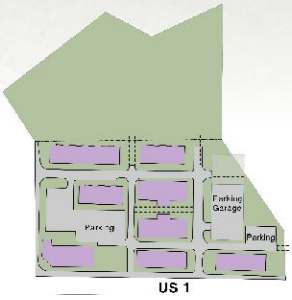
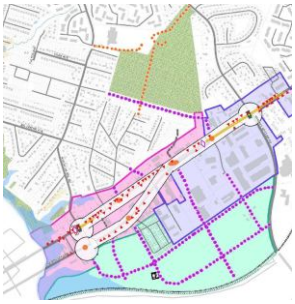
Issues, Opportunities, and Strategies

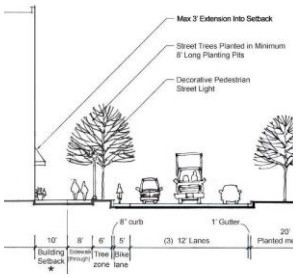
US 1 Corridor Improvement Strategy

Howard County, Maryland

February 2008







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US 1 Corridor Improvement Strategy

Howard County, Maryland

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Howard County US 1 Corridor Improvement Strategy

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Table of Contents

List of Figures

List of Tables

List of Attachments

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Executive Summary

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Executive Summary

The 12-mile US 1 corridor, in Howard County, Maryland, serves a diverse range of users and functions. The corridor is developed with very large tracts of manufacturing and distribution centers, small commercial centers, free-standing retail, hotels, restaurants and service businesses, and many residential communities. Its users include freight haulers and commuters en route to intersecting major highways, buses and transit users destined to neighborhoods and job centers, and growing numbers of pedestrians and bicyclists moving between corridor attractions.

As the primary conduit for all of this activity, US 1 should provide an environment that meets the needs of all its users. Similarly, the network of streets and trails that interact with US 1 should enable people to access their work and leisure activities safely and easily. As a major arterial corridor, plans for US 1 must also recognize its potential for increased use by transit vehicles, passenger safety walking to and waiting at transit stops, and increasing demands on driver awareness at conflict points.

The Phase I and II Route 1 Corridor Revitalization Reports prepared by Nelessen & Associates in 2001-2 recognized a changing land use pattern emerging on the corridor. An area specific Route 1 Manual and new zoning classifications was designed to put in place guidance to make the best use of land use changes and to guide building orientation, facility location and design to reflect the full range of transportation modes. The discussions and analysis presented in this document represent a further refinement of those efforts and is designed to identify and structure an implementation of County visions and State priorities for the US 1 Corridor.

The local vision for the corridor documented in Howard County's "Phase II Revitalization Report" (July 2002) included the following goals related to transportation:

- Promote safe and efficient vehicular travel
- Endorse public transportation in order to increase mobility and to serve as an alternative to the private automobile
- Provide for safe and efficient pedestrian and bicycle travel
- Enhance the streetscape, providing a unifying design for the corridor

The "Reconnaissance Study", prepared as Phase 1 of this study in Sept 2006 by Kittelson and Associates, offers a picture of existing conditions of the road itself as well as the access and circulation systems for property between I-95 and the CSX railroad, and I-95 and Deep Run. It recognizes local and regional travel patterns for automobile and truck traffic as well as increasing needs of pedestrian, bicycle, and transit travelers.

The Reconnaissance Survey also identified a variety of transportation challenges related to the existing conditions in the corridor. Specific examples provided by agency participants and the public during meetings and workshops identified the most important issues to be addressed in any strategy for improvement. They included:

- Limited roadway capacity
- Safety concerns

- Lack of connectivity to serve local vehicular, pedestrian, and bicycle travel needs
- Inconsistent, piecemeal aesthetic

Members of the public participated in this study through an advisory group made up of a cross section of business, resident, developer and trucking interests, and through two sets of public meetings held in July of 2006 and July of 2007 during key points in the study process. This report documents the analyses performed to respond to corridor challenges under future conditions and prepares a path toward their resolution with specific strategies and agency actions.

The Improvement Strategy comprises a physical improvement plan and a variety of tools to bring about change consistent with the local and regional goals. It provides policy direction and builds on existing processes to guide incremental improvements that will occur with private development and investment over time. The Strategy provides a recommended approach to accommodate existing and anticipated future travel demand. It considers land uses and system users throughout the corridor, including pedestrians and bicyclists. Finally, it presents a set of actions that vary broadly in terms of level-of-effort and timeframe in a way that can help to organize, phase, and focus change.

DOCUMENT OVERVIEW

The Reconnaissance Survey presented the details of the existing transportation system and its relationship to land use and access along the US 1 Corridor through Howard County. Building on that document, as well as the Route 1 Corridor Revitalization Study and the Route 1 Manual, this work presents an expanded understanding of issues and opportunities and presents an improvement strategy to bring about a safer, more efficient and attractive multimodal transportation system for the US 1 corridor.

This report is presented in three parts: Refining the Vision, Tools to Implement the Vision and Transportation Improvement Strategy. Each chapter of Parts I and II has been organized to present the relationship of the chapter topic to the vision, the key findings, and the analyses undertaken. Part III, the Transportation Improvement Strategy, comprises actions, their timeframes for implementation, and lead/support agency identification. Actions described are based on the analyses documented in Parts I and II, the findings of the Reconnaissance Survey, and public and agency input. Part III is designed as a stand-alone document that can be used to highlight key issues, to track progress, and to summarize findings and options for managers and elected leaders.

Part I: ***Refining the Vision*** reviews analyses that were undertaken to better understand the future travel demand and presents preliminary alternatives to accommodate those demands. This section also presents methods to achieve target speeds along the corridor and includes a safety screening that can be used to prioritize corridor improvements.

Part II: ***Tools to Implement the Vision*** reviews the policies, processes, and guiding documents that shape public and private investment in the corridor. Tools designed to address conditions specific to the US 1 corridor are presented and discussed. They form the basis for recommendations made in the final chapter, Part III of this document.

Part III: ***Transportation Improvement Strategy*** comprises a physical Improvement Plan that describes the future transportation system elements and Implementation Actions that identify critical, immediate, near-term, and long-term agency actions that will facilitate the physical improvements.

In addition to a technical analysis, a process analysis was conducted which involved discussions with and review by County and SHA staff to determine how recommendations might be implemented. Finally, several case studies were conducted to identify how the existing policies and procedures function and might be improved to streamline outcomes in the corridor. Table 1 identifies the analyses completed, the reference for the analysis documentation, the challenges for which the analysis is relevant, and the key recommendations or conclusions of each analysis.

Table 1 Parts I & II: Analysis Summary Table

Tab	Analysis	Purpose				Recommendations/Key Findings
		Congestion and Speed	Safety	Local Circulation	Aesthetic & Comfort	
Part I – Refining the Vision						
A	Future Traffic Operations	X	X	X		Plan for 6 lanes on US 1 south of Bonnie View Lane as described by Build Option #3. Implement network connections and appropriately spaced traffic signals for additional route options and shorter local trips.
B	Development Trends and Multimodal Travel		X	X	X	Accommodate non-motorized travel throughout the corridor. Provide safe, attractive, and convenient routes of travel between activity nodes and nearby residential and employment areas. Address the design challenges of non-motorized travel needs on major truck routes as part of the future roadway design. Prepare for convenient, reliable transit service to activity nodes and employment centers. Enable viable transit service through site design and provision of pedestrian amenities. Design intersections to accommodate the appropriate design vehicle to avoid over-sizing them. Develop a functional classification system recognizing mode and land use on the local road system.
C	Speed Management	X	X		X	Use speed management techniques to achieve target operating speeds. Install traffic signals at a consistent spacing to permit traffic progression; nearing ¼ mile in urbanized areas.
D	Safety Screening		X			Continue to monitor areas of completed safety improvements and identify locations for more detailed crash studies. Prioritize locations for access management improvements.
E	Major Spot Concepts	X	X			Advance the improvement alternatives for the MD 175 intersection and the MD 32 interchange area.
Part II – Tools to Achieve the Vision						
F	Development Review Analysis	X	X	X	X	Emphasize goal-oriented approach to project review. Strengthen the Sketch Plan phase enforcing concept approvals as a prerequisite to site engineering. Develop overlay requirements for roadway and path connectivity and block spacing. Require pedestrian amenities in site design to enable convenient transit service to activity centers and employment centers as densities increase. Provide safe, attractive, and convenient routes between activity nodes and nearby residential and employment areas. Distribute materials about site design and circulation best practices, and the US 1 vision.
G	Access Management Analysis	X	X	X	X	Adopt desired network connections and local roadway spacing standards. Prioritize access acquisition investments and cross access easements.
H	Roadway Character and Functional Classification Analysis			X	X	Establish functional classification overlay recognizing land use and mode priority. Provide design guidance for local roads accordingly recognizing context and community preservation.
I	US1 Typical Sections and Right-of-Way	X	X		X	Preserve right-of-way for the proposed typical sections. Design and construct US 1 as shown in the typical sections.
J	Network Connections Development	X	X	X		Adopt the proposed connections and accompanying information about the goals and anticipated phasing to retrofit street access. Adopt policy language encouraging desired network connections and spacing.

Part III: Transportation Improvement Strategy

The diagram below provides the basic framework and relationships of the US 1 Corridor Improvement Strategy. Highlights include short- and long-term transportation solutions and tools listed here. The matrix on the following page presents the complete list of actions by agency and is detailed in the last chapter of this document. They are organized to be part of the following set of overarching actions:

- Typical sections for the future widening of US 1;
- Local circulation network connections and public street access;
- Priority access management locations along US 1;
- Enhancements to key regional mobility access points;
- Site design best practices;
- Recommendations regarding development review; and,
- Recommendations regarding roadway character and functional classification.

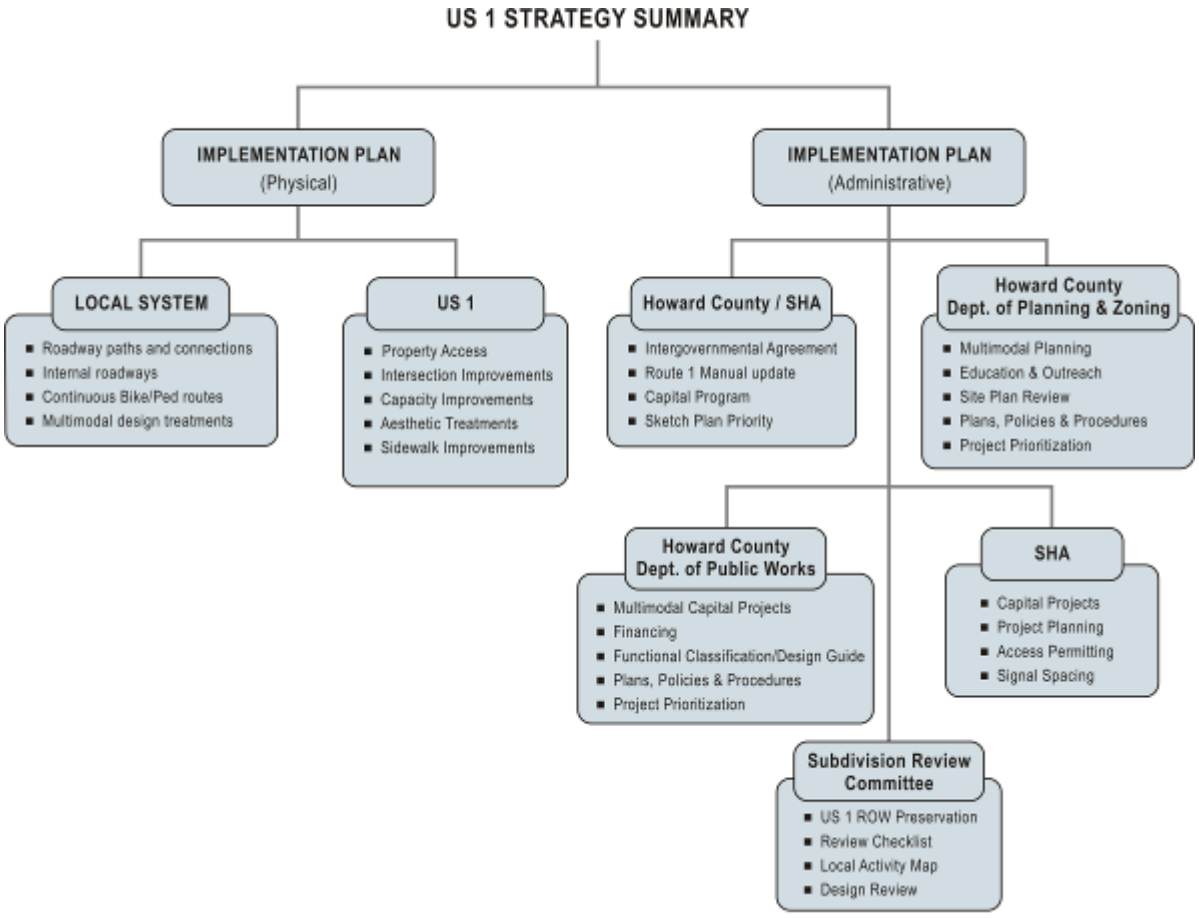

Table 2 Part 3: Summary of Improvements, Strategies and Recommendations

Focus	Item	Strategy Description	Collaborators	Timeline
All Partners				
Plans, Policies & Procedures	Intergovernmental Agreement	Draft and adopt agreement to incorporate US 1 Corridor Improvement Strategy and Recommendations into applicable state and local policy and planning documents.	SHA, Howard County	6 months
	Route 1 Manual Revision	Revise Route 1 Manual for consistency with Transportation Improvement Plan.	Howard County DPZ	6 months
	Capital Improvement Program Additions	Create funding and construction mechanisms for modest capital projects identified in the Transportation Improvement Plan to permit developer contributions and construction as opportunities arise.	SHA, Howard County DPW	9 months
	Sketch Plan Priority	Reestablish Sketch Plan as a prerequisite to site engineering.	DPZ, DPW	6 months
	US 1 Right-Of-Way Preservation/ Acquisition	Incorporate the recommended US 1 typical cross-sections into Spring 2008 update of the Highway Needs Inventory.	OPPE	9 months
Maryland State Highway Administration (SHA) Initiatives				
Capital Projects	US 1 Maintenance and Spot Improvements	Enhance the multimodal environment in all system preservation projects, consulting a plan of priority truck routes to limit locations for large vehicle access, and to improve pedestrian facilities.	District 7, OOTS	Ongoing
	MD 175/US 1 Improvements	Investigate design alternatives that meet travel demands and fit within the increasingly urban character of US 1.	OPPE	To be determined
	MD 32 Area/US 1 Improvements	Investigate improvement alternatives for US 1 between Guilford Road and Howard/Corridor Road to address safety and driver expectancy needs.	District 7, OOTS	To be determined
	US 1 Reconstruction	Establish a project to begin the National Environmental Policy Act (NEPA) planning process to specify location of typical sections; address environmental & property impacts and preliminary project costs.	OPPE	To be determined
Systems Design	Speed Management	Monitor speeds north of Montgomery Road and consider targeted enforcement or speed management.	District 7, OOTS, & Highway Design	9 months
	Access Management	Establish a signal spacing policy consistent with Strategy recommendations. Consolidate access points and obtain frontage access controls in coordination with private development and County roadway projects. Establish a voluntary access control acquisition program for the US1 Corridor similar to SHA's program for limited access highways on the Eastern Shore.	OPPE, EAPD RIPD, EAPD, ORE	Ongoing
Howard County Department Of Planning and Zoning (DPZ) Initiatives				
Multimodal System Planning	Truck Routes	Designate priority truck routes, orient truck traffic to these routes, and provide appropriate design and amenities.	DPZ, DPW, Motor Carriers	6 months
	Bicycle Circulation Network & Facilities	Develop a continuous bicycle circulation network, fill gaps, add signing and lane markings, require bicycle parking in new commercial, employment and civic areas and retrofit existing destinations.	DPZ, Rec & Parks, DPW, Bicycle Advocates	18 months
	Parking Management	Develop parking policy with appropriate consideration of multimodal travel opportunities and shared supply in mixed zones.	DPZ	12 months
	Transit Service	Work with transit providers to locate stops in new development, improve transit service and encourage transit use by corridor employees.	DPZ, Howard Transit, MTA	Ongoing
	North Elkridge Circulation Study	Conduct a targeted study of bicycle and pedestrian circulation north of Old Washington Road.	DPZ, DPW	12 months

Focus	Item	Strategy Description	Collaborators	Timeline
Howard County Department Of Planning and Zoning (DPZ) Initiatives - Continued				
Education & Outreach	Best Practice Materials	Develop informational/educational materials about the US 1 Revitalization Vision, the transportation improvement plan, and multimodal site design (to create successful pedestrian networks) for distribution to development professionals and elected officials.	DPZ, Legislative affairs	9 months
	Staff Workshop	Prepare and present a workshop for the Subdivision Review Committee and engineering staff working in the corridor to raise awareness of best practices for walkable places.	DPZ	9 months
Plan Review	Site Design Guidance	Augment the Route 1 Manual to require site design to advance street connections through sites with roads to adjacent parcels and existing streets; limit dead end access to/from collectors and arterials; enhance connections and facilities for transit, pedestrians and bicycles including bicycle parking in employment and commercial zones.	DPZ	9 months
	Local Activity Submittal	Develop specific requirements and forms for a Local Activity Submittal that will supplement Sketch Plan requirements for all development proposals in the US 1 Corridor.	DPZ	9 months
Plans, Policies & Procedures	Mapping Updates	Revise and amend the Local Network Connections Maps as needed to reflect evolving opportunities and constraints.	DPZ	Ongoing
	US 1 Right-of-way Preservation	Revise the Route 1 Manual to formalize the desired right-of-way preservation and ensure consistency with SHA's pending Highway Needs Inventory (HNI) update.	DPZ, SHA	6 months
	Project Prioritization	Prioritize roadway, transit and path capital improvement projects for agreement and implementation by the Department of Public Works and for State Consolidated Transportation Program inclusion.	DPZ, DPW, Communities	Annually
Howard County Department Of Public Works (DPW) Initiatives				
Capital Projects	County Roadway Connections Projects	Establish an annual capital program to design and construct retrofit roadway and path connections as identified in the Improvement Plan. Priority projects are listed in Section K.	DPW, DPZ	Annually
	Bicycle Routes & Facilities	Establish an annual capital program to fill gaps in the bicycle network; add appropriate signing, pavement markings and traffic control to routes.	DPW, DPZ, Bicycle Advocacy	Annually
	Sidewalk Connections	Construct sidewalks (shaded where possible) on both sides of all new roadways and improvement projects in the corridor. Facilitate provision of adequate ROW for appropriate sidewalk width and inclusion of street trees for all public walking paths.	DPW, DPZ	Ongoing
Finance	Transportation Impact Fees	Establish a mechanism to pool developer contributions and permit timely and orderly implementation of transportation improvements.	DPZ, DPW,	12 months
Follow-up Planning	Functional Classification Overlay/ Street Design Standards	Establish a functional classification overlay for the corridor that supports an interconnected, hierarchical network and provides roadway design guidance based on land use and/or priority users.	DPW, DPZ	12 months
	Dorsey Run Road Access	Establish an access management plan for Dorsey Run Road to manage conflicts, create a connected network and enable viable transit service.	DPW, DPZ	12 months
	Transportation Impact Analysis	Consider revising APFO Roads Test and Traffic Study requirements to include high-volume local road intersections and require pedestrian and crash analysis to encourage safety assessments and improvements.	DPW, DPZ	9 months
Subdivision Review Committee Initiatives				
Development Process	Review Checklists	Highlight issues and desired outcomes related to transportation and identify how the development plan accommodates each element of the US 1 Improvement Plan.	DPZ	6 months
	US 1 Access Design	Restrict widening beyond the planned typical section for US 1. The third outside through lane on US 1 will serve turning movements at driveways, stopping transit vehicles, and trucks.	DPZ, DPW, SHA	Ongoing
	Local Activity Submittal	Incorporate the Local Activity Submittal into the Sketch Plan review process.	DPZ, DPW	6 months

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PART I
Refining the Vision

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Section A
Future Traffic Operations

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A. Future Traffic Operations

PURPOSE

The 2030 traffic operations analysis identifies the extent to which several improvement alternatives are able to accommodate the expected future travel demand on US 1. KAI previously performed an existing conditions analysis of all study intersections along US 1, which is documented in the September 2006 Reconnaissance Survey for the US 1 Corridor Improvement Strategy. The analysis found that all signalized intersections along the corridor currently operate at level-of-service "E" or better (which is the Howard County standard for intersections along a State route) during the weekday a.m. and p.m. peak hour time periods.

Three build options were analyzed for the US 1 study corridor for year 2030 conditions during the weekday a.m. and p.m. peak hours. The analysis presented in this section is a key input to determine the appropriate cross-section for US 1 in Howard County. This is particularly important as properties are improved, buildings located and right-of-way preserved during the development process.

KEY FINDINGS

The US 1 Strategy should include plans for 6 travel lanes (three in each direction) on US 1 south of Bonnie View Lane (located just north of Montgomery Road) as described by Build Option #3. This build option has these benefits:

- Permits the creation of a consistent and enhanced roadway cross-section for the length the corridor
- Avoids lane drops/adds, which can introduce driver expectancy issues
- Provides the ability to plan to incrementally implement a consistent aesthetic throughout the corridor
- Accommodates the potential for additional growth in traffic and corridor transit
- Meets the 2030 traffic projections
- Has potential to accommodate additional traffic that may not be reflected in the 2030 traffic projections (e.g., BRAC, development of the quarry, other local and regional growth).
- Provides longer design-life for infrastructure investments
- Better suited to accommodate diverted traffic when incidents occur on the Baltimore-Washington Parkway and I-95.

As a result of a disconnected local road network and the barriers to secondary access caused by the major highway network and CSX, nearly all travel in the corridor relies on US 1. Additional network connections and traffic signals may improve traffic operations by providing additional routes that accommodate local and short regional trips. The additional connections would reduce circuitous travel, encourage linked trips, and help manage the demand on US 1.

The findings of this traffic operations analysis address vehicular travel only. It is critical that all plans and designs accommodate the competing needs of all travel modes.

METHODOLOGY

The travel forecasting section of the Maryland State Highway Administration (SHA) provided the future year 2030 No-Build traffic volumes used in this traffic operations analysis. The traffic volumes originated from Round 6b of the Baltimore Metropolitan Council (BMC) travel demand model and have been approved by BMC as 2030 No-Build traffic volumes. Round 6b was the most recently approved round available at the time of this analysis.

To ensure that the traffic volumes used account for Howard County's land-use and zoning vision for the corridor, SHA compared the land-use and employment inputs for each study Transportation Analysis Zone (TAZ) in Round 6b to those being used in Rounds 6c and 7. SHA determined that Round 6b sufficiently incorporates Howard County's vision for the US 1 corridor within the study area. Round 6b-prime being developed at the time of this analysis, includes the influence of the United States Department of Defense Base Realignment and Closure (BRAC) plans and is ongoing. The 2030 comparisons used did not include the revised BRAC data; therefore, its full impacts could not be fully integrated. Attachment A-1 is an SHA memorandum that documents the process used to compare the rounds as well as the findings.

The study corridor includes all signalized intersections along US 1 between North Laurel Road to the south and Levering Avenue to the north, as well as a few key non-signalized intersections. Analyses were performed using both the Critical Lane Volume and Highway Capacity Manual methodologies, as explained later in this section.

The initial study area was expanded beyond MD 32 south to the County line. As a result, two intersections were added to the original group of study intersections that were analyzed in the September 2006 Reconnaissance Report—North Laurel Road/US 1 Southbound and North Laurel Road/US 1 Northbound. The Office of Traffic and Safety (OOTS) division of SHA provided the traffic counts from year 2005 for these two intersections. These counts were balanced with the Whiskey Bottom Road/US 1 intersection to the north and documented in the updated reconnaissance report. Also, North Laurel Road/US 1 Southbound and North Laurel Road/US 1 Northbound intersections were not included in the 2030 No-Build traffic volumes provided by SHA. Instead, the balanced volumes at these intersections were increased using an annual growth rate of 1.25 percent over 25 years to develop year 2030 volumes consistent with the average growth rate reflected in the regional travel demand model for US 1.

ANALYSIS

No-Build Transportation Network

The 2030 No-Build transportation network consists of the existing traffic network within the US 1 Corridor Study area as well as the traffic network improvements currently planned and budgeted. Table 3 shows the traffic network improvements planned and budgeted within the study area. Figure 1, also included as Figure 10 in the Reconnaissance Survey, shows these projects within the context of the study area. The US 1 Corridor Improvement Strategy Reconnaissance Survey discusses each of these projects in more detail.

Table 3 Planned Capital Improvement Projects

Project Number	Project Description	Status	Scheduled Completion Date	Project Type
J-4110	Dorsey Run Road - South Link	Design	2008	Roadway Extension
B-3855	Guilford Road CSX Bridge	Construction	2008	Roadway Widening
J-4175	Guilford Road Improvements (Dorsey Run Road to Anne Arundel County Line)	Construction	2008	Roadway Widening
J-4182	Dorsey Run Road Improvements	Design	2009	Roadway Widening
J-4201	Mary Lane Improvements	Design and Land Acquisition	2009	Maintenance
J-4181	Guilford Road Improvements (US1 to Dorsey Run Road)	Design	2010	Roadway Widening
J-4148	Dorsey Run Road Extension	Design	2010	Roadway Extension
J-4206	Montevideo Road Improvements	Design	2010	Safety

Source: Howard County FY2007 Capital Budget

Data source: Howard County GIS data
This data shown provides a general overview and was last updated 3/30/2006. Quality control of data is continuing as of the date of map production.

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PLANNED CORRIDOR IMPROVEMENTS
US 1 RECONNAISSANCE SURVEY

FIGURE 1

The Dorsey Run Road extension is the largest capital improvement project in the area. It is expected to add a layer of connectivity, and to relieve traffic, particularly trucks, destined to the large industrial zones on the east side of US 1. Dorsey Run Road will ultimately extend from MD 32 to MD 103 and parallel, to the east of US 1. The 2030 No-Build transportation network assumes that the section of Dorsey Run Road that extends from MD 175 to MD 103 will be complete. Detailed analysis of the traffic impacts associated with the roadway extension project are described in *Dorsey Run Extended Transportation Planning Study* (Sabra, Wang, & Associates, Inc., November 2004).

Traffic signals were recently installed at the terminus of the westbound MD 32-to-northbound US 1 ramp and at the US 1/Maier Road intersection. Since the traffic operations analysis was completed prior to the installation of these signals, these intersections are not included in this analysis.

In addition, future traffic signals are planned at the Mission Road/US 1 and North Laurel Road (Northbound)/US 1 intersections by year 2030.

According to SHA's 2005 model, US 1 has an average daily traffic volume of 25,000 to 35,000 (this is consistent with a review of actual count data posted on SHA's website). Traffic volumes along US 1 are highest south of MD 32. Under year 2030 future conditions, traffic volumes on US 1 through the study area are expected to reach between 40,000 and 55,000 average daily trips.

Intersection Operations Analysis Results

The traffic volumes provided by SHA include estimated a.m. and p.m. peak-hour turning-movement volumes and link volumes. Without any post-processing of the 2030 No-Build traffic volumes, each intersection was analyzed using these methods:

- Howard County's critical lane volume (CLV) methodology; and
- The *Highway Capacity Manual* (HCM) output from Synchro.

The CLV level of service is based on the *capacity* of critical movements and the HCM level of service is based on the *delay* experienced by all motorists. SHA prefers the CLV methodology where there is an existing or anticipated signal. CLV is supplemented with HCM for unsignalized intersections.

Table 4 shows the level-of-service (LOS) thresholds for both methodologies. Attachment A-2 contains the CLV calculations for each study intersection for each alternative. Attachment A-3 contains the HCM analysis output for each study intersection.

Table 4 LOS Thresholds

Level of Service	CLV Methodology (Critical lane volume per hour expressed in vehicles)	HCM Methodology (Average control delay per vehicle expressed in seconds)	
		Unsignalized	Signalized
A	< 1,000	< 10	< 10
B	1,000 – 1,150	10-15	10-20
C	1,150 - 1,300	15-25	20-35
D	1,300 – 1,450	25-35	35-55
E	1,450 -1,600	35-50	55-80
F	1,600	> 50	> 80

Howard County requires LOS "E" or better (based on CLV methodology) for all state-maintained intersections. Under either methodology, LOS "F" represents excessive vehicle delays and is often referred to as a "failing" condition.

Table 5 shows the results from both methods and Figure 2 shows the location of the intersections analyzed. Figure 3 shows the No-Build lane configurations. Attachment A-2 contains the CLV calculations for each study intersection. Every intersection that is forecast to fail during the a.m. peak hour is also expected to fail during the p.m. peak hour. The weekday p.m. peak hour is the critical time period for traffic operations along the corridor. The results of the 2030 No-Build analysis indicate that 14 of 25 study intersections will operate at LOS "F" during the p.m. peak hour, using either Howard County's CLV level-of-service standards or the HCM level-of-service standards.

