Regional Intergovernmental Council

Spring Hill Corridor Study

South Charleston, West Virginia

2015

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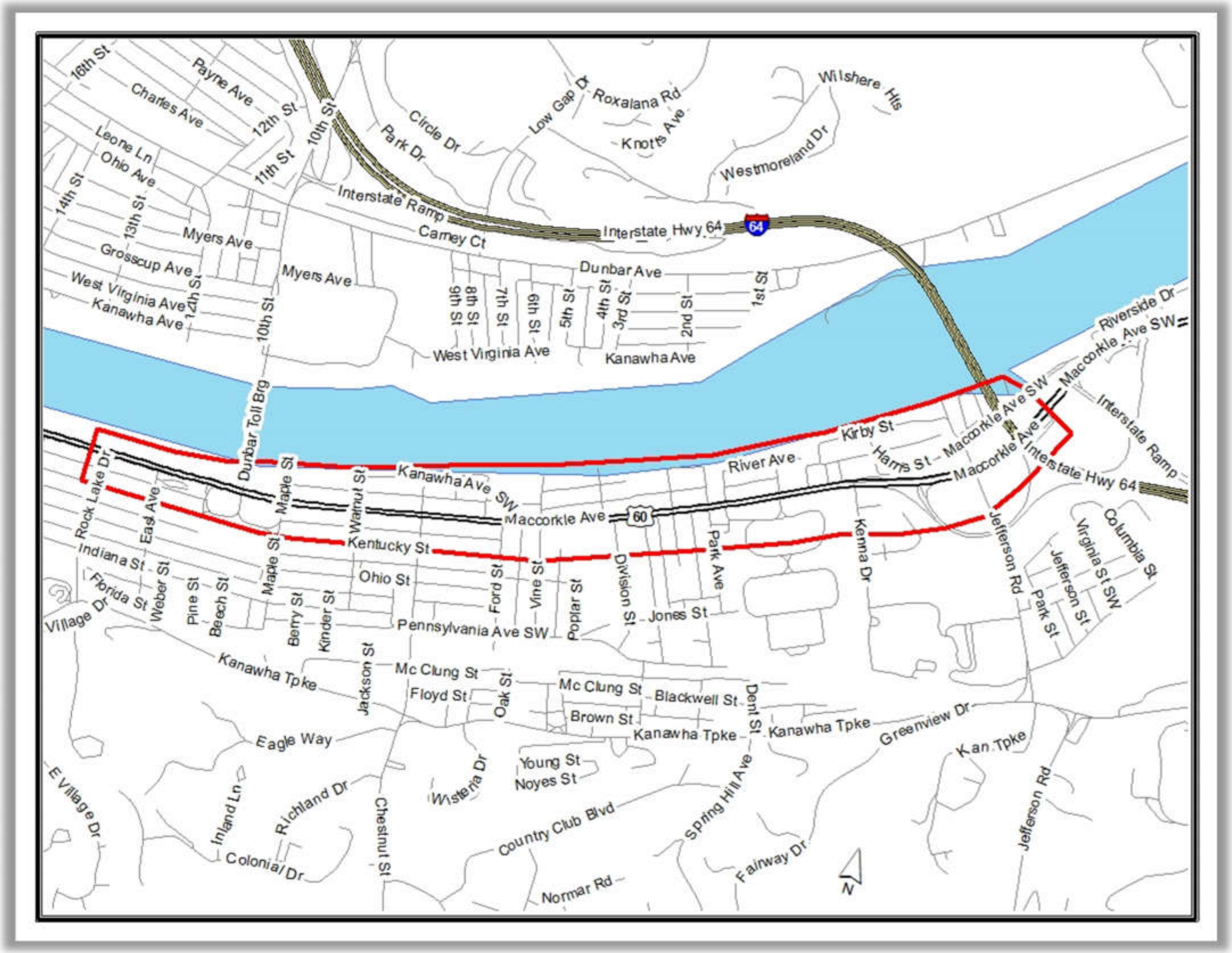
INTRODUCTION

STUDY AREA

The study area consists of a 1.48 mile section of MacCorkle Avenue (US 60) in South Charleston from Rock Lake Drive (mp 9.69) to Jefferson Road (mp 11.17) and contains eight signalized intersections. Throughout this corridor of MacCorkle Avenue there are five lanes with intermittent on-street parking. This corridor was part of a larger corridor review completed in 1982; since that time there have been many changes in land use and intersection improvements. This section of MacCorkle Avenue has been identified as a congested area, with an annual average daily traffic (AADT) flow of over 12,000 in 2010, and contains higher than average historical accident rates. The area has seen employment growth in recent years; the trend is expected to continue. Commercial growth typically leads to a decrease in population with employment increases. Approximately 17% growth in employment is expected between 2010 and 2040; conversely the same loss is expected in population.

As recommended in Metro Mobility 2040, this study of the MacCorkle Avenue corridor within the Spring Hill area of South Charleston intends to analyze existing and future transportation conditions including traffic flow, traffic volumes, crash rate and traffic signal operations for the existing roadway. This study encompasses all modes of travel, including freight truck movements, passenger vehicle flow, transit, and bicycle and pedestrian use and will also address current and future land use in the area. The traffic simulation software TransModeler has been utilized to analyze current and future transportation deficiencies. Accident records from 2009 through 2011 have been evaluated to determine the areas of excessive crashes. Potential improvements have been identified and ranked according to impact and effectiveness.

Figure 1: Study Area



Goals and Objectives

During the most recent update of the Regional Intergovernmental Council's (RIC) long range transportation plan, Metro Mobility 2040, a vision, goals, and objectives were developed. A study of this corridor was recommended in Metro Mobility 2040, and the specific goals and objectives have been refined from the regional plan. The overarching vision of this study is to improve the flow and safety of persons and goods traveling through the MacCorkle Ave/US 60 corridor, in Spring Hill.

Goal 1 Flow: *Improve the flow of traffic through Spring Hill.*

Goal 2 Safety: *Improve the safety and security of all travel modes throughout Spring Hill.*

Goal 3 Access: *Improve access to traffic generators and areas of future growth.*

Outreach and Public Participation

Outreach and public participation was conducted primarily in the form of individual meetings with key stakeholders identified in the original Scope of Work. Stakeholder interviews were conducted an effort to gain insight regarding existing and potential future transportation deficiencies within the study area.

Field visits were performed with representatives from West Virginia Division of Highways (WVDOH) Planning Division, WVDOH Engineering Division and a Traffic Engineer from the WVDOH District 1 headquarters.

Interviews were conducted with the following organizations;

1) West Virginia Division of Highways (WVDOH)
2) City of South Charleston
3) Kanawha Valley Regional Transit Authority (KVRTA)
4) Thomas Memorial Hospital

Stakeholder interviews and field reviews revealed narrow and crumbling sidewalks, inconsistent bike lanes, unmarked and sporadic on-street parking, and a high concentration of traffic signals. Many solutions were discussed and several have been included as recommendations. A full account of field review findings and stakeholder interviews is included in Appendix A.

EXISTING CONDITIONS

In order to fully understand the existing transportation network and develop a base travel demand model, a survey of existing intersections was performed. There are 15 intersections that were studied throughout this corridor; eight intersections are signalized while the remainder are stop-controlled from the cross street approach. Throughout the corridor there are several driveways, side streets, and intermittent on-street parking. MacCorkle Avenue is a five lane facility, yet the center turn lane disappears between Walnut and Ford Streets.

As previously mentioned, the land use around Spring Hill has been changing during the past 10 years. There has been a growth in commercial development, specifically related to Thomas Memorial Hospital and other medical offices and similar businesses. Currently a Sheetz gas station and convenience store is under construction south of MacCorkle Avenue between Park and MacDonald Streets.

Within each intersection analysis a morning and evening peak level of service (LOS) was calculated from five different traffic models in TransModeler. Further analysis regarding the traffic modeling processes and various models (Existing Conditions, Future No-Build, and Scenarios with proposed projects) is included in the Traffic Simulation section. In this study the LOS is used to compare quality of traffic service to its change over time. LOS is expressed as a letter grade A through F, with A being the best and F the worst, and may be used for intersection and segment analysis. The tables below describe LOS at an intersection, related to delay, and the LOS within a roadway segment, related to the volume to capacity ratio.

