.46
ROMP 14 L ARCA AQ MONITOR	NA	0.01	0.00	0.00	0.01	0.00	0.00	-0.01	-0.03	-0.01	-0.02	0.01	0.00	0.04	0.03	0.09
ROMP 16 L ARCA AQ MONITOR	NA	0.03	-0.01	-0.01	0.04	-0.01	-0.01	-0.09	-0.20	-0.05	-0.13	0.05	-0.02	0.25	0.18	0.53
ROMP 26 L ARCA AQ MONITOR	NA	0.05	-0.01	-0.01	0.05	-0.01	-0.02	-0.14	-0.30	-0.09	-0.19	0.05	-0.05	0.31	0.21	0.69
ROMP 28 HTRN	NA	0.01	0.00	0.00	0.01	0.00	-0.01	0.00	-0.04	0.03	0.02	0.06	0.05	0.11	0.10	0.17
ROMP 30 L ARCA AQ MONITOR	NA	0.18	0.05	0.03	0.18	0.02	-0.09	-0.37	-0.89	-0.04	-0.31	0.38	0.10	1.05	0.78	2.08
ROMP 43 L ARCA AQ MONITOR	NA	0.21	0.11	0.08	0.21	0.07	-0.21	0.17	-0.35	0.93	0.82	1.31	1.20	1.77	1.66	2.19
ROMP 5 L ARCA AQ MONITOR	NA	0.03	-0.01	-0.01	0.03	-0.01	-0.01	-0.05	-0.14	-0.04	-0.09	0.05	-0.01	0.20	0.14	0.40
ROMP 59 HTRN AS MONITOR 2	NA	0.41	0.19	0.19	0.44	0.18	0.14	0.83	0.43	0.87	0.74	1.59	1.47	2.19	2.07	2.65
ROMP 9.5 L ARCA AQ MONITOR (MW-2)	NA	0.03	-0.01	-0.02	0.03	-0.02	-0.01	-0.05	-0.16	-0.04	-0.11	0.07	0.00	0.29	0.22	0.55
ROMP TR 1-2 L ARCA AQ MONITOR	NA	0.01	0.00	0.00	0.01	0.00	0.00	-0.01	-0.03	-0.01	-0.02	0.01	0.00	0.05	0.04	0.11
ROMP TR 3-1 L ARCA AQ MONITOR 2	NA	0.02	-0.01	-0.02	0.02	-0.02	-0.01	-0.02	-0.10	-0.02	-0.07	0.07	0.02	0.23	0.18	0.42
ROMP TR 5-1 L ARCA AQ MONITOR	NA	0.02	-0.03	-0.03	0.02	-0.03	0.00	0.07	0.01	0.04	0.00	0.12	0.09	0.30	0.26	0.43
ROMP TR 7-1 L ARCA AQ INTERFACE MONITOR	8.84%	0.04	-0.07	-0.08	0.04	-0.08	-0.01	0.23	0.15	0.15	0.09	0.32	0.27	0.65	0.60	0.87
ROMP TR 9-2 L ARCA AQ MONITOR	NA	0.02	-0.03	-0.03	0.02	-0.03	0.00	0.14	0.11	0.10	0.08	0.17	0.16	0.28	0.26	0.35
SARASOTA 9 DEEP	8.66%	0.07	-0.13	-0.13	0.07	-0.13	-0.01	0.35	0.17	0.19	0.08	0.53	0.41	1.20	1.09	1.65

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

TABLE 21

Simulated ROMP UFA Target Water Level Change Relative to 2010, Alternatives 2, 3, 4, and 5 (Mining Only without Agricultural Reduction) Layer 4

Central Florida Phosphate District, FL

		Mining Only 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	0.09	0.05	0.04	0.09	0.04	-0.06	0.11	-0.08	0.37	0.33	0.52	0.49	0.70	0.66	0.84
FLORIDA POWER FLDN AT PINEY POINT	NA	0.05	-0.11	-0.11	0.06	-0.11	-0.01	0.39	0.28	0.26	0.19	0.50	0.44	0.90	0.83	1.16
KIBLER DEEP	14.01%	0.14	-0.25	-0.27	0.14	-0.27	-0.02	0.71	0.37	0.38	0.15	1.04	0.81	2.46	2.23	3.33
LAKE ALFRED DEEP AT LAKE ALFRED	NA	0.03	0.01	0.01	0.03	0.01	0.01	0.06	0.03	0.07	0.06	0.13	0.12	0.17	0.16	0.21
ROMP 12 AVPK PZ MONITOR	NA	0.03	-0.01	-0.01	0.03	-0.01	-0.01	-0.07	-0.17	-0.04	-0.11	0.05	-0.01	0.22	0.16	0.46
ROMP 123 HTRN AS/U FLDN AQ MONITOR	9.55%	0.19	-0.49	-0.49	0.21	-0.50	-0.02	1.96	1.63	1.46	1.27	2.36	2.17	3.42	3.23	4.15
ROMP 13 AVPK PZ MONITOR	NA	0.02	0.00	-0.01	0.02	-0.01	-0.01	-0.05	-0.13	-0.03	-0.08	0.04	-0.01	0.16	0.12	0.34
ROMP 14 U FLDN AQ MONITOR (AVPK)	NA	0.01	0.00	0.00	0.01	0.00	0.00	-0.01	-0.03	-0.01	-0.02	0.01	0.00	0.04	0.03	0.09
ROMP 15 U FLDN AQ MONITOR MOD	NA	0.03	-0.01	-0.01	0.03	-0.01	-0.01	-0.08	-0.19	-0.05	-0.12	0.05	-0.02	0.24	0.17	0.50
ROMP 17 U FLDN AQ MONITOR (AVPK)	NA	0.04	-0.01	-0.02	0.04	-0.02	-0.01	-0.07	-0.19	-0.05	-0.12	0.06	-0.01	0.28	0.21	0.56
ROMP 19X U FLDN AQ MONITOR (SWNN)	NA	0.04	-0.04	-0.04	0.04	-0.04	-0.01	0.02	-0.10	0.00	-0.08	0.15	0.07	0.45	0.37	0.74
ROMP 20 U FLDN AQ MONITOR (OCAL)	NA	0.03	-0.05	-0.05	0.03	-0.06	-0.01	0.13	0.05	0.07	0.02	0.22	0.16	0.51	0.46	0.72
ROMP 25 U FLDN AQ MONITOR	NA	0.12	-0.11	-0.13	0.12	-0.13	-0.03	-0.28	-0.74	-0.43	-0.76	0.08	-0.26	1.21	0.88	2.49
ROMP 28 AVPK	NA	0.02	0.00	0.00	0.02	0.00	-0.01	0.00	-0.04	0.03	0.02	0.07	0.05	0.12	0.10	0.17
ROMP 30 U FLDN AQ MONITOR	NA	0.18	0.05	0.03	0.18	0.02	-0.09	-0.37	-0.89	-0.04	-0.31	0.38	0.10	1.05	0.78	2.08
ROMP 31 U FLDN AQ MONITOR	NA	0.19	-0.04	-0.05	0.19	-0.07	-0.05	-1.90	-2.88	-1.82	-2.59	-1.18	-1.94	0.06	-0.70	2.97
ROMP 32 U FLDN AQ MONITOR (AVPK)	NA	0.24	-0.27	-0.30	0.25	-0.31	-0.04	-0.23	-1.06	-0.73	-1.35	0.41	-0.22	3.12	2.50	5.49
ROMP 39 AVPK PZ MONITOR	NA	0.16	-0.38	-0.39	0.17	-0.40	-0.03	1.34	1.00	0.91	0.69	1.71	1.49	2.98	2.76	3.80
ROMP 40 U FLDN AQ MONITOR	NA	0.44	-0.74	-0.76	0.46	-0.77	-0.04	3.11	2.36	1.09	0.67	4.04	3.62	6.03	5.61	7.61
ROMP 41 AVPK PZ MONITOR	NA	0.62	0.31	0.25	0.63	0.24	-0.11	0.54	-0.50	1.26	0.91	2.49	2.14	4.08	3.74	5.38
ROMP 43XX U FLDN AQ MONITOR	NA	0.06	0.03	0.02	0.06	0.02	-0.06	0.06	-0.10	0.26	0.23	0.38	0.34	0.52	0.48	0.64
ROMP 45 U FLDN AQ MONITOR (AVPK)	NA	0.69	0.41	0.36	0.71	0.36	-0.03	0.90	-0.03	1.77	1.54	2.84	2.61	3.95	3.72	4.81
ROMP 5 U FLDN AQ MONITOR (SWNN)	NA	0.03	-0.01	-0.01	0.03	-0.01	-0.01	-0.05	-0.14	-0.04	-0.09	0.05	-0.01	0.20	0.14	0.40
ROMP 50 U FLDN AQ MONITOR (SWNN)	13.25%	0.12	-0.26	-0.25	0.13	-0.26	-0.01	1.03	0.81	0.74	0.62	1.28	1.15	1.97	1.85	2.43

TABLE 21

Simulated ROMP UFA Target Water Level Change Relative to 2010, Alternatives 2, 3, 4, and 5 (Mining Only without Agricultural Reduction) Layer 4

Central Florida Phosphate District, FL

		Mining Only 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	0.12	0.06	0.05	0.12	0.05	0.00	0.18	0.03	0.31	0.28	0.51	0.47	0.69	0.65	0.84
ROMP 59 U FLDN AQ INTERFACE MONITOR	NA	0.47	0.21	0.21	0.50	0.21	0.15	0.93	0.48	0.97	0.83	1.79	1.65	2.46	2.33	2.98
ROMP 60X U FLDN AQ MONITOR	NA	0.41	0.15	0.17	0.45	0.16	0.15	0.92	0.53	0.87	0.74	1.65	1.52	2.26	2.14	2.73
ROMP TR 10-2 L ARCA AQ MONITOR	5.41%	0.05	-0.06	-0.05	0.06	-0.05	0.02	0.34	0.28	0.26	0.23	0.43	0.40	0.60	0.57	0.72
ROMP TR 4-1 U FLDN AQ INTERFACE MONITOR	NA	0.02	-0.03	-0.03	0.02	-0.03	0.00	0.07	0.01	0.04	0.00	0.14	0.09	0.33	0.29	0.49
ROMP TR 7-4 U FLDN AQ MONITOR (SWNN)	13.54%	0.06	-0.12	-0.12	0.07	-0.13	-0.01	0.37	0.22	0.22	0.12	0.52	0.42	1.09	0.99	1.46
ROMP TR 8-1 AVPK PZ MONITOR	14.08%	0.05	-0.09	-0.10	0.05	-0.10	-0.01	0.32	0.22	0.21	0.15	0.43	0.37	0.79	0.73	1.03
ROMP TR 9-3 U FLDN AQ MONITOR (SWNN)	7.17%	0.08	-0.15	-0.15	0.09	-0.15	0.00	0.62	0.49	0.45	0.37	0.79	0.71	1.24	1.16	1.54
SMITH DEEP	NA	0.18	0.09	0.06	0.18	0.06	-0.17	0.12	-0.34	0.73	0.62	1.06	0.95	1.49	1.38	1.91
VERNA TEST 0-4	5.50%	0.08	-0.15	-0.16	0.09	-0.16	-0.01	0.40	0.19	0.21	0.07	0.61	0.47	1.45	1.31	2.00
Simulated Change in SWIMAL, ft		0.09	-0.19	-0.19	0.10	-0.19	-0.01	0.65	0.46	0.44	0.32	0.86	0.74	1.55	1.44	2.01

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

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

In scenario 2019A Mining Only, the monitor well water level changes range from -0.18 to 0.27 foot in Layer 1 (Table 18), 0 to 0.39 foot in Layer 2 (Table 19), 0.01 to 0.73 foot in Layer 3 (Table 20), and 0.01 to 0.71 foot in Layer 4 (Table 21). The 2019A Mining Only with other users at 2010 and no agricultural reduction SWIMAL value increases by 0.10 foot, as shown in Table 21. In scenario 2019B Mining Only with other users at 2010 and no agricultural reduction, the monitor well water level changes range from -0.19 to 0.09 foot in Layer 1, -0.19 to 0.16 foot in Layer 2, -0.13 to 0.22 foot in Layer 3, and -0.77 to 0.36 foot in Layer 4. The 2019B Mining Only with other users at 2010 and no agricultural reduction SWIMAL value decreases by 0.19 foot. In scenario 2019C Mining Only with other users at 2010 and no agricultural reduction, the monitor well water level changes range from -0.19 to 0.08 foot in Layer 1, -0.21 to 0.12 foot in Layer 2, -0.21 to 0.18 foot in Layer 3, and -0.17 to 0.15 foot in Layer 4. The 2019C Mining Only with other users at 2010 and no agricultural reduction SWIMAL value decreases by 0.01 foot.