Table 5 Summary of No-Build Traffic Conditions

Cross Street	Intersection Type	Weekday A.M. Peak Hour 2030 No-Build Scenario			Weekday P.M. Peak Hour 2030 No-Build Scenario		
		CLV	CLV LOS	HCM LOS	CLV	CLV LOS	HCM LOS
Levering Avenue	Signalized	1010	B	B	1484	E	D
Montgomery Road	Signalized	***2283***	***F***	***F***	***2280***	***F***	***F***
Rowanberry Drive	Signalized	1262	C	B	1584	E	E
Loudon Avenue	Signalized	***1626***	***F***	***E***	***2130***	***F***	***F***
Troy Hill Drive North	Signalized	1455	E	D	***1734***	***F***	***E***
Troy Hill Drive South	Unsignalized	***1415***	***D***	***F***	***1660***	***F***	***F***
Amberton Road	Signalized	1151	C	B	***2043***	***F***	***F***
MD 100 WB	Signalized	1400	D	B	***2032***	***F***	***F***
MD 100 EB	Signalized	871	A	A	1570	D	D
MD 103	Signalized	***1790***	***F***	***F***	***2128***	***F***	***F***
Business Parkway	Signalized	988	A	B	1333	D	C
Montevideo Road	Signalized	1071	B	C	***1608***	***F***	***F***
MD 175	Signalized	***1644***	***F***	***F***	***2004***	***F***	***F***
Assateague Drive	Signalized	1258	C	B	1442	D	D
Mission Road	**Signalized	1377	D	B	1260	C	A
Patuxent Range Road	Signalized	1474	E	E	***1717***	***F***	***F***
Guilford Road	Signalized	***1686***	***F***	***F***	***1881***	***F***	***F***
MD 32 EB off ramp	Signalized	***998***	***A***	***F***	***943***	***A***	***F***
Howard Street	Signalized	***1367***	***D***	***F***	***1586***	***E***	***F***
Corridor Road East	Signalized	1218	C	E	1197	C	E
Gorman Road	Signalized	1471	E	D	1529	E	D
Freestate Drive	Signalized	1331	D	B	1419	D	D
Whiskey Bottom Road	Signalized	***1811***	***F***	***F***	***2066***	***F***	***F***
North laurel Road (SB)	Signalized	1224	B	A	1154	C	A
North Laurel Road (NB)	**Signalized	541	A	A	1034	B	A

LOS: Level of Service
CLV: Critical Lane Volume
HCM: Highway Capacity Manual
Failing intersection are identified in Bold and Italic.
**Future signalization assumed

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Figure 2 Intersections Evaluated for Operational Performance

Back of Figure 2

Figure 3 No-Build Lane Configurations

Back of Figure 3

PRELIMINARY BUILD OPTIONS

Three preliminary build options were evaluated to determine their potential to accommodate the future traffic demand. A detailed description of the cross-sectional elements of the recommended roadway section are provided in Section I.

- **Preliminary Build Option #1** evaluates the effectiveness and feasibility of maintaining a four-lane cross-section on US 1, adding turn lanes throughout, and additional through lanes on Whiskey Bottom Road and Guilford Road to mitigate failing intersections.
- **Preliminary Build Option #2** evaluates the effectiveness of creating a six-lane cross-section on US 1 without adding lanes to any cross-streets.
- **Preliminary Build Option #3** incorporates elements of the previous build options including maintaining a four-lane cross-section on US 1 in areas that have lower demand or are constrained by environmental features, valuable community assets, and/or physical built obstructions (e.g. CSX bridge at the northern end of the study area) and additional lanes on several major cross-streets.

The preliminary build options discussed in this section do not assume grade separation for any of the existing intersections.

Grade separated intersections are generally inconsistent with the community's vision for US 1, however, the County has identified the MD 175 intersection for a detailed project planning study to evaluate grade separation options as its top transportation priority[1]. This request is based on projected traffic conditions, the critical role the intersection plays in connecting US 1 to the regional network, and the importance of MD 175 to accommodate growth to the east, including BRAC and other expansion decisions affecting Fort Meade. Potential grade-separation options for this location are discussed in the Major Spot Concepts section.

The analysis for the Preliminary Build Options is intended to be applied as a planning tool to identify the capacity needs for US 1 under 2030 conditions. The analysis does not address right-of-way and environmental constraints.

Preliminary Build Option #1: Four-Lane Cross-Section

US 1 currently has a four-lane cross-section with an intermittent two-way center-turn lane. Preliminary Build Option #1 maintains the four-lane cross-section and adds turn lanes at the failing intersections along US 1 and through lanes on Whiskey Bottom Road and Guilford Road to serve future traffic. The purpose of analyzing this option is to assess the effectiveness and value of maintaining a four-lane section throughout the corridor with intersections that have multiple turn lanes. Table 6 shows the results from both LOS analysis methods. Figure 4 shows the lane configurations assumed for the Preliminary Build Option #1 analysis.

A variety of considerations related to the geometry of the auxiliary lanes are not fully reflected in this operational analysis. Adding and dropping multiple turn lanes in succession along an arterial can create friction between vehicles changing lanes and

[1] Transportation Letter from County Executive Ken Ulman to MDOT Secretary John D. Porcari and SHA Administrator Neil J. Pedersen, July 11, 2007

merging. This friction reduces the practical capacity of the lanes. Furthermore, adding multiple lanes to the minor street approaches may have substantial right-of-way and property impacts. Adding turn lanes at the intersections will also increase their overall size, making the crossing distance and time longer for pedestrians.

As shown in Table 6, 12 of 25 study intersections are forecast to fail under Preliminary Build Option #1 during either the weekday a.m. or p.m. peak hour (one fewer than the No-Build Option). The forecast future traffic volumes indicate that acceptable operations cannot be achieved by maintaining the existing US 1 cross-section and adding turn and auxiliary lanes at intersections.

Table 6 Build Option #1
Year 2030 Summary of Weekday Intersection Operational Analysis

Cross Street	Intersection Type	Weekday A.M. Peak Hour Build Option #1			Weekday P.M. Peak Hour Build Option #1		
		CLV	CLV LOS	HCM LOS	CLV	CLV LOS	HCM LOS
Levering Avenue	Signalized	969	A	B	1443	D	C
Montgomery Road	Signalized	***1633***	***F***	***F***	***1903***	***F***	***F***
Rowanberry Drive	Signalized	1262	C	B	1584	E	D
Loudon Avenue	Signalized	1342	D	C	***1830***	***F***	***E***
Troy Hill Drive North	Signalized	1455	E	D	***1734***	***F***	***D***
Troy Hill Drive South	Signalized	***969***	***D***	***F***	***1660***	***F***	***F***
Amberton Road	Signalized	1043	B	B	***1861***	***F***	***F***
MD 100 WB	Signalized	1180	C	B	***1776***	***F***	***E***
MD 100 EB	Signalized	871	A	A	1570	E	C
MD 103	Signalized	1409	D	D	***1657***	***F***	***E***
Business Parkway	Signalized	988	A	B	1333	D	C
Montevideo Road	Signalized	904	A	B	1418	D	C
MD 175	Signalized	1499	E	D	***1775***	***F***	***E***
Assateague Drive	Signalized	1258	C	B	1442	D	C
Mission Road	**Signalized	1377	D	B	1260	C	A
Patuxent Range Road	Signalized	1247	C	E	***1705***	***F***	***C***
Guilford Road	Signalized	1331	D	E	1419	D	E
MD 32 EB off ramp	Signalized	***998***	***A***	***F***	***943***	***A***	***F***
Howard Street	Signalized	***1319***	***D***	***F***	1466	E	E
Corridor Road East	Signalized	1218	C	E	1197	C	D
Gorman Road	Signalized	1471	E	D	1529	E	C
Freestate Drive	Signalized	1331	D	B	1419	D	C
Whiskey Bottom Road	Signalized	***1400***	***D***	***F***	1554	E	E
North laurel Road (SB)	Signalized	1224	C	A	1154	C	A
North Laurel Road (NB)	**Signalized	541	A	A	1034	B	A

LOS: Level of Service
CLV: Critical Lane Volume
HCM: Highway Capacity Manual
Failing intersection are identified in Bold and Italic.
**Future signalization assumed

Figure 4 Build Option #1 Lane Configurations

Back of Figure 4

Preliminary Build Option #2: Six-Lane Cross-Section

Preliminary Build Option #2 assumes one additional northbound and southbound through lane on US 1. With these lanes, US 1 would provide three northbound travel lanes and three southbound travel lanes. The configuration of turn lanes and through movements at the intersections is assumed to be the same as under existing conditions.

Table 7 provides a summary of the CLV and HCM analysis results for Preliminary Build Option #2 with the future 2030 traffic volumes. Figure 5 shows the lane configurations assumed for the Preliminary Build Option #2 analysis.

The LOS analysis indicates that the additional northbound and southbound through lanes reduce the number of intersections that are projected to operate at LOS "F" under either the CLV or HCM methodology from 14 under No-Build conditions to 9 intersections during the weekday p.m. peak hour.

Table 7 Build Option #2
Year 2030 Summary of Weekday Intersection Operational Analysis

Cross Street	Intersection Type	Weekday A.M. Peak Hour 2030 Build Option #2			Weekday P.M. Peak Hour 2030 Build Option #2		
		CLV	CLV LOS	HCM LOS	CLV	CLV LOS	HCM LOS
Levering Avenue	Signalized	792	A	B	1150	B	B
Montgomery Road	Signalized	***1699***	***F***	***F***	***1762***	***F***	***F***
Rowanberry Drive	Signalized	948	A	A	1189	C	C
Loudon Avenue	Signalized	1145	B	D	***1573***	***E***	***F***
Troy Hill Drive North	Signalized	1133	B	C	1295	C	A
Troy Hill Drive South	Unsignalized	792	***B***	***F***	***1225***	***C***	***F***
Amberton Road	Signalized	1037	B	B	***1621***	***F***	***E***
MD 100 WB	Signalized	1168	C	B	***1652***	***F***	***D***
MD 100 EB	Signalized	712	A	A	1256	C	A
MD 103	Signalized	***1367***	***D***	***F***	***1620***	***F***	***F***
Business Parkway	Signalized	754	A	B	1031	B	B
Montevideo Road	Signalized	895	A	C	1285	C	D
MD 175	Signalized	1531	E	E	***1906***	***F***	***F***
Assateague Drive	Signalized	972	A	B	1129	B	D
Mission Road	**Signalized	1056	B	A	937	A	A
Patuxent Range Road	Signalized	1297	C	D	1426	D	D
Guilford Road	Signalized	***1331***	***D***	***F***	***1690***	***F***	***F***
MD 32 EB off ramp	Signalized	1183	C	E	1074	B	E
Howard Street	Signalized	1042	B	C	1271	C	D
Corridor Road East	Signalized	1218	C	E	1197	C	E
Gorman Road	Signalized	1176	C	C	1263	C	C
Freestate Drive	Signalized	998	A	A	1070	B	B
Whiskey Bottom Road	Signalized	1524	E	E	***1838***	***F***	***F***
North Laurel Road (SB)	Signalized	912	A	A	857	A	A
North Laurel Road (NB)	**Signalized	403	A	A	767	A	A

LOS: Level of Service F
CLV: Critical Lane Volume
HCM: Highway Capacity Manual
**Future signalization assumed

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Figure 5 Build Option #2 Lane Configurations

Back of Figure 5

Preliminary Build Option #3

Preliminary Build Option #3 integrates the findings of the first two build options for an improvement scenario that accommodates the forecast traffic demand. This build option assumes three northbound and southbound travel lanes on US 1 south of Bonnie View Lane that continue throughout the corridor. Turn-lanes were added at select intersections on US 1 and several cross-streets to accommodate forecast demand.

Figure 6 shows the lane configurations assumed for the analysis of Preliminary Build Option #3. Table 8 provides a summary of the CLV and HCM analysis results for Preliminary Build Option #3 with the future 2030 traffic volumes.

Under Build Option #3, all signalized intersections are forecast to operate at acceptable LOS during the a.m. peak hour. With the exception of the MD 175 and Whiskey Bottom Road intersections, all signalized intersections are forecast to operate acceptably during the p.m. peak hour. Grade separation is recommended to accommodate the volumes projected at the MD 175 intersection. A more detailed analysis of this intersection is provided in the Major Spots Concepts section of this document.

The Whiskey Bottom Road intersection could be improved by adding through-lanes on Whiskey Bottom Road and/or by improving roadway connectivity to reduce dependence on this intersection. This is recommended in Section E of this study. Intersection forecast results did not include local street connectivity improvements because of the complexity associated with these connections. We recommend additional study at the time such projects are being proposed for implementation.

The eastbound left-turn movement at the unsignalized Troy Hill Drive South/US 1 intersection is forecast to operate over-capacity and at LOS "F" under all scenarios. Mitigation measures should be considered for the eastbound left-turn movement, including restricting left-turn movements with a raised median and signalization (if warranted).

The decision to maintain a 4-lane section on US 1 north of Bonnie View Lane is based on a drop in existing and projected volumes north of Bonnie View Lane, that continues into Baltimore County; environmental constraints along the roadway edge; preservation of the businesses abutting US 1 and the historic character of the Elkridge area; and physical constraints at the CSX railroad bridge.

Table 8 Build Option #3

Year 2030 Summary of Weekday Intersection Operational Analysis

Cross Street	Intersection Type	Weekday A.M. Peak Hour 2030 Build Option #3			Weekday P.M. Peak Hour 2030 Build Option #3		
		CLV	CLV LOS	HCM LOS	CLV	CLV LOS	HCM LOS
Levering Avenue	Signalized	1010	B	B	1484	E	E
Montgomery Road	Signalized	1449	D	E	1576	E	E
Rowanberry Drive	Signalized	948	A	A	1189	C	C
Loudon Avenue	Signalized	1145	B	C	1573	E	E
Troy Hill Drive North	Signalized	1133	B	C	1295	C	A
Troy Hill Drive South	Unsignalized	***1010***	***B***	***F***	***1225***	***C***	***F***
Amberton Road	Signalized	1032	B	C	1596	E	D
MD 100 WB	Signalized	948	A	B	1396	D	B
MD 100 EB	Signalized	712	A	A	1256	C	B
MD 103	Signalized	1162	C	D	1484	E	E
Business Parkway	Signalized	754	A	B	1031	B	C
Montevideo Road	Signalized	895	A	C	1285	C	C
MD 175	Signalized	1316	D	D	***1588***	***E***	***F***
Assateague Drive	Signalized	972	A	B	1129	B	C
Mission Road	**Signalized	1056	B	A	937	A	A
Patuxent Range Road	Signalized	1297	C	D	1426	D	B
Guilford Road	Signalized	1191	C	E	1480	E	D
MD 32 EB off ramp	Signalized	1183	C	E	1074	B	D
Corridor Road West	Signalized	1042	B	C	1271	C	C
Corridor Road East	Signalized	1218	C	E	1197	C	D
Gorman Road	Signalized	1176	C	C	1263	C	B
Freestate Drive	Signalized	998	A	A	1070	B	B
Whiskey Bottom Road	Signalized	1524	E	C	***1664***	***F***	***E***
North laurel Road (SB)	Signalized	912	A	A	857	A	A
North Laurel Road (NB)	**Signalized	403	A	A	767	A	A

LOS: Level of Service F
CLV: Critical Lane Volume
HCM: Highway Capacity Manual
**Future signalization assumed

Figure 6 Build Option #3 Lane Configurations

Back of Figure 6

Summary and Comparison

Table 9 provides a summary of the results of the operational analysis scenarios and demonstrates that the majority of failing intersections are eliminated under Preliminary Build Option #3.

Table 9 Operational Analysis Summary

	AM Peak Hour	PM Peak Hour
	Number of intersections at LOS "F"*	
No-Build	9	14
Build Option 1	5	10
Build Option 2	4	9
Build Option 3	1	3

*Under either HCM or CLV methodology.

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Section B
Development Trends and Multimodal Travel

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B. Development Trends and Multimodal Travel

PURPOSE

This section evaluates the anticipated demand for pedestrians, bicycles, transit users, and vehicles throughout the corridor. It also summarizes key considerations for accommodating each of these travel modes. The land use analysis documented in the Reconnaissance Survey identified existing land uses and activity nodes. This evaluation builds on that analysis and considers where development in the corridor is likely to create new activity nodes and additional travel demand.

Howard County's Departments of Planning and Zoning and the Economic Development Authority have some influence over private development in the corridor; however, the development reality also depends on market trends and the interests and motivations of the property owners. Staying current on development activity and trends will help to ensure that public resources are in place to leverage private investment.

KEY FINDINGS

Transit and non-motorized travel should be accommodated throughout the corridor. While activity is more concentrated in some areas, emerging development patterns and observed behavior suggests that pedestrians are present along most of the corridor today. That trend is expected to continue.

Growing neighborhoods and mixed use centers will increase demand for safe and convenient walking, bicycling and public transportation facilities.

In the near term, multimodal travel improvements will require that:

- Sidewalks are provided on all streets, on both sides, in areas of high activity and be consistent with the County Pedestrian Plan and Capital project K-5061.
- Continuous bicycle routes be designated and appropriate improvements be made to County roads (until US 1 is reconstructed where it too can include marked lanes).
- Non-motorized amenities analysis and requirements be incorporated into development review with a provision for specific time-frames for delivery of improvements.
    - Transportation improvements that will enhance non-motorized travel should be identified and required as conditions of private development.
    - Pedestrian, bicycle, and transit quality and safety should be addressed in the APFO tests and Traffic Studies. Specific requirements should be prescribed for these studies.
- Placement and access for bus stops be planned as part of site design and consider best practices including safe pedestrian crossing, minimizing conflict points, driver visibility, passenger security and waiting comfort, bus stopping safety and traffic re-entry.

Over time, multimodal travel accommodation should be incorporated into street design, site planning, and transportation facilities analysis by:

- Refining County roadway classifications and design guidelines to provide for design variety and flexibility based on adjacent land uses and priority users.
- Requiring site design that recognizes and provides access safety, comfort and convenience for walking to existing or potential future transit, nearby activity centers and civic uses.
- Concentrating truck access at key intersections, allowing other intersections to be scaled for smaller design vehicles and higher concentrations of pedestrian use.

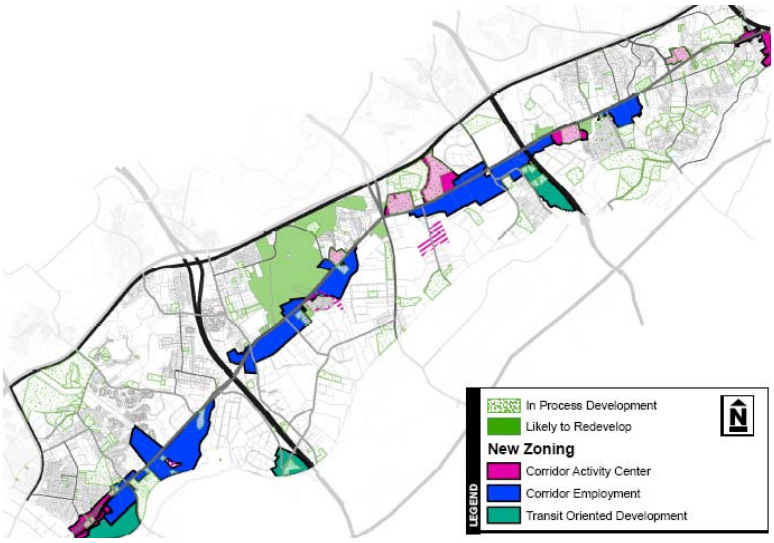
METHODOLOGY

- Anticipated corridor development was estimated by reviewing in-process development and identifying future development and redevelopment.
- Development trends were reviewed to estimate the extent to which anticipated development is likely to generate multimodal travel demand in locations throughout the corridor.
- Key considerations for accommodating travel needs specific to each mode were compiled and reviewed with County and SHA staff.

ANALYSIS

Development Potential

Development potential in the corridor was estimated to better understand the future demand for pedestrian, bicycle, transit, and vehicle travel. The goal was not to determine the precise number of residential units, commercial space, etc.; but rather to estimate the magnitude and type of development and associated demand for multimodal travel that the Strategy plans should accommodate.



Colored areas indicate potential development areas identified in 2002. The potential for new development, redevelopment, and infill development in the US 1 corridor can transform the roads frontage, access and connectivity beyond.

The new zoning categories have been a catalyst for new types of development in the corridor. More than 10% of the corridor (approximately 1,700 acres) falls within the new zoning designations, including:

- 380 acres of Corridor Activity Center (CAC)
- 1,045 acres of Corridor Employment (CE)
- 270 acres of Transit Oriented Development (TOD)

According to the Howard County Division of Research, as of mid-October 2006, approximately 3,500 units and over 1 million square feet of commercial had been proposed in the Corridor Activity Center zones, and more than 250 subdivision and site development applications had been submitted for review within the study area in the last two years.

The majority of the development activity in the corridor is currently taking place in the CAC district. This is largely due to the market demand for housing, which the CAC district allows.

To date, there has been little activity in the CE zone. This may be due to a number of factors including a limited demand for office and commercial uses. While development in the CAC zone is occurring on several undeveloped or underdeveloped sites, much of the CE zone is already built with commercial uses that are currently viable.

Unless they are assembled into larger parcels, the small, narrow parcels under separate ownership in some of the CAC and CE zones have limited potential for the type of development envisioned in the *Route 1 Manual*. It may not be economically feasible, presently, to acquire active, viable uses for redevelopment. The challenges associated with this may be a factor in the lack of redevelopment in some locations. Expanding the new zones in areas where this is a concern or allowing a swap of uses and densities between zones that are adjacent or across the street from one another may facilitate new development.

In addition to rezoned areas, development is also somewhat likely in some traditional zoning areas. A. Nelessen Associates, Inc. estimated the development potential of parcels in the corridor in 2002. The analysis rated 490 acres within the corridor as *likely* or *somewhat likely* to redevelop. Approximately 30 percent (150 acres) of the land rated *likely* or *somewhat likely* to develop has been submitted for subdivision or development since then.

The quarry west of US 1 between MD 32 and MD 175 is expected to remain active until about year 2035; however, it may be developed after that. Much of the industrial land (zoned M-1 and M-2) east of US 1 is currently undeveloped or underdeveloped. Furthermore, the rising value of residential land in the area is creating economic incentives for infill development.

Development Trends

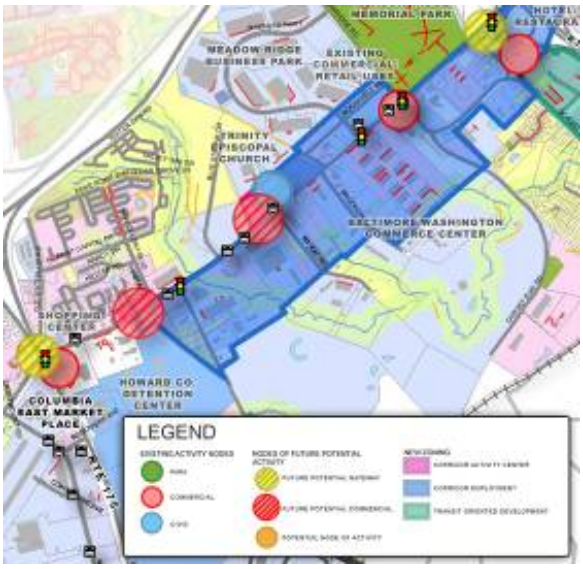
The new zoning districts provide opportunities for higher densities and a richer mix of land uses within the same development. Retail and commercial offerings may be located closer to where people live and work, making walking and biking not only viable, but appealing modes of travel. While past development practices have been largely auto-oriented and focused on providing ample parking immediately in front of the uses, new development patterns will create a more pedestrian-friendly environment, including such amenities as wider sidewalks, plazas for outdoor eating and resting, and reduced exposure to large parking fields. These mixed-use nodes will develop in the CAC, CE, and TOD districts in varying forms and sizes based on the zone's size, location, and market condition.

New zoning districts allow a mix of land uses and higher densities. Organizing them to encourage walking can reduce auto trips.

While the remainder of the corridor will continue to build-out under more traditional zoning, the mixed-use developments will be attractive destinations for nearby communities. Appropriate roadway and path connections should be planned to enable walking and biking to and from the mixed-use areas.

The "Route 1 Manual" prescribes a new approach to site design as part of the new zoning districts that offers the opportunity to create a more urban character for the built environment. Buildings will be located closer to the street to frame and provide scale to the pedestrian environment. Parking will be placed behind and to the sides of buildings to minimize the impact on pedestrians.

Streets within the new zoning districts, and particularly the CAC and TOD districts, have the potential to develop with a more urban character. On-street parking may be appropriate, which provides pedestrians with an additional buffer from traffic. Sidewalk sections may be wider and articulated with decorative light fixtures, street trees, signage and furnishings such as benches and planters. The intent is that these types of sidewalks have a relationship with the uses they front, providing access to storefronts and major building entrances while establishing a character for the community.



Many small nodes of activity will increasingly generate pedestrian, bicycle, and transit travel demand.

The CAC and CE zones are located along most of the Route 1 frontage. Other existing activity centers and potential development sites are located throughout the corridor, such that demand for non-motorized activity and travel are expected throughout the corridor rather than at a few distinct nodes. The illustration to the right shows existing and anticipated activity in a small area of the corridor. This area is typical of most of the corridor. All of these small nodes of activity will interact with each other and increase demand for walking, biking, and transit throughout the corridor. Therefore, it is recommended that multimodal travel be accommodated throughout the corridor.

Historic zoning and land use patterns have created barriers to multimodal travel like this distribution center separating neighbors from a nearby park.

Accommodating Multimodal Travel

Historic zoning and land use patterns in the corridor have created single-use "pockets" of similar development types with little interaction or integration between adjacent uses. This pattern typically separates compatible uses from one another, creating a challenge for walking and biking as viable

travel options. The pattern of dead-end roadways, single-use driveways, and buildings set back from the street also creates challenges for efficient transit service. Despite these challenges, the Reconnaissance Survey noted that pedestrian, bicycle, and transit travel is occurring in the corridor.

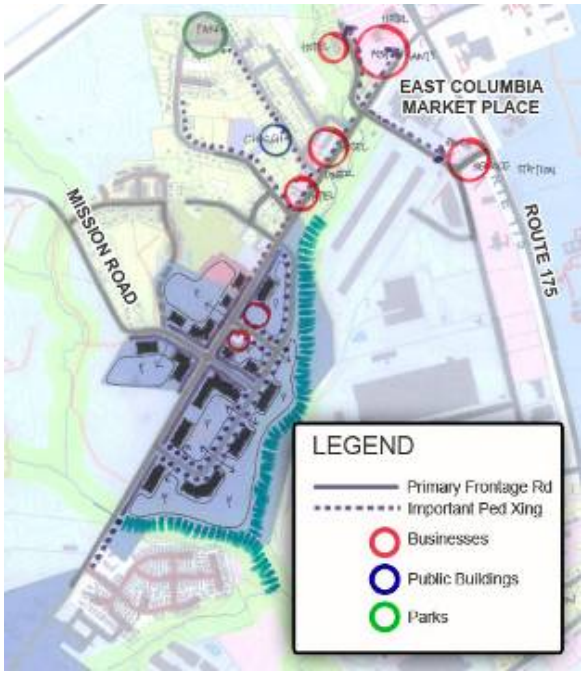
During community meetings, residents agreed that reaching destinations within the corridor should be safe and convenient. They asked for a broader range of travel options that would permit walking and bicycling. They desire a future Route 1 with frontage that reflects their communities, respects historic areas, and provides local business and service options.

Off-road trails, like Savage Mill and Mill Race, are the building blocks of non-motorized travel connections.

A fully connected multi-modal network and the design details of its streets, sidewalks, bicycle facilities, and trails are critical components of an environment that offers travel choice. Overcoming the "cul-de-sac" pattern of development that has dominated the recent past in favor of a more-connected transportation network will help to accommodate expressed desires for change.

MULTIMODAL NETWORKS

As the backbone of the transportation network for all modes, US 1 needs to accommodate all user needs. US 1 should have continuous sidewalks on both sides setback from the travel lanes and wide enough to fit the scale of the roadway; dedicated, striped bike lanes; and clearly designated transit stops with amenities for passengers waiting for transit vehicles.



In this example of a multimodal design concept, connections to local destinations are provided and buildings are oriented to create pedestrian-friendly streets and parking is located behind them.

As mentioned above, many parcels along the corridor are small or narrow. Historically, this has resulted in many driveways and access points along US 1 frontage. Consolidating driveways along US 1 will improve pedestrian safety and comfort by reducing conflicts with turning vehicles.