Table 1: Intersection Level of Service

LOS	Signalized Intersection Delay	Unsignalized Intersection Delay
A	10 seconds or less	11 seconds or less
B	10 to 20 seconds	10 to 15 seconds
C	20 to 35 seconds	15 to 25 seconds
D	35 to 55 seconds	25 to 35 seconds
F	over 55 seconds	over 35 seconds

Table 2: Segment Level of Service

LOS	Segment Volume to Capacity Ratio
A	0 to 0.60
B	0.61 to 0.70
C	0.71 to 0.80
D	0.81 to 0.90
E	0.91 to 1.00
F	over 1.00

Crash Analysis

Accident data throughout the corridor was derived from the WVDOH crash database utilizing a three year analysis period. There were 333 accidents from January 1, 2009 to December 31, 2011. The accident data was analyzed by arranging accident locations by milepost. Any accident occurring within 200 feet of an intersection on the side streets has been identified and counted as an intersection accident. Most of the accidents occurred at intersections. There were 89 accidents at Jefferson Rd/US60 alone. Accident rates were calculated for each intersection and roadway segment. The accident rate for the corridor was 689 accidents per hundred million vehicle-miles (HMVM), which was well above the 2001 statewide average of 495 HMVM. Due to the current inconsistencies of WVDOH crash data a recent and reliable statewide average was not found. West Virginia has consistently shown a decreasing statewide average crash rate, so it is safe to say this corridor has a higher than average crash rate.

The intersections with at least four accidents per year were considered most hazardous and were evaluated more closely. These ten intersections represent 254 out of 333 total accidents. Figure 2 shows the type of accident and the accident rate at each intersection. The accident rate for each intersection was calculated utilizing the number of accidents and average daily traffic (ADT).

In general, WVDOH categorizes intersection accident rates in the following categories:

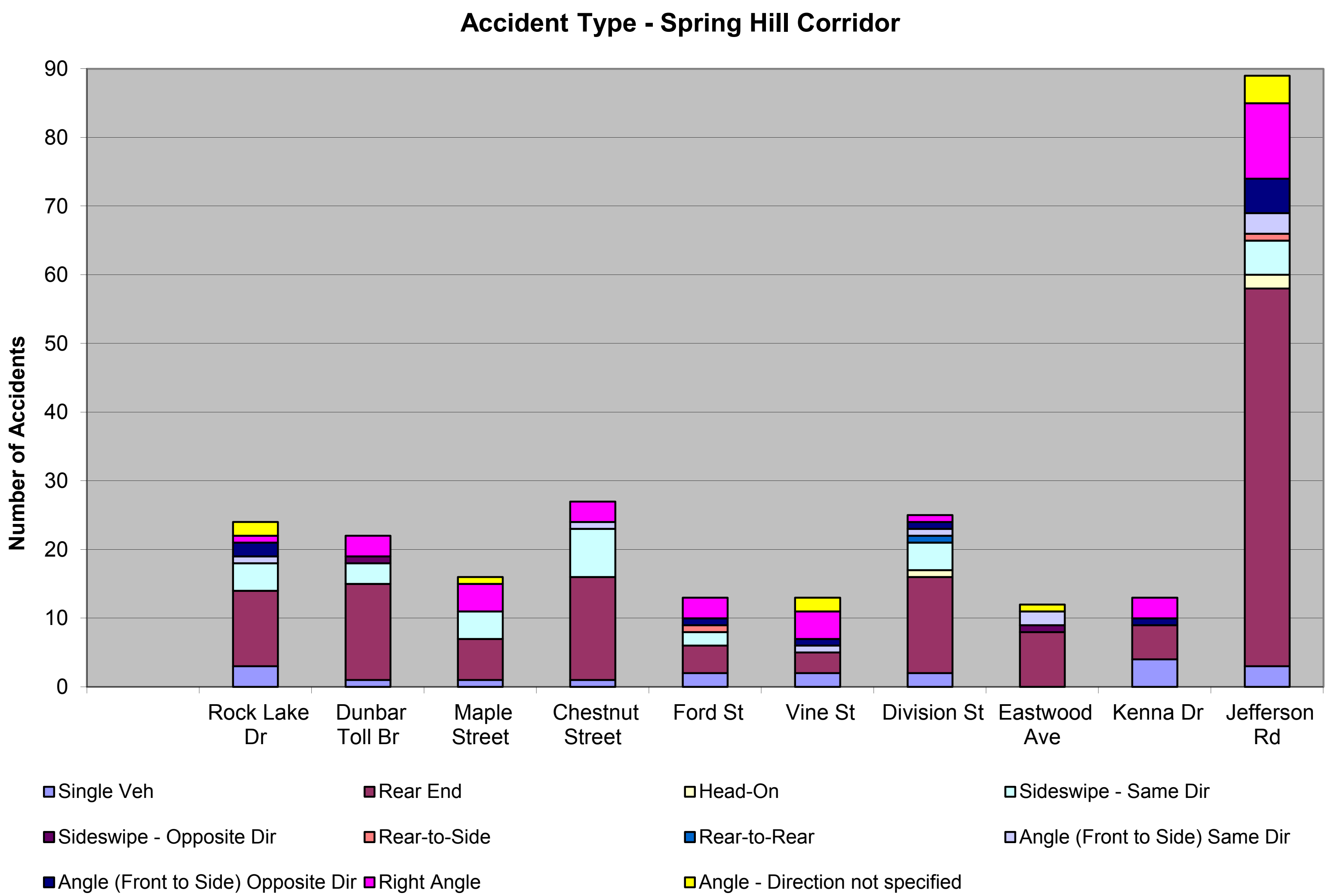
- Average < 1.5 accidents per million entering vehicles (MEV)
- Above Average > 1.5 accidents per MEV

- Significantly Above Average > 2.0 accidents per MEV

With the exception of US 60/Jefferson Road, the rest of the intersections have a below average accident rate. The intersection of US60 and Jefferson Road had an accident rate of 2.37 accidents per MEV, which is significantly above average. It is important to note the accident rate for most intersections along the corridor is well below statewide average. However, the overall corridor accident rate is above the statewide average. The corridor accident rate is a calculation of the number of accidents, AADT, and the length of the corridor; whereas intersection accident rate is a calculation of accidents and AADT. The number of accidents and closely clustered intersections causes the accident rate to increase for the corridor.

Due to the limited availability and lack of detailed crash records, it is not possible to pinpoint the exact location and circumstances of each accident. If this information were available, recommendations to further reduce the number of accidents would be more valuable. All accidents at each intersection are shown in a bar chart (Figure 2) for visual comparison. An individual intersection analysis follows Figure 2.

Figure 2: Accident Type



Rock Lake Drive and MacCorkle Avenue (MP 9.69)

This intersection is a signal controlled T-intersection. The Rock Lake Drive approach has two lanes with narrow sidewalks, with businesses close to the roadway that block the line of sight and shorten the turning radius. The land use is a mix of commercial and residential with no recent change. The existing level of service at this intersection is B for the morning and evening peak periods. The future level of service is expected to change to C for both peak periods if no improvements are implemented.

At this intersection, there were a total of 24 accidents during 2009-2011. The calculated accident rate was 0.75 accidents per million entering vehicles (MEV). The dominant type of accidents were rear-end (11), sideswipe same direction (four) and single vehicle (three).

Most of the rear-end accidents occurred during daylight when the road was dry. Eight of 11 accidents occurred at the intersection, and three were away from the intersection. Four rear-ends were classified as non-collision type. All four sideswipes were away from the intersection. In one case a parked vehicle was hit and in another case, the road was icy. Three single-vehicle accidents were caused by hitting utility poles or traffic signals.

Intersection Recommendations:

- Repair and improve sidewalks.

- Move utilities underground.
- Encourage future development to build away from the roadway to improve sight distance and turning radii.
- Restripe fading pavement markings.

East Avenue and MacCorkle Avenue (MP 9.78)

This intersection is stop controlled from the single East Avenue approach. The surrounding area is primarily residential with one vacant commercial lot. The sidewalks are narrow with utilities blocking pedestrian movement. The existing level of service at this intersection is A for the morning and evening peak periods, and is not expected to change with the predicted future growth.

This intersection was considered a non-hazardous intersection because the average number of accidents is less than four per year.

Intersection Recommendations:

- Repair and improve sidewalks.
- Move utilities underground.

