Transportation Study for the Odenton Town Center Master Plan

ANNE ARUNDEL COUNTY
MARYLAND

June 2010

in association with
The Wilson T. Ballard Company
and
Vision Engineering and Planning

Sabra, Wang & Associates, Inc.
Engineers • Planners • Analysts

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Existing……..AM (PM)
2035 No-Build…….. AM (PM)
2035 TSM Option A……AM (PM)
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2035 Northern Bridge……..AM (PM)
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1.0 EXECUTIVE SUMMARY

1.1 Study Purpose

Odenton today is a crossroads of several regional state highways, along with the busiest commuter rail station outside of downtown Baltimore or D.C. Average daily traffic volumes along MD 175 (Annapolis Road), MD 170 (Telegraph Road) and MD 32 (Patuxent Freeway) range from between 15,000 and 50,000 vehicles per day; while commuter rail passenger boardings average around 2,100 passengers per day across 39 trains. Future County land use plans seek to build on this transportation hub by providing a mix of land uses and improving connections between modes of travel.

Odenton Town Center has extremely good north-south access and capacity via passenger rail connecting Baltimore and Washington employment centers with easy transfer to any activity center along the Northeast Corridor. However, its east-west access is provided by roadways, and limited only to the capacity of the roadways that cross the rail line. Previous studies conducted both by the County (MD 175 Phase I) and by the Maryland State Highway Administration (MD 175 Environmental Assessment) clearly demonstrate the potential for severely congested intersections along this corridor between MD 32 and MD 170, unless proactive action is taken to improve and better use the existing and planned roadway grid.

1.2 Study Goals

The Odenton Town Center Master Plan Transportation Study is a comprehensive assessment of the existing and future mobility needs in the Town Center area. The goal of the transportation study is to develop a set of recommendations for existing and new roadways that can be implemented in a joint private and public sector partnership that will support a transit, pedestrian and bicycle-oriented Town Center. Specifically, the study will assist the County in:

- forecasting future traffic volumes and traffic patterns based on existing and future land uses;
- developing standards for roadway design elements such as cross-sections, on-street parking regulations, intersection traffic controls, traffic flows (one-way vs. two-way) and lane assignments;
- identifying capital improvement project needs such as new or widened roadways and bridges to increase capacity, improve mobility and enhance safety;
- identifying and integrating multi-modal needs including pedestrians, bicycles and transit;

- prioritizing improvements, considering construction costs, environmental impacts, and operational benefits; and

- establishing policies to manage demand for travel in, out and through the Town Center, including parking.

1.3 Study Scope

The scope of this study included the following elements:

- inventory and document the existing transportation network, including roads, trails, sidewalks, parking and transit facilities;

- determine existing roadway capacity and level of service;

- develop future traffic forecasts through a regional travel forecasting process;

- develop a computerized traffic simulation model;

- identify alternative improvement concepts for analysis and testing; and

- offer preliminary recommendations for preferred roadway, trail, and traffic control improvements including alignments and preliminary costs.

1.4 Study Recommendations

The OTC area is expected to transform into a more urban TOD environment building upon the foundation of the existing roadway and railway infrastructure. The demand on travel within, around and through OTC will require a multitude of transportation improvements and management strategies to provide adequate levels of service and mobility.

Under the forecast for OTC and without any transportation improvements, ten out of nineteen intersections will fail in at least one peak hour, primarily along MD 170 and MD 175. Resulting affects of this congestion would be gridlock and blocking of the primary gateway to land uses within OTC as well as direct access to MARC and Fort Meade.

The Odenton Town Center Master Plan December 2009 identifies specific transportation improvement priority projects for sidewalks, trails, and roadways. Based on the results of this study, the following additional or modified preferred improvements have been identified:

1. New East-West Roadway Capacity. A new crossing of the AMTRAK/Penn Line is recommended (P2 alignment).

2. TSM Options. One-ways streets, left-turn restrictions, and peak-hour parking restrictions are recommended (TSM Option B).

3. Traffic Control. Eight new traffic signals are recommended.

4. Upgraded Roadways. The following roadways are recommended for upgrade or extension:

    a. Nevada Avenue,
    b. Hale Street,
    c. Baldwin Road,
    d. Berger Street,
    e. Dare Street, and
    f. MD 170.

5. Access Management/Wayfinding Strategies. Management of access points along MD 175 and wayfinding signing to vehicular parking facilities within the OTC grid are recommended.

6. Pedestrian, Bicycle and Transit Access. Cycle tracks, bicycle lanes, bicycle wayfinding signing, pedestrian accommodations at new traffic signals, and new or upgraded amenities for transit users are recommended.

7. Transportation Demand Management (TDM). To achieve a target 20% additional person trips managed, parking management, TMA participation, and monitoring are recommended.

Disclaimer: As this is a large-scale planning study, the traffic projections are estimated based on the most current information available for approved and potential development plans. It is anticipated that development programs may change as final land use, site plans, access points, financing, tenants, etc. are developed for each individual project. ***This study in no way replaces the need to perform a traffic impact analysis for each site, and it is recommended that specific mitigation needs for individual projects and detailed site access issues be addressed through a formal traffic impact study as each project moves through formal County development review.*** However, the recommendations included in this report should be able to guide the County in identifying potential mitigation needs of future private development.

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2.0 INTRODUCTION

2.1 Study Background and Objective

Odenton today is a crossroads of several regional state highways, along with the busiest commuter rail station outside of downtown Baltimore or D.C. Average daily traffic volumes along MD 175 (Annapolis Road), MD 170 (Telegraph Road) and MD 32 (Patuxent Freeway) range from between 15,000 and 50,000 vehicles per day; while commuter rail passenger boardings average around 2,100 passengers per day across 39 trains. Future land use plans seek to build on this transportation hub by providing a mix of land uses and improving connections between modes of travel.

Anne Arundel County has requested a comprehensive transportation study be performed to forecast, model, analyze and develop improvements to update the transportation elements of the current Odenton Town Center Master Plan (adopted 2004, revised December 2009). Key elements of the study include:

- travel demand modeling;
- travel forecasting of new roadway links;
- traffic data collection;
- traffic modeling and simulation;
- traffic operations and capacity analyses of existing and future roadway networks;
- transportation master planning and development impact analyses;
- pedestrian and bicycle planning and design;
- parking impact and management analyses; and public outreach; and
- transportation facility planning review and development of functional roadway classifications within the Town Center (e.g., preliminary engineering concepts, typical sections, functional classification, construction cost estimates).

Specifically, the study establishes a set of recommendations for roadways that can be implemented in a joint public-private sector partnership that will support a transit, pedestrian, and bicycle-oriented Town Center.

2.2 Study Area Location and Limits

The study area (centered around Central Odenton) consists of the MD 175 (Annapolis Road) corridor between MD 32 (Patuxent Freeway) to the west and MD 170 (Telegraph Road)/Piney Orchard Parkway to the east and the MD 170 (Telegraph Road)/Piney Orchard Parkway corridor between Lamonte Avenue to the north and Odenton Road to the south. MD 175 is the single most important element connecting West, Central, and East Odenton together. The Central Odenton study area between MD 32 and MD 170 includes the older, historic sections of Odenton, centered around the MARC Station, which would support the redevelopment of the Odenton Town Center. The study area

also includes the Odenton Town Center Core Area, which is an area approximately two blocks north and south of MD 175 between MD 32 and MD 170 – an area similar to the "core area" as defined in the Odenton Town Plan. Figure 1 shows existing conditions including the study area roadway network, study intersections, and traffic control.

2.3 Review of Previous Studies

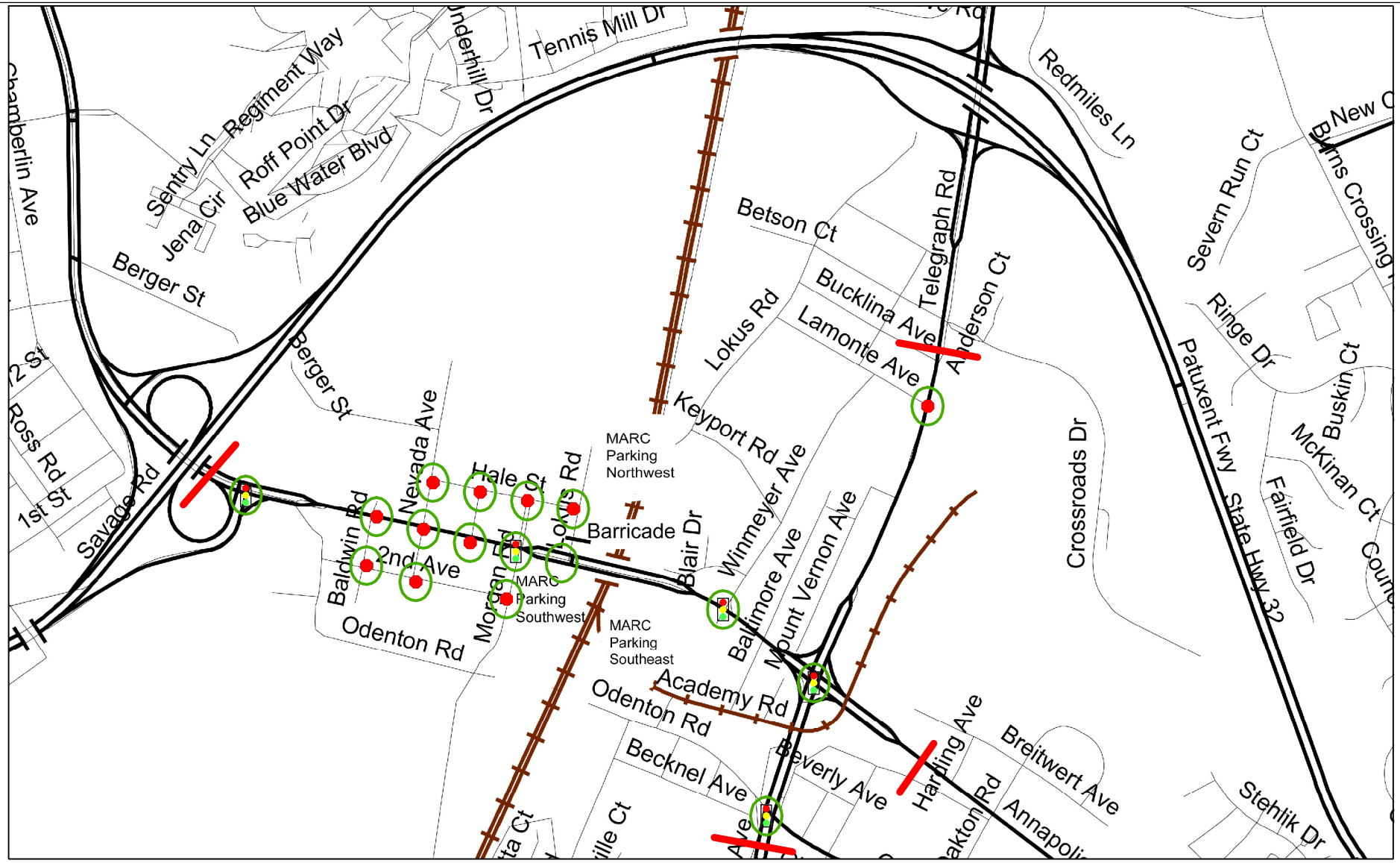
Previous studies conducted by the Transportation Division of the County Office of Planning & Zoning (MD 175 Phase I, 2005 and MD 175 Phase II, 2009) and the Environmental Assessment for MD 175 from the Baltimore Washington Parkway (MD 295) to Telegraph Road (MD 170) by SHA have identified very unacceptable traffic delay along MD 175 from MD 32 to MD 170. The principal locations of substantial delay are at the intersections of MD 175 with Morgan Road (Odenton Town Center Boulevard) and Telegraph Road (MD 170)/Piney Orchard Parkway. The following additional studies were reviewed for applicability and impact to this study:

- Odenton Town Center Master Plan 2004 and 2009 – Anne Arundel County,
- Pedestrian and Bicycle Master Plan – Anne Arundel County,
- MD 175 Phase I – Anne Arundel County,
- MARC Parking Study – Maryland Transit Administration,
- MD 175 Environmental Assessment – State Highway Administration,
- Internal Traffic Study – Fort George G. Meade,
- Fort Meade/BRAC Transit and Ridesharing Study – Anne Arundel County, and
- Fort Meade/BRAC Near Term Highway Corridor Studies – Anne Arundel County.

2.4 Data Collection

Traffic data (taken/obtained at various periods between June 2005 and September 2009) were obtained by Sabra, Wang & Associates, Inc., Anne Arundel County, and SHA, which includes 13-hour turning movement counts for 17 intersections and 48-hour machine classification counts at two locations (i.e., MD 175 north of MD 32, MD 170 north of MD 175).

A comprehensive field inventory was performed to obtain intersection approach photographs at study intersections and to identify key roadway characteristics (e.g., lane use, turn restrictions, parking restrictions, roadway geometrics, lane widths, storage bay lengths, traffic control, sight distance, access points). In addition, an inventory of pedestrian, bicycle, and transit facilities was conducted (e.g., sidewalks, curb ramps, pedestrian signals, crosswalks, bike lanes/trails, bus and rail transit stops, routes and shelters).



LEGEND

- STUDY INTERSECTION
- STUDY BOUNDARY
- STOP SIGN
- TRAFFIC SIGNAL

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ODENTON TOWN CENTER
TRANSPORTATION STUDY

STUDY AREA ROADWAY NETWORK

SCALE:	DATE:	FIGURE NO.
NONE	MAY 2010	1

Field observations of traffic operations along MD 175 and MD 170 in the study area were made during AM and PM commuter peak hours to document vehicular queuing problems; pedestrian, bicyclist and driver behavior; bus transit and heavy truck operations. Field studies that were performed included a travel time study along MD 175 and MD 170 during the AM and PM commuter peak hours and a sight distance study at the intersection of MD 175 and Lokus Road.

SHA and Anne Arundel County officials were contacted to obtain other information such as historical traffic data, traffic signal timing data, and information on transportation improvements that are planned or programmed in the study area through Year 2035.

3.0 EXISTING CONDITIONS

3.1 Study Area Roadways and Intersections

The study area roadway network includes five signalized and eleven unsignalized intersections. The study intersections and their respective traffic control, as shown in Figure 1, include:

- MD 175 (Annapolis Road) @ MD 32 EB Off-Ramp (*signalized*),
- MD 175 (Annapolis Road) @ Baldwin Road (stop-controlled),
- MD 175 (Annapolis Road) @ Nevada Avenue (stop-controlled),
- MD 175 (Annapolis Road) @ Dare Street (stop-controlled),
- MD 175 (Annapolis Road) @ Morgan Road/Town Center Boulevard (*signalized*),
- MD 175 (Annapolis Road) @ Lokus Road (access to MD 175 closed to traffic),
- MD 175 (Annapolis Road) @ Winmeyer Avenue (*signalized*),
- MD 175 (Annapolis Road) @ MD 170 (Telegraph Road) (*signalized*),
- MD 170 (Telegraph Road) @ Lamonte Avenue (stop-controlled),
- Piney Orchard Parkway @ Odenton Road (*signalized*),
- Hale Street @ Nevada Avenue (stop-controlled),
- Hale Street @ Dare Street (stop-controlled),
- Hale Street @ Town Center Boulevard (stop-controlled),
- Hale Street @ Lokus Road (stop-controlled),
- Duckens Street @ Baldwin Road (stop-controlled),
- Duckens Street @ Nevada Avenue (stop-controlled), and
- Duckens Street @ Morgan Road (stop-controlled).

The following describes the roadways in the study area roadway network:

1. MD 175 (Annapolis Road). MD 175 extends from its eastern terminus at MD 3 to the west through Odenton and intersecting with MD 32, MD 295 (Annapolis Junction), I-95, and US 29 in Columbia. MD 175 is a four-lane undivided highway with an east-west orientation and a 40 mph speed limit through the study area. There are three sections of median in the study area: between MD 32 and the Mobil gas station west of Baldwin Road; east of the railroad line to Winmeyer Avenue (TWLTL); and between Baltimore Avenue and MD 170. The width of the pavement is 50 feet, with additional left-turn storage lanes at the intersections of MD 32 (east approach), Town Center Blvd/Morgan Road, Winmeyer Ave, and MD 170.

2. MD 170 (Telegraph Road). MD 170 extends from its northern terminus near the Baltimore-Washington International Airport (BWI) at I-195 to the south to Odenton. MD 170 is a four-lane undivided highway with a north-south orientation and a 40 mph speed limit through the study area, except that it is a four-lane divided section that transitions to a two-lane cross section south of Crossroads

Drive. MD 170 ends just south of its intersection with MD 175, near Odenton Road, where the roadway becomes a minor arterial known as Piney Orchard Parkway and then Patuxent Road.

3. MD 32 (Patuxent Freeway). MD 32 is a four-lane divided, controlled-access highway with an east-west orientation and a 55 mph speed limit. MD 32 serves as a bypass around Odenton and connects to I-97, the Baltimore-Washington Parkway, and I-95. The off ramps from MD 32 at MD 175 are signalized.

4. Morgan Road. Morgan Road is classified as an Urban Boulevard and is the southern leg of the MD 175/Morgan Road/Town Center Boulevard intersection in the central portion of the study area. Morgan Road is a local road having a speed limit of 25 mph that serves as the primary access road to the Odenton MARC Station and southwest parking lot. It also provides local access to residencies and businesses located on Duckens Road and Odenton Road. Morgan Road is a two-lane road with left-turn lanes at key movements along the MARC Station southwest parking lot frontage.

5. Town Center Boulevard. Town Center Boulevard is classified as an Urban Arterial and is the northern leg of the MD 175/Morgan Road/Town Center Boulevard intersection. Within the study area, Town Center Boulevard is a four-lane divided roadway having a speed limit of 25 mph that currently connects MD 175 to Hale Street. Town Center Boulevard provides access to the MARC Station northwest parking lot via Hale Street at Lokus Road. The Odenton Town Center Plan proposed to connect the segment of Town Center Boulevard at MD 175/Morgan Road with that of Town Center Boulevard that is north of MD 32.

6. Nevada Avenue. Nevada Avenue is classified as an Urban Grid Street with a speed limit of 25 mph. Nevada Avenue is a local road that connects residences and businesses in the western portion of the core area of Odenton Town Center to the north (i.e., Hale Street, Berger Street) and to the south (i.e., Duckens Street) of MD 175.

7. Hale Street. Hale Street is classified as an Urban Grid Street with a speed limit of 25 mph. Hale Street is a local road that parallels MD 175 and serves local residences and businesses in the northern core area of Odenton Town Center. Hale Street at Lokus Road also provides primary access to the MARC Station northwest parking lot.

8. Duckens Street. Duckens Street is classified as an Urban Grid Street with a speed limit of 25 mph. Duckens Street is a local road that parallels and serves local residences and businesses in the southern core area of Odenton Town Center. Duckens Street at Morgan Road also provides primary access to the MARC Station platform and southwest parking lot.

9. Lokus Road. Lokus road is classified as an Urban Grid Street that extends from MD 175 along the east side of the core area of Odenton Town Center and provides primary access to the MARC Station northwest parking lot. Lokus Road dead ends to the north and has recently been closed to traffic at its access to MD 175 by SHA for safety reasons.

Figure 2 shows the lane geometry of study roadways and intersections, and Table 1 and Figure 3 provides a complete summary of the roadways in the study area, including functional classification, pavement width, number of lanes, and existing ROW. See Appendix A for intersection photographs and lane diagrams.

3.2 Transit, Pedestrian and Bicycle Facilities

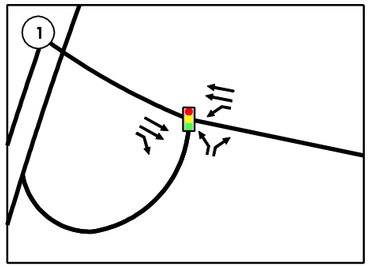
3.2.1 Commuter Rail

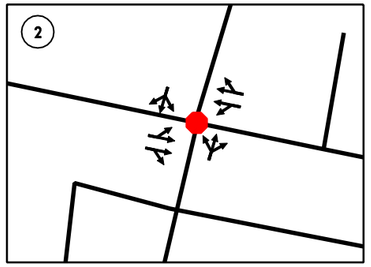
The Odenton MARC Station, which serves the residential communities of west county and Odenton, Fort Meade, and the National Security Agency (NSA), is located along MD 175 and Morgan Road (situated just west of MD 170 and east of the core area of Odenton Town Center) in the southwest quadrant of the MD 175 and MD 170 intersection (see Figure 4). The Odenton MARC Station is along the MARC Penn Line, connecting the Baltimore Penn Station with the Washington, DC Union Station, and handles 19,000 average daily trips. There is an average of 2,100 trips per day at the Odenton MARC Station.

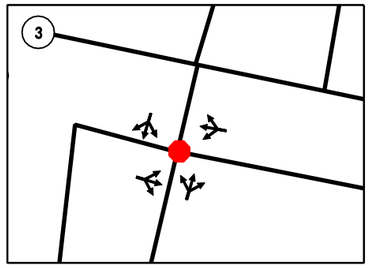
Vehicle parking for the Odenton MARC Station includes the MTA southwest surface lot (approximately 800 spaces with 16 spaces designated as either short-term or 10-minute only parking), the northwest surface lot (approximately 750 spaces), and the Anne Arundel County southeast surface lot (approximately 480 spaces). Overflow parking (approximately 130 spaces) is also provided at the Odenton Volunteer Fire Department surface lot. See Figure 4 for locations of MARC-related surface parking lots.

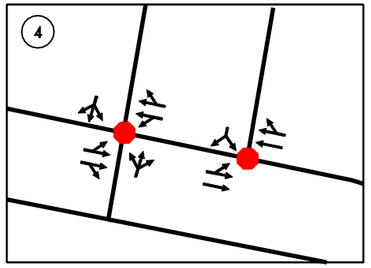
3.2.2 Bus Transit Service

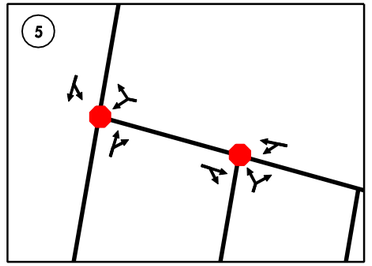
Bus transit service in the study area includes the Central Maryland Regional Transit (CMRT) Connect-a-Ride Route K (1-hour headways), which serves West Anne Arundel County (Arundel Mills Mall/Severn/Meade Village/Pioneer City/Seven Oaks/Odenton MARC Station/Odenton) and Route M, which is a shuttle service between the Odenton Volunteer Fire Department surface parking lot and the Odenton MARC Station. Bus stops are located along MD 170 at Betson Avenue, Mt. Vernon Avenue, and Odenton Road and along at MD 175 at Winmeyer Avenue (see Figure 4).

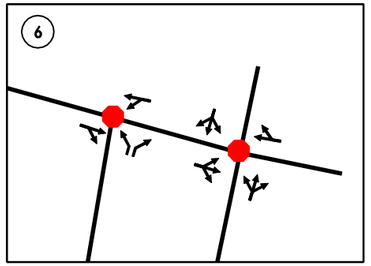


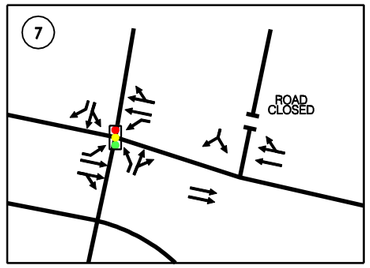


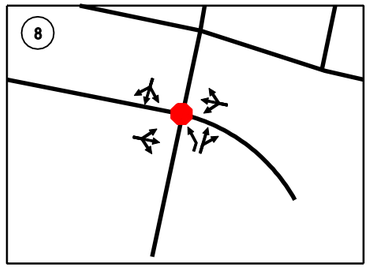


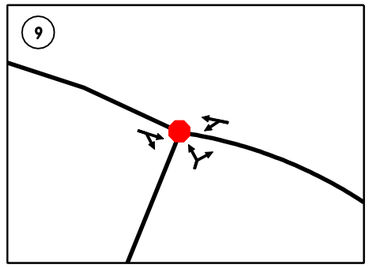


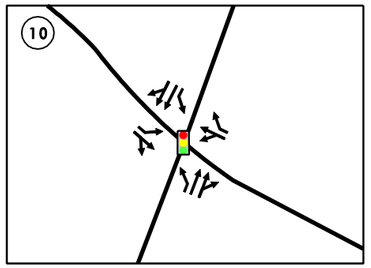


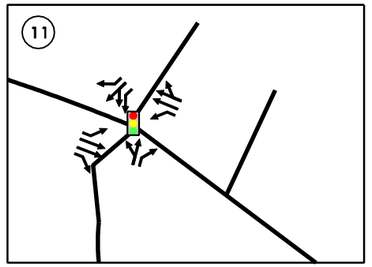


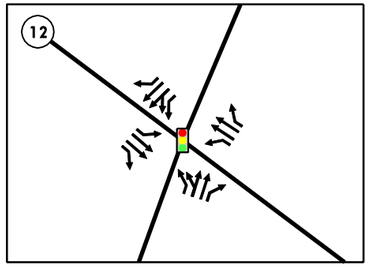


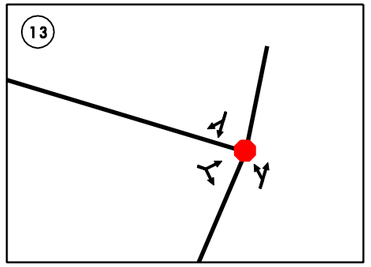


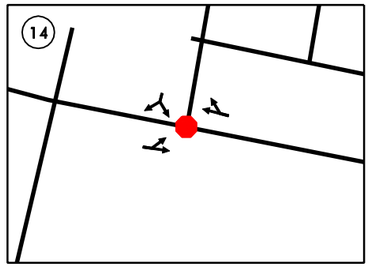


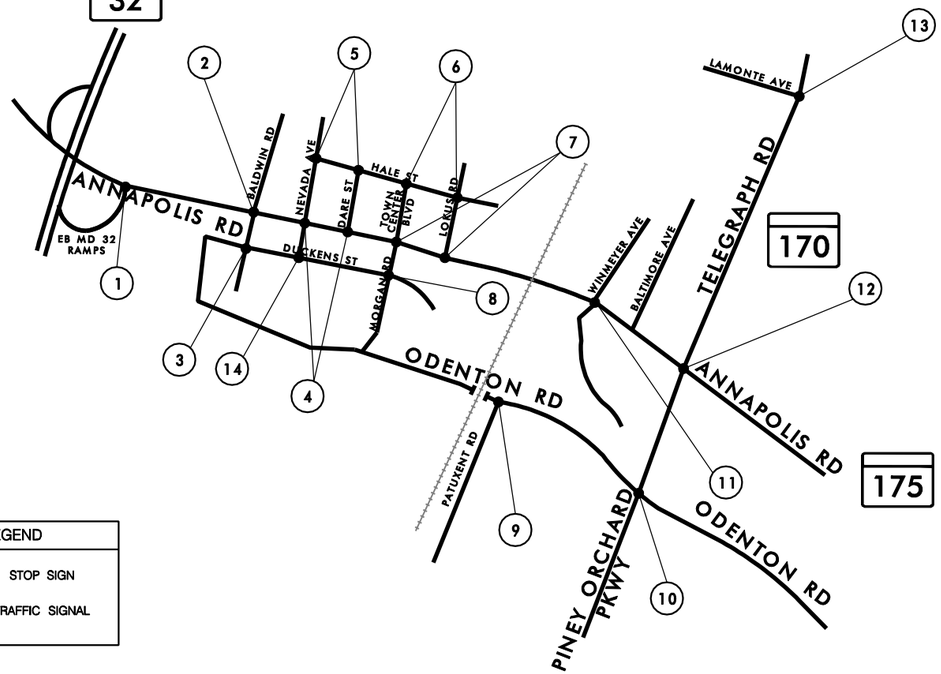












LEGEND

STOP SIGN

TRAFFIC SIGNAL

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ODENTON TOWN CENTER
TRANSPORTATION STUDY

EXISTING CONDITIONS LANE GEOMETRY

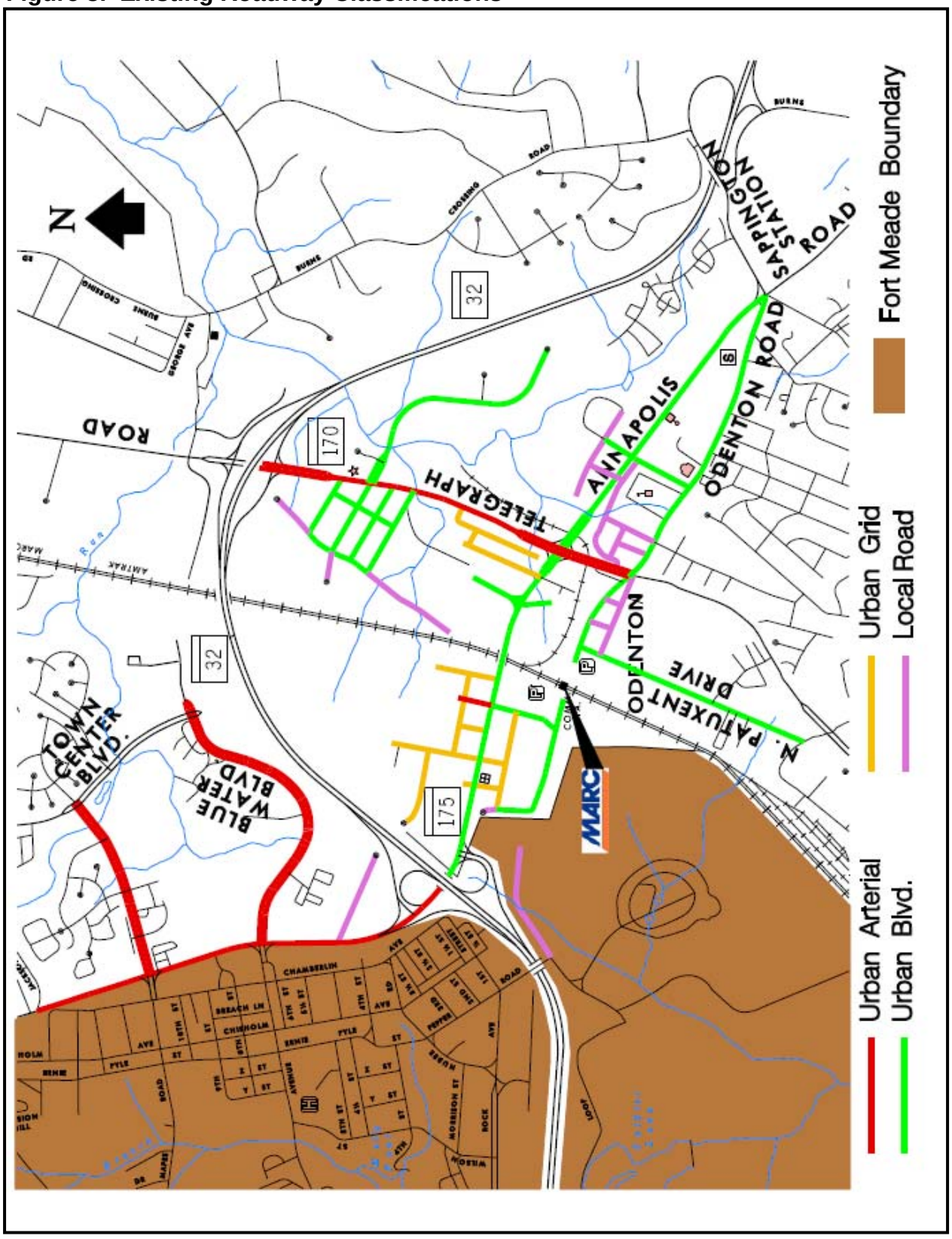
SCALE:	DATE:	FIGURE NO.
NONE	MAY 2010	2

Table 1. Odentown Town Center -- Summary of Existing Roadway Characteristics

Street Name	OTC Roadway Classification[1]	Pavement Width (Feet)	Number of Lanes	Existing ROW (Feet)	Verified	Notes
Annapolis Road (MD 175)	**Urban Boulevard**	**Varies 50' - 82'**	**4***	**Varies 60' - 100'**	**Plans**	*Plus aux. Lanes
Berger Street	Urban Grid Street	20	2	30	Plans	
Nevada Street north of MD 175	Urban Grid Street	22	2	40	Scaled	
Nevada Street south of MD 175	Urban Grid Street	20	2	60	Scaled	
Hale Street west of Town Center Blvd.	Urban Grid Street	20	2	60	Plans	
Hale Street east of Town Center Blvd.	Urban Grid Street	24	2	60	Plans	
Dare Street	Urban Grid Street	22	2	30	Scaled	
Town Center Blvd.	Urban Arterial	22-18-22	4	60	Plans	18' median
Lokus Road	Urban Grid Street	20	2	Varies 30'/40'	Plans**	**Sources are Contradictory
Winmeyer Ave. north of MD 175 for approximately 1,000 feet	Urban Boulevard	48	4	80	Plans	
Winmeyer Ave. approximately 1,000 feet north of MD 175	Urban Boulevard	27	2	80	Plans	
Blair Drive	No classification in current MP	34	2	40	Plans	
Baltimore Ave.	Urban Grid Street	23	2	40	Scaled	
Pine Street	Urban Grid Street	23	2	40	Scaled	
Mt. Vernon Ave.	Urban Grid Street	23	2	40	Scaled	
Morgan Road	Urban Boulevard	36	3	60	Plans	
Duckens Street from Morgan Road to Nevada Ave.	Urban Grid Street	24	2	60	Plans	
Duckens Street west of Nevada Ave.	Urban Grid Street	20	2	60	Plans	
Baldwin Road from MD 175 to Ducken Street	Urban Grid Street	36	2	60	Plans	
Baldwin Road south of Ducken Street	Urban Grid Street	24	2	60	Plans	
Odenton Road from MD 170 west approximately 600 feet	Urban Boulevard	36	3	40	Scaled	
Odenton Road west of MD 170 to Odenton MARC Station	Urban Boulevard	28	2	40	Scaled	
Odenton Road from Duckens St. south to approximately 1,200 ft west of Morgan Rd.	Urban Boulevard	22	2	40	Scaled	
Odenton Road From approximately 900 feet to 1,200 feet west of Morgan Road	Urban Boulevard	36	2	40	Scaled	
Odenton Road from Morgan Road west approximately 900 feet	Urban Boulevard	22	2	40	Scaled	

[1] The Source for OTC Roadway Classifications is the Odenton Town Center Master Plan (revised December 2009).

