Alternates Retained for Detailed Study

I-95 - North of MD 43 to North of MD 22

INTERSTATE 95 SECTION 200

Maryland Transportation Authority

September 2007

Table of Contents

List of Figures

I. Master Plan

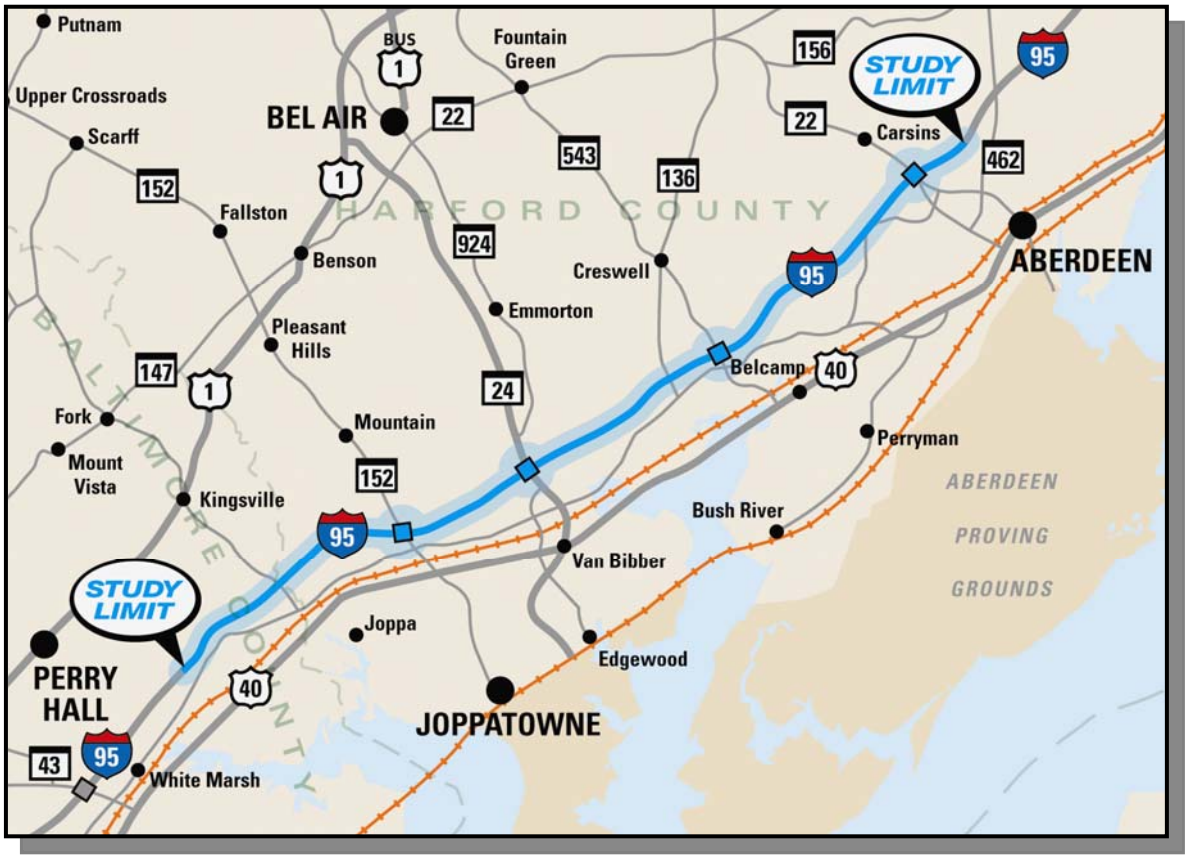
Interstate 95 (I-95) has been identified as the "East's Coast Main Street" because it provides connection for regional traffic from Maine to Florida. The Maryland section of I-95 is approximately 110 miles long and extends from the Delaware State Line to the Woodrow Wilson Bridge (Virginia State Line). The Maryland Transportation Authority (the Authority) owns, operates, and maintains I-95 in Maryland from south of Baltimore City north to the Delaware State Line.

Between 2000 and 2002 the Authority, in cooperation with the Federal Highway Administration (FHWA) and the Maryland Department of Transportation (MDOT) conducted the ***I-95 Master Plan, I-95/I-895(N) Split to the Delaware State Line*** (herein referred to as the I-95 Master Plan) study. The purpose of the study was to comprehensively identify long-range transportation needs that establish clear goals for system maintenance, preservation, and enhancement; and ensure development of environmentally sensitive and intermodal-friendly solutions for the 50 miles of I-95 known as the John F. Kennedy Memorial Highway (JFK).

During the I-95 Master Plan process, the Authority coordinated with local, State and Federal regulatory agencies. As a result, the agencies concurred on the need for four independent projects, the termini for each project, and the concepts to be carried forward. The I-95 Master Plan identified the logical termini for the four independent projects that originated from the I-95 Master Plan:

Section 100: I-95, I-895(N) Split to North of MD 43
Section 200: I-95, North of MD 43 to North of MD 22
Section 300: I-95, North of MD 22 to North of MD 222
Section 400: I-95, North of MD 222 to the Delaware State Line

The I-95 Master Plan was adopted by the Authority in 2003. Section 200 is the second project identified in the I-95 Master Plan to be initiated. The Section 200 corridor identified on the map below is 16 miles long.



Map 1 – Section 200 Study Area

The I-95 Master Plan recommended three concepts for additional study for Section 200 at the project planning phase. These concepts included the No-Build Alternate, General Purpose Lanes (GPL) Alternate, and Managed Lanes (ML) Alternate. The Authority developed preliminary alternates based on these concepts.

The definition of MLs encompasses a range of management strategies that may include restrictions relating to access locations (i.e. at ramps); vehicle class (i.e. cars, busses, trucks, occupancy, and commercial); time of day and/or toll options. MLs could

potentially have a shared use, such as serving commuter and transit traffic during peak hours and commercial traffic only during non-peak hours. The ML strategies could meet a specific individual or a combination of transportation goals. These achievable benefits include: increasing flexibility, providing choices, optimizing highway efficiency, providing reliable travel times, promoting transit, promoting public safety, reducing incident response times, improving work zone safety, and generating revenue.

On May 4, 2004 the Maryland Secretary of Transportation announced an Express Toll Lanes (ETL) initiative. Under this initiative, the Secretary has directed the Maryland Department of Transportation and Maryland Transportation Authority to consider implementing ETLs on several existing facilities in Maryland, including I-95. The ETL initiative involves the construction of new tolled lanes adjacent to existing free lanes. Tolls would be collected electronically, without the use of toll booths, and would vary by time of day and demand. The adjacent Section 100 project from the I-895 Split to North of MD 43 analyzed the various managed lane concepts including ETLs. In determining the best management strategy, the Authority considered the following factors: optimized operational efficiency, safety, congestion management and revenue production. Based upon that analysis the Authority selected the priced management strategy utilizing ETLs with variable or dynamic pricing. FHWA approved the priced management strategy utilizing ETLs. The ETL alternate was later selected as the preferred alternate for the Section 100 project and is currently under construction.

Section 200 has similar characteristics to the Section 100 Corridor. Therefore, similar operational efficiency, safety, congestion management and revenue production are anticipated in Section 200 with an ETL strategy. Introducing a different management strategy in Section 200 would introduce logistical problems and driver confusion at the limits of the two projects. Based on the above, the Authority decided to select ETLs as the management strategy for the Section 200 managed lanes alternate.

II. Preliminary Alternates

A. Introduction

Each of the Master Plan concepts was further evaluated by the Maryland Transportation Authority during the initial stage of the Section 200 project planning study. In addition to the two mainline preliminary build alternates developed during this planning study, interchange options were developed for the four interchanges in the study area for each build alternate. The preliminary alternates and interchange options outlined below were presented to the public at focus group meetings held on April 5, 2006 and May 24, 2006 and a public workshop held on June 22, 2006.

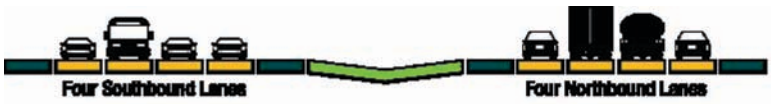
B. No-Build Alternate

1. Mainline

The No Build alternate maintains the I-95 mainline configuration as it is today. Under this alternate, I-95 in each direction would maintain:

- Four GPLs from north of MD 43 to MD 24,
- Three GPLs from MD 24 to the project limits north of MD 22.

I-95 from New Forge Road to MD 24



I-95 from MD 24 to MD 22

Figure 1 – No-Build Alternate - Typical Roadway Section

2. Interchanges

Under the No-Build option the existing MD 152, MD 24, MD 543 and MD 22 interchanges will remain the same. Routine maintenance and safety upgrades will be done as needed. The following list details the existing configuration of each interchange:

Figure 2: I-95/MD 152 Interchange: Diamond
Figure 3: I-95/MD 24 Interchange: Partial Cloverleaf – Triple Loop
Figure 4: I-95/MD 543 Interchange: Diamond
Figure 5: I-95/MD 22 Interchange: Partial Cloverleaf – Double Loop

Necessary traffic and safety improvements to the MD 24 interchange were identified prior to the Section 200 project. These improvements were broken into two phases, with phase 1 being constructed prior to Section 200. The phase 1 improvements were designed to minimize improvements that would be lost from the Section 200 improvements, minimize delay to motorists along I-95 and provide cost effective interim improvements that could be transitioned to the Section 200 improvements. The scheduled completion of the phase 1 improvements is 2010. The phase 1 improvements will temporarily address the following issues: back-ups that occur along I-95 northbound with traffic exiting onto MD 24, the heavy congestion at the at-grade MD 24 intersection with MD 924/Tollgate Road, and the difficult weave movement from I-95/MD 24 ramps to Tollgate Road.

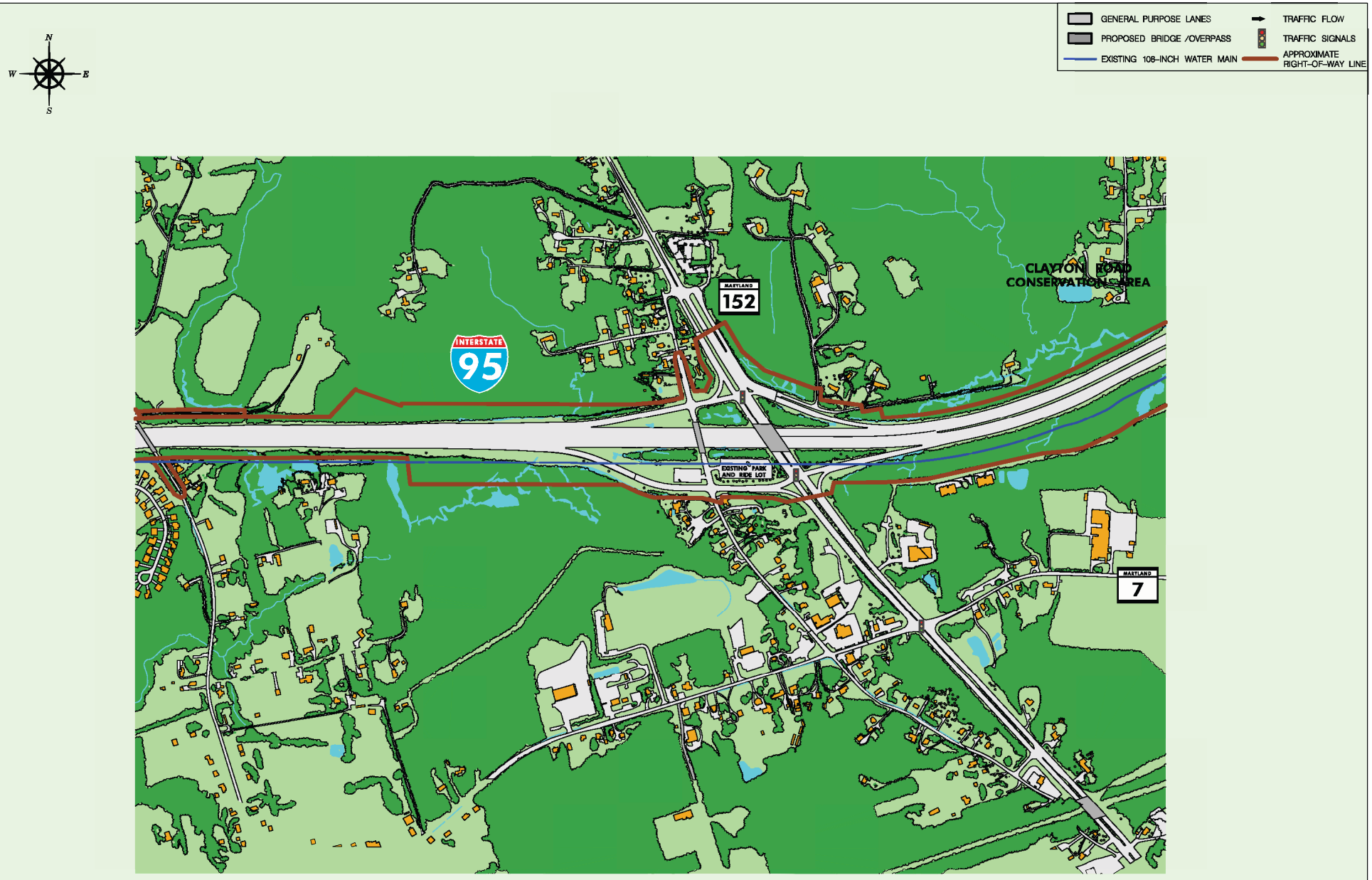


FIGURE 2 – GENERAL PURPOSE LANE – I–95 AT MD 152 INTERCHANGE NO–BUILD: DIAMOND

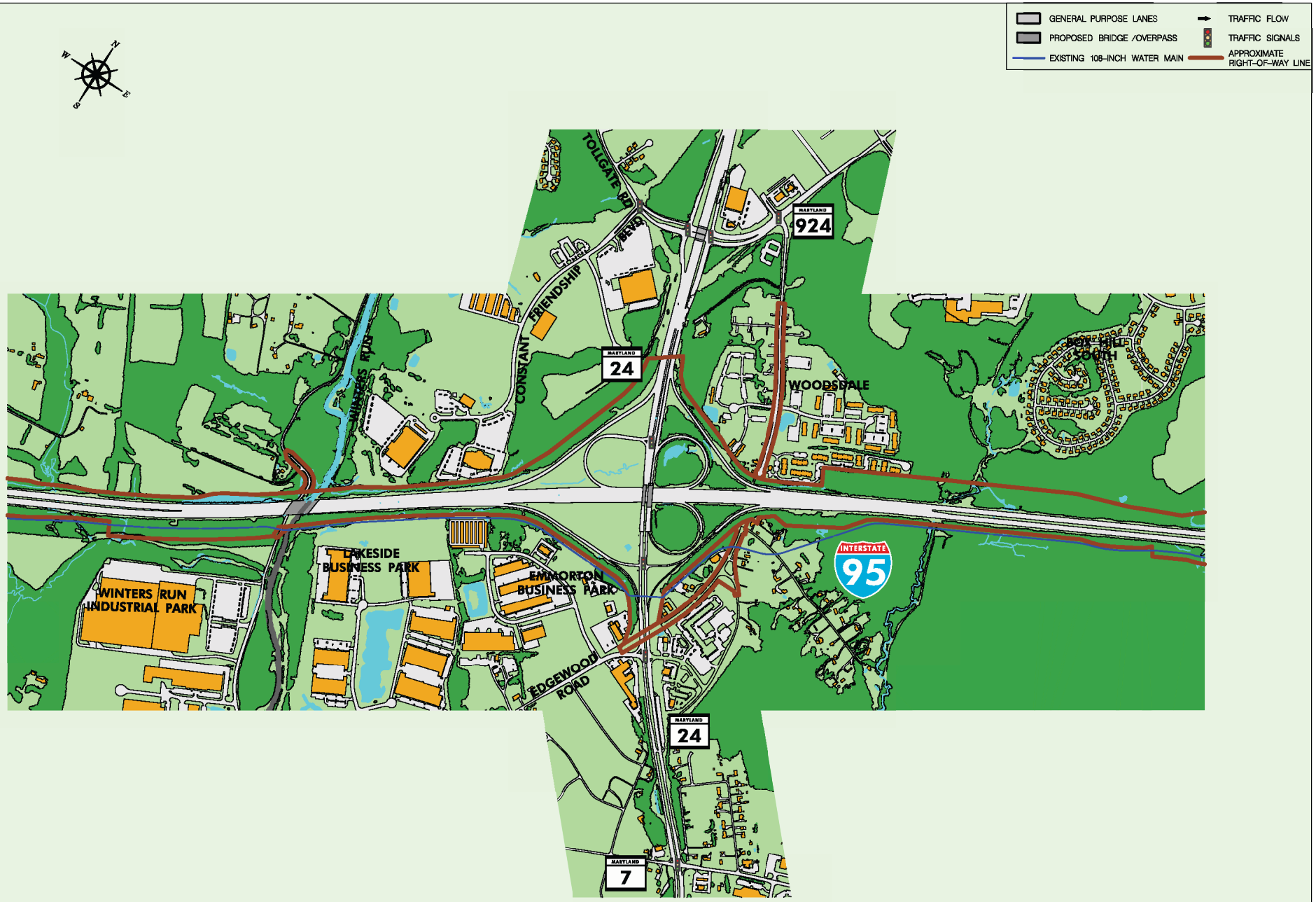


FIGURE 3 – GENERAL PURPOSE LANE – I-95 AT MD 24 INTERCHANGE
NO-BUILD: PARTIAL CLOVERLEAF – TRIPLE LOOP

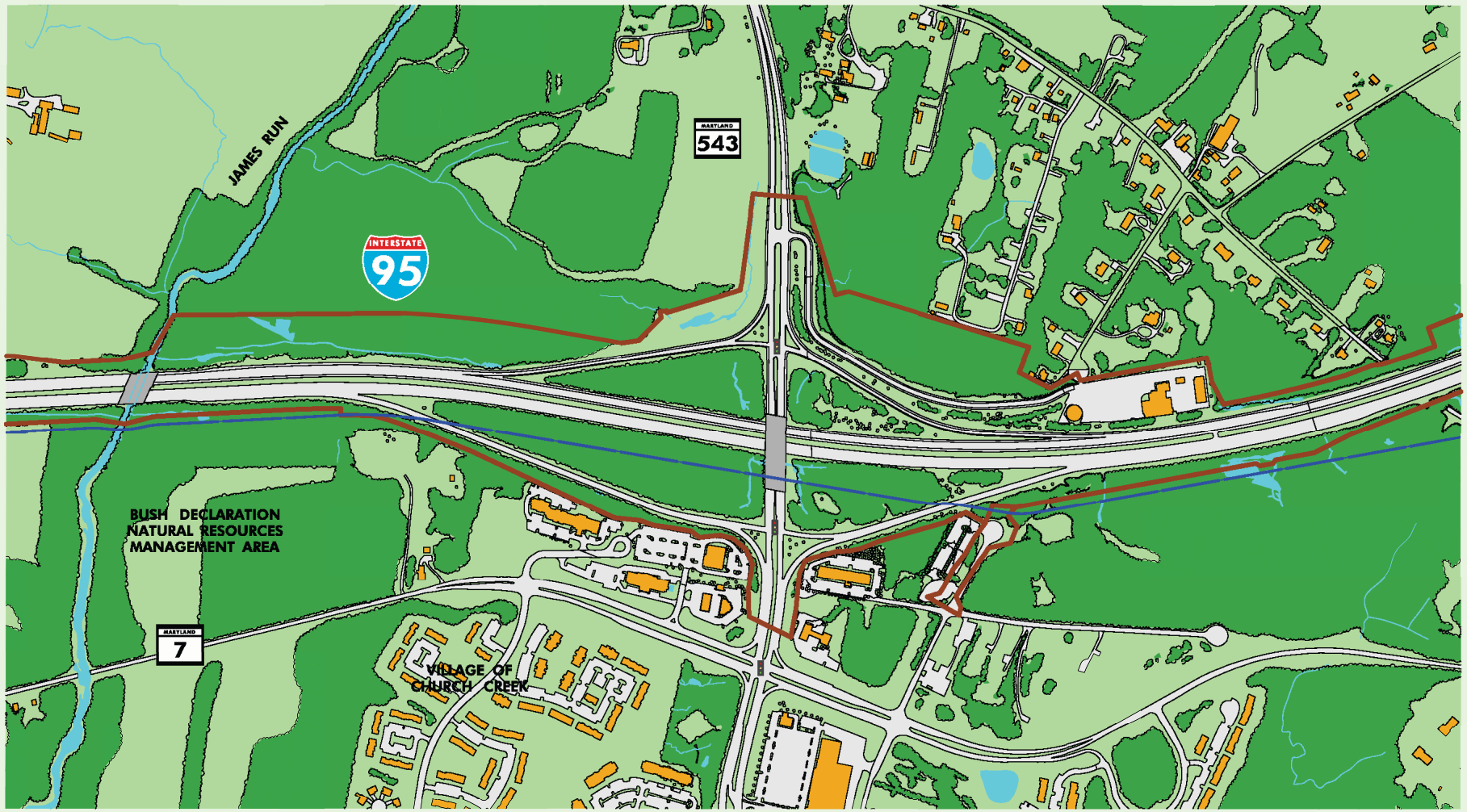


FIGURE 4 – GENERAL PURPOSE LANE – I–95 AT MD 543 INTERCHANGE NO–BUILD: DIAMOND

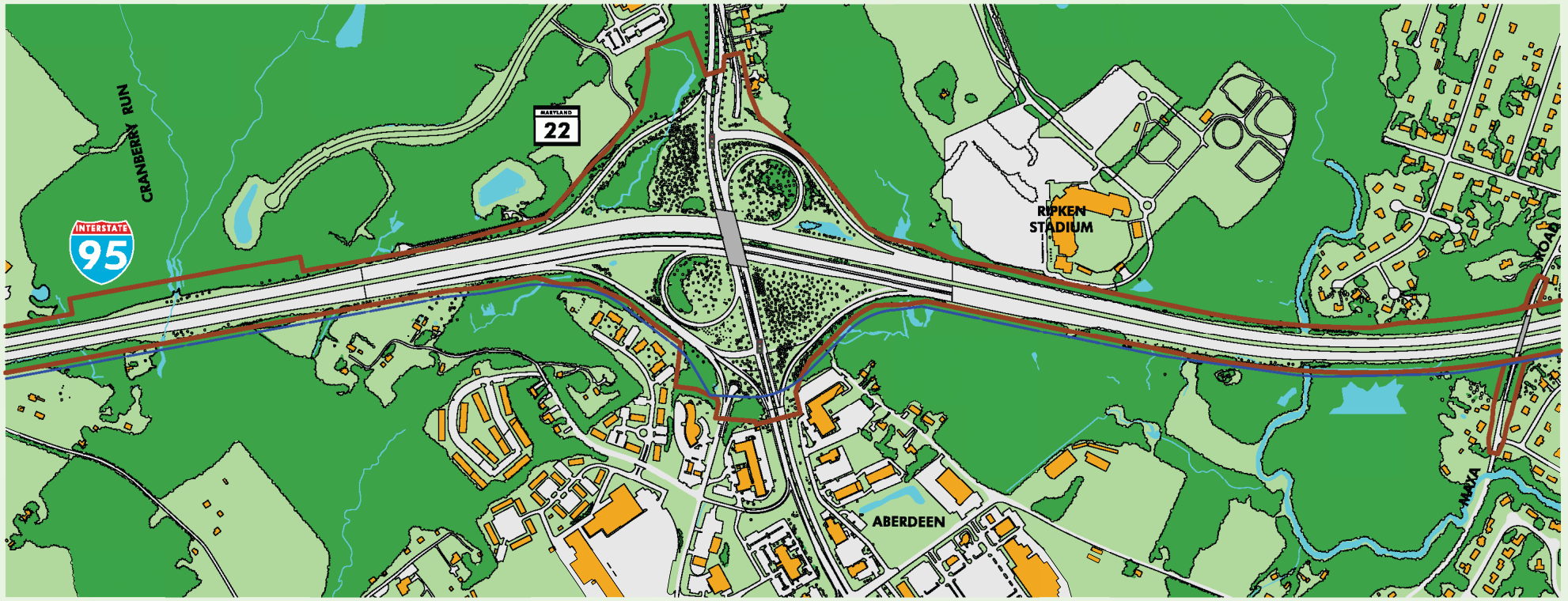


FIGURE 5 – GENERAL PURPOSE LANE – I-95 AT MD 22 INTERCHANGE
NO-BUILD: PARTIAL CLOVERLEAF – DOUBLE LOOP

C. General Purpose Lanes Alternate

1. Mainline

Additional General Purpose Lanes (GPLs) would be added to I-95 to accommodate the projected increase in traffic. Under this 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.

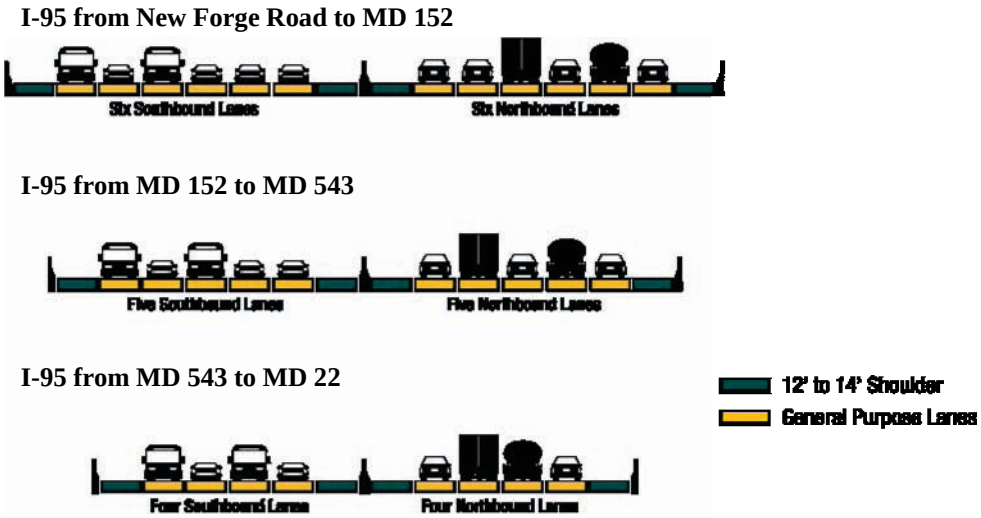


Figure 6 – Preliminary General Purpose Lanes Alternate - Typical Roadway Section

2. General Purpose Lane Interchange Options

a. I-95/MD 152 Interchange

Figure 7 - Option 1: Diamond

Figure 8 - Option 2: Tight Diamond

Figure 9 - Option 3: Single Point Urban Diamond

Figure 10 - Option 4: Partial Cloverleaf – Single Loop

Figure 11 - Option 5: Partial Cloverleaf – Double Loop

b. I-95/MD 24 Interchange

Figure 12 - Option 1: Modifications to structure and ramps

c. I-95/MD 543 Interchange

Figure 13 - Option 1: Diamond

Figure 14 - Option 2: Tight Diamond

Figure 15 - Option 3: Single Point Urban Diamond

Figure 16 - Option 4: Partial Cloverleaf – Single Loop

Figure 17 - Option 5: Partial Cloverleaf – Triple Loop with CD Roads

d. I-95/MD 22 Interchange

Figure 18 - Option 1: Partial Cloverleaf – Double Loop with Modifications to CD roads