In scenario 2019A All Users with agricultural reduction, the monitor well water level changes range from -0.16 to 0.75 foot in Layer 1 (Table 22), 0.03 to 1.24 foot in Layer 2 (Table 23), 0.11 to 1.50 foot in Layer 3 (Table 24), and 0.13 to 1.63 foot in Layer 4 (Table 25). The 2019A All Users with agricultural reduction SWIMAL value increases by 0.98 foot. In scenario 2019B, the monitor well water level changes range from -0.17 to 0.65 foot in Layer 1 (Table 22), 0.02 to 0.95 foot in Layer 2 (Table 23), 0.1 to 0.99 foot in Layer 3 (Table 24), and 0.12 to 1.16 foot in Layer 4 (Table 25). The 2019B All Users with agricultural reduction SWIMAL value increases by 0.69 foot. In scenario 2019C, the monitor well water level changes range from -0.16 to 0.42 foot in Layer 1 (Table 22), 0.02 to 1.12 foot in Layer 2 (Table 23), 0.1 to 0.95 foot in Layer 3 (Table 24), and 0.12 to 1.39 feet in Layer 4 (Table 25). The 2019C All Users SWIMAL value increases by 0.87 foot, as shown in Table 25.

6.2.1.3 2010 to 2020

In 2020A under Alternative 2, it is projected that: the Four Corners, Hookers Prairie, and Hopewell Mines will cease operating; the Ona Mine is pumping its drought annual average withdrawal rate of 11.9 mgd; and the South Fort Meade, Wingate, and South Pasture Mines will continue pumping at their 2010 rates of 11.3, 5.8, and 6.39 mgd, respectively. In 2020B, the Ona and South Fort Meade Mines are withdrawing their flexible permit limit of 15 mgd and 15.4 mgd, respectively, which does not exceed the total drought year annual permit capacity of 36.2 mgd for the three Mosaic mines. In both 2020 All Users scenarios, agricultural withdrawals were reduced to 89 percent of their 2010 rates, in line with the SWUCA recovery strategy.

In scenario 2020A Mining Only with other users at 2010 and no agricultural reduction, the monitor well water level changes range from -0.02 to 0.56 foot in Layer 1 (Table 18), -0.36 to 0.73 foot in Layer 2 (Table 19), -0.37 to 1.33 feet in Layer 3 (Table 20), and -1.90 to 3.11 feet in Layer 4 (Table 21). The 2020A Mining Only with other users at 2010 and no agricultural reduction SWIMAL value increases by 0.65 foot as shown in Table 21. In scenario 2020B Mining Only, the monitor well water level changes range from -0.28 to 0.52 foot in Layer 1, -0.84 to 0.38 foot in Layer 2, -0.89 to 0.55 foot in Layer 3, and -2.88 to 2.36 feet in Layer 4. The 2020B Mining Only with other users at 2010 and no agricultural reduction SWIMAL value increases by 0.46 foot.

In scenario 2020A All Users with agricultural reduction, the monitor well water level changes range from 0 to 0.89 foot in Layer 1 (Table 22), 0.04 to 1.72 feet in Layer 2 (Table 23), 0.10 to 2.17 feet in Layer 3 (Table 24), and -0.82 to 4.26 feet in Layer 4 (Table 25). The 2020A All Users with agricultural reduction SWIMAL value increases by 1.63 feet. In scenario 2020B, the monitor wells water level changes range from 0 to 0.67 foot in Layer 1 (Table 22), 0 to 1.47 feet in Layer 2 (Table 23), 0.06 to 1.40 feet in Layer 3 (Table 24), and -1.79 to 3.51 feet in Layer 4 (Table 25). The 2020B All Users with agricultural reduction SWIMAL value increases by 1.44 feet.

6.2.1.4 2010 to 2025

In 2025A under Alternative 2, it is projected that: the South Fort Meade Mine will cease operating; the Desoto Mine is pumping its drought annual average withdrawal rate of 10.7 mgd; and the Ona, Wingate East, and South Pasture Mines will continue pumping at their drought year annual average rates of 11.9, 5.8, and 6.39 mgd, respectively. In 2025B, the Ona Mine is withdrawing its flexible permit limit of 15 mgd, while the other mines remain at their drought year annual rates. By 2025, the SWUCA recovery strategy assumes that agricultural withdrawals will have been reduced by 50 mgd in the All Users scenarios.

In scenario 2025A Mining Only with other users at 2010 and no agricultural reduction, the monitor well water level changes range from 0 to 0.74 foot in Layer 1 (Table 18), -0.09 to 0.92 foot in Layer 2 (Table 19), -0.09 to 0.93 foot in Layer 3 (Table 20), and -1.82 to 1.77 feet in Layer 4 (Table 21). The 2025A Mining Only with other users at 2010 and no agricultural reduction SWIMAL value increases by 0.44 foot, as shown in Table 21. In scenario 2025B Mining Only with other users at 2010 and no agricultural reduction, the monitor well water level changes range from -0.02 to 0.46 foot in Layer 1 (Table 18), -0.32 to 0.81 foot in Layer 2 (Table 19), -0.09 to 0.93 foot in Layer 3 (Table 20), and -2.59 to 1.54 feet in Layer 4 (Table 21). The 2025B Mining Only with other users at 2010 and no agricultural reduction SWIMAL value increases by 0.32 foot, as shown in Table 21. The 2025B Mining Only with other users at 2010 and no agricultural reduction scenarios are also shown graphically in Figures 25 through 28.

In scenario 2025A All Users with agricultural reduction, the monitor well water level changes range from 0 to 1.70 feet in Layer 1 (Table 22), 0.05 to 2.14 feet in Layer 2 (Table 23), 0.16 to 2.16 feet in Layer 3 (Table 24), and -0.20 to 3.59 feet in Layer 4 (Table 25). The 2025A All Users with agricultural reduction SWIMAL value increases by 1.90 feet. In scenario 2025B All Users, the monitor well water level changes range from 0 to 1.62 feet in Layer 1 (Table 22), 0.04 to 2.03 feet in Layer 2 (Table 23), 0.15 to 2.05 feet in Layer 3 (Table 24), and -0.97 to 3.40 feet in Layer 4 (Table 25). The 2025B All Users with agricultural reduction SWIMAL value increases by 1.78 feet, as shown in Table 25. The 2025B All Users scenarios are also shown graphically in Figures 29 through 32.

6.2.1.5 2010 to 2036

For 2036A, it is projected that the Desoto Mine will cease operating and the Ona, Wingate East, and South Pasture Mines will continue pumping at their drought year annual average rates of 11.9, 5.8, and 6.39 mgd, respectively. In 2025B, the Ona Mine is assumed to be withdrawing its flexible permit limit of 15 mgd, while the other mines remain at their drought year annual rates. For the All Users scenarios, agriculture demands are maintained at their 2025 levels, per the SWUCA recovery strategy.

In scenario 2036A Mining Only with other users at 2010 and no agricultural reduction, the monitor well water level changes range from 0 to 1.43 feet in Layer 1 (Table 18), 0.02 to 1.41 feet in Layer 2 (Table 19), 0.01 to 2.69 feet in Layer 3 (Table 20), and -1.18 to 4.04 feet in Layer 4 (Table 21). The 2036A Mining Only with other users at 2010 and no agricultural reduction SWIMAL value increases by 0.86 foot, as shown in Table 21. In scenario 2036B Mining Only with other users at 2010 and no agricultural reduction, the monitor wells water levels changes ranges from 0 to 1.42 feet in Layer 1 (Table 18), -0.05 to 1.18 feet in Layer 2 (Table 19), -0.05 to 2.40 feet in Layer 3 (Table 20), and -1.94 to 3.62 feet in Layer 4 (Table 21). The 2036B Mining Only with other users at 2010 and no agricultural reduction SWIMAL value increases by 0.74 foot, as shown in Table 21.

In scenario 2036A All Users with agricultural reduction, the monitor wells water level changes range from 0 to 1.99 feet in Layer 1 (Table 22), 0.06 to 2.60 feet in Layer 2 (Table 23), 0.19 to 3.95 feet in Layer 3 (Table 24), and 0.21 to 5.76 feet in Layer 4 (Table 25). The 2036A All Users with agricultural reduction SWIMAL value increases by 2.32 feet, as shown in Table 25. In scenario 2036B All Users with agricultural reduction, the monitor wells water level changes range from 0 to 1.91 feet in Layer 1 (Table 22), 0.05 to 2.42 feet in Layer 2 (Table 23), 0.17 to 3.67 feet in Layer 3 (Table 24), and -0.32 to 5.34 feet in Layer 4 (Table 25). The 2036B All Users with agricultural reduction SWIMAL value increases by 2.20 feet, as shown in Table 25.

6.2.1.6 2010 to 2047

For 2047A, it is projected that the Wingate East and South Pasture Mines will cease operating and the Ona Mine will continue pumping at the drought year annual average rate of 11.9 mgd. In 2047B, the Ona Mine is assumed to be withdrawing at its flexible permit limit of 15 mgd. For the All Users scenarios, agriculture demands are maintained at their 2025 levels, per the SWUCA recovery strategy.

FIGURE 25
Simulated Water Change in SAS (Model Layer 1) Water Level (ft) 2010 to 2025B
Alternatives 2, 3, 4, and 5 Mining Only with no Agricultural Reduction
Central Florida Phosphate District, Florida

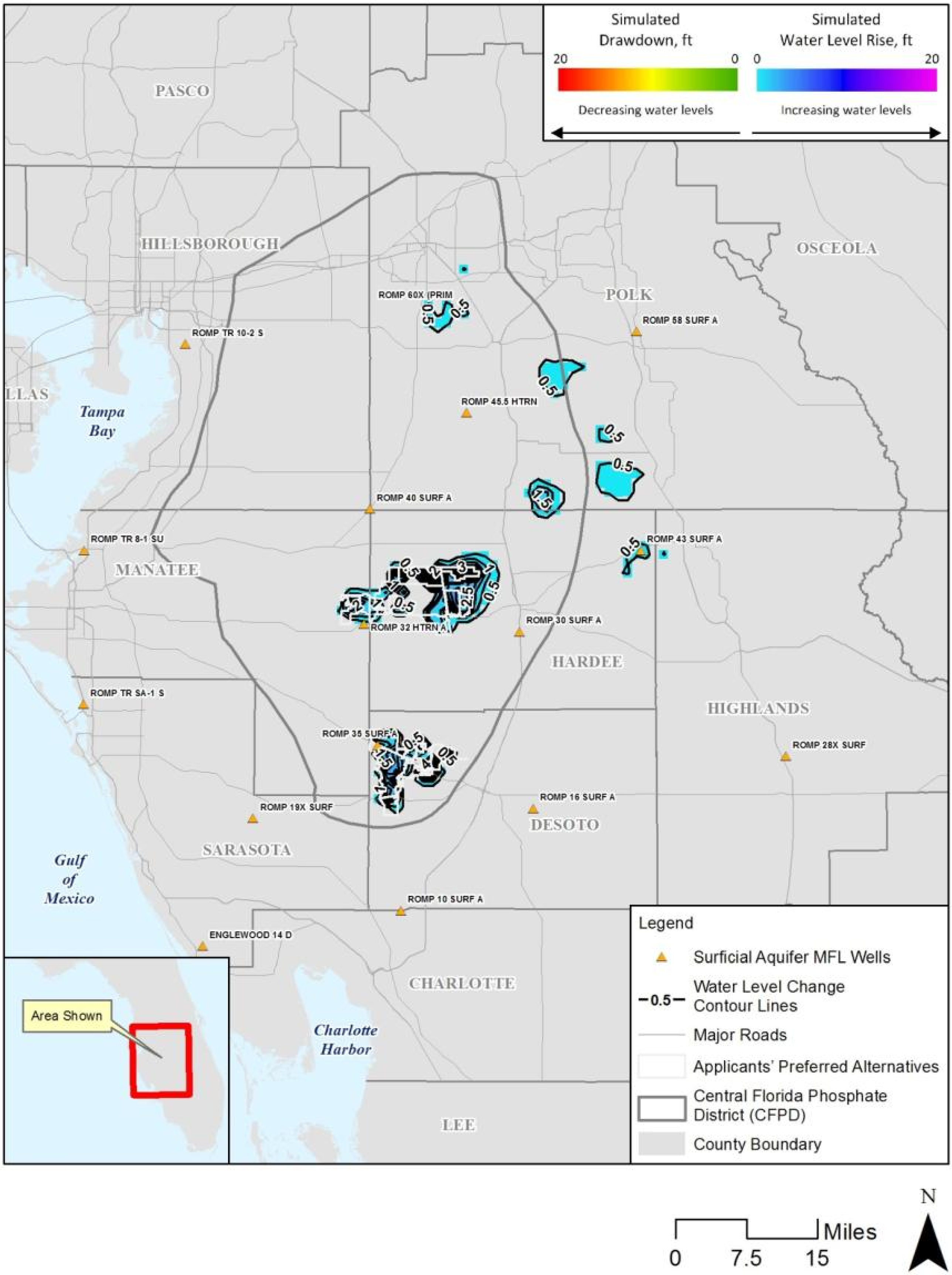


FIGURE 26
Simulated Water Change in IAS Zone 1 (Model Layer 2) Water Level (ft) 2010 to 2025B
Alternative 2, 3, 4, and 5 Mining Only with no Agricultural Reduction
Central Florida Phosphate District, Florida

