TABLES

NWF CR2SWT Final Calibration Metrics			Task 1 Goals
Calibration Target Type	**Calibration Metric**	**Metric Value**	**Metric Target**
Groundwater Heads	Mean Error	0.78	+/- 2 ft
	Mean ABS Error	6.25	5ft
VHDs	Mean ABS Error / Range	3.62%	10%
HHDs	Mean ABS Error / Range	6.81%	10%
THDs	Mean ABS Error / Range	3.99%	20%
Groundwater Concentrations	Mean Error	0.0010	+/- 0.0025 RSU
	Mean ABS Error	0.0031	0.0050 RSU
VCDs	Mean ABS Error / Range	6.15%	10%
TCDs	Mean ABS Error / Range	1.51%	20%

Table 1 – Calibration target metrics

Format of Name	Description	Model Parameter
dsp#	Longitudinal transverse dispersivity (α_L) of HSU "#"	Yes
kh#_pp* **	Horizontal hydraulic conductivity (Kh) pilot of index "***" in HSU "#"	No
kh1	Horizontal hydraulic conductivity (K) of layer 1	Yes
khkv#	Horizontal-to-vertical hydraulic conductivity anisotropy ratio (Kh/Kv) of HSU "#"	Yes†
kv#_pp* **	Vertical hydraulic conductivity (Kv) pilot of index "***" in HSU "#"	No
lbcsf_l*	Lateral boundary concentration scaling factor for Lower Floridan layers	No
lbcsf_u*	Lateral boundary concentration scaling factor for Upper Floridan layers	No
lc_*** **	Lateral boundary concentration in cell with index "*****" (function of adjacent "lbcsf_l*" or "lbcsf_u*" calibration parameters)	Yes
n#	Porosity of HSU "#"	Yes
riv	River conductance multiplier	No
RivCD* **	River conductance in cell with index "***" (function of "riv" calibration parameter)	Yes
ss#	Specific storage of HSU "#"	Yes†
sy1	Specific yield of layer 1	Yes

Notes:

HSU1 = Surficial aquifer (model layer 1)

HSU2 = Intermediate Aquifer System (layers 2-4)

HSU3 = Upper Floridan Aquifer (layers 5-9)

HSU4 = Bucatunna clay, where present (layers 10-12)

HSU5 = Lower Floridan Aquifer (model layers 13-18)

HSU6 = Sub-Floridan formation (model layers 19-21)

† Except for layers 10-12, which contain two HSUs and wherein properties are kriged using parameter values for each HSU zone (see documentation)

Table 2 – Calibration parameter naming conventions

***Note: Calibration parameters that are not also model parameters are used to calculate model parameter values during pre-processing**

Hydrostratigraphic Unit	Units	Calibrated Value (iteration #14)	Minimum Bound	Maximum Bound
Ratio of Horizontal to Vertical Hydraulic Conductivity				
Sand and Gravel Aquifer (layer 1)	-	11.7	5.00	35.0
Intermediate Aquifer System (layers 2 - 4)	-	52.5	17.5	52.5
Upper Floridan Aquifer (layers 5 - 9)	-	1.0	1.0	52.5
Bucatunna Clay Confining Unit/ Undifferentiated Florida Aquifer (layers 10 - 12)	-	33.2	17.5	52.5
Lower Floridan Aquifer (layers 13 - 18)	-	52.5	17.5	52.5
Sub-Floridan Aquifer (layers 19-21)	-	17.5	17.5	52.5
Specific Storage				
Intermediate Aquifer System (layers 2 - 4)	ft^{-1}	4.4E-4	1.0E-5	1.00E-3
Upper Floridan Aquifer (layers 5 - 9)	ft^{-1}	1.0E-5	1.0E-5	1.00E-3
Bucatunna Clay Confining Unit/ Undifferentiated Florida Aquifer (layers 10 - 12)	ft^{-1}	1.3E-4	1.0E-5	1.00E-3
Lower Floridan Aquifer (layers 13 - 18)	ft^{-1}	1.0E-5	1.0E-5	1.00E-3
Sub-Floridan Aquifer (layers 19-21)	ft^{-1}	1.0E-3	1.0E-5	1.00E-3

Table 3a – Non-pilot point calibration parameters

Hydrostratigraphic Unit	Units	Calibrated Value (iteration #14)	Minimum Bound	Maximum Bound
Dispersivity				
Sand and Gravel Aquifer (layer 1)	ft	54.9	1.0	100.0
Intermediate Aquifer System (layers 2 - 4)	ft	54.9	1.0	100.0
Upper Floridan Aquifer (layers 5 - 9)	ft	4.6	1.0	100.0
Bucatunna Clay Confining Unit/ Undifferentiated Florida Aquifer (layers 10 - 12)	ft	1.4	1.0	100.0
Lower Floridan Aquifer (layers 13 - 18)	ft	46.4	1.0	100.0
Sub-Floridan Aquifer (layers 19-21)	ft	70.1	1.0	100.0
Porosity				
Sand and Gravel Aquifer (layer 1)	-	0.15	5.0E-2	0.3
Intermediate Aquifer System (layers 2 - 4)	-	0.15	5.0E-2	0.3
Upper Floridan Aquifer (layers 5 - 9)	-	0.3	1.0E-5	0.3
Bucatunna Clay Confining Unit/ Undifferentiated Florida Aquifer (layers 10 - 12)	-	0.3	1.0E-5	0.3
Lower Floridan Aquifer (layers 13 - 18)	-	0.22	1.0E-5	0.3
Sub-Floridan Aquifer (layers 19-21)	-	0.3	1.0E-5	0.3

Table 3b – Non-pilot point calibration parameters

Format of Name	Description
head_#	Head target number #
vhd_#	Vertical head difference target number #
hhd_#	Horizontal head difference target number #
thd_#	Temporal head difference target number #
rs#_**	Relative salinity target for NWF well id # for either year 19** or 20**
rs#_ep	Relative salinity target for NWF well id # for the end of the simulation
tcd_#	Temporal concentration difference target number #
vcd_#	Vertical concentration difference target number #
baseflow_#	Baseflow target for stress period #
conc_offsh_l##_*_%	Offshore concentration target within layer ## at location * and for stress period %

Table 4a – Calibration target naming conventions

Group Name	Description	Calibration Targets
head_grp1	Head targets within years 1942 - 1965	Yes
head_grp2	Head targets within years 1966 - 1990	Yes
head_grp3	Head targets within years 1991 - 2000	Yes
head_grp4	Head targets within years 2001 - 2015	Yes
head_grp5	Head targets from NWF well id 9852 used as part of a vertical head difference pair	No
vhd_grp	Vertical head difference targets	Yes
hhd_grp	Horizontal head difference targets	Yes
thd_grp	Temporal head difference targets	Yes
conc_grp1	Groundwater concentration targets ranging from 0 - 150 mg/L Cl	Yes
conc_grp2	Groundwater concentration targets ranging from 150 - 350 mg/L Cl	Yes
conc_grp3	Groundwater concentration targets greater than 350 mg/L Cl	Yes
tcd_grp	Temporal concentration difference targets	Yes
vcd_grp	Vertical concentration difference targets	Yes
baseflows	Zero-weighted baseflow targets	No
conc_offsh07	Offshore concentration targets located in R2SWT layer 7	Yes
conc_offsh15	Offshore concentration targets located in R2SWT layer 15	Yes

Table 4b – Calibration target group naming conventions

	Layer(s)	Flow Direction	Instantaneous Rates (ft^3/d)			NET Rates ("IN - OUT", ft^3/d)			Differences (ft^3/d)	
			Pre-Dev	2000	2015	Pre-Dev	2000	2015	Pre-Dev to 2000	2000 to 2015
CONSTANT HEADS	1	In	2.17E+06	2.21E+06	2.23E+06	1.82E+06	1.96E+06	2.03E+06	1.41E+05	7.22E+04
		Out	3.57E+05	2.58E+05	2.04E+05					
	5-9 (UFA)	In	8.34E+06	7.77E+06	8.52E+06	7.01E+06	6.10E+06	7.28E+06	-9.15E+05	1.18E+06
		Out	1.33E+06	1.67E+06	1.24E+06					
	13-18 (LFA)	In	5.12E+06	5.07E+06	5.24E+06	4.08E+06	3.80E+06	4.15E+06	-2.84E+05	3.59E+05
		Out	1.04E+06	1.27E+06	1.09E+06					
	21 (SUB)	In	2.44E+03	2.46E+03	2.49E+03	-4.07E+05	-4.02E+05	-3.98E+05	5.22E+03	4.07E+03
		Out	4.09E+05	4.04E+05	4.00E+05					
RIVERS	5 (UFA)	In	1.55E+06	1.82E+06	2.15E+06	-1.25E+07	-1.17E+07	-1.11E+07	7.91E+05	6.00E+05
		Out	1.40E+07	1.35E+07	1.33E+07					
WELLS	5-18	In	0.00E+00	7.20E+04	3.28E+04	0.00E+00	-4.57E+06	-3.49E+06	-4.57E+06	1.08E+06
		Out	0.00E+00	4.64E+06	3.52E+06					
STORAGE	1-21	In	0.00E+00	1.77E+06	2.60E+05	0.00E+00	1.73E+06	-5.84E+05	1.73E+06	-2.31E+06
		Out	0.00E+00	4.61E+04	8.45E+05					

Table 5 – Instantaneous model-wide fluxes, net fluxes, and net flux differences at the end of the pre-development ("Pre-Dev") simulation, 2000, and 2015

	Flow Direction	Instantaneous Rates (mass/day)			NET Rates ("IN - OUT", mass/day)			Differences (mass/day)	
		Pre-Dev	2000	2015	Pre-Dev	2000	2015	Pre-Dev to 2000	2000 to 2015
CONSTANT HEADS	In	9.78E+08	9.42E+08	1.00E+09	7.80E+08	7.14E+08	8.16E+08	-6.61E+07	1.02E+08
	Out	1.98E+08	2.28E+08	1.85E+08					
RIVERS	In	1.24E+08	1.41E+08	1.62E+08	-7.80E+08	-7.31E+08	-6.93E+08	4.94E+07	3.75E+07
	Out	9.05E+08	8.72E+08	8.56E+08					
WELLS	In	0.00E+00	4.50E+06	2.05E+06	0.00E+00	-2.85E+08	-2.18E+08	-2.85E+08	6.77E+07
	Out	0.00E+00	2.90E+08	2.20E+08					
STORAGE	In	0.00E+00	3.17E+08	1.66E+08	0.00E+00	3.02E+08	9.60E+07	3.02E+08	-2.06E+08
	Out	0.00E+00	1.47E+07	7.05E+07					

Table 6 – Instantaneous model-wide mass fluxes, net mass fluxes, and net mass flux differences at the end of the pre-development ("Pre-Dev") simulation, 2000, and 2015

FIGURES

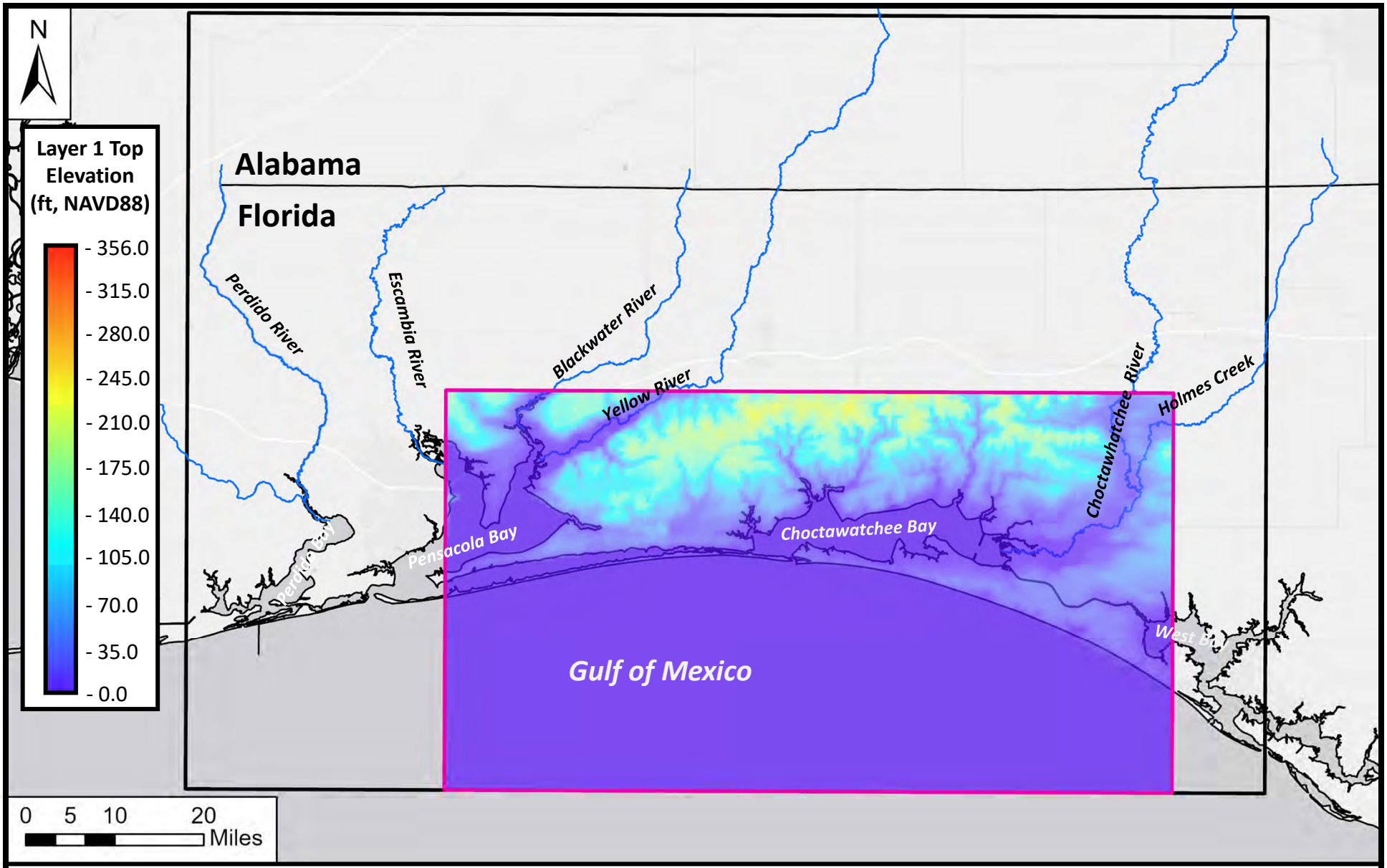

Figure 1 - Model domains, major rivers, Layer 1 topography, and coastal waterbodies.

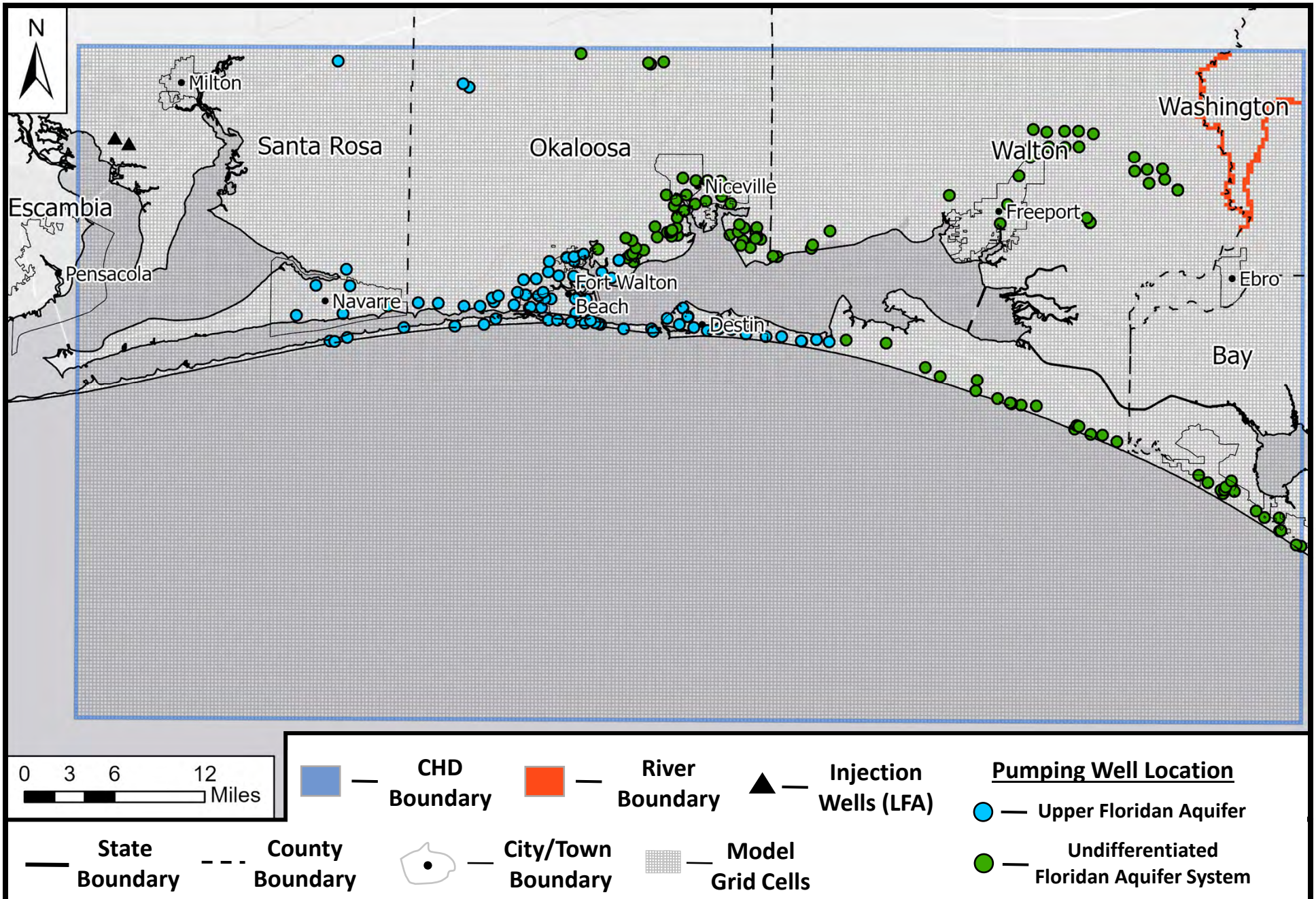

Figure 2 - Model grid, county boundaries, major Florida cities/towns, lateral constant head (CHD) boundaries, pumping and injection wells, and layer 5 river boundaries.

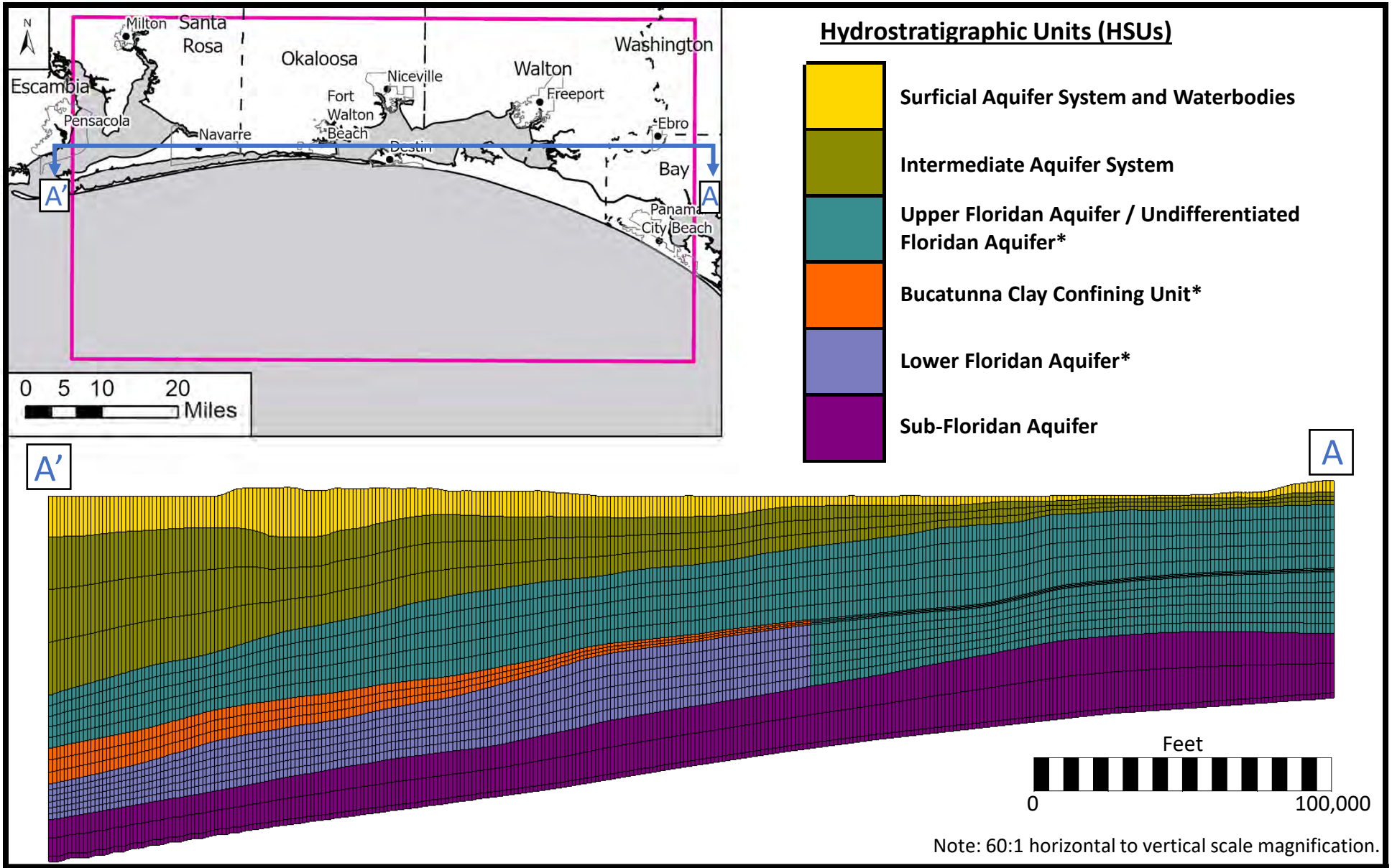

Figure 3 – Cross-section of model layering along row 70.

***Note: Location of transition from differentiated to undifferentiated Floridan Aquifer is approximate.**

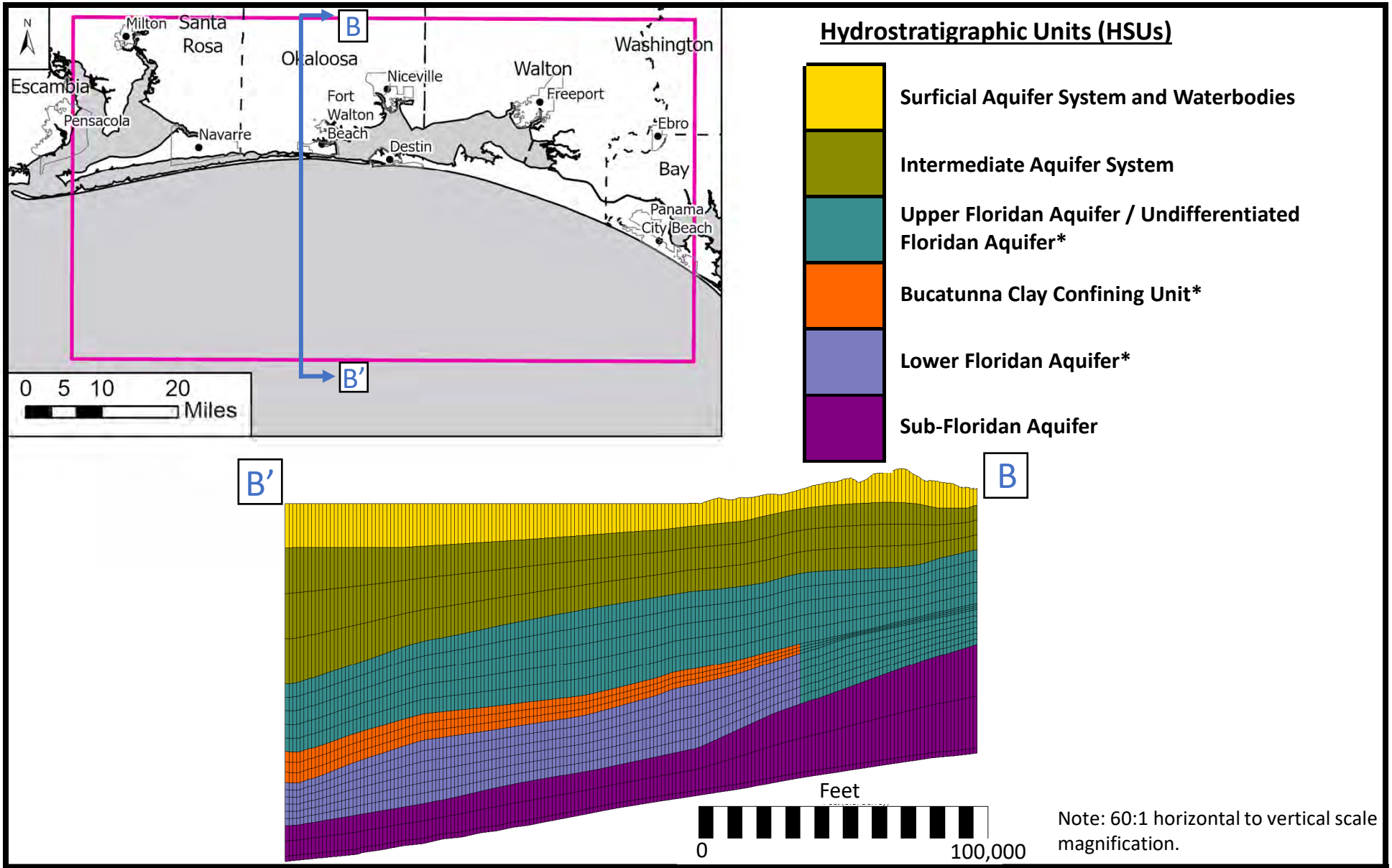

Figure 4 – Cross-section of model layering along column 125.

