FIGURE 53 – EXPRESS TOLL LANE – I-95 AT MD 152 INTERCHANGE OPTION 4A: PARTIAL CLOVERLEAF – SINGLE LOOP WITH ETL MEDIAN ACCESS RAMPS

e. I-95/MD 24 Interchange Option 2: MD 24/MD 924 Flyover Ramp with ETL Median Access Ramps *(see Figure 54)*

This option would be a combination partial cloverleaf/directional configuration, with a single loop in the southwest quadrant, and a flyover ramp. One half traffic signal along MD 24 northbound would provide access for the I-95 northbound GPL on-ramp. One full traffic signal along MD 24 would provide access for the I-95 northbound and southbound ETL median access ramps. One half traffic signal along MD 24 southbound would provide access for the I-95 southbound GPL on- and off-ramps.

The I-95 northbound GPL approach would consist of four lanes. A two-lane flyover ramp would lead to MD 24/MD 924/Tollgate Road. This ramp would then split, with one lane to MD 24 southbound, and two lanes to MD 24 northbound/MD 924/Tollgate Road. This ramp would then split again, with one lane leading to MD 24 northbound and one lane to MD 924/Tollgate Road. Three I-95 northbound GPLs would continue north to MD 543. The I-95 northbound ETL approach would consist of two lanes. A one-lane, left-side median ETL ramp would lead to MD 24. A one-lane, left-side median ETL ramp would lead to the I-95 northbound ETLs. Two I-95 northbound ETLs would continue north to MD 543.

The I-95 southbound GPL approach would consist of three lanes. The I-95 southbound approach would add a one-lane distributor roadway. A one-lane outer connection ramp would lead to MD 924/Tollgate Road. The one-lane far side loop ramp would then lead to MD 24. An outer connection ramp from MD 24/MD 924/Tollgate Road would add a lane to I-95 southbound and four GPLs would continue south to MD 152. The I-95 southbound ETL

approach would consist of two lanes. A one-lane, left-side median ETL ramp would lead to MD 24. A one-lane, left-side median ETL ramp would lead to the I-95 southbound ETLs. Two I-95 southbound ETLs would continue south to MD 152.

Two through lanes would generally be provided on MD 24, with additional turn lanes at the interchange ramps. A braided ramp system would be constructed along MD 24 northbound and southbound between I-95 and the MD 924/Tollgate Road interchange.

Due to the complexity, high traffic volume, high speed ramps, and free flow ramps at MD 24, alternate routes that bypass the interchange were developed. Two shared–use path options are being considered outside the limits of the interchange to accommodate bicyclists along MD 24. The Woodsdale Road Option utilizes shoulders on Woodsdale Road, a shared use bridge over I-95 and a shared roadway along Waldon Road. The Winter's Run Option utilizes a shared use path between Tollgate Road and MD 7 along Winter's Run, passing under I-95 and widened shoulders along MD 7.