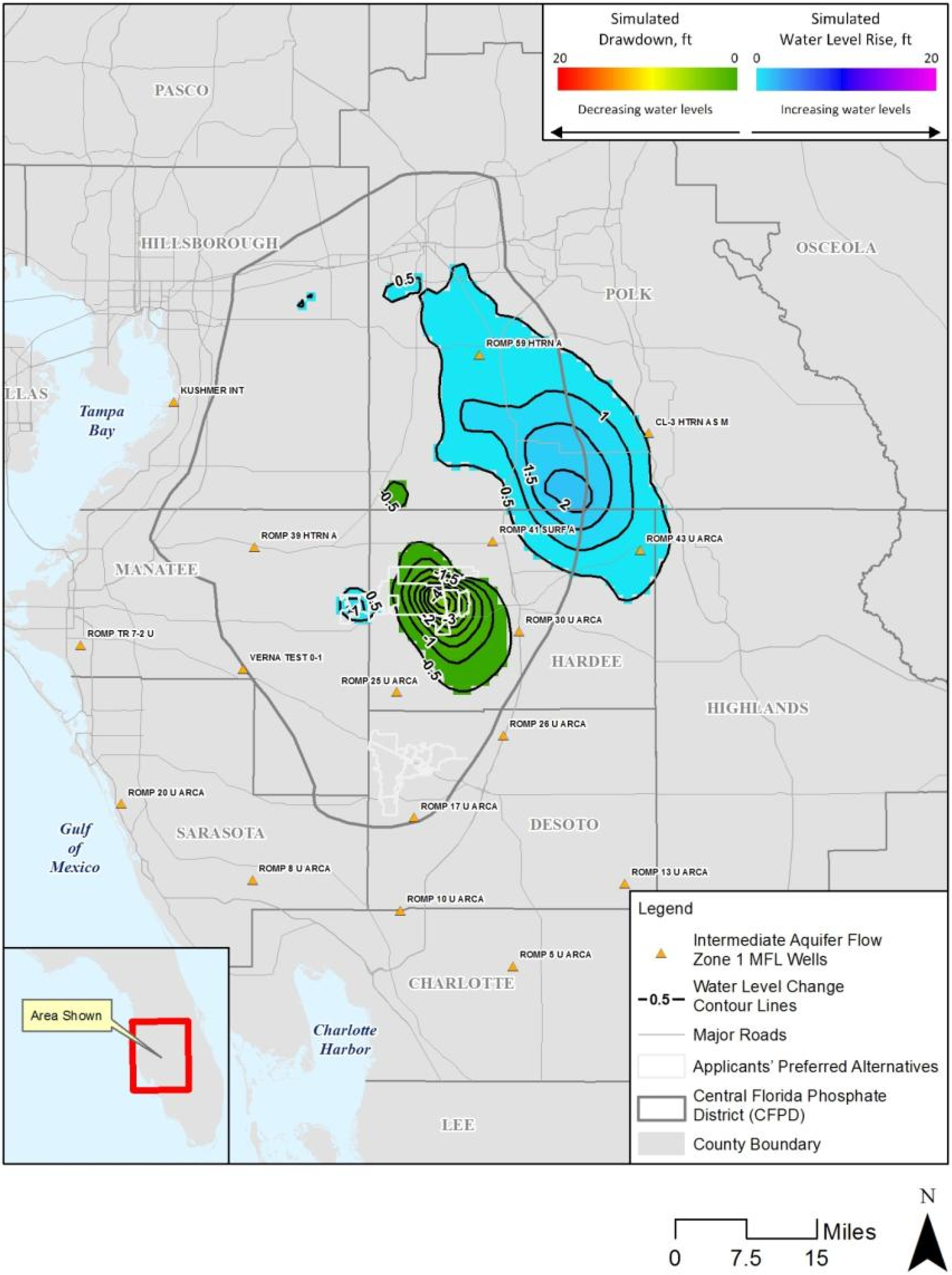
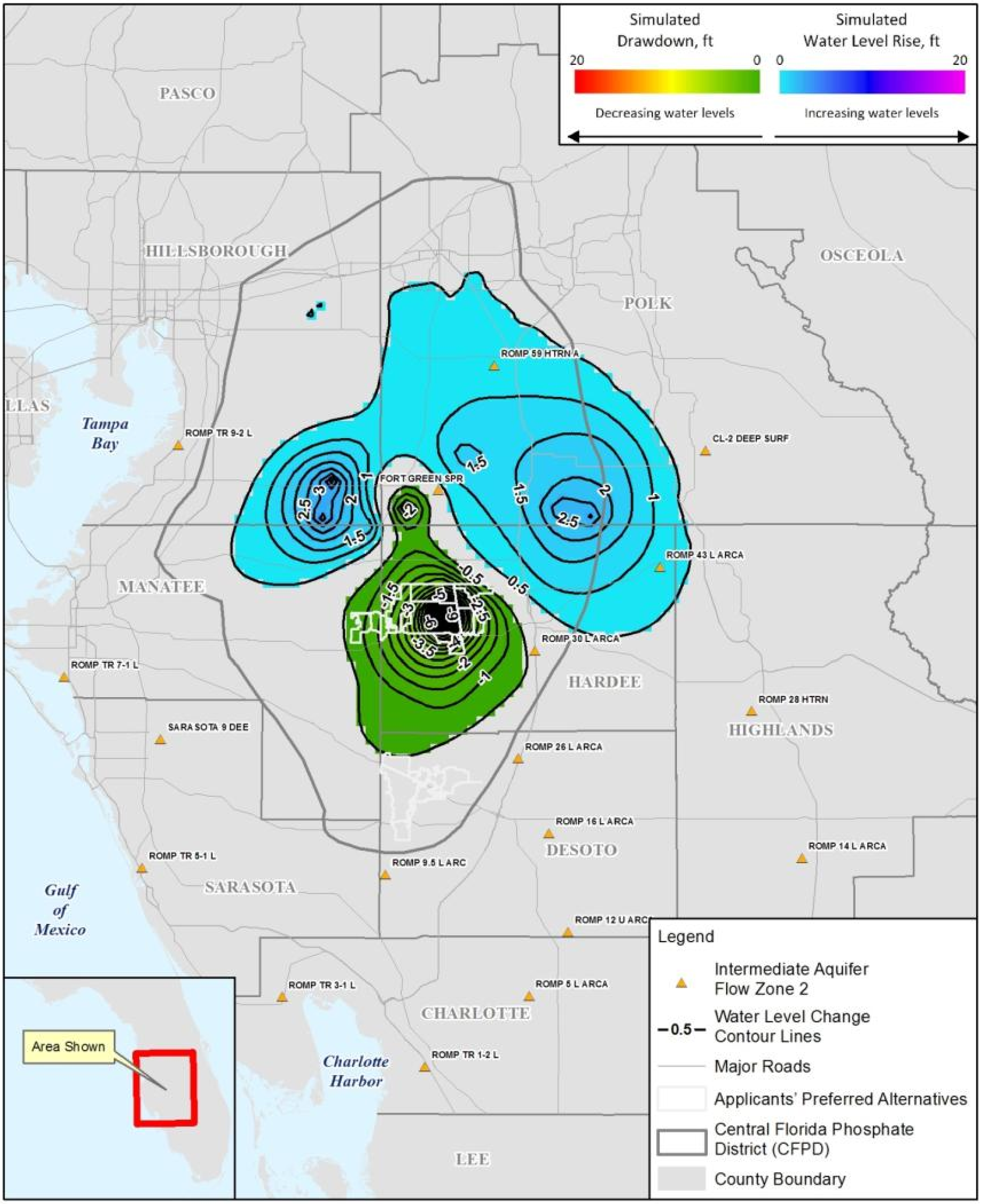


FIGURE 27

Simulated Water Change in IAS Zone 2 (Model Layer 3) Water Level (ft) 2010 to 2025B
Alternative 2, 3, 4, and 5 Mining Only with no Agricultural Reduction
Central Florida Phosphate District, Florida



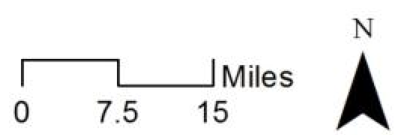
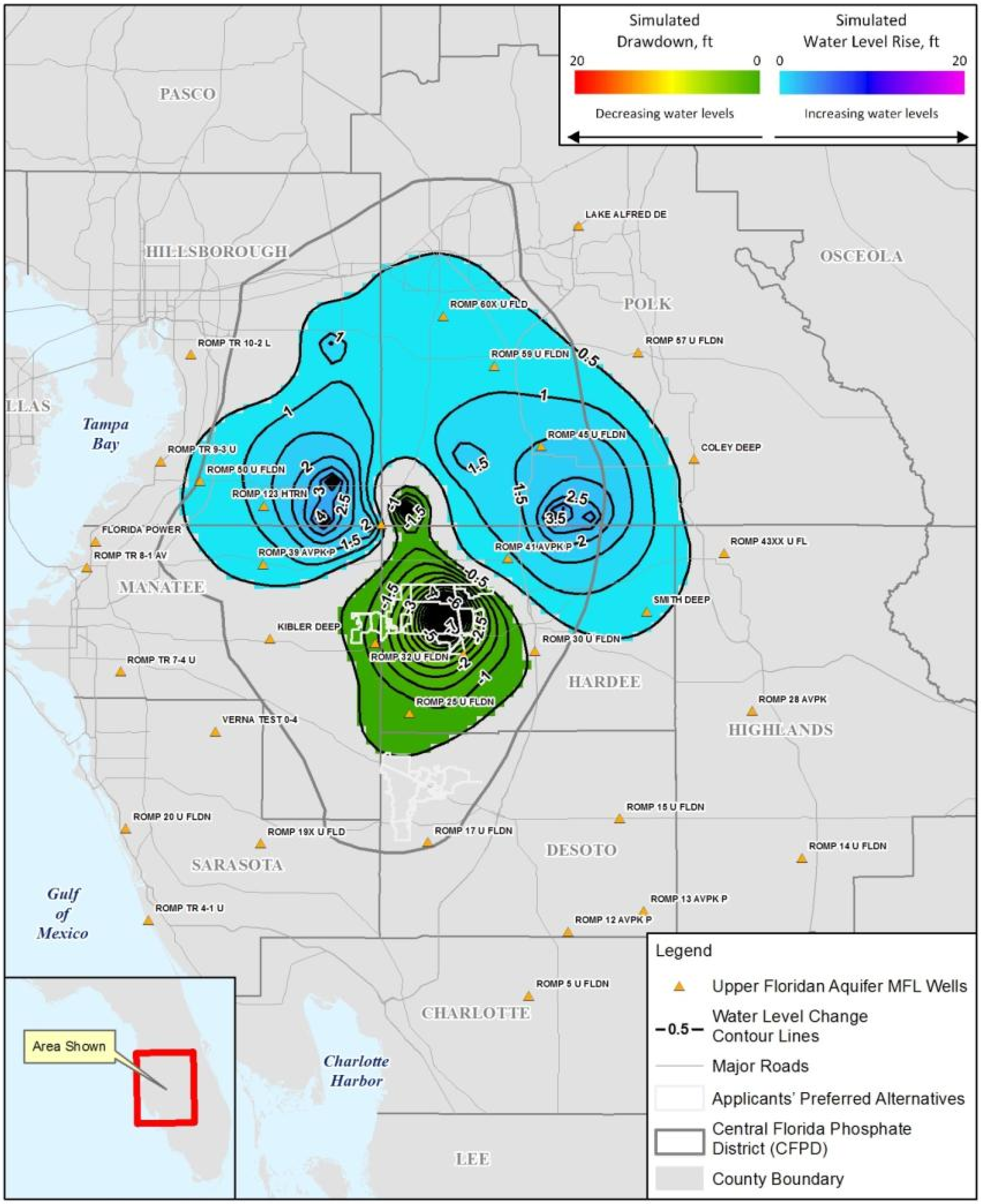


FIGURE 28
Simulated Water Change in the Upper Floridan Aquifer (Model Layer 4) Water Level (ft) 2010 to 2025B
Alternative 2, 3, 4, and 5 Mining Only with no Agricultural Reduction
Central Florida Phosphate District, Florida



