TETRA TECH

ADDENDUM

To:	Chuck Hauber, Brian Olson, Summit County Engineer (SCE)
From:	Cole Blasko, Kevin Kratt, Bill Carlson, Tetra Tech Inc.
Date:	August 27, 2026
Subject:	Addendum to the Aurora Shores 2-D HEC-RAS Model Memorandum

EXECUTIVE SUMMARY

This addendum documents the expanded hydraulic modeling and additional analyses completed as part of further work on the Cuyahoga River and Little Cuyahoga River Watershed Study for the Summit County Engineer (SCE). The purpose of this addendum is to supplement the original memorandum dated April 11, 2025, entitled "Aurora Shores 2-D HEC-RAS Model" (Tetra Tech, 2025), which evaluated flooding within the Aurora Shores neighborhood of Reminderville, Ohio. The original memorandum presented the results of five model scenarios (Scenarios 1–5) run using Tetra Tech's 2-D HEC-RAS model and one model scenario (Scenario 6) run using a 1-D HEC-RAS model developed by another consultant.

Project Timeline

Following the April 2025 analyses and a subsequent public meeting held on August 18, 2025, SCE requested additional scenarios be run to address new potential solutions to the Aurora Shores flooding. These scenarios were evaluated under a wider range of hydrologic conditions than had been done for a previous effort. Specifically, the expanded scope was developed to:

- Assess flooding under multiple design storms (1-, 2-, 10-, and 100-year design storms).
- Quantify surface water ponding and recovery over a 5-day simulation period by incorporating infiltration into the model using soil parameters.
- Evaluate the effects of modifying, removing, or adding to existing ditch and wetland control structures to improve drainage from the backyards along Windjammer Trail and Sea Ray Cove.

To address these objectives, Tetra Tech updated the existing HEC-RAS model described in the April 2025 memorandum (Tetra Tech, 2025). The updated model was run for the four new design storms under existing conditions and with modifications representative of proposed improvements (Scenario 7) for a total of eight additional model runs (i.e., existing conditions for four design storms and Scenario 7 for four design storms).

Following completion of the Existing Conditions and Scenario 7 analyses, two developments warranted additional hydraulic modeling. First, after presentation of the Scenario 7 results in February 2026, Summit Metroparks indicated that they could not support several of the proposed improvements because of permitting considerations and a desire to maintain the original design of the restored wetlands. Second, in March 2026, SCE informed Tetra Tech that OHM Advisors had completed a study proposing a diversion culvert along the Pirates Trail tributary and a detention basin near Anchorage Cove. In response to these events, SCE approved a second scope amendment on June 16, 2026, to evaluate two additional scenarios under the four design storms, resulting in eight additional model simulations. The expanded analyses were developed to address the following questions:

- Can the stormwater improvements proposed by OHM Advisors be implemented concurrently with the proposed drainage improvements without adversely affecting flooding within the primary area of concern?

- If the drainage improvements not supported by Summit Metroparks are removed from the model, do the remaining improvements still provide meaningful reductions in flood depth and ponding duration?

Existing Conditions Model

The existing conditions model represents field conditions observed by Tetra Tech during the week of October 20th, 2025. Multiple field observations contrasted with the wetland and restoration plans outlined in the Pond Brook/Liberty Park Final Mitigation Plan prepared for Ohio Department of Transportation (ODOT; Wetlands Resource Center et al., 2006), which had been used to setup the original HEC-RAS model. The primary differences Tetra Tech observed in the field compared to the mitigation plan were:

1. absence of three wetland control structures including the Agri-Drain adjacent to Wetland Cell 1,
2. absence of the water leveling pipe between Wetland Cell 1 and Wetland Cell 2,
3. absence of the earthen plug at the outlet of Wetland Cell 3.

In addition, Tetra Tech updated the operational elevation of the Agri-Drains at the outlet of Wetland Cell 2 and Wetland Cell 3 from 992.5 feet as listed in the Pond Brook/Liberty Park Final Mitigation Plan (Wetlands Resource Center et al., 2006) to the elevations recorded in the field of 992.0 ft for both structures. Finally, Tetra Tech modified the Manning's n value within Ditches 1 and 2 to be more representative of what was observed in the field (i.e., very heavily vegetated).

Model results for existing conditions indicate that flooding occurs during frequent 1- and 2-year design storms. Under the 1-year storm, the model predicts widespread shallow flooding across the low-lying residential backyards east of Wetland Cell 1, with maximum depths approaching approximately one foot in localized depressions immediately following peak precipitation. These results match photographs provided by residents, including a set of images taken at a single location that shows shallow standing water resulting from multiple rain events since 2021. With the model extended to a five-day simulation period, results indicate that while some floodwaters drain from the area, residual ponding persists for multiple days in areas lacking adequate slope or drainage pathways. These model results are consistent with homeowner observations and photographs which provide confidence that the existing conditions model reasonably represents both the magnitude and duration of flooding currently experienced in the neighborhood.

Scenario Results

The following table summarizes each of the scenarios that have been run using the Aurora Shores 2-D HEC-RAS Model:

Scenario	Purpose
Existing Conditions	Represents field conditions observed during the October 2025 site visit and serves as the reference condition for comparison with all improvement scenarios. This scenario is also used to confirm that the model reasonably reproduces the magnitude and duration of flooding reported by homeowners.
Scenario 1 through Scenario 6	Not presented in this addendum. See the "*Aurora Shores 2-D HEC-RAS Model*" memorandum (Tetra Tech 2025) for information on these scenarios.
Scenario 7	Evaluates the complete set of Tetra Tech's proposed drainage improvements designed to reduce flood depths and ponding duration.
Scenario 8	Evaluates Scenario 7 together with the Pirates Trail diversion culvert and Anchorage Cove detention basin proposed by OHM Advisors. The purpose of this scenario is to determine whether these OHM Advisors projects adversely affect the primary area of concern or can be implemented concurrently with the improvements identified in Scenario 7.
Scenario 9	Evaluates only the Scenario 7 improvements supported by Summit Metroparks together with the OHM Advisors projects. The purpose is to determine whether the reduced set of improvements still provides meaningful reductions in flood depth and ponding duration.

The purpose of Scenario 7 is to test potential solutions to improve drainage through the construction of embankments, diversions, ditches, and swales. These components were identified through an iterative modeling approach with the goal of minimizing the extent and amount of time upon which the flooding occurs across all four design storms. In total, seven components are represented in the model by modifying the terrain. The eighth component is represented by changing the operational elevations of the Agri-Drains.

The proposed improvements evaluated under Scenario 7 result in a shorter duration of ponding across all modeled design storms and a reduction in maximum flood depths for the 10- and 100-year storms. Although minor localized backwater effects are observed for the 1- and 2-year storms, they are negligible in depth, brief, limited in extent, and do not offset the overall benefits. Most notably, flood depths within residential yards 24 hours after peak precipitation are reduced by approximately 1 to 2 feet relative to existing conditions for the 1-, 2-, 10-, and 100-year storms. These results demonstrate that the proposed ditch excavation, diversion embankment, and wetland connectivity improvements effectively redirect stormwater into Wetland Cell 1, increasing storage within the wetland while reducing inundation in residential areas. Time-series results further show that under existing conditions, yards remain flooded for several days, whereas under Scenario 7, most yard areas drain within approximately 24 to 54 hours following peak precipitation. Collectively, these results indicate that Scenario 7 meaningfully improves drainage performance, reduces the duration of flooding, and addresses the primary concerns expressed by Aurora Shores residents.

Scenario 7 results indicate that impacts to Wetland Cell 1 are largely positive. Under existing conditions, only minor inundation occurs within the wetland during frequent 1- and 2-year storms because the Agri-Drain specified in the Pond Brook/Liberty Park Final Mitigation Plan was never installed. The proposed diversion embankment in Scenario 7 achieves the same function as the Agri-Drain that was not installed by redirecting flows into the wetland while reducing flows along the adjacent ditch near the flooded residential area. In addition, the proposed swale excavation at the southern end of Wetland Cell 1 allows the wetland to maintain a zone of saturation while also providing temporary storage during larger storm events, supporting natural seasonal wetting and drying cycles. Collectively, these terrain-based modifications are expected to last longer, require less maintenance, and achieve the intended wetland functions more effectively than the originally proposed control structures.

Scenario 8 evaluated the proposed Scenario 7 improvements in combination with the stormwater improvements identified by OHM Advisors, including the Pirates Trail diversion culvert and Anchorage Cove detention basin. Results indicate that the OHM improvements provide localized flood reduction benefits near Regatta Trail and Anchorage Cove while having negligible impacts within the primary area of concern along Windjammer Cove, Windjammer Trail, and Sea Ray Cove. Overall, the improvements identified by OHM Advisors are compatible with the proposed drainage improvements and do not diminish the reductions in flood depth or ponding duration achieved under Scenario 7.

Scenario 9 evaluated only those proposed improvements from Scenario 7 supported by Summit Metroparks together with the improvements identified by OHM Advisors. Results indicate that the improvements approved by Summit Metroparks continue to reduce peak flood depths, particularly during the 10- and 100-year storms; however, reductions in ponding duration during the more frequent 1- and 2-year storms are less pronounced than under Scenario 7. These results suggest that the improvements not approved by Summit Metroparks (e.g., connecting the ephemeral channel in Wetland Cell 1, excavating an outlet swale in Wetland Cell 1, raising an embankment in Wetland Cell 2, and excavating swales in homeowner backyards) primarily function to accelerate drainage of residual ponded water following storm events, while the improvements supported by Summit Metroparks provide most of the reduction in peak flooding. In lieu of the proposed improvements that were not supported by Summit Metroparks, installation of localized backyard drainage swales, French drains, or similar drainage improvements by individual property owners could provide additional reductions in ponding duration. These improvements on residential properties are within the 100-year floodplain, but outside of the designated wetland footprint, which may reduce the permitting required to complete these homeowner-led improvements.

Groundwater Impacts

Tetra Tech also reviewed previous studies to qualitatively assess whether groundwater may contribute to the observed flooding. Piezometer data collected in 2012 and 2013 show that water table elevations fluctuate by approximately one foot and remain below ground in the affected backyards. This suggests a relatively slow groundwater response to individual storm events. Additionally, the water table slopes from east to west toward Pond Brook, with groundwater elevations consistently higher beneath residential backyards compared to Wetland Cell 1, indicating that the wetland may act as a localized groundwater sink. Previous studies also show that the highest water table elevations spatially coincide with areas of documented backyard flooding. A simplified conceptual projection of the water table surface suggests that Aurora Lake stage may influence groundwater elevations beneath the backyards, such that higher lake levels during frequent storm events could further reduce unsaturated soil storage and limit infiltration capacity. While this conceptual assessment relies on simplifying assumptions and should not be interpreted as a calibrated groundwater analysis, it indicates a plausible connection between lake stage, water table elevations, and the observed surface

flooding. These findings support the conclusion that flooding in Aurora Shores is driven primarily by surface hydrology and topography, with shallow groundwater conditions acting as a secondary factor that may impact ponding duration.

Next Steps

This analysis provides information to assist the Summit County Engineer, the City of Reminderville, Summit Metroparks, and other project stakeholders in evaluating potential options to address the recurrent flooding reported by homeowners. Additional engineering design, permitting, and coordination will be required to move a selected alternative forward.

1.0 HEC-RAS MODIFICATIONS

To supplement the original six modeling scenarios documented in the *Aurora Shores 2-D HEC-RAS Model* memorandum (Tetra Tech, 2025), additional analyses were completed to evaluate flooding across a range of design storms and a longer simulation period. This expanded analysis evaluates 1-, 2-, 10-, and 100-year design storms, allowing for assessment of flooding in response to not only rare/extreme events, but also more frequent storm events that have been reported by Aurora Shores neighborhood residents to cause localized flooding in the backyards of homes on Windjammer Trail and Sea Ray Cove. The model was also expanded to simulate a five-day time frame allowing for assessment of the duration of flooding in response to the newly added soil infiltration parameters. These modifications and subsequent model results provide a more complete understanding of the relationship between design storm frequency, duration of inundation, and impacts of the constructed wetlands and ditch drainage system within the study area. These modifications are discussed in detail in Section 1.1 through Section 1.4 below.

1.1 RAIN-ON-GRID BOUNDARY CONDITION

The use of a rain-on-grid boundary condition is particularly important in this watershed because flooding results from a combination of pluvial (direct rainfall-driven) and fluvial (channel overflow-driven) processes. Direct rainfall contributes to localized ponding on poorly infiltrating soils within low-lying areas, while concurrent channel overflows influence flood extents along the ditches and wetland cells. Applying rainfall directly to the 2-D grid enables the model to capture these processes and better represent how surface water accumulates, drains, and interacts with the constructed wetland and ditch system under varying storm intensities.

Rainfall was applied to the two-dimensional computational mesh using a rain-on-grid boundary condition consistent with the procedures documented in the April 2025 model memo (Tetra Tech, 2025) but expanded to include four design storms of 1-, 2-, 10-, and 100-years. Rainfall depths were derived from NOAA Atlas 14 (NOAA, 2013; Table 1) and applied using the Soil Conservation Service (SCS) Type II temporal distribution (USDA – SCS, 1986; Figure 1). The SCS Type II curve was selected because it represents the typical convective storm patterns observed in Summit County. Despite these rainfall depths being applied to the 24-hour design storm, the SCS Type II temporal distribution is characterized by short-duration, high-intensity rainfall that is responsible for most of the observed flooding events. This resulted in peak rainfall intensities ranging from 2.8- to 7.6-in/hr (Table 1, Figure 2) and 64% of the total rainfall occurring between the 10-hour and 14-hour timeframe of the 24-hour storm (Figure 2).

Table 1. Rainfall statistics derived from the rain on grid boundary condition for all design storms.

Design Storm	Total Rainfall (in)	Peak Intensity (in/hr)
1-year	2.05	2.8
2-year	2.46	3.4
10-year	3.55	4.9
100-year	5.52	7.6

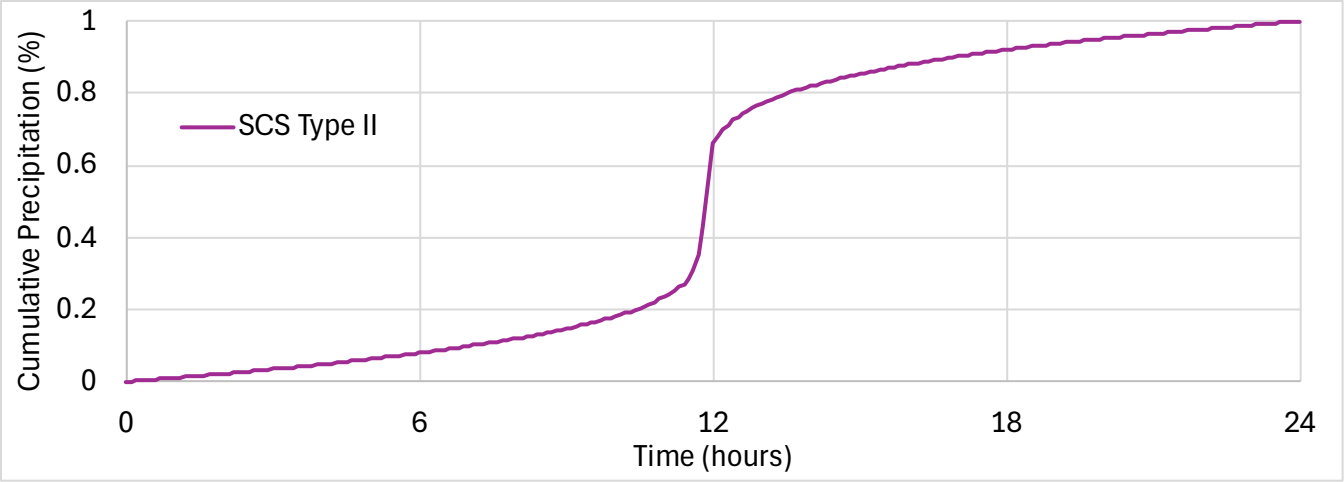


Figure 1. SCS Type II temporal rainfall distribution applied to NOAA Atlas 14 total rainfall depths.

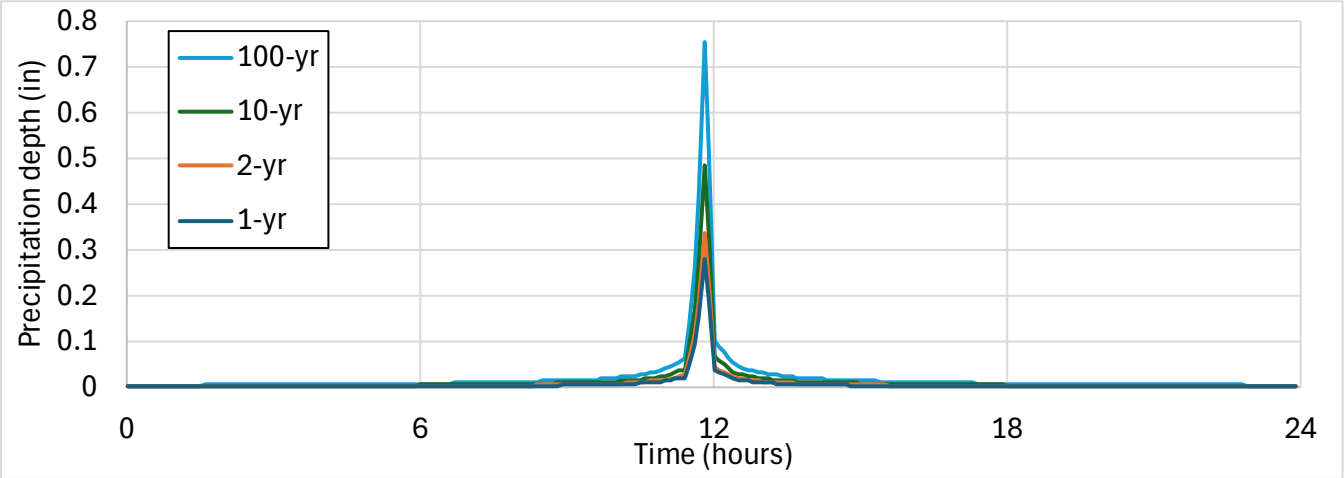


Figure 2. Rainfall time series for all design storms. Note that model timesteps are in six-minute intervals for the rain on grid boundary condition.

1.2 INFLOW HYDROGRAPH BOUNDARY CONDITIONS

The inflow hydrographs for all modeled tributaries were redeveloped to correspond with the new range of design storms. Peak discharges were estimated using the USGS regression equations and flood hydrographs were derived using USGS methods for estimating dimensionless unit hydrographs that were then scaled to match the peak flows (Sherwood, 1993). Peak flow estimates for the 2-, 10-, and 100-year design storms consider the following watershed characteristics in their calculation: drainage area, mean annual precipitation, and presence of basin development factors including channel improvements, channel linings, storm sewers, and curb and gutter streets. The 1-year peak flow is typically omitted from regression estimates because flood-frequency statistical models (e.g., Log-Pearson III, Gumbel) are not defined at exactly a recurrence interval of T = 1, where the probability of exceedance is 100%. The 1-year peak flow was therefore estimated by means of interpolation and checked against a logarithmic curve that fit the rest of the design storm peak flows where satisfactory R^2 values were achieved (Figure 3).

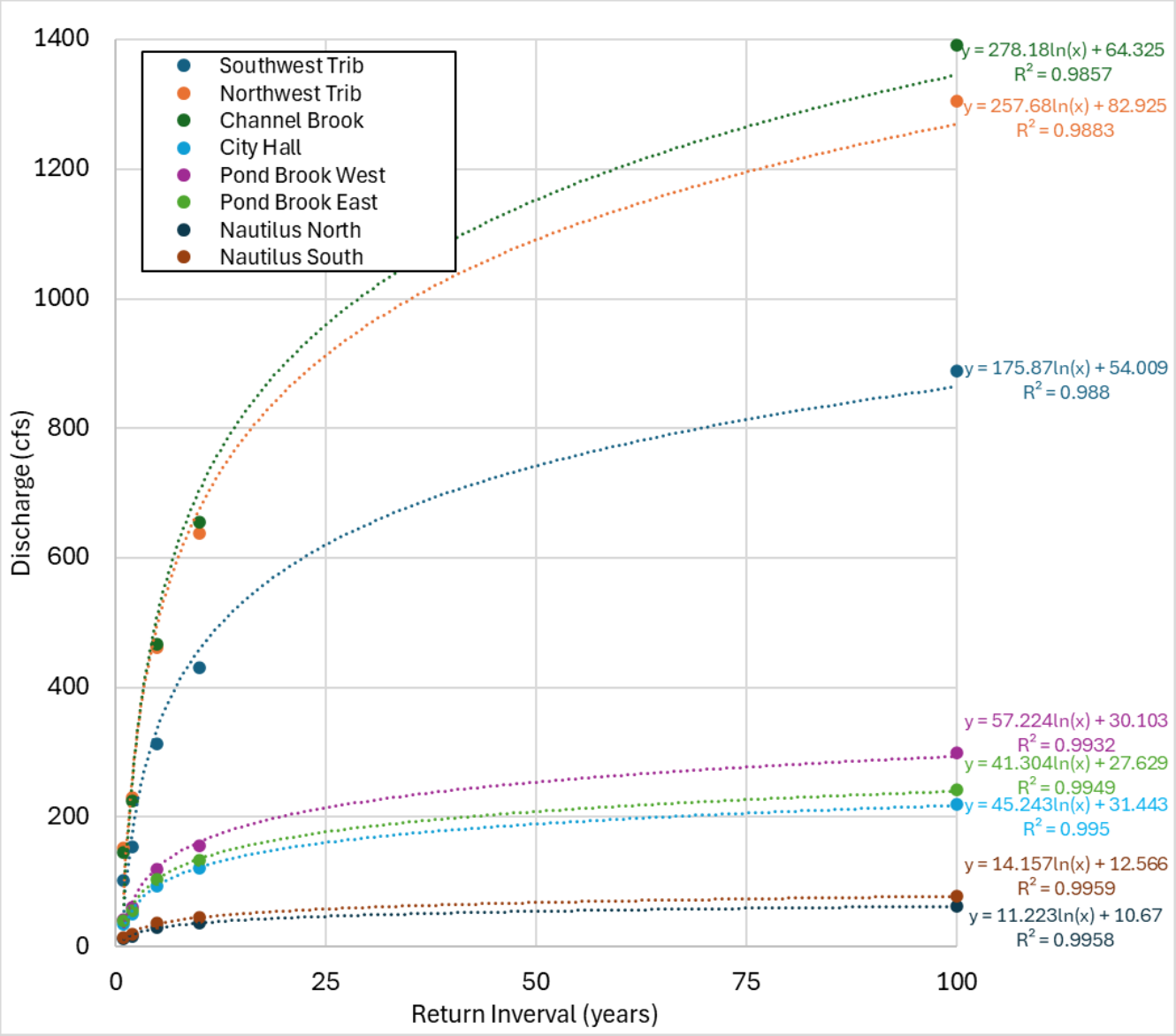


Figure 3. Peak flows for all inflow hydrograph boundary condition for all design storms.

