CHAPTER 7
VISION OUTCOMES:
GOODS MOVEMENT ROUTING
This chapter describes the facilitation of freight mobility in the Neck area, providing a network that increases reliability, reduces congestion, improves safety, and reduces vehicle emissions.

**Goods Movement Routing**

**Urban Policy for Freight Mobility**

From the perspective of facilitating freight mobility, possibly the most important step Charleston and North Charleston can take is the designation of a regional truck route network that is designed, operated and maintained to accommodate the movement of trucks. Historically, many urban areas in the U.S. have designated truck routes as a means of keeping trucks out of residential neighborhoods. However, from the perspective of facilitating freight movements, truck routes should be designated, designed, operated and maintained to accommodate trucks. Growing congestion and the service sensitivity of local industries and major retailers argue for the establishment of a core network that facilitates commercial vehicle flows in the Neck area. The strategic purpose of a designated truck route network should be viewed from two perspectives:

- From a land use and development perspective, the network is protected by zoning, building permits, and enforcement, so it can sustain truck traffic volumes efficiently.
- From an operations perspective, the network is managed for freight. Traffic management centers observe the routes, have staff members conversant with trucking requirements, and can reach the logistics community with timely advisories. Signals are timed for truck movement from known freight generators and receivers.

Goals for the designation of a Neck area truck route network should serve the following purposes:

- Increase freight transit reliability;
- Reduce congestion and provide congestion relief due to incidents on major arterials;
- Improve safety; and
- Reduce truck emissions.

As part of the Neck Area Master Plan effort, a GIS based analysis was undertaken that resulted in a recommended roadway network for a Neck Area Truck Route Network. The proposed truck routes represent a finite set of roadways providing access to, from, and within the Neck area, while providing a minimal level of incursion into residential neighborhoods. The network is illustrated in Figure 7.1.

This proposed truck route network should be viewed as a good starting point for a network that will need updating over time. For instance, roadways within the former US Navy Yard are not included within this network. For connectivity to current facilities present on the former base, Ave B N., Noisette Boulevard, and both North and South Hobson Avenues would likely need to be included. Using the proposed route network, a series of outreach activities with private and public
sector, and with community leaders, should be conducted using the recommended network as an initial foundation for further discussion.

**Analysis of the Freight Network**

**Methodology Introduction**

Commercial vehicle movement, more commonly truck mobility, is a necessary element of local economic vitality and growth. Serving the delivery and shipping needs of a wide range of customers, from residential to big box retail, trucks are essential to the so-called “last mile” of product supply chains. This plan seeks to describe a methodical approach, and potential outcomes that will support truck mobility while meeting the needs of current and future communities, as well as public and private stakeholders within the Neck area.

Designating truck routes and managing these routes as a strategic network is a strategy that can both reduce long term investment and maintenance needs, while mitigating negative externalities (noise, pollution, congestion, etc.) that large truck traffic can impart upon communities. While State DOT, COG and MPO plans often identify commercial vehicle roadway networks, such plans do not often translate into a designated network that is managed specifically for freight mobility.

The methodology utilized in recommending the final network designation for the Neck area provides a degree of analysis, using available data, where the efficiency of the infrastructure is characterized and the freight oriented activities are evaluated together. This analysis does not require a designated route network as an outcome, yet provides the ability to map a network to satisfy current and forecasted future needs. The resulting network provides a tool to monitor and manage truck movements and plan for the interaction of other goals of the Master Plan including bicycle and pedestrian, personal vehicle and transit activities.

The analysis and resulting scorecard utilizing the data fields presented below is a strategic exercise to identify a network of roadways to satisfy current and future commercial vehicle traffic needs. The process described in this Master Plan is largely quantitative and should not be considered as a final network without further vetting by stakeholder groups. The consideration of additional quantitative sources, as well as qualitative input from community and public sector leaders, will supplement the methodology and final outcomes.

“Freight mobility” is an encompassing strategy to provide efficient and effective movement of goods and services necessary to the economic health of a given area. This movement may respond to the needs of local shippers and distribution centers or the traffic associated with the various modal providers present in the area. The development of a successful freight mobility plan requires an understanding of the current freight environment, attraction and detraction features present, and the interrelationships resulting from the interactions between transportation providers, shippers, and receivers.

**Roadway Characteristics**

**Functional Class**

The first assessment for freight mobility examined the intended utilization of Neck area roadways, based on functional class assignment (see Figure 7.2). Optimal assignments of interstate and arterial are founded upon design vehicle dimensions which favor the broad definition of commercial vehicles. Collectors generally provide connectivity and access necessary to service current and future freight activity centers.

**Feature Class Code**

Similar to the functional class assignment, Feature Class Code (FFC) provides a more detailed assessment of roadway condition access management. Access management is an increasingly popular set of techniques used by state and local agencies to control access to major thoroughfares. The result is a safer and more efficient roadway network for users. Without access management, roadways could see an increase in traffic congestion, accidents, and pollution from vehicle emissions. The Transportation Research Board (TRB) describes 10 principles of access management, derived from traffic management experts. Those most applicable to using the FFC in this context are:
• **Provide a Specialized Roadway Network**: Design and manage roadways according to their primary functions.

• **Limit Direct Access to Major Roadways**: Roadways that serve higher volumes of through traffic need more access control to preserve their function.

• **Remove Turning Vehicles from Through Traffic Lanes**: Turning lanes reduce the severity and duration of conflicts between turning vehicles and improves the safety and efficiency of intersections.

• **Use Nontraversable Medians to Manage Left Turn Movements**: Nontraversable medians and other techniques that minimize left turns are effective in improving roadway safety and efficiency.

Three categories of FCC are included by the roadway set shown in **Figure 7.3**;

• Primary Highway with Limited Access (A1)
• Primary Road without Limited Access (A2)
• Secondary and Connecting Road (A3)

Each further sub-categorize based on lane separation, which is a further form of access management by restricting turning maneuvers and directional access onto the roadway from adjoining surfaces. Those roadways categorized as local by FCC have been scored as zero (see **Figure 8.3**). US 52, SC 7, County 48, and Montague Ave required further division during this assessment.

