To:	Moira Homann, DEP; Woo-Jun Kang, DEP; Chandler Keenan, DEP; Tony Tomalewski, DEP; Diana Turner, DEP
From:	Tetra Tech
Date:	October 23, 2025
Subject:	Task 6. ArcNLET-Py Model Development

1.0 INTRODUCTION

The Florida Department of Environmental Protection (DEP) contracted with Tetra Tech to extend the Caloosahatchee River and Estuary Hydrological Simulation Program – FORTRAN (HSPF) Model simulation period from January 1, 1996 – December 31, 2014. As part of this update, the septic system inputs into the HSPF model are being replaced with a comprehensive separate ArcGIS-based Nitrogen Load Estimation Toolkit in Python (ArcNLET-Py) Model of the entire Caloosahatchee River and Estuary Watershed. This memo documents the development, parameterization, calibration, and output processing of this model.

2.0 ARCNLET-PY MODEL DESCRIPTION AND INPUTS

ArcNLET-Py is an analytical, GIS-integrated model originally developed by Florida State University for DEP to simulate nitrogen—and, in its 2023 Python/ArcGIS Pro rewrite, phosphorus—transport from onsite sewage treatment and disposal systems (OSTDS), commonly referred to as septic systems. It couples a simple one-dimensional advection-dispersion-decay framework for both the vadose and saturated zones with closed-form solutions, enabling rapid, catchment-wide estimates of contaminant mass flux from thousands of point sources without the need for a full numerical groundwater model (Core et al, 2023).

This toolkit has been successfully applied to estimate nitrate (NO_3)loads from OSTDS in the City of Port St. Lucie, City of Stuart, and Martin County (Ye et al., 2013); Indian River Lagoon (Sayemuzzaman et al., 2015); City of Vero Beach (Tetra Tech, 2022); St. Lucie County (Tetra Tech, 2020); Indian River County (Tetra Tech, 2023). The 2023 update ported the code to Python for ArcGIS Pro integration and added a phosphorus module, which was leveraged in this Caloosahatchee River and Estuary Watershed application to produce spatially explicit nitrogen and phosphorus load estimates for integration into the regional HSPF model.

For the Caloosahatchee Watershed modeling, the core GIS inputs comprised a high-resolution digital elevation model (DEM) to derive flow directions and depth-to-water-table; hydrography layer delineating rivers, streams, and lakes; Soil Survey Geographic Database (SSURGO)-based soil porosity and saturated hydraulic conductivity rasters, and comprehensive OSTDS point database. Calibration used groundwater level time series from monitoring wells to adjust smoothing factors and NO_3/phosphate (PO_4) concentration data to tune first-order decay and attenuation parameters. Subsections 2.1 through 2.6 that follow describe each dataset's source, projection and processing steps, and its role within the ArcNLET-Py workflow.

For this application, all inputs except OSTDS locations (DEM, waterbodies, soils) were clipped to a 1 kilometer buffer around the existing HSPF model boundary to prevent edge artifacts during model runs.

2.1 ELEVATION DATA

Topography for the Caloosahatchee River and Estuary Watershed was built from two, one-meter U.S. Geological Survey (USGS) Light Detection and Ranging (LiDAR) DEMs: 2018–2020 Florida Peninsular (National Oceanic and Atmospheric Administration [NOAA] Inport 69496) and 2018 Southwest Florida DEM (NOAA Inport 59010). Figure 1 shows the original data spatial extent. Select rasters tiles from both datasets were reprojected to UTM Zone 17N in meters and mosaicked into a seamless surface. To balance spatial detail with computational efficiency, the merged DEM was resampled to a 10 meter resolution. All model inputs and outputs use metric units. The final 10 meter DEM (Figure 2), referenced to North American Vertical Datum of 1988 (NAVD 88), provides the elevation base for ArcNLET-Py's derivation of groundwater flow directions and depth-to-water-table estimates.

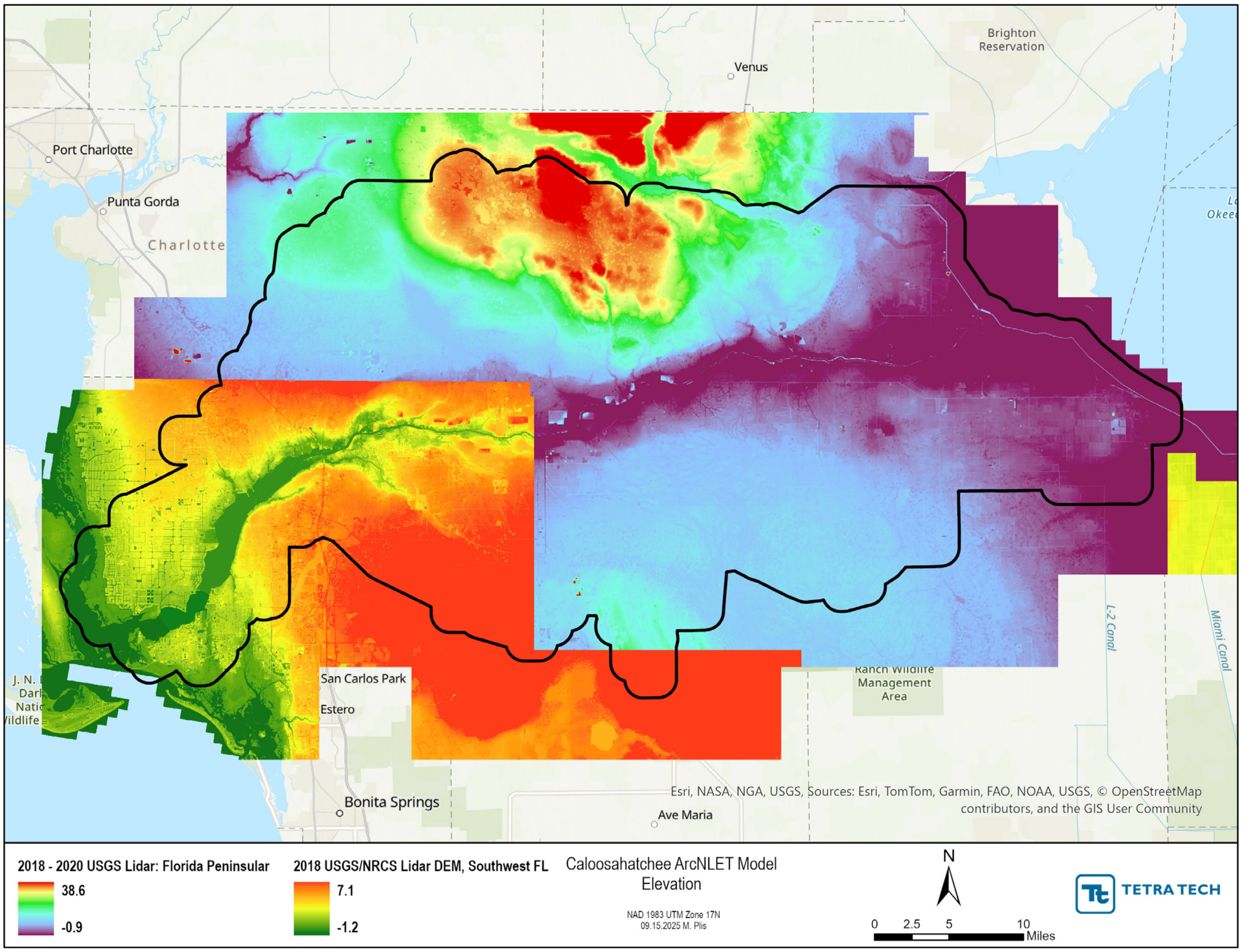

Figure 1. Initial Elevation Datasets

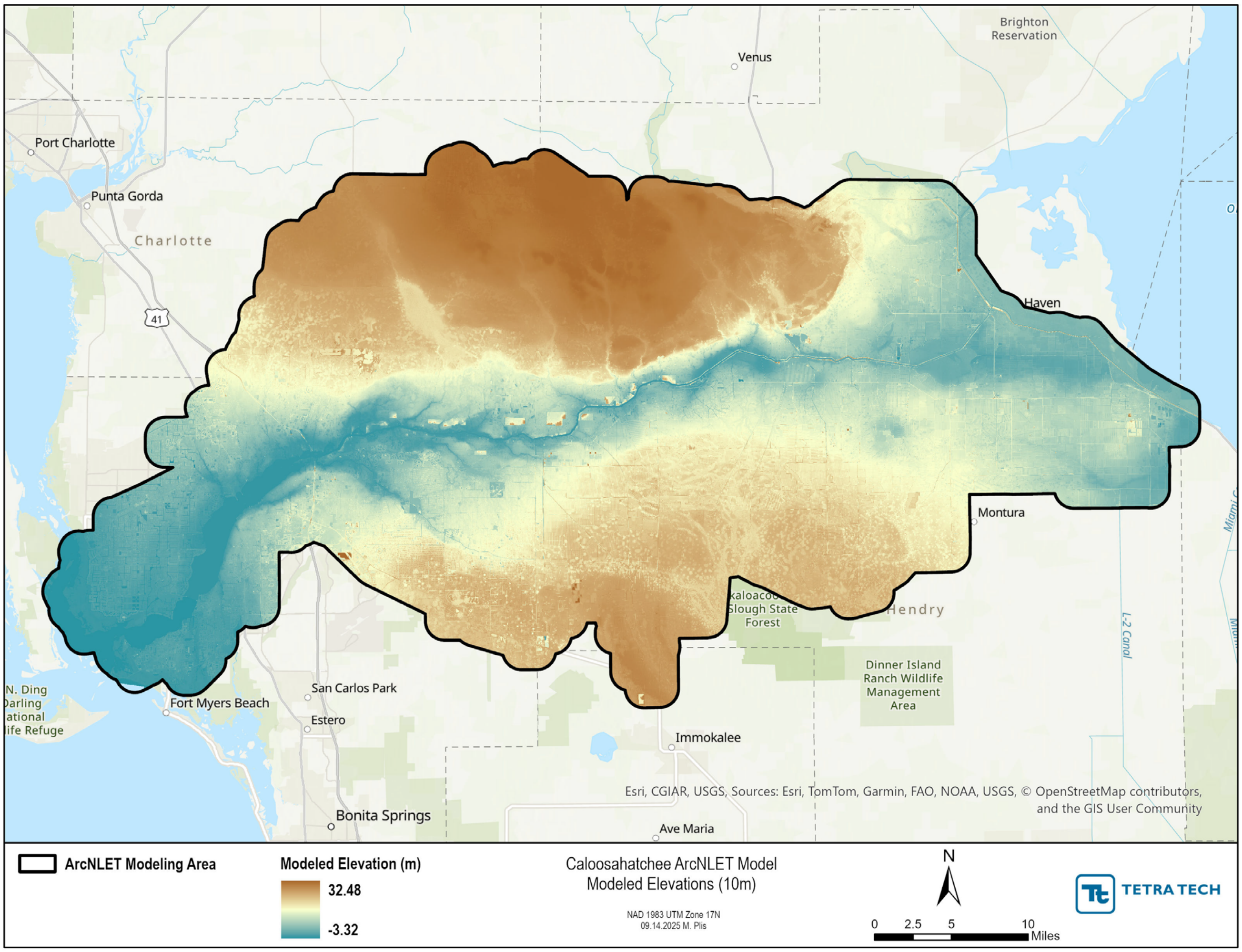

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Figure 2. Modeled 10-meter DEM

2.2 WATERBODIES

No single hydrography layer provided the detail required for ArcNLET-Py, so Tetra Tech combined three primary datasets: the South Florida Water Management District's Arc Hydro Enhanced Database (AHED), U.S. Fish and Wildlife Service's National Wetlands Inventory (NWI), and USGS National Hydrography Dataset High-Resolution (NHD HR). Polygon waterbodies and wetlands from AHED and NWI were used directly; AHED and NHD flowlines were buffered by 6 meters (to ensure even narrow canals are captured by ArcNLET-Py's particle-tracking algorithm), then converted to polygons. All layers were reprojected to UTM Zone 17N and merged into a seamless waterbody coverage.

