GREAT SENECA PLAN – TRANSPORTATION APPENDIX

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INTRODUCTION

This Transportation Appendix summarizes the methodology and analysis used to inform and evaluate the recommendations in the Great Seneca Plan. The overall transportation goal of the Great Seneca Plan is to transform the Great Seneca Plan Area into a place where all travelers—regardless of age, ability, or mode of transportation—have multiple safe and convenient transportation options. The Plan prioritizes safety and choice over mobility and includes goals to eliminate transportation-related fatalities and severe injuries, create a multimodal environment with transportation options, and minimize out-of-direction travel for all modes. The transportation goals and recommendations of this master plan prioritize the safety of all road users, consistent with the Vision Zero policy adopted by the Montgomery County Council in 2016.

While the Plan Area includes 4,330 acres across multiple areas, the most intensive transportation recommendations, and hence most transportation analysis, focuses on the Life Sciences Center, where the most change is anticipated.

COMPLETE STREETS

As stated above, the Great Seneca Plan's overall transportation goal is to transform the Plan Area into a place where all travelers—regardless of age, ability, or mode of transportation—have multiple safe and convenient transportation options. The Plan also includes these supporting goals: prioritize safety and choice, eliminate transportation-related fatalities and severe injuries, create a multimodal environment with transportation options, and minimize out-of-direction travel for all modes. Achieving these goals will require an interconnected network of complete streets, designed, operated, and maintained to provide safe accommodations for people who walk, bicycle, use transit, and drive. Since the operation and maintenance of many roadways in the Plan Area is a shared responsibility between the state and the county, the complete streets policies of each agency are relevant to the implementation of this long-term vision.

The Maryland Department of Transportation State Highway Administration adopted a Complete Streets Policy in 2011 that requires the consideration and incorporation of all transportation modes when developing or redeveloping the state's transportation system. The policy is committed to a safe, efficient and multimodal network as well as partnerships with local governments, transit providers and stakeholders to develop and maintain a complete street network.[1]

The Montgomery County Complete Streets Policy and Standards, included in Section 49-25 of the Montgomery County Code, require that "each County road must be designed so that the safety and convenience of all intended users of the roadway system is accommodated. Complete Streets

[1] "Complete Streets Policy, Maryland State Highway Administration." (http://roads.maryland.gov/OPPEN/SHA_Complete_Street_Policy.pdf)

function as a road transportation network that is safe and convenient for all intended users, regardless of mode."[2]

It is critical that the planning, design, and construction of long-term redevelopment and infrastructure projects implement the Complete Streets policies of the state and county to facilitate the safe and efficient movement of all transportation modes.

GREAT SENECA PLAN EXISTING TRANSPORTATION CHARACTERISTICS

The Plan Area straddles I-270 with ramps at Watkins Mill Road, Quince Orchard Road, West Diamond Avenue, Sam Eig Highway, Omega Drive, Shady Grove Road, and West Montgomery Avenue in close proximity. Six-lane roads, like Darnestown Road, Key West Avenue, Shady Grove Road, and Sam Eig Highway typify the Plan Area; in the Life Sciences Center, 94% of lane miles are on roads with more than two lanes. However, there is limited local street grid connectivity. Protected pedestrian crossings are typically 2,000 feet or more apart in the Life Sciences Center and in some locations, pedestrians must travel up to 3,700 feet to reach the next protected crossing. Free-flowing right-turn slip lanes allow drivers to make right-hand turns without stopping for a signal, further reducing the area's safety and walkability. Sidepaths on larger roadways provide some bicycle connectivity but some segments, particularly along Key West Avenue and Darnestown Road have substandard widths; the lack of local street grid connectivity also leaves bicyclists without safe, connected, convenient routes to their destinations.

LIFE SCIENCES CENTER – SEVERE AND FATAL CRASHES

As shown in Figure 1, between 2015 and 2022, there were two fatal crashes and 27 severe injury crashes in the Life Sciences Center. Although pedestrian and bicycle travel represent less than an estimated 5% of person trips in the area, pedestrians and bicyclists accounted for 28% of fatal and severe injury crashes, including one fatality and seven severe injuries. Comparably, approximately 31% of the fatal and severe crashes in the county between 2015 and 2022 involve a pedestrian or a bicyclist. This high-level analysis suggests that infrastructure improvements are critical to improve safety in the Life Sciences Center, particularly for disproportionately affected, vulnerable users such as pedestrians and bicyclists.

[2] " Montgomery County Road Design and Construction Code" (https://codelibrary.amlegal.com/codes/montgomerycounty/latest/montgomeryco_md/0-0-0-147955#JD_49-25)

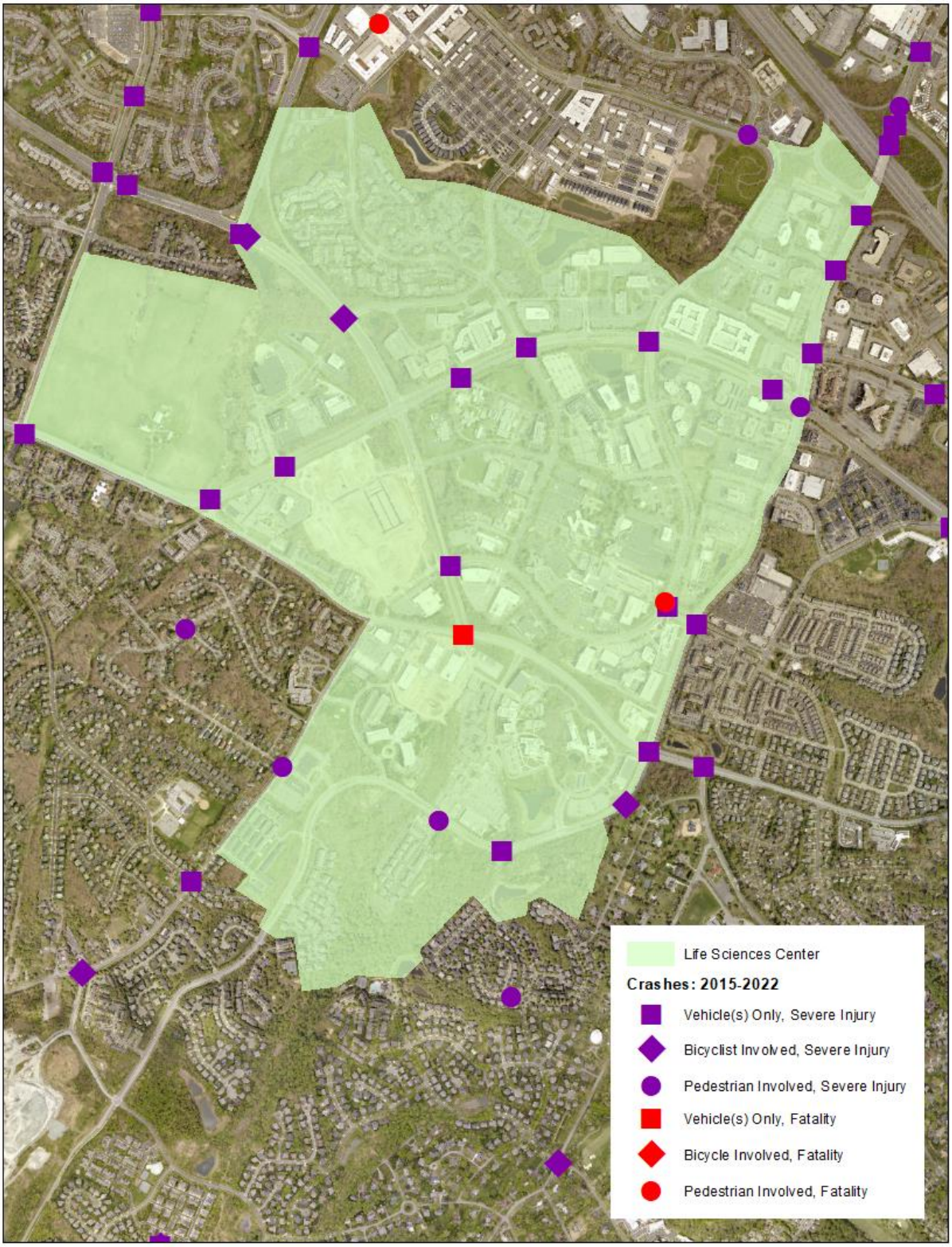

Figure 1: Life Sciences Center Severe Injury and Fatal Crashes, 2015-2022

ROADWAY SAFETY

Roadway safety is achieved through the reduction of crash frequency and crash severity. Methods to reduce crash frequency include providing clearly designated space for each road user, as accomplished through a complete street, and regulating the interaction of road users through traffic signals or other traffic control measures. The reduction of crash severity is primarily achieved through reduced vehicle speeds.