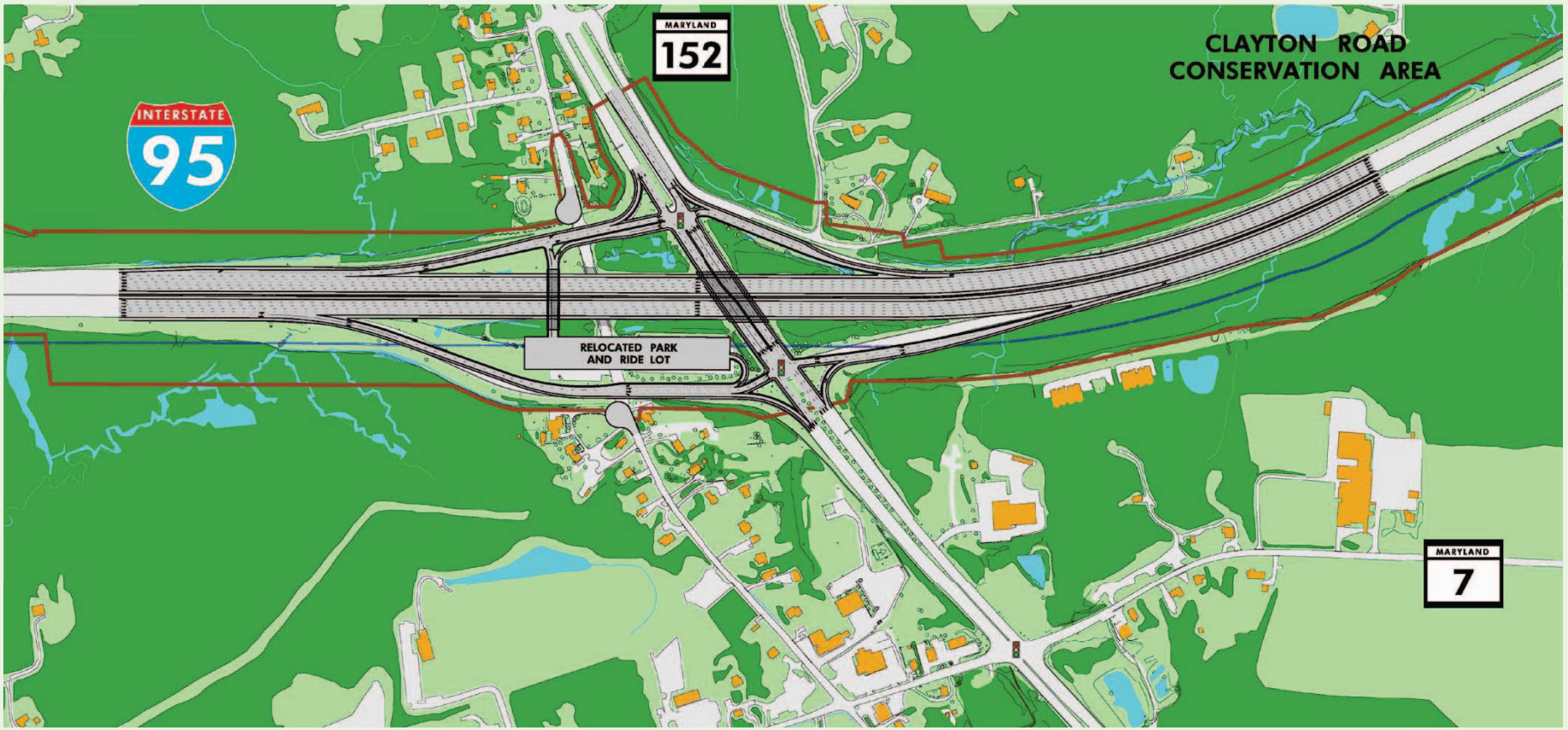


FIGURE 7 - GENERAL PURPOSE LANE - I-95 AT MD 152 INTERCHANGE
OPTION 1: DIAMOND

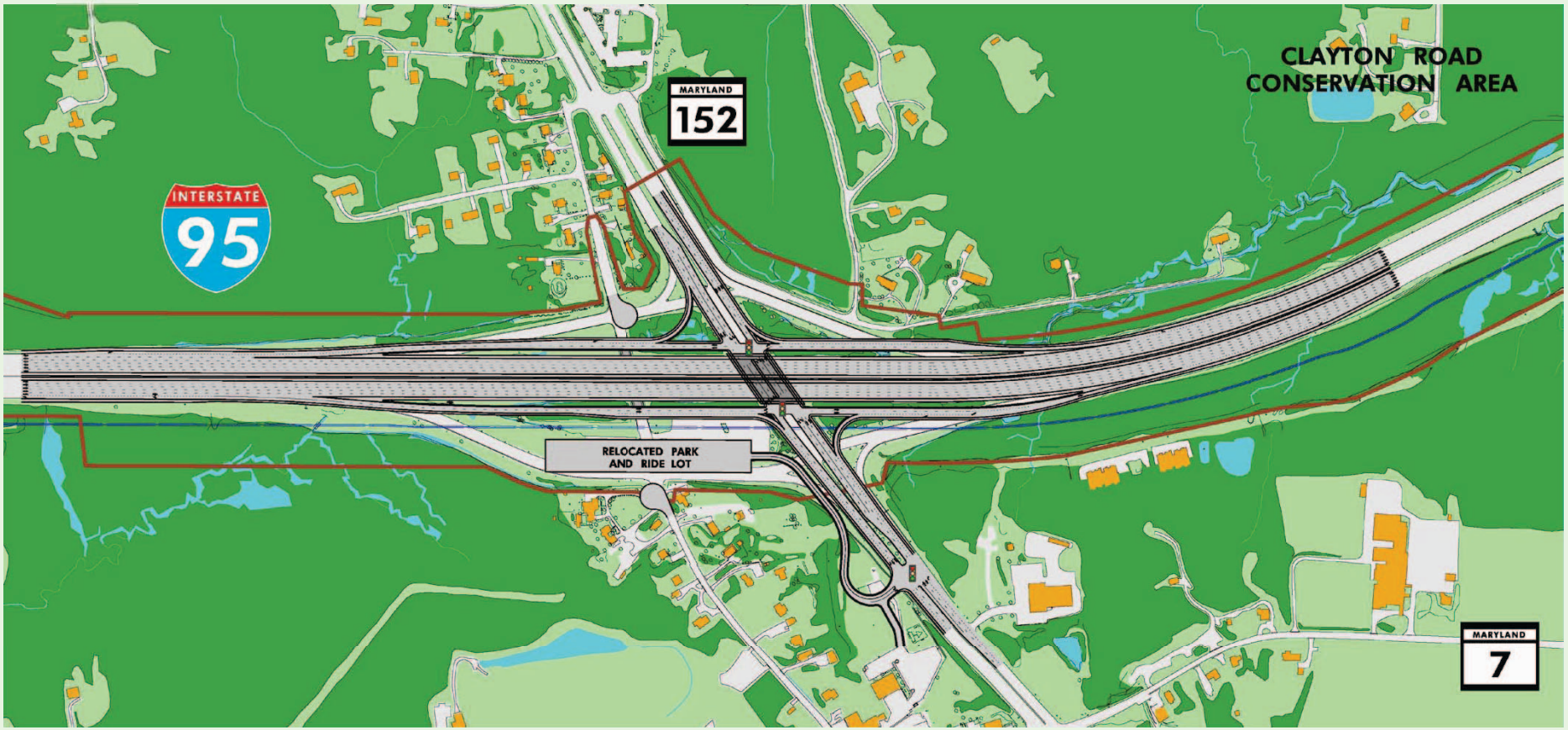


FIGURE 8 - GENERAL PURPOSE LANE - I-95 AT MD AT MD 152 INTERCHANGE
OPTION 2: TIGHT DIAMOND

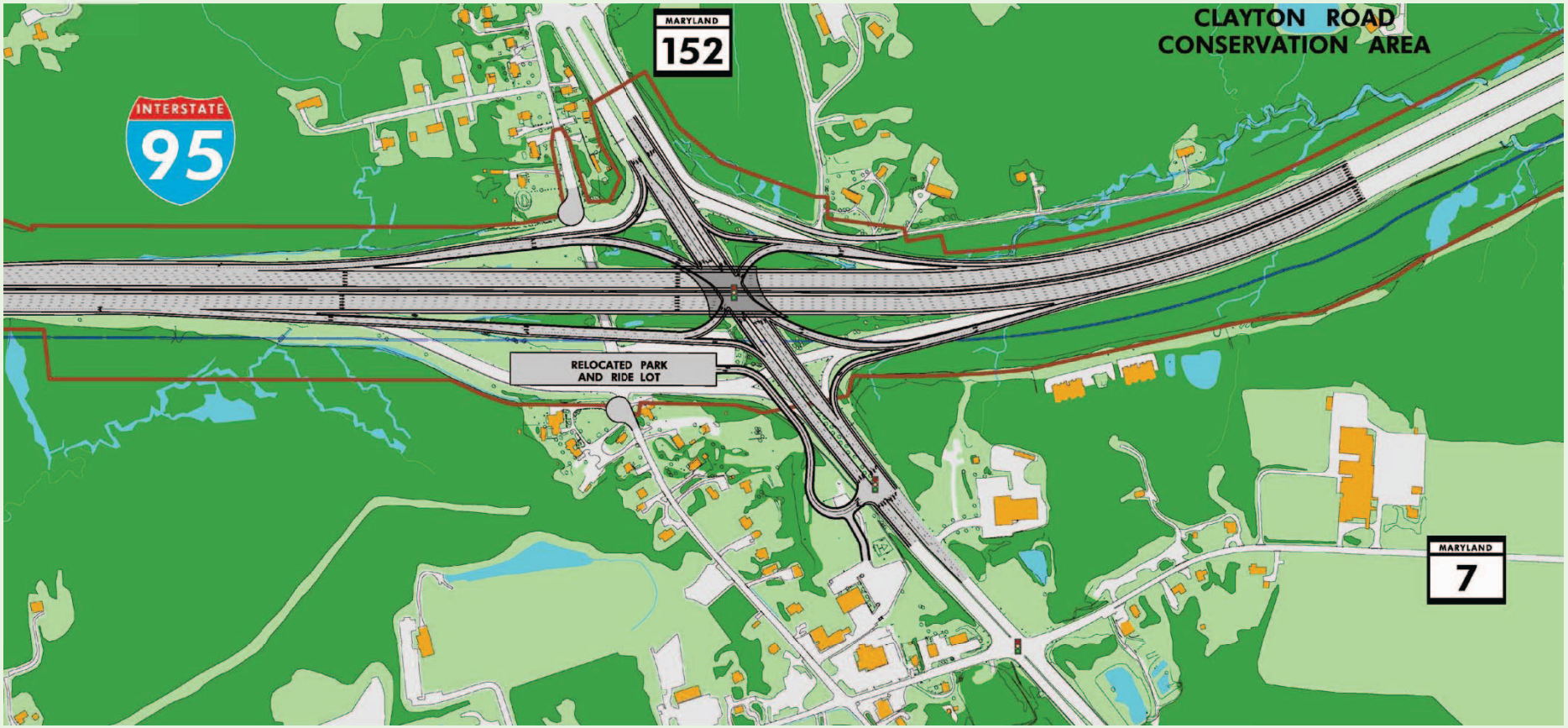


FIGURE 9 - GENERAL PURPOSE LANE - I-95 AT MD AT MD 152 INTERCHANGE
OPTION 3: SINGLE POINT URBAN DIAMOND

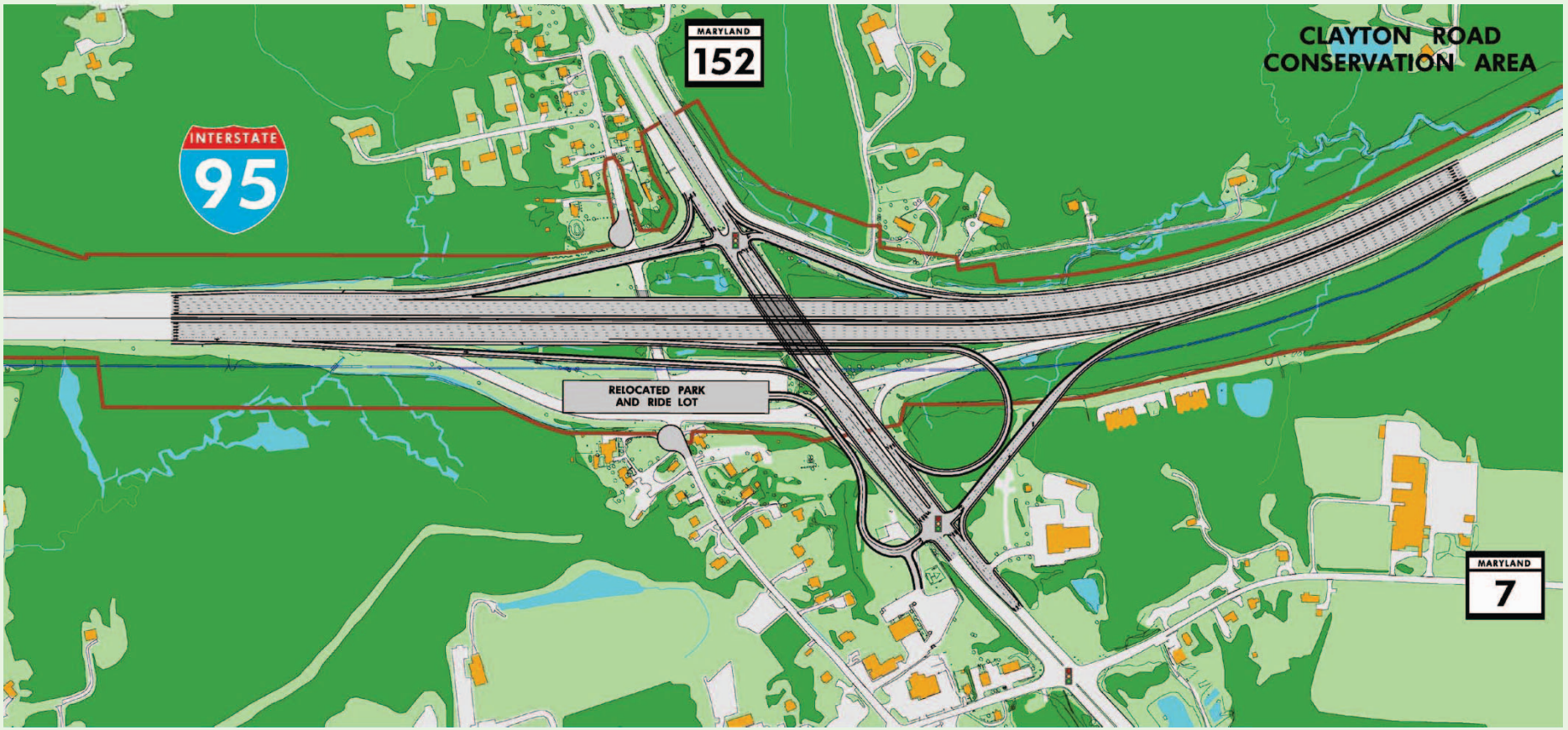


FIGURE 10 - GENERAL PURPOSE LANE - I-95 AT MD 152 INTERCHANGE
OPTION 4: PARTIAL CLOVERLEAF - SINGLE LOOP

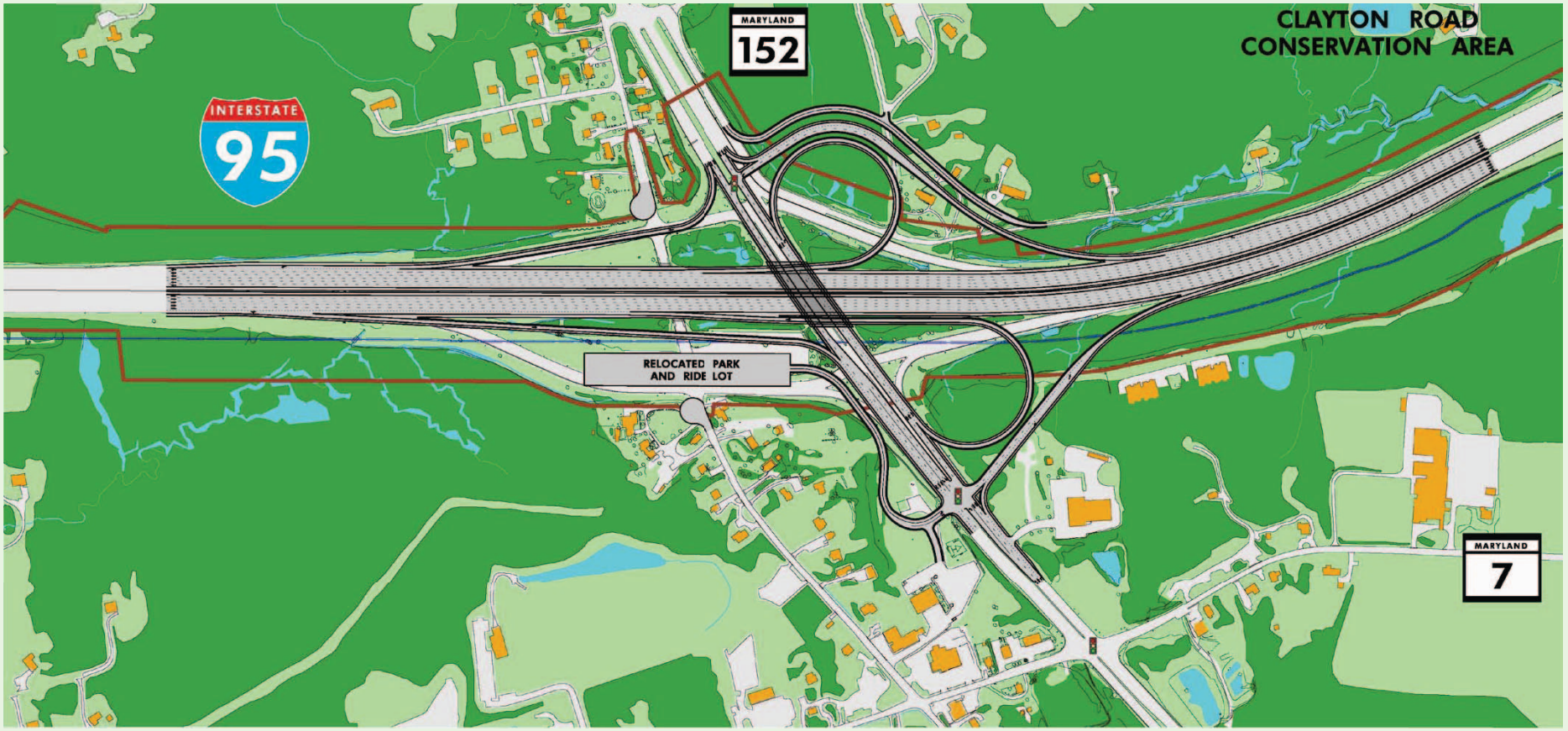


FIGURE 11 - GENERAL PURPOSE LANE - I-95 AT MD 152 INTERCHANGE
OPTION 5: PARTIAL CLOVERLEAF - DOUBLE LOOP

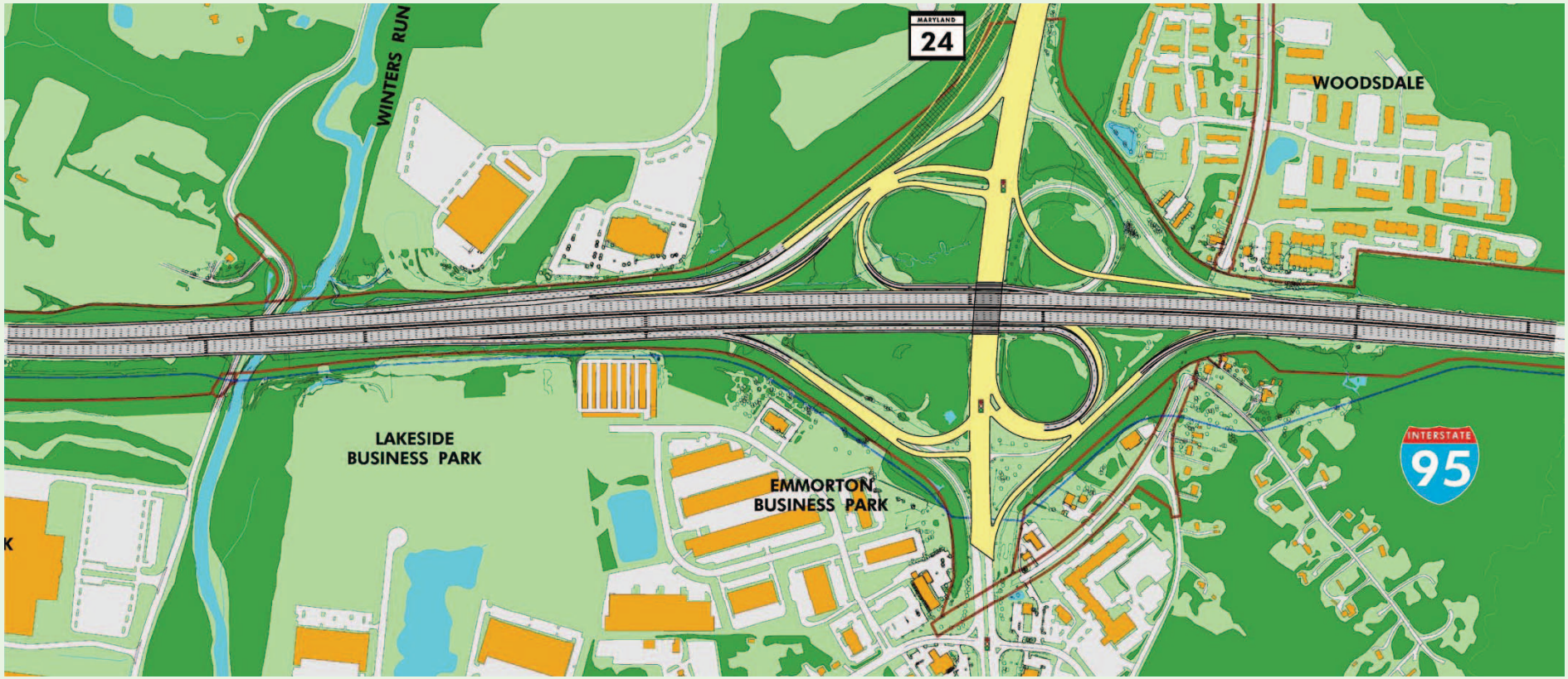


FIGURE 12 - GENERAL PURPOSE LANE - I-95 AT MD 24 INTERCHANGE
OPTION 1: MODIFICATIONS TO STRUCTURE AND RAMPS

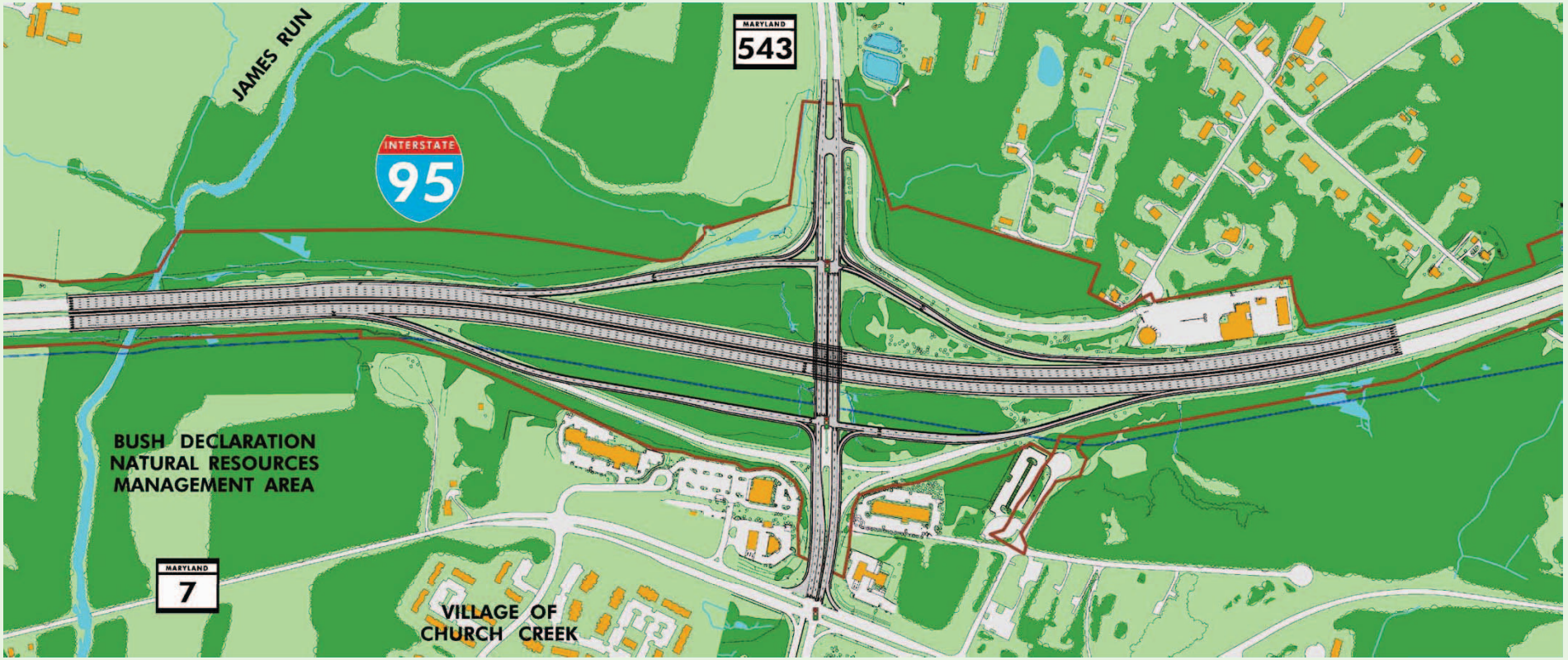


FIGURE 13 - GENERAL PURPOSE LANE - I-95 AT MD 543 INTERCHANGE
OPTION 1: DIAMOND

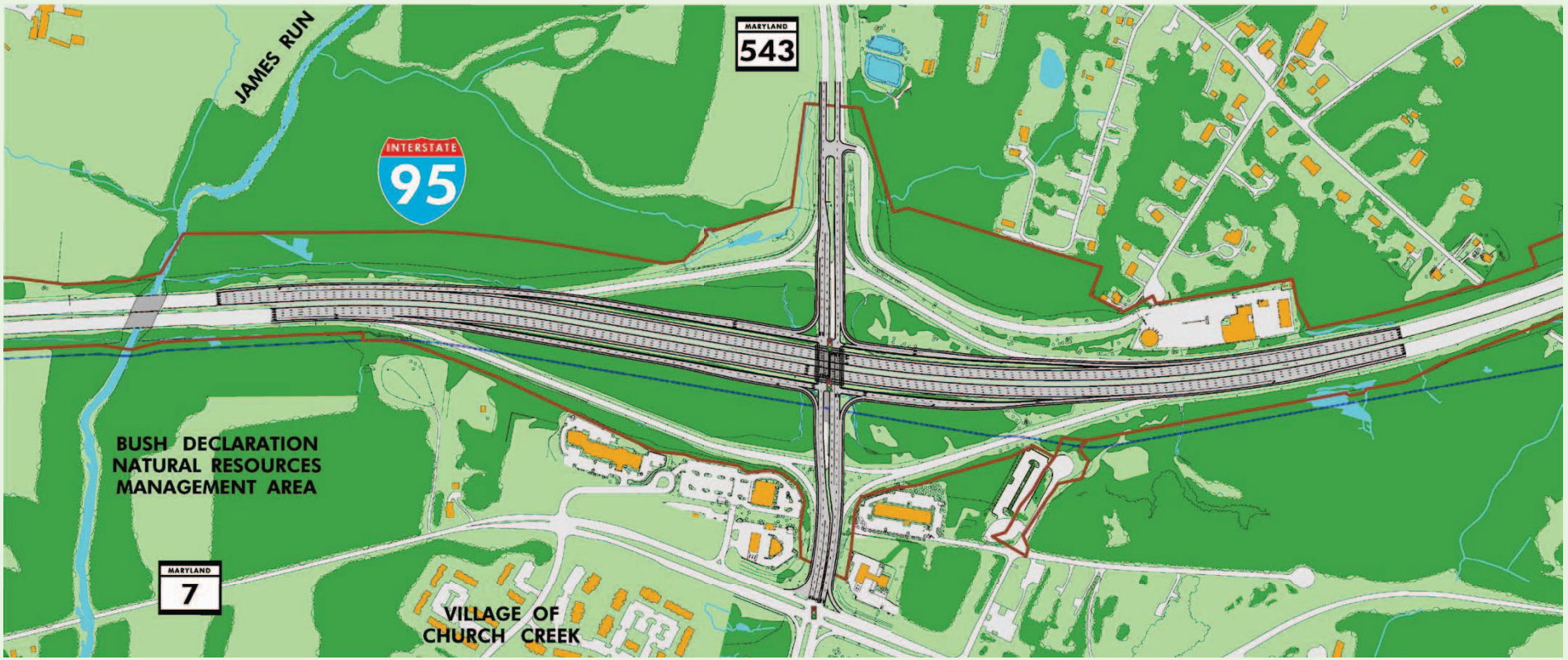


FIGURE 14 - GENERAL PURPOSE LANE - I-95 AT MD 543 INTERCHANGE
OPTION 2: TIGHT DIAMOND

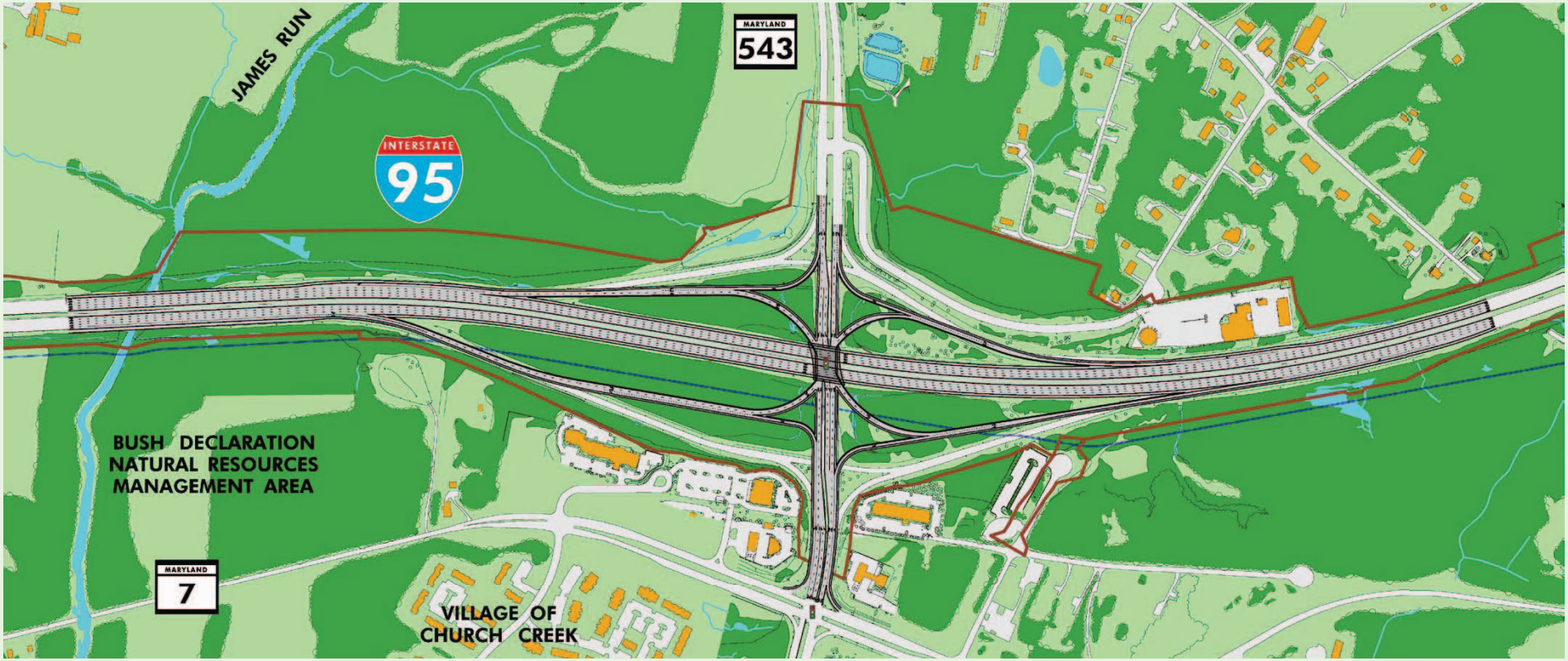


FIGURE 15 - GENERAL PURPOSE LANE - I-95 AT MD 543 INTERCHANGE
OPTION 3: SINGLE POINT URBAN DIAMOND

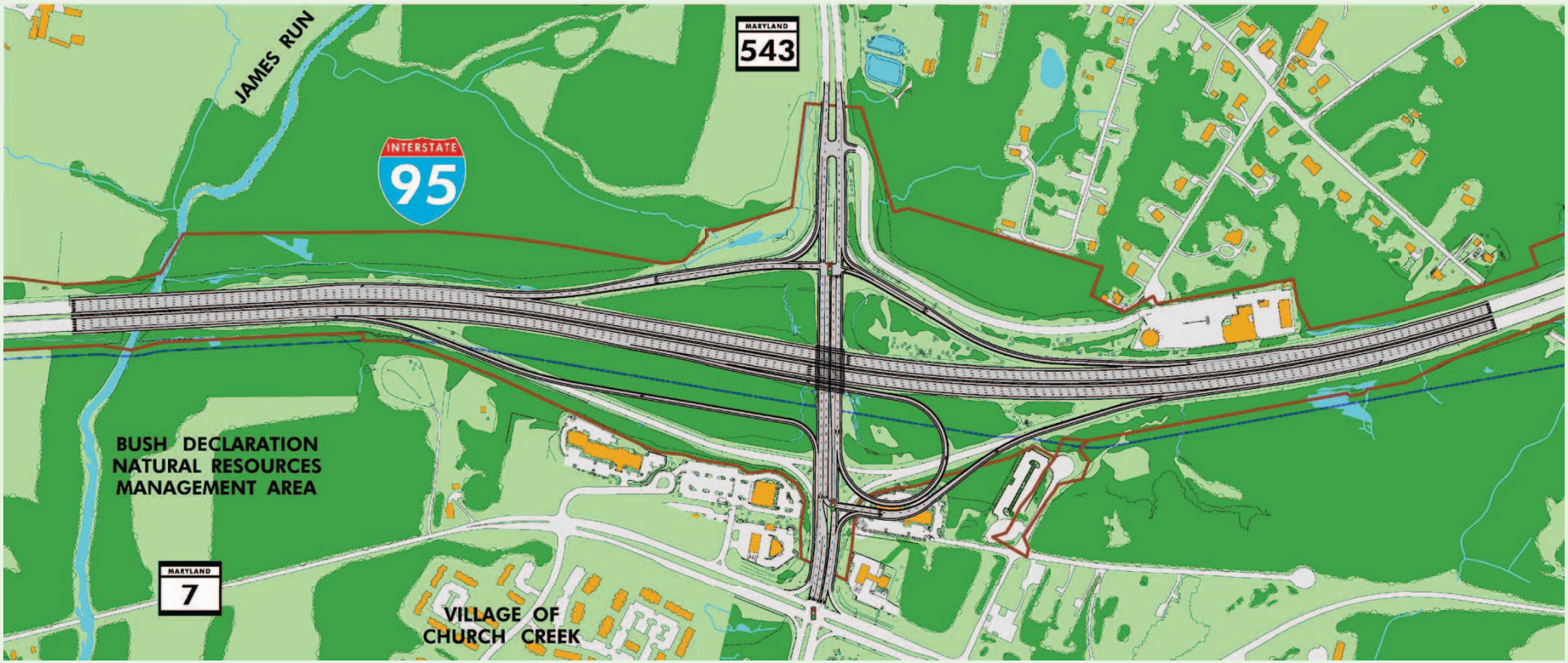


FIGURE 16 - GENERAL PURPOSE LANE - I-95 AT MD 543 INTERCHANGE
OPTION 4: PARTIAL CLOVERLEAF - SINGLE LOOP

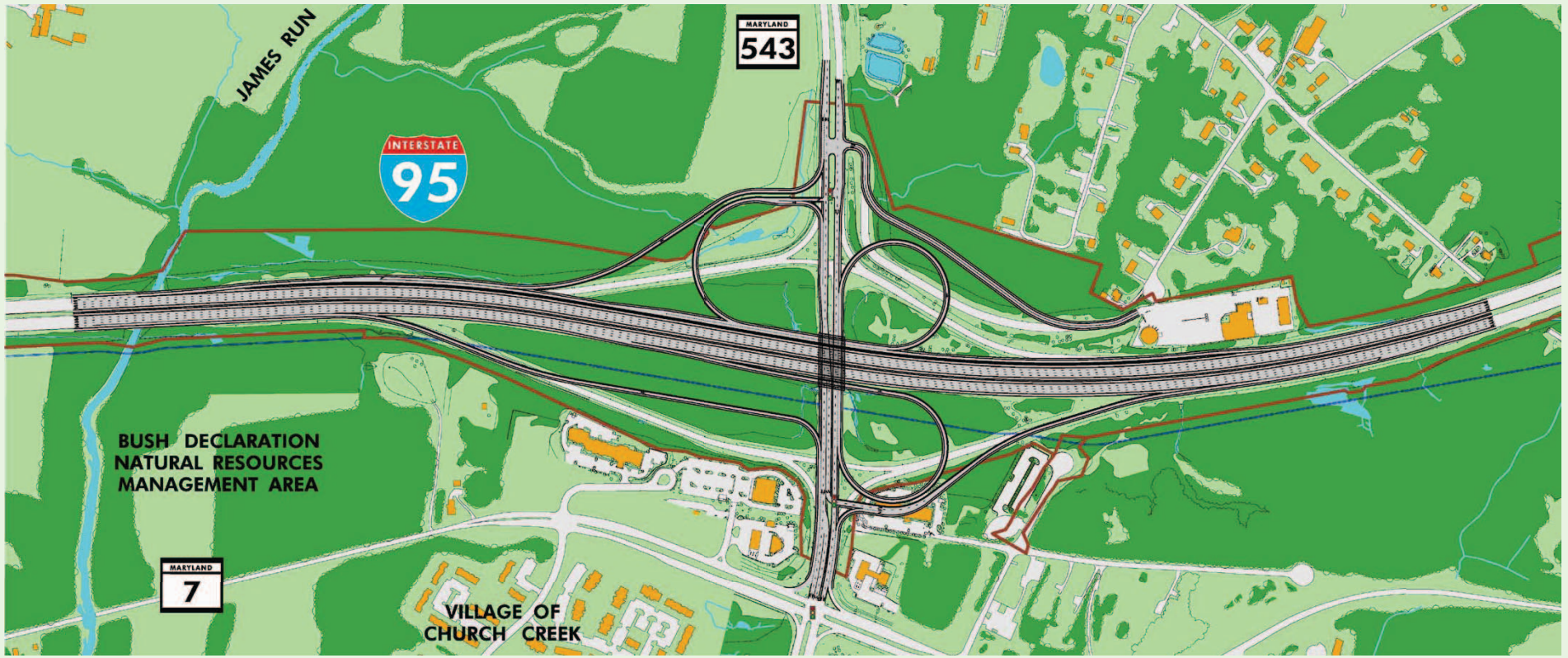


FIGURE 17 - GENERAL PURPOSE LANE - I-95 AT MD 543 INTERCHANGE
OPTION 5: PARTIAL CLOVERLEAF - TRIPLE LOOP WITH CD ROADS

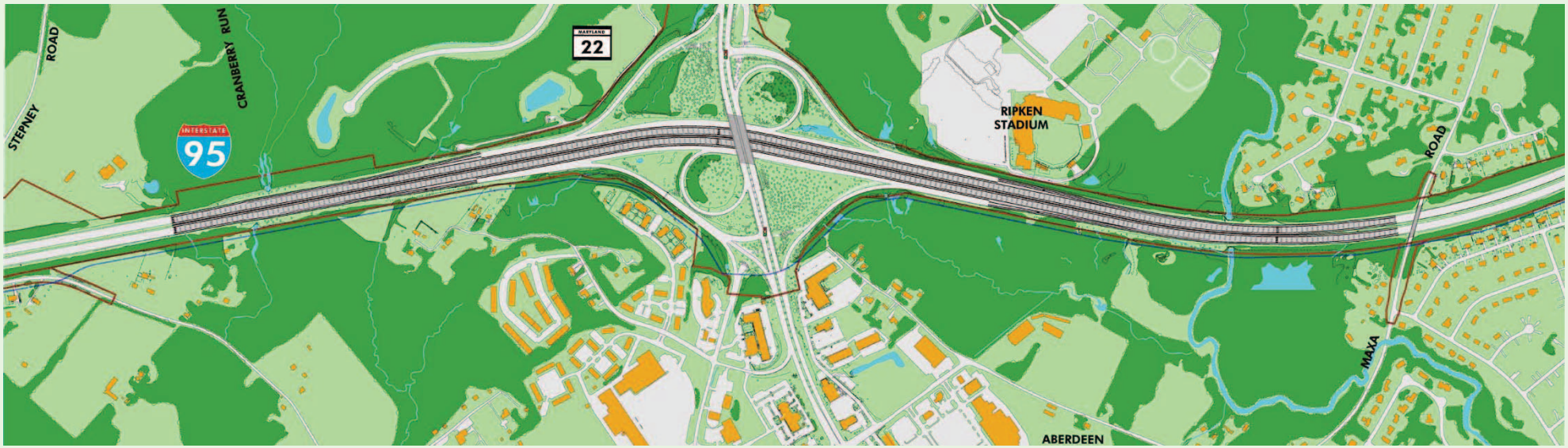


FIGURE 18 - GENERAL PURPOSE LANE - I-95 AT MD 22 INTERCHANGE
OPTION 1: PARTIAL CLOVERLEAF - DOUBLE LOOP WITH MODIFICATIONS CD ROADS

D. Express Toll Lanes Alternate

1. Mainline

A combination of General Purpose Lanes (GPLs) and Express Toll Lanes (ETLs) would be added to I-95 to accommodate the projected increase in traffic. Under this alternate, I-95 in each direction would have:

- Two ETLs and four GPLs from north of MD 43 (where Section 100 ends) to north of MD 543.
- Four GPLs from MD 543 to project limits north of MD 22.

I-95 from New Forge Road to MD 543

I-95 from MD 543 to MD 22

Figure 19 – Preliminary Express Toll Lane Alternate - Typical Roadway Section

2. Express Toll Lane Interchange Options

a. I-95/MD 152 Interchange

Figure 20 - Option 1A: Diamond with ETL Median Access Ramps

Figure 21 - Option 1B: Diamond with ETL Flyover Access Ramps

Figure 22 - Option 2: Tight Diamond with ETL Flyover Access Ramps

Figure 23 - Option 3: Single Point Urban Diamond with ETL Flyover Access Ramps

Figure 24 - Option 4A: Partial Cloverleaf – Single Loop with ETL Median Access Ramps

Figure 25 - Option 4B: Partial Cloverleaf – Single Loop with ETL Flyover Access Ramps

Figure 26 - Option 5A: Partial Cloverleaf – Double Loop with ETL Median Access Ramps

Figure 27 - Option 5B: Partial Cloverleaf – Double Loop with ETL Flyover Access Ramps

b. I-95/MD 24 Interchange

Figure 28 - Option 1: Partial Cloverleaf – Double Loop with ETL Flyover Access Ramps

c. I-95/MD 543 Interchange

Figure 29 - Option 1A: Diamond with ETL Median Access Ramps

Figure 30 - Option 1B: Diamond with ETL Flyover Access Ramps

Figure 31 - Option 2: Tight Diamond with ETL Flyover Access Ramps

Figure 32 - Option 3: Single Point Urban Diamond with ETL Flyover Access Ramps