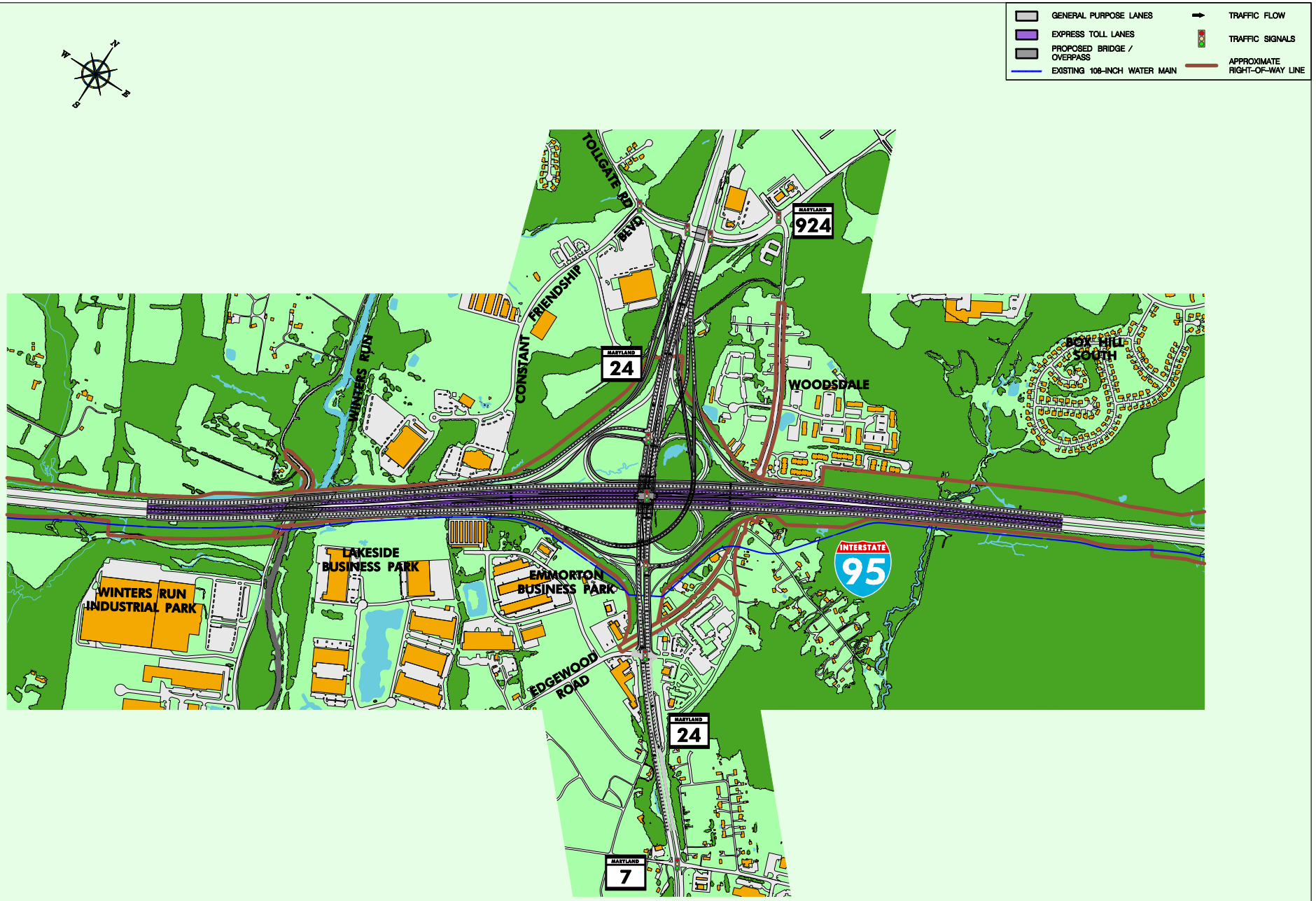

FIGURE 54 - EXPRESS TOLL LANE - I-95 AT MD 24 INTERCHANGE OPTION 2: MD 24 / MD 924 FLYOVER RAMP WITH ETL MEDIAN ACCESS RAMPS

h. I-95/MD 543 Interchange Option 7: Partial Cloverleaf – Single Loop with ETL Median Access Ramps *(see Figure 55)*

This option would include a diamond interchange with the addition of a single loop ramp from westbound MD 543 to southbound I-95. Two full traffic signals on either side of the interchange would provide access for I-95 GPL ramps. One full traffic signal along MD 543 would serve I-95 ETL median access ramps.

The I-95 northbound approach would consist of three lanes. A two-lane diagonal ramp would lead to MD 543. A one-lane diagonal ramp from MD 543 would merge onto I-95 northbound. The I-95 northbound ETL approach would consist of two lanes. The left-hand ETL would drop at the one-lane median access ramp to MD 543. One I-95 northbound ETL would join three GPLs to carry four GPLs north to MD 22.

The I-95 southbound GPL approach would consist of four lanes. The left GPL would drop into the I-95 southbound ETLs and three GPLs would continue south to MD 24. A one-lane outer connection ramp would lead to MD 543. The loop ramp in the northwest quadrant would serve traffic from MD 543 northbound to I-95 southbound. A one-lane diagonal ramp from MD 543 southbound would merge on to I-95 southbound. A one-lane, left-side median ETL ramp would lead to the I-95 southbound ETLs. Two I-95 southbound ETLs would continue south to MD 24.

Two through lanes would generally be provided on MD 543, with additional turn lanes at the interchange ramps.

Bicyclists along MD543 will be accommodated through the interchange with 8'-0" wide shoulders. The intersections along MD 543 at the ramp junctions were developed to be compact to limit vehicle speeds, and to include signalization for most vehicle movements through the intersections. Where free-flowing movements were unavoidable, designs were based on near minimum turning conditions in an effort to limit vehicle speeds.