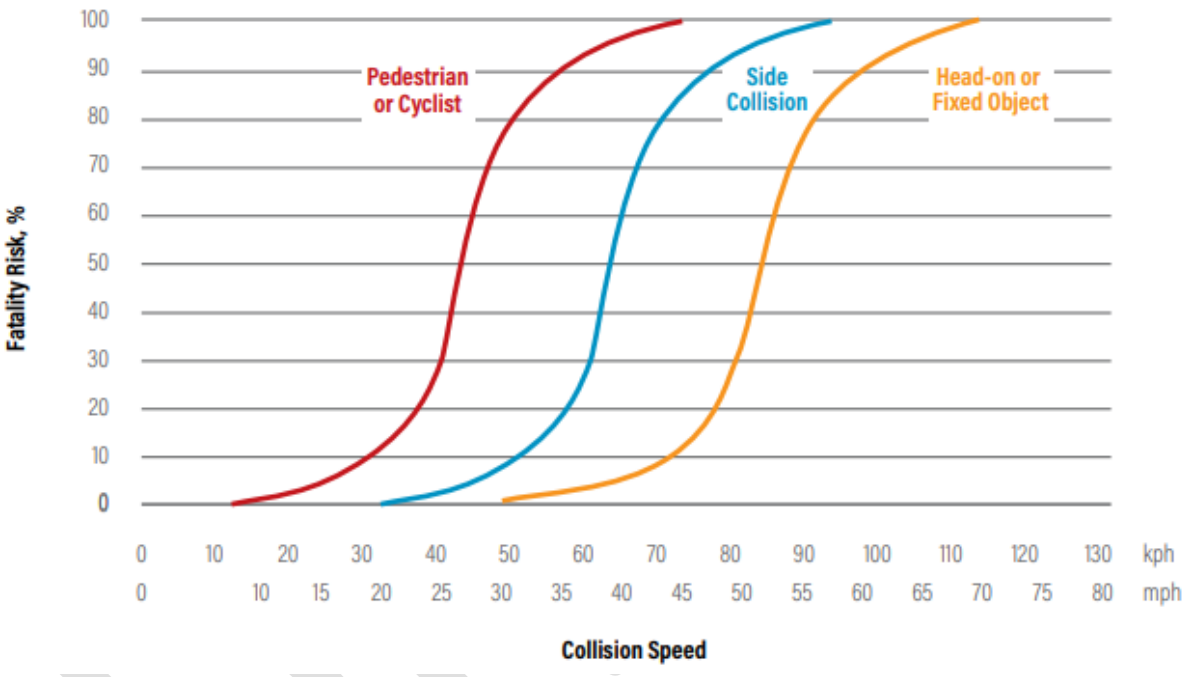

Figure 2: Relationship Between Fatality Risk and Vehicle Speed for Pedestrians, Bicyclists, and Motorists (Adapted from WRI)[3]

The Plan recommends increasing the frequency of protected crossing locations (e.g., fully signalized or all-way stop controlled intersections) to better regulate road user interactions and provide more safe opportunities for the most vulnerable road users to cross vehicular traffic.

The Plan also includes recommendations to reduce speeding vehicles, including assigning Complete Streets Design Guide (CSDG)[4] Street Types that have target speeds more appropriate for a safe, vibrant, mixed-use environment. The Downtown Street, Downtown Boulevard, Town Center Street, and Town Center Boulevard Street Types recommended for the vast majority of Life Sciences Center streets have target speeds ranging from 20 MPH to 30 MPH, as well as corresponding design guidance

[3] *Sustainable & Safe – A Vision and Guidance for Zero Road Deaths.* World Resources Institute. 2018. (https://www.wri.org/research/sustainable-and-safe-vision-and-guidance-zero-road-deaths)
[4] https://montgomeryplanning.org/wp-content/uploads/2022/03/Montgomery-County-CSDG_Approved-2021.pdf

in the CSDG to help achieve those target speeds. The Department's Predictive Safety Analysis[5] found that, even controlling for the level of vehicular traffic and nonmotorized activity, increasing the speed limit of a roadway by 10 MPH increases the risk of certain crashes by 32%.

Reducing the width and number of vehicle travel lanes on the Plan Area's widest streets is another key safety recommendation of the Plan. The Predictive Safety Analysis also found that, even controlling for the level of vehicular traffic and nonmotorized activity, increasing the number of lanes from 2 to 4 increases the risk of certain crashes by 40%; further increasing the number of lanes from 4 to 6 is associated with an additional 40% increase in crash risk. Reducing lane widths to the CSDG recommended widths provides an opportunity to increase safety for road users by slowing speeds and reducing pedestrian crossing times. It also allows reallocation of right-of-way to improve safety for all users by providing adequate width for sidewalks, bikeways, medians, and buffers.

TRANSIT

The Great Seneca Plan seeks to provide all travelers with multiple safe and convenient transportation options, and transit is a key option that the Plan seeks to improve. The Plan's transit recommendations are informed by previous planning efforts and refined and modified to reflect additional attention to the Plan Area itself and evolving land use recommendations. This section describes the foundations of the Plan's recommendations in:

1. Corridor Forward: The I-270 Transit Plan
2. The Great Seneca Transit Network
3. Refinements to Reflect Other Plan Recommendations

CORRIDOR FORWARD: THE I-270 TRANSIT PLAN

Corridor Forward: The I-270 Transit Plan, approved and adopted in 2022, proposes a transit network that includes near-term recommendations for dedicated bus lanes and long-term recommendations for an extension of Metrorail's Red Line and enhancements to MARC commuter rail along the Brunswick Line. The near-term network of dedicated bus lanes, referred to as the Corridor Connectors, builds on existing master-planned projects, including the MD 355 and Veirs Mill Road Bus Rapid Transit (BRT) projects, to create a transit network that serves communities and employment centers along the I-270 corridor.

Corridor Forward re-envisioned the master planned Corridor Cities Transitway as the Corridor Connectors, a network of dedicated bus lanes, which connect the I-270 corridor communities to the county's existing and planned rapid transit network. Several Corridor Connectors are located within

[5] https://montgomeryplanning.org/planning/transportation/vision-zero/predictive-safety-analysis/#:~:text=The%20Predictive%20Safety%20Analysis%20estimates,Safety%20Performance%20Functions%20(SPFs).

the Great Seneca Plan area, including the Life Sciences Connector, Crown Connector, and Great Seneca Connector to provide dedicated bus lanes connecting the Life Sciences Center to several destinations, including the Shady Grove and Rockville Metrorail Stations, Crown Farm, Adventist Healthcare Shady Grove Medical Center, and the Universities at Shady Grove.

Corridor Forward offers two alternative alignments for the Great Seneca Connector: one alternative includes dedicated bus lanes through the Public Safety Training Academy (PSTA) and Belward Farm properties and along Muddy Branch Road, while another option includes dedicated bus lanes along Great Seneca Highway. Corridor Forward acknowledges that the alignment of the Great Seneca Connector should be determined through subsequent planning processes.