Direct links between corridor destinations are needed to accommodate walking, biking, and transit. New development needs to build on the existing network to allow safe and convenient pedestrian travel internal to the site and to maximize connectivity to the surrounding street and sidewalk network. Connections should be made to pedestrian

destinations such as schools, libraries, shopping, and nearby residential communities as well as nearby transit stops.

New local road and path connections will offer quieter, pedestrian-scaled alternatives to walking or bicycling along US 1. Continuous bicycle routes should be designated to create a connected bicycle network linking destinations and regional paths. The pedestrian network should be safe and convenient. As development occurs it should be planned and designed to produce a comfortable environment that invites people to walk.

A major challenge is to create a pedestrian- and bicycle-friendly environment in areas with considerable truck traffic. Concentrating truck traffic to designated truck routes will help to right-size design and limit conflicts between different travel modes. Figures 7 through 10 show the basic network of routes currently serving major truck-oriented destinations and zones in the corridor. These figures provide insight into which routes will need to accommodate heavy truck travel, where road extensions in the connectivity plan will need to be designed to prevent residential impacts, and which intersections should be designed for industrial access to accommodate more general multi-mode circulation.

The major employment districts highlighted in Figures 7 through 10 attract workers who use transit and who will benefit from being able to access surrounding commercial and retail uses on foot. Pedestrian and bicycle facilities should be extended to these employment districts as part of all new construction.

MULTIMODAL DESIGN

Street location and design are key to accommodating the variety of users that currently do, and increasingly will, move throughout the corridor: cars, transit vehicles, trucks, pedestrians, and bikes. With properly designed facilities, these user groups can be accommodated on most roads and within the built environment. For example, trucks can share the road with bikers and pedestrians if the needs of each group are considered in the road design. The size and turning radii of trucks can be accommodated in the road design for those routes that require truck access. Separate, striped, visible bike lanes can be provided outside the maneuvering needs of the truck. Sidewalks that have adequate setback from the road edge can be provided to ensure that pedestrians feel safe. Street trees and other landscape and streetscape amenities can be included to enhance the separation between users, to add scale and shade to the street, and to begin to create a sense of place or identity. Attachment B-1 describes key elements for walkable places.

Wisconsin Avenue through Bethesda provides an example of a walkable State route that is safe and comfortable for all modes, including considerable traffic volumes.

The “Route 1 Manual” gives some guidance for multimodal site design; however, it does little to prescribe roadway design and prioritize elements. Expanded roadway design guidelines that provide design variation based on anticipated land uses and travel modes is

recommended to reinforce the new development patterns and achieve a multimodal environment. Clearly articulating the road classifications and the associated design criteria and amenities will allow incremental development to build on the overall vision. Examples of these design and road classification guidance are discussed in the Part 2: Tools to Implement the Vision, Roadway Character and Functional Classification Analysis.

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Figure 7 Primary Truck Routes (Sub-area A)

Back of Figure 7

Figure 8 Primary Truck Routes (Sub-area B)

Back of Figure 8

Figure 9 Primary Truck Routes (Sub-area C)

Back of Figure 9

Figure 10 Primary Truck Routes (Sub-area D)

Back of Figure 10

Section C
Speed Management

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C. Speed Management

PURPOSE

Vehicle speeds on US 1 influence motorists' perceived level of service as well as the safety and the comfort of all roadway users. The goals of speed often compete. Motorists generally want to reduce their travel time which leads to higher speeds, but higher speeds can lead to an increase in the frequency and severity of crashes and adverse impacts to non-motorized roadway users. The purpose of speed management is to define a desired speed range that balances the competing interests along the corridor and which is reinforced through applied design techniques.

KEY FINDINGS

Speed management techniques along the US 1 corridor should reinforce operating speeds of 35 to 40 mph in activity areas. Higher speeds are expected in areas with low levels of activity and few driveways, such as the quarry area north of Guilford Road. Prevailing speeds are expected to reduce from current conditions in areas where density and activity levels increase in the future. As such, decisions made regarding roadway design and signal spacing along US 1 should consider, and not preclude, the potential for reductions in the prevailing travel speed along the corridor. Special attention should be given to the design of transition areas between segments along the corridor.

METHODOLOGY

The speed management analysis consists of:

- A review of prevailing speeds during the p.m. peak hour;
- Determination of target speed ranges along the corridor; and
- An overview of speed management techniques.

ANALYSIS

Prevailing Speeds

Currently the posted speed limit in the corridor ranges from 35 to 50 mph. At the project Open House held in July 2006, several residents and business owners indicated concern about excessive speeds on US 1.

Prevailing speeds during a typical p.m. peak hour were collected through floating car travel time runs using a handheld GPS unit. Three end-to-end travel time runs were conducted in each direction, and speed location data were recorded every second. The data collection took place during a mid-week day in February 2007. Traffic conditions were typical on this day—no incidents were reported on US 1, the weather was clear and dry, and schools were in session.

Figure 11 shows the travel speeds. In general, free-flow speeds ranged from 45 to 55 mph outside of the influence areas of signalized intersections. Southbound speeds were consistently high (greater than 45 mph) in the vicinity of:

- Guilford Road
- Mission Road
- Montevideo Road
- MD 100
- Rowanberry Drive
- North of Bonnie View Lane

Northbound speeds were consistently high in the vicinity of:

- Maier Road
- South of Mission Road,
- Troy Hill Drive,
- Rowanberry Drive, and
- North of Bonnie View Lane.

Figure 11 demonstrates that the prevailing speeds are consistent with the posted speed through most of the corridor. However, north of Montgomery Road, the prevailing speeds were much higher than the posted speed. Public comments indicated concern about high speeds in this area, particularly related to safety concerns at the Old Washington Road intersection. Additionally, three cross-over crashes were reported in this area between 2002 and 2004. Speed management techniques should be targeted in this area in the near term to attempt to bring speeds closer to the desired operating speed.

Target Speed

Target speed is the speed at which vehicles should operate consistent with the level of multimodal activity generated by adjacent land uses to provide both mobility for motor vehicles and a safe environment for pedestrians and bicyclists. The objective of using a Target Speed is to define a uniform operating environment that cues the driver to observe the speed limit. The target speed is usually the posted speed limit, and the design speed is generally 5 mph over the target speed.

The AASHTO *Policy on Geometric Design* recommends design speeds of 30 to 60 mph (corresponding to target speeds of 25 to 55 mph) for urban arterials; however the AASHTO *Guide for Achieving Flexibility in Highway Design* notes that lower speeds are often appropriate for creating a safe roadway in urban environments. The ITE *Recommended Practice for Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities* recommends target speeds ranging from 25 to 35 mph. Lower target speeds are a key characteristic of thoroughfares in walkable, mixed-use traditional urban areas.

Density and activity levels are expected to increase along the US 1 corridor in the future. As such, the target speeds along these segments of increased activity are likely to decrease over time. From a planning perspective, this requires that the roadway accommodate a higher speed in the near term, and not preclude a lower target speed in the long term.

Speed Management Techniques

Along US 1, recommended target speeds will be achieved through a combination of measures that could include:

- Setting an appropriate and realistic speed limit;
- Maintaining consistent spacing of signalized intersections and setting signal timing for moderate progressive speeds from intersection to intersection;
- Designing smaller curb return radii at intersections that are not used by large trucks;
- Eliminating or minimizing shoulders, super-elevation, and channelized right turns;
- Applying textured paving materials in crosswalks and intersection areas to notify drivers that pedestrians may be present;
- Design elements such as landscaping and active sidewalks at the street edge to create side friction; and
- Applying physical measures such as medians to narrow the traveled way.

Other measures that were considered but will have limited or no application on US 1 are:

- Narrower travel lanes;
- Curb extensions typically used to increase pedestrian visibility and reduce crossing distances on roads with on-street parking; and
- On-street parking (except in the North Laurel couplet area).

The effects of speed reducing treatments must consider the potential impact to non-auto modes. In some cases, a speed reducing treatment may not be appropriate if it creates an unsafe condition for another user type (e.g., minimizing shoulders may adversely impact bicyclists if other facilities are not provided).

Creating an active edge along the roadway by providing a canopy of street trees or a building edge just beyond the sidewalk reduces the perception of openness and informs the driver of the potential for activity in the area.

While it is desirable to reduce the frequency of access points on US 1 that serve single properties, this can have the effect of increasing free-flow speed along the corridor. Thus, reductions in access density should be combined with measures discussed above to manage speeds. Additionally, the introduction of roadside features should be designed and maintained so they do not infringe on required sight distance at intersections and driveways (ITE *Recommended Practice for Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities*, 2007).

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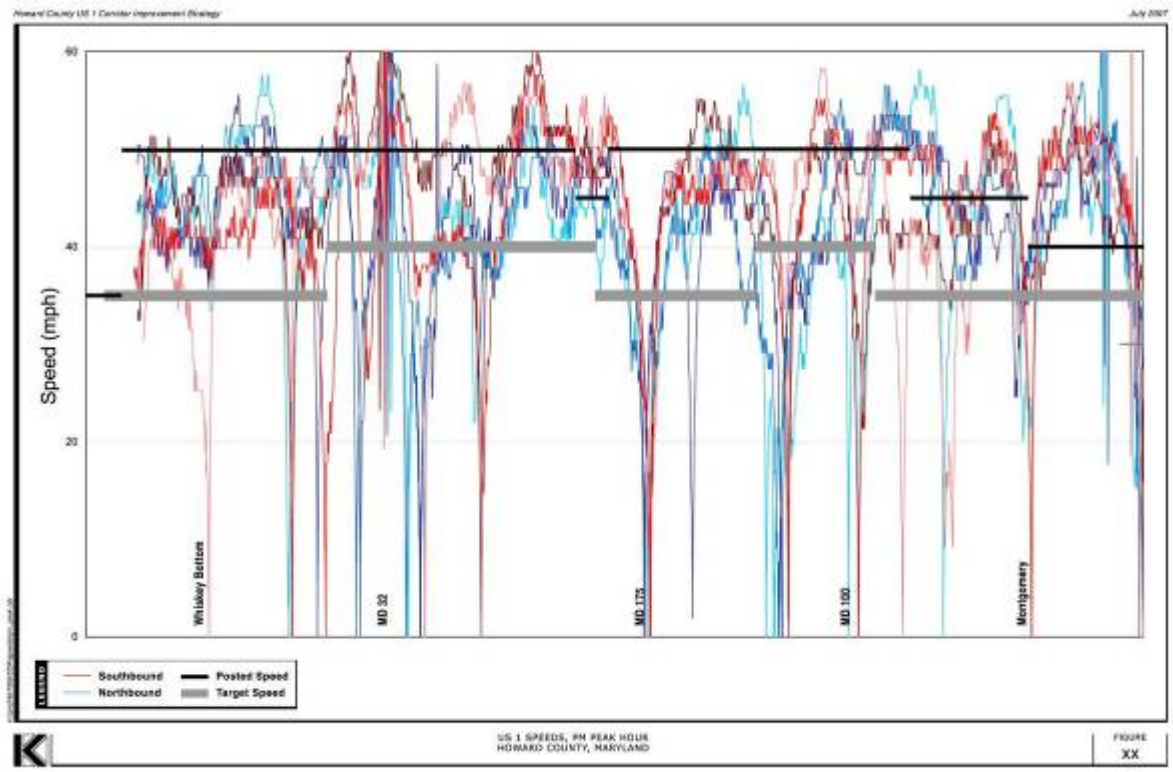
Figure 11 Travel Speeds (PM Peak Hour)



Back of Figure 11

Section D
Safety Analysis

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D. Safety Analysis

PURPOSE

This analysis expands on the safety assessment summarized in the Reconnaissance Report and provides an assessment of where crashes—particularly those likely to be associated with driveway conflicts and high speed regional access transitions—are occurring more frequently than expected. Understanding the characteristics of the recent crash history along US 1 will help identify locations that (1) should be prioritized for spot improvements, (2) may benefit from improved access management, and, (3) will benefit from organizing property access to side streets and providing local network connections to permit introduction of a center median, discussed later in this report.

KEY FINDINGS

The intersections and roadway segments identified in Table 10 in the Critical Crash Rate column had a higher than expected number of crashes compared to similar sites. More detailed safety studies of these locations are needed to identify countermeasures.

The transition areas between limited access highways and busy intersections have the potential to create driver confusion that may lead to conflicts or crashes. Short transition areas can increase the likelihood of these occurrences due to abrupt changes in expected driver behavior related to the appropriate travel speed, the available time to make decisions, and the overlap of merging and diverging movements with crossing conflicts and shorter available stopping distances. The incidents of rear end collisions suggest that such a condition is present in the vicinity of MD 32. Both the Guilford Road intersection and the Howard/Corridor Road intersection were identified as having higher than expected crashes in the Critical Crash Rate analysis. Additionally, the MD 32 EB Ramps and the Howard/Corridor Road intersections both had high proportions of rear-end crashes. The Major Spot Concepts section of this report provides a more detailed analysis of the issues, challenges, and potential improvements in this location.

The number of driveways with full access (i.e. accommodates left and right turn movements to and from US 1) and the absence of a median on US 1 contributes to its safety record for motorists and other users. The intersections and roadway segments identified in Table 10 that had a high proportion of a specific crash type were combined with information about driveway density, pedestrian activity, and transit stops to determine the locations that may experience the greatest benefits from improved access management. Areas to be targeted for access management occur throughout the corridor and are detailed in the Access Management section of this report.

METHODOLOGY

The safety analysis consisted of two stages:

- Identify locations with higher than expected crash frequencies; and
- Identify locations that could have crash frequencies reduced through the application of access management tools.

The corridor analysis is divided into roadway segments and intersections.[2] The crash data for roadway segments and intersections includes driveway crashes. The segments and intersections along the corridor were screened for a high proportion of crash types that may have resulted from high access density to prioritize locations for access management treatments.

Two methods were used in the safety analysis. The Critical Rate Method[3] compares each location with a critical crash rate for facility locations with similar conditions. The High Proportions of Crash Types Method[4] identifies the probability of a predominant crash type based on observation at the subject location. The roadway segments were screened for a high proportion of crash types listed below.

- Angle and Left-turn crashes
- Opposite Direction
- Rear End

The intersections were screened for a high proportion of the following types of crashes:

- Rear End
- Sideswipe

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[2] SHA uses two different processes to identify the top 5% Candidate Safety Improvement Locations statewide; one process identifies intersections and the other identifies sections (i.e. roadway segments). The process for identifying intersections includes calculating the observed crash rate and severity index rate for each intersection. These values are used to establish the top 5% of intersections with the potential for safety improvement, referred to as Candidate Safety Improvement Intersections. The top 5% of Candidate Safety Improvement Sections are identified using Donald A. Morin's Rate Quality Control Method. This method is similar to the Critical Rate Method applied in the US 1 Corridor Safety Analysis. Maryland's 2006 Five Percent Report is attached and has additional information regarding the methods SHA applied.

[3] Critical Rate Method

The Critical Rate Method calculates a crash rate for each location based on the current traffic volumes and crash history over the last three years. A critical crash rate is also calculated for each location. The critical crash rate is based on an average crash rate for similar locations (i.e. either intersections or roadway segments), the specific location's traffic volume, and a factor that incorporates the confidence level in the results. Locations that have crash rates higher than the critical crash rate are flagged as locations with safety concerns. The analysis conducted for US 1 used a 95th percentile confidence level. Intersections and roadway segments operate with distinctively different characteristics that create equally distinctively different potentials for conflicts and collisions. Therefore, the safety analysis conducted for the US 1 corridor analyzed intersections and roadway segments as two separate groups.

[4] High Proportions of Crash Types

The screening analysis identifies sites which are more likely to respond to safety improvements because of a predominant crash type. Conceptually, a site with a higher than expected proportion of a particular crash type or severity may reveal a particular issue at the location under consideration, and suggests that a particular solution (i.e. countermeasure) should be considered for implementation. The observed proportion of a particular crash type at a site is used to calculate the expected long term average proportion of crashes at the site, and to calculate the probability that this long-term average exceeds a selected threshold.

The summary of these analysis results can be found in Table 10 and shown in Figure 12.

ANALYSIS

The results of applying the Critical Rate and High Proportion of Crash Types Methods are summarized in Table 10 and explained below.

Table 10 includes the intersections and roadway segments that were either identified by the Critical Rate Method and/or have an 80% or greater probability of experiencing a larger than expected long-term proportion of the targeted crash types listed above. Study intersections or roadway segments on US 1 within the study area that are not shown in Table 10 were not identified as locations with unexpectedly high crash occurrences or experiencing crash types potentially reduced by applying access management tools. The crash data used for this analysis was provided by SHA and is included as Attachment D-1.

Critical Rate Method Results

The Guilford Road/US 1, Howard Street/Corridor Road/US 1, and Whiskey Bottom Road/US 1 intersections were identified as having crash rates higher than the critical rate for the location. Maryland State Highway Administration (SHA) made improvements to these intersections as Primary or Secondary Candidate Safety Improvement Intersections from 2001 to 2004. None of the intersections or roadway segments along US 1 within the study area were identified in Maryland's 2006 list of the top 5% of Highway Locations Exhibiting the Most Severe Safety Needs. The improved intersections are continuing to be monitored for the effectiveness of improvements.

The additional intersections and roadway segments identified in Table 10 are locations where the crash history indicates a higher observed rate of crashes compared to that location's critical rate. These locations have a potential for safety improvement. Potential countermeasures that may improve safety at the locations flagged can be determined by closer analysis of the crash history to identify patterns that may be related to roadway and/or intersection design elements and surrounding characteristics.

High Proportion of Crash Types Results

Some of the locations identified using the High Proportions of Crash Types method are the same locations identified in the Critical Rate Method. Other locations that are identified with this method may not have a total number of crashes that are higher than expected, but due to the crash types, may be more likely to experience crash reductions as a result of applying access management tools, strategies, and policies.

Potential countermeasures for reducing crash occurrence at these locations include consolidating the number of driveways that access US 1 and converting full access driveways to right-in/right out driveways by installing channelization islands that prohibit left-turn movements and/or adding a median to US 1. Land uses along US 1 would be served by establishing cross easements between properties that share a driveway access or by increasing the connectivity within the study area parallel to US 1.

Driveways located within the influence area of intersections and especially interchange ramp terminals should be prioritized as those to be closed and/or consolidated with an access farther from the ramp terminal and/or intersection. Consolidating driveway accesses

and reducing the number of turn movements accommodated at maintained driveways will reduce the number of conflicts on US 1 for motorists as well as bicyclists and pedestrians. A reduction in conflict points will lead to a reduction in crash occurrence.

The SHA Summary of Reported Crashes for US 1 can be found in Attachment D-1. SHA has performed several spot safety improvements in each of the candidate safety areas identified in the crash data. SHA Office of Traffic and Safety will continue to monitor these and other sites for safety performance and should be included in review of development applications that can provide more comprehensive safety solutions.

Table 10 Safety Screening Results

Location	Safety Screening		
	Critical Rate Method	High Proportion of Specific Crash Types	
		Probability	Crash Type
Levering Avenue/US 1 Intersection		96	Rear End
Segment A1 – Levering Ave to Old Washington Rd	X	93	Rear End
Montgomery Rd (MD 103) /US 1 Intersection	X		
Segment B – Montgomery Rd to Rowanberry Dr	X		
Rowanberry Dr/Pine Ave/US 1 Intersection		81	Sideswipe
Segment C – Rowanberry Dr to Loudon Ave		96	Angle and Left Turn
Segment D – Loudon Ave to Troy Hill Dr		95 (98)	Angle and Left Turn (Opposite Direction)
Troy Hill Dr/US 1 Intersection		96	Rear End
MD 100 Loops and Segment	X		
Segment F – MD 100 Ramps to Meadow Ridge Dr		97	Angle and Left Turn
Business Parkway/US 1 Intersection		98	Rear End
Segment G – Business Pkwy to Montevideo Rd	X	100	Angle and Left Turn
Montevideo Rd/US 1 Intersection	X		
Waterloo Rd (MD 175) /US 1 Intersection		100	Sideswipe
Crestmount Rd/Assateague/US 1 Intersection	X		
Segment K – Mission Rd to Patuxent Range Rd		98	Rear End
Patuxent Range Rd/US 1 Intersection		82	Rear End
Guilford Rd/US 1 Intersection	X		
EB Off Ramp at MD 32/US 1 Intersection		90	Rear End
Howard St/Corridor Rd/US 1 Intersection	X	100	Rear End
Gorman Rd/US 1 Intersection		100	Rear End
Freestate Dr/US 1 Intersection		98	Rear End
Segment P – Freestate Dr to Whiskey Bottom Rd	X	84	Rear End
Whiskey Bottom Rd/US 1 Intersection	X	83	Rear End
Segment Q – Whiskey Bottom Rd to Laurel Rd	X	84	Rear End
North Laurel Rd/US 1 Intersection	X	100	Sideswipe

Note: Study intersections or roadway segments on US 1 within the study area that are not shown in Table 10 were not identified as locations with unexpectedly high crash occurrences or experiencing crash types potentially reduced by applying access management tools.

Numbers shown in the "Probability" column are the probability that the proportion of the target crash type calculated for the analysis period is also reflective of the long-term proportion of the target crash type. High probabilities indicates that the proportion of target crashes will continue to be high (compared to other sites with similar characteristics) unless the geometric or operational characteristics of the site are changed

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Figure 12 Safety Screening Results

Back of Figure 12

Section E
Major Spot Concepts

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E. Major Spot Concepts

PURPOSE

Two locations along the US 1 corridor were identified for major spot improvements. The purpose of this analysis is to provide a basis from which SHA and Howard County can begin planning in these locations. The two locations were identified based on operational and safety analysis, community and stakeholder input, and the potential to improve the locations through modified roadway geometry. These locations are:

- The US 1/MD 175 intersection
- US 1 in the vicinity of the MD 32 (Guilford Road to Corridor Road)

KEY FINDINGS

Multiple options were evaluated for the two identified spot-improvement locations at a conceptual level. Traffic operations, multimodal safety, and right-of-way impacts were the primary performance measures considered. Input from the community and stakeholder group was also considered.

US 1/MD 175 Intersection

Howard County and SHA should consider grade-separation alternatives including the following options prepared for this study:

- Eastbound left-turn flyover ramp;
- Northbound left-turn flyover ramp;
- Single-Point Diamond Interchange (SPDI); and
- Tight Diamond Interchange (similar impact area and operational characteristics as a SPDI).

SHA and Howard County should consider the following challenges and opportunities while evaluating the potential improvements:

- High demand for the northbound and eastbound left-turn movements and the possibility of creating alternative routes to serve these movements;
- Proximity of the I-95 on and off ramps to the US 1/MD 175 intersection and the weaving conflicts and driver navigation challenges that grade separation at US 1/MD 175 creates;
- Driver expectations on US 1 and MD 175 and the overriding design principle of creating a “self-enforcing” roadway that is consistent with the desired function of the facility and character of the area;

- Access impacts to the adjacent developments, the corresponding impacts to driver navigation, and potential need for additional signing or wayfinding guidance; and
- Impact that modifications to the roadway geometry and traffic operations at the US 1/MD 175 intersection could have on the safety and operations of I-95/MD 175 interchange.
- Plans for grade separated connections will need to consider the transition from a freeway to an urban arterial with busy intersecting streets and the presence of bicyclists and pedestrians.

These challenges and potential issues should be carefully considered in future studies that can invest the time and resources necessary to evaluate potential solutions for the US 1/MD 175 intersection in more detail. All alternatives must consider and accommodate non-auto modes. The US 1/MD 175 intersection is a critical node in the transportation network surrounding US 1 and serving I-95. The high traffic demand and changing function of US 1 creates a complex situation that warrants thoughtful evaluation.

US 1/MD 32 Interchange Area

Howard County and SHA should consider the following recommendations for the MD 32/US 1 interchange area:

1 - GUILFORD ROAD/US 1 INTERSECTION

- Realign the intersection to be approximately 90-degrees;
- Eliminate the driveway accesses between the intersection and the MD 32 on and off ramps; and
- Consolidate the driveway accesses on the north side of the intersection.

2 - MD 32/US 1 INTERCHANGE

- Modify loop ramp radii to create a slower speed environment;
- Increase distance between the on and off loop ramps;
- Add a lane on US 1 that continues onto the loop ramps that serve the US 1 southbound to MD 32 westbound movement and the US 1 northbound to MD 32 eastbound movement; and
- Modify the MD 32 westbound off ramp to decrease the exiting speeds and increase distance between the ramp and the Guilford Road/US 1 intersection.

3 - CORRIDOR ROAD/HOWARD STREET/US 1 INTERSECTION

- Consolidate the intersection to one conventional intersection.

Collectively these changes are designed to improve safety by increasing drivers' decision-making time, reducing the number of conflicts, and creating geometric characteristics more appropriate for an urban arterial roadway. Ideally, the MD 32/US 1 interchange would take a form more consistent with service interchanges found in urban areas such as a diamond, split diamond, single-point diamond, tight diamond, or partial cloverleaf interchange. SHA and Howard County may also wish to evaluate these forms in further detail. All alternatives for this location must consider and accommodate non-auto modes.

METHODOLOGY

Each location was evaluated using a basic traffic operations analysis, a detailed review of the issues and challenges, and a review of potential outcomes for various options. A summary review to qualify safety enhancements, traffic operations, right-of-way needs and driver expectancy was prepared for each option and location.

ANALYSIS

US 1/MD 175 Intersection

ISSUES

The high delay and excessive queuing that occurs during the commuter peak periods have made improving the US 1/MD 175 intersection a top priority for Howard County and SHA.

The intersection serves the high volume of truck traffic that travels between the I-95 ramps located 1,500 feet west of the intersection, and the industrial uses along US 1. This intersection also serves a high volume of commuter traffic. The northbound and eastbound left-turn movements are the critical movements (i.e. the highest demand) at the intersection.

CHALLENGES

There are a number of challenges that must be addressed to develop an effective solution and improve traffic operations at the US 1/MD 175 intersection:

- Signal timing modifications alone will not address the deficiencies; additional capacity improvements are needed;
- The close proximity of the I-95/MD 175 interchange limits the extent of improvements that can occur on MD 175 west of US 1;
- All four quadrants of the intersection are fully developed;
- Driveways are located on all intersection approaches; and
- The right-of-way and construction required to address the operational deficiencies will likely carry a high cost.

A frequent issue at the MD 175 intersection is truck stacking to turn left from northbound US 1 to go westbound on MD 175 to I-95. This is a key link for the many warehouse facilities located in the southeastern industrial quadrant.

Each challenge is explained in greater detail below.

SIGNAL TIMING AND PHASING

The northbound and eastbound left-turn movements conflict in signal phasing schemes—they compete for time within each cycle. The demand for both movements cannot be met by simply changing the signal splits or phasing. Geometric changes are needed to allow these movements to operate concurrently or additional capacity must be provided (i.e. additional lanes or grade separation) so that the demand can be served in less time.

PROXIMITY TO I-95

The US 1/MD 175 intersection is 850 feet east of the I-95 northbound off ramp and 1,500 feet east of the I-95 northbound on ramp. Any modifications to the geometry of the US 1/MD 175 intersection should consider and address how additional lanes and/or structures will affect access to the ramps that serve I-95. Particular consideration should be given to driver expectations, the distance and time that motorists need to make decisions and react, and to weaving conflicts that occur on MD 175 as drivers navigate between US 1 and I-95.

EXISTING DEVELOPMENT

There is currently development in all four quadrants of the intersection. An interim measure to allow a restricted left from the Maryland Food Center at Oceana Drive on to Westbound MD 175 was introduced during this study and approved by SHA's Office of Traffic Safety in August 2007. The operations improvement requires the installation of a fully operational traffic signal and is pending funding approval. Once installed, the MD 175/US 1 intersection can be monitored for reductions in the number of left-turning trucks from US 1 northbound.

Depending on the geometric improvements selected in the future, some of the developments in the vicinity of the MD 175 intersection will be physically impacted and others will undergo access changes. The selected alternative should balance traffic operations needs and property impacts. Some alternatives considered thus far impact only one or two quadrants. SHA and Howard County may benefit from considering which, if any, quadrants are likely to redevelop and how the abutting properties contribute to the character of US 1 in this area.

ACCESS

Access to the parcels and developments north, south, and east of the US 1/MD 175 intersection are likely to be impacted by any form of geometric improvement. There are currently numerous curb cuts within the vicinity of the intersection on the north, south, and east approaches. The frequent and relatively uncontrolled access introduces conflicts and friction on US 1, further impairs traffic operations near the intersection, and increases the potential for crashes. Any geometric changes to the intersection will require the existing accesses to be consolidated and may eliminate access or specific movements at existing accesses near the intersection.

RIGHT-OF-WAY AND CONSTRUCTION COSTS

To construct any geometric improvement, right-of-way will need to be acquired from some of the developments surrounding the intersection. The cost of the acquisition and construction will depend on the selected improvement.

IMPROVEMENT CONCEPTS

To effectively improve traffic operations at the US 1/MD 175 intersection, the improvement concepts need to address the high-volume northbound and eastbound left-turn movements.