Where aerial imagery revealed missing or misaligned features, canals and ponds were added, adjusted, or removed manually to improve accuracy. Figure 3 illustrates the combined waterbody layer used in the model. All waterbody polygons serve as the endpoints for nitrogen and phosphorus plumes in the ArcNLET-Py simulation.

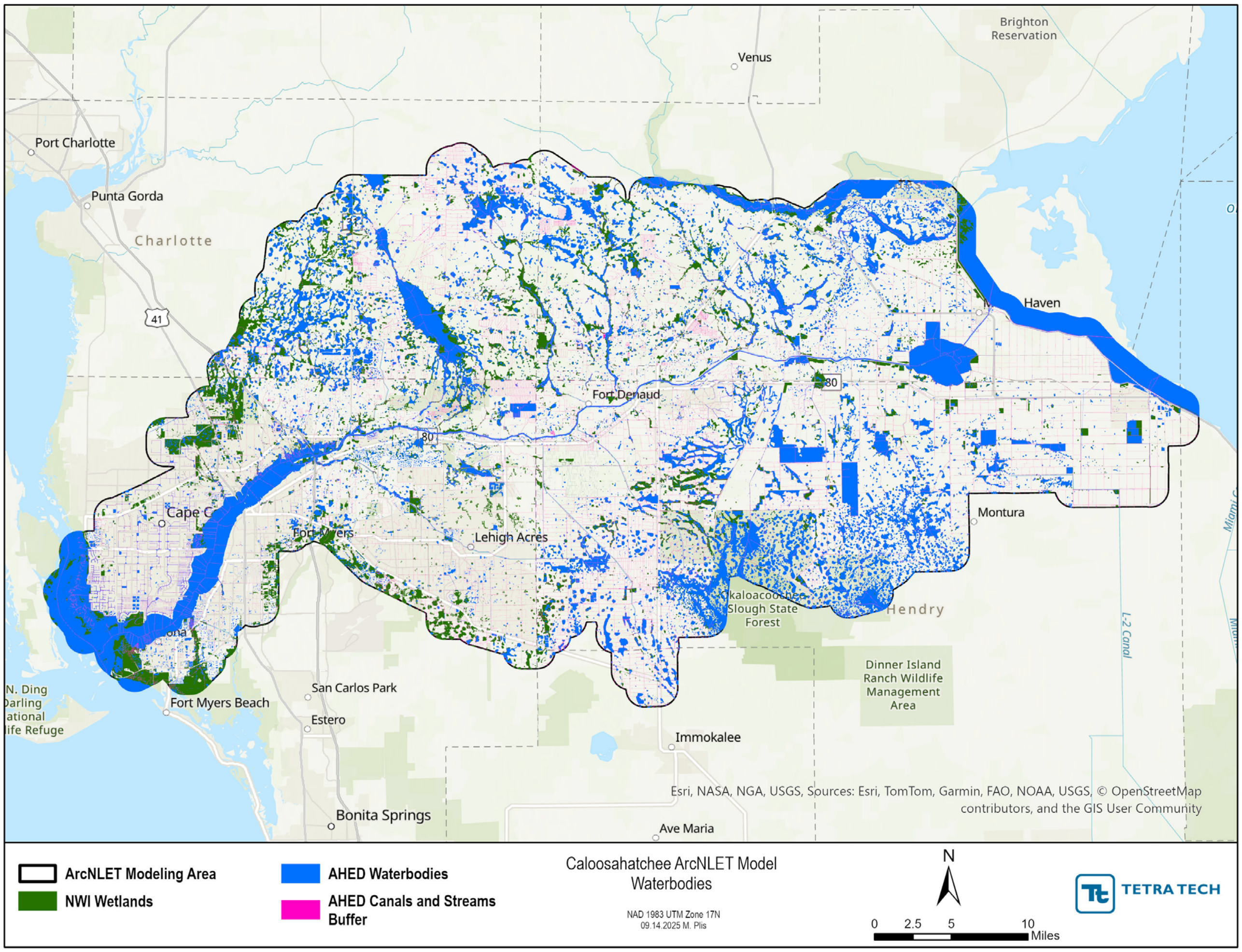

Figure 3. Modeled Waterbodies and Sources

2.3 OSTDS LOCATIONS

Tetra Tech obtained the 2024 parcel layer for Charlotte, Collier, Glades, Hendry, and Lee counties from the Florida Department of Health Florida Water Management Inventory (2024) and selected all parcels identified as “Known Septic” or “Likely Septic.” Tetra Tech then calculated each parcel centroid to serve as the ArcNLET-Py point source location (Figure 4). Because some centroids initially fell within mapped waterbody polygons—resulting in zero-length flow paths and model errors—Tetra Tech applied an automated script to shift points lying closer than 6 meters from a waterbody edge. This adjustment resolved the majority of conflicts; the remaining points (less than 0.1%) were relocated manually within the parcel following visual inspection against aerial imagery. All OSTDS location coordinates are projected to UTM Zone 17N. Table 1 summarizes the number of OSTDS by county.

Table 1: OSTDS Count per County

County	Number of Known or Likely OSTDS
Charlotte	300
Collier	9
Glades	1,746
Hendry	8,241
Lee	41,543

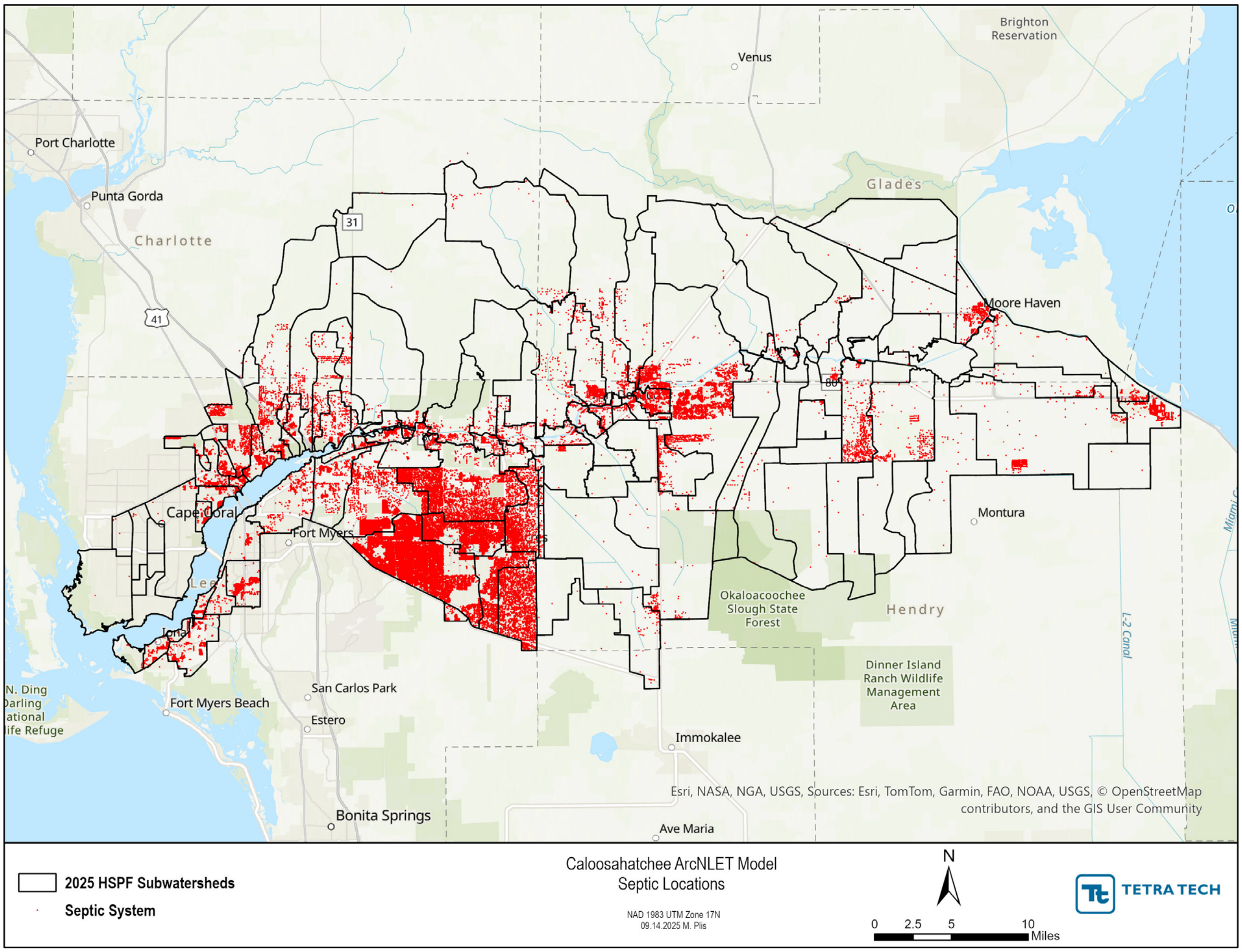

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Figure 4. OSTDS Locations in the ArcNLET-Py Model

2.4 SOIL POROSITY AND SATURATED HYDRAULIC CONDUCTIVITY

The ArcNLET-Py preprocessing module automatically retrieves SSURGO datasets, extracts various soil properties including porosity and saturated hydraulic conductivity, and generates both shapefiles and rasters for model input. However, SSURGO often does not have these values for open water or some urban land (Figure 5). The soil coverage is not as detailed as some of the shorelines, creating voids. These voids are often adjacent to waterbodies and create problems as particle paths and plumes would stop there without terminating at a waterbody. To fix these problems and produce continuous inputs, these gaps were infilled by assigning each empty polygon the value of its nearest valid neighbor, and the corrected rasters were rebuilt. The resulting soil porosity and conductivity surfaces (Figure 6 and Figure 7) provide the spatially explicit parameters for the ArcNLET-Py model.