Figure 33 - Option 4A: Partial Cloverleaf – Single Loop with ETL Median Access Ramps

Figure 34 - Option 4B: Partial Cloverleaf – Single Loop with ETL Flyover Access Ramps

Figure 35 - Option 5A: Partial Cloverleaf – Triple Loop with ETL Median Access Ramps

Figure 36 - Option 5B: Partial Cloverleaf – Triple Loop with ETL Flyover Access Ramps

Figure 37 - Option 6A: Partial Cloverleaf – Double Loop with ETL Median Access Ramps

Figure 38 - Option 6B: Partial Cloverleaf – Double Loop with ETL Flyover Access Ramps

d. I-95/MD 22 Interchange

Figure 18 - Option 1: Partial Cloverleaf – Double Loop with Modifications to CD roads

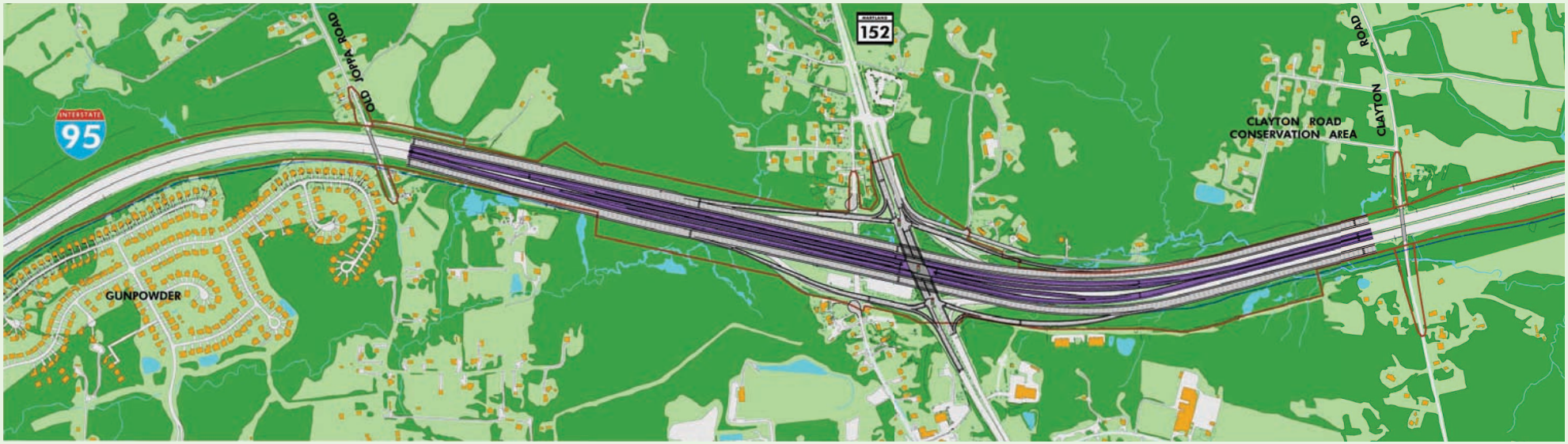


FIGURE 20 - EXPRESS TOLL LANE - MD 152 INTERCHANGE
OPTION 1A: DIAMOND WITH ETL MEDIAN ACCESS RAMPS

FIGURE 21 - EXPRESS TOLL LANE - MD 152 INTERCHANGE
OPTION 1B: DIAMOND WITH ETL FLYOVER ACCESS RAMPS

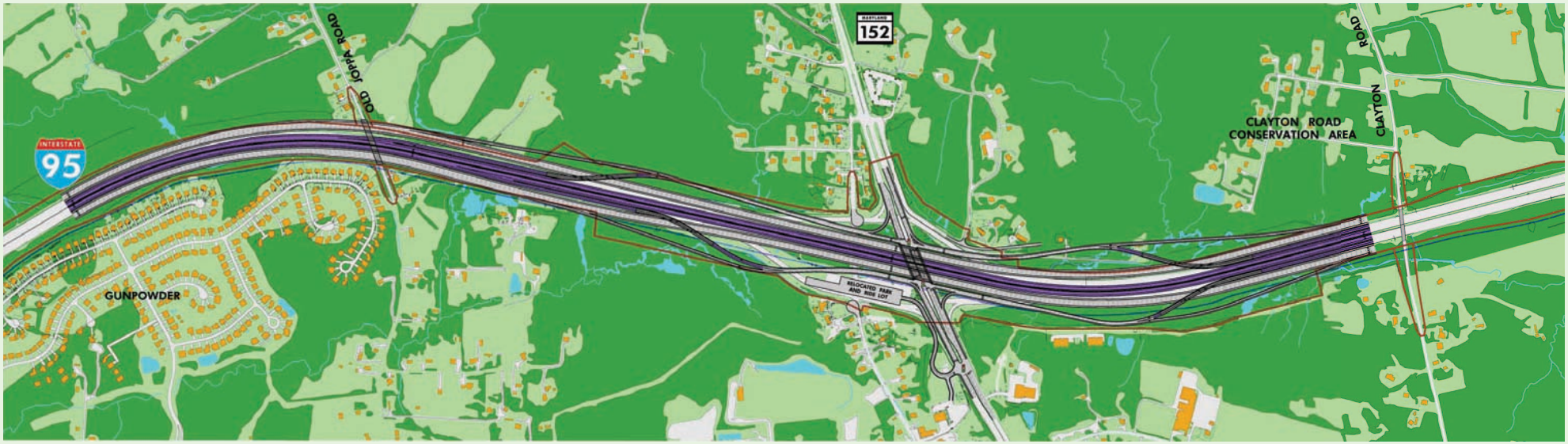


FIGURE 22 - EXPRESS TOLL LANE - MD 152 INTERCHANGE
OPTION 2: TIGHT DIAMOND WITH ETL FLYOVER ACCESS RAMPS

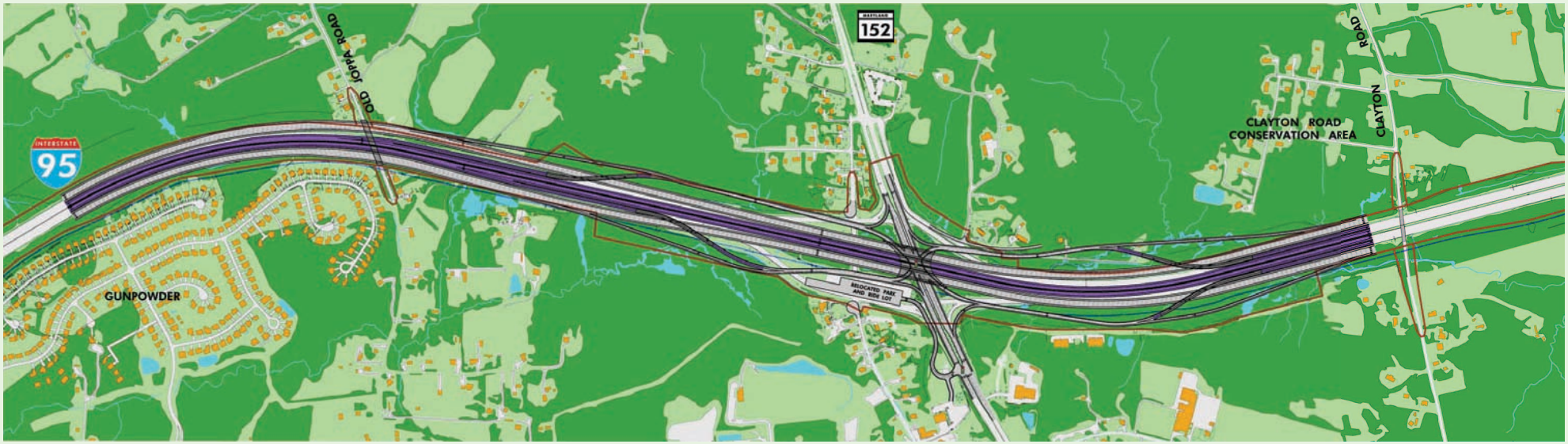


FIGURE 23 - EXPRESS TOLL LANE - MD 152 INTERCHANGE
OPTION 3: SINGLE POINT URBAN DIAMOND WITH ETL FLYOVER ACCESS RAMPS

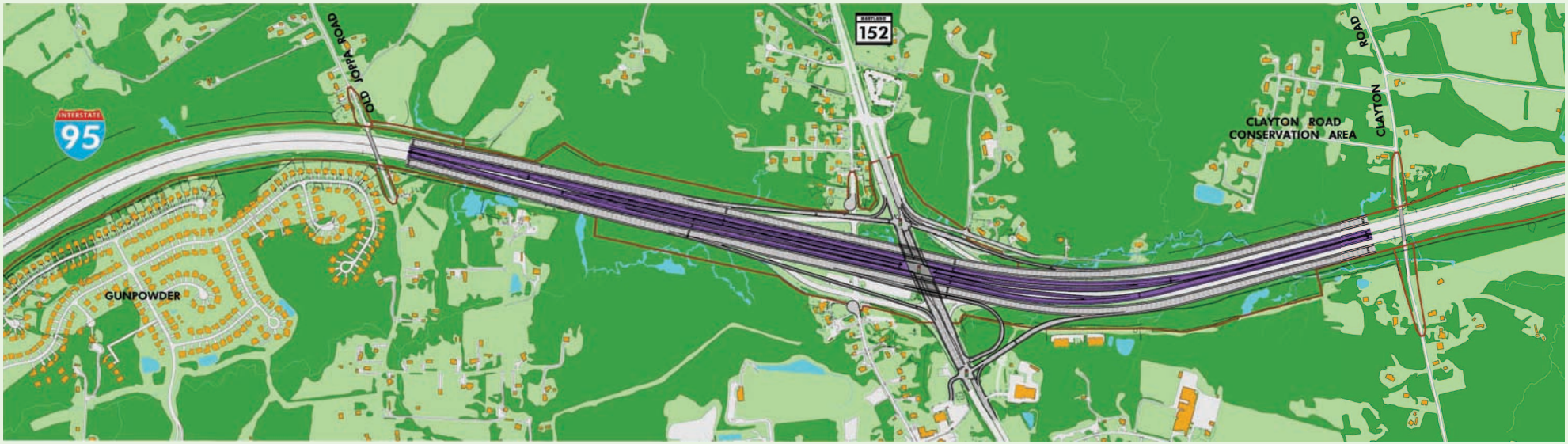


FIGURE 24 - EXPRESS TOLL LANE - MD 152 INTERCHANGE
OPTION 4A: PARTIAL CLOVERLEAF - SINGLE LOOP WITH ETL MEDIAN ACCESS RAMPS

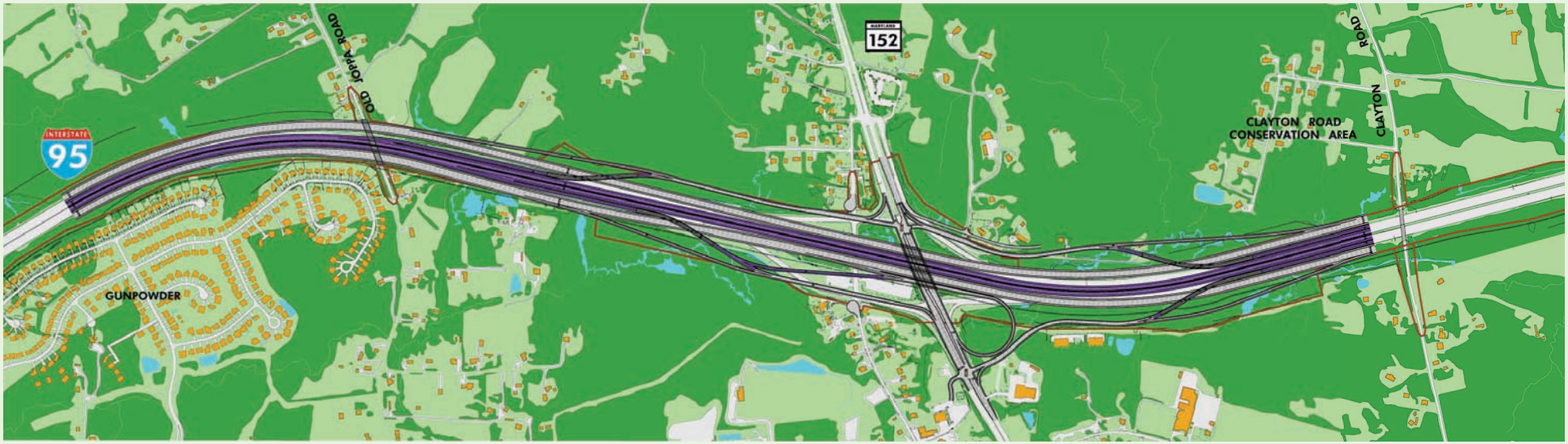


FIGURE 25 - EXPRESS TOLL LANE - MD 152 INTERCHANGE
OPTION 4B: PARTIAL CLOVERLEAF - SINGLE LOOP WITH ETL FLYOVER ACCESS RAMPS

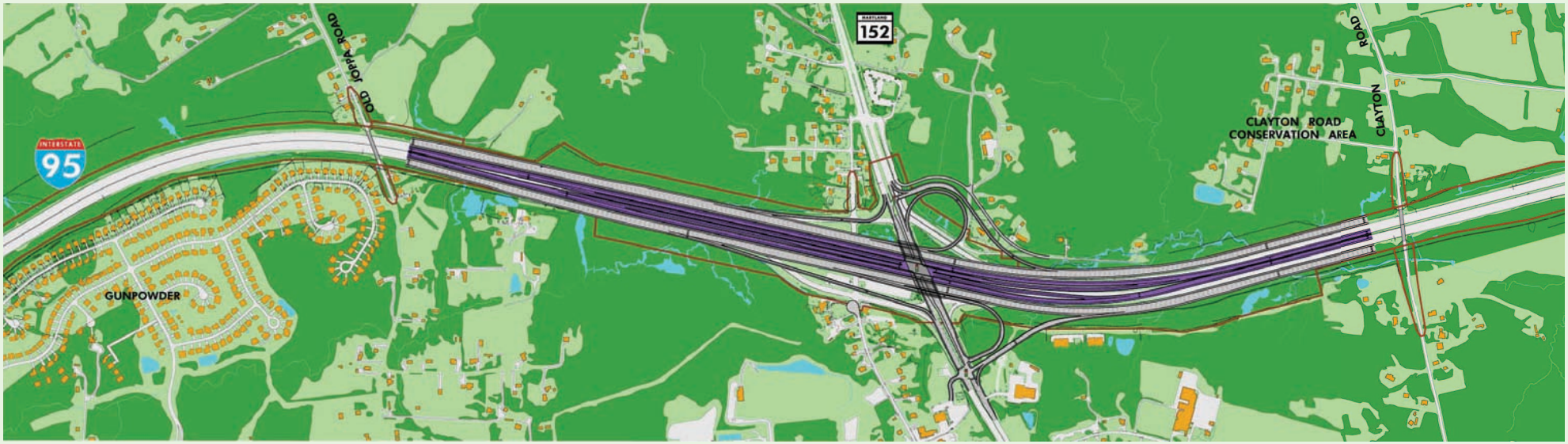


FIGURE 26 - EXPRESS TOLL LANE - MD 152 INTERCHANGE
OPTION 5A: PARTIAL CLOVERLEAF - DOULBE LOOP WITH ETL MEDIAN ACCESS RAMPS

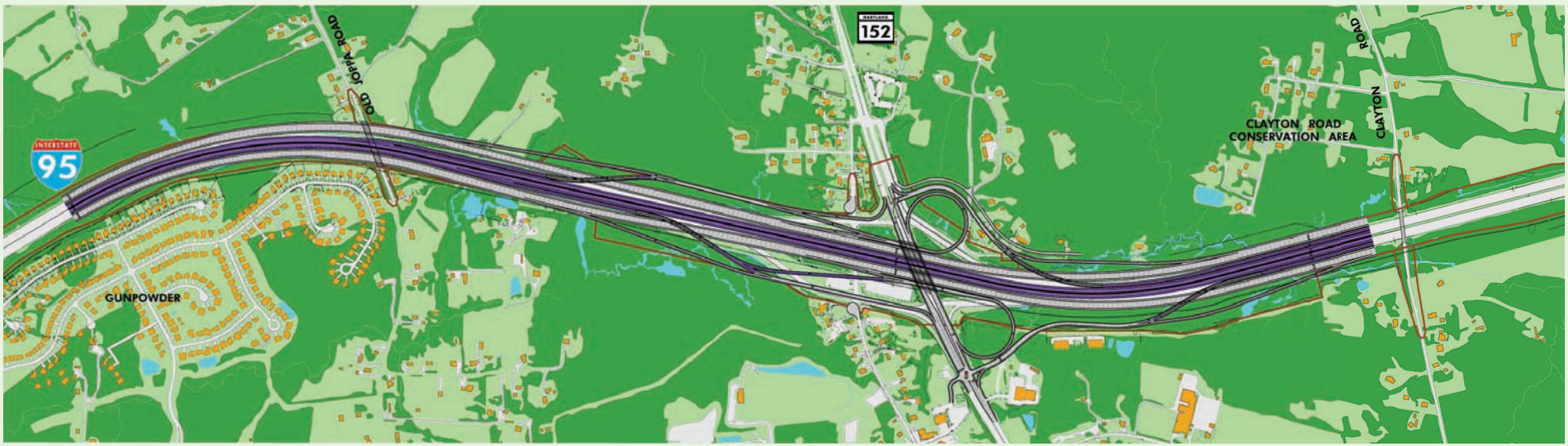


FIGURE 27 - EXPRESS TOLL LANE - MD 152 INTERCHANGE
OPTION 5B: PARTIAL CLOVERLEAF - DOULBE LOOP WITH ETL FLYOVER ACCESS RAMPS

FIGURE 28 - EXPRESS TOLL LANE - MD 24 INTERCHANGE
OPTION 1: PARTIAL CLOVERLEAF - DOUBLE LOOP WITH ETL FLYOVER ACCESS RAMPS

FIGURE 29 - EXPRESS TOLL LANE - MD 543 INTERCHANGE
OPTION 1A: DIAMOND WITH ETL MEDIAN ACCESS RAMPS

FIGURE 30 - EXPRESS TOLL LANE - MD 543 INTERCHANGE
OPTION 1B: DIAMOND WITH ETL FLYOVER ACCESS RAMPS

FIGURE 31 - EXPRESS TOLL LANE - MD 543 INTERCHANGE
OPTION 2: TIGHT DIAMOND WITH ETL FLYOVER ACCESS RAMPS

FIGURE 32 - EXPRESS TOLL LANE - MD 543 INTERCHANGE
OPTION 3: SINGLE POINT URBAN DIAMOND WITH ETL FLYOVER ACCESS RAMPS

FIGURE 33 - EXPRESS TOLL LANE - MD 543 INTERCHANGE
OPTION 4A: PARTIAL CLOVERLEAF - SINGLE LOOP WITH ETL MEDIAN ACCESS RAMPS

FIGURE 34 - EXPRESS TOLL LANE - MD 543 INTERCHANGE
OPTION 4B: PARTIAL CLOVERLEAF - SINGLE LOOP WITH ETL FLYOVER ACCESS RAMPS

FIGURE 35 - EXPRESS TOLL LANE - MD 543 INTERCHANGE
OPTION 5A: PARTIAL CLOVERLEAF - TRIPLE LOOP WITH ETL MEDIAN ACCESS RAMPS

FIGURE 36 - EXPRESS TOLL LANE - MD 543 INTERCHANGE
OPTION 5B: PARTIAL CLOVERLEAF - TRIPLE LOOP WITH ETL FLYOVER ACCESS RAMPS

FIGURE 37 - EXPRESS TOLL LANE - MD 543 INTERCHANGE
OPTION 6A: PARTIAL CLOVERLEAF - DOUBLE LOOP WITH ETL MEDIAN ACCESS RAMPS

FIGURE 38 - EXPRESS TOLL LANE - MD 543 INTERCHANGE
OPTION 6B: PARTIAL CLOVERLEAF - DOUBLE LOOP WITH ETL FLYOVER ACCESS RAMPS

E. Additional Interchange Options

After consideration of public comments received in June 2006 and further detailed analysis, additional interchange options were developed in an effort to meet capacity requirements and minimize community and environmental impacts.

