DRAFT

FEASIBILITY STUDY

FOR

DOWNTOWN COLUMBIA TRANSPORTATION IMPROVEMENTS

LITTLE PATUXENT PARKWAY / US 29 INTERCHANGE

January 2012

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Note:
This is an initial draft report presented to Howard County by the Howard Hughes Corporation. The County staff is in the process of reviewing this document and has not yet accepted it. Any questions or concerns regarding this draft report should be directed to the Howard Hughes Corporation.

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I. Purpose and Need

This Feasibility Study has been prepared for Howard County, Maryland in conjunction with Howard Hughes Corporation (formerly General Growth Properties, Inc.) The purpose of the study is to investigate the feasibility of a new grade-separated interchange on US 29 between the two existing interchanges with Broken Land Parkway and Little Patuxent Parkway (LPP). The interchange would connect LPP with US 29 near the East Mall Entrance Road and allow direct access to Downtown Columbia. This interchange is presented in the DOWNTOWN COLUMBIA PLAN – A General Plan Amendment, adopted February 1, 2010 and as identified in the Downtown Community Enhancements, Programs and Public Amenities (CEPPAs) Implementation Chart, #3 under Howard County Council Bill No. 58-2009. The study includes conceptual alternative alignments, traffic capacity analysis, development of conceptual storm water management requirements, potential environmental impacts, and preliminary cost estimates.

In addition to the US 29 interchange connection to Downtown Columbia, a connection to the Oakland Mills community, on the east side of US 29 has been considered. This report details the interchange with and without the Oakland Mills connection, since the purpose and need is slightly different for this connection to Oakland Mills, including the overall operations and travel demand for the feasibility alternatives evaluated.

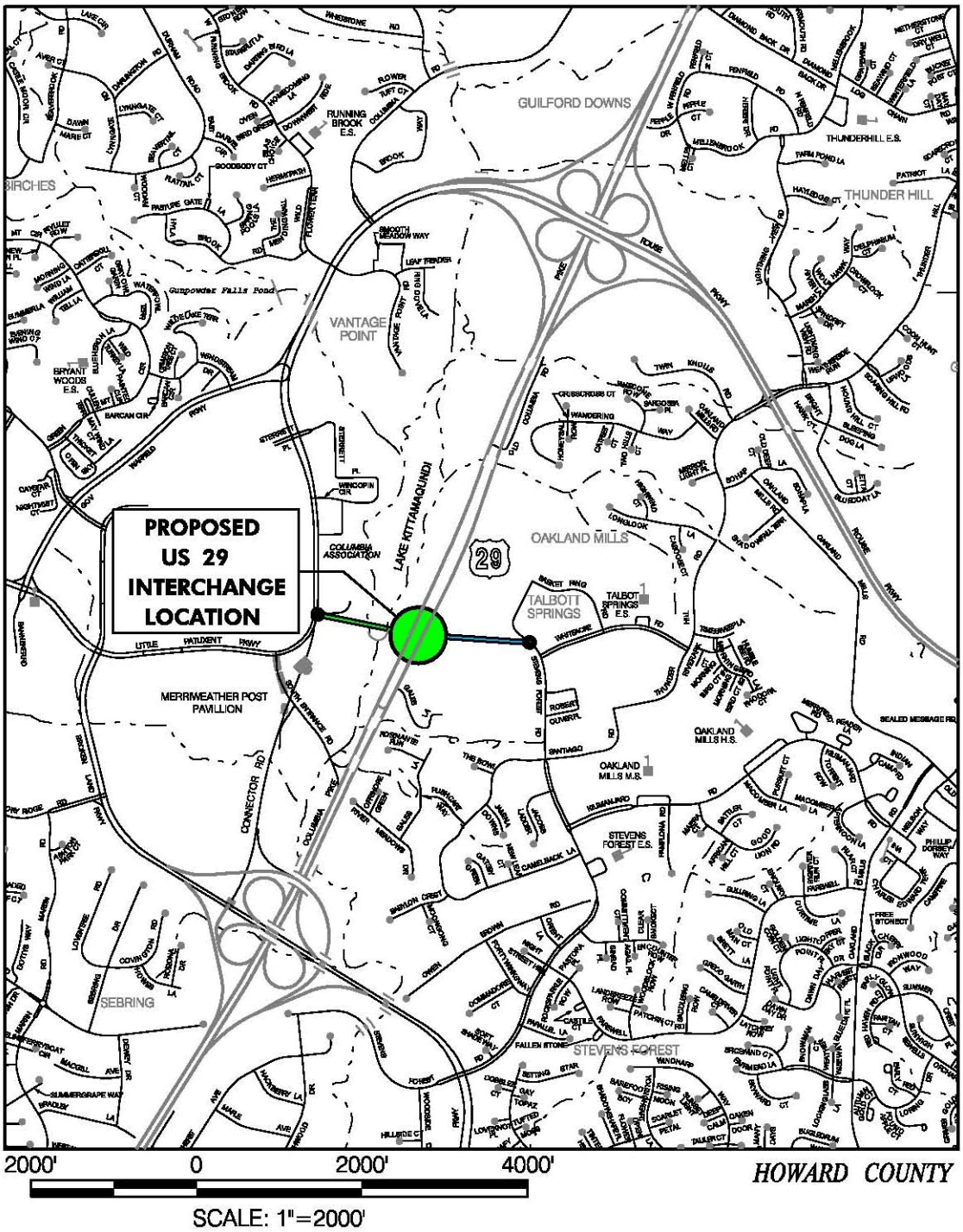
The third US 29 Interchange is needed to increase vehicular mobility and provide adequate capacity to meet the future growth and development as outlined in the Downtown Columbia Plan. The new interchange will address the future traffic demand of access to Downtown Columbia and relieve traffic from the existing interchange connections to US 29 with Broken Land Parkway and MD175/LPP. In addition, the Oakland Mills connection will provide direct access to and from the Oakland Mills community and Downtown Columbia, as well as improve access to Downtown Columbia from points east of Oakland Mills.

The Study Area extends along US 29 from south of the Broken Land Parkway interchange to north of the MD 175/LPP interchange and encompasses Downtown Columbia including The Mall in Columbia and Merriweather Post Pavilion to the west of US 29, and the Oakland Mills community to the east of US 29.

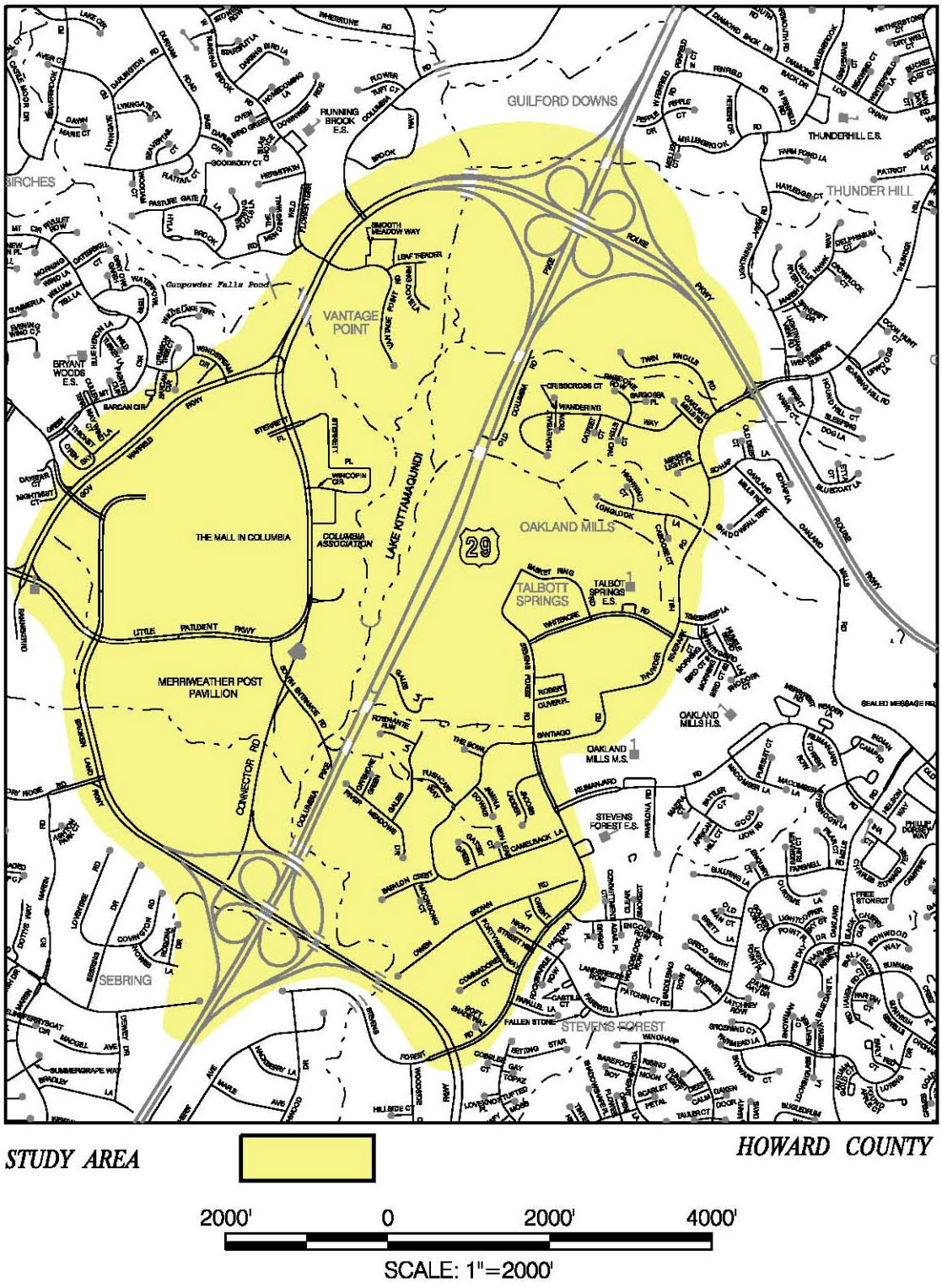
The Downtown Columbia Plan is an amendment to the Howard County General Plan and creates a 30-year master plan for the revitalization and redevelopment of Downtown Columbia. The Plan is a guide to Downtown Columbia's continued evolution as the County's economic and cultural center through increasing the number of people living downtown and by adding more residences, shops and recreational and cultural amenities, while also making downtown more attractive and easier to navigate. The Downtown Columbia Plan includes approximately five million square feet (SF) of new office space, one million SF of new retail space, 5,500 new residential dwelling units, and 640 new hotel rooms. These new uses would displace approximately 618,000 SF of existing office space and 10,000 SF of existing retail space.

US 29 links Downtown Columbia to metropolitan Baltimore to the north and Washington D.C. to the south. Currently, Broken Land Parkway serves as the southern link from US 29 to LPP and Downtown Columbia providing access and carrying most of the traffic for points south. LPP provides the primary access point to US 29 for points north. With the projected revitalization and redevelopment of Downtown Columbia and providing only the current planned and programmed transportation system improvements to the existing Downtown

Columbia roadway network and access links, the loop ramps in the Broken Land Parkway and US 29 interchange will operate at a level of service (LOS) of "F" in the future design year of 2035. In addition, the existing MD 175/LPP and US 29 interchange ramps servicing US 29 northbound will operate at LOS "D" to "F".



MAP No. 1 - LOCATION MAP



MAP No. 2 - STUDY AREA MAP

II. Existing Conditions

Existing Network The Downtown Columbia street network relies on just a few, relatively large, high-speed arterial streets. US 29 links Downtown Columbia to metropolitan Baltimore to the north and Washington, D.C. to the south. LPP, Governor Warfield Parkway, and Broken Land Parkway carry most (approximately 70 percent) of the traffic that currently enters and leaves Downtown Columbia. Hickory Ridge Road and Twin Rivers Road carry approximately 20 percent of traffic into and out of Downtown Columbia. The Mall Ring Road, Banneker Road, and South Entrance Road carry the remaining of Downtown Columbia traffic. There are few collector streets in Downtown Columbia. The Mall Ring Road and parking lot drive aisles function as private local streets.

Existing Bottlenecks Two grade separated interchanges control access to US 29: MD 175/LPP to the north and Broken Land Parkway to the south. South Entrance Road provides at-grade, right-in and right-out access to southbound US 29. Three bottleneck intersections control the volume of traffic that can enter and exit Downtown Columbia: LPP/Governor Warfield Parkway (North), LPP/Broken Land Parkway, and Broken Land Parkway/Hickory Ridge Road.

Street Descriptions The major streets in Downtown Columbia are described as follows:

US 29 (Columbia Pike) provides regional access to Columbia from Baltimore, Washington, and beyond. The Howard County General Plan classifies US 29 as a principal arterial roadway. The controlled-access, median-divided roadway provides two to three lanes in each direction. Grade-separated interchanges at MD 32, Seneca Drive, Broken Land Parkway, MD 175, and MD 108 serve greater Columbia. South Entrance Road provides right-in/right-out only access on southbound US 29. Full Access is provided to Columbia from US 29 through the Broken Land Parkway Interchange. A semi-direct flyover ramp provides access to Columbia (via BLP WB) from southbound US 29. A cloverleaf ramp, located in the southwest quadrant of the interchange, with a spur connection to a signalized intersection with Broken Land Parkway provides access to Columbia from northbound US 29. A directional ramp located in the southwest quadrant from eastbound Broken Land Parkway provides return access to US 29 southbound. A cloverleaf ramp located in the southeast quadrant provides return access to northbound US 29.

Little Patuxent Parkway (LPP) is the "Main Street" of the Downtown Columbia Town Center. LPP is a four to six lane divided roadway with separate left and right turn lanes at major intersections. The section of LPP between the two intersections with Governor Warfield Parkway is classified by the Howard County General Plan as a minor arterial roadway. East and west of Governor Warfield Parkway, LPP is classified by the Howard County General Plan as an intermediate arterial.

Broken Land Parkway provides access to downtown Columbia from MD 32 and US 29 to the south and east. Broken Land Parkway is a four-lane, divided roadway that is classified by the Howard County General Plan as an intermediate arterial.

Governor Warfield Parkway intersects Little Patuxent Parkway to the north and to the west of the Mall in Columbia, forming a loop around Downtown Columbia. Governor Warfield Parkway is a four-lane, divided roadway in Downtown Columbia and is classified by the Howard County General Plan as an intermediate arterial.

Planned and Programmed Improvements.

The 2010 Howard County General Plan Amendment includes a new connection from the interchange of US 29 and Broken Land Parkway to the intersection of the East Mall Entrance and Little Patuxent Parkway. This project, known as the North-South Connector, includes the reconfiguration of LPP just to the south of the East Mall Entrance to introduce a "T" intersection, and a city block configuration. This project is in the feasibility study phase, but is expected to be built prior to the proposed third US 29 interchange.

The 2000 Howard County General Plan includes the extension of Hickory Ridge Road eastward from its present terminus at Broken Land Parkway to the Little Patuxent Parkway.

The Maryland Consolidated Transportation Program (CTP) includes a project, jointly funded by the Maryland State Highway Administration and Howard County, to widen northbound US 29 by one lane from MD 32 north to MD 175. Included in this project is the closure of three u-turn/crossovers and two residential streets on US 29 between Broken Land Parkway and the MD 175/LPP interchanges.

No other new road improvements are known to be currently programmed in the study area.

All of these planned improvements are assumed to be constructed and in service for the future year traffic analysis of the proposed third US 29 interchange developed as part of this feasibility study.

III. Traffic Volumes/Conditions

To forecast traffic volumes on the road network in the Downtown Columbia area, a sub-area travel demand forecasting model was developed. The model was then applied to analyze the traffic demands on the study area road network in the future year (2035). The main purpose of the analysis was to evaluate the operational condition of the roadway network, identify road segments forecasted to be congested in the future year, and also forecast the traffic volumes of potential road projects. The travel demand forecasting model and forecasting of traffic volumes of potential road projects, including the proposed third US 29 Interchange was presented in the Columbia Town Center Travel Demand Model and Traffic Forecast Report (WITH 7C UPDATE AND REVISED ALTERNATIVES), dated May 2011 prepared by Sabra Wang & Associates, Inc. and Vision Engineering & Planning for the Howard County Departments of Public Works and Planning and Zoning.

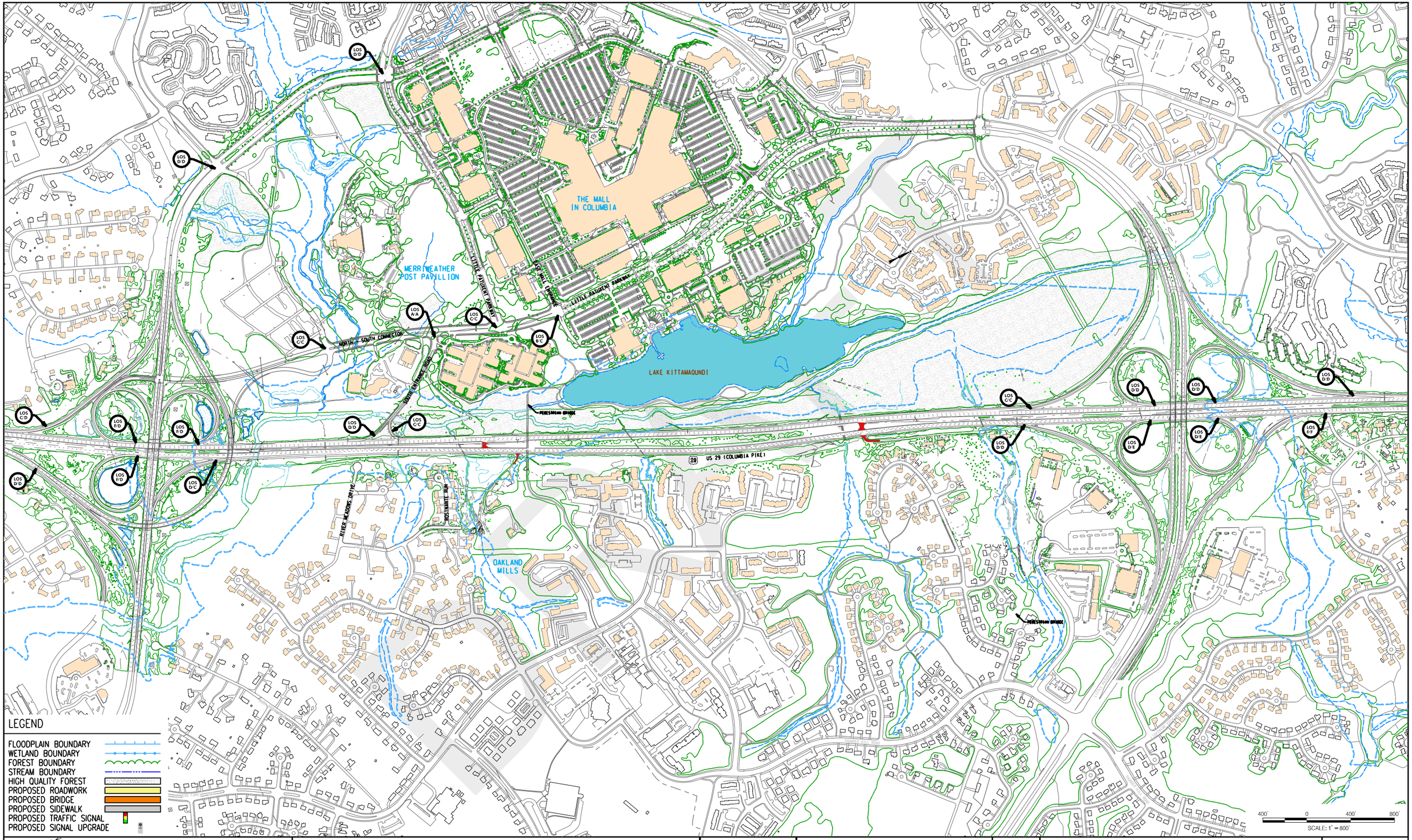
The model incorporated socio-economic characteristics (number of households, population, number of employees by type, etc.) of the proposed redevelopment of Downtown Columbia in accordance with the General Plan Amendment. The socio-economic characteristics data (Round 7C) was provided by the Howard County Department of Planning and Zoning Research Division. In addition, the model incorporated projected traffic data at each major external highway facility (stations) cutting through the boundary of the model area. The traffic demand at these external stations depends on the regional growth of the Baltimore-Washington Metropolitan Area, not just on the development within the study area at these external stations. The projected traffic data (growth rates) were obtained from the Baltimore Metropolitan Council (BMC) Regional Model.

Utilizing the forecasted traffic volumes presented in the Columbia Town Center Travel Demand Model and Traffic Forecast Report, Wells & Associates, LLC performed traffic analysis post-processing. This analysis was performed using Synchro Version 7 and SIDRA

traffic analysis software to determine the intersection capacities (peak volumes, LOS, delays, queues) for the existing downtown Columbia roadway network, and with the current planned and programmed transportation system improvements in the future design year of 2035. Wells and Associates then analyzed the roadway network with the addition of the proposed third US 29 interchange feasibility concepts for the design year of 2035. The results of the intersection capacity traffic analysis performed by Wells & Associates for existing conditions, and the future design year (2035) for each of the conceptual interchange alternatives are included in **Appendix A** of this report.

With the projected revitalization and redevelopment of Downtown Columbia and providing only the current planned and programmed transportation system improvements to the existing Downtown Columbia roadway network and access links, the loop ramps in the Broken Land Parkway/US 29 interchange will operate at a Level of Service (LOS) "F" in the future design year of 2035. In addition, the existing MD 175/LPP and US 29 interchange loop ramps servicing US 29 northbound will operate at LOS "D" to "F".

According to the traffic analysis, the proposed third US 29 interchange would help reduce the traffic demand on the existing US 29 interchanges to the north and south of the proposed third US 29 interchange by adding in a new route directly to Downtown Columbia. The conceptual alternatives that include a connection to the Oakland Mills neighborhood would not only allow local traffic to and from that neighborhood, but also allow traffic coming from east of Oakland Mills that would normally utilize LPP or Broken Land Parkway to now use the neighborhood streets and the connection that the new interchange provides. The degree of traffic volume reduction depends mostly on the number of movements the new interchange provides, with access to northbound US 29 and Oakland Mills providing the greatest reduction. The existing US 29 interchanges have limited opportunities for improvement on their own without requiring major reconstruction, as they are constrained by their cloverleaf configuration. With the proposed third US 29 full directional interchange and the connection to Oakland Mills, the failing LOS "F" operations in the existing US 29 interchanges are improved to LOS "C" in the design year of 2035.



Howard County
MARYLAND

WALLACE MONTGOMERY

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Feasibility Study Only

DESIGN	SHD
DRAWN	SHD
CHECK	RLM

DOWNTOWN COLUMBIA & US 29
INTERCHANGE FEASIBILITY STUDY

NO-BUILD ALTERNATIVE
DESIGN YEAR 2035

DATE: JANUARY 2012 SCALE: 1" = 800'

FIGURE
1

IV. Proposed US 29 Interchange Configuration & Geometrics

All of the conceptual alternatives presented in this report were designed utilizing AASHTO's A Policy on Geometric Design of Highways and Streets, 4th Edition dated 2001, which is the current standard of design for Maryland state roads, as well as the Howard County Design Manual, Volume III, Roads and Bridges, dated October 2006. The connector roads have been designated as a "Boulevard", and functionally classified as a Major Collector in the Downtown Columbia Plan – A General Plan Amendment. In accordance with this classification and the aforementioned design standards, a design speed of 40 mph was utilized for the connector roads.