Hydrograph shapes were generated using a dimensionless unit hydrograph approach (Sherwood, 1993). This approach first estimates the basin lag time using the same basin development factors from the peak flow estimation, the average slope of the channel, and the channel length within the drainage area. The lag time, defined as the time between peak intensity of rainfall and peak channel discharge, was then used to control the time to peak of the flood hydrograph for each tributary. The peak flows were then applied to the time and discharge ratios of the dimensionless unit hydrograph (Sherwood, 1993) to define the rest of the rising and falling limbs of the storm hydrographs. Outside of the stormflow period defined by the lag time, flows were linearly interpolated back to calibrated baseflow conditions (Tetra Tech, 2025). These revised inflow hydrographs allow the model to capture variability in peak timing and flow magnitude between smaller, frequent events and the less frequent 100-year storm across all inflow tributaries (Figure 4). These newly derived hydrographs were applied at the same boundary locations described in Figure 3 of the April 2025 memorandum (Tetra Tech, 2025) to preserve consistency with the original domain configuration.

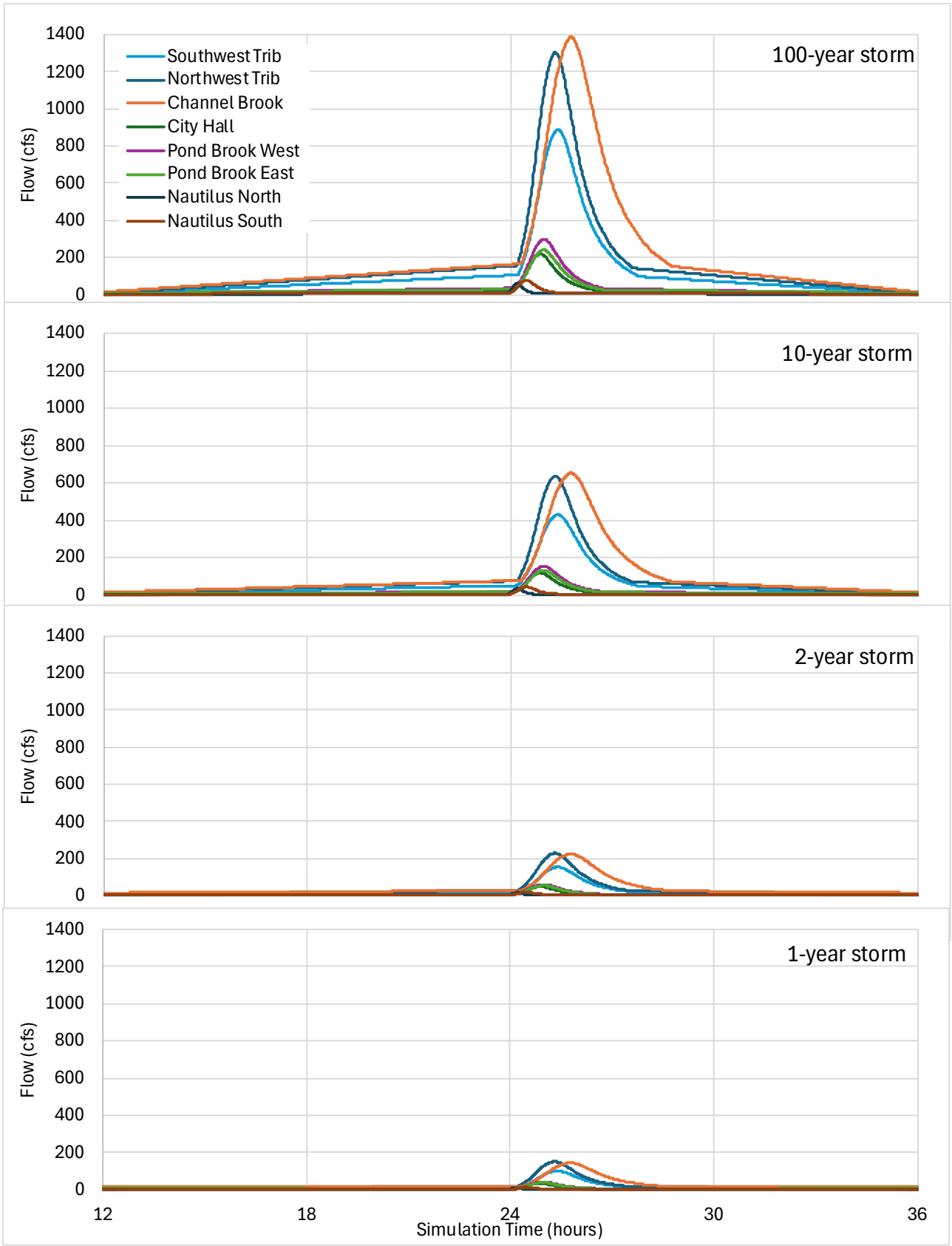


Figure 4. Inflow hydrograph boundary conditions for all design storms and inflow tributaries.

1.3 AURORA LAKE SPILLWAY BOUNDARY CONDITION

To improve the boundary condition for the Aurora Lake spillway discharge into the modeled wetland area, flow time series for all design storms were recalculated using the weir equation with normal spillway gate operations. As-built drawings show the spillway gate is operable between elevations 996.5 ft and 1002.1 ft. Under these revised boundary conditions, it was assumed the stage of the lake is equal to the top elevation of the gate's operational range at an elevation of 1002.1-ft at the beginning of the simulation. The gate is then lowered by 55-in (elevation of 997.5-ft) 12 hours prior to the beginning of the 24-hour storm. This assumption is supported by discussion during the public meeting of lake levels being lowered prior to precipitation to create storage in the lake and by observed operations of the gate on the Aurora Shores Association (ASA) data dashboard[1]. The gate remains at this lowered position for the duration, and 12-hours following the 24-hour storm. The gate is then raised back to an elevation 5-inches below its highest operational range (elevation of 1001.7-ft) and remains here for the duration of the simulation.

Because the gate changes in operational elevation throughout the simulation, discharge from the dam spillway was calculated separately for the gate and concrete spillway components of the dam using the weir equation. These components were summed to obtain the total discharge for each model timestep as follows:

$$Q_{total} = \sum_i C_i L_i H_i^{\frac{3}{2}}$$

where Q = discharge (cubic feet per second; cfs), C = weir coefficient (3.3 was used for sharp-crested assumption), L = effective crest length (ft), and H = head over crest (ft). Effective crest lengths were calculated using the following formula:

$$L_i^{eff} = L_i - \kappa n_i H$$

where L = total length (As-Builts indicate 6-ft for the gate and 67.34-ft for the concrete components of the dam), κ = contraction reduction (0.1 assumed), n = number of contractions (2 used for each component), and H = head over crest (ft).

Spillway outflow time series were then calculated using the following steps and associated assumptions:

1. The volume of flow coming into Aurora Lake at each timestep is calculated as the flow from the Channel Brook hydrograph boundary condition (Section 1.2) plus all other contributing drainage areas to the lake. According to the HEC-1 model results provided by ODNR[2], Channel Brook contributes 37% of all flows to the lake. This ratio was scaled appropriately using the already developed Channel Brook inflow hydrograph to account for all contributing drainage areas to the lake.
2. A new lake volume is calculated that accounts for these inflows during each timestep. The lake stage is calculated using this volume and the stage-storage relationship derived from the HEC-1 model results.
3. This new stage is used to calculate the head over crest values in the weir equations above. Under each timestep, the position of the gate is determined such that the correct head over crest value is used. The subsequent outflow from the spillway is calculated as the sum of the two weir components.

[1] Aurora Lake Association HOBOlink Dashboard. https://auroralakeassociation.com/lake-sensor-dashboard

[2] Email communication with Kathleen McDaniel of Ohio Department of Natural Resources on July 17th, 2024. Files provided to Tetra Tech include "Misc. Correspondence.pdf" and "1213-036 – As-Builts – 2009pdf"

4. The spillway outflow is subtracted from the previous lake volume to calculate the lake volume at the end of each time step. This final volume is then used as the beginning volume for the next timestep.

Figure 5 shows the resulting hydrographs of flow in and out of the lake, and the lake stage over time in response to the gate operations and flow assumptions described above. The top panel of Figure 5 (Flow Into Lake) shows flow from all contributing drainage areas, including Channel Brook. Between hours 12 and 36 of the simulation the 24-hour design storms occur with peak flow volumes entering the lake at the 27-hour mark.

The middle panel of Figure 5 (Lake Stage) shows that between hours 0 and 12 of the simulation, the stage of the lake begins to decrease because the spillway gate has been lowered to create storage in the lake prior to the storm. Under the 1- and 2- year storms, lake stage increases slightly in response to lake inflow but stays beneath the original elevation prior to the lowering of the gate for the duration of the simulation. For the 10- and 100-year design storms, the stage of the lake increases rapidly in response to the greater inflow volumes. This rapid increase in stage results in much higher flows out of the spillway and into the wetlands downstream.

The bottom panel of Figure 5 (Flow Out of Lake) illustrates that flow rates out of the spillway decrease slightly over time as the stage of the lake is lowered prior to the arrival of the design storm. Flow rates remain relatively constant in response to the 1- and 2-year storms at ~150 cfs while the 10-year storm increases flows out of the spillway to a maximum of 197 cfs. The 100-year storm results in peak flows of 478 cfs. Stormflow through the spillway occurs through the 48-hour mark of the simulation because the spillway gate is at its lowered position up until this time (Figure 5 – Flow Out of Lake). The spillway gate is then raised at the 48-hour mark to maintain normal lake stage following the storm. Raising the gate decreases the flow out of the spillway to nearly zero for the 1-, 2-, and 10-year storms. For the 100-year storm, the lake stage is still relatively high and so raising the gate still results in spillway outflows of 48 cfs for the duration of the simulation. These calculated outflows were used to define the Aurora Lake spillway boundary condition for the 1-, 2-, 10-, and 100-year events which serve as the inflow to the HEC-RAS model wetlands.

It should be noted that the same gate operations were assumed for all design storms. These simplified gate operations and flow calculation assumptions described herein are sufficient for estimating flow out of the lake for modeling purposes.

However, further work can be done to optimize spillway gate operations to balance the lake stage and spillway outflows. Maintaining a high lake stage may be good for recreation on the lake but poses a risk of the emergency spillway being breached if a large storm came unexpectedly which would not provide enough time to create storage in the lake by lowering the gate. At the same time, rapidly lowering the lake stage to create this storage for storms will result in large flows to the downstream wetlands which may cause additional flooding via backwater. While this optimization is not within the scope of this study, finding a balance between creating storage in the lake in anticipation of large storms, maintaining a lake elevation sufficient for recreation, and avoiding large spillway releases to not overwhelm the downstream wetlands would be valuable for the neighborhood and its residents.

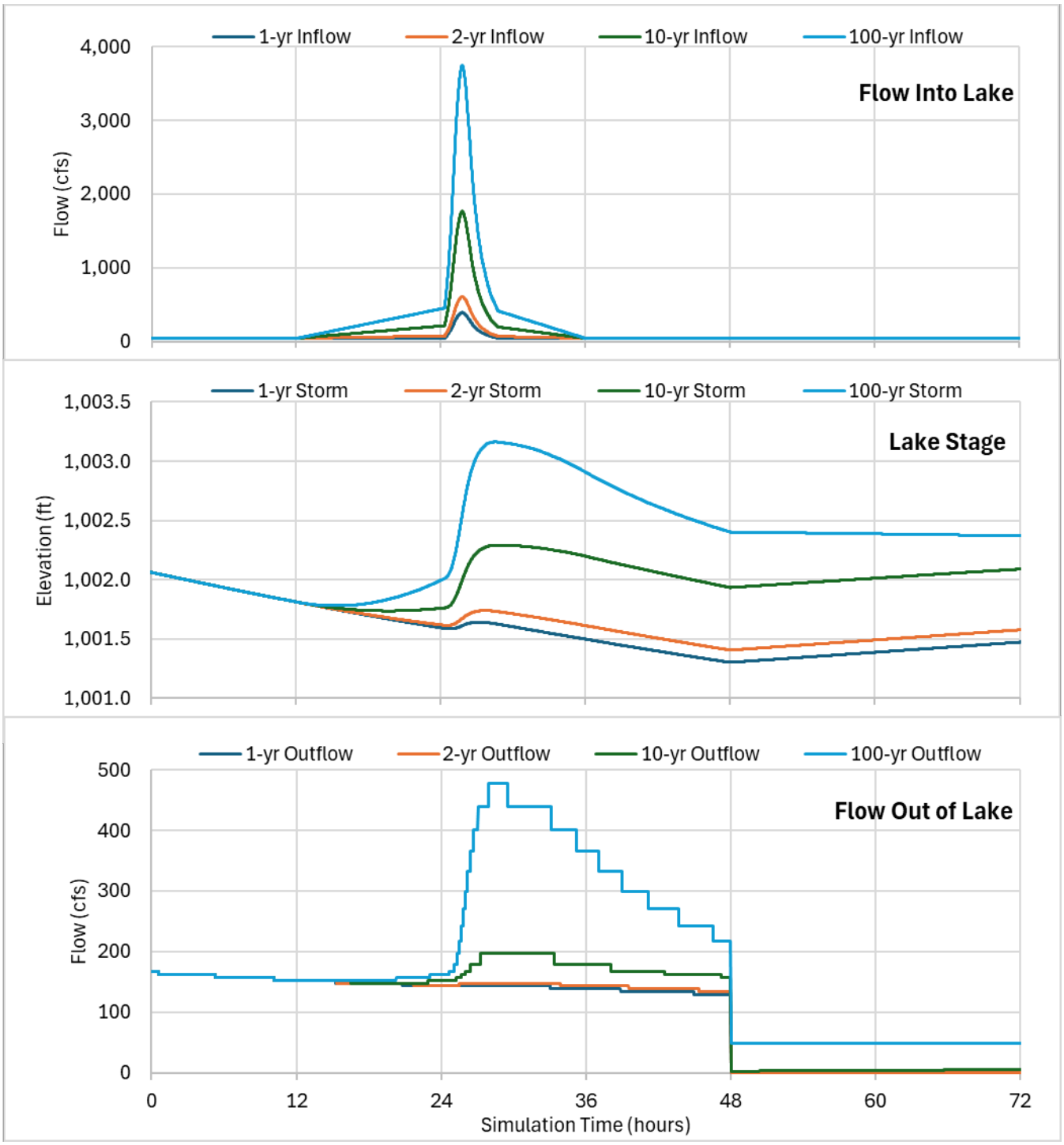


Figure 5. Time series of estimated flow into Aurora Lake, lake stage, and flow out of the spillway as a result of the gate operations and outflow calculations described herein.

1.4 INFILTRATION REPRESENTATION

Infiltration within the model was represented using the Curve Number (CN) loss method applied to the rain-on-grid precipitation boundary condition. Under this approach, infiltration losses are applied directly to precipitation at each computational cell prior to generation of surface runoff. As implemented in HEC-RAS, infiltration is therefore limited to rainfall inputs and is not applied to surface water that is routed into a cell from adjacent areas or boundary inflows nor does it represent time-dependent percolation or groundwater interactions. As a result, post-storm ponding in localized topographic depressions persist in the model. This HEC-RAS limitation is likely an accurate representation of the soil's lack of infiltration capacity given the historic wetlands (Tetra Tech, 2025) and homeowner observations of extended periods of ponding following rainfall.

Spatially variable CN values were developed based on the intersection of Hydrologic Soil Groups (HSGs) and land cover data. The HSG data were obtained from the U.S. Department of Agriculture (USDA) Soil Survey Geographic (SSURGO) Database and classified using the National Cooperative Soil Survey (NRCS) conventions for hydrologic group designation (USDA NRCS, 2024). The custom land cover dataset derived for the model is described in depth in Tetra Tech, 2025. However, these custom land cover classifications do not have readily available CN values reported in the literature. Therefore, CN values were assigned for each unique HSG – land cover combination using equivalent land covers described in NRCS, 2004 (Table 2).

Table 2. CN values based on unique HSG – land cover combinations (NRCS, 2004).

Model Land Cover	NRCS, 2004 Equivalent Land Cover	A *	B	C	D	No Data
Channel Brook	Open Water	--	99	99	99	99
Pond Brook	Open Water	--	99	99	99	99
Lake/Pond	Open Water	--	99	99	99	99
Wetland	Emergent Herbaceous Wetland	--	80	87	93	93
Grass	Developed, Open Space	--	69	79	84	84
Forest	Deciduous Forest	--	48	57	63	63
Floodplain	Emergent Herbaceous Wetland	--	80	87	93	93
Impervious	Developed, High Intensity	--	92	94	95	95

*No soils in the model domain were classified as HSG type A.

Aurora Shores is underlain primarily by Willette Muck and Carlisle Muck soils that are characterized by very poorly drained organics with slow permeability and high water tables. These soils have limited infiltration capacity, resulting in water retention and persistent ponding following rainfall events. As such, HSG Group D soils dominate the area (Figure 6). Adjacent upland areas contain soils of Group C and Group B, which exhibit moderately slow to moderate infiltration characteristics that allow for more rapid drawdown following storm events.

HSG data within the study area contained dual hydrologic soil groups which are defined as wet soils with the presence of a water table within 24 inches of the surface even though the saturated hydraulic conductivity may be favorable for water transmission. If these soils can be adequately drained, then they are assigned to dual hydrologic soil groups (A/D, B/D, and C/D) based on their saturated hydraulic conductivity. The first letter applies to the drained condition and the second to the undrained (i.e., high water table) condition. Because of the historic wetlands and known high water table in the area (Section 5.0) these dual groups were assumed to be HSG D in the model. Additionally, areas with unknown HSG were also assumed to be HSG D within the model domain.

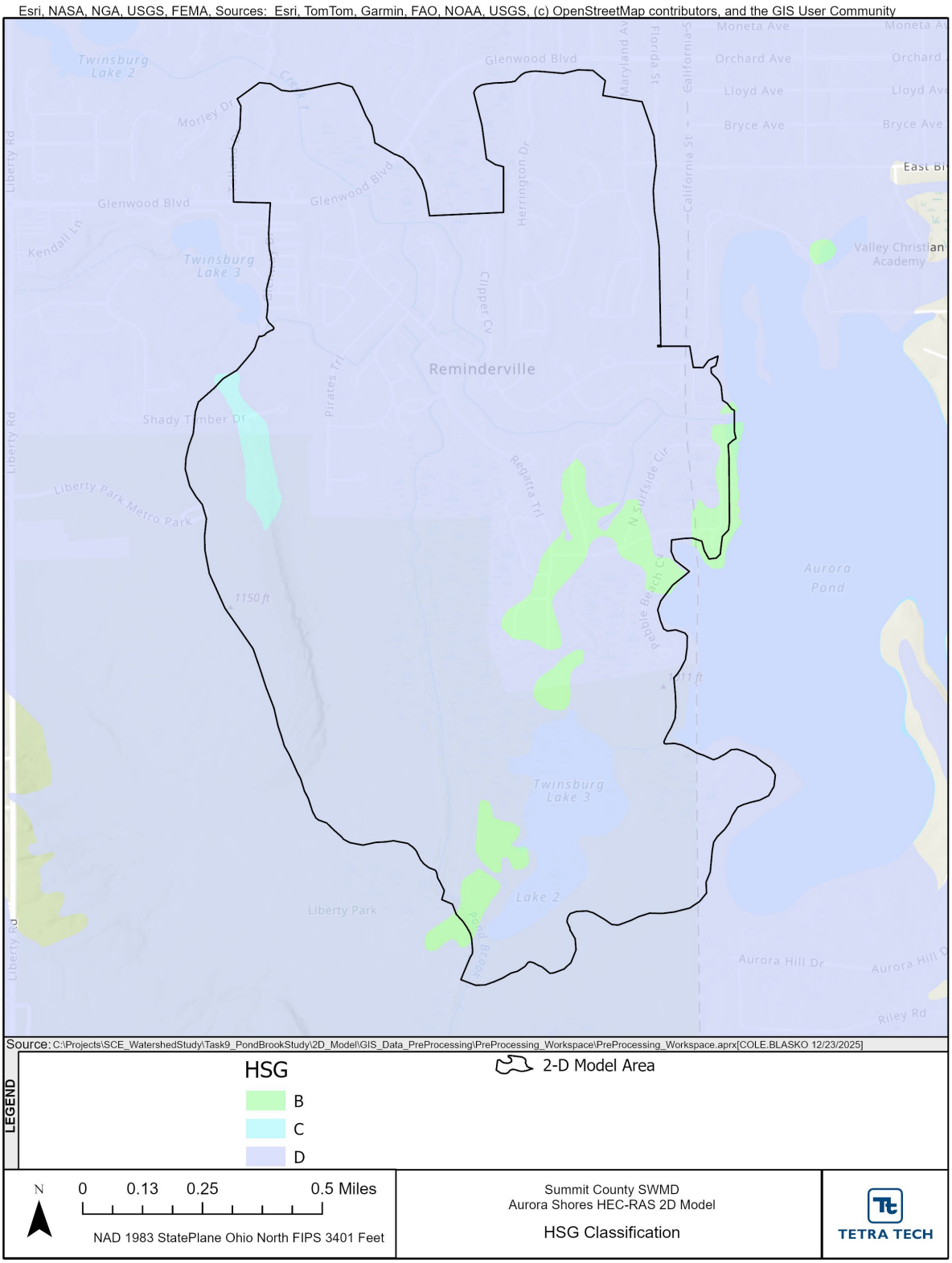


Figure 6. HSG classification in the 2D model (USDA NRCS, 2024).

2.0 SITE VISIT – ELEVATIONS AND FIELD CONDITIONS

Tetra Tech conducted a site visit the week of October 20th, 2025 to confirm elevations, presence of wetland structures, and general field conditions to better inform the Existing Conditions model. Figure 7 shows the 65 locations within the study area where data was collected as part of the site visit. Data collected included surveyed elevations (vertical accuracy of 3cm and horizontal accuracy of 2cm), photos, measurements, and any other notes on the general conditions of the site as related to the HEC-RAS model.

As a result of this field visit, Tetra Tech found that multiple wetland control structures shown in the Pond Brook/Liberty Park Final Mitigation Plan prepared for Ohio Department of Transportation (ODOT; Wetlands Resource Center et al., 2006) were not present in the field. These include the following:

- Agri Drain 1: This Agri-Drain is shown in the mitigation plans to be located at the northeast corner of Wetland Cell 1 and is designed to divert flow from the ditch that runs North-South along the property lines and backyards of homes on Regatta Trail, Windjammer Cove, Windjammer Trail and Sea Ray Cove. Its proposed location from the Pond Brook/Liberty Park Final Mitigation Plan is shown in Figure 8 and the intent of the design is to divert water into Wetland Cell 1. However, when this location was visited by Tetra Tech, the Agri-Drain and diversion embankment were not found. Rather, a shallow vegetated swale was found in this location (Figure 10).
- Water Leving Pipe: This pipe is located between Wetland Cell 1 and Wetland Cell 2 and is designed to maintain a constant water elevation between the two wetlands (Figure 8, Figure 9, Wetlands Resource Center et al., 2006). The inlet and outlet locations of this pipe were visited by Tetra Tech but no evidence of the structure was found due to the area being heavily vegetated (Figure 10). While it is possible that the structure was installed during the construction of the mitigation plan, it is likely not functioning as of 2025 due to being clogged and blocked.
- Earthen Plug: This earthen plug is at the south end of Wetland Cell 3 and is designed to divert flow to the Agri-Drain as the outlet of the wetland rather than the swale where the earthen plug is located (Figure 9, Wetlands Resource Center et al., 2006). However, Tetra Tech visited this location and did not find the earthen plug within the swale (Figure 10). It is possible that this earthen plug was installed during the construction of the mitigation plan but later washed out due to high flow events. Elevations along the swale were recorded to update the terrain within the HEC-RAS model to accurately represent the existing conditions.