***Note: Location of transition from differentiated to undifferentiated Floridan Aquifer is approximate.**

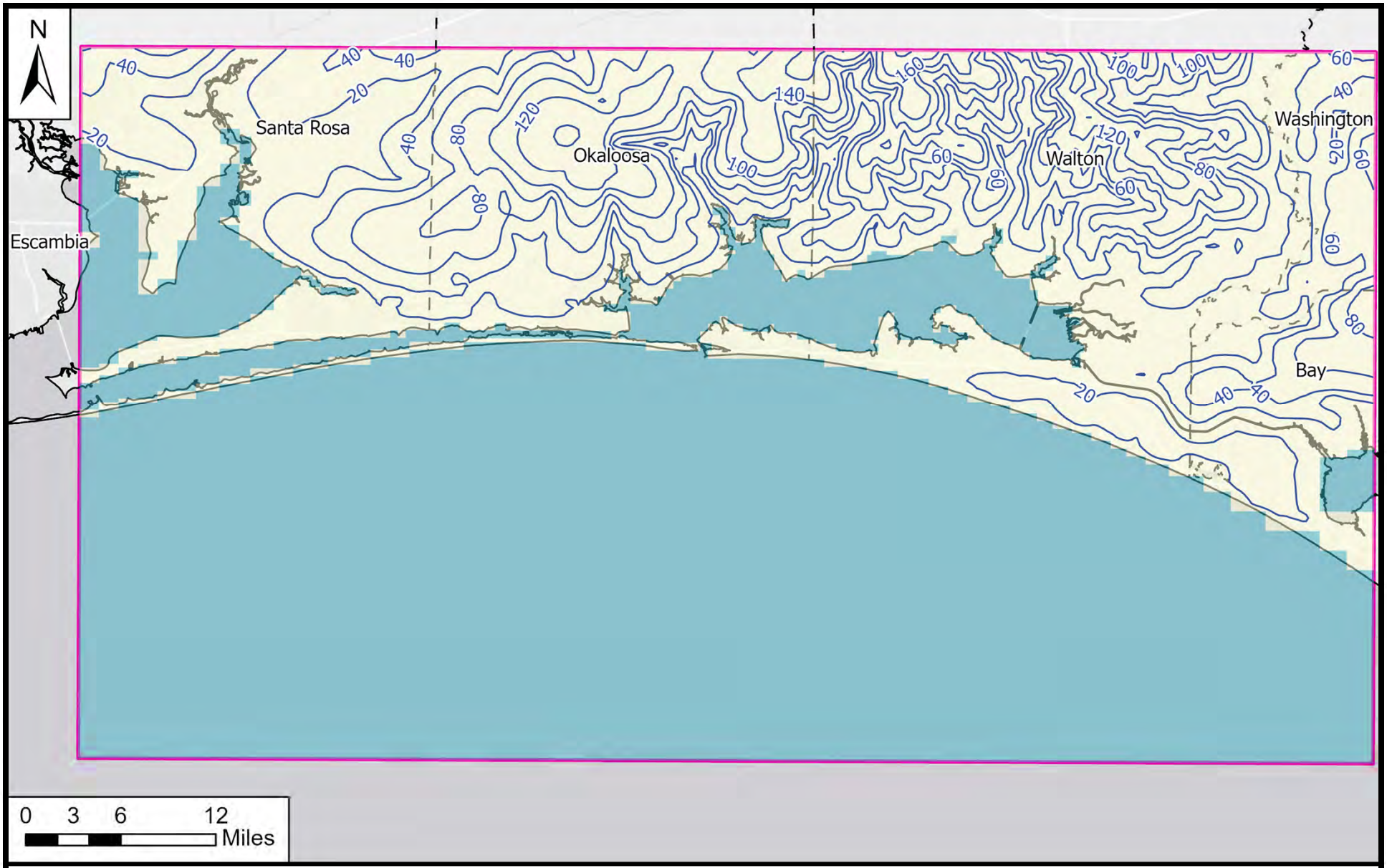

Figure 5 – Layer 1 saline and freshwater boundaries, and layer 1 specified heads at the end of the pre-development model (20 ft contours) based on the R2MF model.

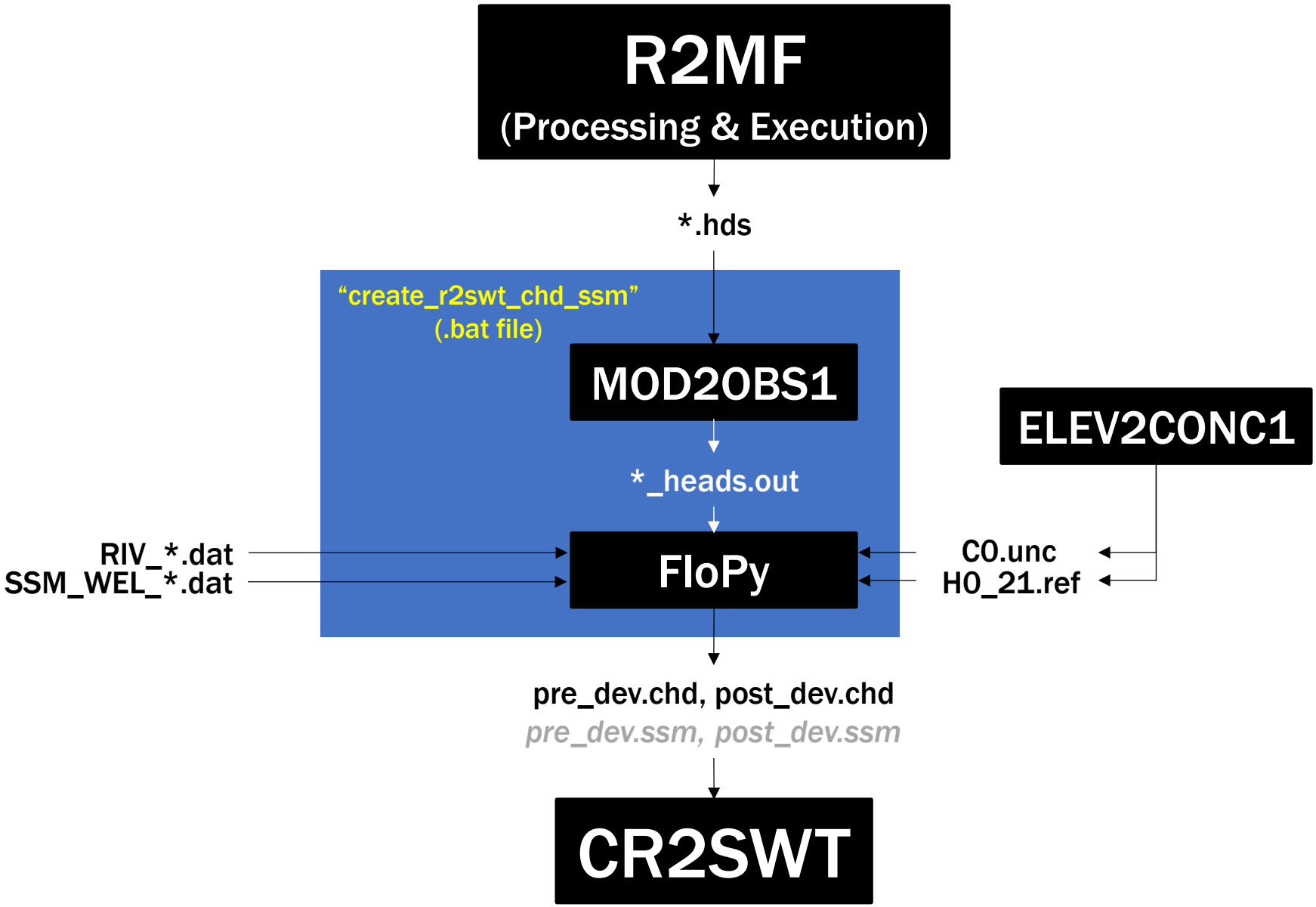

Figure 6 – Overview of information flow between the R2MF model, FloPy, and the CR2SWT model.

Note: SSM Packages were generated by FloPy before (but not after) adding the LBCS parameters during calibration.

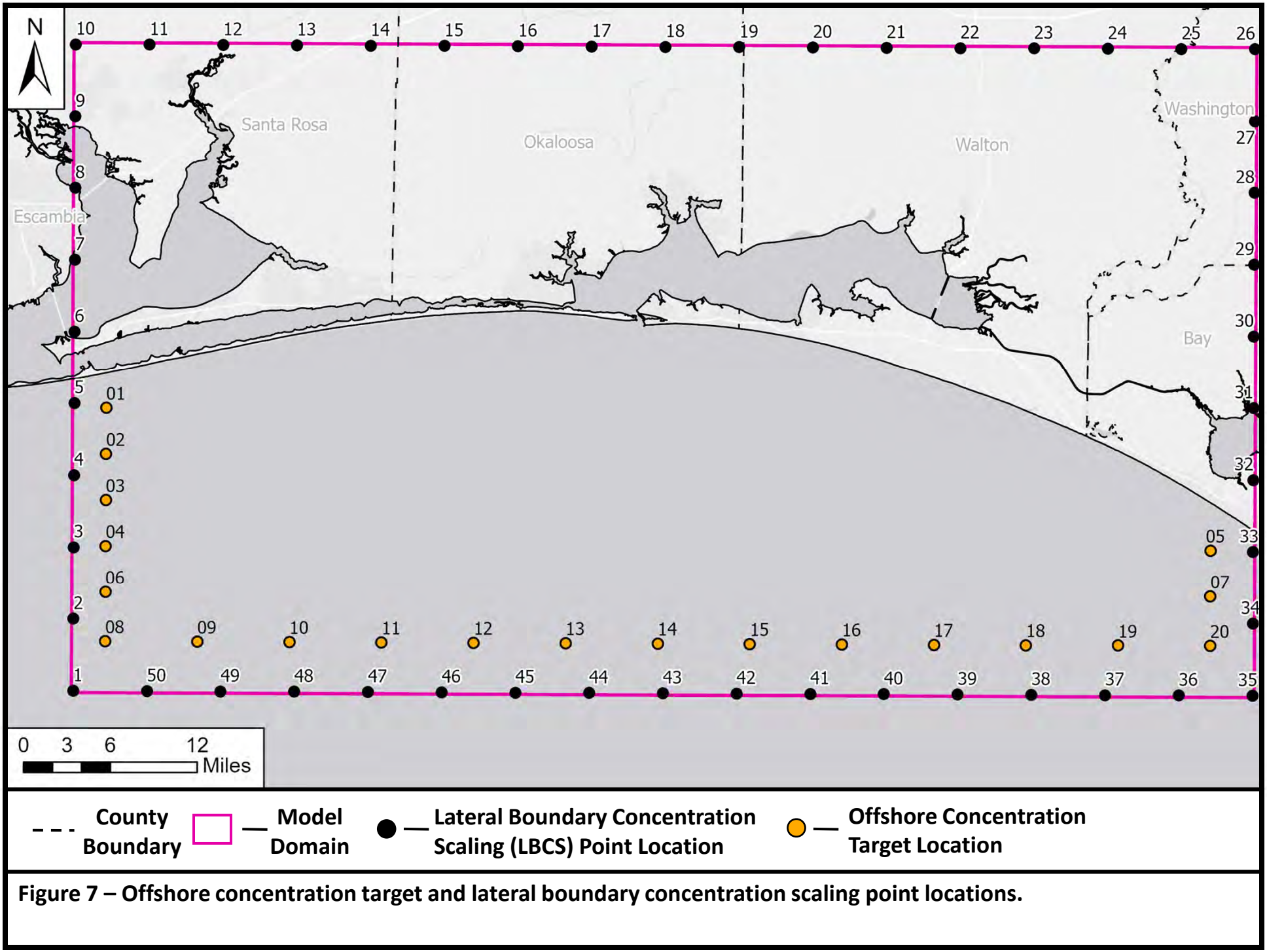

Figure 7 – Offshore concentration target and lateral boundary concentration scaling point locations.

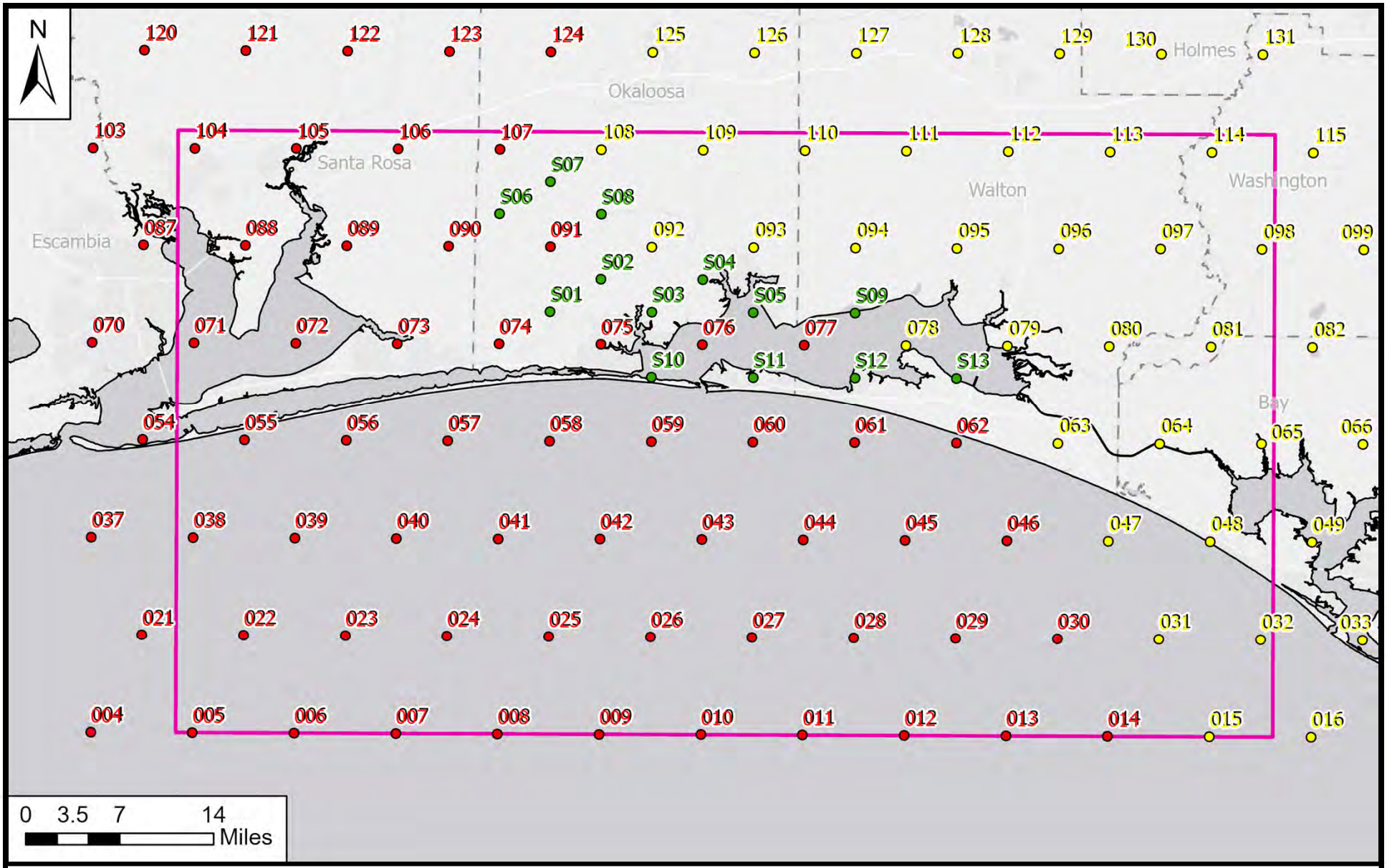

Figure 8 – Pilot point locations used to interpolate vertical hydraulic conductivity in the Bucatunna Clay Confining Unit (where present) / Undifferentiated Upper Floridan Aquifer. (Note: Pilot point indexing comes from the R2MF model)

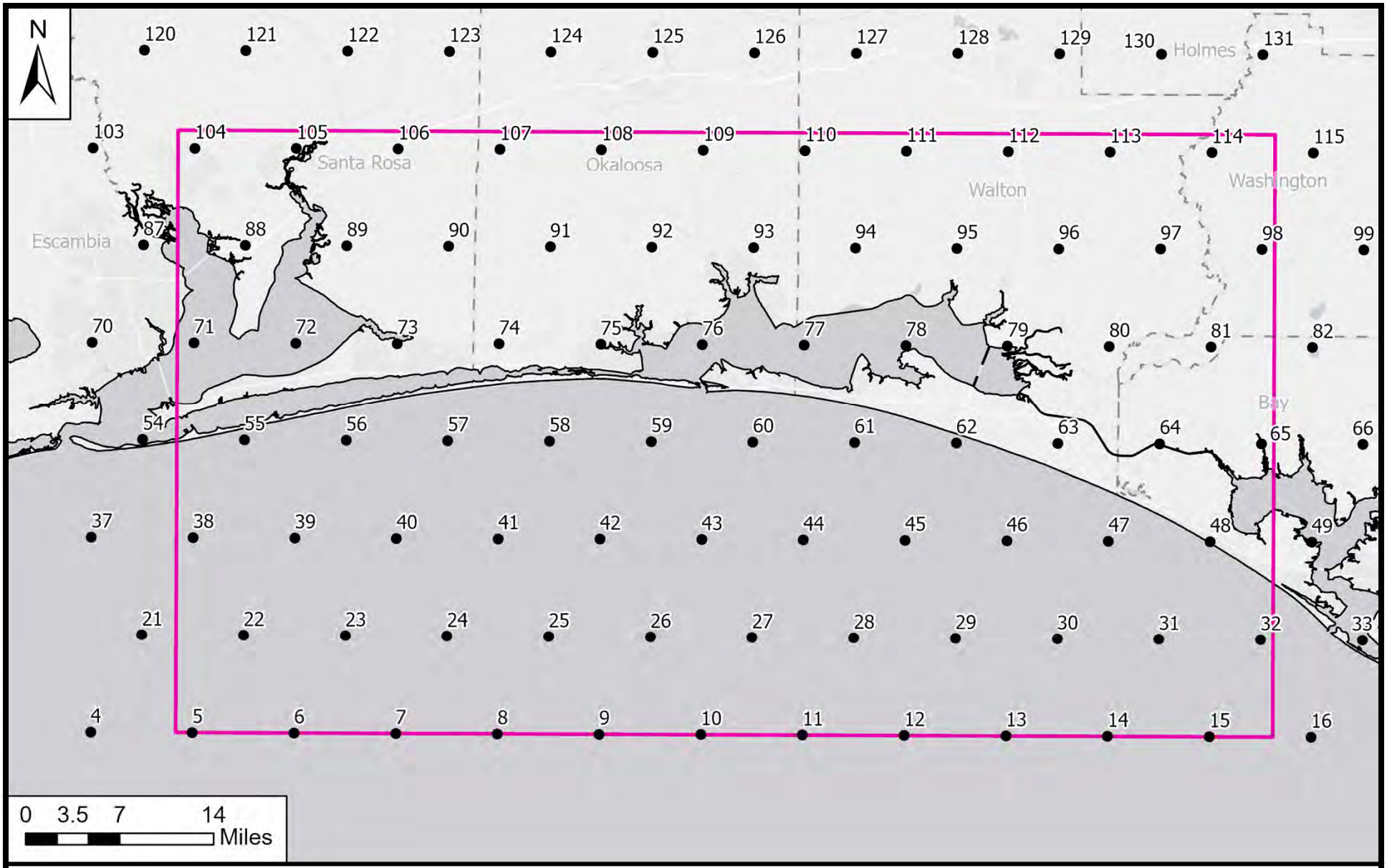

Figure 9 – Pilot point locations used to interpolate storativity and hydraulic conductivities in the Intermediate Aquifer System, Upper Floridan Aquifer, Lower Floridan Aquifer, and Sub-Floridan Aquifer.

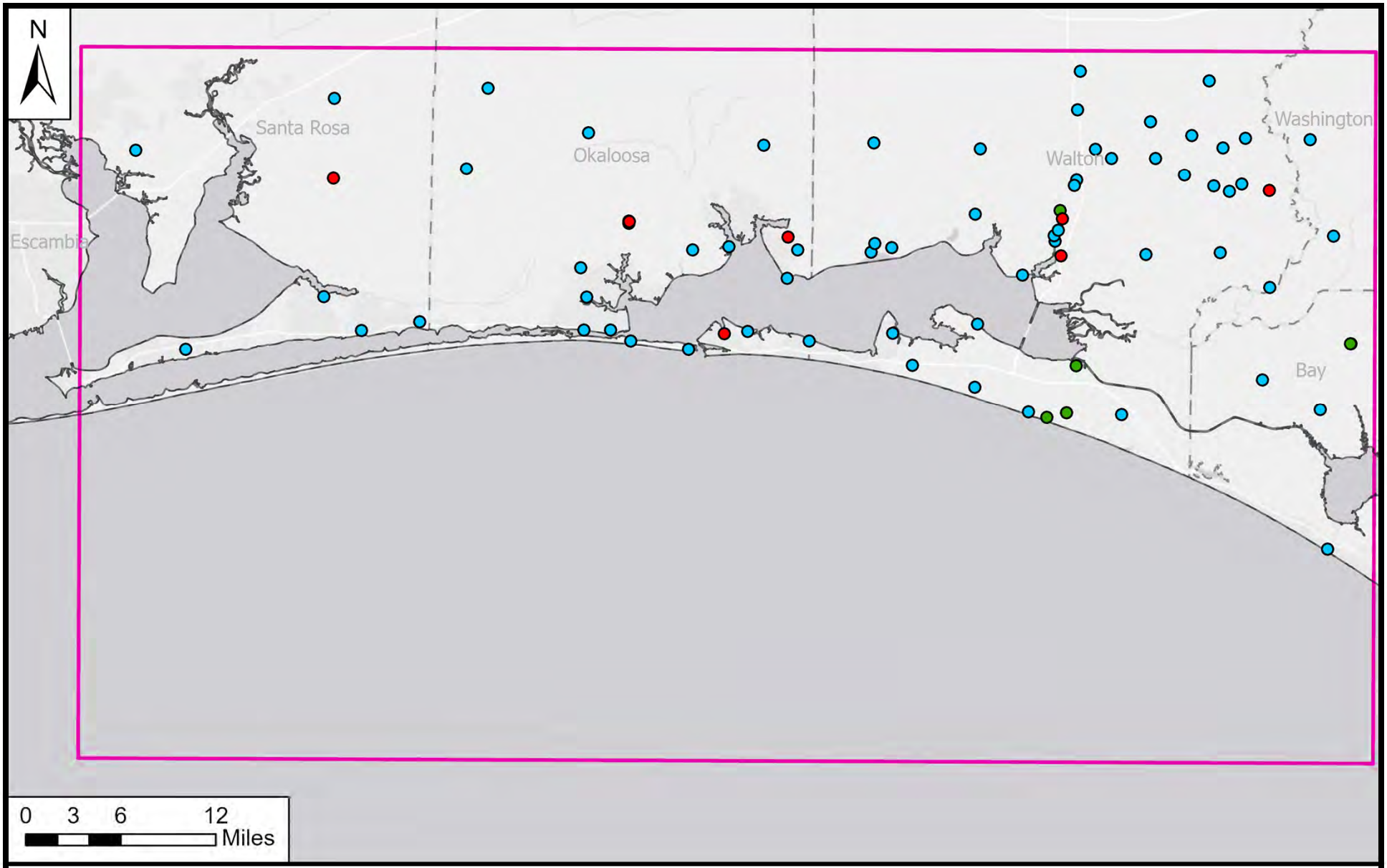

Figure 10 – Groundwater head target locations.