Dunbar Toll Bridge off-ramp (CR25/48) & MacCorkle Ave (MP 9.84)

The Dunbar Toll Bridge serves as a major access point between the cities of South Charleston and Dunbar, and has an AADT of 11,000. This signal controlled intersection has two way traffic along MacCorkle Ave, and one way traffic exiting the bridge. There are ADA accessibility improvements planned for the sidewalk along the bridge, but will not change the roadway design. The dedicated bicycle lane along MacCorkle Avenue ends at this intersection. The existing level of service at this intersection is A for the morning peak period and B for the evening peak. The future level of service is expected to change to B for both peak periods if no improvements are implemented.

There were 22 accidents during the three year period resulting in accident rate of 0.66 accidents per MEV. The dominant type was rear-end accidents, of which there were 14. In an earlier study, using 2000-2002 crash records, there were 43 accidents, 31 of which were rear-ends.

Of the 14 rear-ends, eight occurred at the intersection, six on the bridge ramp and one while merging in traffic on MacCorkle Avenue. Three accidents occurred during night hours and in three other cases, the roadway was wet. Sideswipe same direction accidents occurred at the toll bridge off ramp, at the toll bridge base, and at the outside merge lane.

Intersection Recommendations:

- Repair and improve sidewalks.
- Continue dedicated bicycle lane or provide signage to a route off of MacCorkle Avenue
- Move utilities underground.

Maple Street and MacCorkle Avenue (MP 9.96)

This intersection serves as the entrance ramp for the Dunbar Toll Bridge. The Maple Street approach is stop controlled. Left turns from MacCorkle to Maple (bridge access) may develop queues in the evening peak hour. The existing level of service at this intersection is A for the morning and evening peak periods. The future level of service is expected to change to C for the morning peak, yet remain constant for the evening peak period, if no improvements are implemented.

At this intersection, there were 16 accidents during the three year period resulting in an accident rate of 0.44 accidents per MEV. The dominant type accidents were rear-end (six), sideswipe (four) and right angle (four).

Four rear-ends occurred away from the intersection and the other two at the intersection. In two cases, the road was wet. Out of four right-angle accidents, three occurred away from the intersection; and one at the intersection when the road was wet.

Intersection Recommendations:

- Repair and improve sidewalks.
- Move utilities underground.
- Restripe fading pavement markings along Maple Street.
- Restripe pavement along MacCorkle to maintain a uniform width in the traveling lanes.

Walnut Street and MacCorkle Avenue (MP 10.08)

The Walnut Street approach is stop-controlled, with one lane each way and narrow sidewalks south of MacCorkle. The surrounding land use is mostly commercial. Westbound travelers on MacCorkle are not permitted left turns onto Walnut. The existing level of service at this intersection is A for the morning and evening peak periods. The future level of service is expected to change to B for the morning peak, yet remain constant for the evening peak period if no improvements are implemented.

This intersection was considered a non-hazardous intersection because the average number of accidents is less than four per year.

Intersection Recommendations:

- Repair and improve sidewalks.
- Move utilities underground.
- Restripe pavement along MacCorkle to maintain a uniform width in the traveling lanes.

Chestnut Street and MacCorkle Avenue (MP 10.18)

This signal controlled intersection is located in a mix of residential and commercial properties. North of MacCorkle there are no pavement markings; south of MacCorkle there are two lanes of traffic feeding MacCorkle with one lane of traffic moving away. There are sidewalks along MacCorkle as well as narrow sidewalks south of MacCorkle. The existing level of service at this intersection is A for the morning peak period and B for the evening peak. The future level of service is expected to change to B for the morning peak period and C for the evening peak period, if no improvements are implemented.

There were 27 accidents at this intersection in the three year period with an accident rate of 0.75 per MEV. The dominant accident types were rear-end (15) and sideswipe (seven). In an earlier study, during the late 1990's, there was a total of 57 accidents at this intersection, with 32 rear-end accidents and seven sideswipes. Since that time, rear-end accidents have decreased, whereas sideswipe accidents have stayed the same. Most of the rear-end accidents occurred at the intersection.

There were seven sideswipe same direction accidents at this intersection during the three year period. This number is high when compared to other intersections along this corridor. As stated above, the frequency of this type of accident has remained high at this intersection over the past 15 years. It is likely these accidents are caused by roadway design. On street parking and narrow approaches for the northbound traffic may also be contributing factors for this type of accident.

INTERSECTION RECOMMENDATIONS:

- Repair and improve sidewalks.
- Move utilities underground.
- Restripe pavement along MacCorkle to maintain a uniform width in the traveling lanes.
- Remove on-street parking to allow left turns from MacCorkle on to Chestnut Street.
- Change adjacent vacant property into parking lots.

FORD STREET AND MACCORKLE AVENUE (MP 10.30)

This intersection is signal controlled with commercial properties surrounding it. Along MacCorkle Avenue on-street parking is allowed, spaces are narrow and constricted and signage is unclear. The approaches from Ford Street are very narrow and access to nearby parking lots is inconvenient. The existing level of service at this intersection is A for both morning and evening peak periods. The future level of service is expected to change to B for the morning peak period and C for the evening peak period, if no improvements are implemented.

This intersection had only 13 accidents in the three year period including four rear-end, three right angle, two single vehicle and two sideswipe.

Intersection Recommendations:

- Repair and improve sidewalks.
- Move utilities underground.
- Restripe pavement along MacCorkle to maintain a uniform width in the traveling lanes.
- Widen Ford Street north of MacCorkle Avenue to improve access to medical offices.

Vine Street and MacCorkle Avenue (MP 10.36)

A study to determine if a signal may be warranted has been mentioned at this intersection; however the close proximity of two other signals proves problematic. This intersection is stop controlled from the Vine Street approach. Numerous vehicles turn left from MacCorkle onto Vine to access the Thomas Memorial Hospital Medical Pavilion; the continuous traffic along MacCorkle causes turning delays. The sidewalks along MacCorkle and Vine are adequate yet telephone poles obstruct continuous pedestrian travel. The existing level of service at this intersection is A for both morning and evening peak periods. The future level of service is expected to change to B for the morning peak period and F for the evening peak period, if no improvements are implemented.

This intersection had 13 accidents, including four right angles and three rear-ends. Three right angles were at the intersection, and the fourth one away from intersection was non-collision type.

Intersection Recommendations:

- Repair and improve sidewalks.
- Move utilities underground.
- Restripe pavement along MacCorkle to maintain a uniform width in the traveling lanes.

DIVISION STREET AND MACCORKLE AVENUE (MP 10.47)

Field observation of this offset intersection appears to indicate that any changes would be costly and provide little benefit. This intersection functions very well and any major roadway changes would affect businesses located close to the right-of-way, making any potential improvements costly. Truck volumes are high at this intersection, but all relate to the medical industry. The sidewalks surrounding this signal controlled intersection are narrow with utility poles obstructing pedestrian travel. The sidewalks and bus shelter are well used by individuals traveling to and from Thomas Memorial Hospital. The existing level of service at this intersection is C for both morning and evening peak periods. The future level of service is expected to remain constant for the morning peak period and change to D for the evening peak period, if no improvements are implemented.

At this location, there were 25 accidents reported during the 3-year period resulting in an accident rate of 0.83/MEV. The dominant accident types were rear-ends (14) and sideswipes (four). This is a unique dog-leg intersection which is operated as two T-junctions.

Intersection Recommendations:

- Move utilities underground.
- Restripe pavement along MacCorkle to maintain a uniform width in the traveling lanes.

GREENWAY AVENUE AND MACCORKLE AVENUE (MP 10.50)

This three-way intersection is stop-controlled on the Greenway Avenue approach. Greenway provides access to hospital parking and several medical offices; which contributes to its status as a high traffic volume intersection along a narrow roadway. Buildings are very close to the roadway which results in a limited sight distance from Greenway Avenue. On-street parking is allowed along Greenway Avenue. All of these minor complications add up to make a congested intersection. The existing level of service at this intersection is A for both morning and evening peak periods. The future level of service is expected to change to B for the morning peak period and D for the evening peak period, if no improvements are implemented.

This intersection was considered a non-hazardous intersection because the average number of accidents is less than four per year.

INTERSECTION RECOMMENDATIONS:

- Move utilities underground.
- Repair and improve sidewalks.
- Encourage future development to build away from the roadway to improve sight distance and turning radii.
- Restripe pavement along MacCorkle to maintain a uniform width in the traveling lanes.