Figure 3. Existing Roadway Classifications



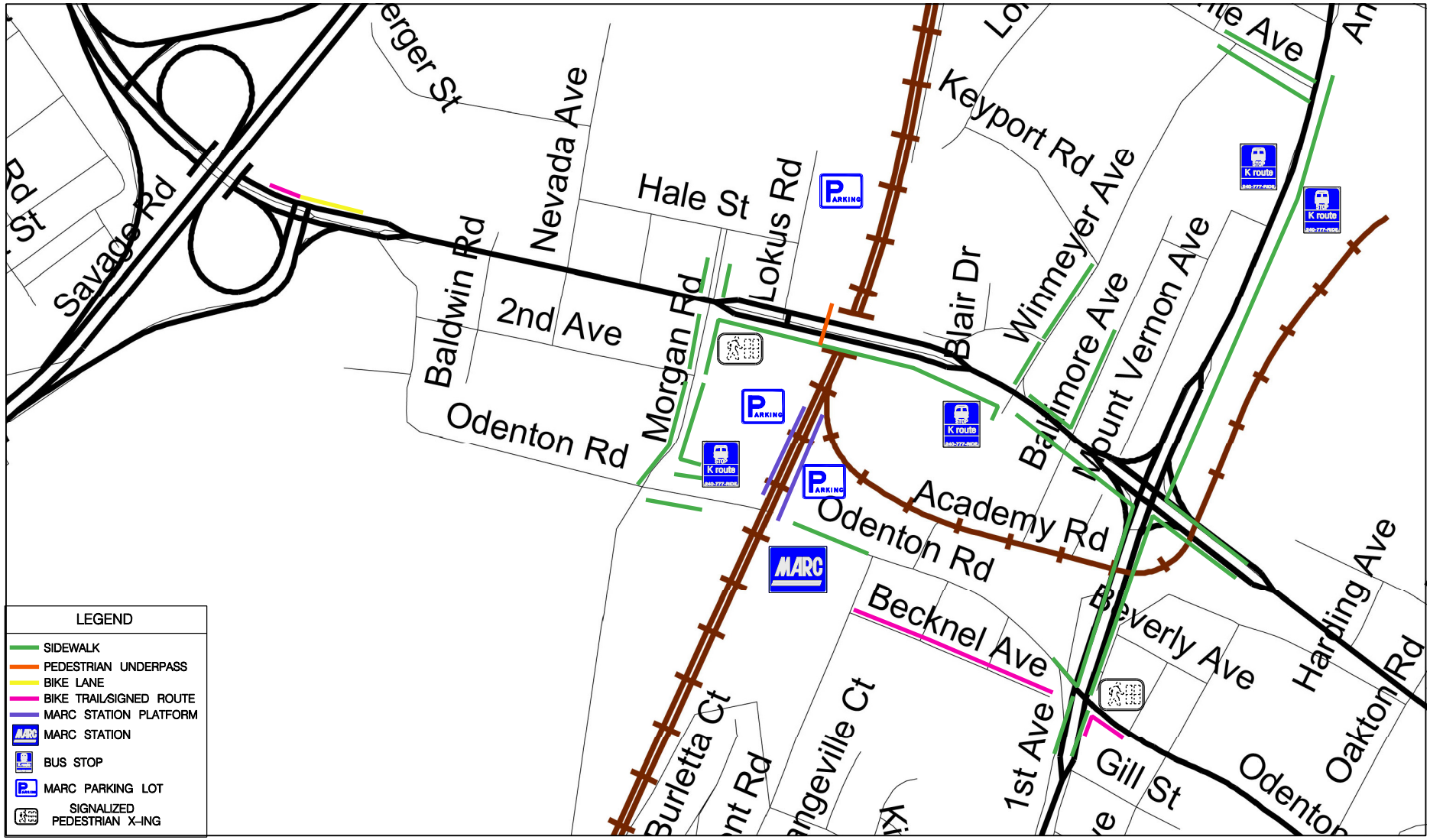
3.2.3 Pedestrians and Bicyclists

Pedestrian and bicycle accommodations in the study area primarily provide access to the core area of Odenton Town Center and the Odenton MARC Station. The Odenton MARC Station northwest surface parking lot and the Odenton MARC Station west platform and southwest surface parking lot are connected by a pedestrian underpass walkway under the MD 175 bridge that carries vehicular traffic over the rail line.

The Washington, Baltimore and Annapolis Trail (WB&A) is a 10.25-mile long discontinuous trail from Lanham to Odenton. From the south into the study area, the trail runs alongside Piney Orchard Parkway before terminating at Odenton Road. At the intersection of Piney Orchard Parkway at Odenton Road, trail users can either continue north along sidewalk on the east side of MD 170, turn east and follow Odenton Road to its terminus with MD 175, or turn west and follow Odenton Road to the Odenton MARC Station. At the intersection of Piney Orchard Parkway and Odenton Road, bike route signage provides guidance to bicyclists destined to the Odenton MARC Station.

The Odenton Town Center Master Plan (2009) and the *Odenton Trails Schematic Plan, URS, January 2007* also illustrate a future hiker biker tail along Morgan Road, Town Center Boulevard (existing section and future extended section), and Odenton Road and a bike lane along MD 175 and MD 170 as well as bicycle signed routes from the core area of Odenton Town Center and the west and east platforms of the Odenton MARC Station via Morgan Road and MD 175/MD 170/Odenton Road.

In addition, on the north side of the MD 175 westbound approach to MD 32, a short section of designated bike lane exists with signing provided to bicyclists to indicate that they should use the MD 32 ramp to access the MD 198-Laurel/Ft. Meade Road/Maryland City bike trail. See Figure 4 for additional pedestrian and bicycle facilities in the study area.



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ODENTON TOWN CENTER
TRANSPORTATION STUDY

EXISTING PEDESTRIAN, BICYCLE AND TRANSIT FACILITIES

SCALE:	DATE:	FIGURE NO.
NONE	MAY 2010	4

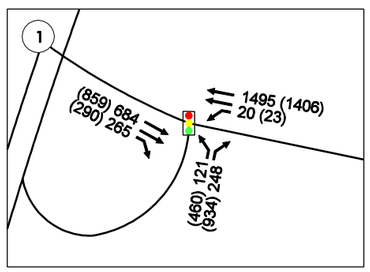
3.3 Traffic Volumes

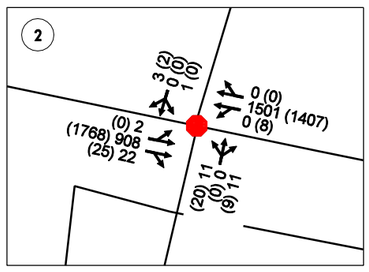
Traffic counts (taken at various periods between June 2005 and September 2009) were obtained by Sabra, Wang & Associates, Inc., Anne Arundel County, and SHA, which includes 13-hour turning movement counts (vehicle, pedestrian, bicycle) for 17 intersections and 48-hour machine classification counts at two locations (i.e., MD 175 north of MD 32, MD 170 north of MD 175). Commuter activity within the study area roadway network occurs in the morning from 7:00 to 9:00 AM and in the evening from 4:00 to 6:30 PM. The AM and PM commuter peak hours in the study area begin at 7:30 AM and 5:15 PM, respectively. The peak direction along MD 175 is westbound in the morning and eastbound in the evening. Pedestrian and bicycle volumes during the AM and PM commuter peak hours were found to be low to moderate at intersections within the study area roadway network. Approximately 6% to 8% heavy truck traffic is on MD 170 north of MD 175 during commuter peak hours; however, no thru trucks over 5 ton GVW are permitted on southbound MD 170 south of MD 175. Figure 5 shows the AM and PM peak hour traffic volumes for existing conditions at study intersections within the study area roadway network. Appendix B contains the raw traffic count data and Appendix C contains the base year balanced traffic volumes developed from the calibrated subarea travel demand model (see Section 4.1).

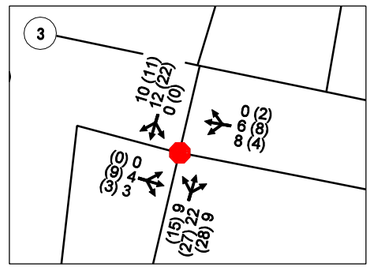
3.4 Field Observations and Queuing

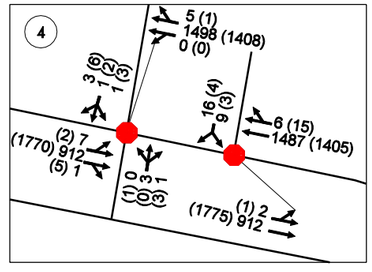
Field observations of AM-peak and PM-peak traffic operations were conducted on Thursday, November 19, 2009. The study specifically focused on driver behavior, conflicts, unusual traffic conditions/maneuvers, signal timing efficiency, roadside safety issues, and overall traffic operations. There were no turn restrictions noted at any of the study intersections. With respect to parking regulations, there is no stopping anytime on MD 175, no parking anywhere along MD 170, no parking anytime on Duckens Street, no parking on Odenton Road near the Odenton MARC Station, and no parking, drop offs, or pickups on Odenton Road adjacent to the Odenton MARC Station. Unless noted in the following observations, no signal cycle/phase failures (e.g., turn bay spillovers, blocking of intersections) or excessive queuing problems were observed during the study:

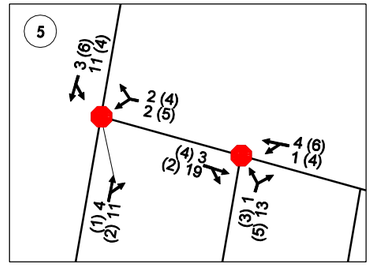
- During the AM peak hour along northbound MD 170, long queues formed in the left-turn lane at the MD 175 intersection, which spilled back past the Odenton Road intersection by approximately 300 ft. Vehicles were observed to change to the left lane prior to the Odenton Road intersection for better lane positioning. There is an uneven distribution of vehicles between the two lanes at the intersections with Odenton Road and MD 175 due to the high volume of vehicles turning left onto MD 175. The right thru lane was typically observed to have much shorter queues.

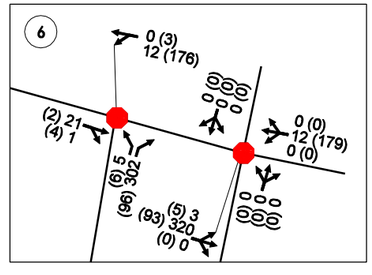


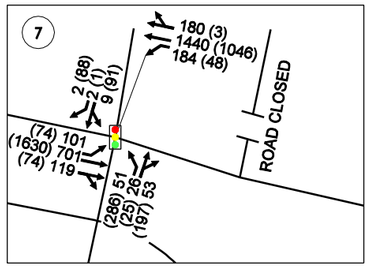


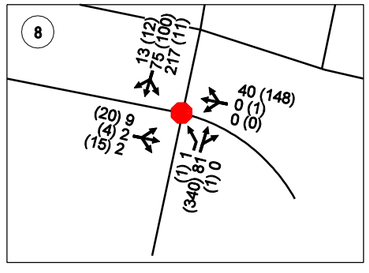


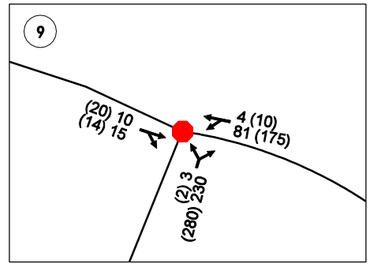


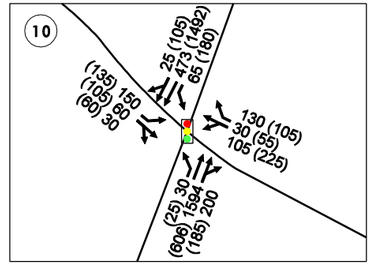


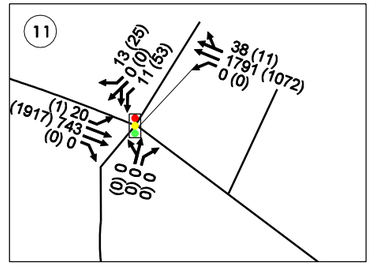


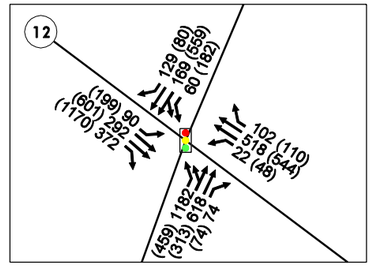


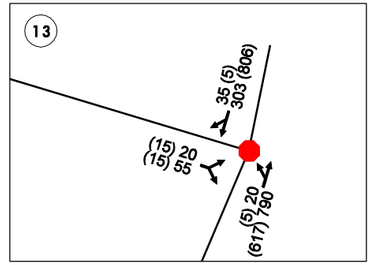


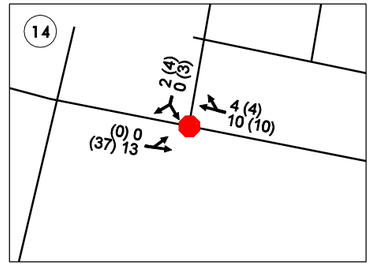


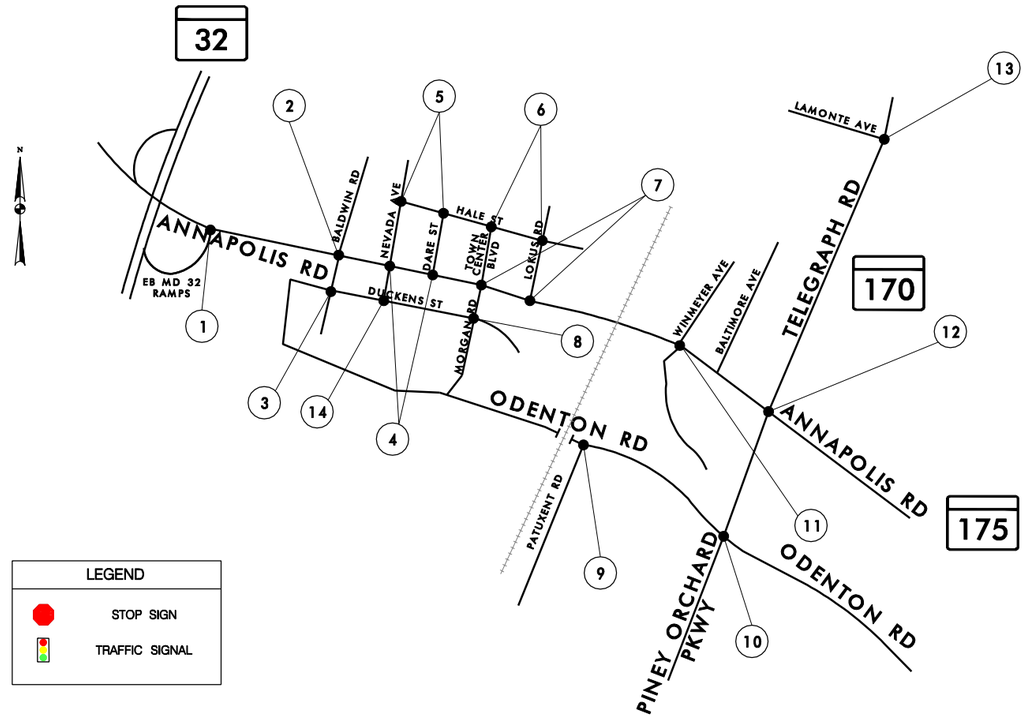












LEGEND

- STOP SIGN
- TRAFFIC SIGNAL

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ODENTON TOWN CENTER
TRANSPORTATION STUDY

EXISTING PEAK HOUR TRAFFIC VOLUMES-AM (PM)

SCALE:	DATE:	FIGURE NO.
NONE	MAY 2010	5

- During the PM peak hour along eastbound MD 175, queues form in the right lane approaching its intersection with MD 170. The queue extends to beyond its intersection with Winmeyer Avenue to the bridge over the railroad tracks.

- During the PM peak hour along Morgan Road, queues extended to Duckens Lane, which was observed to be due to the high volume of vehicles (i.e., from the MARC Station parking lot) leaving at the same time.

3.5 Traffic Signal Operations

There are five signalized intersections within the study area that operate as follows:

1. MD 175 @ MD 32 EB Ramp. The signal at the MD 175 @ MD 32 EB ramp intersection operates in an actuated-coordinated mode with a cycle length of 120 secs during both the AM and PM peak hours. The left-turn movement from westbound MD 175 has protected-permissive phasing.

2. MD 175 @ Morgan Road/Town Center Boulevard. The signal at the MD 175 @ Morgan Road/Town Center Boulevard intersection operates in an actuated-coordinated mode with a cycle length of 120 secs during both the AM and PM peak hours. The left-turn movements from east- and west-bound MD 175 have protected-permissive phasing. The left-turn movements from northbound Morgan Road and southbound Town Center Boulevard have permissive phasing.

3. MD 175 @ Winmeyer Avenue. The signal at the MD 175 @ Winmeyer Avenue intersection operates in an actuated-coordinated mode with a cycle length of 120 secs during both the AM and PM peak hours. The left-turn movements from eastbound and westbound MD 175 have protected-permissive phasing. The Winmeyer Avenue north-south movements have split phasing.

4. MD 175 @ MD 170. The signal at the MD 175 @ MD 170 intersection operates in an actuated-uncoordinated (i.e., isolated) mode with an effective cycle length of 265.5 secs during the AM and PM peak hours. The left-turn movements from eastbound and westbound MD 175 have protected-permissive phasing. The MD 170 north-south movements have split phasing.

5. Piney Orchard Parkway @ Odenton Road. The signal at the Piney Orchard Parkway @ Odenton Road intersection operates in an actuated-uncoordinated mode with a cycle length of 135 secs during both the AM and PM peak hours. The left-turn movements from northbound and southbound Piney Orchard Parkway have protected-permissive phasing. The Odenton Road east-west movements have split phasing.

See Appendix D for the traffic signal data provided by SHA and the County.

3.6 Synchro Model Development and Calibration

A Synchro/Simtraffic model of the study area roadway network was developed to accurately reflect existing baseline conditions (i.e., Year 2009) for the AM and PM commuter peak hours, including traffic control (e.g., stop control, signal timing parameters), traffic volume data (e.g., vehicles, pedestrians, bicycles), lane use, turn restrictions, parking restrictions, roadway geometrics, lane widths, storage bay lengths, access points, pedestrian signals, and bus stops.

The primary calibration measures of the Synchro model were the link speeds, field collected travel times, and field observations. The calibration process utilized field measured queues and travel times to improve the model and ensure that the model reflects the actual field conditions. The SimTraffic simulation was performed to animate the validation.

Synchro uses a deterministic method of calculating measures of effectiveness such as travel times, stopped delay and number of stops per vehicle; this means that the results of Synchro will not vary with the same input data regardless of how many times the program is executed. Synchro models macroscopic events based on a single driver type; it treats traffic conditions as constant events and does not vary the behaviors of individual vehicles records. Synchro is a model, and like all models, it is limited in its ability to precisely predict real-world conditions. Trafficware, the developer of Synchro software, offers the following assumptions under ideal conditions, relative to the accuracy of Synchro's estimated travel-time delays versus field-measured travel time observations:

Accuracy	Delay Computation Variable
+- 5%	typical accuracy of volume counts
+- 5%	typical accuracy of saturation flows calibration (6100vph)
∑ 7%	Total = Combined v/c error
* 2	Magnification of v/c error in delay calculations, when v/c is >= 0.9
∑ +- 14%	Total = raw delay error
+- 5%	Uncertainties about signal timings
+- 5%	Uncertainties about lost time
∑ +- 21%	Expected accuracy in delay calculations

The developer of Synchro, Trafficware, states that field data that matches Synchro's output within a 30% range is normal and acceptable, especially when the difference in unit measures is relatively low, e.g. 3.50 seconds vs. 4.20 seconds, which amounts to a 20% increase. The differences that one might expect between Synchro derived measures and actual field measures are influenced by Synchro's default parameters such as phase lost time, saturation flow rate and traffic composition. Also, consideration should be given to driver types and headways, vehicle turning speeds, the compounding affect of oversaturated traffic conditions, and unaccounted overflow of

traffic in turning lanes and fluctuation of midblock traffic volumes. Therefore, by no means should anyone expect to exactly match Synchro's signal delays and travel time with actual field measurements. There should be, however, consistency in the differences between both measurements, i.e. Synchro and field. Specific parameters were adjusted within the software, based on field-recorded measurements and observations, such as link speeds, peak hour factors, field collected travel time runs and saturation flow rates.

A travel time study was performed on Thursday, November 19, 2009 to establish baseline data necessary to properly calibrate the Synchro model developed for the study. The travel time study was conducted using the multi-run, "floating car" methodology in accordance with standard industry methods and practice (*ITE Manual of Transportation Engineering Studies*). Five runs were performed in each direction along MD 175 and MD 170 within the limits of the study area and during AM and PM commuter peak hours. Appendix E contains the detailed travel time data. A comparison of field versus modeled travel time is shown in Table 2.

Table 2. Comparison of Field vs. Modeled Travel Times

MD 175 WB					
	Node #	**Length (ft)**	**Node Name**	**Field Collected Travel Times (sec)**	**Synchro Travel Times (sec)**
AM	1	0	MD 170	0.0	0.0
	2	935	Winmeyer Ave	18.0	26.5
	3	1791	Morgan Rd	29.0	48.3
	4	2363	EB MD 32 Ramp	42.0	50.4
TOTAL		**5089**		**89.0**	**125.2**
PM	1	0	MD 170	0.0	0.0
	2	935	Winmeyer Ave	24.0	23.5
	3	1791	Morgan Rd	33.0	52.1
	4	2363	EB MD 32 Ramp	51.0	53.6
TOTAL		**5089**		**108.0**	**129.2**
MD 175 EB					
	Node #	**Length (ft)**	**Node Name**	**Field Collected Travel Times (sec)**	**Synchro Travel Times (sec)**
AM	1	0	EB MD 32 Ramp	0.0	0.0
	2	2359	Morgan Rd	39.0	50.2
	3	1762	Winmeyer Ave	28.0	33.4
	4	940	MD 170	78.0	78.3
TOTAL		**5061**		**145.0**	**161.9**
PM	1	0	EB MD 32 Ramp	0.0	0.0
	2	2359	Morgan Rd	76.0	79.9
	3	1762	Winmeyer Ave	54.0	37.1
	4	940	MD 170	57.0	47.1
TOTAL		**5061**		**187.0**	**164.1**

A Synchro/SimTraffic simulation was run for both AM and PM peak hours, using 15-minute initialization period and 60-minute recording period. The results of the simulation represented the queues observed during the field visit. The results of the simulation showed long queues in the northbound direction at the intersection of MD175 and MD 170 during the AM peak hour. Long queues were observed in the eastbound direction on MD 175 approaching MD 170 intersection, which extended beyond the intersection of Winmeyer Avenue during the PM peak hour. Extended queues were observed on Morgan Road until Duckens Street during the PM peak hour.

In conclusion the Synchro/SimTraffic models developed for this study accurately represent real world, site-specific conditions and should be considered acceptable to test alternative roadway improvement and operational scenarios.

3.7 Capacity Analysis

Intersection capacity analyses were performed using the *Highway Capacity Manual 2000 (HCM)* methodology for all study intersections. Measures of effectiveness included level of service (LOS), average control delay, and volume-to-capacity ratio. LOS, as defined by the HCM, is a "qualitative measure describing operational conditions within a traffic stream." LOS ranges from A to F, where A represents optimal conditions and F represents saturated or failing conditions. The v/c, or volume-to-capacity ratio, is the ratio of the current flow rate to capacity, and is used to assess the sufficiency of a roadway facility, such as an intersection. A v/c ratio of 1.0 indicates that the facility is operating at capacity, and a v/c ratio greater than 1.0 indicates that the roadway facility is failing (i.e., the number of vehicles exceeds the facility's capacity). The results of the capacity analyses indicate that all study intersections operate at a LOS D or better during the AM and PM commuter peak hours, except as follows:

1. Stop-Controlled Intersections along MD 175. The stop-controlled intersections along MD 175 at Baldwin Road, Nevada Avenue, and Dare Street have a LOS F based on the critical movements egressing the core area of Odenton Town Center from the stop-controlled minor road onto MD 175. Field observations qualitatively corroborate difficultly in finding an acceptable gap in a reasonable amount of time to perform the egressing movement.

2. MD 175 @ MD 170. During the PM peak hour, this intersection operates at a LOS F. The eastbound MD 175 right turn, and both MD 170 approaches are at saturation and result in significant queues.

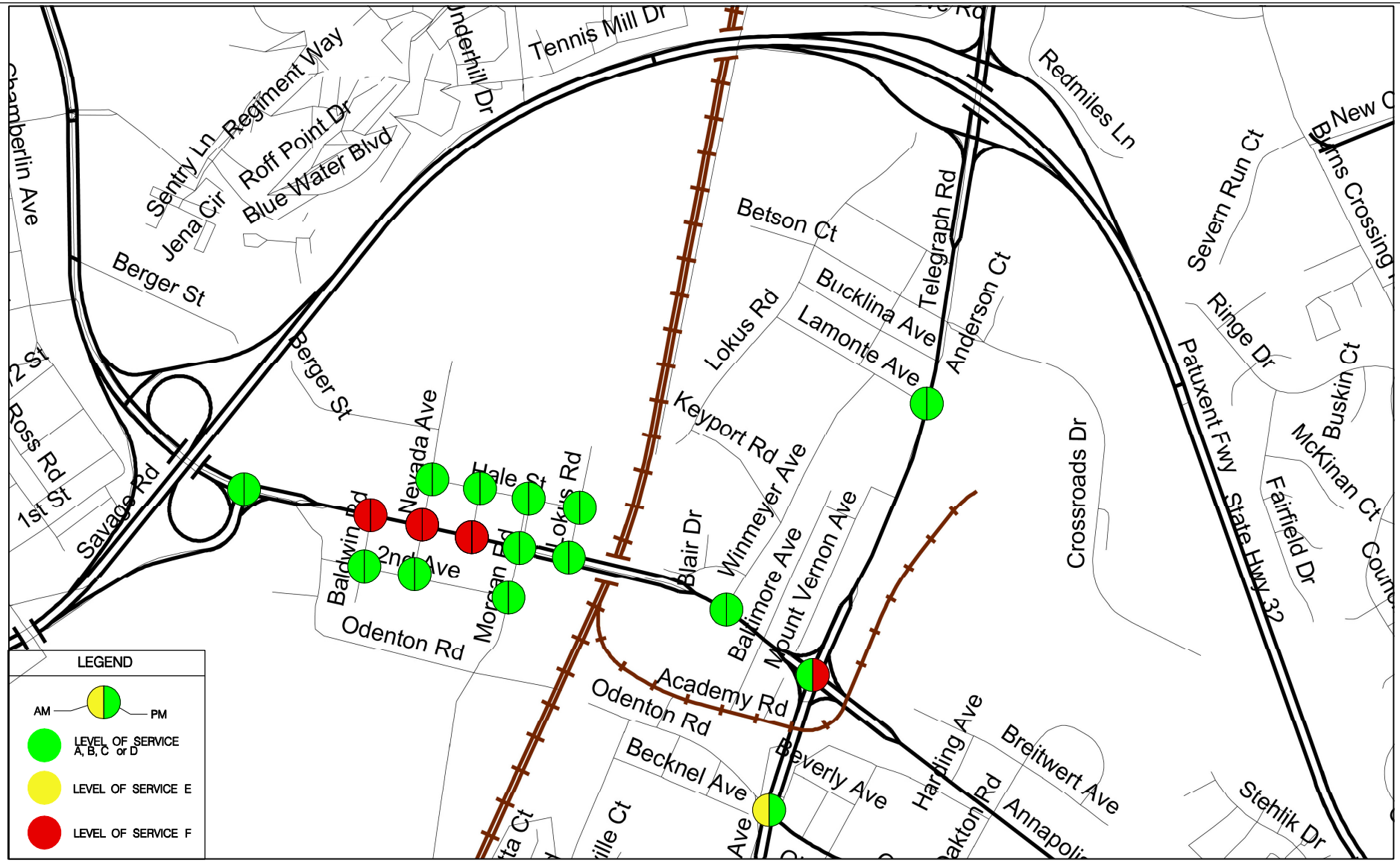
3. Piney Orchard Parkway @ Odenton Road. During the AM peak hour, this intersection operates at a LOS E. The northbound Piney Orchard Parkway approach is nearing saturation and results in significant queues.

Table 3 and Figure 6 presents a summary of results for the HCM analyses. Appendix F contains the HCM Capacity Analysis Worksheets.

Table 3. Existing Conditions – Summary of Capacity Analyses – AM (PM)

Intersection	Level of Service	Average Control Delay (sec/veh)[2]	Volume to Capacity Ratio[2]
MD 175 @ MD 32 EB Off – Ramp	A (C)	7.8 (20.1)	0.57 (0.76)
MD 175 @ Baldwin Rd[1]	**F (F)**	55.1 (>500.0)	0.25 (1.40)
MD 175 @ Nevada Ave[1]	**F (F)**	341.4 (>500.0)	0.30 (1.21)
MD 175 at Dare St[1]	**F (F)**	83.3 (144.6)	0.38 (0.23)
MD 175 @ Morgan Rd/Town Center Blvd	B (C)	13.0 (32.8)	0.62 (0.85)
MD 175 @ Lokus Rd[1]	- (-)	- (-)	- (-)
MD 175 @ Winmeyer Ave	A (A)	4.6 (4.8)	0.64 (0.65)
MD 175 @ MD 170	D **(F)**	48.2 (106.0)	0.72 (1.09)
MD 170 @ Lamonte Ave[1]	C (D)	16.2 (29.2)	0.20 (0.18)
Piney Orchard Pkwy @ Odenton Rd	**E** (D)	67.9 (50.8)	0.93 (0.92)
Hale St @ Nevada Ave[1]	A (A)	7.2 (7.1)	0.02 (0.01)
Hale St @ Dare St[1]	A (A)	8.4 (8.5)	0.01 (0.01)
Hale St @ Town Center Blvd[1]	B (A)	11.3 (9.6)	0.04 (0.20)
Hale St @ Lokus Rd[1]	A (A)	9.4 (8.2)	0.39 (0.22)
Duckens St @ Baldwin Rd[1]	A (A)	9.1 (9.1)	0.05 (0.08)
Duckens St @ Nevada Ave[1]	A (A)	8.4 (8.6)	0.01 (0.01)
Duckens St @ Morgan Rd[1]	C (B)	16.2 (13.6)	0.04 (0.09)

Notes:
(1) Stop-controlled Intersection. Measure of effectiveness reported for critical movement only.
(2) Values may slightly differ based on the version of Synchro/SimTraffic used.



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ODENTON TOWN CENTER
TRANSPORTATION STUDY

Existing Conditions Level of Service

SCALE:	DATE:	FIGURE NO.
NONE	MAY 2010	6

4.0 YEAR 2035 CONDITIONS

4.1 Anne Arundel County SubAreaModel 2 (SAM2) Refinement

The Anne Arundel County SubAreaModel 2 (SAM2) was used to develop the baseline and future no-build and build traffic forecasts for the study. The current model is based on the BMC Round 7B land use inputs. The Odenton demographic data for Base Year 2005 and Planning Horizon Year 2035 is presented in Table 4 (see Appendix G). Because the existing Anne Arundel County SAM2 model did not include all study intersections or roadway links, refinement of the model was necessary prior to developing traffic forecasts, including the following roadway link additions:

- Hale Street between the proposed Odenton Town Center Boulevard and the proposed Odenton Avenue;
- Duckens Street between Morgan Road and Odenton Road;
- Odenton Town Center Boulevard (proposed) between the existing Odenton Town Center Boulevard and MD 175;
- Morgan Road between MD 175 and Odenton Road;
- Dare Street between MD 175 and Hale Street;
- Nevada Avenue between Odenton Road and Berger Street; and
- Baldwin Road between Duckens Street and Hale Street.

A review of the existing SAM2 zone structure in Cube indicate the Transportation Analysis Zones (TAZ) in the Odenton Town Center area as shown in Figure 7. The validation process was initiated by performing a series of model runs with the additional roadway network links coded. A review of the initial model runs indicated that modifications to the centroid connectors were required to properly load the Odenton Town Center Plan to the study area network (see Figure 8). A review of these assignments indicated that the Odenton Town Center area was loading onto all of the additional roadway network links as coded into the network, including minor collectors such as Hale Street. As it is typically very difficult to load short, lower functional class roadway types, it was determined that the modified centroid connectors were adequately loading the Odenton Town Center area without additional zone modifications.