0 7.5 15 Miles
N

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

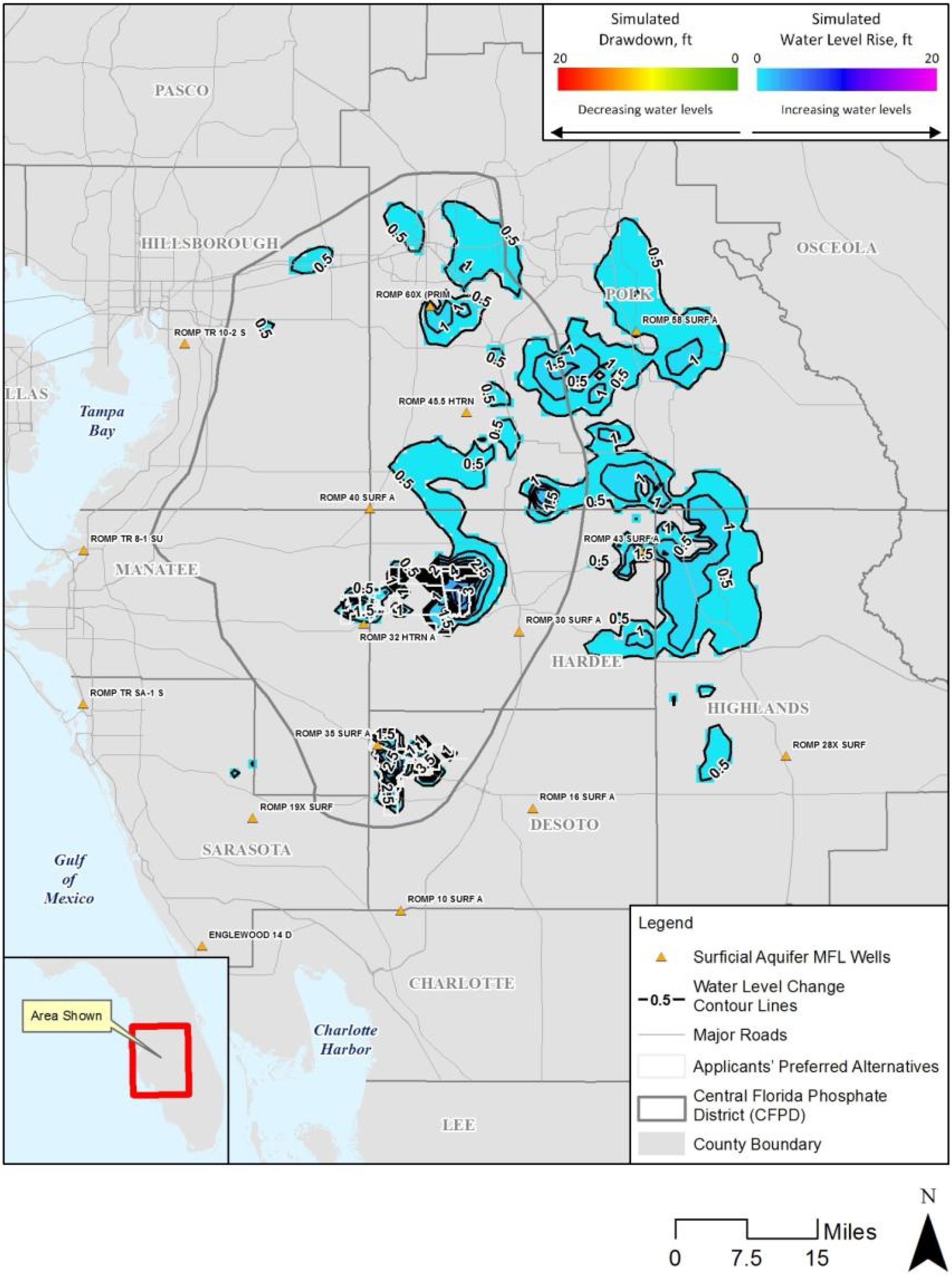


FIGURE 30
Simulated Water Change in IAS Zone 1 (Model Layer 2) Water Level (ft) 2010 to 2025B
Alternative 2, 3, 4 and 5 Mines with All Users with Agricultural Reductions
Central Florida Phosphate District, Florida

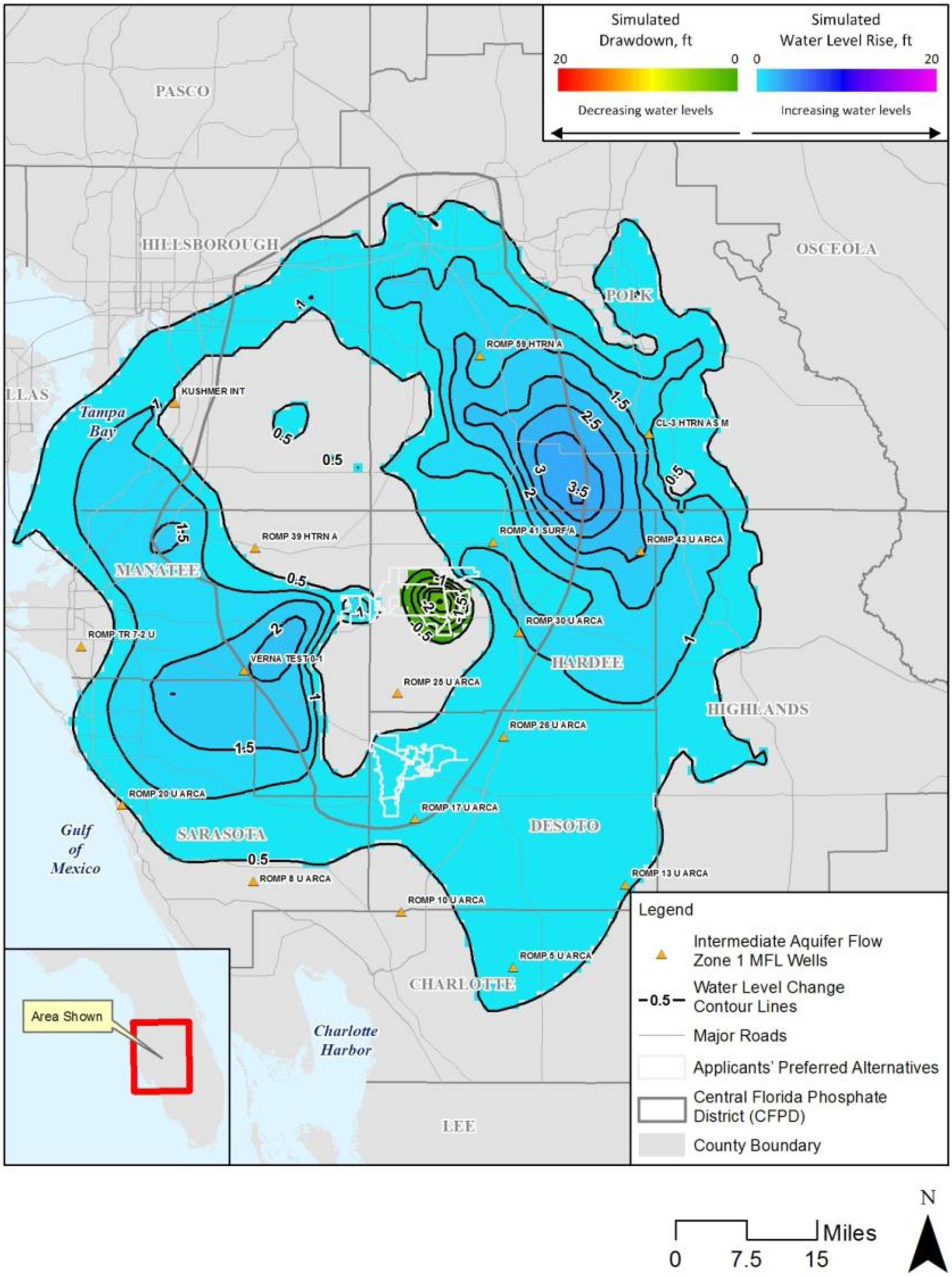


FIGURE 31
Simulated Water Change in IAS Zone 2 (Model Layer 3) Water Level (ft) 2010 to 2025B
Alternative 2, 3, 4, and 5 Mines with All Users with Agricultural Reductions
Central Florida Phosphate District, Florida

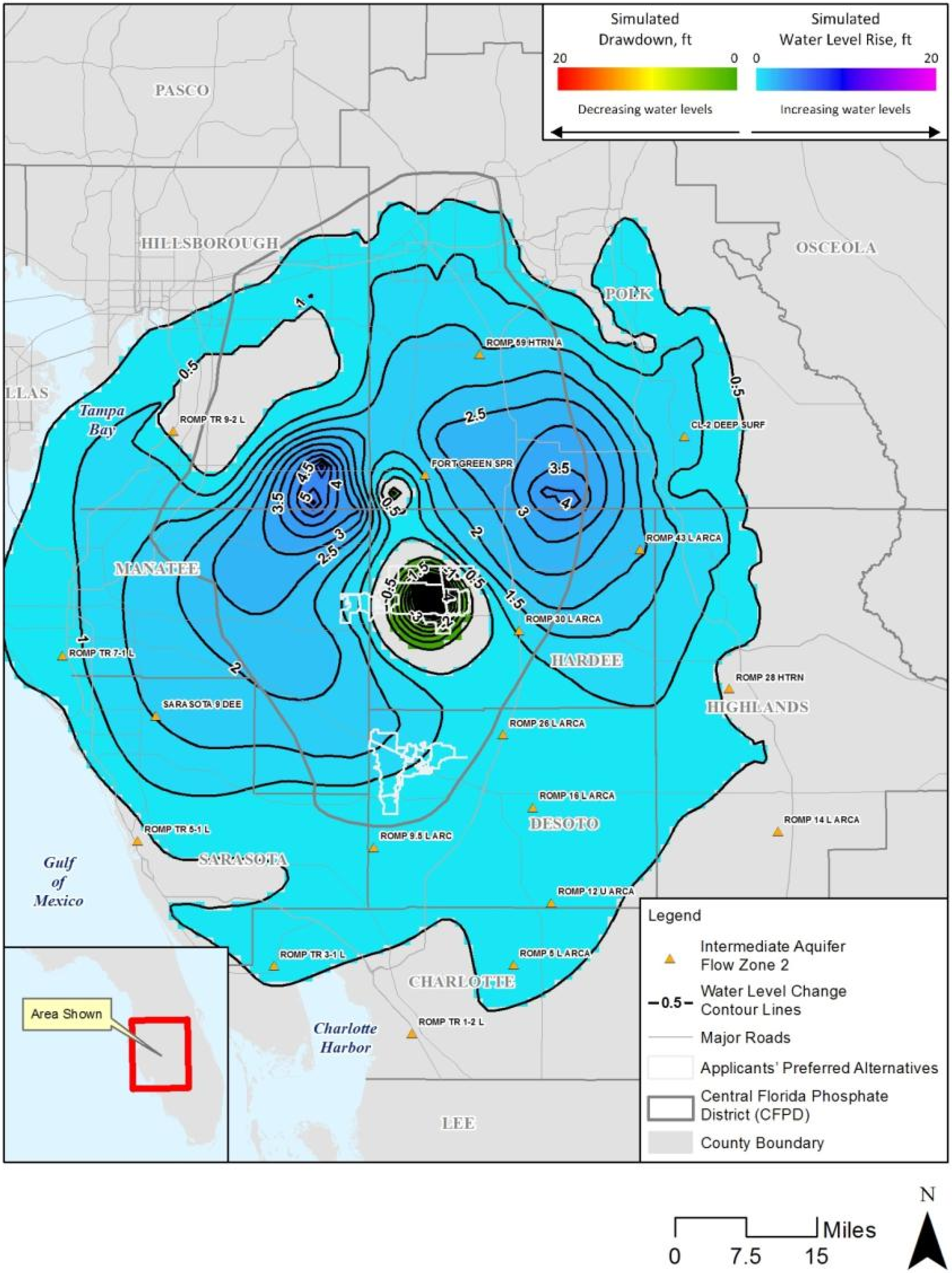
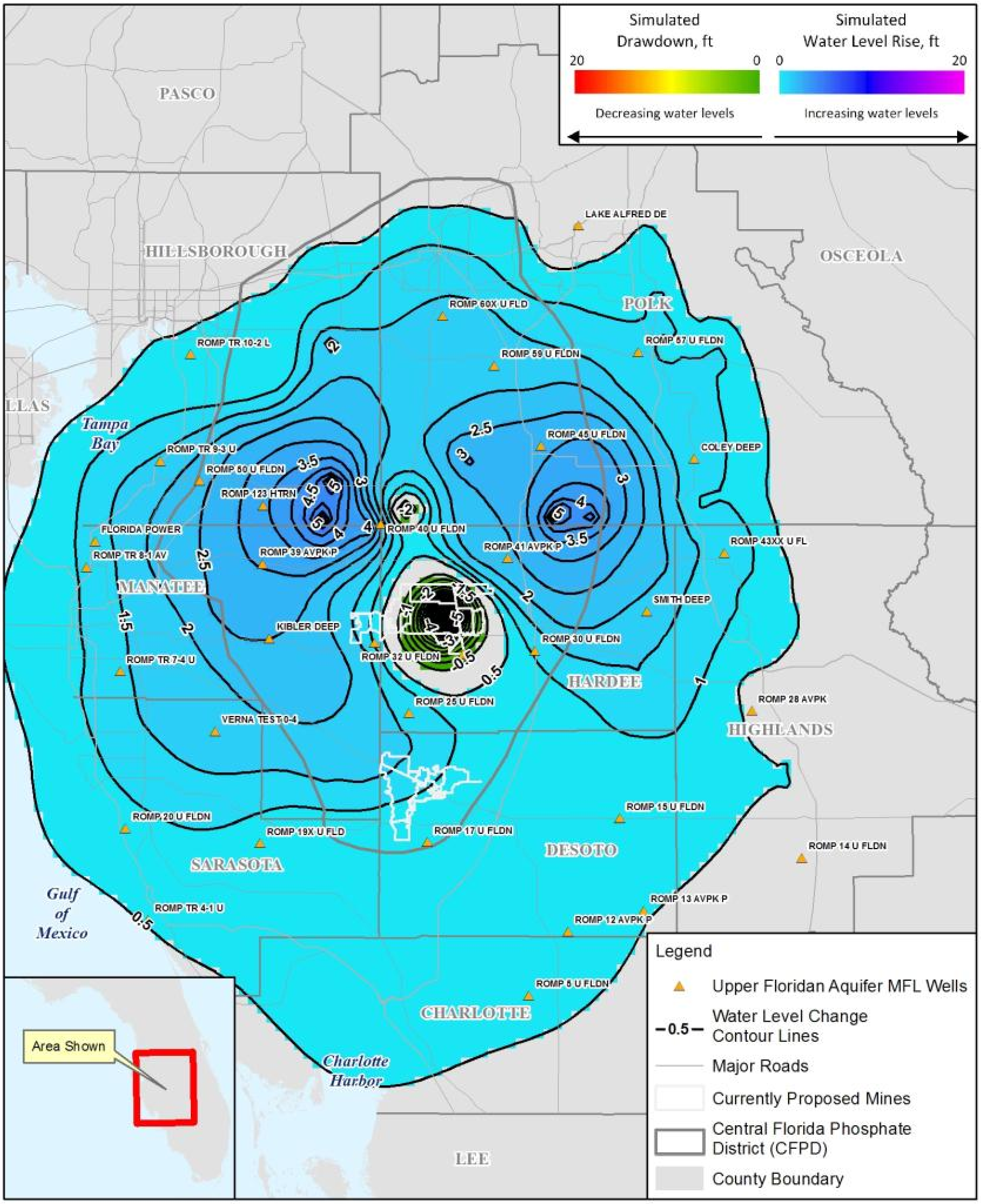


