



TECHNICAL MEMORANDUM

PREPARED FOR: Tradeport Hanover Land, LLC

PREPARED BY: Dewberry Engineers Inc.

DATE: July 28, 2026

SUBJECT: East Ashland Ironhorse Development Water Service Hydraulic Evaluation – Sewer Model

1. Background

Tradeport Hanover Land, LLC (Tradeport) is currently engaged in the planning and design of a new 180-acre development (Ironhorse Development) located in the eastern area of the Town of Ashland in Hanover County, Virginia. Tradeport contracted with Dewberry to utilize the current Hanover County wastewater hydraulic model to evaluate the capacity of the existing wastewater collection to serve the proposed Ironhorse development.

2. Proposed Ironhorse Development

The proposed Ironhorse Development is located on a parcel at the intersection of Mount Hermon Road and East Patrick Henry Road (Highway 54) as shown in **Figure 1**. A 12-inch gravity line will extend to the Ironhorse Development property. Wastewater from the proposed development will be discharged into the proposed 12-inch sewer. Flow from the Ironhorse Development will be conveyed through 67,200 linear feet (LF) of gravity sewer, four PSs (Mechumps Creek PS, Sliding Hill PS, Middle Chickahominy PS and Shelton Pointe PS), and 27,050 LF of force main before reaching the Totopotomoy Wastewater Treatment Plant (WWTP).

3. Existing Modeled Infrastructure

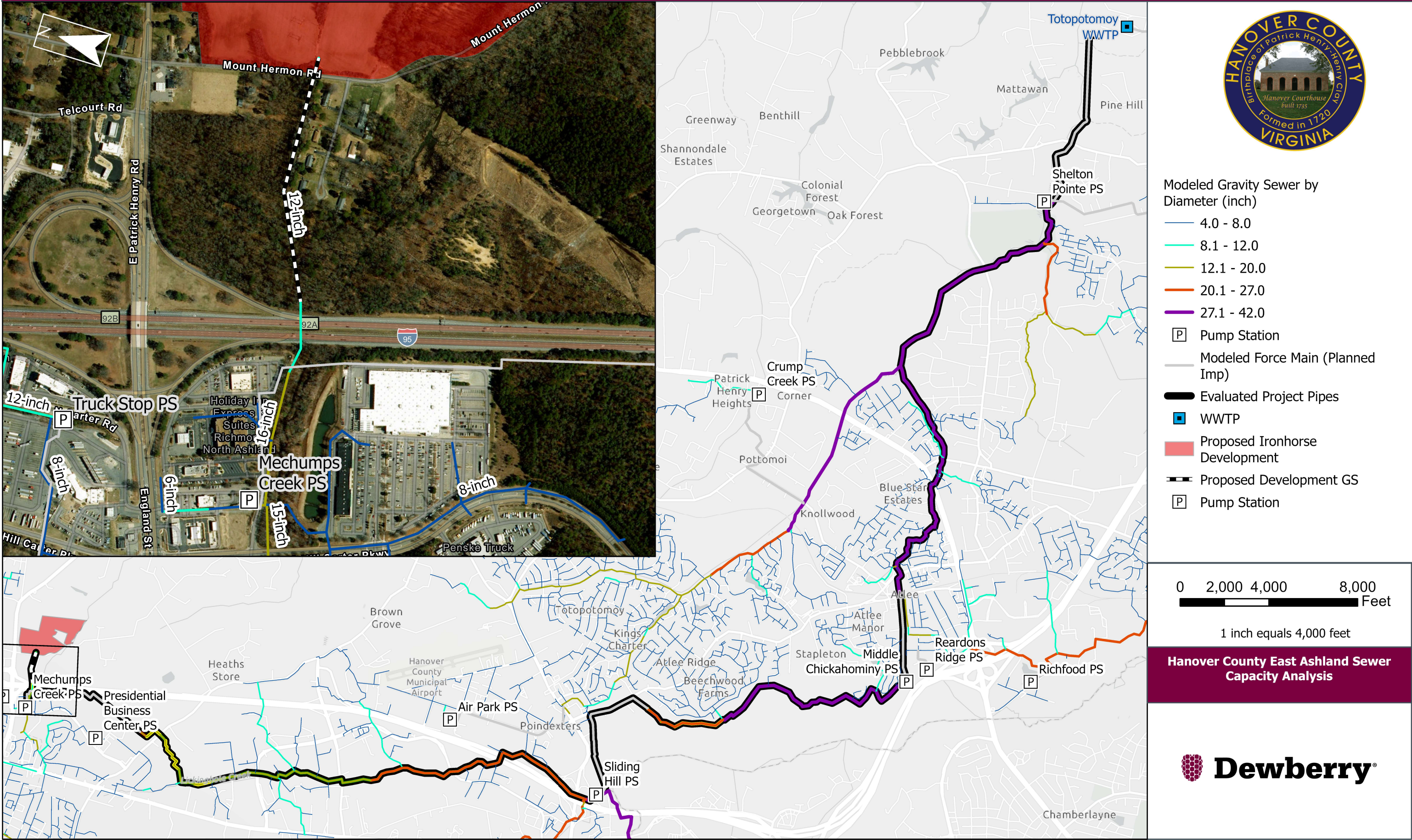
The hydraulic model originally developed for the Hanover County Water and Wastewater Facilities Master Plan (January 2021) was subsequently updated and converted to the InfoWorks ICM platform and served as the basis for this evaluation. A 12-inch gravity sewer extension was incorporated into the model and assumed to be constructed at a 0.22 percent slope from the existing sewer to the Ironhorse Development. The proposed sewer extension was connected to the existing sanitary sewer system at manhole ID 788040M01.