The alignment of the Great Seneca Connector was evaluated through the planning process for the Great Seneca Plan. This Plan recommends that the Great Seneca Connector include dedicated bus lanes through the Public Safety Training Academy (PSTA) and Belward Farm properties and along Muddy Branch Road to improve transit accessibility for development anticipated at both The Elms at PSTA as well as the Belward Farm property.

Corridor Forward also includes several recommendations that seek to support the transit network and strengthen local and regional transit connectivity. These include the following:

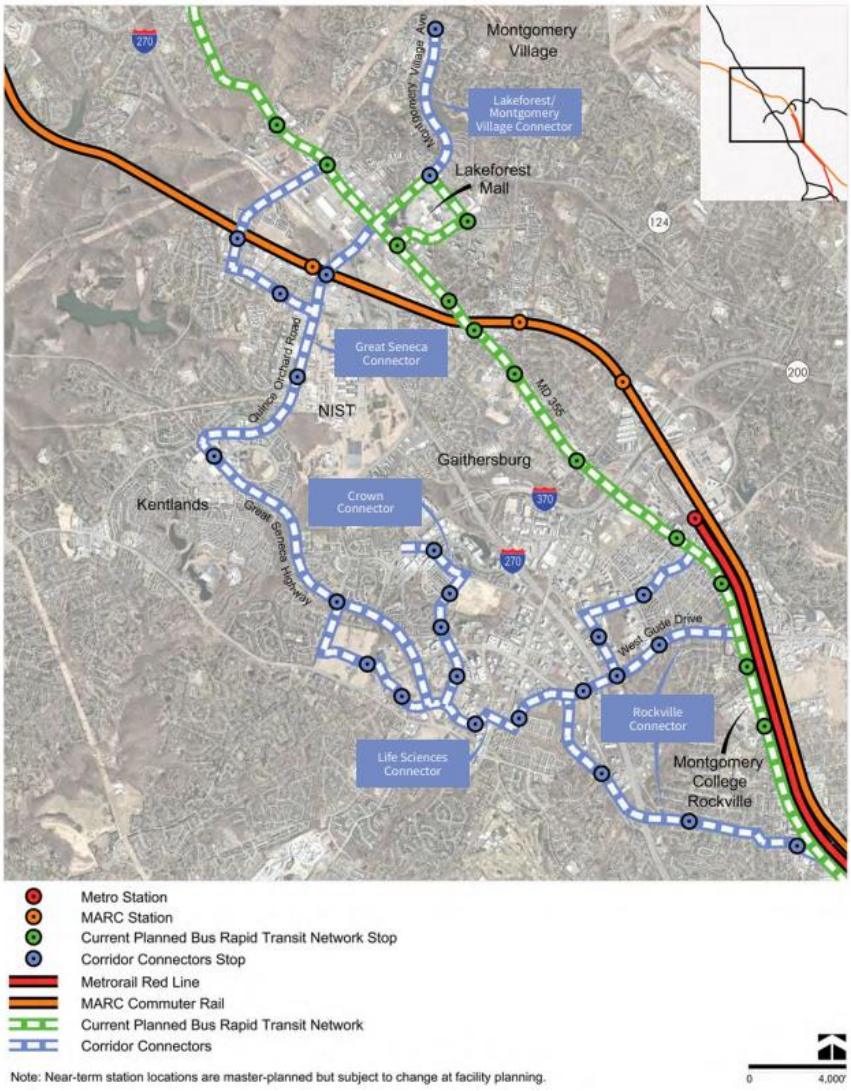

Figure 3: Corridor Forward Dedicated Bus Lane Detail

- Convert existing general purpose travel lanes to dedicated transit lanes on targeted streets to maximize person throughput and improve the relative travel time competitiveness and convenience of transit.
- Prioritize the provision of dedicated transit lanes and spaces for walking, bicycling and other micromobility modes over auto capacity to maximize person throughput and improve the relative travel time competitiveness and convenience of transit.
- Ensure safe and efficient access to planned transit stops for pedestrians, bicyclists, and other micromobility modes.
- Update relevant land use plans and guidelines to support master-planned transit facilities.
    - Update master plans and sector plans, including, but not limited to, the Great Seneca Science Corridor Master Plan, the Germantown Sector Plan, and the MARC Rail Communities Sector Plan, in support of incentivizing compact, transit-oriented development patterns.

The recommendations of the Great Seneca Plan seek to integrate these recommendations in the Life Sciences Center to further the Plan's vision of the Life Sciences Center as a complete community, a place that will include a range of land uses, jobs, diverse housing options, services, and amenities to meet the needs of a variety of people within a 15-minute walk, bike ride, roll, or other trip through safe, accessible, and reliable transportation infrastructure.

THE GREAT SENECA TRANSIT NETWORK[6]

The Great Seneca Transit Network (GSTN) will provide frequent transit options, improving mobility and access to crucial jobs in the healthcare, biotech, and education sectors. The network will be implemented in two phases. Phase 1 includes the Lime Line and the Pink Line. Phase 2 includes two additional routes (Cobalt Line and Gray Line) and an extension of the Lime Line.

The Montgomery County Department of Transportation (MCDOT) is advancing the initial phase of the project (Phase 1A) through planning, design, and construction. This phase includes opening the service with new bus stops at all the recommended station locations, dedicated bus lanes on the Pink and Lime Lines, and Transit Signal Priority (TSP) upgrades for traffic signals on the Pink Line. Montgomery County has funded Phase 1A of the project through design and construction.

Phase 1A (Pink and Lime lines) will connect the Shady Grove Metrorail station to the Traville Transit Center at the Universities of Shady Grove.

[6] More information on MCDOT's Great Seneca Transit Network project is available at https://montgomerycountymd.gov/dot-dte/projects/GST/index.html

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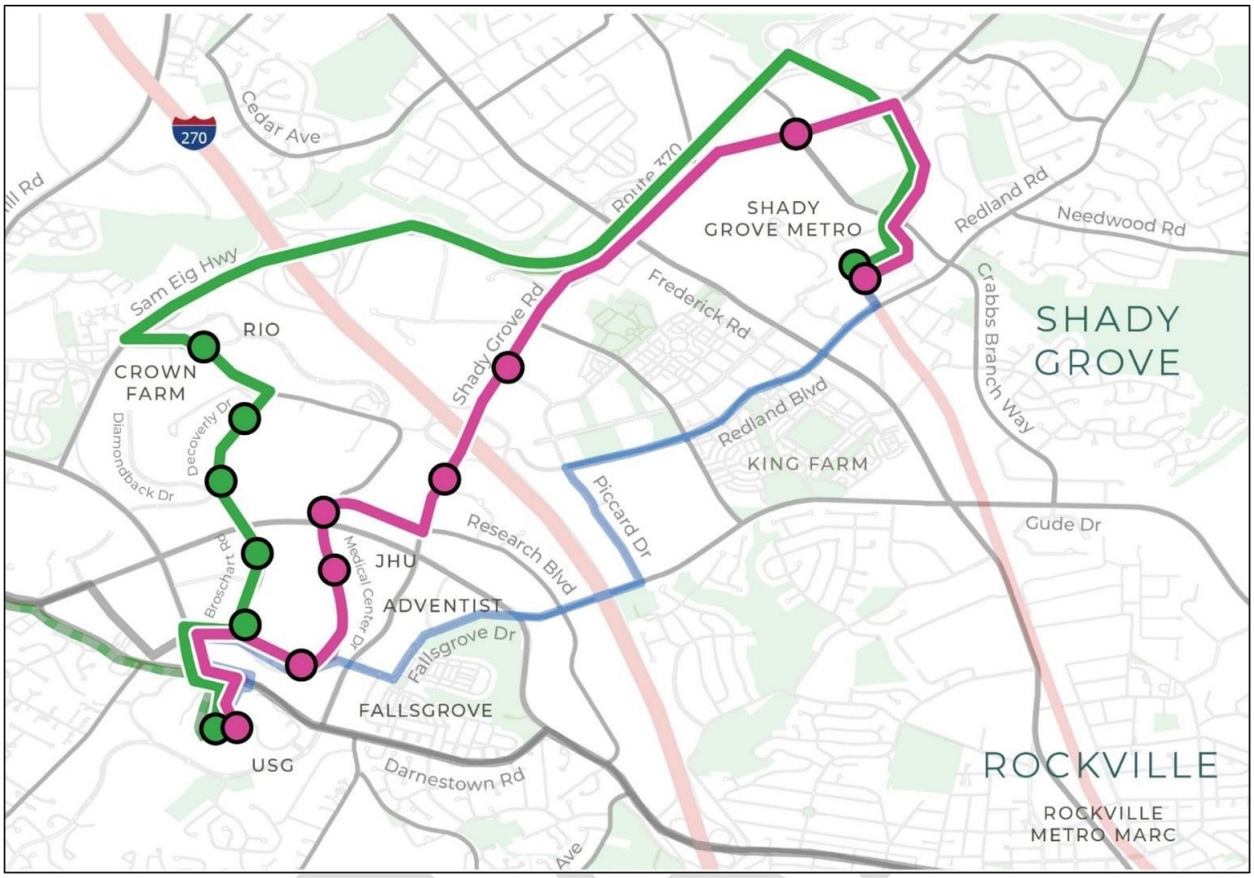