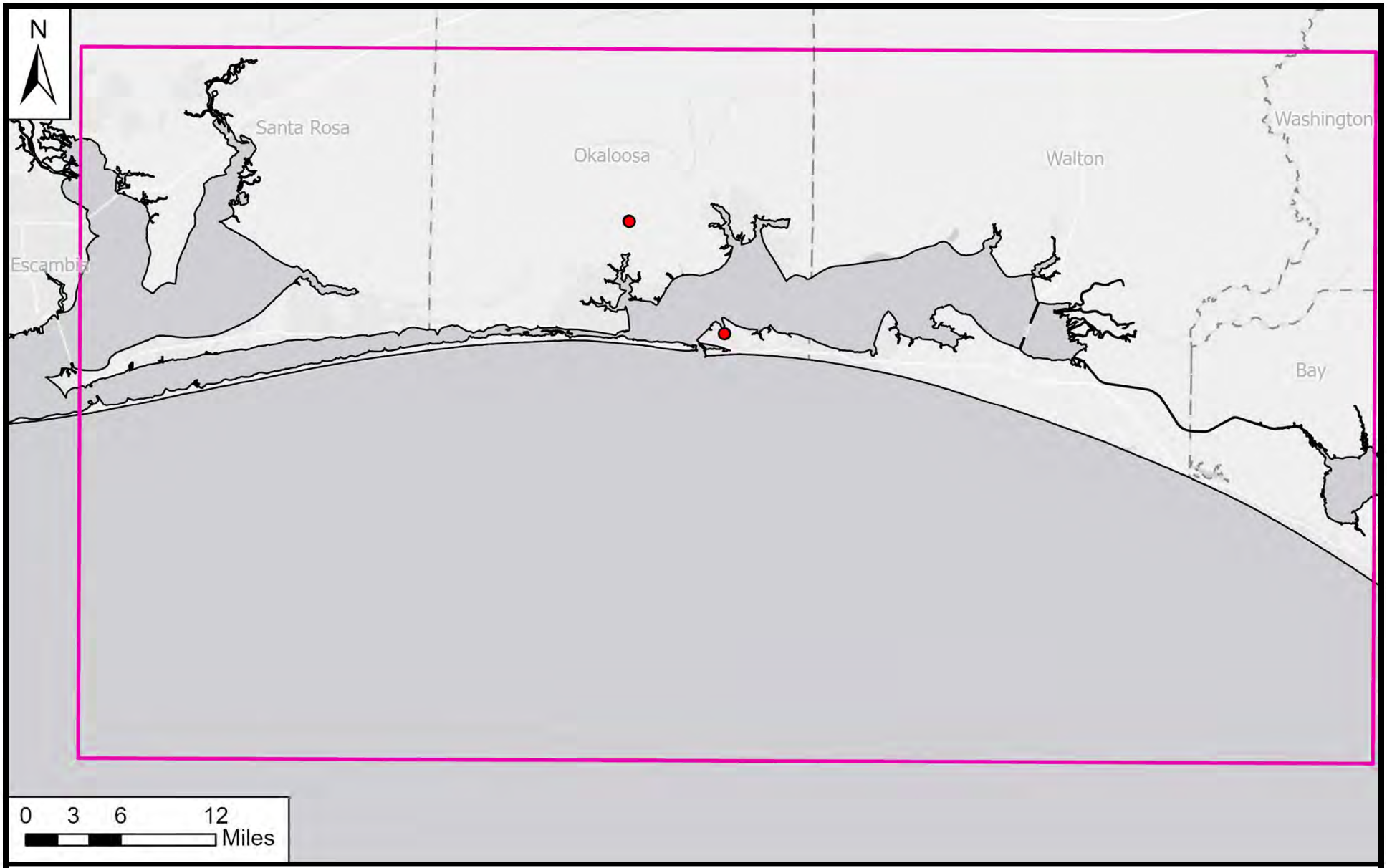

Figure 11 – Vertical head difference (VHD) target locations.

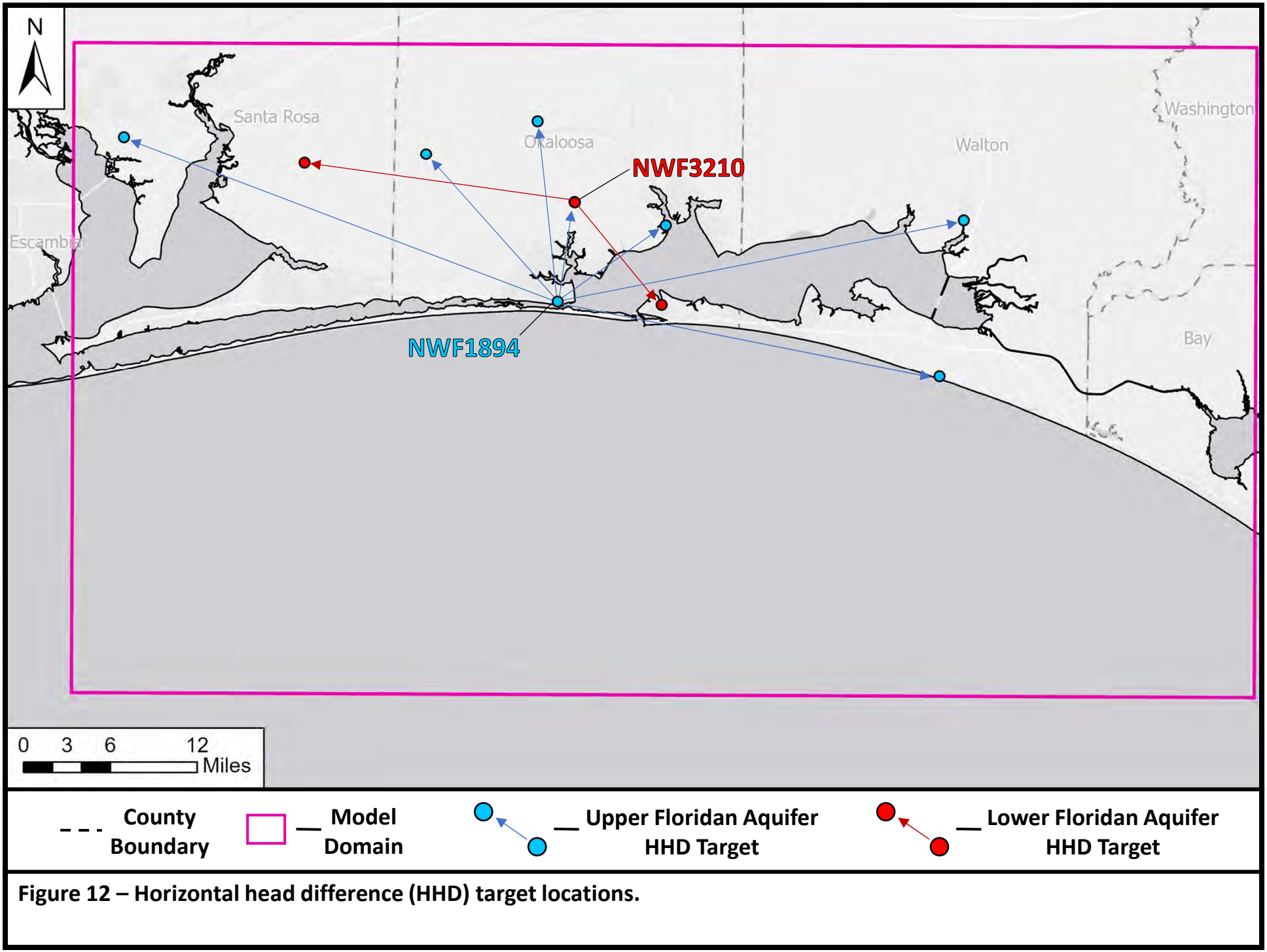

Figure 12 – Horizontal head difference (HHD) target locations.

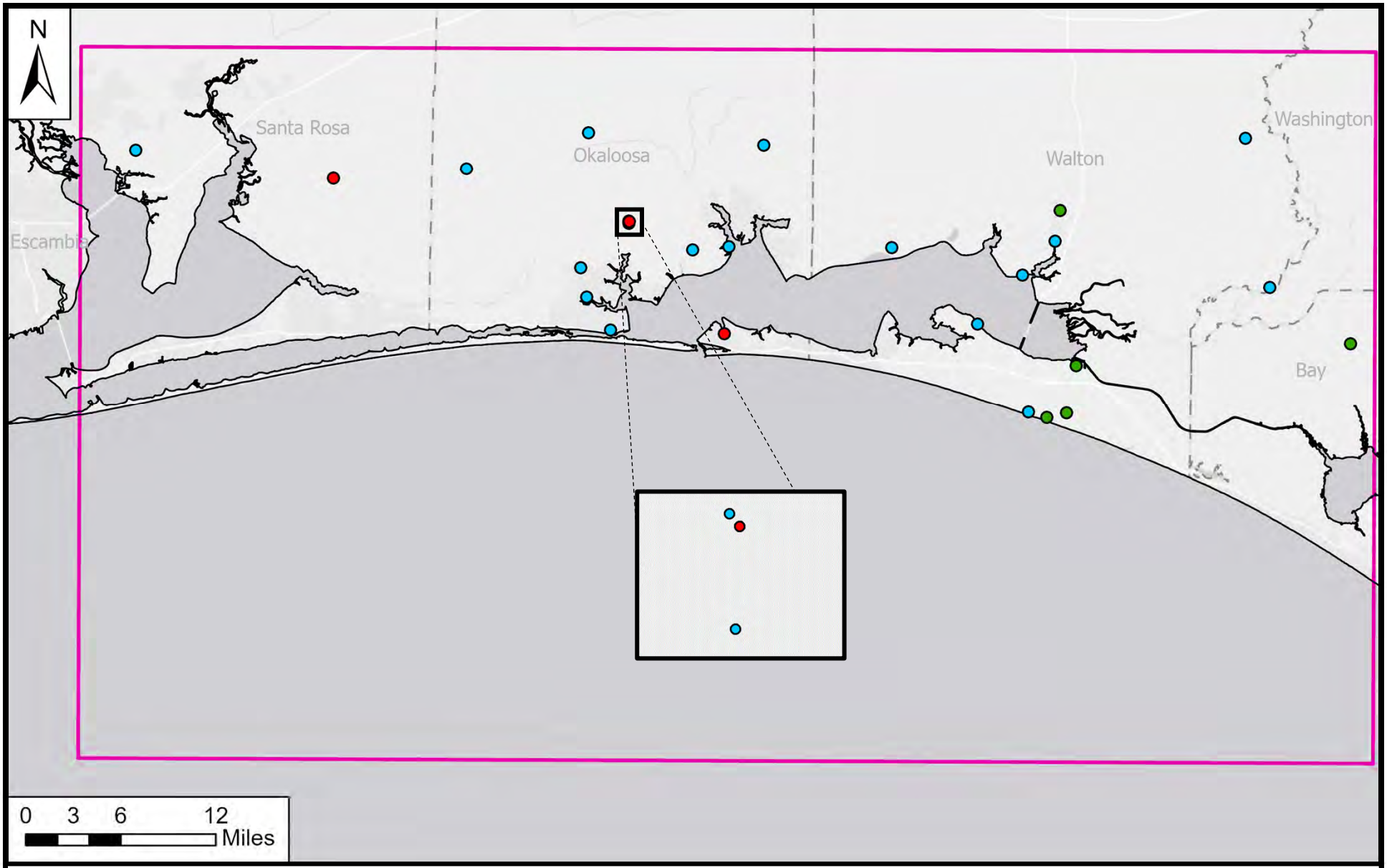

Figure 13 – Temporal head difference (THD) target locations.

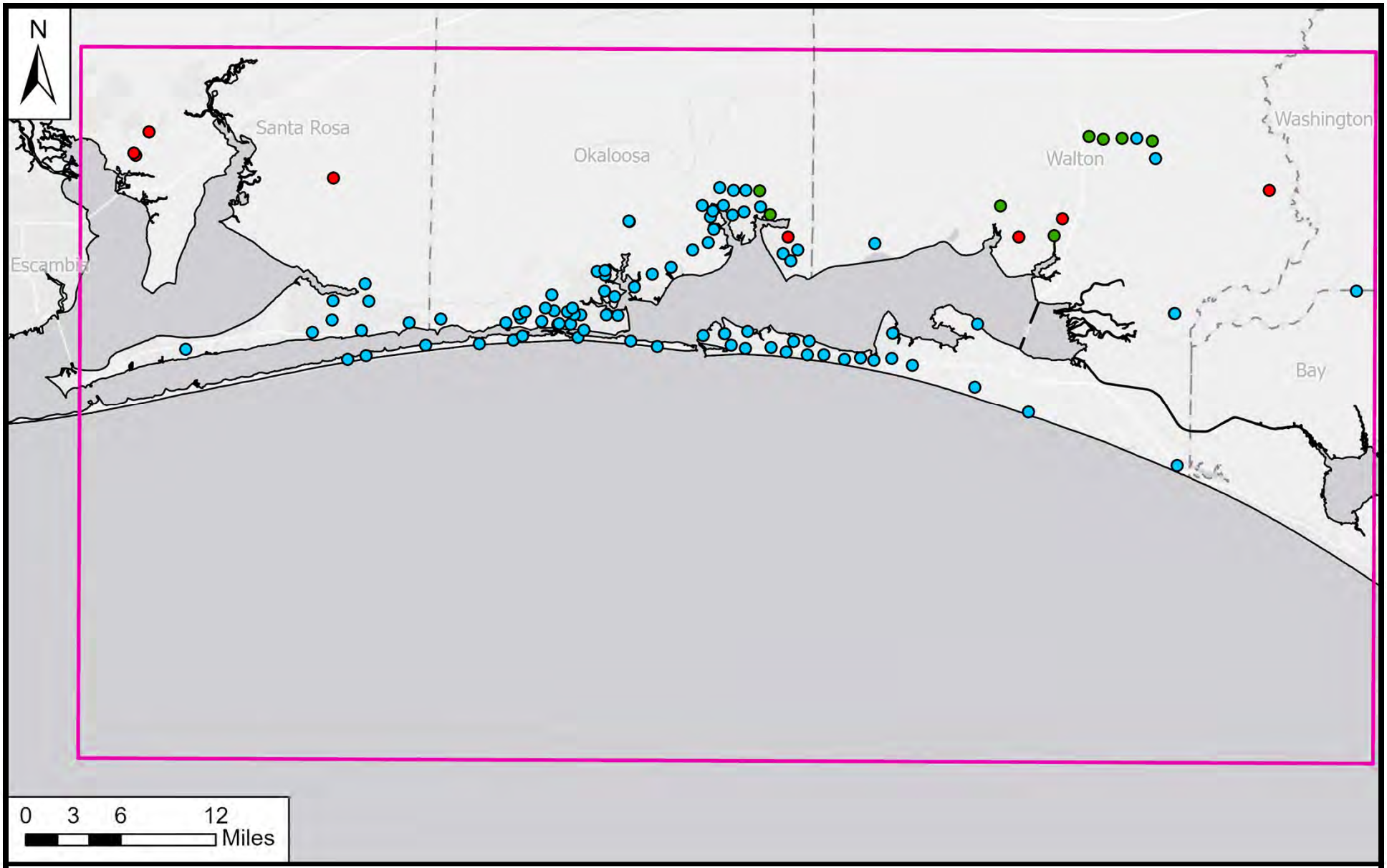

Figure 14 – Groundwater concentration target locations.

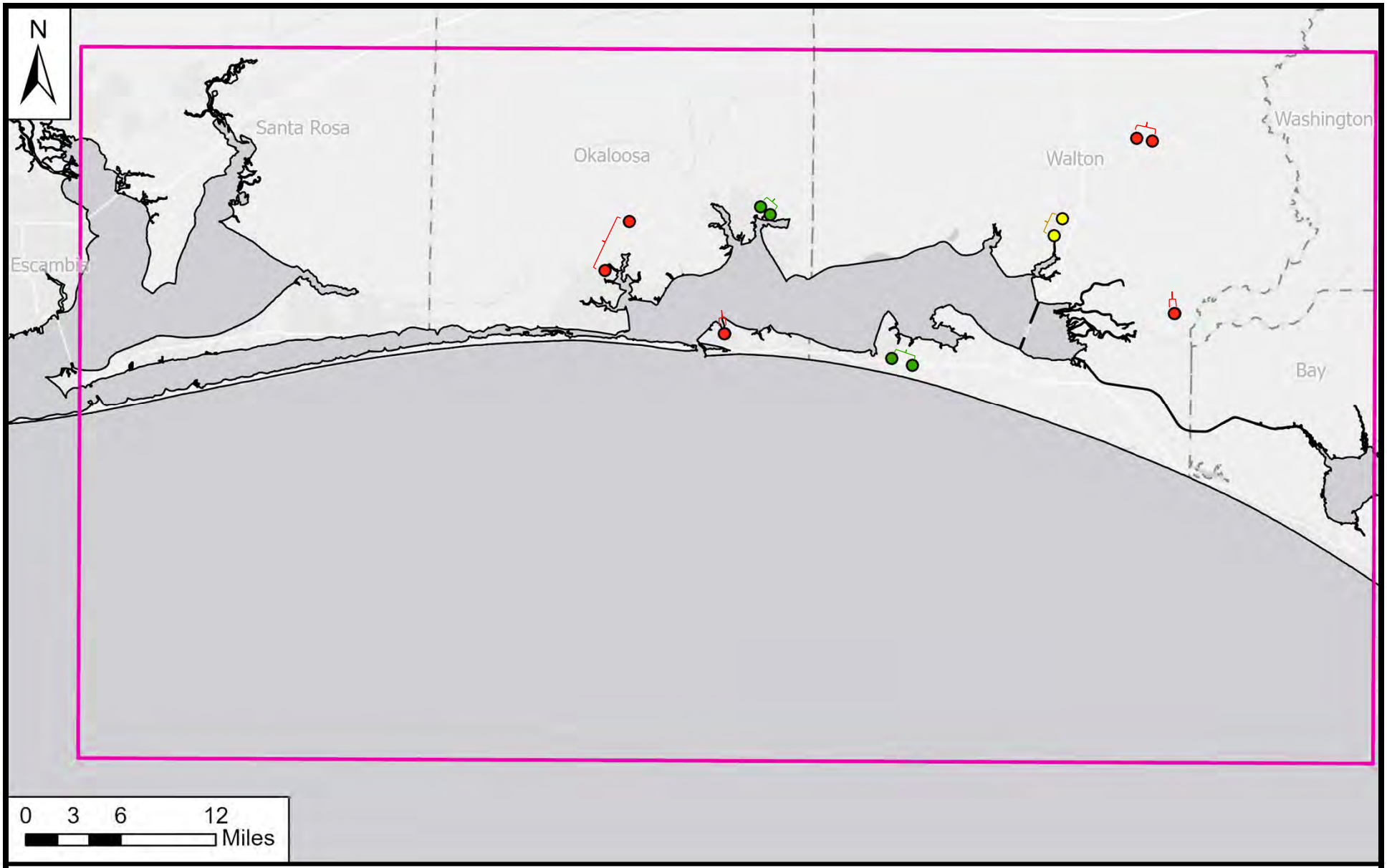

Figure 15 – Vertical groundwater concentration difference (VCD) target locations between Upper Floridan Aquifer (UFA), Lower Floridan Aquifer (LFA), and Undifferentiated Upper Floridan Aquifer locations (FAS).

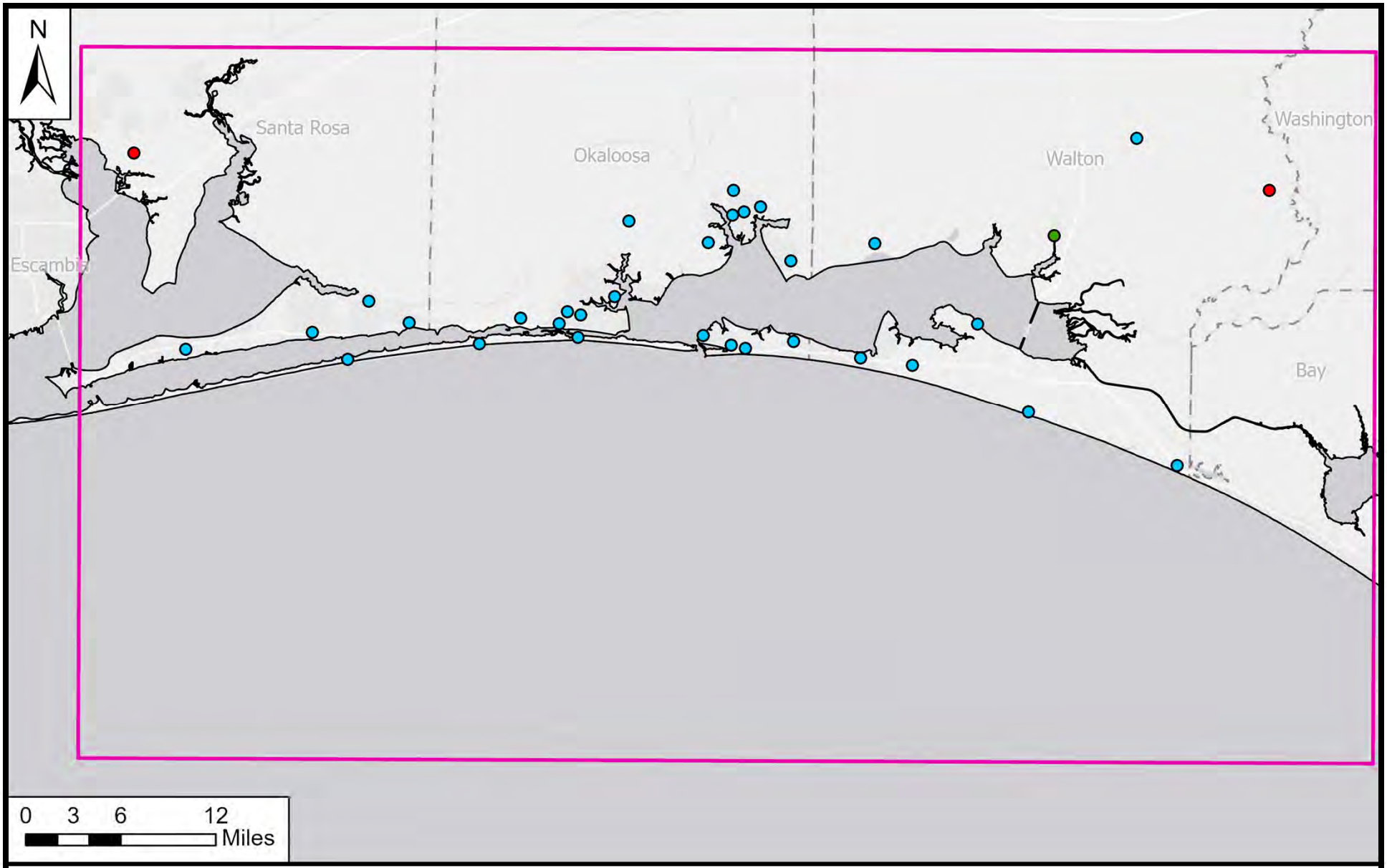

Figure 16 – Temporal groundwater concentration difference (TCD) target locations.