McDonald Street and MacCorkle Avenue (MP 10.56)

This three-way intersection is stop-controlled on the McDonald Street approach which also has on-street parking. The sidewalks are narrow along McDonald Street while the sidewalks along MacCorkle Avenue have utility poles obstructing pedestrian travel. The surrounding area is transitioning from commercial to residential. The existing level of service at this intersection is A for both morning and evening peak periods. The future level of service is expected to change to A for the morning peak period and C for the evening peak period, if no improvements are implemented.

This intersection was considered a non-hazardous intersection because the average number of accidents is less than four per year.

Intersection Recommendations:

- Move utilities underground.
- Repair and improve sidewalks
- Restripe pavement along MacCorkle to maintain a uniform width in the traveling lanes.

PARK AVENUE AND MACCORKLE AVENUE (MP 10.62)

This three way intersection is stop-controlled on the Park Street approach which also has on street parking and narrow sidewalks. The surrounding land use is commercial, a Sheetz Gas Station and Convenience Store is currently under construction. The existing level of service at this intersection is A for both morning and evening peak periods. The future level of service is expected to change to A for the morning peak period and F for the evening peak period, if no improvements are implemented.

This intersection was considered a non-hazardous intersection because the average number of accidents is less than four per year.

INTERSECTION RECOMMENDATIONS:

- Move utilities underground.
- Repair and improve sidewalks
- Restripe pavement along MacCorkle to maintain a uniform width in the traveling lanes.

EASTWOOD AVE AND MACCORKLE AVE

The Eastwood Avenue approaches are stop-controlled in this intersection. Eastwood Avenue is narrow north of MacCorkle. There are also narrow sidewalks with obstructive utility poles, and a mix of commercial and residential land use.

Only 12 accidents occurred at this intersection during the three year period. There is little traffic on Eastwood Avenue. All eight rear-end accidents were away from the intersection on US 60.

Intersection Recommendations:

- Move utilities underground.
- Repair and improve sidewalks
- Restripe pavement along MacCorkle to maintain a uniform width in the traveling lanes.

Kenna Drive and MacCorkle Avenue (MP 10.85)

This intersection is signal-controlled with commercial properties north of MacCorkle and residential properties south of MacCorkle. One minor issue is evident in the picture above. The right turn lane from the westbound MacCorkle approach contains a section of roadway stripped off forcing drivers to veer right unnecessarily. After discussion with WVDOH Traffic Engineering the purpose of this striping is still unclear. It would be possible to restripe the pavement to create a dedicated right turn lane. The existing level of service at this intersection is C for the morning peak period and B for the evening peak period. The future level of service is expected to change to C for both peak periods, if no improvements are implemented.

There were 12 accidents at this intersection; including five rear-ends, four single vehicle and three right-angle. Single vehicle accidents included hitting a bicycle, traffic barrier, utility pole, and a traffic signal support.

Intersection Recommendations:

- Move utilities underground.
- Repair and improve sidewalks
- Restripe pavement along MacCorkle to maintain a uniform width in the traveling lanes.
- Re-stripe westbound MacCorkle Avenue approach to create a right turn lane to Kenna Drive.

Entrance I-64 Ramp A and MacCorkle Avenue (MP 11.10)

This intersection serves as the I-64 Eastbound entrance and exit ramp and is signal controlled. This intersection performs properly and contains no major deficiencies. The existing level of service at this intersection is A for the morning peak period and B for the evening peak period. The future level of service is expected to change to B for the morning peak period and C for the evening peak period, if no improvements are implemented.

This intersection was considered a non-hazardous intersection because the average number of accidents is less than four per year.

Intersection Recommendations:

- Move utilities underground.
- Repair and improve sidewalks
- Restripe pavement along MacCorkle to maintain a uniform width in the traveling lanes.
- Encourage development with excess pavement; multi-use path, greenspace, bicycle lane or pedestrian sidewalk.

Jefferson Road WV601 and MacCorkle Avenue (MP 11.17)

The intersection of Jefferson Road (WV 601) and MacCorkle Avenue (US 60) is a high volume and high accident area. This signal controlled intersection has recently been studied by the WVDOH in the WV601/Jefferson Road Corridor Study. There is a widening project currently in the environmental review stages. Jefferson Road was included in this corridor study, but no projects will be suggested for this intersection because of the recent corridor study and planned projects. The RIC understands the Jefferson Road intersection is a vital part of the Spring Hill Corridor, but feels no need to duplicate efforts already completed by the WVDOH. Currently there is no preferred alternative recommendation from the Jefferson Road Study, but all alternatives end at the intersection of MacCorkle Avenue and Jefferson Road.

The existing level of service at this intersection is B for the morning peak period and D for the evening peak period. The future level of service is expected to change to C for the morning peak period and remain constant for the evening peak period, if no improvements are implemented.

The highest number of accidents on the corridor was at this junction. There were 89 accidents with an accident rate of 2.37 MEV. The dominant type accidents were rear-ends (55) and right angle (11). Of the 55 rear-ends, 34 occurred during day-light hours in good weather conditions; this would suggest congested traffic or driver distraction as the cause of an accident.

Intersection Recommendations:

- Move utilities underground.
- Restripe fading pavement markings.
- Work with WVDOH on existing or future plans to ensure any roadway alignment changes flow into the existing MacCorkle Avenue corridor.

Traffic Simulation

TransModeler is a traffic simulation software that provides time-based multimodal simulation of individual vehicles along a roadway or roadway system. TransModeler can simulate traffic at the microscopic, mesoscopic, and macroscopic levels of a network. The simulation model developed for this study is at the microscopic level. The model attempts to reflect real world conditions based on several input and default parameters. Inputs to the model include roadway geometry, traffic signal timing, traffic volumes. The model also includes default parameters that are related to various driving behaviors, such as driver route choice, lane changing, response to traffic control, acceleration, which are used to simulate traffic flow.

For this corridor study, simulation based dynamic traffic assignment with travel time averaging was used for traffic assignment. Using an origin-destination (O-D) matrix, TransModeler routes trips based on dynamic assignment. Based on the coded model, this procedure develops a set of paths for a single O-D pair and assigns costs in terms of travel times and turning movement delays. These costs and paths are then input into the model to conduct simulations and extract outputs.

Comprehensive measures of effectiveness (MOEs) are collected for each vehicle in the model for every tenth of a second of model simulation. The MOEs collected by the model include system wide measurements as well as measurements by link, such as average delay per vehicle, total intersection delay, and queuing. TransModeler also generates animated graphics, which display street networks, traffic control device indications, and movement of vehicles through the model.

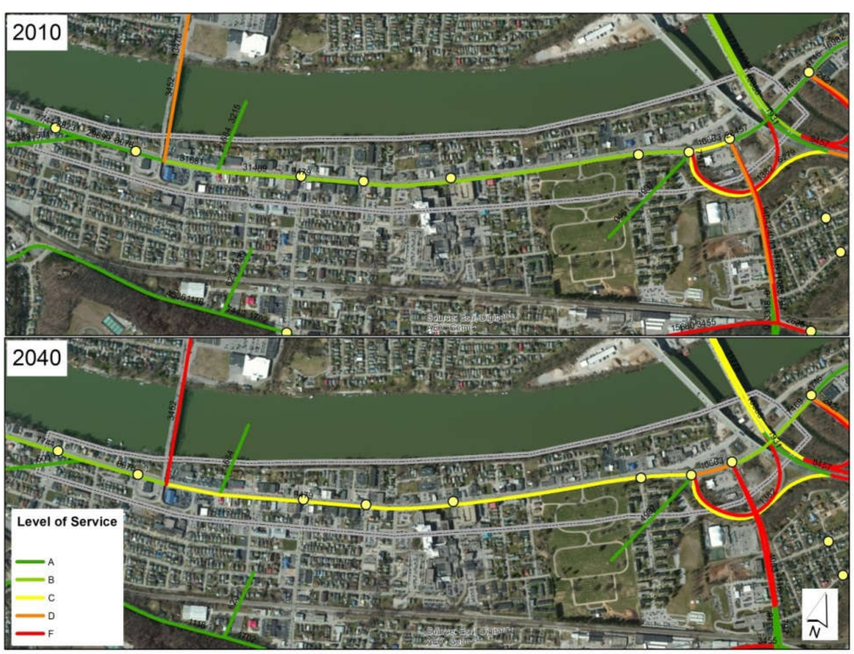
A travel time study was performed on August 26, 27, and 28, 2014 using the hybrid average vehicle/floating vehicle method. For this hybrid method, the driver is to maintain the average speed along the corridor and safely pass as many vehicles as pass the test vehicle. Measurements to be collected include running time, control and end points, distance traveled, and type, location, and duration of any traffic delays mid-route; i.e. stops at traffic signals during red cycles. The route was traveled three times during each peak hour, 7am to 8am and 4pm to 5pm. The purposes of the travel time study were to record delays and calibrate the base model to reflect actual roadway conditions. After completion of the travel time study, analysis showed the existing conditions model was producing accurate results.