Table 4. Odenton Demographic Data (Year 2005 vs. Year 2035)

TAZ	Population	Households	Retail Employees	Office Employees	Industrial Employees	Other Employees
Year 2005						
335	138	55	6	361	83	113
336	75	35	0	8	2	11
337	50	21	21	145	56	106
1196	100	41	0	104	104	208
Year 2035						
335	4908	2131	395	2549	773	813
336	612	301	481	274	35	245
337	3904	1894	1938	4624	1731	3007
1196	1467	663	450	473	473	945
Delta Change (Year2035 - Year 2005)						
335	4770	2076	389	2188	690	700
336	537	266	481	266	33	234
337	3854	1873	1917	4479	1675	2901
1196	1367	622	450	369	369	737

Figure 7. Odenton Transportation Analysis Zones

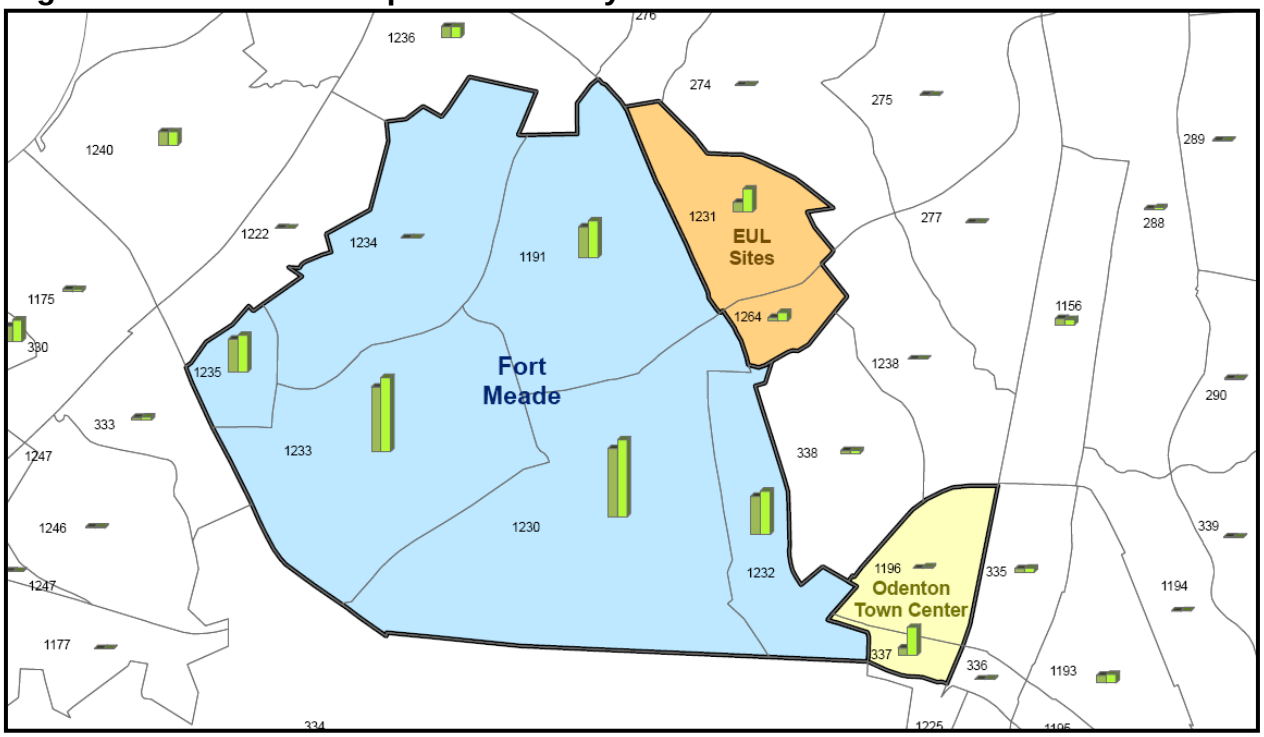
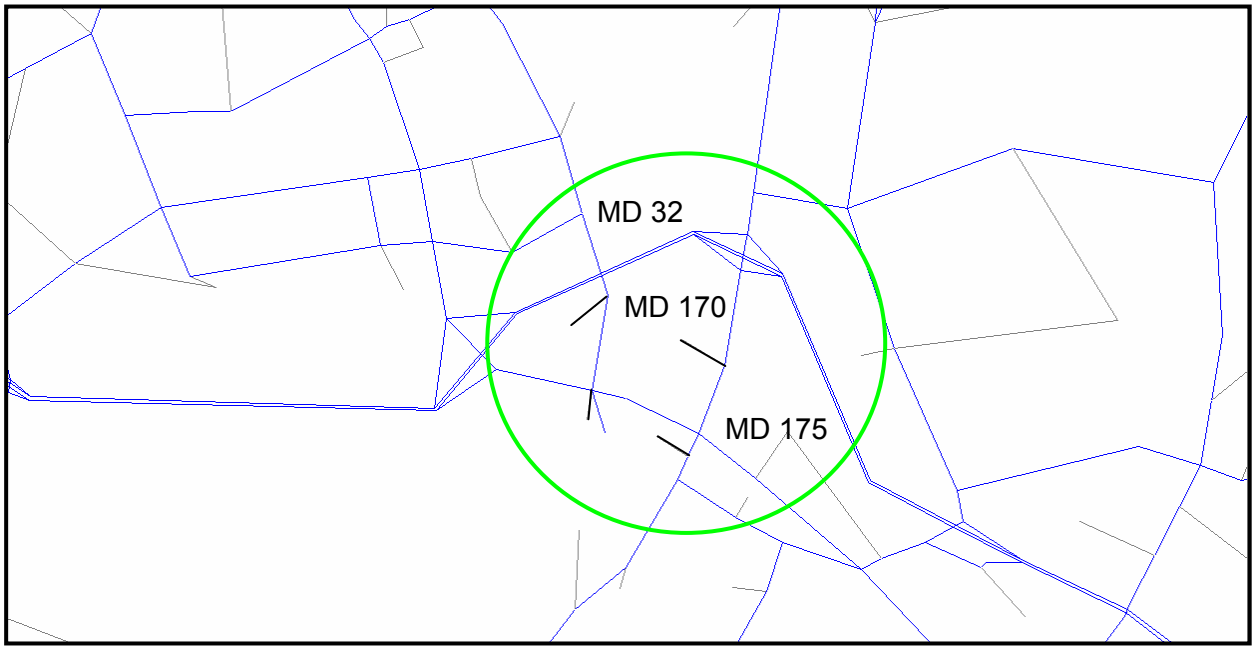
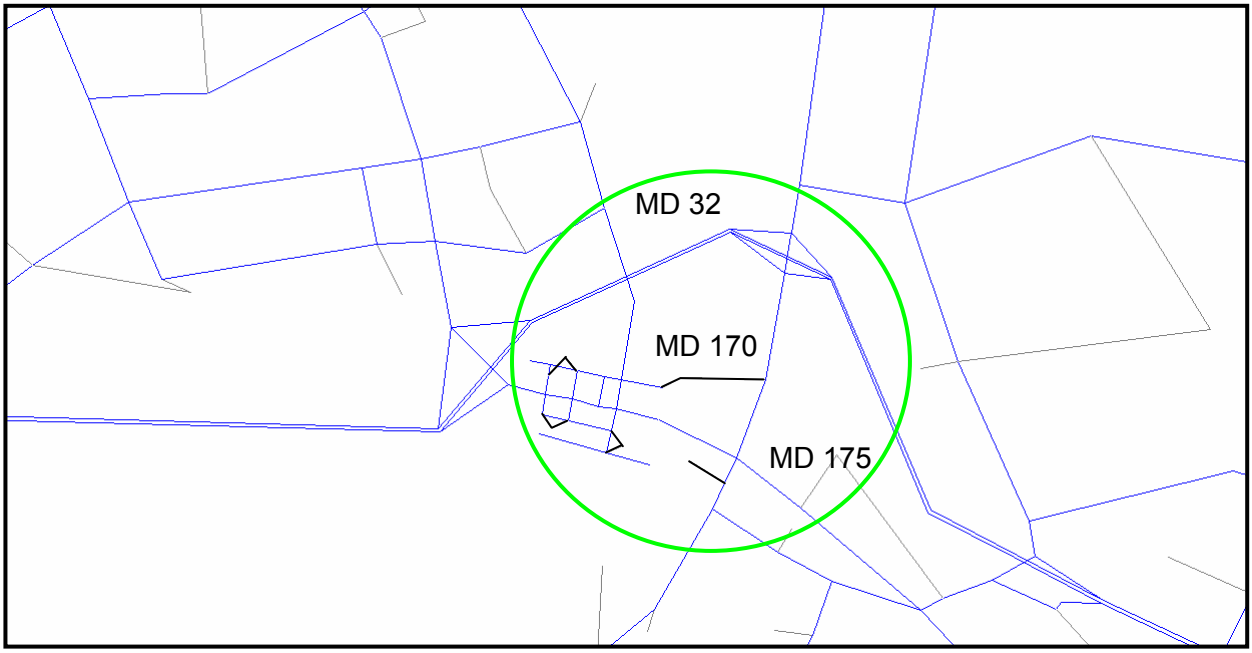


Figure 8. Modification of SAM2 Centroid Locations

SAM2 Original Centroid Locations



Revised Centroid Locations and Highway Network

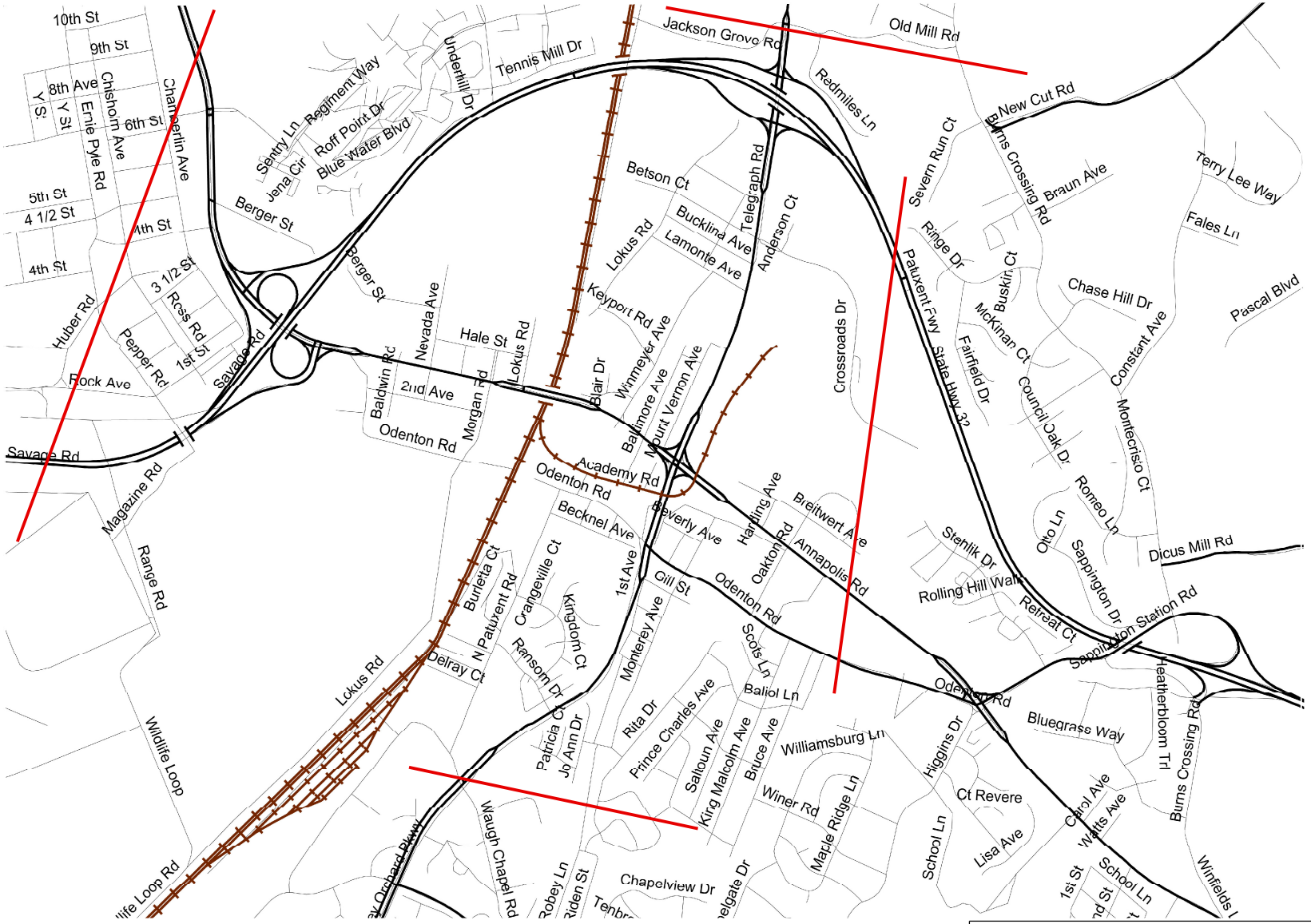


To verify that the model was properly simulating the study area, the base year assignments were validated using the procedures found in the National Cooperative Highway Research Program (NCHRP) Report 365, *Travel Estimation Techniques for Urban Planning*. These procedures use screenlines (i.e., an imaginary line intersecting competing roadways entering the study area) around the study area to compare the simulated volumes to traffic counts collected at the same locations (see Figure 9). The validation year of the SAM2 model is Year 2005; hence, Year 2005 traffic counts were used for validation purposes.

The results of the screenline analysis illustrate that the refined SAM2 model is performing excellent at the screenline level, with differences between simulated and observed traffic ranging from 1% to 2% as shown in Table 5. At the facility level, the refined SAM2 model is assigning traffic within 6% at the freeway level, which is under the 7% threshold recommended by FHWA. The refined SAM2 model simulated major arterials between 5% and 9% of observed volumes, which is under the 10% threshold recommended by FHWA. Regarding minor arterials, the refined SAM2 model simulated Piney Orchard Parkway and MD 175 east of MD 170 within 2% to 11% of observed traffic volumes, which is under the 15% threshold recommended by FHWA. The WB&A Road is simulating just below the FHWA threshold of 25% for minor collectors, but as previously discussed, this can be attributed to the low volume of traffic on this facility; and, given that this facility is at the periphery of the study area, no further modifications were made to the model.

An additional validation was performed using the procedures from NCHRP 255. These procedures compare model assignments against counts at the screenline level, taking into account the facility types crossing the screenline and the overall volume at the screenline. The results of this analysis indicated that all of the screenlines on MD 175 were within the acceptable boundaries.

The NCHRP 255 procedures were also used to post process the raw model assignments. These procedures take the raw model assignments and refine the forecasts based on the differences between simulated volumes and observed counts. The procedures also reassign forecasts in such a manner as to equilibriate the volume-to-capacity ratios of the facilities crossing a particular screenline, which approximates the conditions in the field where drivers will seek out less congested paths until equilibrium is reached in the network. The post processed link volumes were then input into an Iterative Proportional Fitting (IPF) routine to develop daily and peak hour turning movement forecasts for the Year 2035.



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ODENTON TOWN CENTER TRANSPORTATION STUDY

SCREENLINE LOCATIONS

SCALE:	DATE:	FIGURE NO.
NONE	MAY 2010	9

Table 5. Summary of Screenline Analysis

Screenline	Observed	Estimated	Difference	FHWA Threshold
East Screenline				
MD 32	39850	38961	2%	7%
MD 175	13150	14609	-11%	15%
Total	53000	53570	-1%	---
West Screenline				
MD 32	50650	53669	-6%	7%
MD 175	27634	25218	9%	10%
Total	78284	78887	-1%	---
North Screenline				
MD 170	24575	25791	-5%	10%
WB&A Rd	4200	3205	24%	25%
Total	28775	28996	-1%	---
South Screenline				
Piney Orchard Pkwy	28779	28235	2%	15%
Total	28779	28235	2%	---

4.2 2035 Traffic Forecasts

After completing the modifications to the centroid connectors, the SAM2 model was run again for Year 2005 and Year 2035. In addition to the Year 2035 No-Build Conditions, the following two Year 2035 build scenarios were modeled:

1. Southern Bridge Crossing – Lamonte Avenue Extension (P3). The Lamonte Avenue Extension scenario involved extending Lamonte Avenue from west of MD 170 over the CSX railroad line to the proposed intersection of Odenton Avenue at Odenton Town Center Boulevard.

2. Southern Bridge Crossing – Morgan Road Extension (P2). The Morgan Road Extension scenario included a bridge over the existing CSX railroad line that would effectively provide a roadway network link parallel to MD 175 between the proposed Odenton Town Center Road and Piney Orchard Parkway along the existing Baltimore Gas and Electric right-of-way to tie into Piney Orchard Parkway south of Odenton Road.

With the exception of Odenton Town Center Boulevard and Odenton Avenue, which were coded as minor arterials, the additional roadway network links were coded as major collectors for modeling purposes.

A review of the transit access links in the SAM2 model indicated that the drive to transit and walk to transit access links were reasonable for the area type around Odenton Town Center. Also, the county transit routes (CMRT) were confirmed for accuracy in route location and headways. See Section 3.2 for additional information on transit facilities.

The results of the future year analysis indicate that extending Morgan Road would divert a significant amount of traffic away from the intersection of MD 170 at MD 175, which is currently a bottleneck entering the Odenton Town Center area. The Morgan Road extension also redistributes demand to roadways such as Nevada Avenue, Town Center Boulevard, and Baldwin Road south of MD 175. The Lamonte Avenue extension also reduces demand on MD 175, primarily because this extension would effectively provide access to the Odenton Town Center via MD 32 and MD 170, which diverts demand away from the interchange of MD 175 at MD 32, reducing the forecast demand on MD 175 within the study area.

A comparison between the Odenton Town Center forecasts and SHA MD 175 planning study forecasts indicated that the Odenton Town Center forecasts were consistent with the original SHA forecasts, but significantly lower than the revised BRAC forecasts developed by SHA. However, the demographics for BRAC have been revised since the SHA study; and, hence, the most recent and accurate BRAC forecasts are included in the Odenton Town Center study. Moreover, the peak hour forecasts are generally consistent between both studies; and, this is the most important objective for traffic analysis and design purposes.

Figure 10 shows a comparison of existing and future no-build volumes, and Figure 11 shows a comparison of future no-build and build conditions. See Appendix C for the Year 2035 traffic forecasts.

4.3 2035 Land-Use Development

4.3.1 Land-Use Zoning

The seven sub-areas, which serve as regulatory zoning districts in the Odenton Town Center, are shown in Figure 12. Each of sub-area has a specific character and purpose within the overall concept as defined below:

1. Core. This is the heart of the OTC. It will be the most intensely developed area with a diverse mix of retail, office, civic, and housing uses combined to create a vibrant live/work community.

2. Village. The Village area of the OTC is the historic center of the community.

Figure 10. Comparison of Existing and Future No-Build Volumes

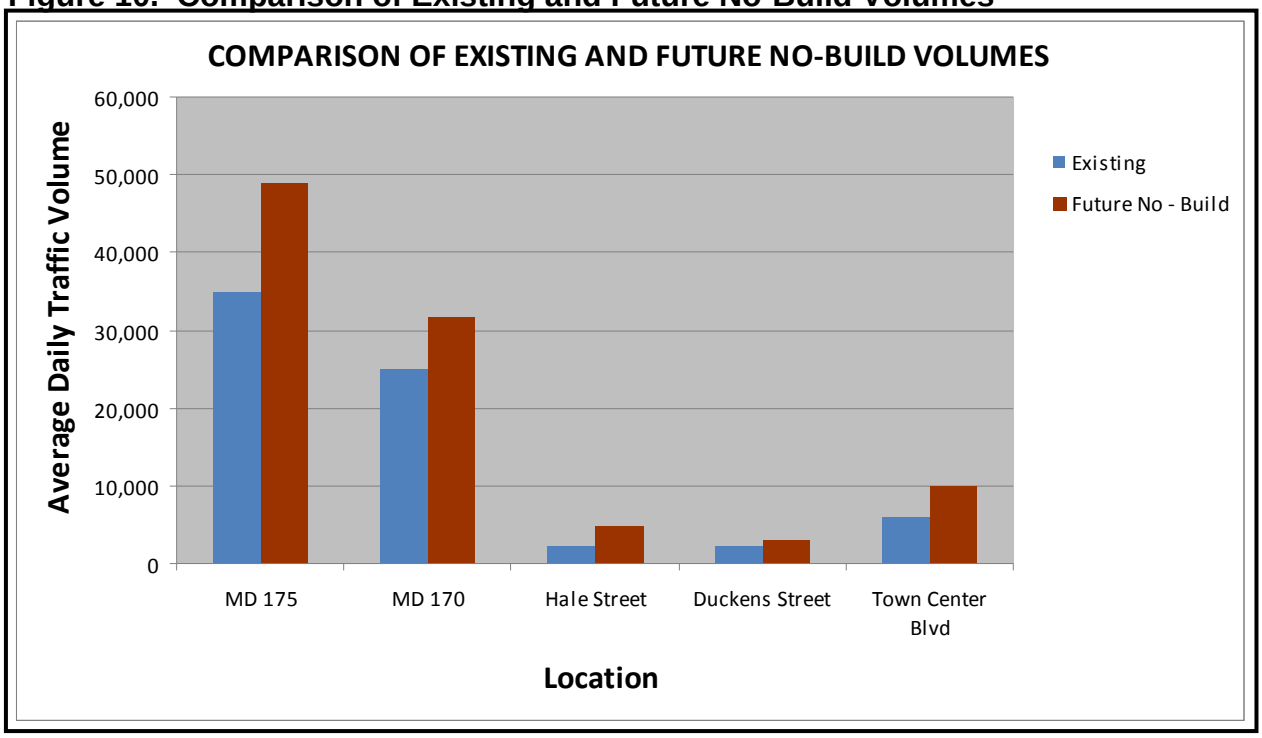
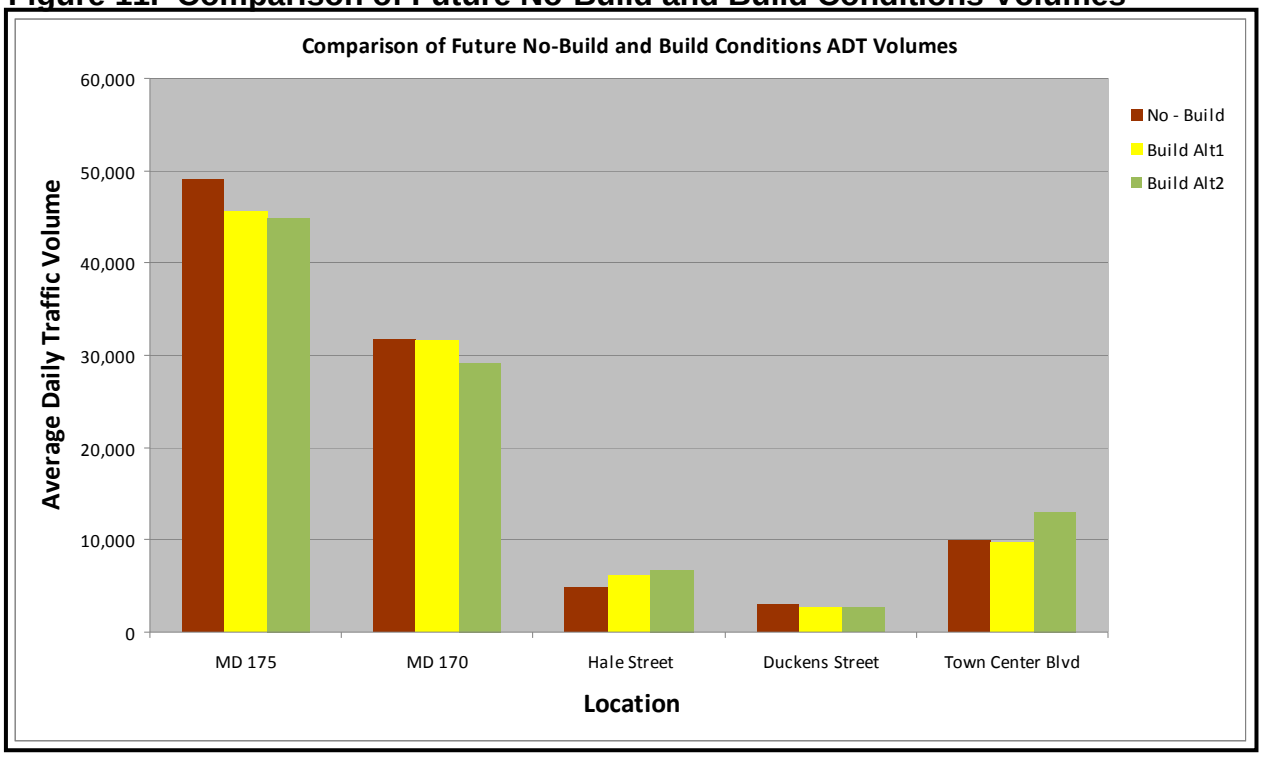


Figure 11. Comparison of Future No-Build and Build Conditions Volumes



Note: Alt1 = Lamonte Avenue Extension and Alt2 = Morgan Road Extension in the above figures.

3. Transition. A mixture of moderate density office, housing and retail is envisioned in this area just north of the Core.

4. Industrial. Large-scale industrial development has already set a pattern in the industrial area to the east of Telegraph Road.

5. East Odenton. This area centers on the commercial corridor along Route 175 to the east of the Core and Village.

6. North Odenton. The MD 175 corridor along the edge of Fort Meade is envisioned to be a business community serving the needs of the local military personnel and their families, the surrounding neighborhoods, and local office development across MD 175 in the Fort Meade area.

7. Fort Meade Development Area. Fort Meade's Master Plan has proposed moderate density office uses in the Fort Meade Development Area.

4.3.2 Land-Use Density

Development intensity in the Odenton Town Center is largely controlled by a combination of building height limitations and the requirements for open area, parking and stormwater management. These have been adjusted to permit a moderate density when combined with the floor-area ratio. A range of maximum floor area ratio limitations has been established for the Odenton Town Center on a block-by-block basis to control development intensity and concentrate density into the core area.

The intent of the floor-area ratio standards is to reward developments that provide multi-story buildings and mixed-use development with structured or shared parking that may be off site. This will help to ensure efficient and compact development on the limited land area, and create a balanced land use mix throughout the Odenton Town Center. Floor-area ratio limitations are also intended to encourage staged development intensification over time. Development intensity is reduced on blocks nearest the Odenton Town Center boundaries to protect adjoining residential communities. Table 6 shows the floor-area ratio limitations for each sub-area in the Odenton Town Center.

4.3.3 Background Developments

As discussed in Sections 4.1 and 4.2, the County's SAM2 model was refined to develop traffic forecasts for existing and Year 2035 based on the demographic data shown in Table 4. Figure 10 shows the results of the model runs comparing existing and future no-build volumes based on the background developments depicted in Figure 13, of which Figure 14 shows the state-owned and county-owned parcels that are slated for

transit-oriented redevelopment at the crossroads of MD 175 and MARC rail line (i.e., #19 in Figure 13). The planned and potential background developments in the pipeline by land-use type considered for the Year 2035 study horizon analyses are as follows:

- Residential – 4,850 Dwelling Units
- Retail – 250,000 Sq Ft
- Office – 750,000 Sq Ft
- Hotel – 400 Rooms
- Warehouse – 80,000 Sq Ft
- Institutional – 12,500 Sq Ft

This study holds constant the land-use type and density, as described, and develops transportation alternatives to enhance mobility that will accommodate the travel needs of these developments as planned for the Odenton Town Center.

4.4 2035 Transportation Improvements

4.4.1 2035 Master Planned Roadways

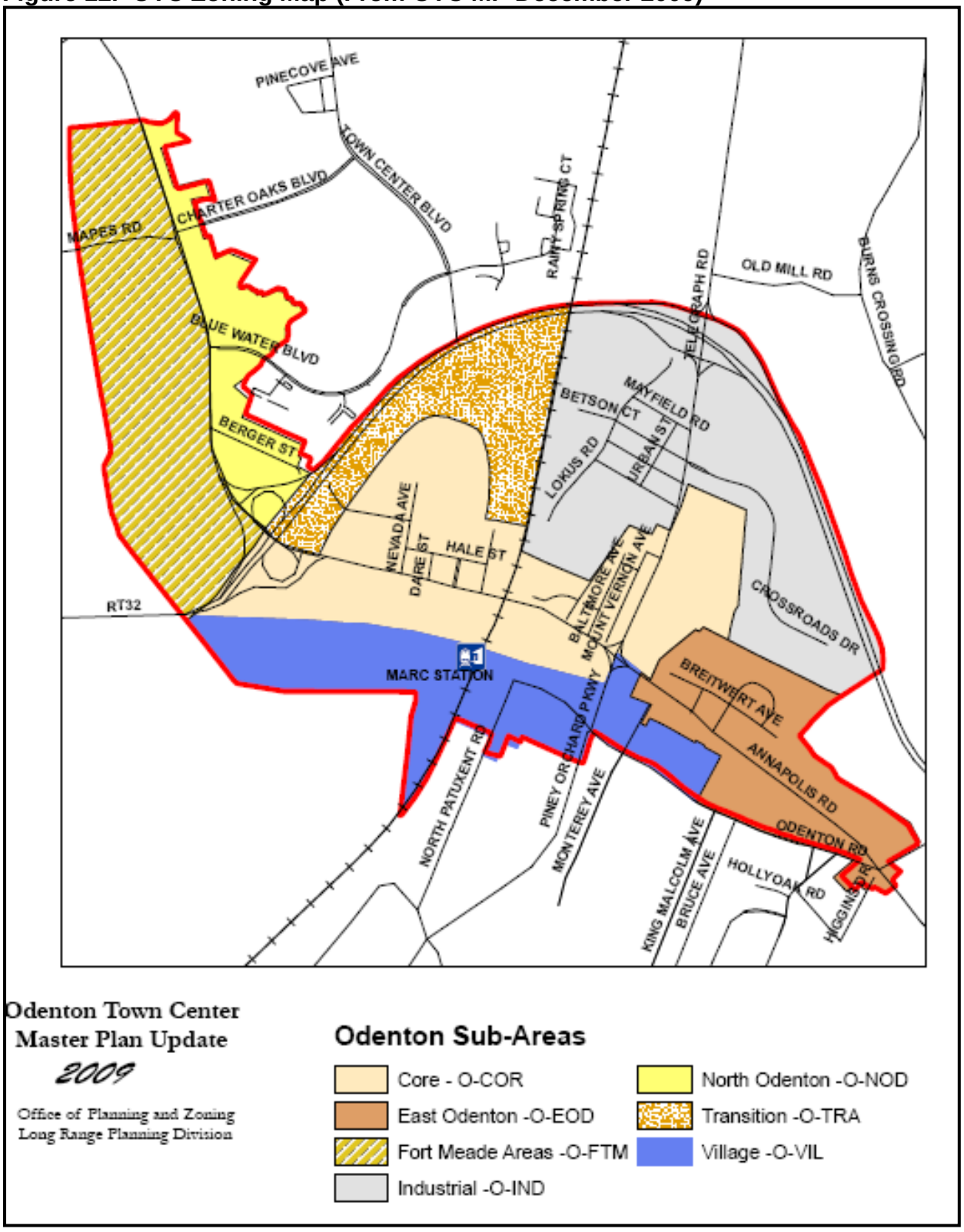
The Odenton Town Center Master Plan December 2009 defines the planned road network and identifies other transportation improvements for potential expansion and/or construction in the Odenton Town Center. These include the extension of some existing roads (e.g., Hale Street, Morgan Road), as well as some new road alignments, such as Town Center Boulevard and Odenton Avenue (see Figure 15):

1. Town Center Boulevard (Urban Arterial). The completion of Town Center Boulevard from Hale Street, under MD 32, to Blue Water Boulevard has right-of-way reserved and is currently under design. It is an important north south urban arterial that parallels with MD 170 connecting the Odenton Town Center to points north across MD 32. Town Center Boulevard is being designed and budgeted for construction utilizing public/private funding.

2. Odenton Avenue (Urban Arterial). Odenton Avenue is a new alignment connecting MD 175 at its signalized intersection with the MD 32 EB ramp to the extension of Town Center Boulevard to the north. This facility will provide needed circulation to points west of the Town Center between MD 175 and Town Center Boulevard. A portion of the land has already been set aside for the required right-of-way; however, this project has not yet been funded. A combination of state, county and private funds is anticipated for this project.

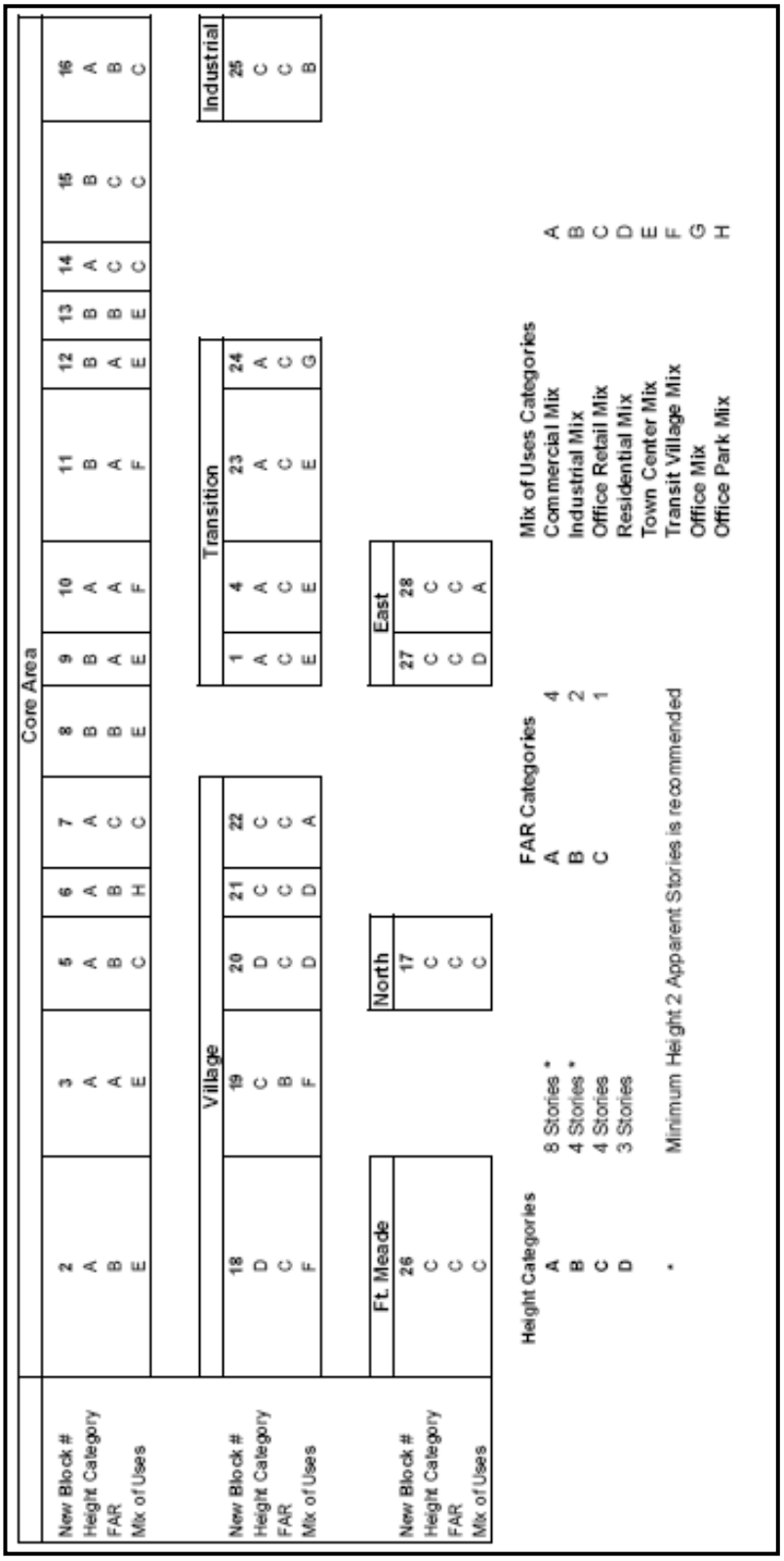
3. MD 170 North of MD 175. It is anticipated that the existing four-lane cross section along MD 170 north or MD 175 will be extended to Lamonte Avenue.