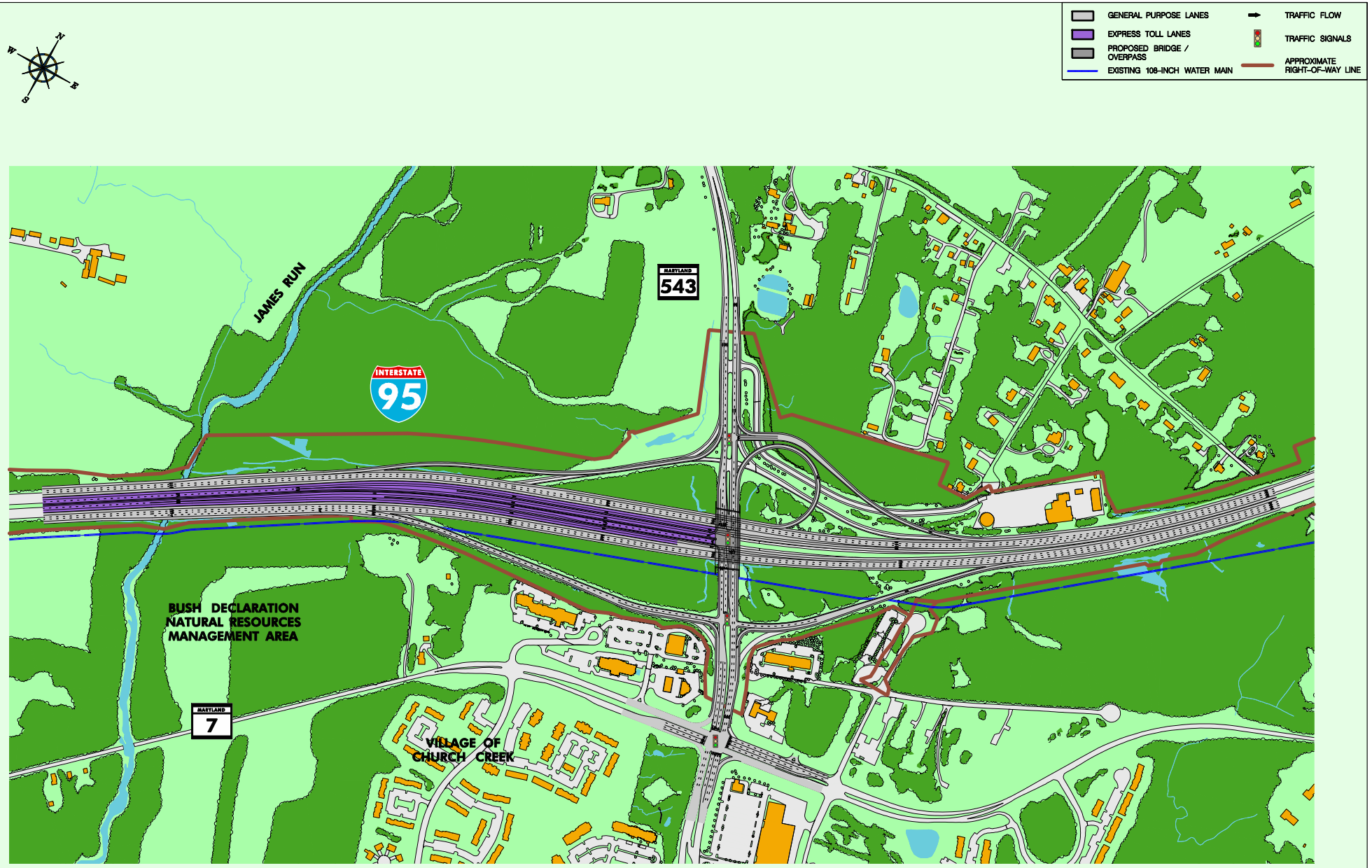

FIGURE 55 - EXPRESS TOLL LANE - I-95 AT MD 543 INTERCHANGE OPTION 7: PARTIAL CLOVERLEAF - SINGLE LOOP WITH ETL MEDIAN ACCESS RAMPS

i. I-95/MD 22 Interchange Option 1: Partial Cloverleaf – Double Loop with Modifications to CD roads *(see Figure 50)*

This option would maintain the existing partial cloverleaf configuration with no modifications. The existing interchange contains loops in the northwest and southeast quadrants. One full traffic signal along MD 22 provides access for the I-95 northbound off-ramp. One full traffic signal along MD 22 provides access for the I-95 southbound off-ramp. I-95 through the interchange would consist of four GPLs in each direction.

The existing I-95 northbound approach adds a one-lane collector/distributor roadway. A one-lane ramp then leads to MD 22. The existing I-95 southbound approach adds a one- lane collector/distributor roadway. A one-lane ramp then leads to MD 22.

Two through lanes are generally provided on the existing MD 22, with additional turn lanes at the interchange ramps. The ETL alternate interchange configuration at MD 22 is identical to the GPL alternate.

There are no modifications to MD 22 through the interchange. Two through lanes are generally provided, with additional turn lanes at the interchange ramps. Bicyclists are accommodated through the interchange with 8'-0" wide shoulders.

B. Alternatives Considered and Dropped from Detailed Study

After consideration of public comments and further detailed analysis regarding environmental features, traffic analysis and engineering studies, the Authority refined the mainline alternates and interchange options. The following presents the rationale for the alternatives that were considered and dropped from detailed study.

1. General Purpose Lanes Alternate

a. Mainline

Under the master plan alternate, I-95 in each direction would have: six GPLs from north of MD 43 to MD 152, five GPLs between MD 152 and MD 543, and four GPLs from MD 543 to the project limits north of MD 22. This option was modified due to the close proximity of MD 152 and MD 24 interchanges and the highway geometry associated with these interchanges and the mainline.