For purposes of this analysis, the Shelton Pointe Pump Station and force main improvements, which are currently under construction, were assumed to be fully operational. This assumption provides the basis for evaluating the collection system and pump station performance under projected future flow conditions.

Flow from the Ironhorse Development is conveyed through the Mechumps Creek PS, where it is pumped through a 12-inch force main consisting of ductile iron pipe (DIP) and high-density polyethylene (HDPE) segments before discharging to the downstream gravity sewer system. The wastewater is subsequently conveyed through the Sliding Hill PS, Middle Chickahominy PS, and Shelton Pointe PS service areas.

As part of this evaluation, the downstream collection system was reviewed to determine its ability to accommodate the additional flow from the Ironhorse Development. This evaluation included the capacity of the gravity sewer system, associated force mains, and the Mechumps Creek, Sliding Hill, Middle Chickahominy, and Shelton Pointe pump stations under projected peak flow conditions.

Figure 1 - Project Area



4. Flow Scenarios

4.1 Scenario 1: Existing Peak Flows (2025)

The original hydraulic model is based on average dry-weather flows measured during spring 2025. Typically, spring conditions correspond to the high groundwater levels, resulting in conservative dry-weather flows. Using these higher flows provides a conservative basis for planning and system evaluation.

Peak flows were calculated in accordance with the Hanover County Water and Sewer Standards as follows:

- For average daily flows less than 0.5 million gallons per day (MGD), a peaking factor of 4.0 was applied to the average daily flow.
- For average daily flows between 0.5 MGD and 6.0 MGD, peak flow was calculated using the following equation:

$$[4.136 - (0.273 \times \text{Average Daily Flow})] \times \text{Average Daily Flow}$$

- For average daily flows greater than 6.0 MGD, a peaking factor of 2.5 is applied to the average daily flow.

To represent the peak flow in the hydraulic model, a diurnal flow pattern was developed for each pump station service area. The patterns were scaled to apply the appropriate peaking factor simultaneously at midday, simulating systemwide peak-hour flow conditions.

4.2 Scenario 2: Existing Peak Flows + Proposed Ironhorse Development

Scenario 2 adds the proposed Ironhorse Development flows to the Scenario 1 peak flows. The Ironhorse Development flow is estimated to be an average of 0.25 MGD and peak hourly flow of 261 gallons per minute (gpm) or 0.38 MGD. A constant flow discharge was used to route peak flows from the Ironhorse development.

5. Capacity Analysis Results

The hydraulic model was used to evaluate system performance relative to the County's Level of Service (LOS) criteria summarized in **Table 1**.

Table 1 - Sewer Level of Service Criteria

SEWER LEVEL OF SERVICE CRITERIA		
FACILITY TYPE	LEVEL OF SERVICE	DEFICIENCY CRITERIA
Force Main	Maximum Velocity	8.0 ft/s
Gravity Sewer	Maximum ratio of flow depth to pipe diameter (d/D) during peak hourly flow (PHF)	80% at PHF
Pump Station	Maximum Capacity	Convey PHF