Figure 12. OTC Zoning Map (From OTC MP December 2009)



Source: Odenton Town Center Master Plan (December 2009)

Table 6. Summary of Development FAR by Sub-Areas



Source: Odenton Town Center Master Plan (December 2009)

Figure 13. Odenton Town Center Background Development Locations

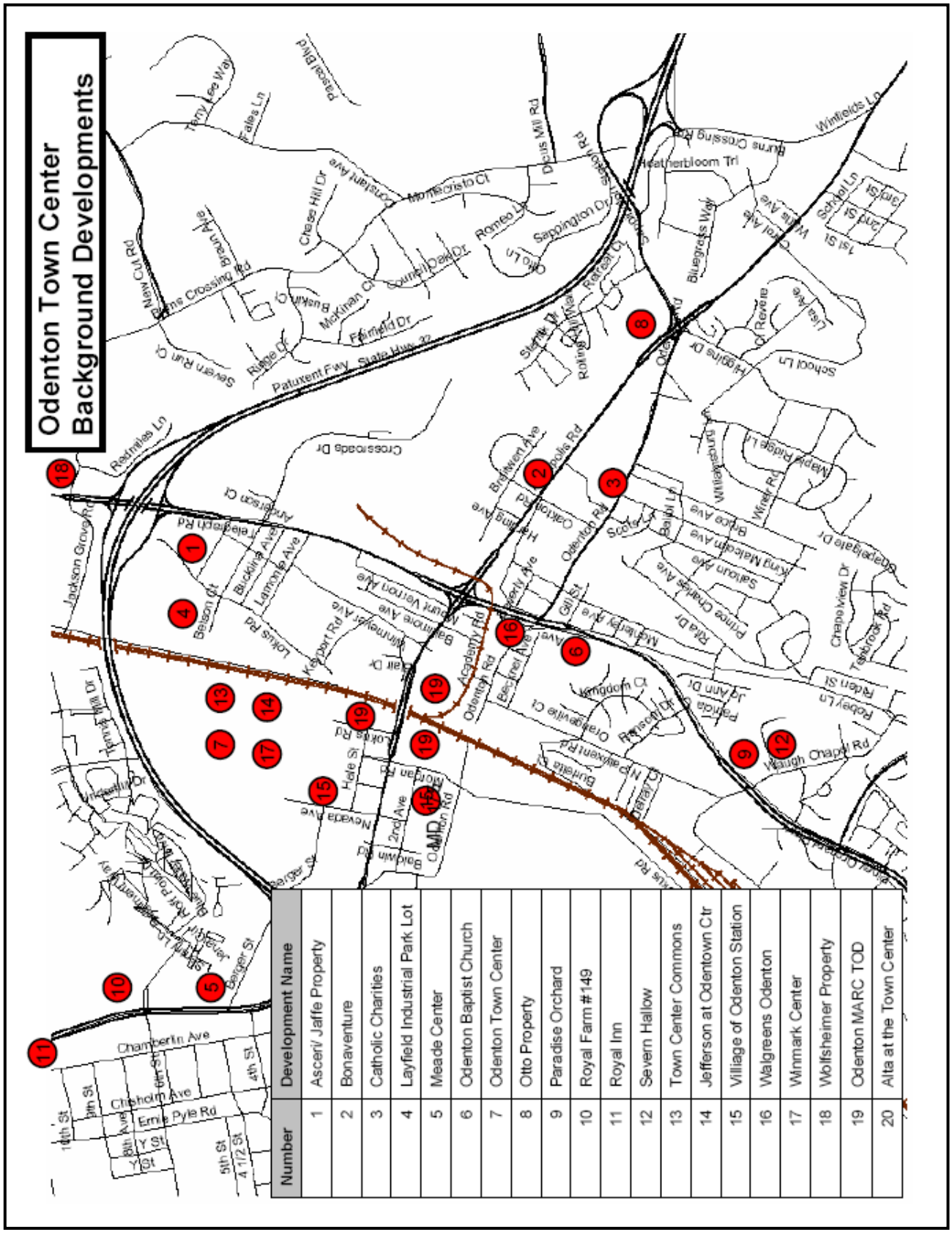


Figure 14. Odenton MARC TOD Site and County-Owned Parcels

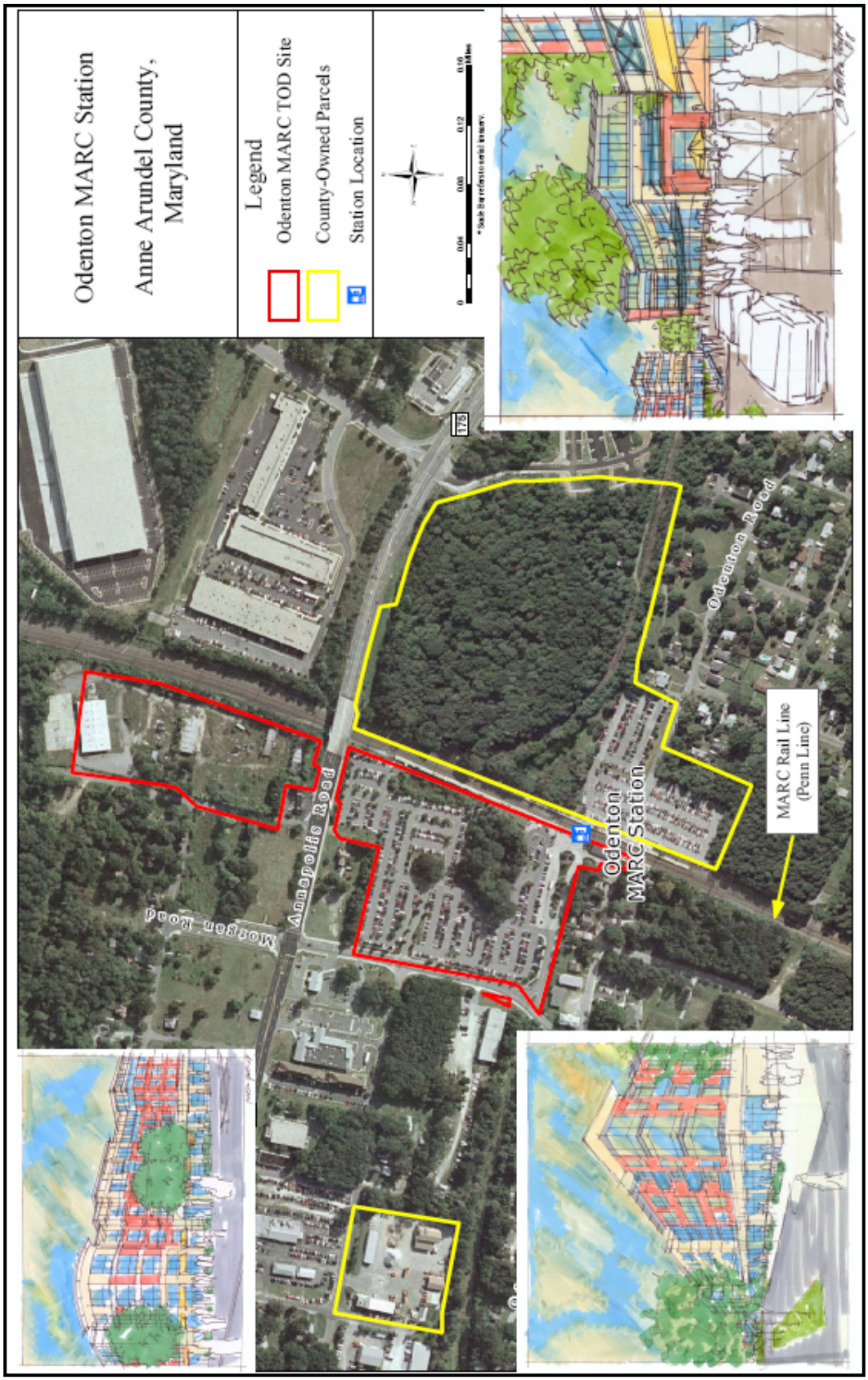
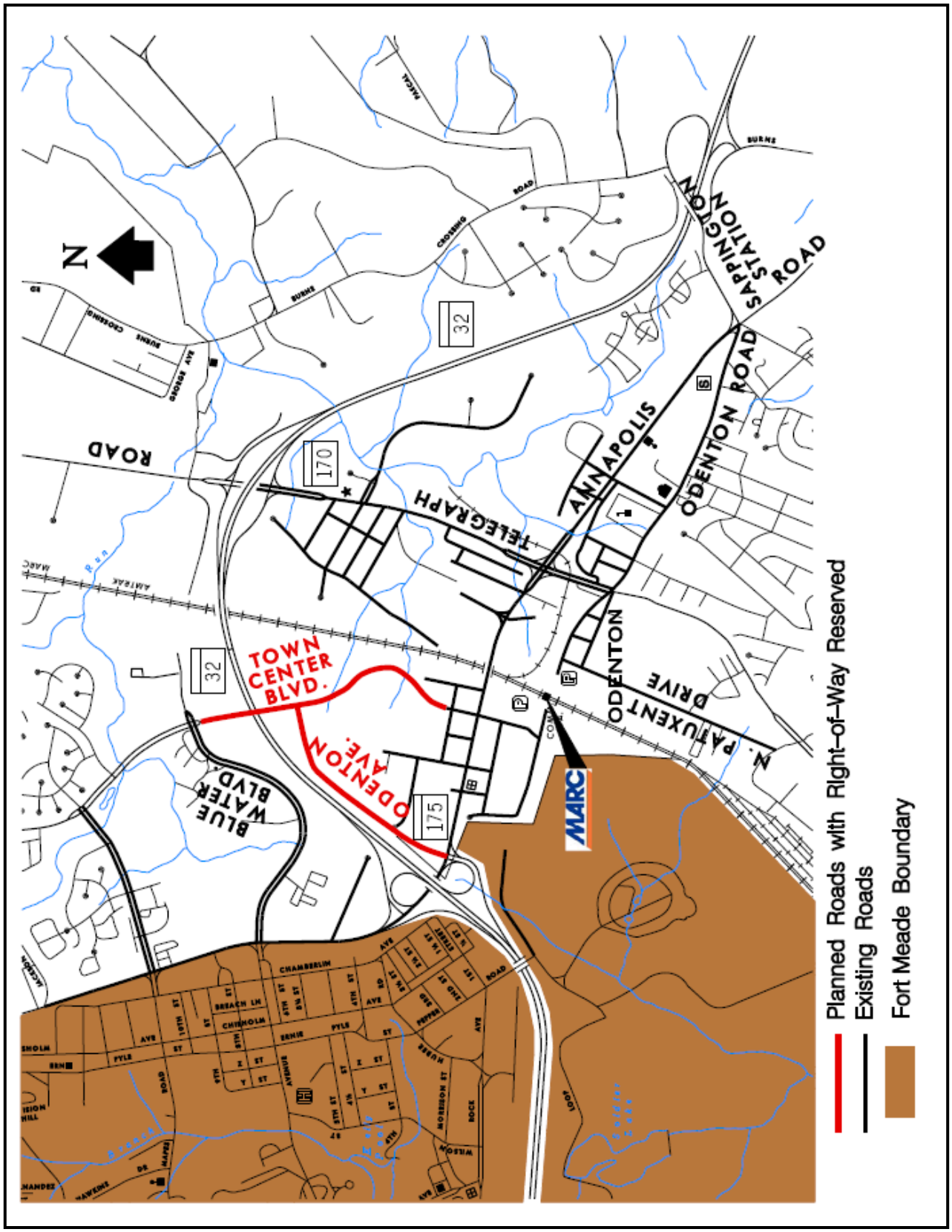


Figure 15. Odenton Town Center Master Planned Roadways



4.4.2 2035 SHA Improvements for MD 175

The MD 175 EA Study Preferred Alternative proposes an Enhanced Transportation Systems Management (TSM) Option in the Odenton Town Center area, which includes no additional through lanes (see Figure 16 and Figure 17). The existing typical sections are a four-lane closed section roadway from MD 32 to Town Center Boulevard/Morgan Road and a five-lane closed section roadway with center turn lane from Town Center Boulevard/Morgan Road to MD 170. Proposed improvements to MD 175 would include resurfacing and roadway widening on the north side between Nevada Avenue and Town Center Boulevard to provide additional turn lanes. A six-foot concrete median would be constructed along MD 175 from Nevada Avenue to Town Center Boulevard/Morgan Road to accommodate pedestrian movements at the intersections, as well as to prohibit left turns onto Dare Street. The proposed alternative would also add a five-foot sidewalk on the north side of the roadway and an eight-foot hiker/biker trail on the south side of the roadway.

4.5 2035 Alternatives Analysis

4.5.1 Alternatives Development

As discussed in Section 2.3, previous studies conducted by the Transportation Division of the County Office of Planning & Zoning (e.g., MD 175 Phase I, 2005, MD 175 Phase II, 2009) and the Environmental Assessment for MD 175 from the Baltimore-Washington Parkway (MD 295) to Telegraph Road (MD 170) by SHA have identified unacceptable traffic operations along MD 175 from MD 32 to MD 170. The principal locations of substantial delay are at the intersections of MD 175 with Morgan Road/Town Center Boulevard and MD 170/Piney Orchard Parkway. To address this congestion problem, to enhance mobility in and around Odenton Town Center, and to better refine transportation improvement priorities, the County has requested this study – *Transportation Study for the Odenton Town Center Master Plan*. Of particular concern is the forecast delay at the intersection of MD 175 at MD 170/Piney Orchard Parkway, which serves as a gateway to the Town Center and a major highway connection to MD 32, the Odenton MARC Rail Station, and Fort Meade.

Specifically, this study attempts to develop alternatives with an integrated, comprehensive, systems-level, multi-modal focus and is sensitive to limited capital budgets. The study assesses 2035 No-Build conditions and evaluates various alternatives, including Transportation Systems Management (TSM) options (lane configurations, parking restrictions, one-way vs. two-way, new signals, roadway extensions to complete grid), potential at-grade improvements to the intersection of MD 175 and MD 170, Transportation Demand Management (TDM) (e.g., pedestrian facilities, bicycle facilities, transit service, parking management), and two new locations for crossing the AMTRAK/Penn Line via a bridge structure. In the Odenton Town Center Master Plan December 2009, the two new crossings are identified as Urban Boulevards labeled P2 (southern bridge crossing – Morgan Road Extension – south of MD 175 along an existing Baltimore Gas and Electric R/W) and P3 (northern bridge crossing – Lamonte Avenue extension – north of MD 175), as shown in Figure 18.

Figure 16. MD 175 SHA Improvements Near OTC – Plan

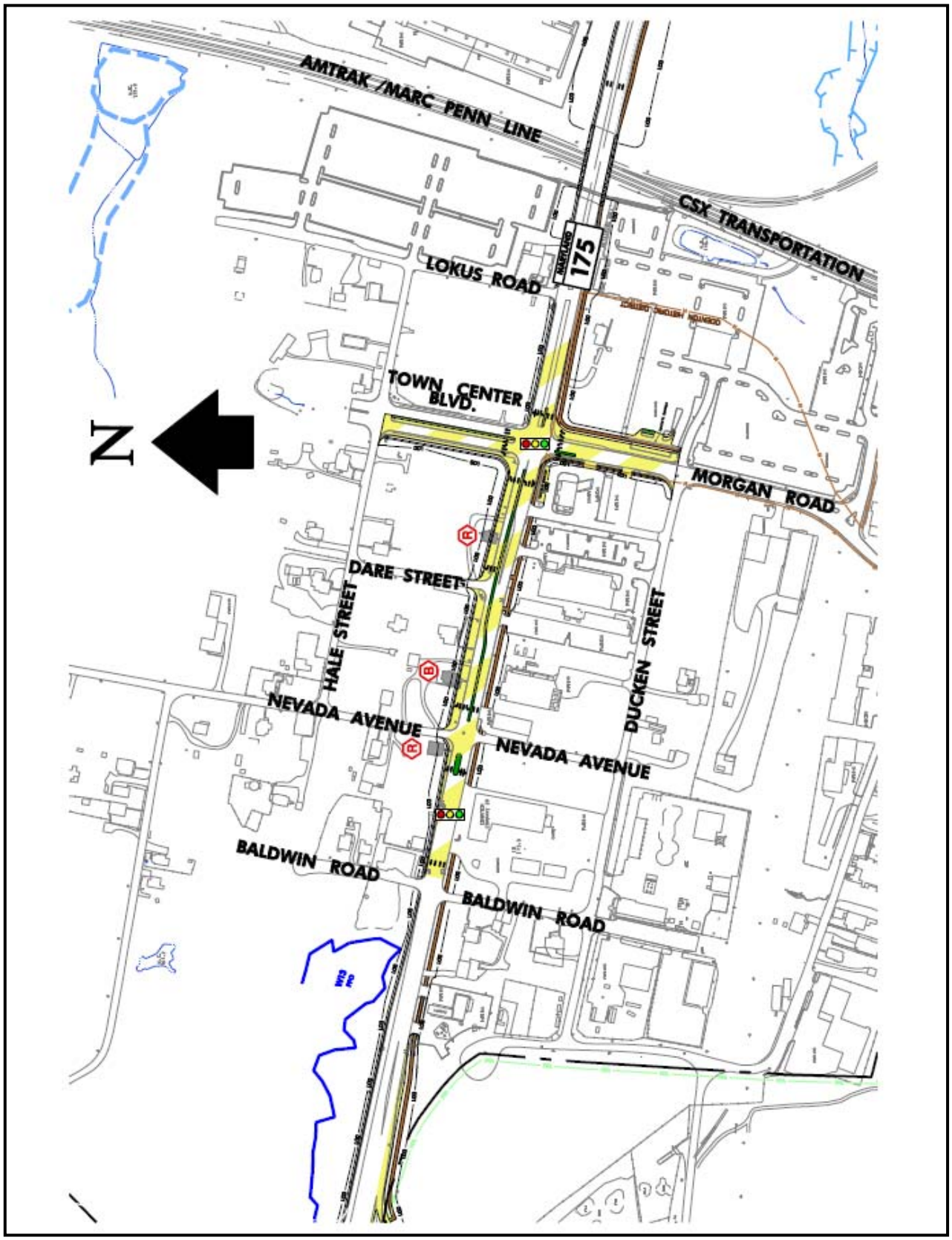


Figure 17. MD 175 SHA Improvements Near OTC – Typical Sections

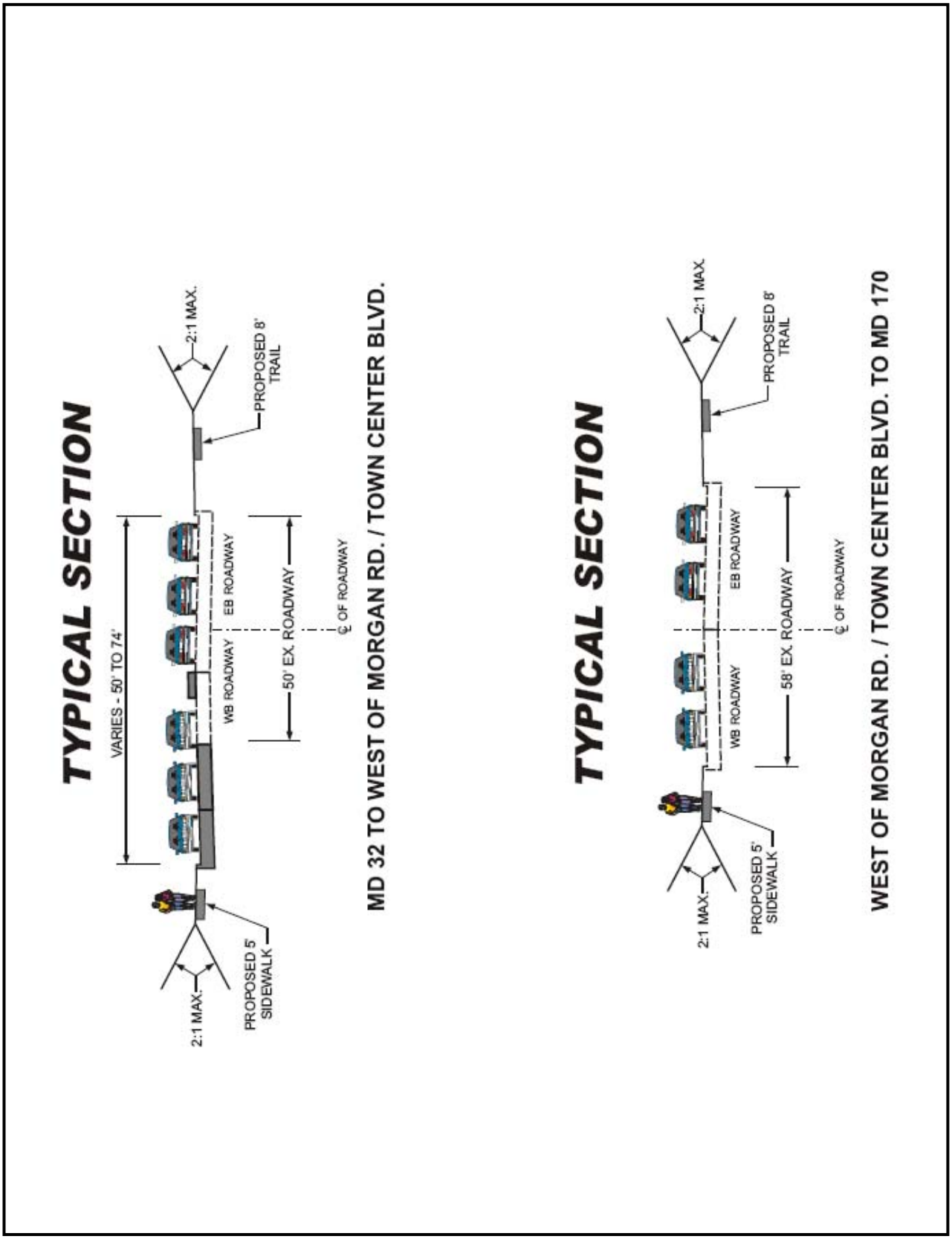
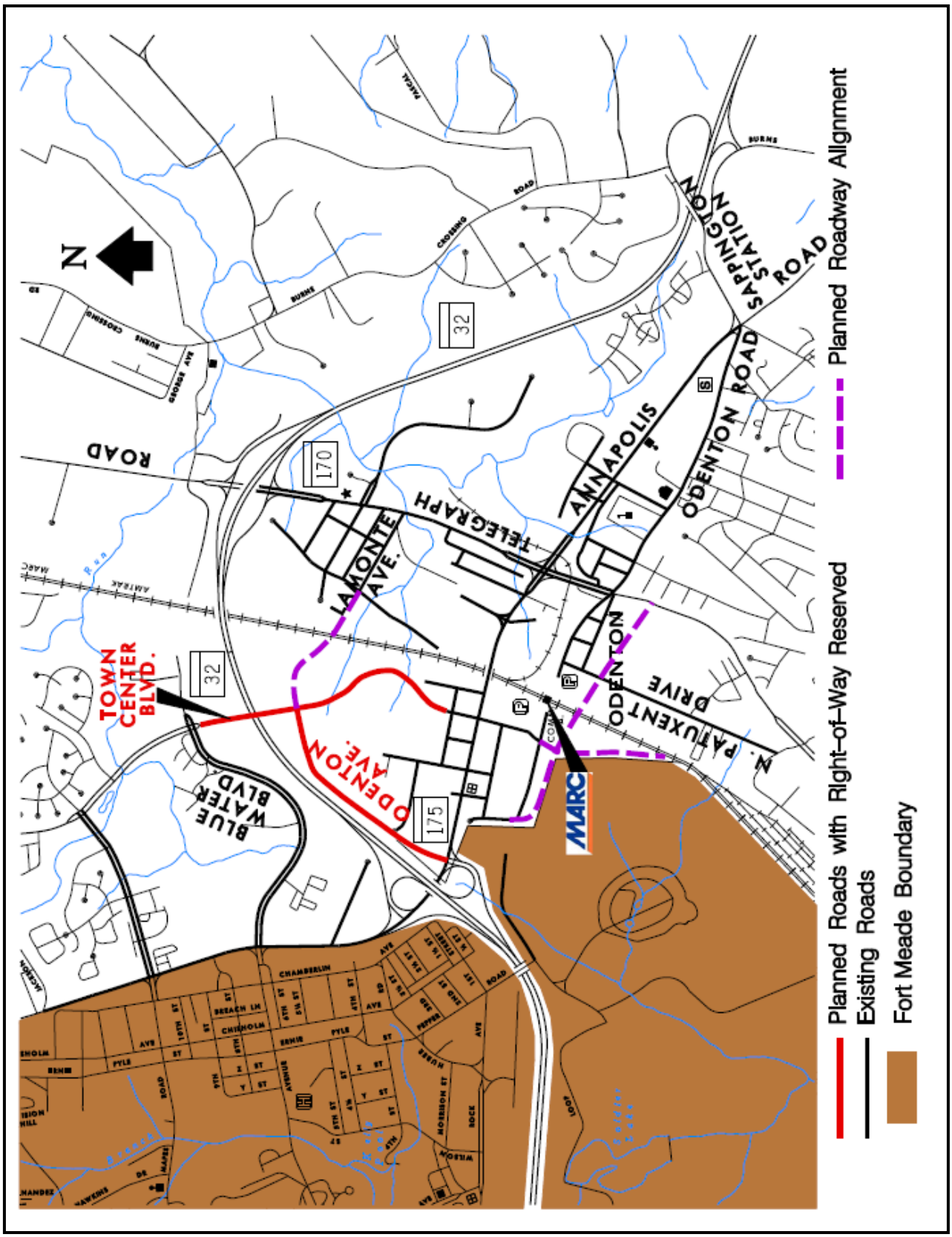


Figure 18. Odenton Town Center Alternative Roadway Alignments



4.5.2 No-Build Conditions

Intersection capacity analyses were performed using the *Highway Capacity Manual 2000 (HCM)* methodology for all study intersections. Measures of effectiveness included level of service (LOS), average control delay, and volume-to-capacity ratio. LOS, as defined by the HCM, is a "qualitative measure describing operational conditions within a traffic stream." LOS ranges from A to F, where A represents optimal conditions and F represents saturated or failing conditions. The v/c, or volume-to-capacity ratio, is the ratio of the current flow rate to capacity, and is used to assess the sufficiency of a roadway facility, such as an intersection. A v/c ratio of 1.0 indicates that the facility is operating at capacity, and a v/c ratio greater than 1.0 indicates that the roadway facility is failing (i.e., the number of vehicles exceeds the facility's capacity). Figure 19 shows the lane configuration, traffic control and AM and PM commuter peak-hour traffic volumes used to assess 2035 no-build conditions. Table 7 and Figure 20 summarizes the results of the analysis.

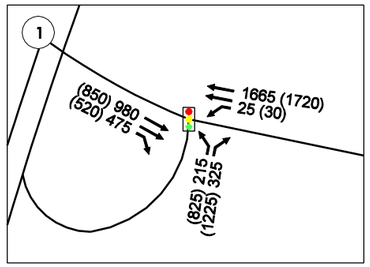
Table 7. 2035 No-Build – Summary of Capacity Analysis – AM (PM)

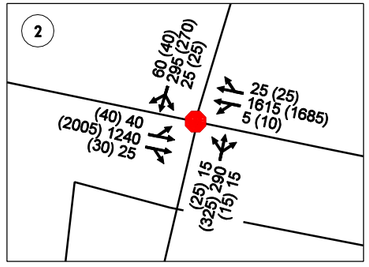
Intersection	Level of Service	Average Control Delay (sec/veh)[2]	Volume to Capacity Ratio[2]
MD 175 @ MD 32 EB Off – Ramp	B (D)	10.8 (43.8)	0.69 (1.08)
MD 175 @ Baldwin Rd[1]	**F (F)**	>500.0 (>500.0)	>2.0 (>2.0)
MD 175 @ Nevada Ave[1]	**F (F)**	>500.0 (>500.0)	>2.0 (>2.0)
MD 175 at Dare St[1]	D (C)	34.6 (16.6)	0.67 (0.16)
MD 175 @ Morgan Rd/Town Center Blvd	C **(F)**	20.4 (241.7)	0.94 (1.83)
MD 175 @ Lokus Rd[1]	- (-)	- (-)	- (-)
MD 175 @ Winmeyer Ave	B (D)	20.0 (37.1)	0.92 (1.01)
MD 175 @ MD 170	**F (F)**	118.3 (212.9)	1.13 (1.56)
MD 170 @ Lamonte Ave[1]	C **(F)**	18.1 (320.8)	0.38 (1.70)
Piney Orchard Pkwy @ Odenton Rd	**F (F)**	142.2 (141.4)	1.13 (1.22)
Hale St @ Baldwin Rd[1]	C (C)	16.5 (15.5)	0.63 (0.60)
Hale St @ Nevada Ave[1]	C (B)	21.1 (14.8)	0.73 (0.58)
Hale St @ Dare St[1]	A (B)	9.3 (11.7)	0.14 (0.45)
Hale St @ Town Center Blvd[1]	**F (F)**	>500.0 (>500.0)	>2.0 (>2.0)
Hale St @ Lokus Rd[1]	B (A)	11.1 (8.4)	0.49 (0.23)
Duckens St @ Baldwin Rd[1]	D (C)	31.3 (20.4)	0.74 (0.60)
Duckens St @ Nevada Ave[1]	A (C)	9.7 (23.3)	0.19 (0.54)
Duckens St @ Morgan Rd[1]	**E (F)**	37.1 (87.4)	0.55 (0.94)
Odenton Rd @ Morgan Dr[1]	D **(F)**	25.2 (454.9)	0.61 (1.82)

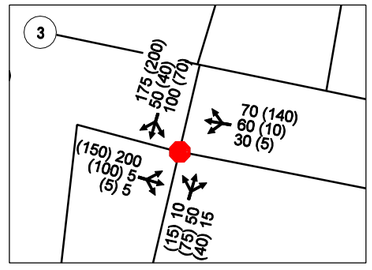
Notes:
(1) Stop-controlled Intersection. Measure of effectiveness reported for critical movement only.
(2) Values may slightly differ based on the version of Synchro/SimTraffic used.

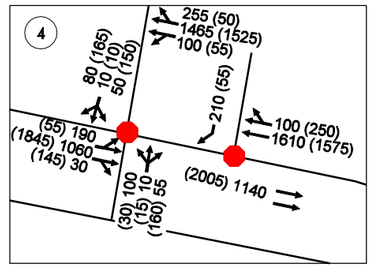
Over existing conditions as discussed in Section 3.7, the analysis shows that the following additional intersections are expected to fail by 2035 without implementation of any of the aforementioned alternatives:

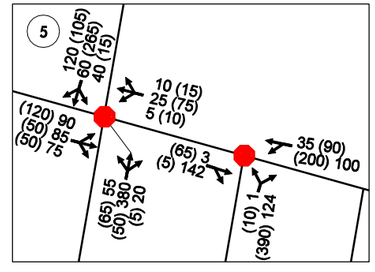
- MD 175 @ Morgan Rd/Town Center Blvd (from LOS C to F in PM);
- MD 175 @ MD 170 (from LOS D to F in AM);
- Piney Orchard Pkwy @ Odenton Rd (from LOS E(D) to F(F) in AM(PM));
- Hale St @ Town Center Blvd (from LOS B(A) to F(F) in AM(PM));
- Duckens St @ Morgan Rd (from LOS C(B) to E(F) in AM(PM)); and
- Odenton Rd at Morgan Rd (expected LOS F in PM).

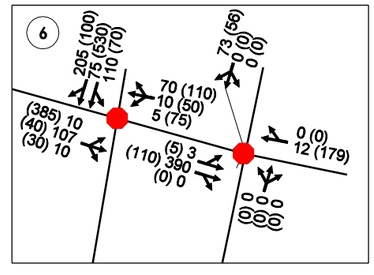


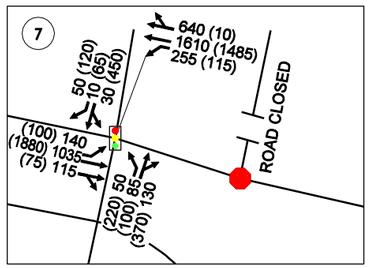


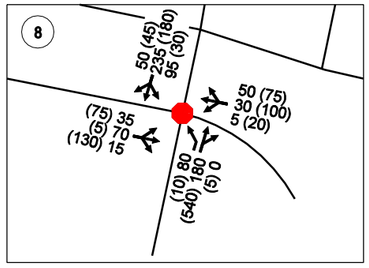


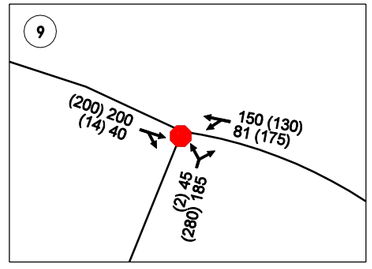


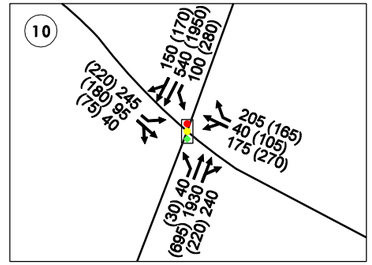


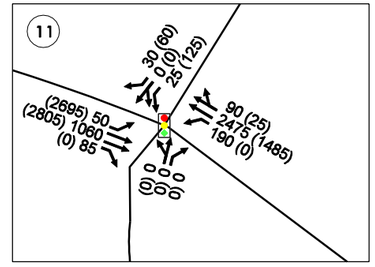


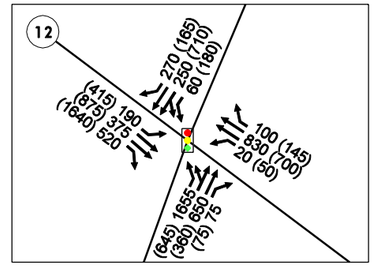


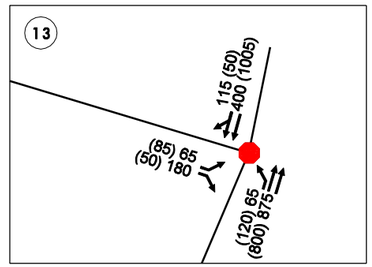


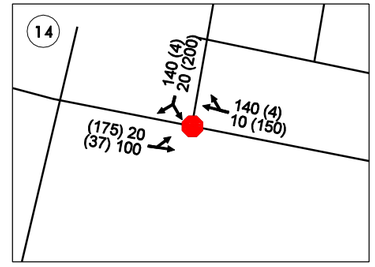


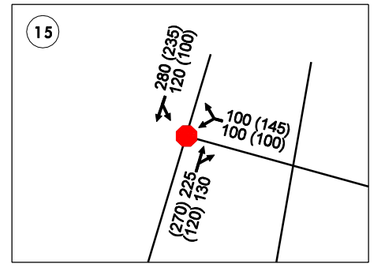


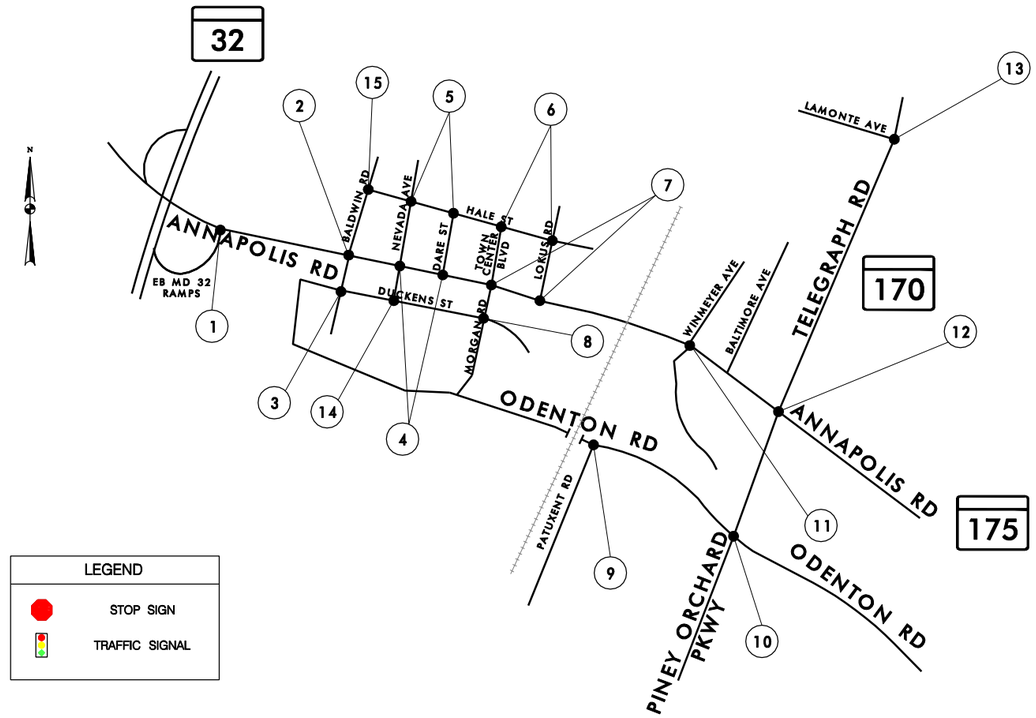












LEGEND

- STOP SIGN
- TRAFFIC SIGNAL

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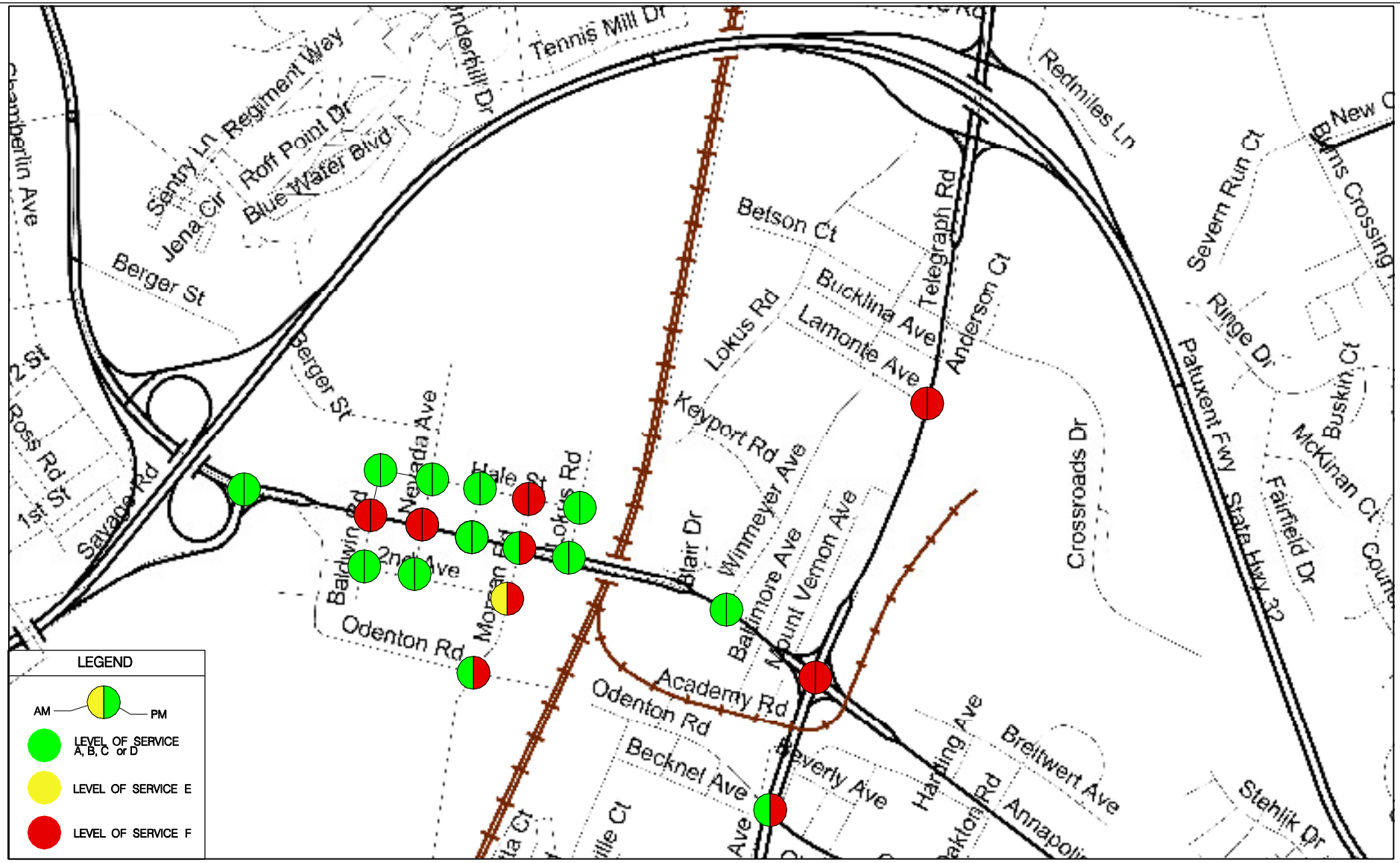
2035 NO-BUILD - LANES, TRAFFIC CONTROL AND PEAK HOUR VOLUMES-AM (PM)

SCALE:	DATE:	FIGURE NO.
NONE	MAY 2010	19



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2035 No-Build Conditions Level of Service

SCALE:	DATE:	FIGURE NO.
NONE	MAY 2010	20

4.5.3 Transportation System Management (TSM) Alternatives

4.5.3.1 Typical TSM Measures

Transportation system management (TSM) options generally consider non-capital intensive measures such as lane configuration changes, parking restrictions, left-turn restrictions, new signalized intersections, roadway extensions to complete a grid network, and changing roadways within the grid system from two-way to one-way directional pairs. The TSM options developed and analyzed included various combinations of two-way and one-way roadways within the OTC grid network. Consider the following advantages and disadvantages with respect to one-way and two-way grid systems:

- A one-way couplet system in the OTC core could potentially relieve traffic demand on MD 175.
- Current best practice in both transportation and land use planning is to maximize the use of a grid street network over one-way circulation or cul-de-sac design.
- One-way streets maximize traffic flow and progression, which is typically a goal for an arterial or downtown street rather than a residential street.
- One-way streets may create additional travel to reach destination, and additional turning volumes and intersections.
- Two-way streets may conform more closely with expectations of drivers, pedestrian and bicyclists.
- Two-way streets provide most direct access to adjacent land uses.