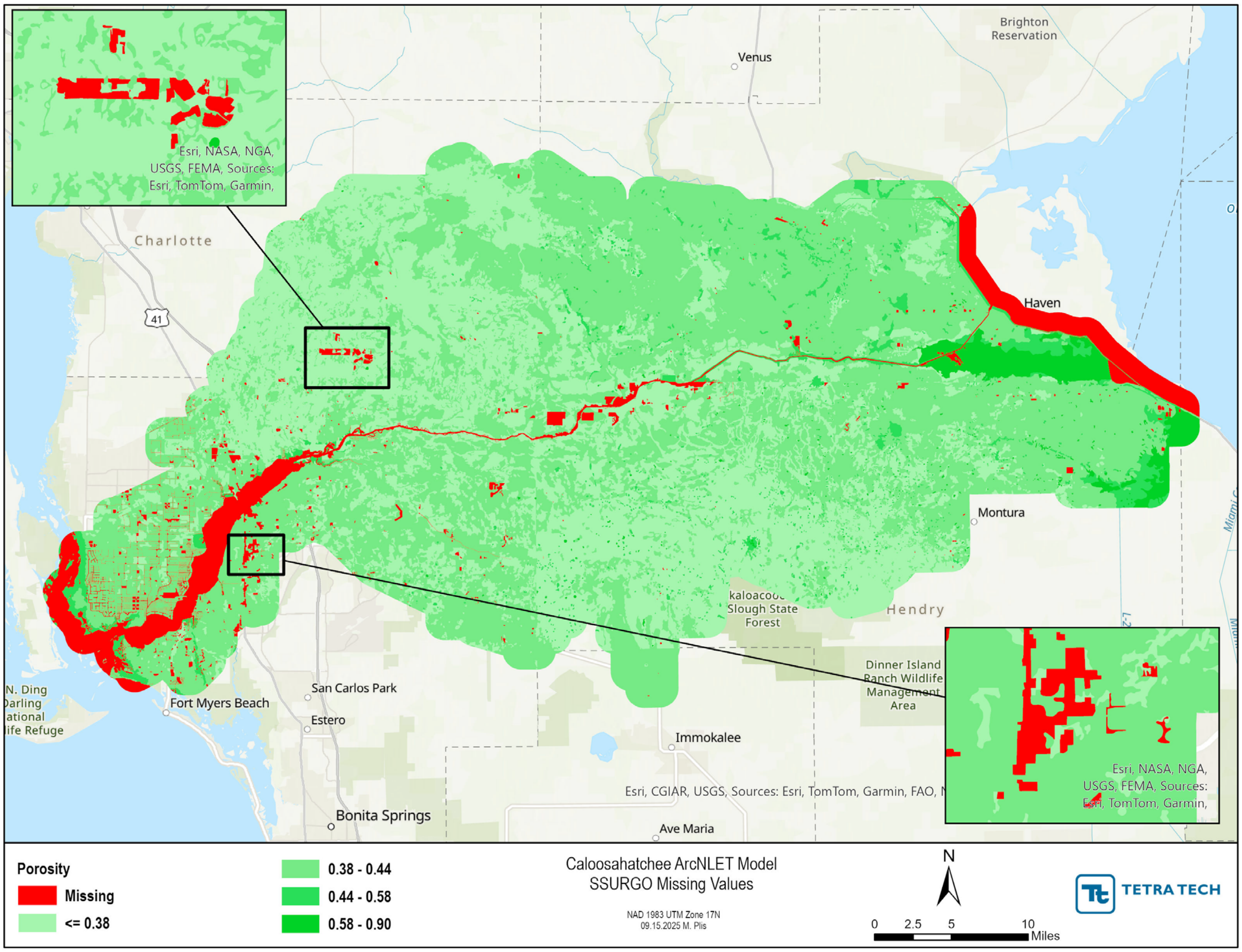

Figure 5. Preprocessing SSURGO Data

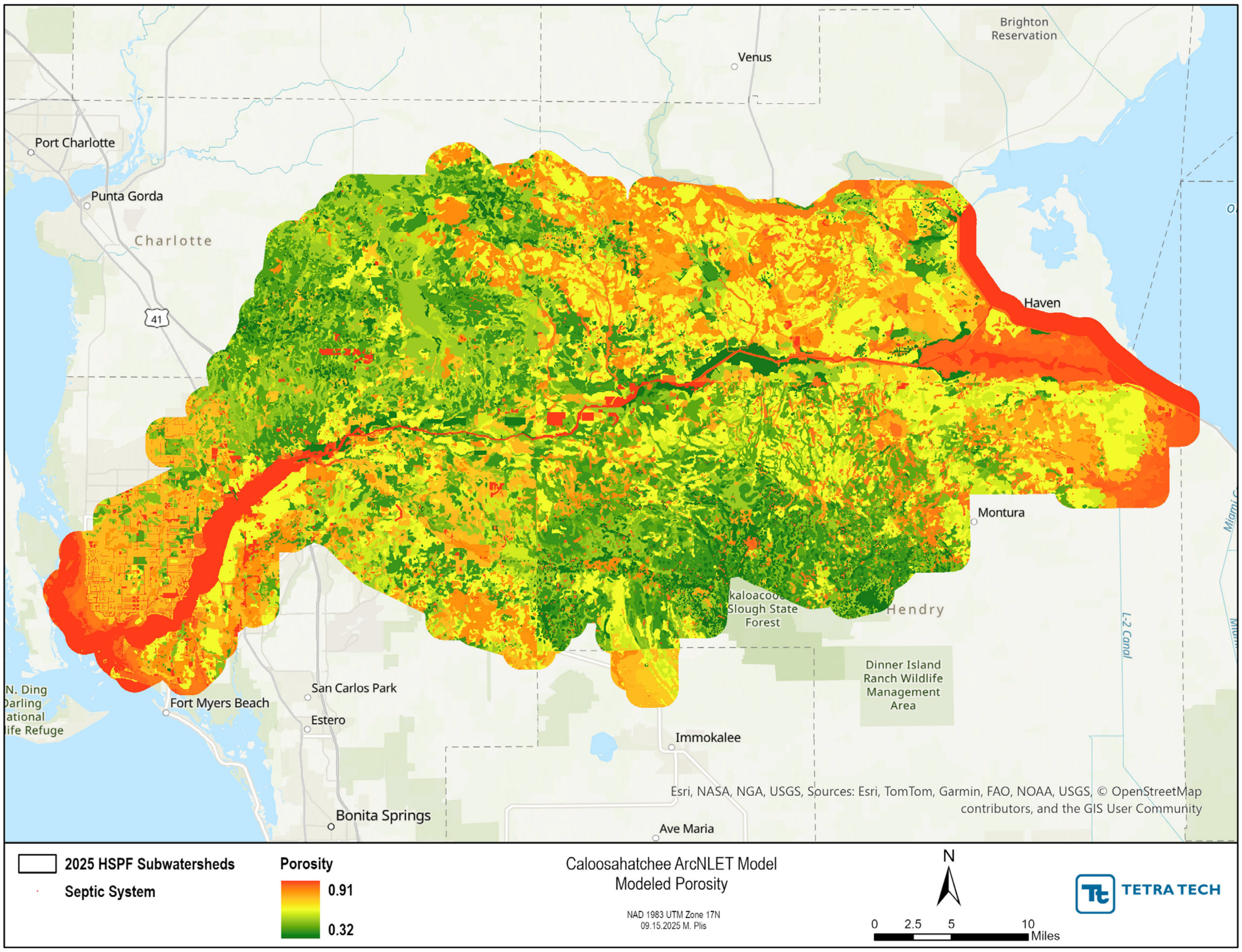

Figure 6. Modeled Porosity

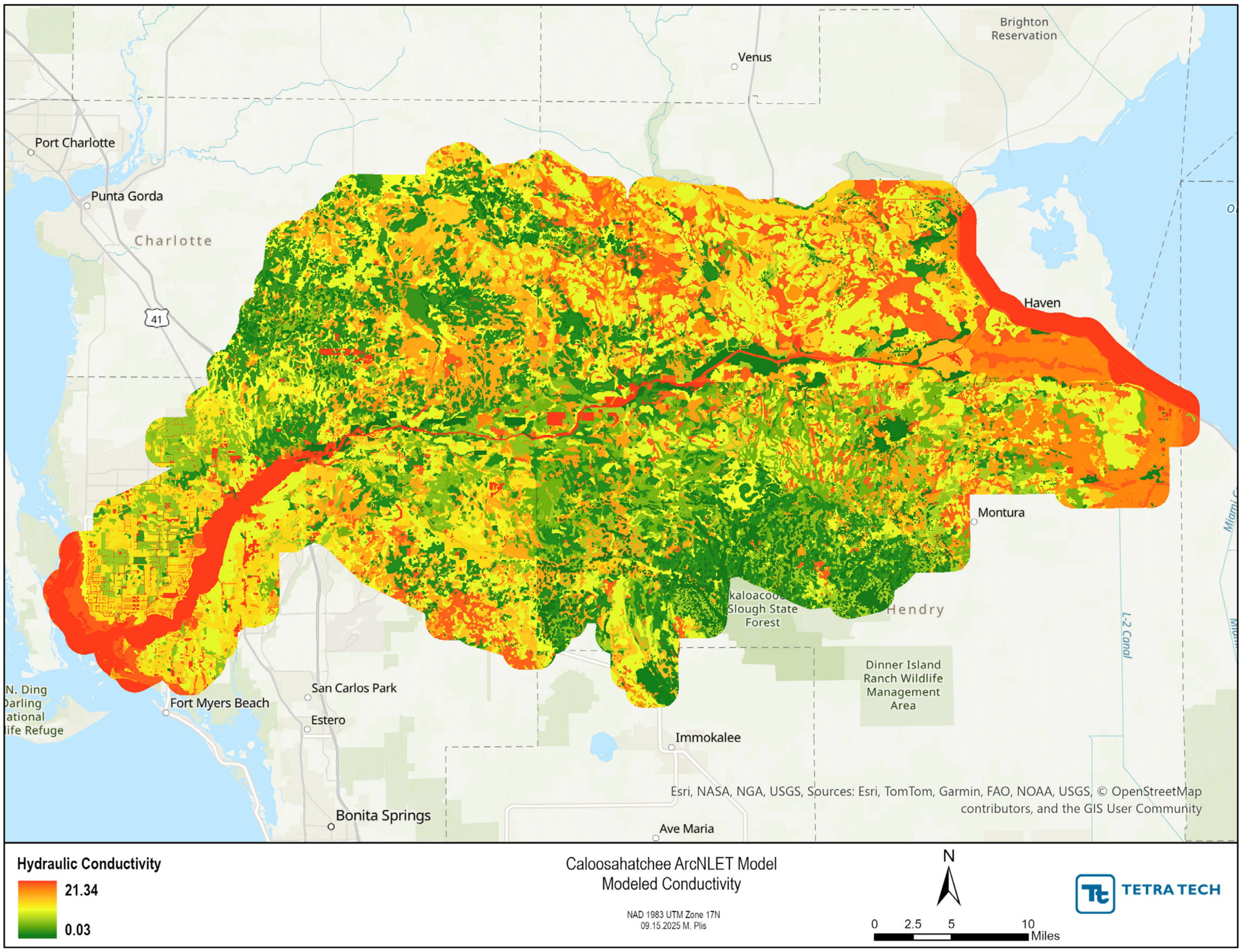

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Figure 7. Modeled Conductivity

2.5 GROUNDWATER LEVELS

DEP provided Tetra Tech with groundwater well measurements from the Watershed Information Network (WIN) database. After screening for wells that measure in the unconfined surficial aquifer, 11 wells were selected for hydrologic calibration. All well locations were reprojected to UTM Zone 17N and their average water-level elevations were calculated and converted to meters relative to NAVD88. Figure 8 maps the calibration wells, and Table 2 lists each site's average water level elevation.