Figure 4: GSTN Phase 1A Routes and Stop Locations

Phase 1A will include dedicated bus lanes along a limited portion of the Lime and Pink Lines, depicted in Figure 5.

Future phases of the GSTN include the Gray, Cobalt, and Lime Extended Lines, all of which terminate at the Traville Transit Center, as shown in Figure 6.

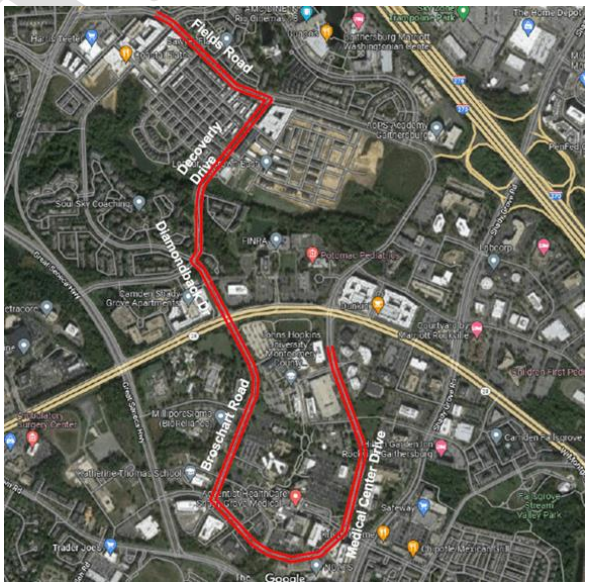

Figure 5: GSTN Phase 1A Dedicated Bus Lanes

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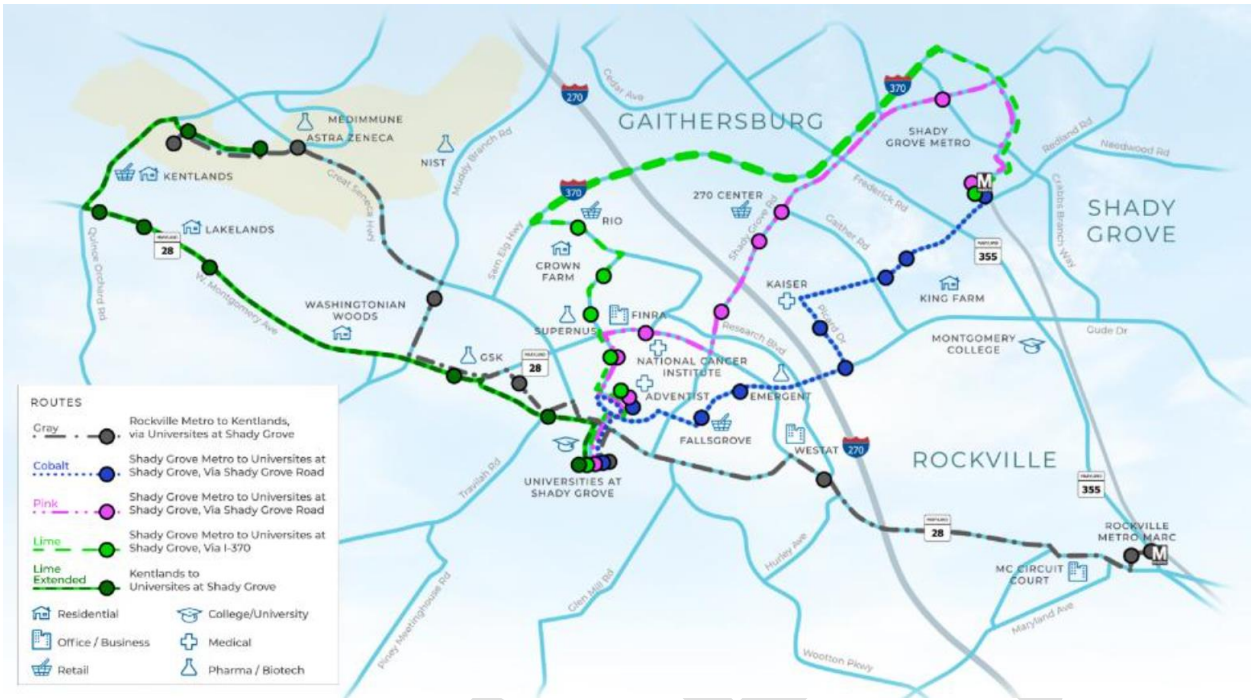

Figure 4: Future Phases of the GSTN

TRANSIT NETWORK REFINEMENTS

Acknowledging the importance of connecting workers, students, patients, visitors, and residents of the Life Sciences Center to the regional transit network in a convenient and appealing way, the Great Seneca Plan recommends providing additional dedicated bus lanes that can be used by the GSTN on portions of Great Seneca Highway, Medical Center Drive, Omega Drive, Research Boulevard, and Shady Grove Road.

Additional recommended dedicated bus lanes on Muddy Branch Road between the Life Sciences Center and Londonderry would provide much-needed transit connectivity for current and future Londonderry residents to access nearby shopping, employment, education, and recreation opportunities. The Great Seneca Plan anticipates substantial housing growth in the Londonderry area not anticipated at the time of the Corridor Forward recommendations. Portions of these recommended dedicated bus lanes pass through the City of Gaithersburg and would be advisory-only recommendations that require additional coordination for implementation.

TRANSPORTATION ANALYSIS

TRAVEL DEMAND FORECASTING PROCESS AND ASSUMPTIONS

An enhanced version of the Planning Department's regional travel demand forecasting model, TRAVEL/4, was used to develop traffic forecast results for weekday travel during AM and PM peak periods. TRAVEL/4 is a Montgomery County-focused adaptation of the regional travel demand model

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developed by the Metropolitan Washington Council of Governments (MWCOG). This tool is a four-step model, consisting of:

- Trip generation: the number of person trips that are generated by given types and densities of land uses within each Transportation Analysis Zone (TAZ).
- Trip distribution: how many person trips generated by each TAZ will travel to each of the other TAZs within the metropolitan area.
- Mode split: which mode of travel the person trips will use, including single occupant auto, multiple occupant auto, transit, or a non-motorized mode such as walking or bicycling.
- Traffic assignment: the roadways that will be used for vehicular travel between TAZs.