5.1 Gravity Sewer Results

Capacity results are shown in **Figures 2 and 3**. The evaluated gravity sewer from the 24-inch proposed Ironhorse Development discharge point to the Topotomoy WWTP is highlighted with a black underlay. For gravity sewer, the percent of capacity used is calculated by comparing the peak depth of flow in the pipe compared to the diameter of the pipe. For example, if the depth in a 12-inch diameter pipe is 6 inches

during peak flow conditions, the percent of pipe capacity used is 50 percent. Capacity figures color-code the gravity sewer based on the modeled peak flow depth divided by the pipe diameter (d/D): blue pipes are those flowing less than 25 percent full, green pipes are those between 25 and 50 percent full, yellow pipes are those between 50 to 80 percent full, orange pipes are those between 80 to 100 percent full, and red pipes are those flowing more than 100 percent full (surched). Pipes more than 80 percent full (orange or red) are considered deficient by Hanover County. It should be noted that modeled surcharging may hold back flow in the existing system. When improvements are made, additional facilities may be identified.

Figure 2 presents the capacity analysis under Scenario 1 conditions (existing peak flows). Under Scenario 1, the majority of gravity sewer from the Ironhorse Development discharge to the Totopotomoy WWTP are predicted to be less than 50 percent full during peak flows. However, there are two locations that are predicted to be slightly greater than 80 percent full both are due to force main discharge and are not a capacity concern.

- Mechumps Creek FM discharge to gravity sewer
- Middle Chickahominy FM discharge to gravity sewer

Figure 3 presents the capacity analysis under Scenario 2 conditions (existing peak flows + proposed Ironhorse Development flow). The model predicts the same two pipes to gravity sewer downstream of force main discharge points to be more than 80 percent full during peak flows, but these are not a capacity concern. No other sewer are predicted to be deficient; however, additional pipes are more than 50 percent full.

5.2 Pump Station and Force Main Results

Peak flow to the pump station is used to evaluate the capacity of each station. Force mains predicted to exceed 8 feet per second (ft/s) are considered deficient. All four downstream pump stations and force mains were evaluated.

Mechumps Creek PS

Under both Scenario 1 and 2, the peak flow is conveyed with both pumps operating. During Scenario 2, the pump is operating under higher head conditions. Dewberry recommends drawdown testing to confirm pump operation.

Hydraulic modeling indicates that peak velocities in the force main remain below the County's deficiency criterion of 8 ft/s under both scenarios. Based on the modeling results, the Mechumps Creek PS and associated force main are expected to have adequate hydraulic capacity to convey the additional 0.38 MGD projected from the Ironhorse Development without exceeding the deficiency criteria.

A review of the results with Hanover Department of Public Utilities staff indicated that the second pump is activated under existing conditions. This observation suggests that the current pump station is operating near its functional capacity and has limited ability to accommodate additional flow generated by the proposed Ironhorse Development without improvements.

Sliding Hill PS

Under both Scenario 1 and Scenario 2, hydraulic model results indicate that the projected peak flow can be conveyed with all three pumps operating. The model predicts that peak force main velocities will remain below the County's deficiency criterion of 8 ft/s under both scenarios.

Based on the hydraulic analysis, the Sliding Hill Pump Station and associated force main have sufficient capacity to convey the additional 0.38 MGD projected from the proposed Ironhorse development.