Table 2: Groundwater Level Data Availability

DEP_ID	Well Type	Aquifer Confinement	Average Water Level (meters NAVD88)
3053	Groundwater Quality Monitoring Well	Unconfined	10.50
3056	Groundwater Quality Monitoring Well	Unconfined	7.82
3059	Groundwater Quality Monitoring Well	Unconfined	4.34
3061	Groundwater Quality Monitoring Well	Unconfined	8.11
3062	Groundwater Quality Monitoring Well	Unconfined	8.11

DEP_ID	Well Type	Aquifer Confinement	Average Water Level (meters NAVD88)
3066	Groundwater Quality Monitoring Well	Unconfined	4.84
3095	Unknown	Unconfined	1.92
3109	Groundwater Quality Monitoring Well	Unconfined	4.24
24182	Unknown	Unconfined	0.73
39163	Groundwater Quality Monitoring Well	Unconfined	7.20
263839081203901	USGS Well	Unconfined	8.15

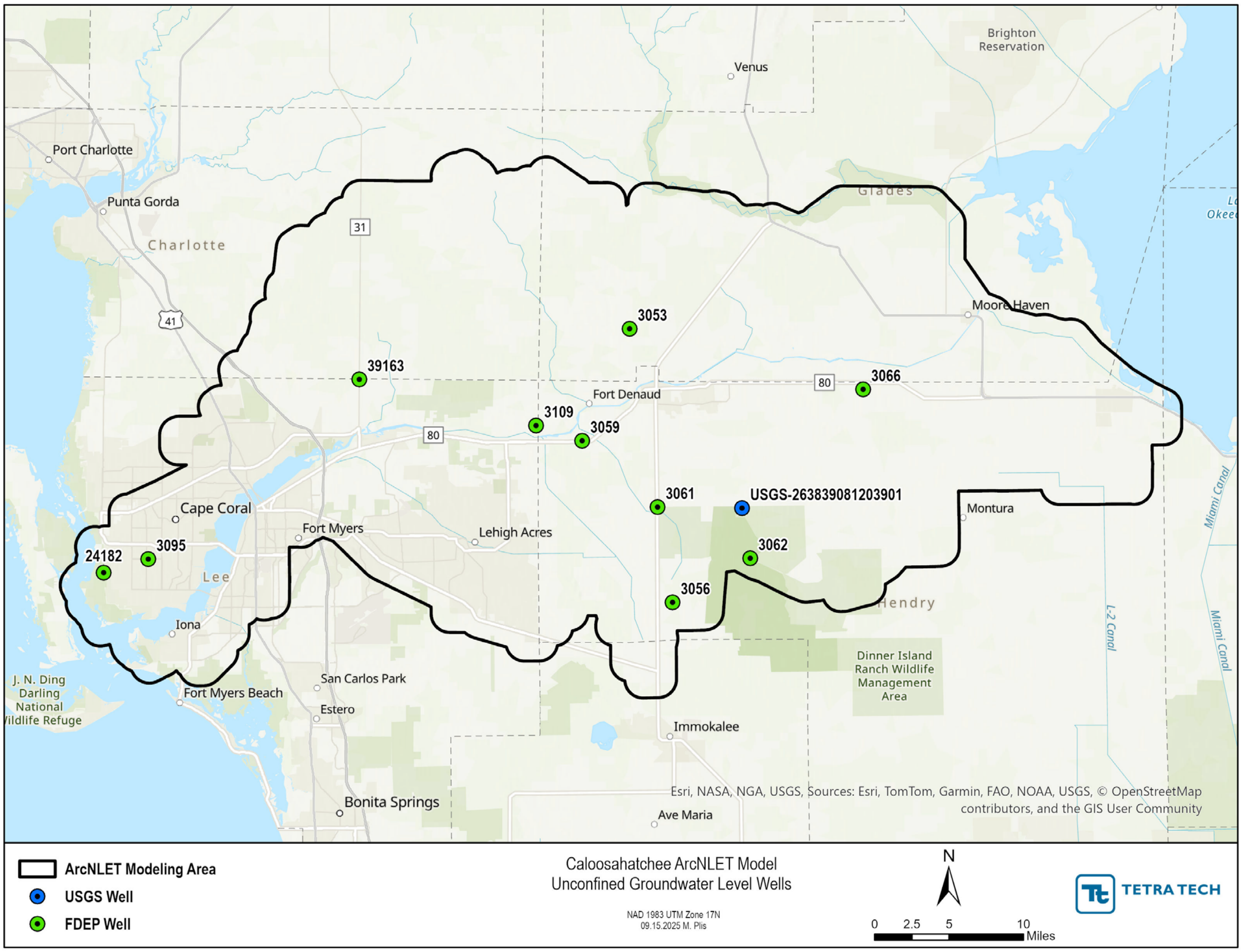


Figure 8. Wells Used in the Hydrology Calibration

2.6 GROUNDWATER WATER QUALITY

Groundwater quality measurements were drawn from the same WIN dataset used for hydrologic calibration. Tetra Tech screened available samples for NO_3, ammonia (NH_4), PO_4, and total phosphorus (TP), retaining only those wells in the unconfined surficial aquifer. There was only one PO_4 measurement, so TP measurements are used in the calibration. Most wells had a single data point per constituent. For each of the 14 selected sites, Tetra Tech computed a mean concentration across all samples. Figure 9 shows the spatial distribution of these calibration wells and Table 3 summarizes the available measurements. Notably, well 4406 exhibited an anomalously high TP concentration (1.8 milligrams per liter [mg/L]), which was far above all other calibration sites. This point was treated as an outlier and calibration did not attempt to match this value.

Table 3. Calibration Wells Used in the ArcNLET-Py Model

DEP_ID	Aquifer Confinement	Average NO_3 (mg/L)	Average NH_4 (mg/L)	Average TP (mg/L)
3053	Unconfined	0.004	0.380	0.004
3056	Unconfined	0.004	0.310	0.148
3059	Unconfined	0.004	0.410	0.230
3061	Unconfined	0.004	0.860	0.210
3062	Unconfined	0.024	0.680	0.515
3066	Unconfined	0.004	0.367	0.018
3095	Unconfined	0.004	0.165	0.495
3109	Unconfined	0.005	0.382	0.069
4406	Unconfined	0.004	0.093	1.800
4408	Unconfined	0.004	0.210	0.012
4548	Unconfined	0.004	0.310	0.006
4555	Unconfined	0.004	0.540	0.009
24182	Unconfined	0.004	0.680	0.170
39163	Unconfined	0.004	0.203	0.019

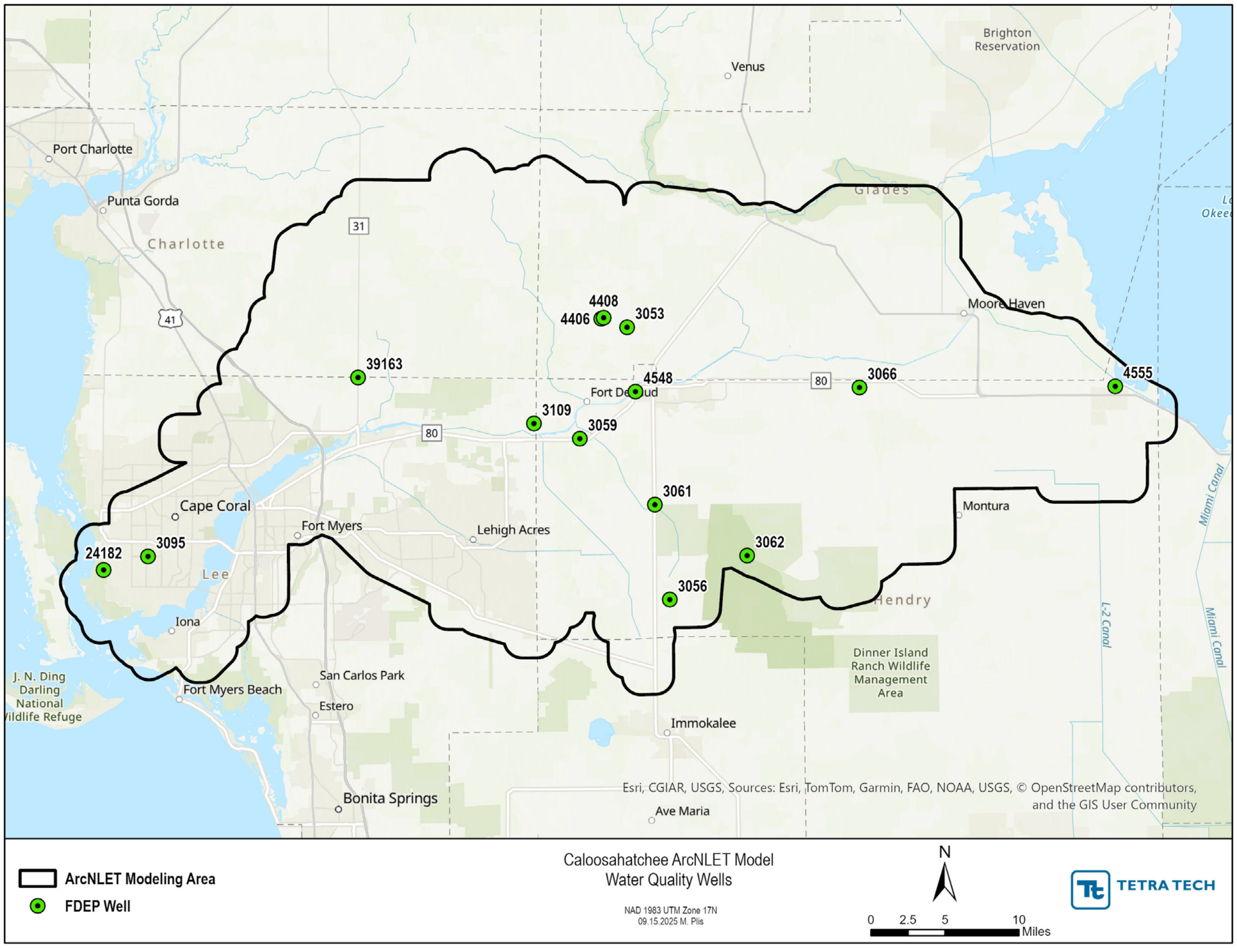


Figure 9. Wells used in Nitrogen and Phosphorus Calibration

3.0 ARCNLET-PY MODEL CALIBRATION

The ArcNLET-Py model was calibrated in three sequential modules – groundwater flow, particle tracking, and reactive nitrogen and phosphorus transport under a steady state assumption. Tetra Tech did not activate the vadose zone routine because the groundwater flow calibration showed the water table is typically within one meter of land surface across most of the watershed, making unsaturated zone travel distances negligible.