Heading northbound along I-95 under the master plan configuration one lane would have been dropped at MD 152 only to be added to accommodate the ramp volumes in advance of MD 24. Likewise, heading southbound along I-95 the ramp from MD 24 would have been merged onto I-95 only to be added at MD 152. The addition of the sixth GPL between MD 152 and MD 24 provides better lane continuity with the interchange options being retained for detailed study.

b. I-95/MD 152 Interchange Option 2: Tight Diamond

This option was dropped due to failing level-of service (LOS F) for the year 2030. Other interchange options providing better 2030 LOS with similar impacts were retained for detailed study. In addition, due to volume of left turning motorists, the intersection would need to effectively operate as one intersection. This would increase the need for longer cycle lengths to clear both intersections. In turn, queues would increase for the ramps and the mainline. *(see Figure 56)*

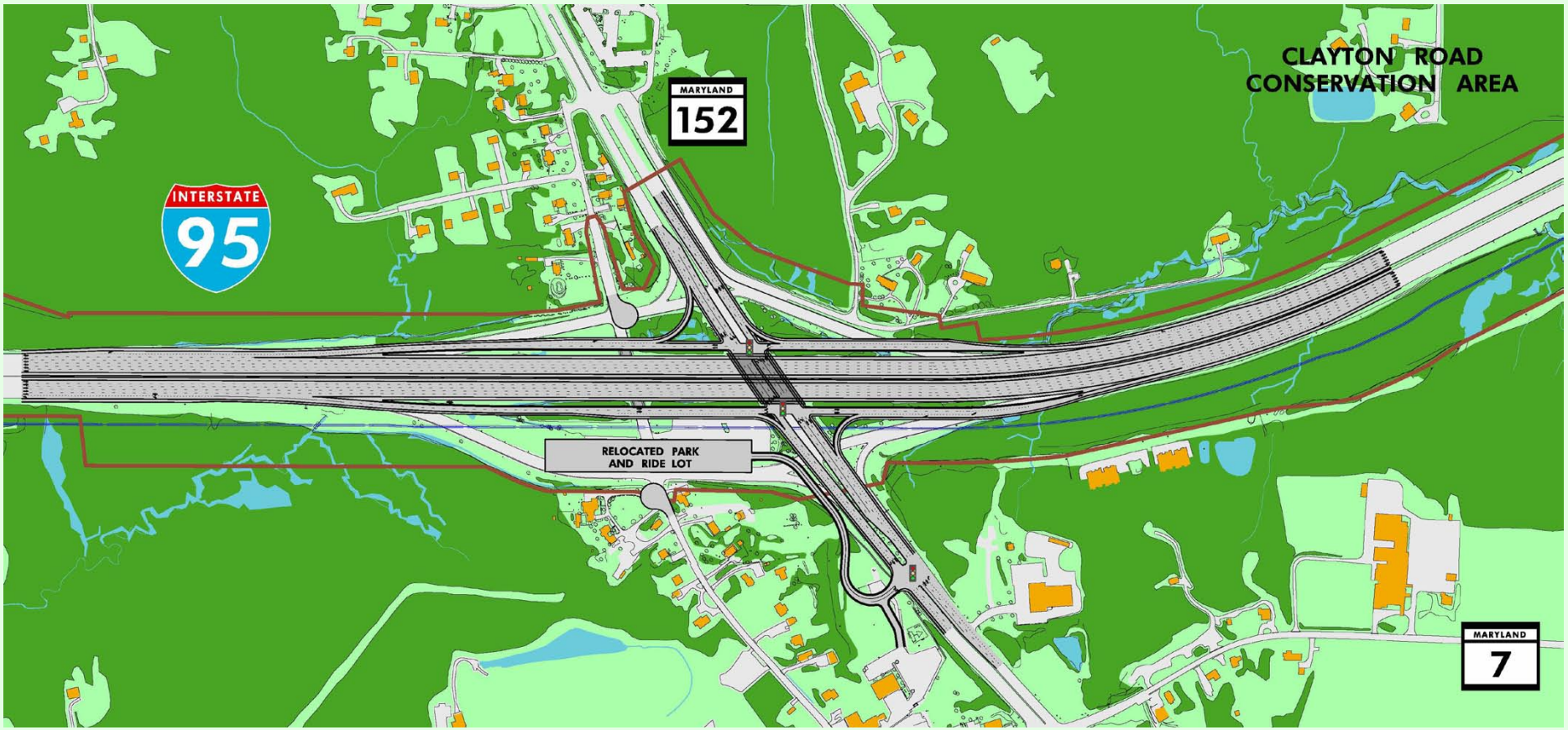

FIGURE 56 - GENERAL PURPOSE LANE - I-95 AT MD AT MD 152 INTERCHANGE
OPTION 2: TIGHT DIAMOND

c. I-95/MD 152 Interchange Option 3: Single Point Urban Diamond

This option was dropped due to issues involving traffic, engineering and maintenance. *(see Figure 57)*

- The 2030 interchange volumes are not compatible with a single point urban diamond due to unbalanced left turning volumes. The northbound I-95 off ramp will experience significant delays operating with a v/c ratio greater than 1.
- Due to the extreme geometry (skew and long span lengths) of the interchange, a disproportionate span to length ratio results in inefficient girder design (deep girders and thick flanges). The required girder depth would require raising the profile significantly in comparison to the other options resulting in additional impacts to the surrounding area.
- During future re-decking of the bridge in this option, it would not be possible to maintain the operation of the single point urban diamond. The interchange would have to be converted to a tight diamond, which was shown to have insufficient capacity under option 2 and would require significant temporary pavement construction.