The TRAVEL/4 model incorporates land use and transportation assumptions for the metropolitan Washington region, using the same algorithms as applied by the Metropolitan Washington Council of Governments (MWCOG) regional travel demand modeling tool, Version 2.3.75, for air quality conformity analysis.

TRAVEL/4 FOR COUNTYWIDE TRAFFIC ANALYSIS

The TRAVEL/4 regional travel demand model is used to reflect county-wide and regional traffic effects. This tool is an adapted version of MWCOG's Version 2.3.75 and 2.3.78 regional travel demand forecasting models, reflecting a more detailed transportation system network structure within Montgomery County relative to the standard MWCOG model. In addition, relative to the standard MWCOG regional modeling tool, a more detailed transportation analysis zone (TAZ) structure is incorporated into TRAVEL/4, reflecting the expansion of the number of TAZs in Montgomery County. Additional model run scripting enhancements were made to the model code. In response to adjustments to the regional model transportation network and zone structure, other inputs, such as aggregate sociodemographic data, lookup tables and model parameters, were revised accordingly for incorporation into TRAVEL/4. When transportation network and TAZ structures in Montgomery County were expanded, the regional total of socio-demographic data, such as population, households and employment in the TRAVEL/4 model remain consistent with MWCOG's Round 9.2 Cooperative Forecast land use data.

TRAVEL/4 MP MODEL REFINEMENTS INCORPORATED INTO TRAVEL/4

The TAZ structure in the Great Seneca area was expanded utilizing block level land use data. Accordingly, the local roadway network and centroid connectors were revised based on the expanded TAZ structure. Figure 7 shows the TRAVEL/4 model TAZ structure within Montgomery County.

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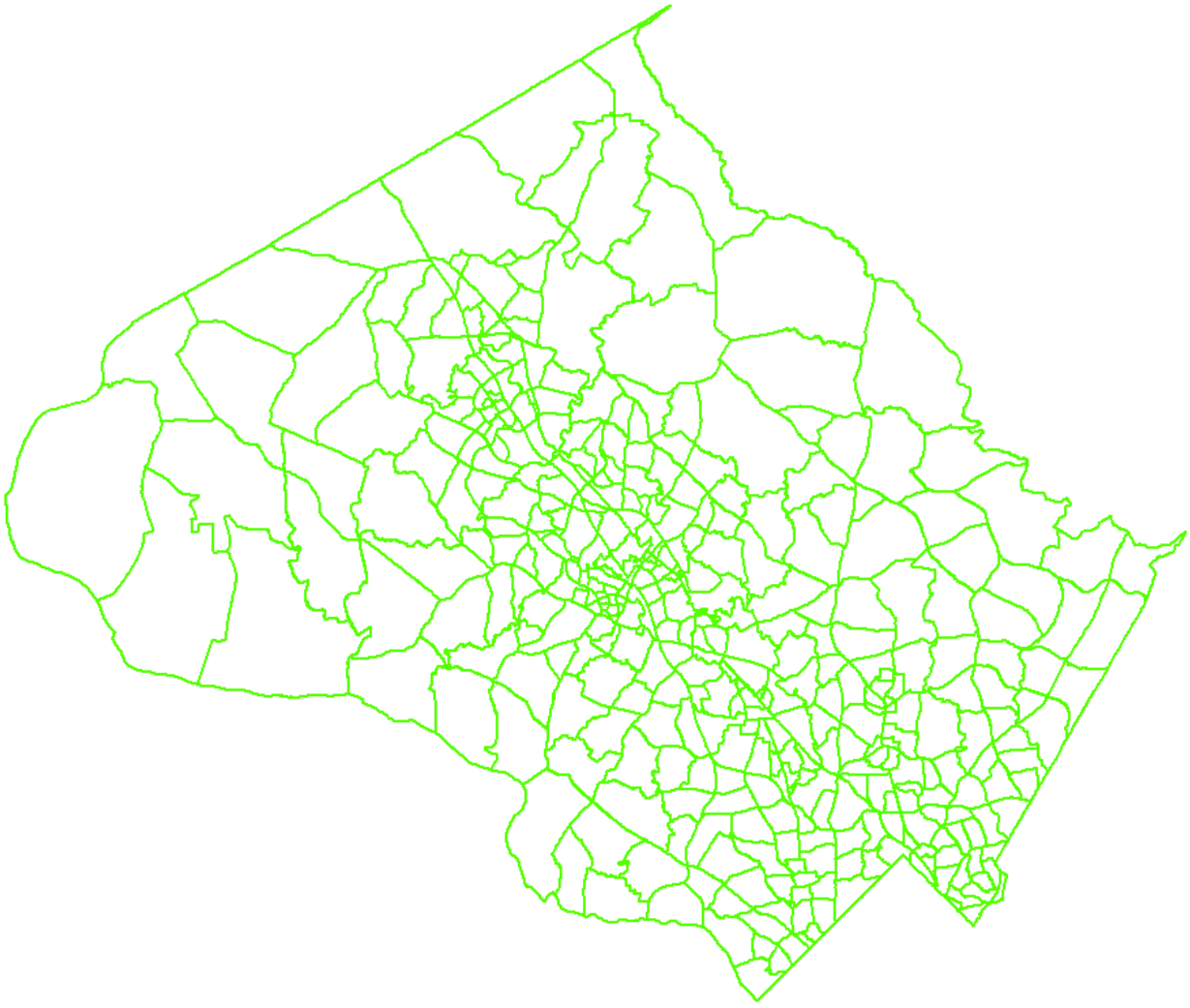

Figure 5: TAZ Structure within Montgomery County

Network and centroid connectors were revised based on the expanded TAZ structure, accordingly. In addition, the standard TRAVEL/4 model network does not reflect minor classification local streets and/or lacks the sufficient level detailed network coding necessary to adequately represent traffic movements within the study area. The roadway network was revised to better represent observed traffic circulation in these areas. In particular, TAZ and network detail was added in the Life Sciences Center as illustrated in Figure 8, below:

Figure 6: Traffic Analysis Zone Structure in the Life Sciences Center Area

LAND USE SCENARIOS FOR THE GREAT SENECA PLAN

In the context of developing the Great Seneca Plan, four (4) land use/transportation scenarios were evaluated using the Department's TRAVEL/4MP model. Each scenario is briefly described below:

- Scenario 1: Year 2015, Existing Conditions land use and transportation network
- Scenario 2: Year 2015, Existing Conditions land use and transportation network scenario with targeted near-term improvements
- Scenario 3: Year 2045 Adopted Plan scenario reflecting currently adopted plans
- Scenario 4: Year 2045 Proposed Master Plan land use and transportation network scenario

Beyond the Plan area, the TRAVEL/4 model runs described above included background regional land use demographics reflecting the MWCOG Round 9.2 Cooperative Forecast for existing conditions (year 2015 TRAVEL/4 model runs) and the Plan vision (year 2045 TRAVEL/4 model runs).

Figure 9 illustrates the land use assumptions within the Plan Area for each Scenario.[7]

[7] HHPOP = Household Population; GQPOP = Group Quarters Population; OFFEMP = Office Employment; RETEMP = Retail Employment; INDEMP = Industrial Employment; OTHEMP = Other Employment.