**Multimodal Facility Access**

With a strong multimodal history, the Neck area economy depends on the ability of trucks to provide connectivity to area ports and rail yards. As a result, connectivity must be a central element to any freight mobility plan and truck network for the region. Facility access is associated with many roadways, depending on the facility connections, but connectivity should not be the only criteria for truck route inclusion. However, the degree to which a roadway provides connectivity should affect its ranking in the analysis. The multimodal facility access criterion applies a value to potential future direct access to the ICTF site. The roadways are evaluated in **Figure 7.4**.
Proximity to High to Moderate Freight Intensity Activity

Roadways with increased freight activities generate higher demands for commercial vehicle traffic. To assess freight activity demand, businesses were analyzed for the level of truck traffic they generate in to, out of, facilities. Commercial traffic can then be projected based on the level of commercial activity or intensity. Though many roadways attract commercial vehicles, the ability to assess where activity is greatest provides the basis for managing through flows onto key routes. Trucks, by servicing local stops, inherently make many cross access movements seeking the shortest route. Visually interpreting business density, as opposed to individual points, can suggest route intensity categorized as low, medium or high. Assigned values are five points for high, three for moderate, one for low, and an additional category of zero points for roadways with no discernible businesses of this type. The assessment is illustrated in Figure 7.5.

Private Sector Utilization

When selecting routes for both local and over the road operations, motor carriers generally chose the most productive roads based on performance and meeting customer needs. Considerations of access, congestion, direct flow, and other performance measures direct company leaders and individual drivers to utilize a concise network of roadways when transiting an area. A qualitative measure of private sector selection provides a value which eases compliance and enforcement in future mobility networks. Polling individual carriers and associations in the area resulted in the utilization responses noted in Figure 7.6.

Negative Characteristics (Traffic Detractors)

At-Grade Railroad Crossings

For large trucks, railroad crossings can pose safety and productivity limitations, to some extent based on the commodity being transported and equipment dimensions, as well as, time and frequency of train activity at the crossing. Mitigation strategies such as grade separation or closure may provide remedies to the potential negative impacts; such strategies may also present a cost or non-reversible solution which is not acceptable. The degree to which at-grade
rail crossings detract potential commercial users from a particular roadway is highly influenced by the number of such crossings on a roadway segment. Figure 7.7 shows those roadways and the number of at-grade crossings present. The detraction value is reverse scoring technique with fewer crossings resulting in a higher value.

<table>
<thead>
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<th>ROADWAY ID</th>
<th>UTILIZATION</th>
<th>NUMBER OF AT-GRADE CROSSINGS</th>
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<td></td>
<td>Multiple Trips</td>
<td>Utilized</td>
</tr>
<tr>
<td>I-26</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>I-526</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>US52 (north of Piggly Wiggly Drive)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>US52 (south of Piggly Wiggly Drive)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>SC642 (Dorchester Road)</td>
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</tr>
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<td></td>
</tr>
<tr>
<td>County48 (McMillan, south of Old Pine Circle)</td>
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<td></td>
</tr>
<tr>
<td>County32 (Spruill Ave: McMillan to Burton)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Virginia Ave (north of I-526)</td>
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</tr>
<tr>
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<td></td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>Montague Ave, W</td>
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<td></td>
</tr>
<tr>
<td>Montague Ave, E</td>
<td>X</td>
<td></td>
</tr>
<tr>
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</tr>
<tr>
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</tr>
<tr>
<td>Virginia Ave (south of I-526)</td>
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</tr>
<tr>
<td>S Rhett Ave</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Durant Ave</td>
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<td></td>
</tr>
<tr>
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<td>X</td>
<td></td>
</tr>
<tr>
<td>Buist Ave</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Figure 7.6 Frequency of Route Utilization by Private Sector Carriers

Figure 7.7 Railroad At-Grade Crossings


**Goods Movement Routing**

**Educational, Medical, Religious Facilities**

For reasons unrelated to at-grade crossings, educational, medical, and religious facilities can also pose periodic disruptions to traffic flow and potentially conflict with commercial vehicle traffic. During peak use these facilities also increase the presence of auto, bicycle and pedestrian traffic, raising potential safety hazards. Assigning values in this field are similar to at-grade crossings and illustrated in Figure 7.8.

<table>
<thead>
<tr>
<th>ROADWAY ID</th>
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<td>X</td>
</tr>
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<td>X</td>
</tr>
<tr>
<td>US52 (south of Piggly Wiggly Drive)</td>
<td></td>
</tr>
<tr>
<td>SC642 (Dorchester Road)</td>
<td></td>
</tr>
<tr>
<td>SC7 (Cosgrove Ave, north of Meering Street)</td>
<td></td>
</tr>
<tr>
<td>SC7 (Cosgrove Ave, south of Meering Street)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>County48 (McMillan, south of Old Pine Circle)</td>
<td></td>
</tr>
<tr>
<td>County32 (Spruell Ave: McMillan to Burton)</td>
<td></td>
</tr>
<tr>
<td>Virginia Ave (north of I-526)</td>
<td></td>
</tr>
<tr>
<td>Remount Road</td>
<td></td>
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<tr>
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</tr>
<tr>
<td>N Rhett Ave</td>
<td></td>
</tr>
<tr>
<td>Montague Ave, W</td>
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</tr>
<tr>
<td>Montague Ave, E</td>
<td></td>
</tr>
<tr>
<td>Spruill Ave (outside McMillan to Burton)</td>
<td></td>
</tr>
<tr>
<td>US78</td>
<td></td>
</tr>
<tr>
<td>Morrison Drive</td>
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<td></td>
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<tr>
<td>S Rhett Ave</td>
<td></td>
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<tr>
<td>Durant Ave</td>
<td></td>
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<tr>
<td>Mall Drive</td>
<td></td>
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<tr>
<td>International Blvd</td>
<td></td>
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<tr>
<td>Meeting Street</td>
<td></td>
</tr>
<tr>
<td>Leeds Ave</td>
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<td>Atalea Ave</td>
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<td>Industrial Ave</td>
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<td>Woodlawn Ave</td>
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</tr>
<tr>
<td>S Johns Ave</td>
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<td>O’Hear Ave</td>
<td></td>
</tr>
<tr>
<td>Buist Ave</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 7.8 Educational, Medical, Religious Facilities**

**Scorecard and Outcomes**

The selection of the truck route network elements results from the cumulative scoring of all characteristics. A prioritization value was also assigned to provide greater weight to specific characteristics that were deemed more important to the selection process. Figure 7.9 lists each characteristic and the weight assigned to it as a percentage of the total calculated value.

<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>PRIORITY</th>
<th>PERCENT OF INFLUENCE</th>
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</thead>
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<tr>
<td>Functional Class</td>
<td>1</td>
<td>30%</td>
</tr>
<tr>
<td>Proximity to Freight Activity</td>
<td>2</td>
<td>20%</td>
</tr>
<tr>
<td>Multi-modal Access</td>
<td>3</td>
<td>15%</td>
</tr>
<tr>
<td>At-grade Crossing</td>
<td>4</td>
<td>10%</td>
</tr>
<tr>
<td>Proximity to Educational, Medical, Religious Facilities</td>
<td>5</td>
<td>10%</td>
</tr>
<tr>
<td>Private Sector Utilization</td>
<td>6</td>
<td>10%</td>
</tr>
<tr>
<td>Feature Class Code</td>
<td>7</td>
<td>5%</td>
</tr>
</tbody>
</table>

**Figure 7.9 Characteristic Prioritization**

Vertical bridge clearance and load restrictions were also considered, but were not found to have an impact on the initial set of roadways selected. If identified, these factors are significant obstacles for at least specific segments of a roadway. Without mitigation, clearance restrictions and load limits would likely keep a road segment from further consideration regardless of other factors.