In addition to the missing wetland control structures, three other key observations were made that impacted the existing conditions model. First, the operational elevations of the Agri-Drains that control the water levels in Wetland Cell 2 and Wetland Cell 3 are 992.0-feet NAVD88. Second, Ditch 1 and Ditch 2 were found to be heavily vegetated. These vegetated conditions warranted an update of the Manning's n roughness value in the model to better represent the resistance to flow within these ditches due to the vegetation. Locations of all Agri-Drains, wetland cells, ditches, the water leveling pipe, and the earthen plug are shown in Figure 8 and Figure 9. All other elevations that Tetra Tech surveyed and field conditions that Tetra Tech observed agree with the digital elevation model (DEM) and other parameters (i.e., Manning's n values) used in the HEC-RAS model. Finally, it should be noted that during the stakeholder meeting homeowners repeatedly stated that beaver dams have been seen downstream. However, Tetra Tech did not observe any beaver dams within the 2D model area (Figure 7) during the site visit and they were not represented in the existing conditions model.

These site visit findings were presented to and discussed with Travis Saunier of Summit Metroparks on November 3rd, 2025 via virtual meeting. Mr. Saunier acknowledged that these site conditions do not align with what is in the Pond Brook/Liberty Park Final Mitigation Plan (Wetlands Resource Center et al., 2006). Mr. Saunier was not aware of any other information regarding site conditions or wetland control structures. It is therefore assumed that the conditions observed by Tetra Tech during the week of October 20th, 2025 and documented herein are the most accurate and up to date.

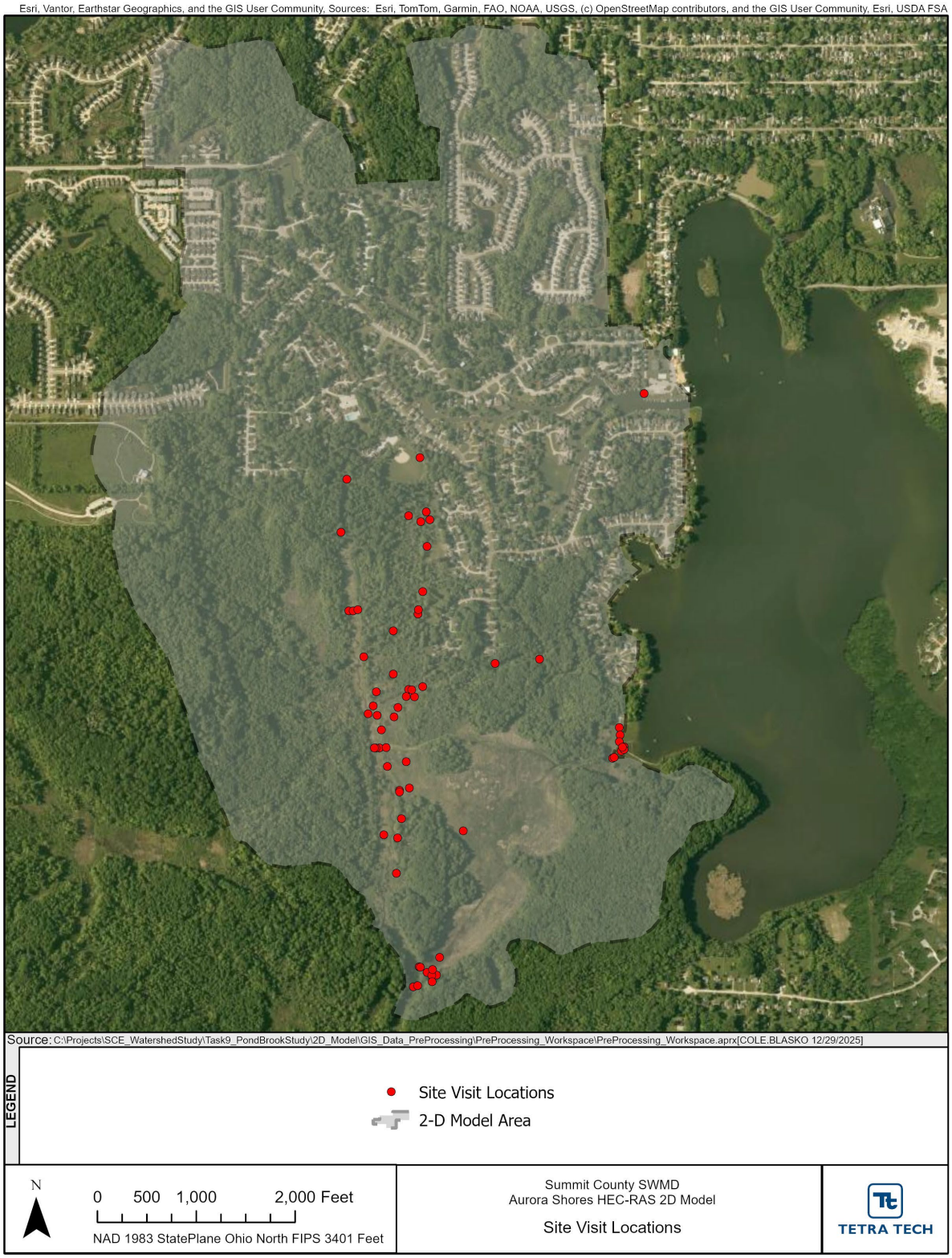


Figure 7. Site visit locations.

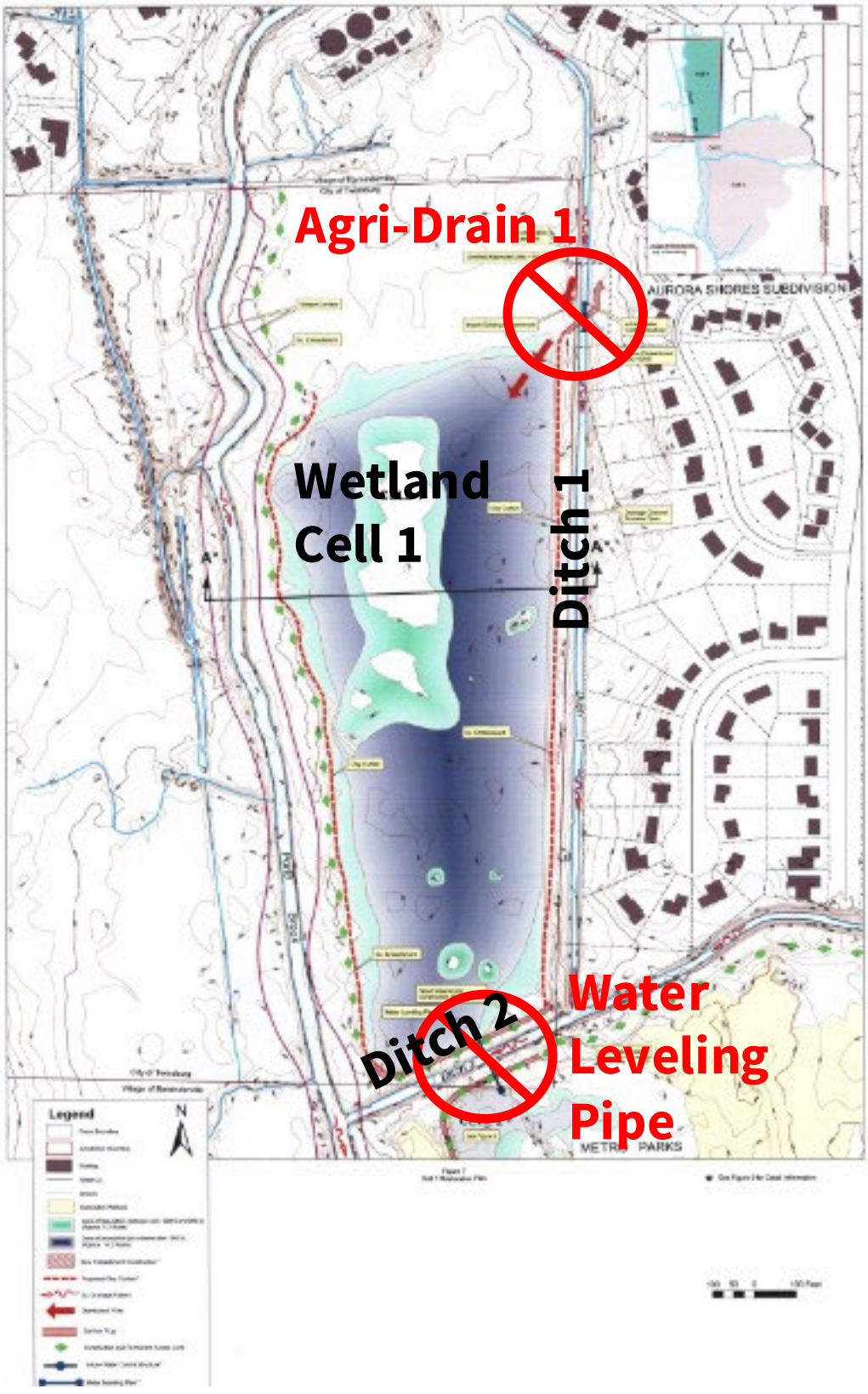


Figure 8. Cell 1 Restoration Plan from the Pond Brook/Liberty Park Final Mitigation Plan (Wetlands Resource Center et al., 2006) marked up with the locations of the missing Agri-Drain and Water Leveling Pipe in red.

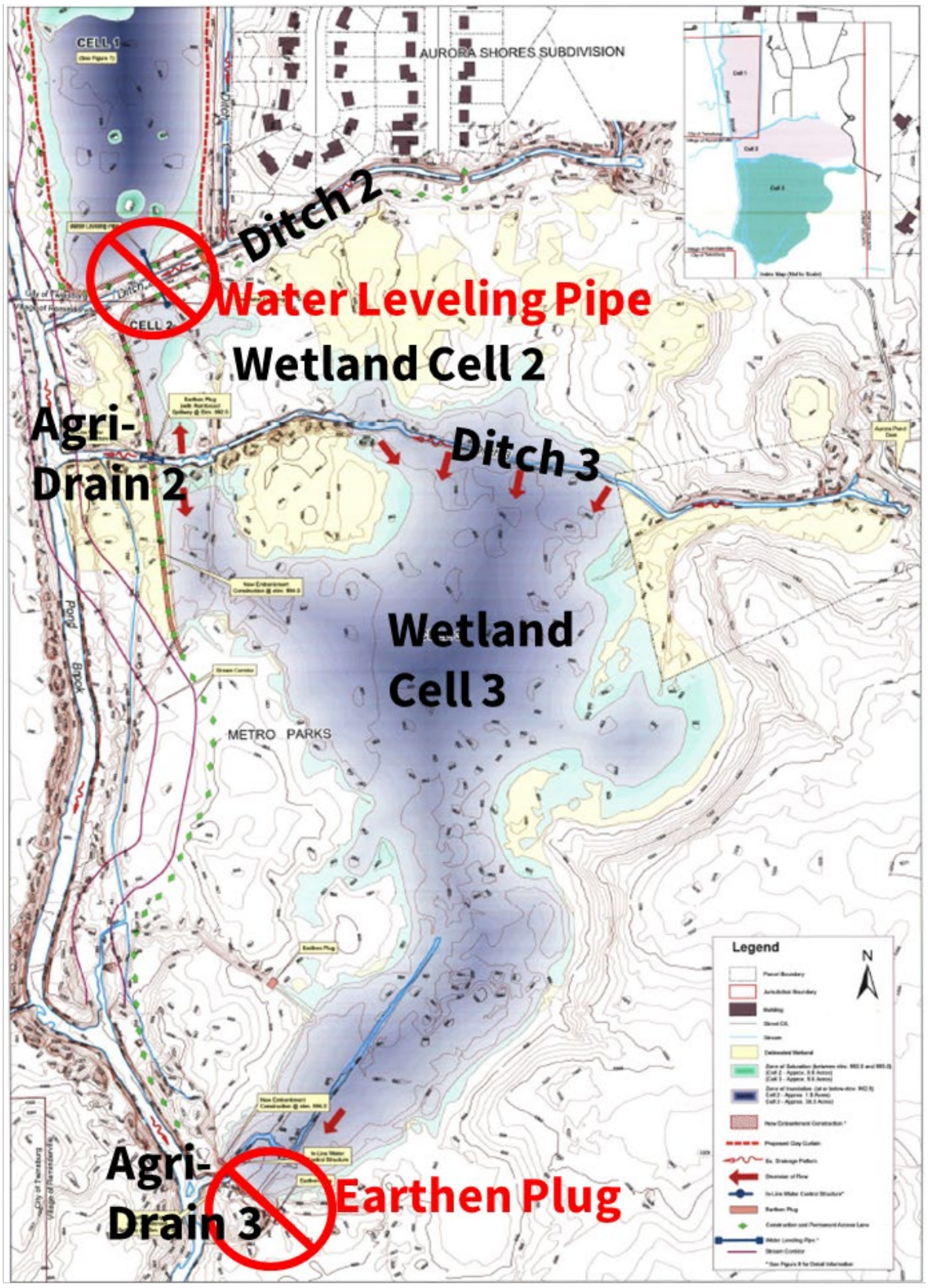


Figure 9. Cell 3 Restoration Plan from the Pond Brook/Liberty Park Final Mitigation Plan (Wetlands Resource Center et al., 2006) marked up with the locations of the missing Water Leveling Pipe and Earthen Plug in red.



Figure 10. Top Left: Agri-Drain 1 not found at its expected location. Top Right: Water Leveling Pipe outlet not found at its expected location. Bottom Left: Earthen Plug at outlet of Wetland Cell 3 not found at its expected location. Bottom Right: Downstream end of ditch at confluence with Pond Brook is heavily vegetated.

3.0 OHM RECOMMENDED IMPROVEMENTS

Upon further coordination with the City of Reminderville, Tetra Tech discovered that two stormwater capital improvement projects are being planned for the study area. As described by OHM Advisors 2025, the Pirates Trail diversion culvert and Anchorage Cove detention basin are intended to reduce localized flooding in the residential parcels between Nautilus Trail and Anchorage Cove (Figure 11). While these improvements are intended to reduce flooding in one area of the Aurora Shores neighborhood, there is the potential for them to propagate flooding issues downstream to other areas. Of particular concern was the Pirates Trail diversion culvert that is proposed to re-direct a large tributary to outlet into Pond Brook directly adjacent to Wetland Cell 1 which is across from the flooded backyards of concern on Windjammer Trail and Sea Ray Cove.

Tetra Tech coordinated with OHM Advisors to obtain design details to simulate the two projects in the 2-D HEC-RAS model. Design details for each improvement are provided below.

3.1.1 Pirates Trail diversion culvert

This improvement consists of a 2,870-ft long, 6-ft diameter single barrel circular culvert with an inlet approximately 300-ft west of Pirates Trail and an outlet located in Pond Brook adjacent to the northern end of Wetland Cell 1 (Figure 11). The culvert slope of 0.18% was determined by an upstream invert elevation of 995.88-ft and a downstream invert elevation of 990.86-ft. While the culvert was simulated with a Manning's n of 0.013, other parameters such as entry and exit loss coefficients and headwall structures were not specified in the OHM model. Therefore, these parameters were assumed to be the same as other culverts within the Aurora Shores neighborhood that were already incorporated into the model. Finally, an earthen dam with a crest elevation of 1006-ft was added to block the tributary channel to force all flows through the diversion culvert.

3.1.2 Anchorage Cove detention basin

This improvement consists of acquiring two parcels (PN6600363 and PN6600755) followed by excavation of a 0.58-acre wetland with a bottom elevation of 993.5-ft and side slopes of approximately 3H:1V (Figure 11). A Manning's n value of 0.15 was used to represent wetland vegetation within the detention basin footprint. Finally, an outlet is defined using the natural surface elevation of 994.5-ft existing in the area. This natural surface feature will connect the detention basin to the small downstream channel which routes to the Clipped Cove aqueduct. As such water will fill or drain the detention basin depending on the water surface elevation of the downstream ditch.

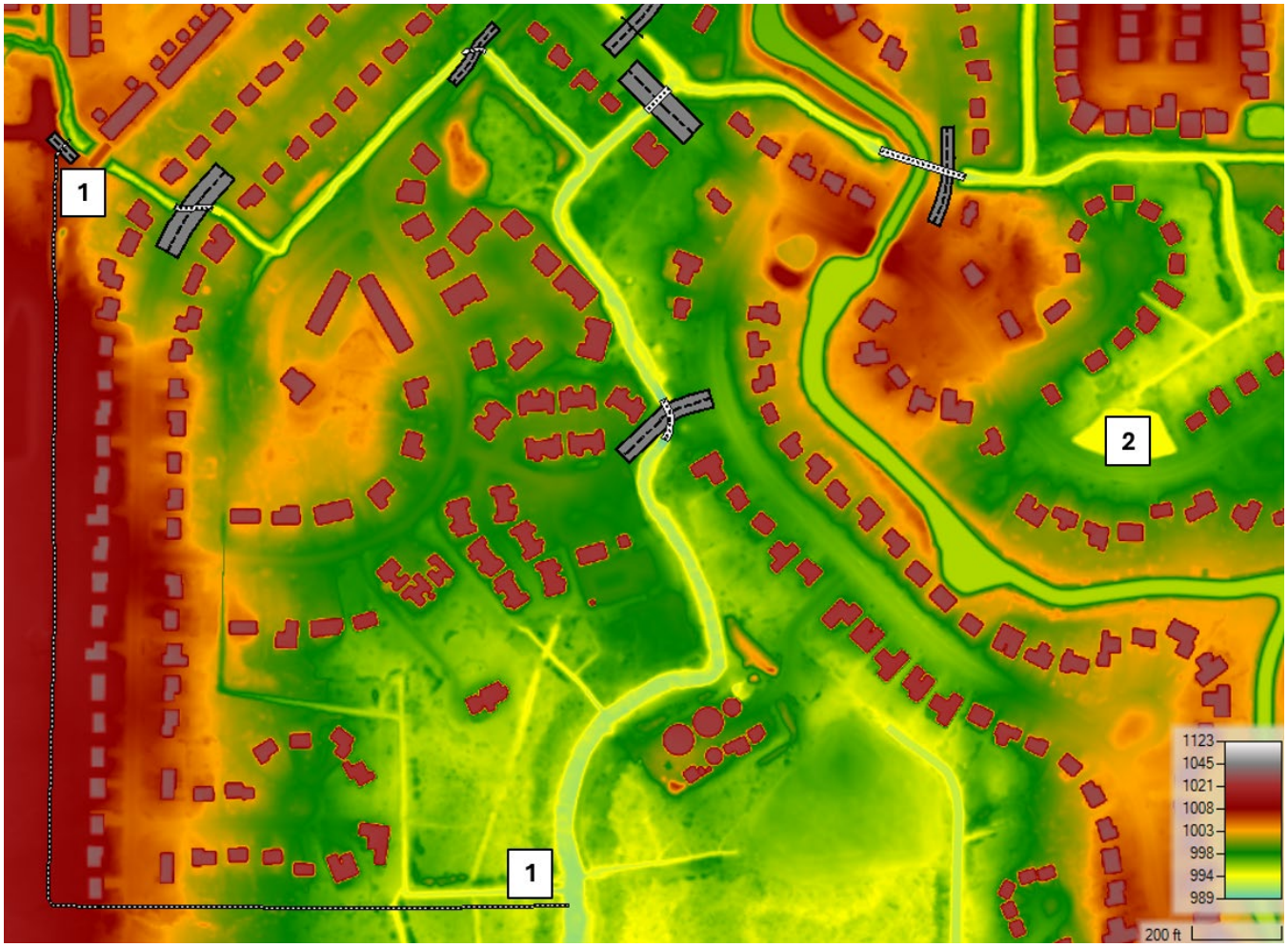


Figure 11. OHM Advisors proposed improvements that are included in Scenario 8 and Scenario 9.

4.0 MODEL SET-UP

The following sections provide detailed descriptions of how Tetra Tech set up the models for Baseline conditions and Scenarios 7, 8, and 9. Table 3 provides a short summary of each for quick reference.

Table 3. Summary of models built and assessed herein.

Number	Scenario Name	Short Description
Baseline	Existing Conditions	Representative of observations made during the site visit in October 2025.
Scenario 7	All Tetra Tech Proposed Improvements	Includes the eight improvements proposed by Tetra Tech.
Scenario 8	All Tetra Tech Proposed Improvements with OHM Advisors Proposed Improvements	Includes the eight improvements proposed by Tetra Tech and the two improvements proposed by OHM Advisors.
Scenario 9	Select Tetra Tech Proposed Improvements with OHM Advisors Proposed Improvements	Includes the three improvements proposed by Tetra Tech that were approved by Summit Metroparks, assumes existing Agri-Drain elevations are maintained, and includes the two improvements proposed by OHM Advisors.

4.1 BASELINE - EXISTING CONDITIONS

Tetra Tech modified various components of the HEC-RAS model to represent the existing conditions observed during the site visit. This model accounts for the following components that match the numbering system in Figure 12:

A. Absence of Agri-Drain 1 along Ditch 1. The structure was removed from the model and the terrain was left un-altered from the original DEM.

B. Absence of the water leveling pipe between Wetland Cell 1 and Wetland Cell 2. The structure was removed from the model and the terrain was left un-altered from the original DEM.

C. Absence of the earthen plug at the outlet of Wetland Cell 3. Because the surveyed elevations match the existing terrain in the model, the DEM was left un-altered.

D. The operational elevation of the Agri-Drains at the outlet of Wetland Cell 2 and Wetland Cell 3 will be updated to the elevations recorded in the field of 992.0 NAVD88 ft for both structures. This is in contrast to the operational elevations specified in the Pond Brook/Liberty Park Final Mitigation Plan (Wetlands Resource Center et al., 2006) of 992.5 feet NAVD88.

E. The Manning's n value within Ditch 1 and Ditch 2 was updated from a value of 0.035 representative of open channel conditions to a value of 0.12 representative of the heavily vegetated conditions observed during the site visit.