1. Additional General Purpose Lane Interchange Options

Figure 39 - I-95/MD 24 Interchange Option 2: MD 24/MD 924 Flyover Ramp

Figure 40 - I-95/MD 543 Interchange Option 6: Partial Cloverleaf – Double Loop

Figure 41 - I-95/MD 543 Interchange Option 7: Partial Cloverleaf – Single Loop

2. Additional Express Toll Lane Interchange Options

Figure 42 - I-95/MD 24 Interchange Option 2: MD 24/MD 924 Flyover Ramp with ETL Median Access Ramps

Figure 43 - I-95/MD 543 Interchange Option 7: Partial Cloverleaf – Single Loop with ETL Median Access Ramps

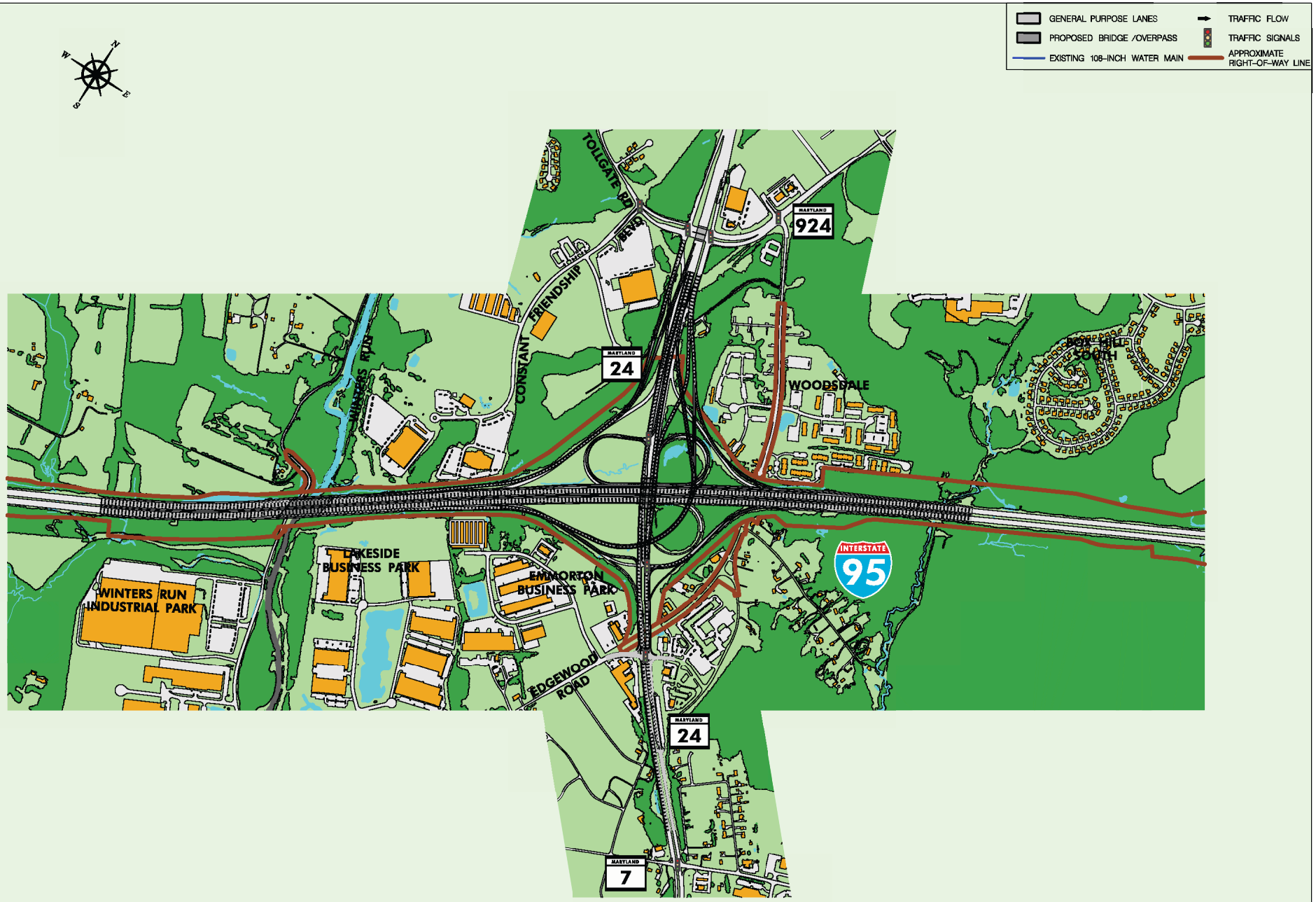


FIGURE 39 – GENERAL PURPOSE LANE – I-95 AT MD 24 INTERCHANGE
OPTION 2: FLYOVER FOR MD 24 /MD 924

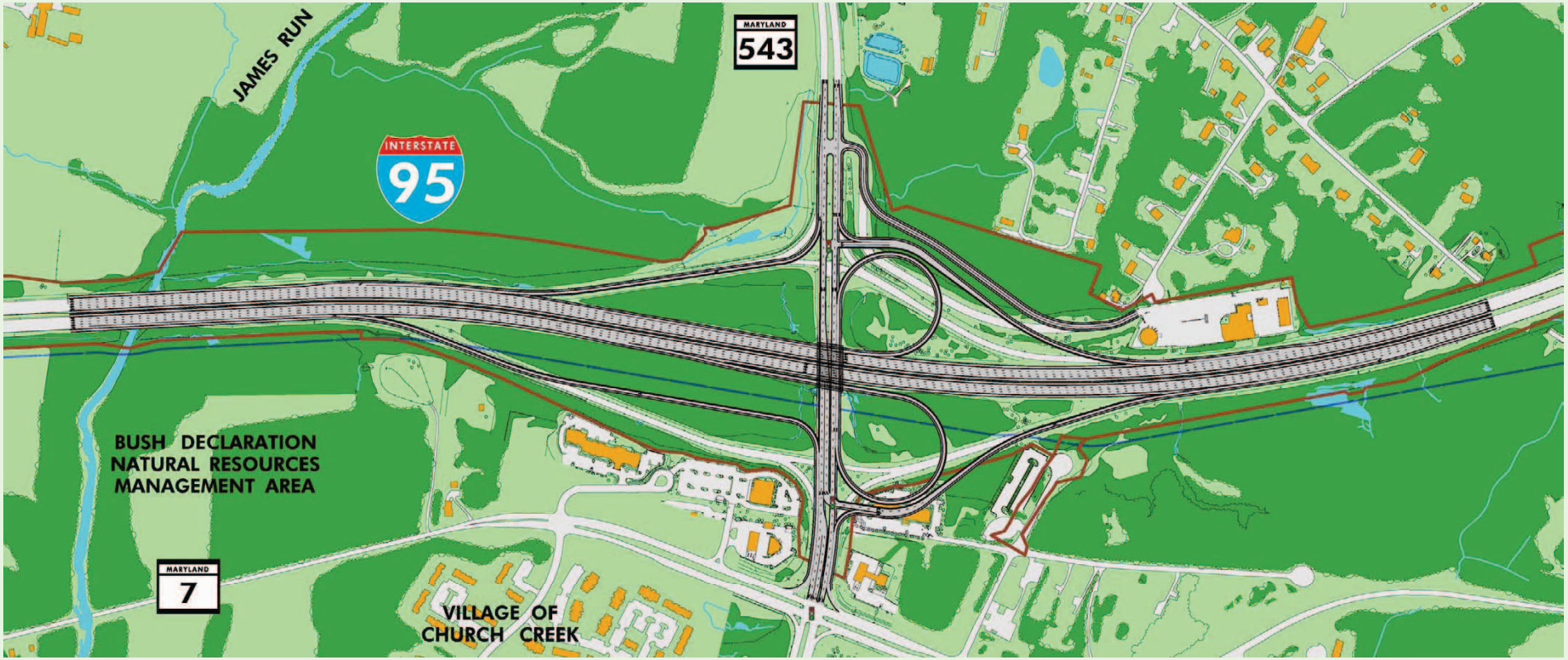


FIGURE 40 - GENERAL PURPOSE LANE - MD 543 INTERCHANGE
OPTION 6: PARTIAL CLOVERLEAF - DOUBLE LOOP

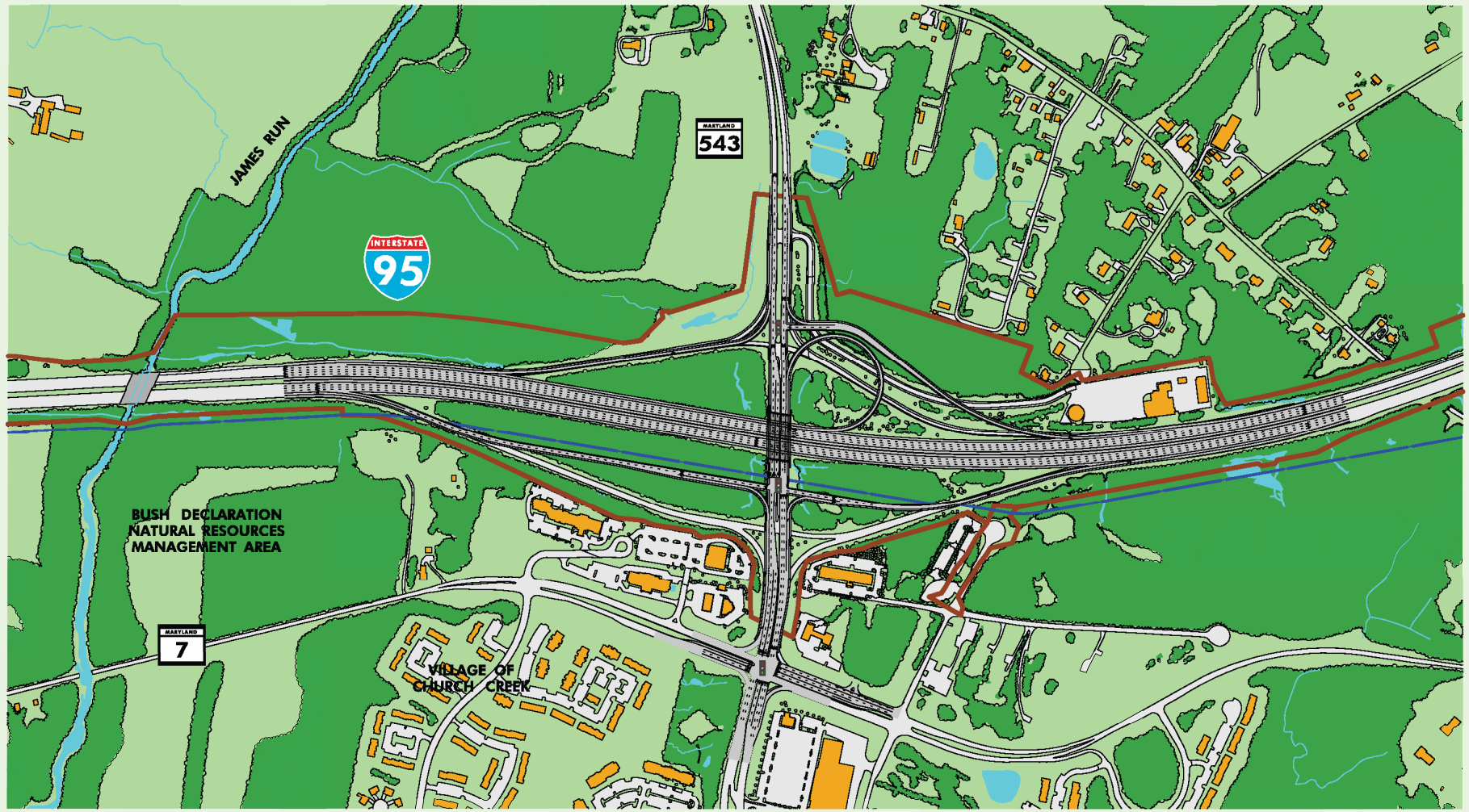


FIGURE 41 – GENERAL PURPOSE LANE – I-95 AT MD 543 INTERCHANGE
OPTION 7: PARTIAL CLOVERLEAF – SINGLE LOOP

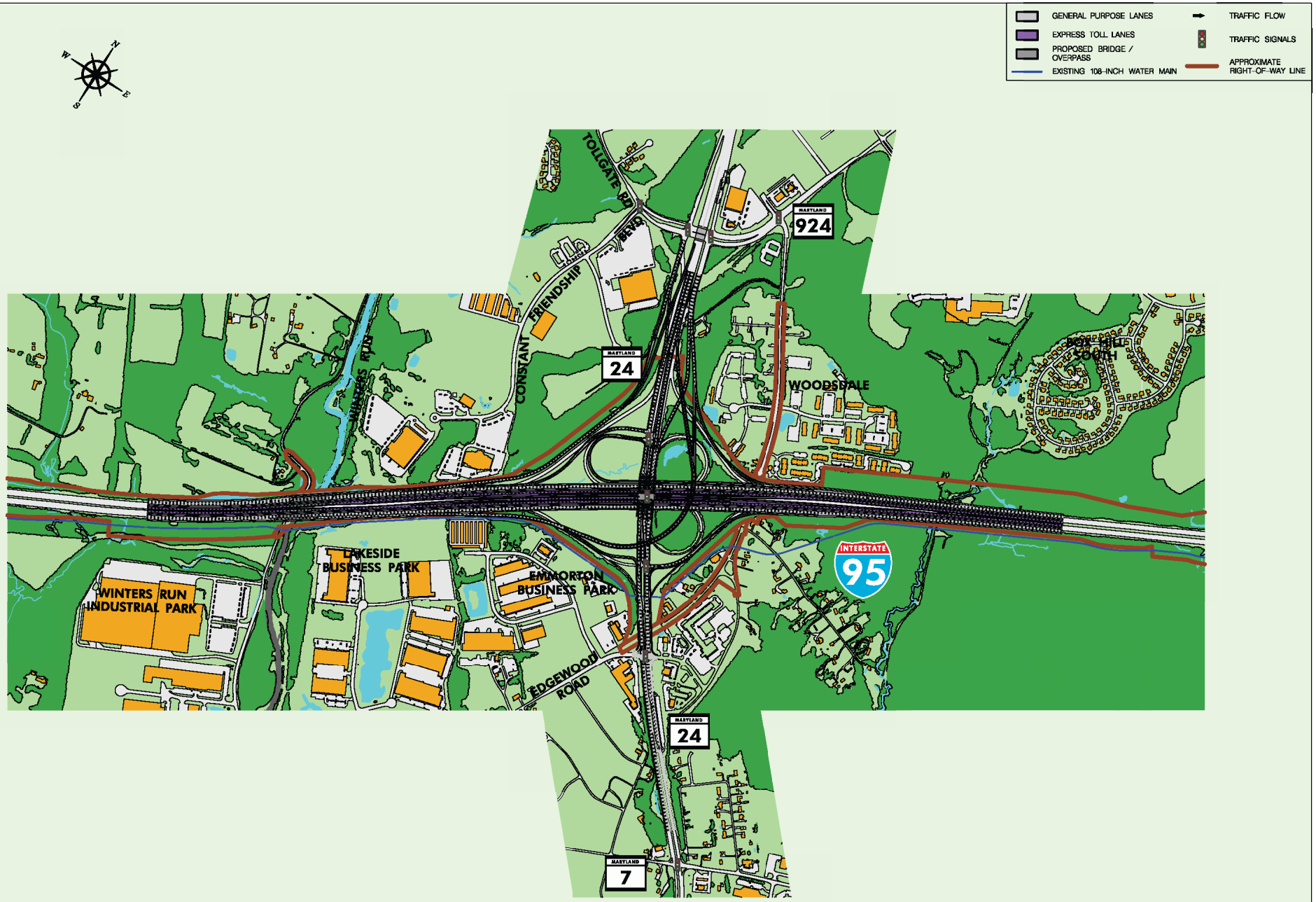


FIGURE 42 – EXPRESS TOLL LANE – I-95 AT MD 24 INTERCHANGE OPTION 2: MD 24 /MD 924 FLYOVER RAMP WITH ETL MEDIAN ACCESS RAMPS

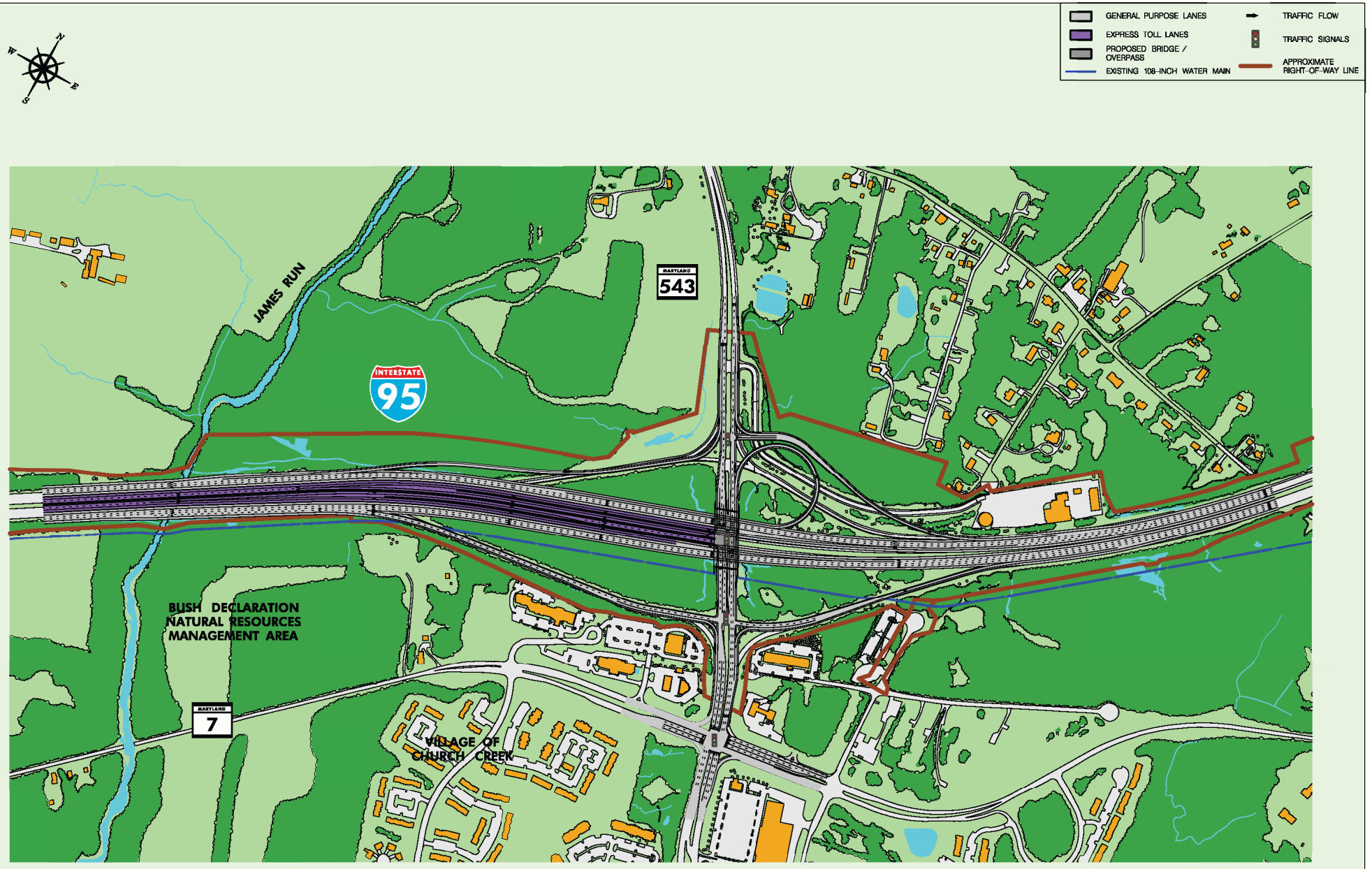


FIGURE 43 – EXPRESS TOLL LANE – I-95 AT MD 543 INTERCHANGE OPTION 7: PARTIAL CLOVERLEAF – SINGLE LOOP WITH ETL MEDIAN ACCESS RAMPS

III. Alternates Descriptions

A. Alternatives Recommended for Detailed Study

The public was given the opportunity to provide feedback on the preliminary alternates, including interchange options, during focus group meetings on April 5, 2006 and May 24, 2006 and a Public Workshop held on June 22, 2006. Based upon public feedback, agency input, engineering traffic analysis, right-of-way impacts, and environmental impacts for each option, the viability of the alternates was evaluated and it was determined which options were to be carried forward and which option would be dropped. The following are descriptions of the mainline alternates, as well as the interchange options that will be carried forward for detailed study.

1. No-Build Alternate

The No-Build Alternate would retain the existing I-95 highway, and allow for maintenance improvements and safety upgrades. Some of the improvements and upgrades associated with the No-Build Alternate include bridge deck replacement, pavement resurfacing, traffic barrier, signing, lighting replacements and upgrades, and replacement of failing structures. There would be no increase in roadway capacity and an increase in congestion and accidents would likely occur. The No-Build option for each interchange has been retained for further study.

2. General Purpose Lanes Alternate

a. Mainline

This alternate would include additional GPLs to accommodate the projected traffic demand. Improvements would be proposed along

the mainline of I-95 from north of MD 43 to north of MD 22 and at the MD 152, MD 24, MD 543 and MD 22 interchanges.

This concept would tie four GPLs and two ETLs in each direction at New Forge Road from Section 100 into six GPLs in each direction from north of MD 43 to the MD 24 interchange. From the MD 24 interchange to the MD 543 interchange, there would be five GPLs in each direction and from the MD 543 interchange to north of MD 22, there would be four GPLs in each direction. At the northern limit of Section 200, the four GPLs would merge to tie into the existing three GPLs in each direction.

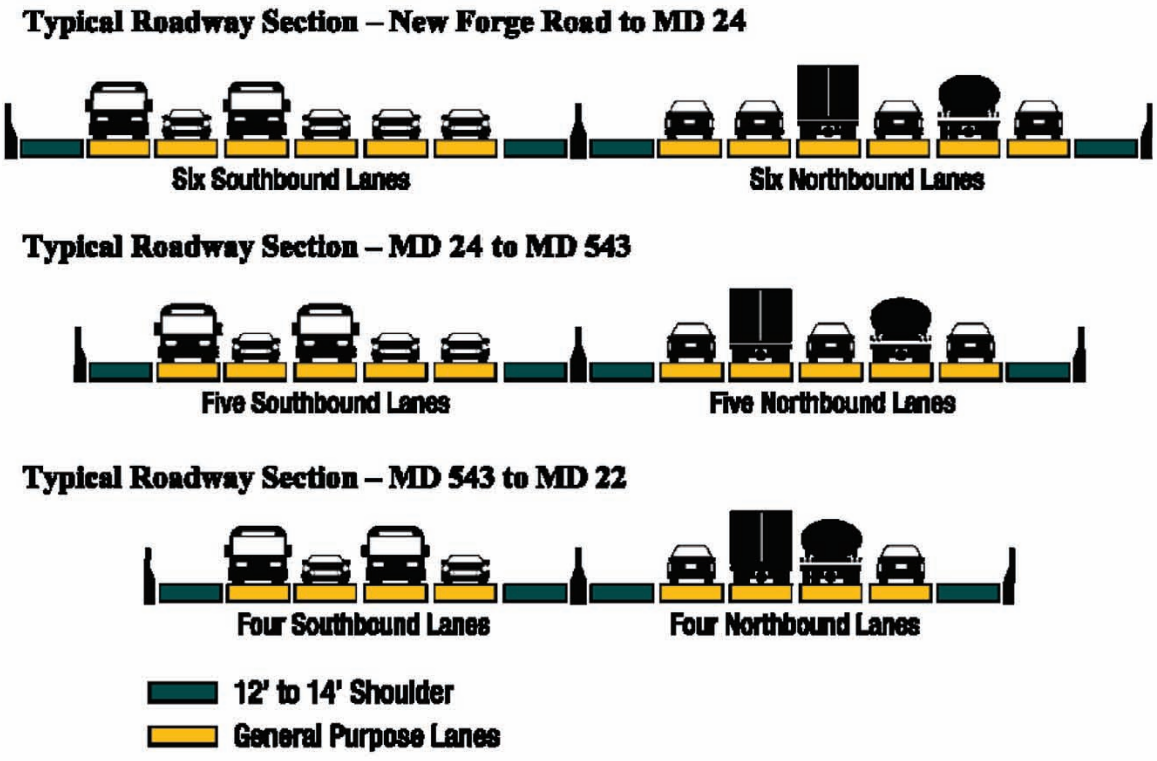


Figure 44 – Recommended General Purpose Lanes Alternate

b. I-95/MD 152 Interchange Option 1: Diamond (*see Figure 45)*

This option would consist of a diamond interchange. Two full traffic signals would be included with this option similar to existing conditions. This option incorporates cul-de-sacs to eliminate direct access from Old Mountain Road into the interchange ramp area. The Old Mountain Road bridge over I-95 would be removed and not need to be replaced. This option could accommodate a potential park-n-ride lot within the interchange. However, a new bridge, similar to the Old Mountain Road bridge, would be constructed to provide access to the potential park-n-ride lot.

The I-95 northbound approach would consist of six lanes. A two-lane diagonal ramp would lead to MD 152 northbound and southbound. A one-lane diagonal ramp from MD 152 would merge into I-95 northbound. Six I-95 northbound lanes would continue north of the interchange.

The I-95 southbound approach would consist of six lanes. A one-lane diagonal ramp would lead to MD 152 northbound and southbound. A two-lane diagonal ramp from MD 152 would merge into I-95 southbound, south of the interchange.

Two through lanes would generally be provided on MD 152, with additional turn lanes at the interchange ramps.

Bicyclists along MD 152 will be accommodated through the interchange with 8'-0" wide shoulders. The intersections along MD 152 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.