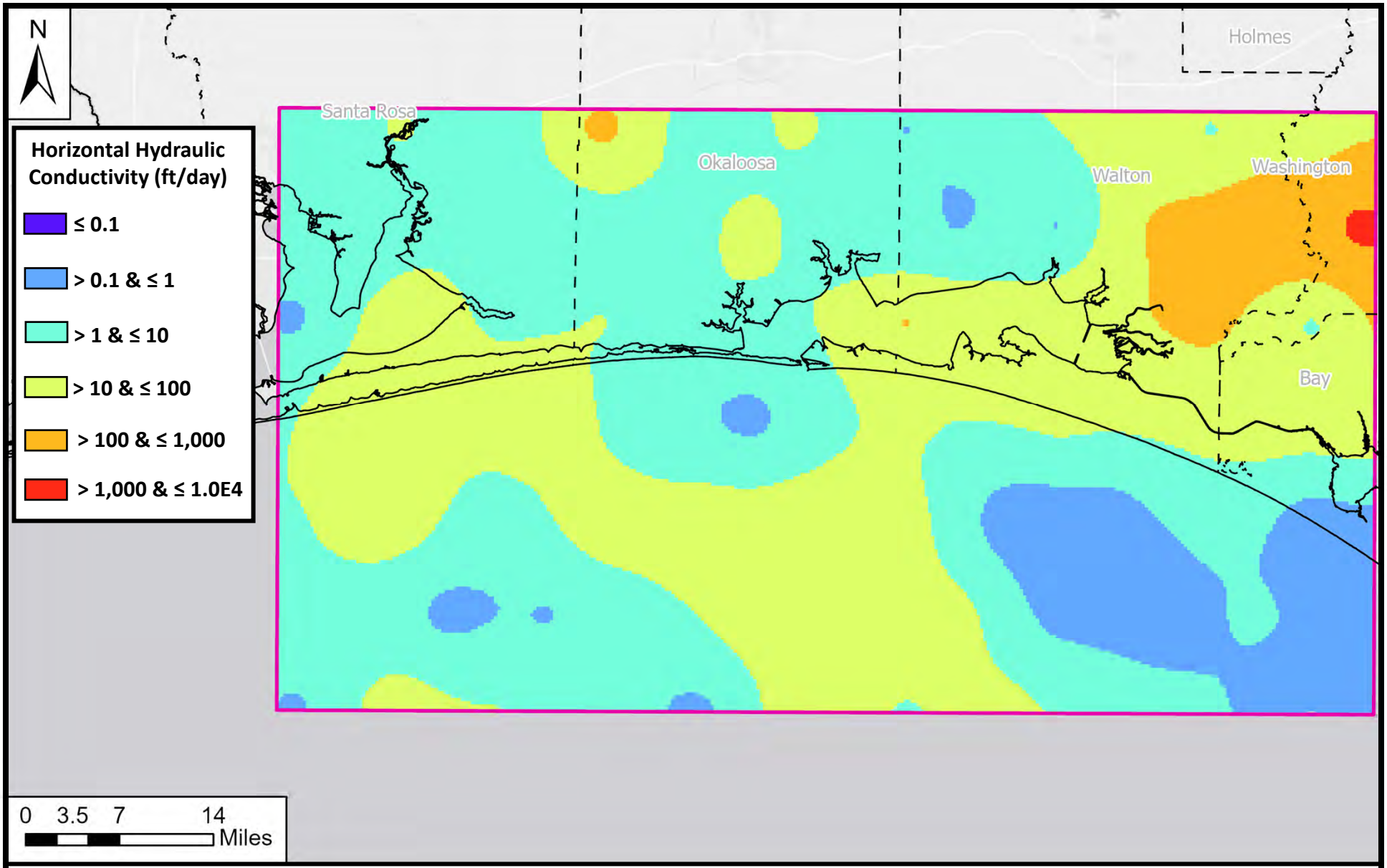

Figure 17 – Horizontal hydraulic conductivity (Kh) of the Upper Floridan Aquifer.

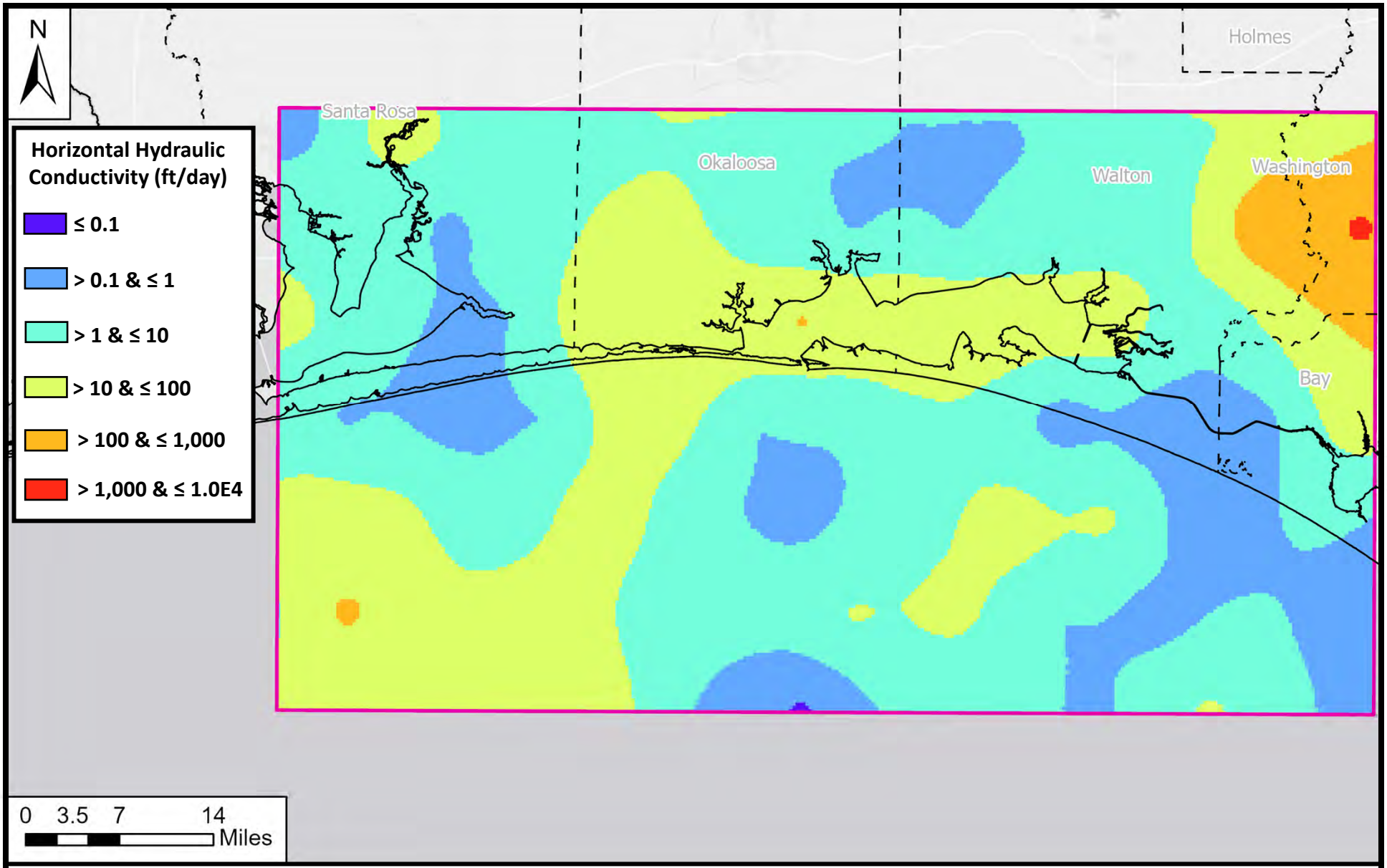

Figure 18 – Horizontal hydraulic conductivity (Kh) of the Lower Floridan Aquifer.

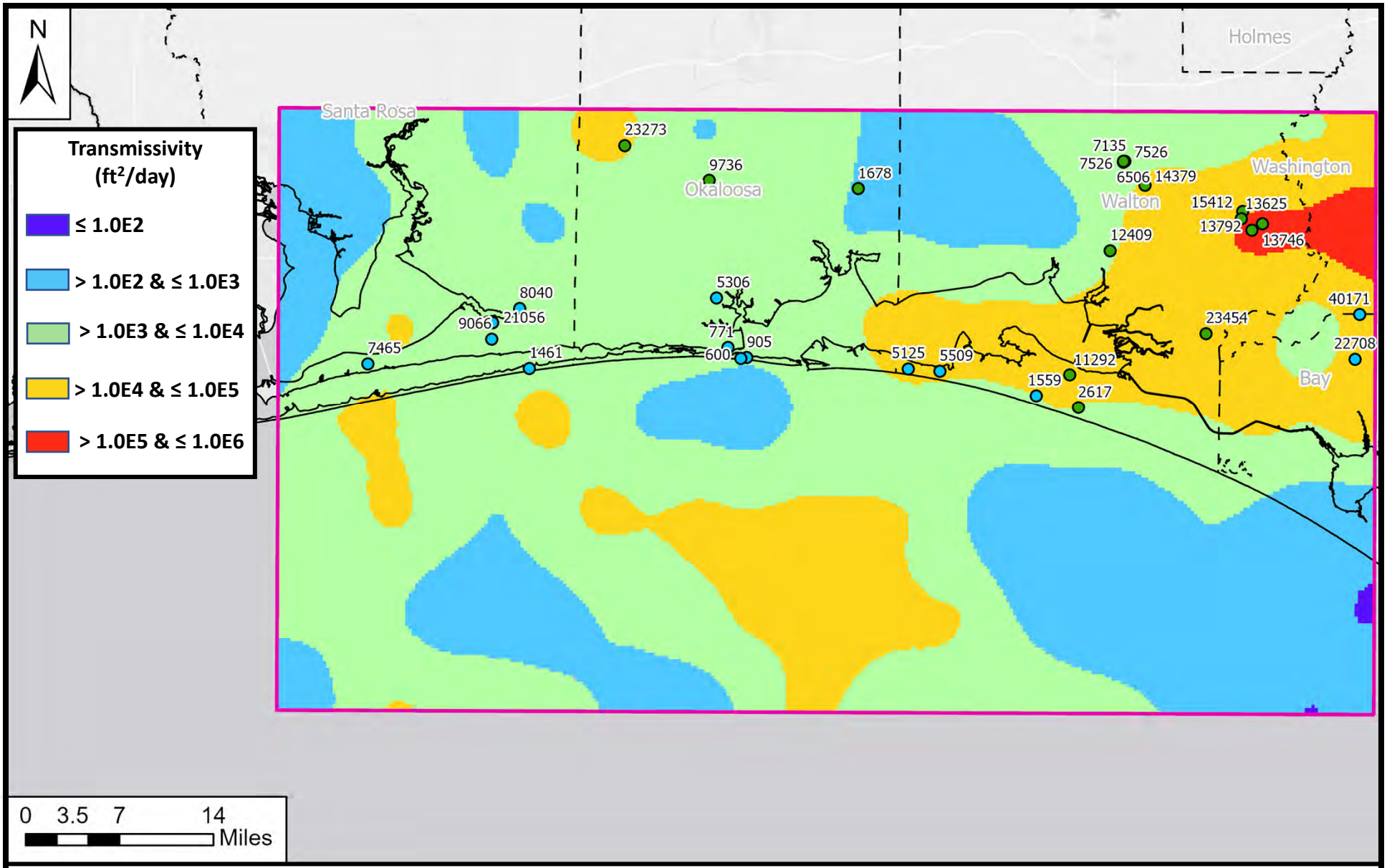

Figure 19 – Transmissivity (T) of the Upper Floridan Aquifer and aquifer performance test (APT) results with HSU designations.

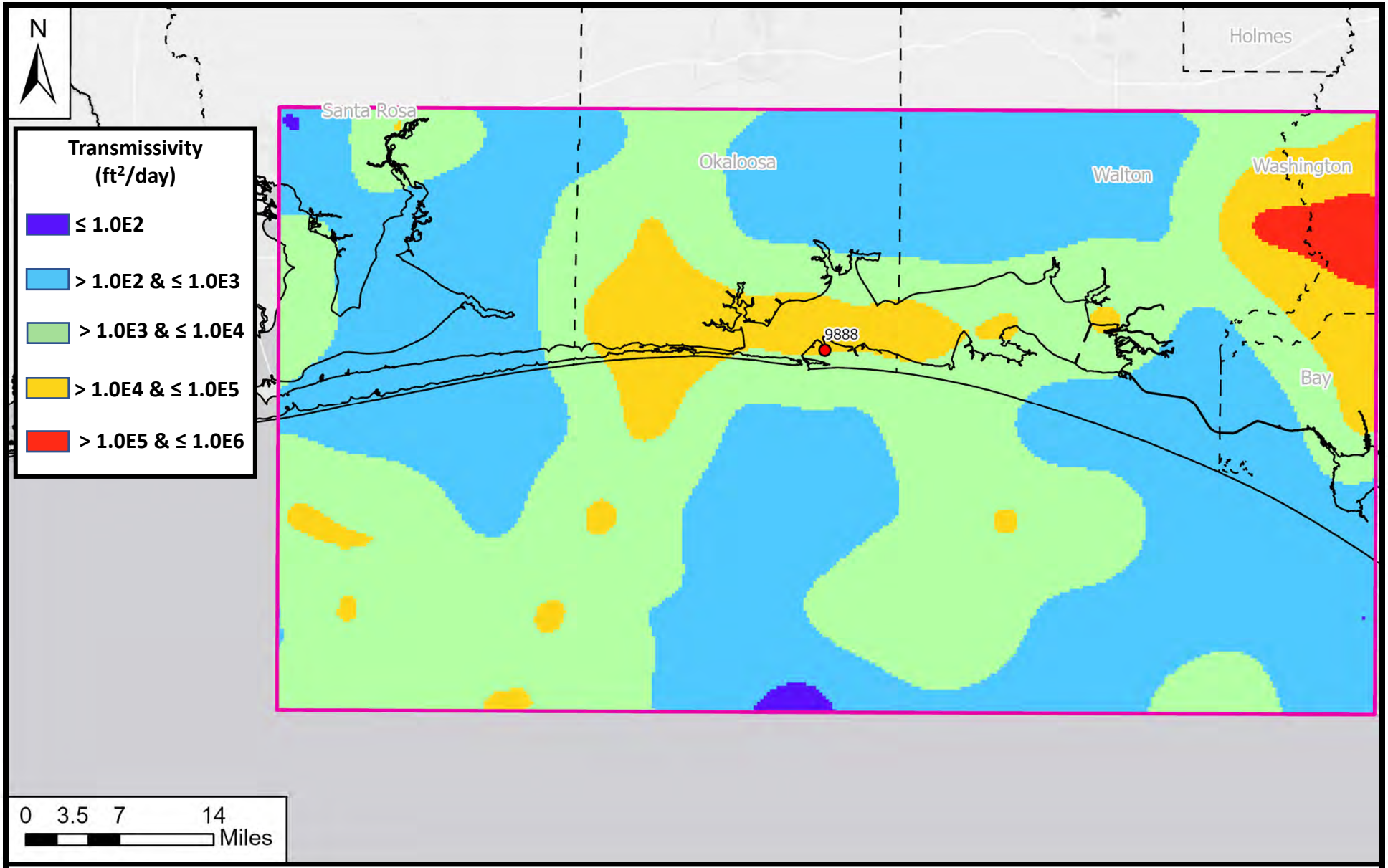

Figure 20 – Transmissivity (T) of the Lower Floridan Aquifer and aquifer performance test (APT) results with HSU designations.

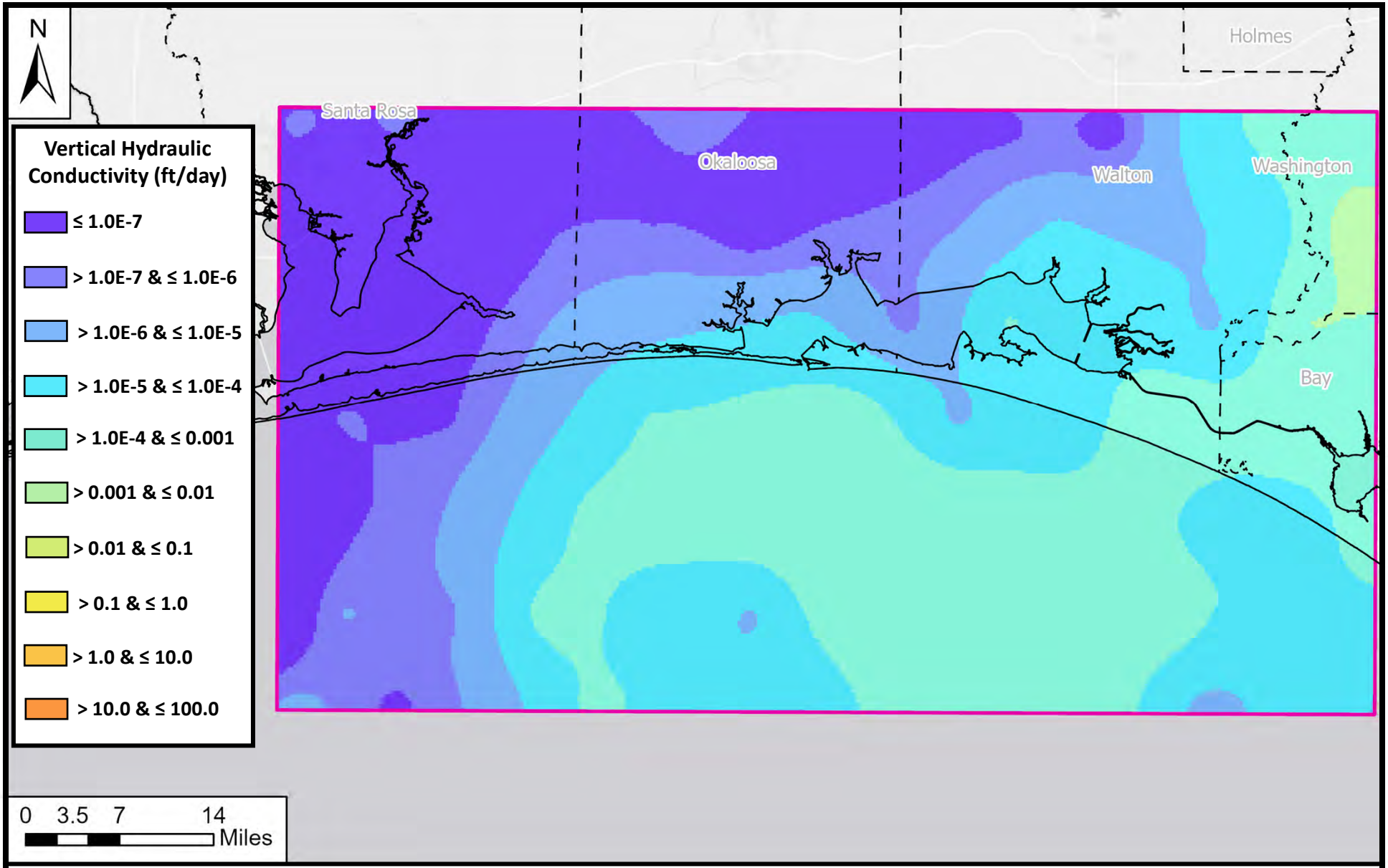

Figure 21 – Vertical hydraulic conductivity (Kv) of the Intermediate Aquifer System.

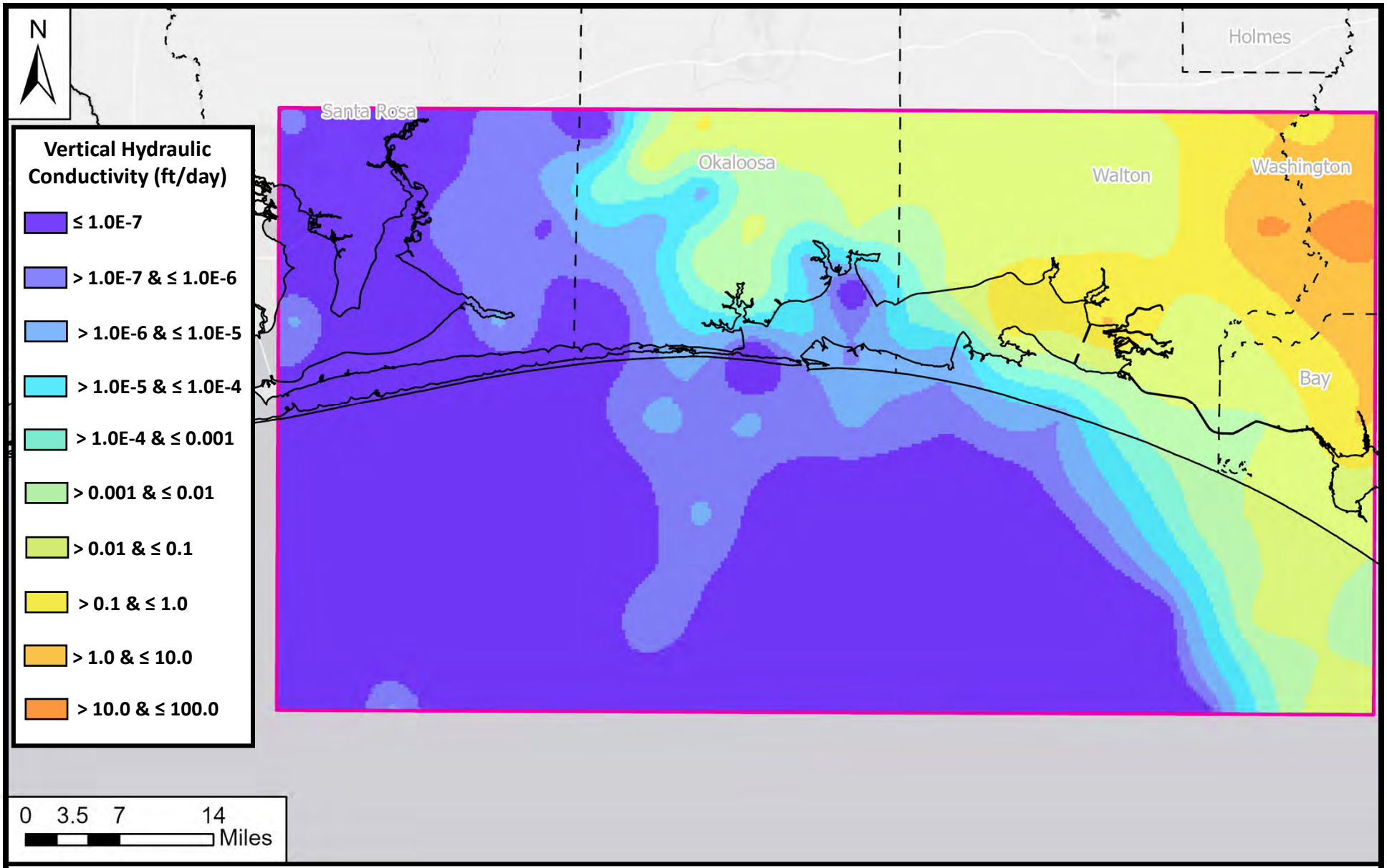

Figure 22 – Vertical hydraulic conductivity (Kv) of the Bucatunna Clay Confining Unit (where present) / Undifferentiated Upper Floridan Aquifer.

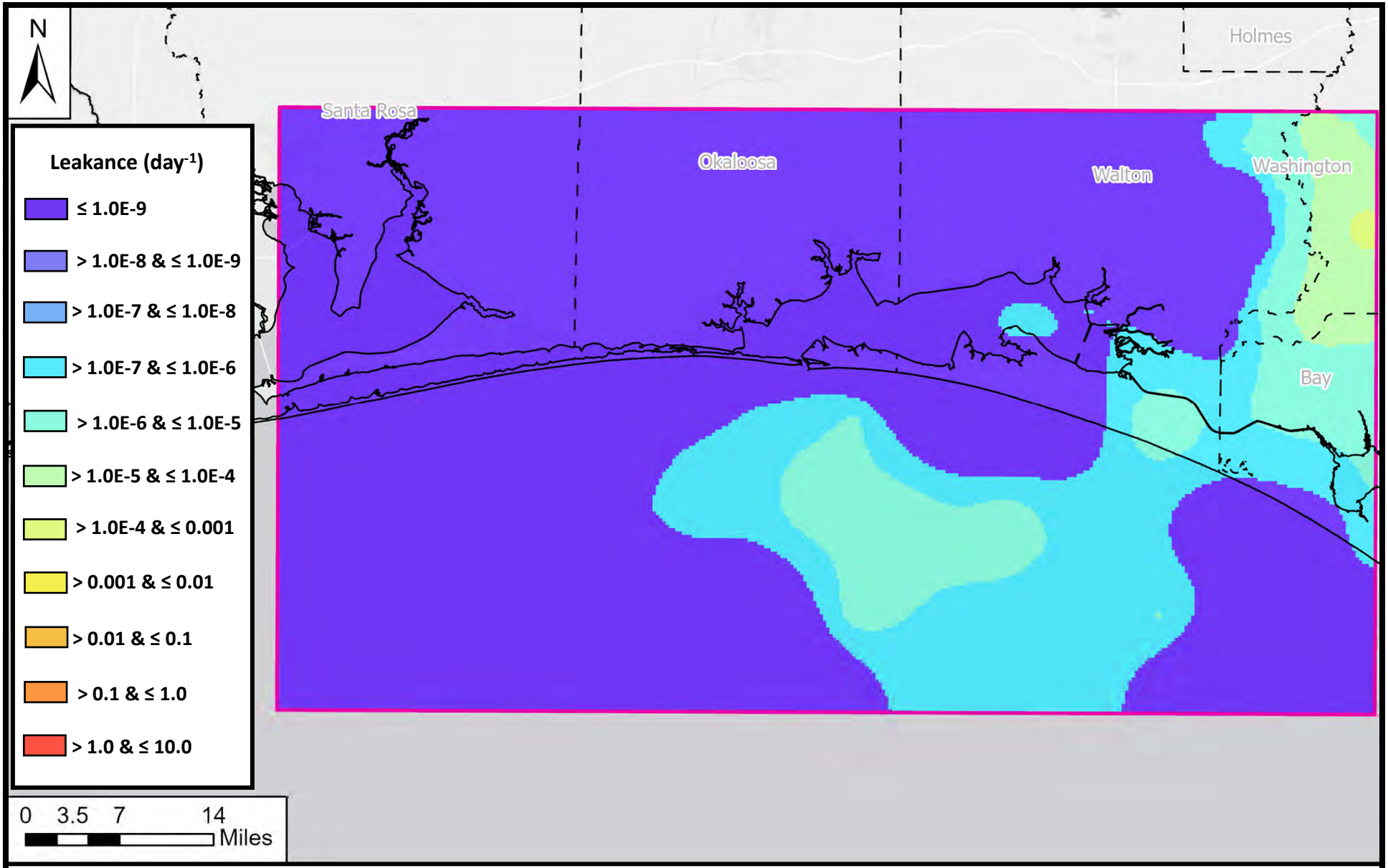

Figure 23 – Leakance of the Intermediate Aquifer System.