The connector road from the East Mall Entrance/Little Patuxent Parkway to the proposed third US 29 interchange will consist of a closed section roadway with four through travel lanes (two in each direction). Since most of these roadways will be on bridge structures, care has been taken to reduce the width of the roadway as much as possible, while still providing adequate facilities, meeting design criteria and allowing for projected traffic volumes. The following lane widths were used in the development of the feasibility study conceptual alternatives:

- Lanes not adjacent to curb or bridge parapet: 11 ft width
- Lanes adjacent to curb or bridge parapet: 12 ft width
- Raised median: 4 ft width
- Multiuse pedestrian and bicycle sidewalk: 8 ft width with 2 ft roadway separation (included with Oakland Mills connection alternatives only)

The conceptual interchange alternatives were developed using AASHTO design guidelines for the geometry. The proposed interchange was designed to accommodate a passenger vehicle aside a WB-50 (Intermediate Semitrailer), or a single WB-67 (Interstate Semitrailer). The lengths and number of turning and traffic storage lanes were designed utilizing the traffic analysis performed by Wells & Associates. The interchange off and on ramps were designed to AASHTO guidelines with standard taper lengths, acceleration and deceleration lengths, configurations and grades. The exit ramps for US 29 have been designed with a 1300 foot lane parallel to US 29, which allows drivers to migrate into the exit lane and start to slow down. After the parallel section, the exit lanes diverge from US 29, and a 650 foot deceleration section starts. This is enough distance for vehicles to slow from 55 mph to a full stop. Immediately following this deceleration area is the storage area. The storage length varies according to the amount of projected traffic, but generally is 650 feet long. This length has been provided to accommodate the projected number of vehicles stopped at the intersection during the peak hour.

The intersection of LPP and the East Mall Entrance has been identified as the western terminus of the proposed third US 29 interchange access road. As part of the North-South Connector project, this intersection would be reconfigured to introduce a "T" intersection to the south of the East Mall Entrance. This configuration has been used for all the conceptual alternatives developed as part of this feasibility study. The proposed third US 29 interchange will bring an increased amount of traffic to this intersection requiring improvements to all approaches to this intersection. Each alternative has been developed to provide the necessary improvements based on the future travel demand.

Pedestrian and bicycle facilities have been included for all the conceptual alternatives that provide a direct connection to the Oakland Mills neighborhood. This connection has been provided by including a shared use path on the south side of the road. For all other conceptual alternatives, the existing bicycle/pedestrian trail and structure over US 29 is assumed to remain in place at the current location.

Alternative A – Half Diamond Interchange with Left Exit/Entrance Ramps to Northbound US 29

Alternative A is a half diamond interchange with access to the northbound US 29. The exit and entrance ramps for US 29 are proposed from the left lanes of the northbound US 29 travel lanes, in the existing median.

Roadway Configuration

From the intersection with the East Mall Entrance and LPP, the existing ground drops in elevation approximately 50 feet to Lake Kittamaqundi. The interchange access road would follow the topography of the existing ground for part of the way, with the bridge structure starting approximately 150 feet from the west side of the lake. The bridge abutment for the structure would be located near where the existing slope starts falling rapidly to the lake, close to the 100-year floodplain elevation.

The interchange access road would continue straight across the lake to the eastern shore of Lake Kittamaqundi. The roadway continues as a proposed bridge structure on this shoreline to minimize impact to the floodplain and parkland, while crossing the Little Patuxent River. The access road would rise in elevation approximately 10 feet to cross the southbound lanes of US 29 to provide the required 16'-9" clearance over US 29. This alternative proposes the interchange ramp to be constructed using the existing median of US 29. In order to minimize impact to existing US 29, a series of retaining walls are included for the ramps and intersection with the access road.

Access to the southbound lanes of US 29 would continue to be provided by South Entrance Road, which may be improved to allow for the additional traffic volumes. South Entrance Road is approximately 2000 feet south of the proposed interchange, and together with this interchange configuration, would allow for full access to US 29 from Downtown Columbia.

Transit Integration

This alternative would not provide separate facilities for transit vehicles, but would allow buses to utilize the new connection with US 29. This connection may improve bus rapid transit opportunities and operations by providing a direct connection between US 29 and Downtown Columbia.

Pedestrian Access

Pedestrian and bicycle access has not be provided for this alternative. Access to Oakland Mills would be via the current pedestrian bridge, located south of this proposed interchange. The interchange ramps would not impact the pedestrian bridge, which could remain in place and in operation with the alternative.

Traffic Effects

This interchange would be approximately 4300 feet from the interchange of Broken Land Parkway and US 29. AASHTO design criteria recommends an interchange separation of one

mile in urban environments, but allows for shorter spacing if needed. The recommended spacing assures enough time for drivers to make any maneuvers to either enter or exit without conflicts from other interchanges. This alternative has the entrance and exit ramps from US 29 on the left side, which introduces a weaving situation between the proposed interchange and the Broken Land interchange. Traffic analysis shows that this weave will operate at a satisfactory level of service.

With the addition of this interchange, less traffic is anticipated to use the Broken Land Parkway interchange when entering Downtown Columbia from the south, and less traffic is anticipated to use the MD 175/LPP interchange when leaving Downtown Columbia headed north. This improves the level of service in the ramp from eastbound Broken Land Parkway to northbound US 29 from an LOS "F" to LOS "D". The LOS on the ramp from Little Patuxent parkway to US 29 north would also improve to a LOS "D".

The addition of this interchange would not provide improved access for the traffic on southbound US 29 entering Downtown Columbia via the South Entrance Road. The intersection of South Entrance Road at the North-South Connector would operate at a LOS "F" during the morning peak. This is due to the growth in traffic, as well as the close proximity of this intersection to the new LPP/LPP "T" intersection. The LOS at this intersection could be improved by prohibiting left turns from southbound North-South Connector, requiring them to continue on the North-South Connector to access southbound US 29 via the Broken Land Parkway interchange.

The proposed intersection upgrade at LPP and the East Mall Entrance would function at a LOS "D" during the afternoon peak hour, with minor upgrades to the intersection. The proposed interchange would also operate at a satisfactory LOS.

Structural considerations

This alternative will require a structure approximately 830 foot long. For a span of this distance, a steel girder bridge is recommended. The proposed bridge and roadway alignment would be straight and cross Lake Kittamaqundi requiring two in-water piers due to the span distance. Painting of the steel girders would be recommended since they will be visible from Downtown Columbia, on the pedestrian path along the lake and to traffic on US 29. Minimal disturbance to the wetland area is anticipated, but some shadowing effects may need to be analyzed further during the next phase of study as part of the permitting process.

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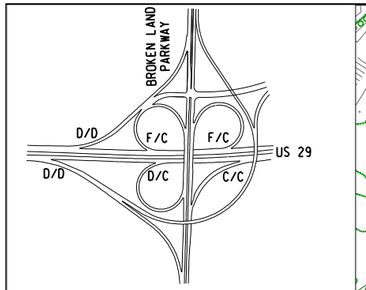
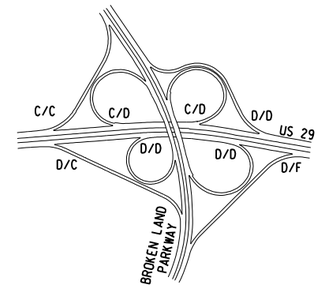


BROKEN LAND PARKWAY / US 29
2035 LEVELS OF SERVICE



LITTLE PATUXENT PARKWAY / US 29
2035 LEVELS OF SERVICE

MERRIWEATHER POST PAVILLION

LITTLE PATUXENT PARKWAY

EAST MALL ENTRANCE

LITTLE PATUXENT PARKWAY

LOS F/D

LOS C/C

LOS C/D

NORTH - SOUTH CONNECTOR

SOUTH ENTRANCE ROAD

LAKE KITTAMAQUNDI

LOS C/C

LOS D/C

PEDESTRIAN BRIDGE TO REMAIN

CROSSOVER TO BE CLOSED BY OTHERS

US 29 (COLUMBIA PIKE)

29

ACCESS TO BE CLOSED BY OTHERS

LOS B/B

RIVER MEADOWS DRIVE

ROSINANTE RUN

GALES LANE

PUSHCART WAY

OAKLAND MILLS

STEVENS FOREST ROAD

LEGEND

- FLOODPLAIN BOUNDARY
- WETLAND BOUNDARY
- FOREST BOUNDARY
- STREAM BOUNDARY
- HIGH QUALITY FOREST
- PROPOSED ROADWORK
- PROPOSED BRIDGE
- PROPOSED SIDEWALK
- PROPOSED TRAFFIC SIGNAL
- PROPOSED SIGNAL UPGRADE

150' 0 150' 300'
SCALE: 1" = 300'

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DOWNTOWN COLUMBIA & US 29 INTERCHANGE FEASIBILITY STUDY

CONCEPT A – HALF DIAMOND INTERCHANGE
LEFT EXIT ON NORTHBOUND US 29

DATE: JANUARY 2012 SCALE: 1" = 300'

FIGURE 2

Alternative B – Half Diamond Interchange with Right Exit to Northbound US 29

Alternative B is a half diamond interchange with access to US 29 northbound only. The entrance and exit onto US 29 would be to the right of the travel lanes.

Roadway Configuration

The interchange access road and the improvements to the intersection of LPP and the East Mall Entrance proposed under Alternative B are the same as Alternative A. The bridge over Lake Kittamaqundi has been designed with a gradual curve to perpendicularly cross US 29. This improves the operation of the proposed intersection and the ramps for US 29 by increasing the sight distance and allowing vehicle paths that are easier to maneuver. The curved roadway over the lake will require a higher cost for the curved girders for the structure.

This alternative provides an entrance and exit ramp to northbound US 29 on the east side of US 29. However, the topography on the east side of US 29 provides some challenges and limitations for the proposed alternative. Along the east side of US 29, there is a steep rocky cliff that raises 40 feet high, located only 15 feet east of northbound US 29. To avoid the higher costs and impacts required to blast the rock, this alternative proposes relocating the northbound lanes of US 29 to the west into the existing median. This will allow the proposed interchange ramps to be located within the footprint of the existing northbound lanes. The realignment of northbound US 29 adds additional cost for this alternative, and will require a greater level of maintenance of traffic during construction.

The existing northbound lanes of US 29 are approximately 10 feet higher than the existing southbound lanes. During the realignment of northbound US 29, the elevation of the proposed mainline US 29 roadway would be lowered slightly to be closer to the elevation of the existing southbound US 29 mainline. If US 29 is not lowered, the interchange access bridge would need to be 10 feet higher than the bridge shown in Alternative A, since the bridge would need to span across the northbound lanes of US 29.

Transit Integration

This alternative would not provide separate facilities for transit vehicles, but would allow buses to utilize the new connection with US 29. This connection may improve bus rapid transit opportunities by providing a direct connection between US 29 and Downtown Columbia.

Pedestrian Access

Pedestrian and bicycle access has not be provided for this alternative. Access to Oakland Mills would be via the current pedestrian bridge, located south of this proposed interchange. This bridge currently has a single pier in the median of US 29, which may be impacted by the realignment of the northbound lanes of US 29. The pedestrian bridge could remain in place and in operation but may require some minor structural modifications based on the realignment of northbound US 29.

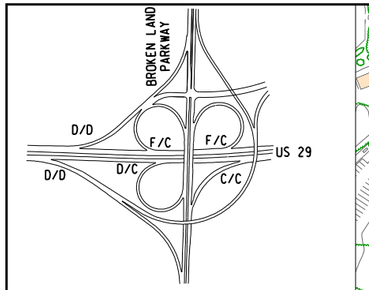
Traffic Effects

Traffic operations for this alternative are functionally similar to Alternative A. The only difference is the entrance and exit lanes are on the right of US 29 northbound. Under this alternative, a continuous exit/entrance lane is proposed with the Broken Land Parkway

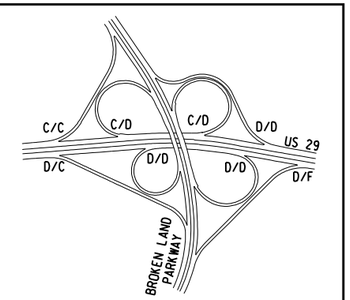
interchange, thereby eliminating the right entrance and left exit weave concerns identified for Alternative A. The overall traffic analysis shows no difference in level of service between Alternatives A and B.

Structural considerations

This alternative will require a structure approximately 865 feet long. For a span of this distance, a steel girder bridge is recommended. The proposed bridge and roadway alignment would be curved and cross Lake Kittamaqundi requiring two in-water piers. Painting of the steel girders would be recommended since they will be visible from Downtown Columbia, on the pedestrian path along the lake and traffic on US 29. Minimal disturbance to the wetland area is anticipated, but some shadowing effects may need to be analyzed further during the next phase of study as part of the permitting process.



BROKEN LAND PARKWAY / US 29
2035 LEVELS OF SERVICE



LITTLE PATUXENT PARKWAY / US 29
2035 LEVELS OF SERVICE

MERRIWEATHER POST PAVILLION

LITTLE PATUXENT PARKWAY

EAST MALL ENTRANCE

LITTLE PATUXENT PARKWAY

LOS F/D

LOS C/C

LOS C/D

NORTH - SOUTH CONNECTOR

SOUTH ENTRANCE ROAD

LAKE KITTAMAQUNDI

LOS C/C

LOS D/C

PEDESTRIAN BRIDGE TO REMAIN

CROSSOVER TO BE CLOSED BY OTHERS

29

ACCESS TO BE CLOSED BY OTHERS

LOS B/B

US 29 (COLUMBIA PIKE)

ROSINANTE RUN

OAKLAND MILLS

LEGEND

- FLOODPLAIN BOUNDARY
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DOWNTOWN COLUMBIA & US 29
INTERCHANGE FEASIBILITY STUDY

CONCEPT B – HALF DIAMOND INTERCHANGE
RIGHT EXIT ON NORTHBOUND US 29

DATE: JANUARY 2012 SCALE: 1" = 300'

FIGURE 3

Alternative C – Full Inside Diamond Interchange

Alternative C is a full diamond interchange with access to both northbound and southbound US 29. Left exit and entrance ramps are proposed for US 29 and would be located in the median of existing US 29.

Roadway Configuration

The interchange access road and the improvements to the intersection of LPP and the East Mall Entrance would be greater than the previous alternatives, since this alternative has full access to northbound and southbound US 29. Since the proposed interchange is located in the median of US 29, the proposed structure only needs to span the southbound lanes of US 29.

With the full movement interchange for US 29, South Entrance Road would be redundant and would introduce a weaving problem. Therefore is recommended as part of the conceptual alternative to be closed. Closing south entrance road would eliminate any weaving conflicts and provide clear direction for drivers entering and exiting Downtown Columbia.

Transit Integration

This alternative would not provide separate facilities for transit vehicles, but would allow buses to utilize the new connection with US 29. This connection may improve bus rapid transit opportunities and operations by providing a direct connection between US 29 and Downtown Columbia.

Pedestrian Access

Pedestrian and bicycle access has not be provided for this alternative. Access to Oakland Mills would be via the current pedestrian bridge, located south of this proposed interchange. This bridge currently has a single pier in the median of US 29, which may be impacted by the proposed ramps on US 29. The pedestrian bridge could remain in place and in operation but may require some minor structural modifications based proposed interchange.

Traffic Effects

This interchange would be approximately 4100 feet north of the interchange of Broken Land Parkway and US 29. This alternative has the entrance and exit ramps from US 29 on the left side, so it would have a high speed weave between the proposed interchange and the Broken Land Parkway interchange. Traffic analysis shows that this weave will operate at an acceptable level of service.

With the addition of this interchange, less traffic is forecasted to use the Broken Land Parkway and MD 175/LPP interchanges when entering and exiting Downtown Columbia. The LOS on the ramp from LPP to US 29 north would improve to a LOS "D", but no other substantial improvements to LOS are reflected in the traffic analysis.

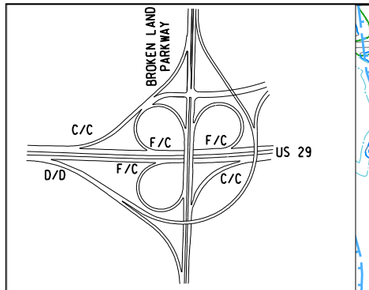
The addition of this interchange would allow South Entrance Road to be closed to traffic from US 29, thus eliminating a major intersection with the North-South Connector. The other intersections on the North-South Connector would continue to operate at an acceptable LOS.

The proposed intersection at LPP and the East Mall Entrance would operate at a LOS "D" during the morning peak hour, with minor upgrades to the intersection. The proposed interchange would also operate at a satisfactory LOS. Since this interchange includes full

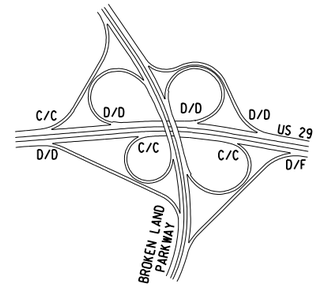
access to US 29, more traffic would be traveling through the intersection of Little Patuxent Parkway and the East Mall Entrance, therefore longer storage lanes have been identified and included as part of this alternative. The traffic analysis predicts that approximately twice the amount of traffic will utilize the full interchange alternative as compared to the half diamond interchange in Alternative A and B. This additional travel demand will also require improvement to the adjacent LLP/North-South Connector intersection. These improvements are included as part of Alternative C.

Structural considerations

This alternative will require a structure approximately 765 feet long. For a span of this distance, a steel girder bridge is recommended. The proposed bridge and roadway alignment would be curved and cross Lake Kittamaqundi requiring two in-water piers. Painting of the steel girders would be recommended since they will be visible from Downtown Columbia, on the pedestrian path along the lake and traffic on US 29. Minimal disturbance to the wetland area is anticipated, but some shadowing effects may need to be analyzed further during the next phase of study as part of the permitting process.



BROKEN LAND PARKWAY / US 29
2035 LEVELS OF SERVICE



LITTLE PATUXENT PARKWAY / US 29
2035 LEVELS OF SERVICE

MERRIWEATHER POST PAVILLION

LITTLE PATUXENT PARKWAY

EAST MALL ENTRANCE

LITTLE PATUXENT PARKWAY

LOS C/C

LOS C/C

NORTH - SOUTH CONNECTOR

SOUTH ENTRANCE ROAD

LOS D/E

LAKE KITTAMAQUNDI

ENTRANCE/EXIT CLOSED

CROSSOVER TO BE CLOSED BY OTHERS

PEDESTRIAN BRIDGE TO REMAIN

CROSSOVER TO BE CLOSED BY OTHERS

US 29 (COLUMBIA PIKE)

29

ACCESS TO BE CLOSED BY OTHERS

LOS D/B

ACCESS TO BE CLOSED BY OTHERS

RIVER MEADOWS DRIVE

ROSINANTE RUN

LEGEND

- FLOODPLAIN BOUNDARY
- WETLAND BOUNDARY
- FOREST BOUNDARY
- STREAM BOUNDARY
- HIGH QUALITY FOREST
- PROPOSED ROADWORK
- PROPOSED BRIDGE
- PROPOSED SIDEWALK
- PROPOSED TRAFFIC SIGNAL
- PROPOSED SIGNAL UPGRADE

200' 0 200' 400'
SCALE: 1" = 400'

Howard County MARYLAND

WALLACE MONTGOMERY

PRELIMINARY
Subject To Revision
Feasibility Study Only

DESIGN	SHD
DRAWN	SHD
CHECK	RLM

DOWNTOWN COLUMBIA & US 29
INTERCHANGE FEASIBILITY STUDY

CONCEPT C
FULL INSIDE DIAMOND INTERCHANGE

DATE: JANUARY 2012 SCALE: 1"=400'

FIGURE 4

Alternative D – Full Diamond Interchange

Alternative D is a full diamond interchange with access to both northbound and southbound US 29. The right lane exit and entrance ramps are proposed for US 29, requiring the relocation of both northbound and southbound US 29 into the existing median.

Roadway Configuration

The interchange access road and the improvements to the intersection of LPP and the East Mall Entrance are similar to those provided under Alternative C. This alternative is shown with a straight bridge, since the interchange is separated into a single "T" intersection for access to northbound US 29. Directional ramps are included for access to and from southbound US 29. This configuration provides smoother traffic flow with fewer conflicts than Alternative B.

With the full movement interchange for US 29, South Entrance Road would be redundant and would introduce a weaving problem. Therefore is recommended as part of the conceptual alternative to be closed. Closing south entrance road would eliminate any weaving conflicts and provide clear direction for drivers entering and exiting Downtown Columbia.

Transit Integration

This alternative would not provide separate facilities for transit vehicles, but would allow buses to utilize the new connection with US 29. This connection may improve bus rapid transit opportunities by providing a direct connection between US 29 and Downtown Columbia.

Pedestrian Access

Pedestrian and bicycle access would not be provided along this new interchange. Access to Oakland Mills would be via the current pedestrian bridge, located south of this proposed interchange. This bridge currently has a single pier in the median of US 29, which may be impacted by the realignment of the northbound and southbound lanes of US 29. The pedestrian bridge could remain in place and in operation with some minor structural modifications.

Traffic Effects

For Alternative D, the traffic operations for the surrounding intersections and interchanges are the same as Alternative C. However, the intersection for the proposed interchange with US 29 operates at a LOS "A" for both the AM and PM peak hours. The improved level of service is a result of the need for a signalized intersection for only northbound US 29 traffic. Southbound traffic is accommodated by a direct movement.

Structural considerations

This alternative will require a structure approximately 945 feet long. For a span of this distance, a steel girder bridge is recommended. The proposed bridge and roadway alignment would be straight and cross Lake Kittamaqundi requiring two in-water piers. Painting of the steel girders would be recommended since they will be visible from Downtown Columbia, on the pedestrian path along the lake and traffic on US 29. Minimal disturbance to the wetland area is anticipated, but some shadowing effects may need to be analyzed further during the next phase of study as part of the permitting process.