3.1 GROUNDWATER FLOW CALIBRATION

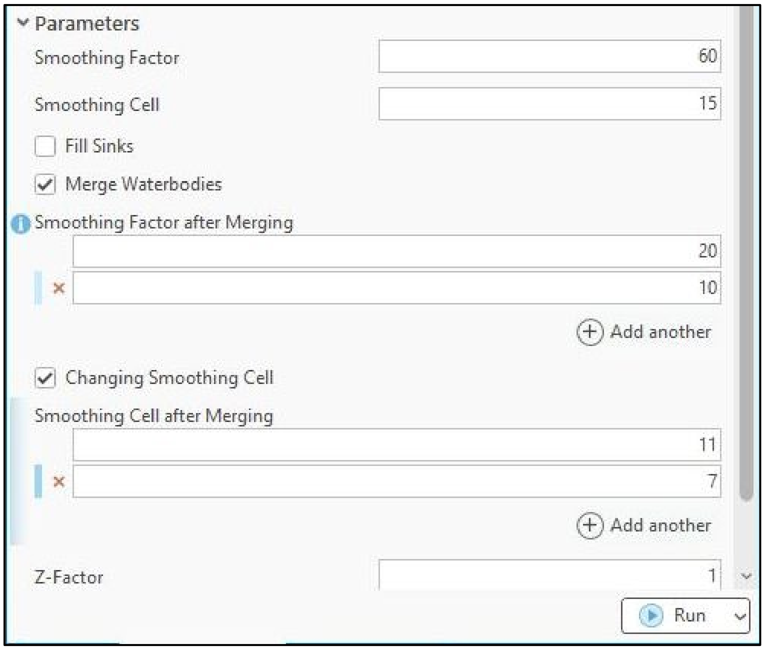
ArcNLET-Py's groundwater flow module relies on a smoothed DEM surface to approximate the steady state water table and to calculate both hydraulic gradients and flow directions. Calibration therefore centers on selecting an appropriate smoothing parameter that minimizes the difference between modeled heads (smoothed DEM) and measured groundwater levels, while also yielding realistic flow path geometries when used in the subsequent particle tracking routine. This is an iterative process. Tetra Tech evaluated a series of smoothing factors ranging from 10 to 150 applied to the 10 meter DEM. For each candidate smoothing factor, Tetra Tech:

- Generated the smoothed DEM surface.

- Extracted modeled head values at the 11 calibrations well locations and performed a linear regression against the observed mean heads. Computed the slope, intercept, R^2, and root-mean-square error (RMSE).
- Ran the particle tracking algorithm using the smoothed surface and inspected the resulting flow lines in ArcGIS Pro, verifying that flow directions radiated smoothly downslope without abrupt reversals or inflection points and terminated at the mapped waterbodies rather than terminating inland or crossing ridges.

Of the multiple smoothing scenarios, a combination approach was the best fit. Tetra Tech applied an iterative three-step smoothing procedure re-imposing waterbody elevations between each pass to strike the right balance between statistical fit to observed heads and realistic flow-line geometry. First, a focal-mean smoothing was run with a 15-cell window and smoothing weight factor of 60, then the original waterbody elevations were merged back into the surface to ensure mapped sinks remained true to their known depths. Second, Tetra Tech repeated the smoothing at the weight factor of 20 over a 10-cell window, again restoring waterbody elevations. Finally, Tetra Tech applied a lighter smoothing (weight factor 11 over a 7-cell window) to remove residual high-frequency noise without undermining the overall gradient. Parameters are shown in Figure 10.

Comparison between the modeled and measured water level values show a good correlation. The final surface produced a regression slope of 1.03, intercept of +0.54 meters, R^2 of 0.98, the results are presented in Figure 11. Particle tracking lines comprised gently curving streamlines that consistently converged on river and canal polygons, with no spurious flow reversals or dead ends (Figure 12).



Parameters

Smoothing Factor 60

Smoothing Cell 15

☐ Fill Sinks

☑ Merge Waterbodies

Smoothing Factor after Merging

20

10

☑ Changing Smoothing Cell

Smoothing Cell after Merging

11

7

Z-Factor 1

Figure 10. Parameterization of the Groundwater Flow Module

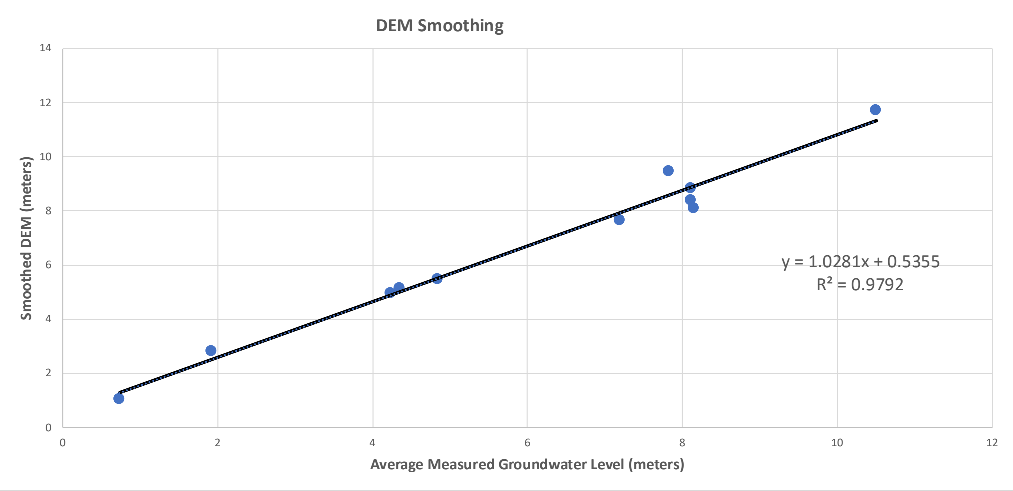


Figure 11. Parameterization of the Groundwater Flow Module

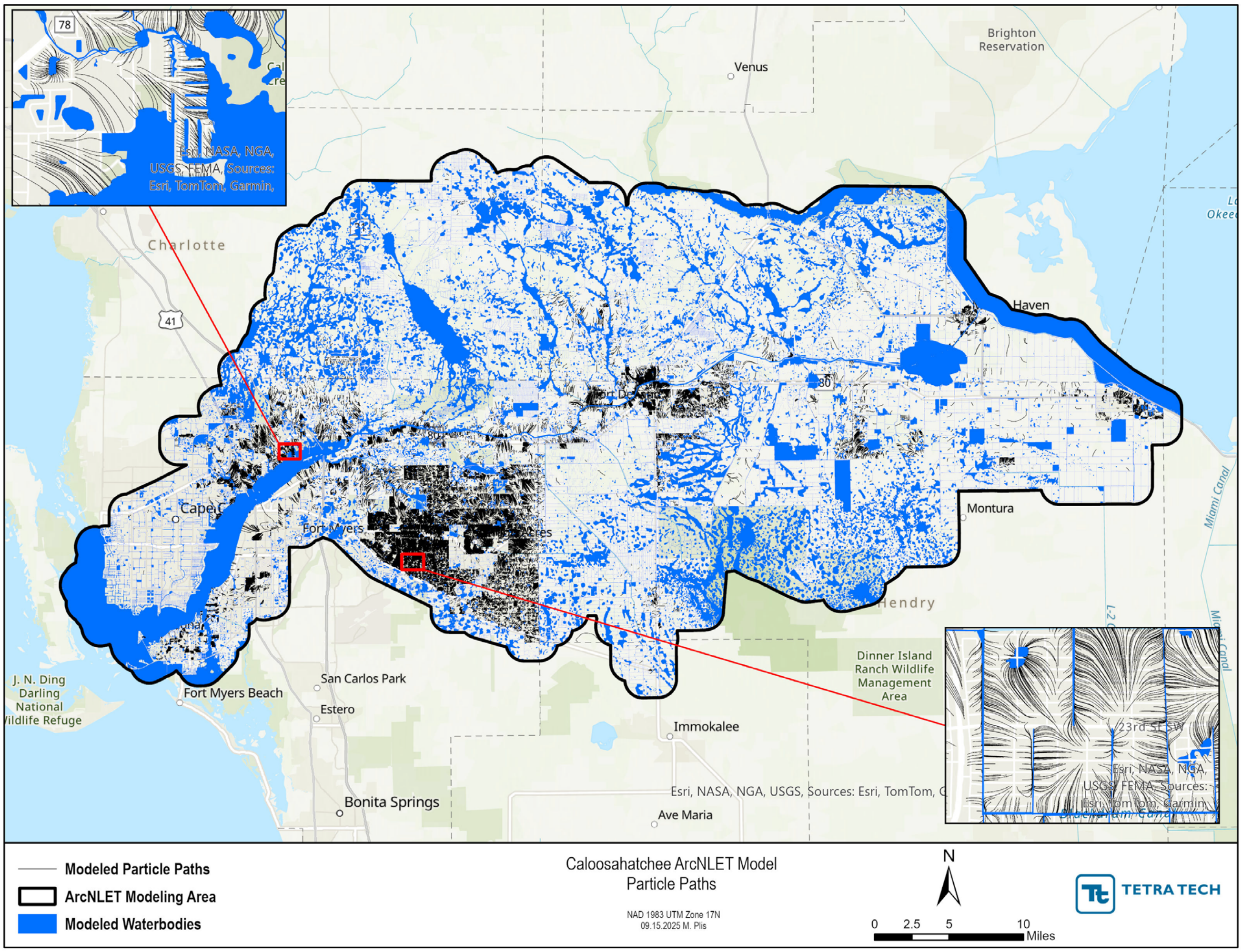


Figure 12. Modeled Particle Paths

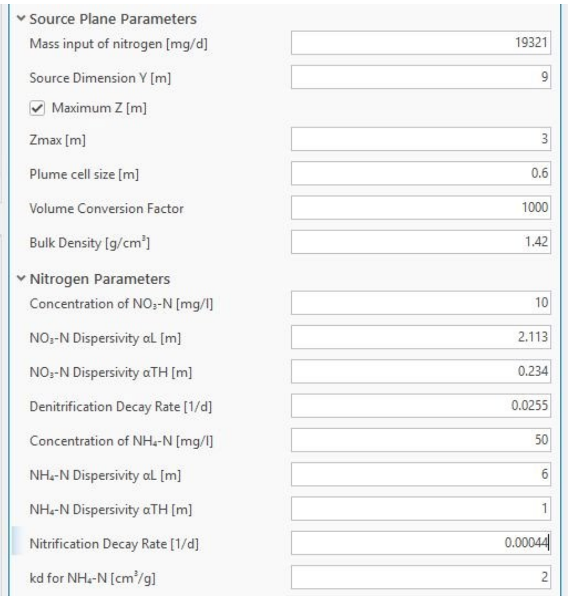
3.2 NITROGEN TRANSPORT CALIBRATION

Of the 14 surficial aquifer wells with DEP water quality data, only six (DEP_IDs 3059, 3066, 3109, 4406, 4408, and 4548) were located downgradient of OSTDS. Those six wells formed the calibration set.