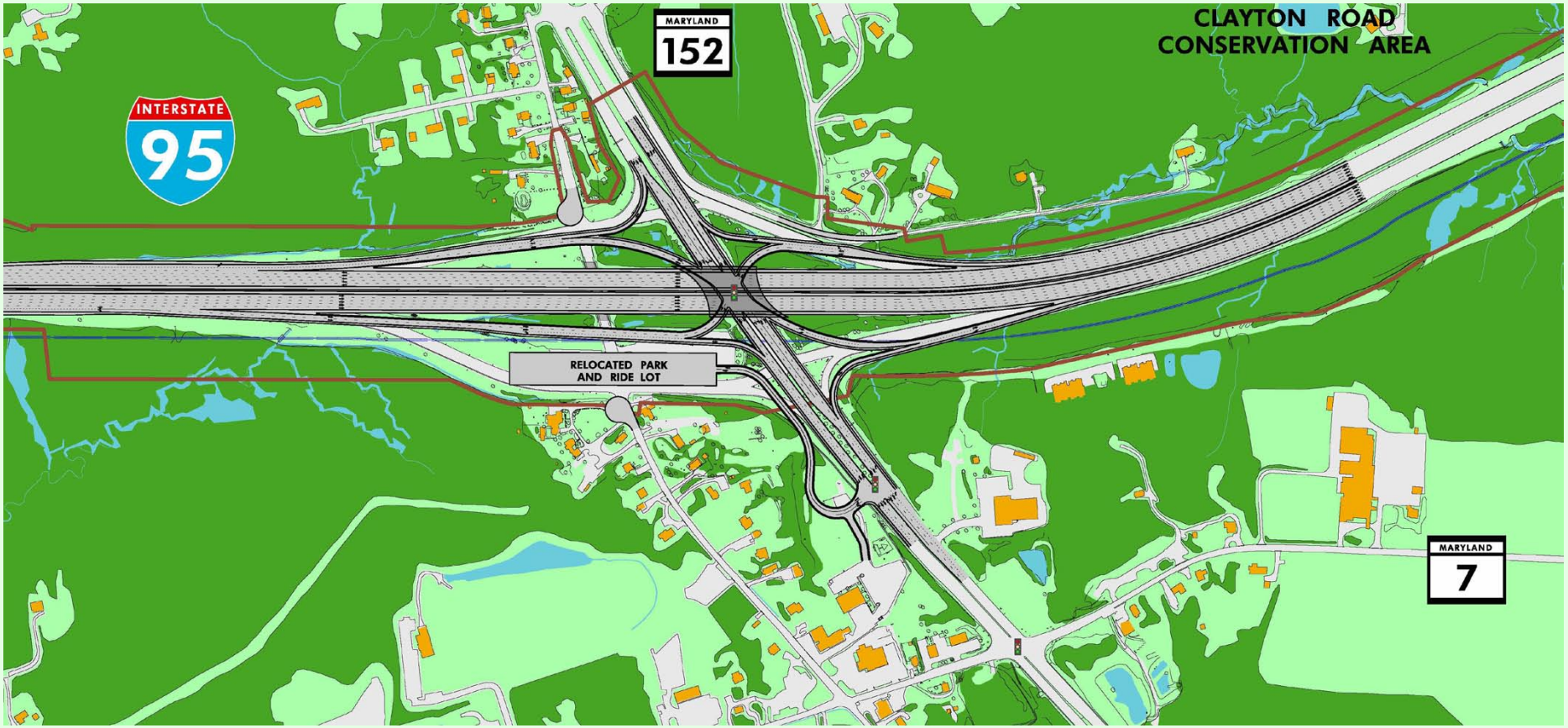

FIGURE 57 - GENERAL PURPOSE LANE - I-95 AT MD AT MD 152 INTERCHANGE
OPTION 3: SINGLE POINT URBAN DIAMOND

d. I-95/MD 152 Interchange Option 5: Partial Cloverleaf - Double Loop

This option was dropped due to the combination of environmental impacts, residential displacements and traffic. *(see Figure 58)*

- The proposed loop ramp and outer connection ramp in the northwest quadrant of the interchange will require considerable streams and wetland impacts.
- The proposed loop ramp and outer connection ramp in the northwest quadrant of the interchange will require two residential displacements, a significant amount of additional right-of-way (ROW), and alteration of residential access to MD 152.
- The proposed loop ramp and outer connection ramp in the northeast quadrant of the interchange will require a significant amount of additional ROW.
- This option provides a similar LOS as other retained interchange options having fewer impacts.