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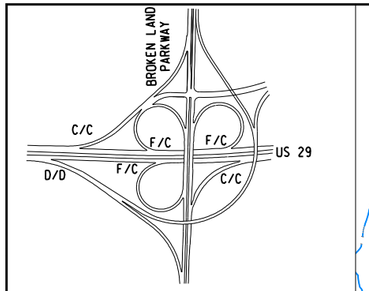
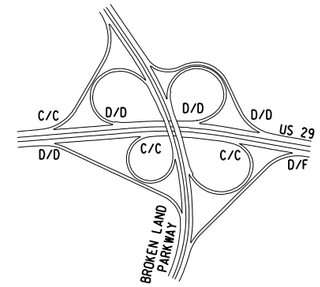


BROKEN LAND PARKWAY / US 29
2035 LEVELS OF SERVICE



LITTLE PATUXENT PARKWAY / US 29
2035 LEVELS OF SERVICE

MERRIWEATHER POST PAVILLION

LITTLE PATUXENT PARKWAY

EAST MALL ENTRANCE

LITTLE PATUXENT PARKWAY

LOS C/C

NORTH - SOUTH CONNECTOR

LOS D/E

SOUTH ENTRANCE ROAD

ENTRANCE/EXIT CLOSED

PEDESTRIAN BRIDGE TO REMAIN

CROSSOVER TO BE CLOSED BY OTHERS

SHARED ENTRANCE & EXIT LANE

ACCESS TO BE CLOSED BY OTHERS

LOS A/A

US 29 (COLUMBIA PIKE)

CROSSOVER TO BE CLOSED BY OTHERS

ACCESS TO BE CLOSED BY OTHERS

LEGEND

- FLOODPLAIN BOUNDARY
- WETLAND BOUNDARY
- FOREST BOUNDARY
- STREAM BOUNDARY
- HIGH QUALITY FOREST
- PROPOSED ROADWORK
- PROPOSED BRIDGE
- PROPOSED SIDEWALK
- PROPOSED TRAFFIC SIGNAL
- PROPOSED SIGNAL UPGRADE

ROSINANTE RUN

OAKLAND MILLS

150' 0 150' 300'
SCALE: 1" = 300'

Howard County MARYLAND

WALLACE MONTGOMERY

PRELIMINARY
Subject To Revision
Feasibility Study Only

DESGN	SHD
DRAWN	SHD
CHECK	RLM

DOWNTOWN COLUMBIA & US 29 INTERCHANGE FEASIBILITY STUDY

CONCEPT D – COMPRESSED DIAMOND INTERCHANGE

DATE: JANUARY 2012 SCALE: 1" = 300'

FIGURE 5

Alternative E – Directional Flyover to the North

Alternative E is a directional flyover interchange providing US 29 access to and from the north. Access to US 29 is provided by an exit from southbound 29 and an entrance ramp to northbound US 29. Both the exit and entrance ramps are provided as left exits from US 29.

Roadway Configuration

The improvements to the intersection of LPP and the East Mall Entrance would be similar to Alternative D. The flyover bridge has been designed for travel speeds up to 50 mph, with only one lane and a wide shoulder in each direction. Although the bridge would be longer that other alternatives, and would incorporate a sweeping curve, the width of the structure is narrower. The overall cost is similar to the previous alternatives despite the geometric difference. Since the interchange is in the median of US 29, the bridge only needs to span the southbound lanes. Consequently, the bridge can be 10 feet lower in elevation than the structure for Alternative D.

This configuration would not offer full access to US 29, as it has no direct access from northbound US 29. This interchange, along with the Broken Land Parkway and US 29 interchange, would handle all traffic in and out of Downtown Columbia. The flyover would be a fast and efficient interchange for traffic entering and leaving Downtown Columbia to the north. Access to southbound US 29 will continue to be serviced by the South Entrance Road.

Transit Integration

This alternative would not provide separate facilities for transit vehicles, but would allow buses to utilize the new connection with US 29. This connection may improve bus rapid transit opportunities by providing a direct connection between US 29 and Downtown Columbia.

Pedestrian Access

Pedestrian and bicycle access would not be provided along this new interchange. Access to Oakland Mills would be via the current pedestrian bridge, located south of this proposed interchange.

Traffic Effects

This interchange would enter US 29 approximately 3900 feet from the center of the interchange of Little Patuxent Parkway and US 29. This alternative has the entrance and exit from US 29 on the left side, so it would have a high speed weave between the proposed interchange and the LPP interchange. Traffic analysis shows that this weave will operate at a satisfactory level of service.

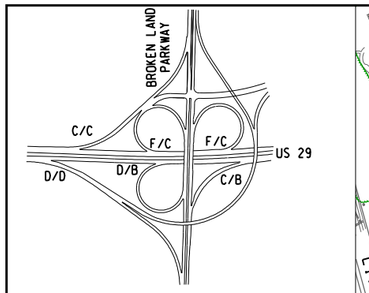
With the addition of this interchange, less traffic will use the LPP interchange when entering Downtown Columbia from the north, and when leaving Downtown Columbia headed north. Minimal improvements would be seen in the LOS of the existing LPP interchange.

The addition of this interchange would allow South Entrance Road to be closed to traffic from southbound US 29, but remain open for traffic from Downtown Columbia to southbound US 29. This would relieve traffic from the intersection with the North-South Connector, which would operate at a LOS “D” during the morning peak. The other intersections on the North-South Connector would operate at a passing LOS.

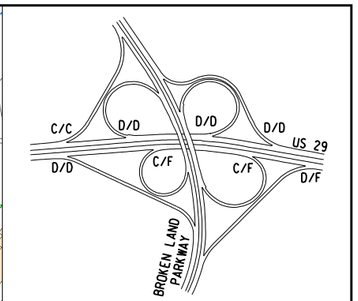
The proposed intersection upgrade at LPP and the East Mall Entrance Road would function at a LOS "E" during the afternoon peak hour, even with major expansion of the intersection. This expansion shows the maximum recommended reconfiguration of this intersection.

Structural considerations

This alternative will require an approximately 1,100 foot long steel girder bridge. The bridge would be curved and cross Lake Kittamaqundi requiring two in-water piers. Painting of the steel girders would be required since they will be visible to the public on the pedestrian path and traffic on US 29. Minimal disturbance to the wetland area is anticipated, but some shadowing effects may need to be analyzed further during the next phase of study as part of the permitting process.



BROKEN LAND PARKWAY / US 29
2035 LEVELS OF SERVICE



LITTLE PATUXENT PARKWAY / US 29
2035 LEVELS OF SERVICE

MERRIWEATHER POST PAVILION

LITTLE PATUXENT PARKWAY

EAST MALL ENTRANCE

LITTLE PATUXENT PARKWAY

LOS D/C

NORTH - SOUTH CONNECTOR

LOS D/C

LOS D/E

SOUTH ENTRANCE ROAD

LAKE KITTAMAQUNDI

PEDESTRIAN BRIDGE TO REMAIN

CROSSOVER TO BE CLOSED BY OTHERS

CROSSOVER TO BE CLOSED BY OTHERS

29

ACCESS TO BE CLOSED BY OTHERS

US 29 (COLUMBIA PIKE)

ACCESS TO BE CLOSED BY OTHERS

LEGEND

- FLOODPLAIN BOUNDARY
- WETLAND BOUNDARY
- FOREST BOUNDARY
- STREAM BOUNDARY
- HIGH QUALITY FOREST
- PROPOSED ROADWORK
- PROPOSED BRIDGE
- PROPOSED SIDEWALK
- PROPOSED TRAFFIC SIGNAL
- PROPOSED SIGNAL UPGRADE

OAKLAND MILLS

150' 0 150' 300'
SCALE: 1" = 300'

Howard County MARYLAND

WALLACE MONTGOMERY

PRELIMINARY
Subject To Revision
Feasibility Study Only

DESIGN	SHD
DRAWN	SHD
CHECK	RLM

DOWNTOWN COLUMBIA & US 29
INTERCHANGE FEASIBILITY STUDY

CONCEPT E
DIRECTIONAL FLYOVER TO THE NORTH

DATE: JANUARY 2012 SCALE: 1" = 300'

FIGURE 6

Alternative F – Half Diamond Interchange with Left Exits with Northbound US 29 and a Southern Connection to Oakland Mills

Alternative F is a half diamond interchange with access to the northbound lanes of US 29 and a connection through to the Oakland Mills Community. The exit and entrance would be on the left side of the travel lanes on US 29.

Roadway Configuration

This alternative introduces a connection to Oakland Mills. This "southern connection" alternative utilizes the corridor currently used by the pedestrian multi-use trail that connects Downtown Columbia to Oakland Mills. The corridor on the east side of US 29 is currently a wooded area between large apartment building clusters. The multi-use path winds its way through, following the topography, but the new boulevard would follow a fairly straight path, and level out the peaks and valleys. The new boulevard would terminate at the existing intersection of White Acre Road and Stevens Forest Drive.

This "southern connection" to Oakland Mills requires the connector road from Downtown Columbia to follow a different path than the previous alternatives. The roadway would have a large "S" bend, and would avoid bridging over Lake Kittamaqundi completely. However, to avoid impacts to the 100 year floodplain, as well as reducing impacts to streams and forest, the roadway would be on structure for most of the distance. The alternative shows a bridge that starts approximately where the bridges start in previous alternatives.

In the vicinity of the interchange, the northbound and southbound sections of US 29 are close to the same elevation, but the median is narrower than the previous alternatives. Enough space is available to construct the interchange ramps, and maintain a full 12 foot shoulder. The retaining walls would be at the edge of this shoulder.

This configuration allows only access to and from northbound US 29. This interchange along with an upgraded South Entrance Road would provide full access to US 29 from Downtown Columbia. The median width in this area is not wide enough to provide for a full movement interchange.

Transit Integration

This alternative would not provide separate facilities for transit vehicles, but would allow buses to utilize the new connection with US 29, as well as the new direct connection with Oakland Mills. This connection may improve bus rapid transit opportunities by providing a direct connection between US 29, Downtown Columbia and Oakland Mills.

Pedestrian Access

Pedestrian access would be integrated into this new boulevard. The existing pedestrian bridge would be removed, and replaced by an 8 foot wide multi-use path on the south side of the proposed road, with a 2 foot buffer from the edge of the roadway. Having this path follow the new well-traveled roadway may increase pedestrian use, and may help improve the safety concerns identified for the existing multi-use trail.

Traffic Effects

The proposed interchange is approximately 3400 feet, center to center, from the Broken Land Parkway interchange. This is enough space for a single exit lane to the new interchange; however, the exit lane would be directly opposite an entrance from westbound Broken Land

Parkway. The distance from this on ramp is only 1500 feet, measured from the entrance gore to the exit gore of the new interchange. This configuration would allow a vehicle to enter US 29 from Broken Land Parkway, and immediately cross three lanes on US 29 and exit on the new interchange. While this maneuver would be a more direct route to Downtown Columbia, it could be an unsafe high speed maneuver. The weave condition could be eliminated in design, but this study is merely highlighting this conflict.

Having two interchanges so close together is not recommended, even in an urban setting. AASHTO recommends one mile between urban interchanges, but allows for flexibility to space them closer. The multiple entrances and exits slow down the flow of traffic, and provide less efficient traffic flow.

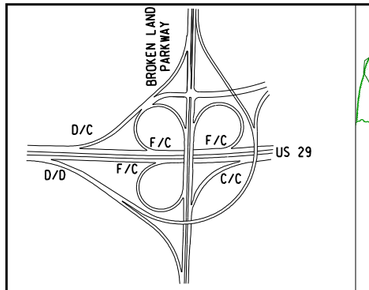
With the addition of this interchange, less traffic will use the Broken Land Parkway interchange when entering Downtown Columbia from the south, and less traffic will use the LPP interchange when leaving Downtown Columbia headed north. In addition, some traffic coming from east of Oakland Mills would divert through the new connection, and would reduce the amount of traffic of LPP headed west. This interchange would improve the LOS on three ramps of the MD 175/LPP interchange with US 29 from LOS "F" to LOS "E". There would be no significant change to the operations of the Broken Land Parkway interchange.

The proposed intersection upgrade at LPP and the East Mall Entrance would function at LOS "D" during the afternoon peak hour, with major upgrades to the intersection. The proposed interchange would operate at a LOS of "F" as designed. This failing level of service is mostly due to the additional vehicles coming from Oakland Mills. Improvement would require a larger intersection with additional turn lanes. However, this design shows the maximum recommended reconfiguration of this intersection.

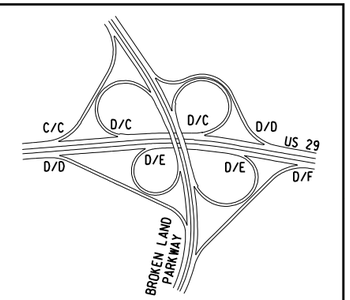
The new connection to Oakland Mills would bring more traffic into the community. This traffic would not only be local traffic, but also traffic that would have used LPP and Broken Land Parkway. This connection would serve as a cut-though for traffic headed to Downtown Columbia or US 29.

Structural considerations

This alternative will require two steel girder bridges totaling approximately 1030 feet. The main bridge would be curved and would not cross Lake Kittamaqundi. Eliminating the two in-water piers will reduce construction time and lower the overall cost for the proposed structure. Painting of the steel girders would be required since they will be visible to the public from Downtown Columbia, the pedestrian path and US 29. Minimal disturbance to the wetland area is expected. Minimal disturbance to the wetland area is anticipated, but some shadowing effects may need to be analyzed further during the next phase of study as part of the permitting process.



BROKEN LAND PARKWAY / US 29
2035 LEVELS OF SERVICE



LITTLE PATUXENT PARKWAY / US 29
2035 LEVELS OF SERVICE

MERRIWEATHER POST PAVILLION

LITTLE PATUXENT PARKWAY

EAST MALL ENTRANCE

LOS C/C

LOS C/C

LOS C/C

NORTH / SOUTH CONNECTOR

SOUTH ENTRANCE ROAD

LOS D/E

LAKE KITTAMAQUNDI

PEDESTRIAN BRIDGE TO BE REMOVED

LOS C/C

LOS C/C

CROSSOVER TO BE CLOSED BY OTHERS

US 29 (COLUMBIA PIKE)

ACCESS TO BE CLOSED BY OTHERS

LOS D/F

29

RIVER MEADOWS DRIVE

ROSINANTE RUN

OAKLAND MILLS

STEVENS FOREST DRIVE

WHITE ACRE ROAD

LEGEND

- FLOODPLAIN BOUNDARY
- WETLAND BOUNDARY
- FOREST BOUNDARY
- STREAM BOUNDARY
- HIGH QUALITY FOREST
- PROPOSED ROADWORK
- PROPOSED BRIDGE
- PROPOSED SIDEWALK
- PROPOSED TRAFFIC SIGNAL
- PROPOSED SIGNAL UPGRADE

400' 0 400' 800'
SCALE: 1" = 400'

Howard County MARYLAND

WALLACE MONTGOMERY

PRELIMINARY
Subject To Revision
Feasibility Study Only

DESIGN	SHD
DRAWN	SHD
CHECK	RLM

DOWNTOWN COLUMBIA & US 29
INTERCHANGE FEASIBILITY STUDY

CONCEPT F – HALF DIAMOND INTERCHANGE
WITH LEFT EXITS AND SOUTHERN CONNECTION

DATE: JANUARY 2012 SCALE: 1" = 400'

FIGURE 7

Alternative G – Half Diamond Interchange with Right Exits to Northbound US 29 and Southern Connection to Oakland Mills

Alternative G is a half diamond interchange with access to the northbound lanes of US 29 and includes a connection through to the Oakland Mills Community. The entrance and exit ramps for northbound US 29 would be to the right of the existing US 29 travel lanes.

Roadway Configuration

This boulevard and interchange alignment for this alternative is similar to Alternative F, with the exception of the entrance and exit lanes on US 29. The topography in this area allows the entrance and exits ramps to be built outside the existing travel lanes, since the land is fairly level.

Transit Integration

This alternative would not provide separate facilities for transit vehicles, but would allow buses to utilize the new connection with US 29, as well as the new direct connection with Oakland Mills. This connection may improve bus rapid transit opportunities and local transit service by providing a direct connection between US 29, Downtown Columbia and Oakland Mills.

Pedestrian Access

Pedestrian access would be integrated into this new boulevard. The existing pedestrian bridge would be removed, and replaced by an 8 foot wide multi-use path on the south side of the proposed road, with a 2 foot buffer from the edge of the roadway. Having this path follow the new well-traveled roadway may increase pedestrian use, and may help improve the safety concerns identified for the existing multi-use trail.

Traffic Effects

This alternative is operates functionally the same as Alternative F. The only difference is the entrance and exit lanes are on the right of the US 29 travel lanes, so weave conflicts are eliminated. Having the access to US 29 on the right side eliminates the weaving conflict with the Broken Land Parkway interchange, and allows for a shared entrance and exit lane between the interchanges. Even though this conflict has been removed, these interchanges are still closer than the recommended spacing.

Structural considerations

This alternative will require an approximately 1030 foot long steel girder bridge. The bridge would be curved and would not cross Lake Kittamaqundi. Eliminating the two in-water piers will reduce construction time and lower the overall cost for the proposed structure. Painting of the steel girders would be required since they will be visible to the public from Downtown Columbia, the pedestrian path and US 29. Minimal disturbance to the wetland area is anticipated, but some shadowing effects may need to be analyzed further during the next phase of study as part of the permitting process.

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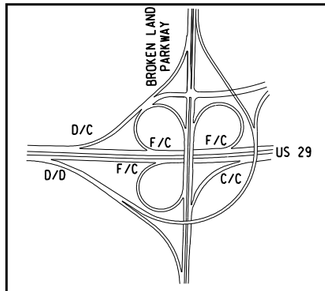
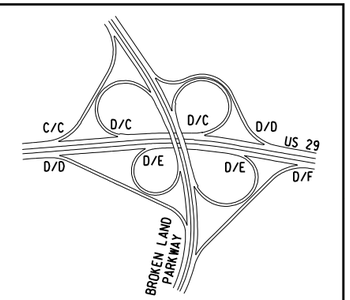


BROKEN LAND PARKWAY / US 29
2035 LEVELS OF SERVICE



LITTLE PATUXENT PARKWAY / US 29
2035 LEVELS OF SERVICE

MERRIWEATHER POST PAVILLION

LITTLE PATUXENT PARKWAY

EAST MALL ENTRANCE

LOS C/C

LOS C/C

LOS C/C

LOS D/E

NORTH - SOUTH CONNECTOR

SOUTH ENTRANCE ROAD

LAKE KITTAMAQUNDI

PEDESTRIAN BRIDGE TO BE REMOVED

LOS C/C

LOS C/C

CROSSOVER TO BE CLOSED BY OTHERS

US 29 (COLUMBIA PIKE)

ACCESS TO BE CLOSED BY OTHERS

LOS D/F

RIVER MEADOWS DRIVE

ROSINANTE RUN

OAKLAND MILLS

STEVENS FOREST DRIVE

WHITE ACRE ROAD

LEGEND

- FLOODPLAIN BOUNDARY
- WETLAND BOUNDARY
- FOREST BOUNDARY
- STREAM BOUNDARY
- HIGH QUALITY FOREST
- PROPOSED ROADWORK
- PROPOSED BRIDGE
- PROPOSED SIDEWALK
- PROPOSED TRAFFIC SIGNAL
- PROPOSED SIGNAL UPGRADE

200' 0 200' 400'
SCALE: 1" = 400'

Howard County MARYLAND

WALLACE MONTGOMERY

PRELIMINARY
Subject To Revision
Feasibility Study Only

DESIGN	SHD
DRAWN	SHD
CHECK	RLM

DOWNTOWN COLUMBIA & US 29
INTERCHANGE FEASIBILITY STUDY

CONCEPT G – HALF DIAMOND INTERCHANGE
WITH RIGHT EXITS AND SOUTHERN CONNECTION

DATE: JANUARY 2012 SCALE: 1" = 400'

FIGURE 8

Alternative H – Half Diamond Interchange with Left Exits to Northbound US 29 and Northern Connection to Oakland Mills

Alternative H is a half diamond interchange with access to the northbound lanes of US 29 and includes direct connection to the Oakland Mills Community. The entrance and exit on northbound US 29 would be to the left of the travel lanes, located in the median of existing US 29.

Roadway Configuration

This boulevard and interchange layout would be similar to Alternative A, but with some slight modifications. First, the boulevard across the lake would bend slightly to the north, to allow the continuation across US 29 to the Oakland Mills community. The bridge would be wider to accommodate the increase of traffic from the Oakland Mills connection. Also, since the bridge would cross both southbound and northbound US 29, it would be higher in elevation.

This alternative allows a connection to the Oakland Mills community through a narrow ravine between large apartment buildings. This ravine currently has a stream and some wetland areas, and is in the 100 year floodplain. These environmental features would require mitigation if they were impacted. The alternative assumes that the roadway would require a significant amount of fill material in the ravine area. There are other design options, however, such as continuing the bridge structure, or constructing retaining walls to contain the fill. Each of these options would add additional cost to the alternative. Based on the conceptual alternative, it is anticipated that one apartment building would be impacted by this alternative, due to the proximity to the roadway and necessary embankment.

This "northern connection" to Oakland Mills terminates at a ninety degree bend in Stevens Forest Drive, where an apartment building driveway enters the road. This intersection would be reconfigured as a "T" intersection with a signal.

Transit Integration

This alternative would not provide separate facilities for transit vehicles, but would allow buses to utilize the new connection with US 29, as well as the new direct connection with Oakland Mills. This connection may improve bus rapid transit and local transit opportunities by providing a direct connection between US 29, Downtown Columbia and Oakland Mills.

Pedestrian Access

Pedestrian access would be integrated into this new boulevard. The existing pedestrian bridge could be removed, although it could remain in place if desired. An 8 foot wide multi-use path on the south side of the proposed road, with a 2 foot buffer from the edge of the proposed roadway, is included a part of this alternative.

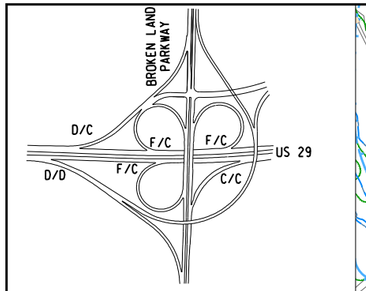
Traffic Effects

In regard to traffic, this alternative operates the same as Alternative F. The only difference is the location of the interchange, which allows more weave distance between the Broken Land interchange.

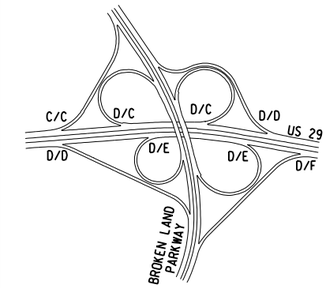
Structural considerations

This alternative will require two steel girder bridges totaling approximately 1025 feet. The bridge would be fairly straight and cross Lake Kittamaqundi requiring two in-water piers.

Painting of the steel girders would be required since they will be visible to the public from Downtown Columbia, on the pedestrian path and by traffic on US 29. Minimal disturbance to the wetland area is expected. Minimal disturbance to the wetland area is anticipated, but some shadowing effects may need to be analyzed further during the next phase of study as part of the permitting process.