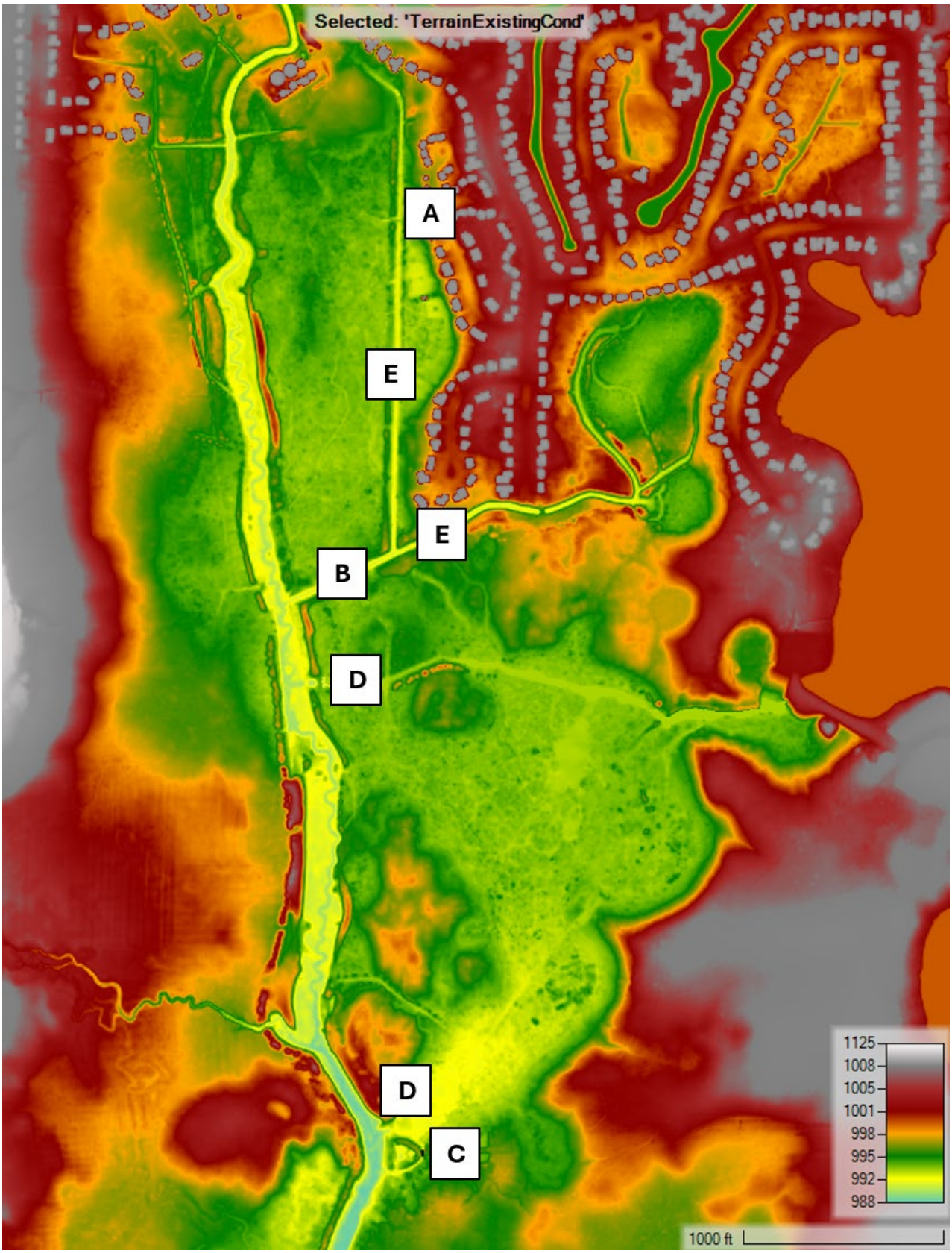


Figure 12. Existing conditions model components.

4.2 SCENARIO 7 – ALL TETRA TECH PROPOSED IMPROVEMENTS

Scenario 7 proposes drainage improvements to decrease the extent and duration of flooding. This scenario is comprised of eight components, each of which were designed through an iterative modeling approach to minimize the extent and amount of time upon which the flooding occurs. While filling the entire footprint of the backyards up to an elevation above the 100-year flood elevation would eliminate the flooding, this approach would involve large permitting hurdles, require extensive mitigation to offset the impacts of filling within wetlands and the FEMA 100-year floodplain, and would be extremely costly due to the volume of material needed. Filling of the backyards was not further explored for these reasons. Therefore, Scenario 7 and the eight components listed below (Figure 13) are representative of the most feasible/actionable solutions.

1. Excavate and clear Ditch 1 and 2 for improved drainage out of the flooded area at a proposed slope of 0.067%.
2. Use excavated ditch material to create an embankment on the east side of Wetland Cell 1 to prevent 100-year floodwaters within Wetland Cell 1 from flowing to the lower elevation backyards.
3. Construct a diversion embankment at an elevation of 996.0 feet NAVD88 (higher than the 100-year flood water level) where the Agri-Drain was supposed to be installed. This diverts all water to the wetland and removes the uncertainty and maintenance requirements associated with an Agri-Drain.
4. Connect the existing ephemeral channel at the north end of Wetland Cell 1 to the south end of Wetland Cell 1.
5. Excavate a swale to serve as the outlet to Wetland Cell 1 at an elevation of 992.5 feet NAVD88 (equal to the "Zone of Saturation" elevation in the ODOT mitigation report). This replaces water leveling pipe which proved difficult to maintain and allowed backwater from Wetland Cell 2 to increase water levels in Wetland Cell 1.
6. Raise the low spot on the embankment that defines the north edge of Wetland Cell 2 to a minimum elevation of 995.0 feet NAVD88 which will prevent any backwater flow from traveling north towards the area of interest.
7. Maintain the existing two Agri-Drains at their current surveyed operational elevations of 992.0 feet NAVD88 to allow the maximum amount of water to flow out of the wetlands and into Pond Brook.
8. Excavate small swales to such that the low spots in the backyards can drain after storms. (an alternative to this component which is not readily modeling in HEC-RAS would be french drains).

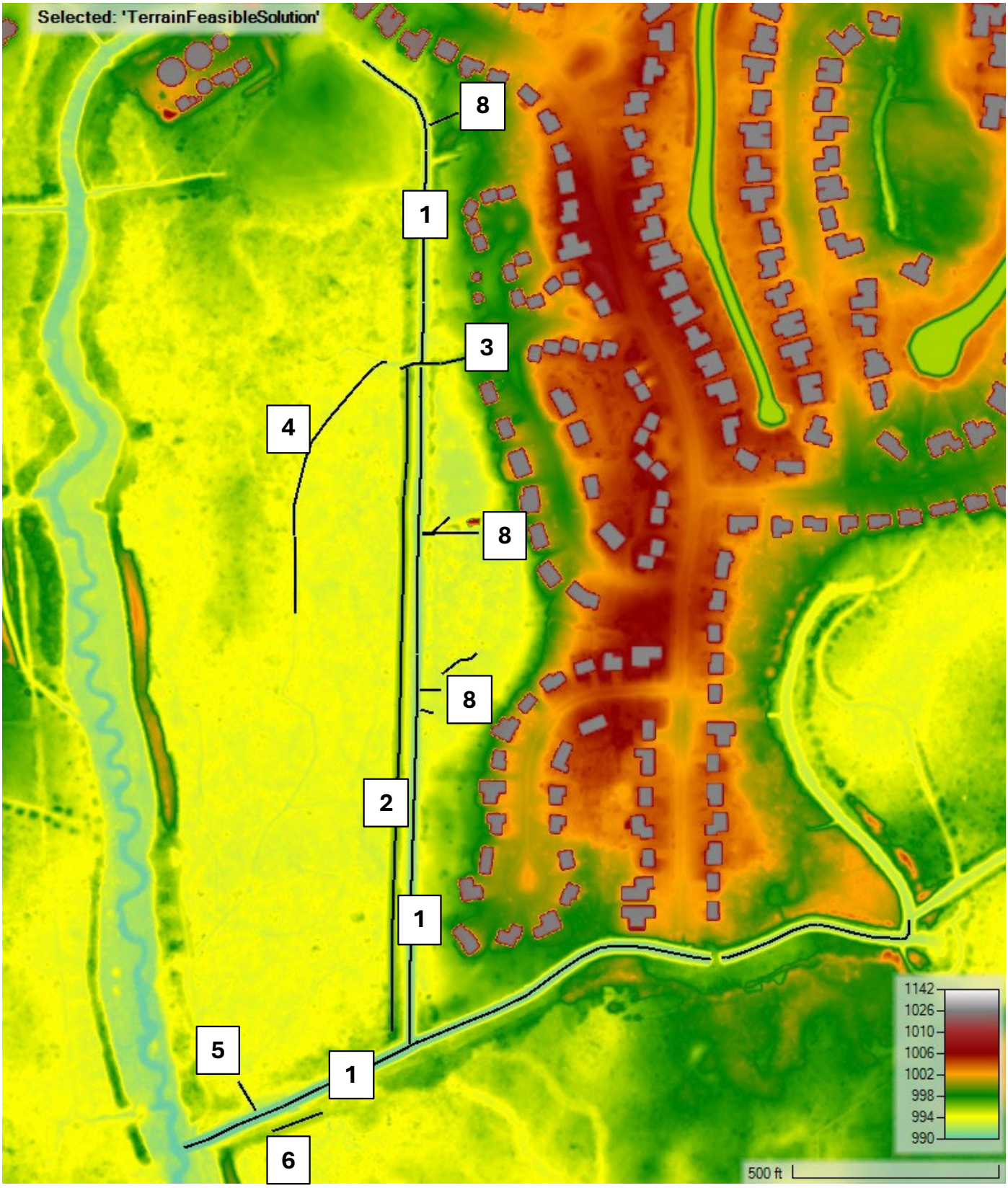


Figure 13. Scenario 7 model components (component 7 not shown).

4.3 SCENARIO 8 – ALL TETRA TECH PROPOSED IMPROVEMENTS WITH OHM ADVISORS PROPOSED IMPROVEMENTS

Scenario 8 represents all eight proposed improvements from Scenario 7 with the addition of the two improvements proposed by OHM Advisors improvements: Pirates Trail diversion culvert (component 1 in Figure 11) and Anchorage Cove detention basin (component 2 in Figure 11) as described in Sections 3.1.1 and 3.1.2.

4.4 SCENARIO 9 – SELECT TETRA TECH PROPOSED IMPROVEMENTS WITH OHM ADVISORS PROPOSED IMPROVEMENTS

Scenario 9 represents only the three proposed improvements that were approved by Summit Metroparks (components 1, 2, and 3 from Scenario 7) and assumes that component 7 (which is maintaining the Agri-Drains at their surveyed elevations of 992.0 feet NAVD88) will remain, with the addition of the OHM Advisors improvements of the Pirates Trail diversion culvert (component 1 in Figure 11) and Anchorage Cove detention basin (component 2 in Figure 11) as described in Sections 3.1.1 and 3.1.2.

5.0 MODEL RESULTS

Flooding in the Aurora Shores neighborhood is well documented by the Aurora Shores Homeowners Association and its residents. Of particular concern is the frequent flooding (e.g., because of the 1- and 2-year storms) and the duration of flooding as homeowners report ponded water remains in their yards for days or weeks after rainfall. As previously described, the revised model aims to address these concerns by adding the 1- and 2-year design storms to the analysis and by incorporating infiltration parameters to assess drainage of ponded water over a five-day period.

5.1 EXISTING CONDITIONS RESULTS

Results from the Baseline existing conditions model are consistent with homeowner observations and photographic documentation provided to Tetra Tech during the August 18, 2025 stakeholder meeting and through subsequent email correspondence. Under the 1-year design storm, the model predicts widespread shallow flooding across the low-lying residential yards east of Wetland Cell 1, with maximum flood depths approaching approximately 1 foot in localized depressions immediately following peak precipitation (Figure 14). The modeled depths and extents are consistent with homeowner reports of frequent flooding that occurs during relatively common storm events (e.g., 1- and 2- year storms) rather than only during extreme rainfall.

Extending the simulation period to five days provides additional insight into post-storm drainage and extended ponding duration. While a substantial portion of the floodwaters drain from the area within several days of the storm peak, the model shows that residual ponding remains in isolated low spots where local topographic relief is minimal and no direct drainage outlet exists. In these areas, modeled water depths remain several inches deep even multiple days after peak precipitation. This prolonged ponding behavior closely aligns with homeowner accounts describing standing water persisting for days following moderate rainfall events.

Figure 14 illustrates both the maximum flood depths during the 1-year storm and the flood depths 24 hours after peak precipitation under existing conditions. Tetra Tech removed the Agri-Drain at the north end of the ditch from the model as a result of the site visit. The lack of this structure eliminates the intended diversion of flow into the adjacent wetland cell, resulting in increased inundation within the residential backyards relative to Wetland Cell 1. This redistribution of flow shows the potential for reduced flood impacts through a modified drainage system and supports the need for evaluating scenarios that model potential improvements.

Model performance under existing conditions was further evaluated through comparison with photographs collected at a consistent reference location (i.e., location of shed shown in Figure 14). Figure 15 shows a shed located in the backyard of a home on Windjammer Trail, where flood depths and extents were documented for three separate storm events since 2021. Although the timing of each photograph relative to peak rainfall and precise flood depths are unknown, the modeled flood depths at this location are consistent with the observed conditions of frequent flooding captured in the photographs. The model also reproduces the duration of flooding, with simulated water depths remaining a few inches deep as much as four days after peak precipitation, consistent with homeowner documentation.

These comparisons demonstrate the existing conditions model reasonably represents the magnitude and duration of flooding observed in the Aurora Shores neighborhood during frequent storm events. While inherent uncertainties remain due to limited quantitative field measurements, the agreement between modeled results and multiple independent homeowner observations provides confidence the model is suitably calibrated for evaluating the alternative scenarios developed under the expanded scope of work. These results were presented to the Summit County Engineer and deemed sufficient to support further scenario analysis and conceptual planning.

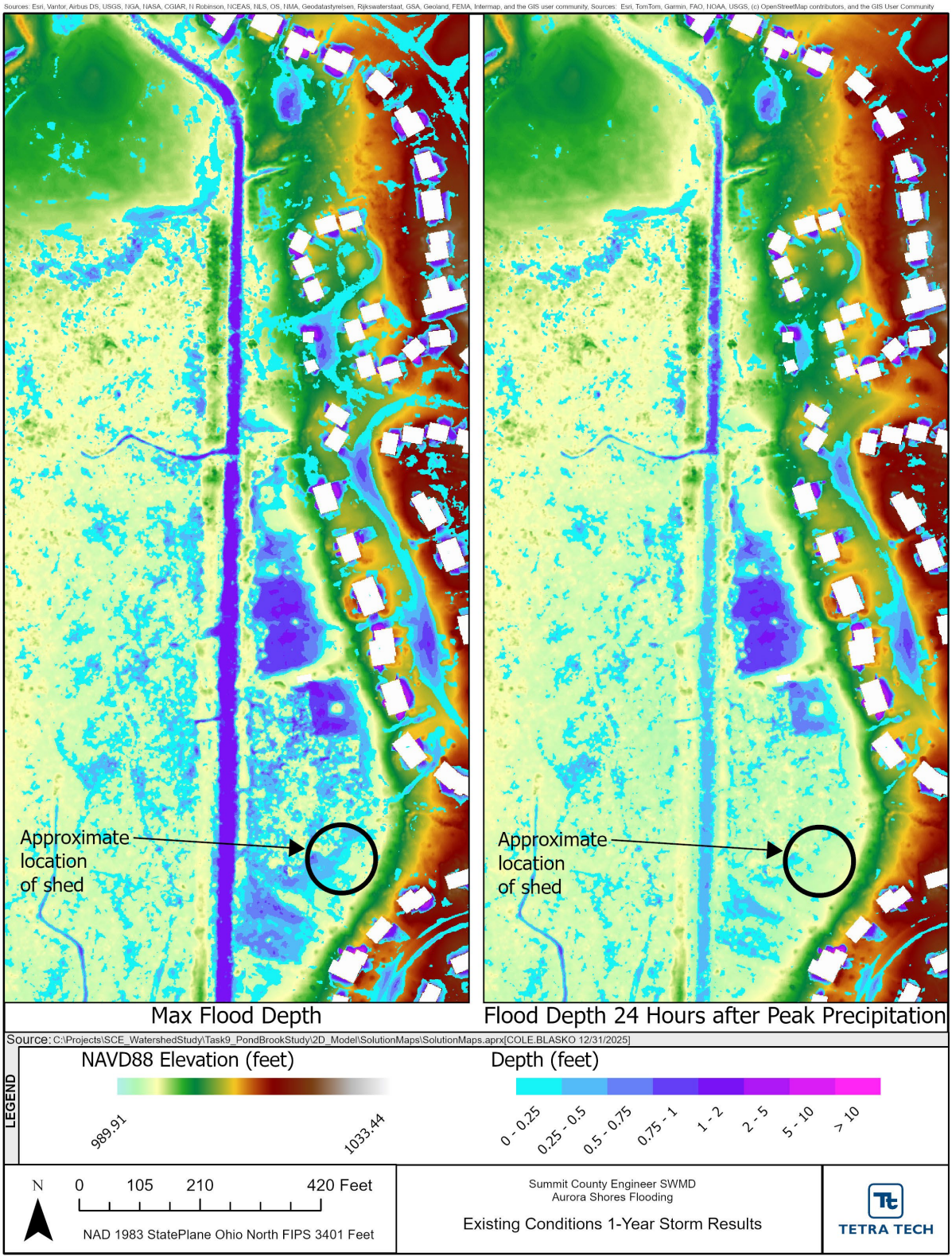


Figure 14. Max flood depths (left) and flood depths 24 hours after peak precipitation (right) for the 1-year storm under existing conditions.

7/17/2021



6/19/2025



10/30/2025



Figure 15. Documented flood depth and extent at the “shed” location for three different storms since 2021.

5.2 SCENARIO 7 RESULTS – ALL TETRA TECH PROPOSED IMPROVEMENTS

The flood inundation figures presented in the following sections are laid out in a grid pattern such that the flood depth and extent can be easily compared across all design storms for the existing conditions and proposed improvements scenario. The bottom row of the figures displays depth difference for each design storm (e.g., Scenario 7 minus Existing Conditions) such that a positive value indicates an increase in depth and a negative value indicates a decrease in depth. To assess the effectiveness of the proposed drainage improvements in a scenario, flood depths were mapped at two different times during the simulation. The mapped maximum depth results represent the highest water depth attained at each model cell at any time during the simulation, whereas flood depths shown 24 hours after peak precipitation represent instantaneous conditions at a fixed time step and are used to evaluate post-storm drainage and ponding duration. Finally, maps were exported at multiple spatial scales to best visualize patterns and extents of inundation.

Model results for Scenario 7 indicate a substantial improvement in post-storm drainage and a reduction in flood depths within the backyards east of Wetland Cell 1 across all modeled design storms. Most notably, flood depths within the yards 24 hours after peak precipitation are reduced by as much as 1 to 2 feet relative to existing conditions for the 1-, 2-, 10-, and 100-year events (Figure 16). These reductions show that the proposed improvements decrease the time in which yards are flooded with ponded water. The flood depth maps zoomed to the entirety of Wetland Cell 1 (Figure 17), show a clear increase in flood depths within the wetland and decrease in flood depths in the backyards. These simulated changes in depth indicate that the diversion embankment of Scenario 7 (Component 3 in Figure 13) functions as intended by redirecting flow from the ditch system into Wetland Cell 1 during storm events. This redistribution of flow reduces flood depths in homeowner backyards while utilizing available storage within Wetland Cell 1 which is consistent with the design intent per the Pond Brook/Liberty Park Final Mitigation Plan (Wetlands Resource Center et al., 2006).

For all design storms, maximum flood depths occur during and immediately following the period of peak precipitation, corresponding to approximately the 12- to 13-hour mark of the 24-hour storm simulation (Figure 2). Following this peak, flood depths decline as water is conveyed through the ditch network and stored within the wetland cells, with the most pronounced reductions observed at the 10- and 100-year events (Figure 18). Under these larger storms, Scenario 7 results in a widespread decrease in flood depths and inundation extent relative to existing conditions, indicating improved drainage during higher-magnitude rainfall.

At the smaller, more frequent 1- and 2-year events, the swales constructed to drain the yards also allow for a minor increase in localized flooding via a backwater effect from the ditch. In these cases, the swales introduce a slight increase in flood depth in limited areas; however, this effect is small in magnitude and does not offset the overall benefit of reduced ponding duration and lower flood depths across the broader residential area. Additionally, this backwater effect is constrained to only impact areas downstream of the diversion embankment where a decrease in max flood depths is observed for all design storms in the northern extent of the area near the baseball field (Figure 19).

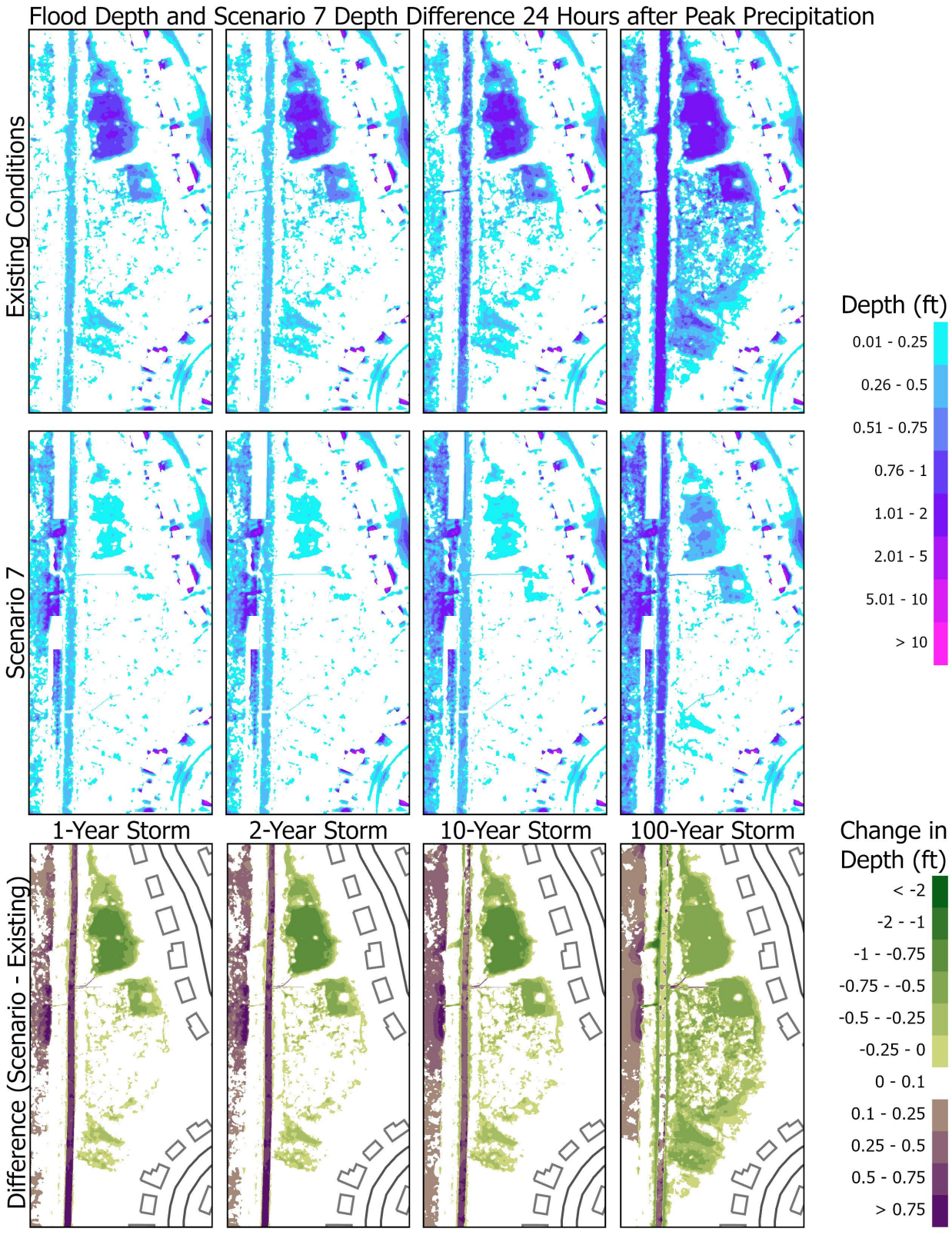


Figure 16. Flood depth and Scenario 7 depth difference maps 24 hours after peak precipitation zoomed to the backyards.