OSTDS nitrogen inputs were set at 29.7 grams of total nitrogen (TN)/day/tank, based on the U.S. Environmental Protection Agency's (USEPA) 11.2 grams of TN/day/person and an average household size of 2.65 between Charlotte, Glades, Hendry, and Lee counties. Because the water table in the study area lies near land surface and the monitoring wells showed minimal NO_3 concentrations, Tetra Tech assumed negligible nitrification in the vadose zone. Consistent with Toor et al. (2011), Tetra Tech applied a 35% removal of TN in the septic tank and drainfield, resulting in 19.3 grams of TN/day/tank entering the groundwater. Tetra Tech then partitioned this at the groundwater interface into an applied concentration of 10 mg/L NO_3 and 50 mg/L NH_4.

Table 4 summarizes the measured versus modeled steady state concentrations of NO_3 and NH_4 at the six calibration wells. At these calibration wells, measured NO_3 concentrations were uniformly low, with five wells at the minimum detection limit of 0.004 mg/L and one well (3109) at 0.012 mg/L. Modeled NO_3 ranged from 0.000 mg/L at well 4406 up to 0.075 mg/L at well 4548. This corresponds to an average overprediction of about 0.03 mg/L (maximum bias +0.071 mg/L at well 4548) and a regression R^2 of 0.88. NH_4 measurements spanned 0.037–0.49 mg/L (mean 0.27 mg/L), whereas simulated NH_4 varied from 0.000 mg/L at well 4406 to 0.410 mg/L at well 3059. The model closely matched five of six sites, with mean absolute error ≤ 0.06 mg/L, but underpredicted at well 4406 (0.000 versus 0.093 mg/L), yielding an R^2 of 0.92 and a mean bias of –0.06 mg/L.

The overprediction of NO_3 likely reflects the model's assumption of continuous nitrification of NH_4 in groundwater. Simulated NO_3 and NH_4 concentrations remain within an order of magnitude of observed suggesting a reasonable calibration. Final nitrogen transport parametrization is shown on Figure 13 and the resulting NO_3 and NH_4 plumes in Figure 14 and Figure 15.



Source Plane Parameters

Mass input of nitrogen [mg/d]	19321
Source Dimension Y [m]	9
☑ Maximum Z [m]	
Zmax [m]	3
Plume cell size [m]	0.6
Volume Conversion Factor	1000
Bulk Density [g/cm³]	1.42

Nitrogen Parameters

Concentration of NO₃-N [mg/l]	10
NO₃-N Dispersivity αL [m]	2.113
NO₃-N Dispersivity αTH [m]	0.234
Denitrification Decay Rate [1/d]	0.0255
Concentration of NH₄-N [mg/l]	50
NH₄-N Dispersivity αL [m]	6
NH₄-N Dispersivity αTH [m]	1
Nitrification Decay Rate [1/d]	0.00044
kd for NH₄-N [cm³/g]	2

Figure 13. Parameterization of the Nitrogen Transport Module

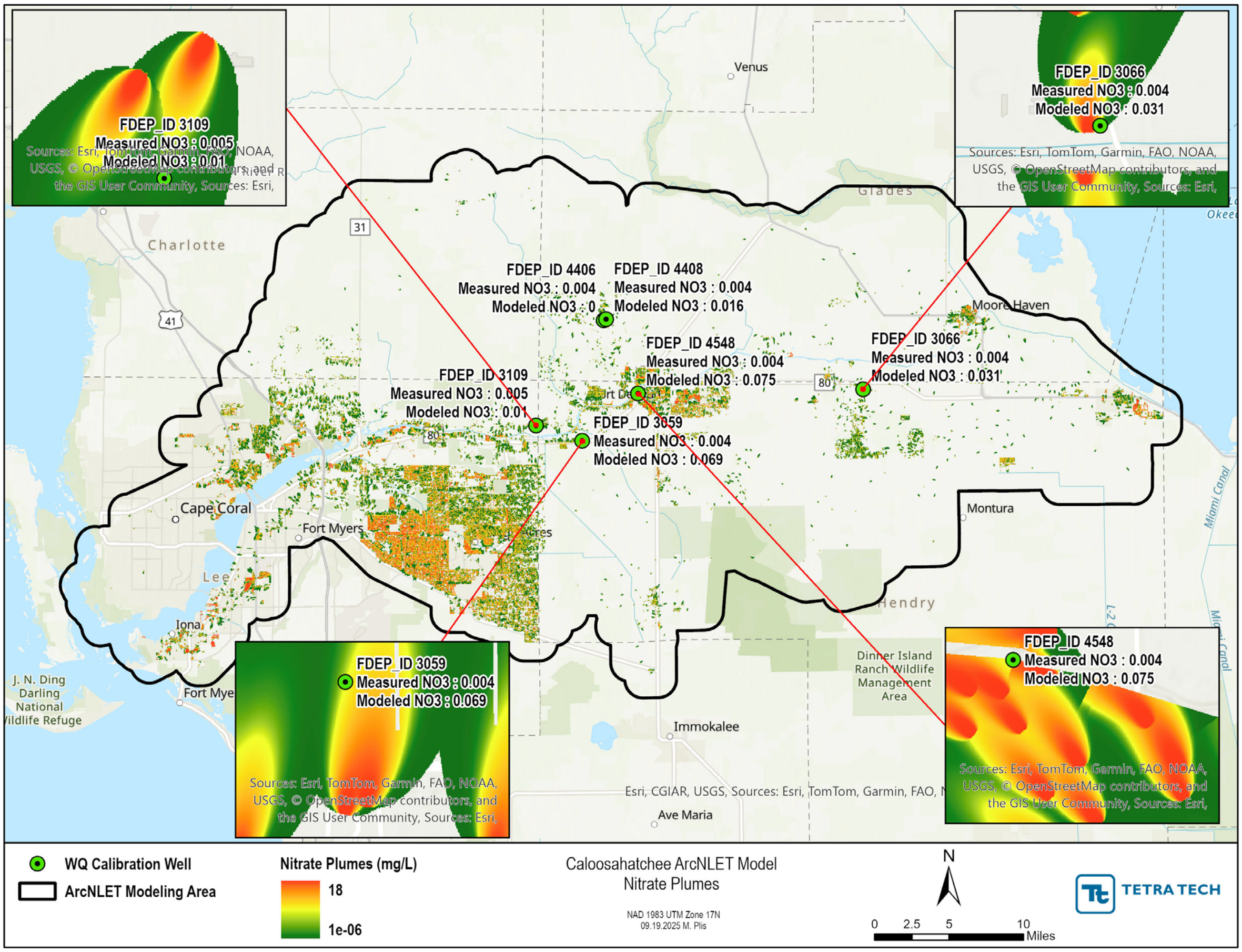


Figure 14. Calibrated NO_3 Plumes Compared to Measured Values

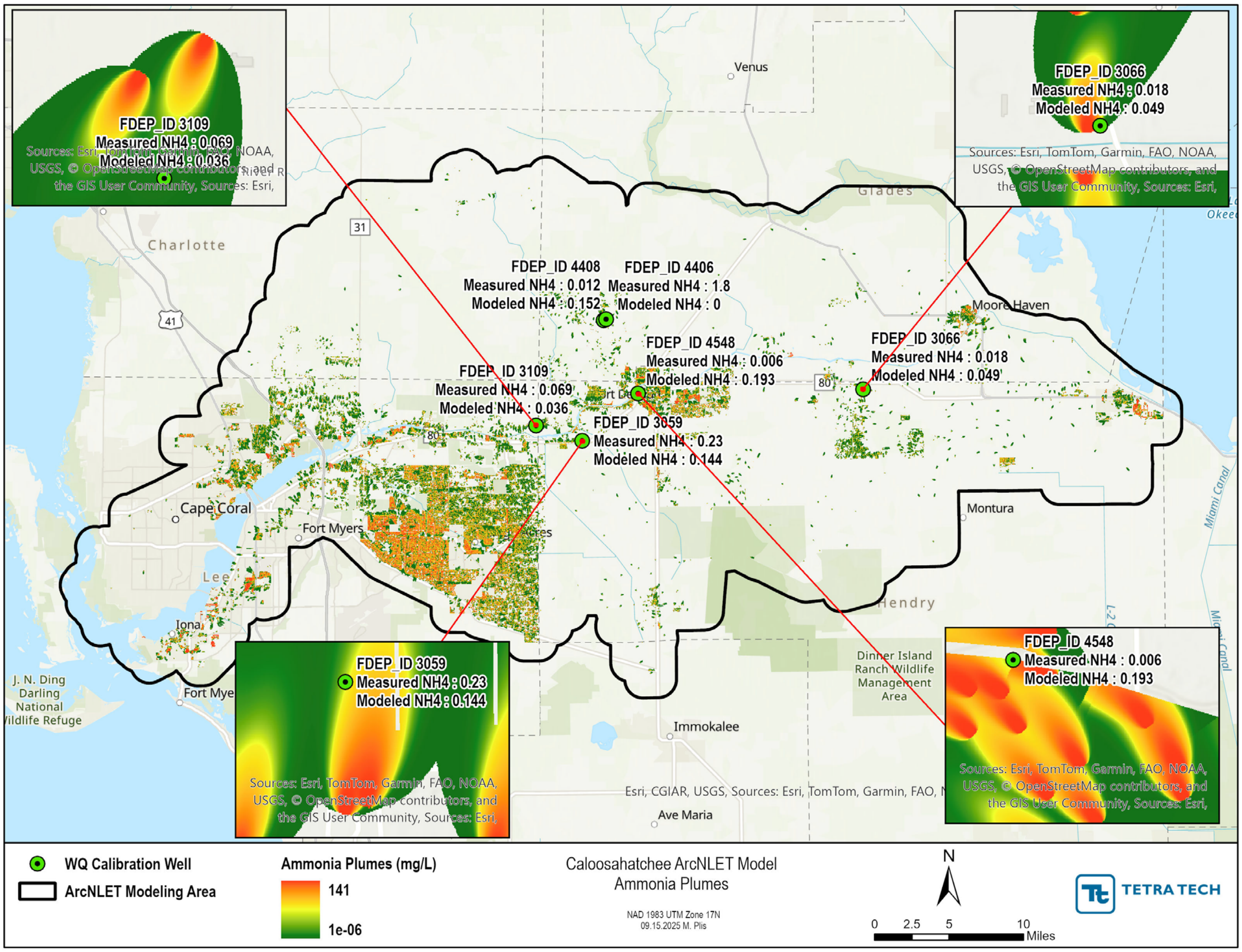


Figure 15. Calibrated NH_4 Plumes Compared to Measured Values

Table 4. Comparison of Measured and Modeled Nitrogen

DEP_ID	Measured NO_3 (mg/L)	Modeled NO_3 (mg/L)	Measured NH_4 (mg/L)	Modeled NH_4 (mg/L)
3059	0.004	0.069	0.410	0.410
3066	0.004	0.031	0.310–0.430	0.273
3109	0.004–0.012	0.010	0.037–0.490	0.028
4406	0.004	0.000	0.092–0.094	0.000
4408	0.004	0.016	0.210	0.235
4548	0.004	0.075	0.310	0.354