In addition, stop control, converting stop control to signalized intersections, and coordination of traffic signals are considered appropriate for TSM alternatives. Although the TSM alternatives developed and analyzed consider such traffic controls, roundabouts were not considered for the OTC grid network due to right-of-way constraints, pedestrian access requirements, number of circulating lanes required, and the need to move traffic quickly across the grid network, especially when prioritizing the east-west movements parallel to MD 175. For example, the hourly entering volumes for most OTC grid intersections within the core (e.g., Town Center Blvd. at Hale St.) exceed 1100 vehicles, which requires a roundabout with 2 circular lanes and approximately 150 ft in diameter – which is impractical within the OTC core. Other TSM measures that were considered include parking restrictions during peak hours and left-turn restrictions at key intersections. In addition, all TSM alternatives analyzed included the extension of Dare Street to Berger Street, the extension of Berger Street to Town Center Boulevard, and the upgrading of the functional class of Nevada Avenue to OTC Urban Boulevard. Note that the forecasts for all TSM Options considered assume the extension of Town Center Boulevard north to Blue Water Boulevard.

4.5.3.2 TSM Option A

TSM Option A is the most restrictive of the three TSM options considered. In addition to what was discussed in Section 4.5.3.1, the following measures were included in TSM Option A:

1. Left-Turn Restrictions. TSM Option A evaluated the following left-turn restrictions along MD 175:

   - MD 175 at Baldwin Road (all directions),
   - MD 175 at Nevada Avenue (all directions),
   - MD 175 at Dare Street (all directions),
   - MD 175 at Town Center Blvd (all directions), and
   - MD 175 at Lokus Road (all directions).

2. One-Way Streets (Direction). TSM Option A evaluated the following one-way street within the OTC grid network:

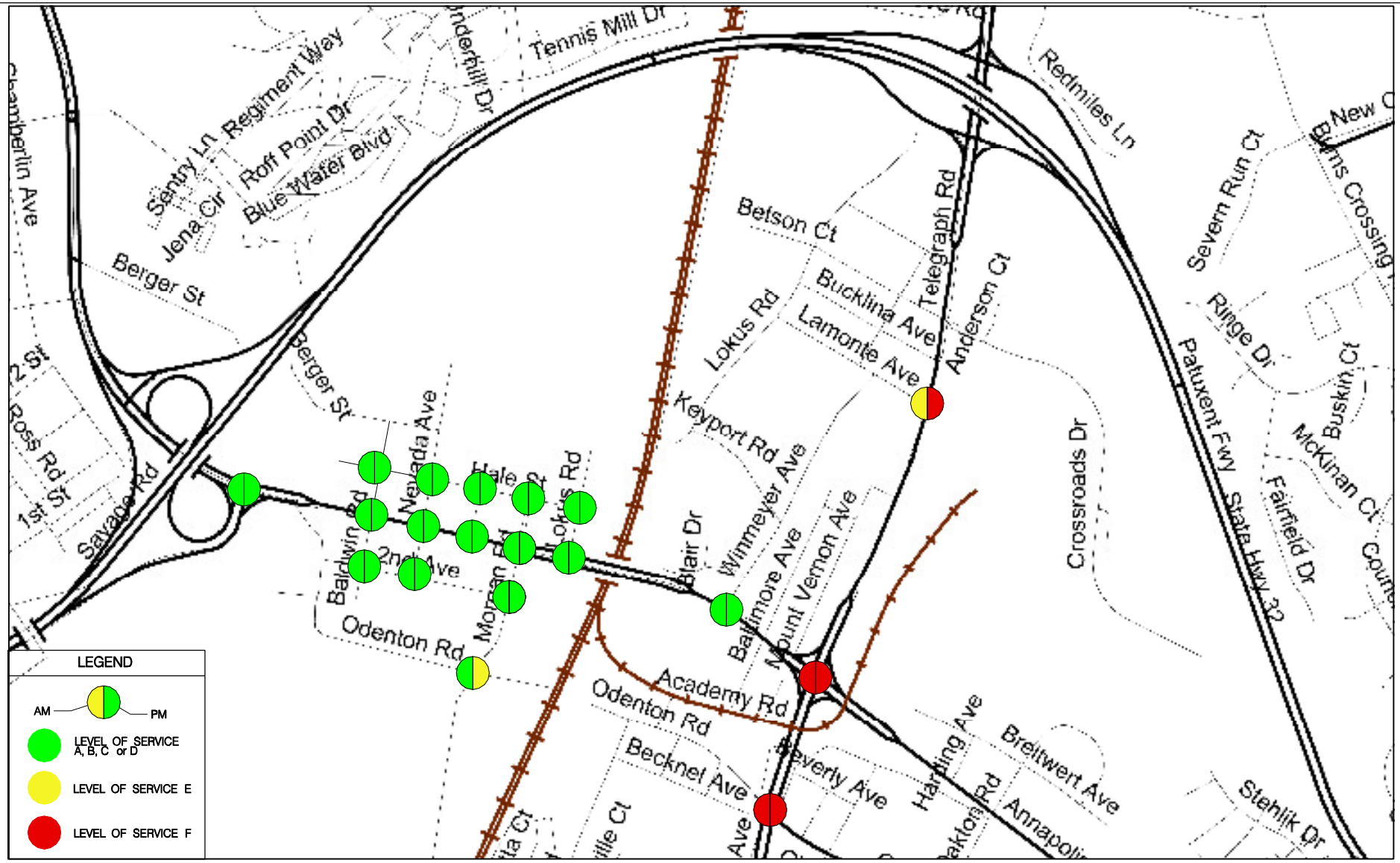
   - Hale Street between Lokus Road and Baldwin Road (WB),
   - Baldwin Road between Hale Street and Duckens Street (SB),
   - Duckens Street between Baldwin Road and Morgan Road (EB), and
   - Lokus Road between Hale Street and MD 175 (NB).

   Note that a consequence of these one-way restrictions is that access to the MARC north parking lot is constrained.

3. New Signalized Intersections. TSM Option A evaluated the following new signalized intersections, which includes two new signals on MD 175:

   - MD 175 at Baldwin Road,
   - MD 175 at Nevada Avenue,
   - Hale Street at Baldwin Road,
   - Hale Street at Nevada Avenue,
   - Hale Street at Town Center Blvd,
   - Duckens Street at Baldwin Road,
   - Duckens Street at Nevada Avenue, and
   - Duckens Street at Morgan Road.

See Appendix H for the lane configurations, traffic control, and AM and PM commuter peak-hour traffic volumes used to analyze Year 2035 TSM Option A. Intersection capacity analyses were performed using the *Highway Capacity Manual 2000 (HCM)* methodology for all study intersections. Table 8 and Figure 21 summarize the results of the analysis.



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2035 TSM Option A - Level of Service

SCALE:	DATE:	FIGURE NO.
NONE	MAY 2010	21

Table 8. 2035 TSM Option A – Summary of Capacity Analysis – AM (PM)

Intersection	Level of Service	Average Control Delay (sec/veh)[3]	Volume to Capacity Ratio[3]
MD 175 @ MD 32 EB Off – Ramp	A (D)	8.8 (53.2)	0.68 (1.11)
MD 175 @ Baldwin Rd[2]	C (C)	21.3 (32.2)	0.79 (0.98)
MD 175 @ Nevada Ave[2]	B (B)	12.2 (14.0)	0.76 (0.88)
MD 175 at Dare St[1]	B (B)	13.1 (11.2)	0.27 (0.16)
MD 175 @ Morgan Rd/Town Center Blvd	B (D)	16.9 (36.0)	0.82 (0.97)
MD 175 @ Lokus Rd[1]	- (-)	- (-)	- (-)
MD 175 @ Winmeyer Ave	B (C)	15.0 (22.7)	0.87 (0.99)
MD 175 @ MD 170	**F (F)**	354.1 (237.7)	1.75 (1.63)
MD 170 @ Lamonte Ave[1]	**E (F)**	35.2 (>500.0)	0.38 (1.70)
Piney Orchard Pkwy @ Odenton Rd	**F (F)**	119.2 (129.0)	1.11 (1.20)
Hale St @ Baldwin Rd[2]	B (B)	11.2 (15.5)	0.40 (0.66)
Hale St @ Nevada Ave[2]	C (D)	25.3 (44.8)	0.69 (0.82)
Hale St @ Dare St[1]	B (C)	13.5 (17.9)	0.01 (0.25)
Hale St @ Town Center Blvd[2]	B (B)	10.3 (12.3)	0.58 (0.61)
Hale St @ Lokus Rd[1]	B (A)	12.4 (8.6)	0.60 (0.17)
Duckens St @ Baldwin Rd[2]	A (B)	8.8 (12.1)	0.55 (0.47)
Duckens St @ Nevada Ave[2]	A (C)	2.4 (23.8)	0.36 (0.73)
Duckens St @ Morgan Rd[2]	B (B)	19.9 (18.5)	0.37 (0.49)
Odenton Rd @ Morgan Dr[1]	D (**E**)	29.7 (45.6)	0.67 (0.76)

Notes:
(1) Stop-controlled Intersection. Measure of effectiveness reported for critical movement only.
(2) New Traffic Signal Control.
(3) Values may slightly differ based on the version of Synchro/SimTraffic used.

4.5.3.3 TSM Option B

TSM Option B is less restrictive and a good balance of the three TSM options considered. In addition to what was discussed in Section 4.5.3.1, the following measures were included in TSM Option B:

1. Left-Turn Restrictions. TSM Option B evaluated the following left-turn restrictions along MD 175:

   - MD 175 at Baldwin Road (all directions),
   - MD 175 at Dare Street (all directions),
   - MD 175 at Town Center Blvd (all directions),
   - MD 175 at Lokus Road (all directions), and
   - MD 175 at Nevada Avenue (east-west directions).

   Note that some left turns could be permitted from MD 175 at Nevada to improve access and circulation. With the PM peak hour controlling under TSM Option B, approximately 130 left-turn vehicles can be additionally accommodated from MD 175 to Nevada Avenue before saturation of the intersection occurred. Note also that the SB through movement along Baldwin Road at MD 175 is restricted in TSM Option B.

2. One-Way Streets (Direction). TSM Option B evaluated the following one-way street within the OTC grid network:

   - Hale Street between Town Center Blvd and Nevada Avenue (WB),
   - Duckens Street between Nevada Avenue and Morgan Road (EB),
   - Lokus Road between Hale Street and MD 175 (NB), and
   - Baldwin Road between Hale Street and Duckens Street (SB).

3. New Signalized Intersections. TSM Option B evaluated the following new signalized intersections, which includes one new signal on MD 175:

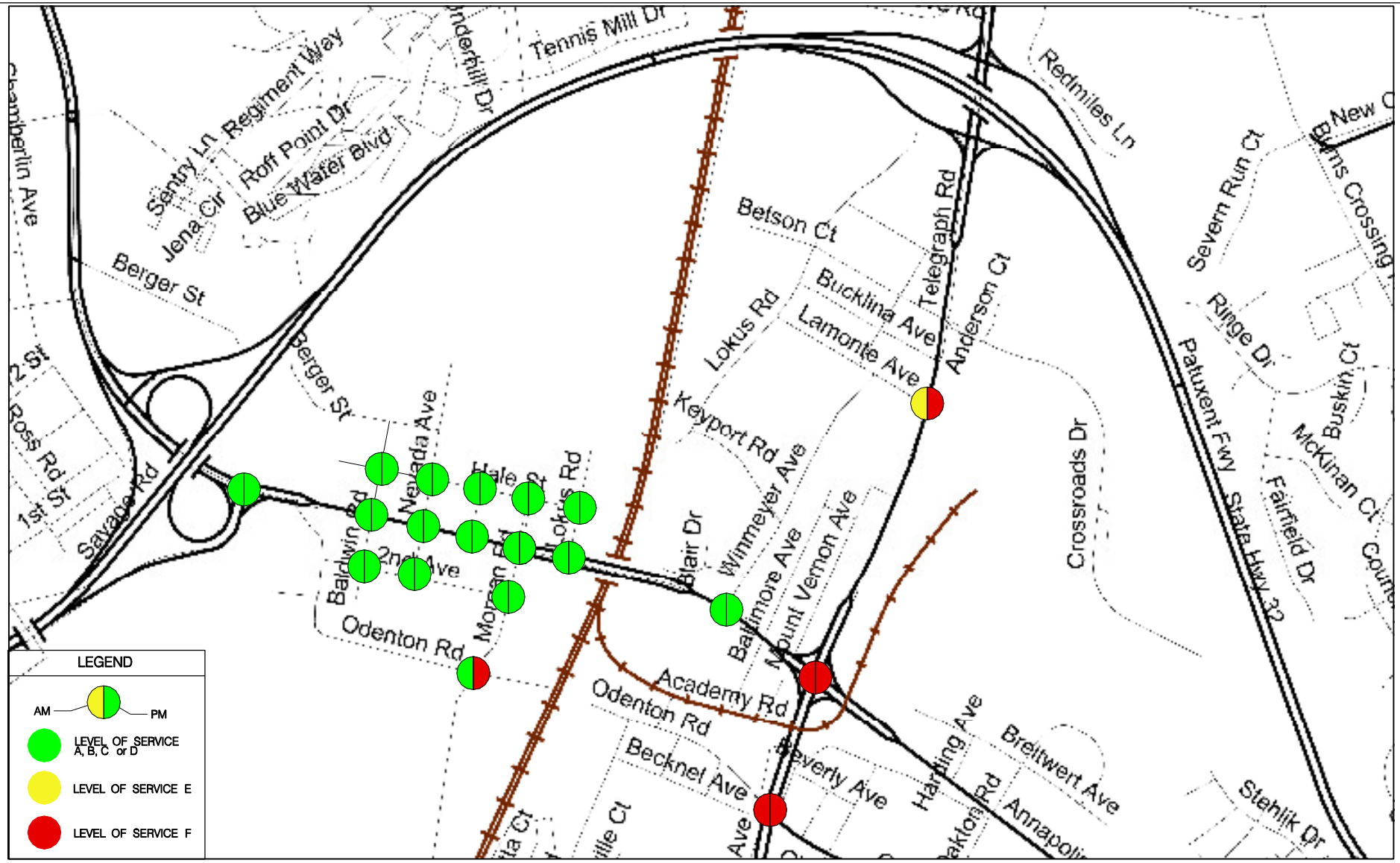
   - MD 175 at Nevada Avenue,
   - Hale Street at Nevada Avenue,
   - Hale Street at Town Center Blvd,
   - Duckens Street at Nevada Avenue,
   - Duckens Street at Morgan Road, and
   - Duckens Street at Baldwin Road.

See Appendix H for the lane configurations, traffic control, and AM and PM commuter peak-hour traffic volumes used to analyze Year 2035 TSM Option B. Intersection capacity analyses were performed using the *Highway Capacity Manual 2000 (HCM)* methodology for all study intersections. Table 9 and Figure 22 summarize the results of the analysis.

Table 9. 2035 TSM Option B – Summary of Capacity Analysis – AM (PM)

Intersection	Level of Service	Average Control Delay (sec/veh)[3]	Volume to Capacity Ratio[3]
MD 175 @ MD 32 EB Off – Ramp	A (D)	9.1 (51.7)	0.68 (1.08)
MD 175 @ Baldwin Rd[1]	B(B)	14.0 (14.0)	0.37 (0.35)
MD 175 @ Nevada Ave[2]	C (D)	29.4 (42.0)	0.84 (1.05)
MD 175 at Dare St[1]	C (C)	17.7 (15.7)	0.28 (0.35)
MD 175 @ Morgan Rd/Town Center Blvd	C (C)	23.9 (33.8)	0.97 (1.01)
MD 175 @ Lokus Rd[1]	-(-)	- (-)	- (-)
MD 175 @ Winmeyer Ave	B (C)	13.8 (30.2)	0.87 (0.99)
MD 175 @ MD 170	**F (F)**	353.4 (237.3)	1.75 (1.63)
MD 170 @ Lamonte Ave[1]	**E (F)**	35.2 (>500.0)	0.38 (1.70)
Piney Orchard Pkwy @ Odenton Rd	**F (F)**	119.2 (129.0)	1.11 (1.20)
Hale St @ Baldwin Rd[1]	C (C)	19.1 (24.0)	0.71 (0.81)
Hale St @ Nevada Ave[2]	B (C)	14.0 (22.5)	0.52 (0.60)
Hale St @ Dare St[1]	C (D)	16.9 (26.3)	0.23 (0.30)
Hale St @ Town Center Blvd[2]	B (C)	10.3 (21.9)	0.54 (0.79)
Hale St @ Lokus Rd[1]	A (A)	9.0 (9.3)	0.23 (0.26)
Duckens St @ Baldwin Rd[2]	C (B)	24.3 (12.5)	0.51 (0.61)
Duckens St @ Nevada Ave[2]	A (B)	9.1 (11.4)	0.49 (0.54)
Duckens St @ Morgan Rd[2]	B (B)	15.5 (16.2)	0.36 (0.46)
Odenton Rd @ Morgan Dr[1]	C (**F**)	21.5 (85.2)	0.29 (0.58)

Notes:
(1) Stop-controlled Intersection. Measure of effectiveness reported for critical movement only.
(2) New Traffic Signal Control.
(3) Values may slightly differ based on the version of Synchro/SimTraffic used.



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2035 TSM Option B - Level of Service

SCALE:	DATE:	FIGURE NO.
NONE	MAY 2010	22

4.5.3.4 TSM Option C

TSM Option C is the least restrictive the three TSM options considered. In addition to what was discussed in Section 4.5.3.1, the following measures were included in TSM Option C:

1. Left-Turn Restrictions. TSM Option C evaluated the following left-turn restrictions along MD 175:

   - MD 175 at Baldwin Road (all directions),
   - MD 175 at Nevada Avenue (east-west directions),
   - MD 175 at Dare Street (all directions),
   - MD 175 at Town Center Blvd (all directions), and
   - MD 175 at Lokus Road (all directions).

   Note also that the NB and SB through movements along Baldwin Road at MD 175 are restricted in TSM Option C.

2. One-Way Streets (Direction). TSM Option C evaluated the following one-way street within the OTC grid network:

   - Lokus Road between Hale Street and MD 175 (NB).

3. New Signalized Intersections. TSM Option A evaluated the following new signalized intersections, which includes one new signal on MD 175:

   - MD 175 at Nevada Avenue,
   - Hale Street at Nevada Avenue,
   - Hale Street at Town Center Blvd,
   - Duckens Street at Nevada Avenue,
   - Duckens Street at Morgan Road, and
   - Duckens Street at Baldwin Road.

See Appendix H for the lane configurations, traffic control, and AM and PM commuter peak-hour traffic volumes used to analyze Year 2035 TSM Option C. Intersection capacity analyses were performed using the *Highway Capacity Manual 2000 (HCM)* methodology for all study intersections. Table 10 and Figure 23 summarize the results of the analysis.

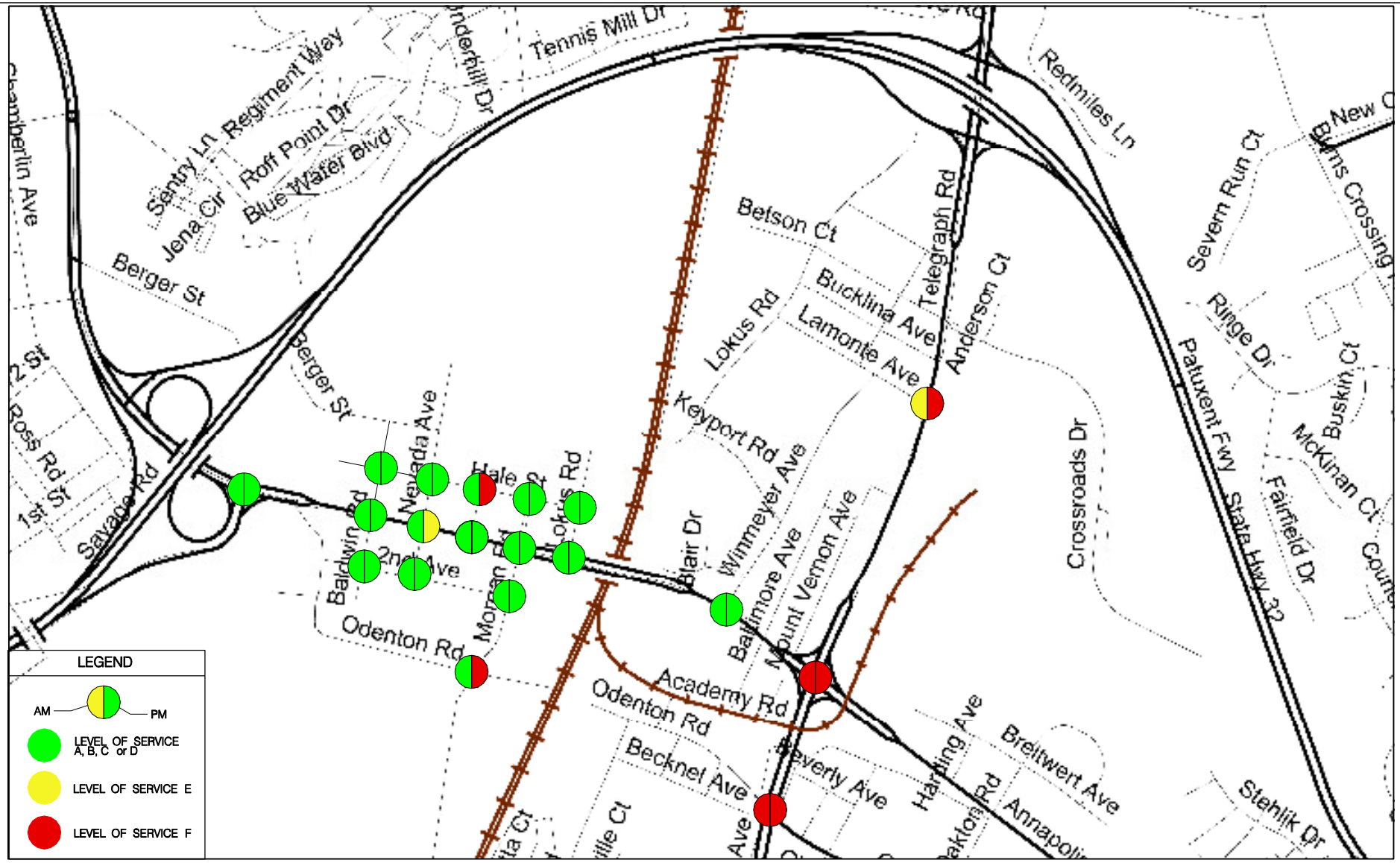
Table 10. 2035 TSM Option C – Summary of Capacity Analysis – AM (PM)

Intersection	Level of Service	Average Control Delay (sec/veh)[3]	Volume to Capacity Ratio[3]
MD 175 @ MD 32 EB Off – Ramp	A (D)	9.1 (49.0)	0.68 (1.07)
MD 175 @ Baldwin Rd[1]	B (C)	13.7 (22.4)	0.04 (0.07)
MD 175 @ Nevada Ave[2]	C **(E)**	27.9 (60.1)	0.86 (1.04)
MD 175 at Dare St[1]	C (D)	22.1 (27.6)	0.58 (0.67)
MD 175 @ Morgan Rd/Town Center Blvd	C (C)	25.8 (26.2)	0.91 (0.95)
MD 175 @ Lokus Rd[1]	- (-)	- (-)	- (-)
MD 175 @ Winmeyer Ave	B (C)	13.7 (22.8)	0.89 (0.99)
MD 175 @ MD 170	**F (F)**	353.0 (236.8)	1.75 (1.63)
MD 170 @ Lamonte Ave[1]	**E (F)**	35.2 (>500.0)	0.38 (1.70)
Piney Orchard Pkwy @ Odenton Rd	**F (F)**	119.2 (129.7)	1.11 (1.20)
Hale St @ Baldwin Rd[1]	C (B)	16.3 (14.5)	0.63 (0.55)
Hale St @ Nevada Ave[2]	D (D)	35.4 (52.7)	0.79 (0.99)
Hale St @ Dare St[1]	D **(F)**	26.1 (51.8)	0.55 (0.84)
Hale St @ Town Center Blvd[2]	B (C)	13.5 (23.1)	0.57 (0.79)
Hale St @ Lokus Rd[1]	B (A)	11.4 (9.0)	0.46 (0.24)
Duckens St @ Baldwin Rd[2]	C (C)	21.2 (32.5)	0.52 (0.51)
Duckens St @ Nevada Ave[2]	B (C)	17.7 (22.6)	0.57 (0.60)
Duckens St @ Morgan Rd[2]	C (B)	26.4 (11.0)	0.38 (0.49)
Odenton Rd @ Morgan Dr[1]	C **(F)**	21.2 (163.1)	0.29 (1.05)

Notes:
(1) Stop-controlled Intersection. Measure of effectiveness reported for critical movement only.
(2) New Traffic Signal Control.
(3) Values may slightly differ based on the version of Synchro/SimTraffic used.

4.5.4 MD 175/ MD 170 At-Grade Solutions

The traffic volumes for the left-turn movement from NB MD 170 to WB MD 175 in the AM peak hour is very high, which is a primary reason why SHA has the intersection running in an uncoordinated, fully-actuated mode with an effective 265.5-sec cycle length. Further widening of the intersection approaches to accommodate additional turn lanes was not considered due to right-of-way constraints; however, it was determined worthy to consider an alternative intersection design. After consideration of Michigan U-Turns, quadrants and jug-handles, it was decided to use existing roadway right-of-way for an indirect loop ramp in the northeast quadrant of the intersection to accommodate the left-turn movement. See Appendix H for the lane configurations, traffic control, and AM and PM commuter peak-hour traffic volumes used to analyze the loop ramp under the TSM options. The calibrated Synchro/Simtraffic model was adjusted, seeded and run in accordance with County criteria, and the results of five one-hour simulations clearly indicated severe queuing along the ramp that would backup into the intersection and affect its operations. No further analysis was performed on this option, and it was dropped from further consideration.



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2035 TSM Option C - Level of Service

SCALE:	DATE:	FIGURE NO.
NONE	MAY 2010	23

4.5.5 Northern Bridge Crossing – Lamont Avenue Extension (P3)

As discussed in Section 4.5.1, previous studies conducted by the County have identified unacceptable traffic delay by Year 2035 along MD 175 between MD 32 and MD 170, especially at the intersection of MD 175 at MD 170/Piney Orchard Parkway, the gateway to Odenton Town Center, Odenton MARC Rail Station, and Fort Meade. To alleviate the congestion, the Odenton Town Center Master Plan December 2009 identifies two new candidate locations for crossing the AMTRAK/Penn Line via bridge structures to provide the much needed additional east-west capacity that parallels MD 175. The Master Plan identifies the new crossings as Urban Boulevards labeled P2 (southern crossing – Morgan Road Extension – south of MD 175 along an existing Baltimore Gas and Electric R/W) and P3 (northern crossing – Lamonte Avenue extension – north of MD 175). See Figure 18 for the alignment of the P3 northern bridge crossing alignment along the extension of Lamont Avenue from MD 170 west, over the AMTRAK/Penn Line track, to the planned extension of Town Center Boulevard. The northern bridge crossing P3 alternative considers the following:

1. Left-Turn Restrictions/One-Way Streets. Because the purpose of this analysis is to test P3's ability to, unilaterally, alleviate congestion along MD 175 between MD 32 and MD 170, left-turn restrictions along MD 175 or changes to the directionality (e.g., one way) of streets in the OTC grid network were not considered. Such TSM options, such as TSM A, B or C as discussed in Section 4.5.3, are not mutually exclusive to the P3 alternative and can be combined, as practicable, to achieve the highest level of service and mobility.

2. New Signalized Intersections. The only new signal required under the P3 alternative is at the intersection of MD 170 at Lamonte Avenue.

3. New Bridge Structure. A new bridge structure will be required over the AMTRAK/Penn Line track along the Lamonte Avenue extension alignment as shown in Figure 18. The structure should be constructed with a four-lane cross-section; even though the Lamonte Avenue extension assumed a two-lane cross section to reduce the impact of the final design.

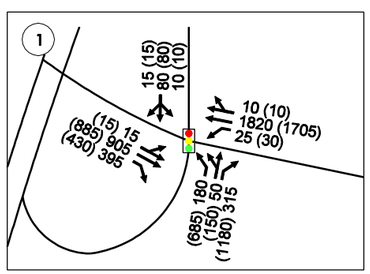
Figure 24 shows the lane configurations, traffic control, and AM and PM commuter peak-hour Year 2035 traffic volumes used to analyze the northern bridge crossing P3 alternative. The revised SAM2 model (see Section 4.1) shows that the P3 alternative reduces traffic along MD 175 west of MD 170, but not as much as alternative the southern bridge crossing P2 alternative (see Section 4.5.6), as shown in Figure 11. Intersection capacity analyses were performed using the Highway Capacity Manual 2000 (HCM) methodology for all study intersections. Table 11 and Figure 25 summarize the results of the analysis. The P3 alternative does not meet the primary objective of alleviating congestion at the OTC gateway intersection of MD 175 at MD 170, which is expected to operate at a LOS F in both the AM and PM commuter peak hours.

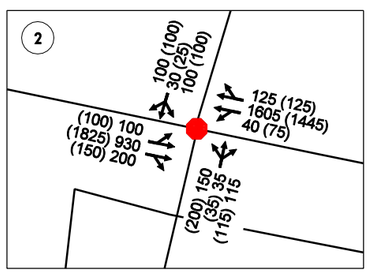
Table 11. Northern Bridge Crossing – Summary of Capacity Analysis – AM (PM)

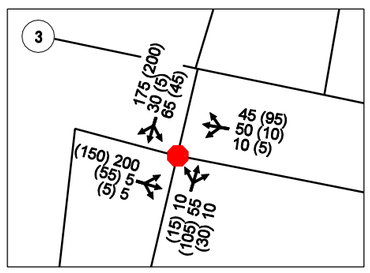
Intersection	Level of Service	Average Control Delay (sec/veh)[6]	Volume to Capacity Ratio[6]
MD 175 @ MD 32 EB Off – Ramp[1]	B (D)	10.9 (35.5)	0.75 (0.97)
MD 175 @ Morgan Rd/Town Center Blvd[3]	C (C)	21.6 (34.1)	0.81 (0.96)
MD 175 @ Winmeyer Ave[2]	A (C)	6.6 (20.1)	0.82 (0.90)
MD 175 @ MD 170	**F (F)**	96.3 (195.6)	0.97 (1.48)
MD 170 @ Lamonte Ave[4]	B (B)	17.8 (13.7)	0.98 (0.78)
Lamonte Ave Ext @ Town Center Blvd[5]	- (-)	- (-)	- (-)
Piney Orchard Pkwy @ Odenton Rd	**F (F)**	131.2 (134.2)	1.15 (1.22)

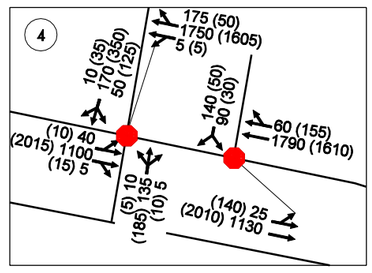
Notes:
(1) Assumes new Odenton Ave Connection to the north and a NB dual left lane configuration.
(2) Assumes splits optimized.
(3) Assumes four-lane divided boulevard north-south approaches on Town Center Blvd and new cycle length, phasing, timing, and actuated-coordinated mode.
(4) New Signal.
(5) Roundabout (see Section 4.5.7)
(6) Values may slightly differ based on the version of Synchro/SimTraffic used.

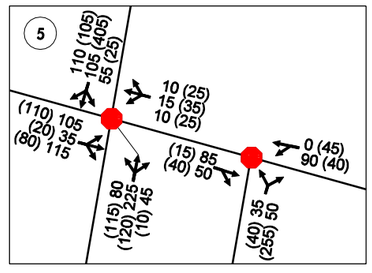
It is recognized that SHA EA 175 improvements may limit access to some grid streets (e.g., Dare Street); however, for testing purposes at critical intersections, initial raw travel demand output was not refined.