A base model was constructed using the existing roadway conditions. Volume and capacity of each road segment, along with signal timing and turning movement counts from each intersection, were utilized in model creation. Levels of service, travel time, and delay were calculated for the peak hours utilizing the existing conditions model. The LOS and average delay are represented in tabulation format for both AM and PM peaks in the attached Appendix B.

A future no-build model was created from the Metro Mobility 2040 travel demand model volumes. This model approximates traffic based upon projected growth and no improvements. Three additional traffic simulation models were created to show suggested projects. These model variations will provide a visualization of recommended projects and comparison to future no-build conditions.

In Figure 3 the study area is shown with the model network, a simple drawing that reflects the existing (2010) roadway conditions and the future (2040) projected conditions. The varying colors refer to the *daily* average level of service. It is evident that the LOS is predicted to change from a B to C before 2040. It is important to note that during the existing conditions summary the PM and AM peak hour LOS was identified. The level of service is usually worse during the peak hours as more cars travel during peak times.

Figure 3: 2010 to 2040 Conditions



Recommendations

As discussed previously, an existing conditions summary was produced in order to identify deficiencies within the transportation network. Many of these deficiencies were related to signage, pavement markings, or lane width; all small improvements that can make a larger impact to the overall flow and appearance of the corridor. Some deficiencies would require a large scale project to improve the corridor. To accurately address deficiencies and show potential improvements, several low cost improvements have been identified and grouped together to form Scenario A. Two additional, larger scale projects were identified and modeled as Scenario B and C.

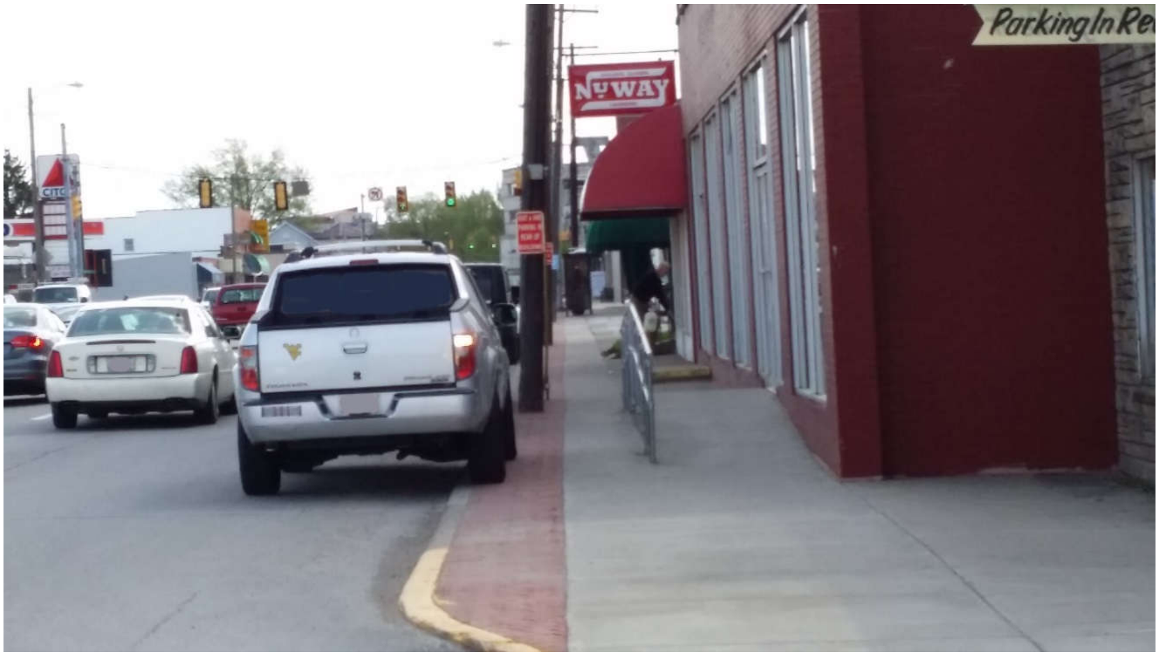
Scenario A: There are eight coordinated traffic signals through this corridor; traffic volume growth can affect the efficiency of a traffic signal. Signal optimization is one of the most cost-effective ways to improve traffic flow, and is recommended in this scenario. Throughout the corridor, lane width should be made consistent and pavement markings upgraded. Additionally, the existing on-street parking should be removed and the center turn lane made constant. With a consistent roadway width, existing right-of-way would allow for wider sidewalks or the addition of a bike lane. Along MacCorkle Avenue and several side streets there are crumbling curbs and narrow sidewalks which need repaired. If these sidewalks were slightly widened and the utilities were relocated, the sidewalks would become wheelchair accessible. Figure 4 illustrates the narrow and crumbling sidewalks. It is also recommended to alter the intersection of Kenna and MacCorkle Avenue to a standard plus intersection. Currently the westbound approach on MacCorkle Avenue includes a section of roadway stripped off between the slow lane and the right turn lane, visible in Figure 5. This odd right turn lane causes some drivers to overlook the turn lane and congest traffic in the slow lane while turning right; this was evidenced during field reviews.

Figure 4: Crumbling and narrow sidewalks along MacCorkle Ave.

Figure 5: Kenna and MacCorkle Ave.

Currently, the left (or fast) lane remains a constant width while the right (or slow) lane varies. On-street parking is also inconsistent and lacks proper signage and pavement markings. Inadequate signage allows for on-street parking where there is not sufficient space; this creates at the best a delay in traffic and at the worst a collision. As evident in Figure 6, there is not adequate parking space along MacCorkle Avenue. This causes cars to park on the sidewalk which then weakens the sidewalk. As noted in the Crash Analysis for the intersection of Chestnut Street and MacCorkle Ave, sideswipe accidents have remained constant over time where on-street parking occurs, yet the overall accident rate has decreased. This suggests overall roadway safety is increasing while on-street parking is resulting in sideswipe collisions.

Figure 6: Parking along MacCorkle Ave.



Currently, left turns from the westbound MacCorkle Avenue to south Chestnut Street are illegal; see Figure 7 for an aerial view of the intersection. This section of MacCorkle Avenue does not have a center turn lane, there is not adequate space. If the on-street parking were removed and lane widths made consistent the center turn lane could be added, making left turns onto Chestnut Street legal. Several drivers do make illegal left turns onto Chestnut Street from MacCorkle Avenue. More drivers cut through a closed gas station to access North Chestnut and then drive straight through the intersection. During stakeholder interviews it was mentioned that the previous business owner would frequently complain of drivers cutting through his property. During a field review several vacant lots were identified as potential parking lots, in Figure 7 only two have been highlighted.

Figure 7: Chestnut Street Intersection

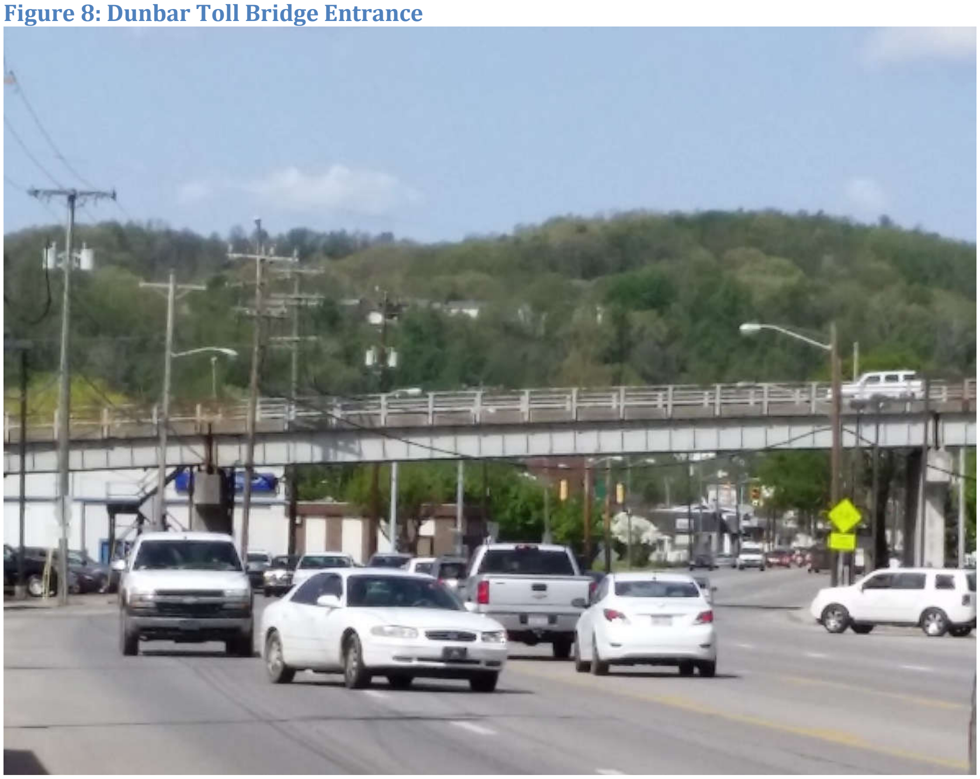
It is important to note that removing on-street parking has been recommended in past transportation studies and never fully implemented. Interviews with stakeholders have suggested local business owners feel the removal of parking will negatively impact their business. However, it is clear that removing on-street parking would improve the flow and safety of MacCorkle Avenue through Spring Hill. There are existing vacant lots near businesses that could be converted to parking.