Figure 2 -Scenario 1 (Existing Peak Flows) Capacity Evaluation

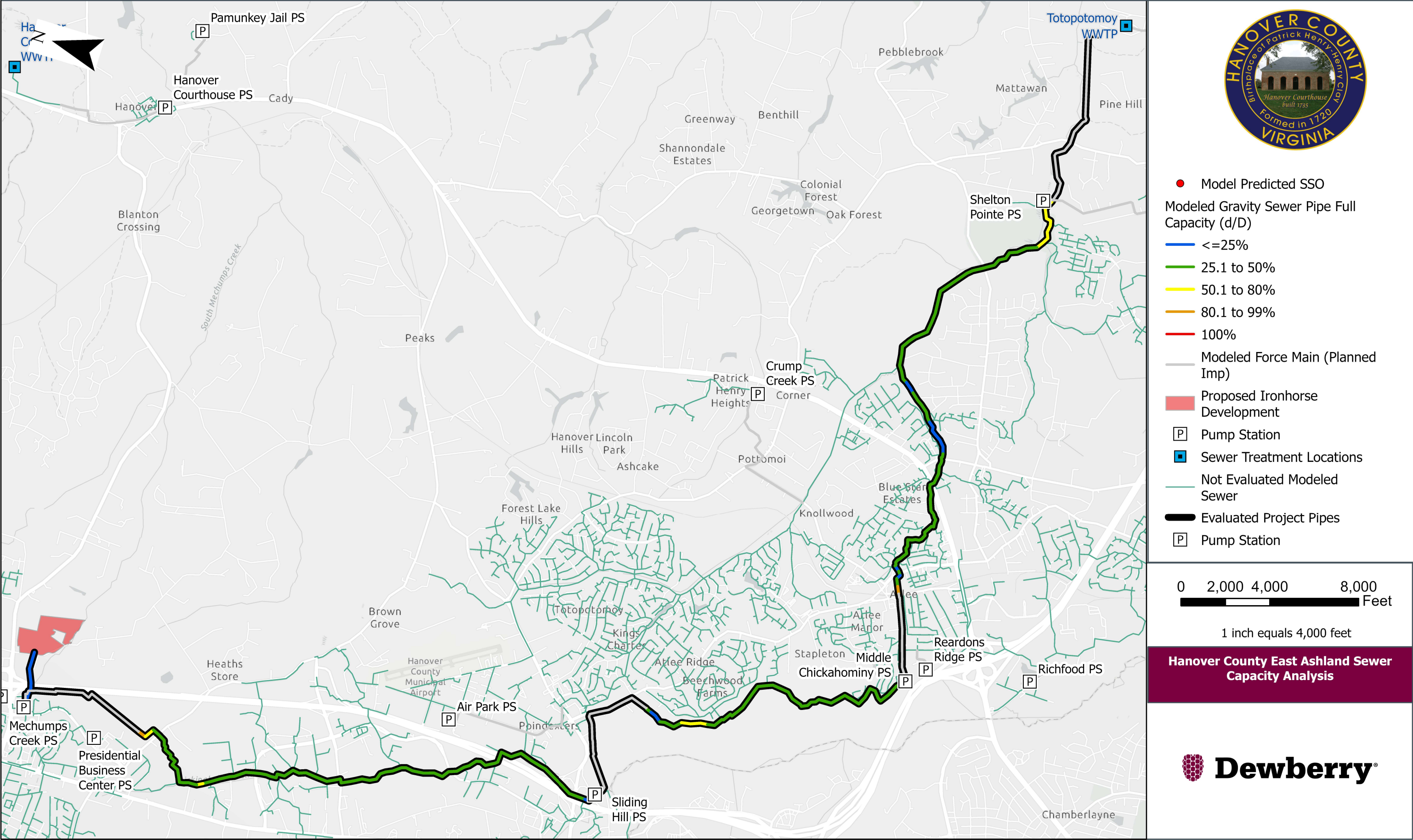
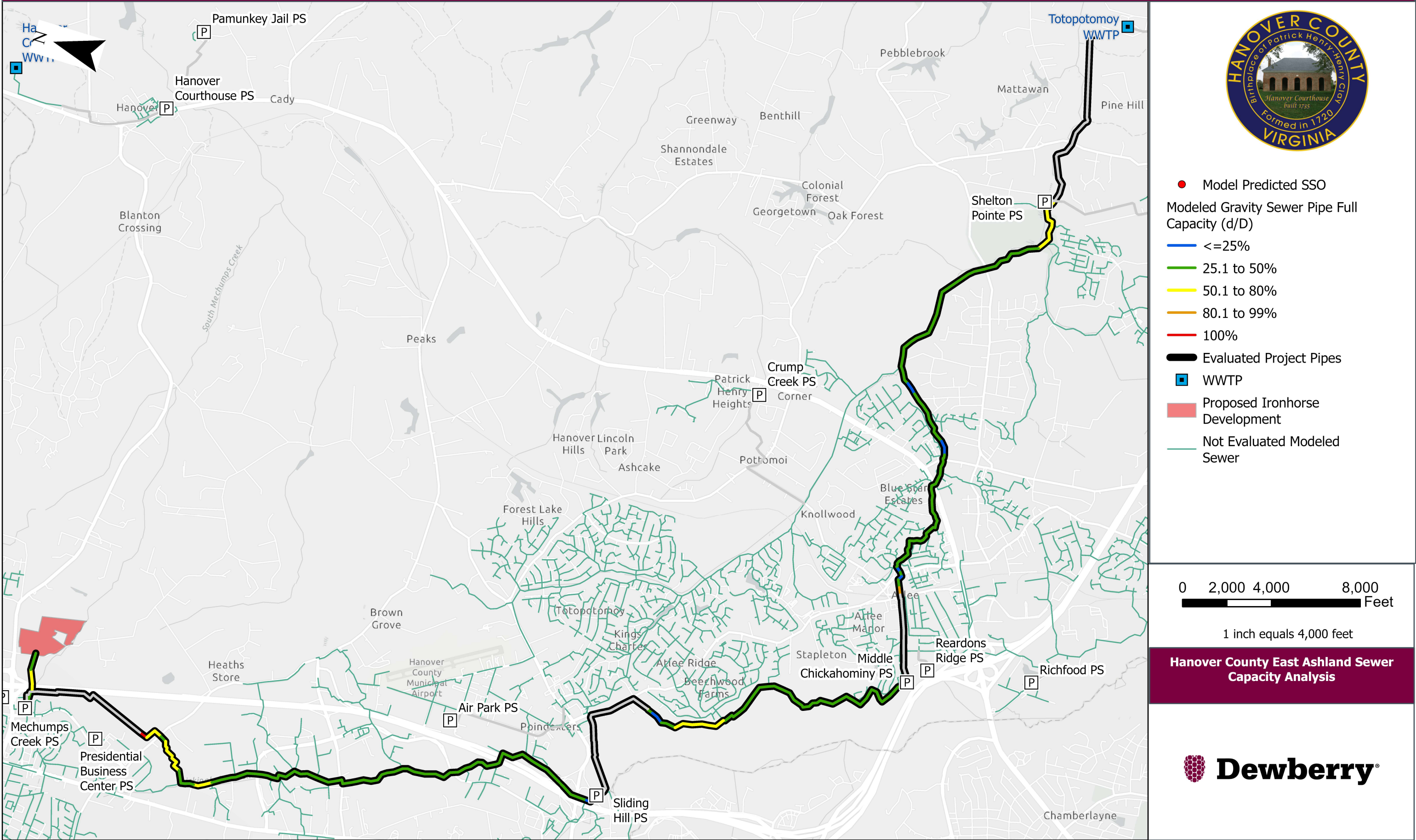