BROKEN LAND PARKWAY / US 29
2035 LEVELS OF SERVICE



LITTLE PATUXENT PARKWAY / US 29
2035 LEVELS OF SERVICE

MERRIWEATHER POST PAVILLION
LITTLE PATUXENT PARKWAY
EAST MALL ENTRANCE
LITTLE PATUXENT PARKWAY
LOS C/C
LOS C/C
LOS C/C
LOS D/E
NORTH - SOUTH CONNECTOR
SOUTH ENTRANCE ROAD
LAKE KITTAMAQUNDI
LOS C/C
LOS C/C
LOS C/C
CROSSOVER TO BE CLOSED BY OTHERS
CROSSOVER TO BE CLOSED BY OTHERS
US 29 (COLUMBIA PIKE)
ACCESS TO BE CLOSED BY OTHERS
LOS D/F
ACCESS TO BE CLOSED BY OTHERS
29
RIVER MEADOWS DRIVE
ROSINANTE RUN
OAKLAND MILLS
STEVENS FOREST ROAD
WHITE ACRE BLVD
200' 0 200' 400'
SCALE: 1" = 400'

LEGEND

- FLOODPLAIN BOUNDARY
- WETLAND BOUNDARY
- FOREST BOUNDARY
- STREAM BOUNDARY
- HIGH QUALITY FOREST
- PROPOSED ROADWORK
- PROPOSED BRIDGE
- PROPOSED SIDEWALK
- PROPOSED TRAFFIC SIGNAL
- PROPOSED SIGNAL UPGRADE

Howard County MARYLAND

WALLACE MONTGOMERY

PRELIMINARY
Subject To Revision
Feasibility Study Only

DESIGN	SHD
DRAWN	SHD
CHECK	RLM

DOWNTOWN COLUMBIA & US 29
INTERCHANGE FEASIBILITY STUDY

CONCEPT H – HALF DIAMOND INTERCHANGE
WITH LEFT EXITS AND NORTHERN CONNECTION

DATE: JANUARY 2012 SCALE: 1" = 400'

FIGURE 9

Alternative I – Half Diamond Interchange with Right Exits to Northbound US 29 and Northern Connection to Oakland Mills

Alternative I is a half diamond interchange with access to the northbound lanes of US 29 and a northern connection to the Oakland Mills community. The entrance and exit on northbound US 29 would be to the right of the existing US 29 travel lanes.

Roadway Configuration

This boulevard and interchange configuration would be similar to Alternative H, but with the entrance and exits ramps on the right side of US 29 northbound. The northbound lanes of US 29 would need to be shifted to the west into the median of existing US 29. This shift is required in order to fit these ramps in without blasting away the large rocky cliff just to the east of the US 29, similar to Alternative B.

Transit Integration

This alternative would not provide separate facilities for transit vehicles, but would allow buses to utilize the new connection with US 29, as well as the new direct connection with Oakland Mills. This connection may improve bus rapid transit and local transit opportunities by providing a direct connection between US 29, Downtown Columbia and Oakland Mills.

Pedestrian Access

Pedestrian access would be integrated into this new boulevard. The existing pedestrian bridge could be removed, although it could remain in place if desired. An 8 foot wide multi-use path on the south side of the proposed road, with a 2 foot buffer from the edge of the proposed roadway, is included a part of this alternative.

Traffic Effects

In regard to traffic, this alternative operates functionally the same as Alternative H.

Structural considerations

This alternative will require an approximately 970 foot long steel girder bridge. The bridge would be straight and cross Lake Kittamaqundi requiring two in-water piers. Painting of the steel girders would be required since they will be visible to the public from Downtown Columbia, on the pedestrian path and by traffic on US 29. Minimal disturbance to the wetland area is expected. Minimal disturbance to the wetland area is anticipated, but some shadowing effects may need to be analyzed further during the next phase of study as part of the permitting process.

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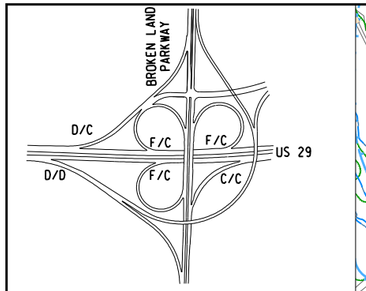
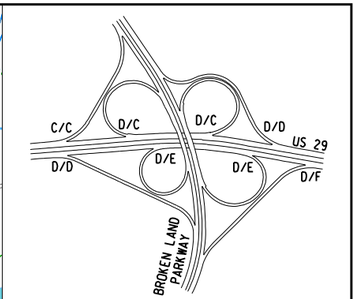


BROKEN LAND PARKWAY / US 29
2035 LEVELS OF SERVICE



LITTLE PATUXENT PARKWAY / US 29
2035 LEVELS OF SERVICE

MERRIWEATHER POST PAVILLION

LITTLE PATUXENT PARKWAY

EAST MALL ENTRANCE

LITTLE PATUXENT PARKWAY

LAKE KITTAMAQUNDI

LOS C/C

LOS C/C

LOS C/C

LOS D/E

LOS C/C

NORTH - SOUTH CONNECTOR

SOUTH ENTRANCE ROAD

LOS C/C

LOS C/C

CROSSOVER TO BE CLOSED BY OTHERS

COSSOVER TO BE CLOSED BY OTHERS

US 29 (COLUMBIA PIKE)

29

ACCESS TO BE CLOSED BY OTHERS

ACCESS TO BE CLOSED BY OTHERS

LOS D/F

RIVER MEADOWS DRIVE

ROSINANTE RUN

OAKLAND MILLS

STEVENS FOREST DRIVE

WHITE ACRE ROAD

LEGEND

- FLOODPLAIN BOUNDARY
- WETLAND BOUNDARY
- FOREST BOUNDARY
- STREAM BOUNDARY
- HIGH QUALITY FOREST
- PROPOSED ROADWORK
- PROPOSED BRIDGE
- PROPOSED SIDEWALK
- PROPOSED TRAFFIC SIGNAL
- PROPOSED SIGNAL UPGRADE

200' 0 200' 400'
SCALE: 1" = 400'

Howard County MARYLAND

WALLACE MONTGOMERY

PRELIMINARY
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Feasibility Study Only

DESIGN	SHD
DRAWN	SHD
CHECK	RLM

DOWNTOWN COLUMBIA & US 29
INTERCHANGE FEASIBILITY STUDY

CONCEPT I – HALF DIAMOND INTERCHANGE
WITH RIGHT EXITS AND NORTHERN CONNECTION

DATE: JANUARY 2012 SCALE: 1" = 400'

FIGURE 10

Alternative J – Single Point Urban Interchange and Northern Connection to Oakland Mills

Alternative J is single point urban interchange (SPUI) with full access to US 29 and a northern connection to the Oakland Mills Community. The entrances and exits on US 29 would be to the right of the existing US 29 travel lanes.

Roadway Configuration

This alternative has full access to northbound and southbound US 29 as well as a connection to the Oakland Mills Community. The on and off ramps on US 29 would be to the right of the existing US 29 travel lanes. In order to avoid impacts to the rocky cliff to the east of US 29, and the floodplain, forest and wetland to the west of US 29, the US 29 travel lanes would be shifted towards each other, and the ramps could be built within the existing roadway footprint.

This interchange has been designed with a single point urban interchange (SPUI) configuration. This SPUI is similar to the diamond interchange used in Alternative D, but it compresses the two intersections into one, which allows concurrent left turns from the US 29 off ramps. With the additional traffic from the Oakland Mills connection, a traditional compressed diamond interchange would operate at a LOS "F". The SPUI improves the interchange's operation to an acceptable LOS "E". However the SPUI would require a wider bridge than a diamond, adding cost to the alternative.

With the full movement interchange for US 29, South Entrance Road would be redundant and would introduce a weaving problem. Therefore is recommended as part of the conceptual alternative to be closed. Closing South Entrance Road would eliminate any weaving conflicts and provide clear direction for drivers entering and exiting Downtown Columbia.

Transit Integration

This alternative would not provide separate facilities for transit vehicles, but would allow buses to utilize the new connection with US 29, as well as the new direct connection with Oakland Mills. This connection may improve bus rapid transit and local transit opportunities by providing a direct connection between US 29, Downtown Columbia and Oakland Mills.

Pedestrian Access

Pedestrian access would be integrated into this new boulevard. The existing pedestrian bridge could be removed, although it could remain in place if desired. An 8 foot wide multi-use path on the south side of the proposed road, with a 2 foot buffer from the edge of the proposed roadway, is included a part of this alternative.

Traffic Effects

With the addition of this interchange, less traffic will use the Broken Land Parkway interchange and the Little Patuxent Parkway interchange when entering or leaving Downtown Columbia. This improves the level of service on each of the three on-ramps in the Broken Land Parkway interchange to either LOS "D" or "E". Also, two of the on-ramps in the Broken Land interchange would improve to LOS "D".

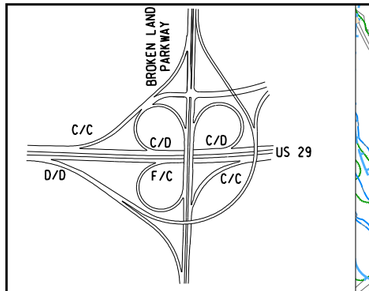
The addition of this interchange would allow South Entrance Road to be closed to traffic from US 29, thus eliminating a major intersection from the North-South Connector. The other intersections on the North-South Connector would operate at an acceptable LOS.

The proposed intersection upgrade at LPP and the East Mall Entrance would function at a LOS "D" during the afternoon peak hour, with major upgrades to the intersection. The proposed interchange would also operate at an acceptable LOS "E". The acceptable LOS of the interchange is due to the SPUI configuration, as it is an efficient system to handle the projected volume of traffic.

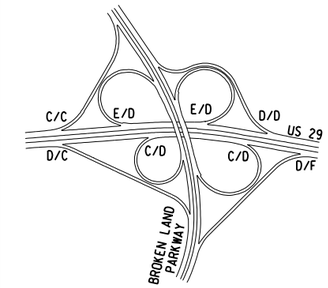
The new connection to Oakland Mills would bring more traffic into the community. This traffic would not only be local traffic, but also traffic that would have used LPP and Broken Land Parkway. This connection would serve as an alternative route for traffic headed to Downtown Columbia or US 29.

Structural considerations

This alternative will require an approximately 970 foot long steel girder bridge. The bridge would be straight and cross Lake Kittamaqundi requiring two in-water piers. Painting of the steel girders would be required since they will be visible to the public from Downtown Columbia, on the pedestrian path and traffic on US 29. Minimal disturbance to the wetland area is expected. In order to accommodate this type of interchange, the bridge crossing US 29 would be an unconventional design, requiring short radius curved girders. This configuration would create challenges during construction, and may increase the cost of design and construction.



BROKEN LAND PARKWAY / US 29
2035 LEVELS OF SERVICE



LITTLE PATUXENT PARKWAY / US 29
2035 LEVELS OF SERVICE

MERRIWEATHER POST PAVILLION

LITTLE PATUXENT PARKWAY

EAST MALL ENTRANCE

LITTLE PATUXENT PARKWAY

LOS C/C

LOS D/E

LOS C/C

NORTH - SOUTH CONNECTOR

SOUTH ENTRANCE ROAD

LAKE KITTAMAQUNDI

PEDESTRIAN BRIDGE TO REMAIN

ENTRANCE/EXIT CLOSED

CROSSOVER TO BE CLOSED BY OTHERS

CROSSOVER TO BE CLOSED BY OTHERS

US 29 (COLUMBIA PIKE)

ACCESS TO BE CLOSED BY OTHERS

ACCESS TO BY CLOSED BY OTHERS

LOS E/D

RIVER MEADOWS DRIVE

ROSINANTE RUN

OAKLAND MILLS

STEVENS FOREST DRIVE

WHITE ACRE ROAD

LEGEND

- FLOODPLAIN BOUNDARY
- WETLAND BOUNDARY
- FOREST BOUNDARY
- STREAM BOUNDARY
- HIGH QUALITY FOREST
- PROPOSED ROADWORK
- PROPOSED BRIDGE
- PROPOSED SIDEWALK
- PROPOSED TRAFFIC SIGNAL
- PROPOSED SIGNAL UPGRADE

200' 0 200' 400'
SCALE: 1" = 400'

Howard County MARYLAND

WALLACE MONTGOMERY

PRELIMINARY
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DESIGN	SHD
DRAWN	SHD
CHECK	RLM

DOWNTOWN COLUMBIA & US 29
INTERCHANGE FEASIBILITY STUDY

CONCEPT J - SINGLE POINT URBAN
INTERCHANGE WITH NORTHERN CONNECTION

DATE: JANUARY 2012 SCALE: 1" = 400'

FIGURE 11

V. Proposed US 29 Interchange Stormwater Management

The proposed project lies within the Little Patuxent River Watershed (02-13-11-05) within the Patuxent River Area Watershed (02-13-11).

For this feasibility study, it is assumed that the existing impervious area within the proposed limit of disturbance (LOD) is less than 40%; therefore, the site is considered new development and 100% stormwater management (SWM) treatment is required for the reconstructed impervious areas. Assuming new development is a conservative approach. Upon more detailed design and investigation, certain alternatives may qualify for redevelopment, and less stormwater management may be required. Since this feasibility study lies within one watershed, quality SWM may be provided anywhere throughout the project site. However, quantity SWM must be provided at each drainage area where new impervious area is proposed. Under existing conditions, runoff leaves the project site at 8 locations along US 29. Below is a summary table describing the approximate location of each Point of Investigation (POI).

POI	Location
1	Existing 24" pipe approximately 4680 ft. north of S. Entrance Rd.
2	Existing Dual 72" pipe approximately 4030 ft. north of S. Entrance Rd.
3	Existing Swale approximately 2450 ft. north of S. Entrance Rd.
4	Existing 54" pipe approximately 2070 ft. north of S. Entrance Rd.
5	Existing 24" pipe approximately 1550 ft. north of S. Entrance Rd.
6	Existing 72" pipe approximately 500 ft. north of S. Entrance Rd.
7	Existing 72" pipe at S. Entrance Rd.
8	South end of Lake Kittamaqundi (varies with bridge location of each alternative)

Table No. 1 – Point of Investigation Locations

Calculations have been performed to estimate the amount of impervious area requiring treatment, and Environmental Site Design Volume (ESDv) requiring storage. This analysis was done for each alternative as a whole rather than per POI. The table below provides an estimated breakdown of SWM requirements for each alternative. Although it is assumed the project is new development, redevelopment computations have been provided as well to show a general range of treatment requirements.

Alternative	New Development		Redevelopment	
	Impervious Area Requiring Treatment (acres)	ESD_V (cubic feet)	Impervious Area Requiring Treatment (acres)	ESD_V (cubic feet)
A	4.49	30,968	4.04	25,553
B	9.21	63,521	7.04	40,347
C	6.00	41,382	5.63	35,813
D	15.45	106,559	11.81	67,211
E	4.02	27,726	3.46	21,139
F	8.25	56,900	7.56	49,038
G	7.68	52,969	7.08	45,969
H	7.64	52,693	6.96	44,848
I	11.11	76,626	8.59	49,848
J	17.26	119,042	12.80	71,194

Table No. 2 – SWM Requirements by Alternative

Locating Potential ESD

Based on the early review and analysis of SWM needs, it appears that onsite ESD may not be feasible for this project. There are two main areas of concern when analyzing SWM feasibility for the conceptual alternatives:

1. The first area of concern is the proposed bridge over Lake Kittamaqundi connecting Little Patuxent Parkway and US 29. For each conceptual alternative a sump is proposed over Lake Kittamaqundi; therefore, stormwater management will need to be provided on the bridge. If SWM on the bridge is not feasible, a variance from quantity control may be requested. Since runoff from the bridge will discharge directly into the lake, no channels will require protection. In addition, offsite mitigation will be needed for quality SWM.
2. The second area of concern is the existing median of US 29. The existing median of US 29 may be used to accommodate some of the SWM needs for the proposed conceptual alternatives developed for this study. However, there is currently a project under design for widening northbound US 29 from the Middle Patuxent River to south of MD 175. SWM for this project is proposed in the median of US 29. As a result, the median will consist predominantly of existing SWM facilities, virtually eliminating the ability to provide SWM in the median for this project.

   In addition, each conceptual alternative developed required a reduction of the available US 29 median area which may impact the existing SWM facilities in place at the time of this project. Therefore, additional SWM will be required for the displacement of any existing SWM facilities in the median.

   Quality SWM may be addressed through offsite mitigation; however, quantity control must be provided at each drainage area where new impervious area is proposed. Possibilities to treat quantity SWM include underground facilities, or the conversion of existing quality/quantity SWM facilities to solely quantity control facilities. Any conversion of existing SWM facilities will result in the need offsite mitigation for quality control.

   There is a possibility that existing SWM facilities in the median are treating more impervious area than required and/or will have room to expand and provide more treatment. If this is the case, a portion of the SWM requirements for this project may be provided in the existing SWM facilities; however, at this time more information is needed to make this assessment.

For the conceptual alternatives that include a connection to Oakland Mills, the northern connector (alternatives F and G) and the southern connector (alternatives H, I and J) conceptual alignment alternatives have an additional proposed roadway segment connecting US 29 to Stevens Forest Road. It may be possible to provide linear SWM along this roadway, such as bio-swales; however, it appears the longitudinal slope of the proposed roadway may be too steep to construct swales at the maximum allowable 4% slope. Further site investigation and roadway detail design are required before a determination is made. As with other areas of the project, offsite mitigation for quality control may be feasible, however quantity control is not. Quantity control may be possible via infiltration trenches or underground storage facilities along the roadway.

VI. Proposed US 29 Interchange Bridge and Retaining Structures

All but two of the alternatives include a structure crossing Lake Kittamaqundi. There are challenges to constructing piers in the lake. The lake would need to be to be lowered, or a cofferdam would need to be built so that the water can be pumped out of the pier construction area. Access to the construction area will be more difficult and construction staging on a barge in the lake will be necessary. Also the bridge spans that cross the water will be subject to harsher external conditions than the other bridge spans, so additional maintenance would be required. Painting the girders and concrete repairs to the piers are likely to be required more frequently given the visual aesthetics of the structure. Since the pier footing would be submerged, divers and special equipment would be used to examine the foundation.

Alternatives F and G do not cross the lake and have the advantage of the possibility of using retaining structures instead of steel girder spans for a portion of the structure. Since part of the construction area is within the floodplain, cast in place concrete retaining walls would most likely be used instead of the less expensive mechanically stabilized earth (MSE) walls, since these walls cannot be submerged. Where the structure traverses the pedestrian path near the lake, a culvert can be used to provide passage underneath the roadway. These options may reduce cost and should be considered during the next stage of study.

VII. Environmental Resources Impacts

An environmental inventory was compiled for this study using readily available information from previously prepared inventories compiled for the Downtown Columbia Plan - General Plan Amendment and the ongoing SHA Northbound US 29 Widening Project from MD 32 north to MD 175. The environmental inventories compiled for the Downtown Columbia General Plan Amendment were prepared by Biohabitats, Inc. with their findings documented under the Columbia Town Center Merriweather & Crescent Environment Enhancements Study dated September 2008 and the Best Management Practices for Symphony Stream and Lake Kittamaqundi Watersheds dated September 2008. In addition, FEMA Flood Map data was used to review and supplement the General Plan Amendment and SHA Northbound US 29 Widening Project floodplain and wetland delineations.

The primary environmental resources within the proposed interchange site area consist of the Little Patuxent River watershed and forest community habitats. The proposed conceptual alternatives were developed to avoid or minimize impacts where possible.

Little Patuxent River and Lake Kittamaqundi

The Little Patuxent River is located Downtown Columbia and US 29. Lake Kittamaqundi is a tributary to the Little Patuxent River which flows in a southerly direction towards Broken Land Parkway before turning east under US 29 just north of Broken Land Parkway.

The Little Patuxent River flows adjacent to Lake Kittamaqundi along US 29. There are several wetland areas throughout this watershed area. All of the proposed conceptual alternatives propose structure crossings of the Little Patuxent River, Lake Kittamaqundi and the identified wetland areas. While these crossing will have minimal impact the resources, piers will be required for the structure and some temporary construction impacts will be required. In addition, coordination with the review and regulatory agencies will be required

during the next stage of study. Coordination will include the potential shading impacts the proposed structure may have to these resources.

Much of the proposed boulevard and interchange would be within The Little Patuxent River floodplain, which has been delineated at an elevation of approximately 308 feet. This floodplain spans from within a few hundred feet of the intersection of LPP and the East Mall Entrance to the travel lanes of US 29. The proposed bridge structures for the conceptual alternatives would span the entire length of the floodplain. Each alternative would have impacts to the floodplain, although most of the physical impact would be the bridge piers, and would have minimal upstream or downstream effects.

There is a tributary to the Little Patuxent River that travels west from Stevens Forest Drive, crosses under US 29 in a culvert, and flows into the river on the west side of US 29. Several wetland areas have been identified surrounding this tributary, as well as 100 year floodplain. This tributary flows in the ravine that would be used for the connection to Oakland Mills in Alternatives "H", "I", and "J" (the Northern Connection). These alternatives would have direct impacts to 750 feet of the stream bed, and would require mitigation for the stream, wetland and floodplain.

All of the alternatives, with the exception of "F" and "G" would have impacts crossing Lake Kittamaqundi. The bridge construction would require piers to be built within the lake and on its banks, and the structure would have shading affects over the lake.

Forest Community Habitats

As noted in Merriweather and Crescent Environment Enhancements Study, within the Merriweather Post/Symphony Woods and the Little Patuxent River Corridor areas, there are four primary forest community habitats: Mixed Hardwood Park, Mixed Hardwood Riparian Wetland Forest, Mixed Hardwood Upland-Early Succession, and Mixed Hardwood Upland-Mature. The Enhancement Study inventoried samplings of trees within the areas' forest stands and estimated 49% of the forest stands' trees are between 18 inch and 23 inch DBH, 36% of trees are between 24 and 29 inch DBH, and 15% of the trees 30 inch DBH or greater. Also, 2% of the trees are dead, 11% of the trees are in poor condition, 22% of the trees are in fair condition, and 65% of the trees are in good condition. Furthermore, the Study noted that the areas contain some healthy natural features. However, the ecosystem is negatively affected by the encroachment of non-native invasive species. The forest community habitats have many areas that have been compromised and degraded by the influence of non-native invasive species. The study identifies one forest stand within the proposed interchange corridor with the highest quality (93 acres in size). The stand is bordered on the south by South Entrance Road, on the west by US 29, and on the east by Lake Kittamaqundi.

The proposed US 29 third interchange conceptual alternatives will impact this forest stand. The impacts range from 0.7 to 2.1 acres, depending on the alternative. Although the boulevard would cross this forest stand on a bridge, forest areas would need to be cleared to accommodate the bridge as well as for construction access. Tree felling and shading would require mitigation.

Environmental Impact Summary

Each alternative has some impact on the existing environmental features identified in this section. Below is a summary table of the potential impacts. Detailed field studies will be required during the next phase of study.

Alternative	High Quality Forest	Wetland	Stream	Lake Kittamaqundi
A	0.7 acres	0.1 acres	-	0.5 acres
B	0.7 acres	0.1 acres	-	0.5 acres
C	0.7 acres	0.1 acres	-	0.7 acres
D	1.5 acres	0.3 acres	-	0.7 acres
E	1.1 acres	0.3 acres	-	0.6 acres
F	2.1 acres	0.6 acres	-	-
G	2.1 acres	0.6 acres	-	-
H	0.9 acres	0.5 acres	750 lf	0.7 acres
I	0.9 acres	0.5 acres	750 lf	0.7 acres
J	0.9 acres	0.5 acres	750 lf	0.7 acres

Table No. 3 – Potential Environmental Impacts

The above impacts to the environmental features were based on previously compiled environmental inventories and available project engineering data. No formal jurisdictional delineations of environment resources or hydrology and hydraulic analysis were performed as part of this feasibility study. Formal jurisdictional delineations of the environmental resources and in particular hydrology and hydraulic analysis of the proposed interchange will be needed during the engineering design phase to fully confirm the actual impacts.