As part of this study 17 preliminary concepts were initially developed and evaluated for the US 1/MD 175 intersection. Each option was evaluated in terms of safety (including ability to meet driver expectations), traffic operations, right-of-way impact, and impact on the existing and desired character of US 1. The concepts range from a no-build scenario to grade-separated options. The traffic volumes projected for the year 2030 were used to

evaluate the traffic operations for each concept. The 2030 traffic volumes were provided by SHA and account for regional growth in the area.

Attachment E-1 provides a summary of the safety, traffic operations, and right-of-way impacts along with the general assessment for all 17 concepts evaluated for the US 1/MD 175 intersection.

From the 17 options considered, three were chosen for further analysis based on the operations, safety, and right-of-way considerations. Single-line sketches were developed for the three chosen concepts to highlight and uncover specific design considerations and concerns. The single-line sketches illustrate the modifications to the geometry and the approximate right-of-way impact. The three options are:

- Eastbound left-turn flyover ramp
- Northbound left-turn flyover ramp
- Single-Point Diamond Interchange (also representative of the relative right-of-way impact a Tight Diamond Interchange could have)

Table 11 provides a summary of the safety, operations, right-of-way, and driver-expectancy considerations of these alternatives.

Table 11 MD 175 Improvement Alternatives Summary

	Safety Perspective	Future Traffic Operations (HCM)	ROW Impact	Driver Expectancy
Northbound Left Turn Flyover Ramp	Removes a critical movement from the intersection. Creates weaving maneuver for traffic destined to the on ramp	v/c = 1.0 LOS = D (assumes six lanes on US 1)	Impacts to Southeast, Southwest, and Northwest quadrants	This would be the first flyover ramp located on US 1. Signing for downstream movements would be needed in advance of the intersection.
Eastbound Left Turn Flyover Ramp	Removes a critical movement from the intersection. Creates a weaving maneuver for traffic traveling from the I-95 northbound off-ramp.	v/c = 0.90 LOS = D (assumes six lanes on US 1)	Impacts to Northeast, Southwest, and Northwest quadrants	Reasonably consistent with driver expectancy because drivers have just traveled through an interchange. Signing for downstream movements would be needed in advance of the intersection.
Single Point Urban Interchange **(MD 175 over US 1 changes grade)**	Eliminates MD 175 through traffic conflicts. Creates weaving interaction on MD 175 west of US 1.	v/c = 0.96 LOS = D (assumes six lanes on US 1)	Impacts to access onto MD 175 east of the intersection. ROW impacts to all quadrants.	

All three options improve traffic operations by providing additional capacity for the eastbound left-turn and/or northbound left-turn movements. While all three have elements of grade separation, they have less impact than the larger interchange concepts, with limited impact to existing development and driveway access. The design of any change must consider driver expectations, avoid creating weaving conflicts on US 1 and on MD 175, and accommodate pedestrian and bicycle travel through the intersection.

The single-line sketches and approximate impact areas for these alternatives are shown in Figures 13 to 16.

Figure 13 MD 175 High Volume Movements

Back of Figure 13

Figure 14 MD 175 Improvement Concept (Eastbound Left Turn Flyover)

Back of Figure 14

Figure 15 MD 175 Improvement Concept (Northbound Left Turn Flyover)

Back of Figure 15

Figure 16 MD 175 Improvement Concept (Single Point Diamond Interchange)

Back of Figure 16

US 1/MD 32 Interchange Area

The US 1/MD 32 interchange area includes the portion of US 1 that extends from the north side of the US 1/Guilford Road intersection south through the US 1/Howard Street/Corridor Road intersection.

ISSUES

The US 1/MD 32 interchange area warrants a more detailed review due to the safety and traffic operations history at the US 1/Guilford and US 1/Howard Street/Corridor Road intersections, and because of the close proximity of the US 1/MD 32 interchange.

SHA identified the US 1/Guilford Road and the US 1/Howard Street/Corridor Road intersections as Primary or Secondary Candidate Safety Improvement Intersections from 2001 to 2004. These intersections were also identified in this study as having higher-than-expected crash rates compared to the other signalized intersections along the US 1 corridor prior to safety improvements made to the intersection during an SHA roadway resurfacing in Spring 2007. The US 1/Howard Street/Corridor Street intersection was also identified as having a higher-than-expected proportion of rear-end crashes compared to similar intersections on the US 1 corridor. A complete description of the safety analysis is included in Attachment E-2.

Motorists at the US 1/Guilford intersection experience high delays during the morning and evening peak hours. These delays are expected to worsen as traffic volumes on US 1 grow in the future. Currently, the US 1/Guilford Road intersection operates at Level-of-Service (LOS) E with a volume-to-capacity ratio (v/c ratio) of 1.00 during the p.m. peak hour. If no changes are made to the intersection, it is expected to operate at LOS F with a v/c ratio of 1.75 in the year 2030.

Similarly, the US 1/Howard Street/Corridor Road intersection also has high delay in the morning and evening peak hours. Currently, the intersection operates at LOS D with a v/c ratio of 0.69. If no changes are made to the intersection, it is expected to operate at LOS F with a v/c ratio of 1.06 in the year 2030.

CHALLENGES

There are several geometric characteristics unique to the US 1/Guilford Road intersection and to the US 1/Howard Street/Corridor Road intersection that contribute to their safety and traffic operational difficulties.

The skew and geometry of the US 1/Guilford Road intersection requires that the intersection operate with split signal phasing for the east- and westbound approaches. The split-phase operation, percentage of heavy vehicles, volume of traffic, and the close proximity of the MD 32 westbound off ramp all contribute to the safety and traffic operations issues. Realigning Guilford Road to reduce the skew of the intersection will require right-of-way acquisition and will impact access to the current businesses located in the intersection quadrants.

The US 1/Howard Street/Corridor Road intersection shown on the next page has an unconventional geometric configuration. The intersection is controlled as one intersection but is physically split because of the approximately 150-foot-wide median. The

configuration results in inefficient operations and vehicles stacking in the intersection between phases.

The location and skew of Guilford Road crossing US 1 is recommended for a more detailed planning study to reorient the intersection for improved site distance, lower turning speeds, and improved non-motorized safety.

The MD 32/US 1 interchange introduces issues related to driver expectations, navigation and decision-making, and the desired function of US 1. The ramp loops create a weaving section on US 1 as it passes underneath MD 32. The interchange ramps are designed for a free-flow, controlled-access environment, which is inconsistent with the uncontrolled access and at-grade intersections on US 1. The high-speed geometry and free-flow characteristics of the westbound MD 32 off ramp bring traffic exiting MD 32 directly into the influence area of the Guilford Road/US 1 intersection. The overlap of the free-flow nature of the interchange and the increasingly urbanized character of US 1 increases conflict and decreases the amount of time that drivers have to make decisions and react to the surrounding roadway.

IMPROVEMENT RECCOMENDATIONS

Improvement concepts were developed that increase the decision-making time for drivers, reduce conflict points, and maintain or increase capacity at the intersections and interchange.

Attachment E-3 provides a summary of the safety, traffic operations, and right-of-way impacts along with the general assessment for the proposed modifications to the MD 32/US 1 interchange area. The modifications focus on geometric changes that can be made without completely rebuilding the existing interchange.

Drivers traveling north through the interchange zone of MD 32 are met with an abrupt change in scale and roadway character at Guilford Road.

GUILFORD ROAD/US 1 INTERSECTION

The following set of actions is recommended as a concept to improve safety for all modes and traffic operations at the Guilford Road intersection:

- Realign the Guilford Road/US 1 intersection to an approximate 90-degree intersection;
- Eliminate the driveway accesses between the Guilford Road/US 1 intersection and the MD 32 on and off ramps; and
- Consolidate the driveways accesses adjacent to the Guilford Road/US 1 intersection to the north.

Realigning the Guilford Road/US 1 intersection would improve traffic operations by eliminating split signal phasing on the east/west approaches and increasing the distance from the MD 32 ramps. This would increase the decision making and reaction time available to drivers, reduce crossing distances for pedestrians and potentially offer more crossing time. Additionally, consolidating and eliminating driveway accesses near the intersection would decrease the number of conflicts points for all users.

MD 32/US 1 INTERCHANGE

The following series of improvements are recommended as a concept to improve safety and improve transitions to and from US1 to the MD 32 interchange ramps:

- Modify loop-ramp radii to create slower speed environment;
- Increase distance between the on and off loop ramps to provide drivers with more time to make decisions and change lanes;
- Add a lane on US 1 that continues onto the loop ramps to serve the US 1 southbound to MD 32 westbound movement and the US 1 northbound to MD 32 eastbound movement; and
- Modify the MD 32 westbound off ramp to reduce speeds and increase the distance between the end of the ramp and the Guilford Road/US 1 intersection.

The current design provides 575 feet between the entering and exiting loop ramp lanes, creates a weaving section on US 1. Adding a lane on US 1 that continues onto the MD 32 loop ramps will eliminate the need for motorists on US 1 traveling onto MD 32 to make a

The Corridor Road (to the south) and Howard Street (to the north) and ramp access area of US 1 that creates the MD 32 interchange introduces an interstate character to this section of US 1.

lane change. This would reduce conflicts and eliminate the required weaving movement. Modifying the MD 32 westbound off ramp would reduce the speed of the westbound exiting movement to a speed more consistent with an uncontrolled access facility with at-grade intersections. It would also increase the time that drivers have to decide which lane they need to choose.

CORRIDOR ROAD/HOWARD STREET/US 1 INTERSECTION

If consolidated into a single conventional intersection, the Corridor Road and Howard Street intersections would see improved driver expectancy and potentially improved traffic operations at the intersection. This improvement would decrease the size of the intersection and is expected to enhance traffic operations and safety.

Table 12 and Figure 17 summarize the improvement alternatives for the MD 32 area. Attachment E-3 provides additional information about improvement alternatives for the MD 32 area.

Table 12 MD 32 Area Improvement Recommendations Summary

	Safety	Future Traffic Operations	ROW Impacts
Guilford/US 1			
Realign Eastbound/Westbound approaches	Potential to reduce crashes by increasing distance and time for driver decisions and improving sight distance.	Improves efficiency by eliminating geometric offsets and split phasing for E/W movements.	Commercial property impacts
Consolidate Driveways near Intersection	Potential to reduce crashes by reducing conflicts between driveway traffic, intersection traffic and vehicles traveling to and from MD 32.	Improved operations. Operations analysis model unable to estimate LOS value for this improvement.	A local road needs to be constructed to give access to properties.
MD 32/US 1			
Reduce Loop Ramp Radii	Potential to reduce crashes by increasing distances between on and off ramps and increasing time for decision-making.	No impact	No impacts
Add Additional Lane on Loop	Potential to reduce crashes by reducing the weaving movement between the loop ramp and US 1.	Provides lane balance, eliminates need for mandatory lane changes from US 1.	
Modify MD 32 WB Off-Ramp	Potential to reduce crashes by increasing distance and time, and reducing speed for driver decisions.	Reduces turbulence by increasing the length of available weaving distance.	Relocate or modify existing storm water collection pond.
Howard/Corridor/US 1			
Consolidate into one physical intersection	Potential to reduce crashes by reducing exposure and increasing distance and time decision making.	Reduces loss time associated with current configuration.	Minimal Impacts

Figure 17 MD 32 Area Improvement Concepts

Back of Figure 17

PART II
Tools to Implement the Vision

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Section F
Development Review

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F. Development Review

PURPOSE

Private development is vital to building and shaping transportation systems. Development activity occurring over time, when planned and managed can help to repair and build a more integrated transportation system. The Development Review analysis consists of a review of State and County development policies and procedures, the identification of issues and challenges associated with the current practice, and opportunities to achieve transportation improvements that better serve the US 1 revitalization goals through development and private investment in the corridor. The purpose of this analysis is to identify key findings and opportunities. Alternatives to the current practice are offered to help achieve the desired US 1 transportation goals through private development.

KEY FINDINGS

The positive impacts of redevelopment are maximized through early planning and coordination between land owners, developers, and State and County agencies. The Subdivision Review Committee is a good forum for communication and collaboration about the various impacts of development.

During this study, we reviewed many development applications and site plans. These case studies raised the following issues and challenges associated with the development review process and policies for the US 1 corridor.

- Site Design
  - Conflicts with one or more policies can derail desirable elements of development plans. Creative ways to meet the policy requirements and achieve the desired outcome may exist, but are not apparent (ex. Sidewalks without logical termini).
  - Roadway design flexibility and multimodal amenities appropriate to the context are not adequately addressed through Design Manual standards.
- Impact Assessment
  - Local streets do not trigger APFO roads tests or Traffic Studies. Many roadways have a local street designation but carry volumes that are more significant.
  - Safety and Pedestrian components of Traffic Studies are not typically required. Standards and mitigations related to these impacts and opportunities are not identified.
- Access and Circulation
  - Cross-easements are not considered or applied as tools to limit the number of access points.
  - Property access along US 1 has not been guided by a blueprint plan favoring local roads and shared connections, so has typically been provided site-by-site.
  - Circulation and facility compatibility with adjacent neighborhood streets is not adequately addressed.
  - Access to transit service is not addressed.
- Sidewalks

- Howard County generally cannot require developers to provide sidewalks off-site unless there is a very good case for a pedestrian connection to "nearby pedestrian centers." (*Subdivision & Land Development Regulations)*
- The lack of sidewalks and pedestrian facilities on US 1 does not support the need for pedestrian accommodations off of US 1, which contributes to the lack of walkability of the study area.

- Improvement Funding
  - County and State cannot receive developer contributions to mitigate impacts without an approved capital project or specific program such as Transportation Demand Management (TDM).
  - One development is burdened with the full cost of an improvement rather than each developer contributing proportionate shares for needed system improvements.

METHODOLOGY

The development review analysis comprises:

- A review of policies, regulations and guidelines that direct transportation and land development in the corridor;
- A review of the land development process;
- A summary of issues and matrix identifying regulations and policies that guide development review decisions based on discussions with County and State site-plan reviewers regarding current practice and their perspectives on opportunities for improvement;
- A case study offering best practices that may be applicable to the US 1 corridor.

ANALYSIS

Review of Policies, Regulations, and Guidelines

COUNTY-WIDE GUIDANCE

The Howard County General Plan lays out broad goals related to development, land preservation, neighborhood sustainability, capital projects, County services, and other key issues in Howard County. The fundamental goals of the General Plan are to strengthen existing communities and encourage compatible infill development and redevelopment in the eastern part of Howard County. The General Plan has a long-term horizon and is very broad in nature. The zoning regulations, land-development regulations, design manual, and other guiding documents are referred to during development review to provide specific guidance for implementing the General Plan. The 2000 General Plan calls for use of the Route 1 Corridor Revitalization Study as a pilot project to develop and test the community planning process.

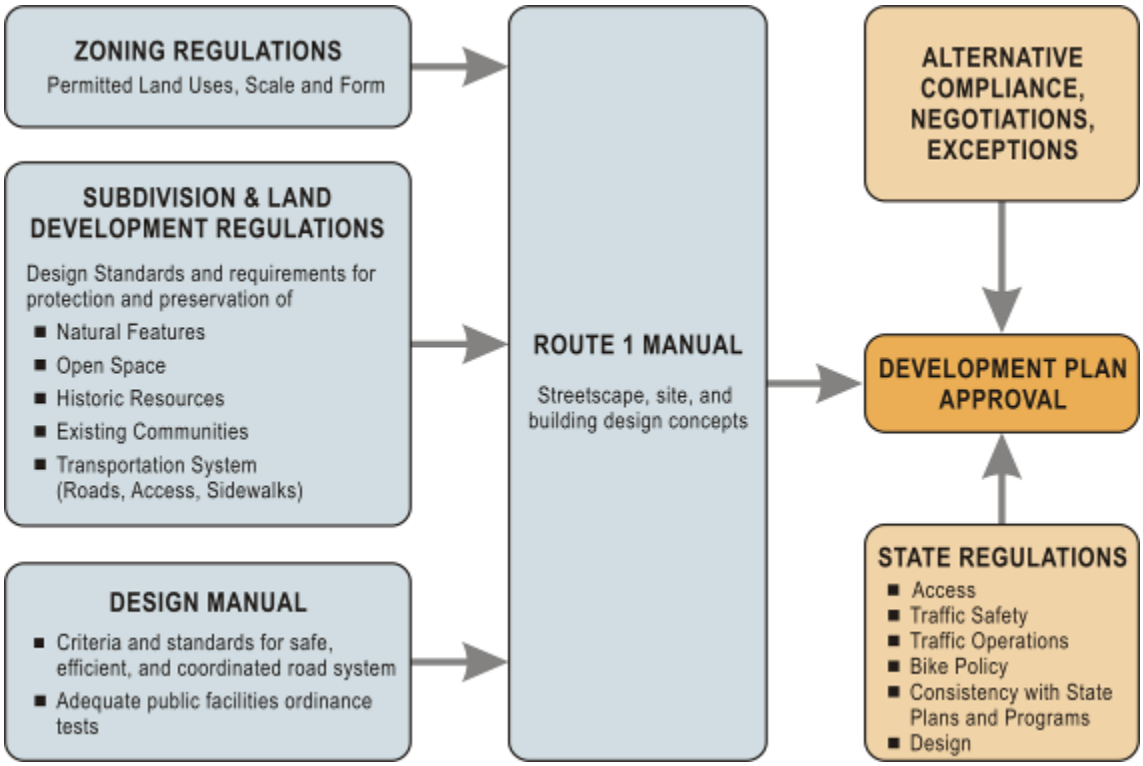
> "*As the County matures, the sustainability and redevelopment of the County's existing communities and infrastructure will assume more importance. Rather than simply building more and bigger roads, the County must look at ways to make transportation infrastructure and programs more efficient, more diverse, and more responsive to environmental and community concerns*." (Howard County General Plan, 2000)

The Zoning Regulations dictate the permitted land uses, and their scale and form, for all parcels in the County. The Subdivision and Land Development Regulations provide design guidelines and standards for protecting and preserving natural and historic features, open space, existing communities and transportation systems. The Design Manual

establishes criteria for safe and efficient infrastructure and sets out the requirements for Adequate Public Facilities tests and Traffic Studies.

This diagram identifies the key County and State regulations and policy documents used in the review process to direct transportation and land development in the US 1 Corridor.

General Plan Diagram



The zoning regulations, subdivision and land development regulations and the design manual are designed to guide the development in support of the General Plan. The following policies and actions within the General Plan provide insight into transportation-related policy direction for implementing ordinances, programs and projects affecting development and improvements in the US 1 corridor:

- "Encourage the use of public transportation, reduce private automobile usage and facilitate access to employers" (Policy 2.4)
  - Coordinate land use changes along existing and planned transit corridors to support and reinforce ridership potential.
  - Encourage the reservation of space for sheltered transit stops in major employment and mixed-use centers.
  - Provide the opportunity for long-term conversion to light rail along transit corridors.
- "Make efficient use of land resources for long-term economic growth" (Policy 4.4) and "economic growth…to ensure the County's fiscal health." (Policy 4.5)
  - Encourage activity near Transportation Nodes.
  - Encourage revitalization and redevelopment of older commercial areas and business parks with planning and incentives for private investment.

- Leverage County funds to accelerate improvements for regionally important corridors.
- Design standards for site development and streets must encourage linkages and accessibility for all modes of travel, including auto, transit, bike, and pedestrian transportation.
- Promote housing adjacent to employment.

- Reduce dependence on the automobile (Policy 4.9, 4.10)
  - Ensure that future highway improvements in transit corridors do not preclude transit service.
  - Promote the use of transit, ridesharing, bicycling, and other alternatives to single-occupant vehicles.
- Enhance and encourage walking and bicycling (Policy 4.11, 5.15)
  - Prioritize potential pedestrian and bicycle facility improvemets emphasizing improving safety, eliminating gaps, creating consistency with or enhancement of community character and providng connections to bus and rail stops libraries, shopping, schools, employment centers, park-and-ride lots, and government services.
  - Seek to link community systems to the regional pedestrian/bicycle network.
  - Encourage construction of sidewalks, designated bike lanes and/or the use of paved shoulders for bike routes as appropriate.
  - Explore potential revisions to the Howard County Design Manual and the Subdivision and Land Development Regulations to encourage and accommodate walking and bicycling as both a recreational and commuter-oriented activity.
- Enhance the Howard County park system and recreational facilities (Policy 4.18)
  - Develop a detailed greenway plan to create continuous greenways and provide trail or path access in appropriate areas.
  - Connect the existing trail and pathway system with other areas of the County.
- Reduce inappropriate pass-through traffic in residential communities (Policy 5.13)
  - Provide adequate capacity on arterial highways to lessen the motivation for pass-through traffic within residential communities.

GUIDANCE SPECIFIC TO THE ROUTE 1 CORRIDOR

The "Route 1 Manual" augments the county-wide regulations by more fully describing the desired characteristics of streetscape, building, and site design in the Route 1 corridor. Key design concepts in the manual related to transportation include:

- Improving Route 1 right-of-way by addition of landscaped medians and streetscape elements such as sidewalks, crosswalks, street trees, street furniture, and lighting.
- Providing convenient vehicular and pedestrian access to transit, both MARC train and bus.
- Orienting buildings to the street, especially along Route 1.
- Locating parking to the side and rear.
- Instituting on-street parking in the TOD and CAC Districts.
- Providing pedestrian and vehicular connections between adjacent commercial uses and to parking lots.

These design concepts are supported by requirements and recommendations related to site design. Developers must address the requirements and are strongly encouraged to address the recommendations.

Development Review and Approval

SUBDIVISION REVIEW COMMITTEE

The Subdivision Review Committee (SRC) is the body that coordinates review of development applications for Howard County. The SRC includes representatives of many State and County agencies and departments, each reviewing plans for compliance with specific regulations and commenting on any perceived issues related to the agency's service mission. The SRC is designed to have all perspectives and interests represented during the review of proposed developments. The SRC meets once every week to discuss each development and to resolve any conflicting comments that may arise so that the Division of Land Development can communicate a list of comments to which the developer can reasonably respond, while satisfying all interests of the SRC.

The Division of Land Development within the County Department of Planning and Zoning coordinates the subdivision review and permitting process. The Division of Land Development accepts plans from developers, distributes them to the Subdivision Review Committee (SRC), facilitates meetings of the SRC, compiles comments from the SRC, and provides them to the developer.

Because US 1 is a State facility, SHA has a key role in reviewing plans for properties abutting and adjacent to US 1. Properties that do not have need for an access permit are reviewed by SHA at the County's discretion. A representative from The SHA Engineering Access Permits Division (EAPD) sits on the SRC to review the impact proposed developments will have on State facilities. The EAPD distributes subdivision plans to and solicits comments from SHA's Office of Traffic and Safety, Office of Planning and Preliminary Engineering, and Assistant District Traffic Engineer. Each of these bodies reviews subdivision plans to ensure the continued safe and efficient operations of state facilities in accordance with the State Highway Access Manual and locally adopted area plans and administrative policies.

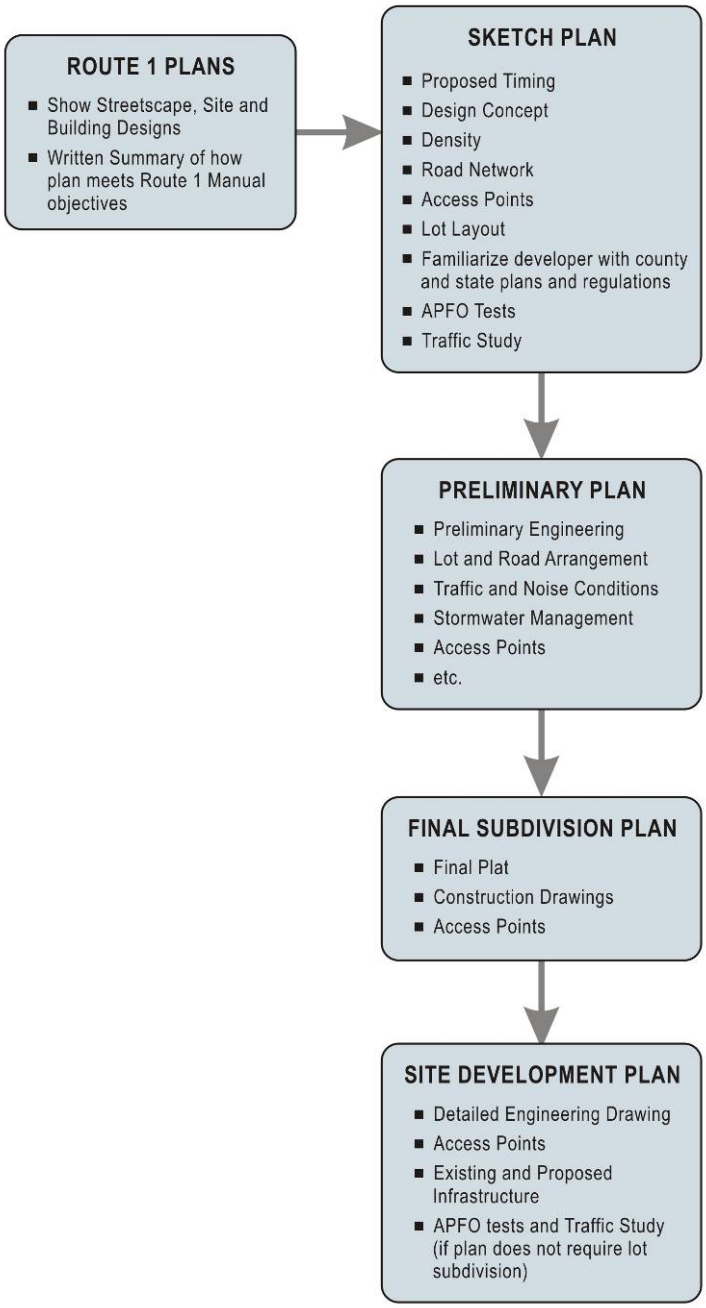
SUBDIVISION AND SITE DEVELOPMENT PLAN SUBMITTALS

The Subdivision and Land Development Regulations prescribe procedures for review and approval of development plans in the County. The elements of the submittals and reviews that directly relate to the transportation system are summarized in the standard plan submission diagram. Additional requirements for forest conservation, cemetery preservation, and water and environmental quality also apply.

A subdivision approval is required for land-development proposals that involve any subdivision or modification of tax lots, including easements. The subdivision approval process consists of a series of submittals including a sketch plan, a preliminary plan, and a final plan. Depending on the size and impacts of the proposed subdivision, the sketch and/or preliminary plan submittal may not be required. The Sketch Plan includes the Adequate Public Facilities Ordinance (APFO) for school and road capacity and public notice of intended use of site. Ideally the Sketch Plan permits the agencies to understand the scope and scale of the development and address questions of transportation framework

that considers mode priority, access to and circulation on and around the site. The Preliminary Plan includes dimensions of all public areas and right-of-way, as well as centerline and typical section of proposed roads. The Final Plan includes the final plat, construction drawings infrastructure items (including roads, water and sewer, and stormwater).

Standard Plan Submission



At each submittal stage, the Subdivision Review Committee (SRC) has 60 days to provide comments to the developer, and the developer has 45 days to respond to comments. Once agreement has been reached on the Final Plan and all comments have been addressed, from 45 to 180 days are allowed to negotiate the Developer Agreements and to pay all fees.

A Site Development Plan (SDP) must be submitted for all residential development, new or expanded non-residential development, any establishment or change of nonresidential causing greater than 5,000 square feet of disturbance, or alteration of access, parking, circulation, or structures. All APFO tests must be included in the SDP submittal. As with the subdivision submittals, the SRC has 60 days to provide comments on the plan and the Developer has 45 days to respond to comments. Once all comments have been addressed in a timely manner, 180 days are allowed for negotiation of Developer Agreements and payment of fees. A subdivision application may be submitted concurrently with a Site Development Plan.

SHA is often involved in reviewing and approving development plans, however, SHA generally defers to County regulations for submission requirements. SHA may require developers to meet additional requirements in order to adequately satisfy SHA's questions about the effects on the State highway system.

Additionally, the "Route 1 Manual" requires submissions for projects in the US 1 corridor with frontage on US 1 or that are in the CE, CAC, or TOD Districts to show all applicable streetscape, site, and building designs and to provide a written summary of how the proposed design meets the applicable objectives of the "Route 1 Manual." Relief from any of the requirements of the manual can be requested via a letter of justification for alternative compliance that may be authorized by the Department of Planning and Zoning.

DEVELOPER CONTRIBUTIONS

A traffic impact study (TIS) can be thought of as one of the first contributions that the developer will make to a site and its surroundings. The study will provide not only an understanding of potential impacts, but can be used to identify opportunities for improvements to the transportation network and can be a resource for making the most of the new development's capital investment. In addition to understanding traffic impacts to an existing system, the TIS can address how the developer proposes to improve pedestrian and bicycle as well as auto circulation and access to and through the site.