Figure 3 - Scenario 2 (Existing Peak Flows + Proposed Ironhorse Development Peak Flow) Capacity Evaluation



Middle Chickahominy PS

Hydraulic model results indicate that, under both Scenario 1 and Scenario 2, the projected peak flow is conveyed with all three pumps operating. However, when all three pumps are in service and the combined discharge exceeds approximately 7.3 MGD, velocities within the force main exceed the County's deficiency criterion of 8 ft/s.

Given the historical predicted operating conditions, Dewberry recommends conducting pump station drawdown testing and a detailed pump station performance evaluation to verify pump operation, confirm the active pump configuration under peak flow conditions, and assess the potential impacts of sustained operation at flow rates that result in force main velocities exceeding the established design criterion.

Shelton Pointe PS

Under both Scenario 1 and Scenario 2, hydraulic model results indicate that the projected peak flow is conveyed with 3 pumps operating. The model predicts that peak velocities within the 30-inch force main remain below the County's deficiency criterion of 8 ft/s under both scenarios.

Based on the hydraulic analysis, both the Shelton Pointe PS and its associated force main are expected to have sufficient capacity to convey the additional 0.38 MGD generated by the proposed Ironhorse development while maintaining compliance with applicable hydraulic design criteria. No capacity-related deficiencies are anticipated within the modeled pump station or force main facilities under the evaluated conditions.

6. Conclusion

The hydraulic model predicts that two gravity sewer segments downstream of the Mechumps Creek PS and Middle Chickahominy PS will operate at depths exceeding 80 percent of pipe diameter under peak flow conditions. However, these conditions are attributable to the operational characteristics of the upstream pump stations rather than insufficient gravity sewer capacity. As a result, the modeled deficiencies are considered operationally driven and do not indicate capacity limitations within the downstream gravity sewer system.

For Mechumps Creek PS, the model indicates that both pumps operate during Scenario 2 peak flow conditions and do so under elevated head conditions relative to existing operations. Although the pump station is projected to convey the modeled peak flow, Dewberry recommends performing drawdown testing to verify pump performance and confirm the operating head conditions when both pumps are running.

Based on the projected increase in flow and the current operating condition of the Mechumps Creek PS, upgrades to the existing facility are expected to be required to accommodate the proposed Ironhorse development.

For Middle Chickahominy PS, the model predicts that all three pumps are operating during peak flow conditions in both Scenario 1 and Scenario 2. Under this operating configuration, the total discharge is projected to exceed approximately 7.3 MGD, resulting in force main velocities greater than the County's 8 ft/s deficiency criterion. Dewberry recommends conducting drawdown testing and a detailed pump station performance evaluation to verify the pumping rate achieved with all three pumps in operation and to assess the corresponding impacts on force main hydraulics.