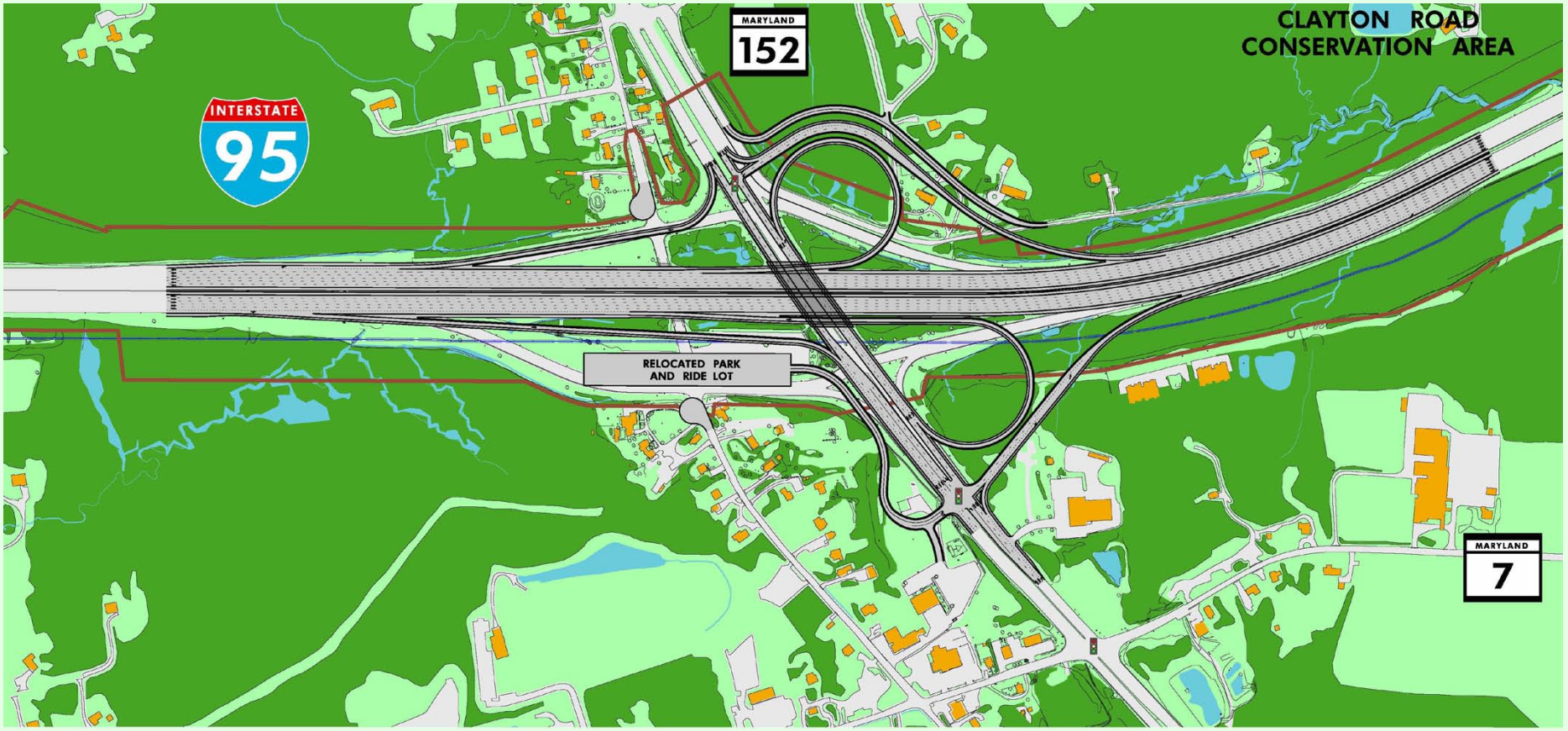

FIGURE 58 - GENERAL PURPOSE LANE - I-95 AT MD 152 INTERCHANGE
OPTION 5: PARTIAL CLOVERLEAF - DOUBLE LOOP

e. I-95/MD 24 Interchange Option 1: Partial Cloverleaf – Double Loop

This option was dropped from further consideration because it was no longer compatible with the Phase 1 interchange improvements being progressed at the I-95/MD 24/MD 924 interchange. *(see Figure 59)*