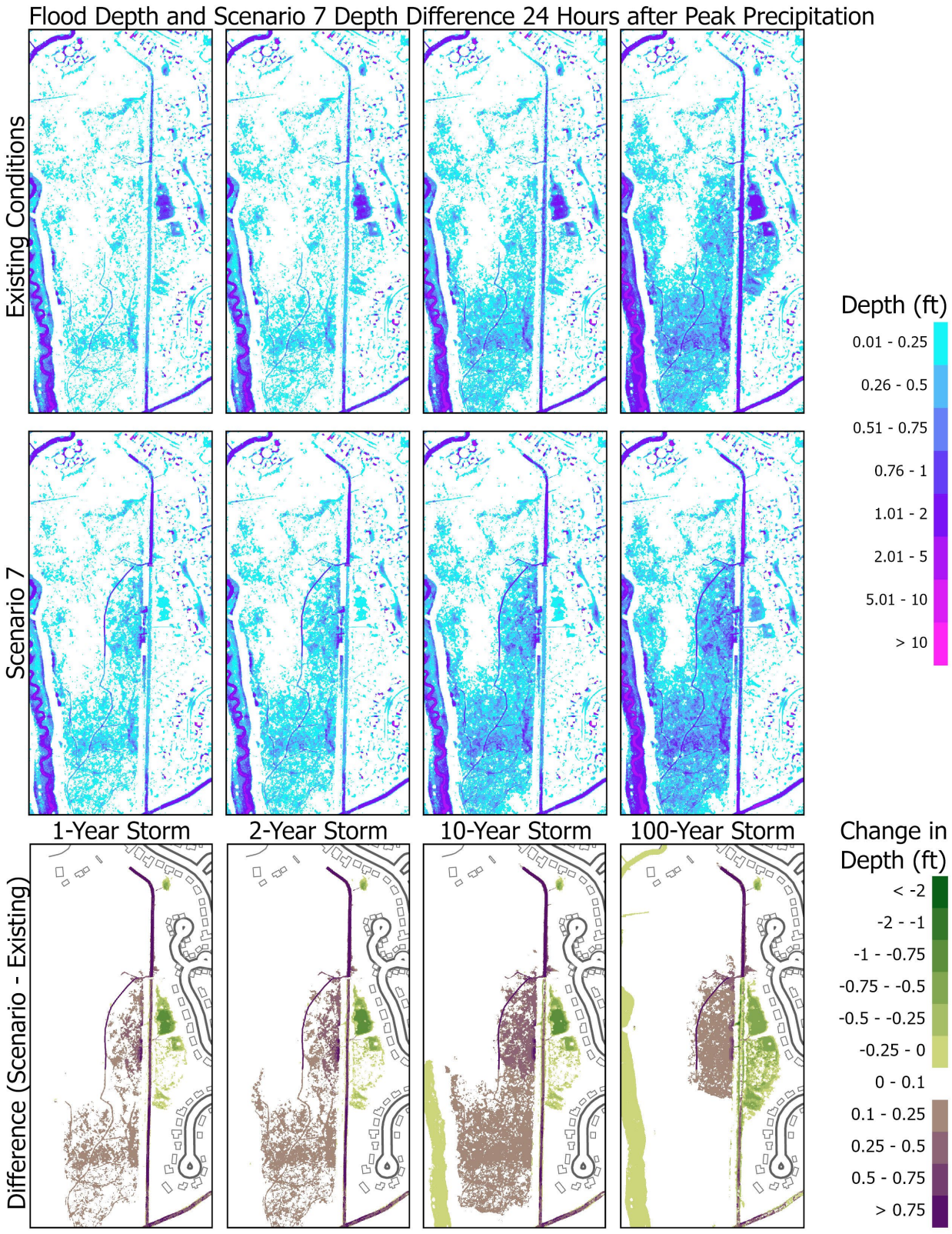


Figure 17. Flood depth and Scenario 7 depth difference maps 24 hours after peak precipitation zoomed to Wetland Cell 1.

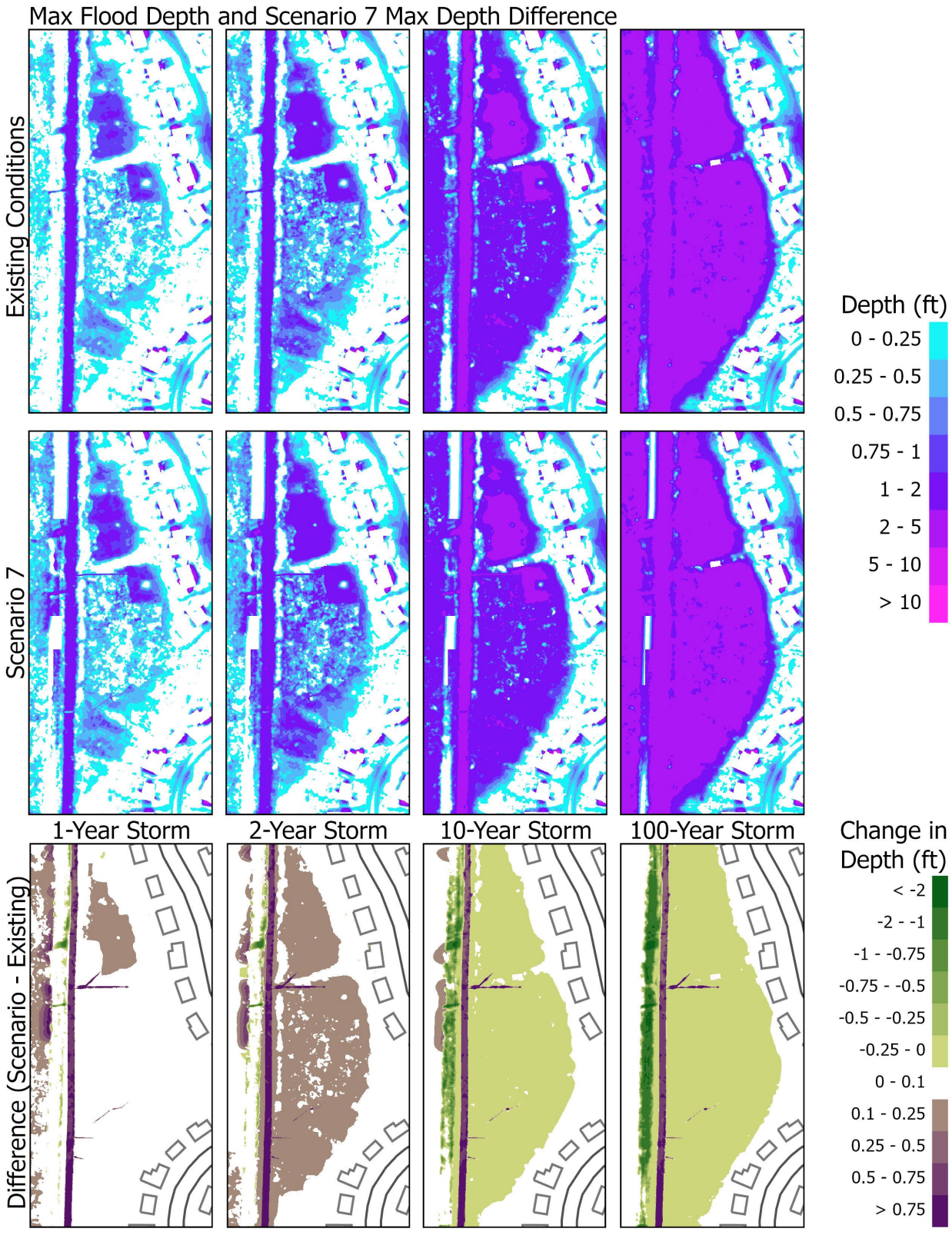


Figure 18. Maximum flood depth and Scenario 7 depth difference maps zoomed to the backyards.

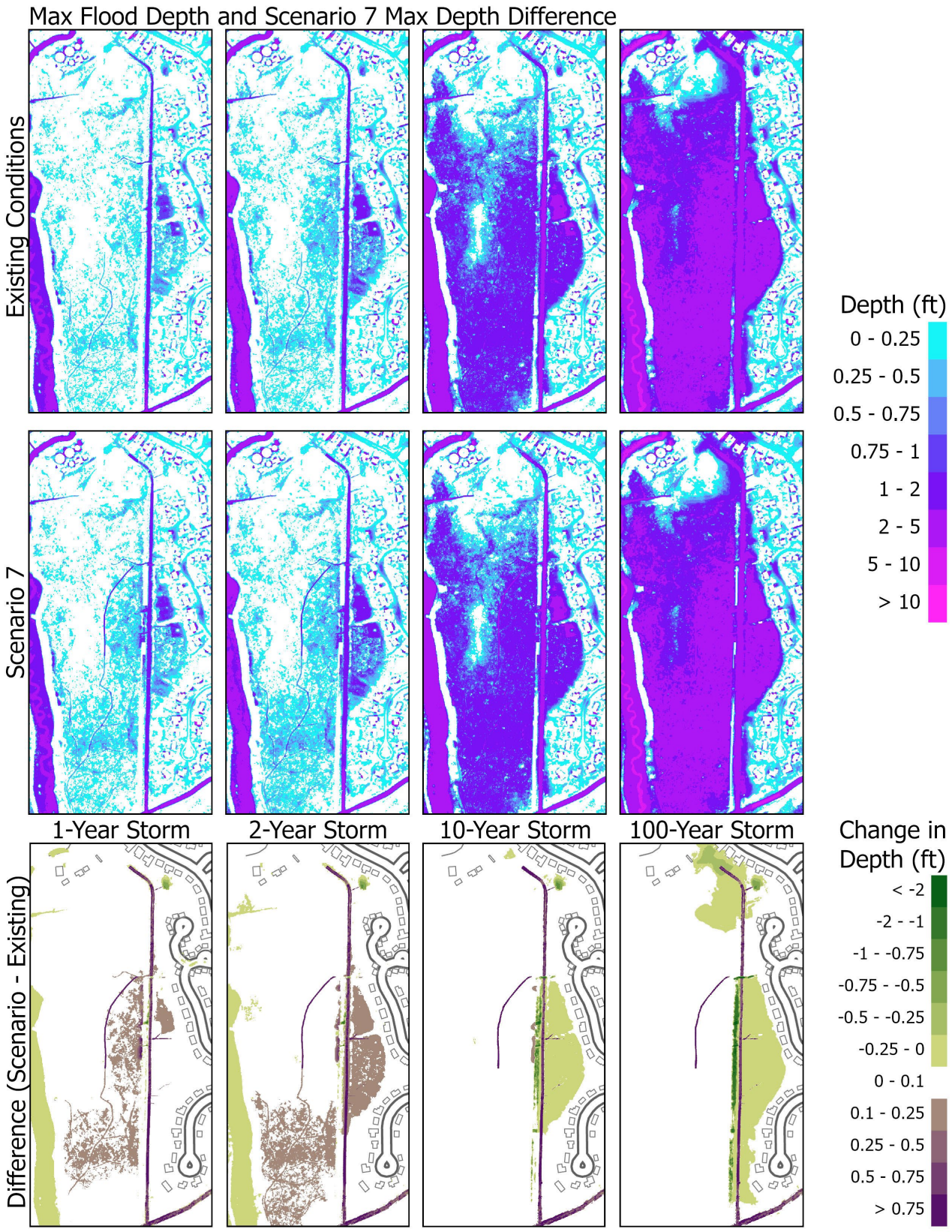


Figure 19. Maximum flood depth and Scenario 7 depth difference maps zoomed to Wetland Cell 1.

Figure 20 illustrates modeled water depth over time (depths measured at 6 hour intervals) at a single location under both existing conditions and the proposed Scenario 7 for the 1-, 2-, 10-, and 100-year design storms. This location within the flooded backyards is representative of the deepest non-draining depression and was selected because it corresponds to an area where persistent ponding has been documented by homeowners. Therefore, this location serves as a useful indicator of both peak flooding and post-storm drainage duration where flooding is expected to be the worst.

Although each design storm is represented by a 24-hour event, most of the rainfall occurs within a relatively short window where peak rainfall intensity is concentrated within approximately a three-hour period (Figure 2), resulting in rapid increases in surface water depth during the rising limb of each hydrograph. For all design storms, maximum water depths occur immediately following this peak rainfall period, after which depths decline as runoff is conveyed to Ditch 1.

The temporal results highlight a key difference in drainage duration between existing and proposed conditions. Under existing conditions, the modeled water depths remain elevated (i.e., > 1-foot deep) for at least 5 days following the storm, indicating prolonged ponding and limited drainage capacity in the low-relief yards. In contrast, water depths decline to depths of 3-inches only 30-hours after the peak precipitation for all design storms under Scenario 7. This reduction in ponding duration represents a substantial improvement in post-storm drainage and directly addresses homeowner concerns regarding standing water persisting for several days after rainfall events.

It should be noted that, as discussed in Section 1.4, HEC-RAS does not simulate time-dependent percolation or groundwater interactions. Additionally, these concept level terrain modifications can be improved upon during later planning stages. As such, the simulated results that show this deepest non-draining depression still retains a few inches of water under scenario conditions and over a foot of water under existing conditions is a proof of concept that flood conditions can be improved. Evaporation and soil infiltration, neither of which were modeled, will also impact ponding duration. However, these results still demonstrate that the proposed ditch excavation and diversion improvements reduce both the magnitude and duration of flooding at this location.

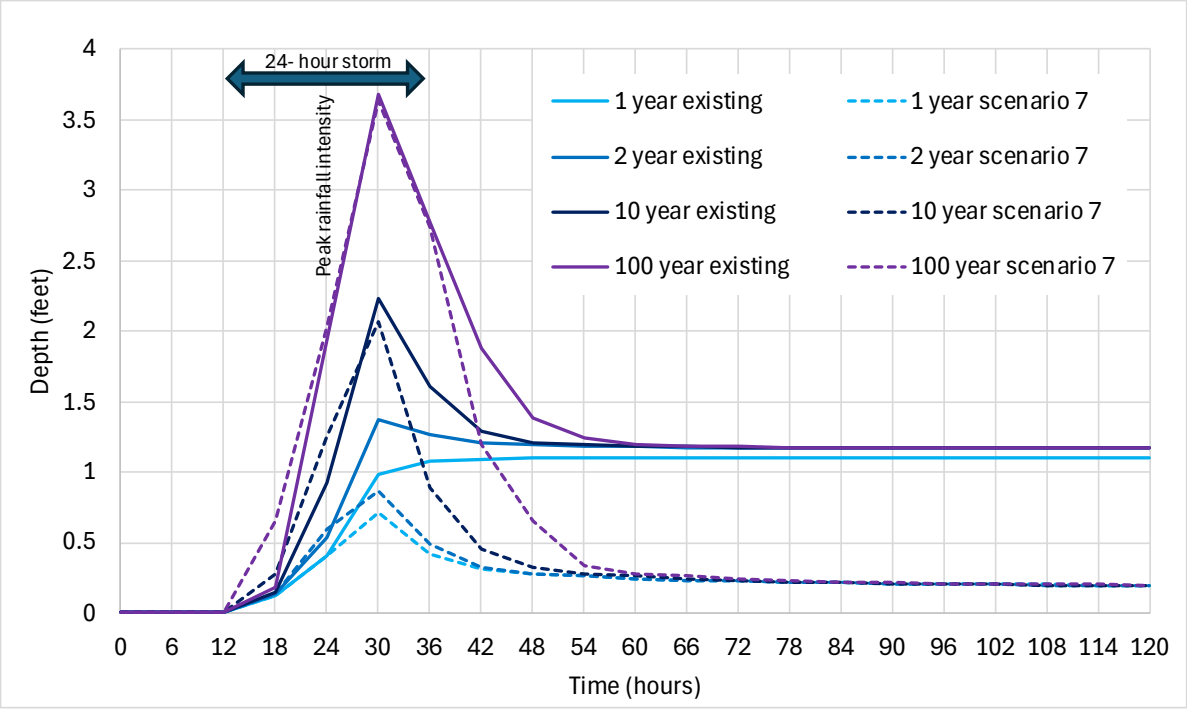


Figure 20. Flood depth measured in six-hour intervals at a representative backyard location for existing conditions and Scenario 7.

In summary, the results of the proposed improvements scenario show that impacts on Wetland Cell 1 are largely positive in nature. First, because the Agri-Drain in Ditch 1 specified in the Pond Brook/Liberty Park Final Mitigation Plan was never installed, there is only minor inundation within the wetland under existing conditions for the frequent 1- and 2-year storms. The proposed diversion embankment in Scenario 7 achieves the same flows into the wetland as was intended by the Agri-Drain that was never installed while also decreasing the flows along the ditch adjacent to the flooded area of concern. Second, the proposed swale excavation at the southern end of Wetland Cell 1 is at an elevation such that the zone of saturation can be maintained while also allowing for the wetland to act as temporary storage for larger storms, creating a natural seasonal or inter-seasonal wetting and drying of the wetland. Both proposed improvements are modifications to the terrain via earthwork and are expected to last longer, be easier to maintain, and achieve the same results as the Agri-Drain and water leveling pipe that were proposed in the Pond Brook/Liberty Park Final Mitigation Plan.

5.3 SCENARIO 8 RESULTS – ALL TETRA TECH PROPOSED IMPROVEMENTS WITH OHM ADVISORS PROPOSED IMPROVEMENTS

Scenario 8 results were compared with Scenario 7 to isolate the effects of the proposed OHM Advisors improvements (i.e., diversion culvert and detention basin). Both scenarios include the eight Tetra Tech-proposed improvements, with the OHM components representing the only difference. Changes in maximum flood depth and flood depth 24 hours after peak precipitation were evaluated to determine whether the OHM improvements adversely affect flooding within the study area.

Like the analysis performed for Scenario 7, Figure 21 illustrates modeled water depth over time under Scenario 7 and Scenario 8 for the 1-, 2-, 10-, and 100-year design storms. This location within the flooded backyards is representative of the deepest non-draining depression and was selected because it corresponds to an area where persistent ponding has been documented by homeowners. Therefore, this location serves as a useful indicator of both peak flooding and post-storm drainage duration where flooding is expected to be the worst. Figure 21 shows there are negligible changes in water depth over time under all design storms as a result of the addition of the OHM improvements.

For the remaining areas of interest addressed in this study, narrative results summarized in Table 4 and spatial results shown in Figure 22 show that the diversion culvert and detention basin have a positive impact on Regatta Trail and a negligible impact on Windjammer Cove, Windjammer Trail, and Sea Ray Cove in terms of maximum inundation depth.

The 2D HEC-RAS model shows an increase in flood depths for areas upstream of the diversion culvert. However, the SWMM model from OHM used to propose the diversion culvert includes a detention basin along the diversion culvert tributary that is located outside the HEC-RAS model domain. Consequently, the HEC-RAS tributary inflow boundary condition does not reflect the attenuation provided by the basin and likely overestimates peak flows entering the diversion culvert area. This results in an overestimation of the extent and depth of flooding upstream of the diversion embankment. Therefore, the OHM SWMM model likely provides the more representative estimate of flooding within this localized area. This limitation in the HEC-RAS model does not affect the interpretation of results in the area of interest assessed in the memo.

Figure 23 shows that there are negligible changes between the two scenarios 24 hours after the peak precipitation indicating the diversion culvert and detention basin have little impact on ponding duration across the entire study area.

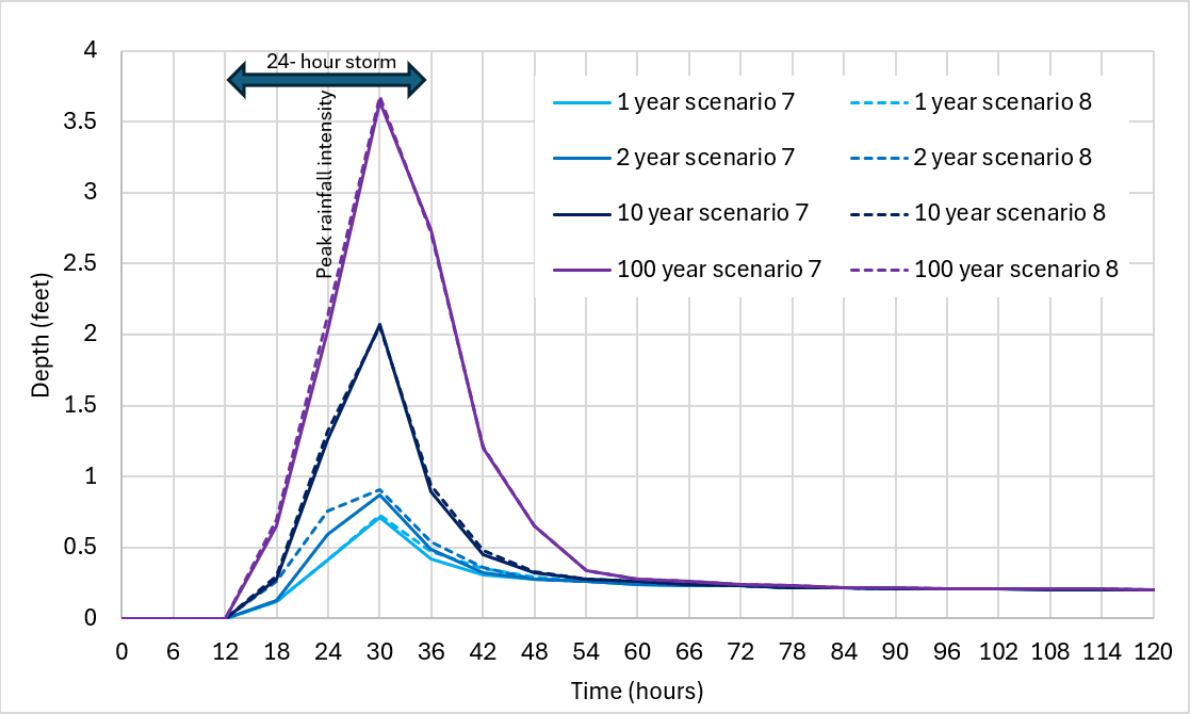


Figure 21. Flood depth measured in six-hour intervals at a representative backyard location for Scenario 7 and Scenario 8.

Table 4. Narrative description of inundation depth results by location for Scenario 8 compared to Scenario 7.