The costs of building and upgrading county roads within a subdivision including required connections to adjacent properties, signals, signage, and pavement markings are the developer's responsibility. If extensive off-site roadway improvements are needed to accommodate projected traffic (ex. grade separation, additional through lanes) the Capital Improvements Program budget must be amended and the developer may be required to contribute funds. Generally, developers only contribute to major collectors and arterials if:

- The road serves the proposed development;
- The development is related to the need for construction; or
- Construction of the road otherwise benefits the development.

Right-of-way dedication is required if:

- A development borders an existing public road which does not meet the Design Manual or SHA minimum ROW widths.
- The General Plan shows realignment or a new road that requires use of the land and direct driveway access is provided to the development.
- A planned road is identified in the General Plan and no direct access to the development is planned.
- A state highway is planned for improvements and has NEPA or selected alternative/location approval.

Development Review Work Session

In February 2007 County and State subdivision and site plan reviewers participated in a work session to offer insight into how they review plans and ideas about potential tools that would better enable them to achieve the desired goals. The group specifically discussed the development review policies and procedures that support, enable, or hinder the redevelopment of US 1 consistent with revitalization and mobility goals. The meeting also helped to reinforce the concept of the corridor as a network of transportation connections that could benefit from a more comprehensive approach to site design and access provision.

The key points from the discussion are listed here:

- Communication initiated through this study has helped resolve conflicts between agencies and policies.
- Recognize that political leadership is crucial; may need to educate public decision-makers and elected representatives about the variety of actions that must come together to build a complete transportation system.
- Developer Interactions
  - Developers may press for answers at initial meetings and are typically present when reviewers have first look at plans
  - Reviewers may not realize potential tradeoffs upon initial review and don't have a chance to work through conflicts in advance
  - Perceptions of the Route 1 corridor seem to influence quality of some development plans and developer expectations for variance(s)/exception(s)
- Flexibility, Negotiations, Exceptions
  - Concern that "Route 1 Manual" and other guidelines are not being enforced consistently.
  - Flexibility and negotiation make it challenging to apply guidelines consistently. Exceptions can undermine reviewer authority.
  - Route 1 Manual's flexibility leads to requests for alternative compliance and individual property owner negotiations, leading to a range of outcomes.
- Local Connections
  - General Plan is (and should be) conceptual, giving flexibility to choose alignment.
  - Past planning efforts have avoided putting things on Master Plan because it creates the expectation that the County will build the improvements.
  - Would like to see County plan showing feasible connections.

US 1 DEVELOPMENT DECISION MATRIX

The Development Decision Matrix (Table 13) lists the physical elements of US 1 and its frontage, identifies the vision for each element, and identifies the regulations and policies that are direct decisions about each of those elements during development review. In some cases, the guiding documents allow flexibility and it is useful to highlight conflicts or variations and to encourage development reviewers to exercise flexibility to achieve the vision. In other cases, there may be direct conflicts between the guiding documents and the US 1 vision.

The development decision matrix demonstrates the complexity involved in some decisions made during development review. Better information about the travel needs and functions in and near proposed development sites will help reviewers determine whether it is appropriate to allow flexibility in applying the regulation, to modify the regulation, and/or to defer to the local plan.

Table 13 Development Decision Matrix

		Route 1 Vision	HC Route 1 Manual	HC Zoning Regulations	HC Subdivision and Land Development Regulations	HC Design Manual, Vol 3	HC Landscape Manual	SHA Highway Needs Inventory	SHA Access Manual	SHA Bike Policy	SHA ADA Policy & Guidelines	SHA Guidelines for Traffic Barrier Placement	AASHTO
Local Transportation System													
Circulation and Property Access	**Connectivity**	Direct routes between destinations; route and mode choice	X		X								
	Pathways	Pedestrian and bicycle paths provided where roadway connections are not possible			X								
	Roadway Design	Safe and comfortable options for all users				X	X	X		X	X	X	X
	Access	Hierarchical access, minimize private driveways on US 1				X		X	X				X
Site Design	**Site Circulation**	Pedestrian routes, transit access, reduce dependence on US 1	X		X								
	Building Mass and Orientation	Oriented to pedestrian streets	X	X	X								
	Parking	Utilize shared parking; locate off of pedestrian routes	X	X			X						
Roadway Design	**Travel Lanes**	Width appropriate for desired speed and function				X		X					X
	Bike Lanes	Continuous bicycle network								X			X
	Sidewalks	Sidewalks on all streets, direct pedestrian routes to destinations and transit	X		X	X					X		X
	On-street Parking	Provides pedestrian buffer in dense activity areas, permit only where it is likely to be used	X	X	X	X							X
	Landscaping and Furnishings	Use to reinforce function and users	X				X					X	

		Route 1 Vision	HC Route 1 Manual	HC Zoning Regulations	HC Subdivision and Land Development Regulations	HC Design Manual, Vol 3	HC Landscape Manual	SHA Highway Needs Inventory	SHA Access Manual	SHA Bike Policy	SHA ADA Policy & Guidelines	SHA Guidelines for Traffic Barrier Placement	AASHTO
US 1 Transformation													
Roadway Geometry	**Travel Lanes**	Long-term 6-lane divided section	X					X					
	Auxiliary Lanes	Only at major intersections							X				X
	Median	20' raised, landscaped where possible	X					X				X	X
	Barrier/ Clear Zone	Avoid barrier where pedestrian facilities are present/desired										X	X
	Landscaping	See typical sections										X	
Multimodal Facilities	**Transit**	Convenient to pedestrian generators, comfortable and safe facilities	X								X		
	Bicycle	Along Route 1 and alternate routes								X			X
	Pedestrian	6' to 10' width, see typical sections	X								X	X	X
Traffic Management	**Intersection Design and Traffic Control**	Concentrate truck access at major intersections, planned signal spacing							X	X	X		X

Best Practices Development Review Policies

Many jurisdictions struggle with the challenge of achieving a desirable multimodal transportation system through piecemeal private development, limited right-of-way, and competing and incompatible user demand. Some places (including Wilmington, DE; Fort Collins, CO; Eugene, OR; Federal Way, WA) have successfully used provisions to:

- Extend and continue existing or planned arterials, collectors, and local streets surrounding the development;
- Achieve desired street spacing through standards for maximum block lengths, perimeters, and/or minimum connectivity indexes; and
- Identify pedestrian and bike connections to activities and transit stops within a specified distance.

More information about these policies can be found in the Bibliography of this report and specific recommendations for the US 1 Corridor will be provided in the improvement strategy. Borrowing from these examples may help achieve the transportation goals through the development process.

Conclusions

The short timeframe for reviewing projects and identifying developer improvements suggests the need for several tools early in the process. They are an early agreement on conceptual project design with a checklist of key questions that include connections beyond the site; a broadened scope for traffic impact study that moves beyond the traffic considerations and immediate site issues to related destinations and alternative transportation access modes; a good working knowledge of bicycle and pedestrian design best practices by SHA and County review staff and broad knowledge of these elements by elected officials and County leadership; availability of programs and budget categories for developer mitigation contributions to jointly funded projects, including transportation demand management initiatives and transit enhancements; and area maps that include connections, priority access management areas and local cross-streets plan for use by reviewers, developers, and elected officials.

Section G
Access Management Analysis

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G. Access Management Analysis

PURPOSE

Appropriate property access along US 1 is a major factor in road-user safety as well as the economic viability of many of the businesses along US 1. Managing access to corridor properties can begin to improve conditions for pedestrians, bicycles, and vehicles by reducing the number of conflict points in the right-of-way. Roadway operations can also be improved by organizing turning locations at fewer managed locations. Access management and development of a local road network are essential to maintaining a system that meets all of the demands of a corridor such as US 1.

Changes that reduce driveways and create parking access from local connections will bring about important visual and safety enhancements.

Access is currently determined almost exclusively through the private development and permitting process. This analysis considers the review process and also provides a prioritization scheme for modifying accesses through state-initiated projects. Directing access management funding to the most problematic areas of the US 1 corridor has the greatest potential to improve safety and circulation.

KEY FINDINGS

In general, the SHA spacing standards for US 1 access are consistent with the corridor improvement vision. Working with SHA EAPD, the County should develop and adopt a Best Practice Policy for a hierarchical access system which

- encourages public street access according to local roadway-spacing standards tailored to the corridor ,
- discourages driveways fronting on US 1 and serving only frontage properties,
- provides a greater number of route and access options, and
- orients local traffic, trucks and bicyclists to the most appropriate streets and accommodates pedestrians throughout.

Since influence over the layout of proposed developments rests primarily with Howard County, development policies and reviews would provide clear guidance in placement, function, and design of internal roadway networks. The hierarchical circulation system policy would avoid single-property access for small parcels and provide greater ability to require and fund new links necessary to complete the network chain.

Public resources for acquiring property and access, and for designing and building access improvements, should be prioritized as described in this analysis.

METHODOLOGY

The access management analysis included:

- A review of SHA and Howard County permitting practices and policies guiding access management on US 1;
- A review of strategies and policies used successfully in other jurisdictions to manage access through the development review process; and
- Prioritization of locations that would benefit from access management improvements.

ANALYSIS

Policy Review

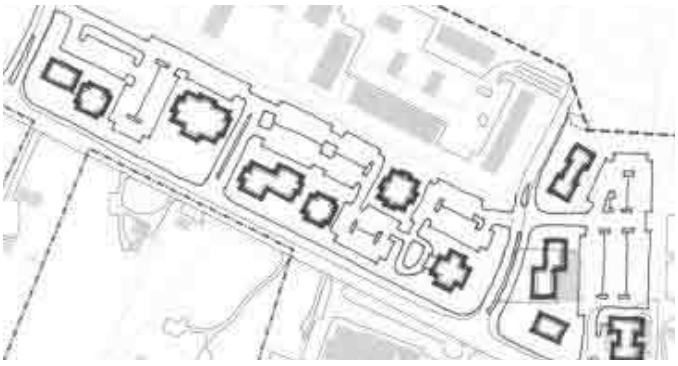
SHA is responsible for controlling access along US 1 to provide and maintain a safe and well-functioning highway system. A permit must be obtained from SHA prior to any construction activity on the State's right-of-way, including, but not limited to, the construction of driveways, entrances, and street connections for site development and subdivision access.

SHA's Engineering Access Permits Division (EAPD) administers regulations pertaining to commercial and subdivision access to State highways and issues permits for the construction of approved entrances, street connections, and highway capacity improvements according to the SHA "Access Management Manual."

US 1 is an arterial highway with uncontrolled access in the state's secondary system. Based on this system classification, the abutting properties are entitled to reasonable access. SHA may recommend that the County require some or all access via a local road, and may limit the number of access points and movements permitted onto US 1, limited to those which are appropriate for the development and can safely be accommodated. Regardless of frontage, a development may be restricted to a single entrance and exit.

If reasonable access to another public road is available, SHA may deny a property owner new access to US 1. Furthermore, SHA may deny a property owner all access to US 1 if the denial is based on an access management plan that has been agreed to by SHA and Howard County and alternative access can be provided.

The "Access Management Manual" notes that the use of inter-parcel connections is encouraged to reduce traffic in and out of the State highway, to alleviate localized congestion, and to provide easy access between adjacent properties; however, it does not stipulate whether or not inter-parcel connections may be required. Sections 16.119(a)(8) and 16.119(b)(4) of the Howard County Subdivision and Land Development Regulations empower



Inter-parcel connections and accesses that serve multiple developments improve local circulation and are particularly important in commercial areas.

the Department of Planning and Zoning to require shared access between abutting parcels.

Table 14 provides a summary of the access spacing standards applicable to US 1 based on Chapter 10 of the access manual.

Table 14 Comparison of SHA Access Spacing Standards for US 1

Standard	SHA Access Manual			Recommended Guidance	
	Preferred	Minimum	Notes	Preferred	Acceptable Range
Access Points per Development	--	0	SHA allows a maximum of two for the first 200 feet and one for each additional 100 feet.	0 (access via side streets)	1 for each 325 ft of frontage
Spacing between Entrances	--	20 ft (on same side of highway)	--	325 ft	200 ft to 500 ft spacing
Corner Clearance	200 ft	100 ft	--	--	Beyond intersection influence area
Median Crossover Spacing	--	750 ft	750 ft spacing may be acceptable in densely developed urban areas where posted speeds are 40 mph or less and route function will not be compromised.	650 ft in highly developed areas	
Public Street Spacing		750 ft	--	325 ft	250 ft to 500 ft right-in-right-out spacing

SHA specifies that a maximum of two entrances may be allowed in the first 200 feet of frontage, and a maximum of one may be allowed for each additional 100 feet. Based on a review of national best practices for access management, it is recommended that a maximum of one driveway be allowed in the first 325 feet of frontage. Driveways should be spaced no closer than 200 feet apart, and should not be allowed within the influence area of an intersection. Public streets should be spaced no closer than 250 feet for right-in, right-out approaches and 325 feet for full-movement public street approaches. The outcome should create streets and blocks spaced and controlled to manage conflicts and pedestrian crossing points for improved multimodal safety and comfort as well as traffic operations.

The desired spacing standards for median crossovers and public street connections are less restrictive than the SHA access manual. Less-restrictive median crossover spacing will encourage mid-block organization of access to minor roadways where full-access movements are permitted. The 650-foot spacing was selected based

Roads with property access from side streets provide a safe uninterrupted pedestrian experience and permit the introduction of a median that can improve the road's appearance and safety.

on the anticipated spacing of full-access signalized intersections at approximately 1320 feet (1/4 mile). The safety and operational considerations of permitting design exceptions for median crossovers should be considered on a case-by-case basis.

An overlay policy to permit public street spacing, as shown in Table 15, is recommended to permit development of a more grid-like pattern of streets, rather than a series of single-use driveways. While this goal is echoed in the access manual, it is inconsistent with the public street spacing standard. These access points would not be guaranteed full-access movements.

Overall, Howard County has the authority and responsibility to require internal circulation patterns that reduce dead-end streets, culs-de-sac, and private-driveway access; and, increase connectivity. While SHA has the authority to issue or refuse an access to US 1, SHA has little authority to dictate the function of that access point. Developing a hierarchical access system will require joint effort between SHA EAPD and Howard County.

Best Practices for Hierarchical Access Systems

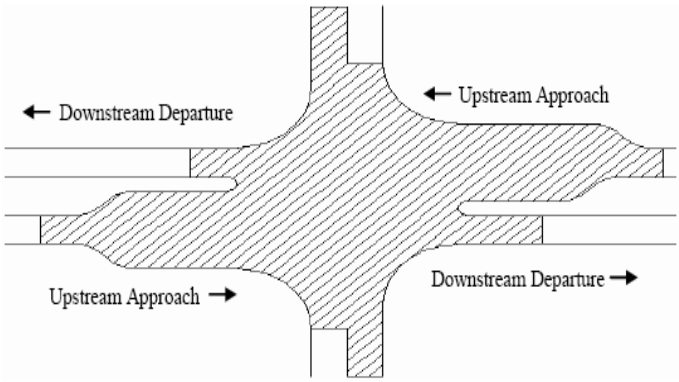
Many jurisdictions have adopted policies and standards to develop a system of lower-order roads, rather than a series of driveways. Most of these are local rather than State DOT policies. Some examples include:

- Adopting street spacing minimums and connectivity requirements.
- Requiring cross-access easements, agreeing to close temporary driveways, and developing maintenance agreements for shared driveways.
- Requiring an access study submittal that includes a safety and operational review of existing and proposed access along the length of the site's frontage plus the distance of the applicable access spacing standard measured from the property lines.
- Permitting temporary access with agreement to provide cross-easements in the future.
- Tying in stub-outs and other design features to make it visually obvious that the abutting properties provide cross-access via a service drive.

Prioritizing Access Improvements

INTERSECTION INFLUENCE AREAS

Driveways within the influence area of an intersection are problematic as they present drivers with multiple conflicts, often leading to high crash rates. The influence area of an intersection shown in this diagram includes the queue storage area, deceleration distance, perception-reaction distance on each approach, and acceleration distance on each departure.



The influence area of an intersection includes space for queuing, deceleration, acceleration, seeing and reacting . Conflict points in this area should be minimized or managed.

At many intersections along the corridor the intersection influence area is larger than the SHA access manual recommended corner clearance of 200 feet. Access management should be prioritized to reduce driveways within the influence areas of intersections along US 1.

PRIORITIES MATRIX

The safety analysis described in Section D of this report was incorporated with additional considerations to develop Table 15, to identify priority locations for access management. The shaded rows indicate the highest priority locations. Although the safety screening was designed to focus on crashes that are more likely to be related to driveways, driveway density was included in the matrix to reinforce the flagged safety locations where there are more than 15-20 driveways per mile in either direction. Pedestrian and bicycle crashes and demand are considered because these users are particularly vulnerable to conflicts at driveways. Transit stop locations are included as supporting evidence of the potential for pedestrian demand and conflicts within the roadway.

Table 15 Access Management Priority Locations

Location	Safety Screening	Pedestrian and Bike Crashes (2003 through 2005)	High Driveway Density	High Pedestrian Demand (Near Term)	Transit Stop
High Priority Locations					
Levering Avenue	X	2	X	X	X
Levering Ave to Old Washington Rd (segment)	X	2	X		
Montgomery Rd (MD 103)	X	1	X	X	X
Rowanberry Dr to Loudon Ave (segment)	X		X	X	X
Business Pkwy to Montevideo Rd (segment)	X	1	X	X	
Montevideo Rd	X		X	X	X
MD 175	X	1		X	
Freestate Dr	X		X		X
Whiskey Bottom Rd	X		X	X	X
Whiskey Bottom Rd to Laurel Rd (segment)	X	1	X	X	X
North Laurel Rd	X	1	X	X	X
Additional Priority Locations					
Loudon Ave to Troy Hill Dr (segment)	X			X	X
Troy Hill Dr	X				X
MD 100 Ramps to Meadow Ridge Dr (segment)	X				
Business Parkway	X			X	X

Crestmount Rd/Assateague		1	X	X	
Mission Rd to Patuxent Range Rd (segment)	X		X		
Patuxent Range Rd	X				
Guilford Rd	X		X		
EB Off Ramp at MD 32	X				
Howard St/Corridor Rd	X			X	X
Gorman Rd	X		X		

As shown in Table 15, the following general areas are the highest priority locations for access management:

- Levering Road to Montgomery Road
- Rowanberry Drive to Loudon Avenue
- Business Parkway to MD 175
- Whiskey Bottom Road to North Laurel Road

Figures 23 to 26 highlight these locations within the corridor. Opportunities to acquire access, consolidate driveways, and develop local facilities from which indirect access may be provided should be focused in these areas in the near term.

The area highlighted in white exhibits high proportions of crashes that may be related to driveways and high access densities. Access consolidation and orientation to local roads is recommended.

Safety screening, as well as existing driveway density, pedestrian and bicycle crashes, and fatal crashes along the corridor should be used as criteria considered in determining appropriate access.

Conclusion

An Access Management Plan should be prepared that includes priority access control areas based on safety considerations for a voluntary access acquisition and cross-easement program; a local streets network, extensions and access strategy; and, intersection spacing standards that are specific to US 1 and mapped for use by reviewers. The plan should identify the appropriate lead agency and the roles and responsibilities of participating agencies to implement and management attainment of cross-easements. SHA's Access Manual should be revised such that the guidance provided in Section 10.2.1 A through D be applied to all arterials rather than only those on the primary system.

Section H
Roadway Character and Functional Classification Analysis

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H. Roadway Character and Functional Classification Analysis

PURPOSE

New roads and road segments ultimately become part of a street system used by a variety of modes for a variety of purposes. When planning for a transportation system able to serve a variety of modes, those roads beyond the main artery must be linked and designed so that they are sized appropriately for the volume and arterial type of traffic expected and include those elements that define the travelway to match user type. Design details that determine speed, user space, safety and comfort, and driveway density must also be considered as new links are created.

Roads and road segments will be largely built by the private sector during the development process. Guidance that helps to assess system needs, especially those that improve connectivity, must be designed to keep speeds and volumes in line with the goal to protect neighborhood quality of life. Roads used by trucks and heavy equipment should be separated from those serving neighborhoods, schools, and recreation areas. Where incompatible user mixes cannot be avoided, design should be used to mitigate the conflicts.

This section includes a review of the current Howard County roadway design guidelines, some examples of roadway design guideline best practices from around the country, and some general and specific recommendations about how the County can move forward on this issue.

KEY FINDINGS

A connected layer of collector streets is a key feature of the US 1 Transportation Strategy. These streets will be used to gain access to multiple properties and businesses to reduce direct driveway access from US 1. They will be the connective tissue between uses and places beyond the corridor that reduce circuitous travel for "light modes", such as pedestrians and bicyclists, and vehicles. Their design should be guided by user type, area context, and appropriate travel speed.

Collectors and arterials, like Montgomery Road, can be improved with pedestrian and bicycle accommodation to increase connectivity and safety for all travelers.

Sidewalks should be required on both sides of all streets within the US 1 corridor.

Howard County should develop an overlay set of design guidelines for the US 1 corridor that:

- Modify street design elements (i.e. sidewalk width, planting strip presence, bicycle facility, on-street parking, etc.) based on expected activity, land use, density, and mode priority.

- Reevaluate the criteria for County roadway functional classification to better support a connected roadway network of local, collector, and arterial streets.

METHODOLOGY

- Evaluate existing roadway design criteria and guidelines according to functional class.
- Review multimodal design guidance that considers land use context and user type including industrial truck traffic in its road classification system:
  - ITE-CNU "Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities"
  - Massachusetts DOT Project Development and Design Guide
  - Portland's Metro 2040 Plan, Washington County, OR
  - Arlington Co., VA
  - Charlotte, NC
- Select criteria applicable to US 1 corridor conditions for an overlay for roadway design guidelines and provided specific recommendations on issues of pedestrian accommodation.

ANALYSIS

Howard County Roadway Design

Howard County's existing criteria and guidelines for the design of roads allow for the inclusion of non-auto modes, stating that design should consider the needs of all users and the intended role of the road in relation to "service function, vehicular and pedestrian safety, economy, and the environment." How these criteria translate into the actual cross-sections can be greatly enhanced given the relationship between scale and design features and the comfort of bicycles and pedestrians. Howard County's current design manual provides little variation in section width based on the environment around the roadway. In some cases, new roadway segments are out of scale with those that they connect to and the type of activity occurring at the road edge.

Extensions of existing neighborhood streets should have compatible width and design elements to preserve community character.

When retrofitting an area with new infrastructure, it is valuable to look at the adjacent activity on the network as well as the users to be served. For example in industrial areas, truck size and volume will influence the scale of the road, but the needs of workers arriving by bus and walking to their employment location suggest that sidewalks and space for bus stops will be important road features. The orientation of the building access and any major street crossings will also affect how the facility is used by pedestrians. As local truck routes often carry low volumes of traffic, they can also provide good links in a bicycle network. When a route has been identified that can serve this function, bicycle lanes might also be

appropriate. Bicycle lanes on roadways with heavy truck traffic can also provide additional turning space for trucks without increasing driveway or lane widths.

A new connection to an existing street may change the function of that street to produce more traffic. Such a street with a high number of residential driveways, no sidewalk, and a narrow travelway should influence the design of the connection to keep speeds low so that traffic has the ability to react in the presence of entering vehicles and pedestrians. Residential street design should also consider the actual densities and the provision of off-street parking to determine whether on-street parking is necessary and will be used. Otherwise, this might create a wider road than necessary and induce higher speeds than appropriate for the area.

Providing streets that are tailored to fit within the context of the communities around them will improve the feasibility of adding roadway connections and developing greater connectivity. If new roadway links clearly fit the character of the adjacent land uses, neighbors will be more likely to tolerate new connections. Roadway design should make clear whether a route is appropriate for through traffic, truck traffic, commercial traffic, or should only be used for local traffic.

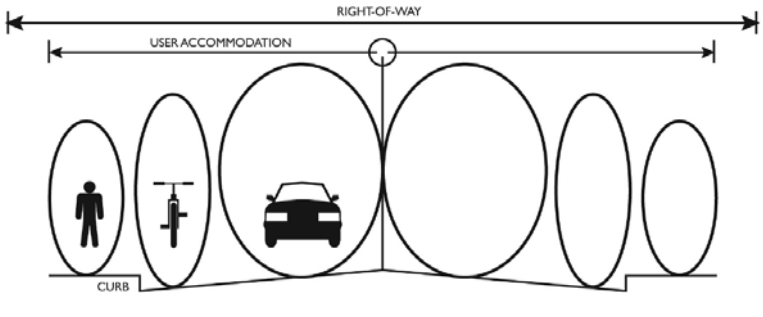
This mixed commercial street has been designed with a sidewalk to serve a variety of activities that make it very inviting to pedestrians.

Roadway Design Best Practices

Many jurisdictions are changing their approach to roadway design and developing practices that enhance their systems for multimodal travel at an appropriate scale. The cases below focus on jurisdictions that have conditions similar to the US 1 corridor, including industrial uses, truck traffic, and transitioning land uses.

ITE/CNU CONTEXT SENSITIVE SOLUTIONS IN DESIGNING MAJOR URBAN THOROUGHFARES FOR WALKABLE COMMUNITIES

This national reference document resulted from collaboration between the Institute of Transportation Engineers (ITE) and the Congress for the New Urbanism (CNU). While it does not provide a specific classification scheme, it does provide guidelines for a variety of scenarios and general parameters for arterials and collectors, in urban and suburban contexts



Source: MassHighway

Exhibit 5-1 Case 1: Separate Accommodation For All Users *(from the Massachusetts Highway Department Project Development & Design Guide, p. 5-5)*

with residential and commercial land uses. This document was used to help develop the typical sections for US 1 and could also provide useful guidance for Guilford, Whiskey Bottom, Montgomery, and other collector and arterial streets in the corridor that serve a variety of modes.

MASSACHUSETTS

The Massachusetts Highway Department's Project Development & Design Guide was drafted in 2006 to establish a flexible, multimodal, and context sensitive approach to roadway planning and design for that state. It uses 9 area types to complement functional classification and added new measures of effectiveness to track performance. One key piece of that document is the reduction and added flexibility in design speeds from their previous version. Additionally, the document recognizes the wide variety of ways in which pedestrians and bicyclist facilities should be provided needs to be adjusted based upon the context of the project, predominantly density, roadway speed, and right-of-way. The image shown above depicts "Case 1," the maximum separate accommodations for users, with a sidewalk for pedestrians and a bicycle lane separate from the auto travel lane, intended for moderate to high-density areas with curbed roadways and where speed differentials necessitate creating a separate space for bicyclists comfort and safety.

METRO 2040

As part of the 2040 long-range plan for the Portland, Oregon, region, Metro (the regional planning agency) developed a guidebook for roadway design to help jurisdictions build from the strategies laid out in the Regional Transportation Plan and Growth Concept. *Creating Livable Streets* contains a set of design guidelines and a functional classification system based upon the user groups, adjacent land uses, and the roadway's place within the transportation network. It establishes four basic street design types (Throughways, Boulevards, Streets, and Roads) and then provides design guidelines for each of these with variations based upon whether they are serving regional or local needs, and if they are urban or rural. Pedestrian accommodations are varied based upon the intensity, density, and mix of land uses.

ARLINGTON COUNTY, VIRGINIA

Arlington County, Virginia, revised its roadway design guidelines in the Streets Element of its Master Transportation Plan to increase network connectivity, reduce 'superblocks,' and implement a 'Complete Streets' approach. The plan encourages block lengths to be less than 600 feet, limits the development of culs-de-sac and other dead end streets, and looked to re-open streets previously closed where it could not adversely affect safety or livability.

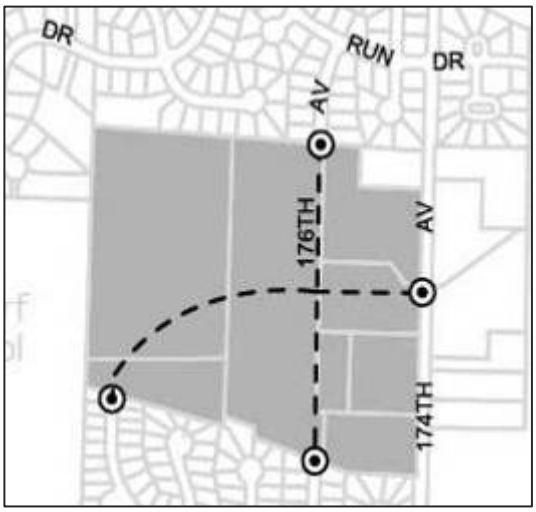
The design elements focus on the context in which the street is located, looking at the surrounding land uses and urban design, and creating roadway typologies for arterial and local streets that are designed to be appropriate for a specific land use. There are six arterial typologies and three local street typologies, with the pedestrian and bicycle elements for each shown in the table below. The full plan notes the level of transit service on each type, along with parking priority, travel lanes, paved width, target speed, and minimum right-of-way. The plan also introduces priority street types by mode so primary transit streets, where possible are not primary bicycle streets given their inherent incompatibilities.