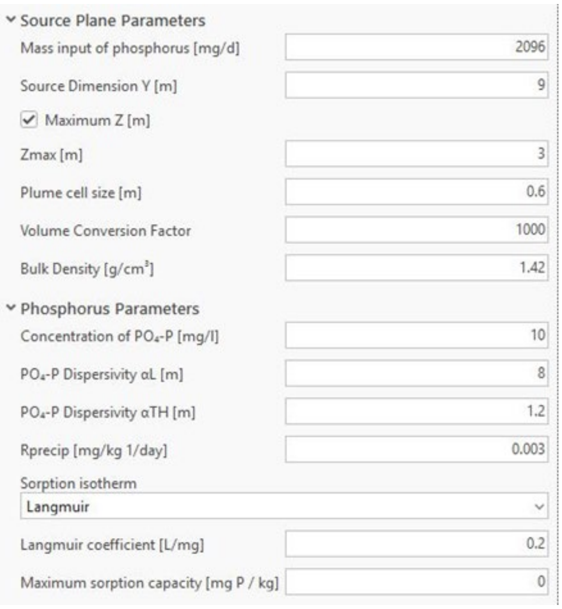
3.3 PHOSPHORUS TRANSPORT CALIBRATION

OSTDS phosphorus inputs were based on an USEPA estimate of 2.7 grams/day/person phosphorus load. Using an average household size of 2.65 persons, this yields 7.2 grams of phosphorus/day/tank. Based on Toor et al. (2011) Tetra Tech accounted for in-tank sludge settling (assumed 25% loss) and rapid phosphorus precipitation in the drainfield (61%

removal). resulting in a net groundwater phosphorus input of 2.1 grams of phosphorus/day/tank. A concentration of 10 mg/L PO_4 was applied at each point source.

The OSTDS layer included a free-text "WW_SRC_NAM" field that often contained either a construction-approval date or the date of the last repair, plus a generic "2009 Inventory" tag for OSTDS with no later record. Tetra Tech ran a parser to pull out the year of each OSTDS' most recent interaction, which showed that 86% of OSTDS had their last recorded date more than six years before the 2023 model run, 7% had a date within the past six years, and 7% had no date. Based on Mechtensimer and Toor (2016), which shows that a year of effluent loading saturates 18% of a drainfield's phosphorus sorption capacity, and given that most local systems exceed six years of service, Tetra Tech assumed full sorption capacity exhaustion in the surrounding soils. Final phosphorus parameterization is shown on Figure 16.

Of the six wells downgradient of OSTDS (DEP_IDs 3059, 3066, 3109, 4406, 4408, 4548), no dissolved PO_4 data were available; therefore TP measurements were used as the calibration target. Table 5 compares the observed TP concentrations against the modeled PO_4 values. Simulated PO_4 generally falls within the same order of magnitude as measured TP, although the model underpredicts the high TP reading at well 4406 (0 mg/L vs. 1.8 mg/L observed) and overpredicts at wells 4408 and 4548. Given the inherent uncertainties in soil sorption rates and the use of TP in lieu of PO_4, the model's performance is acceptable for estimating watershed wide OSTDS derived phosphorus loads.



Source Plane Parameters

Mass input of phosphorus [mg/d]	2096
Source Dimension Y [m]	9
☑ Maximum Z [m]	
Zmax [m]	3
Plume cell size [m]	0.6
Volume Conversion Factor	1000
Bulk Density [g/cm³]	1.42

Phosphorus Parameters

Concentration of PO_4-P [mg/l]	10
PO_4-P Dispersivity αL [m]	8
PO_4-P Dispersivity αTH [m]	1.2
Rprecip [mg/kg 1/day]	0.003
Sorption isotherm	Langmuir
Langmuir coefficient [L/mg]	0.2
Maximum sorption capacity [mg P / kg]	0

Figure 16. Parameterization of the Phosphorus Transport Module

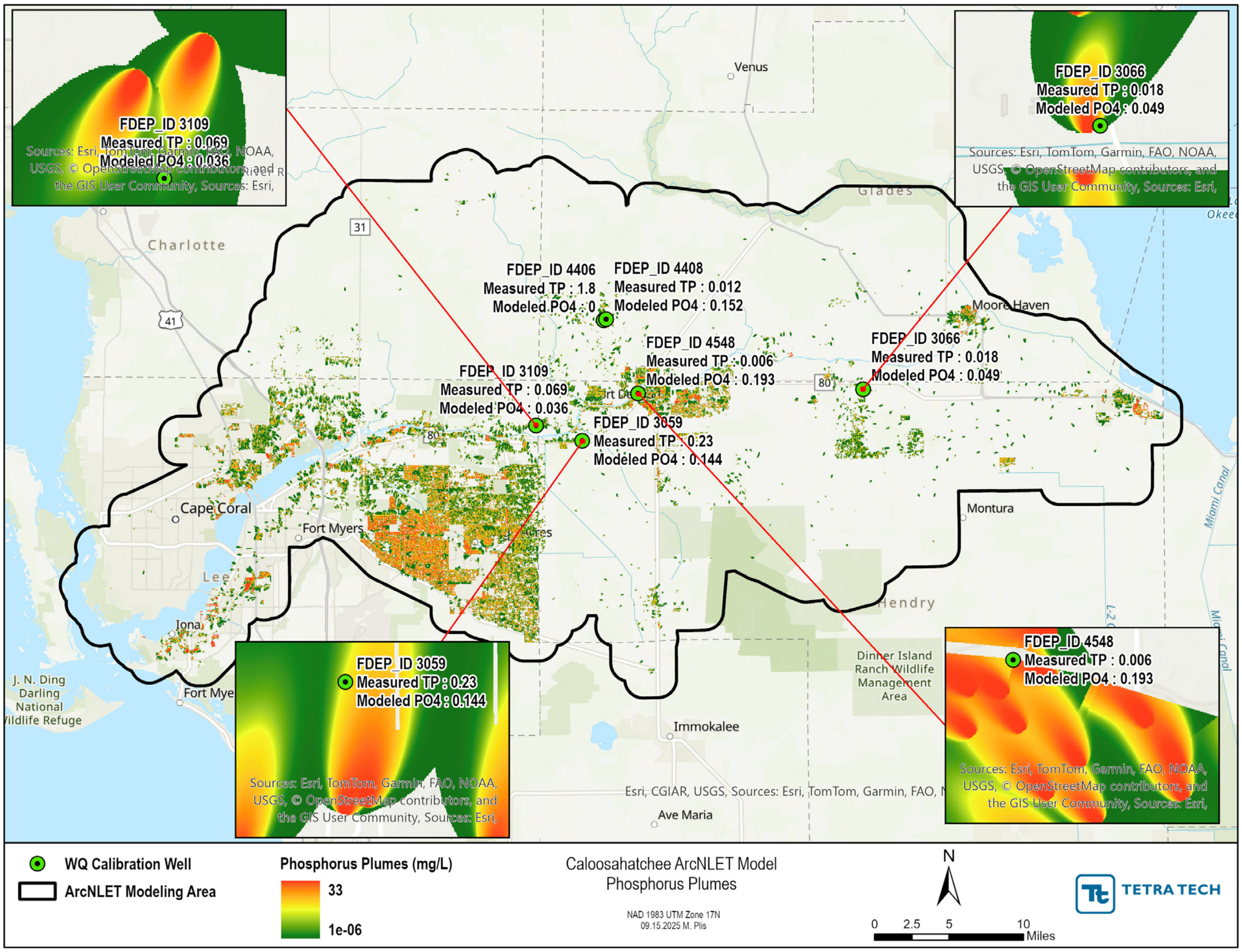


Figure 17. Calibrated Phosphorus Plumes Compared to Measured Values

Table 5. Comparison of Measured and Modeled Phosphorus

DEP_ID	Measured TP (mg/L)	Modeled PO_4 (mg/L)
3059	0.230	0.144
3066	0.017–0.019	0.049
3109	0.045–0.550	0.036
4406	1.800	0.000
4408	0.012	0.152
4548	0.006	0.193

4.0 MODEL RESULTS AND OUTPUT LOADS

Once calibration was complete, Tetra Tech ran ArcNLET-Py for all 51,840 OSTDS across the modeling domain. The model produced rasters of NO_3, NH_4, and PO_4 as well as point shapefiles containing loads. Using GIS, each OSTDS output was joined to its associated HSPF subwatershed polygon. Within each subwatershed, the individual loads were summed to derive TN and TP loads for that HSPF model reach.

4.1 NITROGEN LOADS

The NO_3 and NH_4 loads were summed and tabulated, summarized, and assigned to each HSPF model reach as a point source inflow. Total load from the entire model showed 173,534.56 pounds per year (lbs/yr) of nitrogen is going into the system. Overall loads spanned between 0.00 and 14.27 lbs/yr/OSTDS, with an average of 3.35 lbs/yr/OSTDS. Figure 18 shows the summed loads to each HSPF reach, and Table 6 shows the per-reach load that is input into the HSPF model.