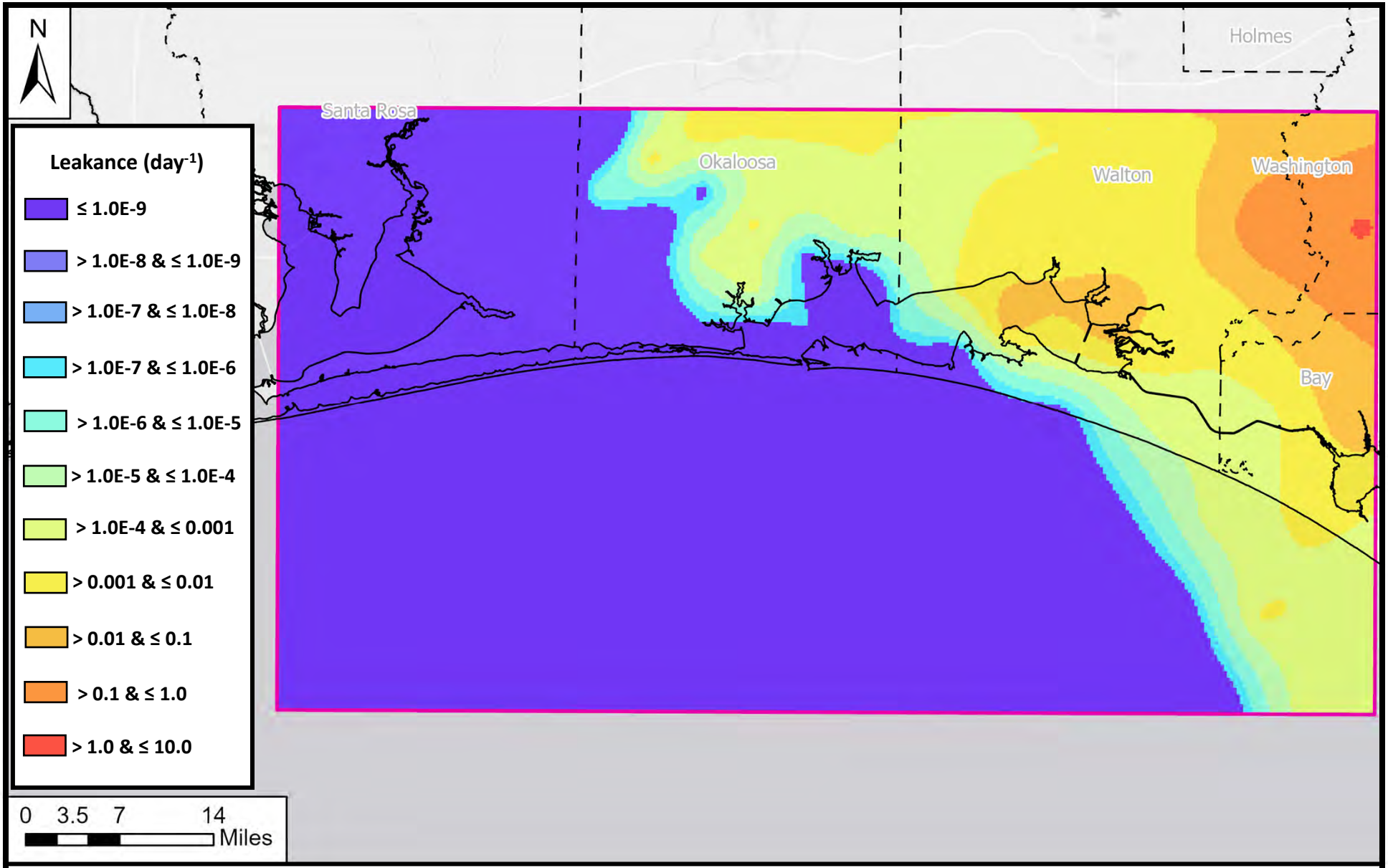

Figure 24 – Leakance of the Bucatunna Clay Confining Unit (where present) / Undifferentiated Upper Floridan Aquifer.

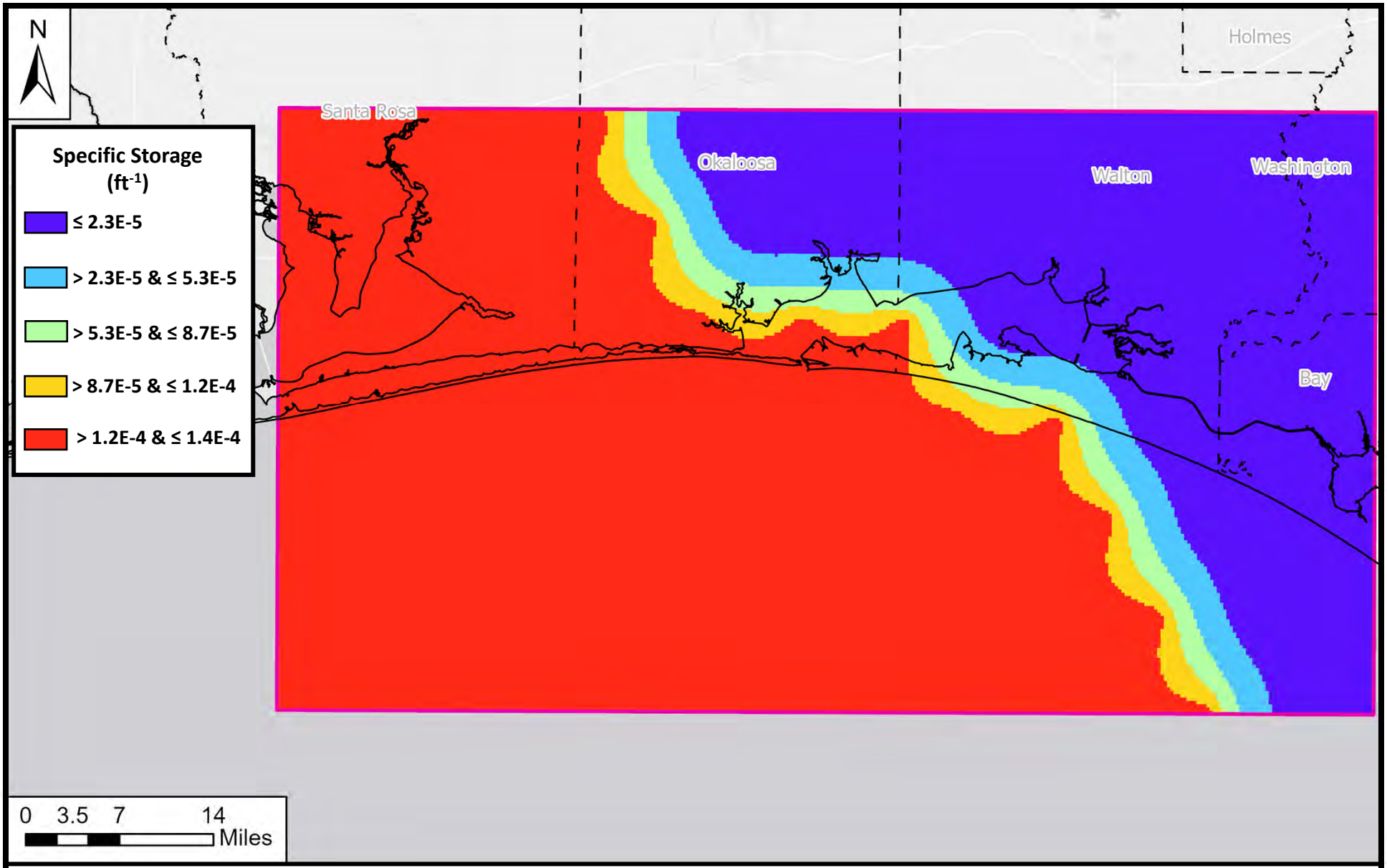

Figure 25 – Specific storage of the Bucatunna Clay Confining Unit (where present) / Undifferentiated Upper Floridan Aquifer.

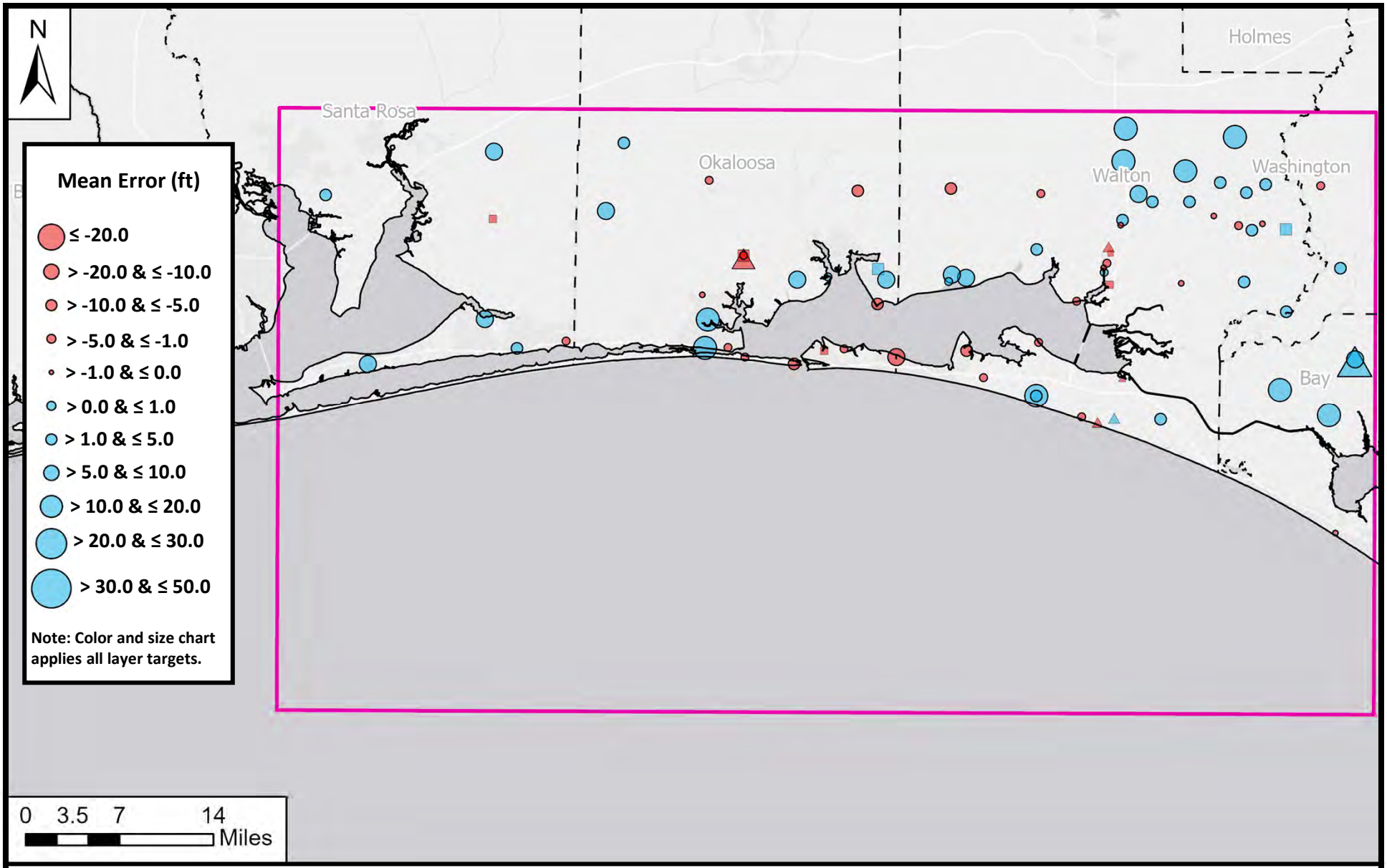

Figure 26 – Mean error by target well (head target) during the transient simulation period (1942-2015).

Note: Error = Measured – Modeled

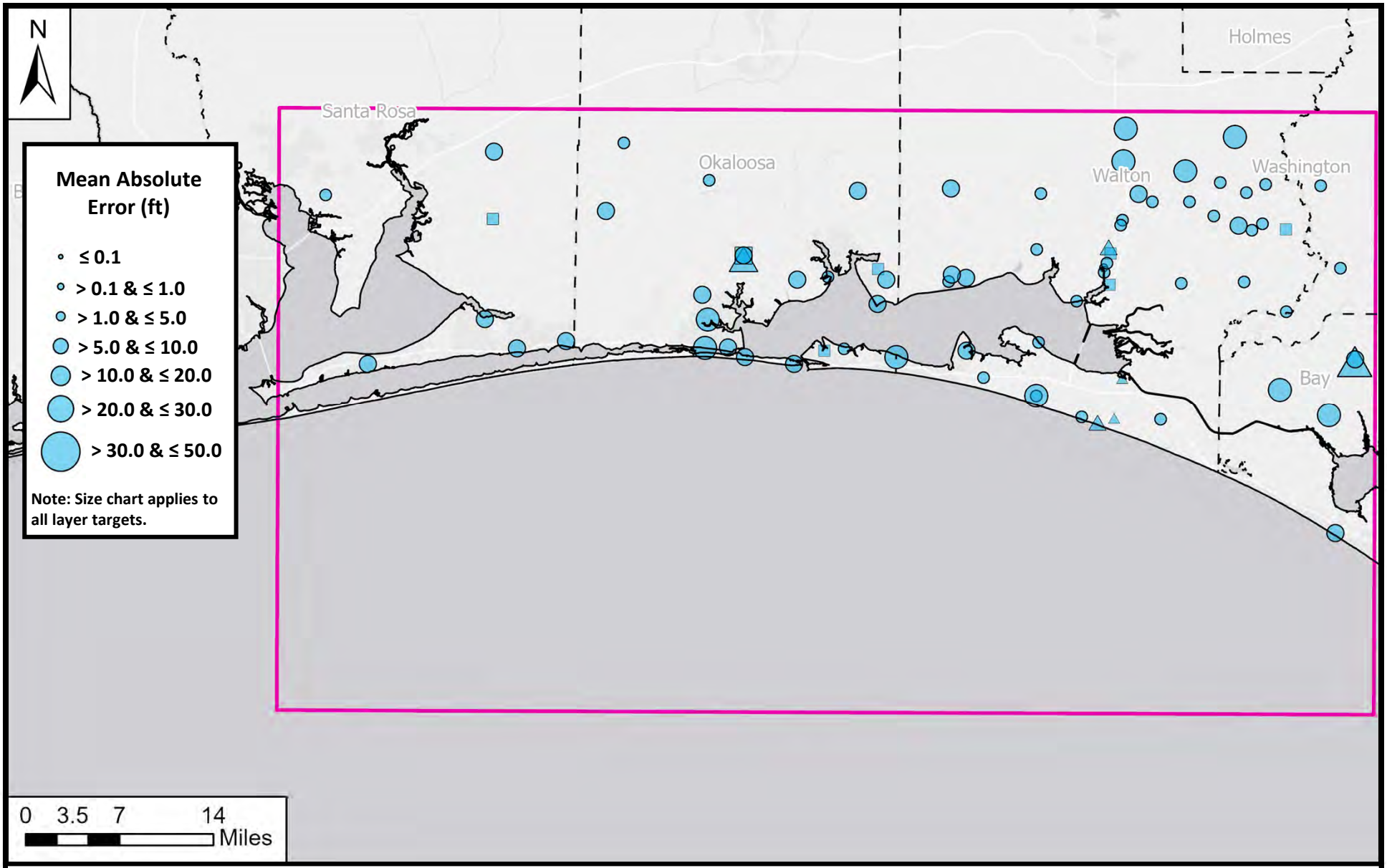

Figure 27 – Mean absolute error by target well (head target) during the transient simulation period (1942-2015).

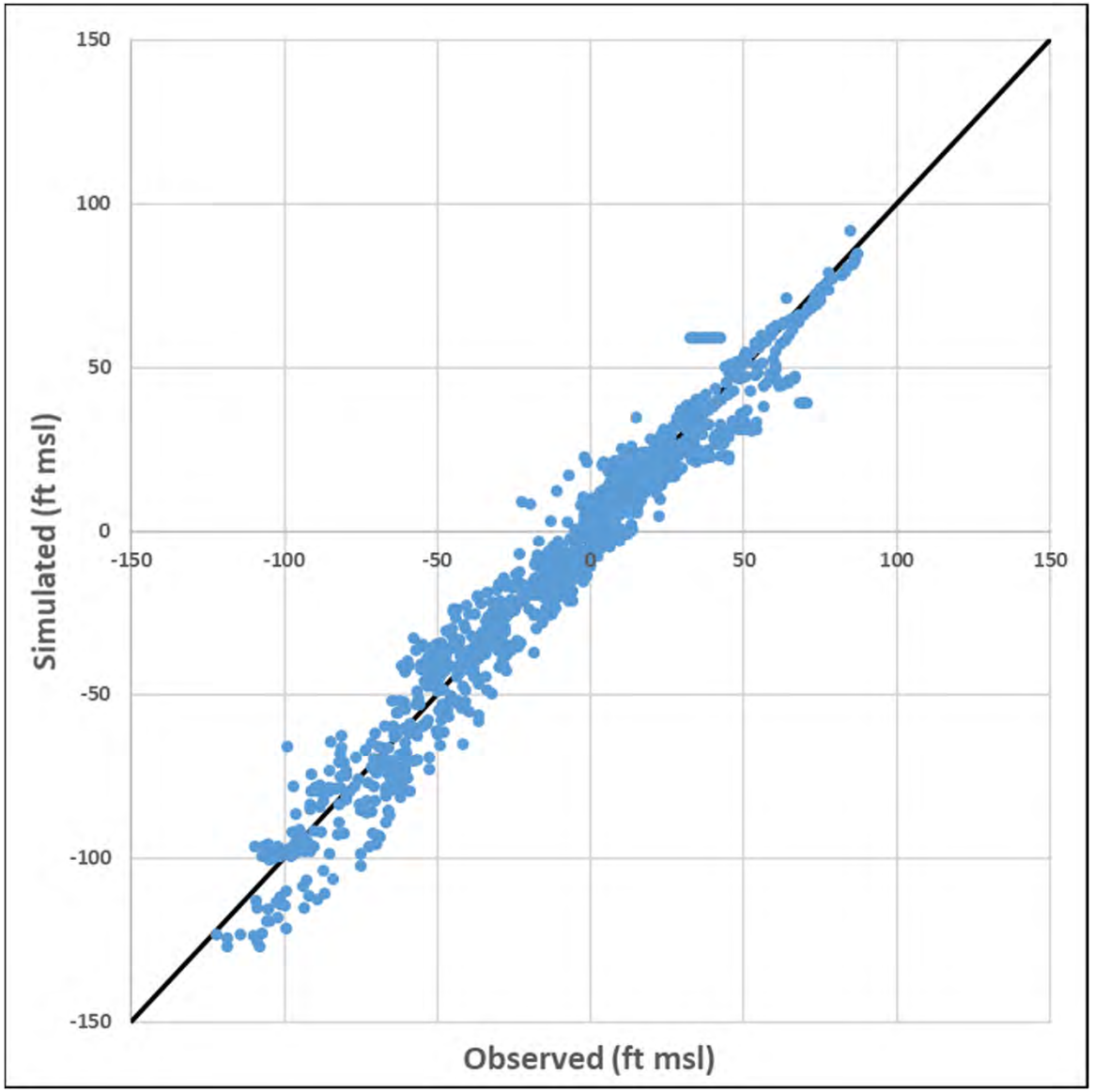

Figure 28 – Observed versus Simulated Head Targets.

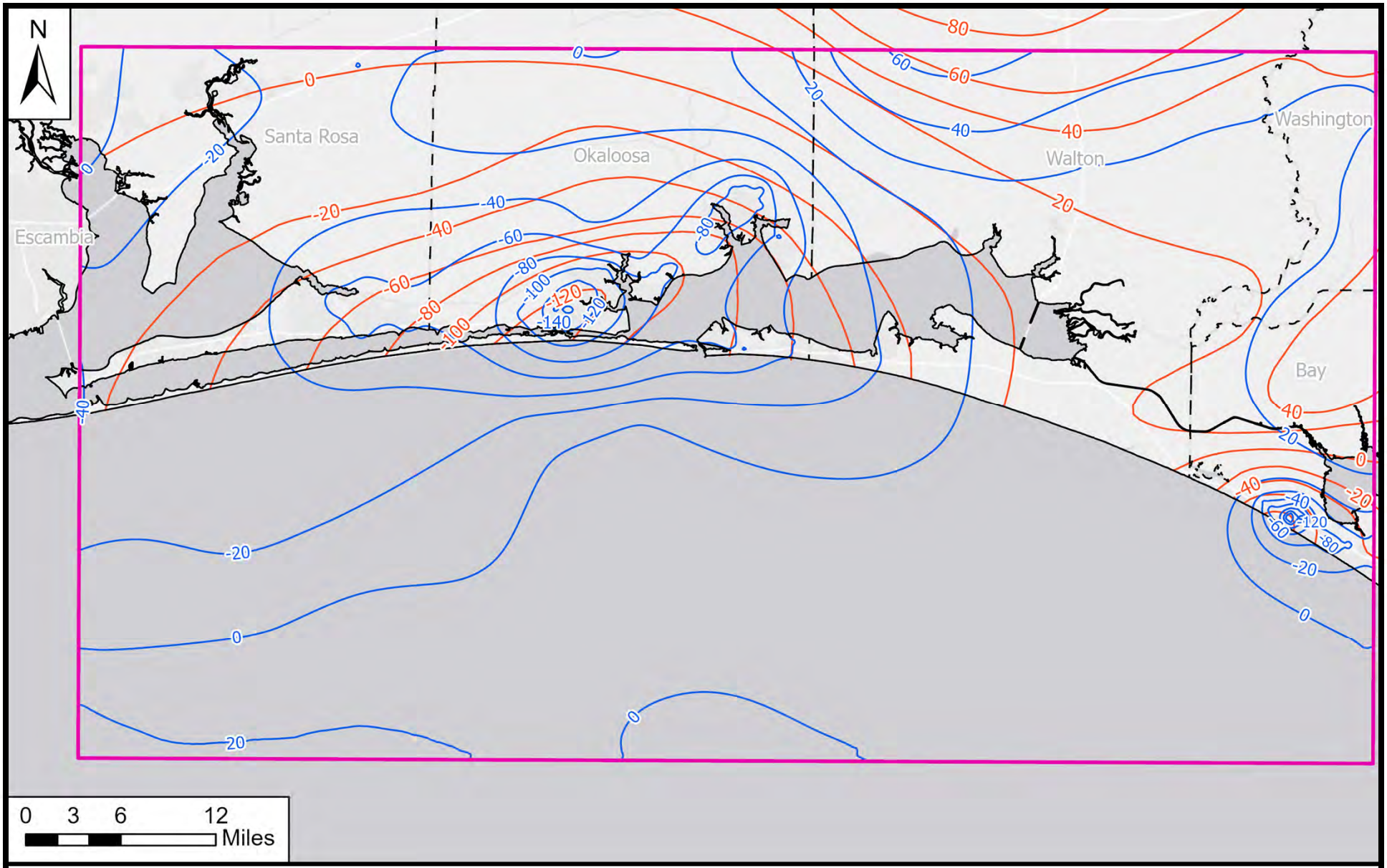

Figure 29 – Layer 7 observed and simulated freshwater equivalent 20-ft head contours for year 2000.