Figure 7.10 displays the final scorecard results based on the cumulative scores or predictor values of a given roadway to meet the needs of commercial vehicles. Figure 7.11 presents these values graphically. This view provides a spatial reference for the roadways under review. As the final network should be one of connectivity across the study area, facilitating efficient and controlled movement, identifying what areas may have multiple solutions and those with only one roadway are important factors in the process.

**Freight Roadway Network Selection**

Determining the roadways advanced for the final truck route network was based on the following considerations for each individual roadway assessment:

- Predictor score
- Connectivity
- Most appropriate, given multiple roadways

The scale of the study area predisposes that all routes are accessible by commercial vehicles within five minutes drive of any roadway in the area. A roadway’s assignment to the truck route network and presumably performance enhancing projects related to physical design features that make these routes more “truck friendly” are intended to entice more drivers to utilize the network up to the closest point or connection to the final destination or stop. If implemented successfully, these routes should attract more commercial vehicle traffic.
Figure 7.10 Outcome Predictor Scores, Tabular

<table>
<thead>
<tr>
<th>ROADWAY ID</th>
<th>Functional Class</th>
<th>Proximity to Freight Activity (Density)</th>
<th>Multi-modal Access</th>
<th>At-grade Crossing</th>
<th>Proximity of Educational, Medical, Religious Facilities</th>
<th>Private Sector Utilization</th>
<th>Feature Class Code</th>
<th>Predictor Score</th>
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<td>0.50</td>
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<td>0.50</td>
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<tr>
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<td>0.30</td>
<td>0.50</td>
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First Quintile

Those scoring in the top 20 percent (the first quintile scores above 3.5) of compliant roadways are:

- US 52/Rivers Avenue, at Piggly Wiggly Drive, traveling south as Carner Avenue to Meeting Street, at the intersection with Mount Pleasant Street;
- Cosgrove Avenue, from Azalea Drive to Rivers Avenue;
- Dorchester Road, from Rivers Avenue exiting the Neck area to the west;
- Remount Drive, outside the Neck area, yet included due to the influence on traffic flow attempting to bypass I-526 and I-26 junction; and
- County Road 86.
Dorchester Road from Leeds Avenue, east to Rivers Avenue currently experiences heavy automobile and pedestrian traffic, especially near educational facilities along the route. As a result, an alternative will be sought that may satisfy truck movements while providing similar access.

All roadways noted above are recommended to be included in the Neck area freight network except for the segment on Dorchester Road.

**SECOND QUINTILE**

The second quintile of scores (the next 20 percent), scoring from 3.00 to 3.49, is another set to consider for inclusion in the network. This set includes:

- I-26;
- I-526;
- Rivers Avenue, north of Piggly Wiggly Drive;
- Morrison Drive;
- Virginia Avenue, north of I-526; and
- Spruill Avenue, from McMillian Drive to County Road 86.

As with Dorchester Road previously, since this segment of Spruill Avenue has a high degree of residential land uses, an alternative roadway will be sought.

All noted roadways are recommended for inclusion in the freight network except for the segment of Spruill Avenue.

**THIRD QUINTILE**

The third quintile, scoring 2.50 to 2.99, contains roadways which may serve as alternative corridors to those identified in the first two quintiles. These alternatives may be in lieu of or in addition to the roadways in the top two quintiles, the latter case providing additional capacity for primary roadways which may presently or in the future be expected to be subject to highly concentrated commercial vehicle traffic. These include:

- North Rhett Avenue
  - Motor carrier facilities are located along this roadway north of I-526
  - Potential tertiary roadway within the network
- West Montague Avenue
  - Motor carriers are located at the farthest west segment
  - Provides ready access to businesses, e.g. Tanger Mall
  - Strong evidence for inclusion
- East Montague Avenue
  - Access to local businesses
  - Potential for inclusion in “final mile” network
- Spruill Avenue (north of the second quintile segment)
  - Provides potential access to East Montague Avenue
  - High residential land use

![Figure 7.12 Outcome Predictor Scores, Graphical without other roadways](image-url)
• Spruill Avenue (south of the second quintile segment)
  ° Provides access to US 52
  ° High residential land use
  ° With Virginia Avenue and US 52 already designated for inclusion, Spruill Avenue may be designated within a “final mile” network
• International Boulevard, providing access to Charleston International Airport
• US 78/Meeting Street south as King Street Extension
  ° Parallel roadway to US 52
  ° Access to railroad intermodal facilities

Roadways recommended for inclusion in the freight network are:
• West Montague Avenue;
• International Boulevard; and
• US 78/Meeting Street south as King Street Extension.

Fourth and Fifth Quintiles
These quintiles identify roadways with a low degree of design characteristics applicable to the assessment methodology. Within these two categories, roadways would be evaluated to satisfy connectivity of the previously identified network components to freight traffic generation centers or activities. These also may serve as alternatives to previously identified roadways, with the expectation that design characteristics or adjacent land uses may require review and mitigation.

• Virginia Avenue, south of I-526
  ° Heavy petroleum distribution activity
  ° Access to future port terminal
  ° Access to future Intermodal Container Transfer Facility
• Durant Avenue
  ° Strong residential land use
  ° Low connectivity with the exclusion of East Montague and North Rhett Avenue
• Leeds Avenue-Azalea Avenue corridor
  ° Alternative for Dorchester Road segment previously identified for exclusion
  ° Identified during private sector interaction as highly desirable; currently utilized
• Woodlawn Drive-Industrial Drive

In order to provide connectivity to current and future modal facilities, e.g. the new port terminal, and satisfy alternative routings, the following roadways are recommended for inclusion in the freight network:

• Virginia Avenue, south of I-526; and
• Leeds Avenue-Azalea Avenue corridor.

Recommended Network
The final network represents a finite set of roadways providing access to, from, and within the area, while providing a minimal level of incursion. The network is illustrated in Figure 7.13.

Roadways within the former US Navy Yard are not included within this network. For connectivity to current facilities present on the former base, Ave B N., Noisette Blvd, and both North and South Hobson Avenues would be included.

A series of outreach activities with the private and public sectors, and with community leaders, may utilize this network as an initial foundation for further discussion.