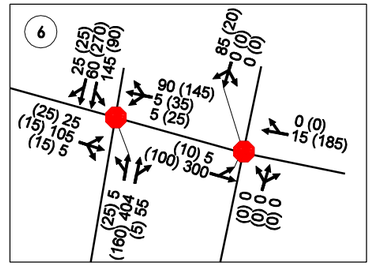


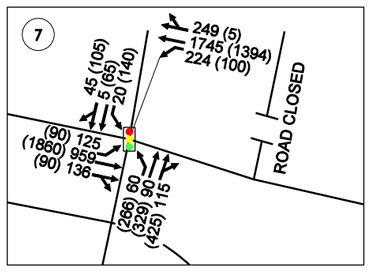


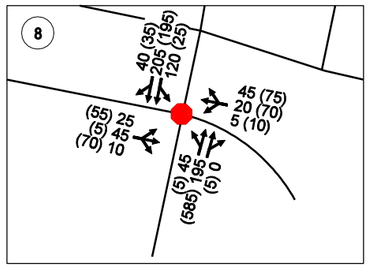


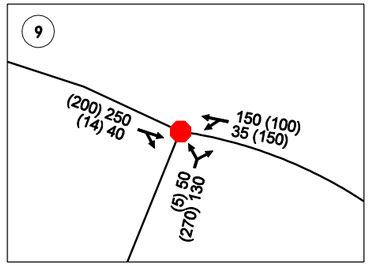


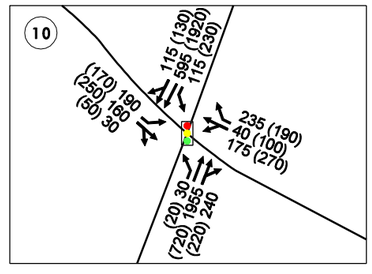


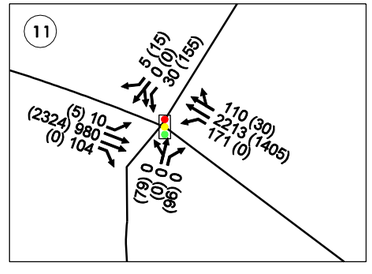


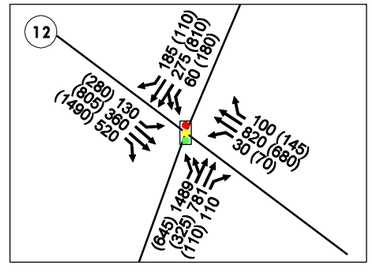


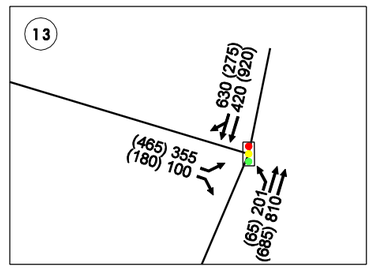


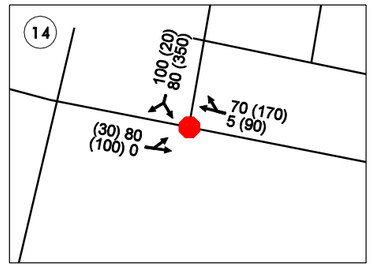


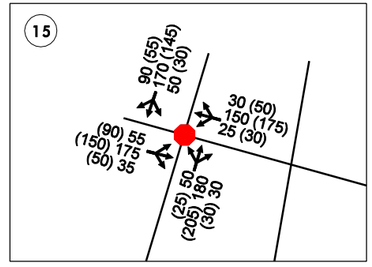


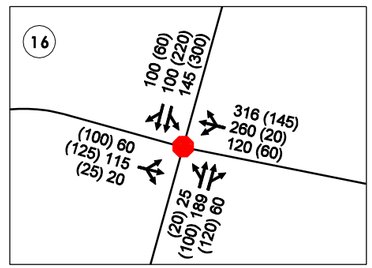


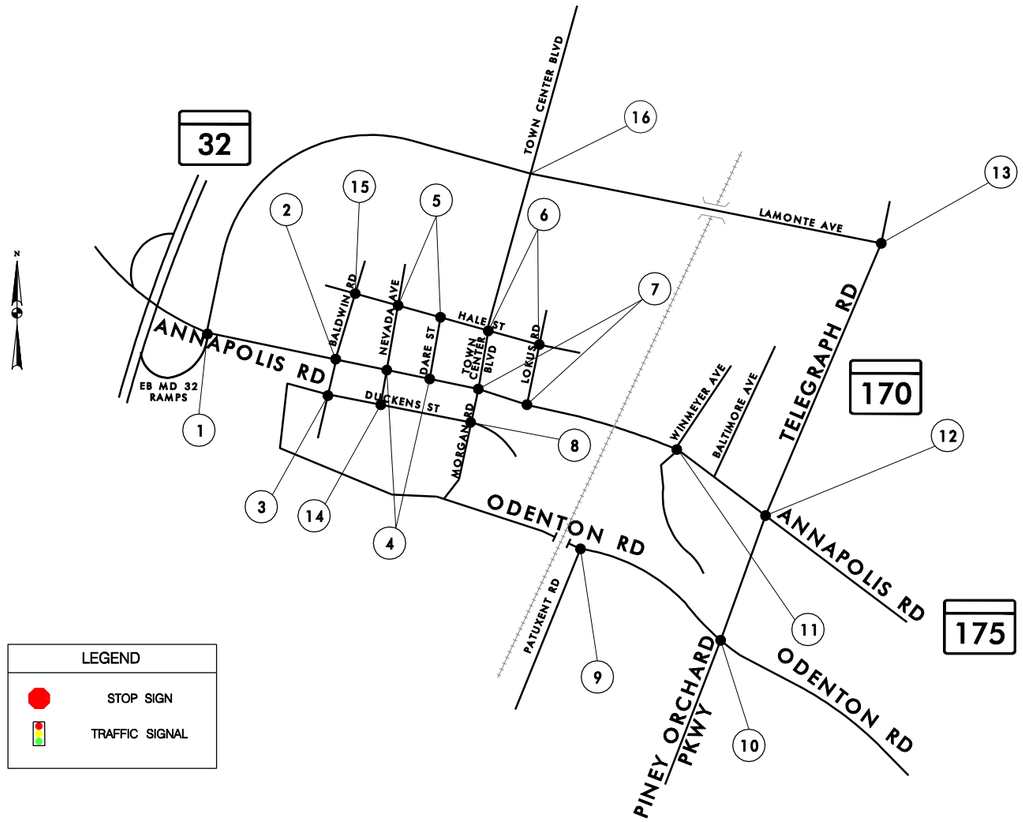












LEGEND

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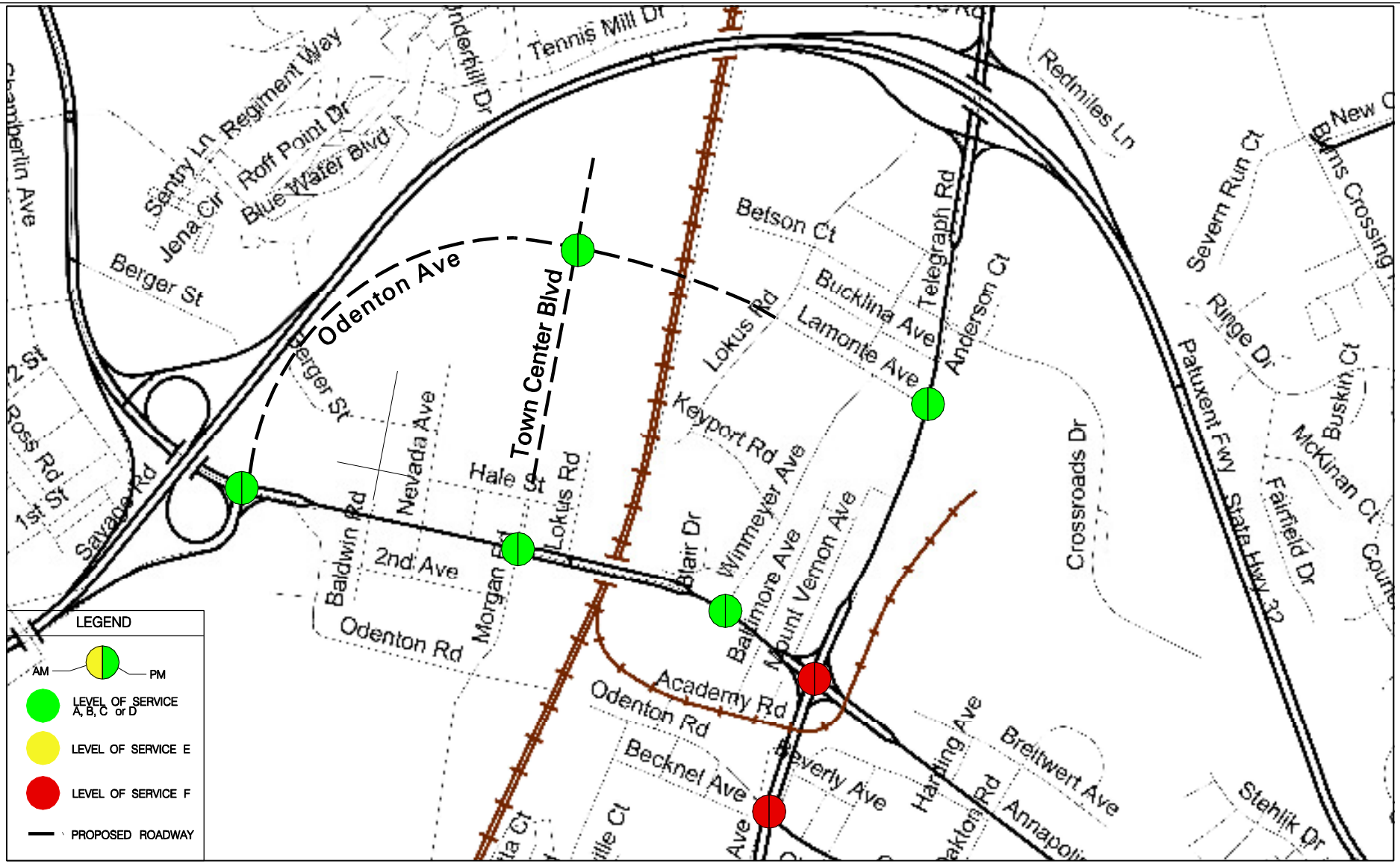
TRANSPORTATION STUDY

2035 NORTHERN BRIDGE CROSSIING (P3) - LANES, TRAFFIC CONTROL AND PEAK HOUR VOLUMES - AM (PM)

SCALE:	DATE:	FIGURE NO.
NONE	MAY 2010	24



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TRANSPORTATION STUDY

2035 NORTHERN BRIDGE CROSSING (P3) –
LEVEL OF SERVICE

SCALE:	DATE:	FIGURE NO.
NONE	MAY 2010	25

4.5.6 Southern Bridge Crossing – Morgan Road Extension (P2)

As discussed in Section 4.5.1, previous studies conducted by the County have identified unacceptable traffic delay by Year 2035 along MD 175 between MD 32 and MD 170, especially at the intersection of MD 175 at MD 170/Piney Orchard Parkway, the gateway to Odenton Town Center, Odenton MARC Rail Station, and Fort Meade. To alleviate the congestion, the Odenton Town Center Master Plan December 2009 identifies two new candidate locations for crossing the AMTRAK/Penn Line via bridge structures to provide the much needed additional east-west capacity that parallels MD 175. The Master Plan identifies the new crossings as Urban Boulevards labeled P2 (southern crossing – Morgan Road Extension – south of MD 175 along an existing Baltimore Gas and Electric R/W) and P3 (northern crossing – Lamonte Avenue extension – north of MD 175). See Figure 18 for the alignment of the P2 southern bridge crossing alignment along a new Urban Boulevard facility from Piney Orchard Parkway west, over the AMTRAK/Penn Line track, to the planned extension of Morgan Road. The southern bridge crossing P2 alternative considers the following:

1. Left-Turn Restrictions/One-Way Streets. Because the purpose of this analysis is to test P2's ability to, unilaterally, alleviate congestion along MD 175 between MD 32 and MD 170, left-turn restrictions along MD 175 or changes to the directionality (e.g., one way) of streets in the OTC grid network were not considered. Such TSM options, such as TSM A, B or C as discussed in Section 4.5.3, are not mutually exclusive to the P2 alternative and can be combined, as practicable, to achieve the highest level of service and mobility.

2. New Signalized Intersections. The southern bridge crossing P2 alternative evaluated the following new signalized intersections:

   - Duckens Street at Morgan Road,
   - Odenton Road at Morgan Road,
   - New Bridge Road at Morgan Road, and
   - New Bridge Road at N. Patuxent Road.

3. New Bridge Structure. A new bridge structure will be required over the AMTRAK/Penn Line track along the new Urban Boulevard facility alignment between Piney Orchard Parkway and the planned extension of Morgan Road, as shown in Figure 18. The structure should be constructed with a four-lane cross-section; even though the new Urban Boulevard facility is assumed to be a two-lane cross section to reduce the impact of the final design.

Figure 26 shows the lane configurations, traffic control, and AM and PM commuter peak-hour Year 2035 traffic volumes used to analyze the southern bridge crossing P2 alternative. The revised SAM2 model (see Section 4.1) shows that the P2 alternative reduces more traffic along MD 175 west of MD 170 than the northern bridge crossing P3 alternative, as shown in Figure 11. Intersection capacity analyses were performed

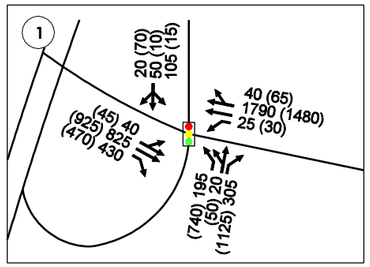
using the Highway Capacity Manual 2000 (HCM) methodology for all study intersections. Table 12 and Figure 27 summarize the results of the analysis. The P2 alternative meets the primary objective of alleviating congestion at the OTC gateway intersection of MD 175 at MD 170, which is expected to operate at a LOS D in both the AM and PM commuter peak hours.

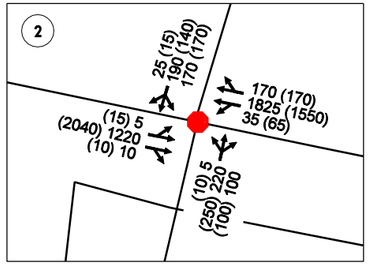
Table 12. Southern Bridge Crossing – Summary of Capacity Analysis – AM (PM)

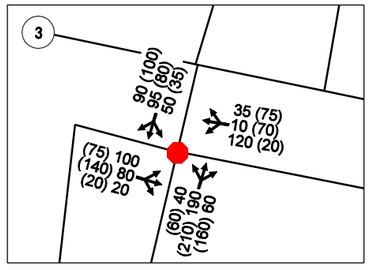
Intersection	Level of Service	Average Control Delay (sec/veh)[3]	Volume to Capacity Ratio[3]
MD 175 @ MD 32 EB Off – Ramp[1]	B (C)	19.1 (30.5)	0.80 (0.94)
MD 175 @ Morgan Rd/Town Center Blvd[4]	C **(F)**	30.3 (80.5)	0.88 (1.15)
MD 175 @ Winmeyer Ave	A (B)	5.7 (15.1)	0.63 (0.77)
MD 175 @ MD 170[2]	D (D)	45.3 (49.5)	0.92 (1.02)
Odenton Ave @ Town Center Blvd[7]	- (-)	- (-)	- (-)
Piney Orchard Pkwy @ Odenton Rd[5]	**E (F)**	71.6 (96.4)	1.01 (1.11)
Piney Orchard Pkwy @ New Bridge Rd[6]	C (C)	20.0 (22.6)	0.70 (0.92)
Duckens St @ Morgan Rd[6]	B (B)	12.9 (14.5)	0.81 (0.79)
Odenton Rd @ Morgan Rd[6]	B (A)	14.1 (6.3)	0.70 (0.49)
New Bridge Rd @ Morgan Rd Ext[6]	C (B)	28.5 (19.9)	0.81 (0.89)
New Bridge Rd @ N Patuxent Rd[6]	B (B)	10.1 (13.5)	0.67 (0.85)

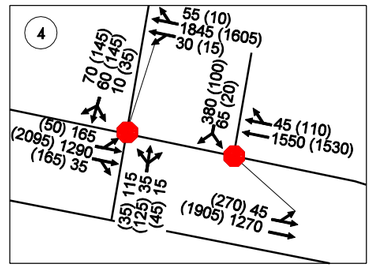
Notes:
(1) Stop-controlled Intersection. Measure of effectiveness reported for critical movement only.
(2) New Traffic Signal Control.
(3) Values may slightly differ based on the version of Synchro/SimTraffic used.
(4) Assumes four-lane divided boulevard north-south approaches on Town Center Blvd and new cycle length, phasing, timing, and actuated coordinated mode.
(5) Assumes new WB Odenton Rd-approach lane configuration, new cycle length, phasing, splits, and actuated-coordinated mode.
(6) New signal.
(7) Roundabout (see Section 4.5.7)

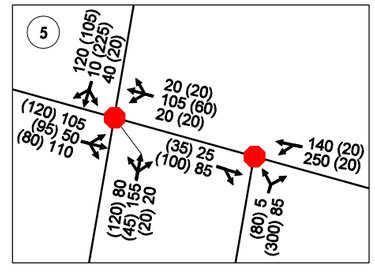
It is recognized that SHA EA 175 improvements may limit access to some grid streets (e.g., Dare Street); however, for testing purposes at critical intersections, initial raw travel demand output was not refined.

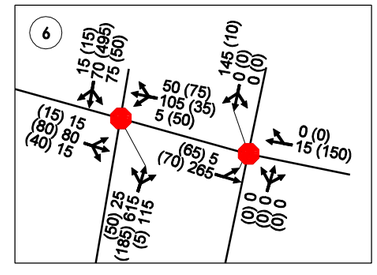


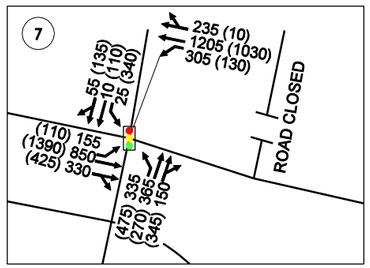


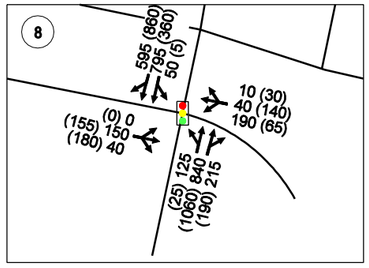


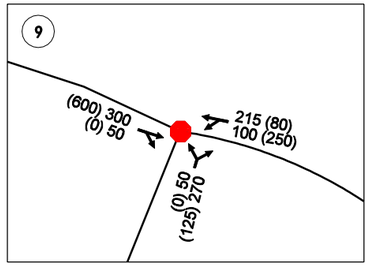


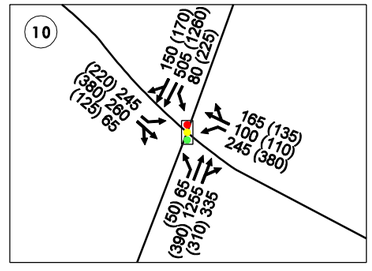


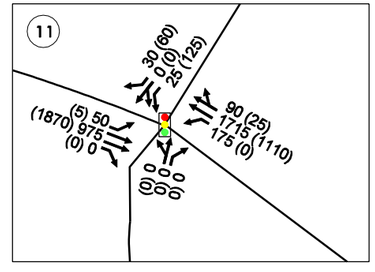


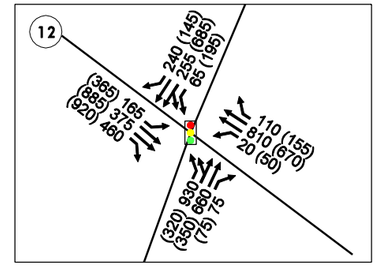


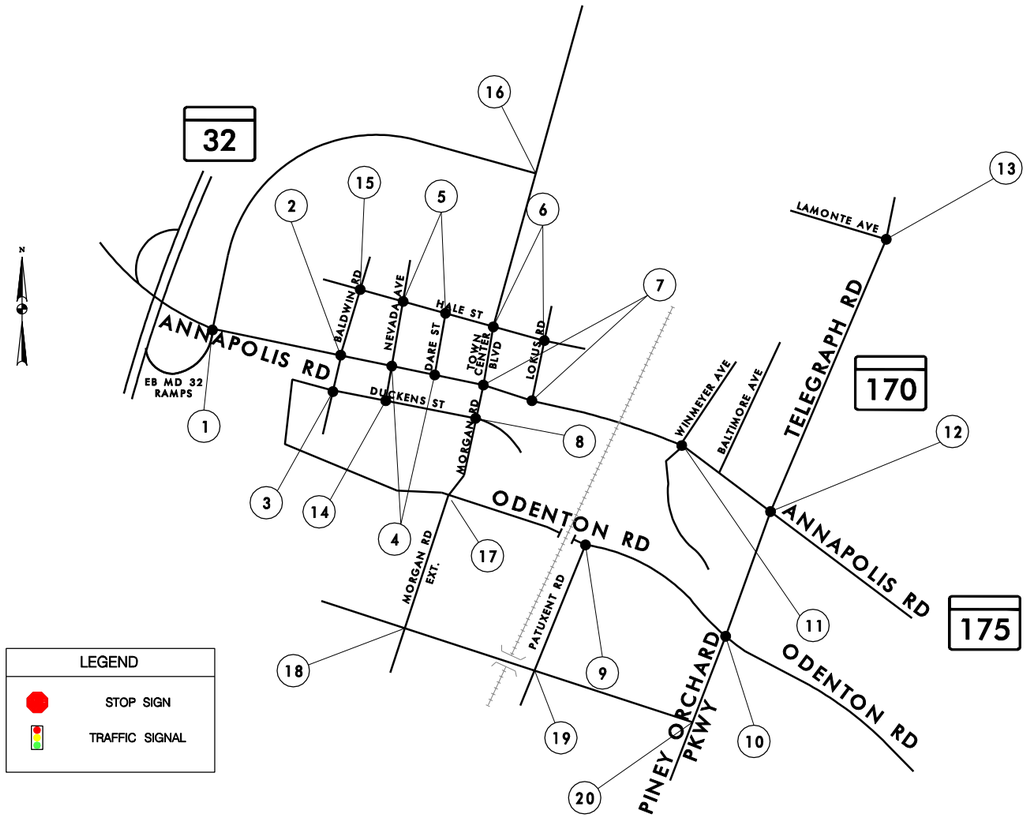


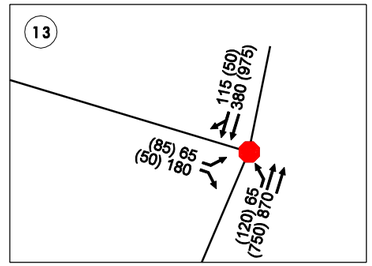


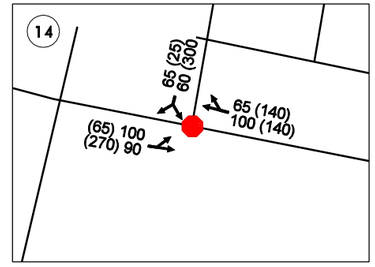


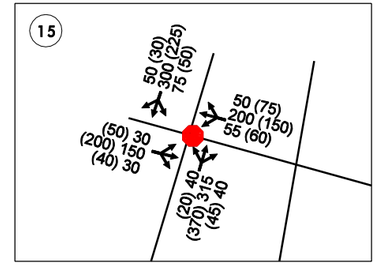


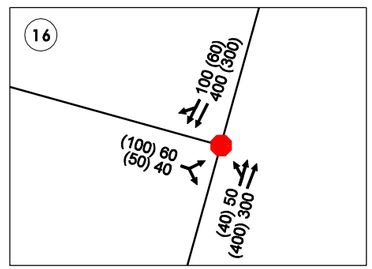


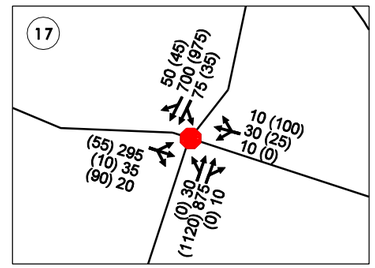


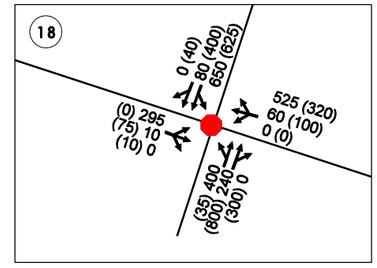


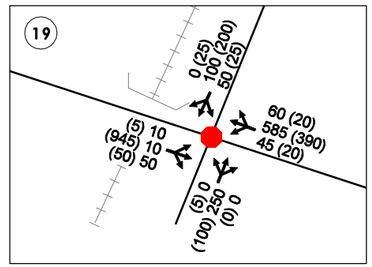


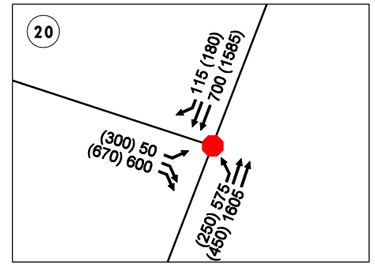












LEGEND

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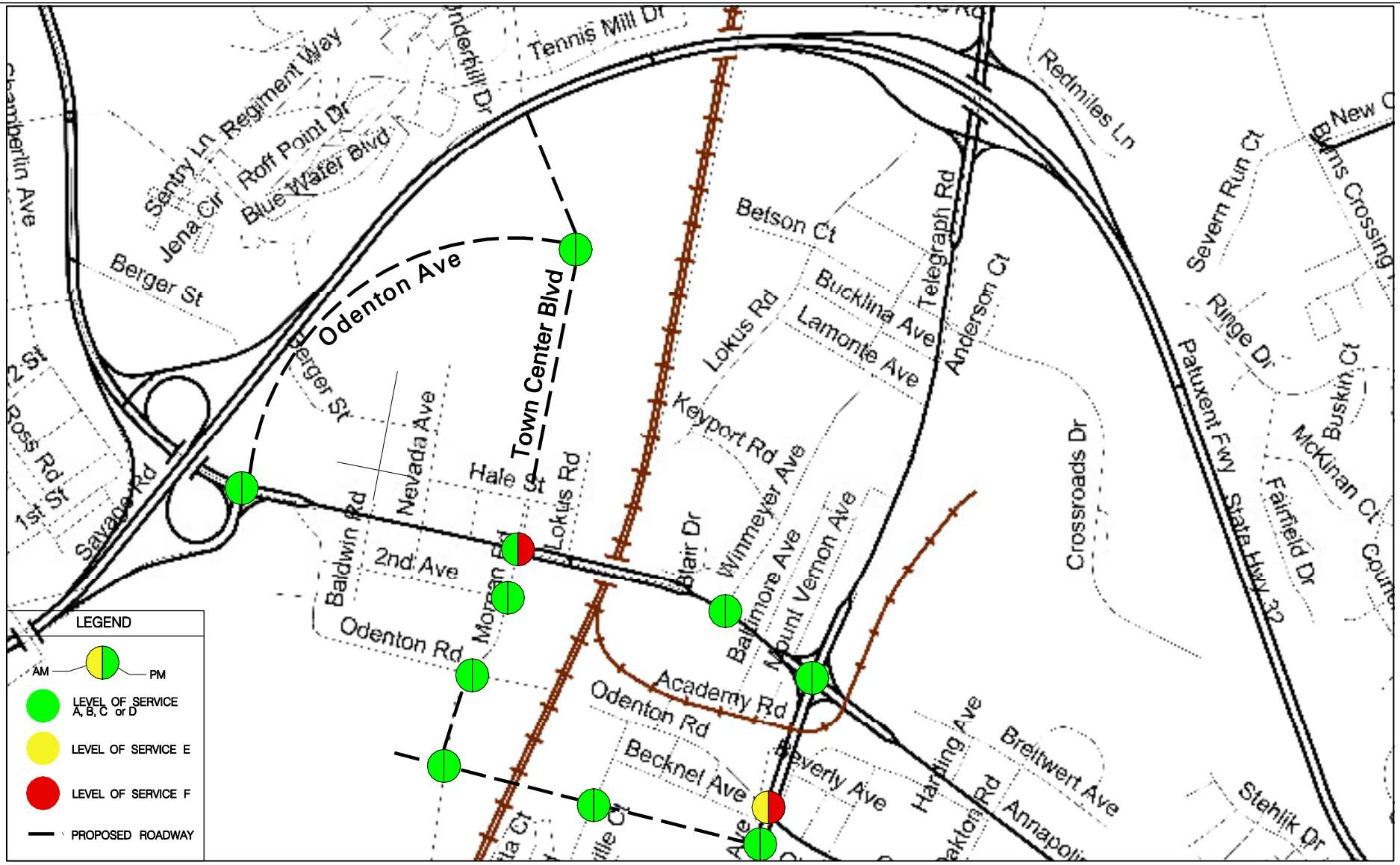
2035 SOUTHERN BRIDGE CROSSIING (P2) - LANES, TRAFFIC CONTROL AND PEAK HOUR VOLUMES - AM (PM)

SCALE:	DATE:	FIGURE NO.
NONE	MAY 2010	26



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TRANSPORTATION STUDY

2035 SOUTHERN BRIDGE CROSSING (P2) - LEVEL OF SERVICE

SCALE:	DATE:	FIGURE NO.
NONE	MAY 2010	27

4.5.7 Roundabout Analysis

In the P2 and P3 alternatives, a roundabout was considered at the intersection of the Odenton Avenue and the planned extension of Town Center Boulevard as follows:

1. Northern Bridge Crossing (P3). The roundabout modeled for the Lamonte Avenue extension P3 alternative is a two-lane, four-leg roundabout with single lane approaches from the east and from the west. There is a two-lane approach from the north and from the south.

2. Southern Bridge Crossing (P2). The roundabout modeled for the Morgan Road extension P2 alternative is a two-lane, three-leg roundabout with a single lane approach from the west. There is a two-lane approach from the north and from the south.

Both roundabouts are expected to operate at a LOS A, as shown in Table 13. There is more expected utilization of the proposed roundabout under the Lamonte Avenue extension P3 alternative compared to the Morgan Road extension P2 alternative due to the connection directly from the roundabout to MD 170 via Lamonte Ave. The degree of saturation in the P3 alternative reflects a higher ratio of 0.88 compared to 0.22 for the roundabout modeled for the P2 alternative. However, based on the average delays at each approach, there is additional roundabout capacity under each alternative, as both operate at a LOS A. See Appendix I for the Sidra analysis reports.

Table 13. Town Center Blvd @ Odenton Ave Roundabout Capacity Analysis

Movement	Delay (sec/ veh)	Degree of Saturation	Level of Service	Max. Queues (vehicles)
Northern Bridge Crossing (P3) – Lamonte Ave Extension – Double Lane (Four-leg) Roundabout				
EB	4.7 (7.1)	0.30 (0.43)	A (A)	2 (3)
WB	11.7 (3.7)	0.88 (0.29)	B (A)	16 (2)
NB	4.8 (8.1)	0.17 (0.18)	A (B)	1 (1)
SB	5.4 (3.5)	0.23 (0.26)	A (A)	2 (2)
Intersection Summary	8.1 (5.1)	0.88 (0.43)	A (A)	16 (3)
Southern Bridge Crossing (P2) – Morgan Rd Extension – Double Lane (Three-leg) Roundabout				
EB	5.4 (5.2)	0.15 (0.21)	A (A)	1 (1)
NB	1.9 (2.0)	0.16 (0.22)	A (A)	1 (2)
SB	1.4 (1.4)	0.20 (0.15)	A (A)	1 (1)
Intersection Summary	2.0 (2.3)	0.20 (0.22)	A (A)	2 (2)

4.5.8 Alternatives Comparison

Table 14 shows a comparison of the characteristics and impacts of each of the following Year 2035 alternatives considered:

- No-Build,
- TSM Option A,
- TSM Option A,
- TSM Option A,
- Northern Bridge Crossing (P3), and
- Southern Bridge Crossing (P2).

The analyses demonstrates that it will be necessary to use a combination of alternatives to achieve the stated goals: alleviate congestion along MD 175 west of MD 170 and enhance the level of service and mobility within the OTC grid network. Based on the results of the analyses, it is recommended to consider implementing the southern bridge crossing P2 alternative in conjunction with the TSM Option B, as defined in Section 4.5.3.3. In addition, the analysis shows the incremental benefits of additionally constructing the northern bridge crossing P3 alternative may be cost prohibitive.

Table 14. Odenton Town Center Transportation Alternatives Comparison Table

Alternative	TSM Measure			Failing Intersection	LOS AM (PM)	Comments
	Left-Turn Restriction Location	One-Way Street (Direction)	New Signal			
2035 No-Build	N/A	N/A	N/A	MD 175 at Town Center Blvd MD 175 at MD 170 MD 170 at Lamonte Avenue Piney Orchard Parkway at Odenton Rd MD 175 at Baldwin Road MD 175 at Nevada Avenue MD 175 at Dare Street Hale Street at Town Center Blvd Duckens Street at Morgan Road Odenton Road at Morgan Road	C (F) C (F) F (F) F (F) F (F) F (F) F (F) F (F) E (F) D (F)	N/A
TSM Option A	MD 175 at Baldwin Road (all directions) MD 175 at Nevada Avenue (all directions) MD 175 at Dare Street (all directions) MD 175 at Town Center Blvd (all directions) MD 175 at Lokus Road (all directions)	Hale Street between Lokus Road and Baldwin Road (WB) Baldwin Road between Hale Street and Duckens Street (SB) Duckens Street between Baldwin Road and Morgan Road (EB) Lokus Road between Hale Street and MD 175 (NB)	MD 175 at Baldwin Road MD 175 at Nevada Avenue Hale Street at Baldwin Road Hale Street at Nevada Avenue Hale Street at Town Center Blvd Duckens Street at Baldwin Road Duckens Street at Nevada Avenue Duckens Street at Morgan Road	MD 175 at MD 170 MD 170 at Lamonte Avenue Piney Orchard Parkway at Odenton Rd Odenton Road at Morgan Road	F (F) F (F) F (F) D (E)	Constrained access to MARC north parking lot due to One-way restrictions 2 new signals on MD 175 at Baldwin Road and Nevada Avenue
TSM Option B	MD 175 at Baldwin Road (all directions) MD 175 at Dare Street (all directions) MD 175 at Town Center Blvd (all directions) MD 175 at Lokus Road (all directions) MD 175 at Nevada Avenue (east-west directions)	Hale Street between Town Center Blvd and Nevada Avenue (WB) Duckens Street between Nevada Avenue and Morgan Road (EB) Lokus Road between Hale Street and MD 175 (NB) Baldwin Road between Hale Street and Duckens Street (SB)	MD 175 at Nevada Avenue Hale Street at Nevada Avenue Hale Street at Town Center Blvd Duckens Street at Nevada Avenue Duckens Street at Morgan Road Duckens Street at Baldwin Road	MD 175 at MD 170 MD 170 at Lamonte Avenue Piney Orchard Parkway at Odenton Rd Odenton Road at Morgan Road	F (F) F (F) F (F) C (F)	1 new signal on MD 175 at Nevada Avenue 2 new signals on Hale Street at Nevada Avenue and Town Center Blvd SB through movement restricted at MD 175 and Baldwin Road
TSM Option C	MD 175 at Baldwin Road (all directions) MD 175 at Nevada Avenue (east-west directions) MD 175 at Dare Street (all directions) MD 175 at Town Center Blvd (all directions) MD 175 at Lokus Road (all directions)	Lokus Road between Hale Street and MD 175 (NB)	MD 175 at Nevada Avenue Hale Street at Nevada Avenue Hale Street at Town Center Blvd Duckens Street at Nevada Avenue Duckens Street at Morgan Road Duckens Street at Baldwin Road	MD 175 at MD 170 MD 170 at Lamonte Avenue Piney Orchard Parkway at Odenton Rd Hale Street at Dare Street MD 175 at Nevada Avenue Odenton Road at Morgan Road	F (F) F (F) F (F) D (F) C (E) C (F)	1 new signal on MD 175 at Nevada Avenue NB and SB through movements restricted at MD 175 and Baldwin Road
2035 Northern Bridge Crossing – Lamonte Avenue Extension (P3)	N/A	N/A	MD 170 at Lamonte Avenue	MD 175 at MD 170 Piney Orchard Parkway at Odenton Rd MD 175 at Baldwin Road MD 175 at Nevada Avenue MD 175 at Dare Street Hale Street at Town Center Blvd Odenton Road at Morgan Road	F (F) F (F) F (F) F (F) F (F) E (C) D (F)	new bridge on Lamonte Avenue between MD 170 and Town Center Blvd extension
2035 Southern Bridge Crossing – Morgan Road Extension (P2)	N/A	N/A	Duckens Street at Morgan Road Odenton Road at Morgan Road New Bridge Rd at Morgan Road New Bridge Rd at N Patuxent Road	MD 175 at Town Center Blvd MD 170 at Lamonte Avenue Piney Orchard Parkway at Odenton Rd MD 175 at Baldwin Road MD 175 at Nevada Avenue MD 175 at Dare Street Hale Street at Baldwin Road Hale Street at Town Center Blvd Duckens Street at Baldwin Road Duckens Street at Nevada Avenue	C (F) C (F) E (F) F (F) F (F) F (F) F (F) E (F) F (F) B (E)	new bridge on Morgan Road extended to Piney Orchard Parkway

4.6 Pedestrian, Bicycle and Transit

4.6.1 Overview

To fulfill the vision of the OTC redevelopment, there will be a need to provide high-quality non-motorized rights-of-way and safe and convenient access to high-frequency transit. ***This can be realized by implementing a 'pedestrian first' and pedestrian priority mentality in all roadway and land use design elements.***

The key element in shaping the overall non-motorized plan is to establish priority corridors for each mode of travel, such as automobile, pedestrian, bicycle and transit that will connect key land uses and destinations within and around the Town Center. Thus, the network can be focused to match non-motorized facility types with the appropriate roadway based on functional classification, geometry and traffic characteristics.