FIGURE 32
Simulated Water Change in Upper Floridan Aquifer (Model Layer 4) Water Level (ft) 2010 to 2025B
Alternative 2, 3, 4, and 5 Mines with All Users with Agricultural Reductions
Central Florida Phosphate District, Florida



In scenario 2047A Mining Only with other users at 2010 and no agricultural reduction, the monitor well water level changes range from 0 to 1.76 feet in Layer 1 (Table 18), 0.03 to 1.94 feet in Layer 2 (Table 19), 0.04 to 4.11 feet in Layer 3 (Table 20), and 0.04 to 6.03 feet in Layer 4 (Table 21). The 2047A Mining Only with other users at 2010 and no agricultural reduction SWIMAL value increases by 1.55 feet, as shown in Table 21. In scenario 2047B Mining Only with other users at 2010 and no agricultural reduction, the monitor wells water levels changes ranges from 0 to 1.75 feet in Layer 1 (Table 18), 0.03 to 1.83 feet in Layer 2 (Table 19), 0.03 to 3.89 feet in Layer 3 (Table 20), and -0.70 to 5.61 feet in Layer 4 (Table 21). The 2047B Mining Only with other users at 2010 and no agricultural reduction SWIMAL value increases by 1.44 feet, as shown in Table 21.

In scenario 2047A All Users with agricultural reduction, the monitor wells water level changes range from 0 to 2.35 feet in Layer 1 (Table 22), 0.07 to 3.61 feet in Layer 2 (Table 23), 0.23 to 5.37 feet in Layer 3 (Table 24), and 0.25 to 7.74 feet in Layer 4 (Table 25). The 2047A All Users with agricultural reduction SWIMAL value increases by 3.01 feet, as shown in Table 25. In scenario 2047B All Users with agricultural reduction, the monitor wells water level changes range from 0 to 2.27 feet in Layer 1 (Table 22), 0.07 to 3.44 feet in Layer 2 (Table 23), 0.21 to 5.09 feet in Layer 3 (Table 24), and 0.24 to 7.32 feet in Layer 4 (Table 25). The 2047B All Users with agricultural reduction SWIMAL value increases by 2.89 feet, as shown in Table 25.

6.2.1.7 2010 to 2049

For 2049, it is projected that all mines will have ceased operating. For the All Users scenarios, agriculture demands are maintained at their 2025 levels, per the SWUCA recovery strategy.

In scenario 2049 Mining Only with other users at 2010 rates and no agricultural reduction, the monitor well water level changes range from 0 to 1.72 feet in Layer 1 (Table 18), 0.05 to 2.38 feet in Layer 2 (Table 19), 0.09 to 5.19 feet in Layer 3 (Table 20), and 0.09 to 7.61 feet in Layer 4 (Table 21). The 2049 Mining Only SWIMAL value increases by 2.01 feet, as shown in Table 21.

In scenario 2049 All Users with agricultural reduction, the monitor wells water level changes range from 0 to 2.68 feet in Layer 1 (Table 22), 0.09 to 4.26 feet in Layer 2 (Table 23), 0.28 to 6.44 feet in Layer 3 (Table 24), and 0.29 to 9.32 feet in Layer 4 (Table 25). The 2049 All Users SWIMAL value increases by 3.46 feet, as shown in Table 25.

6.3 Effect of Aquifer Water Level Changes on Spring Discharge - Alternatives 1, 2, 3, 4, and 5

The model results indicate that for all phosphate mining scenarios simulated, regional water levels in the aquifer layers will increase over most of the model domain as agricultural water use in the SWUCA is curtailed by SWFWMD restrictions. Additionally, the Mining Only results that do not include the agricultural reduction assumption generally show regional water levels increasing in all aquifer layers. As currently operating mines cease withdrawing groundwater from the UFA, localized water level rebound will occur. Localized drawdown (lowering) of the UFA will occur as the pumpage from individual mines is increased or new mines come on-line (for example, Ona Mine). Overall, the net change is positive over the majority of the model domain.

As spring discharge depends on the potentiometric surface of the IAS and/or the UFA, an increase in the potentiometric surface of the IAS and/or UFA can be expected to result in additional spring flow, if the spring already flows and is in an area near mine wellfields where more than a few feet of change is estimated to occur. If the spring does not flow, or is in an area of a few feet or less of water level change associated with the mining withdrawals, no change in spring flow of those particular springs will occur. There are springs, however, that are not expected to recover even if all withdrawals for mining cease. An analysis conducted by SWFWMD in 2006, as part of its SWUCA recovery strategy, estimated that groundwater withdrawals would have to decrease by as much as 450 mgd (or 69 percent of the 650 mgd SWUCA goal) before Kissengen Spring would flow again.

6.3.1 Impact to Other Users – Alternatives 2, 3, 4, and 5 Mining Only

As the withdrawals by the mining industry change in quantity and location, the water levels in the UFA will change in response. In much of the study area, the UFA water levels remain the same or increase leading to no detrimental impact to other well owners. Where increased drawdown in the UFA occurs, other well owners may experience lower water levels during parts of the year. 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 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.

TABLE 27
Surface Water Available to Meet Public Supply Demand
Central Florida Phosphate District, FL

Watershed	SWFWMD Water Supply Plan					Basin-wide Mining Operation Impacts from 2009 to 2050		
	Adjusted Annual Average Flow[1] (mgd)	Permitted Average Withdrawal[1] (mgd)	2003 to 2007 Withdrawal[1] (mgd)	2003 to 2007 Unused Permitted Withdrawal[1] (mgd)	Unpermitted Potentially Available Withdrawal[1] (mgd)	Change in Surface Water Runoff[2] (mgd)	Change in Streamflow Contribution from Groundwater[3] (mgd)	Total Change in Streamflow Contribution[4] (mgd)
Peace River	813.0	32.8	14.9	17.9	80.4	62.69	14.52	77.21
Hillsborough River	255.0	113	91.6	21.4	TBD	NC	2.78	NC
Alafia River	261.0	23.6	15.7	7.9	18.5	NC	3.02	NC
Manatee River	117.0	35	30	5	2.2	NC	0.25	NC
Little Manatee River	98.6	8.7	3.7	5	0.2	NC	0.36	NC
Myakka River	163.5	0	0	0	41.7	18.10	1.15	19.25
Withlacoochee River	1002.0	0.5	0.01	0.49	93.2	NC	0.96	NC
Total	2710.1	213.6	155.91	57.69	236.2	80.8	23.0	96.5

Notes:
[1] Values are from SWFWMD 2010 RWSP
[2] Values are from Surface Water Analysis, Appendix G (Only the Peace and Myakka River Basins were assessed for future changes to flow resulting from land use change in the AEIS)
[3] Values are from Groundwater Modeling River Cells for Alternatives 2, 3, 4 and 5 with Agricultural Reduction
[4] Sum of Change in Surface Water Runoff and Change in Streamflow Contribution from Groundwater
NC = Not Calculated

Using the results of the surface water analysis described in Appendix G and the changes in flow from River Cells in the DWRM2.1 model for Alternatives 2, 3, 4, and 5 All Users with Agricultural Reduction, an estimate of the combined changes resulting from mining was prepared. Changes in surface water flow were determined for the Peace and Myakka Rivers, taking into account runoff changes resulting from future land use changes throughout the river basins. Changes in groundwater contribution were calculated for all of the river basins. The last column in Table 27 shows the sum of the two calculations; it demonstrates, in every case where values were determined, that the river flow will increase as a result of mining. The streamflow contribution will increase by 77.21 mgd in the Peace River and 19.25 mgd in the Myakka River from 2009 to 2050, which will substantially increase the amount of surface water available for public supply.

7.0 Transient Modeling to Evaluate Seasonal Impact of Mining

Seasonal variability in withdrawal rates typically results in regional lowering of aquifer levels during the spring dry season and recovery of water levels in the winter. Simulation of monthly changes in water levels required that the DWRM2.1 model be run in transient mode instead of steady state used for all other simulations. Transient mode allows the recharge to change monthly to more accurately simulate seasonal conditions. Pumping can also be varied by month to simulate changes in demand. Both recharge and pumping were varied by month for a hypothetical year, in this case the 2025B Alternatives 2, 3, 4, and 5 All Users with and without Agricultural Reduction.

This evaluation was done by first compiling regional withdrawals for water use types for seven years (from 1996 to 2002) using SWFWMD information. This compilation was used to determine the monthly multipliers applicable to each water use type (i.e., public supply, agriculture, and industrial). Those multipliers were used in the model simulations to develop the seasonal water level changes tables and graphs. Seasonal recharge values were obtained from the DWRM2.1 transient model calibration files and were applied to the future model simulations in the appropriate month of the simulations. Three transient models were set up to evaluate seasonal variations within IAS Zones 1 and 2 and the UFA aquifer layers using 13 stress periods, or time periods. The SAS was not evaluated because the SAS was not calibrated to transient conditions.[1]

The first stress period is a steady-state model with average annual withdrawal amounts followed by 12 monthly transient stress periods as follows:

- Stress Period 2 - January – 31 days non peak withdrawal
- Stress Period 3 - February – 28 days non peak withdrawal
- Stress Period 4 - March – 31 days intermediate withdrawal
- Stress Period 5 - April – 30 days peak month withdrawal
- Stress Period 6 - May – 31 days intermediate withdrawal
- Stress Period 7 - June – 30 days non peak withdrawal
- Stress Period 8 - July – 31 days non peak withdrawal
- Stress Period 9 - August – 31 days non peak withdrawal
- Stress Period 10 - September – 30 days non peak withdrawal
- Stress Period 11 - October – 31 days non peak withdrawal
- Stress Period 12 - November – 30 days non peak withdrawal
- Stress Period 13 - December – 31 days non peak withdrawal

The base year 2010 was modeled along with two models for the year 2025; one representing the change in withdrawal from users with agricultural reduction and the other for the change in withdrawal by mining only with other users at 2010 rates and no agricultural reduction. The mining withdrawal is the same as in Alternative 2, 3, 4, and 5, scenario 2025B with the Ona Mine at its flexible permit withdrawal limit. The transient model peaking factor (included on the last row of Table 17) was applied to Stress Period 5, which represents the month of April (Ona: 1.88, Desoto: 1.88, Wingate: 1.25, and South Pasture: 1.17). An intermediate peaking factor was applied to

[1] The River and Drain Cell elevations were not modified from steady state. As a result, the DWRM2.1 model cannot be used to reliably simulate the SAS under transient conditions.

the month preceding and following April to represent the dry season. The rest of the months were adjusted downward, so that the average withdrawal for the year is the same as the drought year average annual as shown in Table 17. The other users' well withdrawals were adjusted according to well type using the multipliers in Table 28, which were averaged using data from the DWRM2.1 transient calibration as described previously. The DWRM2.1 transient model uses 7 years of actual monthly withdrawals provided by SWFWMD.

TABLE 28

Transient Model Monthly Well Withdrawal Multipliers

Central Florida Phosphate District, Florida

	Monthly Multiplier					
Month	**Agriculture**	**Industrial Commercial**	**Mining Dewatering**	**Public Supply**	**Recreation**	**Unspecified Use**
January	1.06	0.96	0.75	0.93	0.70	0.90
February	1.19	1.00	1.28	1.01	0.86	1.00
March	1.24	1.00	0.76	1.03	0.99	1.18
April	1.59	1.05	1.32	1.12	1.23	1.66
May	1.68	1.03	1.21	1.16	1.41	1.70
June	1.04	1.01	0.95	1.06	1.20	1.21
July	0.47	1.02	0.92	0.96	0.90	0.58
August	0.44	0.97	0.94	0.94	0.92	0.46
September	0.52	0.85	0.81	0.90	0.85	0.49
October	0.81	0.93	1.14	0.97	1.03	0.78
November	1.04	1.11	0.81	0.99	1.08	1.05
December	0.93	1.08	1.13	0.93	0.84	0.97

Note: The Mining Dewatering values are used for mines other than CF Industries and Mosaic

Monthly recharge values were also obtained from the DWRM2.1 transient calibration by averaging the 7 years of recharge data for each month and cell. For the 2025 scenario, the recharge was also increased with the Preferred Alternatives mine footprints using the multipliers presented in Table 4. The total model recharge varies for the monthly stress periods, as shown in Table 29.