Infrastructure Design for Freight Mobility
Historically, many urban areas in the United States have designated truck routes as a means of keeping trucks out of residential neighborhoods, and as such have largely failed to view truck routes as corridors needing special attention to best accommodate the needs of larger, heavier vehicles. However, serving the delivery and shipping needs of residents and commercial businesses, from residential to big box retail, trucks are essential to the so-called “last mile” of product supply chains. This next section discusses roadway geometrics and design features that will support truck mobility while meeting the needs of current and future communities, as well as public and private stakeholders within the Neck area.
The Neck area must deal with some through traffic on Interstates I-26 and I-526 to the extent that trucks accessing port facilities in Charleston and Mount Pleasant travel through the area and contribute to congestion on those interstate highways. It is the intent of this Master Plan to recommend a series of roadways that either “encourage” or “discourage” specific types of users to use specific routes within the Neck area. It has been observed that the freight movements through the Neck area have traditionally been disorganized in nature and some routes on local and neighborhood streets are sporadically posted as “truck prohibited.”

While traditional freight mobility plans describe in detail “Through Routes” and “Regional Arterial Stem Routes,” The Neck Area Master Plan has included “Local Connectors to Freight Intensive Activity Centers” and “Local Connectors to Non-Freight Intensive Activity Centers” to demonstrate the use of roadway design to both “encourage” the flow of trucks in appropriate areas as well as “discourage” the movement of trucks where roads should otherwise focus on other modes of transport. This approach allows for both reinforcement of efficient movement while avoiding conflict between modes, thus reducing safety concerns for all users.

**Important Design Considerations for Truck Routes**

Designs and specifications for local streets and roads generally focus on passenger movements, and traffic control system designs focus on the performance characteristics of passenger vehicles rather than large combination trucks or even light duty combination vehicles and large straight trucks. In most situations, the percentage of trucks in the traffic stream is small enough that an occasional inability to accommodate the performance or dimensions of a truck is not a safety or operational issue. However, trucks going off the road as they go around street corners with high pedestrian volumes can result in significant safety conflicts between the rear tires of an off-track trailer and pedestrians waiting to cross the road. Accommodating a wide turning radius at and near truck traffic generators is critical for safe operation of streets and sidewalks.

Designing roadways to accommodate trucks requires an understanding of the static and dynamic interactions of the characteristics and performance of the driver, the vehicle, the roadway, and the other motorized and non-motorized roadway users. Designs that accommodate the typical passenger car or light-duty truck cannot always accommodate the largest vehicles in the traffic stream. At locations where there will be significant truck volumes, the performance attributes and characteristics of trucks and their drivers must be taken into account for the roadways and streets to operate efficiently and safely and to obtain the expected life from the roadway or street assets. This is especially true for designated truck routes.

Several previous efforts to examine roadway design for accommodating large trucks have broken geometric and design issues into: (1) point features; and, (2) continuous features:

1. **Through Routes**;
2. **Regional Arterial Stem Routes**;
3. **Local Connectors (to Freight Intensive Activity Centers);** and
4. **Local Connectors (to Non-Freight Intensive Activity Centers).**
• **Point features** are located at specific locations on a route, and include bridge condition, railroad crossings, turning radii, and vertical clearance.

• **Continuous features** occur along the length of the route, and include lane width and roadway weight capacity.

**Truck Route Point Features**

**Intersection Design**

A large truck making a right turn through an inadequate intersection can cause property damage, injury, and/or create traffic conflicts with other motorists. When the rear wheels of a large truck track outside the lane edge or shoulder of an intersection, the truck may strike objects or persons on the street edge (fire hydrants, signs, or pedestrians) near the intersection. Alternatively, to avoid tracking across curbs in an intersection with insufficient turning radii, trucks often must encroach on opposing traffic lanes. The minimum turning radius for truck is defined as the path of the outer front wheel, following a circular arc at a very low speed, and is limited by the vehicle’s steering mechanism.

The layout of urban intersections on heavily used truck routes affects freight mobility through delayed right turns due to oncoming traffic. For instance, during the Master Plan charrette exercise, representatives from Neck area trucking companies noted: “Two crossings on Hackerman and Disher are “awful” and dangerous. Trucks often have to wait at intersections while hanging out over the railroad tracks.” Inadequate turning radii can result in lane encroachment or “curb hopping” to navigate intersections, resulting in premature curb deterioration. Impediments, such as telephone poles or signs immediately next to the curb can also affect maneuverability due to the off-tracking characteristics of large trucks. Landscaping, when combined with either oncoming traffic or center medians, can place a tremendous burden on truck drivers in terms of sight distance and maneuverability. Such effects can directly impact intersection safety for freight and passenger traffic alike.

An FHWA research effort from 1990 the Truck Characteristics Study1, found that the turning or swept path width for trucks with a wheelbase of 62 feet (WB-62) or larger are so great that the truck cannot make a 90-degree right turn from one two-lane road to another while remaining within a 12-foot lane for turning radii of 75 feet or less. Trucks making such turns at locations with curb return radii less than 75 feet must either encroach on the roadway shoulder (or curbline) or into an opposing lane of traffic. On a turn between multilane roads, trucks with sizes up to the WB-77 can make a 90-degree right turn while encroaching on an adjacent same-direction lane, but without encroaching on an opposing lane. Figure 7.14 provides selected examples of off-tracking for several intersection turn radii.

A more recent evaluation in 2003 by the National Cooperative Freight Research Program (NCFRP) of roadway design for trucks suggested revisions to the

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Note: For combination trucks with a wheelbase (WB) of 62, 67 and 71 feet the distance between the kingpin and center of the rear tandem axle is assumed to be 41 feet.

**Figure 7.14 Maximum Low-Speed Off-tracking and Swept Path Width**

(Selected design vehicles in 90-degree turns)

American Association of State Highway and Transportation Officials (AASHTO) design manual. A summary of the recommended changes to the AASHTO Green Book for single unit and tractor-semitrailer truck combinations included:2

**Single-Unit Trucks:**

- The current two-axle SU design vehicle should be retained and designated the SU-30 design vehicle.
- A longer three-axle SU design vehicle should be added and designated the SU-25 design vehicle.

**Single-Trailer Combinations (Five-Axle Tractor-Semitrailers):**

- The WB-40 should be retained for application to container trucks and local pickup and delivery operations.
- The WB-50 is no longer common and should be dropped.
- The WB-62 design vehicle represents a truck configuration specified in Federal law and should be retained. The kingpin to center of the rear tandem (KCRT) distance for this design vehicle should be increased from 40.5 ft to 41 ft to correspond to the maximum limits applicable in 19 states. The WB-62 design vehicle should be used for design of offtracking and swept path width for all longer tractor-semitrailer combinations that are configured with a 41-ft maximum kingpin-to-center-of-rear axle-set distance.