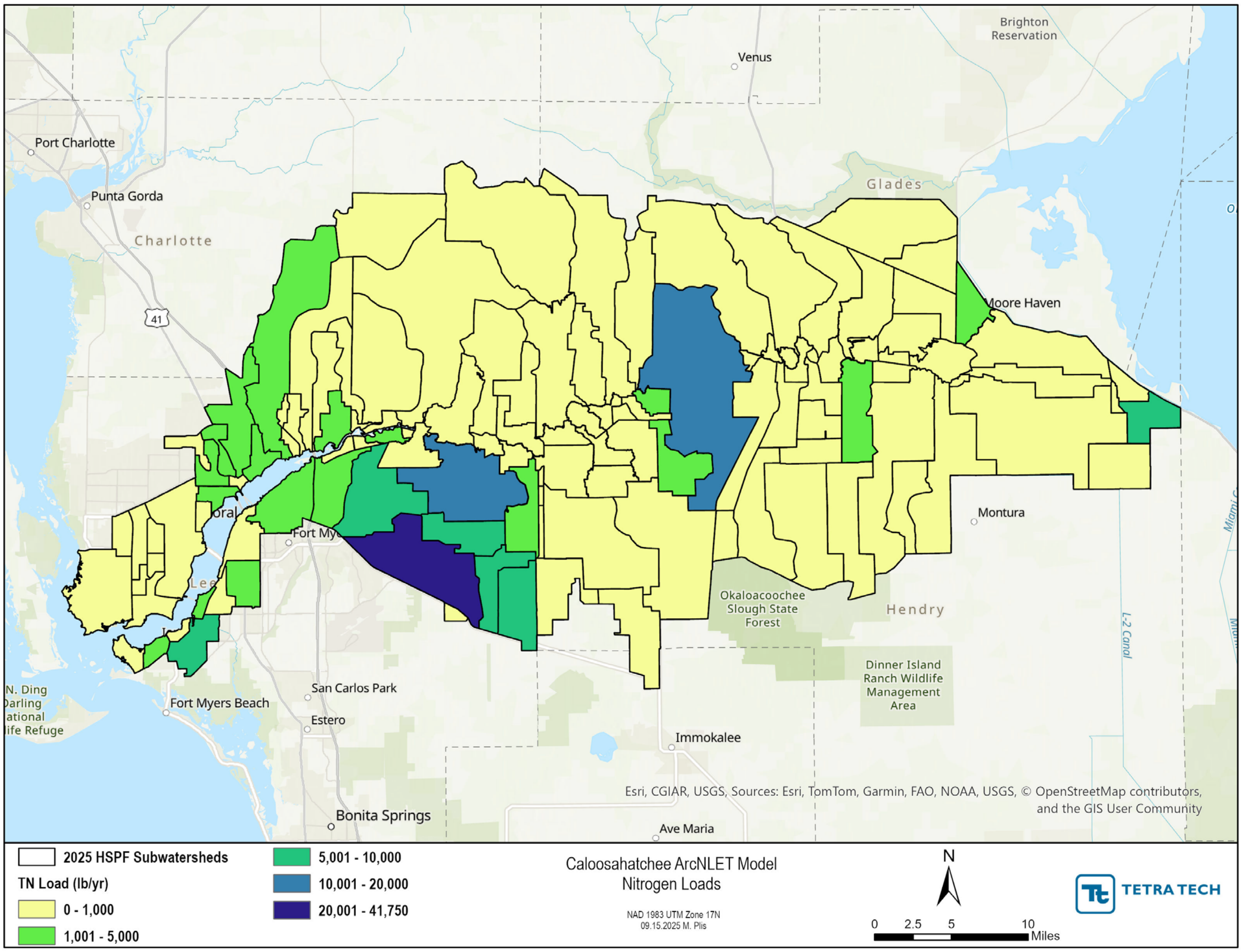


Figure 18. Modeled Nitrogen Loads per HSPF Subwatershed

Table 6. Summary of Nitrogen Load to HSPF Reach

HSPF Reach ID	TN Load (lbs/yr)	HSPF Reach ID	TN Load (lbs/yr)	HSPF Reach ID	TN Load (lbs/yr)
101	3.44	142	9,554.87	183	35.20
102	30.67	143	5,806.73	184	0.00
103	0.00	144	48.23	185	70.84
104	0.00	145	530.73	186	5.75
105	27.01	146	2,170.93	187	44.01
106	0.00	147	705.78	188	210.72

HSPF Reach ID	TN Load (lbs/yr)	HSPF Reach ID	TN Load (lbs/yr)	HSPF Reach ID	TN Load (lbs/yr)
107	0.00	148	14,455.00	189	241.86
108	302.25	149	685.34	190	0.00
109	957.38	150	181.74	191	8.70
110	1,527.55	151	695.13	192	94.28
111	1,637.29	152	264.80	193	0.14
112	699.79	153	4,019.89	194	18.57
113	491.98	154	489.45	195	0.00
114	1,025.93	155	26.38	196	93.92
115	1,865.52	156	150.61	197	199.83
116	3,915.35	157	36.23	198	55.87
117	3,226.85	158	133.76	199	1,066.26
118	220.68	159	135.25	200	6.88
119	779.48	160	8,214.49	201	133.31
120	520.97	161	4.63	202	2.23
121	846.13	162	16.94	203	600.44
122	1,301.05	163	216.63	204	2.90
123	44.52	164	444.31	205	6.82
124	291.80	165	298.82	206	11.31
125	50.75	166	68.06	207	8.37
126	124.47	167	0.00	208	31.58
127	320.99	168	387.45	209	22.93
128	4.04	169	467.83	210	9.42
129	284.90	170	151.41	211	0.00
130	1,563.70	171	830.11	212	46.79
131	708.77	172	665.78	213	689.15
132	7,043.18	173	161.88	214	234.33
133	1,865.10	174	12.82	215	2,328.74
134	406.34	175	1,257.96	216	310.68
135	4,094.09	176	357.28	217	90.67
136	217.81	177	705.56	218	418.84
137	1,316.81	178	2,320.69	219	5,343.55
138	2,710.44	179	711.10	220	0.11
139	9,255.76	180	11,128.66	221	182.38
140	41,749.68	181	22.98		
141	936.31	182	2.15		

4.2 PHOSPHORUS LOADS

The PO_4 loads were summed and tabulated, summarized and assigned to each HSPF model reach as point source inflow. TP load from the entire model showed 71,577.60 lbs/yr of phosphorus is going into the system. Overall loads spanned between 0.00 and 1.68 lbs/yr/OSTDS, with an average of 1.38 lbs/yr/OSTDS. Figure 18 shows the summed loads to each HSPF reach, and Table 7 shows the per-reach load that is input into the HSPF model.

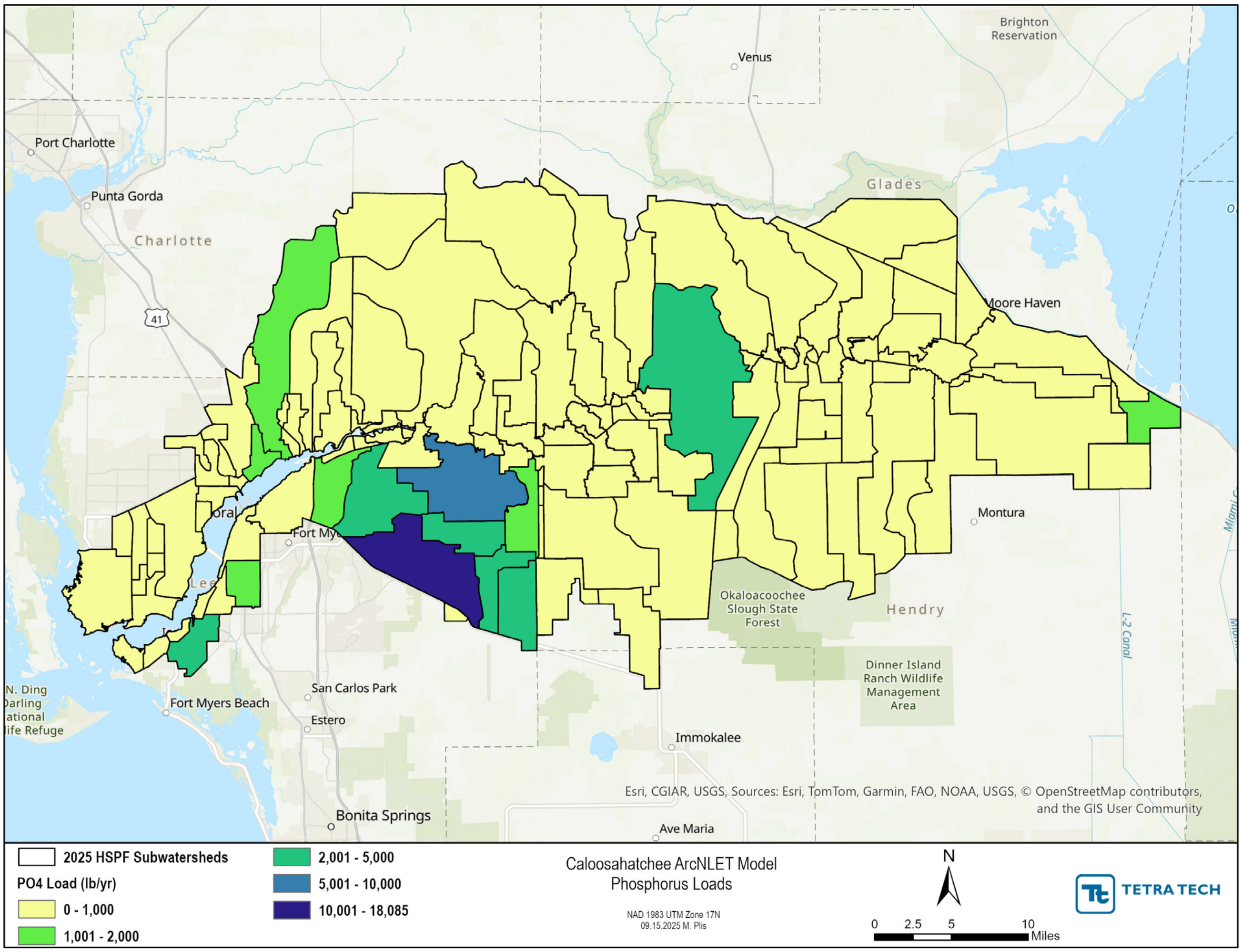


Figure 19. Modeled Phosphorus Plumes

Table 7. Summary of Phosphorus Load to HSPF Reach

HSPF Reach ID	TP Load (lbs/yr)	HSPF Reach ID	TP Load (lbs/yr)	HSPF Reach ID	TP Load (lbs/yr)
101	1.61	142	4,263.97	183	25.80
102	16.17	143	2,311.88	184	0.00
103	0.00	144	21.04	185	32.37
104	0.00	145	286.13	186	3.23
105	8.15	146	720.80	187	16.25
106	0.00	147	235.93	188	55.44
107	0.00	148	6,099.94	189	85.84
108	147.21	149	280.32	190	0.00
109	321.87	150	73.01	191	6.44
110	508.91	151	326.75	192	42.07

HSPF Reach ID	TP Load (lbs/yr)	HSPF Reach ID	TP Load (lbs/yr)	HSPF Reach ID	TP Load (lbs/yr)
111	565.51	152	147.04	193	0.00
112	312.38	153	1,668.29	194	12.90
113	213.71	154	239.49	195	0.00
114	402.23	155	12.94	196	37.31
115	741.21	156	88.76	197	87.49
116	1,147.74	157	19.39	198	24.29
117	1,265.33	158	39.12	199	482.63
118	119.52	159	71.12	200	4.83
119	325.71	160	3,493.45	201	26.30
120	244.36	161	3.22	202	1.61
121	378.84	162	12.88	203	284.89
122	576.36	163	108.37	204	1.61
123	17.85	164	206.83	205	3.23
124	124.78	165	123.10	206	4.86
125	22.68	166	25.90	207	1.64
126	47.09	167	0.00	208	12.98
127	134.47	168	186.09	209	8.14
128	3.21	169	219.94	210	4.86
129	81.54	170	71.18	211	0.00
130	714.02	171	370.62	212	24.27
131	232.43	172	217.53	213	341.22
132	2,768.51	173	71.35	214	105.26
133	537.84	174	4.86	215	778.80
134	147.77	175	501.24	216	99.19
135	1,951.71	176	165.08	217	46.88
136	101.96	177	331.30	218	179.81
137	517.44	178	991.51	219	1,541.03
138	1,033.32	179	310.66	220	0.00
139	3,852.69	180	4,776.54	221	92.32
140	18,084.84	181	9.72		
141	321.89	182	1.61		

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