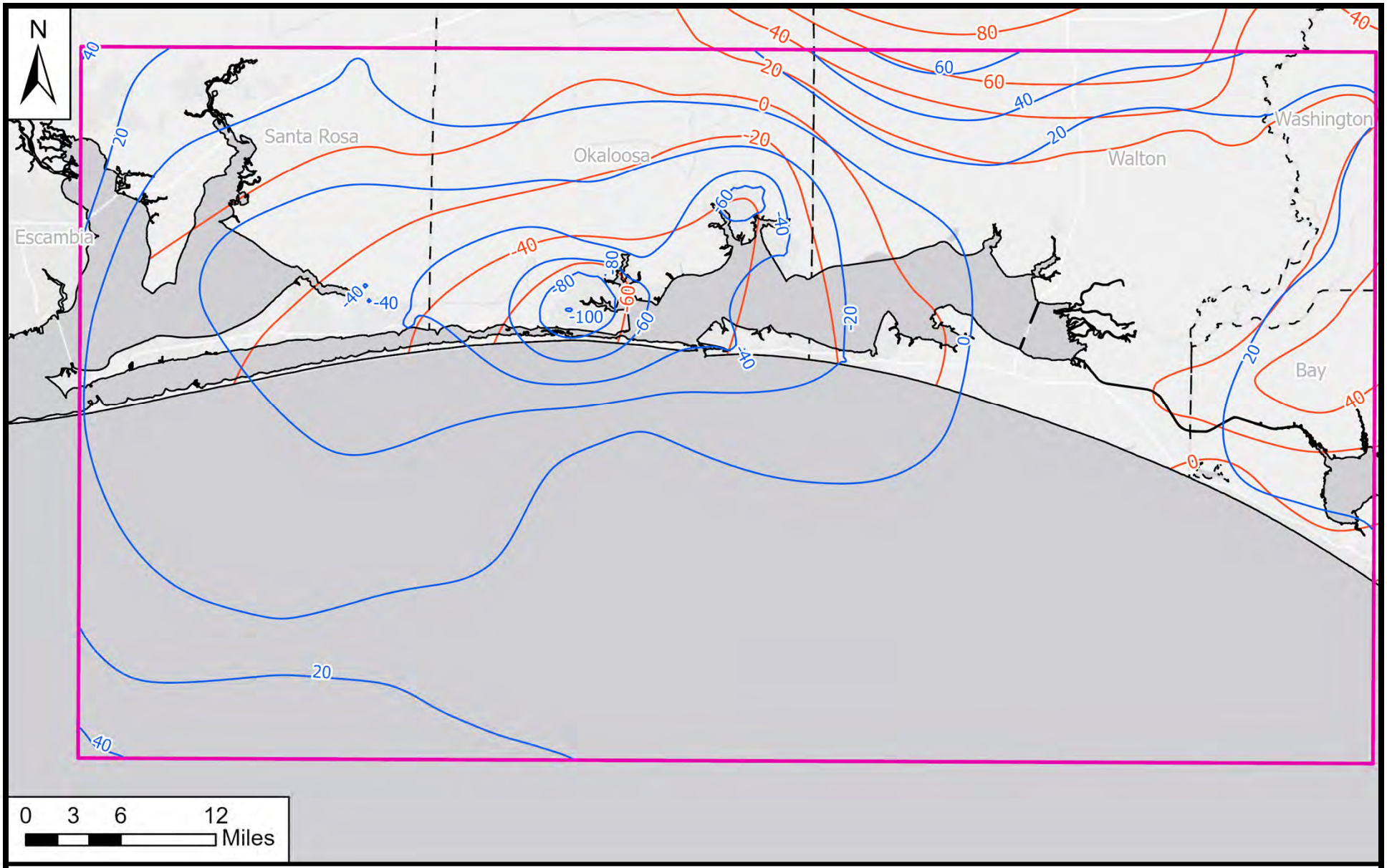

Figure 30 – Layer 7 observed and simulated freshwater equivalent 20-ft head contours for year 2015.

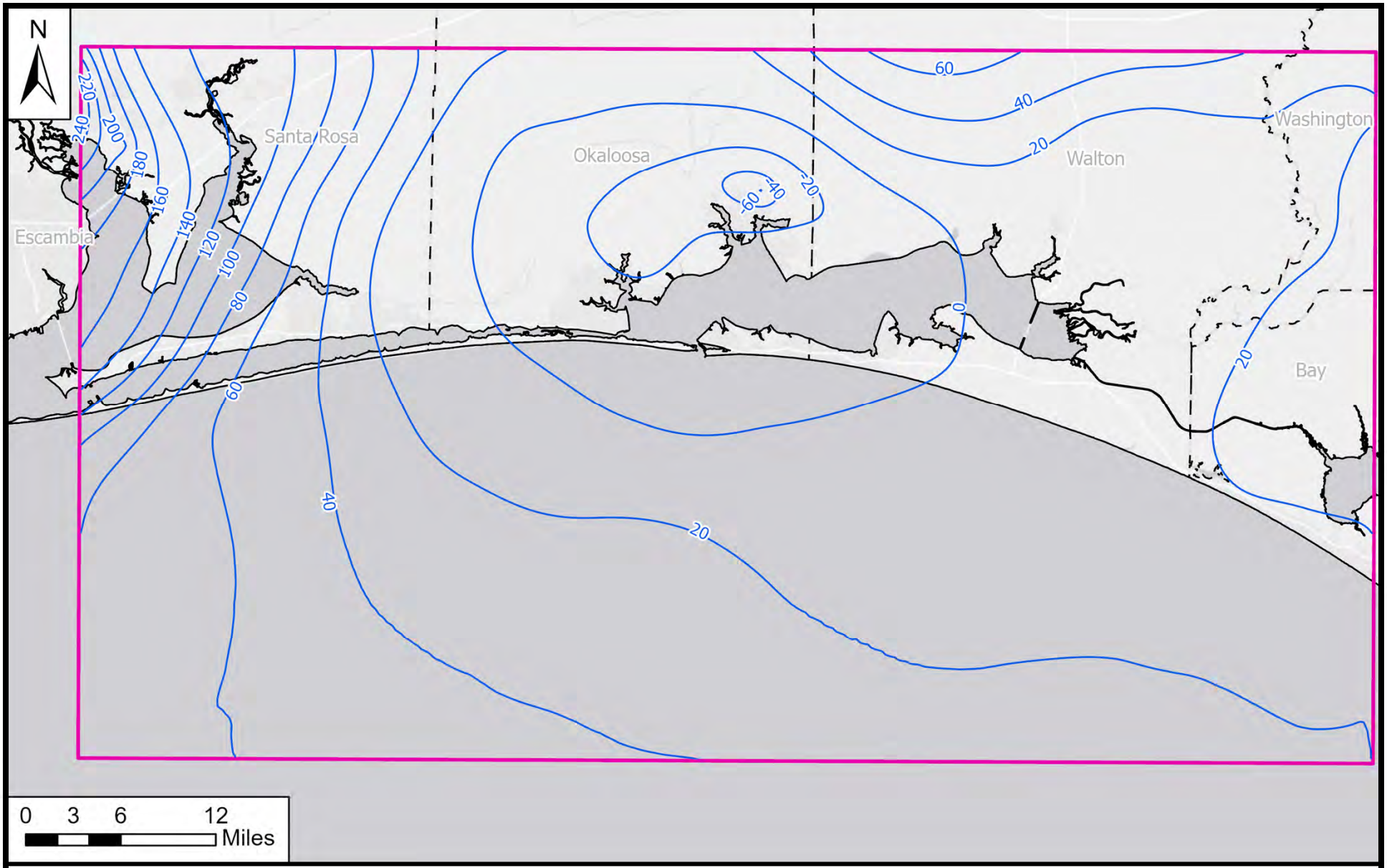

Figure 31 – Layer 15 simulated freshwater equivalent 20-ft head contours for year 2015.

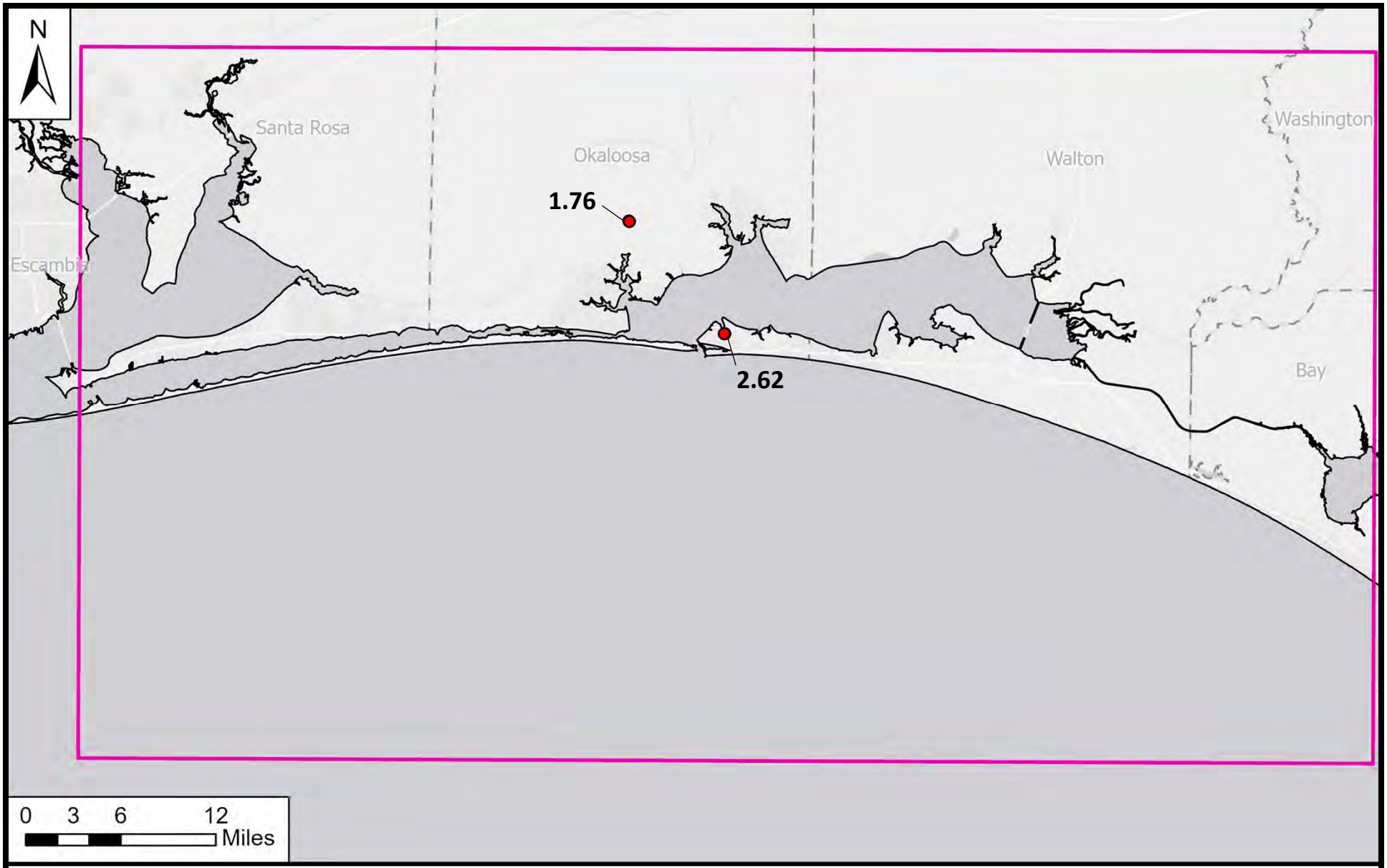

Figure 32 – Mean absolute error (ft) of vertical head difference targets.

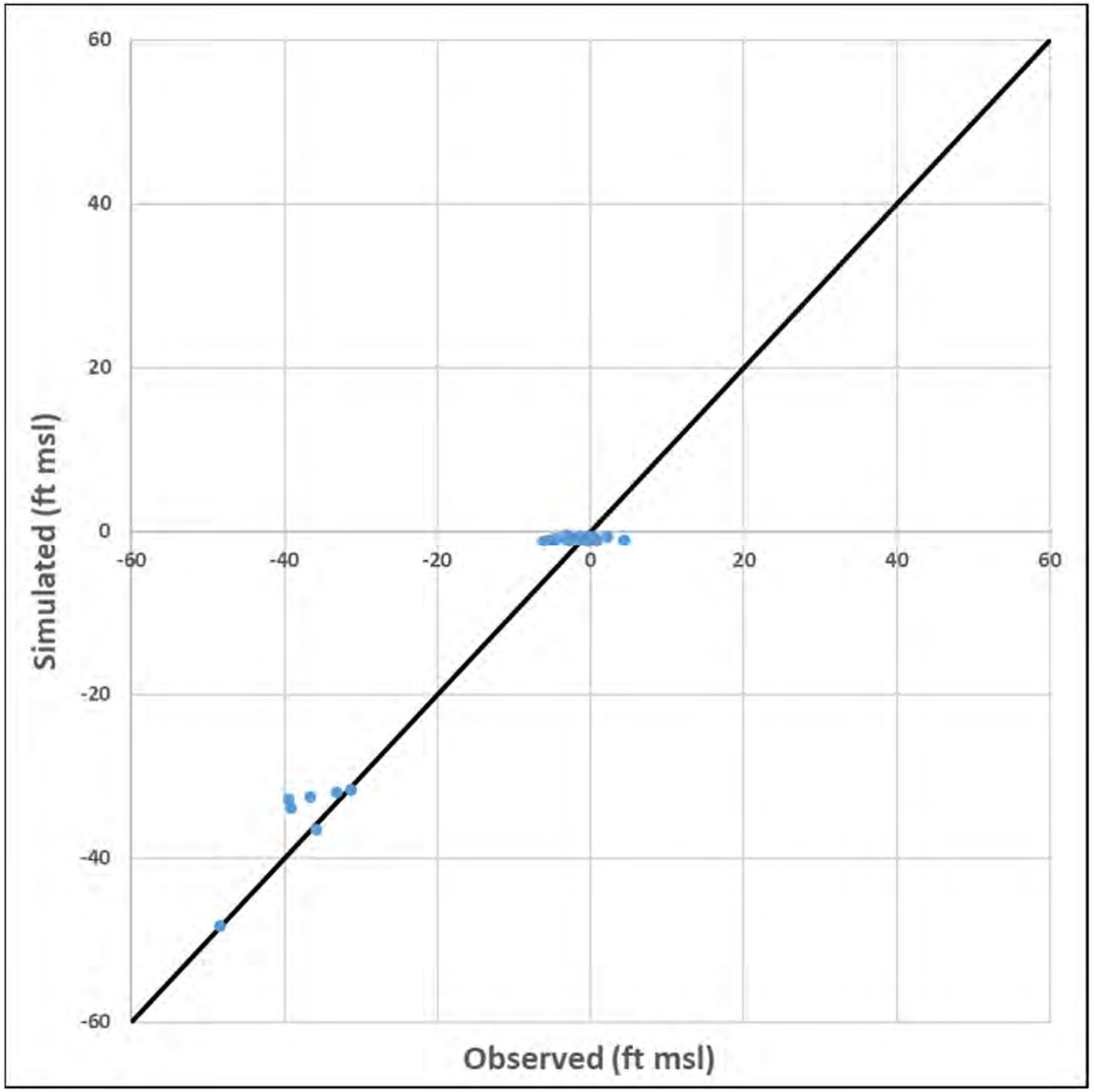

Figure 33 – Observed versus Simulated Vertical Head Difference Targets.

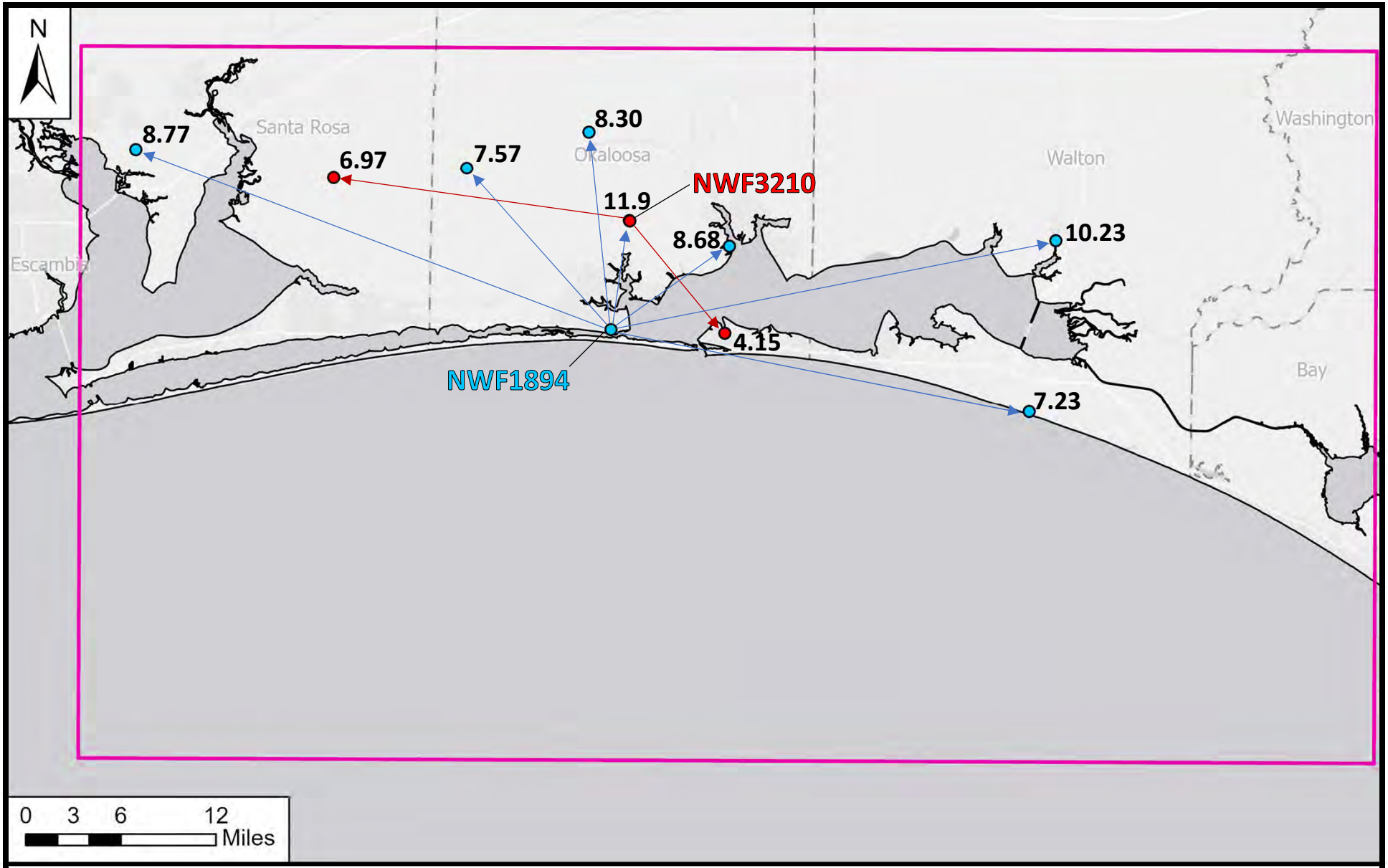

Figure 34 – Mean absolute error (ft) of horizontal head difference targets.

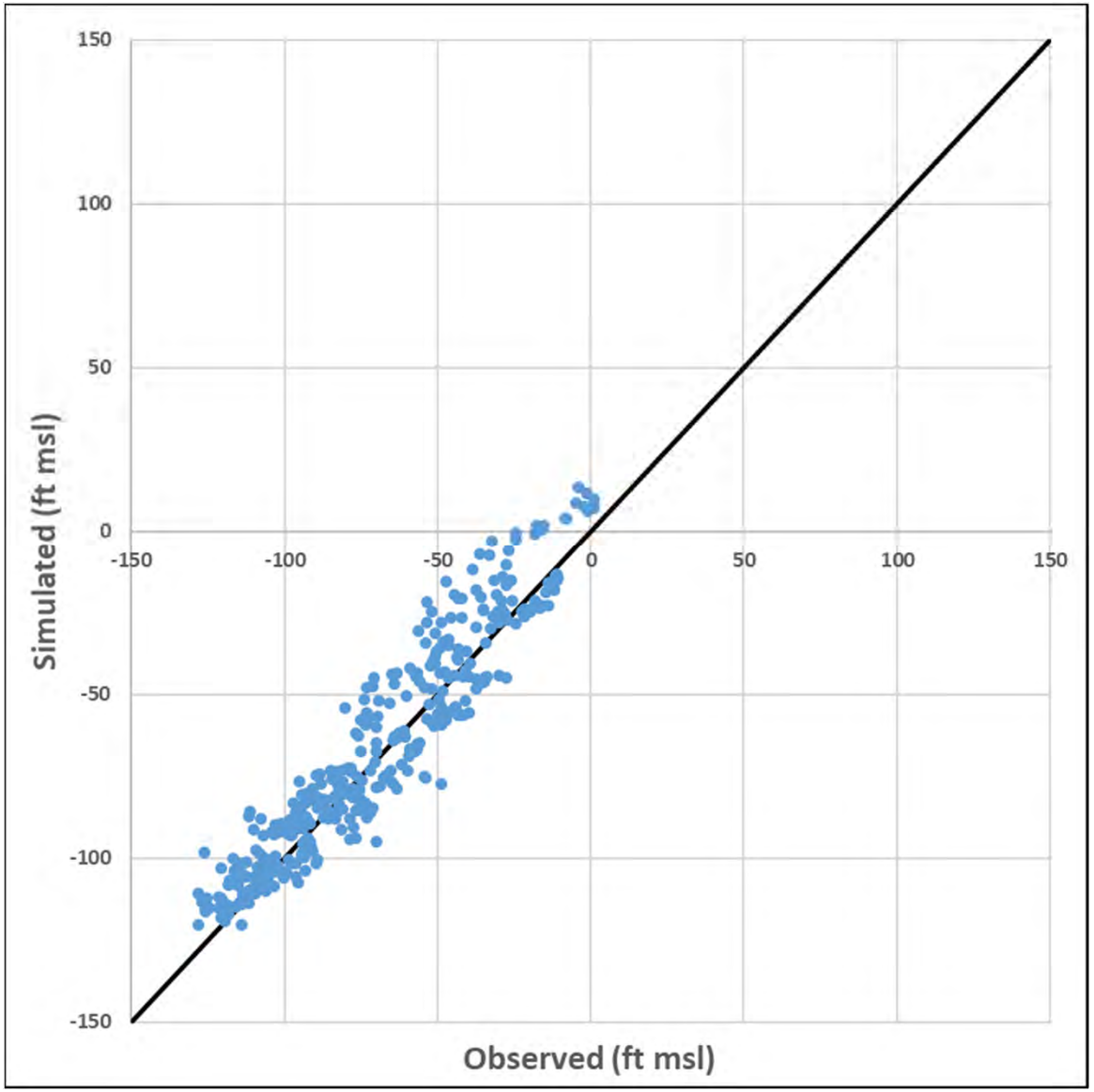

Figure 35 – Observed versus Simulated Horizontal Head Difference Targets.