Table 16 Arlington County Arterial and Local Street Typologies

Street Type	Pedestrian Accommodation	Planting Strip	Bicycle Accommodation
Arterial – Regional Connector	6' sidewalk or 10' shared use path	6' strip	Dedicated shared use path
Arterial – Urban Center Mixed Use	6-12' sidewalk	6' strip	Bike lane/shared lane
Arterial – Urban Center Retail	6-12' sidewalk	6' strip	Bike lane/shared lane
Arterial – Commercial Primary	6-8' sidewalk	5-6' strip	Bike lane
Arterial – Med-High Density Residential	6-8' sidewalk	5-6' strip	Bike lane
Arterial – Low Density Residential	5-6' sidewalk	4-6' strip	Bike lane/shared lane
Local - Urban Center	6-8' sidewalk	4-6' strip	Bike lane/shared lane
Local – Neighborhood Principal	4-5' sidewalk	4' strip	Shared Lane
Local - Neighborhood Minor	4-5' sidewalk	4' strip	Shared Lane

WASHINGTON COUNTY, OREGON

Washington County, Oregon, was selected because it was seen as having a number of similarities to Howard County, with new development occurring in the context of historic communities and industrial areas. Washington County's typical street guidelines include a specific category for commercial and industrial areas that includes bicycle lanes and sidewalks but no planting strip. The document also provides guidance to link key streets through new development sites. The City of Beaverton, within Washington County, included in its Transportation System Plan a set of maps depicting future road connectivity



City of Beaverton, OR requires street connections through new development *(Beaverton's Transportation System Plan)*

CHARLOTTE, NORTH CAROLINA

Charlotte, North Carolina, recently created new draft street design standards to support their Smart Growth strategy and to ensure that new streets built within the county are "complete

streets," accommodating users of all modes. An important aspect of identifying geometric improvements is the process developed for considering the context in which the roadway operates. The Urban Street Design Guidelines document lays out a six-step process in which the land use and transportation contexts are identified, deficiencies within the existing roadway network are acknowledged and the future objectives of the specific roadway segment are defined. Finally street type and cross section are selected recognizing the tradeoffs involved.

Within the design guidelines there are specific characteristics provided for Main Streets, Avenues, Boulevards, Parkways, and Local Residential Streets, each with cross-sections that describe how each mode is served and how the geometry should vary based upon local conditions.

Conclusion

The examples listed above are from a sampling of the jurisdictions proactively working to create complete streets in transportation networks with changing user demand. Because this approach is relatively new, tools and approaches are evolving with experiences at the state and local level. The Urban Streets Symposium, sponsored by TRB, ITE, and others, provides an annual resource for communities to learn from other jurisdictions and best practices from around the country. Howard County should consider a pilot project to revise its functional classification system and design guidelines to include mode priority and land use context for the US 1 corridor area.

Section I
Typical Sections and Right-of-Way

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I. Typical Sections and Right-of-Way

PURPOSE

The results of the Future Traffic Operations analysis (Section A of this document) indicate that the US 1 Strategy should plan for a 6-lane boulevard through most of the corridor, with the possibility to retain a 4-lane section north of Bonnie View Lane, and to reduce the 4-lane sections of the one-way couplet in Laurel to 3 lanes with parking. The right-of-way analysis and development of the typical sections for the corridor is designed to balance the needs of all of the roadway users with minimal impact to the environment and private property.

The set of typical sections resulting from this analysis will guide right-of-way reservation along the corridor, building setbacks and sidewalk placement, and recognizes the variety of type and size of amenities for all roadway users. The sections can create greater consistency at the street edge as incremental improvements are made. While some flexibility will be needed to accommodate specific interests and constraints, the analysis and discussions leading to the proposed typical sections ensures that these sections are feasible and will support the corridor vision.

KEY FINDINGS

The typical sections for US 1 serve the needs of motorists, pedestrians, and bicyclists in the corridor while respecting environmental and property impacts. Several sections were developed to reflect roadway and edge conditions in these sections: North Laurel one-way couplet section, the mid-section that is planned to be a 6-lane boulevard, and in the northern section planned to remain as 4 lanes with some pedestrian, bicycle, safety, and aesthetic improvements.

Planning for and preserving future right-of-way as soon as possible will minimize or avoid new development being located in the path of needed improvements. Right-of-way at intersections, particularly MD 175 will be greater based on the need for space for turning vehicles.

Mapping shown in Figure 18 shows the location of existing and proposed future right-of-way. A review of this planning level (center-line) mapping suggests that impacts to existing structures on the corridor would be modest. None of these impacts suggests that alternative alignments should be considered or that right-of-way constraints were so extensive in any area of the corridor that a different long-term vision is needed.

Integrated design standards that incorporate street trees, utilities, street furniture, and other components of the overall street design are essential for ultimately designing a cohesive urban roadway environment.

METHODOLOGY

The right-of-way analysis included a review of the existing right-of-way along the corridor and the land uses and potential for redevelopment that could result in additional right-of-way dedication in the future. The analysis is based on GIS data provided by Howard County. This analysis should not be used to determine specific property impacts, as the

data have not been verified and there is potential for slight realignments of the US 1 centerline. This analysis was useful to understand the order of magnitude of property impacts that potential widening of US 1 could have on the properties that front the road.

The analysis included a review of urban arterials with similar projected land use and traffic volumes and can be found in Attachment I-1. The precedent examples were particularly useful for understanding the effect of various roadway characteristics, including the number of travel lanes, intersection spacing, driveway density, building scale and setback and landscaping and other elements related to pedestrian use and safety. Looking at the current traffic and safety conditions of these routes also helped to raise awareness of the need to plan for and locate development based on the desired future condition.

The typical sections were developed through an iterative, collaborative process involving the US 1 Advisory Committee, as well as County and State staff and are included later in this section. Discussion and revisions to the typical sections were discussed at several meetings and through written comments from Howard County and SHA staff.

Planning for the recommended cross-section also considered the policies, regulations, and procedures in place to guide reconstruction and public investment along US 1.

ANALYSIS

Right-of-Way

Figure 18 shows the existing and estimated future right-of-way to accommodate improved pedestrian, bicycle, and landscape amenities, and six travel lanes with a median between Davis Road and Bonnie View Lane.

Relatively few buildings will be impacted to accommodate a wider US1 cross-section. Utility impacts may be more significant.

EXISTING RIGHT-OF-WAY

The existing right-of-way in the corridor varies from about 50 feet to well over 150 feet at some intersections and interchanges. At the south end of the corridor, through the one-way couplet area, the existing right-of-way varies from approximately 50- to 65-feet wide in each direction. North of the couplet and south of MD 100, the existing right-of-way is generally between 50- and 100-feet wide. Between MD 100 and Bonnie View Lane the right-of-way is generally between 60- and 100-feet wide. North of Bonnie View Lane the right-of-way is generally 55- to 75-feet wide.

US 1 FRONTAGE LAND USES AND ZONING

Approximately 415 parcels front US 1 in Howard County. Of those, more than half are in new zoning areas (105 in CAC and 154 in CE). Of the remaining parcels, about 20 percent are zoned for Office/Commercial uses, 8 percent are zoned for manufacturing uses, and the remaining 8 percent are zoned for residential uses.

ESTIMATED FUTURE RIGHT-OF-WAY

The future right-of-way needs are estimated to be:

- 69-foot right-of-way in each direction south of Davis Road;
- 134-foot right-of-way centered on the existing US 1 centerline between Davis Road and Bonnie View Lane; and
- Widening north of Bonnie View Lane limited to median, sidewalk, and bike lanes.

These dimensions are sufficient to accommodate the proposed travel lanes, median, bicycle, and pedestrian facilities shown in the typical sections.

For the purposes of this analysis, it was assumed that widening would occur evenly on both sides of US 1. It may be possible to minimize property impacts by making minor adjustments to the future roadway alignment during the planning and design phases for the roadway widening. Right-of-way for intersection improvements like those proposed at the MD 175 intersection and locations requiring additional turn lanes will be reviewed on a site-by-site basis and will exceed the numbers shown above.

ESTIMATED IMPACTS TO EXISTING USES

Measurements of the existing US 1 right-of-way were determined and mapped using GIS data provided by Howard County. The number and types of parcels and land uses that are within the proposed expanded right-of-way were then estimated using geospatial analysis.

Approximately 100 existing buildings are within ten feet of the estimated future right-of-way. These buildings are located on approximately 65 parcels. The vast majority are commercial land uses, with three residential use buildings, and three industrial buildings. Approximately six of these buildings were built in the last twenty years and none were built in the last 10 years. Nearly all of these buildings are on parcels within the new zoning designations.

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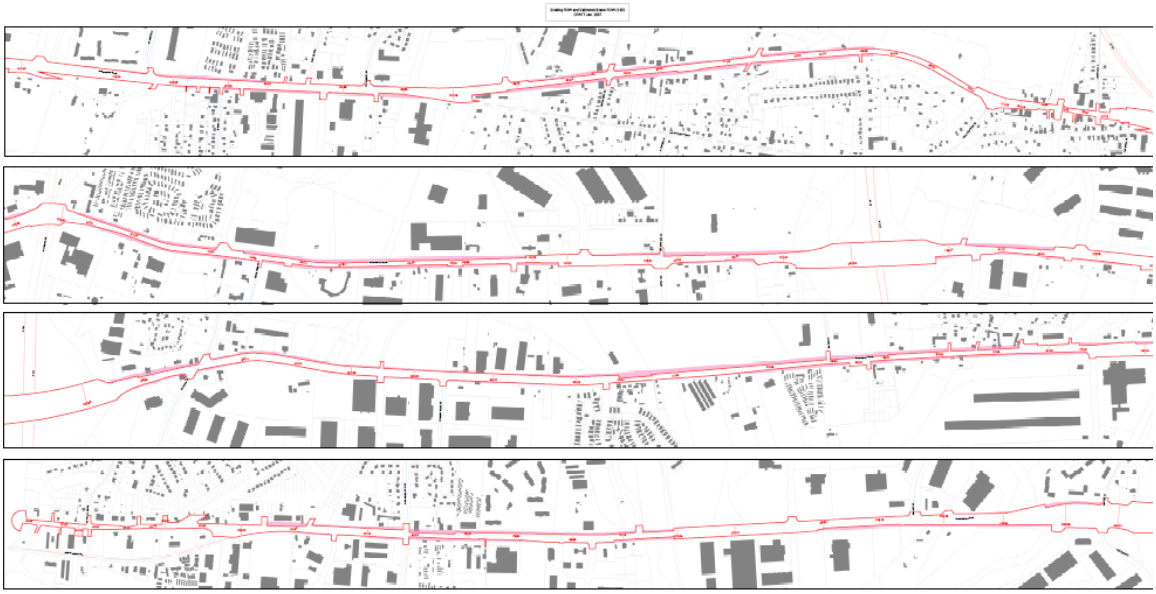
Figure 18 Estimated Existing and Future Right-of-Way



Back of Fig. 18.

Typical Sections

ELEMENTS AND AMENITIES

The following diagrams show the typical sections prepared for US 1. The key elements of the US 1 6-lane cross-sections are as follows:

TRAVEL LANES: Are planned as 12-foot-wide lanes. While SHA policy allows 11-foot lanes on its urban arterials, high truck volumes on US 1 indicate the need for 12-foot widths that reduce the potential for sideswipe collisions. Acceleration and deceleration lanes currently being provided throughout the corridor and any bus pull-offs will become the future curb lane. Once converted, the outside curb lane is intended for use by transit vehicles for boarding and alighting of passengers. Therefore, bus pull-offs and deceleration will no longer be required.

BIKE LANES: As required by SHA guidelines, a 5-foot-wide, striped bike lane is recommended next to the outside travel-lane in both directions.

CROSS-SECTION TYPE: Closed curb and gutter are recommended through most of the corridor to manage drainage, to provide positive control to motorists, and to reinforce the urban character of the roadway.

SIDEWALK WIDTH: Sidewalks ranging from 6 feet to 15 feet in width are recommended depending on the adjacent land uses and building orientation. Although ADA, Howard County, and SHA policies generally permit 5-foot sidewalks, wider sidewalks are preferred along US 1 to fit the scale of the roadway, to accommodate anticipated pedestrian demand, and to indicate the priority of pedestrian travel to motorists in certain areas of the corridor.

LANDSCAPING: Trees are recommended along the entire edge of the roadway to create a more uniform and attractive definition to the roadway. Based on the scale, speeds, and noise along US 1, landscaped buffer areas are also included in the typical sections and are recommended wherever possible to provide for pedestrian safety and comfort.

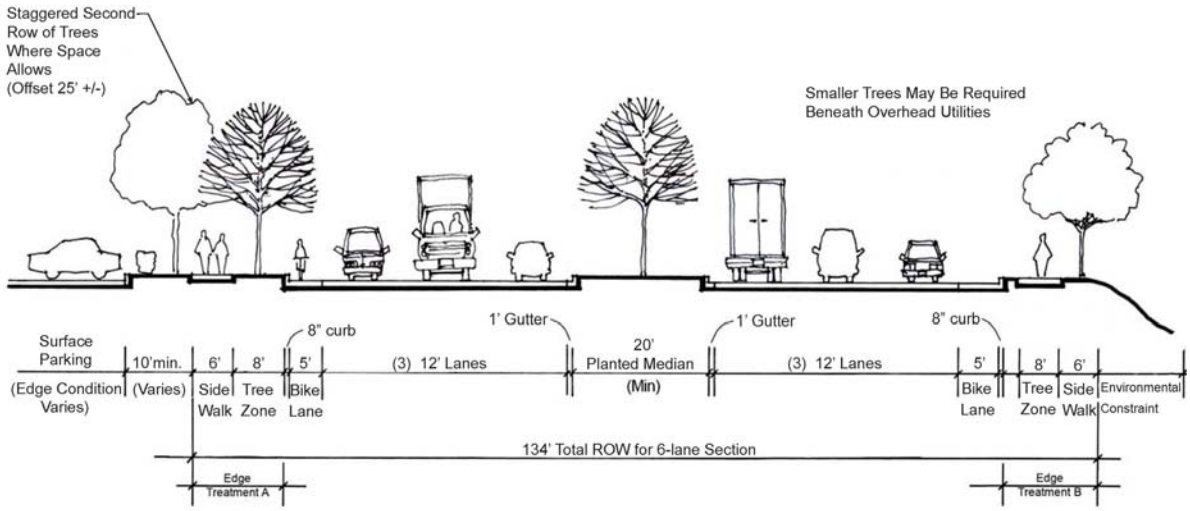
MEDIAN: A 20-foot raised median is recommended to provide physical and visual separation between north- and southbound traffic on US 1, to provide sufficient area for landscaping and gateway treatments, and to provide the potential for a left-turn and pedestrian refuge area at intersections without additional widening. The effect of the median on traffic operations at non-signalized intersections and the potential for partial or full openings at certain locations should be evaluated on an intersection-by-intersection basis.

Quality landscaping and street trees along the road edge and in the median are an essential element of the typical sections to promote the walkability and aesthetic goals of the Route 1 vision. Well-spaced trees may also improve driver comfort by providing relief from the sun and wind and reducing cross-glare. Trees also provide shade and offer a vertical edge that supports the visibility of the pedestrian realm. They should be placed in all locations where pedestrians will be present.

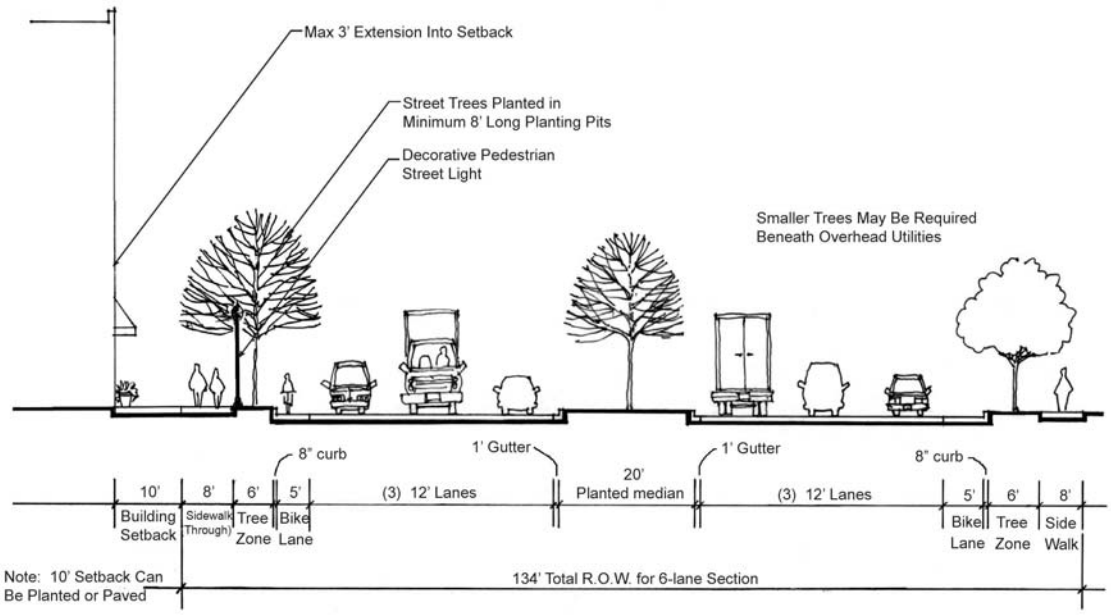
Policies and Procedures Guiding Public Investment on US 1

Spot improvements and reconstruction design should be consistent with the typical section included in the Improvement Plan. The needs of all users and the importance of

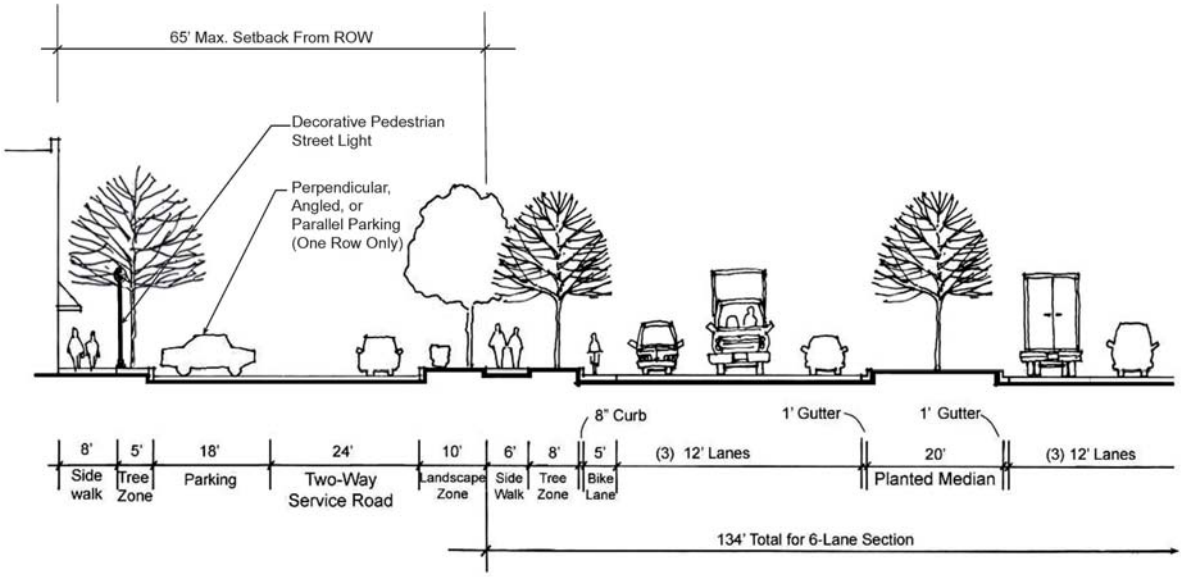
appropriate scale and amenities should be thoroughly considered before making design modifications.



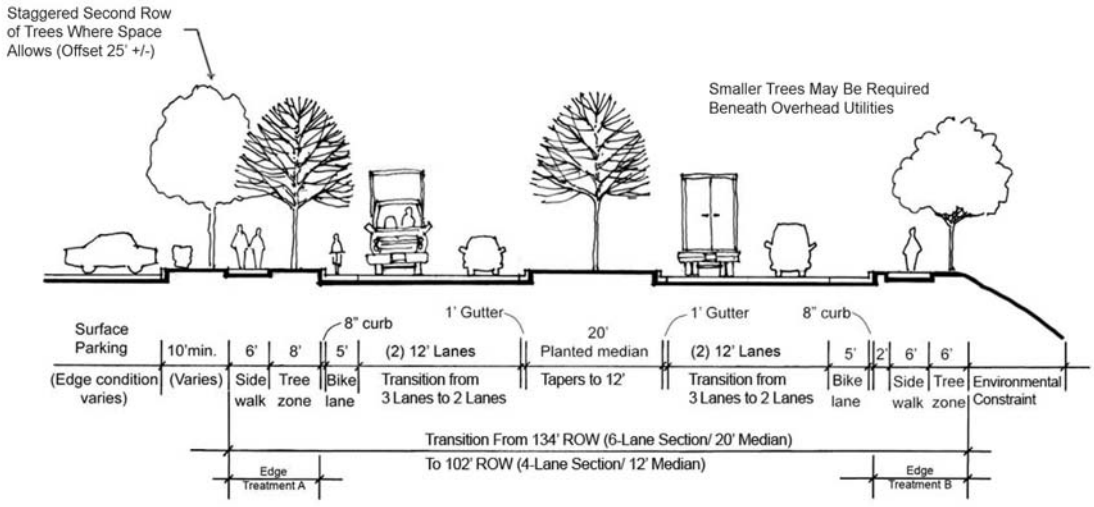
1 US Route 1: Main Line - Typical ROW Section
Not to Scale



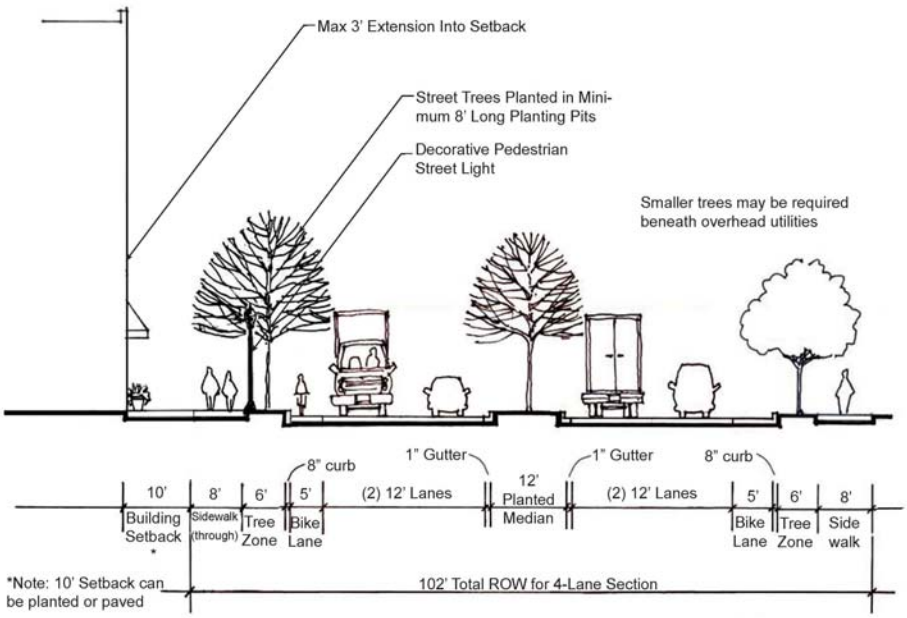
2 US Route 1: Minimum Building Setback: CAC District
Not to Scale



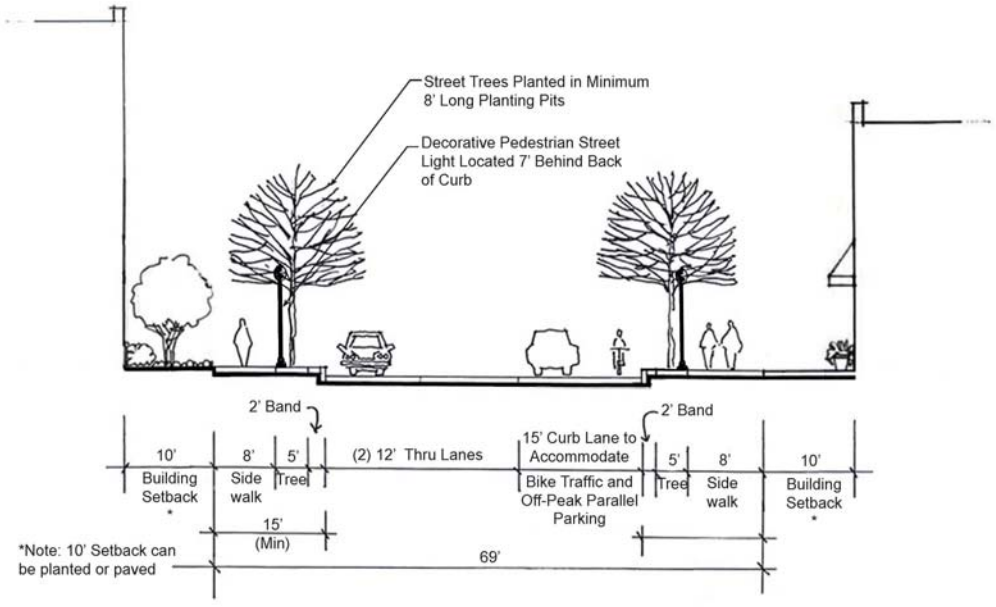
3 US Route 1: Frontage Road Treatment: CAC District
Not to Scale



4 US Route 1: Typical ROW Section - Montgomery Road to Bonnie View Lane
Not to Scale



5 US Route 1: Typical ROW Section - Bonnie View Lane to County Line North
Not to Scale



6 US Route 1 North of Laurel: One-Way Section
Not to Scale
Section Drawn Looking in Direction of Travel

Section J
Network Connections

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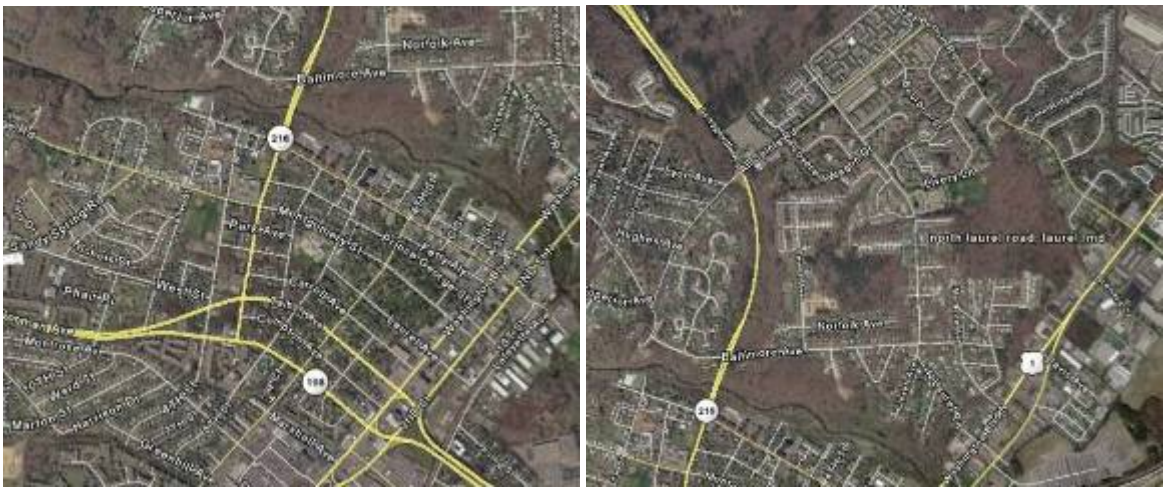
J. Network Connections

PURPOSE

Building a network of connections beyond US 1 is essential to the goals and vision for the corridor. Using Howard County's regulatory authority to require roadway and/or pathway connections for development will be most effective with a plan in place that identifies feasible connections from engineering, political, and systems perspectives.



This aerial photograph of the City of Laurel (left) shows a well-connected system of streets organized with clear road hierarchy. The aerial of North Laurel (right), by contrast, suggests the challenges to getting from place to place,, particularly for pedestrians and bicyclists.

The goal of the Network Connections analysis is to develop such a plan with future street and path connections. Potential links have had public review and input, a safety and capacity analysis, a review of existing and projected land use activity, and a series of field reviews. While all details cannot be resolved at this broad planning study level, the involvement of many stakeholders and the predictability of an adopted plan have been able to yield progress toward a more complete network.

The identified connections do not describe specific roadway alignments or designs, but rather key points that should be connected as opportunities arise. In sum, these connections represent a transportation system that will function for all roadway users, providing more direct connections for pedestrians and bicyclists, enabling a more efficient system for local automobile trips, and improving the function and aesthetics of US 1 for regionally oriented travel.