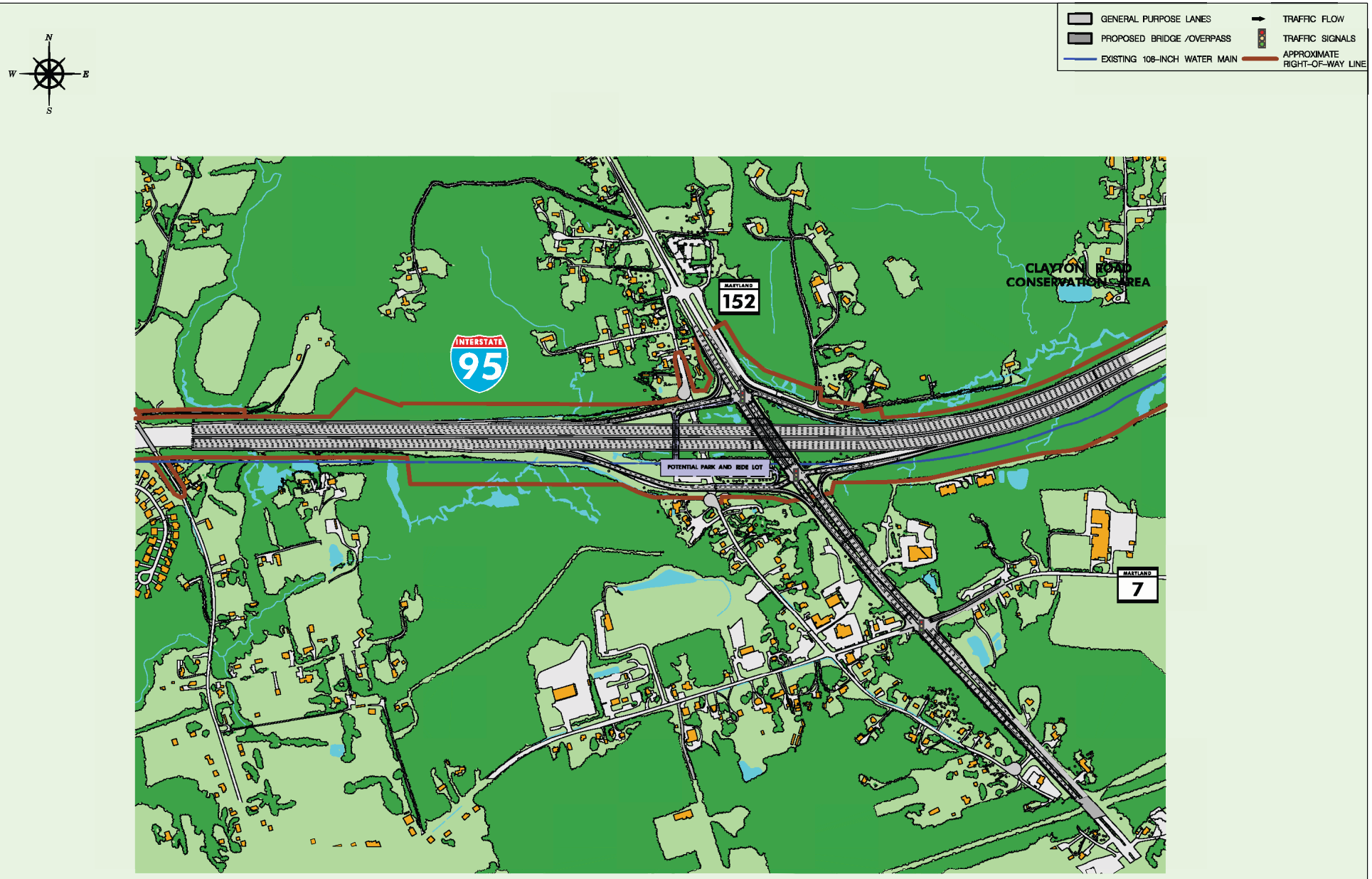


FIGURE 45 – GENERAL PURPOSE LANE – I–95 AT MD 152 INTERCHANGE OPTION 1: DIAMOND

c. I-95/MD 152 Interchange Option 4: Partial Cloverleaf – Single Loop (*see Figure 46)*

This option would include a diamond interchange with the addition of a single loop ramp from northbound I-95 to northbound MD 152. Two full traffic signals would be included with this option similar to existing conditions. This option incorporates cul-de-sacs to eliminate direct access from Old Mountain Road into the interchange ramp area. The Old Mountain Road bridge over I-95 would be removed and not need to be replaced.

The I-95 northbound approach would consist of six lanes. A one-lane diagonal ramp would lead to MD 152 southbound, followed by a one-lane loop ramp to MD 152 northbound. Six I-95 northbound lanes would continue north of the interchange.

The I-95 southbound approach would consist of six lanes. A one-lane diagonal ramp would lead to MD 152. A two–lane diagonal ramp from MD 152 would merge into I-95 southbound, south of the interchange.

Two through lanes would generally be provided on MD 152, with additional turn lanes at the interchange ramps.

Bicyclists along MD 152 will be accommodated through the interchange with 8'-0" wide shoulders. The intersections along MD 152 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.

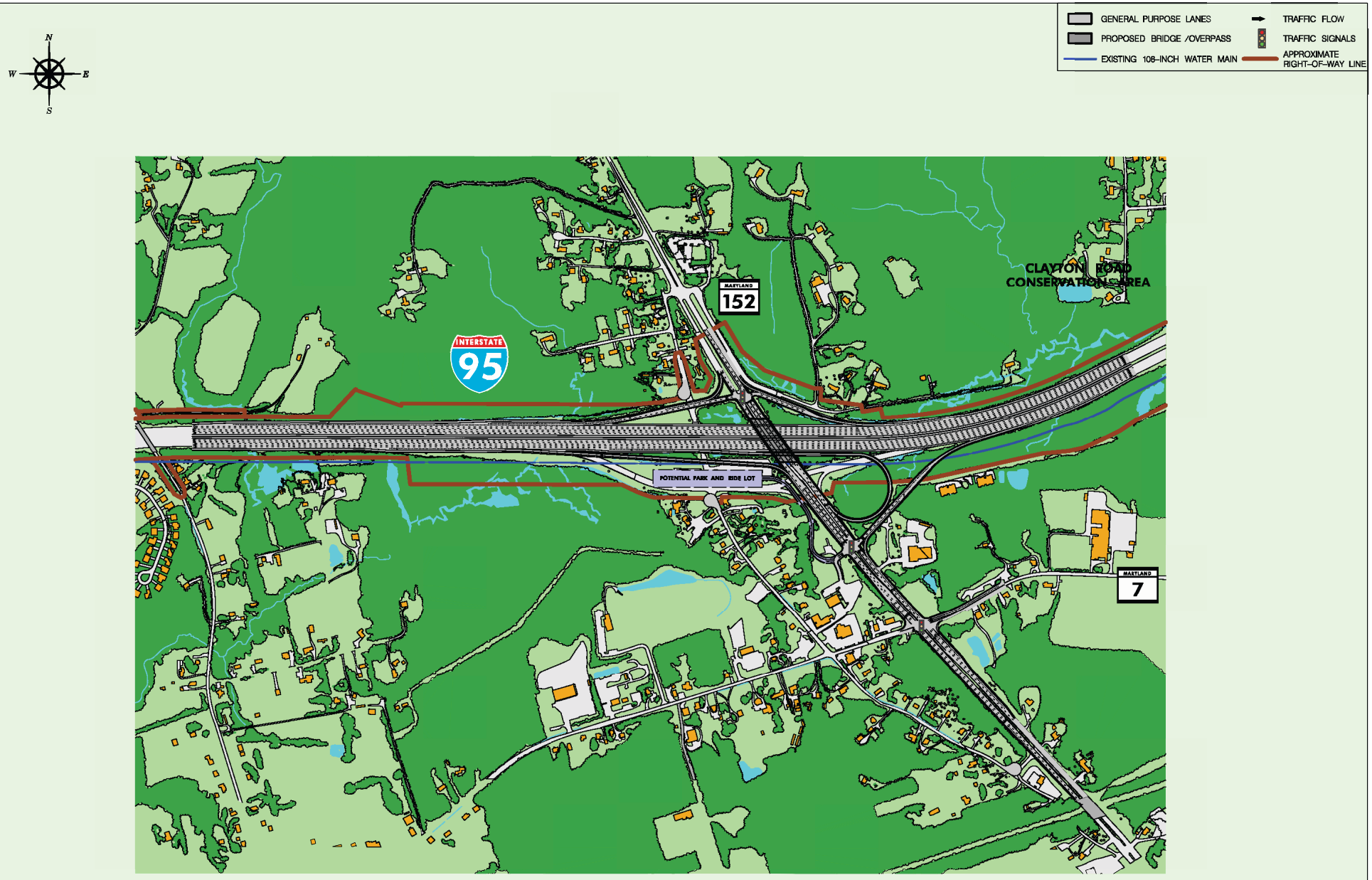


FIGURE 46 – GENERAL PURPOSE LANE – I-95 AT MD 152 INTERCHANGE
OPTION 4: PARTIAL CLOVERLEAF – SINGLE LOOP

d. I-95/MD 24 Interchange Option 2: Flyover for MD 24/MD 924 (*see Figure 47)*

This option would be a combination partial cloverleaf/directional configuration, with loops in the northwest and southwest quadrants, and a flyover ramp. One half traffic signal along MD 24 northbound would provide access for the I-95 northbound on ramp. One half traffic signal along MD 24 southbound would provide access for the I-95 southbound off- ramp.

The I-95 northbound approach would consist of six lanes. A three-lane directional 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 directional flyover ramp would then split again, with one lane to MD 24 northbound and one lane leading to MD 924/Tollgate Road. Five I-95 northbound lanes would continue north to MD 543.

The I-95 southbound approach would consist of five lanes. The I-95 southbound approach would add a one-lane collector/distributor roadway. A one-lane outer connection ramp would lead to MD 924/Tollgate Road. The loop ramp in the southwest quadrant would lead to MD 24. The loop ramp in the northwest quadrant would serve traffic from MD 24 northbound to I-95 southbound. The one-lane collector/distributor roadway would then merge into I-95 southbound. A two-lane outer connection ramp from MD 24 Southbound/MD 924/Tollgate would merge to form a sixth lane added to I-95 southbound.

Two through lanes would generally be provided on MD 24, with additional lanes added or dropped at 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.

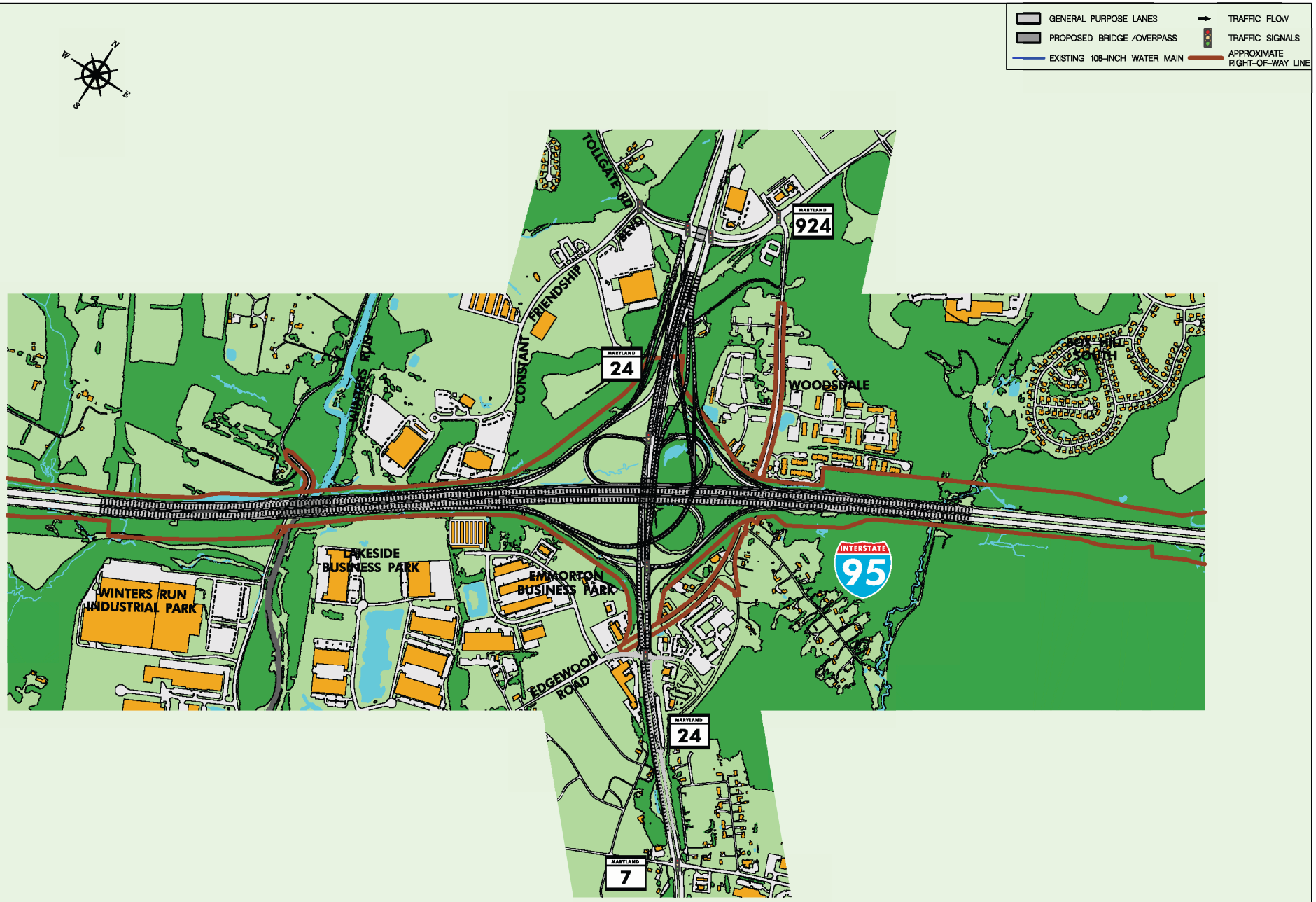


FIGURE 47 – GENERAL PURPOSE LANE – I-95 AT MD 24 INTERCHANGE
OPTION 2: FLYOVER FOR MD 24 /MD 924

e. I-95/MD 543 Interchange Option 1: Diamond *(see Figure 48)*

This option consists of a diamond interchange. Two full traffic signals would be included with this option similar to existing conditions.

The I-95 northbound approach would consist of five lanes. A two-lane diagonal ramp would lead to MD 543 northbound and southbound with the fifth lane of I-95 northbound dropping at this ramp. A one-lane diagonal ramp from MD 543 would merge into I-95 northbound. Four I-95 northbound lanes would continue north to MD 22.

The I-95 southbound approach would consist of four lanes. A one-lane diagonal ramp would lead to MD 543 northbound and southbound. A two-lane diagonal ramp from MD 543 would merge to form a fifth added lane to I-95 southbound.

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

Bicyclists along MD 543 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.

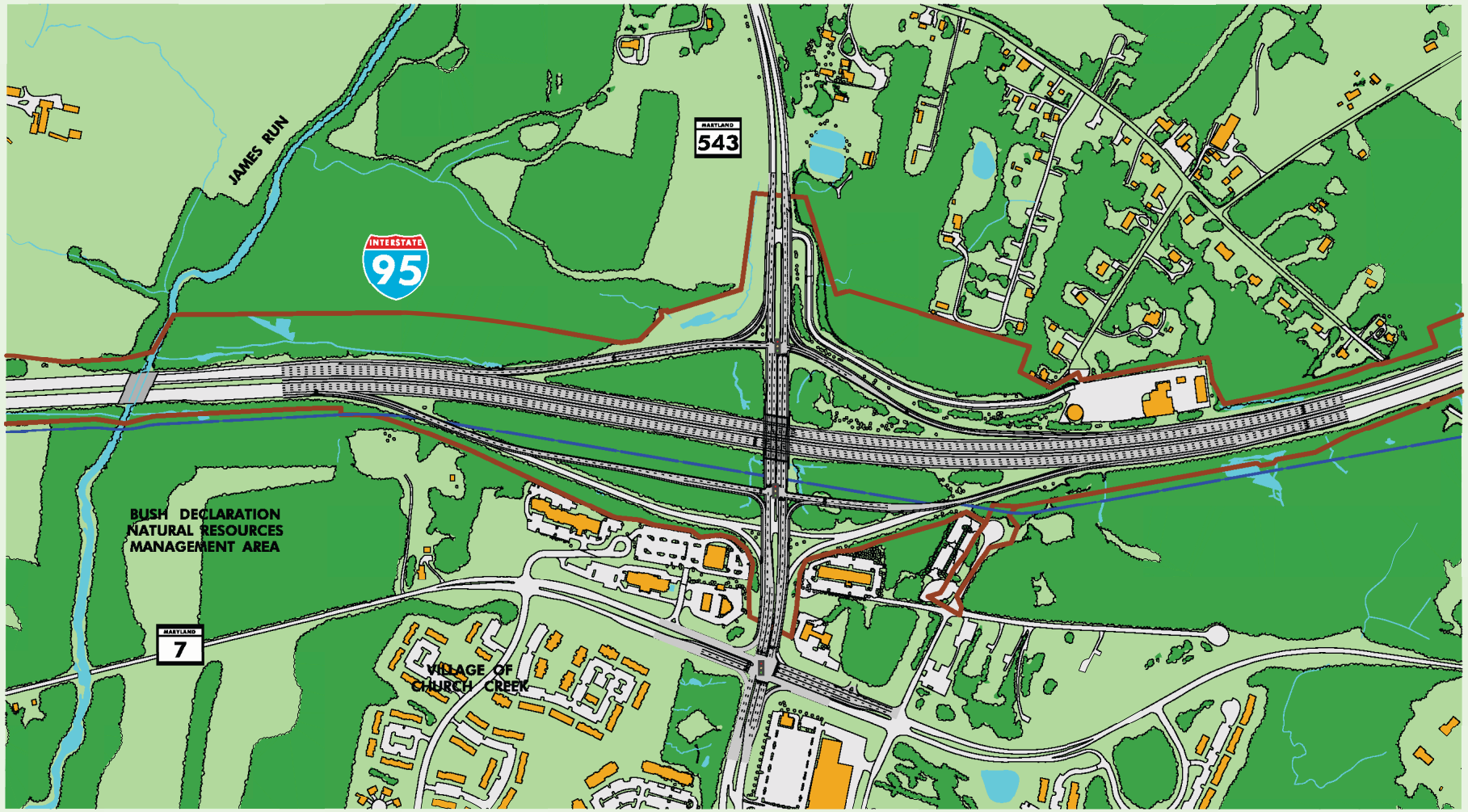


FIGURE 48 – GENERAL PURPOSE LANE – I–95 AT MD 543 INTERCHANGE OPTION 1: DIAMOND

f. I-95/MD 543 Interchange Option 7: Partial Cloverleaf – Single Loop *(see Figure 49)*

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 would be included with this option similar to existing conditions.

The I-95 northbound approach would consist of five lanes. A two-lane diagonal ramp would lead to MD 543 northbound and southbound with the fifth lane of I-95 northbound dropping at this ramp. A one-lane diagonal ramp from MD 543 would merge into I-95 northbound. Four I-95 northbound lanes would continue north to MD 22.

The I-95 southbound approach would consist of four lanes. A one-lane outer connection ramp would lead to MD 543 northbound and southbound. The loop ramp in the northwest quadrant would serve traffic from MD 543 northbound to I-95 southbound adding the fifth lane on I-95 southbound. A two-lane diagonal ramp from MD 543 southbound would merge into I-95 southbound.

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

Bicyclists along MD 543 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.

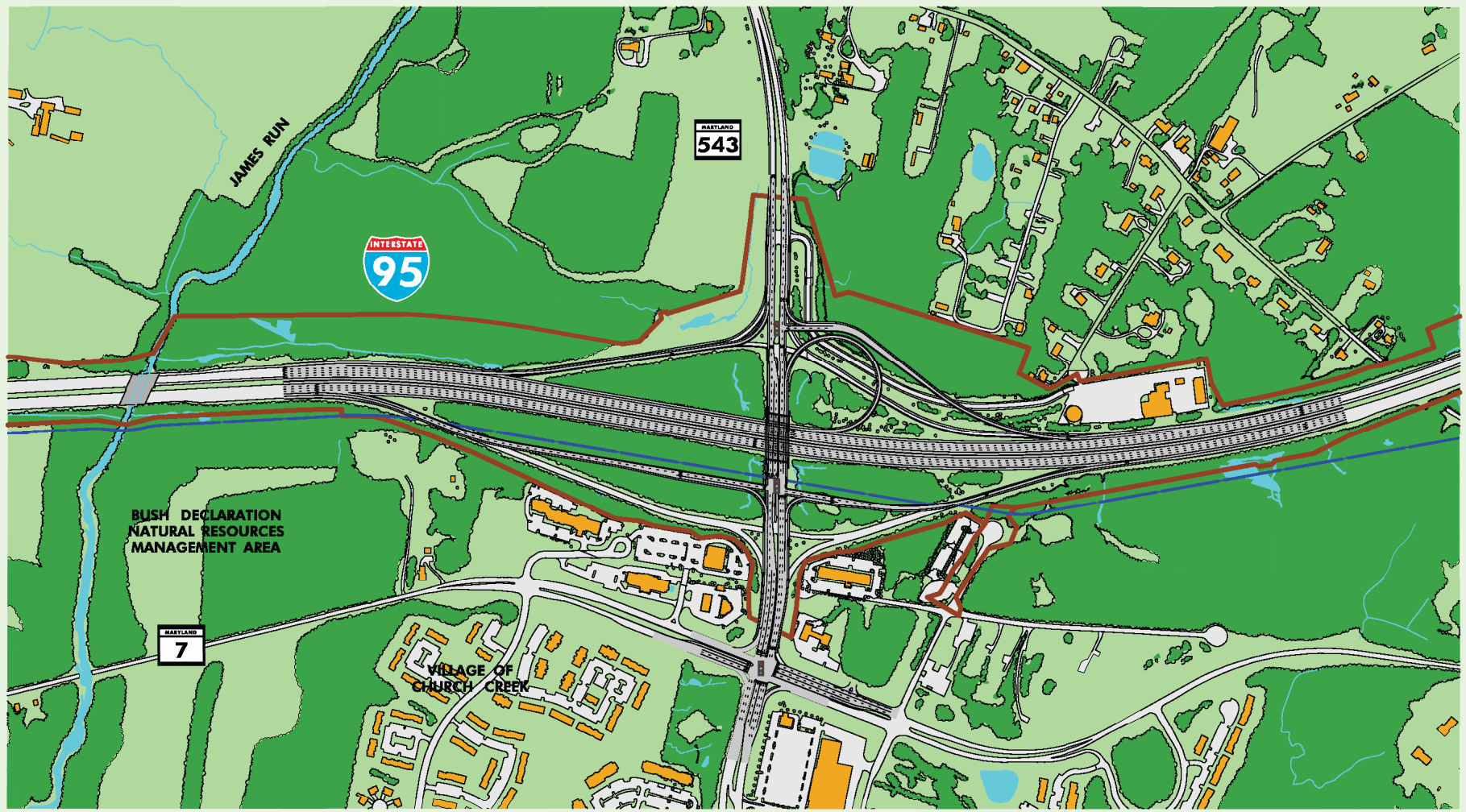


FIGURE 49 – GENERAL PURPOSE LANE – I-95 AT MD 543 INTERCHANGE
OPTION 7: PARTIAL CLOVERLEAF – SINGLE LOOP

g. 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.

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.

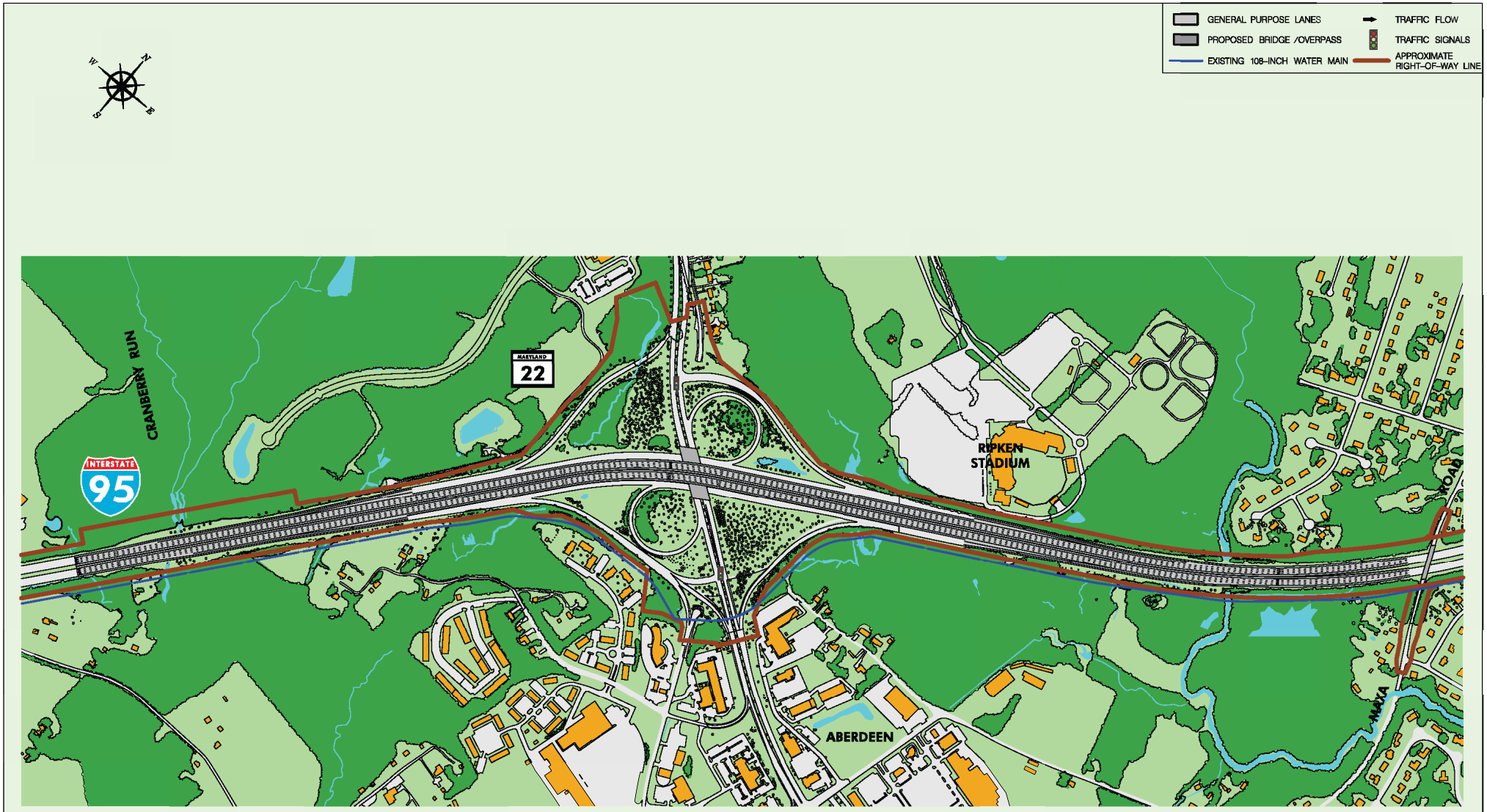


FIGURE 50 – GENERAL PURPOSE LANE – I-95 AT MD 22 INTERCHANGE OPTION 1: PARTIAL CLOVERLEAF – DOUBLE LOOP WITH MODIFICATIONS TO CD ROADS

3. Express Toll Lanes Alternate

a. Mainline

This alternate would include adding ETLs to the existing GPLs to accommodate the projected traffic demand. This alternate would extend the typical section of Section 100 from just north of the MD 43 interchange to north of MD 24 interchange. This typical section consists of four GPLs and two ETLs in each direction. From north of MD 24 to north of MD 543, three existing GPLs would be retained, providing three GPLs and two ETLs in each direction. The ETLs would terminate at MD 543 providing four GPLs to the project limits north of MD 22. Improvements would be proposed at the MD 152, MD 24, and MD 543 interchanges. At the northern limit of Section 200, the four GPLs will merge to tie into the existing three GPLs in each direction.

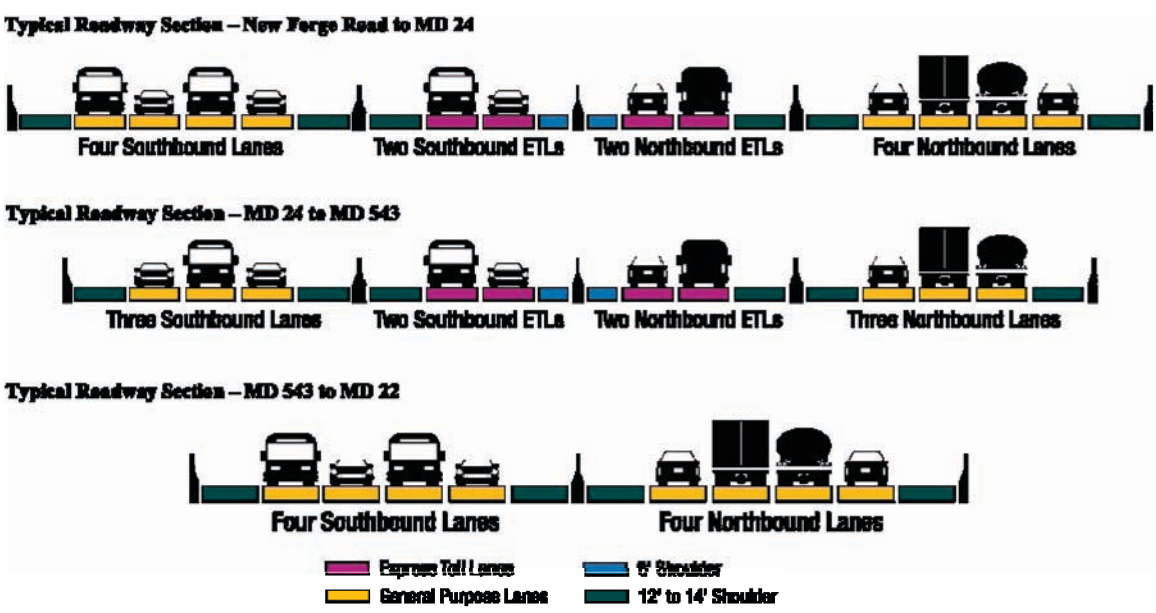


Figure 51 – Recommended Express Toll Lane Alternate

b. I-95/MD 152 Interchange Option 1A: Diamond with ETL Median Access Ramps *(see Figure 52)*

This option would consist of a diamond interchange. The interchange includes median ETL ramp access to MD 152. Two full traffic signals would serve I-95 GPL traffic and one full traffic signal would serve I-95 ETL traffic. This option incorporates cul-de-sacs to eliminate direct access from Old Mountain Road into the interchange ramp area. The Old Mountain Road bridge over I-95 would be removed and would not be replaced.