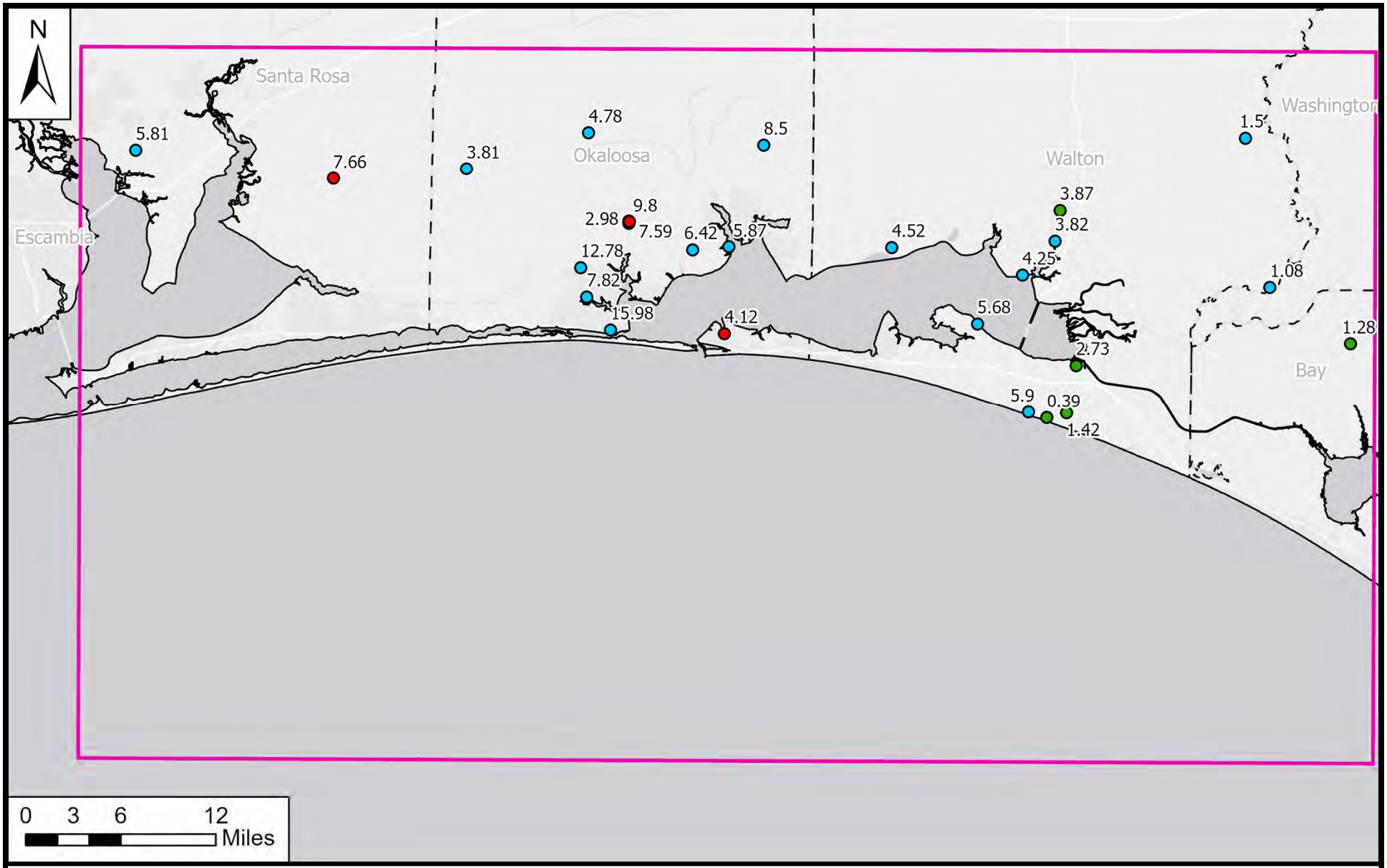

Figure 36 – Mean absolute error (ft) of temporal head difference targets.

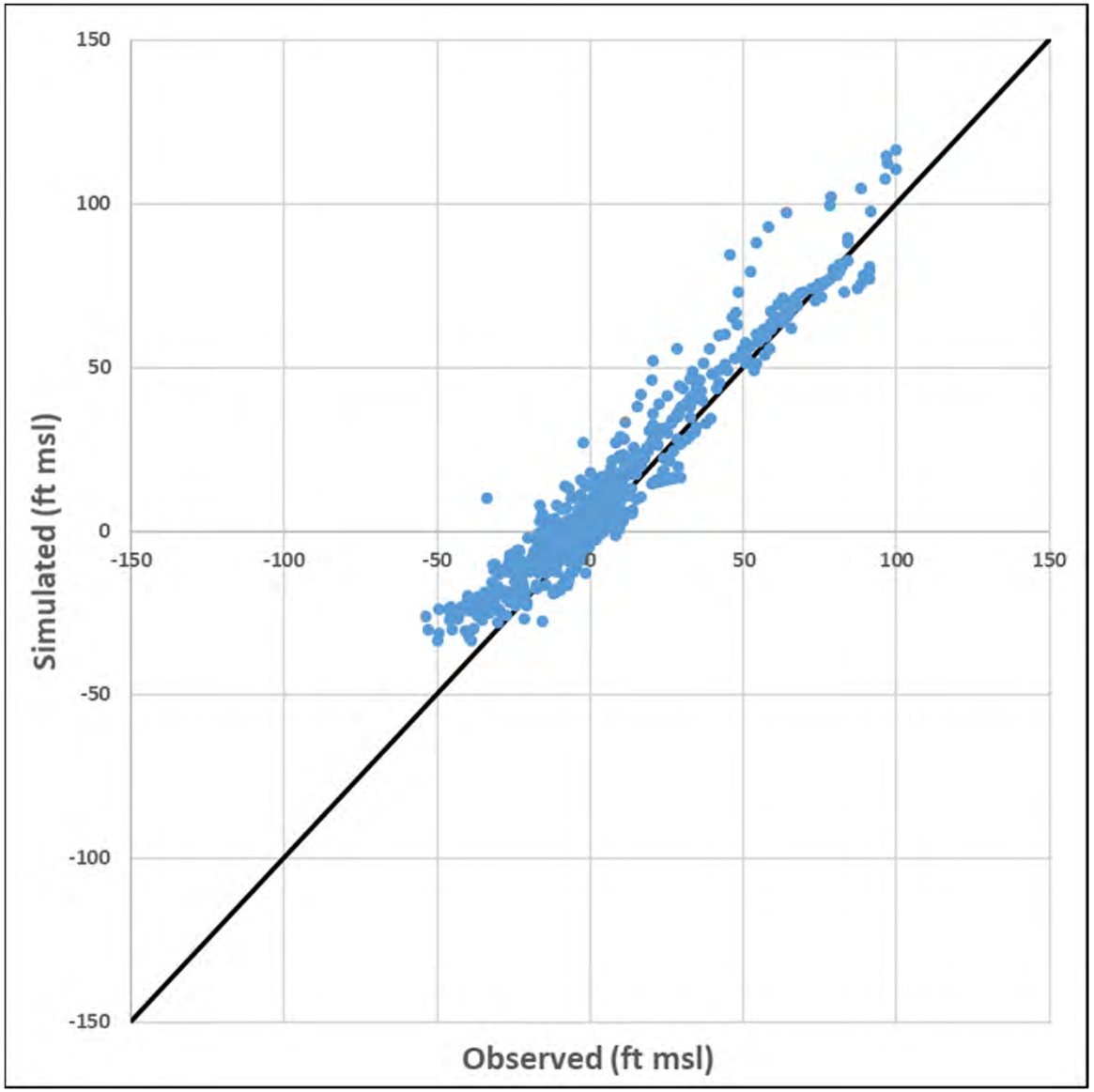

Figure 37 – Observed versus Simulated Temporal Head Difference Targets.

Figure 38 – Mean error by target well (concentration targets) during the transient simulation period (1942-2015).
Note: Error = Measured – Modeled

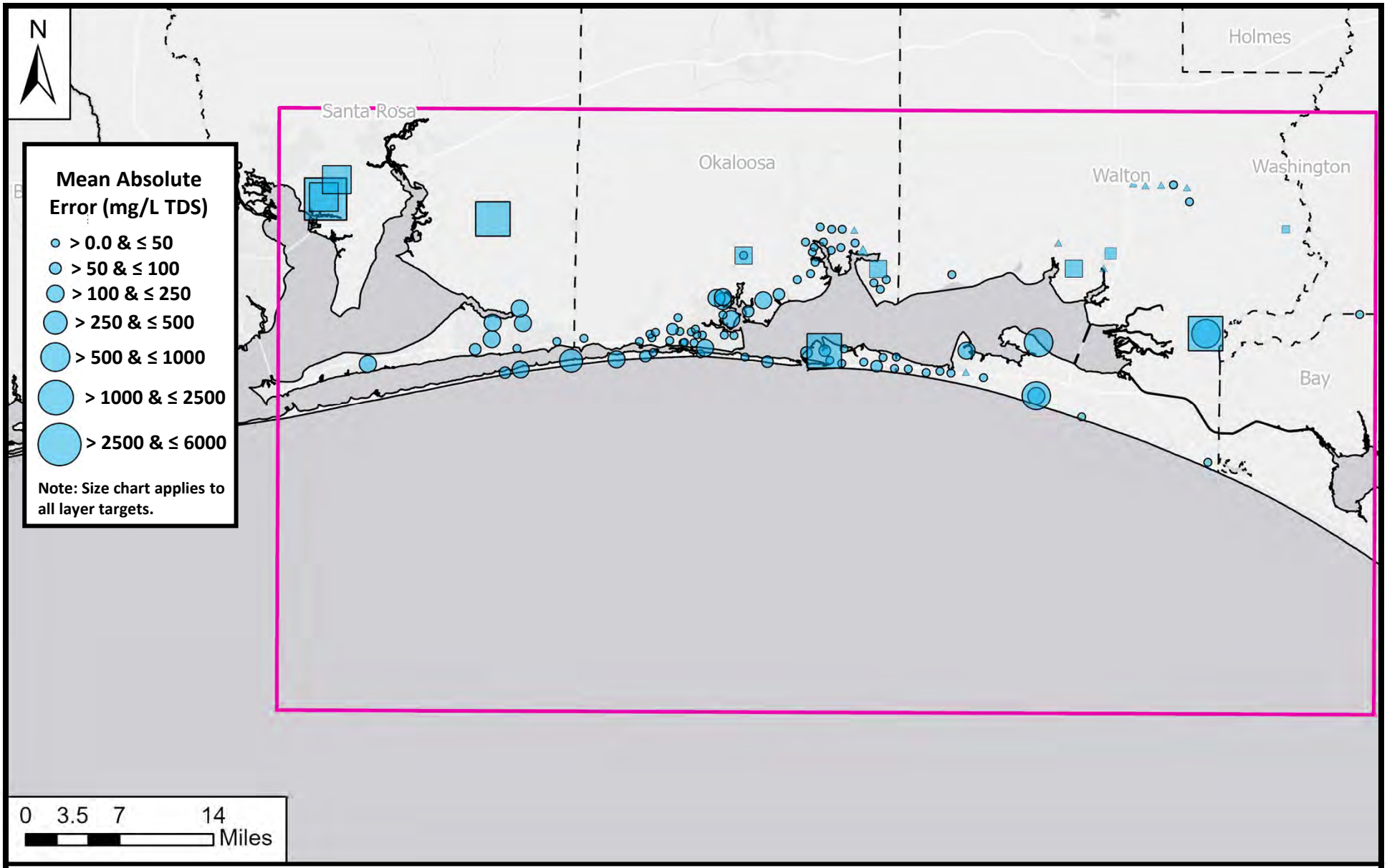

Figure 39 – Mean absolute error by target well (concentration targets) during the transient simulation period (1942-2015).

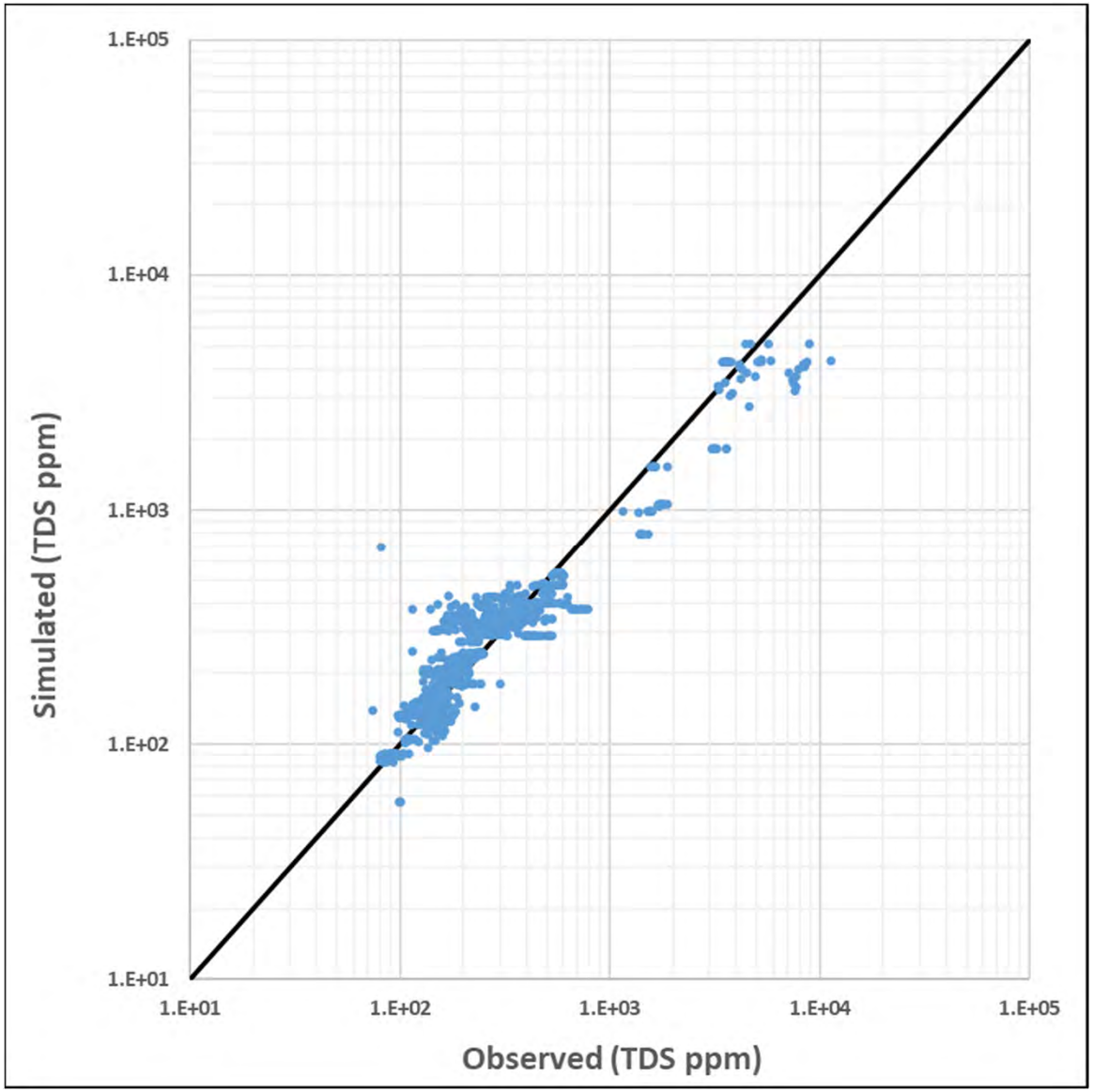

Figure 40 – Observed versus Simulated Concentration Targets in mg/L TDS (or parts per million, "ppm").

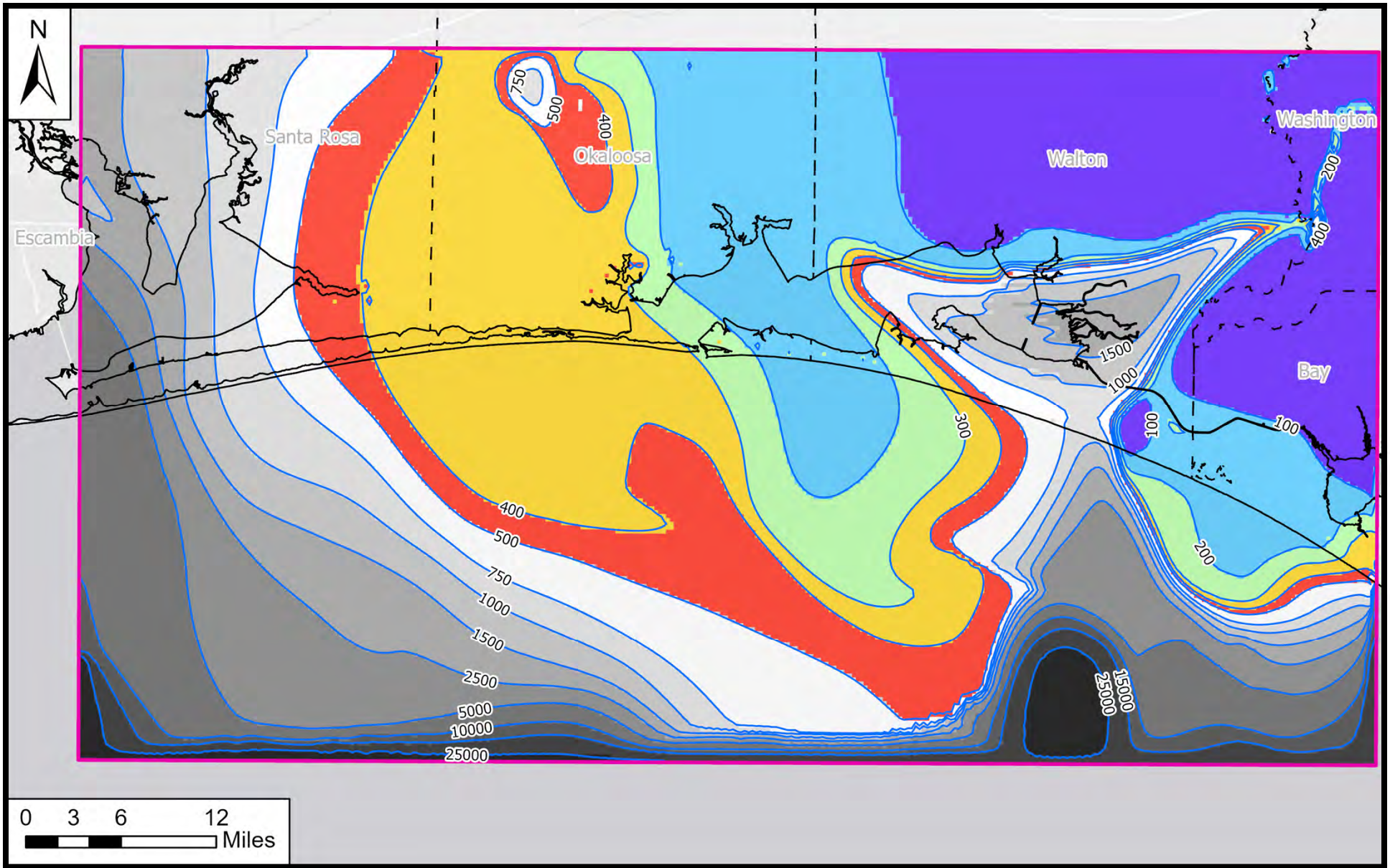

Figure 41 – Simulated Upper Floridan Aquifer concentrations (mg/L TDS) for year 2015.

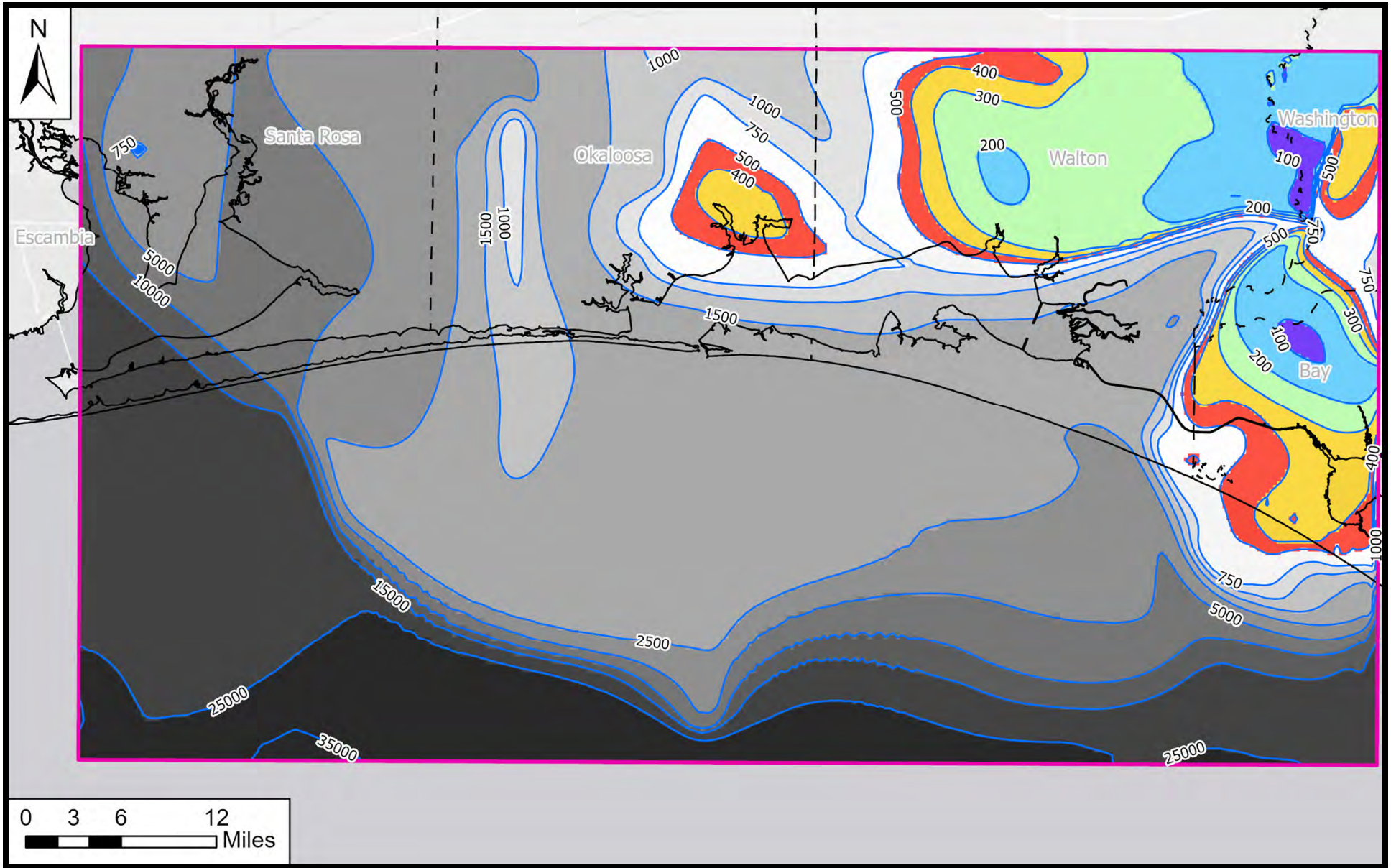

Figure 42 – Simulated Lower Floridan Aquifer concentrations (mg/L TDS) for year 2015.

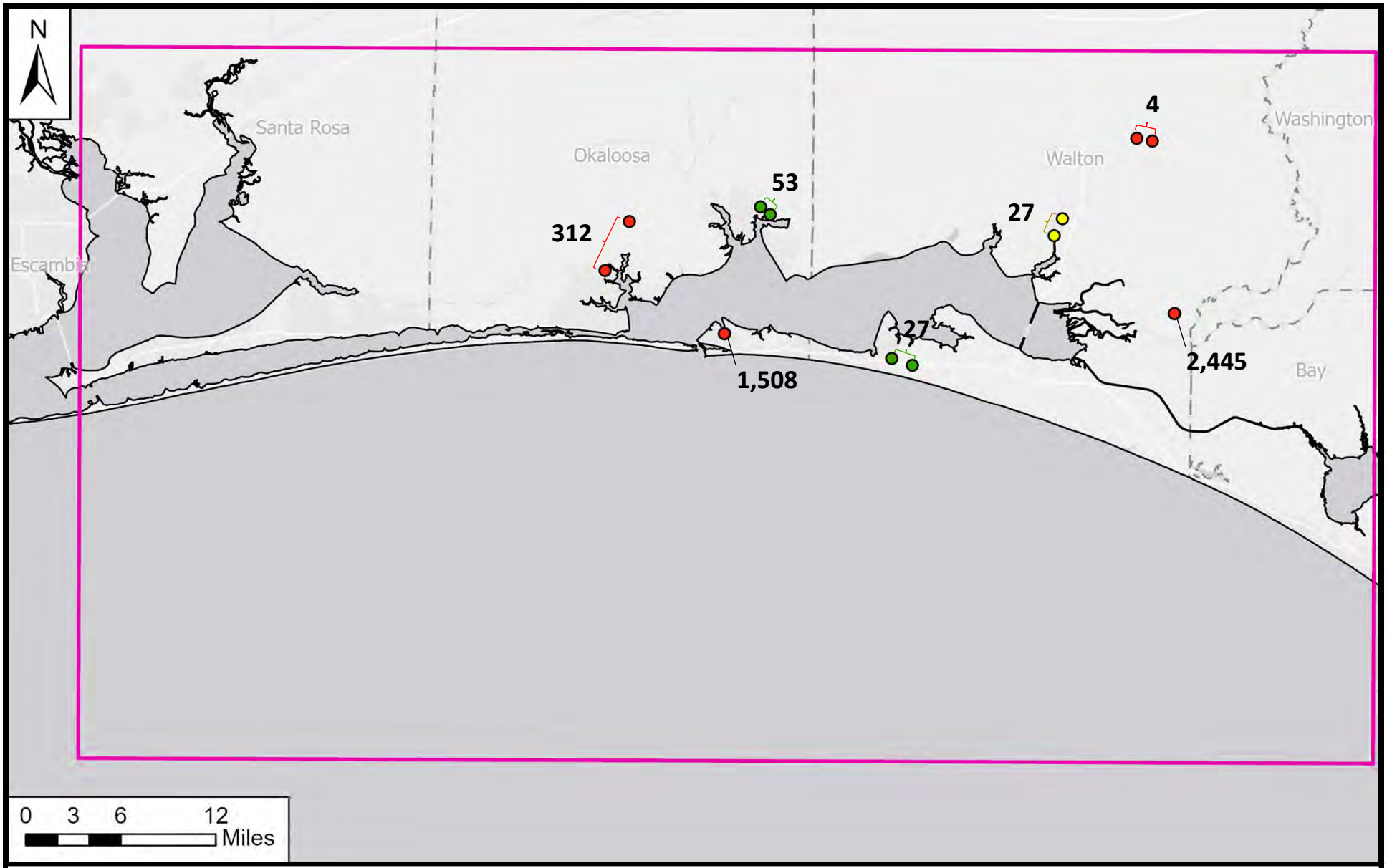

Figure 43 – Mean absolute error (mg/L TDS) of vertical concentration difference targets.