TABLE 29

Seasonal Recharge Summary from DWRM2.1 Transient Calibration Files

Central Florida Phosphate District, Florida

	Average Model Recharge (in/year)	
	2010	**2025**
Average Annual	4.05	4.07
January	2.84	2.84
February	2.95	2.96
March	3.71	3.72
April	1.88	1.88
May	1.95	1.96
June	6.66	6.68
July	6.88	6.90
August	6.26	6.27
September	7.08	7.10
October	2.34	2.35
November	2.14	2.14
December	3.97	3.98

Table 30 summarizes the results of the three transient models in the IAS Zone 1 (Layer 2).

Figure 33 presents the IAS Zone 1 ROMP monitoring well water level differences compared to the 2010 base scenario. Figure 33 shows that the water levels are lower in the spring dry season, but recover in the late summer, fall, and winter. The change in water level fluctuation varies by as much as 8 feet above and below the 2010 base conditions but as the chart illustrates, the annual average water level remains stable.

FIGURE 33
Transient 2010 Model Simulated Water Change in the IAS Zone 1 Aquifer (Model Layer 2) Water Level (ft)
Central Florida Phosphate District, Florida

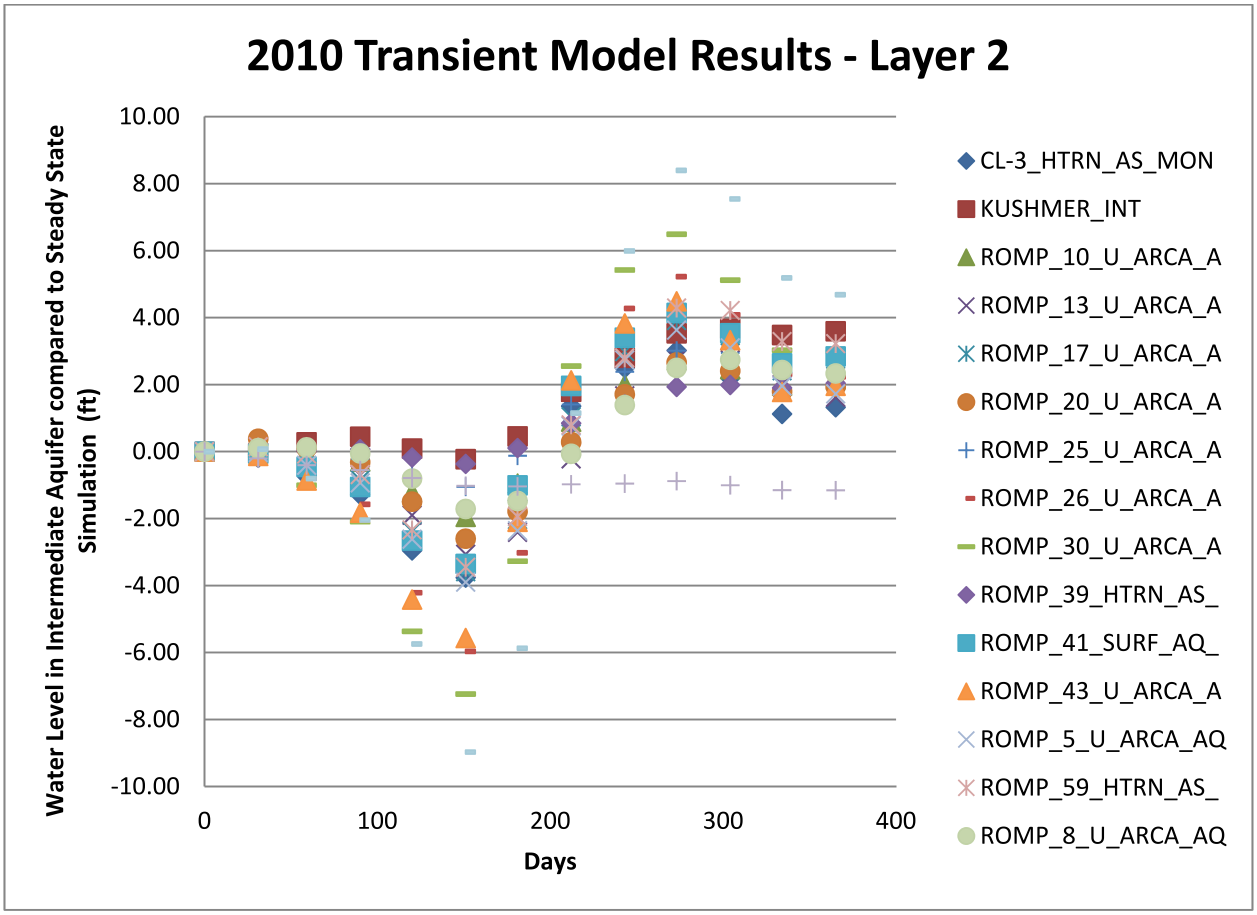


TABLE 30
Transient Model Simulated IAS Zone 1 ROMP Monitor Well Water Levels (Layer 2)
Central Florida Phosphate District, Florida

Well	Maximum Elevation (ft)	Minimum Elevation (ft)	Maximum Water Level Change (ft)	Maximum Elevation (ft)	Minimum Elevation (ft)	Maximum Water Level Change (ft)	Change in Maximum Water Level Change from 2010 (ft)	% Change in Maximum Water Level Change from 2010
	2010 All Users with Mining			**Scenario 2025B Alternatives 2, 3, 4, and 5 All Users with Mining, *with Agriculture Reduction***				
CL-3_HTRN_AS_MON	98.33	91.58	6.75	99.33	93.15	6.18	-0.57	-8.5
KUSHMER_INT	22.60	18.72	3.88	22.92	19.18	3.74	-0.14	-3.7
ROMP_10_U_ARCA_A	22.52	17.83	4.69	22.67	18.11	4.56	-0.13	-2.7
ROMP_13_U_ARCA_A	46.15	40.33	5.82	46.54	41.07	5.47	-0.35	-6.0
ROMP_17_U_ARCA_A	42.09	34.59	7.50	42.56	35.50	7.05	-0.44	-5.9
ROMP_20_U_ARCA_A	13.49	8.23	5.26	13.86	8.91	4.95	-0.32	-6.1
ROMP_25_U_ARCA_A	71.32	67.27	4.05	71.45	67.48	3.97	-0.08	-1.9
ROMP_26_U_ARCA_A	45.20	34.03	11.18	45.75	35.26	10.49	-0.69	-6.2
ROMP_30_U_ARCA_A	55.68	42.11	13.56	56.36	43.40	12.96	-0.60	-4.5
ROMP_39_HTRN_AS_	89.15	86.75	2.40	89.38	87.02	2.36	-0.04	-1.8
ROMP_41_SURF_AQ_	93.39	86.08	7.31	94.25	87.12	7.14	-0.17	-2.4
ROMP_43_U_ARCA_A	81.63	71.68	9.94	83.38	74.38	9.00	-0.94	-9.5
ROMP_5_U_ARCA_AQ	45.25	37.72	7.53	45.64	38.56	7.08	-0.44	-5.9
ROMP_59_HTRN_AS_	94.62	87.02	7.60	95.92	88.82	7.11	-0.49	-6.5
ROMP_8_U_ARCA_AQ	25.64	21.18	4.46	25.96	21.72	4.24	-0.22	-4.9
ROMP_TR_7-2_U_AR	15.91	14.75	1.16	15.95	14.83	1.13	-0.03	-2.4
VERNA_TEST_0-1	25.55	8.24	17.32	26.95	11.04	15.91	-1.41	-8.1

TABLE 30
Transient Model Simulated IAS Zone 1 ROMP Monitor Well Water Levels (Layer 2)
Central Florida Phosphate District, Florida

Well	Maximum Elevation (ft)	Minimum Elevation (ft)	Maximum Water Level Change (ft)	Maximum Elevation (ft)	Minimum Elevation (ft)	Maximum Water Level Change (ft)	Change in Maximum Water Level Change from 2010 (ft)	% Change in Maximum Water Level Change from 2010
	2010 All Users with Mining			**Scenario 2025B Alternatives 2, 3, 4, and 5 All Users with Mining, *without Agriculture Reduction***				
CL-3_HTRN_AS_MON	98.33	91.58	6.75	98.72	92.05	6.67	-0.08	-1.2
KUSHMER_INT	22.60	18.72	3.88	22.71	18.85	3.86	-0.02	-0.5
ROMP_10_U_ARCA_A	22.52	17.83	4.69	22.50	17.79	4.71	0.03	0.6
ROMP_13_U_ARCA_A	46.15	40.33	5.82	46.09	40.21	5.88	0.06	1.1
ROMP_17_U_ARCA_A	42.09	34.59	7.50	42.10	34.51	7.59	0.09	1.2
ROMP_20_U_ARCA_A	13.49	8.23	5.26	13.51	8.22	5.29	0.02	0.4
ROMP_25_U_ARCA_A	71.32	67.27	4.05	71.27	67.10	4.17	0.12	2.9
ROMP_26_U_ARCA_A	45.20	34.03	11.18	45.06	33.69	11.38	0.20	1.8
ROMP_30_U_ARCA_A	55.68	42.11	13.56	55.49	41.44	14.05	0.48	3.6
ROMP_39_HTRN_AS_	89.15	86.75	2.40	89.19	86.78	2.41	0.01	0.4
ROMP_41_SURF_AQ_	93.39	86.08	7.31	93.73	86.30	7.43	0.12	1.6
ROMP_43_U_ARCA_A	81.63	71.68	9.94	82.43	72.66	9.77	-0.17	-1.7
ROMP_5_U_ARCA_AQ	45.25	37.72	7.53	45.18	37.56	7.61	0.09	1.2
ROMP_59_HTRN_AS_	94.62	87.02	7.60	95.30	87.80	7.50	-0.10	-1.3
ROMP_8_U_ARCA_AQ	25.64	21.18	4.46	25.63	21.13	4.50	0.04	0.9
ROMP_TR_7-2_U_AR	15.91	14.75	1.16	15.91	14.77	1.15	-0.01	-0.7
VERNA_TEST_0-1	25.55	8.24	17.32	25.67	8.24	17.44	0.12	0.7

Table 31 summarizes the results of the three transient models in the IAS Zone 2 (Layer 3).

Figure 34 presents the IAS Zone 2 ROMP monitoring well water level differences compared to the 2010 base scenario. Figure 34 shows that the water levels are lower in the spring dry season, but recover in the late summer, fall, and winter. The change in water level fluctuation varies by as much as 7 feet above and below the 2010 base conditions but as the chart illustrates, the annual average water level remains stable.

FIGURE 34
Transient 2010 Model Simulated Water Change in the IAS Zone 2 (Model Layer 3) Water Level (ft)
Central Florida Phosphate District, Florida

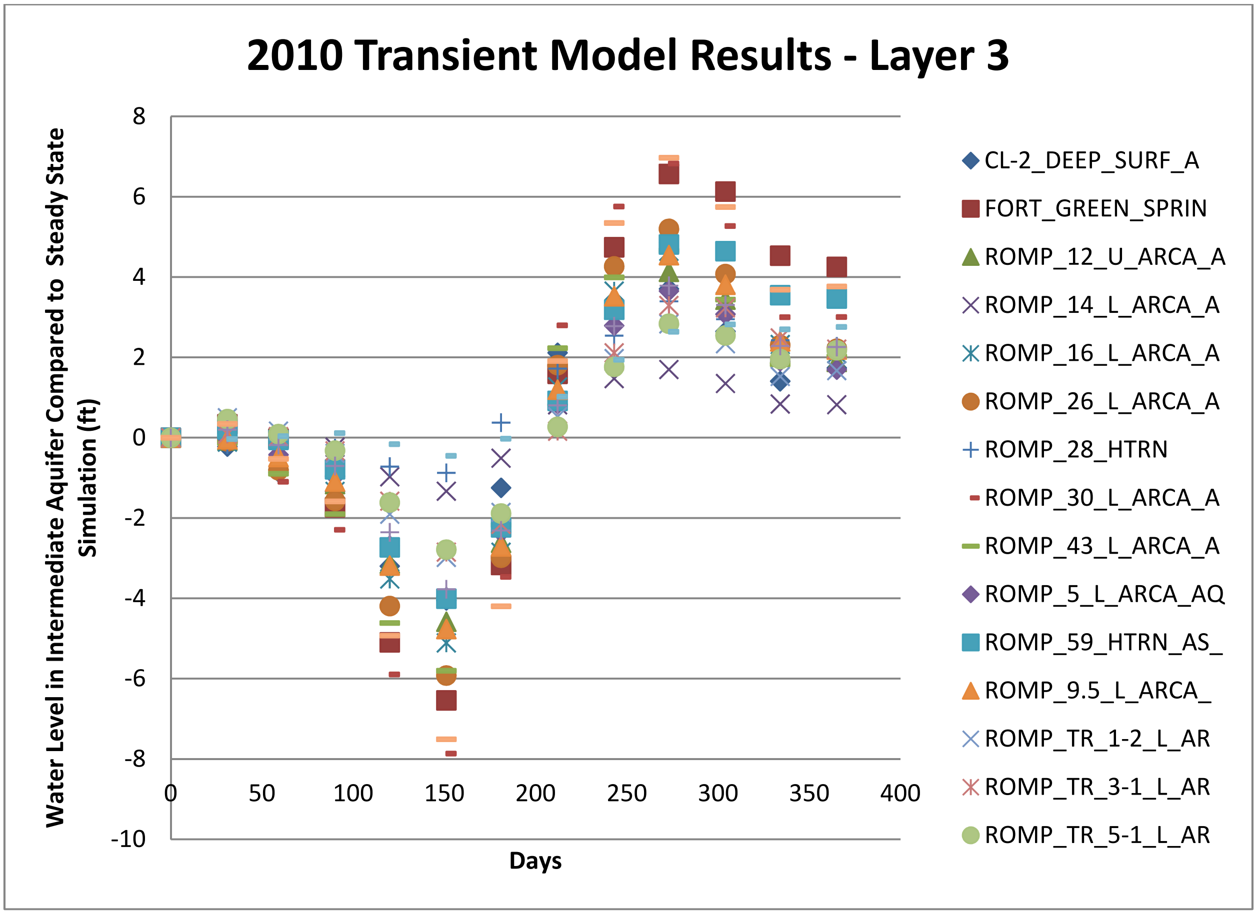


Table 32 summarizes the results of the three transient models in the UFA (Layer 4).