The I-95 northbound approach would consist of four GPLs and two ETLs through the interchange. A one-lane diagonal GPL ramp would lead to MD 152 northbound and southbound. A one-lane diagonal ramp from MD 152 would merge into I-95 GPL northbound. One-lane, left-side median ETL ramp would connect I-95 northbound ETLs to MD 152 northbound and southbound. A one-lane, left-side median ETL ramp would lead to the I-95 northbound ETLs.

The I-95 southbound approach would consist of four GPLs and two ETLs through the interchange. A one-lane diagonal GPL ramp would lead to MD 152 northbound and southbound. A two-lane diagonal ramp from MD 152 would merge into I-95 GPL southbound. One-lane, left-side median ETL ramps would connect I-95 southbound ETLs to MD 152 northbound and southbound. A one-lane, left-side median ETL ramp would lead to the I-95 southbound ETLs.

Two through lanes would generally be provided on MD 152, with additional turn lanes at the interchange ramps.

Bicyclists along MD 152 will be accommodated through the interchange with 8'-0" wide shoulders. The intersections along MD 152 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.

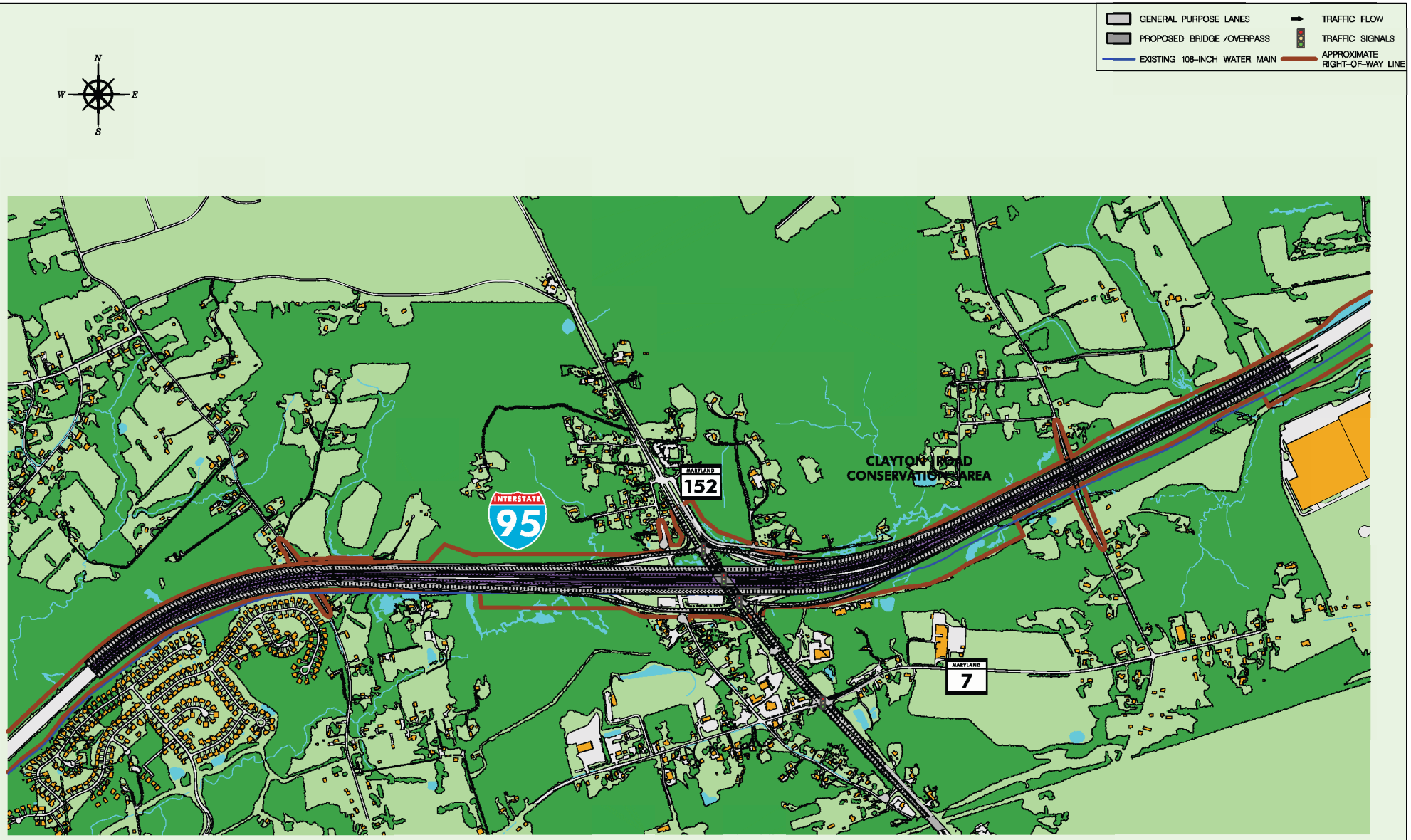


FIGURE 52 – EXPRESS TOLL LANE – I-95 AT MD 152 INTERCHANGE OPTION 1A: DIAMOND WITH MEDIAN ACCESS RAMPS

c. I-95/MD 152 Interchange Option 4A: Partial Cloverleaf – Single Loop with ETL Median Access Ramps *(see Figure 53)*

This option would include a diamond interchange, with a single loop ramp from northbound I-95 to northbound MD 152. The interchange includes median ETL ramp access to MD 152. Two full traffic signals would serve I-95 GPL traffic and one full traffic signal would serve I-95 ETL traffic. This option incorporates cul-de-sacs to eliminate direct access from Old Mountain Road into the interchange ramp area. The Old Mountain Road bridge over I-95 would be removed and would not be replaced.

The I-95 northbound approach would consist of four GPLs and two ETLs through the interchange. A one-lane diagonal GPL ramp would lead to MD 152 southbound, followed by a one-lane loop GPL ramp to MD 152 northbound. A one-lane, left-side median ETL ramp would lead to MD 152. A one-lane, left-side median ETL ramp would lead to the I-95 northbound ETLs.

The I-95 southbound approach would consist of four GPLs and two ETLs through the interchange. A one-lane diagonal GPL ramp would lead to MD 152 northbound and southbound. A two-lane diagonal ramp from MD 152 would merge into I-95 GPL southbound. One-lane, left-side median ETL ramps would connect I-95 southbound ETLs to MD 152 northbound and southbound. A one-lane, left-side median ETL ramp would lead to the I-95 southbound ETLs.

Two through lanes would generally be provided on MD 152, with additional turn lanes at the interchange ramps.

Bicyclists along MD 152 will be accommodated through the interchange with 8'-0" wide shoulders. The intersections along MD 152 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.

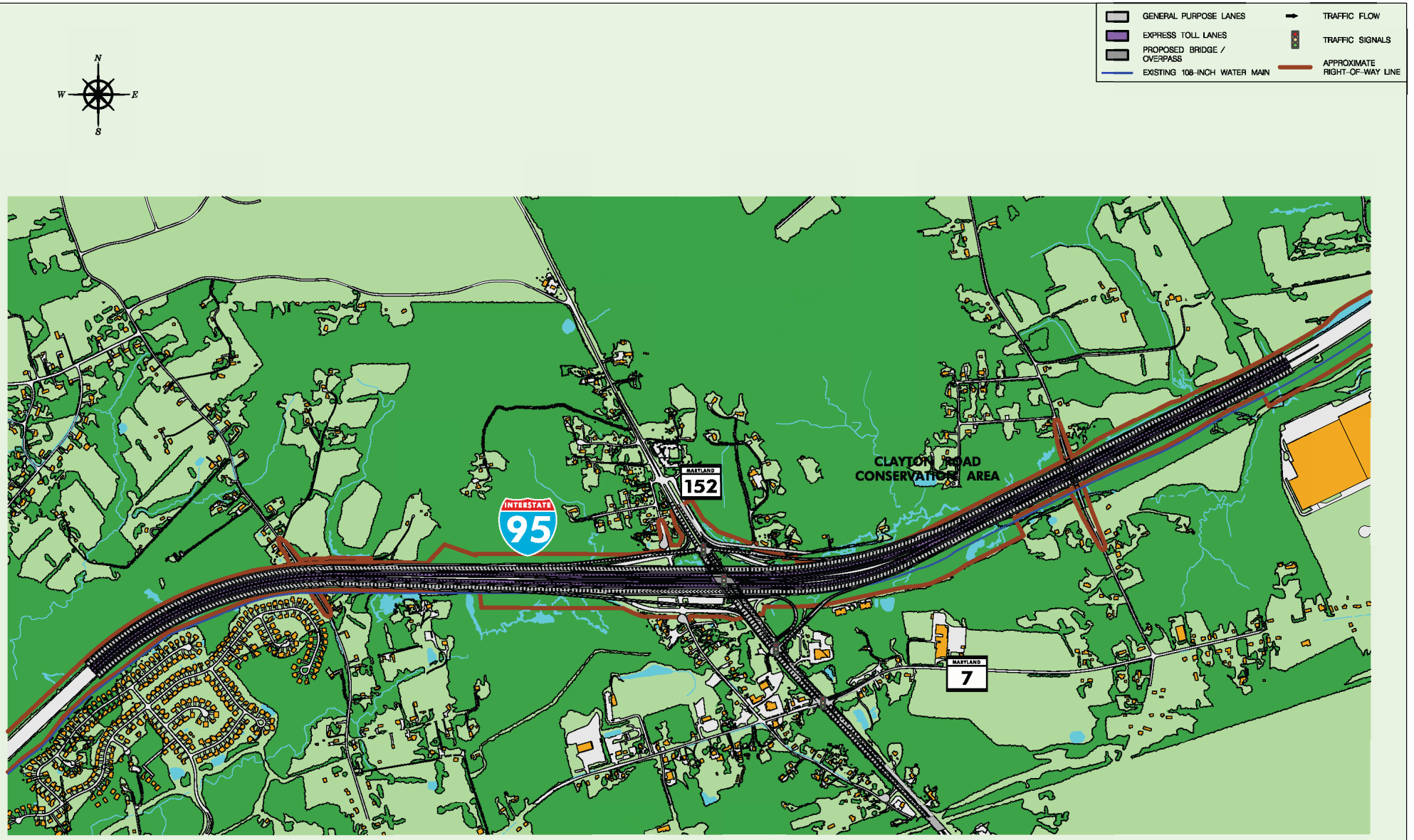


FIGURE 53 – EXPRESS TOLL LANE – I-95 AT MD 152 INTERCHANGE OPTION 4A: PARTIAL CLOVERLEAF – SINGLE LOOP WITH ETL MEDIAN ACCESS RAMPS

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.

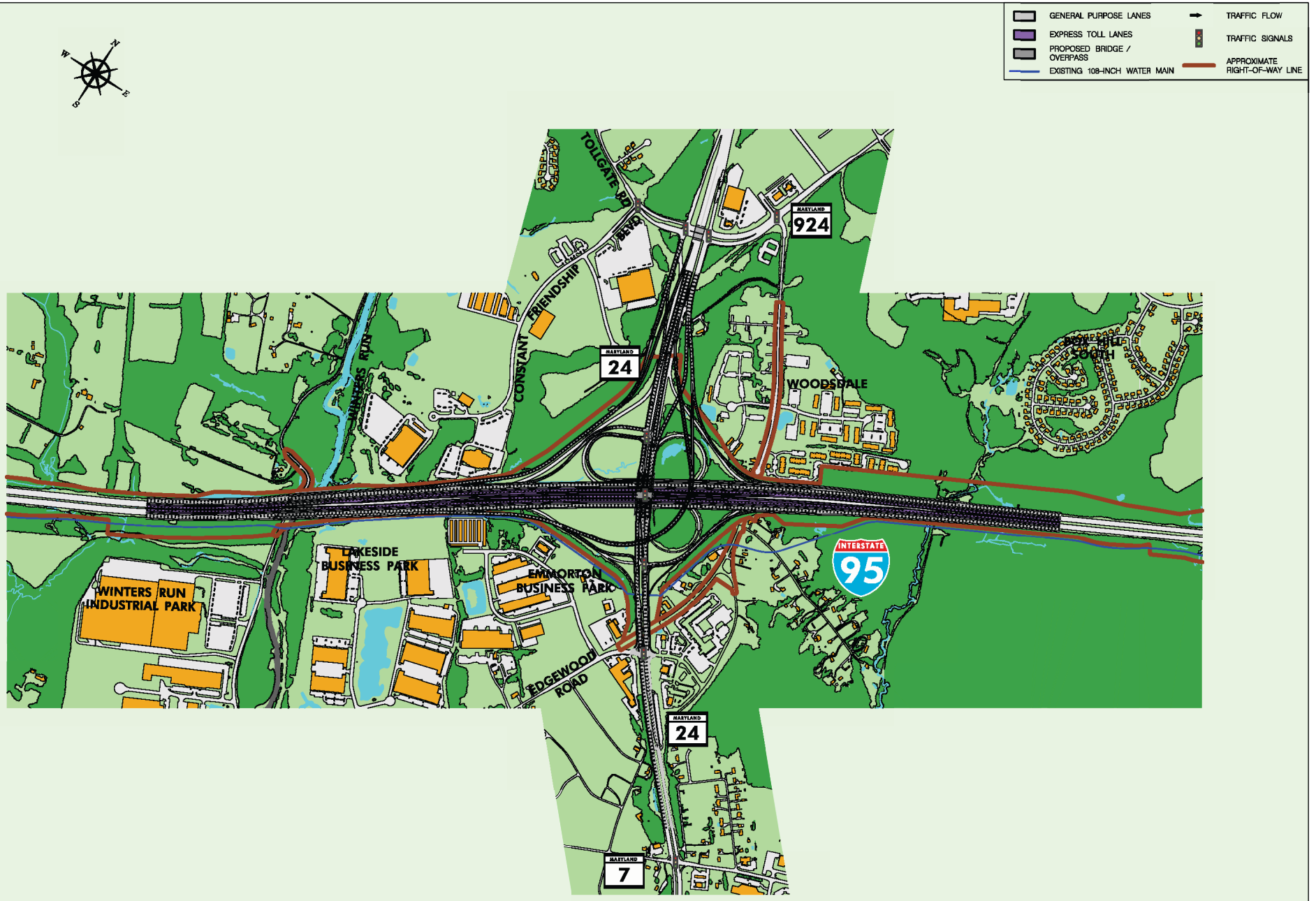


FIGURE 54 - EXPRESS TOLL LANE - I-95 AT MD 24 INTERCHANGE OPTION 2: MD 24 / MD 924 FLYOVER RAMP WITH ETL MEDIAN ACCESS RAMPS

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.

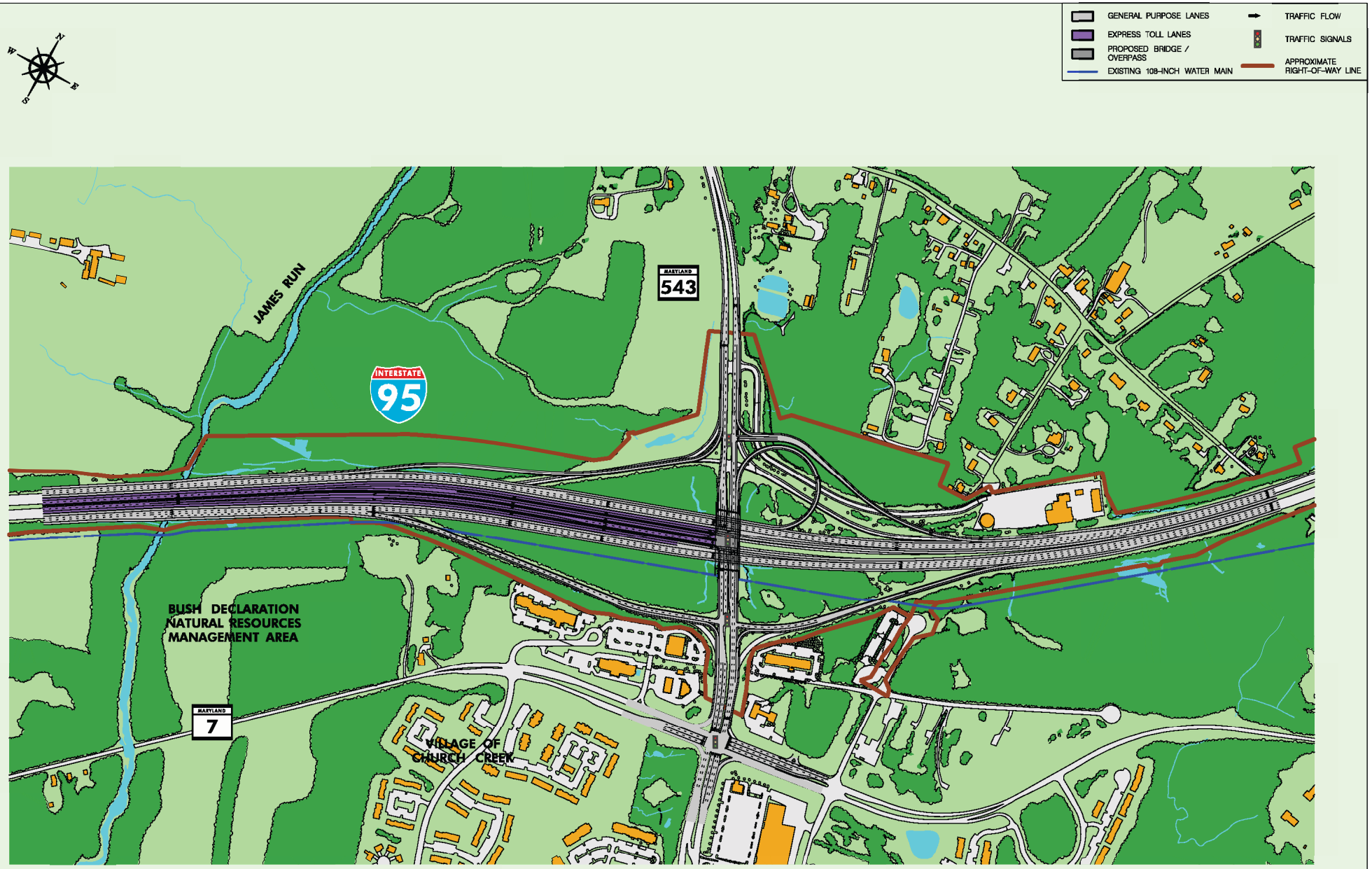


FIGURE 55 - EXPRESS TOLL LANE - I-95 AT MD 543 INTERCHANGE OPTION 7: PARTIAL CLOVERLEAF - SINGLE LOOP WITH ETL MEDIAN ACCESS RAMPS

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)*

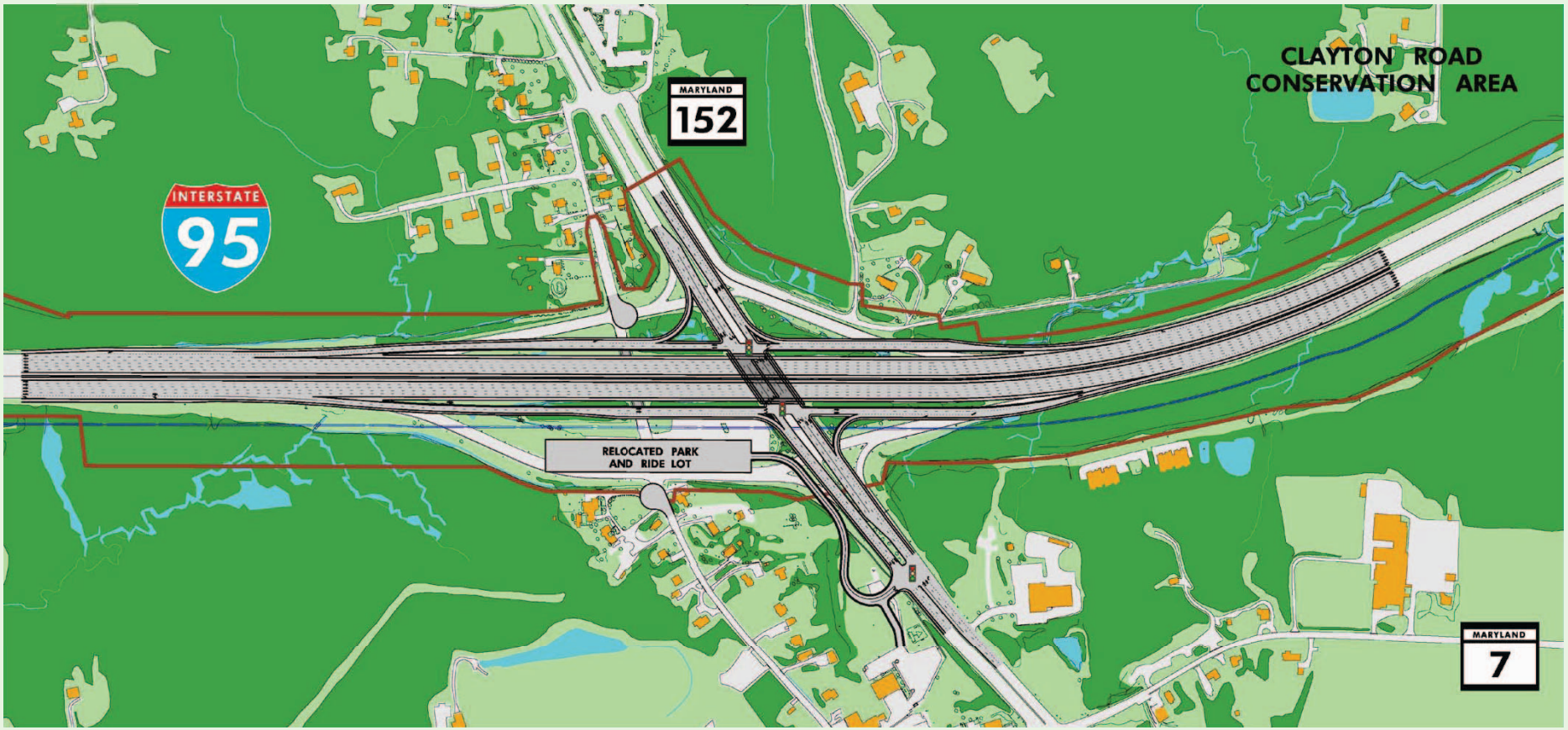


FIGURE 56 - GENERAL PURPOSE LANE - I-95 AT MD AT MD 152 INTERCHANGE OPTION 2: TIGHT DIAMOND

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.

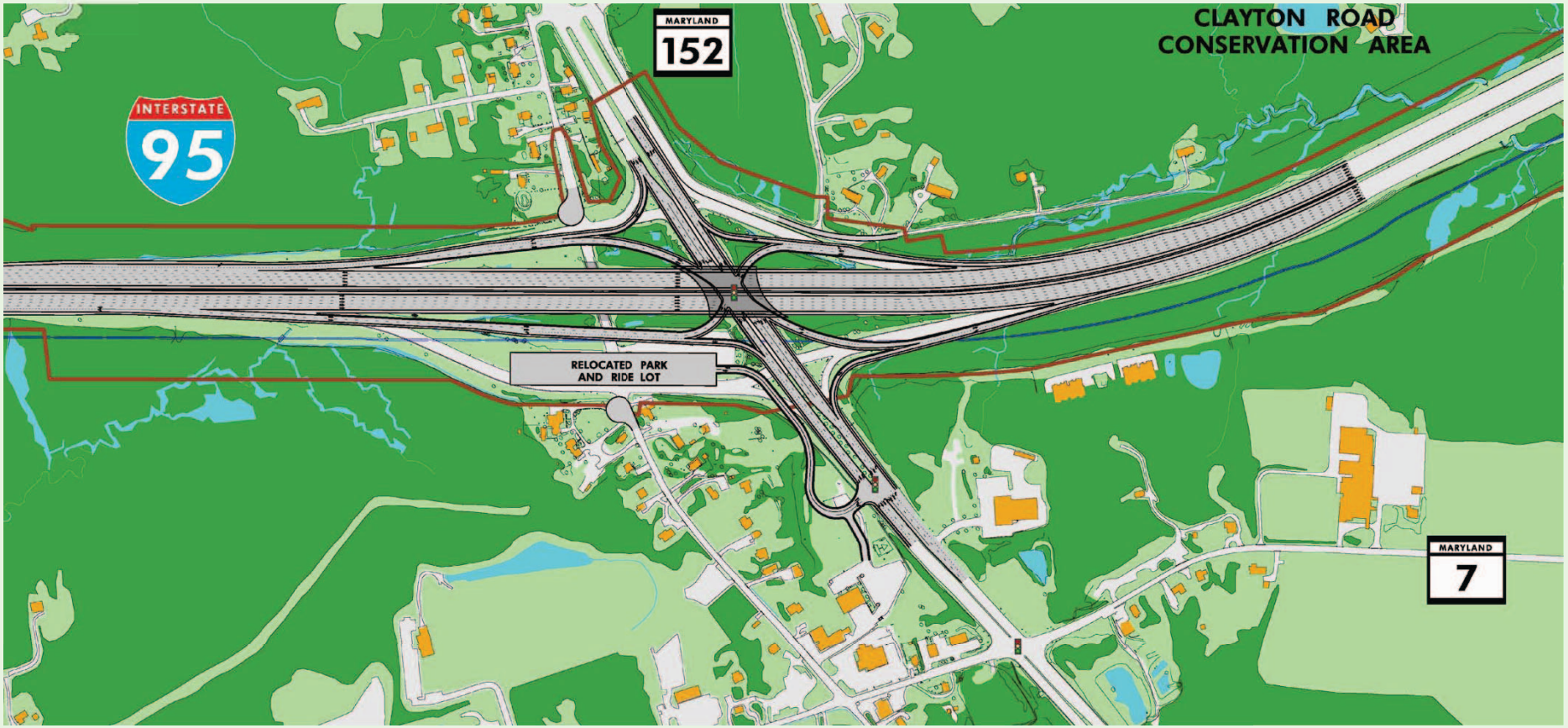


FIGURE 57 - GENERAL PURPOSE LANE - I-95 AT MD AT MD 152 INTERCHANGE
OPTION 3: SINGLE POINT URBAN DIAMOND

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.