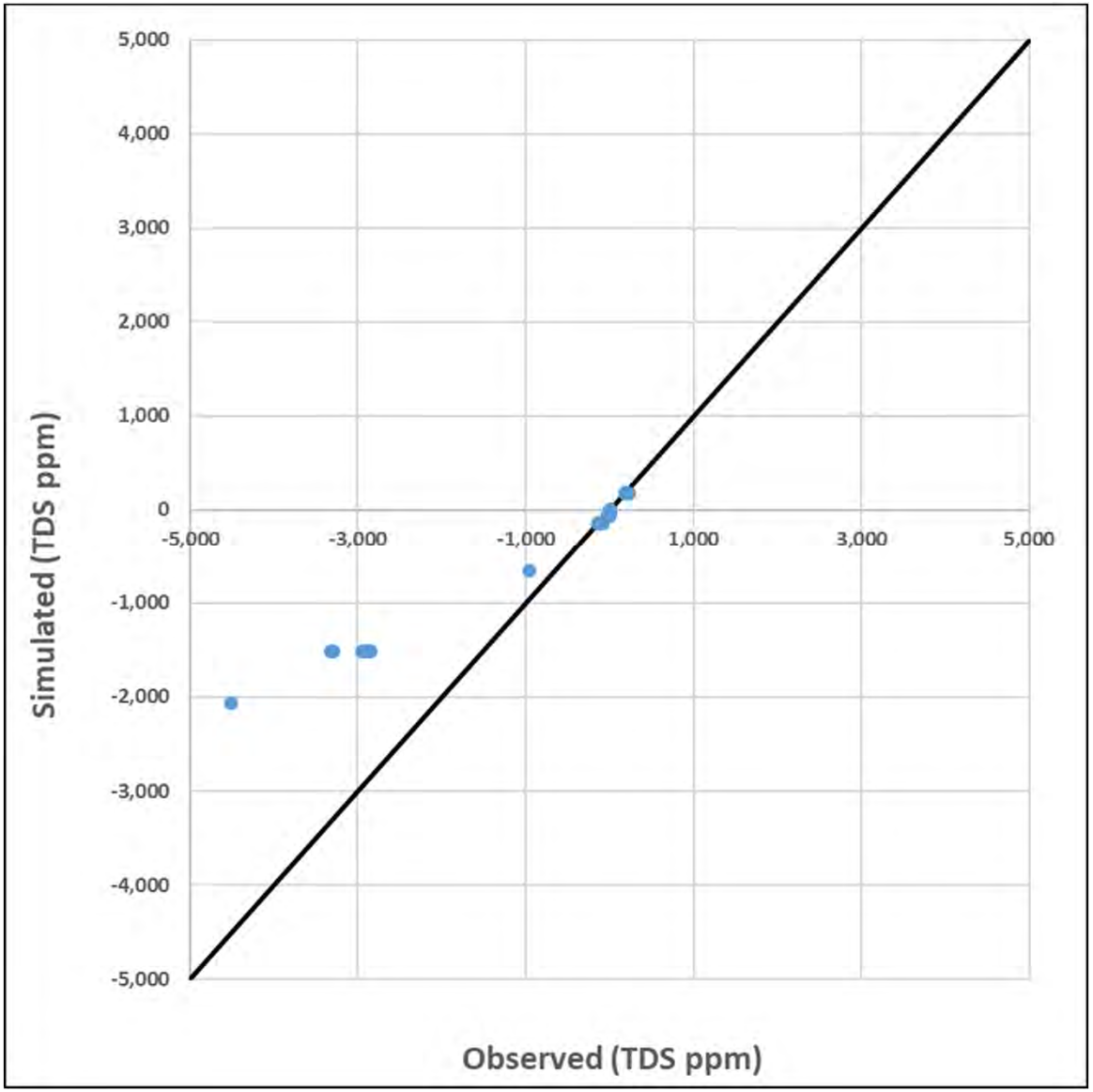

Figure 44 – Observed versus Simulated Vertical Concentration Difference Targets in mg/L TDS (or parts per million, "ppm").

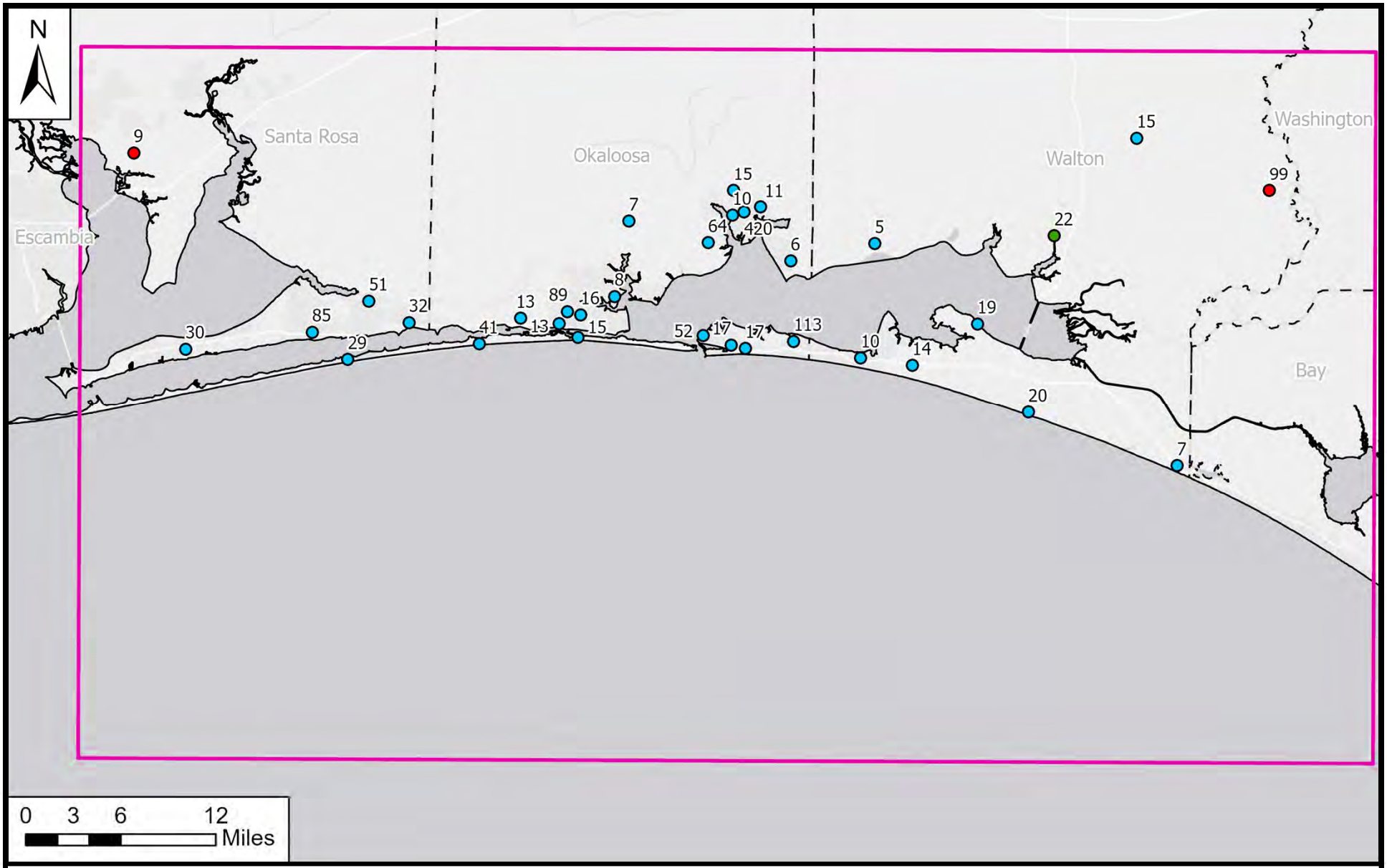

Figure 45 – Mean absolute error (mg/L TDS) of temporal concentration difference targets.

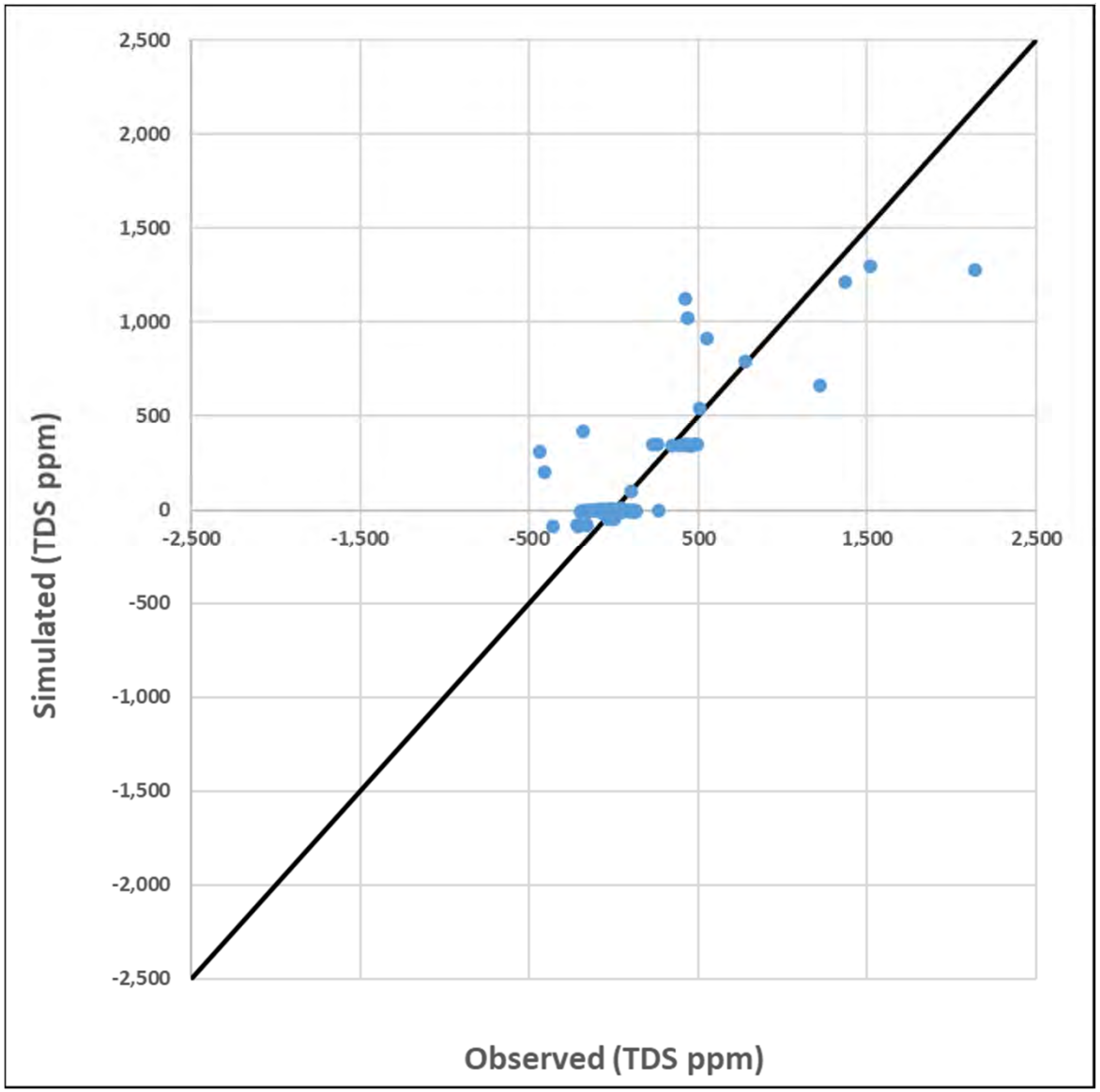

Figure 46 – Observed versus Simulated Temporal Concentration Difference Targets in mg/L TDS (or parts per million, "ppm").

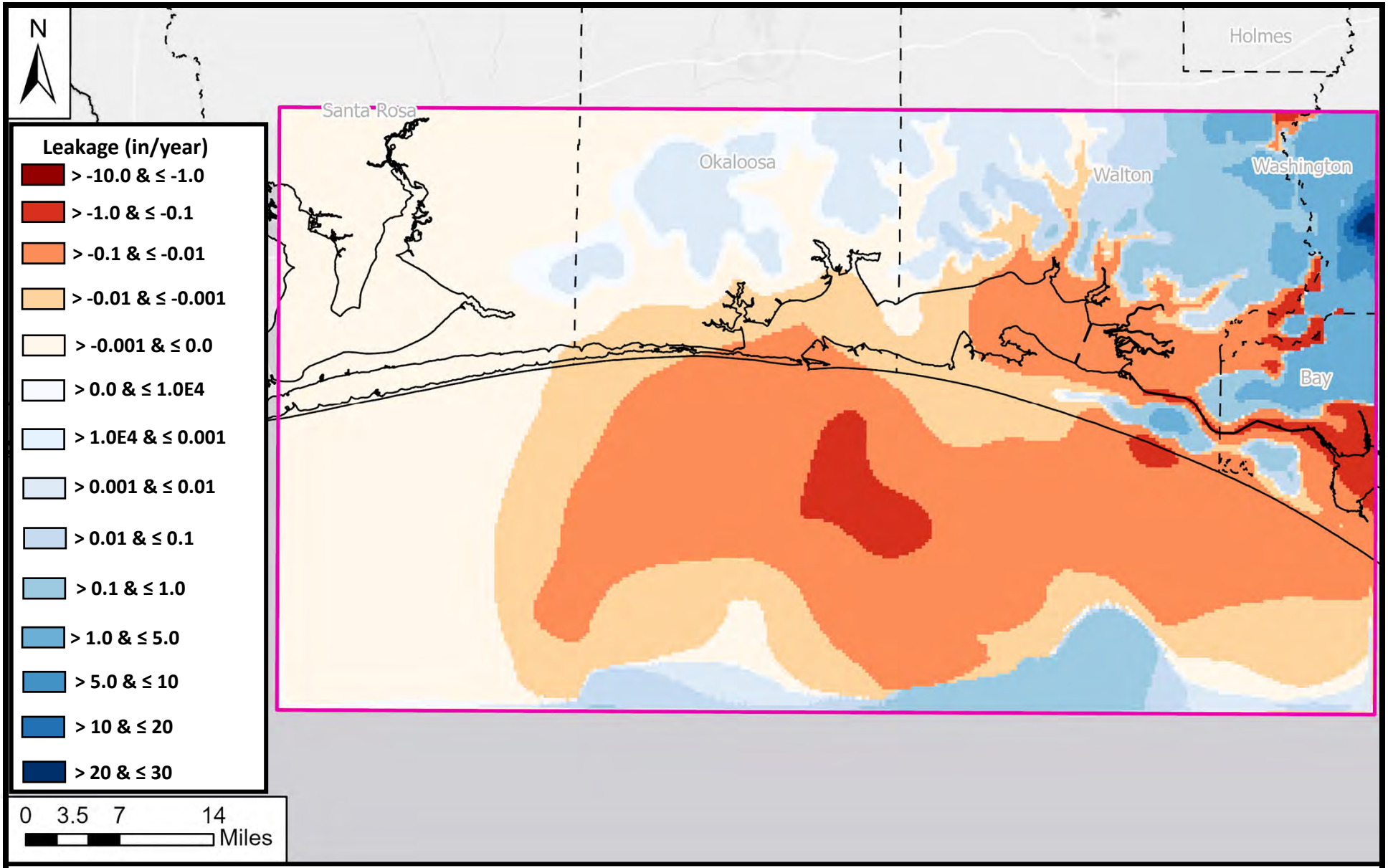

Figure 47 – Leakage into the Upper Floridan Aquifer (layer 5) from the Intermediate Aquifer System (layer 4) at the end of pre-development.

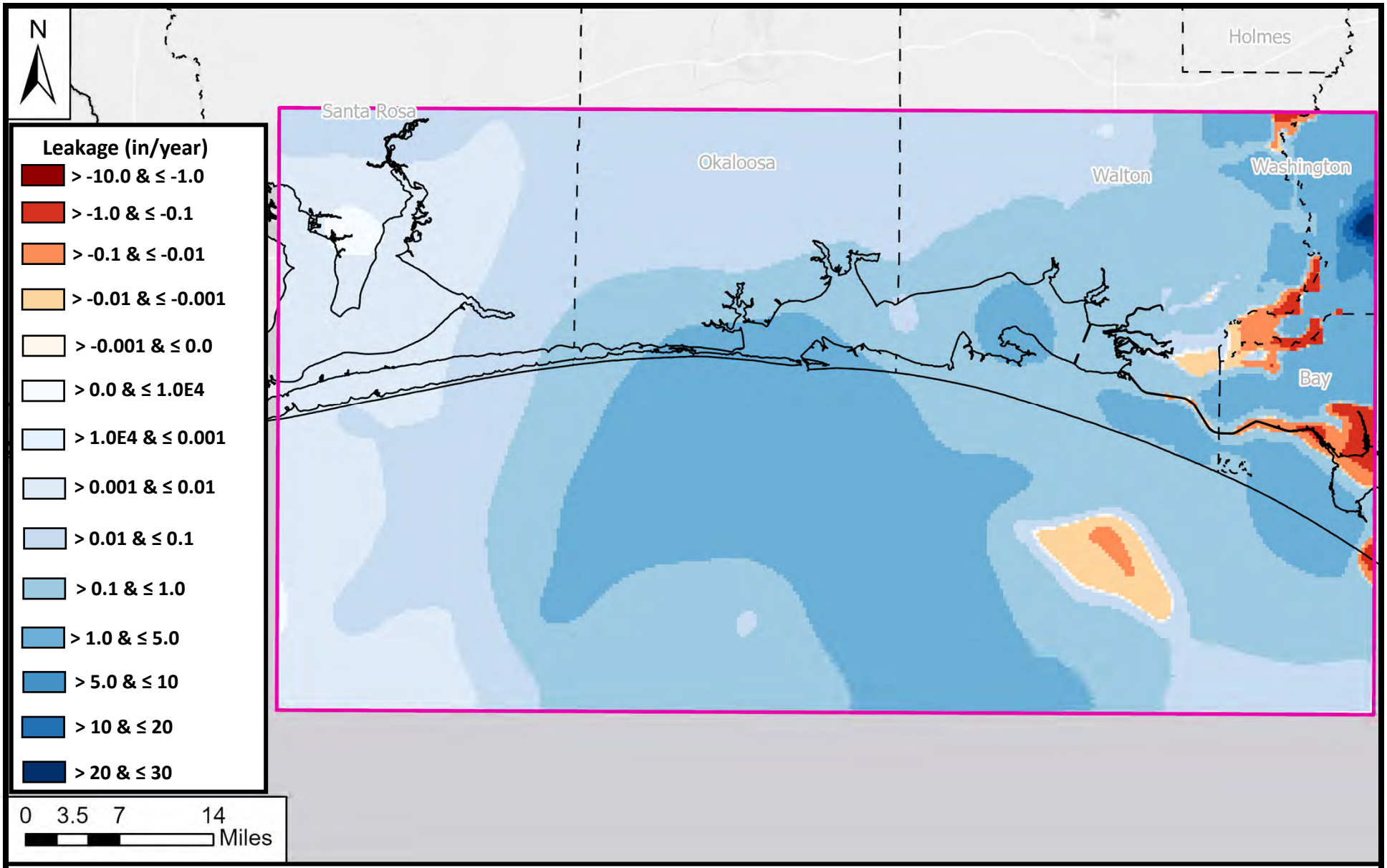

Figure 48 – Leakage into the Upper Floridan Aquifer (layer 5) from the Intermediate Aquifer System (layer 4) in 2000.

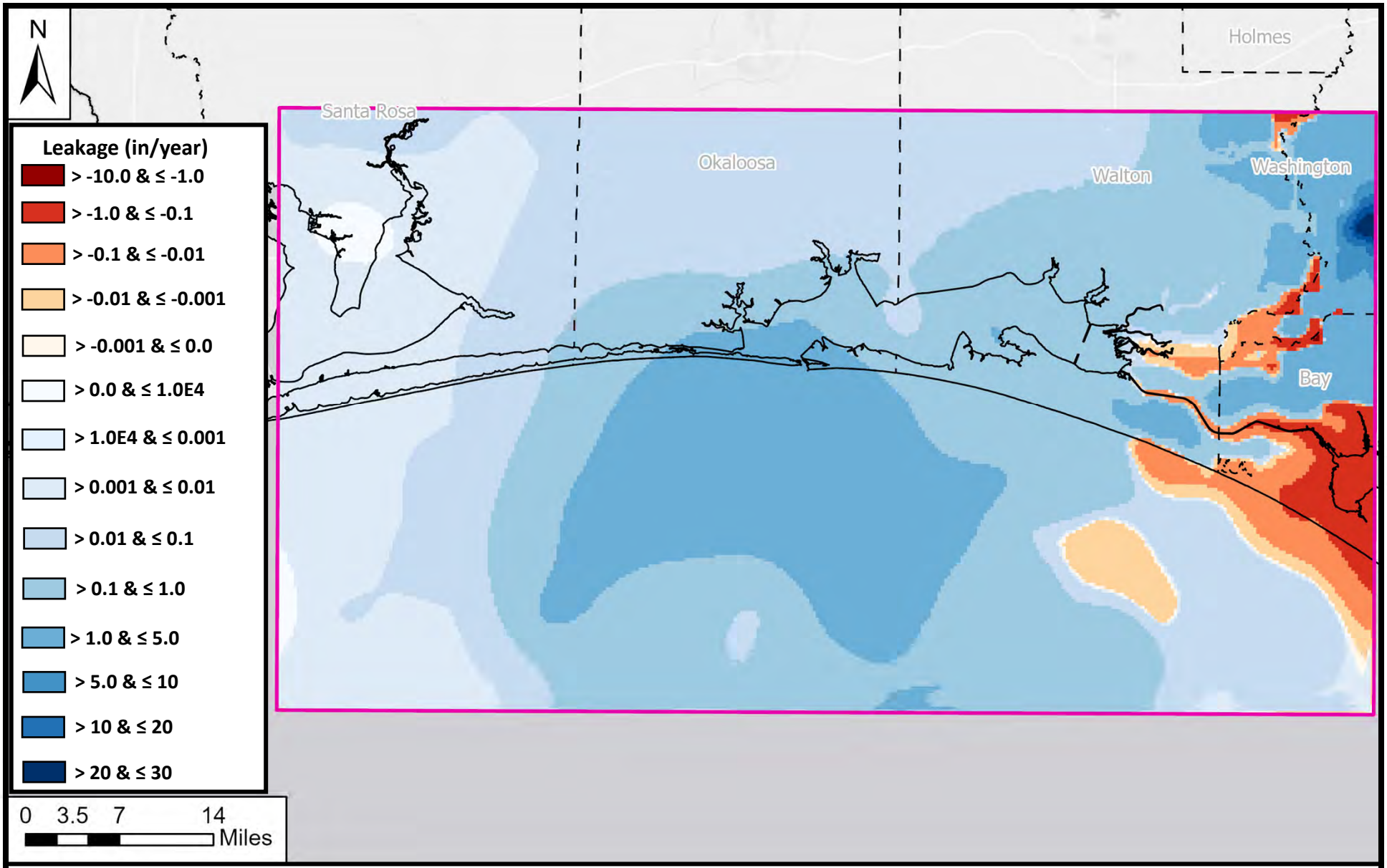

Figure 49 – Leakage into the Upper Floridan Aquifer (layer 5) from the Intermediate Aquifer System (layer 4) in 2015.