Summary of Recommendations for Scenario A:

- Signal Optimization
- Consistent traveling lane width.
- Repurpose on-street parking for wider sidewalks or extension of bike lane.
- Make center turn lane consistent throughout corridor.
- Relocate utilities or take necessary steps to follow ADA accessibility guidelines in sidewalk construction.
- Correct intersection of Kenna and MacCorkle Ave.

Scenario B: Vehicles entering the Dunbar Toll Bridge que in the center turn lane of MacCorkle Avenue while waiting for a break in eastbound traffic. The que can become quite lengthy during the PM peak, as mentioned during stakeholder interviews. Figure 8 was taken midday, there are four vehicles waiting to access the Dunbar Toll Bridge. Adding a signal at this intersection would only add congestion to a corridor with too many signals. It is recommended to widen the exit ramp to allow two-way traffic. All traffic entering the Dunbar Toll Bridge would be pushed to the signal at the existing exit of the Dunbar Toll Bridge. There would be no need for an extra signal, and the traffic entering the bridge would have a protected light giving access.

Figure 8: Dunbar Toll Bridge Entrance

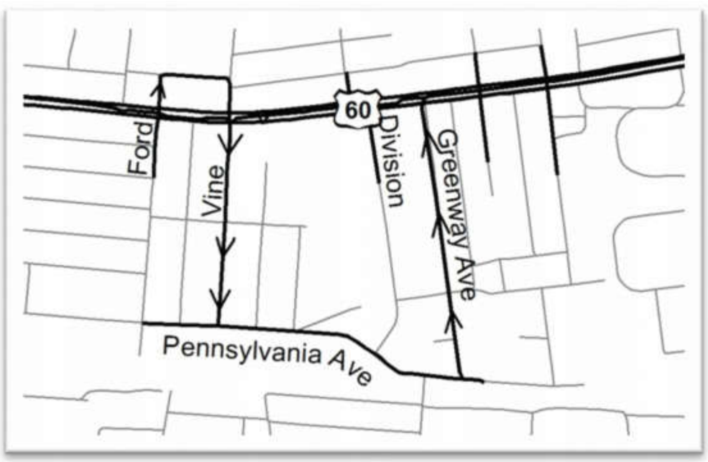


Summary of Recommendations for Scenario B:

- All recommendations from Scenario A
- Change entrance to Dunbar Toll Bridge
- Update and retime traffic signal

SCENARIO C: During field reviews it was noted that the side streets are extremely narrow and are expected to accommodate residential parking and two-way traffic. In some situations travel is quite difficult, specifically when two cars attempting to pass with cars parked alongside the street. Because the land use has been changing in the recent years, from residential to commercial, this situation is becoming more common. Instead of taking developed property to widen side streets, it would be better to restrict movement on specific side streets to allow better access to commercial properties. Further study would be needed, but for the purposes of this study it is recommended to change North Ford and North Vine and South Vine and South Greenway to one-way pairs, respectively. The recommended directional traffic flow is illustrated in Figure 9.

Figure 9: One-Way Pairs



Ford, Vine and Greenway were selected because the majority of traffic travels in one direction along those streets, and those streets provide the most access to medical offices and parking lots. This area is expected to continue to grow and develop various properties to support the medical industry. It should be noted that proper informational signing directing traffic to Thomas Memorial Hospital and Medical Pavilion and other medical offices in the surrounding area is lacking. This was discovered during field reviews. Inadequate signage makes driving difficult and dangerous for the unfamiliar driver such as, someone only driving in an area once a year or visiting a new doctor.

Summary of Recommendations for Scenario C:

- All recommendations from Scenario A
- Change North Ford and North Vine to one-way pairs
- Change South Vine and South Greenway to one-way pairs connect to Pennsylvania Avenue

Conclusion

In a perfect world, the proper funds exist to solve problems and solutions come easy. However, this imperfect world requires careful weighing of costs and benefits. A project prioritization process was developed using quantitative and qualitative measures. Quantitative measures (level of service, cost and time of delay) are easily evaluated, however qualitative measures are more subjective (stakeholder input and community goals) and therefore difficult to measure. Specific evaluation measures were selected to assist in identifying which of the proposed projects would achieve the project goals of enhanced traffic flow and safety for future traffic needs.

Peak period delays and levels of service have been calculated from the traffic simulation models. The projects with the largest impact on reduced delays and improved level of service received a higher score.

During the accident analysis the accident rate for the specific road segment or intersection was calculated. Higher scores are assigned to areas with a high accident rate under the assumption that the project will reduce the frequency and/or severity of crashes.

Community Input encompasses study goals, community impact, stakeholder input, and overall project effectiveness. This qualitative measure aims to quantify the projects ability to fit with community vision; higher scores are awarded to projects that are a better fit to community goals.

Figure 10 shows the project ranking while Figure 11 explains how the scores were derived.

Figure 10: Project Selection Matrix

Selection Criteria		Weighted Values	Scenarios A	Scenarios B	Scenarios C
Quantitative	Peak Period Delays	20%	4	3	2
Quantitative	Level of Service	20%	3	3	2
Quantitative	Accident Rate	25%	4	3	2
Qualitative	Community Input: combines stakeholder input, community goals and overall project systemwide improvement	35%	3	2	2
	Totals		3.45	2.65	2

Figure 11: Scoring Description

Does not improve future delays	1	2	3	4	Does improve future delays
Does not improve level of service	1	2	3	4	Does improve level of service
Low accident rate	1	2	3	4	High accident rate
Does not align with stakeholder input, community goals or overall improvements	1	2	3	4	Does align with stakeholder input, community goals or overall improvements

Detailed cost estimation was not completed during this study. With basic descriptions of each scenario the scale and cost are easily approximated. Scenario A is by far the least expensive recommendation. There are very few changes to the existing roadway, and many could be implemented during the next paving cycle if all interested parties are agreeable. Scenario B is likely the most costly because the existing ramp will need to be widened. Currently, a construction project is underway; the existing exit ramp will be widened to provide ADA accommodations. The current project was initially estimated at 1.1 million, anything like Scenario B suggests would be more costly. Scenario C does not involve major changes to roadway design, but the communication and public education necessary for converting two-way traffic to one-way traffic would be extensive. The burden of changing driving habits is difficult to express monetarily.

Based upon the project selection matrix, the projects encompassing Scenario A scored highest and should be completed. Scenario A includes; signal optimization, basic upgrading of lane widths, lane markings, sidewalk renovation and additional signage. The projects are simple and extremely effective at reducing delays and improving level of service.

APPENDIX A

Inventory of Side Streets/Parking/Sidewalks along MacCorkle Ave
5/21/2014
Starting at Rock Lake Drive and traveling west.

MacCorkle Ave: center turn lane, two lanes both directions, narrow sidewalks and bike lanes on both roadway edges

Rock Lake Drive: Left and right turn lanes feeding MacCorkle Avenue from the south, one lane traveling away from MacCorkle Ave. narrow sidewalk, pedestrian crosswalk, and signal controlled.