	1-year	2-year	10-year	100-year
Tetra Tech area of interest				
Wetland Cell 1	No Change	No Change	No Change	No Change
Regatta Trail	In channel decreases up to 2-ft	In channel decreases up to 2-ft	Localized decrease > 2-ft	Widespread decrease up to 0.75-ft
Windjammer Cove/ Windjammer Trail	No Change	No Change	No Change	No Change
Sea Ray Cove	No Change	No Change	No Change	No Change
OHM Advisors area of interest				
Upstream of diversion culvert	In-channel increases >0.75-ft	Localized overbank increases >0.75-ft	Widespread increases >0.75-ft	Widespread increases >0.75-ft
Downstream of diversion culvert	In-channel decreases up to 2-ft	In-channel decreases up to 2-ft	Localized overbank decreases >2-ft	Widespread overbank decreases up to 2-ft
Detention basin vicinity / Anchorage Cove	Localized decreases up to 0.5-ft	Localized decreases up to 0.5-ft	Widespread decreases up to 0.25-ft	Widespread decreases up to 0.25-ft

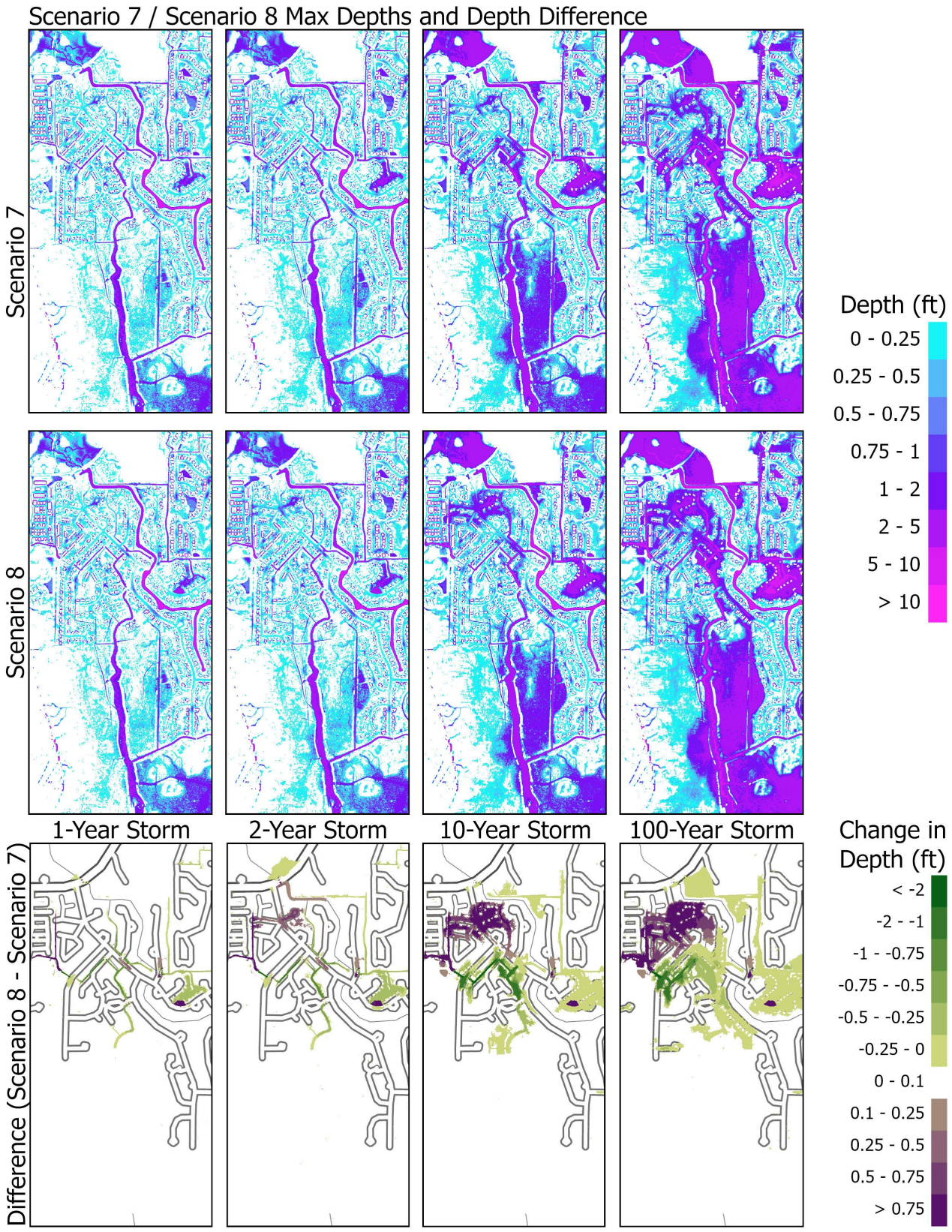


Figure 22. Maximum flood depth and depth differences for Scenario 7 and Scenario 8.

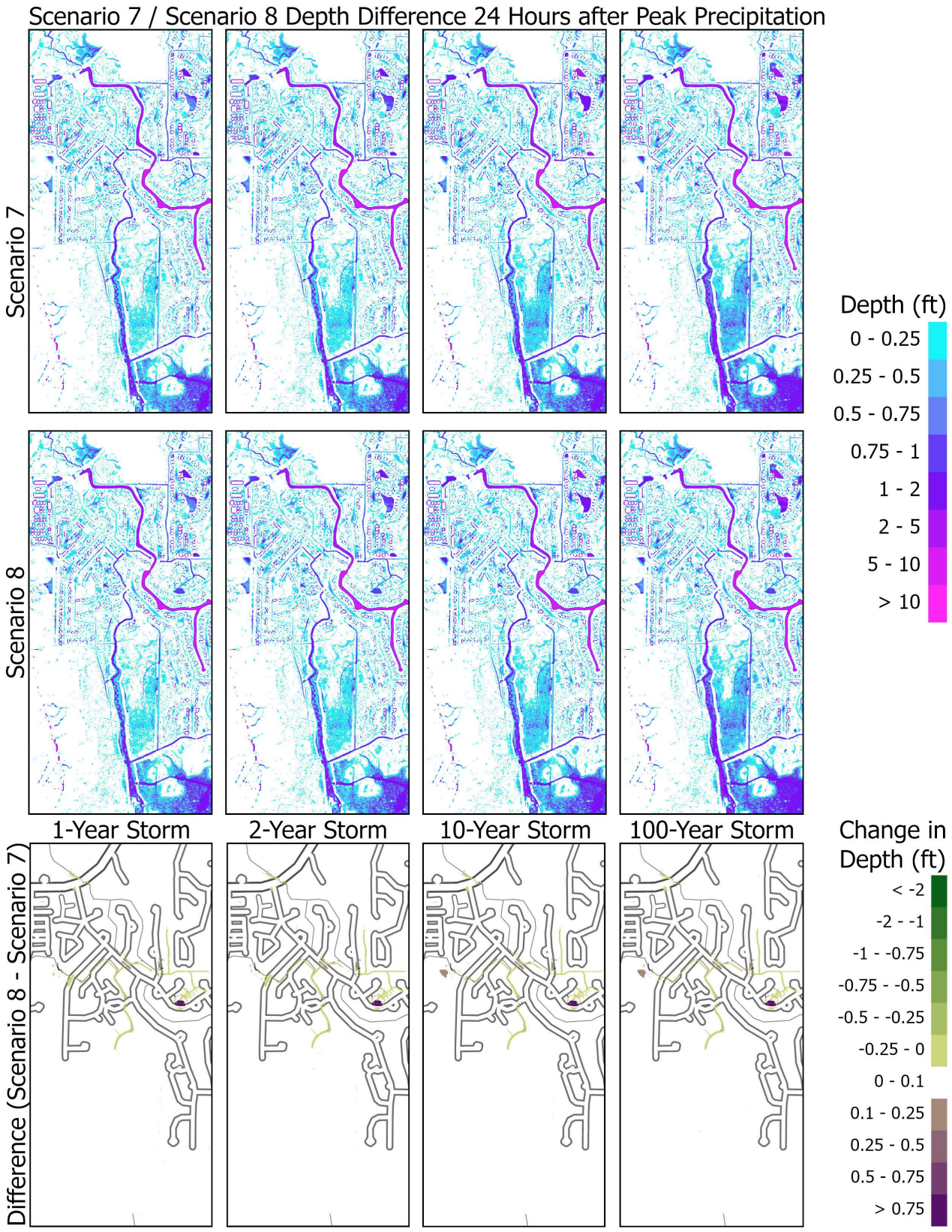


Figure 23. Flood depths and depth differences 24 hours after peak precipitation for Scenario 7 and Scenario 8.

5.4 SCENARIO 9 RESULTS – SELECT TETRA TECH PROPOSED IMPROVEMENTS WITH OHM ADVISORS PROPOSED IMPROVEMENTS

Scenario 9 results were compared to Baseline existing conditions to assess the effectiveness of the improvements proposed by OHM Advisors (i.e., diversion culvert and detention basin) coupled with the improvements proposed by Tetra Tech that were approved by Summit Metroparks (excavation of Ditches 1 and 2, construction of embankment on east side of Wetland Cell 1, and the diversion embankment where the Agri-Drain was supposed to be installed).

With the Tetra Tech components not approved by Summit Metroparks removed and the OHM improvements incorporated, Scenario 9 generally produced results similar to those observed in Scenario 7. However, there is one notable difference for the 100-year event where changes in maximum flood depth are negligible relative to Existing Conditions, whereas Scenario 7 indicated reductions of approximately 0.25 ft. This difference is likely due to the diversion culvert bypassing upstream floodplain storage and conveying a more rapid inflow to Pond Brook near Wetland Cell 1. Although the diversion culvert had little effect within the area of concern when evaluated in combination with all eight Tetra Tech-proposed components, its influence becomes more apparent when only the improvements approved by Summit Metroparks are included.

Narrative descriptions of changes in maximum flood depth are in Table 5 while spatial patterns in depth extent are shown in Figure 24.

Table 5. Narrative description of maximum inundation depth results by location for Scenario 9 compared to Existing Conditions.

	1-year	2-year	10-year	100-year
Tetra Tech area of interest				
Wetland Cell 1	Increases up to 0.25-ft	Increases up to 0.25-ft	No Change	No Change
Regatta Trail	In channel decreases up to 0.75-ft	In channel decreases up to 1- ft	Localized decrease up to 2-ft	Widespread decrease up to 0.5-ft
Windjammer Cove/ Windjammer Trail	Increases up to 0.25-ft	Increases up to 0.5-ft	Decreases up to 0.25-ft	No Change
Sea Ray Cove	Increases up to 0.25-ft	Increases up to 0.25-ft	Decreases up to 0.25-ft	No Change
OHM Advisors area of interest				
Upstream of diversion culvert	In-channel increases >0.75-ft	Localized overbank increases up to 0.75-ft	Widespread increases >0.75-ft	Widespread increases >0.75-ft
Downstream of diversion culvert	In-channel decreases up to 2-ft	In-channel decreases up to 2-ft	Localized overbank decreases up to 1-ft	Widespread overbank decreases up to 2-ft
Detention basin vicinity / Anchorage Cove	Localized decreases up to 0.5-ft	Localized decreases up to 0.5-ft	Widespread decreases up to 0.25-ft	Widespread decreases up to 0.25- ft

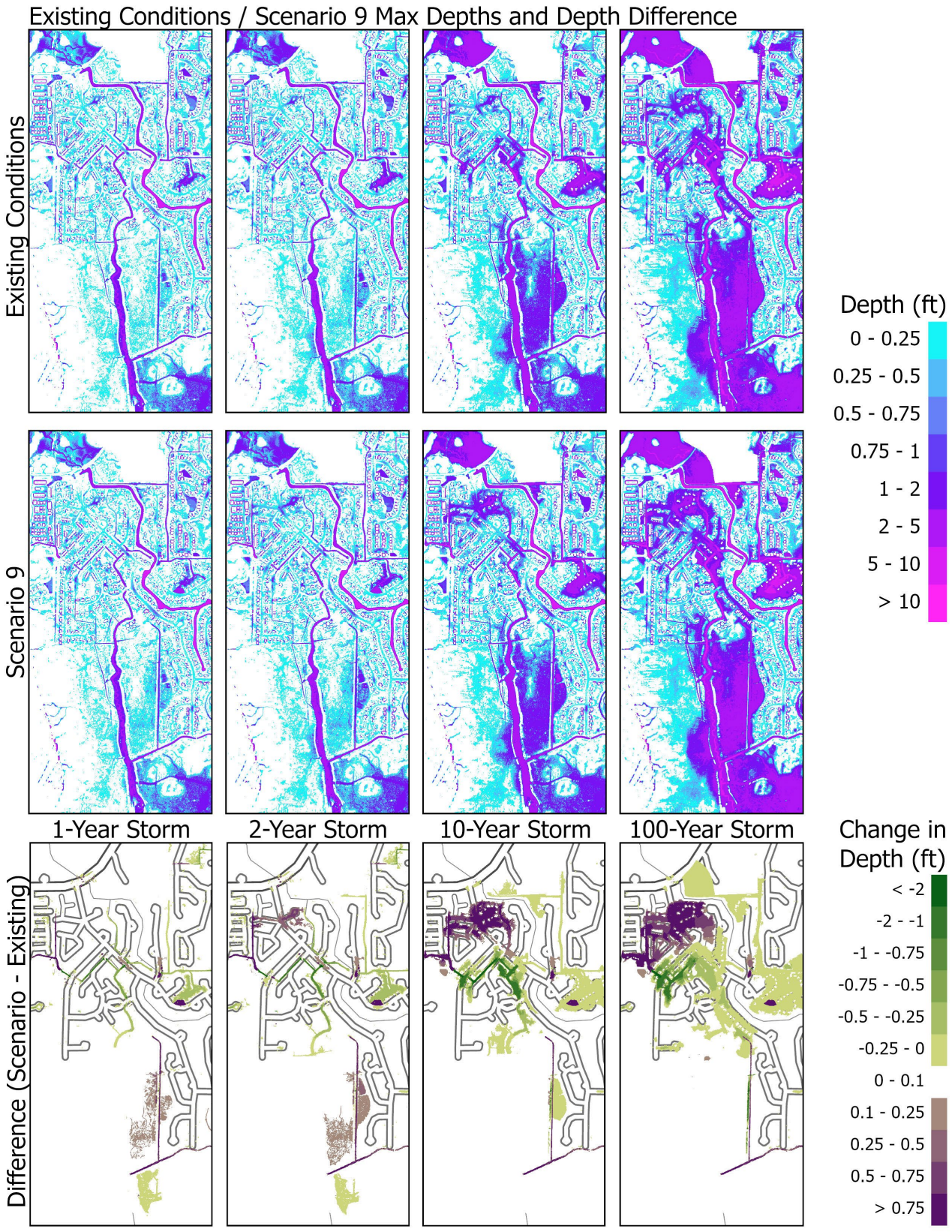


Figure 24. Maximum flood depth and depth differences for Existing Conditions and Scenario 9.

Like previous scenarios, flood depths 24 hours after peak precipitation were evaluated to determine whether the OHM improvements coupled with the Tetra Tech approved improvements have a net positive impact on flooding duration within the study area.

With the components that Summit Metroparks did not approve removed from the model, and with the addition of the OHM components, Scenario 9 did not produce the same results as Scenario 7. At 24 hours after peak precipitation, backyard ponding for the 1- and 2-year events was comparable to Existing Conditions while the 10- and 100-year events continued to show reduced flooding, although to a lesser extent than under Scenario 7. Revisiting the deepest non-draining depression within the flooded backyards, Figure 26 shows negligible changes in water depth under Scenario 9 compared to existing conditions for all design storms. This distinction is important because prolonged backyard ponding was a primary concern expressed by residents. This extended ponding duration is likely due to the removal of the proposed components that were designed to drain the wetland and backyards faster. These extended ponding results are summarized in Table 6 and Figure 25.

Table 6. Narrative description of inundation depth results 24 hours after peak precipitation by location for Scenario 9 compared to Existing Conditions..

	1-year	2-year	10-year	100-year
Tetra Tech area of interest				
Wetland Cell 1	Increases up to 0.5-ft	Increases up to 0.5-ft	Increases up to 0.75-ft	Increases up to 0.5-ft
Regatta Trail	In channel decreases up to 0.25-ft	In channel decreases up to 0.25-ft	In channel decreases up to 0.25-ft	In channel decreases up to 0.25-ft
Windjammer Cove/ Windjammer Trail	In ditch increases but no change in overbank	In ditch increases but no change in overbank	In ditch increases and decrease up to 0.25-ft in overbank	In ditch increases and decrease up to 0.5-ft in overbank
Sea Ray Cove	In ditch increases but no change in overbank	In ditch increases but no change in overbank	In ditch increases and decrease up to 0.25-ft in overbank	In ditch increases and decrease up to 0.5-ft in overbank
OHM Advisors area of interest				
Upstream of diversion culvert	In-channel increases >0.75-ft	In-channel increases >0.75-ft	Localized overbank increases up to 0.25-ft	Localized overbank increases up to 0.25-ft
Downstream of diversion culvert	In-channel decreases up to 0.5-ft	In-channel decreases up to 0.5-ft	In-channel decreases up to 0.5-ft	In-channel decreases up to 0.5-ft
Detention basin vicinity / Anchorage Cove	Localized decreases up to 0.25-ft	Localized decreases up to 0.25-ft	Localized decreases up to 0.25-ft	Localized decreases up to 0.25-ft

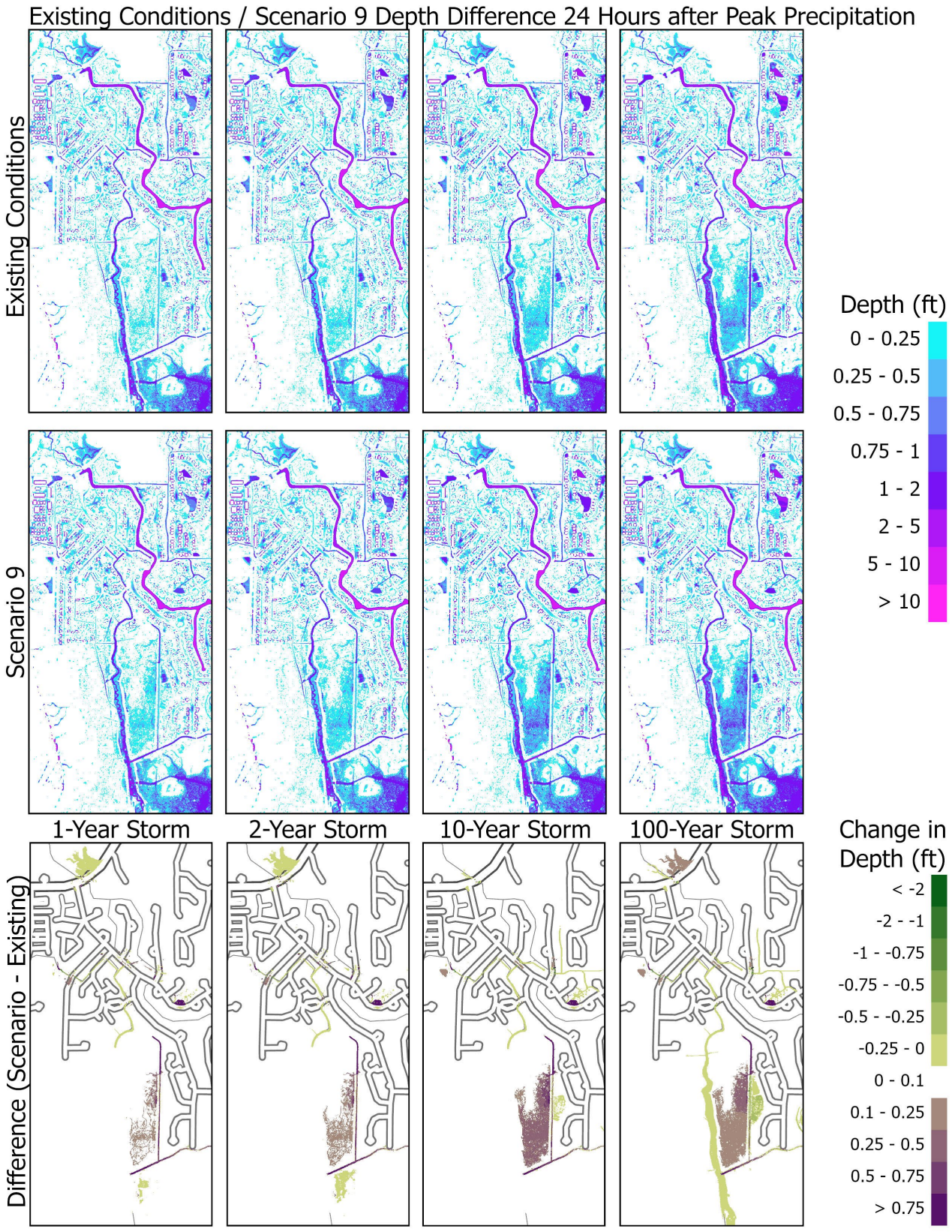


Figure 25. Flood depths and depth differences 24 hours after peak precipitation for Existing Conditions and Scenario 9.

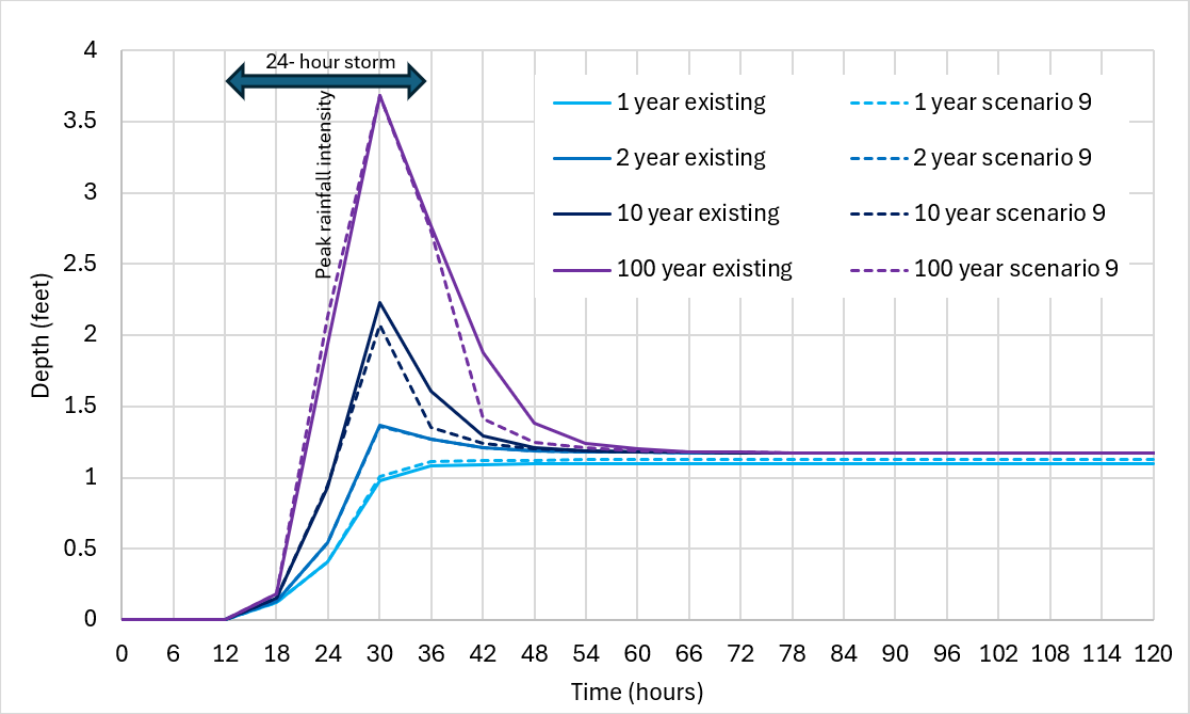


Figure 26. Flood depth measured in six-hour intervals at a representative backyard location for existing conditions and Scenario 9.

6.0 GROUNDWATER INFLUENCES

A detailed groundwater analysis was outside the scope of this study. However, given the persistent nature of flooding and prolonged ponding observed in the Aurora Shores neighborhood, Tetra Tech reviewed available groundwater information from previous studies to qualitatively assess whether shallow groundwater conditions and a high water table may contribute to reduced soil infiltration capacity and extended surface inundation.

Tetra Tech collected water table elevation data from September 2012 to September 2013 from the wetland and backyard sides of Ditch 1 as part of the Monitoring and Management Report (Davey Resource Group, 2013). Within the backyards, groundwater elevations fluctuate by approximately one foot over time and consistently remain below the ground surface suggesting that the shallow groundwater system responds slowly and within a one-foot range relative to individual storm events (Figure 27). However, there are two significant dips in water table levels around 11/11/2012 and 7/11/2013 that occur in multiple monitoring wells across the study area. While these dips in the water table do roughly correspond to precipitation events, they are infrequent and do not appear for all precipitation events. It is possible these dips are associated with changes in the water surface of Aurora Lake, which is discussed further below.