TABLE 31

Transient Model Simulated IAS Zone 2 ROMP Monitor Well Water Levels (Layer 3)

Central Florida Phosphate District, Florida

Well	2010 All Users with Mining			Scenario 2025B Alternatives 2, 3, 4, and 5 All Users with Mining, *with Agriculture Reduction*				
	Maximum Elevation (ft)	Minimum Elevation (ft)	Maximum Water Level Change (ft)	Maximum Elevation (ft)	Minimum Elevation (ft)	Maximum Water Level Change (ft)	Change in Maximum Water Level Change from 2010 (ft)	% Change in Maximum Water Level Change from 2010
CL-2_DEEP_SURF_A	86.95	79.19	7.76	87.93	80.83	7.11	-0.65	-8.4%
FORT_GREEN_SPRIN	76.38	63.80	12.58	77.83	65.68	12.14	-0.44	-3.5%
ROMP_12_U_ARCA_A	44.78	36.07	8.71	45.24	37.07	8.17	-0.54	-6.2%
ROMP_14_L_ARCA_A	44.28	41.24	3.03	44.40	41.51	2.89	-0.14	-4.6%
ROMP_16_L_ARCA_A	45.63	35.88	9.75	46.13	36.99	9.15	-0.60	-6.2%
ROMP_26_L_ARCA_A	45.26	34.15	11.11	45.81	35.39	10.42	-0.69	-6.2%
ROMP_28_HTRN	74.41	70.14	4.27	74.86	70.64	4.22	-0.05	-1.2%
ROMP_30_L_ARCA_A	54.70	40.19	14.51	55.47	41.65	13.82	-0.70	-4.8%
ROMP_43_L_ARCA_A	81.11	70.76	10.35	82.86	73.50	9.36	-0.99	-9.5%
ROMP_5_L_ARCA_AQ	45.25	37.62	7.63	45.64	38.47	7.18	-0.45	-5.9%
ROMP_59_HTRN_AS_	89.48	80.83	8.65	90.93	82.87	8.06	-0.59	-6.8%
ROMP_9.5_L_ARCA_	42.14	32.83	9.31	42.64	33.93	8.71	-0.60	-6.4%
ROMP_TR_1-2_L_AR	15.84	10.01	5.83	15.97	10.21	5.75	-0.08	-1.3%
ROMP_TR_3-1_L_AR	34.22	28.08	6.14	34.64	28.86	5.78	-0.36	-5.9%
ROMP_TR_5-1_L_AR	13.28	7.64	5.64	13.62	8.25	5.37	-0.27	-4.8%
ROMP_TR_7-1_L_AR	17.76	10.21	7.55	18.39	11.47	6.93	-0.63	-8.3%
ROMP_TR_9-2_L_AR	23.81	20.54	3.27	24.16	21.07	3.09	-0.18	-5.4%
SARASOTA_9_DEEP	20.99	6.53	14.46	22.05	8.75	13.30	-1.15	-8.0%

TABLE 31

Transient Model Simulated IAS Zone 2 ROMP Monitor Well Water Levels (Layer 3)

Central Florida Phosphate District, Florida

	2010 All Users with Mining			**Scenario 2025B Alternatives 2, 3, 4, and 5 All Users with Mining, *without Agriculture Reduction***				
Well	**Maximum Elevation (ft)**	**Minimum Elevation (ft)**	**Maximum Water Level Change (ft)**	**Maximum Elevation (ft)**	**Minimum Elevation (ft)**	**Maximum Water Level Change (ft)**	**Change in Maximum Water Level Change from 2010 (ft)**	**% Change in Maximum Water Level Change from 2010**
CL-2_DEEP_SURF_A	86.95	79.19	7.76	87.24	79.53	7.71	-0.04	-0.6
FORT_GREEN_SPRIN	76.38	63.80	12.58	76.85	63.86	12.99	0.41	3.3
ROMP_12_U_ARCA_A	44.78	36.07	8.71	44.70	35.88	8.82	0.11	1.2
ROMP_14_L_ARCA_A	44.28	41.24	3.03	44.26	41.21	3.05	0.02	0.5
ROMP_16_L_ARCA_A	45.63	35.88	9.75	45.53	35.65	9.88	0.13	1.3
ROMP_26_L_ARCA_A	45.26	34.15	11.11	45.12	33.82	11.31	0.20	1.8
ROMP_28_HTRN	74.41	70.14	4.27	74.45	70.16	4.29	0.02	0.5
ROMP_30_L_ARCA_A	54.70	40.19	14.51	54.53	39.52	15.01	0.50	3.4
ROMP_43_L_ARCA_A	81.11	70.76	10.35	81.91	71.74	10.17	-0.18	-1.7
ROMP_5_L_ARCA_AQ	45.25	37.62	7.63	45.18	37.46	7.72	0.09	1.2
ROMP_59_HTRN_AS_	89.48	80.83	8.65	90.24	81.71	8.53	-0.12	-1.4
ROMP_9.5_L_ARCA_	42.14	32.83	9.31	42.05	32.63	9.43	0.12	1.3
ROMP_TR_1-2_L_AR	15.84	10.01	5.83	15.83	9.98	5.85	0.02	0.3
ROMP_TR_3-1_L_AR	34.22	28.08	6.14	34.17	27.96	6.21	0.07	1.1
ROMP_TR_5-1_L_AR	13.28	7.64	5.64	13.29	7.62	5.67	0.02	0.4
ROMP_TR_7-1_L_AR	17.76	10.21	7.55	17.87	10.31	7.55	0.00	0.0
ROMP_TR_9-2_L_AR	23.81	20.54	3.27	23.91	20.66	3.25	-0.01	-0.4
SARASOTA_9_DEEP	20.99	6.53	14.46	21.10	6.57	14.52	0.07	0.5

TABLE 32
Transient Model Simulated UFA ROMP Monitor Well Water Levels (Layer 4)
Central Florida Phosphate District, Florida

Well	2010 All Users with Mining			Scenario 2025B Alternatives 2, 3, 4, and 5 All Users with Mining, *with Agriculture Reduction*				
	Maximum Elevation (ft)	Minimum Elevation (ft)	Maximum Water Level Change (ft)	Maximum Elevation (ft)	Minimum Elevation (ft)	Maximum Water Level Change (ft)	Change in Maximum Water Level Change from 2010 (ft)	% Change in Maximum Water Level Change from 2010
COLEY_DEEP	87.72	79.59	8.13	88.81	81.37	7.43	-0.70	-8.6%
FLORIDA_POWER_FL	17.36	6.73	10.63	18.29	8.62	9.67	-0.97	-9.1%
KIBLER_DEEP	23.06	0.09	22.96	24.79	3.78	21.02	-1.94	-8.5%
LAKE_ALFRED_DEEP	124.70	122.30	2.40	125.04	122.72	2.32	-0.08	-3.4%
ROMP_12_AVPK_PZ_	44.78	36.05	8.73	45.24	37.06	8.19	-0.54	-6.2%
ROMP_123_HTRN_AS	29.28	7.14	22.15	31.95	12.21	19.74	-2.41	-10.9%
ROMP_13_AVPK_PZ_	45.23	39.23	6.00	45.63	39.99	5.64	-0.36	-6.0%
ROMP_14_U_FLDN_A	44.26	41.22	3.05	44.39	41.48	2.91	-0.14	-4.6%
ROMP_15_U_FLDN_A	45.48	35.66	9.82	45.99	36.82	9.17	-0.65	-6.6%
ROMP_17_U_FLDN_A	43.30	33.50	9.79	43.81	34.65	9.16	-0.63	-6.5%
ROMP_19X_U_FLDN_	35.33	25.39	9.94	35.94	26.67	9.27	-0.67	-6.7%
ROMP_20_U_FLDN_A	21.94	15.17	6.77	22.48	16.19	6.28	-0.49	-7.2%
ROMP_25_U_FLDN_A	35.34	14.68	20.66	36.15	16.65	19.50	-1.16	-5.6%
ROMP_28_AVPK	73.99	69.69	4.30	74.45	70.21	4.24	-0.06	-1.4%
ROMP_30_U_FLDN_A	54.66	40.13	14.54	55.43	41.59	13.84	-0.70	-4.8%
ROMP_31_U_FLDN_A	50.83	34.79	16.04	49.90	33.10	16.80	0.76	4.7%
ROMP_32_U_FLDN_A	35.99	13.90	22.09	36.56	15.00	21.56	-0.53	-2.4%
ROMP_39_AVPK_PZ_	24.49	1.18	23.31	26.73	5.68	21.05	-2.26	-9.7%
ROMP_40_U_FLDN_A	52.29	33.90	18.39	54.34	36.95	17.39	-1.00	-5.4%
ROMP_41_AVPK_PZ_	72.04	57.03	15.00	74.06	60.05	14.01	-1.00	-6.7%
ROMP_43XX_U_FLDN	88.15	82.47	5.67	89.37	84.15	5.22	-0.45	-7.9%
ROMP_45_U_FLDN_A	78.61	65.17	13.44	81.06	68.91	12.15	-1.29	-9.6%
ROMP_5_U_FLDN_AQ	45.25	37.61	7.64	45.64	38.46	7.18	-0.45	-5.9%
ROMP_50_U_FLDN_A	23.20	4.68	18.52	25.06	8.37	16.69	-1.83	-9.9%

TABLE 32
Transient Model Simulated UFA ROMP Monitor Well Water Levels (Layer 4)
Central Florida Phosphate District, Florida

	2010 All Users with Mining			**Scenario 2025B Alternatives 2, 3, 4, and 5 All Users with Mining, *with Agriculture Reduction***				
Well	**Maximum Elevation (ft)**	**Minimum Elevation (ft)**	**Maximum Water Level Change (ft)**	**Maximum Elevation (ft)**	**Minimum Elevation (ft)**	**Maximum Water Level Change (ft)**	**Change in Maximum Water Level Change from 2010 (ft)**	**% Change in Maximum Water Level Change from 2010**
ROMP_57_U_FLDN_A	107.75	102.09	5.66	108.78	103.50	5.28	-0.38	-6.6%
ROMP_59_U_FLDN_A	84.18	74.33	9.85	85.79	76.63	9.15	-0.70	-7.1%
ROMP_60X_U_FLDN_	83.98	74.46	9.52	85.46	76.55	8.92	-0.61	-6.4%
ROMP_TR_10-2_L_A	29.25	17.12	12.13	30.26	17.74	12.52	0.39	3.2%
ROMP_TR_4-1_U_FL	22.66	17.69	4.97	23.06	18.41	4.65	-0.32	-6.4%
ROMP_TR_7-4_U_FL	18.76	5.99	12.76	19.74	8.03	11.71	-1.05	-8.2%
ROMP_TR_8-1_AVPK	17.42	8.14	9.29	18.22	9.75	8.46	-0.82	-8.9%
ROMP_TR_9-3_U_FL	19.93	6.17	13.76	21.29	8.80	12.49	-1.28	-9.3%
SMITH_DEEP	75.86	65.27	10.59	77.38	67.72	9.67	-0.93	-8.7%
VERNA_TEST_0-4	21.97	4.93	17.03	23.20	7.55	15.65	-1.38	-8.1%