KEY FINDINGS

Howard County should adopt a plan of proposed connections using the accompanying information about the goals and anticipated phasing.

Howard County and/or SHA should consider adopting language to assist the development of a system of streets to support the US 1 revitalization vision, similar to the following:

- Pedestrian ways shall be provided between parking areas and from building entrances to surrounding streets, external sidewalks, and outparcels.
- A 10-foot-wide multiuse path easement shall be provided to connect culs-de-sac or to pass through blocks in excess of 500 feet.

Developments must include street connections in direction of all existing or planned streets within a quarter-mile radius, and continue any street that abuts, is adjacent to, or terminates at the site.

METHODOLOGY

The development of the proposed Network Connections is based on:

- A summary of existing authority and guidance,
- Goals, objectives, and issues related to the desired transportation network,
- An iterative process of identifying and revising potential roadway and path connections.

ANALYSIS

Transportation Network Regulations and Authority

The Howard County General Plan identifies major roadway improvement projects that must be accommodated by proposed development. Minor roadways are not identified on the General Plan and little guidance is given for planning these roadways. County reviewers indicated that they are able to recommend connections to abutting roadways during the site plan review, but requiring the connections is often difficult. Section 16.119(b)(2) of the Howard County Subdivision and Land Development Regulations states that, "streets carrying commercial and industrial traffic, especially truck traffic, shall not normally be extended to the boundaries of adjacent residential areas."

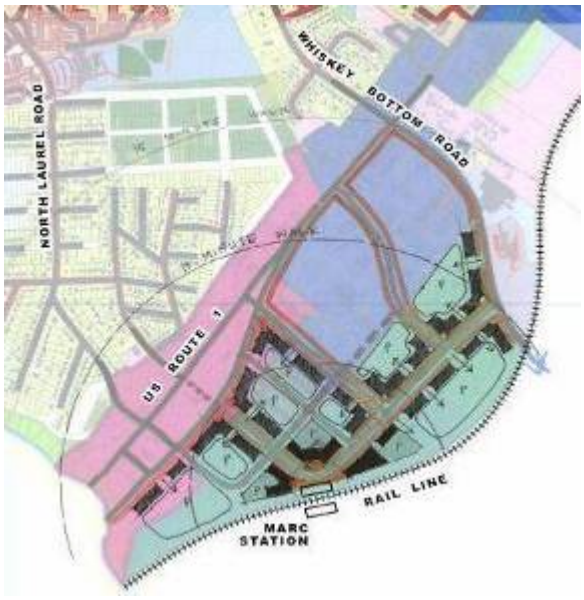
No specific statement addresses connections between complementary land uses or provides for the creation of connections from new residential areas through industrial zones. As the US 1 corridor changes and attracts residential and mixed-use development, and some industrial areas shift to commercial development more compatible with residential life, connections such as these will be needed to ensure the creation of a complete network.

Based on the SHA access manual, the minimum distance between centerlines for streets intersecting US 1 is 750 feet. Additionally, the minimum median crossover spacing is 750 feet. This minimum spacing is recommended only where speeds are no greater than 40 mph. The Howard County Design Manual includes minimum spacing for driveways on County roads.

Target Signal Spacing and Block Size

As discussed previously, signal spacing along US 1 offers the opportunity to manage traffic speed through signal progression, improve property access, and enhance elements of pedestrian safety. The "Access Management Manual" recommends one-half-mile signal spacing and many local and state guidelines recommend minimum arterial signal spacing ranging from 1000 feet to one-half mile. Minimum spacing is desired to improve accessibility and reduce speed of through traffic on US 1.

While the priority for many arterial signal systems is to move traffic through the system, US 1 serves a high proportion of local trips and must also accommodate pedestrian demand and urban land uses. Closely spaced signals provide benefits by providing more controlled crossing locations for pedestrians and less concentrated left-turn and minor street volumes.



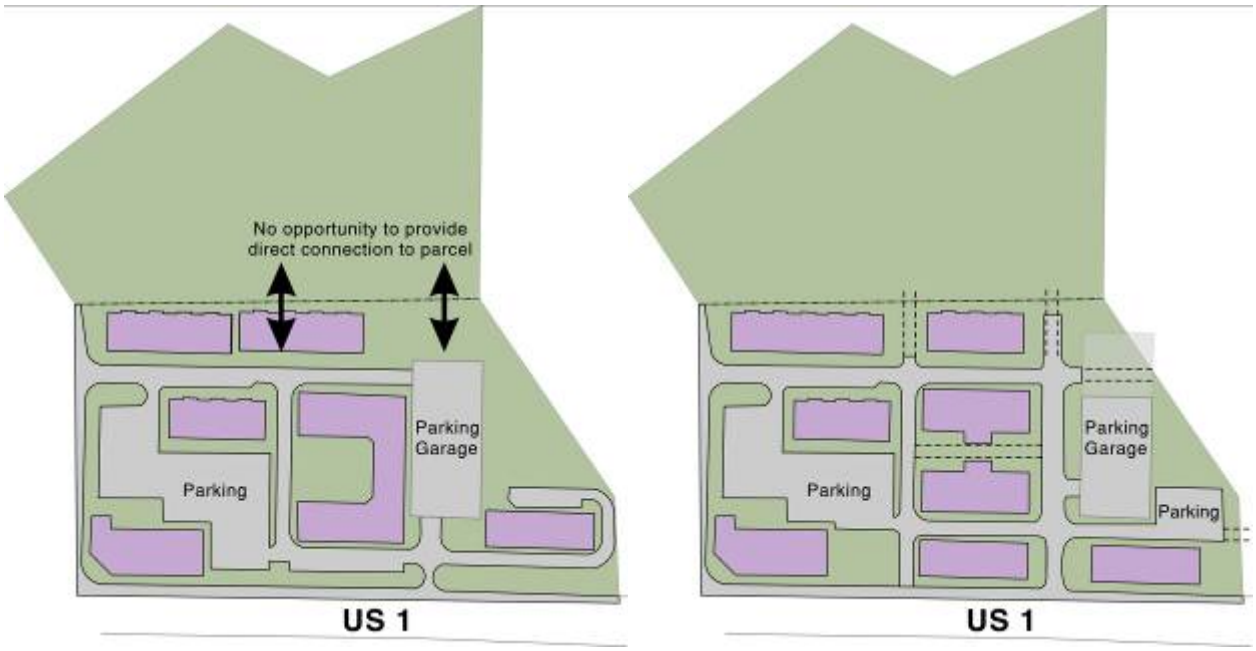
This vision for North Laurel shows new collector roads through the site linking US 1 and Whiskey Bottom road and site design that places buildings fronting the street.

Appropriate signal spacing on US 1 should:

- Provide crossing opportunities for pedestrians;
- Enhance connections to US 1 and the local street system;
- Manage speeds; and
- Provide viable access to properties on and near US 1.

Consistent block lengths provide the best opportunity to progress traffic on US 1. Considering the competing needs of vehicular and pedestrian travel on US 1, and the ability to develop intersecting roads for potential signalization, quarter-mile signal spacing is recommended as the target signal spacing along US 1.

A finer-grained street network is needed to accommodate vehicular, bicycle, transit, and pedestrian travel and to reduce out-of-direction travel. Local street block lengths of 200 to 400 feet are generally recommended to support pedestrian activity. The ITE *Recommended*



Left: Roadways that dead-end into buildings, garages and parking lots inhibit pedestrian and bike circulation. Right: Encourage a more grid-like pattern that provides direct pedestrian routes and allows future roadway connections.

Practice for Context Sensitive Solutions in Designing Walkable Urban Thoroughfares states that, "pedestrian facilities should be spaced so block lengths in less dense areas (suburban or general urban) do not exceed 600 ft. (preferably 200 to 400 ft.)."

Development of the proposed connections was guided by the objectives listed here.

- Development of a more consistent, hierarchical roadway network made up of:
  - Major roadways spaced at ¼ mile intervals, continuing on both sides of US 1 where possible
  - Minor roadways or pedestrian connections spaced at 330 to 660 feet, depending on the intensity and type of development.
  - Improved multimodal access to local amenities including parks, schools, libraries, commercial centers, transit nodes, and trail heads.

Transportation Network and Connectivity

The roadway and path connections identified in the strategy should support and address:

- Public comments received at the Open House in July 2006 and the Public Meetings in June 2007;
- Desired signal spacing along US 1(approximately ¼ mile) to support speed management and pedestrian accessibility; and
- Direct local circulation that will
  - Reduce dependence on US 1 for local trips,
  - Improve pedestrian and bicycle travel options, and
  - Protect neighborhoods from excessive cut-through traffic.

Specific issues that were considered as the proposed connections and recommended policy language were developed are discussed in the following sections organized according to corridor segment:

NORTH LAUREL

The area south of Whiskey Bottom Road exhibits a more grid-like roadway system than other places in the corridor. It also has potential for major redevelopment along and east of US 1. To the south, Laurel has a strict grid pattern of streets and a more walkable environment. These circumstances make the area south of Whiskey Bottom well suited to the walkable, main-street environment characterized in previous US 1 revitalization documents.

To achieve this, it is important to reinforce the grid pattern east of US 1 by providing several direct connections to US 1 and to Whiskey Bottom Road. The grid pattern will increase accessibility to and from the MARC station, improve the ability to route transit through this area, and enable walking and biking as viable modes of transport.

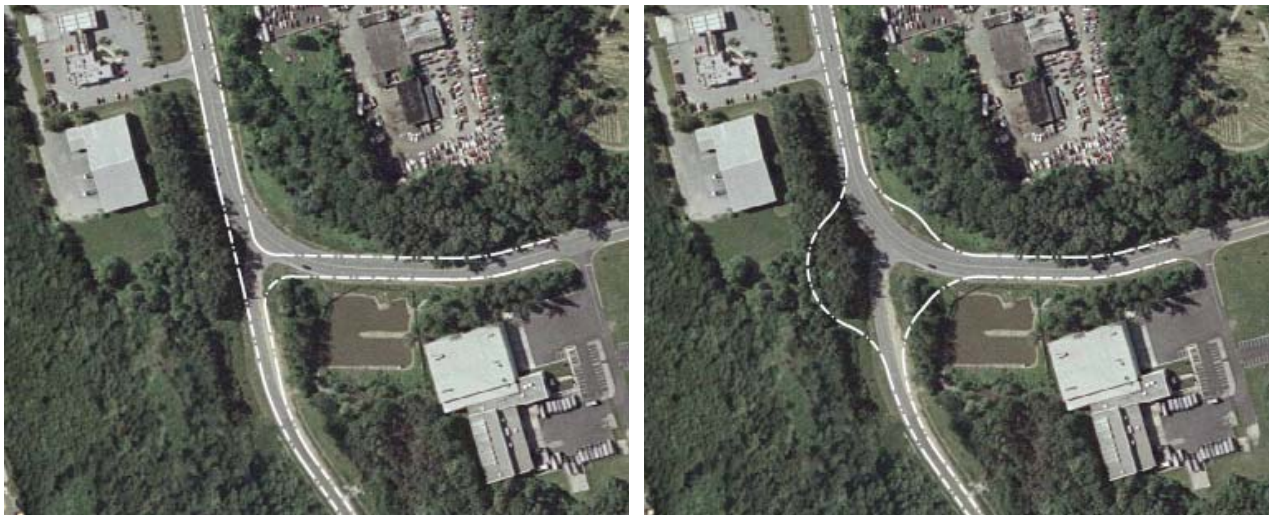
The west side of US 1 in this area is nearly built out with residential development. To the extent possible, connections should be made between the neighborhoods, the planned park, and the commercial centers that may develop in the CAC zone.

Limiting additional dependence on the US 1/Whiskey Bottom intersection is also important, as most development in the area is currently accessed through this intersection and it is forecast to fail in all future traffic scenarios. Multiple connections to US 1 and Whiskey Bottom Road on the east side of US 1 will help avoid further reliance on this intersection. Better connections to North Laurel Road and Meier Road on the west side of US 1 could reduce reliance on this intersection; however, these would be challenging connections because of the developed land uses.

DORSEY RUN ROAD

Dorsey Run Road is a major capital improvement project that will extend a major collector parallel to US 1 on the east side of the corridor. It passes through primarily industrially zoned land and is expected to carry most of this area's truck traffic, relieving US 1 of this burden.

The minimum driveway spacing on Dorsey Run Road is 250 feet, and industrial driveways are allowed direct access onto the road. There is no requirement to align driveways on opposite sides of the roadways, and no restriction of left-turns. In addition to accommodating truck traffic, this road should also be designed to accommodate pedestrian, bicycle, and transit travel to and from the employment centers that are expected to develop along it. Reducing curb cuts (driveways and intersections) along this road and concentrating access at fewer roadway connections rather than many individual driveways will improve safety and efficiency for all roadway users. Direct connections



Volumes suggest that the intersection of Dorsey Run Road and Dorsey Road should inform its redesign. A roundabout alternative (right) might be considered to provide equal access to Dorsey Road in the direction of the Dorsey MARC Station.

between US 1 and Dorsey Run Road should be provided at more frequent intervals to enable more direct travel between the destinations along US 1 and to avoid point-loading MD 175 and MD 103 (the only planned connections to US 1 and the regional network).

The diagrams above show two alternatives for the Dorsey Road/Dorsey Run Road intersection. In both alternatives, the intersection is realigned to give priority to movements between US 1 (to the north) and Dorsey Run Road to the south. Either intersection

alternative is expected to provide safety and operational improvements. Preliminary operational analysis indicates that either a signal or a single-lane roundabout could operate acceptably with 2030 forecast volumes.

NORTH ELKRIDGE

The topography and environmental features of the north Elkridge area challenge connectivity and transportation in this area. The Montgomery Road intersection is relied upon for access to most of the development in the area and operates under stressed conditions during peak hours. The planned signal at the new Elkridge Crossing development may relieve some of this congestion if connections are made to serve existing development.

The area on the west side of US 1 north of Bonnie View Lane is predominantly undeveloped. Although it is zoned residential, it is not likely to build out at the maximum permitted density due to the topography of the land. Developing another connection to US 1 to serve this area, if and when it does develop, is important to avoid overburdening the scenic Lawyers Hill Road and Montgomery Road.

The CSX railroad bridge over US 1 is another major constraint in this area. The bridge is quite narrow, leaving almost no room for pedestrian or bike amenities. There is currently demand for pedestrian and bike travel through this area. There are many commercial businesses north and south of the bridge, north of the bridge is a main access to Patapsco State Park, and southeast of the bridge is the connection to the East Coast Greenway facilities. Furthermore, the land on both sides of the bridge is zoned CAC, indicating potential for development of more intense, mixed-use activity.

PART III
Improvement Strategy

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Section K
Transportation Improvement Strategy

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K. Transportation Improvement Strategy

STRATEGY DESCRIPTION

The Transportation Improvement Strategy presents a set of recommendations, plans, and projects to enable growth toward the revitalized, multimodal US 1 envisioned in Howard County's community plan for the area. The Transportation Improvement Strategy addresses the form, function, and aesthetics of US 1, its local street and path networks, and the administrative actions needed to achieve the physical goals. Recognizing that successful implementation will require many actions by State and County agencies and elected leaders, the Improvement Strategy incorporates a broad base of transportation and urban design analysis and input from a variety of conversations with multiple State and County agencies and the public. A citizen's advisory committee helped to vet initial ideas, to review analysis, and to focus the team on specific issues. The staff oversight team worked across disciplines to identify ways to strengthen policies, programs, and processes.

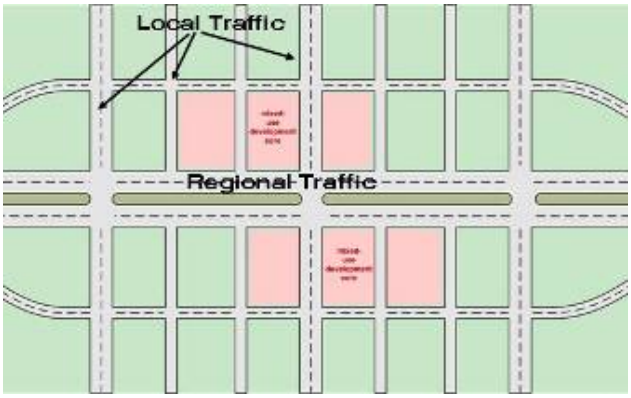
The improvement strategies are presented in two parts: the Physical Improvement Plan and the Administrative Implementation Actions. The Physical Improvement Plan provides a physical transportation framework, including the transformation of US 1 and street and path connections to enhance local travel options. It identifies the need to develop pedestrian, bicycle, transit, and access systems. It addresses both US 1 and the surrounding transportation network.

Administrative Implementation Actions identify the immediate, near-term, and long-term agency activity needed to implement planned improvements. The near-term actions include policy and process measures to allow and encourage the desired urban design patterns to be built over time. They also include first steps for key break-out capital projects. The design and reconstruction of US 1 is a long-term project. The first phases will focus on those areas that will experience the most immediate land-use changes.

PHYSICAL IMPROVEMENT PLAN

Local Transportation System

An interconnected system of streets and paths in a mixed-use environment will help to:



- Expand the local travel network to reduce the reliance on US 1 for local trips;
- Allow for a network of regularly-spaced signalized intersections that progress traffic at target speeds;
- Reduce conflict points on US 1 by replacing single-use driveways with public road connections;
- Enable more direct travel between local activities and destinations; and
- Create viable walking and biking routes and reduce auto dependence.

The local transportation system is based on the following road-spacing guidelines:

- Potentially-signalized, full-movement intersections at quarter-mile intervals along US 1.
- Unsignalized, potentially full-movement intersections spaced 650-feet (roughly half-way between signals) apart along US 1 in intensely developed areas.
- Unsignalized, partial-movement (e.g., right-in/right-out) intersections spaced no closer than 350-feet apart (two to three between signals) along US 1.
- Parallel collector roadways extended where possible to meet lateral streets.

BUILD PRESCRIBED ROADWAY AND PATH CONNECTIONS

Figures 19 to 22, Potential Network Connections for Sub-Areas A through D, identify key roadway and path connections that create the framework described in Section J for the local transportation system. These maps introduce opportunities for key connecting points to guide incremental improvements toward a more inter-connected, functional system. Some of the connections serve existing development and may be built through public projects. However, many of the connections will cross through potential development or re-development sites and are intended to be built as part of private development if and when the land develops. Some existing signals could be relocated as part of the creation of new access points. One example is that Montevideo Road could be realigned (shown in Figure 21) and the signal shifted to the new intersection of Montevideo Road and Port Capital Drive. This information, as well as the objectives, anticipated barriers, and priority of each connection, is described in the project description matrices included in Section K.

The connections mapping is not intended to indicate specific alignments, but rather key connection points. The connections were reviewed by County and SHA staff and were presented and reviewed at two public meetings in June 2007.

CONNECT INTERNAL ROADWAYS

The local system should provide multimodal routes from each development to existing or planned neighborhood centers, parks, and schools without requiring users to navigate arterial streets, unless the connection is rendered otherwise infeasible. Local streets should be short interconnected streets with direct paths. Loops are preferred to culs-de-sac. Local streets can be designed and organized to keep through traffic on appropriate streets, reduce traffic impacts on local streets, and link neighborhoods with one another, community facilities, shopping, and schools.

In addition to the connections shown in Potential Network Connections for Sub-Areas 1-4, a finer-grained system of local roadways will enhance circulation and access. Minor roadways should be spaced 350-feet apart, yielding two minor connections between key connections along US 1. Block perimeters should not exceed 1,400 feet for non-motorized travel and 2,800 feet for streets. New development shall include connections to any streets that abut, are adjacent to, or terminate at the development site. Development plans shall provide for future street connections to adjacent parcels as appropriate.

A connectivity ratio quantifies the travel options available within a street network for moving between destinations. This ratio has been introduced to assess walkability from the perspective that the more connections that exist, the more likely that destinations will be linked directly and within walkable distance of one another. This ratio represents the

number of intersections divided by intersections and dead-ends, expressed on a scale from zero to 1.0 (USEPA, 2002). Path connections should be included in the calculation. As part of a traffic impact study new development could include a calculation of the project's connectivity ratio and would optimally be greater than 0.75. The ratio may by lower than 0.75 for sites limited by physical barriers such as limited-access highways and environmental areas.

PROVIDE CONTINUOUS BICYCLE AND PEDESTRIAN ROUTES

Incorporate on-road marking and path connections to introduce bicycling as a safe and viable mode of travel. Provide continuous bicycle routes and pedestrian routes linking transit stops, employment centers, residential areas, retail and civic activity centers, and recreational trails. Many potential connections have been identified and can be found on the network connections maps in the next chapter. Designated bike routes will be signed and will include roadway and path links.

Provide on-site pedestrian facilities that link streets and primary entrances of the structures on site with existing pedestrian systems on adjacent developments.

Provide convenient, direct pedestrian access to transit stops.

Designers and reviewers should understand and have available examples of best practices for creating walkable places. Some sources for these are identified in the bibliography of this document. They can also be gathered from local examples and other planning processes, like the Columbia Town Center Plan where cases studies of Bethesda and Arlington were prepared. Training workshops can also have participants assemble their own examples of walkable places.

DESIGN FOR MULTIMODAL ACTIVITY

Roadway and site design will accommodate walking, biking, and transit as well as general traffic. The new zoning categories support densities and mixed land uses that are better-suited to multimodal activity. However, zoning and density are not sufficient to create successful multimodal places. Street and site design must attend to the details that will encourage non-motorized travel by considering the convenience, comfort, and safety of each user type.

A variety of street types, expanded to consider land use and mode in their classification, will ease the process of prioritizing certain elements in street designs. Mixed-use areas may include a main street classification such as the example image to the right, with parking for cars and bicycles at the street edge and wider sidewalks to encourage community gathering and retail activity. Residential communities are more likely to prefer narrower streets, with less public space, more planted trees and on-street parking only where needed. Industrial-area collectors should be clearly identified. Those with good connectivity are

likely to be designated as bicycle routes due to typically low traffic volumes on such roads. Buildings on all streets expected to attract pedestrians should be oriented to those streets or, at a minimum, have windows facing those streets. Blank walls and service areas should not face those streets when it can be avoided.

Arterial roads facing increased development and density can expect transit use to increase, particularly as the supporting road network becomes more connected and amenable to walking. Large development and employment sites should be encouraged to coordinate with transit providers to locate and design stops that include waiting amenities as well as safe and convenient access routes.

Transportation System Improvements

US 1 IMPROVEMENTS

US 1 serves a variety of travel types and users, and is planned as a multimodal, multifunction boulevard. As an important link in the regional roadway system with access to major travel corridors, it will continue to serve regional traffic, at times providing an alternate route during incidents on I-95 or MD-295. The highway's central location within the I-95 corridor and its accessibility and convenience will continue to attract warehousing and distribution industries. US 1 will continue to serve motor-carrier traffic and related services.

Similarly, the strong market for housing and retail in Howard County will increase demand for auto and pedestrian travel on US 1. While pedestrian, bicycle, and transit demands are already clearly visible along US 1, development trends including higher residential densities, mixed-use centers, and growth in industrial, warehouse, and service commercial employment indicate that demand for these travel modes is likely to increase.

TYPICAL SECTIONS

The long-term improvement plan for US 1 includes widening to six lanes through most of Howard County. The boulevard concept proposed for this widening is key to the routes attractiveness and safe mode integration. Managed access coupled with side and parallel property access will work in tandem with the streetscape elements: a raised median, continuous bike lanes, landscaping, sidewalks, and parking design. The Reconstruction Plan for US 1 through Howard County includes:

- A one-way couplet with three lanes in each direction in North Laurel (south of Davis Road) (69-foot right-of-way in each direction)
- A 6-lane boulevard from Davis Road through Montgomery Road (134-foot right-of-way)
- A 4-lane modified boulevard north of Montgomery Road (100-foot right-of-way)

Typical Sections 1 through 7 at the end of this chapter show the cross-sections for US 1 reconstruction. The sections depict amenities for a variety of adjacent land uses, setbacks, and environmental features. The sections balance flexibility and consistency throughout the corridor.

PROPERTY ACCESS

Property access along US 1 to collector streets must be re-oriented prior to any US 1 reconstruction and in tandem with new local road connections. This includes reducing

single-use driveways on US 1 and should concentrate truck access to major, full-access intersections.

Building an efficient access system that reduces reliance on US 1 is essential to ensure the vitality of frontage properties once the raised median is constructed.

REGIONAL INTERSECTION IMPROVEMENTS

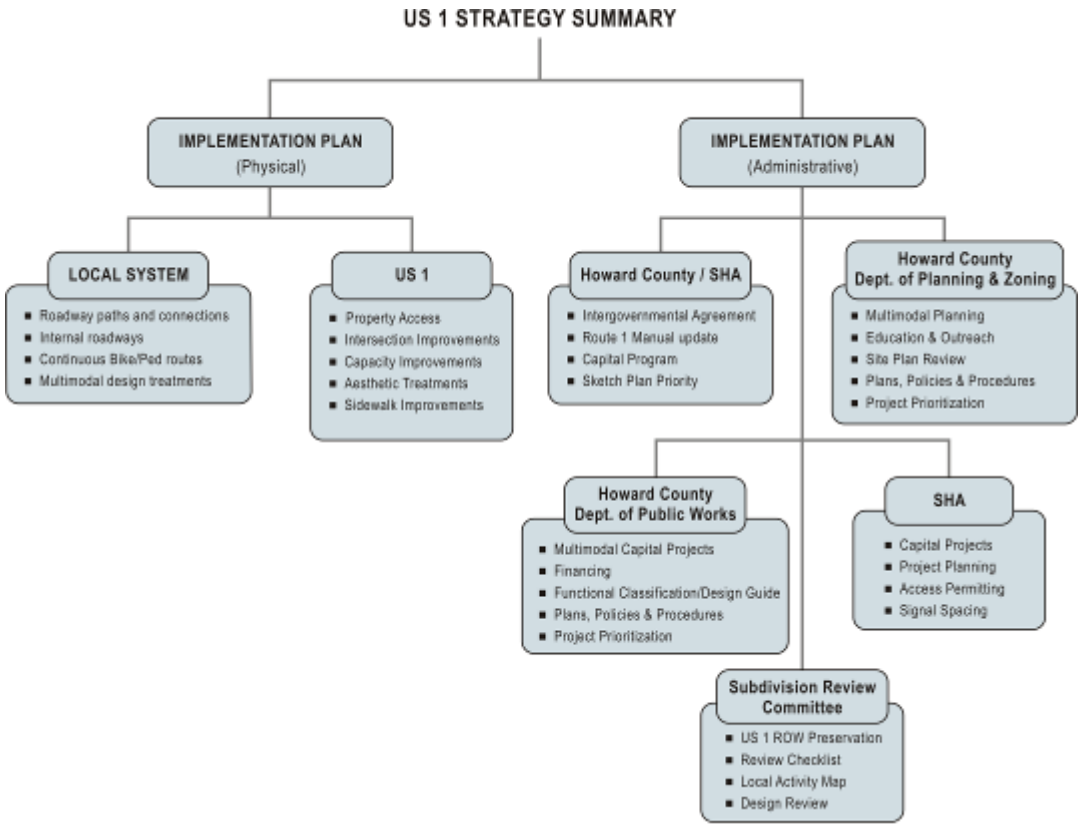
Partial or full grade-separation of the MD 175/US 1 intersection is necessary to meet the forecast travel demands.

Safety and operational improvements to the MD 32/US 1 interchange area, including the Guilford Road and Howard/Corridor Road intersections, are recommended to improve safety and operations.

Improvements to the I-895/US 1 interchange ramps may be appropriate to improve safety and operations and to accommodate multimodal travel.

ADMINISTRATIVE IMPLEMENTATION ACTIONS

Achieving the Physical Improvement Plan will require a combination of public and private projects as well as policy and procedural changes. The Phasing Matrix, Table 17, describes the near-term, ongoing, and long-term actions geared to implement the Physical Improvement Plan. It has been organized by lead agency and type of action recommended.



In Howard County, the Department of Planning and Zoning (DPZ) will implement the Improvement Strategy through the development process. DPZ's oversight of public policy and land development process decisions will advance specific concepts. Maryland SHA will provide key support for implementing improvements to State routes, establish intersection spacing on US 1, and apply proposed access management strategies. Howard County's Department of Public Works (DPW) will design projects and provide critical oversight for local street improvements and pathway connections that will be funded, designed, and built through public and private initiatives.

IMMEDIATE ACTIVITIES

All Partners

PLANS POLICIES & PROCEDURES

The immediate activities should resolve conflicting direction and offer consistent guidance toward the long-term vision. They should create staff consensus for moving forward with a set of tools for best use of developer and public resources. The recommendations are presented here and are identified with key collaborators and anticipated time frame at the end of this chapter.