The WB-65 design vehicle represents an “in between” axle placement that is neither a best nor a worst case for design. This design vehicle should be dropped.

The WB-67 design vehicle should be retained, but the KCRT distance should be increased from 43.5 to 45.5 ft to represent a “worst case” condition.

In South Carolina commercial vehicle operators can use semitrailers up to 53 feet in length, provided the KCRT setting does not exceed 41 feet (SCCL § 56-5-4070). Thus, South Carolina law corresponds to the WB-62 vehicle with a 41 foot KCRT. It should be noted however that over dimension cargoes moving in and out of Neck area ports may warrant at least some routes being designed to accommodate the larger WB-67 vehicle.

If North Charleston designates a priority truck route network, a simple intersection metric can be applied to begin programming those intersections most in need of redesign or expansion. Initial criteria can be based upon whether or not the selected intersection was able to accommodate tractor semi-trailer combinations with a 67-foot wheelbase or longer. For example:

- **Preferred**: Intersections designed to accommodate tractor semi-trailer combinations with a 67-foot wheelbase or longer.
- **Less than Adequate**: Intersections that are not designed to accommodate tractor semi-trailer combinations with a 67-foot wheelbase.

A low cost procedure for determining intersection turning radii can be based on high-resolution aerial photography and AutoTURN Software to develop a WB-67 design vehicle turning movement template. The WB-67 design vehicle turning template can then be manually laid-over aerial photographs of intersections along the proposed truck route network.

During discussions with trucking officials, several intersections in the Neck area were noted as needing improvement:

- Hackerman Ave and Disher Street intersections with King Street
- The intersection of Azalea Ave and King Street, improve turning radii for southbound King Street onto Azalea Ave
- Virginia Ave and Ave B N redirect priority direction to align Virginia with Ave B
- Ave B N and Noisette Blvd, redirect priority direction to align Ave B N with Noisette

The intersection of Leeds Ave and Azalea Ave, adjust signal timing to accommodate more efficient truck movements

**Signalization**

The spacing and timing patterns of traffic signals are typically based on accommodating light-vehicle mobility and in most cases fails to account for the time it takes heavy truck traffic to attain a reasonable speed or to stop. Abrupt starting and stopping by heavy trucks wastes fuel, increases transport costs, and diminishes air quality in the Neck Region. Research has also show that the dynamic forces from heavy trucks repeatedly stopping at intersections results in premature pavement deterioration at the intersection approach. With just-in-time delivery practices, truckers must maintain tight delivery schedules. The less delivery schedules are impeded by inadequate signalization or intersection maneuverability, the greater the ability for truck drivers to make multiple deliveries during a trip.

**Bridge Condition**

This point feature represents the physical and structural condition of a bridge to determine whether commercial vehicle traffic may be safety accommodated. The sufficiency rating formula evaluates highway bridge data by calculating four separate factors to obtain a metric indicative of the overall bridge condition. The resulting score from 1 to 100 suggests that a score of 100 represents an entirely sufficient bridge and zero represents an entirely deficient bridge.

One approach to assessing this feature for bridges located on truck routes is to monitor the bridge condition rating. Under the Federal Highway Bridge Replacement and Rehabilitation Program, a bridge with a sufficiency rating less than 80 qualifies a bridge for rehabilitation. A sufficiency rating lower than 50 qualifies a bridge for replacement. The adequacy ranking is also influenced by the presence or absence of a bridge posting for load carrying capacity. The National Bridge Inspections Standards require the posting of load limits only if the maximum legal load configurations in the State exceed the load permitted under the operating rating. A “less than adequate” bridge has a lower operating rating than the legal maximum gross vehicle weight (GVW) of operating trucks. Under these circumstances (legal truck GVW exceeds bridge operating rating) the bridge would be posted. At publication, the only bridge in the study area restricted to truck traffic is the US 78 bridge near the Military Magnet School, and this bridge is part of the active Bridge Replacement Program through SCDOT. The bridge, along with the Cosgrove Avenue overpass, is scheduled for replacement in late 2012, early 2013.

Bridges in the Neck area and corresponding data from the National Bridge Inventory is included in Figure 7.15.
Vertical Clearance

This point feature is defined as the vertical clearance height of bridges and over head signs or gantries along a route, to determine the routes ability to accommodate truck traffic. There is no federal regulation for vehicle height regarding commercial trucks, and so states may set their own height restrictions. South Carolina law establishes a maximum height limit for commercial vehicles in normal operations of 13 feet, 6 inches; however, automobile transporters are allowed 14 feet under special permit (SCCL § 56-5-4060). Once again, the likelihood of over-dimension cargoes moving to and from the port may warrant at least some routes accommodating permitted loads in excess of 13 feet 6 inches. The AASHTO Green Book recommends a vertical clearance of 14 feet on local roads and collectors, and 16 feet on arterials and freeways.

Railway Crossings

On steep approaches, trucks require longer distances to accelerate and cross railroad tracks following a complete stop. The increased time needed by some trucks to clear certain at-grade rail crossing, may also require longer sight distances at unsignalized crossings to ensure that trucks clear safely. At-grade rail crossings with steep approach grades or “humped crossings” can also cause trucks with a long wheelbase to “bottom out” and become stuck on the tracks.

One method of assessing the sufficiency of at-grade railroad crossing design is to examine a crossing’s accident prediction rate (as defined by the USDOT Accident Prediction Formula). Rating factors from the Accident Prediction Formula are predicated on the following five factors:

• The at-grade crossing intersection should be close to 90 degrees,
• The crossing should have sufficient sight distance (if there is insufficient sight distance, warning gates and/or signals should be present),
• Crossings should have smooth pavement/surface quality,
• Crossing should have nearly level approach grades, and
• Have an accident prediction rate of less than .05 (less than one accident every 20 years).

Truck Route Continuous Features

Lane Width

Lane width can have significant implications for the safe operation of commercial vehicles, especially in areas with high pedestrian or bicycle traffic. Trucks are significantly wider than passenger cars, and as a result the problems resulting from inadequate lane widths are greater for trucks. The AASHTO Green Book encourages wide lanes when designing roads to accommodate trucks. The preferred lane width for roads carrying high truck volumes is 12 feet or more, with adequate shoulders to accommodate trucks that may need to pull over to the side of road in an emergency situation.