East Ave: Narrow sidewalk in both directions, no pavement markings stop controlled

Dunbar Toll Bridge (exit ramp): Signal Controlled, Two turn lanes pedestrian crosswalk, no sidewalk but plans exist for future ADA access to bridge.

MacCorkle Ave: bike lane markings stop just before Dunbar Toll Bridge intersection

Maple Street: entrance ramp for Dunbar Toll Bridge Right turn lane from MacCorkle Ave going south to access the bridge. Non signalized, no sidewalk. It has been mentioned there is a long queue of cars in the west bound left turn lane on MacCorkle Avenue (cars entering the bridge) and a light might be necessary. Others feel a light would prevent cars exiting the bridge and force a queue on the bridge.

MacCorkle Ave: center turn lane becomes left only turn lane to access Dubar Toll Bridge (as mentioned above) Narrow sidewalks break for access to businesses and homes.

Walnut Ave: One lane each direction, narrow sidewalks exist south of MacCorkle

MacCorkle Ave: 2 lanes both direction sidewalks with sporadic non-marked on street parking.

Chestnut: 2 pedestrian crosswalks, signal north of MacCorkle Ave. Pavement lanes not marked. South of MacCorkle Ave two lanes feed MacCorkle Ave, one lane leads away from MacCorkle Ave. Sidewalks only south of MacCorkle.

MacCorkle Ave: left turn lane (onto North Ford) and right turn lane (onto South Ford) on street parking

Ford Street: Pedestrian crosswalk, narrow sidewalk, one lane both directions

MacCorkle Ave: two lanes each direction, center turn lane, narrow sidewalks, on street parking

Vine Street: one lane each direction, sidewalks, no pavement markings except stop bars

Division Street: off-set intersection, pedestrian crosswalk, sidewalks, and one bus shelter. South Division Street has two lanes feeding MacCorkle Ave. one lane away from MacCorkle Ave, one lane north division street.

Greenway Ave: one lane in each direction, on street parking, narrow sidewalks

New Sheetz planned between Greenway and McDonald Ave.

McDonald Street: One lane in each direction. No pavement markings except 2 stop bars. Sidewalks and on street parking.

Park Ave: Same as McDonald, both non signalized. On street parking makes easy travel difficult, land use transitioning residential area.

Eastwood Ave: South entrance to cemetery, North- one lane both directions, no pacement markings. Only stop bar, sidewalks.

Cemetery- no sidewalks along MacCorkle Ave.

Kenna Drive: South residential area, north commercial signalized pedestrian crosswalk one lane both ways (south), NORTH: left turn and right turn lanes feeding MacCorkle Ave.

MacCorkle Ave: no sidewalks no on street parking entrance ramp to I-64, median divided

Jefferson Road: Crosswalk, sidewalks, park n ride, parking lot. Suggest bus shelter to complement the park ‘n’ ride.

Overall, side streets have random on-street parking, narrow or crumbling sidewalks. On-street parking directly correlates with the residential areas. The land use has been transitioning from mixed use residential commercial to more commercial over the past 20 years.

US 60 – MacCorkle Ave
Driving Tour
4June2014

Manoo Saidi District 1 Traffic Engineer
Elwood Penn DOH Planning
Don Meadows DOH Traffic Engineer
Masood Akhtar RIC
Kara Greathouse RIC

Pre-tour discussions:

Change access to Dunbar Toll Bridge. At signalized intersection with MacCorkle Ave only one way traffic (Bridge exit traffic) CHANGE to two way traffic, direct all bridge traffic to that intersection. Remove delays at Maple Street (no existing signal). Don't know if the current roadway is wide enough to handle two way traffic and keep both turn lanes. The ADA improvements to the Dunbar Toll Bridge should not impact the roadway width.

Mention removing on-street parking in the study.

If any changes are made to the roadway the sidewalks will have to be made ADA compliant.

Jefferson Road: recent study/construction plans won't impact the study, except possibly increase traffic. More left turn accidents higher than normal. North Jefferson Road right turn lane could be stripped, pavement markings are worn off. Increase signage, identify turn lanes on Jefferson Road, would need to add structure, signs wouldn't hang on signal wires.

Kenna Dr.: Odd Traffic pattern, due to existing roadway. No marks for right turn lane, add pavement markings or signage. People coming out of Kenna Homes complain about time waiting at signal, can't remove 'no turn on red' sign.

Sidewalks: In general lots of telephone poles in the way. Most are not ADA compliant. Short curbs and lots of curb cuts.

Lots of access problems with doctor's offices on river side. Narrow alleys, no pavement markings hard to decipher where to go. Parking is difficult. Change parking garage to employee parking only, that would allow more free parking.

Walked Division Street to Ford Street: noticed the above issues with parking, side streets, etc. On street parking starts after Ford Street.

Chestnut: people from Mac. Ave WB turn right onto Chestnut, u-turn and go straight to access doctor's, bakery and high school down Chestnut. No left turn onto Chestnut because city does not want to remove on street parking to make room for turn lane. Chestnut connects with Kanawha Turnpike, and other residential areas. Restricting left turns is odd. Citgo, out of business, but people cut through the lot frequently, former owner used to complain.

Very wide sidewalks on south side of MacCorkle Ave. KRT wants to add bus shelter in front of Family Dollar. If this is installed flush with the existing Family Dollar façade there will be no ADA problems.

Walnut Street – no issues, low accident rate

Dunbar Bridge Entrance – mentioned addition of signal, if so it would only be a two phase signal, the side street would change to one way only.

Rock Lake – short sight distance and small turn radius. Complaints about side streets receiving green light in early morning when no cars are there. Issue with the camera/radar/detection.

Steve DeBarr, City Engineer for South Charleston

4/8/2014

- Residents are concerned about the new Sheetz, added traffic and people using residential streets to access the stop light at Division Street – signal needed.
- Possibility of shifting signal at Division to Vine Street, but Thomas Hospital is against this. Steve spoke to Bob Gray before he retired.
- A new medical complex – 12,000 s.f. on riverside of MacCorkle and MacDonald St.
- Within Comprehensive Plan, the zoning will be changed in study area to accommodate more commercial property. This plan is to make MacCorkle Avenue area a medical campus and leave residential area strictly residential.
- All traffic signals need to be upgraded; this would improve flow immediately.
- Businesses area completely against removing the on-street parking or removing any signals. Mayor Mullens agrees.
- Traveling westbound on MacCorkle, parking seems to disappear without notice or signage, causing a dangerous situation.
- Bike/pedestrian/accidents.

Discussion with Brian Ulery
Thomas Memorial Hospital, VP, Ancillary and Support Service
4/11/2014
(304) 766-3445

Brian is new to Thomas (6 months), but has participated in many other traffic studies throughout his career – Ft. Lauderdale and Georgia. He expects to see more growth in out-patient care and less in-patient care at the hospitals. This would lead to more out-patient facilities at the hospital. Brian feels the traffic flow is great, especially compared to other hospitals he's been associated with, but there are a few issues:

- Traffic signals do not seem to be accurately timed.
- There are too many signals and pedestrian congestion at Division St.
- Has received complaints about availability of parking, however, parking garage is never full to capacity.
- A lot of morning congestion on Vine St. Starbuck patrons park in the loop and clog entrance to Medical Pavilion.
- Bus service good, but could be more frequent.

Spring Hill Field Review
15May2015

Elwood Penn WVDOH Planning
Brian Carr WVDOH Planning
Scott Ferry RIC
Kara Greathouse RIC

Reviewed the field notes from the last tour and discussed viable options.

Changing access to Dunbar Bridge, validity of Kenna traffic light, ADA compliance and telephone poles obstruction

If you add a bridge across the Kanawha River at Institute you would eliminate a large portion of traffic. This project would be outside the scope of our project area, but might be considered in the Travel Demand Modeling process for the next long range plan update.

Remove the odd right turn to City National Bank at Kenna Street; simple restripe to a traditional turn lane and leave the additional pavement.

Put Route 60 on a road diet, this would eliminate on street parking, slow down traffic and increase safety (possibly) and widen sidewalks.

Remove the Kentucky and Ford Street speed bumps.

Status of Jefferson Road: Still in the process of selecting alternatives, (for cost) ie. Overpass or at-grade intersection.

Implementing newer signal technologies: DOH is in the process of testing newer technologies (that have been used out of state). Even with new/updated signals would that help congestion due to the concentration of signals?

Remove on-street parking and identify (within the plan) various city-lots available for free parking for businesses. If keeping on-street parking add bump-outs to improve safety.