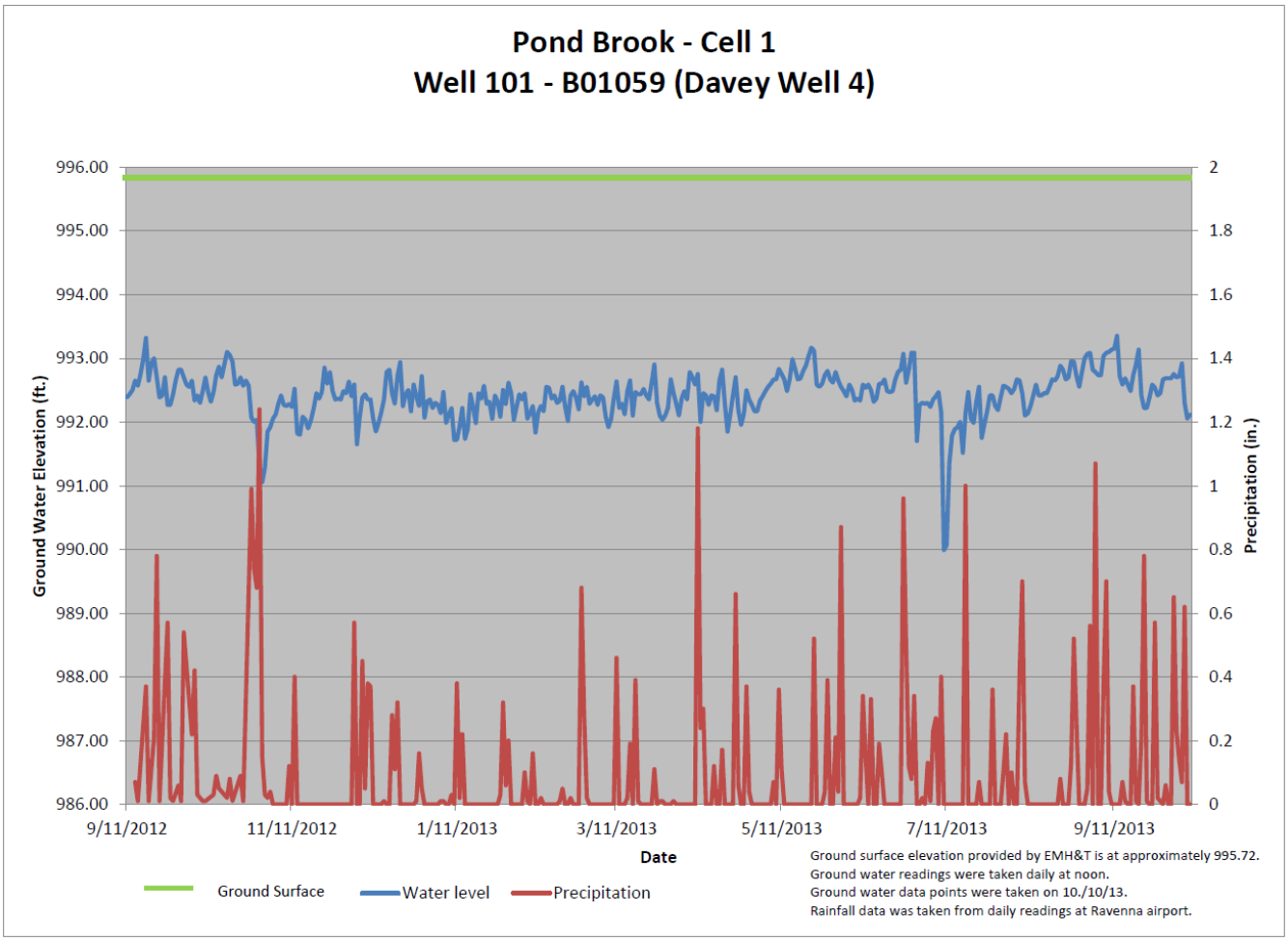


Figure 27. Water table monitoring data in backyard of home on Windjammer Cove (Davey Resource Group, 2013).

A University of Akron graduate student thesis (Dzirasah, 2008) provides additional insight into groundwater conditions and shows that the water table slopes from east to west toward Pond Brook (Figure 28). These profiles also indicate that groundwater elevations are higher beneath the residential backyards than beneath the adjacent wetland areas. This hydraulic gradient suggests that groundwater discharge toward Pond Brook is a dominant control on subsurface flow, and that the wetland system may act as a localized groundwater sink. Furthermore, Dzirasah 2008 also mapped the water table surface for specific dates of interest in plan view (Figure 29) which shows that the highest water table elevations correspond almost exactly with the locations of flooding in the backyards. This presence of a persistently shallow water table reduces the available unsaturated soil storage and limits infiltration following rainfall, particularly within the poorly drained organic soils that underlie the affected backyards.

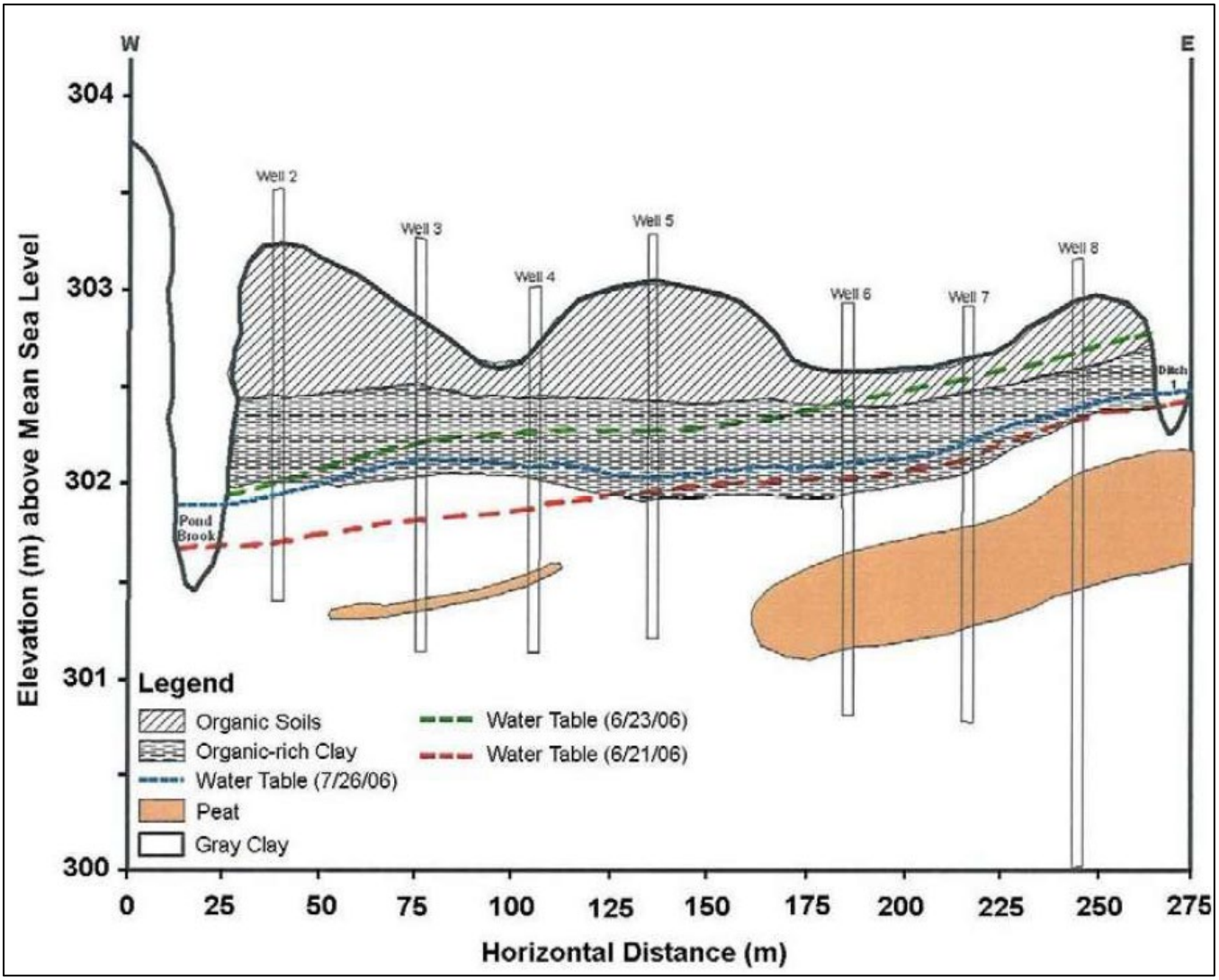


Figure 28. West-east cross section of Wetland Cell 1 with interpolated water table surfaces (Dzirasah, 2008).

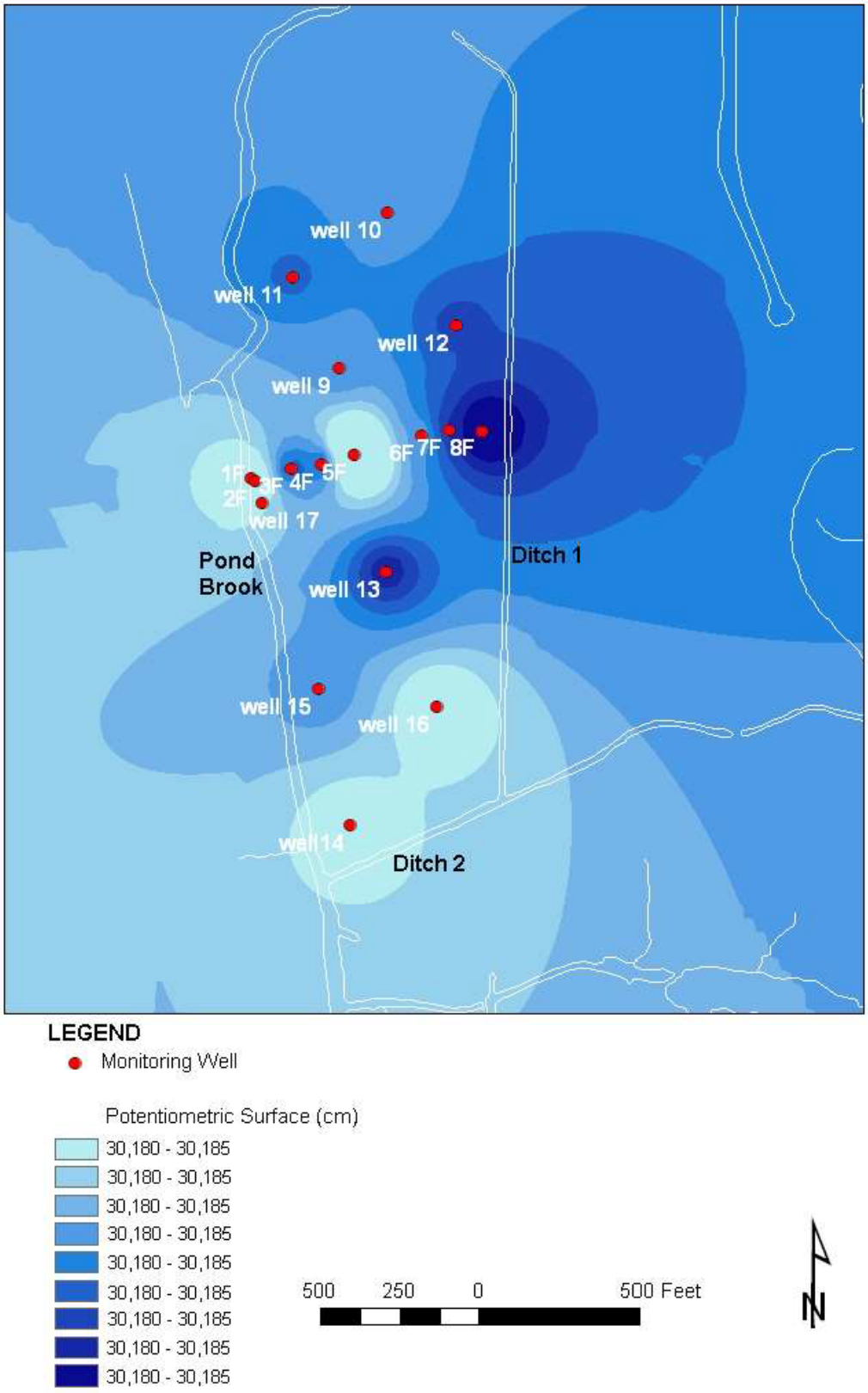


Figure 29. Plan view of the water table surface elevation in centimeters on 8/8/2006 (Dzirasah, 2008).

Tetra Tech developed a conceptual projection of water table elevation to evaluate the potential influence of Aurora Lake water levels on groundwater elevations beneath the backyards (Figure 30). This projection assumes the same water table slope and elevation from Dzirasah, 2008 (Figure 28) and projects it linearly to potential Aurora Lake stage elevations. This highly simplified conceptual model should not be used in lieu of a calibrated groundwater simulation. However, it does show the potential for increases in lake stage to increase groundwater elevations extending toward the residential area, potentially further reducing infiltration capacity and contributing to prolonged ponding following storm events. More specifically, if the water tables observed by Dzirasah on 6/21/2006 and 6/23/2006 are linearly projected to an Aurora Lake stage of 999.7 feet NAVD88, the water table remains below the ground surface. However with the water surface of Aurora Lake stage at 1000.7 feet NAVD88 and Pond Brook at bankfull conditions, both of which are expected during a 1-year storm, the water table surface is projected to be approximately six inches above the ground surface in the backyards, consistent with observed flood depths.

While these assumptions represent a simplified conceptualization of subsurface conditions, the analysis shows the potential for hydraulic connection between lake stage, groundwater elevations, and surface drainage. This conceptual relationship supports the conclusion that surface flooding and delayed drainage in the Aurora Shores neighborhood are primarily driven by surface hydrology and topography with secondary influence of shallow groundwater conditions and limited soil permeability. These findings reinforce the importance of surface-based mitigation strategies, such as improved conveyance, storage, and drainage pathways as proposed in Scenario 7.

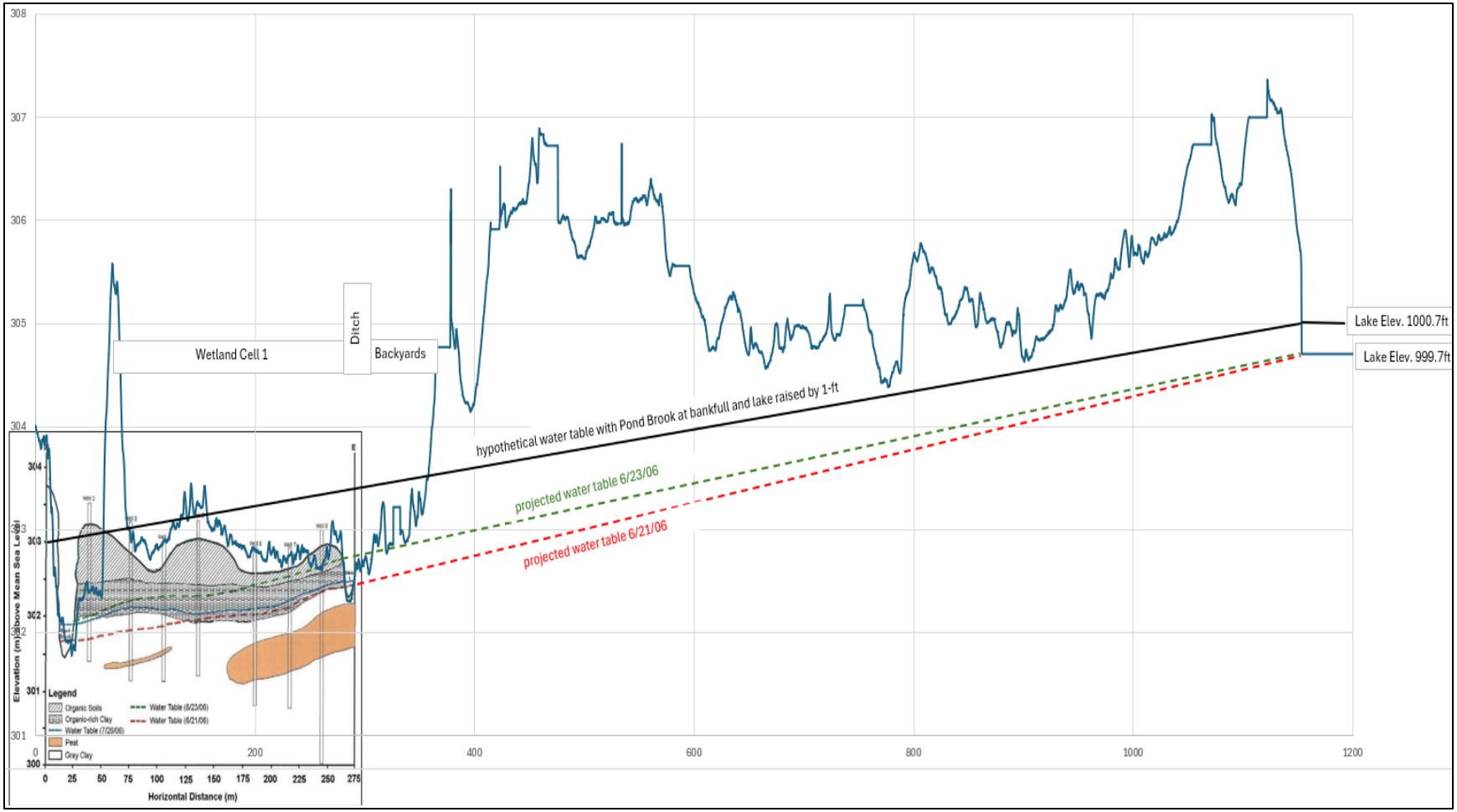


Figure 30. Conceptual water table surface using water table slopes from Dzirasah, 2008 (Figure 21) projected linearly to Aurora Lake compared to ground surface profile from HEC-RAS model.

7.0 CONCLUSIONS

This addendum expands upon the findings presented in the April 2025 *Aurora Shores 2-D HEC-RAS Model* memorandum with incorporation of observed field conditions, additional design storms, revised hydrologic boundary conditions, soil infiltration parameters, and a five-day simulation period to evaluate both the magnitude and duration of flooding within the Aurora Shores neighborhood. This expanded scope of work evaluated a series of conceptual drainage improvements under three scenarios that included proposed improvements to reduce flood depths, decrease ponding duration, and improve utilization of the existing wetland system.

The conclusions presented herein should be considered in the context of previous studies completed within the watershed. Tetra Tech agrees with the conclusions of the Pond Brook restoration study and subsequent one-dimensional (1-D) hydraulic analyses performed for Summit Metroparks, which showed that the restoration of the Pond Brook main channel did not increase flooding within the study area. However, that model was developed to evaluate hydraulic conditions within the main stem of Pond Brook and did not explicitly represent direct rainfall runoff from adjacent developed areas, the complex ditch network surrounding the wetland cells, wetland water control structures, or inflows from the Aurora Lake spillway.

Tetra Tech also agrees with the conclusions of the OHM Advisors studies and SWMM models that informed the Anchorage Cove, Pirates Trail, and Clipper Cove proposed improvements. However, the SWMM model did not incorporate the improvements proposed by Tetra Tech, the Aurora Lake outflow boundary condition, or the full spatial extent of all the wetlands that are represented in the 2D HEC-RAS model. As such, the 2-D HEC-RAS model developed by Tetra Tech incorporates each of these components and was further validated against homeowner observations and documented flooding associated with frequent storm events. Consequently, the model provides a comprehensive representation of the hydrologic and hydraulic processes contributing to localized flooding and serves as an appropriate basis for evaluating the conceptual mitigation alternatives presented in this addendum. A summary of the model set up, discussion, and conclusion of each scenario are provided below.

Existing Conditions

- Model set-up – The existing conditions model was updated to represent field conditions observed during the October 2025 site visit, including removal of wetland control structures that were not present in the field, revision of Agri-Drain operational elevations, increased Manning's *n* values within Ditches 1 and 2 to represent dense vegetation, revised hydrologic boundary conditions for the 1-, 2-, 10-, and 100-year design storms, and incorporation of soil infiltration parameters into a five-day simulation period.
- Discussion – Model results indicate that localized flooding occurs during frequent 1- and 2-year design storms and that ponded water persists in low-lying residential backyards for several days following rainfall. Simulated flood depths, inundation extents, and ponding duration closely match homeowner observations and photographic documentation, providing confidence that the updated model reasonably represents existing hydrologic and hydraulic conditions. Field observations also confirmed that several wetland control structures identified in the Pond Brook/Liberty Park Final Mitigation Plan are no longer present or functional, resulting in hydraulic conditions that differ from those originally intended for the wetland system.
- Conclusion – The updated existing conditions model provides a representative baseline for evaluating conceptual drainage improvements within the Aurora Shores neighborhood. Results indicate that the primary flooding concern is prolonged ponding from direct precipitation on low-lying residential areas with limited

drainage, rather than widespread overbank flooding from Pond Brook. This validated baseline provides the foundation for assessing the effectiveness of the proposed mitigation scenarios evaluated in this addendum.

Scenario 7 – All Tetra Tech Proposed Improvements

- Model set-up – Scenario 7 evaluated the complete set of eight proposed drainage improvements developed by Tetra Tech, including excavation of Ditches 1 and 2, construction of embankments and diversions to increase utilization of Wetland Cell 1 storage and to prevent backwater flooding from Aurora Lake spillway outflows, excavation of outlet swales, and restoration of positive drainage within the flooded backyards.
- Discussion –Flood depths within residential backyards 24 hours after peak precipitation were reduced by approximately 1 to 2 feet across all design storms, while ponding duration was reduced from several days under existing conditions to approximately 24 to 54 hours. The proposed diversion embankment successfully redirected runoff into Wetland Cell 1, utilizing available wetland storage while decreasing flood depths within the adjacent residential properties. Although localized backwater effects were observed for the 1- and 2-year storms, these increases were minor, limited in extent, and outweighed by the overall reductions in flood depth and ponding duration. The proposed improvements also provide positive benefits to Wetland Cell 1 by restoring the intended zone of saturation and utilizing the wetland for temporary stormwater storage through terrain modifications rather than water control structures requiring long-term maintenance.
- Conclusion – Scenario 7 represents the most comprehensive conceptual solution evaluated in this study. The greatest hydraulic benefit is attributed to ditch excavation, construction of the Wetland Cell 1 embankment, and the diversion embankment (Components 1, 2, and 3), which together improve conveyance, redirect runoff away from the flooded backyards, and utilize available wetland storage. While these improvements substantially reduce both flood depths and ponding duration, they do not eliminate flooding because the affected backyards remain topographically low, continue to receive direct precipitation, and are located above a high groundwater table. Complete elimination of flooding would require raising and re-grading the residential backyards above the 100-year flood elevation, an alternative that was not pursued due to the extensive fill volumes required, anticipated permitting and wetland mitigation requirements, and associated construction costs.

Scenario 8 – All Tetra Tech Proposed Improvements with OHM Advisors Proposed Improvements

- Model set-up – Scenario 8 incorporated the eight proposed drainage improvements developed by Tetra Tech together with the two stormwater improvements proposed by OHM Advisors, including the Pirates Trail diversion culvert and the Anchorage Cove detention basin. Results were compared directly with Scenario 7 to isolate the hydraulic effects of the OHM improvements within the study area.
- Discussion – The addition of the OHM improvements produced localized hydraulic changes near the diversion culvert and detention basin while having negligible effects within the primary area of concern along Windjammer Cove, Windjammer Trail, and Sea Ray Cove. The diversion culvert reduced flooding downstream near Regatta Trail but increased modeled flood depths immediately upstream of the diversion embankment. However, these upstream increases are likely overestimated because the HEC-RAS model does not include the attenuation provided by the upstream detention basin represented in the OHM SWMM model. Within the residential backyards addressed by this study, maximum flood depths and ponding duration remained essentially unchanged relative to Scenario 7.
- Conclusion – The improvements proposed by OHM Advisors are compatible with the drainage improvements proposed by Tetra Tech and do not adversely affect flooding within the primary area of concern. The Pirates Trail diversion culvert and Anchorage Cove detention basin provide localized flood reduction benefits while maintaining the reductions in flood depth and ponding duration achieved under Scenario 7. As such, the

improvements can be implemented concurrently with the proposed drainage improvements without compromising their effectiveness.