Lane width was another issue mentioned by trucking representatives during stakeholder outreach meetings. Some ideas that came out of the meeting included:

• 0.7 to 1.9 miles north of Azalea Avenue and King Street: improve and or widen existing two lane configuration to correspond to adjoining roadway at either end.
• Avenue B between Virginia Avenue and Noisette Boulevard: improve or widen existing roadway
• Noisette Boulevard between Avenue B N to 5th Street: improve or widen existing roadway
• Hobson Ave/S. Hobson Avenue, from Noisette to Register street: improve or widen existing roadway

A parallel feature to wide shoulders for accommodating trucks pulling to the side of the road is the need for occasional staging areas where truck drivers can stop and wait for scheduled appointment times, use cell phones, or check their load upon departing from a terminal.

Categorization of Route Types in the Neck Area

In order to best describe the route types needed to shape a freight mobility network for the Neck area, the following categories of route types have been compiled: Through Routes, Regional Arterial Stems, Local Connectors to Freight Intensive Activity Centers, and Local Connectors to Non-Freight Intensive Activity Centers. This categorization and characterization is preliminary in nature for the purposes of the Master Plan and will require additional engineering level analysis and recommendations as projects move towards programming phases.

Through Routes

The goal of Through Routes is moving freight and autos longer distances between local and regional locations. Also, Through Routes are intended to provide efficient connections to the Interstate System. Drawing from the guidelines above, Through Routes should strive to provide the following characteristics:

• 13 foot lanes
• Turning radii to accommodate large commercial vehicles
• Minimal signals; traffic operations to support truck movements
• Wide shoulders and/or pull outs for commercial vehicles
• Pavement types (resurfacing) that support higher tonnage, to reduce long term maintenance costs
• Appropriate signage for trucks
• Minimal tree and other vision obstructions
• Setbacks for utility poles and other objects in right of way, particularly near intersections
• Reduce grades
• Minimal super-elevated curves
• Clearly marked facilities for bicycles and pedestrian users
• Separated, clearly marked facilities for transit stops

Regional Arterial Stems

Within the Neck area context, Regional Arterial Stems have the goal of moving all users quickly across a roadway and making regional connections to activity centers and/or the Interstate System. These roadways are more urban in nature and have more access management concerns than Through Routes. It is expected that these routes would be the location for warehouses and other businesses more industrial in nature which require truck access. Characteristics of Regional Arterial Stems should include:

• 12 Foot Lanes
• Turning Radii to accommodate large commercial vehicles
• Traffic operations, ITS to support safe truck movements
• Apply pavement types (resurfacing) that supports tonnage to reduce long term maintenance costs
• Appropriate signage for trucks (particularly “out of town” trucks looking for destinations or more “Through Routes”)
• Minimal street trees and other vision obstructions
• Setbacks for utility poles and other objects in the right of way, particularly near intersections
• Reduce grades
• Minimal super-elevated curves
• Clearly marked facilities for bicycles and pedestrian users
• Separated, clearly marked facilities for transit stops

Local Connectors to Freight Intensive Activity Centers

Local Connectors to Freight Intensive Activity Centers should be designed to balance the needs of all roadway users - autos, freight, transit, bicycles, and pedestrians - in a slower, multimodal roadway environment. These typically carry regional and local transit service, resulting in higher use of bicycle and pedestrian to access businesses, residences, and transit stops in the corridor. These routes will not be designed to prohibit freight movements, but rather to make local deliveries safe and efficient while minimizing conflicts with other users in the urban environment. Freight users will be accommodated by design, but land uses should not encourage freight intensive businesses to locate directly on a corridor of this type.

Desirable characteristics to balance this range of users safely and efficiently include:

• 10 to 12 foot lanes
• Turning radii to accommodate large commercial vehicles
**Goods Movement Routing**

- Traffic operations and ITS to support safe truck movements
- Appropriate signage for trucks (particularly “out of town” trucks looking for destinations or more Through Routes)
- Minimal street trees and other vision obstructions
- Setbacks for utility poles and other objects in the right of way, particularly near intersections
- Reduce grades
- Minimal super-elevated curves
- Clearly marked, potentially separated facilities for bicycle and pedestrian users
- Separately, clearly marked facilities for transit stops
- ITS facilities for autos, bicycle, and pedestrian users
- Urban speeds (25-35 miles per hour)

**Strategies Beyond Infrastructure Design to Improve Freight Mobility**

The traffic design issues reviewed in the previous section are sometimes referred to as “supply side” answers for creating a more reliable freight network. However, there are also “demand side” actions that can promote freight mobility. Demand side actions that are typically policy or regulatory actions that are intended to limit or influence undesirable actions or consequences associated with commercial vehicles. However, it is important to note that unless well thought-out, some demand side actions can actually impede freight mobility (an example might be land use policy that prohibits truck terminals from being located in urban areas near freight activity centers that trucks must continue to access on a daily basis).

The following policy discussion is premised on the idea that in developing a defined truck route network and understanding the specific roles played by key routes such as “connectors” and “last mile routes” highway design improvement strategies such as those already discussed are likely to be more successful. There are several common commercial vehicle regulatory policy issues that often go hand-in-hand with defined truck routes:

- Route restrictions;
- Commercial vehicle parking regulation / curbside access;
- Size and weight regulation; and
- Idling regulations/emission controls.

Some cities may also enforce safety regulations; however, for the most part commercial vehicle safety compliance is typically handled by state and federal jurisdictions through the Federal Motor Carrier Safety Assistance Program (MCSAP).

Prior to discussing various forms of commercial vehicle regulations, it is important to note that commercial vehicles are defined differently across jurisdictions. A consistent definition for a commercial vehicle is a necessary prerequisite to a regulatory framework for defining truck routes and enforcing truck regulations. Trucks are defined in a number of different ways, depending on the regulating entity. Generally, in an urban context trucks are defined in one or more of the following ways:

**Local Connectors to Non-Freight Intensive Activity Centers**

It is the intent of designing facilities such as Local Connectors to Non-Freight Intensive Activity Centers to make local and regional connections for users other than freight. These are envisioned to be the preferred routes of commuters and other travelers looking to avoid conflict with freight vehicles. These corridors are designed to encourage use by non-freight users: autos, transit, bicycles, and pedestrians in an even slower, more multimodal roadway environment than the freight intensive local connectors. These typically carry local transit service, resulting in higher use of bicycle and pedestrian users. Freight users will not be encouraged but accommodated, as these routes will serve some warehousing and retail locations, as necessary, but land uses will not be freight intensive. The implementation of this strategy will depend on infrastructure design and operations as well as land use regulation.