Target corner lots/businesses for acquisition to create parking lots AND improve turning radii.

Is there a possibility to reroute traffic from Kenna Road to Jefferson Road, then remove the traffic signal from Kenna/MacCorkle.

Appendix B

Table 3: Average Delay Base and No Build Conditions

Average Delay (Seconds per vehicle)						
			Base		No Build	
			AM	PM	AM	PM
MacCorkle Ave	and	Park Ave	1.5	2.4	4.2	35.9
MacCorkle Ave	and	Division	28.4	23.6	29	43.5
MacCorkle Ave	and	Vine	7.9	4.2	14.1	39.1
MacCorkle Ave	and	Ford	6.4	6.1	14.2	30.4
MacCorkle Ave	and	Chestnut	6.9	10.2	17.8	26.7
MacCorkle Ave	and	Dunbar exit	8.2	15.6	11.3	13.4
MacCorkle Ave	and	Walnut	4.4	2.1	18.2	9.1
MacCorkle Ave	and	Maple	2.3	2.2	18.7	9.9
MacCorkle Ave	and	Kenna	21.8	14.6	20.6	22.1
MacCorkle Ave	and	Jefferson	14.6	35.6	28	49.3
MacCorkle Ave	and	East	3	3.6	4.9	3.2
MacCorkle Ave	and	McDonald	1.2	1.3	3.1	16
MacCorkle Ave	and	Greenway	1.6	5	13.7	25.8
MacCorkle Ave	and	I-64	3.2	10.6	13.5	20.7
MacCorkle Ave	and	Rock Lake	12.5	12.5	21.5	27.1

Delay Decreased
Delay Constant
Delay Increased

Table 4: Average Delay No Build and Scenario A Conditions

Average Delay (Seconds per vehicle)						
			No Build		Scenario A	
			AM	PM	AM	PM
MacCorkle Ave	and	Park Ave	4.2	35.9	2.5	10.3
MacCorkle Ave	and	Division	29	43.5	25	31.2
MacCorkle Ave	and	Vine	14.1	39.1	9.9	20.9
MacCorkle Ave	and	Ford	14.2	30.4	5.5	21
MacCorkle Ave	and	Chestnut	17.8	26.7	10.8	49.9
MacCorkle Ave	and	Dunbar exit	11.3	13.4	11.1	13.4
MacCorkle Ave	and	Walnut	18.2	9.1	9.5	24.3
MacCorkle Ave	and	Maple	18.7	9.9	11.3	36
MacCorkle Ave	and	Kenna	20.6	22.1	21.2	78.1
MacCorkle Ave	and	Jefferson	28	49.3	27.5	75.5
MacCorkle Ave	and	East	4.9	3.2	4.4	3.2
MacCorkle Ave	and	McDonald	3.1	16	2.9	8.8
MacCorkle Ave	and	Greenway	13.7	25.8	15.3	19.7
MacCorkle Ave	and	I-64	13.5	20.7	4.4	3.4
MacCorkle Ave	and	Rock Lake	21.5	27.1	17.1	26.6

Table 5: Average Delay No Build and Scenario B Conditions

Average Delay (Seconds per vehicle)						
			No Build		Scenario B	
			AM	PM	AM	PM
MacCorkle Ave	and	Park Ave	4.2	35.9	4.4	3.7
MacCorkle Ave	and	Division	29	43.5	23.7	24.1
MacCorkle Ave	and	Vine	14.1	39.1	7.7	4.4
MacCorkle Ave	and	Ford	14.2	30.4	5.5	9.6
MacCorkle Ave	and	Chestnut	17.8	26.7	10.4	22.8
MacCorkle Ave	and	Dunbar exit	11.3	13.4	46.4	53.1
MacCorkle Ave	and	Walnut	18.2	9.1	10.5	3.1
MacCorkle Ave	and	Maple	18.7	9.9	8.5	4.6
MacCorkle Ave	and	Kenna	20.6	22.1	24.2	83
MacCorkle Ave	and	Jefferson	28	49.3	27.8	76.2
MacCorkle Ave	and	East	4.9	3.2	40.2	3.6
MacCorkle Ave	and	McDonald	3.1	16	2.7	2.7
MacCorkle Ave	and	Greenway	13.7	25.8	15.3	15.9
MacCorkle Ave	and	I-64	13.5	20.7	2.6	4.8
MacCorkle Ave	and	Rock Lake	21.5	27.1	76.3	26.5

Table 6: Average Delay No Build and Scenario C Conditions

Average Delay (Seconds per vehicle)						
			No Build		Scenario C	
			AM	PM	AM	PM
MacCorkle Ave	and	Park Ave	4.2	35.9	5.3	31.8
MacCorkle Ave	and	Division	29	43.5	33.3	51.3
MacCorkle Ave	and	Vine	14.1	39.1	7.5	26
MacCorkle Ave	and	Ford	14.2	30.4	15	34.8
MacCorkle Ave	and	Chestnut	17.8	26.7	11.8	48.8
MacCorkle Ave	and	Dunbar exit	11.3	13.4	11.6	18
MacCorkle Ave	and	Walnut	18.2	9.1	6.1	30.2
MacCorkle Ave	and	Maple	18.7	9.9	13.7	43.7
MacCorkle Ave	and	Kenna	20.6	22.1	23.1	98.1
MacCorkle Ave	and	Jefferson	28	49.3	27	41.1
MacCorkle Ave	and	East	4.9	3.2	4.3	6.6
MacCorkle Ave	and	McDonald	3.1	16	4.5	19.8
MacCorkle Ave	and	Greenway	13.7	25.8	32.9	59.3
MacCorkle Ave	and	I-64	13.5	20.7	17.5	13.7
MacCorkle Ave	and	Rock Lake	21.5	27.1	16.2	26.1

Table 7: Level of Service along MacCorkle Avenue

Change in Level of Service along MacCorkle Avenue

	Base				Future No Build			
	Morning Peak		Evening Peak		Morning Peak		Evening Peak	
	Eastbound	Westbound	Eastbound	Westbound	Eastbound	Westbound	Eastbound	Westbound
West of Dunbar Toll Bridge	C	A	C	B	D	C	D	C
Dunbar Toll Bridge	A	A	B	C	D	B	D	F
between bridge and Ford Street	C	A	B	C	D	C	C	D
between Ford and Greenway	C	A	B	C	D	B	D	F
between Greenway and Kenna	C	A	B	C	C	B	C	D
East of Kenna	D	B	C	D	F	D	F	F

	Future No Build				Scenario A			
	Morning Peak		Evening Peak		Morning Peak		Evening Peak	
	Eastbound	Westbound	Eastbound	Westbound	Eastbound	Westbound	Eastbound	Westbound
West of Dunbar Toll Bridge	D	C	D	C	C	B	D	C
Dunbar Toll Bridge	D	B	D	F	B	B	B	D
between bridge and Ford Street	D	C	C	D	C	C	B	D
between Ford and Greenway	D	B	D	F	C	B	C	D
between Greenway and Kenna	C	B	C	D	C	B	B	D
East of Kenna	F	D	F	F	D	C	C	F

	Future No Build				Scenario B			
	Morning Peak		Evening Peak		Morning Peak		Evening Peak	
	Eastbound	Westbound	Eastbound	Westbound	Eastbound	Westbound	Eastbound	Westbound
West of Dunbar Toll Bridge	D	C	D	C	D	B	C	B
Dunbar Toll Bridge	D	B	D	F	C	C	C	D
between bridge and Ford Street	D	C	C	D	B	B	B	B
between Ford and Greenway	D	B	D	F	C	C	B	C
between Greenway and Kenna	C	B	C	D	C	A	B	C
East of Kenna	F	D	F	F	D	C	B	D

	Future No Build				Scenario C			
	Morning Peak		Evening Peak		Morning Peak		Evening Peak	
	Eastbound	Westbound	Eastbound	Westbound	Eastbound	Westbound	Eastbound	Westbound
West of Dunbar Toll Bridge	D	C	D	C	D	B	C	C
Dunbar Toll Bridge	D	B	D	F	C	A	C	B
between bridge and Ford Street	D	C	C	D	C	B	C	C
between Ford and Greenway	D	B	D	F	C	B	C	D
between Greenway and Kenna	C	B	C	D	C	A	D	D
East of Kenna	F	D	F	F	D	C	D	F

level of service declined
level of service stayed constant
level of service improved

Level of Service	
A	Good
B	
C	Fair
D	
F	Failing