Scenario 9 – Select Tetra Tech Proposed Improvements with OHM Advisors Proposed Improvements

- Model set-up – Scenario 9 evaluated the three drainage improvements proposed by Tetra Tech that were approved by Summit Metroparks, including excavation of Ditches 1 and 2, construction of the Wetland Cell 1 embankment, and construction of the diversion embankment while also keeping the operational elevations of the Agri-Drains the same as what was observed during the site visit. This scenario also incorporated the OHM Advisors improvements, including the Pirates Trail diversion culvert and Anchorage Cove detention basin, while excluding the remaining Tetra Tech proposed improvements that were not approved.
- Discussion – Scenario 9 produced many of the same hydraulic benefits observed under Scenario 7, particularly with respect to reducing peak flood depths during the larger 10- and 100-year design storms. However, removal of the remaining proposed improvements resulted in reduced drainage efficiency following storm events. Most notably, backyard ponding 24 hours after peak precipitation during the frequent 1- and 2-year storms remained comparable to Existing Conditions, whereas Scenario 7 substantially reduced ponding duration. These results indicate that while the approved improvements effectively increase conveyance and redirect runoff into Wetland Cell 1, the omitted components primarily function to accelerate drainage of residual ponded water from the backyards following storm events.
- Conclusion – Scenario 9 demonstrates that meaningful reductions in flood impacts can still be achieved using only the improvements approved by Summit Metroparks in combination with the OHM Advisors projects. The approved improvements address the primary hydraulic deficiencies within the ditch system and improve utilization of Wetland Cell 1 storage. However, the components removed from Scenario 7 are important for reducing ponding duration following the more frequent storm events that are of greatest concern to homeowners. In lieu of the proposed improvements that were not approved by Summit Metroparks, installation of localized backyard drainage swales, French drains, or similar drainage improvements by individual property owners could provide additional reductions in ponding duration. These improvements on residential properties are within the 100-year floodplain, but outside of the designated wetland footprint, which may reduce the permitting required to complete these homeowner-lead improvements.

This analysis provides information to assist the Summit County Engineer, the City of Reminderville, Summit Metroparks, and other project stakeholders in evaluating potential options to address the recurrent flooding reported by homeowners. Additional engineering design, permitting, and coordination will be required to move a selected alternative forward.

8.0 REFERENCES

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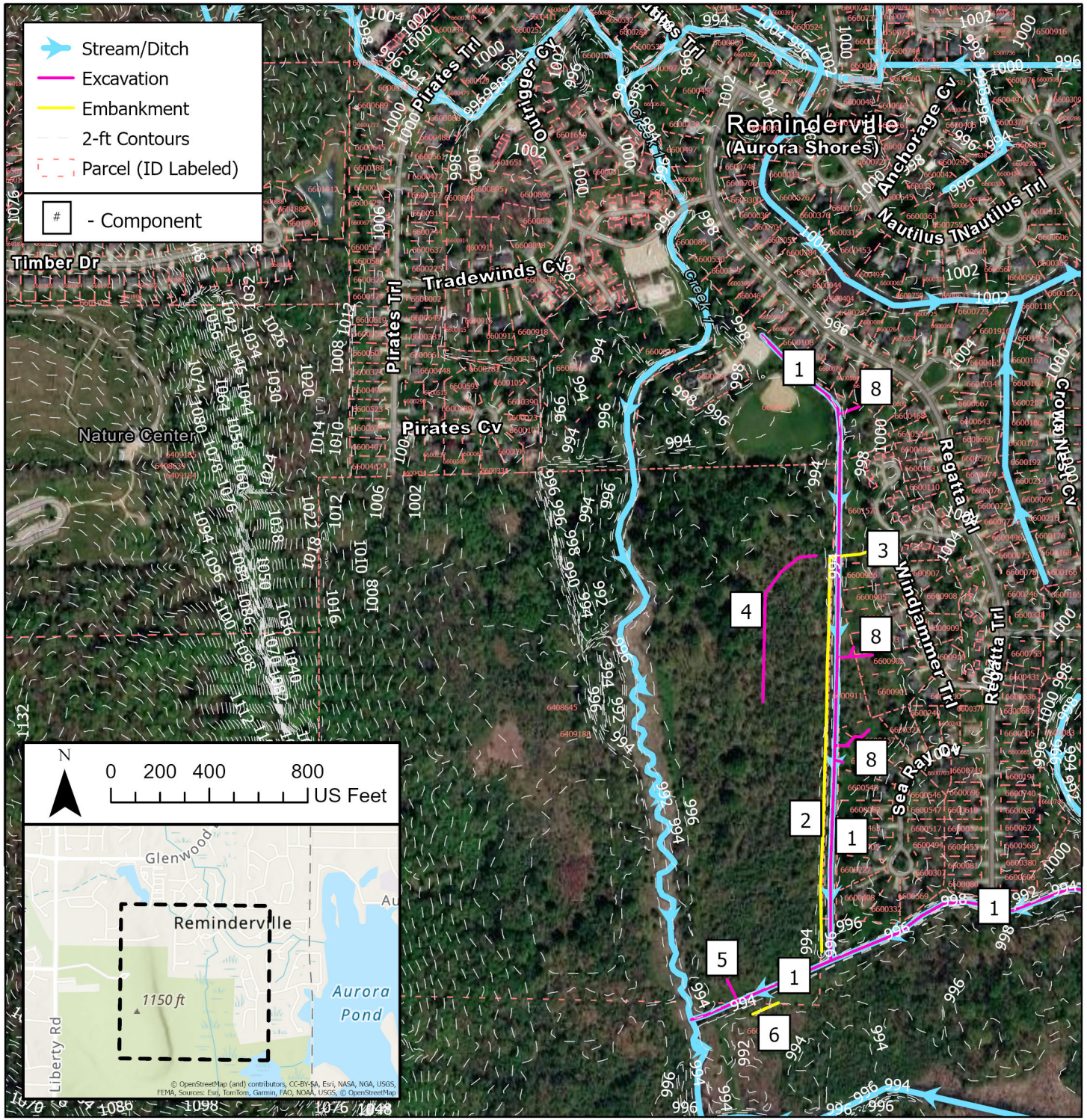
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Project Details

Watershed: Pond Brook
HUC12: 041100020501
Municipality: City of Reminderville

Field Visit Date:10/20/2025

Project Narrative

Flooding in backyards of Regatta Trail, Windjammer Cove, Windjammer Trail, and Sea Ray Cove is longstanding and well documented. Historically a natural wetland/swamp, Tetra Tech's 2-D HEC-RAS model shows that flooding occurs due to pooling of direct precipitation and lack of adequate grade to drain the area rather than overtopping of the ditch. Scenario 7 proposes the following improvements:

[1] Excavate and clear ditches at a slope of 0.067% for improved drainage

[2] Create an embankment on the east side of Wetland Cell 1 to separate the wetland from the lower elevation backyards.

[3] Construct a diversion embankment at an elevation of 996.0 feet NAVD88 where the Agri-Drain was supposed to be installed.

[4] Connect the existing ephemeral channel within Wetland Cell 1

[5] Excavate a swale as the outlet to Wetland Cell 1 at an elevation of 992.5 feet NAVD88

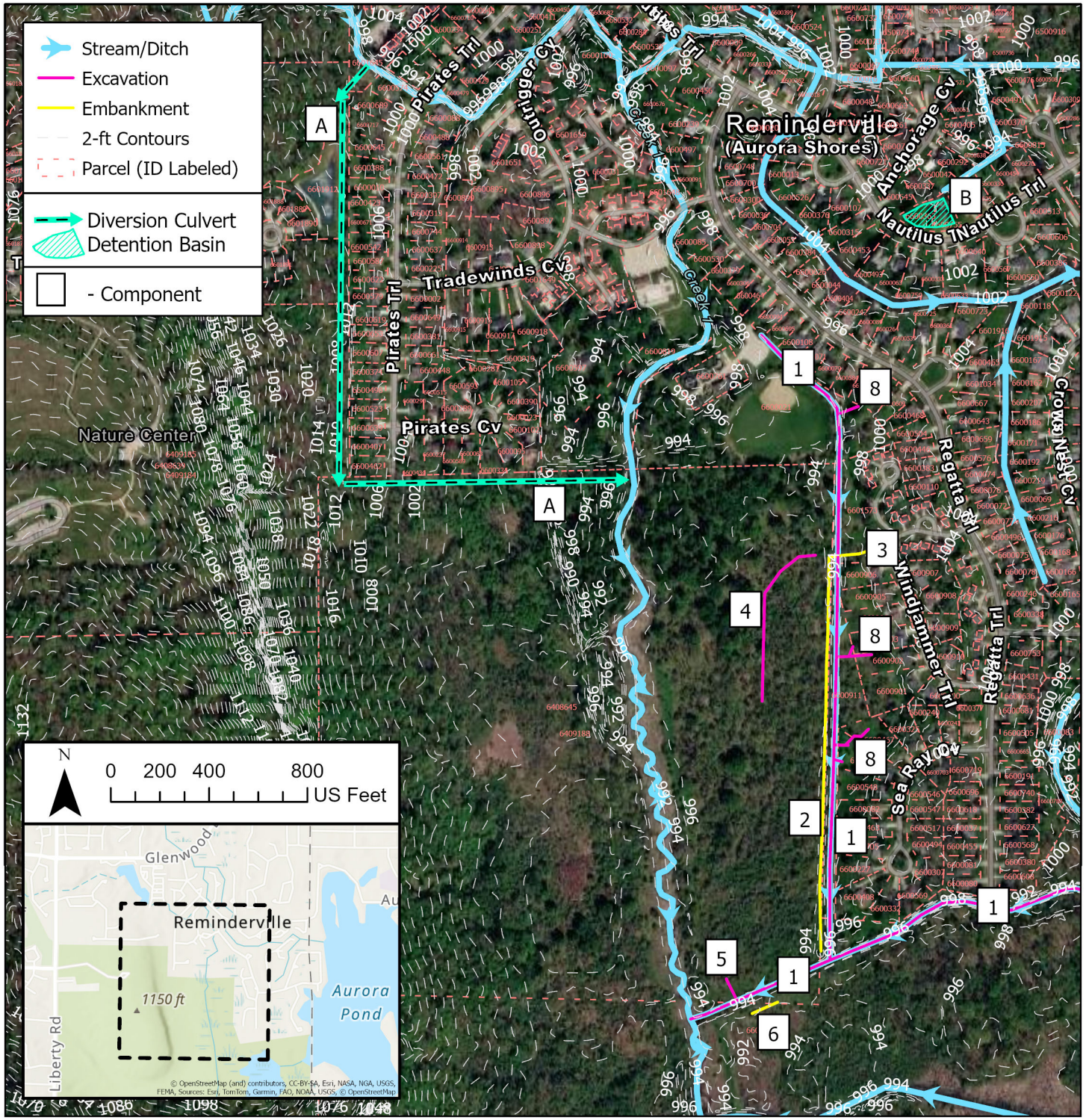
[6] Raise the low spot on the embankment that defines the north edge of Wetland Cell 2 to a minimum elevation of 995.0 feet NAVD88

[7] (Not shown) Maintain existing Agri-Drain operational elevations of 992.0 feet NAVD88

[8] Excavate small swales to drain low spots in the backyards.

Summit County Engineer
Cuyahoga River Watershed Study
ASN_AOI_9
Aurora Shores Flooding - HEC-RAS Scenario 7 Alternative

TETRA TECH



Project Details

Watershed: Pond Brook
HUC12: 041100020501
Municipality: City of Reminderville

Field Visit Date:10/20/2025

Project Narrative

Flooding in backyards of Regatta Trail, Windjammer Cove, Windjammer Trail, and Sea Ray Cove is longstanding and well documented. Historically a natural wetland/swamp, Tetra Tech's 2-D HEC-RAS model shows that flooding occurs due to pooling of direct precipitation and lack of adequate grade to drain the area rather than overtopping of the ditch. Scenario 8 proposes the following improvements:

[1] Excavate and clear ditches at a slope of 0.067% for improved drainage

[2] Create an embankment on the east side of Wetland Cell 1 to separate the wetland from the lower elevation backyards.

[3] Construct a diversion embankment at an elevation of 996.0 feet NAVD88 where the Agri-Drain was supposed to be installed.

[4] Connect the existing ephemeral channel within Wetland Cell 1

[5] Excavate a swale as the outlet to Wetland Cell 1 at an elevation of 992.5 feet NAVD88

[6] Raise the low spot on the embankment that defines the north edge of Wetland Cell 2 to a minimum elevation of 995.0 feet NAVD88

[7] (Not shown) Maintain existing Agri-Drain operational elevations of 992.0 feet NAVD88

[8] Excavate small swales to drain low spots in the backyards.

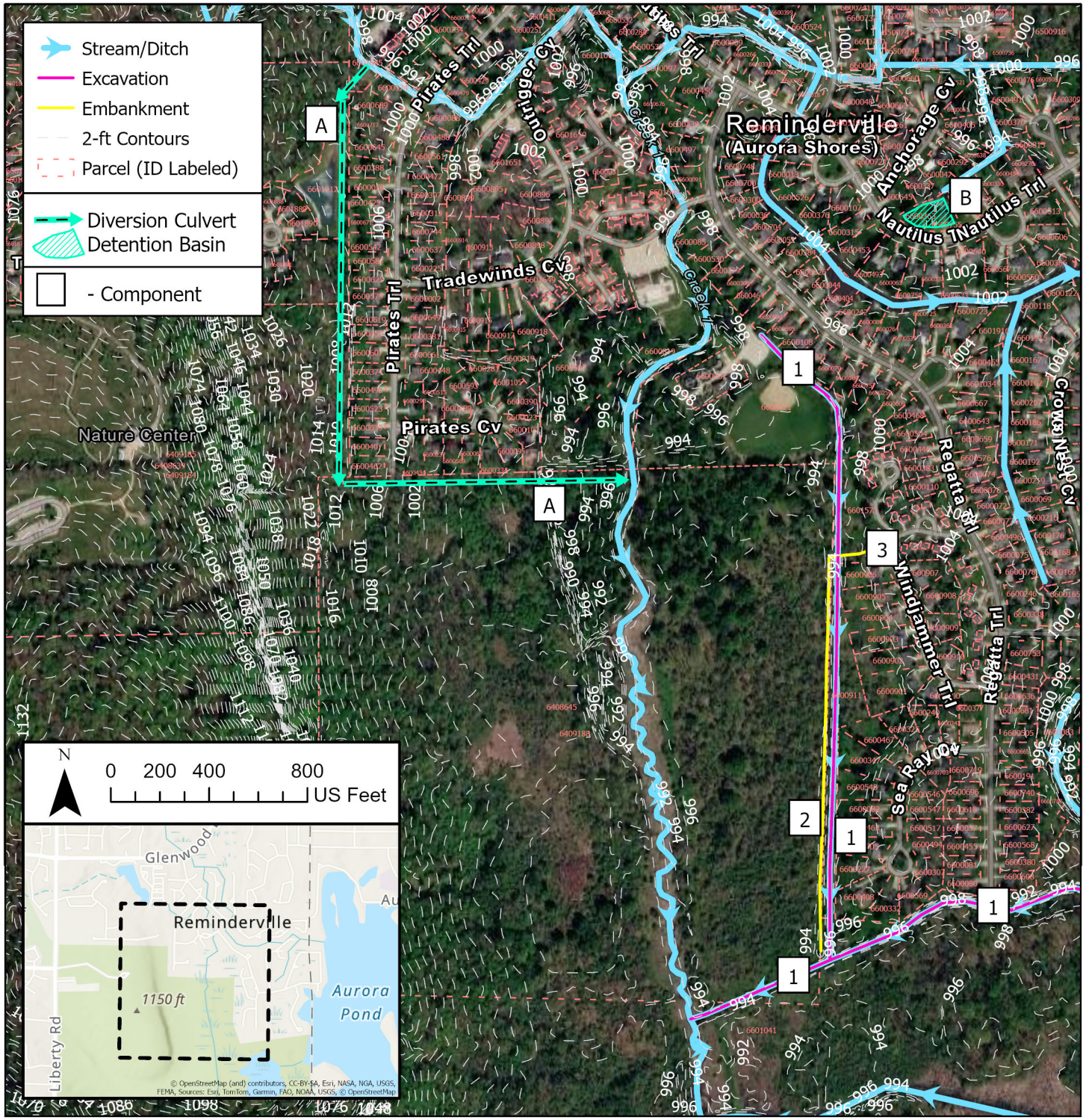
OHM Advisors proposed improvements are also shown in this figure:

[A] Pirates Trail diversion culvert

[B] Anchorage Cove detention basin

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Cuyahoga River Watershed Study
ASN_AOI_9
Aurora Shores Flooding - HEC-RAS
Scenario 8 Alternative

TETRA TECH



Project Details

Watershed: Pond Brook
HUC12: 041100020501
Municipality: City of Reminderville

Field Visit Date:10/20/2025

Project Narrative

Flooding in backyards of Regatta Trail, Windjammer Cove, Windjammer Trail, and Sea Ray Cove is longstanding and well documented. Historically a natural wetland/swamp, Tetra Tech's 2-D HEC-RAS model shows that flooding occurs due to pooling of direct precipitation and lack of adequate grade to drain the area rather than overtopping of the ditch. Scenario 9 proposes only the improvements from Scenario 7 that were approved by Summit Metroparks:

[1] Excavate and clear ditches at a slope of 0.067% for improved drainage

[2] Create an embankment on the east side of Wetland Cell 1 to separate the wetland from the lower elevation backyards.

[3] Construct a diversion embankment at an elevation of 996.0 feet NAVD88 where the Agri-Drain was supposed to be installed.

[7] (Not shown) Maintain existing Agri-Drain operational elevations of 992.0 feet NAVD88

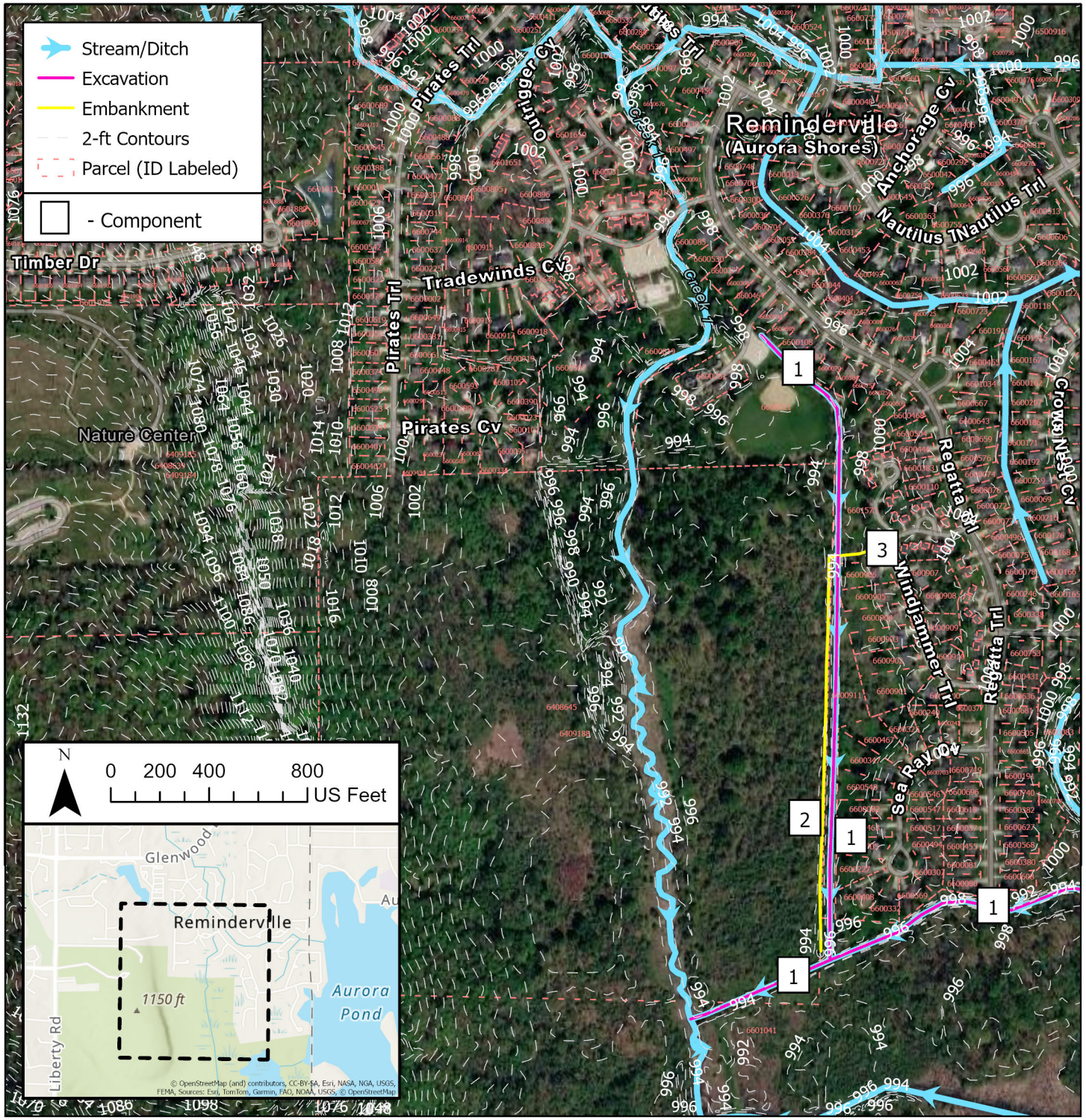
OHM Advisors proposed improvements are also shown in this figure:

[A] Pirates Trail diversion culvert

[B] Anchorage Cove detention basin

Summit County Engineer
Cuyahoga River Watershed Study
ASN_AOI_9
Aurora Shores Flooding - HEC-RAS
Scenario 9 Alternative

TETRA TECH



Project Details

Watershed: Pond Brook
HUC12: 041100020501
Municipality: City of Reminderville

Field Visit Date:10/20/2025

Project Narrative

Flooding in backyards of Regatta Trail, Windjammer Cove, Windjammer Trail, and Sea Ray Cove is longstanding and well documented. Historically a natural wetland/swamp, Tetra Tech's 2-D HEC-RAS model shows that flooding occurs due to pooling of direct precipitation and lack of adequate grade to drain the area rather than overtopping of the ditch. Scenario 9 proposes only the improvements from Scenario 7 that were approved by Summit Metroparks:

[1] Excavate and clear ditches at a slope of 0.067% for improved drainage

[2] Create an embankment on the east side of Wetland Cell 1 to separate the wetland from the lower elevation backyards.

[3] Construct a diversion embankment at an elevation of 996.0 feet NAVD88 where the Agri-Drain was supposed to be installed.

[7] (Not shown) Maintain existing Agri-Drain operational elevations of 992.0 feet NAVD88

Summit County Engineer
Cuyahoga River Watershed Study
ASN_AOI_9
Aurora Shores Flooding - HEC-RAS
Scenario 9 Alternative

TETRA TECH