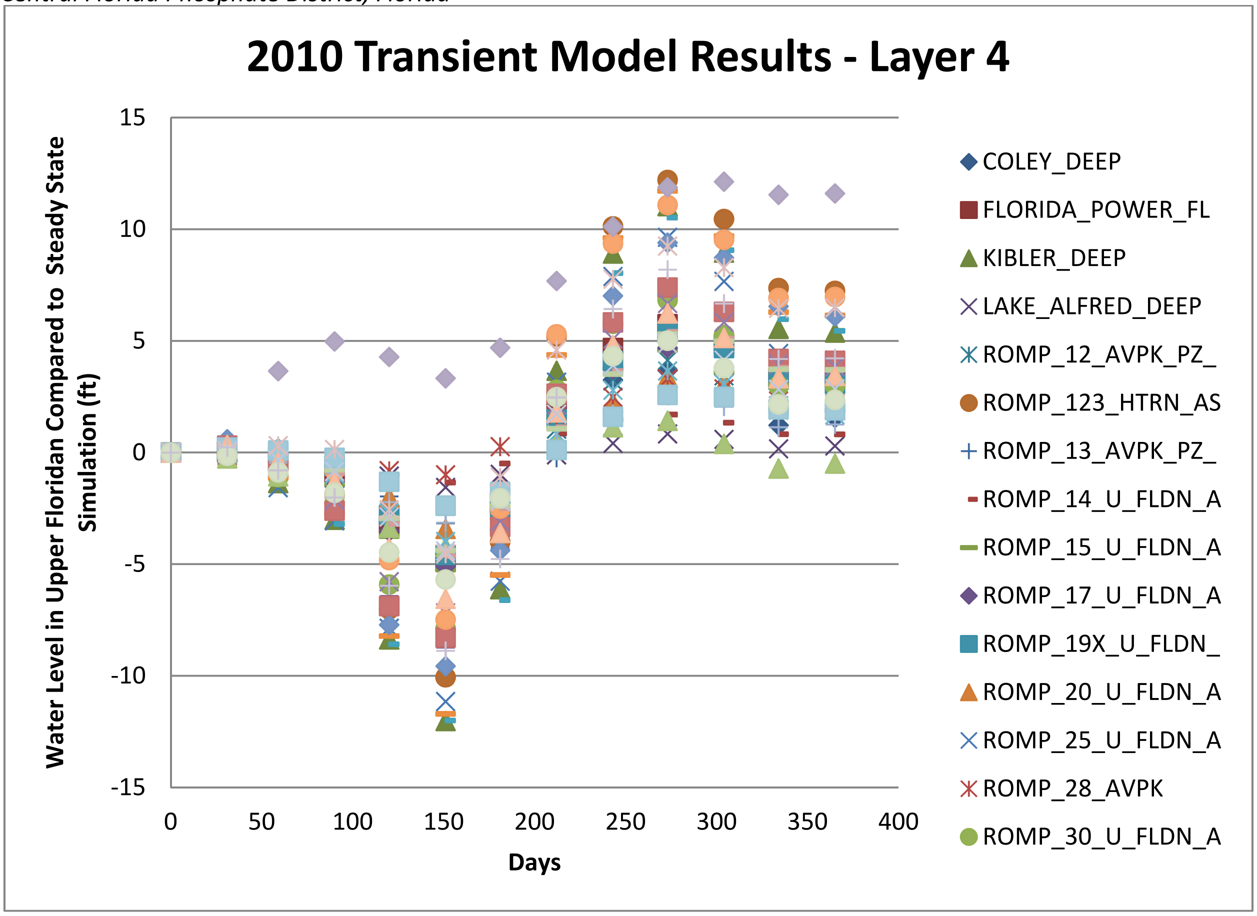
	2010 All Users with Mining			**Scenario 2025B Alternatives 2, 3, 4, and 5, All Users with Mining, *without Agriculture Reduction***				
Well	**Maximum Elevation (ft)**	**Minimum Elevation (ft)**	**Maximum Water Level Change (ft)**	**Maximum Elevation (ft)**	**Minimum Elevation (ft)**	**Maximum Water Level Change (ft)**	**Change in Maximum Water Level Change from 2010 (ft)**	**% Change in Maximum Water Level Change from 2010**
COLEY_DEEP	87.72	79.59	8.13	88.07	80.00	8.07	-0.06	-0.7
FLORIDA_POWER_FL	17.36	6.73	10.63	17.58	6.99	10.59	-0.04	-0.4
KIBLER_DEEP	23.06	0.09	22.96	23.28	0.17	23.11	0.15	0.7
LAKE_ALFRED_DEEP	124.70	122.30	2.40	124.78	122.37	2.41	0.01	0.3
ROMP_12_AVPK_PZ_	44.78	36.05	8.73	44.70	35.86	8.84	0.11	1.2
ROMP_123_HTRN_AS	29.28	7.14	22.15	30.51	8.86	21.65	-0.50	-2.2
ROMP_13_AVPK_PZ_	45.23	39.23	6.00	45.17	39.10	6.07	0.06	1.1
ROMP_14_U_FLDN_A	44.26	41.22	3.05	44.25	41.19	3.06	0.02	0.6
ROMP_15_U_FLDN_A	45.48	35.66	9.82	45.39	35.45	9.94	0.12	1.2
ROMP_17_U_FLDN_A	43.30	33.50	9.79	43.20	33.28	9.93	0.13	1.3

TABLE 32
Transient Model Simulated UFA ROMP Monitor Well Water Levels (Layer 4)
Central Florida Phosphate District, Florida

Well	2010 All Users with Mining			Scenario 2025B Alternatives 2, 3, 4, and 5, All Users with Mining, *without Agriculture Reduction*				
	Maximum Elevation (ft)	**Minimum Elevation (ft)**	**Maximum Water Level Change (ft)**	**Maximum Elevation (ft)**	**Minimum Elevation (ft)**	**Maximum Water Level Change (ft)**	**Change in Maximum Water Level Change from 2010 (ft)**	**% Change in Maximum Water Level Change from 2010**
ROMP_19X_U_FLDN_	35.33	25.39	9.94	35.28	25.23	10.05	0.11	1.1
ROMP_20_U_FLDN_A	21.94	15.17	6.77	21.97	15.17	6.80	0.03	0.5
ROMP_25_U_FLDN_A	35.34	14.68	20.66	34.78	13.37	21.42	0.76	3.7
ROMP_28_AVPK	73.99	69.69	4.30	74.03	69.71	4.32	0.02	0.5
ROMP_30_U_FLDN_A	54.66	40.13	14.54	54.49	39.46	15.03	0.50	3.4
ROMP_31_U_FLDN_A	50.83	34.79	16.04	48.83	30.66	18.17	2.13	13.3
ROMP_32_U_FLDN_A	35.99	13.90	22.09	35.04	11.55	23.48	1.40	6.3
ROMP_39_AVPK_PZ_	24.49	1.18	23.31	25.20	2.05	23.15	-0.16	-0.7
ROMP_40_U_FLDN_A	52.29	33.90	18.39	53.10	34.39	18.72	0.33	1.8
ROMP_41_AVPK_PZ_	72.04	57.03	15.00	73.01	57.90	15.10	0.10	0.7
ROMP_43XX_U_FLDN	88.15	82.47	5.67	88.40	82.73	5.66	-0.01	-0.1
ROMP_45_U_FLDN_A	78.61	65.17	13.44	80.09	67.00	13.09	-0.35	-2.6
ROMP_5_U_FLDN_AQ	45.25	37.61	7.64	45.18	37.45	7.73	0.09	1.2
ROMP_50_U_FLDN_A	23.20	4.68	18.52	23.86	5.56	18.30	-0.22	-1.2
ROMP_57_U_FLDN_A	107.75	102.09	5.66	108.04	102.41	5.64	-0.02	-0.4
ROMP_59_U_FLDN_A	84.18	74.33	9.85	85.03	75.32	9.71	-0.14	-1.4
ROMP_60X_U_FLDN_	83.98	74.46	9.52	84.75	75.35	9.41	-0.12	-1.2
ROMP_TR_10-2_L_A	29.25	17.12	12.13	29.69	17.35	12.34	0.21	1.8
ROMP_TR_4-1_U_FL	22.66	17.69	4.97	22.66	17.67	5.00	0.03	0.6
ROMP_TR_7-4_U_FL	18.76	5.99	12.76	18.91	6.12	12.79	0.02	0.2
ROMP_TR_8-1_AVPK	17.42	8.14	9.29	17.60	8.33	9.27	-0.02	-0.2
ROMP_TR_9-3_U_FL	19.93	6.17	13.76	20.38	6.74	13.64	-0.13	-0.9
SMITH_DEEP	75.86	65.27	10.59	76.48	65.99	10.49	-0.10	-1.0
VERNA_TEST_0-4	21.97	4.93	17.03	22.08	4.95	17.14	0.10	0.6

Figure 35 presents the UFA ROMP monitoring well water level differences compared to the 2010 base scenario. Figure 35 shows that the water levels are lower in the spring dry season, but recover in the late summer, fall, and winter. The change in water level fluctuation varies by as much as 12 feet above and below the 2010 base conditions but as the chart illustrates, the annual average water level remains stable.

FIGURE 35
Transient 2010 Model Simulated Water Change in the UFA (Model Layer 4) Water Level (ft)
Central Florida Phosphate District, Florida



8.0 Summary

The results of the groundwater modeling performed to evaluate relative changes to SAS, IAS and UFA water levels are summarized in this section.

8.1 No Action Alternative

The model results indicate that water levels in the SAS, IAS, and UFA will rise in every year (relative to a simulated 2010 baseline) when currently operating mines cease to pump groundwater as their reserves are exhausted and mining ceases. Table 33 summarizes the average simulated water level change in the SAS, IAS, and UFA relative to 2010 for the year and type of water use. The values in Table 33 were calculated by averaging the simulated water level change for every model cell within the CFPD. As this is an average of the CFPD, the simulated water level changes in the vicinity of the mines will be greater. However, the results illustrate that under the No Action Alternative, the simulated increase in water levels from reductions in groundwater withdrawal at currently operating phosphate mines accounts for more than half of the total projected water level rise in the area.

As water levels are projected to increase throughout the area from the cessation of pumpage for phosphate mines and SWFWMD anticipated reductions in agricultural water use, the overall impact to the hydrogeology of the study area is positive.

TABLE 33

Simulated Water Level Change within CFPD, No Action Alternative

Central Florida Phosphate District, Florida

	Layer 1 - Surficial Aquifer		Layer 2 - Intermediate Aquifer Zone 1		Layer 3 - Intermediate Aquifer Zone 2		Layer 4 - Upper Floridan Aquifer	
	Average Simulated Change:							
Year	Phosphate Mining Only (ft)	All Users (ft)	Phosphate Mining Only (ft)	All Users (ft)	Phosphate Mining Only (ft)	All Users (ft)	Phosphate Mining Only (ft)	All Users (ft)
2015	0.04	0.08	0.14	0.34	0.25	0.65	0.28	0.74
2020	0.19	0.34	0.76	1.21	1.77	2.61	2.02	2.96
2025	0.28	0.46	1.12	1.77	2.39	3.62	2.70	4.09
2030	0.33	0.52	1.34	1.98	2.82	4.05	3.18	4.56

8.2 Applicants' Preferred Alternatives 2, 3, 4, and 5

Table 34 summarizes the average simulated changes in the water levels of the SAS, IAS, and UFA for Applicants' Preferred Alternatives 2, 3, 4, and 5. If only phosphate mining is considered, the average simulated change is a decrease of slightly more than 0.01 foot in scenarios 2015B and 2019B. The average simulated change is positive for all other scenarios. When all users are considered, the average simulated change in the water levels of the aquifers increases every year. By 2049 the simulated rise in the UFA is approximately 4.58 feet.

TABLE 34

Simulated Water Level Change within CFPD, Alternatives 2, 3, 4, and 5

Central Florida Phosphate District, Florida

	Layer 1 - Surficial Aquifer		Layer 2 - Intermediate Aquifer Zone 1		Layer 3 - Intermediate Aquifer Zone 2		Layer 4 - Upper Floridan Aquifer	
	Average Simulated Change:							
Year	Phosphate Mining Only (ft)	All Users (ft)	Phosphate Mining Only (ft)	All Users (ft)	Phosphate Mining Only (ft)	All Users (ft)	Phosphate Mining Only (ft)	All Users (ft)
2015A	0.04	0.03	0.14	0.34	0.25	0.65	0.28	0.74
2015B	0.01	0.05	0.03	0.23	-0.03	0.37	-0.05	0.40
2015C	0.01	0.05	0.01	0.21	0.02	0.42	0.03	0.48
2019A	0.04	0.11	0.15	0.51	0.27	0.99	0.31	1.12
2019B	0.00	0.07	0.01	0.38	-0.05	0.68	-0.06	0.76
2019C	0.00	0.07	0.00	0.36	0.00	0.73	0.01	0.83
2020A	0.09	0.17	0.19	0.59	0.48	1.29	0.62	1.53
2020B	0.03	0.11	-0.06	0.35	0.03	0.84	0.13	1.04
2025A	0.18	0.29	0.27	0.87	0.42	1.62	0.53	1.89
2025B	0.16	0.27	0.16	0.76	0.20	1.40	0.29	1.65
2036A	0.30	0.41	0.62	1.22	1.13	2.33	1.34	2.69
2036B	0.28	0.39	0.51	1.11	0.91	2.11	1.10	2.45
2047A	0.40	0.50	1.03	1.62	2.04	3.23	2.33	3.68
2047B	0.38	0.48	0.92	1.52	1.81	3.01	2.09	3.44
2049	0.45	0.56	1.42	2.01	2.88	4.07	3.23	4.58

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