Intergovernmental Agreement

DPZ and SHA Office of Planning: Howard County and SHA leadership should cooperatively adopt an agreement pursuant to recommendations identified in the "US 1 Corridor Improvement Plan" and the stated and implied actions required by both agencies to achieve the plan.

Route 1 Manual Revision

Howard County Department of Planning and Zoning (DPZ): revise the "Route 1 Manual" to be consistent with the "US 1 Corridor Improvement Plan." Known issues requiring specific direction and consistency include:

- US 1 typical sections and right-of-way should be revised to be consistent with the recommendations of this process.
- Recommended setbacks should be consistent with the recommended typical sections
- Priority on achieving pedestrian accommodation and comfort including the provision of street trees or awnings along all pedestrian facilities.

Capital Improvement Program Additions

Howard County/SHA Office of Planning and DPW: SHA and Howard County should create multi-year capital improvement project funds for sidewalk retrofits, pathway connections, and street extensions identified in a comprehensive Access Management Plan for US 1. These approved CIP designations will permit developer contributions and public funds to be pooled for County or single-developer construction projects identified in the Physical Improvement Plan.

US 1 Right-of-Way Preservation/Acquisition: Include the reconstruction plan in future updates of the Highway Needs Inventory.

Sketch Plan Priority

Howard County Office of Planning and DPW: Review of the development approval process and discussions with members of the Subdivision Review Committee revealed that many of the tools and policies, including the Route 1 Manual, are already in place to achieve desired outcomes (sidewalks, connections, fee-in-lieu, etc.). However, it is challenging to manage the coordination and negotiation and to address competing site requirements on the short timeframe allotted for submittal review. Reestablishing the Sketch Plan application as a tool to get the basic framework right prior to accepting engineering plans can make reviews proceed more smoothly. It can also ensure that the US 1 Revitalization Plan goals are

served by the development and reduces the unintended use of the Manual's development flexibility as a means to ease the burden on the development.

FUTURE AND ONGOING ACTIVITIES

Maryland State Highway Administration (SHA) Initiatives

CAPITAL PROJECTS

US 1 maintenance and Spot improvements: Enhance multimodal environment by selecting appropriate design vehicle based on general traffic vs. designated truck route intersections, improving pedestrian facilities, and integrating speed management treatments. (District 7)

MD 175/US 1 improvements: The US 1/MD 175 intersection, currently rated its highest priority on the County's list of state highway improvements, should advance to the next phase of study to investigate design alternatives. The concepts described in Part I of this document provides a starting point for a National Environmental Policy Act (NEPA) planning study to begin the process of project development. The alternatives should be consistent with the US 1 reconstruction plan, should provide continuous facilities for pedestrians and bicyclists on US 1, and should balance the urban context with the travel demands. This study should explore opportunities to redistribute intersection demand by reorienting truck access to and from Assateague Drive. (Project Planning)

MD 32/US 1 improvements: Determine preferred improvement plan for US 1 between Guilford Road and Howard/Corridor Road. The concepts described in Part I of this document provide a starting point to direct the future analysis. The improvement plan for this area should address the safety and driver expectancy considerations described in Part I, and should be consistent with the urban arterial context. Opportunities to separate truck traffic from general traffic should be explored by expanding the study area to include the MD 32/Dorsey Road interchange and Corridor Road access. (Project Planning & District 7)

US 1 Reconstruction: Establish a NEPA process for US 1 reconstruction to locate the typical section that addresses environmental preservation, property impacts, and preliminary construction costs. Phase 1 of any reconstruction should begin where private development is most imminent: the sections north of MD 175 and South of MD 32. This study will result in a more precise alignment, stormwater management plan, and estimated costs and impacts. (Project Planning)

SYSTEM DESIGN

Speed management: Monitor speeds north of Montgomery Road and consider targeted enforcement or speed management treatments (pavement markings, visible shoulder treatments, signing, re-striping to narrow shoulders and separate opposing traffic). (District 7)

Coordinate and progress traffic signals for speeds compatible with the context and function of the roadway in conjunction with access management. Target speeds along the corridor are shown in Part I, Section C. (District 7 and OOTS)

Access Management: Work with property owners to design and construct access improvements that reduce conflicts on US 1 and reduce dependence on US 1 for local

travel. The safety and access prioritization matrices shown in Tables 10 and 15 of this document should be used to identify target areas for improvement projects. Projects that will concentrate truck access at signalized intersections should be given the highest priority. Where possible, access improvement projects should be coordinated with County roadway connections projects and/or private development to redirect property access to local roads that serve multiple properties. The combination of proposed connections and road extensions, signalized intersections and intersection spacing recommendations will be organized into a set of Access Management Plan maps for easy reference by County Staff, EAPD and RIPD. (EAPD, Regional Planning & District 7)

Establish a fund to permit acquisition of access rights in an urban arterial context similar to that currently available for designated corridors in SHA's Consolidated Transportation Program. Howard County and/or SHA should establish Access Management capital projects that include all the components of the Access Management Plan to which developers could be asked to contribute. (Regional Planning)

Howard County Department of Planning and Zoning (DPZ) Initiatives

MULTIMODAL SYSTEM PLANNING

Truck Routes: Designate truck routes, orient truck traffic to these routes, provide appropriate design and amenities, and develop industrial access requirements to concentrate truck access at major intersections.

Bicycle Circulation Network: Designate existing and planned bicycle routes (including street and trail links) that will create a continuous bicycle system.

Parking: Review parking requirements and recent design exceptions. Consider instituting maximum parking rates, revising current minimum rates, providing incentives for shared parking and park-once systems, and providing additional incentives for developments that encourage and support non-auto travel.

Transit Service: Coordinate with transit providers to review and revise transit routes, stop locations, and service hours as new development and activity in the corridor proceed. Have transit development plans identify improvements that can be funded or built by developers.

North Elkridge Circulation Study: Direct a focused study of circulation in North Elkridge. The study should focus on pedestrian and bicycle circulation and destinations, including the St. Denis MARC station in Baltimore County, the East Coast Greenway, Patapsco Valley State Park, and development near Montgomery Road. The study should recommend bicycle routes for signing and improvement; determine the need for a pedestrian underpass of the CSX rail line; and an improvement plan to accommodate multimodal travel through the I-195 and I-895 ramps.

EDUCATION & OUTREACH

Best Practice Materials: Develop educational/informational materials about the US 1 revitalization vision and the "US 1 Corridor Improvement Plan." The materials may cover the importance of an integrated, connected local transportation system and site design best practices or provide examples for creating vibrant multimodal places. These materials

could be distributed to developers at pre-submittal meetings, to local elected officials, and to local residents and businesses.

Staff Workshop: Provide a workshop series for subdivision review committee and engineering staff to raise awareness of best practices for walkable places.

PLAN REVIEW

Site Design Guidance: Augment the "Route 1 Manual" to require site design to work to provide access streets that connect through the site to adjacent parcels and existing streets and to work to limit dead end access to/from collectors or higher classified roads. Guidance should also recommend building orientation and avoidance of "dead zones" at the street edge, particularly for streets meant to convey pedestrians.

Local Activity Submittal: Develop specific requirements and forms for a Local Activity Submittal that will supplement Sketch Plan requirements for all development proposals in the US 1 corridor. The Local Activity submittal should include a map showing activity generators (including employment, civic, and retail centers and residential neighborhoods), and transit stops within one-half mile of the proposed site. Access and circulation paths should be identified to link the proposed development to these destinations for pedestrians, bicycles, and general traffic. This should demonstrate that the site design minimizes circuitous travel and integrates with the local transportation network and land uses. Where physical, environmental, or political barriers prohibit direct connections, site design and easements should preserve the potential for future connection. Contributions to a capital improvement fund for local roadway and/or path connections should be collected to fund the off-site connectivity improvements identified in the Local Activity submittal.

PLANS, POLICIES & PROCEDURES

Mapping Updates: Revise and amend the Local Connections Maps (Section K), as needed, to reflect changing opportunities and constraints.

Project Prioritization: Prioritize roadway/pathway capital improvement projects for review by the Department of Public Works.

Howard County Department of Public Works (DPW) Initiatives

CAPITAL PROJECTS

County Roadway Connections Projects: Design and construct the roadway and path connections identified as "retrofit" projects in Section K. Highest priority should be given to path connections identified in the DPZ sidewalks prioritization, to roadway connections that will enhance local circulation to existing or planned activity centers, and to roadway connections that will build a hierarchical access system for Dorsey Run Road. Design should provide facilities for all travel modes—sidewalks with street trees should be provided on both sides of all new roads, striped bike lanes should be considered on collector roads, and the width of the travelway should fit with the context of adjacent land uses and expected need to designate space within the right-of-way for associated user activity.

Bicycle Routes: Fill in the gaps in the bicycle network particularly creating more links to off-road recreational trails in Savage and Elkridge areas. Add appropriate signing and pavement markings and traffic control to bike routes.

Bicycle Routes: Fill in the gaps in the bicycle network particularly creating more links to off-road recreational trails in Savage and Elkridge areas. Add appropriate signing and pavement markings and traffic control to bike routes.

Sidewalk Connections: Provide sidewalks on both sides of every new roadway and improvement project in the corridor. Sidewalk width should be no less than 6 feet except in commercial areas where street furniture and activity space suggest a need for wider paved areas.

FINANCING

Transportation Impact Fees: Establish capital improvement projects to permit developer and public contribution to roadway and path retrofit projects in the US 1 corridor. These should include, but not be limited to, the connections identified in Section K. In addition to appropriation of public funds, private contributions should be exacted when off-site connections to nearby destinations are identified during development review.

FOLLOW-UP PLANNING

Functional Classification Overlay/Street Design Standards: Many of the County roads have seen increased traffic volumes, the main indicator of Howard County's functional designation, without being re-classified. As a first step it may be appropriate to re-classify some County roadways based on the current classification criteria to ensure that APFO and Traffic Studies adequately address potential impacts. Concurrently, the County should document a more inclusive set of indicators of functional need with an overlay classification system based on priority users and land use. This would include a reevaluation of volume thresholds, particularly for local streets that should allow higher volumes of traffic in a more connected network. Street design standards should permit flexibility based on land-use context and roadway users to better accommodate multimodal travel.

Dorsey Run Road Access: Adopt an access management plan for Dorsey Run Road and other key roadways to manage vehicular and non-auto conflicts. Direct property access to these roadways should be minimized in favor of minor roadway connections that may serve multiple properties and provide direct routes for pedestrian, bicycle, and transit circulation.

Transportation Impact Analysis: Augment APFO Roads Test and Traffic Impact Study requirements for developments in the US 1 corridor to address the following:

- Intersections of local roads with major collector or higher classified roads should not be precluded from analysis.
- Pedestrian study of roadways and intersections within one-half mile of site perimeter, including pedestrian facilities (including on-site and through parking areas) and deficiencies (including obstructions, gaps, missing ramps, etc.).
- Safety analysis of study intersections within 500 feet of site frontage including three years of historic crash data and a summary of crash type, severity, contributing factors, and rate. Crash rates on state facilities should be compared to statewide average rates for the facility type. Intersection crash rates on County facilities should be calculated per million entering vehicles. Segment crash rates on County facilities should be calculated per million vehicle miles traveled. Where high crash rates (greater than the statewide average, greater than 1.0 per million entering vehicles/per million vehicle miles traveled)

are identified, potential safety issues should be identified along with potential improvements. High crash rates along site frontage should be improved as a condition of development.

- Designated bicycle routes and trails with street access within one-half mile of the site should be identified and appropriate connections that link the site with these facilities should be identified.
- Access to and from transit stops within one-half mile.

Subdivision Review Committee Initiatives

DEVELOPMENT PROCESS

US 1 Reconstruction Right-of-Way Preservation: Right-of-way preservation consistent with the "US 1 Corridor Improvement Strategy" has already begun. Revising the "Route 1 Manual" for consistency will help formalize the desired right-of-way preservation. US 1 reconstruction will require approximately:

- 134-feet between Bonnie View Lane and Davis Road
- 69-feet in each direction of the couplet south of Davis Road
- 100-feet to 110-feet north of Bonnie View Lane

Review Checklists: Review the Pre-Submittal Transportation Checklist with developers at pre-submittal meetings. This process should highlight issues and desired outcomes related to transportation to be accommodated in the development proposal. Key issues include access, roadway connections, transit service, and pedestrian and bicycle routes.

The Pre-Submittal Transportation Checklist will be completed by the developer and included with the first submittal and all subsequent submittals. This checklist will identify how the development plan accommodates each element of the "US 1 Corridor Improvement Plan."

Auxiliary Lanes: Auxiliary lanes should not be constructed, except at major intersections, once US 1 widening has occurred. Rather than constructing auxiliary lanes to accommodate driveway conflicts, opportunities should be sought to relocate turning movements to major intersections. (District 7)

Local Activity Submittal: Review of the Local Activity submittal for early site assessment.

CLOSING

The improvement plan and implementation strategies that make up the "US 1 Corridor Improvement Strategy" are summarized in Table 17. They will be implemented over many years through State, County, and private actions and investments. Changes to corridor zoning, local and regional transportation, economies, and development trends will affect travel demand and the implementation of this plan. The strategies and improvement plan may need to be modified to reflect such changes. For example, if the passenger rail service on the CSX rail lines is improved and expanded, development and travel demand near these stations will certainly change. It would then be appropriate to assign higher priority to connections to the TOD areas. The basic elements of the improvement plan, however, are unlikely to change. Their timing will require oversight and periodic reassessment of priorities.

Table 17 Summary of Action Strategies and Recommendations

Focus	Item	Strategy Description	Collaborators	Timeline
All Partners				
Plans, Policies & Procedures	Intergovernmental Agreement	Draft and adopt agreement to incorporate US 1 Corridor Improvement Strategy and Recommendations into applicable state and local policy and planning documents.	SHA, Howard County	6 months
	Route 1 Manual Revision	Revise Route 1 Manual for consistency with Transportation Improvement Plan.	Howard County DPZ	6 months
	Capital Improvement Program Additions	Create funding and construction mechanisms for modest capital projects identified in the Transportation Improvement Plan to permit developer contributions and construction as opportunities arise.	SHA, Howard County DPW	9 months
	Sketch Plan Priority	Reestablish Sketch Plan as a prerequisite to site engineering.	DPZ, DPW	6 months
	US 1 Right-Of-Way Preservation/ Acquisition	Incorporate the recommended US 1 typical cross-sections into Spring 2008 update of the Highway Needs Inventory.	OPPE	9 months
Maryland State Highway Administration (SHA) Initiatives				
Capital Projects	US 1 Maintenance and Spot Improvements	Enhance the multimodal environment in all system preservation projects, consulting a plan of priority truck routes to limit locations for large vehicle access, and to improve pedestrian facilities.	District 7, OOTS	Ongoing
	MD 175/US 1 Improvements	Investigate design alternatives that meet travel demands and fit within the increasingly urban character of US 1.	OPPE	To be determined
	MD 32 Area/US 1 Improvements	Investigate improvement alternatives for US 1 between Guilford Road and Howard/Corridor Road to address safety and driver expectancy needs.	District 7, OOTS	To be determined
	US 1 Reconstruction	Establish a project to begin the National Environmental Policy Act (NEPA) planning process to specify location of typical sections; address environmental & property impacts and preliminary project costs.	OPPE	To be determined
Systems Design	Speed Management	Monitor speeds north of Montgomery Road and consider targeted enforcement or speed management.	District 7, OOTS, & Highway Design	9 months
	Access Management	Establish a signal spacing policy consistent with Strategy recommendations. Consolidate access points and obtain frontage access controls in coordination with private development and County roadway projects. Establish a voluntary access control acquisition program for the US1 Corridor similar to SHA's program for limited access highways on the Eastern Shore.	OPPE, EAPD RIPD, EAPD, ORE	Ongoing
Howard County Department Of Planning and Zoning (DPZ) Initiatives				
Multimodal System Planning	Truck Routes	Designate priority truck routes, orient truck traffic to these routes, and provide appropriate design and amenities.	DPZ, DPW, Motor Carriers	6 months
	Bicycle Circulation Network & Facilities	Develop a continuous bicycle circulation network, fill gaps, add signing and lane markings, require bicycle parking in new commercial, employment and civic areas and retrofit existing destinations.	DPZ, Rec & Parks, DPW, Bicycle Advocates	18 months
	Parking Management	Develop parking policy with appropriate consideration of multimodal travel opportunities and shared supply in mixed zones.	DPZ	12 months
	Transit Service	Work with transit providers to locate stops in new development, improve transit service and encourage transit use by corridor employees.	DPZ, Howard Transit, MTA	Ongoing
	North Elkridge Circulation Study	Conduct a targeted study of bicycle and pedestrian circulation north of Old Washington Road.	DPZ, DPW	12 months

Focus	Item	Strategy Description	Collaborators	Timeline
Howard County Department Of Planning and Zoning (DPZ) Initiatives - Continued				
Education & Outreach	Best Practice Materials	Develop informational/educational materials about the US 1 Revitalization Vision, the transportation improvement plan, and multimodal site design (to create successful pedestrian networks) for distribution to development professionals and elected officials.	DPZ, Legislative affairs	9 months
	Staff Workshop	Prepare and present a workshop for the Subdivision Review Committee and engineering staff working in the corridor to raise awareness of best practices for walkable places.	DPZ	9 months
Plan Review	Site Design Guidance	Augment the Route 1 Manual to require site design to advance street connections through sites with roads to adjacent parcels and existing streets; limit dead end access to/from collectors and arterials; enhance connections and facilities for transit, pedestrians and bicycles including bicycle parking in employment and commercial zones.	DPZ	9 months
	Local Activity Submittal	Develop specific requirements and forms for a Local Activity Submittal that will supplement Sketch Plan requirements for all development proposals in the US 1 Corridor.	DPZ	9 months
Plans, Policies & Procedures	Mapping Updates	Revise and amend the Local Network Connections Maps as needed to reflect evolving opportunities and constraints.	DPZ	Ongoing
	US 1 Right-of-way Preservation	Revise the Route 1 Manual to formalize the desired right-of-way preservation and ensure consistency with SHA's pending Highway Needs Inventory (HNI) update.	DPZ, SHA	6 months
	Project Prioritization	Prioritize roadway, transit and path capital improvement projects for agreement and implementation by the Department of Public Works and for State Consolidated Transportation Program inclusion.	DPZ, DPW, Communities	Annually
Howard County Department Of Public Works (DPW) Initiatives				
Capital Projects	County Roadway Connections Projects	Establish an annual capital program to design and construct retrofit roadway and path connections as identified in the Improvement Plan. Priority projects are listed in Section K.	DPW, DPZ	Annually
	Bicycle Routes & Facilities	Establish an annual capital program to fill gaps in the bicycle network; add appropriate signing, pavement markings and traffic control to routes.	DPW, DPZ, Bicycle Advocacy	Annually
	Sidewalk Connections	Construct sidewalks (shaded where possible) on both sides of all new roadways and improvement projects in the corridor. Facilitate provision of adequate ROW for appropriate sidewalk width and inclusion of street trees for all public walking paths.	DPW, DPZ	Ongoing
Finance	Transportation Impact Fees	Establish a mechanism to pool developer contributions and permit timely and orderly implementation of transportation improvements.	DPZ, DPW,	12 months
Follow-up Planning	Functional Classification Overlay/ Street Design Standards	Establish a functional classification overlay for the corridor that supports an interconnected, hierarchical network and provides roadway design guidance based on land use and/or priority users.	DPW, DPZ	12 months
	Dorsey Run Road Access	Establish an access management plan for Dorsey Run Road to manage conflicts, create a connected network and enable viable transit service.	DPW, DPZ	12 months
	Transportation Impact Analysis	Consider revising APFO Roads Test and Traffic Study requirements to include high-volume local road intersections and require pedestrian and crash analysis to encourage safety assessments and improvements.	DPW, DPZ	9 months
Subdivision Review Committee Initiatives				
Development Process	Review Checklists	Highlight issues and desired outcomes related to transportation and identify how the development plan accommodates each element of the US 1 Improvement Plan.	DPZ	6 months
	US 1 Access Design	Restrict widening beyond the planned typical section for US 1. The third outside through lane on US 1 will serve turning movements at driveways, stopping transit vehicles, and trucks.	DPZ, DPW, SHA	Ongoing
	Local Activity Submittal	Incorporate the Local Activity Submittal into the Sketch Plan review process.	DPZ, DPW	6 months

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Section L.
Access Management Plan Matrix and Maps

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Table 17 Local Network Connectivity Project Matrix

Project Description		Project Details/Intent	Phase			Objectives						Barriers		
			Retrofit	Development	Both/Either	Local Amenities	Safety	Signal Planning	Truck Access	Access Management	Circulation/ Distribution	Political	Engineering/ Environemental	Property Impacts
A1	High Ridge Park Access	Improve local access to High Ridge Park	X			X						X		
A2	High Ridge residential connectivity	Provide for light mode connection between residential areas	X			X						X	X	
A3	Baltimore Ave Improvements	Improve geometry and non-auto facilities to improve access between High Ridge and North Laurel	X			X	X						X	
A4	North Laurel Park Access	Make amenity accessible to all adjacent neighborhoods	X			X								
A5	North Laurel Grid	Connections and block spacing for multimodal activity node		X						X	X			
A6	North Laurel Grid	Connections and block spacing for multimodal activity node		X						X	X			
A7	North Laurel Grid	Connections and block spacing for multimodal activity node		X						X	X			
A8*	Dreyer's bike/pedestrian path	Provide pedestrian/bike connection between Dreyer's employment and North Laurel MARC stop			X	X					X			X
A9	Brewers Court Connection	Reduce dependence on North Laurel Rd signal, provide direct multimodal route to US 1			X	X		X			X	X		
A10	Lynn Buff Realignment	Reduce dependence on Whiskey Bottom signal, route to neighborhood commercial			X			X			X			X
A11	Lynn Buff Realignment	Realign Lynn Buff Court opposite Maier, Logical location for potential signal		X				X	X	X				
A12*	Lynn Buff/Country Meadows connection	Connect Country Meadows to neighboring communities and provide access to signalized intersection with US 1			X	X	X	X			X			
A13	Savage Park Trail Access	Ped/Bike connection to Wincopin Trail and Savage Park fields, and adjacent senior community	X			X							X	
A14*	Birkenhead path connection	Provide pedestrian/bike connection between neighboring residential areas, and access to library	X			X					X			
A15*	Freestate/Gorman Connections	Improve circulation for transit and commercial vehicles; access management		X				X	X	X			X	
A16*	Dorsey Run/MD 32 loop ramp	Loop ramp; redirect Corridor Rd truck traffic from US 1; separate truck traffic on Dorsey Run from light modes near proposed Savage TOD	X						X		X			

*Shaded rows indicate Pedestrian/Bike connections, * Indicates connection added/modified based on Public Meeting comments*

Table 17 Local Network Connectivity Project Matrix

Project Description		Project Details/Intent	Phase			Objectives						Barriers		
			Retrofit	Development	Both/Either	Local Amenities	Safety	Signal Planning	Truck Access	Access Management	Circulation/ Distribution	Political	Engineering/ Environemental	Property Impacts
B1	Guilford neighborhood connections	Provide light mode connections between neighborhoods and local commercial areas	X			X						X	X	X
B2	Guilford Rd realignment	Correct intersection skew and associated safety and capacity problems	X				X						X	X
B3	Jones Rd extension	Connect neighboring residential to CE zone if redevelopment occurs		X		X		X			X			
B4	CE zone network and signal	Plan logical connection through area likely to redevelop		X				X		X	X			
B5	Connections and spacing in Quarry property	Plan collector/distributor network		X				X		X	X			
B6*	Rails/Trails I-95 crossing	Develop trail crossing of I-95 along CSX right-of-way	X					X			X		X	X
B7*	Mission/Lincoln connection	Provide neighborhood connection off US 1 to neighboring communities and amenities	X			X						X		
B8	CE zone spacing and connections	Plan logical connections through area likely to redevelop		X		X		X		X	X			
B9	Mission Place pedestrian connection	Connect neighborhoods		X		X					X			
B10*	Hicks Rd pedestrian connection	Connect neighborhoods	X			X					X			
B11	Assateague Ave realignment	Redirect truck access to MD 175			X		X	X	X	X	X			X
B12	Dorsey Run Rd access road	Provide access management on Dorsey Run Road			X				X	X				

*Shaded rows indicate Pedestrian/Bike connections, * Indicates connection added/modified based on Public Meeting comments*

Table 17 Local Network Connectivity Project Matrix

Project Description		Project Details/Intent	Phase			Objectives						Barriers		
			Retrofit	Development	Both/Either	Local Amenities	Safety	Signal Planning	Truck Access	Access Management	Circulation/ Distribution	Political	Engineering/ Environemental	Property Impacts
C1	Montevideo Realignment	Realign Montevideo opposite Port Capital, signalize (remove existing signal at Montevideo)			X		X	X		X	X			X
C2	Dorsey Run Road connections	Manage access on Dorsey Run Road (DRR)		X					X	X	X			X
C3*	Bluestream/Bus. Pkwy connection	Preserve ped/bike direct route between CAC and Meadowridge		X		X					X			
C4*	Dorsey Road connection	Provide direct connections through CE zone		X			X		X	X	X			X
C5*	Dorsey Road Intx alignment	Realign Dorsey Rd/Dorsey Run Rd intx			X		X				X			
C6*	Industrial east-west collector	Parallel connection to DRR and US 1 through industrial area. Important for transit service		X					X	X	X			X
C7*	Dorsey Run Road connections	Manage access on DRR		X					X	X	X			X
C8	Dorsey Rd MARC station access	Connection between Dorsey TOD and adjacent residential	X			X					X		X	

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Table 17 Local Network Connectivity Project Matrix

Project Description		Project Details/Intent	Phase			Objectives						Barriers		
			Retrofit	Development	Both/Either	Local Amenities	Safety	Signal Planning	Truck Access	Access Management	Circulation/ Distribution	Political	Engineering/ Environemental	Property Impacts
D1	Troy Hill South/Santa Barbara connection	Possibly abandon signal at Amberton, provide transition area near interchange			X	X		X			X		X	
D2*	Troy Hill Park local connection	Light mode connection between future park and neighborhoods	X			X							X	X
D3	Hawthorn Ave/CAC connection	local access to CAC amenities			X	X							X	
D4	Ducketts/Hunt Club neighborhood connection	Light mode connection between neighborhoods	X			X							X	
D5	Hunt Club Rd realignment	Eliminate offset between Hunt Club and South Hanover, provide new signal	X			X	X	X			X			X
D6	Smith Ave/Coca Cola connection	Redirect South Hanover trucks from US 1 to Coca Cola			X				X		X			
D7	Hunt Club/Rowanberry neighborhood connection	Light mode connection between neighborhoods	X			X							X	X
D8	Montgomery local connection	Light mode connections to school and neighborhoods	X			X	X							
D9	Montgomery local connection	Light mode connections to school and neighborhoods	X			X	X							

*Shaded rows indicate Pedestrian/Bike connections, * Indicates connection added/modified based on Public Meeting comments*

Table 17 Local Network Connectivity Project Matrix

Project Description		Project Details/Intent	Phase			Objectives						Barriers		
			Retrofit	Development	Both/Either	Local Amenities	Safety	Signal Planning	Truck Access	Access Management	Circulation/ Distribution	Political	Engineering/ Environemental	Property Impacts
D10	Abel St alignment, Old Washington stub	Align Abel and Greenfield, Eliminate high-speed roadway connection to Old Washington			X	X		X			X		X	
D11	Bonnie View school connection	Light mode connections to school and neighborhoods	X			X								
D12	Bonnie View realignment	Eliminate skewed intx, reduce cut-through traffic, connect to local commercial	X			X	X	X		X	X	X	X	X
D13	Montgomery Rd extension	Reduce dependence on Hanover Rd and Old Washington		X		X					X		X	X
D14	Hanover area local connections	Reduce dependence on Hanover Rd for light mode trips	X			X	X							
D15	Hanover area local connections	Reduce dependence on Hanover Rd for light mode trips	X			X	X							
D16	Hanover area local connections	Reduce dependence on Hanover Rd for light mode trips	X			X	X							
D17*	Main Street stub	Conflicts with 895 ramp	X				X			X				

*Shaded rows indicate Pedestrian/Bike connections, * Indicates connection added/modified based on Public Meeting comments*

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Figure 19 Potential Network Connections (Sub-area A)

Back of Figure 19

Figure 20 Potential Network Connections (Sub-area B)

Back of Figure 20

Figure 21 Potential Network Connections (Sub-area C)

Back of Figure 21

Figure 22 Potential Network Connections (Sub-area D)

Back of Figure 22

Figure 23 Access Management Priorities (Sub-area A)

Back of Figure 23

Figure 24 Access Management Priorities (Sub-area B)

Back of Figure 24

Figure 25 Access Management Priorities (Sub-area C)

Back of Figure 25

Figure 26 Access Management Priorities (Sub-area D)

Back of Figure 26

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