VIII. Construction Estimate

Conceptual construction cost estimates were developed for each alternative. Cost estimates were developed using the Maryland State Highway Administration's Highway Construction Cost Estimating Manual, dated October 2011. The estimates include major items and costs that are appropriate for a planning phase project, and include a 40% contingency.

Included in the estimates is a lump sum for preliminary items, which includes maintenance of traffic, mobilization, clearing and demolition, etc. This lump sum has been estimated as a percentage of major construction items, and the percentage depends on the complexity of maintenance of traffic for each alternative.

A lump sum breakdown for the estimated cost for storm water management has been included in the appendix. This cost is based on offsite quality treatment, so it includes preliminary right of way acquisition cost based on a percentage basis for the offsite locations. Right-of-way costs for the conceptual alternative are not included as part of the overall cost.

Since these cost estimates are for future construction, a 15% inflation rate has been added to the total cost, which is prescribed in the SHA Cost Estimation Manual for a five year term.

Alternative	Total Estimated Construction Cost
A	$44.2 million
B	$61.3 million
C	$62.7 million
D	$83.9 million
E	$41.2 million
F	$81.7 million
G	$80.6 million
H	$74.3 million
I	$82.2 million
J	$104.1 million

Table No. 4 – Conceptual Construction Cost Estimates

The data sheets for the conceptual construction cost estimates are included in **Appendix C** of the study. Construction costs do not include estimates for engineering or right-of-way.

IX. Summary

The proposed US 29 Third Interchange increases vehicular mobility and provides adequate capacity to meet the planned future growth and development. Each of the new interchange conceptual alternatives would address the future traffic demand of access to Downtown Columbia and relieve traffic from the existing interchange connections to US 29 with Broken Land Parkway and MD175/LPP.

In addition, the Oakland Mills connection provides direct access to and from the Oakland Mills Community and Downtown Columbia, as well as improves access to Downtown Columbia from points east of Oakland Mills. The new connection would also support transit opportunities, with the addition of a direct connection between US 29, Downtown Columbia, and Oakland Mills.

The Conceptual Alternatives provide a range of possible interchange configurations, each with a varying range of benefit and impacts. The construction cost range of $41 million to $104 million is appropriate for the scope of the project. The true construction cost may be decreased as more detailed information is developed during the next phase of study. However, at this stage it would be imprudent to expect the cost to be lower, given the uncertainty of scope and construction timeline.

All of the alternatives have impacts on the surrounding existing environmental features. Determination on the significance of the impacts would be determined during the next phase of study through coordination with the appropriate review and regulatory agencies. This study considered the impacts to high quality forest land, 100-year floodplain, wetlands, and waters. All of the conceptual alternatives would impact the high quality forest situated between Lake Kittamaqundi and US 29. The construction for the conceptual alternatives would require clearing an area of forest, which would range from 0.7 to 2.1 acres. All efforts to minimize impacts will be taken into consideration during the next phase of study. Contained in this forest area is a wetland that surrounds the streambed that runs between Lake Kittamaqundi and US 29. The conceptual alternatives would not directly impact this wetland; however indirect effect may result from shading from the structure. Temporary

impacts from construction and permanent impacts from the bridge piers would add to the wetland impact, which ranges from 0.1 to 0.6 acres. The alternatives also have stream and lake impacts. The 750 linear foot stream impacts in Alternatives "H", "I" and "J", will likely require stream reconstruction. The lake impacts resulting from any of the Alternatives will include shading, as well as temporary construction impacts or the piers within the lake.

The alternatives have a range of traffic effects in the surrounding roadway network. The alternatives that incorporate the connection to Oakland Mills have the greatest improvement to the nearby US 29 interchanges with Broken Land Parkway and MD175/LLP. These alternatives allow vehicles travelling between Downtown Columbia and Oakland Mills (and points east) to bypass these interchanges, thus reducing the traffic demand. However, this means more traffic would travel through the Oakland Mills community. The alternatives that do not incorporate the Oakland Mills connection do provide benefits, primarily to the MD 175/LLP interchange.

The alternatives presented in this study demonstrate that the proposed Little Patuxent Parkway and US 29 Interchange is feasible, and would help reduce the travel demand to surrounding network, resultant from the planned growth of the Downtown Columbia Plan.

This study is based on available information. Further field investigation concerning both the design and environmental resources are necessary during the next stage of study to further quantify the impacts and costs associated with each alternative. Coordination with Howard County, SHA and the environmental review and regulatory agencies are required as the study progresses.

X. References

County Council of Howard County. DOWNTOWN COLUMBIA PLAN – A General Plan Amendment, adopted February 1, 2010

County Council of Howard County. Howard County Council Bill No. 58-2009.

Columbia Town Center Travel Demand Model and Traffic Forecast Report (WITH 7C UPDATE AND REVISED ALTERNATIVES), dated May 2011 prepared by Sabra Wang & Associates, Inc. and Vision Engineering & Planning for the Howard County Departments of Public Works and Planning and Zoning.

Howard County Design Manual, Volume III, Roads and Bridges

Downtown Columbia Design Guidelines, Downtown-wide, dated November 2010

AASHTO's A Policy on Geometric Design of Highways and Streets, 4th Edition, dated 2001

Columbia Town Center Merriweather & Crescent Environment Enhancements Study dated September 2008; a supplemental document to the General Plan Amendment

Stormwater Management Act of 2007

Best Management Practices for Symphony Stream and Lake Kittamaqundi Watersheds dated September 2008

APPENDIX A

Design Year 2035 Intersection Capacity Traffic Analysis

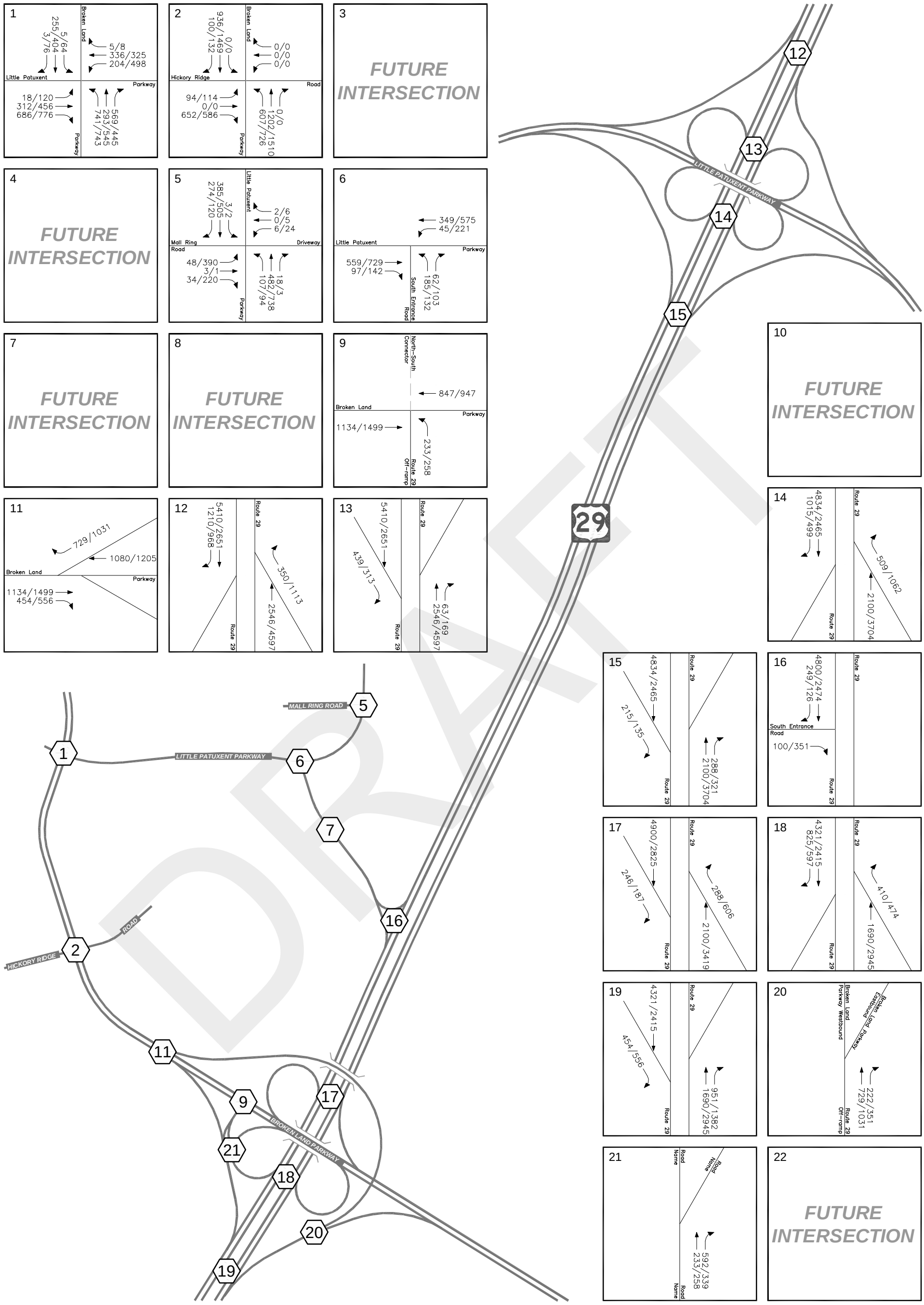


Figure 1
Existing Traffic Volumes

AM PEAK HOUR
PM PEAK HOUR
000/000

North

US 29 Interchange Feasibility Study
Howard County, Maryland

Wells + Associates, Inc.

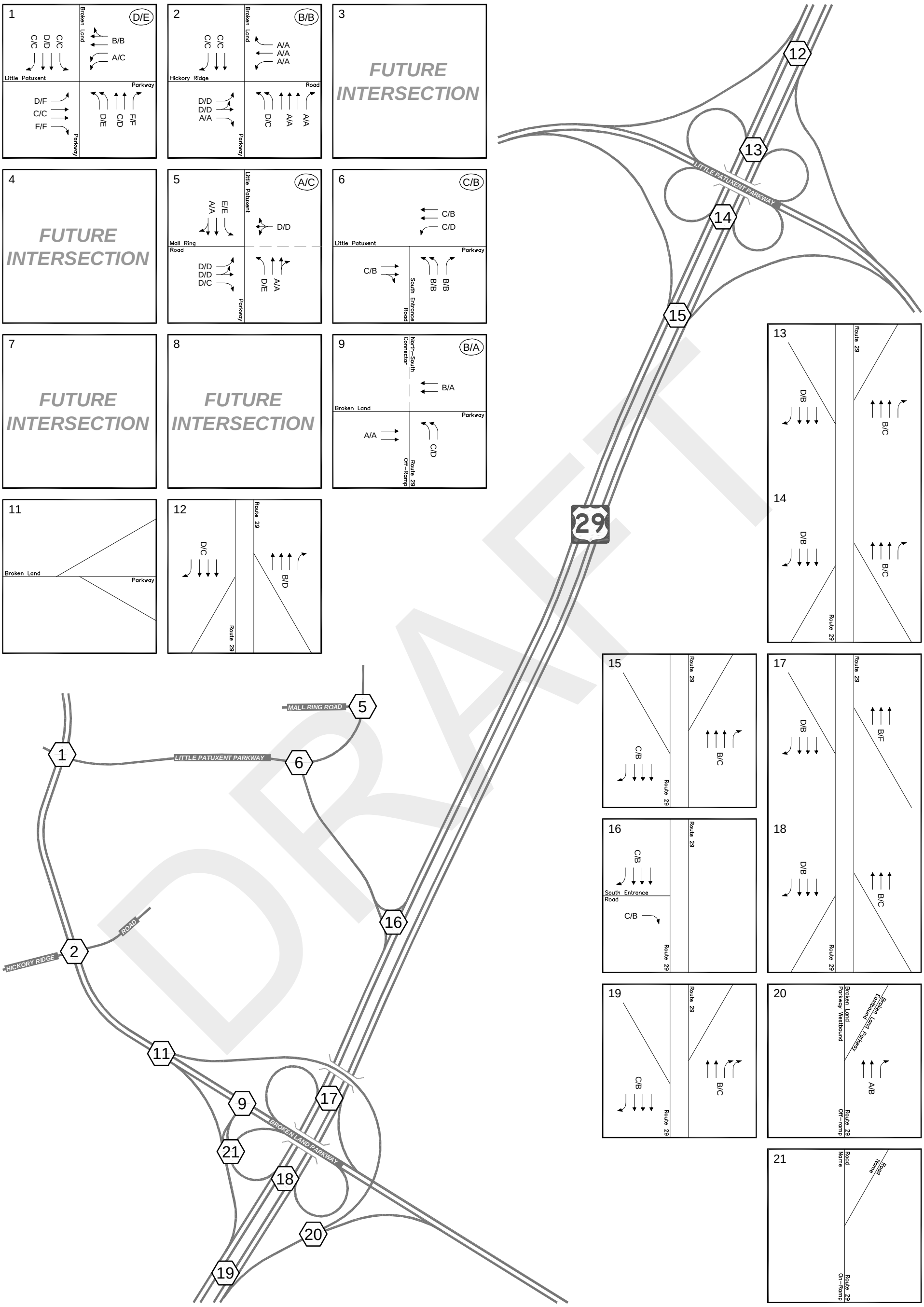


Figure 2
Existing Levels of Service

North

US 29 Interchange Feasibility Study
Howard County, Maryland

Wells + Associates, Inc.

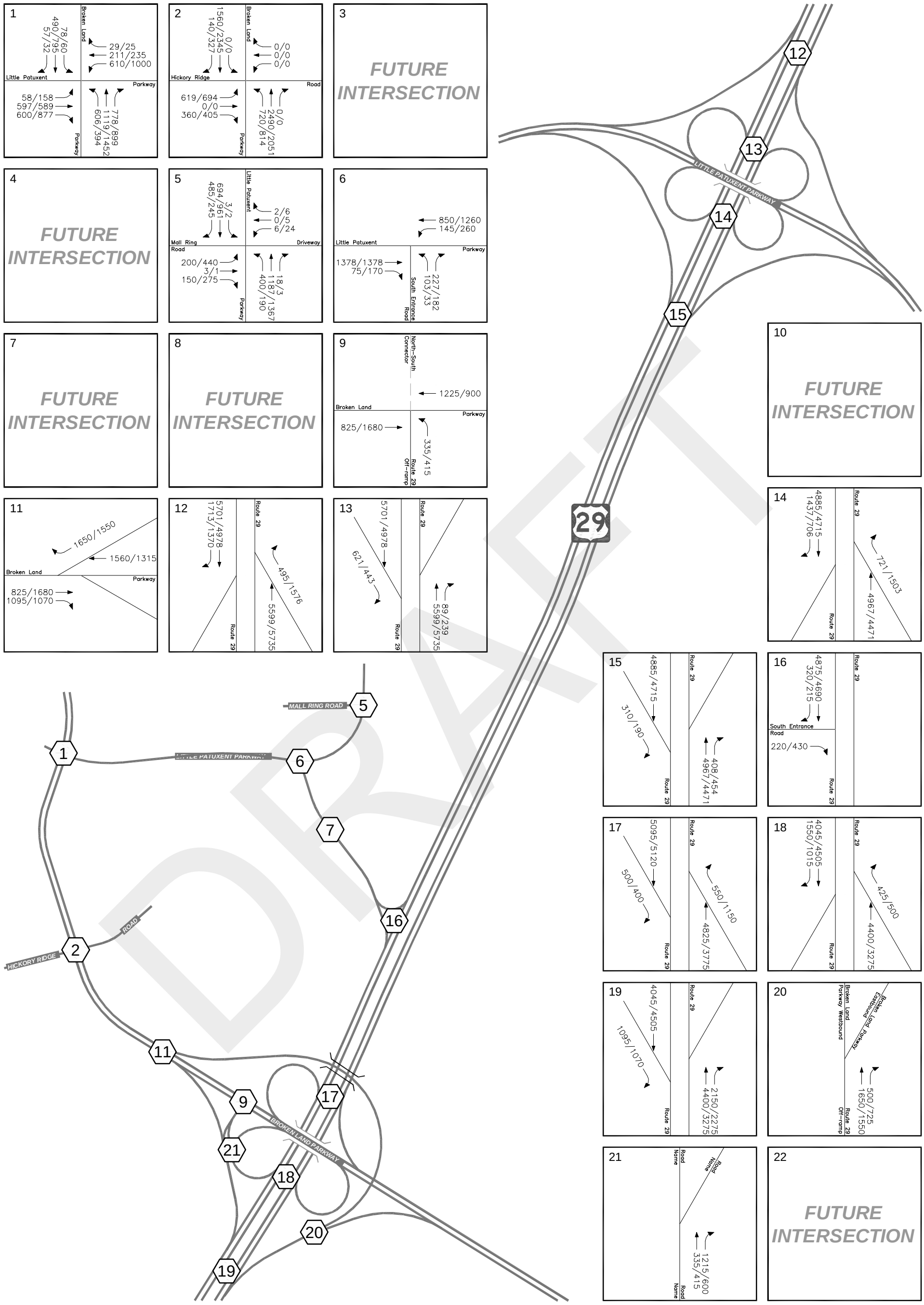


Figure 3
2035 Traffic Volumes without NS Connector

AM PEAK HOUR
PM PEAK HOUR
000/000

North

US 29 Interchange Feasibility Study
Howard County, Maryland

Wells + Associates, Inc.

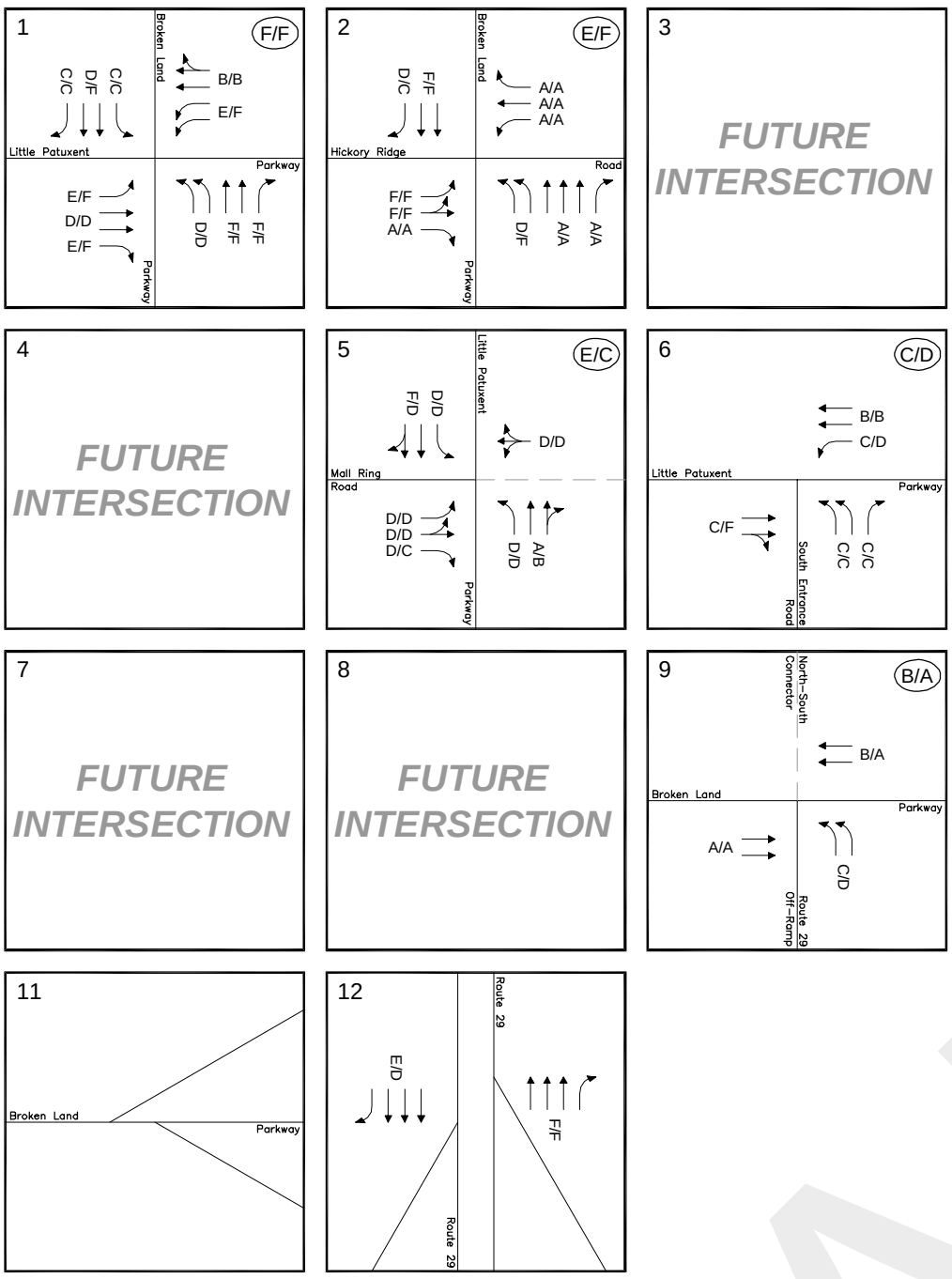


Figure 4
2035 Levels of Service without NS Connector

North

US 29 Interchange Feasibility Study
Howard County, Maryland

Wells + Associates, Inc.