Desired characteristics of a Local Connector to Non-Freight Intensive Activity Centers include:

- 9-10 foot lanes
- Tighter turning radii to discourage large commercial vehicles
- Traffic operations to support auto, bicycle, transit and pedestrian movements
- Appropriate signage, including truck prohibitions as needed
- Street trees and overhead lighting
- Sidewalks and other treatments for bicycle and pedestrian users
- On-street parking where appropriate
- Clearly marked facilities for bicycle and pedestrian users
- Integrated, clearly marked facilities for transit stops (pull outs where necessary)
- On street or buffered bicycle lanes
- ITS facilities for transit, auto, bicycle, pedestrian users
- Urban speeds (25-35 miles per hour)
• **Vehicle Purpose:** Trucks can be defined as commercial vehicles that haul goods. This type of definition is generally used in the context of defining other commercial vehicles, including commercial passenger vehicles such as buses and taxis, or in combination with dimension or axle attributes.

  ![Truck Types Diagram](source: CDM Smith)

  - **Urban Delivery / Last Mile Operations**
  - **Line Haul Operations**

• **Vehicle Dimensions:** Federal and state laws typically regulate commercial vehicles according to length, width, and height. However, some urban areas that may have more restrictive roadway geometry or low clearance issues may also impose dimensional restrictions on some routes.

• **Number of Axles/Tires:** Many urban areas define trucks as commercial vehicles designed to carry property with more than two axles, or more than four tires.

• **Vehicle Weight and Capacity:** Trucks conforming to federal regulations are typically registered with a maximum gross vehicle weight that includes the weight of the truck plus the weight of the cargo. Many definitions identify trucks as any cargo-carrying commercial vehicle rated at a particular gross weight or higher.

**POSITIVE ROUTE GUIDANCE**

**Improve Signs – Larger, Directional, Improved Lettering**

The use of larger signs and larger lettering could be implemented for truck-oriented signage if a high priority truck route is adopted in the Neck area. The signs would specifically include regulatory and other information for truck drivers using bigger and brighter signs, larger lettering, and a higher print contrast. This will help to improve safety and compliance and increase the effectiveness of the signs.

**Improve Advanced Signage on Arterials for Freeway Entrances**

Signage guiding drivers to the correct lane for a freeway entrance could be placed upstream from freeway interchanges, allowing truck drivers enough time to move to the correct lane in advance of the interchange. Where it is practical, guide signs should be placed upstream for the ramp anywhere from one-quarter of a mile to one mile, depending on the local conditions. This would allow truck drivers and other travelers to travel fewer miles, as well as enable drivers to select the correct lanes to travel on the freeway. Lane assignment in advance of the interchange reduces the risk of crashes.

**Provide Advance Route Information**

The ability to provide advance route information, including weather, road conditions, and work zone activity can help drivers to navigate truck routes in the Neck area more efficiently. Intelligent Transportation Systems (ITS) that use telecommunications and other technology to convey information and

**Marketing Truck Routes and Selling Compliance**

Three overarching strategies are presented to market the improved truck routes and sell compliance to drivers in the Neck area, local communities, and local and regional authorities. These strategies include:

• Positive route guidance;

• Enhanced route enforcement; and

• Freight quality partnerships – a grass roots approach to win-win solutions.

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*In 2008, NYCDOT petitioned the FHWA to conduct a truck route signage pilot program that would allow the city to experiment with new truck route sign designs to make signs more identifiable to truck drivers. The first generation of experimental truck route signs incorporated a green circle, the universally accepted symbol for positive guidance, into the existing conventional sign. A prohibitive route sign incorporated the red circle and diagonal line. The pilot signage program was implemented in the Hunts Point area of the Bronx in 2010, and NYCDOT is now monitoring truck route compliance in the project area and a control area adjacent to it.*
Develop a Truck’s Guide

A trucker’s guide document with maps, truck routes, and truck parking information would provide useful information to the truckers especially if a new route system is designated. This would help truckers and dispatchers to navigate the area more efficiently resulting in reduced truck miles and less time spent on the routes. The guide could be a virtual document accessed via the web. It might also be possible to work with GPS application providers to the trucking industry to highlight key truck routes and also incorporate features such as low clearance bridges, hazardous ramp locations and other special features.

Enhance Truck Route Enforcement

Enforce Compliance with Truck Routes and Restrict Non-truck Routes

If a truck route system is designated in the Neck Area of North Charleston, City Officials should make the time and effort to ensure that enforcement staff is fully knowledgeable of the routes and the rules governing their use, and the rules that would allow trucks off primary routes.

Congestion, noise, pollution and safety are major concerns for citizens in the Neck area as expressed during public outreach activities conducted for the Master Plan. Mobility on poorly designed streets can be especially challenging for tractor-semitrailer combinations with “sleeper cabs” or long trailers typically used in line-haul operations or for over-dimension cargoes such as pipe or wind turbine components. It is prudent for city planners to restrict certain vehicle types or cargos from residential areas or in areas challenged by older infrastructure with low clearances and short turning radii.

Planners and local decision makers recognize the conflicts between these competing and somewhat incompatible uses. They may impose truck routing restrictions in these areas as well as limitations on delivery times and idling. These are reasonable restrictions provided that viable routes exist to carry commercial traffic. However, if restrictions on non-commercial truck routes are imposed they must also be enforced, either through active patrols or by providing residents a web portal or phone number to lodge complaints when trucks needlessly use non-designated routes.

Commercial Parking Regulations / Curb Side Access

Central business districts and urban corridors with high commercial activity often experience significant parking challenges, especially for trucks. This includes on-street parking (curbside) as well as off-street parking (on commercial properties). The inability to find parking near the delivery point slows down delivery for multiple-stop routes, the penalty being higher cost and diminished service (delivery services only serve areas that are viable from an economic standpoint). The decline in service ultimately impacts downtown business vitality. Poorly managed curbside access also raises the cost of goods to consumers; in many large urban areas delivery fleets pay millions of dollars each year in parking fines – a cost of doing business.

Most curbside parking, even for commercial purposes, is designed for smaller vehicles such as pickup trucks, vans, and single unit trucks. Curbside Management can be enhanced using a variety of methods, including strict enforcement of designated commercial parking zones for use by commercial vehicles only, providing larger curbside parking spaces, increasing the frequency of commercial curbside spaces, designating commercial curb parking during peak periods, and peak hour pricing mechanisms to regulate parking behavior.

Parking on commercial properties that attract significant truck traffic can also be a concern in many urban areas. Retail strip malls, shopping malls, hotels and recreational areas, convention centers, and office parks often do not plan for truck parking needs. Building codes for urban commercial properties should include specifications for truck parking and loading/unloading.