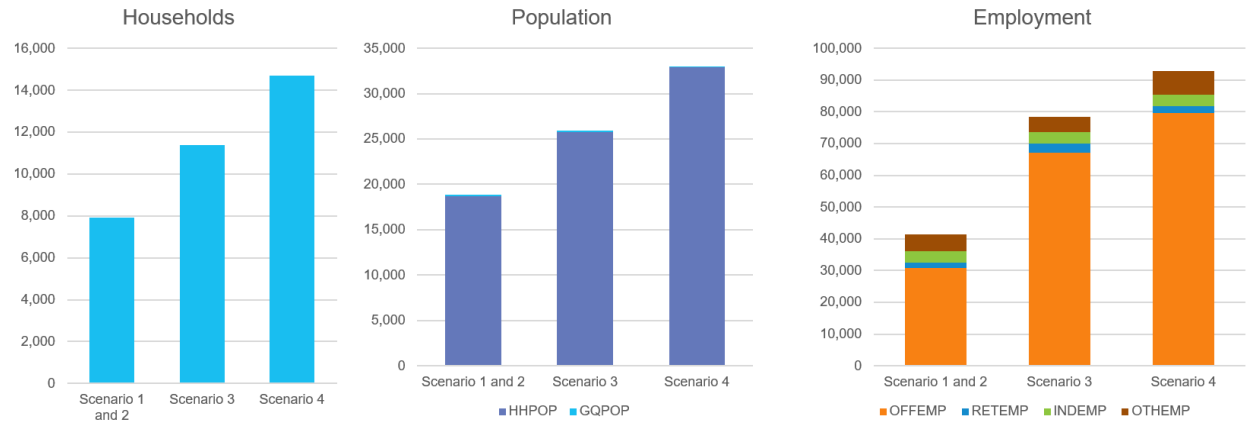

Figure 7: Plan Area Land Use Assumptions by Scenario

REGIONAL TRAVEL DEMAND MODEL FORECASTING ASSUMPTIONS

The Great Seneca Plan forecasts assumed the following parameters:

- A 2045 horizon year. This is currently the most distant horizon year for which forecast land use and transportation system development is available.
- Regional growth per the MWCOG Round 9.2 Cooperative Forecast beyond the Plan Area.
- Transportation improvements in the region's Constrained Long Range Plan (CLRP), a fiscally constrained transportation network. Notable projects assumed to be in place for the build-out of the Great Seneca Plan include:
    - the Purple Line between Bethesda and New Carrollton
    - Randolph Road, North Bethesda, US 29, MD 355, Veirs Mill Road, and MD 650 BRT
    - transit service envisioned in Corridor Forward: The I-270 Transit Plan
    - express toll lanes on I-495 and on I-270 from I-495 to the city of Frederick

TRANSPORTATION SYSTEM PERFORMANCE METRICS

In the fall of 2020, the County Council adopted a new Growth and Infrastructure Policy (GIP) that focuses on two primary tasks:

- Identify opportunities to incorporate the county's Vision Zero travel safety objectives into the Local Area Transportation Review process

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- Reintroduce a policy area-level-review to evaluate a master plan's balance between transportation capacity and land-use travel demand

The policy area-level metrics to evaluate the transportation adequacy of master plans are composed of five transportation system performance metrics. These metrics and how they are derived and interpreted are briefly described below.

Accessibility is defined as the number of jobs that can be reached in the Washington, D.C. metropolitan region within 45 minutes by auto and by transit at the time of buildout. Adequacy is achieved if the master plan improves average accessibility [8] for the Plan area relative to the currently adopted master plan. The projected auto job and transit job accessibility for the year 2045 proposed Plan scenario exceed the corresponding values for the year 2045 adopted plan scenario by 1% and 9%, respectively, indicating that the Plan achieves transportation adequacy for these metrics at buildout.

Travel time is defined as the average per-trip time by auto and by transit, considering all trip purposes during all times on a weekday at time of buildout. Adequacy is achieved if the master plan improves average travel time for the Plan area relative to the currently adopted master plan. The projected travel time by auto and by transit are each approximately one minute longer under the year 2045 proposed Plan scenario than under the year 2045 adopted plan scenario, indicating that the Plan does not achieve transportation adequacy for these metrics at buildout. These changes reflect an increase of approximately 6% in the duration of the average modeled vehicle trip from approximately 23 minutes to approximately 24 minutes and an increase of approximately 2% in the duration of the average modeled transit trip from 52 minutes to 53 minutes. These travel times do not reflect the same origin-destination trip patterns in each scenario; rather, they reflect the modeled trip-making patterns for each scenario. Furthermore, the year 2045 adopted plan scenario—against which the year 2045 proposed Plan scenario is compared—included recommendations for four additional grade-separated interchanges of surface roadways, one additional freeway interchange, and widened roadways, including Key West Avenue (widened from six lanes to eight lanes), Great Seneca Highway (widened from four lanes to six lanes), and Darnestown Road (widened from three or four lanes to six lanes); these recommendations are inconsistent with the subsequently-adopted Thrive Montgomery 2050, which includes explicit guidance to "give a lower priority to construction of new 4+ lane roads, grade-separated interchanges, or major road widenings."

Vehicle miles traveled (VMT) per capita is defined as the sum of the weekday VMT from trips that both start and end within the Plan area and half the weekday VMT from trips that either start or end within the Plan area. Adequacy is achieved if the Plan improves (i.e., reduces) average VMT per capita (including residents and workers) for the Plan area relative to the currently adopted plan. The projected VMT per capita under the year 2045 proposed Plan scenario is approximately 3% lower than

[8] Transportation analysis zone-level; weighted by the sum of population and employment

the projected VMT per capita under the year 2045 adopted plan scenario, indicating that the Plan achieves transportation adequacy for this metric at buildout.

Non-auto-driver mode share (NADMS) is defined as the non-auto-driver mode share for the journey to work in the Plan area. This is the meaning of the measure in current master plans, the 2020-2024 Growth and Infrastructure Policy, and the goals used by the county regulating transportation demand management. Adequacy is achieved if the Plan confirms the relevant pre-established journey-to-work NADMS goal for the Plan area. The projected NADMS for journey to work trips for the Plan area under the year 2045 proposed Plan scenario is approximately 29%, which exceeds the highest NADMS goal for the Great Seneca Science Corridor Master Plan Area of 28% established in the 2020-2024 Growth and Infrastructure Policy.[9] This result indicates that the Plan achieves transportation adequacy for this metric at buildout.

Low-stress bicycle accessibility is defined as the percentage of potential bicycle trips that can be accommodated on a low-stress (LTS-2)[10] bikeway network. Adequacy is achieved if the Plan meets or improves the average for the percentage for the county at the time of buildout. The low-stress bicycle accessibility analysis is in progress at the time of writing so results are not currently available; however, because the Plan proposes additional low-stress bicycle facilities and continues to plan land development near existing and planned low-stress bicycle facilities, low-stress bicycle accessibility should improve, indicating that the Plan would likely achieve transportation adequacy for this metric at buildout.

ADDITIONAL VEHICULAR TRAFFIC ANALYSIS

Additional vehicular traffic analysis is not required to evaluate master plan transportation adequacy. However, additional vehicular traffic analysis was performed to inform and evaluate the vehicular traffic implications of proposed Plan recommendations.

METHODOLOGY

Multimodal, peak hour turning movement counts were collected at 21 locations in and around the Life Sciences Center during the spring of 2023:

- Muddy Branch Rd. & MD 119 (Great Seneca Hwy.)
- MD 119 (Great Seneca Hwy.) & Sam Eig Hwy.
- MD 119 (Great Seneca Hwy.) & Decoverly Dr.

[9] https://montgomeryplanning.org/wp-content/uploads/2020/11/20210101-Text-of-the-2020-2024-Growth-and-Infrastructure-Policy-with-Maps.pdf

[10] LTS-2 is defined as bicycle travel network "appropriate for most adults" or "appropriate for most children." (Consistent with the approach for Objective 2.1 of the Bicycle Master Plan – "Countywide Connectivity.")