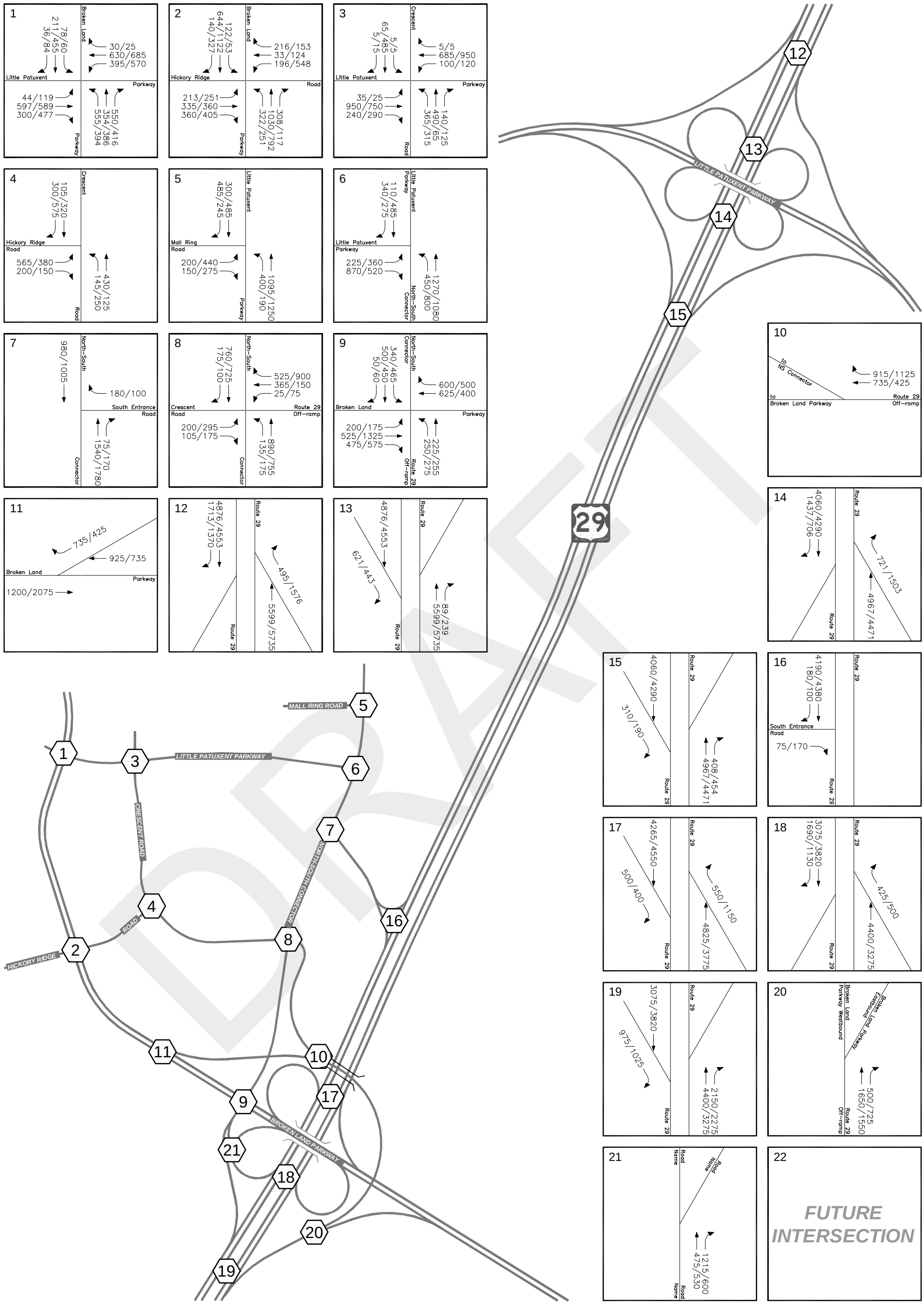


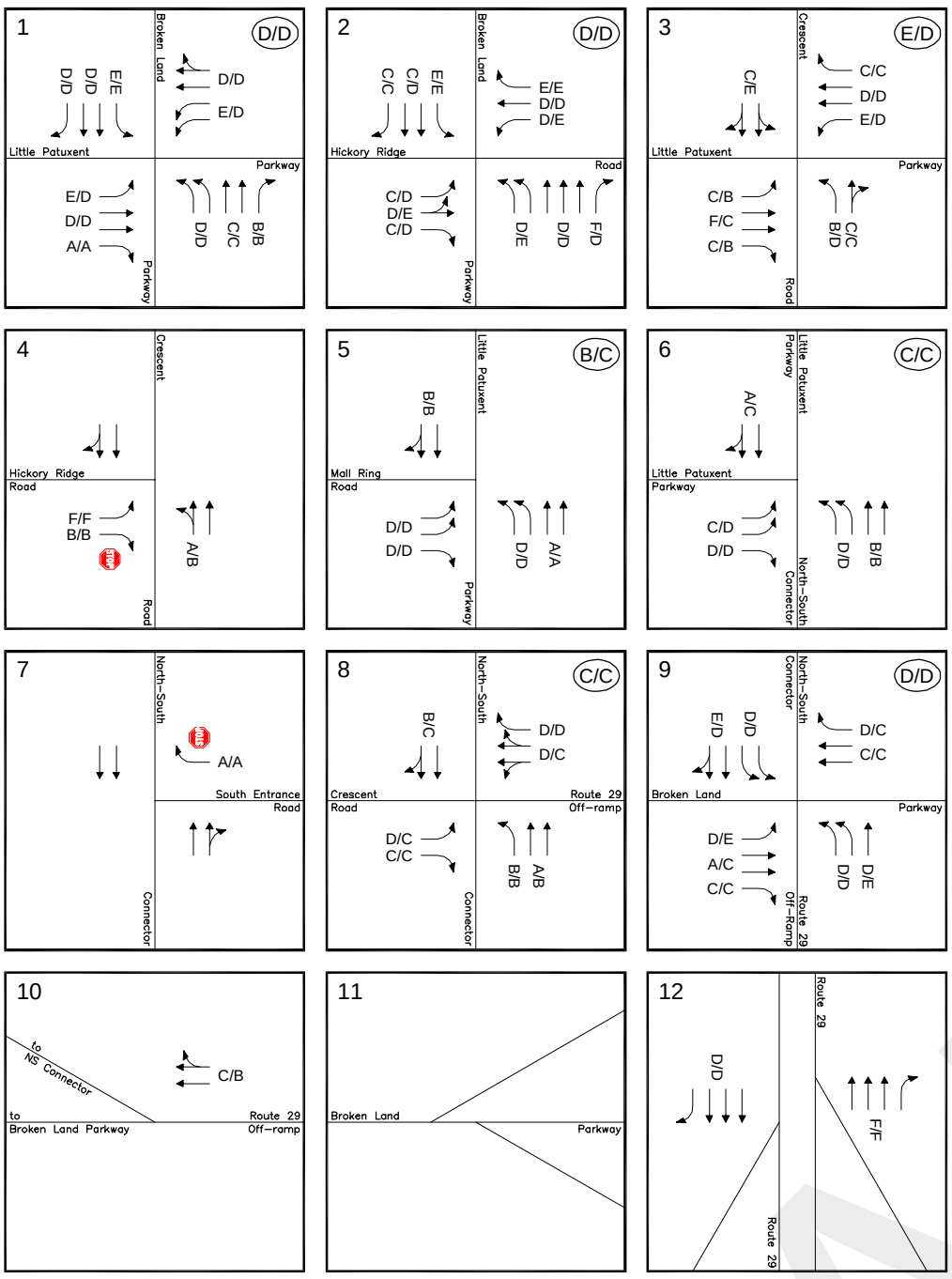
Figure 5
2035 Traffic Volumes with NS Connector

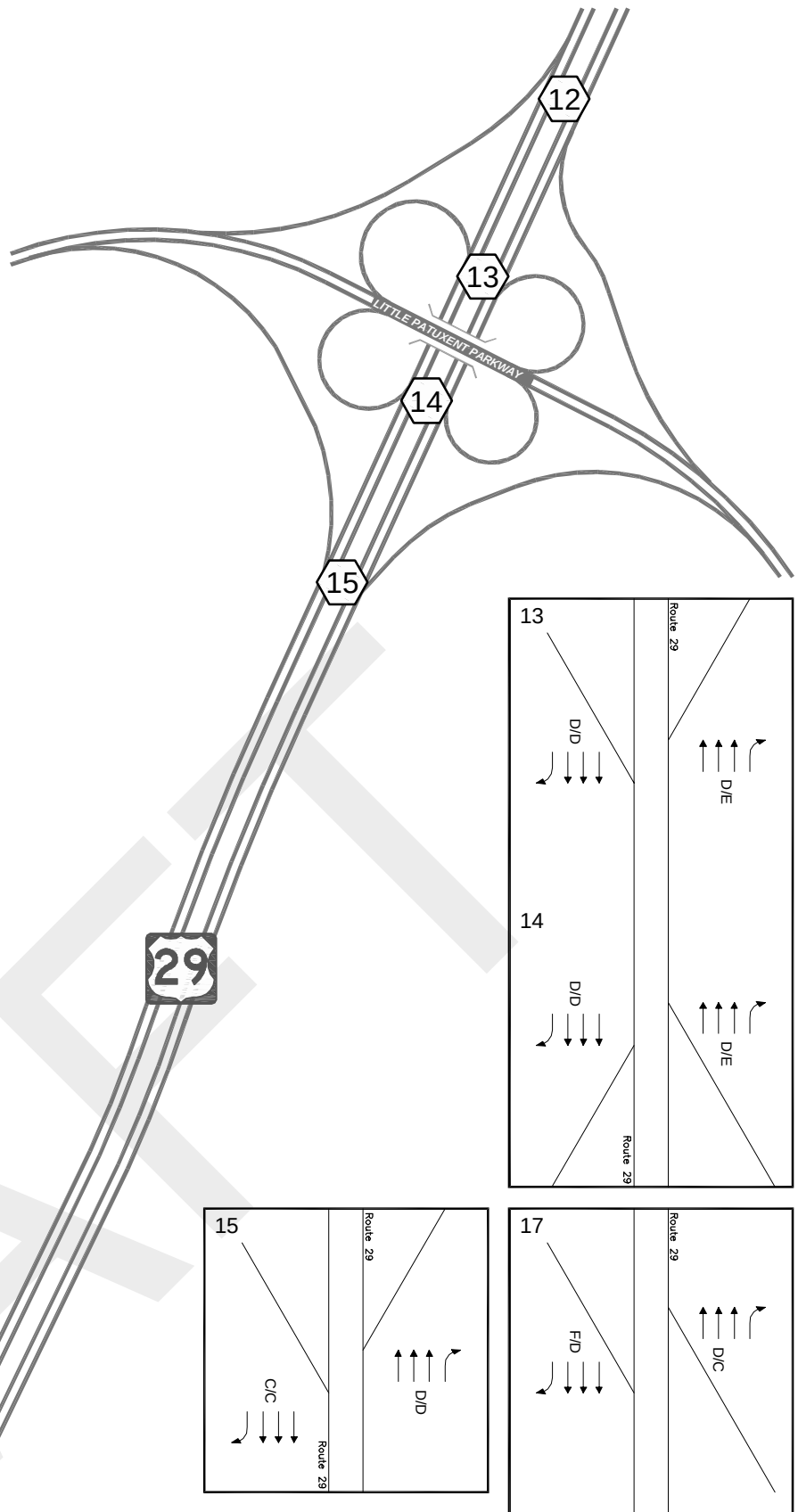
AM PEAK HOUR
PM PEAK HOUR
000/000

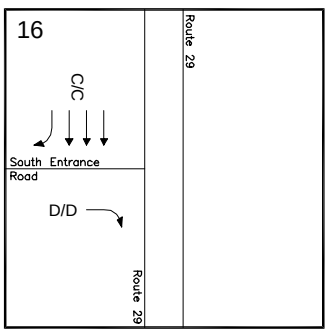
North

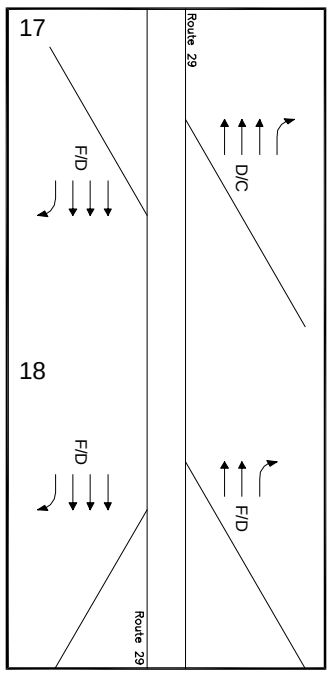
US 29 Interchange Feasibility Study
Howard County, Maryland

Wells + Associates, Inc.









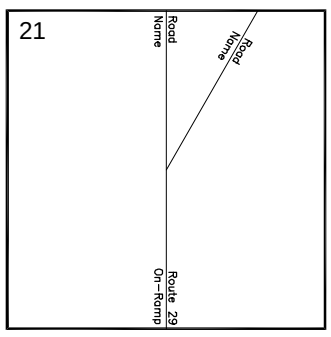


Figure 6
2035 Levels of Service with NS Connector

AM PEAK HOUR
PM PEAK HOUR
000/000

North

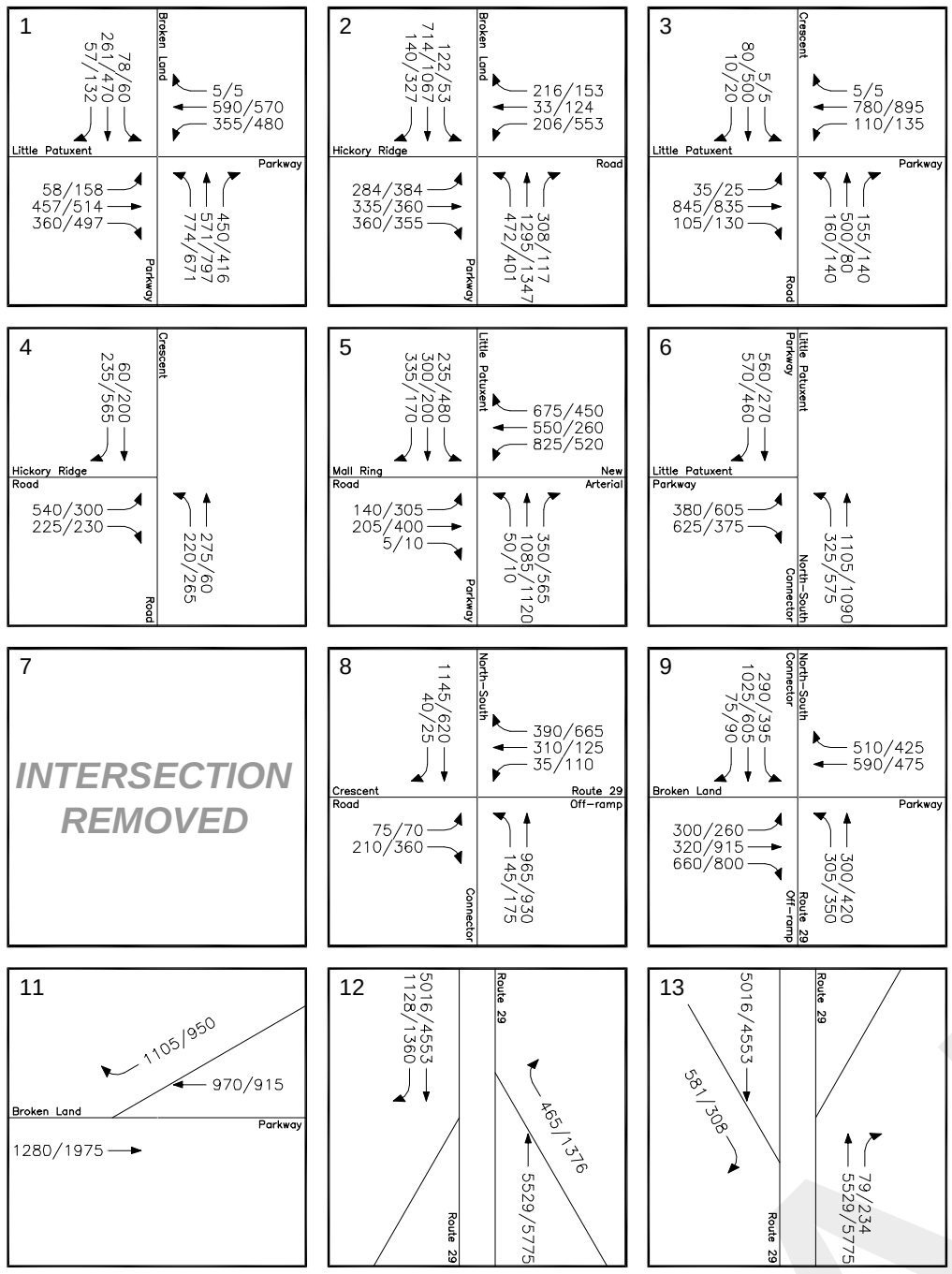


Figure 7
2035 Traffic Volumes with NS Connector and Full Diamond Interchange with Oakland Mills Connection

AM PEAK HOUR
PM PEAK HOUR
000/000

North

US 29 Interchange Feasibility Study
Howard County, Maryland

Wells + Associates, Inc.

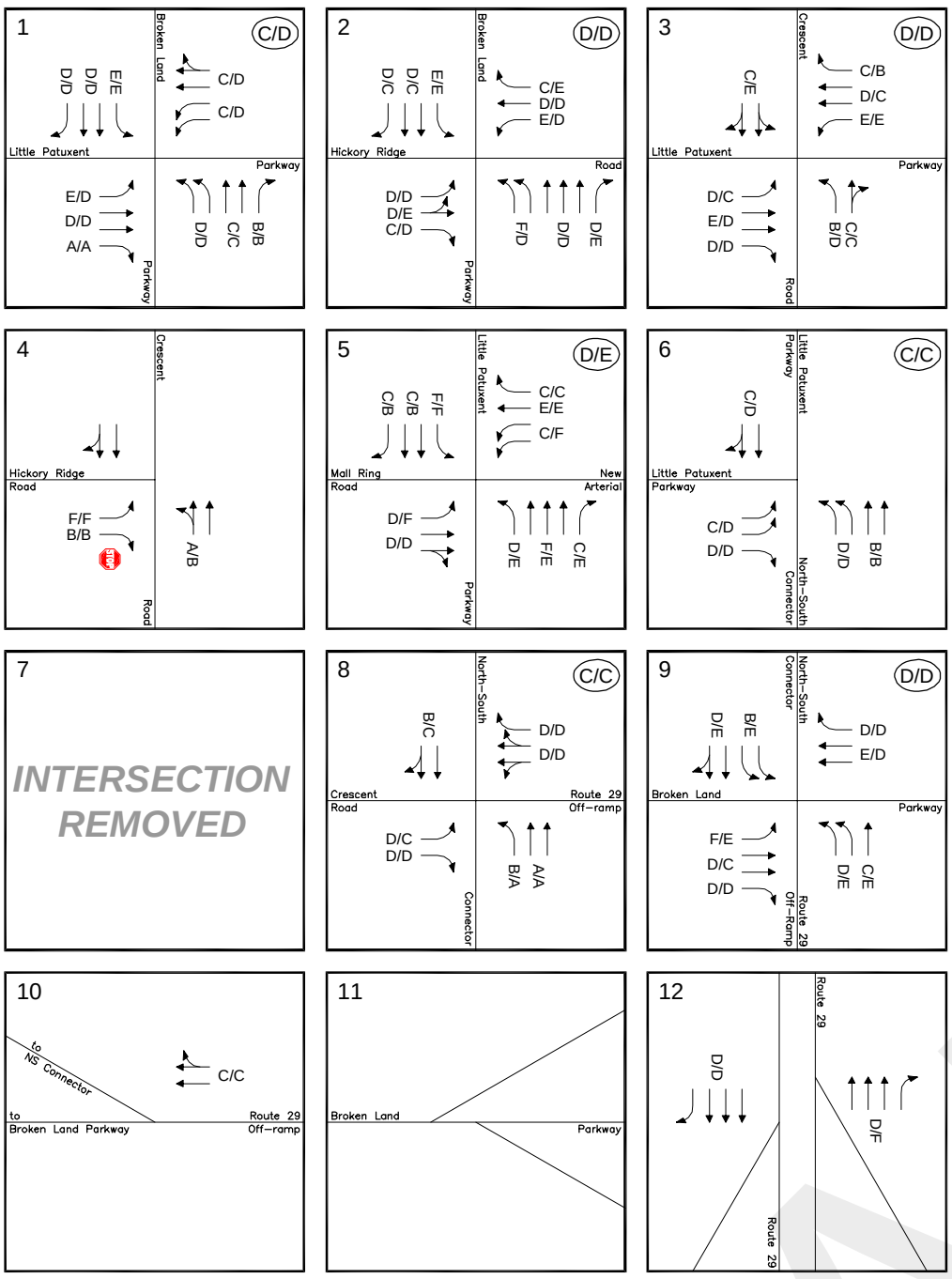


Figure 8
2035 Levels of Service with NS Connector and Full Diamond Interchange with Oakland Mills Connection

AM PEAK HOUR
PM PEAK HOUR
000/000

North

US 29 Interchange Feasibility Study
Howard County, Maryland

Wells + Associates, Inc.

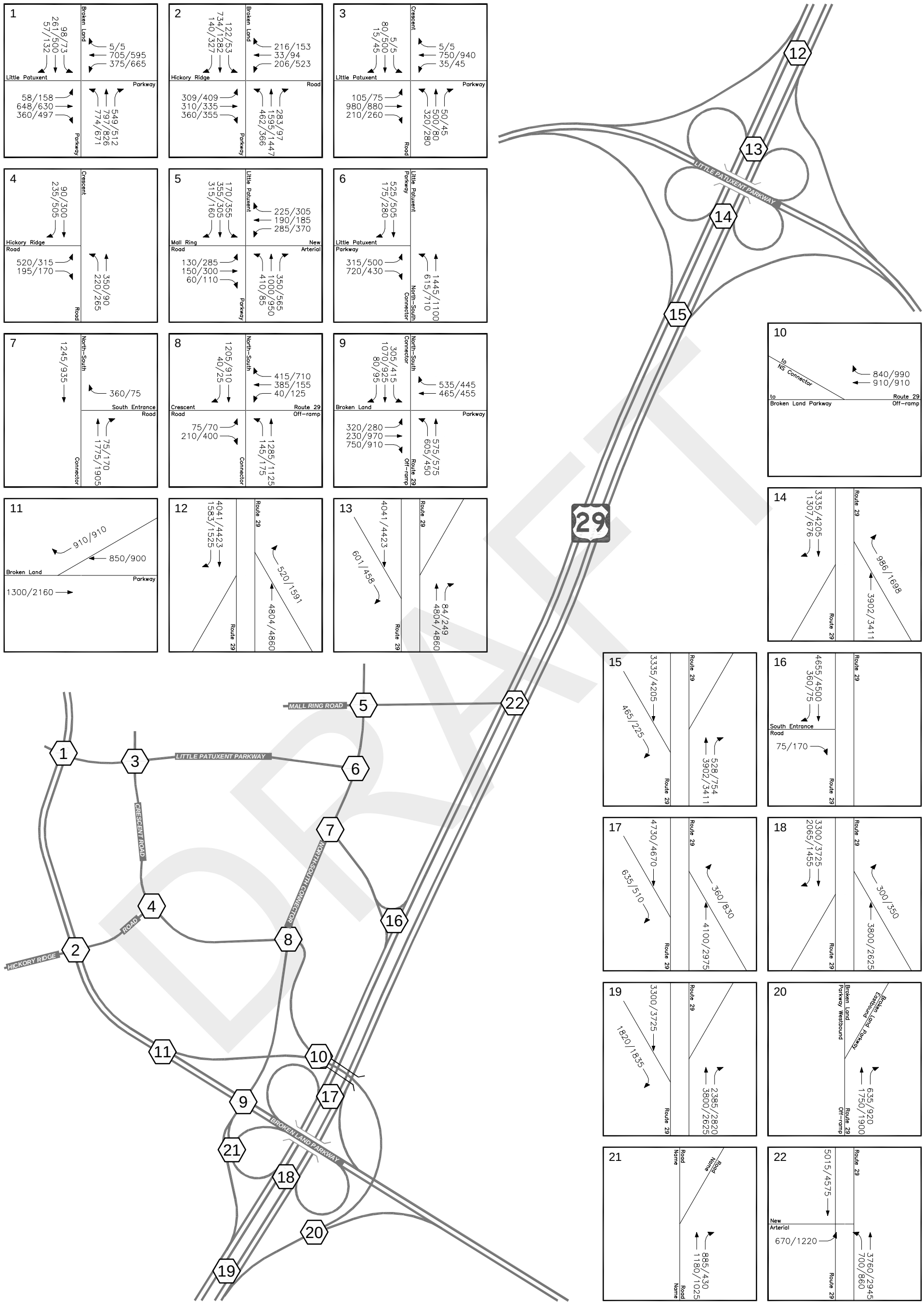


Figure 9
2035 Traffic Volumes with NS Connector and Half Diamond Interchange without Oakland Mills Connection

AM PEAK HOUR
PM PEAK HOUR
000/000

North

US 29 Interchange Feasibility Study
Howard County, Maryland

Wells + Associates, Inc.