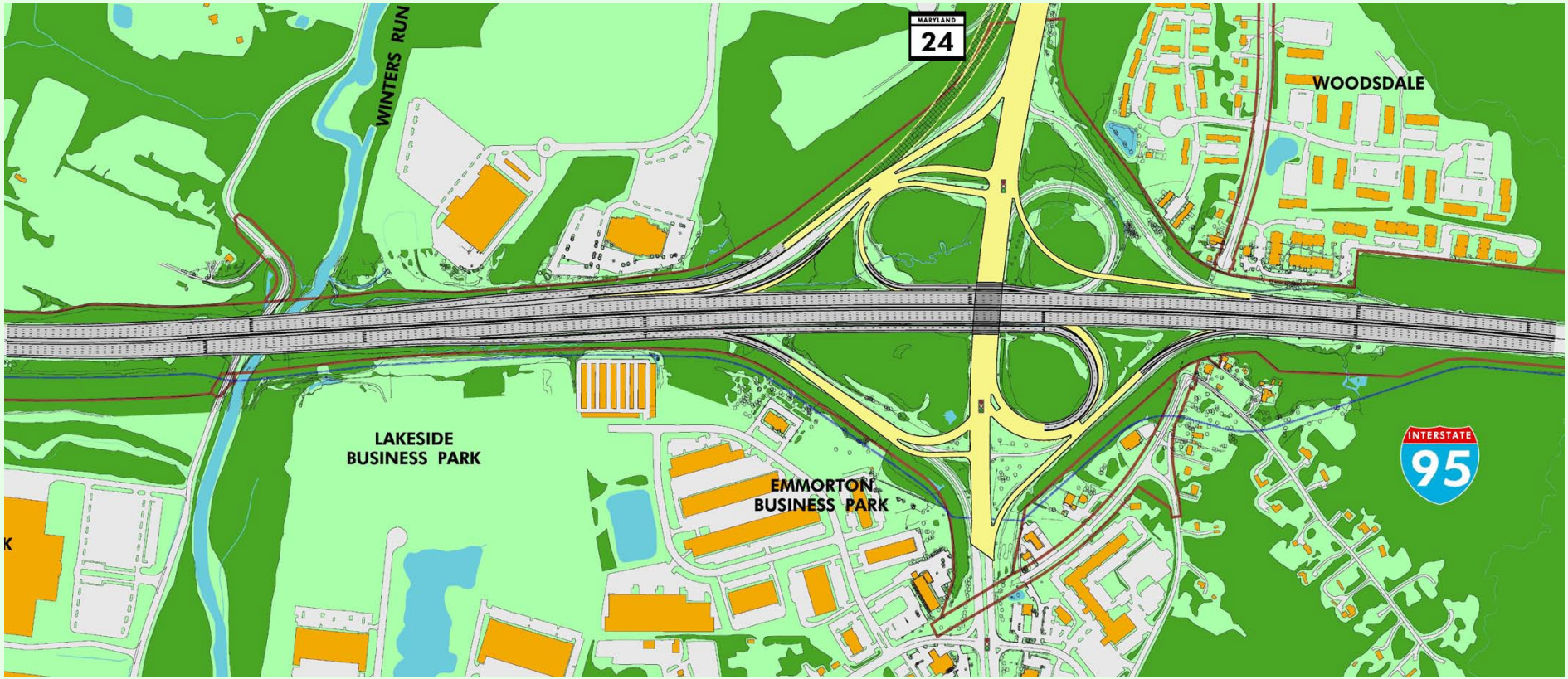

FIGURE 59 - GENERAL PURPOSE LANE - I-95 AT MD 24 INTERCHANGE
OPTION 1: MODIFICATIONS TO STRUCTURE AND RAMPS

f. I-95/MD 543 Interchange Option 2: Tight Diamond

This option was dropped due to failing level-of service (LOS F) for the year 2030. The high volume of left turning motorists on MD 543 northbound to I-95 southbound would effectively require that the two intersections operate as one due to the limited ability to store turning vehicles. This would mean longer queues, longer cycle lengths and poorer traffic operations. Other interchange options providing better 2030 LOS with similar impacts were retained for detailed study. *(see Figure 60)*