- MD 119 (Great Seneca Hwy.) & MD 28 (Key West Ave.)
- Darnestown Rd. & MD 119 (Great Seneca Hwy.)
- Darnestown Rd. & MD 28 (Key West Ave.)
- MD 28 (Key West Ave.) & Johns Hopkins Dr.
- Broschart Dr./Diamondback Dr. & MD 28 (Key West Ave.)
- Omega Dr. & MD 28 (Key West Ave.)
- Shady Grove Rd. & MD 28 (Key West Ave.)
- Travilah Rd. & Darnestown Rd.
- Shady Grove Rd. & Darnestown Rd.
- Shady Grove Rd. & Fallsgrove Blvd.
- Shady Grove Rd. & Blackwell Rd.
- Shady Grove Rd. & Research Blvd.
- Shady Grove Rd. & Corporate Blvd.
- Gude Dr. & MD 28 (Key West Ave.)
- Muddy Branch Rd. & Darnestown Rd.
- Broschart Dr. & Blackwell Rd.
- Medical Center Dr. & Broschart Dr.
- Great Seneca Highway and Quince Orchard Road

Counts were collected in 15-minute increments between 6:30-9:30 AM, 11:00 AM – 1:00 PM, and 4:00PM – 7:00 PM and the AM and PM peak hours comprising any four consecutive 15-minute periods (e.g., 4:45 – 5:45 PM) were identified for each location.

The TRAVEL/4MP model described above was executed, resulting in peak period (6:00-9:00 AM and 3:00-7:00 PM) vehicular traffic volumes for each modeled roadway link for each scenario. Peak hour turning movement counts were then estimated by post processing the corresponding modeled peak period volumes provided in the model networks based on processing methods outlined in the National Cooperative Highway Research Program (NCHRP) Reports 255 and 765. Post processing

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starts by calculating average annual growth rates between the base year (2015) and the future year (2045) model outputs for each roadway link within the study area. The growth rates applied to each turning movement are then calculated by averaging the growth rates for the origin and destination links. The 2023 field collected turning movement counts are then adjusted by those annual growth rates to reach the analysis year of each scenario. Using this process, AM and PM forecasted turning movements were developed for all study intersections. These forecasted turning movement volumes were then summed for each entering and exiting link and, where imbalances exist, the entering and exiting volumes of the two link ends were averaged. The result of this process is a forecasted AM and PM peak hour vehicular travel volume for each modeled link.

The number of vehicular travel lanes available for through travel, excluding lanes for turning, parking, acceleration/deceleration, or other purposes for travel, was identified. Dividing the peak hour volumes by the number of through vehicular travel lanes yields a "vehicles per hour per lane" (vphpl) metric that helps to represent traffic conditions and inform and evaluate the vehicular traffic implications of the proposed Plan recommendations.

RESULTS AND DISCUSSION

Figure 10 and Figure 11 illustrate the vphpl results for the Year 2045 Proposed Plan Recommendations scenario for the AM Peak Hour and PM Peak Hour, respectively.

Segments exceeding 900-1,000 vphpl may approach congested conditions. To be conservative, the analysis assumes segments exceeding 800 vphpl may approach congested conditions in the 2045 horizon year. By this 800 vphpl threshold, approximately 3% of the network in the Life Sciences Center may approach congested conditions during the AM or PM peak hour. Conversely, 97% of the network remains uncongested throughout the day; the 3% of locations that may become congested during peak hour(s) also remain uncongested during the majority of the day, reflecting underutilized capacity.

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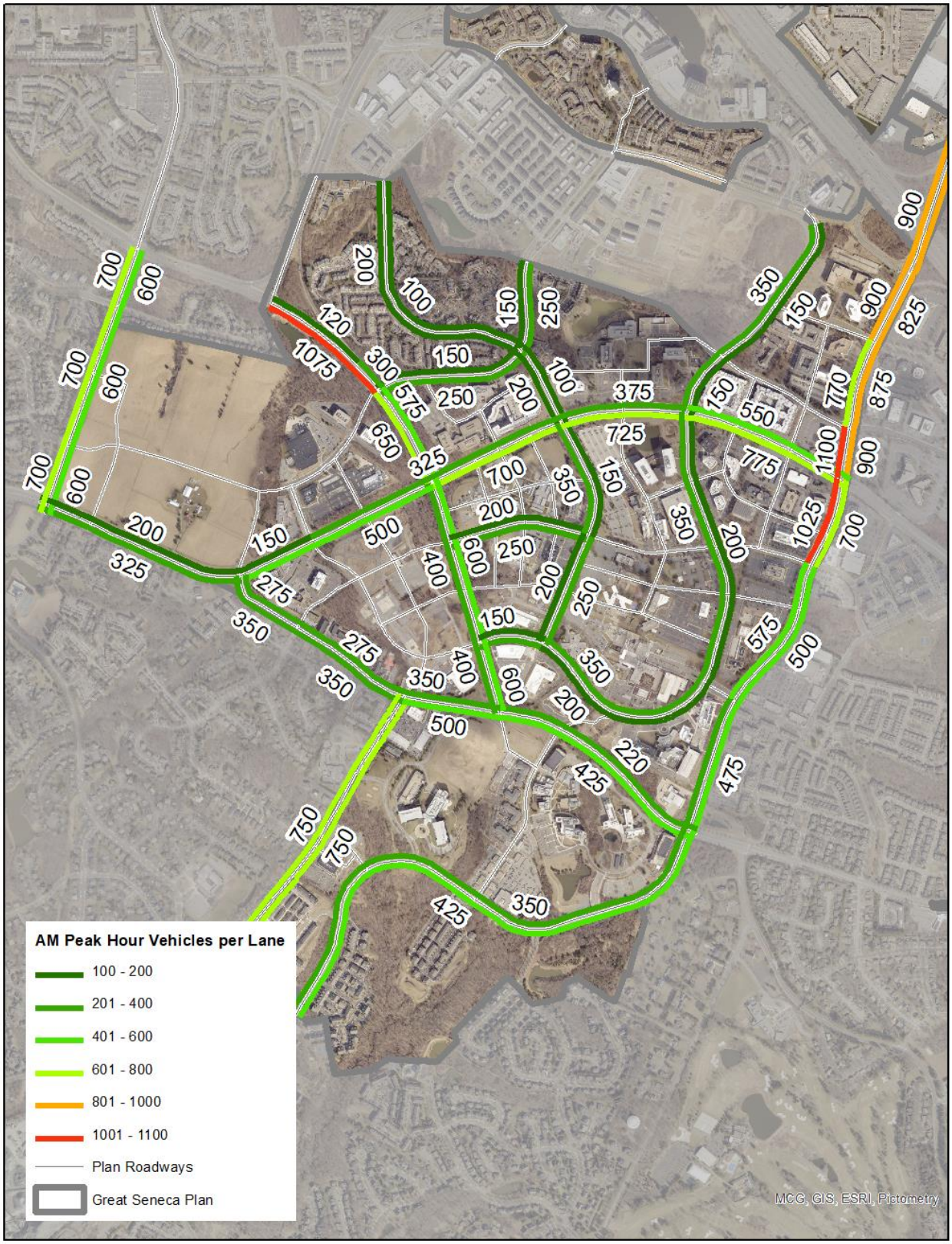

Figure 8: AM Peak Hour Vehicles per Lane - Year 2045 Proposed Plan Recommendations - Life Sciences Center