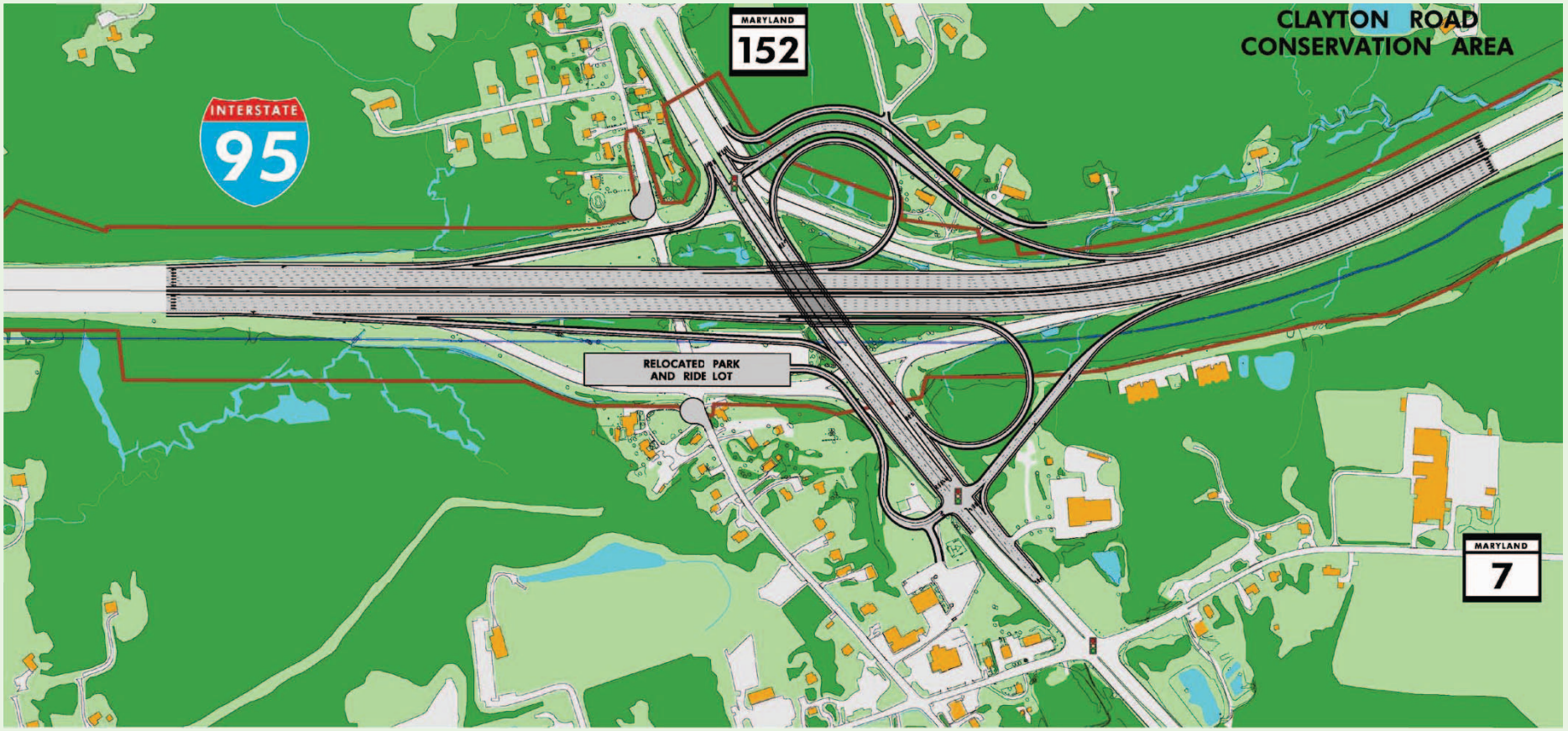


FIGURE 58 - GENERAL PURPOSE LANE - I-95 AT MD 152 INTERCHANGE
OPTION 5: PARTIAL CLOVERLEAF - DOUBLE LOOP

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)*

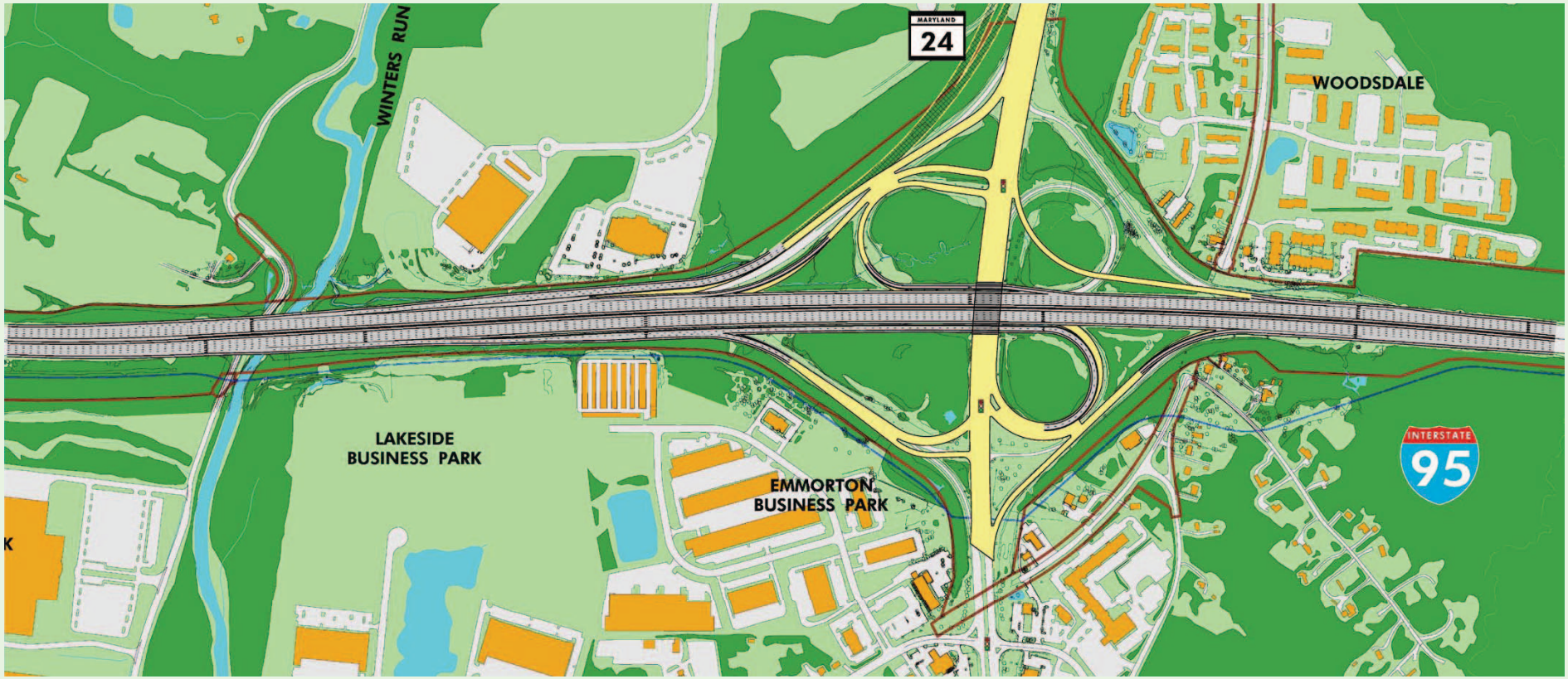


FIGURE 59 - GENERAL PURPOSE LANE - I-95 AT MD 24 INTERCHANGE
OPTION 1: MODIFICATIONS TO STRUCTURE AND RAMPS

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)*

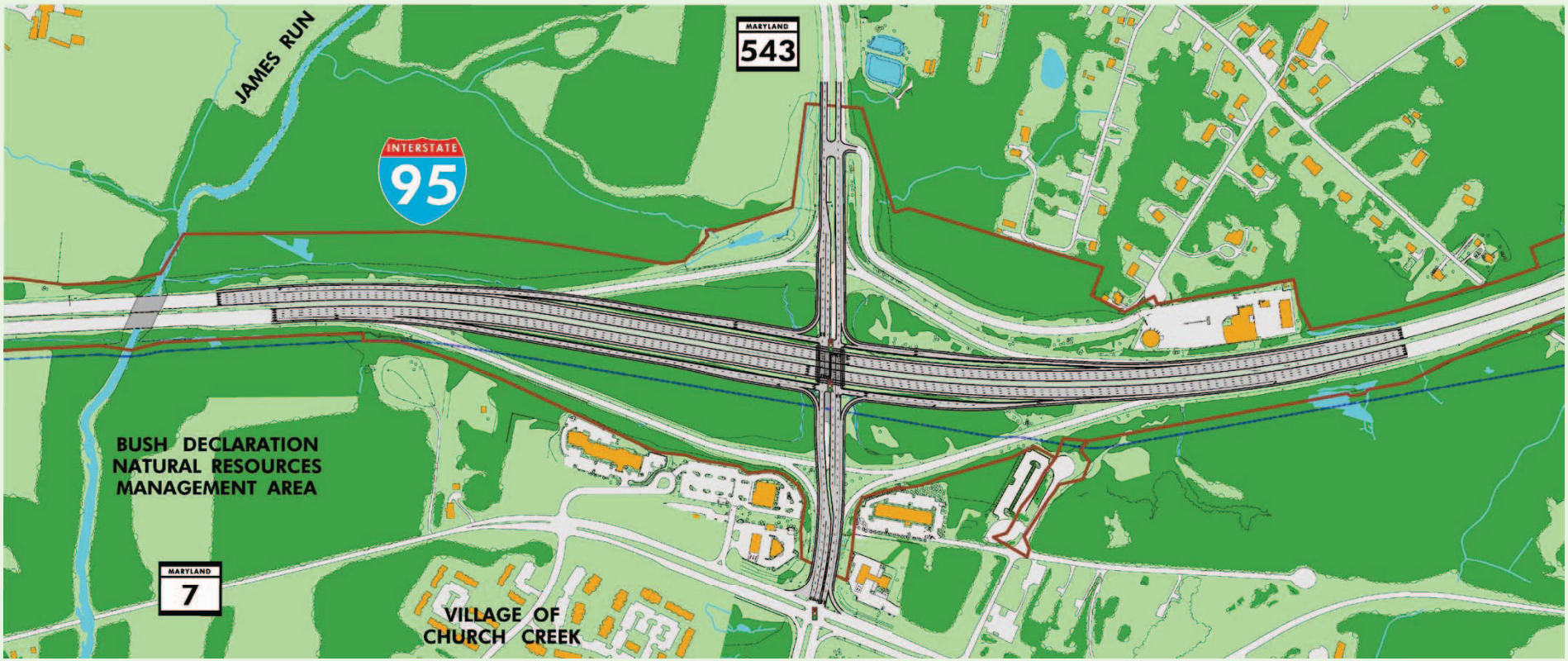


FIGURE 60 - GENERAL PURPOSE LANE - I-95 AT MD 543 INTERCHANGE
OPTION 2: TIGHT DIAMOND

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.

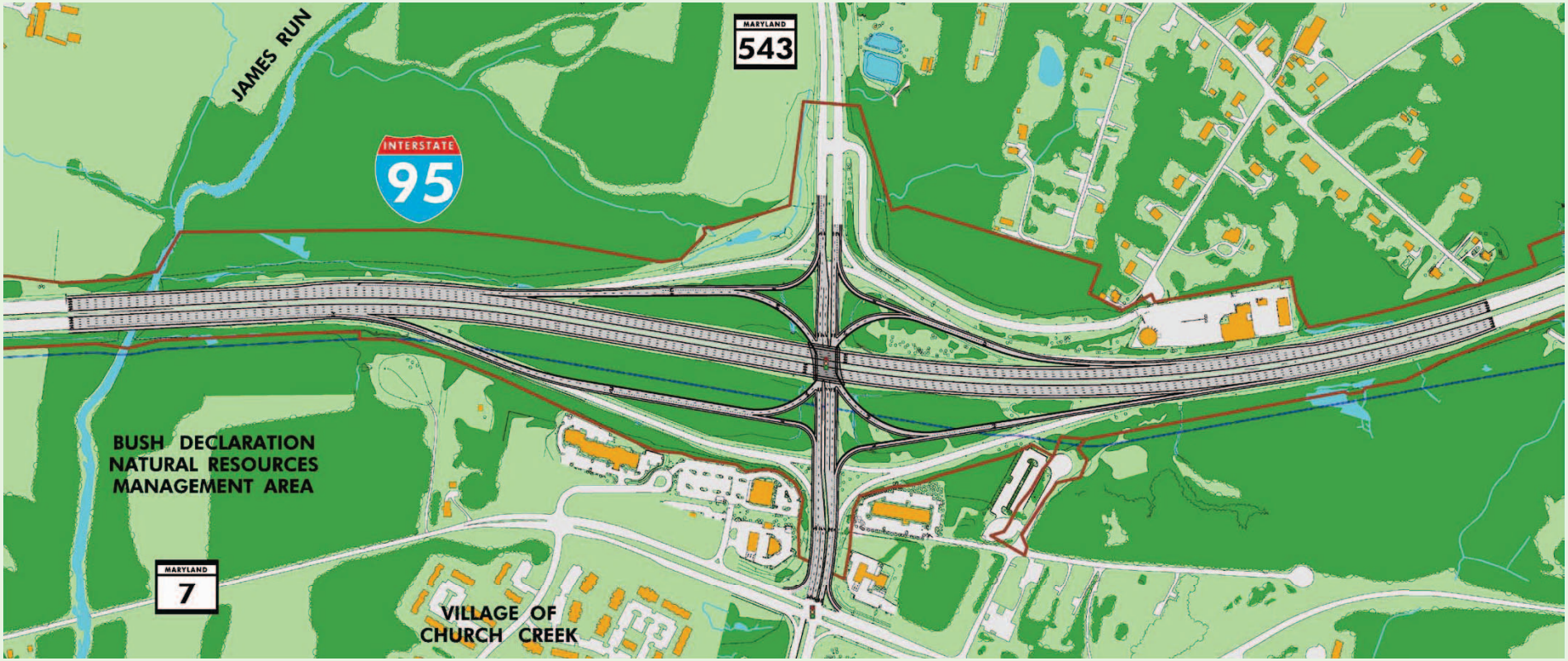


FIGURE 61 - GENERAL PURPOSE LANE - I-95 AT MD 543 INTERCHANGE
OPTION 3: SINGLE POINT URBAN DIAMOND

h. I-95/MD 543 Interchange Option 4: Partial Cloverleaf – Single Loop

This option was dropped due to the combination of commercial displacements and traffic. *(see Figure 62)*

- The proposed loop ramp and outer connection ramp in the northeast quadrant of the interchange will require one commercial displacement.
- This option provides a similar LOS as other retained interchange options having fewer impacts.

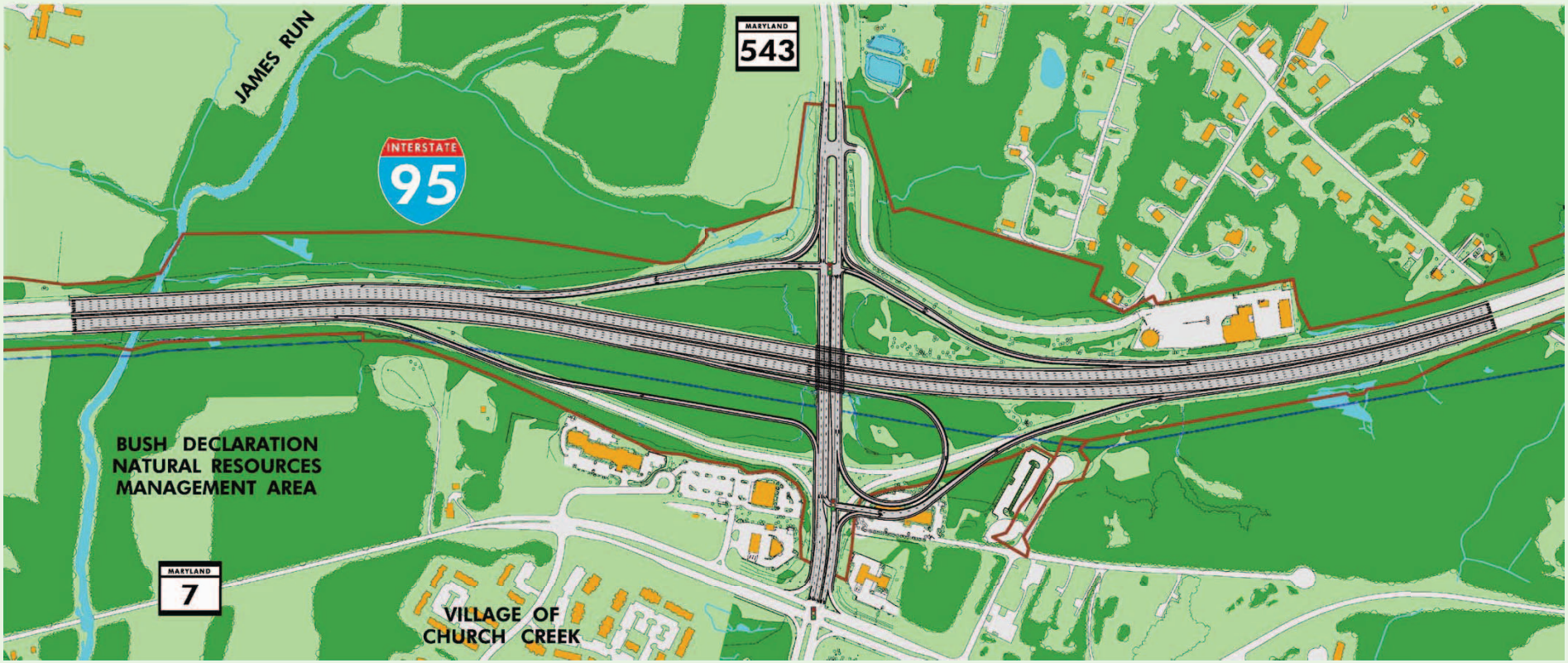


FIGURE 62 - GENERAL PURPOSE LANE - I-95 AT MD 543 INTERCHANGE
OPTION 4: PARTIAL CLOVERLEAF - SINGLE LOOP

i. I-95/MD 543 Interchange Option 5: Partial Cloverleaf - Triple Loop

This option was dropped due to the combination of environmental impacts, commercial displacements and traffic. *(see Figure 63)*

- The loop ramp and outer connection ramp in the southwest quadrant of this interchange had significant stream and forest impacts.
- The loop ramp and outer connection ramp in the northeast quadrant of the interchange will require one commercial displacement.
- It was determined after further traffic studies that the loop ramp in the southwest quadrant was not necessary for this interchange to function at an acceptable LOS in 2030.
- The movement from I-95 southbound to MD 543 southbound has relatively low traffic volumes that could operate acceptably in combination with the outer directional ramp. This would eliminate a weave along I-95 southbound.

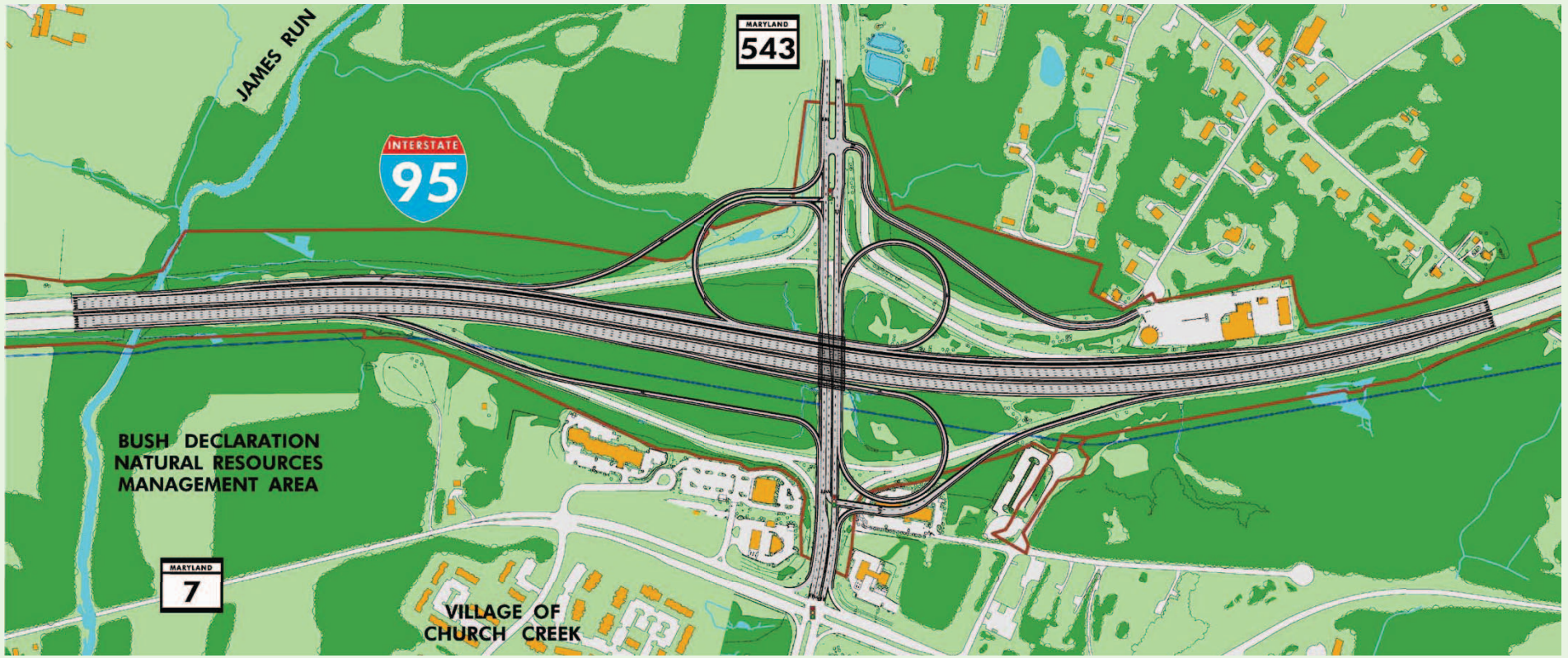


FIGURE 63 - GENERAL PURPOSE LANE - I-95 AT MD 543 INTERCHANGE
OPTION 5: PARTIAL CLOVERLEAF - TRIPLE LOOP WITH CD ROADS

j. I-95/MD 543 Interchange Option 6: Partial Cloverleaf – Double Loop

This option was dropped due to the combination of commercial displacements and traffic. *(see Figure 64)*

- The proposed loop ramp and outer connection ramp in the northeast quadrant of the interchange will require one commercial displacement.
- It was determined after further traffic studies that loop ramp in the northeast quadrant was not necessary for this interchange to function at an acceptable LOS in 2030. Also, a weave section would be eliminated along MD 543 northbound.

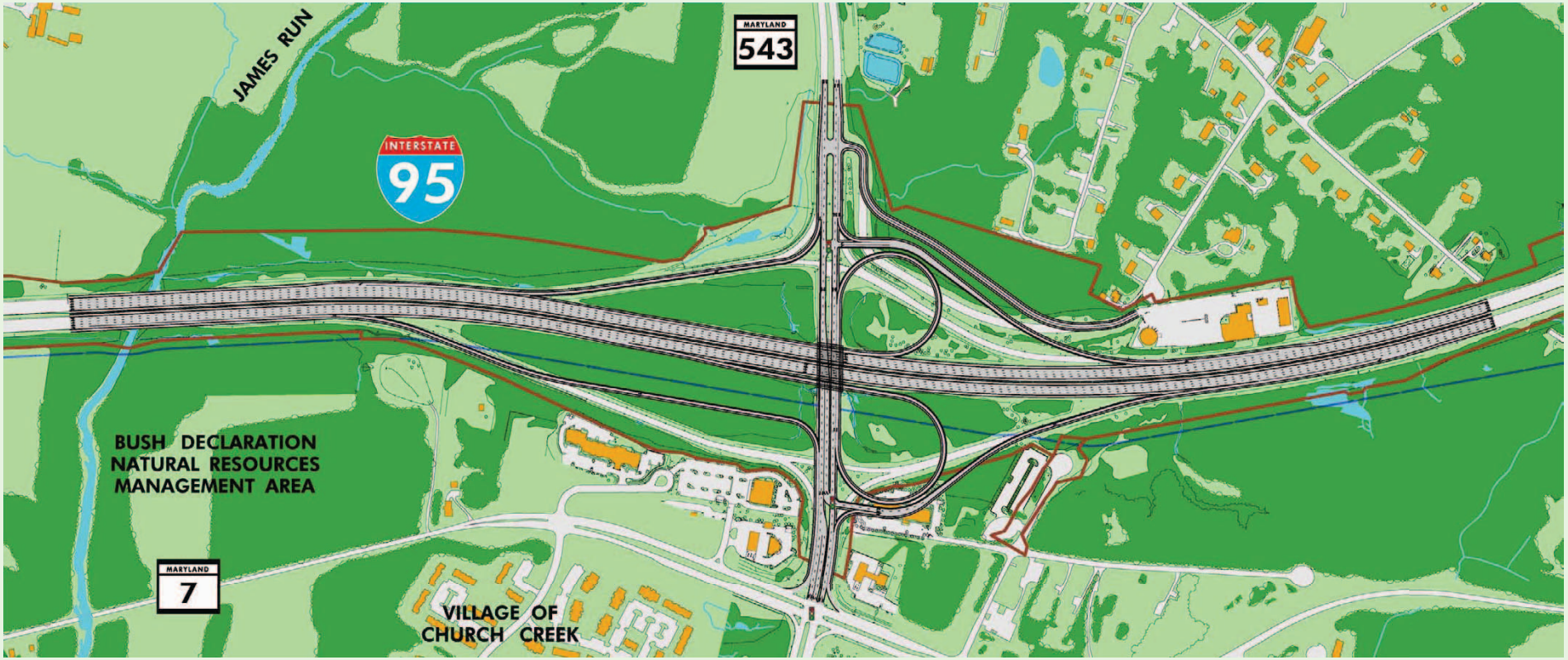


FIGURE 64 - GENERAL PURPOSE LANE - MD 543 INTERCHANGE
OPTION 6: PARTIAL CLOVERLEAF - DOUBLE LOOP

2. Express Toll Lanes Alternate

a. Mainline

The master plan alternate provided a combination of General Purpose Lanes (GPLs) and Express Toll Lanes (ETLs) that would be added to I-95 to accommodate the projected increase in traffic. Under this alternate, I-95 in each direction would have two ETLs and four GPLs from north of MD 43 to north of MD 543, four GPLs from MD 543 to project limits north of MD 22. This option was dropped/modified for several reasons. Results of the traffic analysis indicated that in order to meet the desired LOS under this alternate it was necessary to add only the ETLs while maintaining the same number of GPLs that exist today. Therefore, we were able to reduce impacts since it was not necessary to add an additional GPL between MD 24 and MD 543. In addition, this two ETL and three GPL section in both directions to MD 543 provides a better lane balance as the lanes are transitioned into 4 GPLs in the vicinity of MD 543.

b. I-95/MD 152 Interchange Option 1B: Diamond with ETL Flyover Access Ramps

This option has been dropped due to issues involving environmental impact, residential displacement, and traffic. *(see Figure 65)*

- The flyover ramps have extensive environmental impacts (forest, stream and wetland) along both northbound and southbound I-95.
- The flyover ramp in the northwest quadrant of the interchange impacts Clayton Road Conservation Area (Section 4(f) resource).
- The flyover ramps require additional ROW and several residential displacements.
- This option provides a lower LOS than Option 1A which has been retained for detailed study.

FIGURE 65 - EXPRESS TOLL LANE - MD 152 INTERCHANGE
OPTION 1B: DIAMOND WITH ETL FLYOVER ACCESS RAMPS

c. I-95/MD 152 Interchange Option 2: Tight Diamond with ETL Flyover Access Ramps

This option has been dropped due to issues involving environmental impact, residential displacement, and traffic. *(see Figure 66)*

- The flyover ramps have extensive environmental impacts (forest, stream and wetland) along both northbound and southbound I-95.
- The flyover ramp in the northwest quadrant of the interchange impacts Clayton Road Conservation Area (Section 4(f) resource).
- The flyover ramps require additional ROW and several residential displacements.
- This option provides a failing level of service (LOS F) for the year 2030.

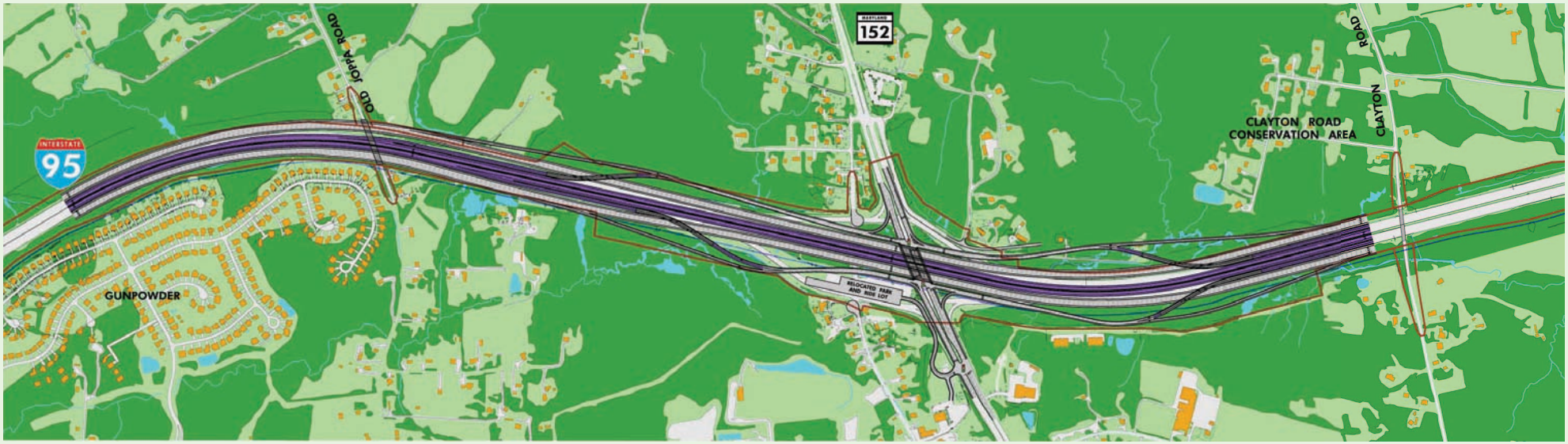


FIGURE 66 - EXPRESS TOLL LANE - MD 152 INTERCHANGE
OPTION 2: TIGHT DIAMOND WITH ETL FLYOVER ACCESS RAMPS

d. I-95/MD 152 Interchange Option 3: Single Point Urban Diamond with ETL Flyover Access Ramps

This option was dropped due to issues involving environmental impacts, traffic, engineering and maintenance. *(see Figure 67)*

- The flyover ramps have extensive environmental impacts (forest, stream and wetland) along both northbound and southbound I-95. The flyover ramp in the northwest quadrant of the interchange impacts Clayton Road Conservation Area (Section 4(f) resource). The flyover ramps require additional ROW and several residential displacements.
- 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 at LOS E 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.

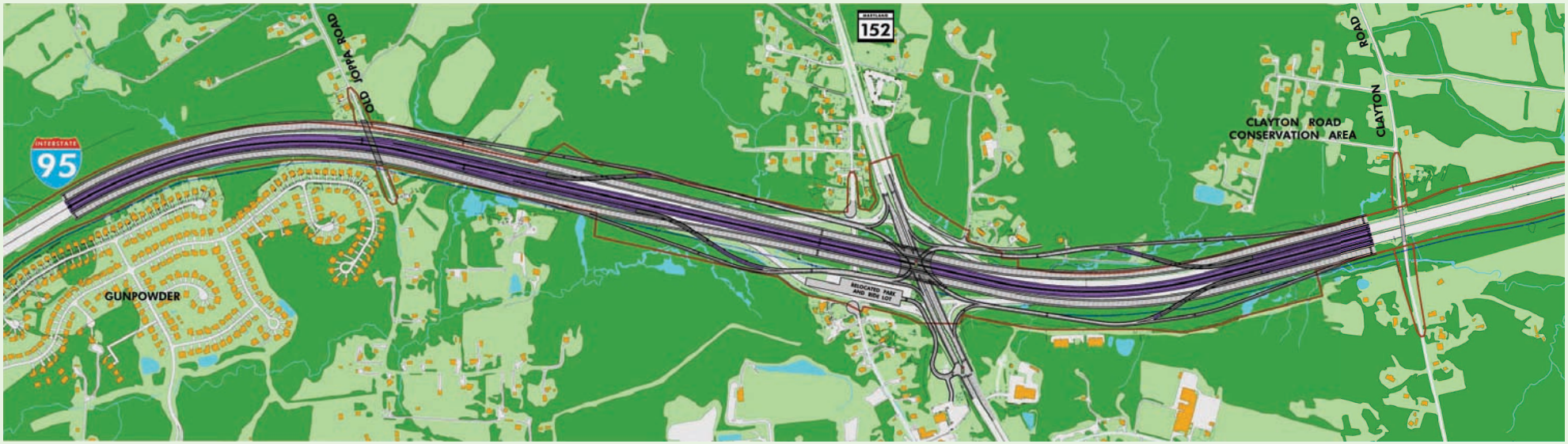


FIGURE 67 - EXPRESS TOLL LANE - MD 152 INTERCHANGE
OPTION 3: SINGLE POINT URBAN DIAMOND WITH ETL FLYOVER ACCESS RAMPS

e. I-95/MD 152 Interchange Option 4B: Partial Cloverleaf – Single Loop with ETL Flyover Access Ramps

This option has been dropped due to issues involving environmental impact, residential displacement, and traffic. *(see Figure 68)*

- The flyover ramps have extensive environmental impacts (forest, stream and wetland) along both northbound and southbound I-95.
- The flyover ramp in the northwest quadrant of the interchange impacts Clayton Road Conservation Area (Section 4(f) resource).
- The flyover ramps require additional ROW and several residential displacements.
- This option provides a lower LOS than Options 1A and 4A which has been retained for detailed study.