To support these recommendations, ***accommodations for the prioritized mode must in some cases precede consideration over improvements, operations or capacity for other modes in the corridor*** (e.g. bicycle lane replacing a second travel lane, signal timing for pedestrians disrupting vehicular traffic progression).

Based on the existing conditions assessment, review of background studies, future land use and traffic forecasts, as well as input from key stakeholders, the following items are presented and discussed to create a more seamless non-motorized and transit network.

4.6.2 MD 175

The crossing of MD 175 by pedestrians and bicycles must be provided for in a safe and convenient manner. Without such connections, the Town Center will remain fragmented and MD 175 will become a barrier to pedestrian and bicycle access. In building upon the SHA EA recommendations, the following design elements should be considered:

1. Construct Median. Construction of a median a minimum of 6 feet wide to calm through traffic along MD 175, reduce the number of access points and conflicts, and provide a pedestrian refuge area is recommended.

2. Install Traffic Signal. Construction of a new traffic signal at MD 175/ Nevada Avenue with phasing (e.g., leading pedestrian intervals), timing (e.g., MUTCD compliant walk and flashing don't walk), countdown and audible pedestrian signals, crosswalks, and ADA ramps is suggested.

3. Construct Sidewalks. Construction of sidewalks along both sides of MD 175, a minimum of five feet but preferably eight feet is recommended.

4. Reconfigure Bicycle Trail. Reconfiguration of the proposed bicycle trail along the south side in a cycle track envelope (as shown in the photo to the right), to more clearly delineate pedestrian and bicycle rights-of-way in what will be a lively sidewalk area with potentially active storefronts should be considered.

4.6.3 Pedestrian Facilities

Creating a comfortable, active and urban pedestrian environment will require a complete and integrated pedestrian system of sidewalks as well as appropriate intersection and bus stop treatments. Consider the following:

1. Signalized Intersections. Pedestrians should be accommodated at all new traffic signals in the Town Center through phasing (e.g., leading pedestrian intervals), timing (e.g., MUTCD compliant walk and flashing don't walk), countdown and audible pedestrian signals, crosswalks, and ADA ramps.

2. Unsignalized Intersections. All non-signalized intersections should have marked crosswalks and ADA ramps.

3. Traffic Calming. Where ultimate lane configuration and curb parking regulations permit (e.g. full time parking), neckdowns should be considered at intersections to reduce pedestrian exposure and crossing distance. On long blocks (.e.g. greater than 400 feet), midblock chokers should be considered to provide a more convenient pedestrian crossing point.

4. Sidewalks. The minimum OTC streetscape design standards are 5 ft for an urban arterial (e.g. MD 175), 6 ft for an urban boulevard (e.g. Morgan Road), 10 ft for an urban grid street (e.g. Hale Street) and 6 ft for a local rod (e.g. Old

Odenton Road). However, to provide a more comfortable pedestrian experience and mitigate clearance reductions from street furniture, active storefronts, outdoor seating and utilities, a desirable width would be 10 ft for an arterial, 18 ft for a boulevard, 12 ft for a grid street and 8ft for a local street.

5. Lighting. Pedestrian lighting should be considered along all roadways within the OTC to both enhance the uniformity of the OTC district public spaces as well as safety. A lighting level of 1.5 footcandles is recommended based on the Illuminating Engineering Society of North America (IESNA) criteria for urban business districts.

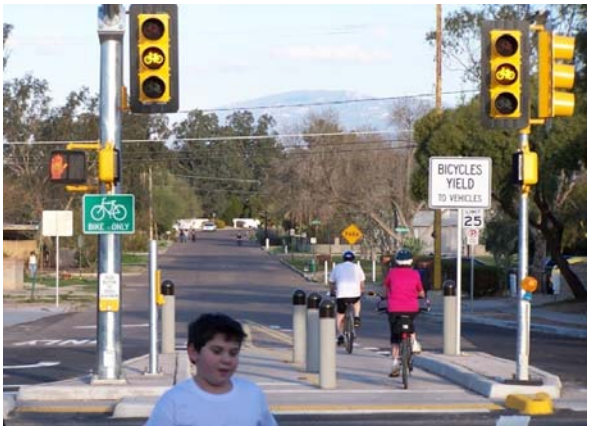
6. Transit Access. Provide new or upgraded amenities for transit users (e.g., shelters, benches, real time transit information) at existing and proposed bus stops within OTC.

4.6.4 Bicycle Facilities

Bicycle travel in and around the OTC will be a viable mode for work, shopping and recreational trips (see Figure 28). To ensure the accessibility of the local streets as well as the connections to regional trails, consider the following:

1. On-Road Facilities. Installation of wide curb lanes with share-the-road signing and marking or exclusive signed and marked bicycle lanes should be incorporated on all urban grid and local roadways.

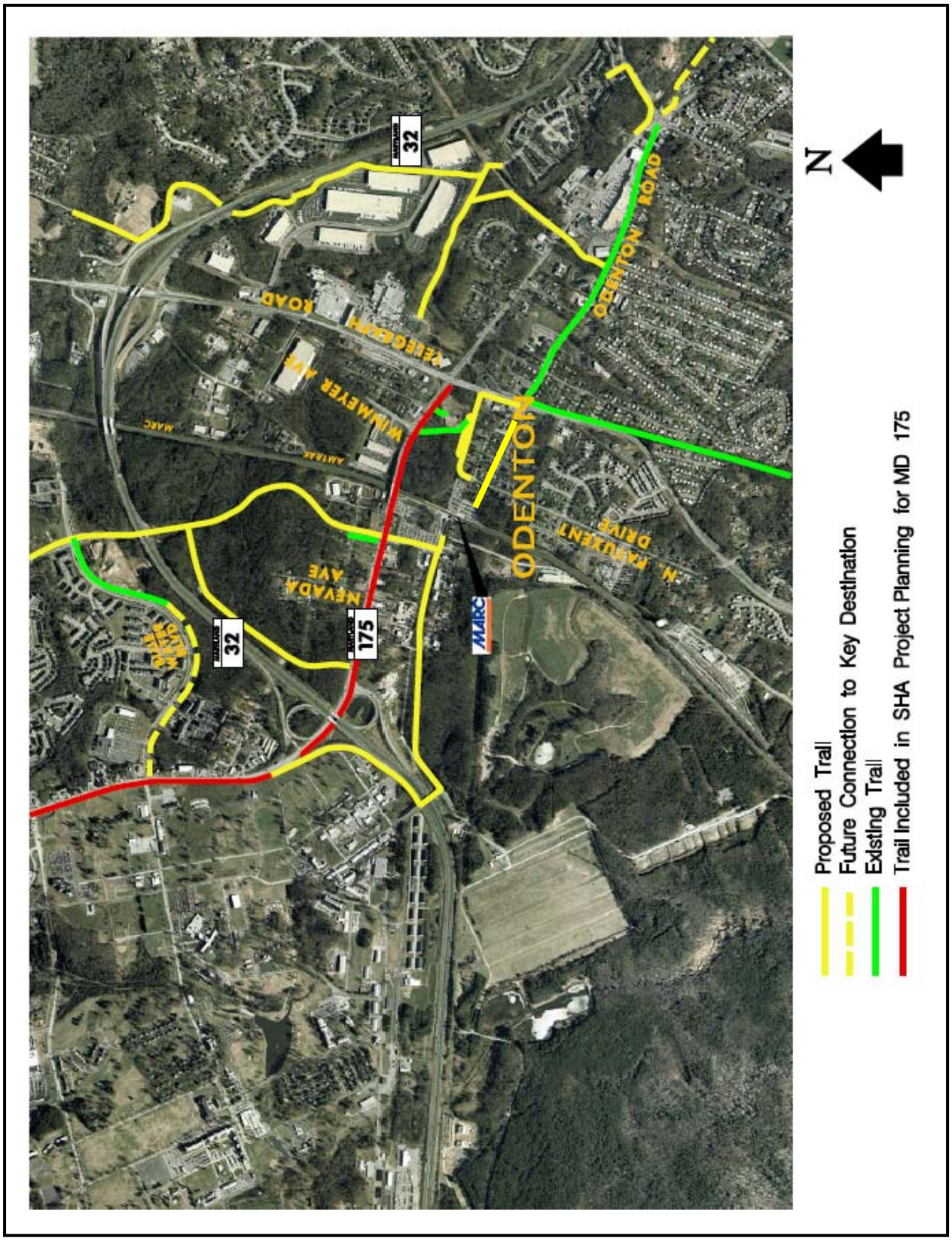
2. Trail Crossings. To improve safety for bicyclists as well as pedestrians and vehicles at major trail crossings (e.g. MD 175 at Town Center Blvd), intersection treatments such as bicycle signals should be implemented.



3. Bicycle Depot. A bicycle hub should be located at or adjacent to the MARC station with bicycle valet service, bicycle lockers, and bicycle rental facilities to improve intermodal connections.

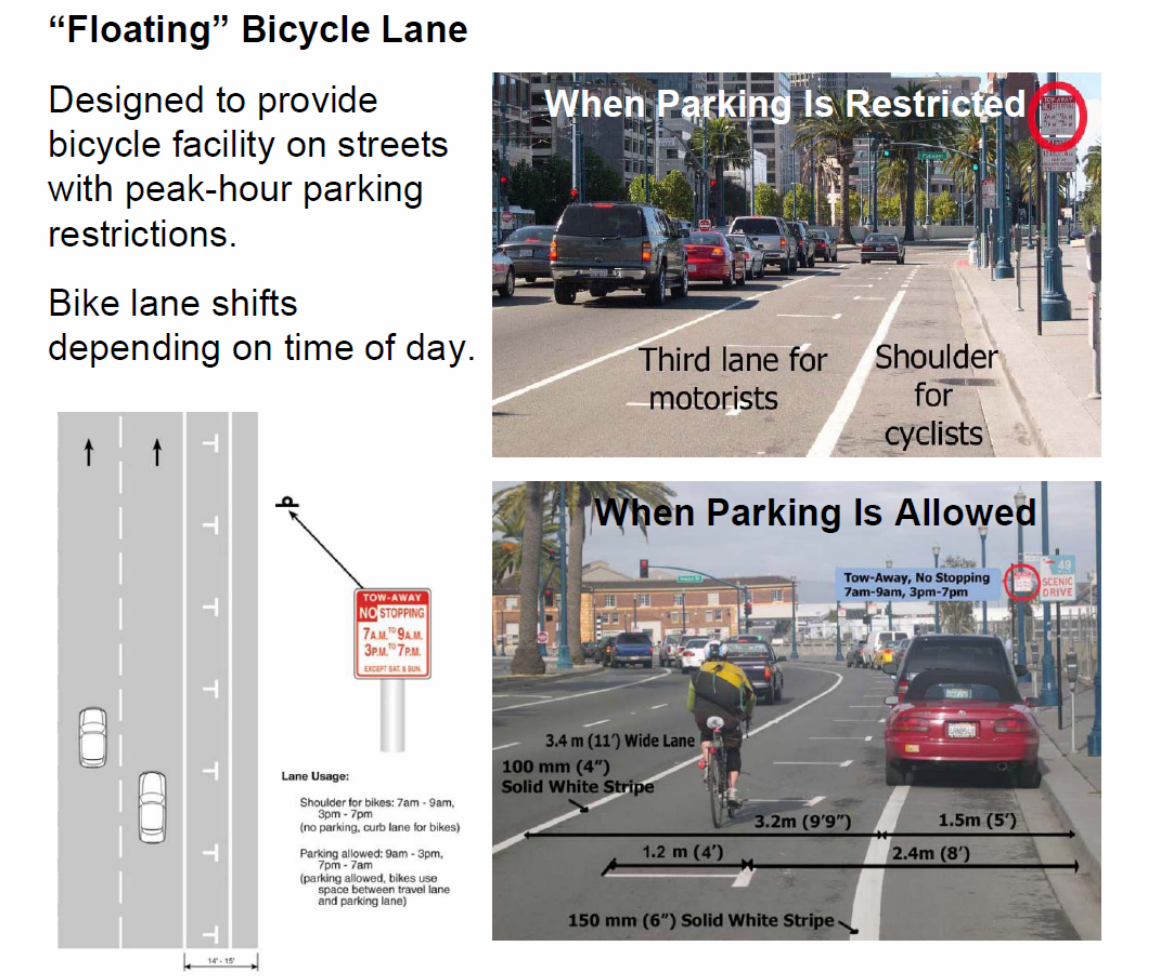
4. Bicycle Racks. Bicycle racks should be installed at all major public parking facilities.

Figure 28. Odenton Trails Schematic Plan



5. Wayfinding Signage. Wayfinding signage for bicyclists is also recommended in conjunction with on and off-road bicycle route designation signs to further aid cyclists in finding transit connections, shopping areas, and other destinations. An example of wayfinding signing designed for similar bicycle networks is shown to the right. Destinations and distances shown on the subplates should include the MARC station, key parking structures with secure bicycle parking, historic properties, future public spaces/ parks, and other trails such as MD 175, WB&A Trail, and the South Shore Trail.

6. Floating Bicycle Lanes. Floating bicycle lanes should be considered to accommodate bicycle lanes where curb lanes are used for parking during off-peak hours and vehicle travel during peak hours.



Source: Baltimore City Bicycle Master Plan Toolkit, Baltimore City DOT.

4.6.5 Transit Service and Routing

The OTC area will be served by expanded options for both local and regional transit service. The following is a summary of planned and potential future transit services as well as recommendations based on review of the County's BRAC and Transit Development Plan, and discussions with the County, MTA and other local stakeholder agencies (e.g. BMC, Ft. Meade). Consider the following:

1. Town Center Shuttle Service. To enhance existing local transit service, it is suggested to develop and brand a new shuttle or jitney service with circulatory routing and frequent headways that would exclusively serve the Town Center. The transit service should be supplemented with new bus shelters and 'NextBus' real-time signage. The shuttle service should be operated by a single entity, publicly-available, and serve a variety of markets. Fast and frequent 10 to 12 minute headways are suggested, or providing an on-demand dispatch capability, with 25-40 seats per vehicle, and service 7 days/ week from the early AM to late PM. Stops should include transfer locations such as the MARC station as well as major parking facilities. An annual operating budget of $600,000 to $750,000 would be expected (source: MTA Baltimore City neighborhood shuttles). A separate vehicle should be considered for paratransit needs.

2. Future Local Transit. Two new local bus routes are currently funded for deployment:

   - a consolidation of the existing NSA-Odenton MARC to Visitors Gate/ MD 32 shuttle with additional Ft. Meade Stops via MD 198, MD 32 and MD 175; and

   - proposed Route M (Figure 4-1g from the 2009 BRAC Transit and Ridesharing Study) connecting Piney Orchard, Odenton Town Center, and Ft. Meade via Piney Orchard, MD 175 and the Baltimore-Washington Parkway.

   Additional proposed but unfunded routes include:

   - proposed Route X (Figure 4-1a) connecting North Crofton, Odenton Town Center and Ft. Meade via MD 3, Waugh Chapel, Piney Orchard and MD 175;

   - proposed Route Y (Figure 4-1b) connecting Russett Green, Odenton Town Center and Ft. Meade via MD 32 and MD 175; and

   - proposed route from Arnold/ Severna Park to Odenton Town Center (Figure 4-1f) via MD 175 and MD 3.

3. Regional Transit – Express Bus Service. The Maryland Transit Administration is considering future bus service connecting Odenton with Annapolis and Washington, D.C. via the Greenbelt Metro Station. The service would originate locally at the MARC commuter Park-and-Ride lots and would complement existing rail service.

4. Regional Transit – Commuter Rail and Bus Rapid Transit. Improvements to or new fixed guideway transit service under study include:

    a. MARC Upgrades. Upgrades to MARC service including higher frequency, reversed peak hour, extended hours for evening and weekend service and extended routes to northern Virginia is under study by MTA.

    b. BRT Service. A bus rapid transit service east-west from Columbia Town Center to Odenton Town Center via MD 175, US 1 and MD 32 is under study by Howard County.

A summary of the planned and potential transit services in the Odenton Town Center area is shown in Figure 29.

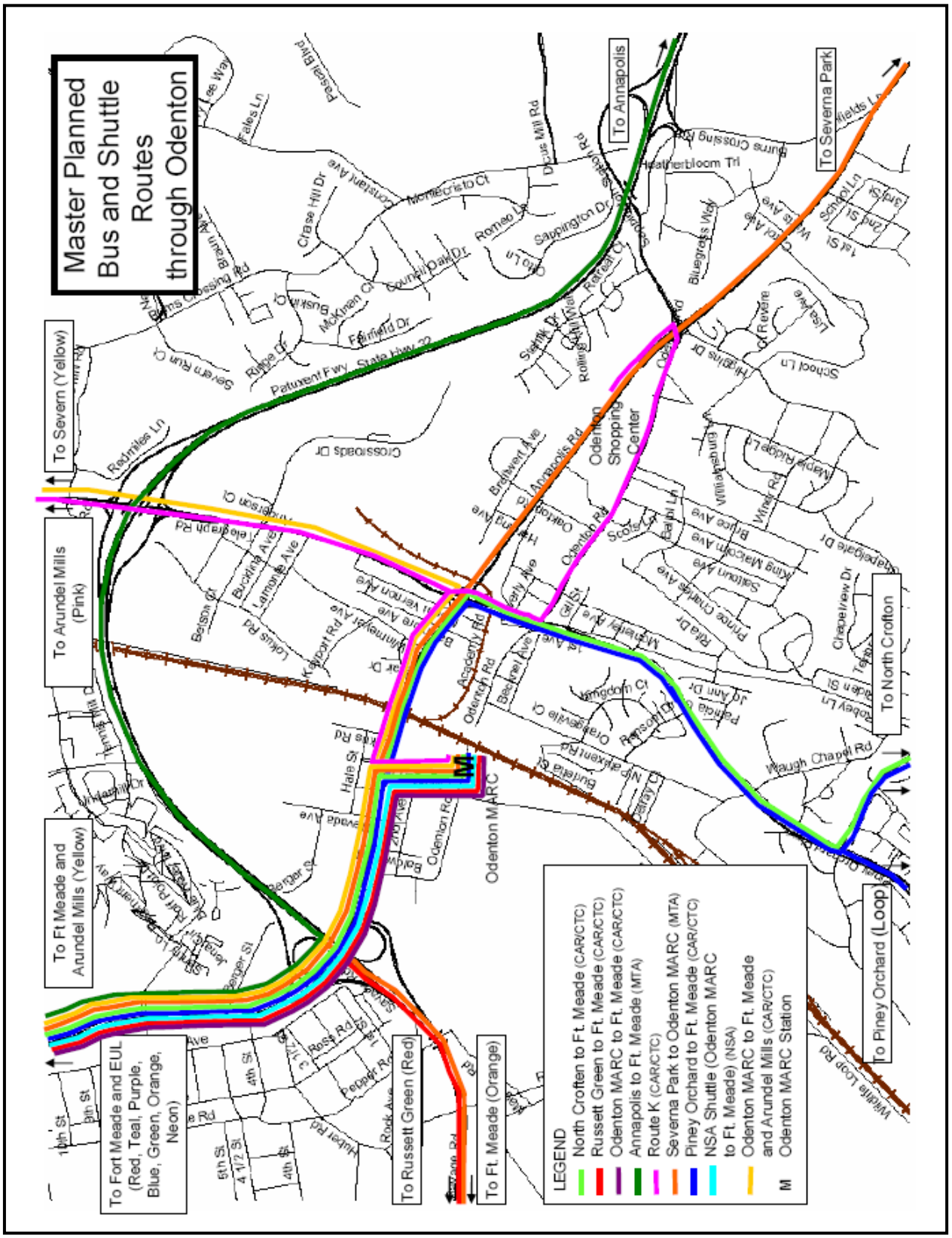
4.6.6 Public and Commuter Parking Facilities

This section summarizes on and off-street parking facilities, as well as parking demand management strategies. The balancing of parking demand and supply will have an important influence on the long-term success and viability of the Odenton Town Center as a walkable, transit-oriented development. Providing too much and too inexpensive parking may discourage people from using other modes of travel and limiting the potential for a more balanced mode share. However, providing too little or too costly parking may deter potential residents, employers and customers from living, working and patronizing the Town Center. Consider the following:

1. Commuter Parking. Commuter parking will likely be consolidated into structure facilities, and should consider the following design elements:

    - abutment to potential station locations;
    - staging and drop-off zones for local transit connections including bus and taxi; and
    - bicycle and pedestrian connections to potential station locations.

Figure 29. Master Planned Bus and Shuttle Routes through Odenton



2. Transportation Center. The Transportation Center will serve as a multi-modal hub with structured parking where connections between private vehicular, taxi and car share, pedestrian, bicycle, local bus, and commuter rail modes can be made. The Transportation Center must be easily accessible by all modes to be successful. A minimum 1,000 spaces is suggested, with shared usage (i.e. leased private daytime (commuter) or nighttime (resident) parking and opportunity for retail or office space. Initially, this Transportation Center should be constructed as a surface parking lot, and structured levels added as development occurs. The location of the Transportation Center should have convenient or direct access to major arterials, but within convenient walking distance to major activity centers, retail, etc. Shared parking recommendations are as follows:

Land Use	Weekday Utilization			Weekend Utilization	
	Day	Evening	Night	Day	Evening
Residential	70%	100%	100%	90%	100%
Office	100%	10%	5%	10%	5%
Retail	60%	90%	5%	100%	70%
Restaurant	50%	100%	10%	100%	100%
Hotel	75%	100%	75%	100%	100%

Photographs of Transportation Centers in Fort Worth, Texas (left) and Minneola, New York (right) are shown below:

3. On-Street Parking. On-Street parallel parking should primarily serve short-term commercial land uses and should be provided along most urban boulevard and all urban grid and local roadways, as noted in Table 15. To maximize the use of curbside spaces, it is suggested to install automated parking machines on each block instead of traditional parking meters.

4. Off-Street Parking. The overall approach to off-street parking should be a 'Park Once' philosophy to maximize the use of parking resources and to improve the availability and appearance of parking facilities in the Activity Centers. It is proposed to accomplish this goal through the following actions:

- develop an effective urban parking system to consolidate parking into centralized, shared, consumer-oriented facilities in each downtown grid block;

- develop clear permanent wayfinding signage for motorists; and
- integrate intermodal connections from parking facilities such as bus stops, sidewalks and trails.

4.7 Transportation Demand Management (TDM)

Although the private automobile will continue to play a substantial role in the OTC transportation system, there is significant potential to leverage the extensive transit system, walkability and bikeability, and mixed land uses to reduce overall demand for automobile travel. Such a strategy is known as Transportation Demand Management (TDM).

Transportation demand derives from individual decisions driven by numerous factors (e.g., trip purpose, available modes, distance, costs, etc.). By shifting these factors to favor non-auto travel for some travelers, programmatic TDM strategies have the potential to have a large positive impact. Based on the future traffic forecasts, levels of service, and cost of roadway improvements necessary to maintain adequate vehicular mobility there is a strong need to manage future trips, with a goal of 20% additional person trips managed. Managed trips are defined as:

- trips shifted to another mode,
- trips shifted to another time (outside of peak hour),
- trips shifted to another route, and
- trips not made.

While the need for TDM within the OTC is clear, mechanisms to ensure that appropriate TDM programs are in place are already in place within the County – known as Transportation Management Associations – although there is no TMA yet within the OTC. Current best TDM practice in the U.S. indicates success is typically achieved through the establishment of a Transportation Management Association (TMA). A TMA is a non-profit, member-controlled organization, often affiliated with a Business Improvement District, which provides transportation services and information in a given area. They are generally created through a public-private partnership where area residents and businesses work with local government to provide an institutional framework for TDM programs. TMA's are typically more efficient than government-controlled programs because they are administered directly by the member organizations. By pooling resources within the service area, TMA's also allow smaller business to offer commute benefits or programs typically associated with larger companies. The strongest TMA's:

- support a variety of transportation services, travel options and incentives, including planning efforts to create more pedestrian- and transit-friendly land use, and parking brokerage services to help businesses share and trade their parking resources;

- include both positive and negative incentives. TDM programs tend to be most effective when they improve consumers' travel choices and provide incentives to use alternatives to driving when possible;

- work to develop and maintain cooperation between transportation agencies, transit service providers, businesses, employees and residents who are affected by their programs;

- produce an annual "State of the Commute" report, which describes TDM programs and resources, travel trends, and comparisons with other communities; and

- utilize increased parking rates and parking revenue to fund TMA initiatives.

For the OTC, it is recommended that all developers/ major tenants/ employers join one of the County's two existing Transportation Management Associations – the BWI Business Partnership (http://www.bwipartner.org/) or the Annapolis Regional Transportation Association (http://www.artma.org/), or provide their own TDM plan. Together, these TMAs should develop programming specific for the OTC to educate, and manage TDM programs as required in the OTC Master Plan (Chapter 3, Section 4.10). To achieve the target 20% additional person trips managed, recommended TMA strategies include:

1. Parking Management Plan. Develop a parking management plan to include some or all of the following elements:

    - shared parking,
    - satellite parking,
    - car shares (e.g. Zipcar),
    - carpool priority parking,
    - performance parking,
    - bicycle amenities (e.g., lockers, parking and rentals),
    - taxi,
    - shuttle, and
    - paratransit.

2. Educational Materials. Develop educational materials about travel choices and economic benefits.

3. Ride Sharing. Promote and coordinate ride sharing, park-and-ride and telecommuting options.

4. Mode Share. Monitor mode share through counts of vehicles, pedestrians, bicycles, transit, parking surveys and employee surveys and producing an annual report.

5. Transit Passes. Work with employers, Ft. Meade, and local governments to subsidized or provide free transit passes.

6. Circulator Shuttle. Develop a new local circulator shuttle route within OTC.

7. Shared Parking. Identify shared parking opportunities (e.g. daytime office and nighttime residential).

8. Car Shares. Coordinate car shares (e.g. Zipcar).

To facilitate the TMA approach in the OTC, it is further suggested to create a Multi-Modal Planning Team to spearhead efforts in and around OTC. The planning team would be comprised of County officials from representative stakeholder agencies, consultants, developers, business owners, and citizens. The Team would be tasked with:

- studying, managing and developing strategies to improve and fund transit, pedestrian and bicycle facilities, and modal connections;
- initiating TDM programs and expanding existing TMA coverage to the OTC area;
- marketing and publicizing travel choices through flyers, kiosks, and websites for commuters, shoppers, and visitors;
- identifying parking strategies and programs, improving wayfinding signage; and
- working with local, state and private transit operators and community associations to simplify routing, service, and integrated payment mediums.

Examples of existing multi-modal Task Forces can be found in locations as diverse as Alameda, CA, Burlington, VT and Lincoln, NE.

4.8 Geometric, Environmental, and Cost Considerations

4.8.1 Typical Sections

The proposed typical sections for Odenton Town Center are shown in Figure 30. The proposed typical closed section for the TSM Option B, which generally follows the existing centerline of roadways for the local grid streets, consists of a 40-foot wide street section (one 10-foot travel lane, one 10-foot travel lane, which converts to an off peak hour parking lane, in each direction). In the case of a one-way roadway, the same overall dimensions apply, but in one direction only. Along Nevada Avenue, the proposed typical closed section consists of two 24-foot wide roadways (one 12-foot travel lane, one 12-foot travel lane, which converts to an off peak hour parking lane, in each direction, separated by an 18-foot median. Pedestrian and bicycle accommodations would be included as part of this option. The proposed southern bridge crossing P2 alignment, generally a new alignment parallel to the existing Baltimore Gas and Electric R/W from Piney Orchard Parkway, across the tracks, to the planned Morgan Road extension, the typical open section consists of two 24-foot wide roadways (two 12-foot travel lanes in each direction) with 10-foot shoulders.

4.8.2 Functional Classification

The Existing Roadways and Streetscape Design Standards, see Table 15, provides the governing road and streetscape design standards for the Odenton Town Center area, including minimum right-of-way, number of travel lanes, and requirements for medians, on-street parking, bike lanes, sidewalks, streetscape features and functional classification. The Proposed Roadways and Streetscape Design Standards, see Table 16, presents the same information, but with proposed revisions based on analysis performed by this study. The proposed changes would require revisions to the Anne Arundel County Design Manual and adopted December 2009 OTC Master Plan.

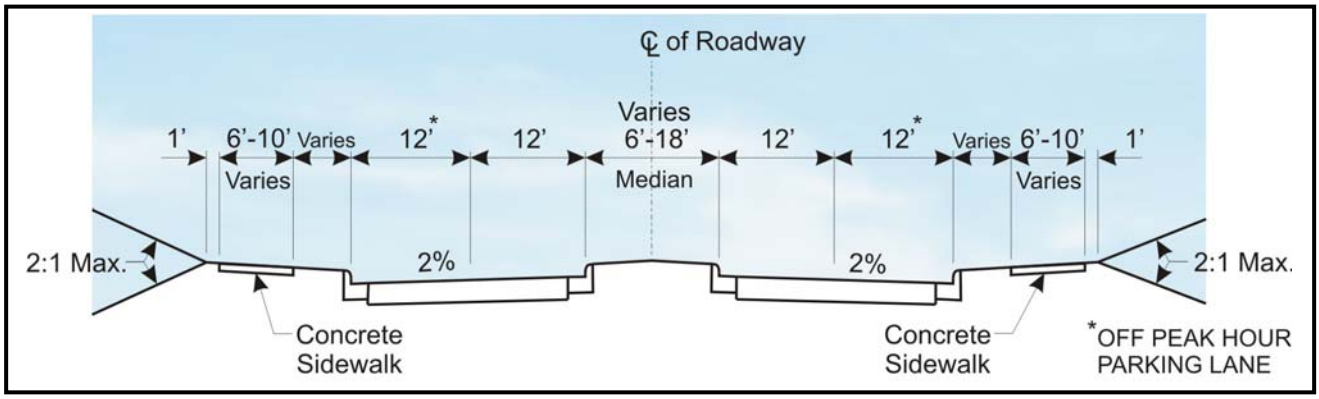
4.8.3 Environmental and Other Impacts

Figure 31 illustrates existing environmental and historic features in the Odenton Town Center area. The potential impacts for TSM Option B include the following:

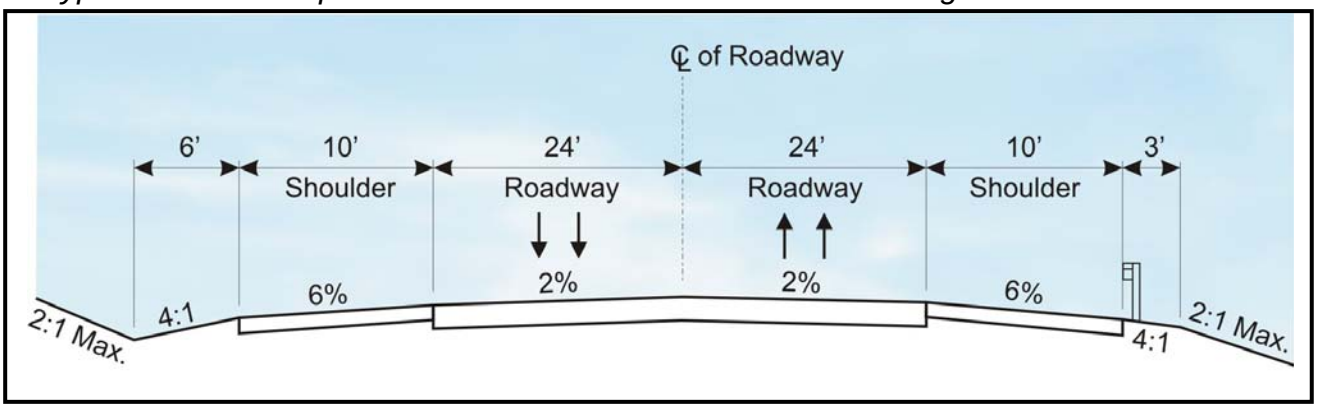
- property impacts in the form of right-of-way acquisition from commercial and residential properties;
- property acquisition within the Odenton Historic District (Epiphany Episcopal Chapel and Church House Cemetery and MARC Odenton Station);
- residential and commercial displacements; and
- some impacts to woodland areas.