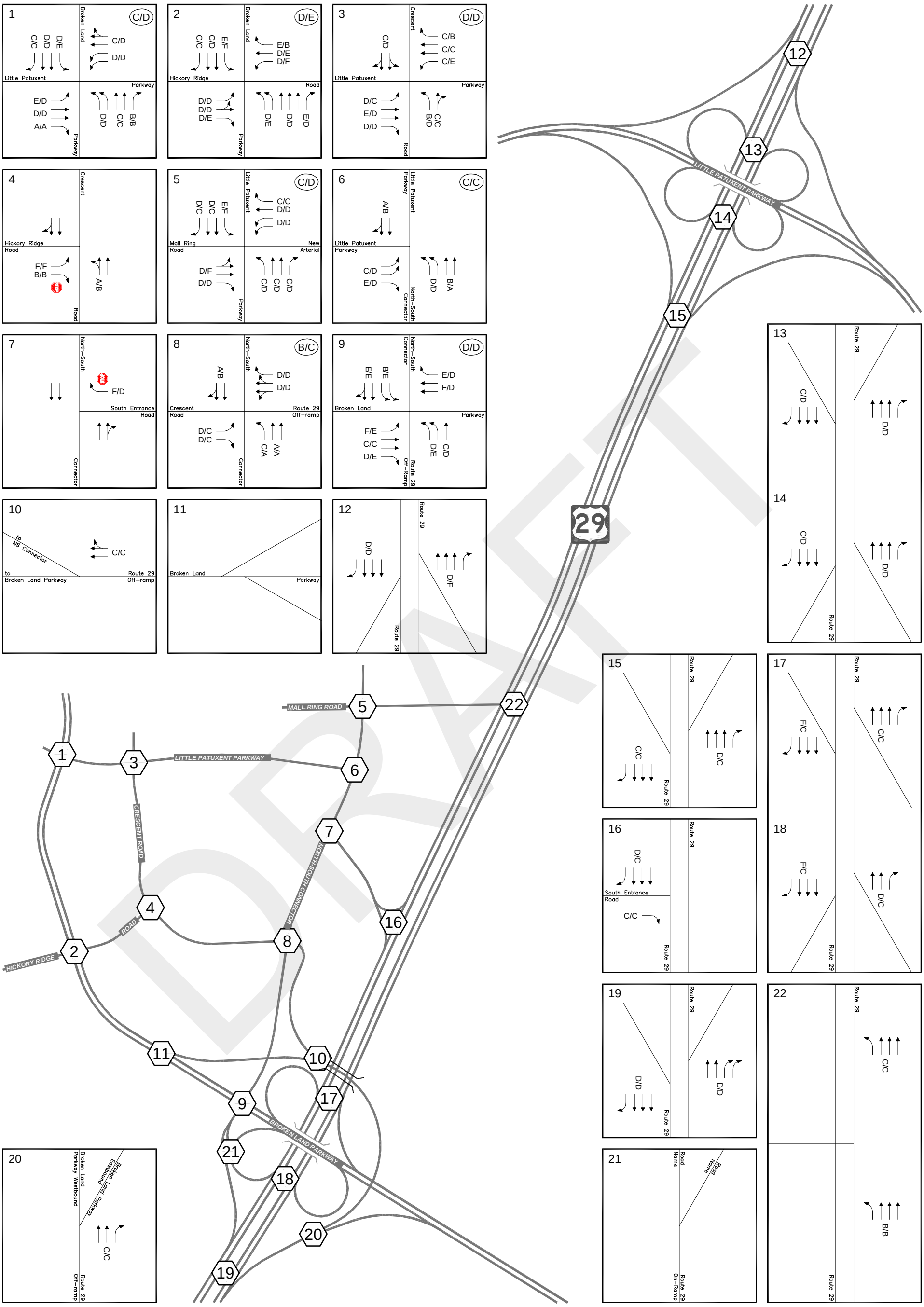


Figure 10
2035 Levels of Service with NS Connector and Half Diamond Interchange without Oakland Mills Connection

AM PEAK HOUR
PM PEAK HOUR
000/000

North

US 29 Interchange Feasibility Study
Howard County, Maryland

Wells + Associates, Inc.

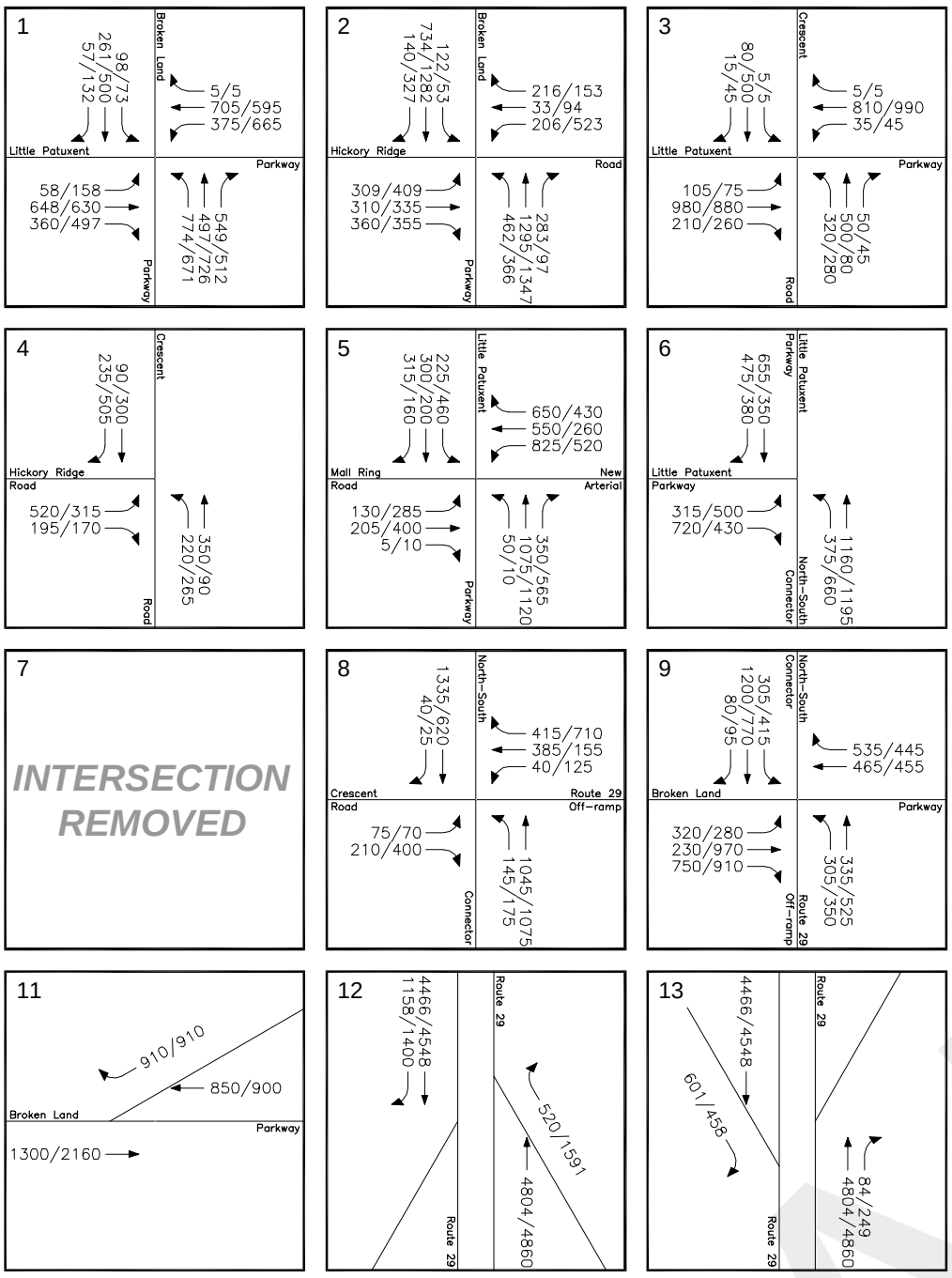


Figure 11
2035 Traffic Volumes with NS Connector and Full Diamond Interchange without Oakland Mills Connection

AM PEAK HOUR
PM PEAK HOUR
000/000

North

Wells + Associates, Inc.

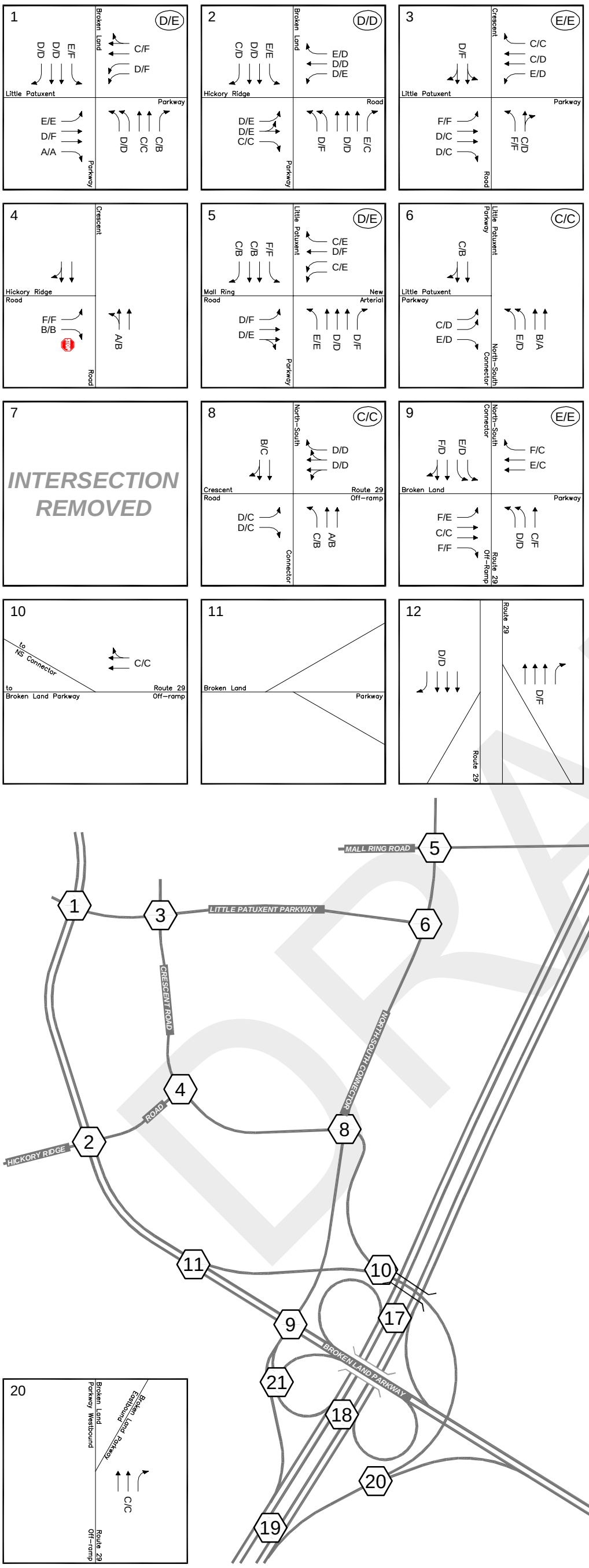


Figure 12
2035 Levels of Service with NS Connector and Full Diamond Interchange without Oakland Mills Connection

AM PEAK HOUR
PM PEAK HOUR
000/000

North

US 29 Interchange Feasibility Study
Howard County, Maryland

Wells + Associates, Inc.

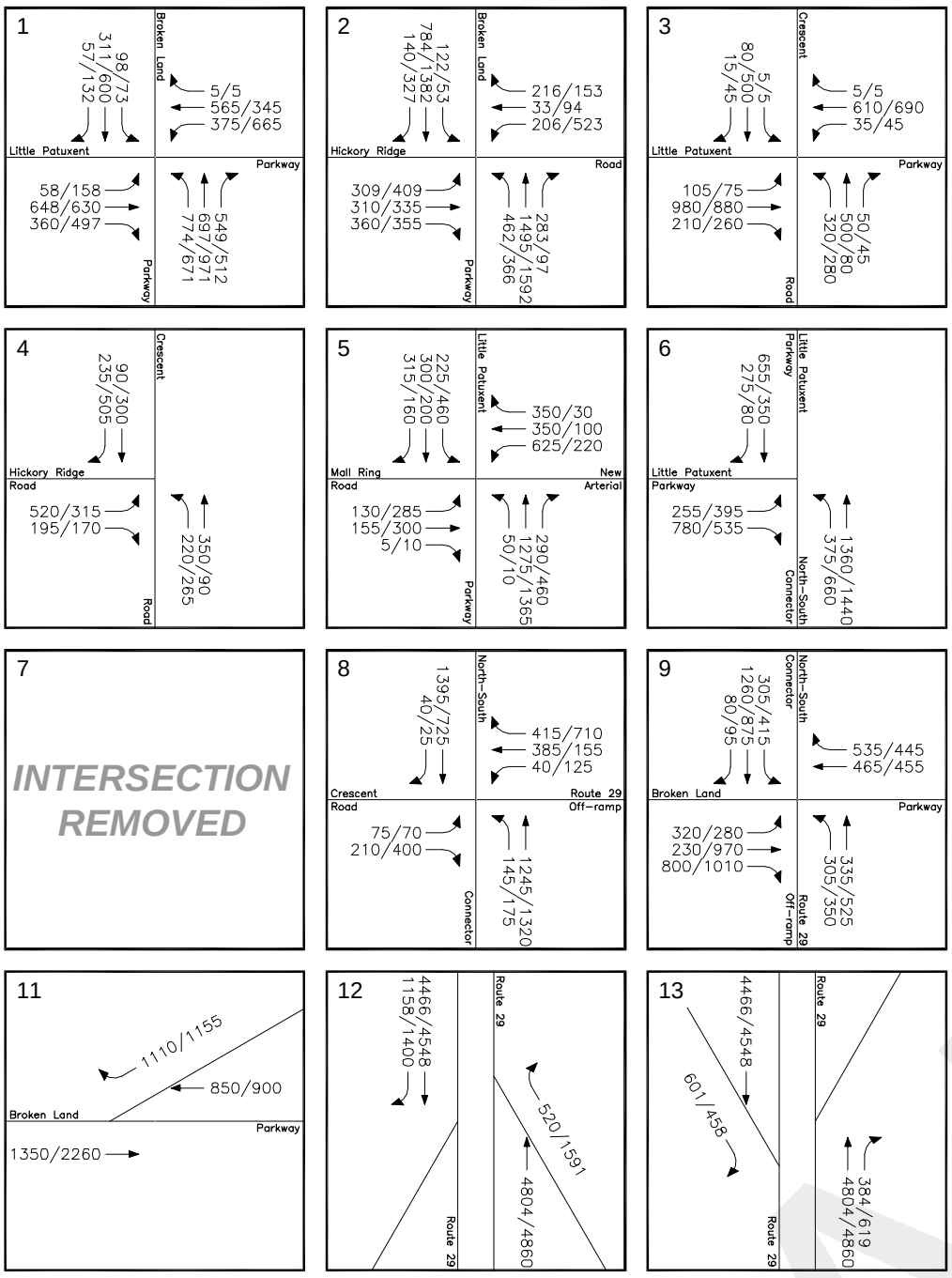


Figure 13
2035 Traffic Volumes with NS Connector and Directional Flyover to the North

AM PEAK HOUR
PM PEAK HOUR
000/000

North

Wells + Associates, Inc.

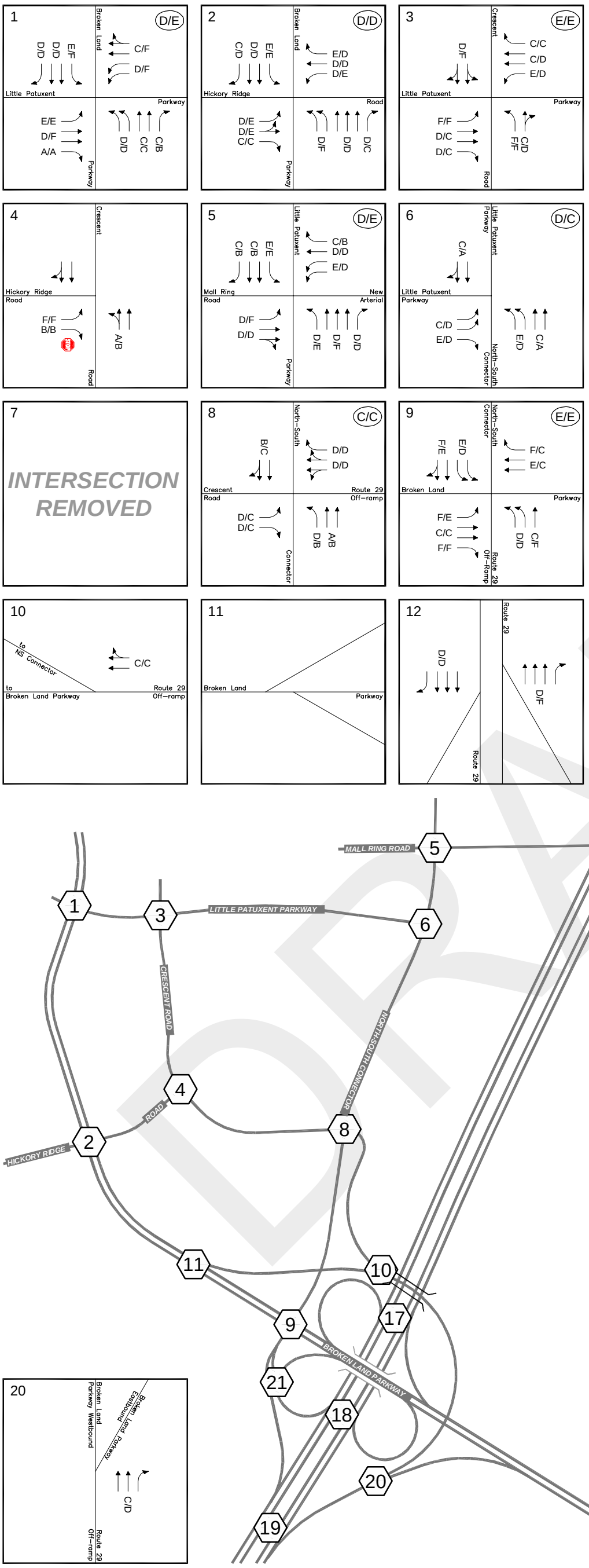


Figure 14
2035 Levels of Service with NS Connector and Directional Flyover to to the North

AM PEAK HOUR
PM PEAK HOUR
000/000

North

US 29 Interchange Feasibility Study
Howard County, Maryland

Wells + Associates, Inc.

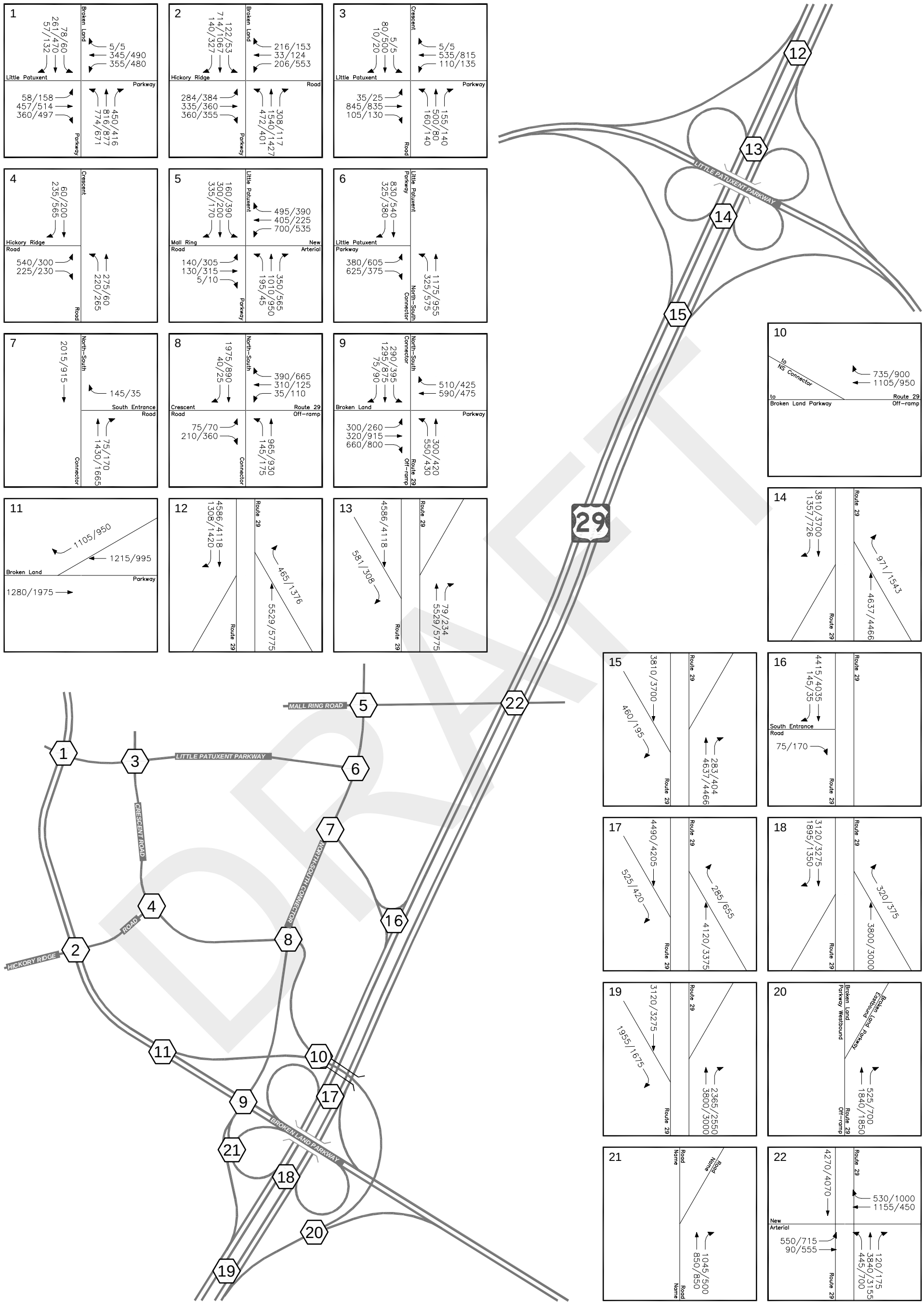


Figure 15
2035 Traffic Volumes with NS Connector and Half Diamond Interchange with Oakland Mills Connection

AM PEAK HOUR
PM PEAK HOUR
000/000

North

Wells + Associates, Inc.