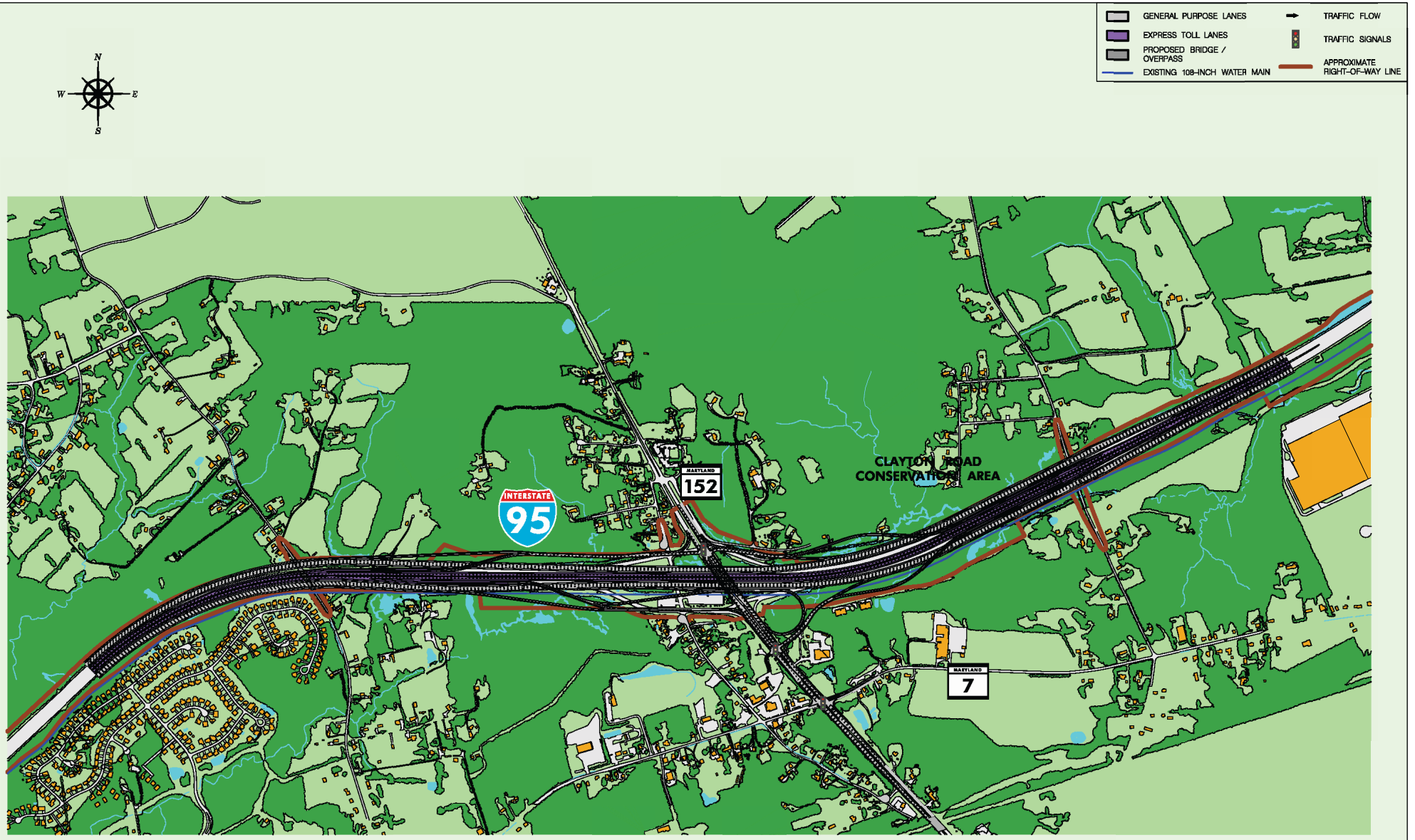


FIGURE 68 - EXPRESS TOLL LANE - I-95 AT MD 152 INTERCHANGE OPTION 4B: PARTIAL CLOVERLEAF - SINGLE LOOP WITH ETL FLYOVER ACCESS RAMPS

f. I-95/MD 152 Interchange Option 5A: Partial Cloverleaf – Double Loop with ETL Median Access Ramps

This option was dropped due to the combination of environmental impacts, residential displacements and traffic. *(see Figure 69)*

- 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.

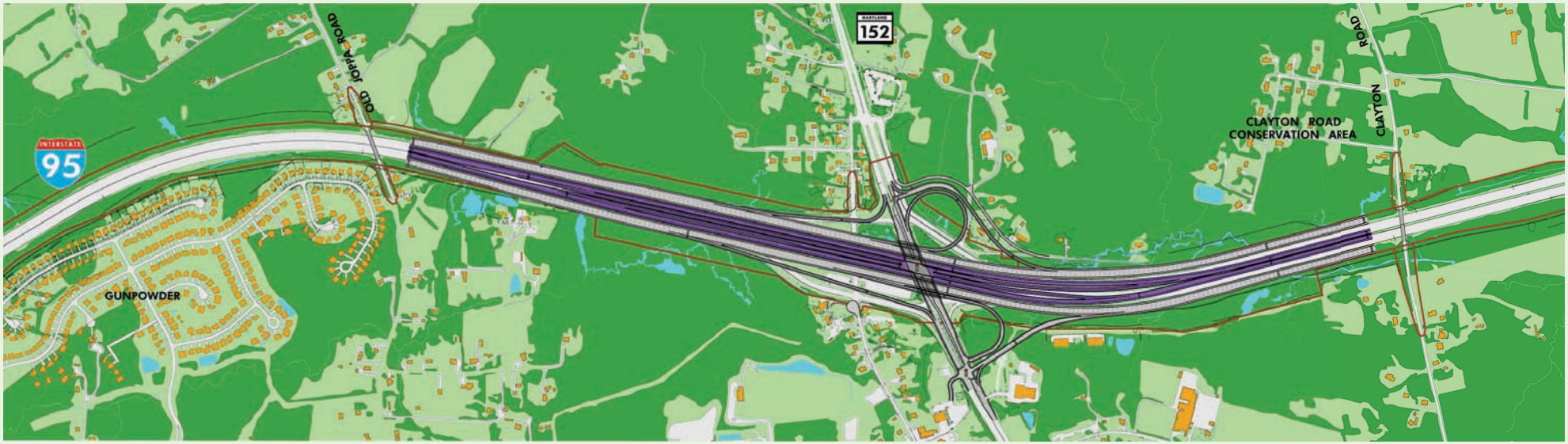


FIGURE 69 - EXPRESS TOLL LANE - MD 152 INTERCHANGE
OPTION 5A: PARTIAL CLOVERLEAF - DOULBE LOOP WITH ETL MEDIAN ACCESS RAMPS

g. I-95/MD 152 Interchange Option 5B: Double Loop with ETL Flyover Access Ramps

This option was dropped due to the combination of environmental impacts and residential displacements caused by the double loop and outer connection ramps. *(see Figure 70)*

- The proposed loop ramp and outer connection ramp in the northwest quadrant of the interchange will require considerable streams and wetland impacts.
- The flyover ramps have extensive environmental impacts (forest, stream and wetland) along both northbound and southbound I-95.
- 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.

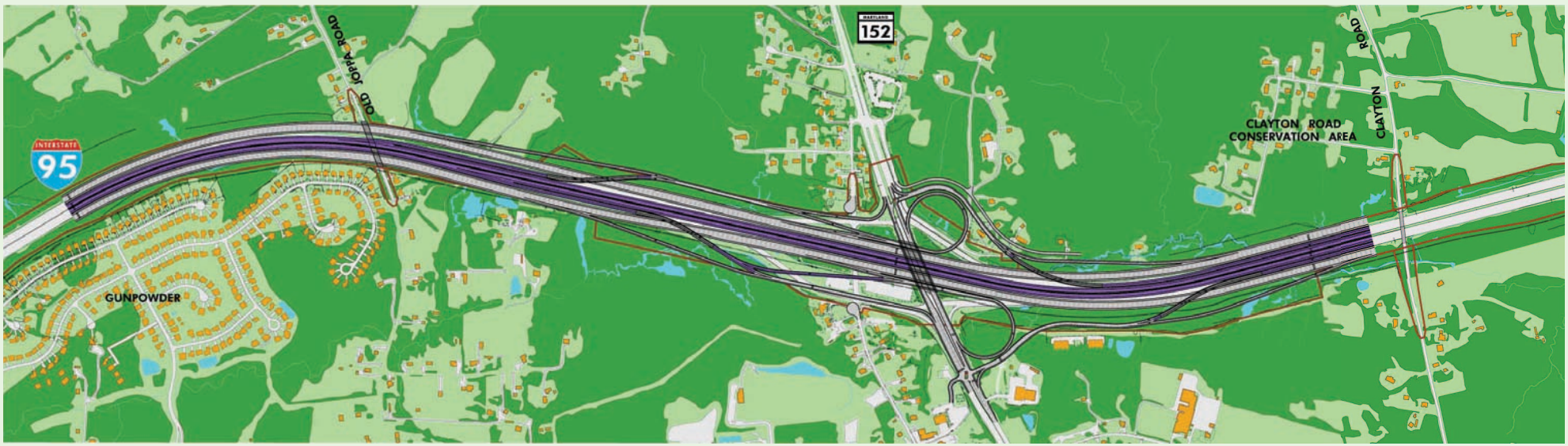


FIGURE 70 - EXPRESS TOLL LANE - MD 152 INTERCHANGE
OPTION 5B: PARTIAL CLOVERLEAF - DOULBE LOOP WITH ETL FLYOVER ACCESS RAMPS

h. I-95/MD24 Interchange Option 1: Double Loop with ETL Flyover Access Ramps

This option was dropped due to the significant environmental impacts associated with the ETL flyover access ramps. This option was developed assuming that the Phase 1 Improvements previously designed for the I-95/MD 24/MD 924 interchange would be constructed prior to the Section 200 project. The I-95/MD 24/MD 924 improvements in combination with the 2030 traffic volumes and the close proximity of the MD 152 interchange required the use of extensive flyover access ramps to provide ETL access to MD 24 and dictated the location of these ramps.

- The ramps proposed south of MD 24, required four additional structures crossing over Winters Run and a significant amount of additional ROW.
- The flyover ramps to the north would require a significant amount of forest impacts due to clearing and a significant amount of additional ROW.

Modifications to Phase 1 of the I-95/MD 24/MD 924 interchange improvement project were implemented as a result of the coordination between these two projects. These modifications would accommodate the use of median access ramps for ETLs. Another interchange option was developed with significantly less environmental impact. *(see Figure 71)*

FIGURE 71 - EXPRESS TOLL LANE - MD 24 INTERCHANGE
OPTION 1: PARTIAL CLOVERLEAF - DOUBLE LOOP WITH ETL FLYOVER ACCESS RAMPS

i. I-95/MD 543 Interchange Option 1A: Diamond with ETL Median Access Ramps

This option was dropped due to failing level-of service (LOS F) at the GPL ramps to southbound I-95 for the year 2030. Other interchange options providing better 2030 LOS were retained for detailed study. *(see Figure 72)*

FIGURE 72 - EXPRESS TOLL LANE - MD 543 INTERCHANGE
OPTION 1A: DIAMOND WITH ETL MEDIAN ACCESS RAMPS

j. I-95/MD 543 Interchange Option 1B: Diamond with ETL Flyover Access Ramps

This option was dropped due to a combination of environmental impacts and traffic. *(see Figure 73)*

- The flyover ramps proposed would require three additional structures over James Run, resulting in significant stream and forest impacts.
- The flyover ramp from I-95 northbound to MD 543 impacts the Bush Declaration Area (4(f) resource).
- This option provided a similar 2030 LOS as other retained interchange options having fewer impacts.

FIGURE 73 - EXPRESS TOLL LANE - MD 543 INTERCHANGE
OPTION 1B: DIAMOND WITH ETL FLYOVER ACCESS RAMPS

k. I-95/MD 543 Interchange Option 2: Tight Diamond with ETL Flyover Access Ramps

This option was dropped due to a combination of environmental impacts and traffic. *(see Figure 74)*

- The flyover ramps proposed would require three additional structures over James Run, resulting in significant stream and forest impacts.
- The flyover ramp from I-95 northbound to MD 543 impacts the Bush Declaration Area (4(f) resource).
- This option had a 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 intersection due to limited ability to store turning vehicles. This would mean longer queues, longer cycle lengths and poorer traffic operations.

FIGURE 74 - EXPRESS TOLL LANE - MD 543 INTERCHANGE
OPTION 2: TIGHT DIAMOND WITH ETL FLYOVER ACCESS RAMPS

l. I-95/MD 543 Interchange Option 3: Single Point Urban Diamond with ETL Flyover Access Ramps

This option was dropped due to issues involving environmental impacts, traffic and maintenance. *(see Figure 75)*

- The flyover ramps proposed would require three additional structures over James Run, resulting in significant stream and forest impacts.
- The flyover ramp from I-95 northbound to MD 543 impacts the Bush Declaration Area (4(f) resource).
- 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 75- EXPRESS TOLL LANE - MD 543 INTERCHANGE
OPTION 3: SINGLE POINT URBAN DIAMOND WITH ETL FLYOVER ACCESS RAMPS

m. I-95/MD 543 Interchange Option 4A: Partial Cloverleaf – Single Loop with ETL Median Access Ramps

This option was dropped due to the combination of commercial displacements and traffic. *(see Figure 76)*

- The proposed loop ramp and outer connection ramp in the northeast quadrant of the interchange will require one commercial displacement.
- It was determined after further traffic studies that the loop ramp in the northeast quadrant was not necessary for this interchange to function at an acceptable LOS in 2030.
- This option provides a similar LOS as other retained interchange options having fewer impacts.

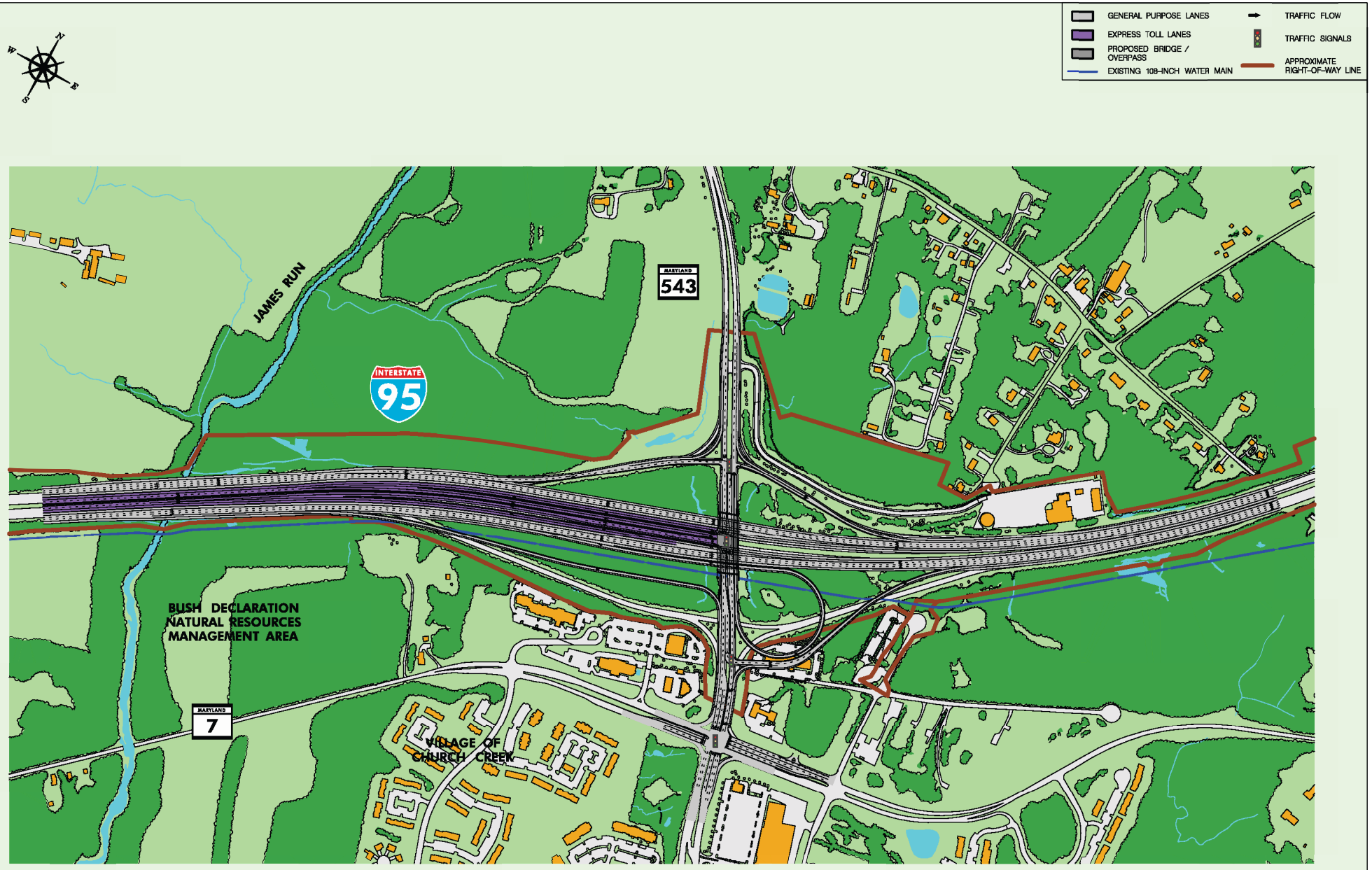


FIGURE 76 - EXPRESS TOLL LANE - I-95 AT MD 543 INTERCHANGE OPTION 4A: PARTIAL CLOVERLEAF - SINGLE LOOP WITH ETL MEDIAN ACCESS RAMPS

n. I-95/MD 543 Interchange Option 4B: Partial Cloverleaf – Single Loop with ETL Median Access Ramps

This option was dropped due to a combination of environmental impacts and traffic. *(see Figure 77)*

- The flyover ramps proposed would require three additional structures over James Run, resulting in significant stream and forest impacts.
- The flyover ramp from I-95 northbound to MD 543 impacts the Bush Declaration Area (4(f) resource).
- This option provided a similar 2030 LOS as other retained interchange options having fewer impacts.

FIGURE 77 - EXPRESS TOLL LANE - MD 543 INTERCHANGE
OPTION 4B: PARTIAL CLOVERLEAF - SINGLE LOOP WITH ETL FLYOVER ACCESS RAMPS

o. I-95/MD 543 Interchange Option 5A: Partial Cloverleaf – Triple Loop with ETL Median Access Ramps

This option was dropped due to the combination of environmental impacts, commercial displacements and traffic. *(see Figure 78)*

- The loop ramp and outer connection ramp in the southwest quadrant of this interchange had significant stream and forest impacts.
- The loop ramp and outer connection ramp in the northeast quadrant of the interchange will require one commercial displacement.
- It was determined after further traffic studies that the loop ramp in the southwest quadrant was not necessary for this interchange to function at an acceptable LOS in 2030.
- The movement from I-95 southbound to MD 543 southbound has relatively low traffic volumes that could be handled from the outer directional ramp. The removal of the loop would eliminate a weave section along I-95 southbound.

FIGURE 78 - EXPRESS TOLL LANE - MD 543 INTERCHANGE
OPTION 5A: PARTIAL CLOVERLEAF - TRIPLE LOOP WITH ETL MEDIAN ACCESS RAMPS

p. I-95/MD 543 Interchange Option 5B: Partial Cloverleaf - Triple Loop with ETL Flyover Access Ramps

This option was dropped due to the combination of environmental impacts, commercial displacements and traffic. *(see Figure 79)*

- The flyover ramps proposed would require three additional structures over James Run, resulting in significant stream and forest impacts.
- The flyover ramp from I-95 northbound to MD 543 impacts the Bush Declaration Area (4(f) resource).
- The loop ramp and outer connection ramp in the southwest quadrant of this interchange had significant stream and forest impacts.
- The loop ramp and outer connection ramp in the northeast quadrant of the interchange will require one commercial displacement.
- It was determined after further traffic studies that loop ramp in the southwest quadrant was not necessary for this interchange to function at an acceptable LOS in 2030.
- The movement from I-95 southbound to MD 543 southbound has relatively low traffic volumes that could be handled from the outer directional ramp. The removal of the loop would eliminate a weave section along I-95 southbound.

FIGURE 79 - EXPRESS TOLL LANE - MD 543 INTERCHANGE
OPTION 5B: PARTIAL CLOVERLEAF - TRIPLE LOOP WITH ETL FLYOVER ACCESS RAMPS

q. I-95/MD 543 Interchange Option 6A: Partial Cloverleaf – Double Loop with ETL Median Access Ramps

This option was dropped due to the combination of environmental impacts, commercial displacements and traffic. *(see Figure 80)*

- The loop ramp and outer connection ramp in the northeast quadrant of the interchange will require one commercial displacement.
- It was determined after further traffic studies that the loop ramp in the northeast quadrant was not necessary for this interchange to function at an acceptable LOS in 2030.
- This option provides a similar LOS as other retained interchange options having fewer impacts.

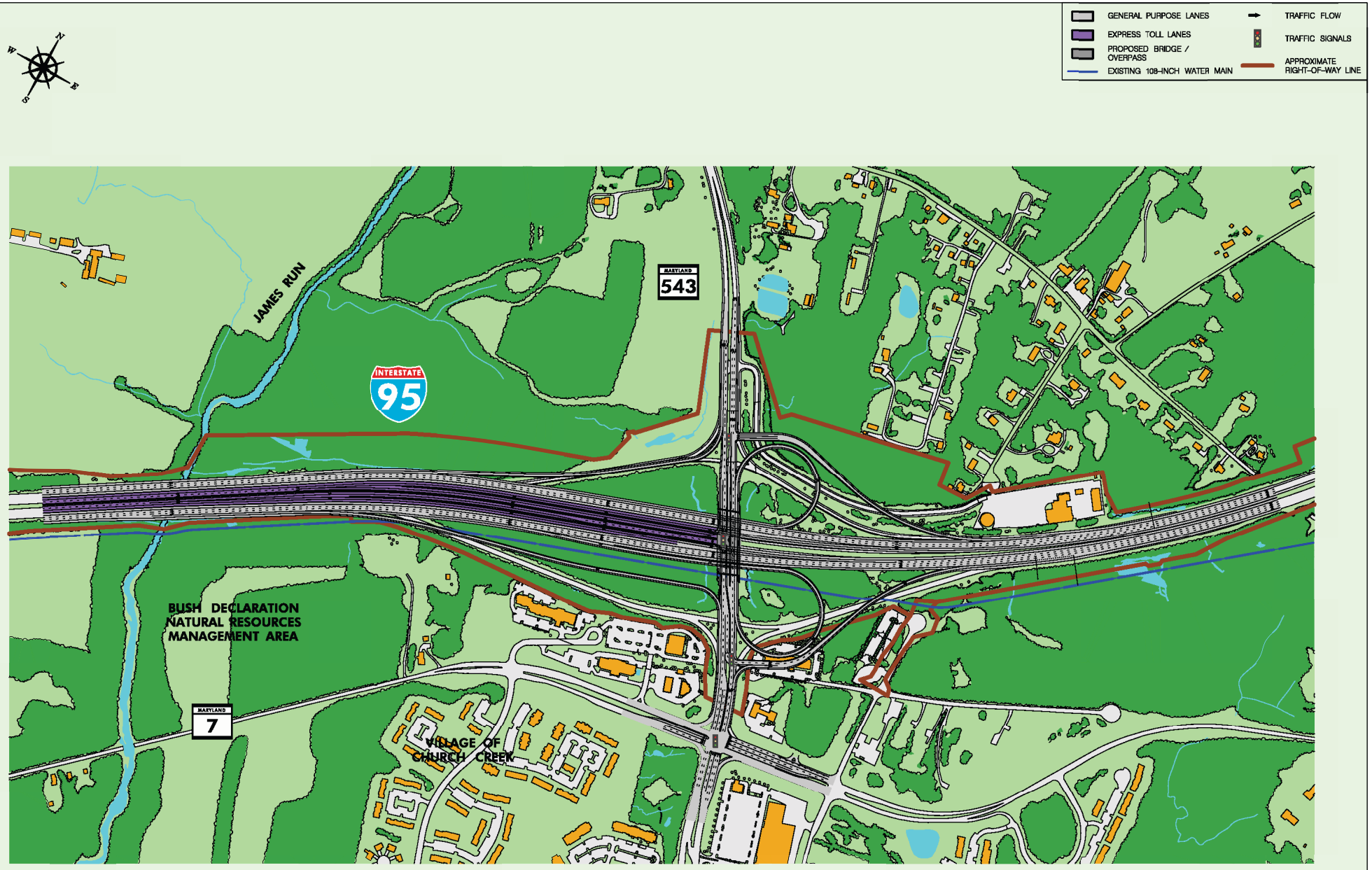


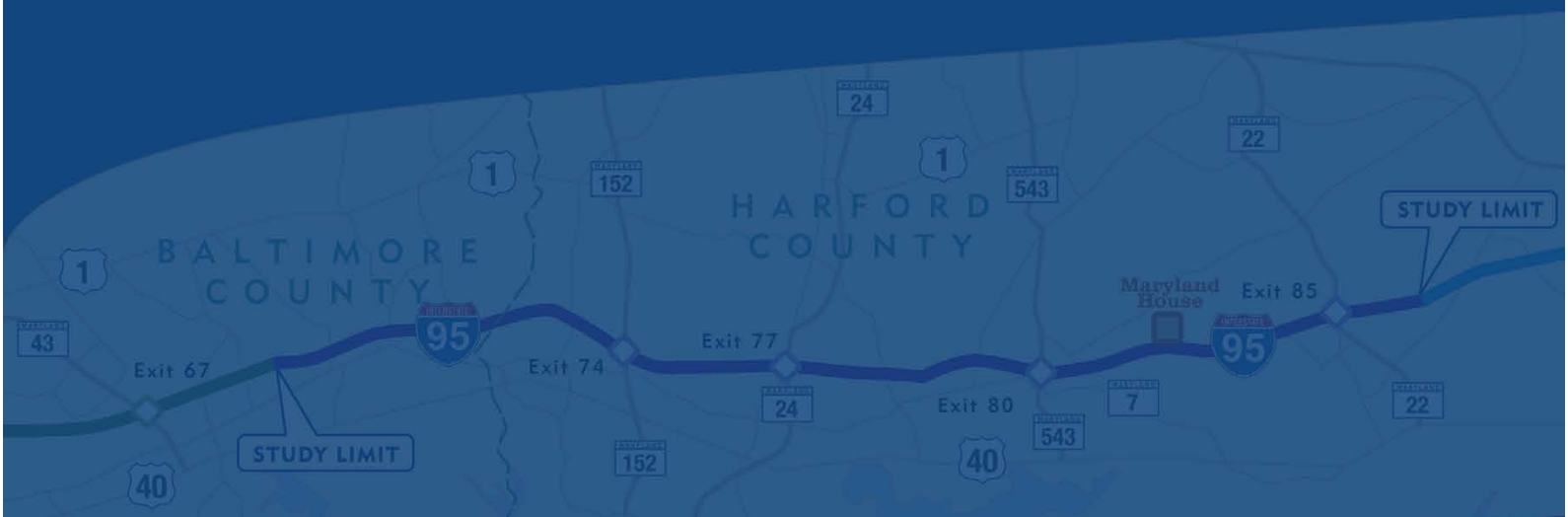
FIGURE 80 - EXPRESS TOLL LANE - I-95 AT MD 543 INTERCHANGE OPTION 6A: PARTIAL CLOVERLEAF - DOUBLE LOOP WITH ETL MEDIAN ACCESS RAMPS

r. I-95/MD 543 Interchange Option 6B: Partial Cloverleaf – Double Loop with ETL Flyover Access Ramps

This option was dropped due to the combination of environmental impacts, commercial displacements and traffic. *(see Figure 81)*

- The flyover ramps proposed would require three additional structures over James Run, resulting in significant stream and forest impacts.
- The flyover ramp from I-95 northbound to MD 543 impacts the Bush Declaration Area (4(f) resource).
- The proposed loop ramp and outer connection ramp in the northeast quadrant of the interchange will require one commercial displacement.
- It was determined after further traffic studies that loop ramp in the northeast quadrant was not necessary for this interchange to function at an acceptable LOS in 2030.
- By dropping this option it would eliminate a weave section along MD 543 northbound.

FIGURE 81 - EXPRESS TOLL LANE - MD 543 INTERCHANGE
OPTION 6B: PARTIAL CLOVERLEAF - DOUBLE LOOP WITH ETL FLYOVER ACCESS RAMPS



INTERSTATE 95

SECTION 200