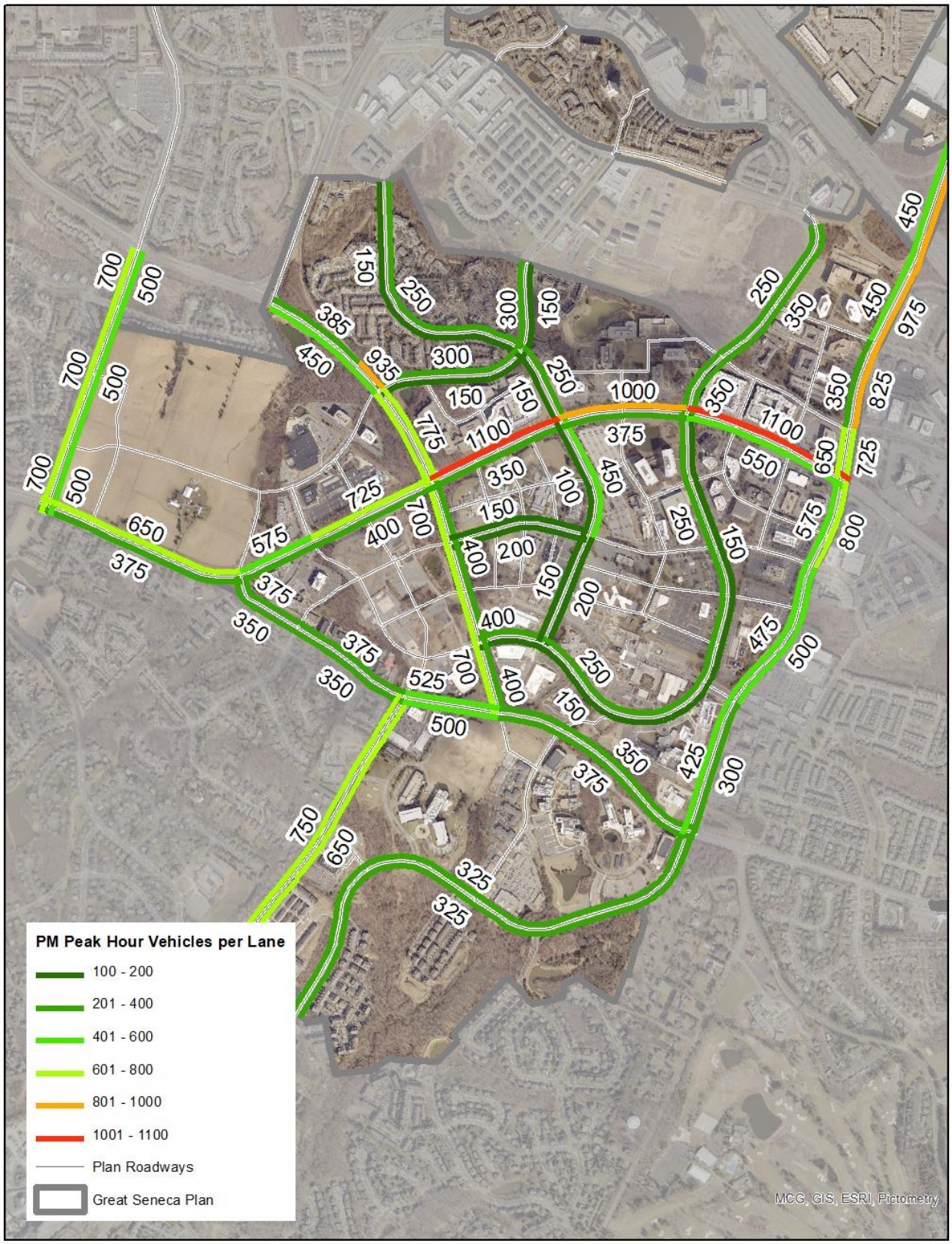

Figure 9: PM Peak Hour Vehicles per Lane - Year 2045 Proposed Plan Recommendations - Life Sciences Center

Several caveats apply to the interpretation of the results presented in Figure 10 and Figure 11:

- **In Montgomery County, values significantly exceeding 1,100 vphpl have been observed during routine studies.** Data collected for analysis of vehicle lane capacities in the 2013 *Countywide Transit Corridors Functional Master Plan* indicate that numerous road segments operate with volumes above 1,100 vphpl (the highest forecasted volume of any segment in the Life Sciences Center under the Year 2045 Proposed Plan Recommendations scenario), including:
    - Colesville Road from the Northwest Branch to University Boulevard (1,525 vphpl)
    - Colesville Road from University Boulevard to Franklin Avenue (1,325 vphpl)
    - Georgia Avenue from Windham Lane to Dennis Avenue (1,425 vphpl)
    - Georgia Avenue from Dennis Avenue to Forest Glen Road (1,200 vphpl)
    - Georgia Avenue from Forest Glen Road to I-495 (1,100 vphpl)
    - Frederick Road from Shakespeare Boulevard to Germantown Road (1,175 vphpl)
    - Rockville Pike from Grosvenor Lane to I-495 (1,200 vphpl)
    - Rockville Pike from I-495 to Pooks Hill Road (1,550 vphpl)
    - Rockville Pike from Pooks Hill Road to Cedar Lane (1,200 vphpl)
    - Rockville Pike from Cedar Lane to Wood Road / South Drive (1,325 vphpl)
- **The analysis relies on a regional travel demand model to forecast localized conditions 20 years into the future.** Although great care was applied in the development and application of the TRAVEL/4MP Model and in subsequent post-processing, forecasting future travel conditions on a 20-year time horizon is inherently uncertain. A national survey of 46 travel demand forecasters indicated 20-year horizon forecasts for a major highway could be expected to vary from actual conditions by more than 40% (NCHRP

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Report 765, p. 79); roadways with lower volumes than major highways could intuitively be expected to vary even more on a percentage basis.

Table 4-2. Model accuracy expectations as a function of time horizon.

Forecast Horizon	Existing Road	New Road
Next Day	±7.5%	NA
1 Year	±12.5%	±17.5%
5 Years	±20.0%	±27.5%
20 Years	±42.5%	± 47.5%

- **Methodological limitations when applying regional travel demand model peak period factors to observed peak hour counts may result in overestimation of peak hour volumes.** The TRAVEL/4MP model does not use dynamic traffic assignment, so applying the peak period growth rates to peak hour counts may overstate future peak hour volumes. The analysis presented above uses data collected at the peak hour of each individual count location, reflecting the observed "worst case" hour for all locations at the same time (e.g., one intersection might experience its highest hourly volume from 4:30-5:30 PM, while another intersection experiences its highest hourly volume from 5:30-6:30 PM; both are presented as one simultaneous "peak hour"). These observed one-hour counts are grown using a factor derived from the model's peak period volumes (reflecting 3 hours in the AM and 4 hours in the PM), which, by definition, are less congested than the most congested single hour within each period (peak hour). The model assigns traffic to the fastest routes first, so when the model assigns traffic using this broader peak period that it considers less congested than the peak hour, it allows more traffic growth to occur before it redirects trips to alternate routes than it would allow if it were making decisions based on the peak hour conditions alone. This higher growth rate is then applied to the single peak hour of observed traffic counts, resulting in a potential volume overestimate.

- **Travelers may "peak spread" when faced with congested conditions.** Travelers tend to adjust their departure or arrival times when anticipating recurring congestion, helping to reduce peak hour congestion; however, the TRAVEL/4MP model does not have a mechanism for reflecting this phenomenon.

- **Alternate, uncongested routes are available for access to and circulation within the Life Sciences Center.**

    - Trips within the area can use uncongested new and existing connections, including Belward Campus Dr, Research Blvd Extended, Blackwell Dr, Medical Center Way, Medical Center Drive, and Darnestown Rd to relieve potential congestion on Key West Ave.

    - Trips to/from the area can use the I-270 off-ramp to uncongested Omega Drive, as well as Montgomery Ave (entering Key West Ave from the east),

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Darnestown Rd to enter the area from the east and west, and Sam Eig Hwy to Diamondback Dr, Decoverly Dr, and Omega Dr to enter the area from the north.

    - Many modeled existing and future baseline trips exit I-270 to Montgomery Ave and Key West to traverse the Plan area and reenter I-270 farther north/west; in the future, these through trips may choose to remain on I-270 rather than relying on Montgomery Avenue and Key West Ave to bypass congestion on I-270.

- **Forecasts do not account for nontraditional behavioral trends.** The regional travel demand model is predicated on logic developed from travel behavior patterns established over the past several decades, with parameters estimated before the COVID-19 Public Health Emergency and other recent behavioral shifts. Future increases in telework, more flexible work schedules, and non-traditional shifts in the life sciences industry may also reduce peak hour congestion pressures.

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