Figure 30. Proposed Typical Sections for Odenton Town Center

Typical Section – Closed Section – 4-Lane Divided Nevada Avenue



Typical Section – Open Section – 4-Lane Undivided Sothern Alignment



Typical Section – Closed Section – Local Streets

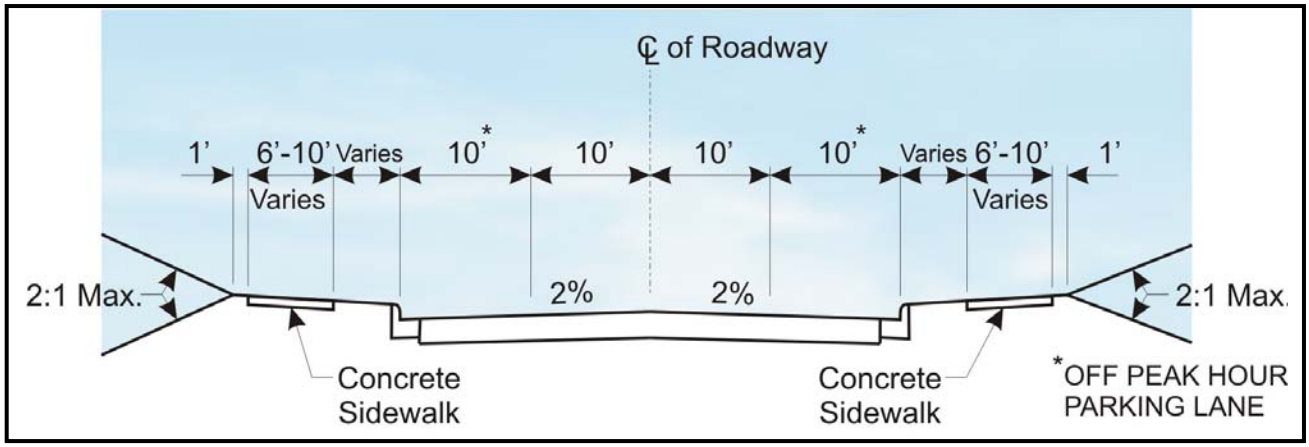


Table 15. Odenton Town Center Transportation Study Existing Roadways and Streetscape Design Standards

Street Name	Road Segment		Functional Classification	Minimum ROW Width	# of Lanes	Minimum Roadway Width	Median (Y/N)	Parking Lanes (Y/N)	Bike Lanes/Compatible (Y/N)	Minimum Sidewalk Width	Minimum Hiker/Biker Trail Width
	From	To									
Urban Arterial											
Town Center Blvd. (P)	Annapolis Road (MD 175)	Blue Water Boulevard	Minor Arterial	100'	4	50'-78'	Y	N	Y	5'	10'
Urban Boulevard											
Morgan Road	Odenton Road	Annapolis Road (MD 175)	Minor Arterial	80'	4	50'	Y	Y	N	10'	10'
Odenton Road	Magazine Road	Terminus (MARC Station)	Collector Road	64'	2	36'	N	Y	N	6'	-
Planned Road (P2)	Piney Orchard Parkway	Morgan Road Extended	Collector Road	64'	2-3	36'	N	N	Y	6'	-
Planned Road (P3)	Lokus Road	Town Center Blvd. (P)	Collector Road	64'	2-3	36'	N	N	Y	6'	-
Urban Grid											
Baldwin Road	Terminus	Berger Street	Collector Road	60'	2-3	36'	N	Y	Y	10'	-
Berger Street	Odenton Avenue	Nevada Avenue	Collector Road	60'	2-3	36'	N	Y	Y	10'	-
Dare Street	Annapolis Road (MD 175)	Hale Street	Local Road	50'	2	28'	N	Y	Y	10'	-
Dare Street Extended	Hale Street	Proposed Alley	Local Road	50'	2	28'	N	Y	Y	10'	-
Duckens Street	Baldwin Road	Morgan Road	Collector Road	60'	2-3	36'	N	Y	Y	10'	-
Duckens Street	Old Odenton Road	Baldwin Road	Local Road	50'	2-3	28'	N	Y	Y	10'	-
Hale Street	Baldwin Road	Lokus Road	Collector Road	60'	2-3	36'	N	Y	Y	10'	-
Hale Street Extended	Odenton Avenue	Baldwin Road	Collector Road	60'	2-3	36'	N	Y	Y	10'	-
Lokus Road	Annapolis Road (MD 175)	Hale Street	Collector Road	60'	2-3	36'	N	Y	Y	10'	-
Lokus Road	Hale Street	Terminus (TC Blvd)	Local Road	50'	2	28'	N	Y	Y	10'	-
Nevada Avenue	Duckens Street	Terminus	Collector Road	60'	2-3	36'	N	Y	Y	10'	-
Nevada Avenue Extended	Odenton Road	Duckens Street	Collector Road	60'	2-3	36'	N	Y	Y	10'	-
Local Road											
Morgan Road Extended	Odenton Road	Terminus	Local Road	54'	2	28'	N	N	N	6'	10'
Old Odenton Road	Magazine Road	Terminus	Local Road	54'	2	28'	N	Y	N	6'	10'
Planned Road (P1)	Prop. Old Odenton Road	Terminus (MARC Station)	Collector Road	54'	2-3	36'	N	Y	N	6'	-

Table 16. Odenton Town Center Transportation Study Proposed Roadways and Streetscape Design Standards

Street Name	Road Segment		Functional Classification	Minimum ROW Width[4]	# of Lanes	Minimum Roadway Width[4]	Median (Y/N)	Parking Lanes (Y/N)	Bike Lanes/Compatible (Y/N)	Minimum Sidewalk Width	Minimum Hiker/Biker Trail Width
	From	To									
Urban Arterial											
Town Center Blvd. (P)	Annapolis Road (MD 175)	Blue Water Boulevard	Minor Arterial	100'	4	50'-78'	Y	N	Y	5'	10'
Southern Alignment - Planned Road (P2)[1]	Piney Orchard Parkway	Morgan Road Extended	Minor Arterial	100'	4	68'	N	N	Y	-	-
Northern Alignment - Planned Road (P3)[1]	MD 170	Town Center Blvd. (P)	Minor Arterial	100'	4	68'	N	N	Y	-	-
Urban Boulevard											
Morgan Road	Odenton Road	Annapolis Road (MD 175)	Minor Arterial	80'	4	50'	Y	Y	N	10'	10'
Morgan Road Extended[2]	Odenton Road	Terminus	Minor Arterial	86'	4	62'	N	Y	N	6'	10'
Odenton Road	Magazine Road	Terminus (MARC Station)	Collector Road	64'	2-4	40'	N	Y	N	6'	-
Nevada Avenue[3]	Duckens Street	Terminus	Minor Arterial	90'	2-4	48'	Y	Y	Y	10'	-
Urban Grid											
Baldwin Road	Terminus	Terminus	Collector Road	64'	2-4	40'	N	Y	Y	10'	-
Berger Street	Odenton Avenue	Town Center Blvd. (P)	Collector Road	64'	2-4	40'	N	Y	Y	10'	-
Dare Street	Annapolis Road (MD 175)	Hale Street	Collector Road	64'	2-4	40'	N	Y	Y	10'	-
Dare Street Extended	Hale Street	Berger Street	Collector Road	64'	2-4	40'	N	Y	Y	10'	-
Duckens Street	Baldwin Road	Morgan Road	Collector Road	64'	2-4	40'	N	Y	Y	10'	-
Duckens Street	Old Odenton Road	Baldwin Road	Collector Road	64'	2-4	40'	N	Y	Y	10'	-
Hale Street	Baldwin Road	Lokus Road	Collector Road	64'	2-4	40'	N	Y	Y	10'	-
Hale Street Extended	Odenton Avenue	Baldwin Road	Collector Road	64'	2-4	40'	N	Y	Y	10'	-
Lokus Road	Annapolis Road (MD 175)	Hale Street	Collector Road	46'	2	22'	N	Y	Y	10'	-
Lokus Road	Hale Street	Terminus (TC Blvd)	Collector Road	64'	2-4	40'	N	Y	Y	10'	-
Nevada Avenue Extended	Odenton Road	Duckens Street	Collector Road	60'	2-3	36'	N	Y	Y	10'	-
Local Road											
Old Odenton Road	Magazine Road	Terminus	Local Road	64'	2-4	40'	N	Y	Y	6'	10'
Planned Road (P1)	Prop. Old Odenton Road	Terminus (MARC Station)	Collector Road	54'	2-3	36'	N	Y	N	6'	-

Notes:

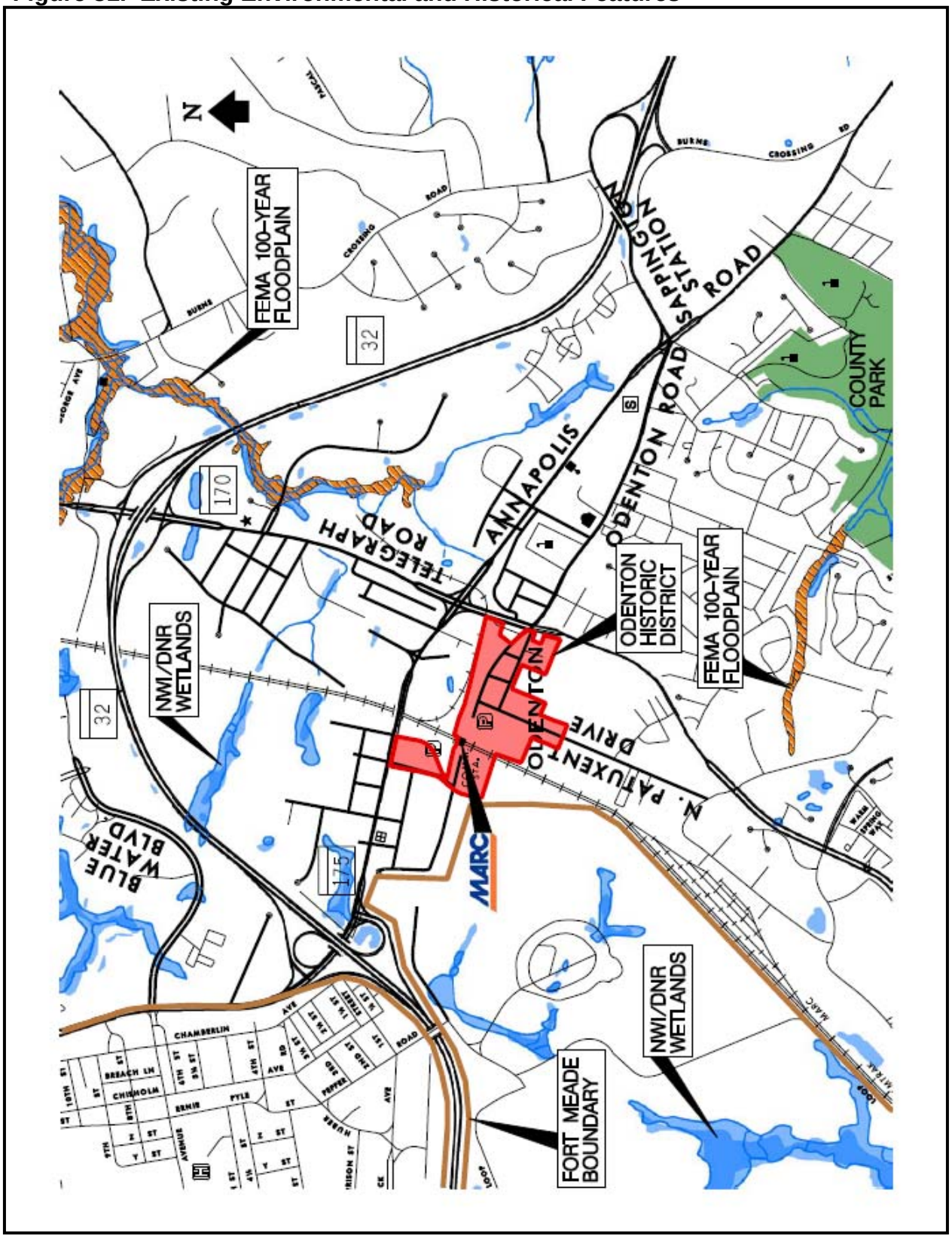
[1] *Previously designated Urban Boulevard*

[2] *Previously designated Local Road*

[3] *Previously designated Urban Grid*

[4] *Would require revision to the Anne Arundel County Design Manual*

Figure 31. Existing Environmental and Historical Features



The potential impacts for the southern bridge crossing P2 alternative include the following:

- property impacts in the form of right-of-way acquisition from commercial and residential properties;
- property acquisition within the Odenton Historic District (Epiphany Episcopal Chapel and Church House Cemetery and MARC Odenton Station);
- residential and commercial displacements;
- some impacts to woodland areas and a stormwater management facility;
- a new bridge crossing over the CSX/Amtrak/MARC line; and
- some impacts to the Baltimore Gas and Electric R/W high tension tower corridor running in a westerly direction from MD 170. Impacts would be in the form of land acquisition to accommodate the roadway; retaining walls would be needed to protect existing utility towers.

The potential impacts for the northern bridge crossing P3 alternative include the following:

- property impacts in the form of right-of-way acquisition from commercial and residential properties;
- some impacts to wetland and woodland areas; and
- a new bridge crossing over the CSX/Amtrak/MARC line.

Table 17 presents a summary of alternatives' impact assessment

Table 17. Summary Impact Assessment of Alternatives (Yes/No)

Odenton Master Plan Impacts Assessment (Yes/No)												
Improvement Option	Socioeconomic Impacts								Environmental Impacts			
	Property Impacts	Odenton Historic District Impacts	Residential Displacements	Commercial Displacements	Church and/or Cemetery Impacts	MARC Station Parking Impacts	AMTRAK/CSX Crossing	Utility Corridor Impacts	Wetland	100-Year Floodplain	Forest	Stormwater Management Facilities
TSM Option B	Y	Y	Y	Y	N	Y	N	N	N	N	Y	N
Southern Alignment - P2	Y	Y	Y	Y	N	Y	Y	Y	N	N	Y	Y
Northern Alignment - P3	Y	N	N	N	N	N	Y	N	Y	N	Y	N

4.8.4 Cost Considerations

Costs were estimated using the 2009 Maryland State Highway Administration Highway Construction Cost Estimating Manual. Because of lack of engineering detail performed to estimate quantities, cost per mile estimates were used for TSM Option B and the southern bridge crossing P2 alignment option. Overhead costs for Project Planning, Preliminary Engineering and Construction were 12.3%, 13% and 15.3%, respectively. Contingency costs were set at 40%, consistent with Cost Per Mile estimates. Utility costs were determined by using the SHA Alternate Method (15% of the construction project sub-total cost).

For TSM Option B, the project cost (minus right-of-way) is $73.7 million. The estimate was based on 11.06 lane miles of closed section roadway at $2,500,000/lane mile. The per lane mile cost assumed inclusion of all roadway items (grading, roadway and shoulder items). There we no estimated structural items. Traffic items assumed streetscape lighting, pedestrian signals, ground mounted signing, pavement markings and traffic signals. Estimated environmental items included stormwater management facilities, reforestation and planting and beautification items.

The southern bridge crossing P2 alignment option project cost is $52.4 million. The estimate consisted of 3.12 lane miles of open section roadway at $5,500,000/lane mile. The per lane mile cost assumed inclusion of all roadway items (grading, roadway and shoulder items). Structural items included a new bridge (new crossing over the CSX/Amtrak/MARC line) and retaining walls. Traffic items assumed lighting, signals for pedestrians and traffic, ground mounted signing and pavement markings. Estimated environmental items included stormwater management facilities, reforestation and planting and beautification items.

Individual category costs are shown in Table 18. Overall cost estimates for the selected alternatives are shown in Table 19. See Appendix J for detailed cost estimate sheets.

Table 18. Individual Category Costs

Proposed Alignment	Highway ($Millions)	Structure ($Millions)	Traffic ($Millions)	Utilities ($Millions)	Environmental ($Millions)
TSM Option B	38.7	0.0	3.6	7.2	5.7
Southern Alignment (P2)	24.0	6.9	1.1	4.2	2.9

Table 19. Overall Cost Estimate

Proposed Alignment	Project Planning Cost ($Millions)	Preliminary Engineering Cost ($Millions)	Construction Cost ($Millions)	Total Project Cost ($Millions) *
TSM Option B	0.5	9.6	63.6	73.7
Southern Alignment (P2)	0.5	6.8	45.1	52.4

** Costs do not include Right-of-Way*

4.8.5 Concept Plans

Concept plans for TSM Option B and the southern bridge crossing P2 alignment are shown in Figure 32 and Figure 33, respectively. Full size plan sheets of these figures are provided in Appendix L.

4.8.6 Lokus Road Deceleration Lane

Appendix K identifies sight distance problems at the intersection of MD 175 and Lokus Road. The SHA currently has blockaded the Lokus Road access to MD 175. Under TSM B, it is recommended to reopen Lokus Road northbound for westbound MD 175 right turns only. However, in doing so, is it also recommended to provide a deceleration lane of approximately 150 ft in length for the westbound traffic turning right off of MD 175 northbound on Lokus Road.

Figure 32. Concept Plan – Odenton Town Center TSM Option B

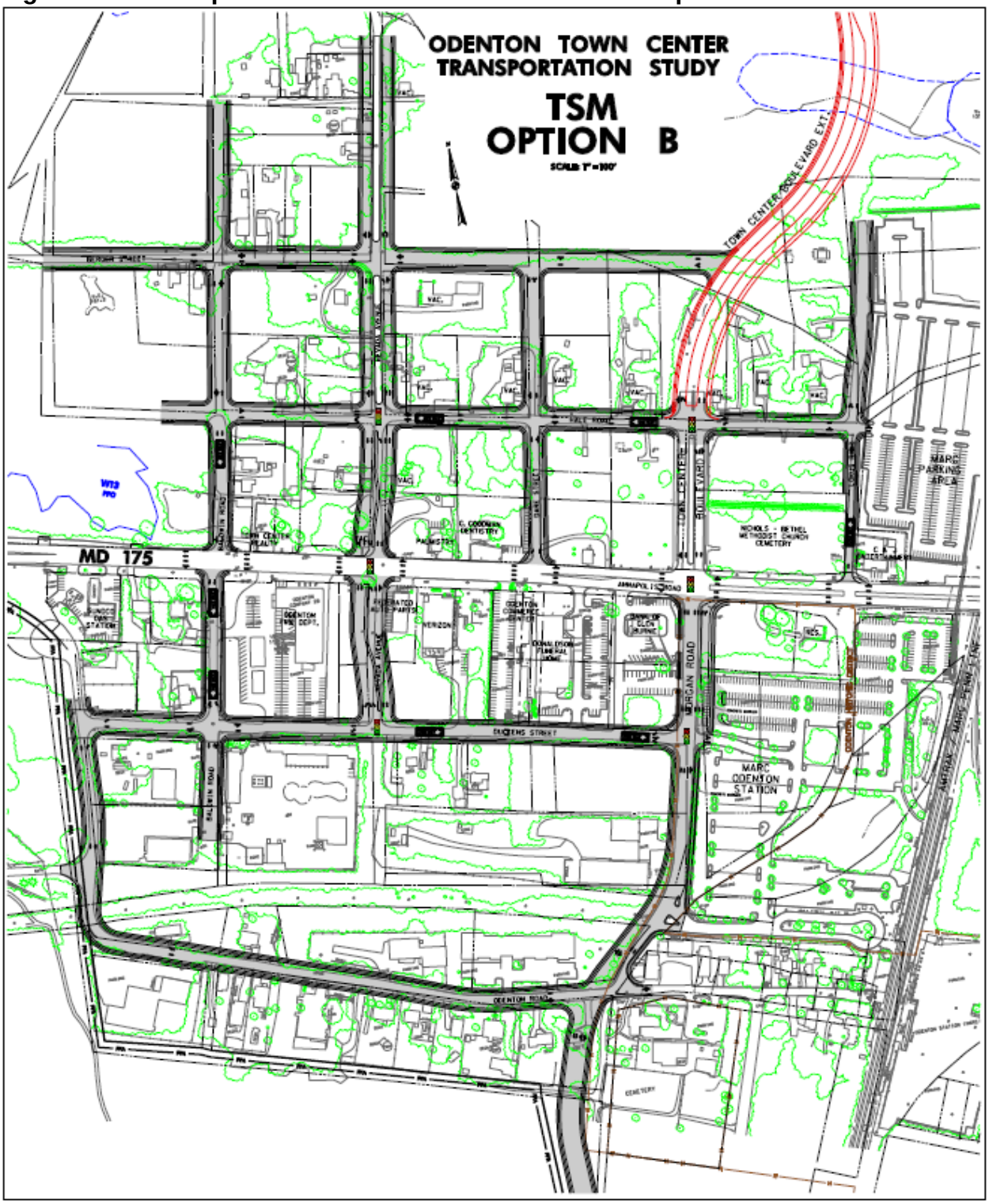
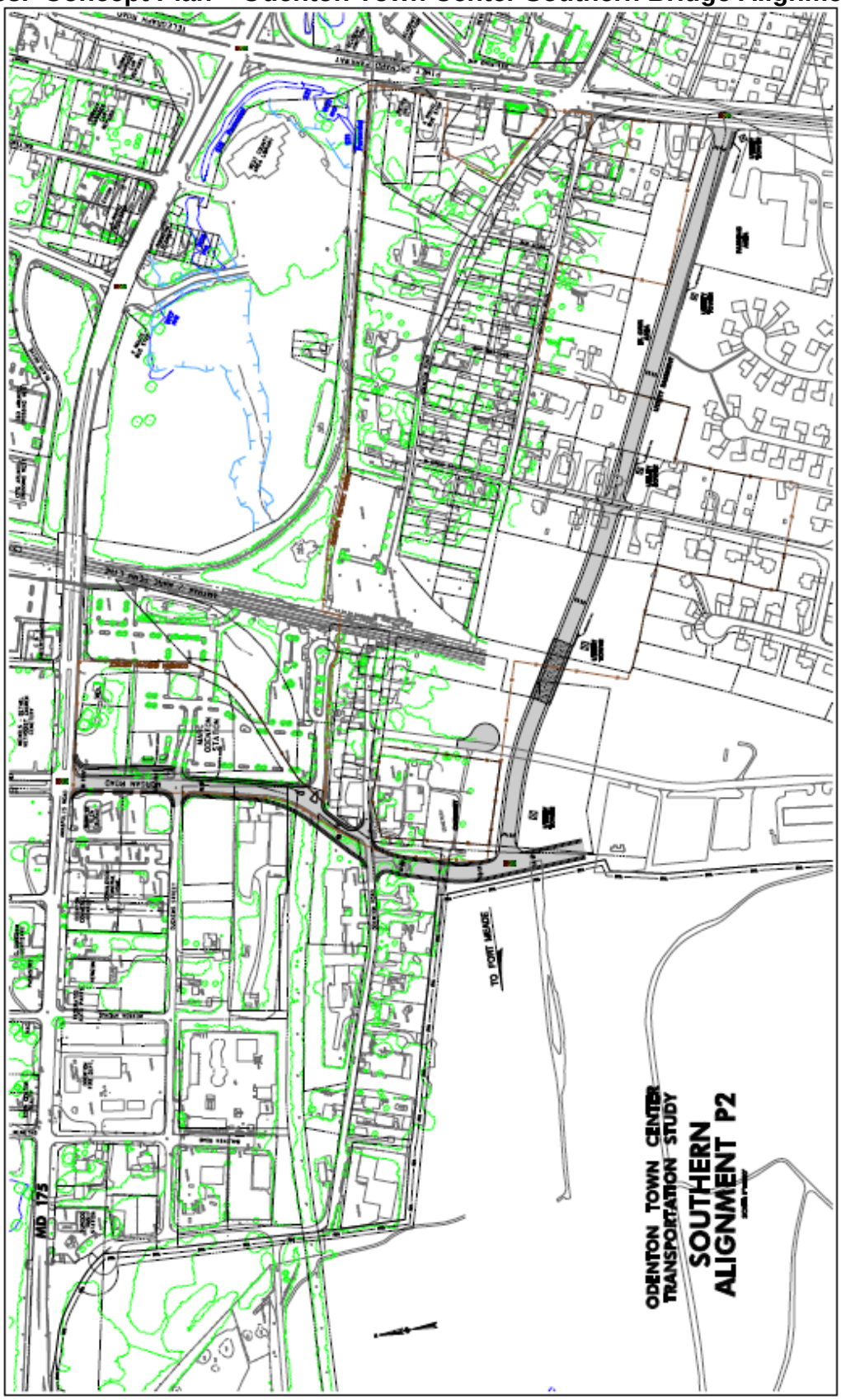


Figure 33. Concept Plan – Odenton Town Center Southern Bridge Alignment P2



5.0 FINDINGS AND RECOMMENDATIONS

The OTC area is expected to transform into a more urban TOD environment building upon the foundation of the existing roadway and railway infrastructure. The demand on travel within, around and through OTC will require a multitude of transportation improvements and management strategies to provide adequate levels of service and mobility. It is intended that the recommendations presented herein will provided a more detailed blueprint for the County and private sector partners to develop a CIP and CTP program to achieve the vision as documented by the OTC Master Plan December 2009.

Under full build-out of OTC and without any transportation improvements, ten out of nineteen intersections will fail in at least one peak hour, primarily along MD 170 and MD 175. Resulting affects of this congestion would be gridlock and blocking of the primary gateway to land uses within OTC as well as direct access to MARC and Fort Meade.

The Odenton Town Center Master Plan December 2009 identifies specific transportation improvement priority projects for sidewalks, trails, and roadways. Based on the results of this study, the following additional or modified preferred improvements should be considered:

1. New East-West Roadway Capacity. A new crossing of the AMTRAK/Penn Line tracks is most beneficial to improving overall traffic flow and levels of service in the study area. The southern bridge crossing P2 alignment is recommended.

2. TSM Options. There is a need for regulation of traffic flow within the OTC grid streets to provide efficient and optimal mobility such as one-ways streets, left-turn restrictions, and peak-hour parking restrictions. Specifically TSM Option B (see Figure 34):

    a. one-way flow westbound on Hale between Town Center and Nevada,

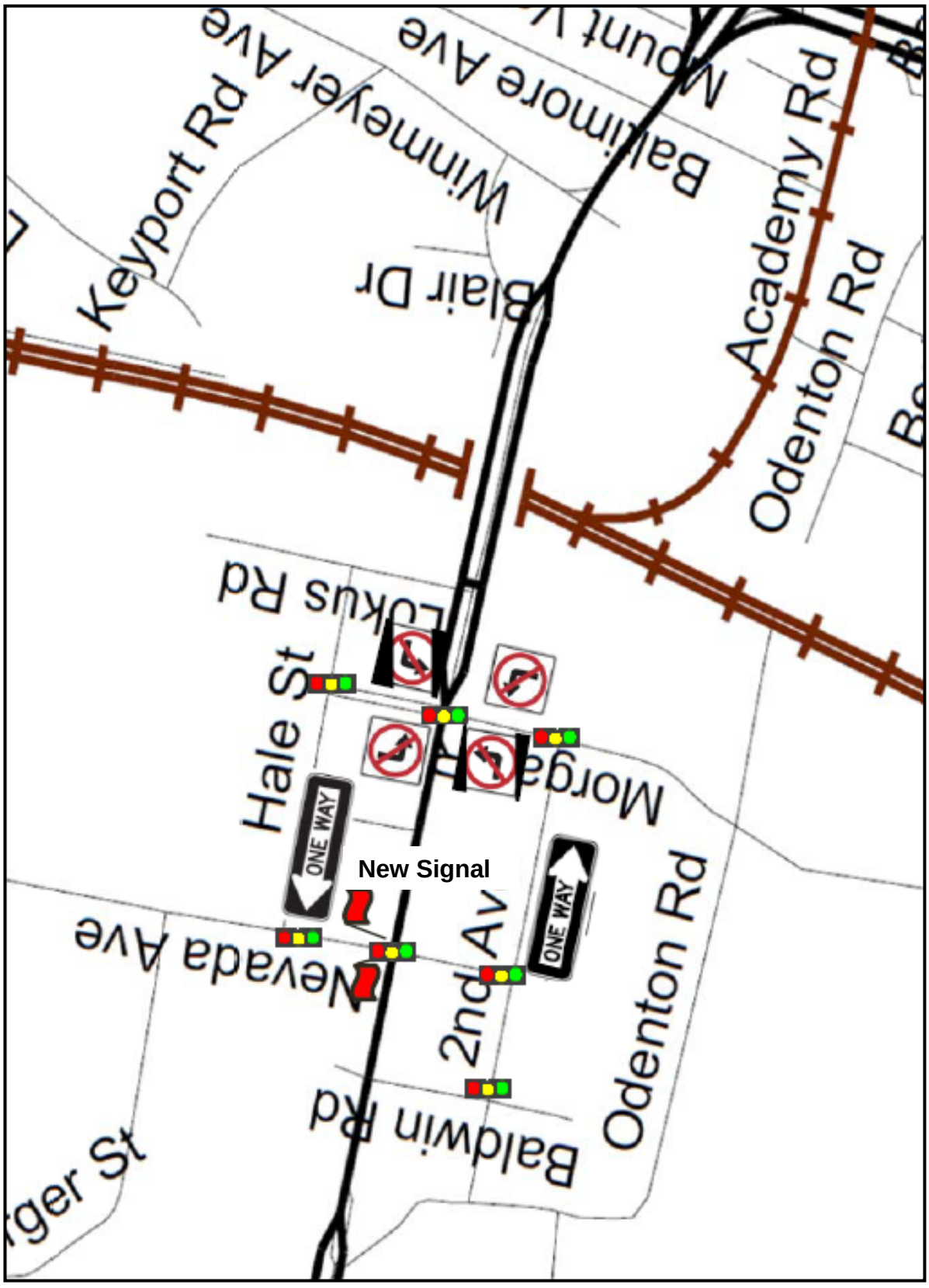
    b. one-way flow eastbound on Duckens Street between Nevada and Morgan,

    c. one-way flow southbound on Baldwin Road between Hale Street and Duckens Street,

    d. peak hour curbside parking restrictions to provide turn lanes at key intersections; and

    e. full-time left-turn prohibitions in all directions at MD 175/ Town Center and MD 175/Baldwin, except at Nevada Avenue.

Figure 34. OTC Grid Street Recommendations



3. Traffic Control. There will be a need for upgrade intersection traffic controls to provide safe and efficient traffic flow at major intersections. New traffic signals are recommended at the following intersections:

   - MD 175 at Nevada Avenue (the signal should incorporate preemption for the existing firehouse),
   - Hale Street at Nevada Avenue,
   - Hale Street at Town Center Blvd,
   - Duckens Street at Nevada Avenue,
   - Duckens Street at Morgan Road,
   - Duckens Street at Baldwin Road,
   - P2 at Morgan Road extended,
   - P2 at Piney Orchard Road, and
   - MD 170 at Lamonte Ave.

4. Upgraded Roadways. There will be a need to strengthen the existing grid and enhance north-south access within OTC. The following specific improvements are suggested:

   a. upgrade Nevada Avenue to a four-lane divided OTC Urban Boulevard,

   b. extend Hale Street west to the planned alignment of Odenton Avenue,

   c. extend Baldwin Road north to Berger Street,

   d. extend Berger Street to Town Center Boulevard (Lokus Road),

   e. extend Dare Street to Berger Street,

   f. upgrade MD 170 to a four-lane divided roadway north from MD 175 to Crossroads Drive,

   g. provide for a potential new point of access to Fort Meade at the intersection of the P2 alignment with Morgan Road to enhance access to the MARC Station and provide relief at other Fort Meade gates, and

   h. construct an access roadway from Winmeyer Avenue to the planned commuter parking structure.

   i. provide a 150-ft long right-turn lane for the north-, south- and east-bound right-turn movements at Piney Orchard Parkway at Odenton Road, with overlap phases for the north- and south-bound right-turn movements.

5. Access Management/Wayfinding Strategies. There will be a need to implement access management strategies along MD 175 to reduce or eliminate curb cuts,

which will reduce conflicts and enhance safety. Although, businesses will want frontage on MD 175 for visibility, their primary vehicular access points should be on north-south streets and east-west streets (e.g., Hale Street, Duckens Road). In addition, wayfinding signing to direct motorists and support a park-once-and-walk approach for the Town Center area.

6. Pedestrian, Bicycle and Transit Access. There will be a need to provide high-quality non-motorized rights-of-way within OTC. The following specific additional improvements are suggested:

   a. develop a cycle track configuration for the MD 175 planned bicycle facility to more clearly delineate pedestrian and bicycle envelopes;

   b. accommodate pedestrians at all new traffic signals through phasing (e.g., leading pedestrian intervals), timing (e.g., MUTCD compliant walk and flashing don't walk), countdown and audible pedestrian signals, crosswalks, and ADA ramps;

   c. installation of bicycle lanes (e.g., share-the-road signing and marking, wide curb lanes), a bicycle depot at the MARC Station and bicycle wayfinding signing on the grid streets to connect the trail network to destinations within the Town Center;

   d. new or upgraded amenities for transit users (e.g., shelters, benches, real time transit information) at existing and proposed bus stops within OTC;

   e. provide wider sidewalks and traffic calming devices such as chokers where practicable; and

   f. work with State and regional agencies (e.g., CMRT) to deploy additional local and regional transit services.

7. Transportation Demand Management (TDM). There will be a need to implement policies and programs to manage demand for travel in the OTC area and encourage use of alternative travel modes. To achieve the target 20% additional person trips managed, recommended strategies include:

   a. designate one public parking facility as a transportation center within the Town Center where connections between private and public transit, motorized and non-motorized modes, can be seamlessly made;

   b. create a multi-modal task force to spearhead TDM and TMA efforts for OTC;

c. develop a parking management plan to include some or all of the following elements:

- shared parking,
- satellite parking,
- car shares (e.g. Zipcar),
- carpool priority parking,
- performance parking,
- bicycle amenities (e.g., lockers, parking and rentals),
- taxi,
- shuttle, and
- paratransit;

d. require developers and employers to join one of the County's existing Transportation Management Associations (TMA), such as the BWI Partnership or Annapolis Regional TMA, which will assist in providing the following;

- educational materials about travel choices and economic benefits, and

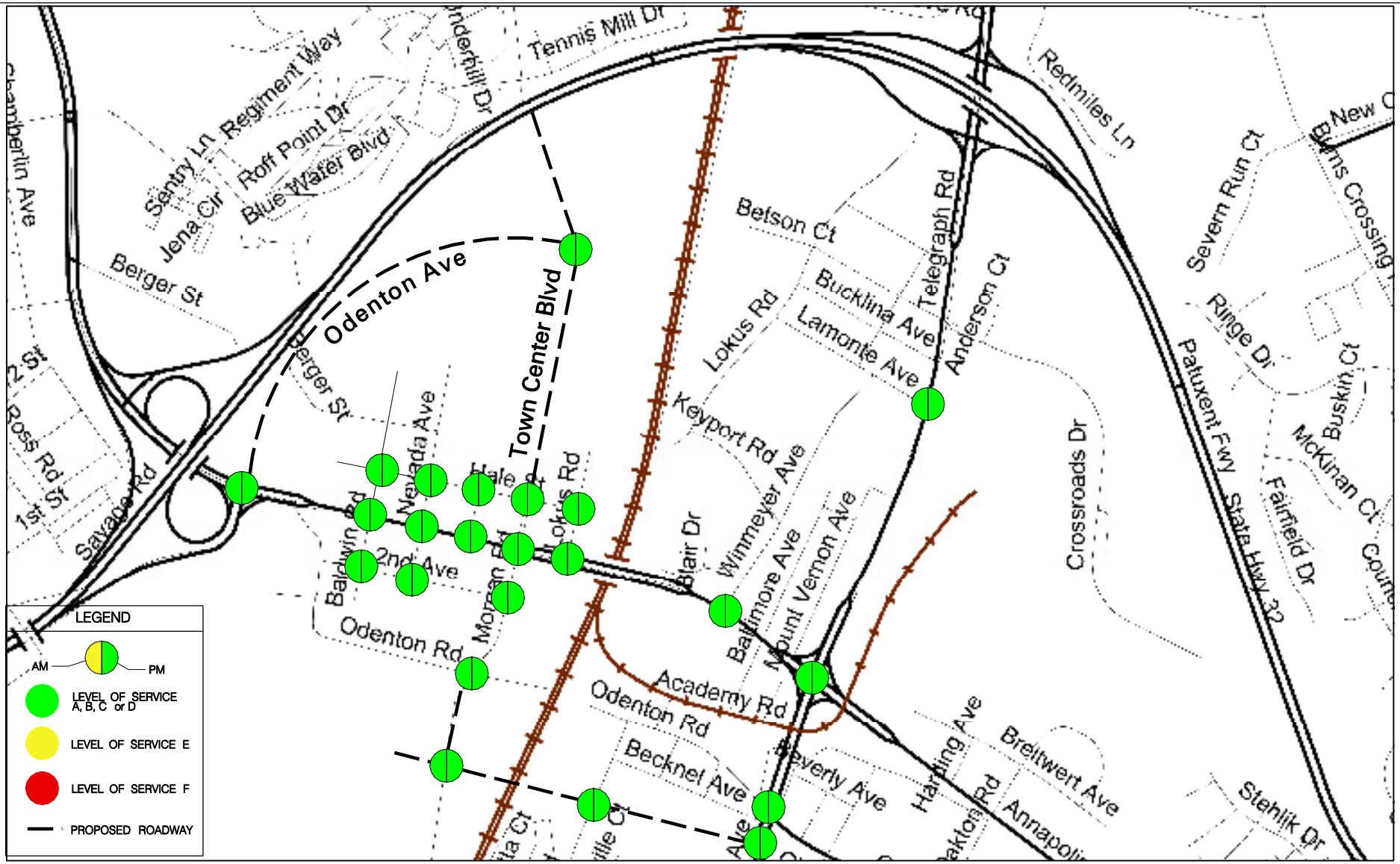
- promotion and coordination of ride sharing, park-and-ride and telecommuting;

e. produce an annual report to monitor mode share through counts of vehicles, pedestrians, bicycles, transit, parking surveys and employee surveys.

Table 20 summarizes the changes in recommendations from the current December 2009 Odenton Town Center Master Plan. Figure 35 illustrates the resulting levels of service with all recommended improvements implemented.

Table 20. Summary of Changes from Odenton Town Center Master Plan

IMPROVEMENT TYPE/ LOCATION	COMMENT
Nevada Avenue	Upgrade to urban arterial.
Morgan Road Extended	Upgrade to urban arterial.
Southern Alignment (P2)	Upgrade to urban arterial.
Northern Alignment (P3)	Eliminate planned roadway.
Dare Street	Extend from Odenton to Berger Street.
Berger Street	Extend east to Town Center Blvd.
Winmeyer Avenue	New public access road to future parking garage.
Hale Street	One-Way WB from Town Center to Nevada.
2nd Avenue/ Duckens	One-Way EB from Nevada to Morgan Road.
MD 175 Bicycle Path	Design as a cycle track .
TDM	Create a multi-modal task force.
Sidewalks	Consider exceeding current minimum standards to (10 feet for an arterial, 18 feet for a boulevard, 12 feet for a grid street and 8 feet for a local street.
Bicycles	Bicycle signals, floating bicycle lanes, bicycle depot, wayfinding signage.
Bus Rapid Transit	Participate in joint study with Howard County, MTA, SHA.
Transportation Center	Designate one public parking facility as official OTC transportation center.
On-Street Parking	Performance Parking with automated parking meters.



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ODENTON TOWN CENTER
TRANSPORTATION STUDY

2035 SOUTHERN BRIDGE CROSSING (P2)
WITH TSM OPTION B - LEVEL OF SERVICE

SCALE:	DATE:	FIGURE NO.
NONE	MAY 2010	35

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