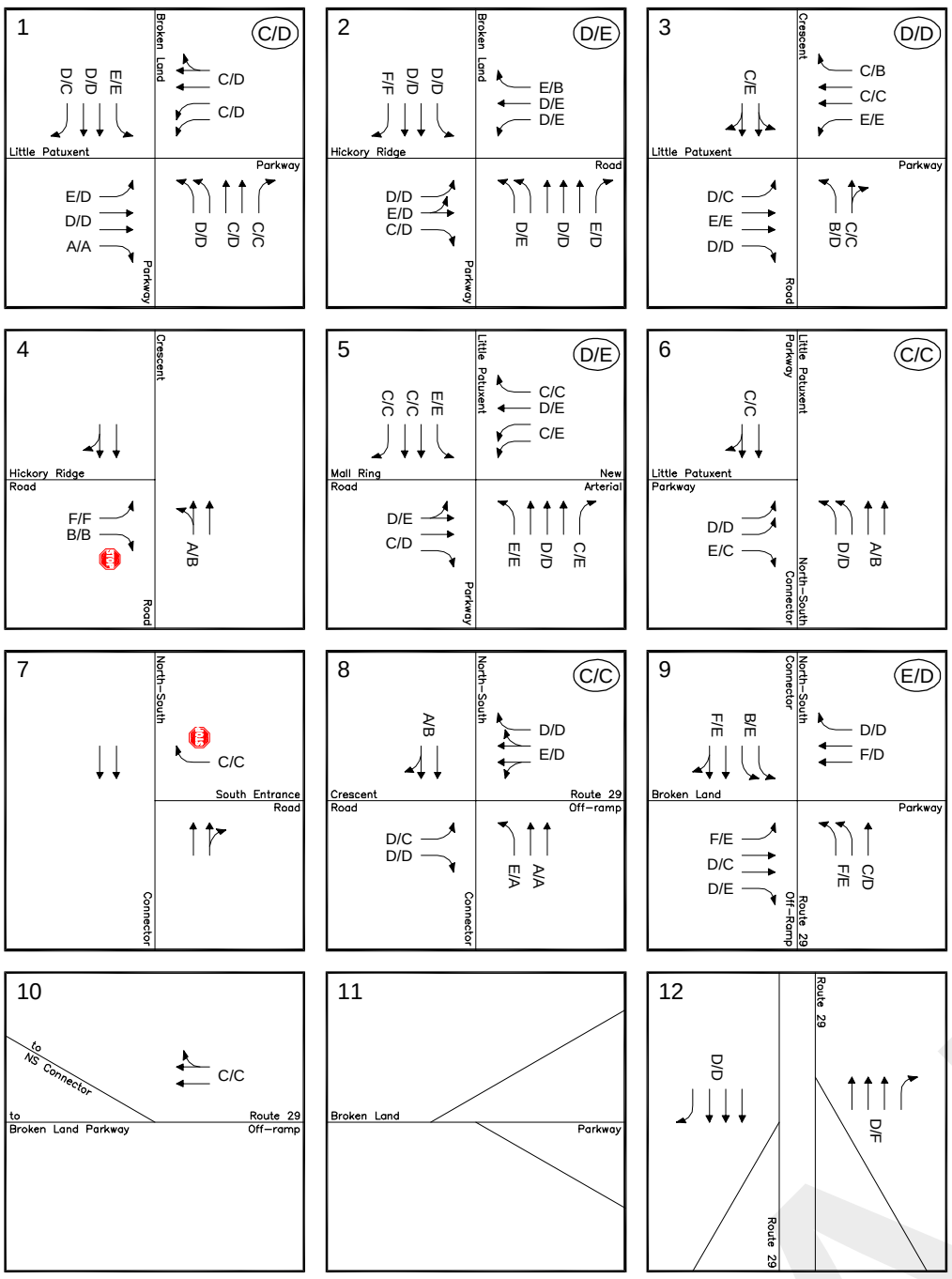


Figure 16
2035 Levels of Service with NS Connector and Half Diamond Interchange with Oakland Mills Connection

AM PEAK HOUR
PM PEAK HOUR
000/000

North

Wells + Associates, Inc.

APPENDIX B

Concept Construction Cost Estimates

WALLACE MONTGOMERY & ASSOCIATES
110 WEST ROAD SUITE 300
TOWSON, MARYLAND 21204

Feasibility Study
Downtown Columbia Transportation Improvements
Little Patuxent Parkway / US 29 Interchange

CONCEPTUAL ALTERNATIVE CONSTRUCTION COST ESTIMATE

Alternative A – Half Diamond Interchange with Left Exit to Northbound US 29

Jan-12

ITEM DESCRIPTION	UNIT	QUANT	UNIT PRICE	TOTAL AMOUNT
PRELIMINARY (40% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$6,762,000	$6,762,000
GRADING	CY	18000	$20	$360,000
DRAINAGE & STORM WATER MANAGEMENT	LS	1	$982,000	$982,000
EROSION AND SEDIMENT CONTROL (4% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$676,200	$676,200
BRIDGE	SF	46000	$250	$11,500,000
RETAINING WALL	SF	23000	$150	$3,450,000
ROADWAY PAVEMENT AND BASE	SF	152000	$10	$1,520,000
CURB AND GUTTER	LF	3000	$25	$75,000
TRAFFIC SIGNAL (NEW)	EA	2	$250,000	$500,000
TRAFFIC SIGNAL (MODIFICATION)	EA	1	$150,000	$150,000
INTERCHANGE SIGNING	LS	1	$345,000	$345,000
INTERCHANGE LIGHTING	LS	1	$275,000	$275,000
ROADWAY PAVEMENT MARKING	LANE MILE	4	$32,000	$128,000
LANDSCASPING (4% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$676,200	$676,200
FOREST MITIGATION	AC	0.7	$8,700	$6,090
WETLAND MITIGATION	AC	0.1	$170,000	$17,000
			Subtotal	$27,422,490
			15% Inflation at 2017	$4,113,374
			40% Contingency	$12,614,345
			Total	$44,150,209

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Feasibility Study
Downtown Columbia Transportation Improvements
Little Patuxent Parkway / US 29 Interchange

CONCEPTUAL ALTERNATIVE CONSTRUCTION COST ESTIMATE

Alternative B – Half Diamond Interchange with Right Exit to Northbound US 29

Jan-12

ITEM DESCRIPTION	UNIT	QUANT	UNIT PRICE	TOTAL AMOUNT
PRELIMINARY (45% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$10,249,088	$10,249,088
GRADING	CY	28000	$20	$560,000
DRAINAGE & STORM WATER MANAGEMENT	LS	1	$1,719,200	$1,719,200
EROSION AND SEDIMENT CONTROL (4% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$911,030	$911,030
CURVED BRIDGE	SF	48500	$287	$13,919,500
RETAINING WALL	SF	30750	$150	$4,612,500
ROADWAY PAVEMENT AND BASE	SF	362000	$10	$3,620,000
CURB AND GUTTER	LF	2550	$25	$63,750
TRAFFIC SIGNAL (NEW)	EA	2	$250,000	$500,000
TRAFFIC SIGNAL (MODIFICATION)	EA	1	$150,000	$150,000
INTERCHANGE SIGNING	LS	1	$345,000	$345,000
INTERCHANGE LIGHTING	LS	1	$275,000	$275,000
ROADWAY PAVEMENT MARKING	LANE MILE	7	$32,000	$224,000
LANDSCASPING (4% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$911,030	$911,030
FOREST MITIGATION	AC	0.7	$8,700	$6,090
WETLAND MITIGATION	AC	0.1	$170,000	$17,000
			Subtotal	$38,083,188
			15% Inflation at 2017	$5,712,478
			40% Contingency	$17,518,266
			Total	$61,313,932

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Feasibility Study
Downtown Columbia Transportation Improvements
Little Patuxent Parkway / US 29 Interchange

CONCEPTUAL ALTERNATIVE CONSTRUCTION COST ESTIMATE

Alternative C – Full Inside Diamond Interchange

Jan-12

ITEM DESCRIPTION	UNIT	QUANT	UNIT PRICE	TOTAL AMOUNT
PRELIMINARY (40% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$9,724,700	$9,724,700
GRADING	CY	43000	$20	$860,000
DRAINAGE & STORM WATER MANAGEMENT	LS	1	$1,228,000	$1,228,000
EROSION AND SEDIMENT CONTROL (4% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$972,470	$972,470
CURVED BRIDGE	SF	54000	$287	$15,498,000
RETAINING WALL	SF	38300	$150	$5,745,000
ROADWAY PAVEMENT AND BASE	SF	214500	$10	$2,145,000
CURB AND GUTTER	LF	2550	$25	$63,750
TRAFFIC SIGNAL (NEW)	EA	2	$250,000	$500,000
TRAFFIC SIGNAL (MODIFICATION)	EA	1	$150,000	$150,000
INTERCHANGE SIGNING	LS	1	$550,000	$550,000
INTERCHANGE LIGHTING	LS	1	$350,000	$350,000
ROADWAY PAVEMENT MARKING	LANE MILE	5	$32,000	$160,000
LANDSCASPING (4% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$972,470	$972,470
FOREST MITIGATION	AC	0.7	$8,700	$6,090
WETLAND MITIGATION	AC	0.1	$170,000	$17,000
			Subtotal	$38,942,480
			15% Inflation at 2017	$5,841,372
			40% Contingency	$17,913,541
			Total	$62,697,393

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Feasibility Study
Downtown Columbia Transportation Improvements
Little Patuxent Parkway / US 29 Interchange

CONCEPTUAL ALTERNATIVE CONSTRUCTION COST ESTIMATE

Alternative D – Full Diamond Interchange

Jan-12

ITEM DESCRIPTION	UNIT	QUANT	UNIT PRICE	TOTAL AMOUNT
PRELIMINARY (50% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$15,014,750	$15,014,750
GRADING	CY	43350	$20	$867,000
DRAINAGE & STORM WATER MANAGEMENT	LS	1	$2,700,000	$2,700,000
EROSION AND SEDIMENT CONTROL (4% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$1,201,180	$1,201,180
BRIDGE	SF	71000	$250	$17,750,000
RETAINING WALL	SF	46500	$150	$6,975,000
ROADWAY PAVEMENT AND BASE	SF	435000	$10	$4,350,000
CURB AND GUTTER	LF	3500	$25	$87,500
TRAFFIC SIGNAL (NEW)	EA	2	$250,000	$500,000
TRAFFIC SIGNAL (MODIFICATION)	EA	1	$150,000	$150,000
INTERCHANGE SIGNING	LS	1	$550,000	$550,000
INTERCHANGE LIGHTING	LS	1	$350,000	$350,000
ROADWAY PAVEMENT MARKING	LANE MILE	11	$32,000	$352,000
LANDSCASPING (4% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$1,201,180	$1,201,180
FOREST MITIGATION	AC	1.5	$8,700	$13,050
WETLAND MITIGATION	AC	0.3	$170,000	$51,000
			Subtotal	$52,112,660
			15% Inflation at 2017	$7,816,899
			40% Contingency	$23,971,824
			Total	$83,901,383

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Feasibility Study
Downtown Columbia Transportation Improvements
Little Patuxent Parkway / US 29 Interchange

CONCEPTUAL ALTERNATIVE CONSTRUCTION COST ESTIMATE

Alternative E – Directional Flyover to the North

Jan-12

ITEM DESCRIPTION	UNIT	QUANT	UNIT PRICE	TOTAL AMOUNT
PRELIMINARY (40% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$6,404,600	$6,404,600
GRADING	CY	13000	$20	$260,000
DRAINAGE & STORM WATER MANAGEMENT	LS	1	$736,800	$736,800
EROSION AND SEDIMENT CONTROL (4% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$640,460	$640,460
CURVED BRIDGE	SF	44500	$287	$12,771,500
RETAINING WALL	SF	10450	$150	$1,567,500
ROADWAY PAVEMENT AND BASE	SF	132500	$10	$1,325,000
CURB AND GUTTER	LF	3500	$25	$87,500
TRAFFIC SIGNAL (NEW)	EA	1	$250,000	$250,000
TRAFFIC SIGNAL (MODIFICATION)	EA	1	$150,000	$150,000
INTERCHANGE SIGNING	LS	1	$600,000	$600,000
ROADWAY PAVEMENT MARKING	LANE MILE	3	$32,000	$96,000
LANDSCASPING (4% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$640,460	$640,460
FOREST MITIGATION	AC	1.1	$8,700	$9,570
WETLAND MITIGATION	AC	0.3	$170,000	$51,000
			Subtotal	$25,590,390
			15% Inflation at 2017	$3,838,559
			40% Contingency	$11,771,579
			Total	$41,200,528

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Feasibility Study
Downtown Columbia Transportation Improvements
Little Patuxent Parkway / US 29 Interchange

CONCEPTUAL ALTERNATIVE CONSTRUCTION COST ESTIMATE

Alternative F – Half Diamond Interchange with Left Exit and Southern Connection

Jan-12

ITEM DESCRIPTION	UNIT	QUANT	UNIT PRICE	TOTAL AMOUNT
PRELIMINARY (40% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$12,678,400	$12,678,400
GRADING	CY	31500	$20	$630,000
DRAINAGE & STORM WATER MANAGEMENT	LS	1	$1,473,600	$1,473,600
EROSION AND SEDIMENT CONTROL (4% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$1,267,840	$1,267,840
PEDESTRIAN BRIDGE DEMOLITION	LS	1	$500,000	$500,000
CURVED BRIDGE	SF	78500	$287	$22,529,500
RETAINING WALL	SF	37750	$150	$5,662,500
ROADWAY PAVEMENT AND BASE	SF	239250	$10	$2,392,500
CURB AND GUTTER	LF	10500	$25	$262,500
CONCRETE SIDEWALK	SF	21900	$10	$219,000
TRAFFIC SIGNAL (NEW)	EA	3	$250,000	$750,000
TRAFFIC SIGNAL (MODIFICATION)	EA	1	$150,000	$150,000
INTERCHANGE SIGNING	LS	1	$345,000	$345,000
INTERCHANGE LIGHTING	LS	1	$275,000	$275,000
ROADWAY PAVEMENT MARKING	LANE MILE	6	$32,000	$192,000
LANDSCASPING (4% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$1,267,840	$1,267,840
FOREST MITIGATION	AC	2.1	$8,700	$18,270
WETLAND MITIGATION	AC	0.6	$170,000	$102,000
			Subtotal	$50,715,950
			15% Inflation at 2017	$7,607,393
			40% Contingency	$23,329,337
			Total	$81,652,680

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Feasibility Study
Downtown Columbia Transportation Improvements
Little Patuxent Parkway / US 29 Interchange

CONCEPTUAL ALTERNATIVE CONSTRUCTION COST ESTIMATE

Alternative G – Half Diamond Interchange with Right Exit and Southern Connection

Jan-12

ITEM DESCRIPTION	UNIT	QUANT	UNIT PRICE	TOTAL AMOUNT
PRELIMINARY (40% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$12,493,400	$12,493,400
GRADING	CY	29000	$20	$580,000
DRAINAGE & STORM WATER MANAGEMENT	LS	1	$1,473,600	$1,473,600
EROSION AND SEDIMENT CONTROL (4% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$1,249,340	$1,249,340
PEDESTRIAN BRIDGE DEMOLITION	LS	1	$500,000	$500,000
CURVED BRIDGE	SF	78500	$287	$22,529,500
RETAINING WALL	SF	35000	$150	$5,250,000
ROADWAY PAVEMENT AND BASE	SF	239250	$10	$2,392,500
CURB AND GUTTER	LF	10500	$25	$262,500
CONCRETE SIDEWALK	SF	21900	$10	$219,000
TRAFFIC SIGNAL (NEW)	EA	3	$250,000	$750,000
TRAFFIC SIGNAL (MODIFICATION)	EA	1	$150,000	$150,000
INTERCHANGE SIGNING	LS	1	$345,000	$345,000
INTERCHANGE LIGHTING	LS	1	$275,000	$275,000
ROADWAY PAVEMENT MARKING	LANE MILE	6	$32,000	$192,000
LANDSCASPING (4% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$1,249,340	$1,249,340
FOREST MITIGATION	AC	2.1	$8,700	$18,270
WETLAND MITIGATION	AC	0.6	$170,000	$102,000
			Subtotal	$50,031,450
			15% Inflation at 2017	$7,504,718
			40% Contingency	$23,014,467
			Total	$80,550,635

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TOWSON, MARYLAND 21204

Feasibility Study
Downtown Columbia Transportation Improvements
Little Patuxent Parkway / US 29 Interchange

CONCEPTUAL ALTERNATIVE CONSTRUCTION COST ESTIMATE

Alternative H – Half Diamond Interchange with Left Exit and Northern Connection

Jan-12

ITEM DESCRIPTION	UNIT	QUANT	UNIT PRICE	TOTAL AMOUNT
PRELIMINARY (40% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$11,453,600	$11,453,600
GRADING	CY	36000	$20	$720,000
DRAINAGE & STORM WATER MANAGEMENT	LS	1	$1,473,600	$1,473,600
EROSION AND SEDIMENT CONTROL (4% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$1,145,360	$1,145,360
BRIDGE	SF	74250	$250	$18,562,500
RETAINING WALL	SF	45000	$150	$6,750,000
ROADWAY PAVEMENT AND BASE	SF	236400	$10	$2,364,000
CURB AND GUTTER	LF	4000	$25	$100,000
CONCRETE SIDEWALK	SF	13750	$10	$137,500
TRAFFIC SIGNAL (NEW)	EA	3	$250,000	$750,000
TRAFFIC SIGNAL (MODIFICATION)	EA	1	$150,000	$150,000
INTERCHANGE SIGNING	LS	1	$345,000	$345,000
INTERCHANGE LIGHTING	LS	1	$275,000	$275,000
ROADWAY PAVEMENT MARKING	LANE MILE	6	$32,000	$192,000
LANDSCASPING (4% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$1,145,360	$1,145,360
FOREST MITIGATION	AC	0.9	$8,700	$7,830
WETLAND MITIGATION	AC	0.5	$170,000	$85,000
STREAM MITIGATION	LF	750	$675	$506,250
			Subtotal	$46,163,000
			15% Inflation at 2017	$6,924,450
			40% Contingency	$21,234,980
			Total	$74,322,430

WALLACE MONTGOMERY & ASSOCIATES
110 WEST ROAD SUITE 300
TOWSON, MARYLAND 21204

Feasibility Study
Downtown Columbia Transportation Improvements
Little Patuxent Parkway / US 29 Interchange

CONCEPTUAL ALTERNATIVE CONSTRUCTION COST ESTIMATE

Alternative I – Half Diamond Interchange with Right Exit and Northern Connection

Jan-12

ITEM DESCRIPTION	UNIT	QUANT	UNIT PRICE	TOTAL AMOUNT
PRELIMINARY (45% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$13,743,000	$13,743,000
GRADING	CY	47000	$20	$940,000
DRAINAGE & STORM WATER MANAGEMENT	LS	1	$1,964,800	$1,964,800
EROSION AND SEDIMENT CONTROL (4% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$1,221,600	$1,221,600
BRIDGE	SF	74250	$250	$18,562,500
RETAINING WALL	SF	45000	$150	$6,750,000
ROADWAY PAVEMENT AND BASE	SF	405000	$10	$4,050,000
CURB AND GUTTER	LF	4000	$25	$100,000
CONCRETE SIDEWALK	SF	13750	$10	$137,500
TRAFFIC SIGNAL (NEW)	EA	3	$250,000	$750,000
TRAFFIC SIGNAL (MODIFICATION)	EA	1	$150,000	$150,000
INTERCHANGE SIGNING	LS	1	$345,000	$345,000
INTERCHANGE LIGHTING	LS	1	$275,000	$275,000
ROADWAY PAVEMENT MARKING	LANE MILE	8	$32,000	$256,000
LANDSCASPING (4% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$1,221,600	$1,221,600
FOREST MITIGATION	AC	0.9	$8,700	$7,830
WETLAND MITIGATION	AC	0.5	$170,000	$85,000
STREAM MITIGATION	LF	750	$675	$506,250
			Subtotal	$51,066,080
			15% Inflation at 2017	$7,659,912
			40% Contingency	$23,490,397
			Total	$82,216,389

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Feasibility Study
Downtown Columbia Transportation Improvements
Little Patuxent Parkway / US 29 Interchange

CONCEPTUAL ALTERNATIVE CONSTRUCTION COST ESTIMATE

Alternative J – Single Point Urban Interchange and Northern Connection

Jan-12

ITEM DESCRIPTION	UNIT	QUANT	UNIT PRICE	TOTAL AMOUNT
PRELIMINARY (50% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$18,638,750	$18,638,750
GRADING	CY	51000	$20	$1,020,000
DRAINAGE & STORM WATER MANAGEMENT	LS	1	$2,947,200	$2,947,200
EROSION AND SEDIMENT CONTROL (4% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$1,491,100	$1,491,100
BRIDGE	SF	86870	$250	$21,717,500
RETAINING WALL	SF	53500	$150	$8,025,000
ROADWAY PAVEMENT AND BASE	SF	628000	$10	$6,280,000
CURB AND GUTTER	LF	4000	$25	$100,000
CONCRETE SIDEWALK	SF	13500	$10	$135,000
TRAFFIC SIGNAL (NEW)	EA	3	$250,000	$750,000
TRAFFIC SIGNAL (MODIFICATION)	EA	1	$150,000	$150,000
INTERCHANGE SIGNING	LS	1	$550,000	$550,000
INTERCHANGE LIGHTING	LS	1	$350,000	$350,000
ROADWAY PAVEMENT MARKING	LANE MILE	12	$32,000	$384,000
LANDSCASPING (4% OF CATEGORY 2,4,5,6 ITEMS)	LS	1	$1,491,100	$1,491,100
FOREST MITIGATION	AC	0.9	$8,700	$7,830
WETLAND MITIGATION	AC	0.5	$170,000	$85,000
STREAM MITIGATION	LF	750	$675	$506,250
			Subtotal	$64,628,730
			15% Inflation at 2017	$9,694,310
			40% Contingency	$29,729,216
			Total	$104,052,255

Storm Water Management Lump Sum Breakdown								
Alternative	Impervious area requiring treatment (acres)	lane miles equivalent	Earthwork CY @ 4200cy/LM	Earthwork @ $18/cy	ROW Acres @ .5ac/LM	ROW @ $250,000/ac	Hydraulic Structure	Total
A	4.49	4	16,800	$302,400	2	$500,000.00	$180,000	$982,400
B	9.21	7	29,400	$529,200	3.5	$875,000.00	$315,000	$1,719,200
C	6	5	21,000	$378,000	2.5	$625,000.00	$225,000	$1,228,000
D	15.45	11	46,200	$831,600	5.5	$1,375,000.00	$495,000	$2,701,600
E	4.02	3	12,600	$226,800	1.5	$375,000.00	$135,000	$736,800
F	8.25	6	25,200	$453,600	3	$750,000.00	$270,000	$1,473,600
G	7.68	6	25,200	$453,600	3	$750,000.00	$270,000	$1,473,600
H	7.64	6	25,200	$453,600	3	$750,000.00	$270,000	$1,473,600
I	11.11	8	33,600	$604,800	4	$1,000,000.00	$360,000	$1,964,800
J	17.26	12	50,400	$907,200	6	$1,500,000.00	$540,000	$2,947,200