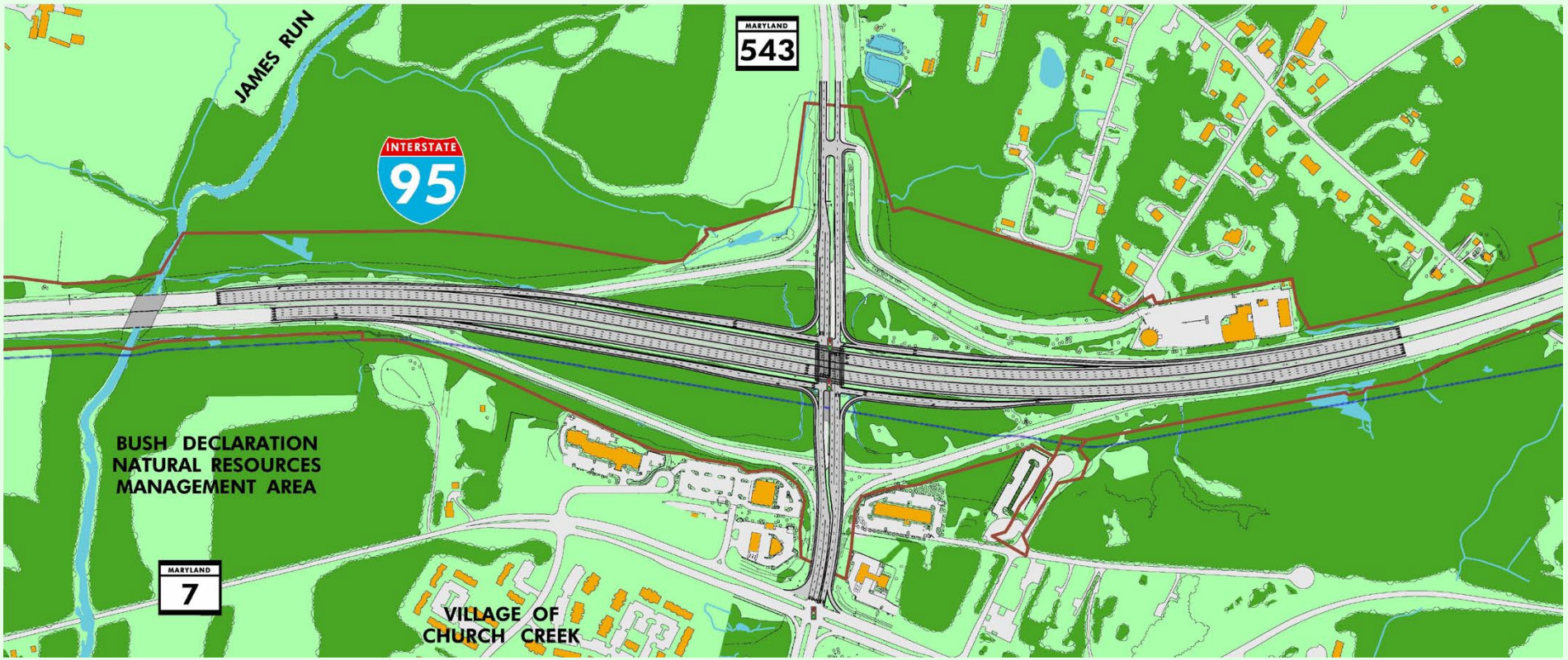

FIGURE 60 - GENERAL PURPOSE LANE - I-95 AT MD 543 INTERCHANGE
OPTION 2: TIGHT DIAMOND

g. I-95/MD 543 Interchange Option 3: Single Point Urban Diamond

This option was dropped due to issues involving traffic and maintenance. *(see Figure 61)*

- The 2030 interchange volumes are not compatible with a single point urban diamond resulting in LOS F.
- During future re-decking of the bridge in this option, it would not be possible to maintain the operation of the single point urban diamond. The interchange would have to be converted to a tight diamond, which was shown to have insufficient capacity under option 2 and would require significant temporary pavement construction.

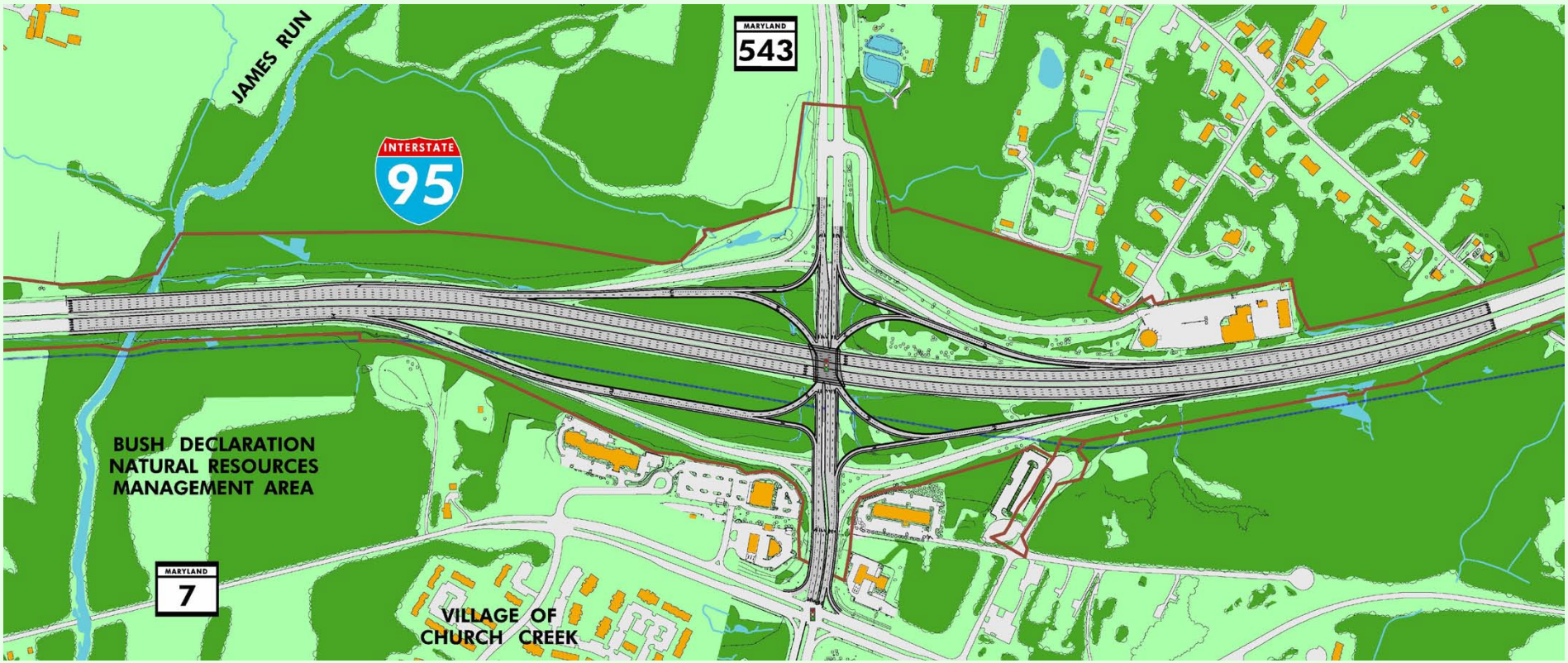

FIGURE 61 - GENERAL PURPOSE LANE - I-95 AT MD 543 INTERCHANGE
OPTION 3: SINGLE POINT URBAN DIAMOND