Freight Quality Partnerships — A Grass Roots Approach to Win-Win Solutions

Freight Quality Partnerships (FQPs) are an emerging concept whereby all stakeholders, including local government, business, freight operators, and local communities agree upon freight transport solutions in response to the needs of any particular region or area. FQPs aim to provide safe, efficient, and environmentally-friendly solutions to freight transport issues by implementing positive and tangible actions at a regional or location level. Establishing an effective FQP in the Neck area can result in the following:
• Help regional and local authorities to better understand the needs of the freight transport industry and its customers to have timely and efficient delivery of freight, and the views of other legitimate stakeholders;

• Provide a single point of contact for early consultation, yet represent a large number of organizations;

• Agree upon realistic and achievable actions that provide clear economic, social, and environmental benefits; and

• Provide an effective working forum in which to agree and deliver solutions.

The FQP can also assist in land use planning by helping to establish freight provisions to include in local development plans in the Neck Area, as well as other actions that would generally fall within the area of transport or traffic management.

**CORRIDOR LEVEL DESIGN IMPROVEMENTS: DESIGNING “COMPLETE CORRIDORS”**

Similar to “complete streets,” “complete corridors” are for everyone. The concept of “complete streets” has often included consideration, principally, of autos, pedestrians, transit users and bicyclists in an urban area. This Master Plan suggests the following expansion of the principles of “complete streets” to the larger urban-suburban corridor level, developing a concept of the “complete corridor.” The thinking behind this concept is to include freight mobility and goods movement into the next phase of completing urban-suburban corridors. Corridors, in this context, are not limited to a single roadway or street level project. For this planning exercise, corridors are considered general routes, or group of routes, connecting origins and destinations within a community or region.

By examining the Neck Area Master Plan freight network, as established earlier in this chapter, one quickly observes the range of land uses in those subareas as well as parallel routes that could support the movement of both people and goods. The challenge within the Neck area has been to organize and identify optimal routes for both people and goods. In some cases that movement can be safely achieved on a common roadway. In other cases, those movements can be separated for safer, more efficient mobility for all users.

This section details recommended roadway improvements on the corridor level for the following corridors included in the freight network:

• Dorchester Road Corridor (which includes Azalea Drive and Leeds Avenue);

• Cosgrove Avenue Corridor;

• Virginia Avenue Corridor;

• US 52/US 78/Rivers Avenue Corridor (which includes Spruill Avenue, McMillan Avenue and King Street Extension); and

• Montague Avenue Corridor.

It is important to note that these specific roadways included in the freight corridor discussion are not necessarily designated as “freight routes.” Rather, these roadways are considered part of the corridors where freight movements occur and improvements are recommended to make them “complete corridors” for all users, including autos, transit, pedestrians, bicycles, and freight vehicles.

This collection of recommendations for infrastructure improvements includes both point features (bridge crossings, rail crossings, intersections, vertical clearances) and continuous features (lane widths, roadway capacities, speeds, pavement condition).

Roadways included in these corridor improvement recommendations are generally categorized using the four route types described earlier in this chapter. Route types included in the improvement tables in this section are presented in more detail by purpose and design characteristics in [Figure 7.16](#). [Figure 7.17](#) depicts the recommended road improvements through the study area.

**Through Routes**

<table>
<thead>
<tr>
<th>Goal: Move freight and autos longer distances between local and regional locations. Provide efficient connections to the Interstate system.</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 foot lanes</td>
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<tr>
<td>Turning radii to accommodate large commercial vehicles</td>
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<tr>
<td>Minimal signals; traffic operations to support truck movements</td>
</tr>
<tr>
<td>Wide shoulders and/or pull outs for commercial vehicles</td>
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<tr>
<td>Appropriate signage for trucks</td>
</tr>
<tr>
<td>Minimal tree and other vision obstructions</td>
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<tr>
<td>Set backs for utility poles and other objects in right of way</td>
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<tr>
<td>Reduce grades</td>
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<tr>
<td>Minimal super-elevated curves</td>
</tr>
<tr>
<td>Urban to Suburban speeds (35 - 55) MPH</td>
</tr>
</tbody>
</table>

*Recommended roadways: Azalea Drive, Cosgrove Avenue, Virginia Avenue, West Montague Avenue*
Regional Arterial System

**Goal:** Move all users quickly across a roadway, making regional connections to activity centers and/or the Interstate System. These roadways are more urban in nature and have more access management concerns than “Through Routes.”

12 foot lanes

**Turning**

Turning radii to accommodate large commercial vehicle

**Traffic Operations to Support Truck Movement**

Appropriate signage for trucks

Minimal tree and other vision obstructions

Set backs for utility poles and other objects in right of way

Reduce grades

Minimal super-elevated curves

Clearly marked facilities for bicycle and pedestrian users

Separated, clearly marked facilities for transit stops

**Urban Speeds (35 - 45 MPH)**

*Recommended roadways: Leeds Avenue, Nissetie Avenue/Avenue B, West Montague*

Local Connector, Not Freight Intensive

**Goal:** Encourage the use by non-freight users: auto, transit, bicycle and pedestrian in an even slower, more urban roadway environment. These typically carry local transit service, resulting in higher use of bicycle and pedestrian users. Freight users will not be encouraged but accommodated as these routes will serve some warehousing and retail locations.

9 - 10 foot lanes

**Tightening turning radii to discourage large commercial vehicles**

**Traffic Operations to Support Auto, Bicycle, Transit, and Pedestrian Movements**

Appropriate signage for trucks (where prohibited or towards appropriate routes)

Higher occurrence of street trees and lighting

Sidewalks and other treatments for bicycle/pedestrian and transit users

**On-street parking where appropriate**

Clearly marked facilities for bicycle and pedestrian users

Separated, clearly marked facilities for transit stops

**On-street bicycle lanes, where appropriate**

**ITS facilities for transit, auto, bicycle, pedestrian users**

**Urban speeds (25 - 35 MPH)**

*Recommended roadways: Spruill Avenue, US 78/King Street Extension, East Montague*

Figure 7.16 Freight Route Characteristics

Figure 7.17 Recommended Road Improvements (See Appendix A pg. 254)
**GOODS MOVEMENT ROUTING**

**DORCHESTER ROAD CORRIDOR**

Dorchester Road is an urban minor arterial and ranges from two to six lanes. It is currently posted at 45 MPH from I-526 to Leeds Avenue and then posted at 35 MPH between Leeds Avenue to Rivers Avenue. Average daily traffic along Dorchester Road ranges from 7,500 to 28,810 vehicles. In 2010, the roadways carried a range of 4 percent to 16 percent trucks. The types of trucks observed in this corridor include light trucks, buses, and heavy trucks.

In addition to vehicular traffic, this is also a heavily used transit route. CARTA bus routes currently serving the Dorchester Road Corridor are 11, 12, and 103. Coupled with the transit service, pedestrians and bicycles traverse this corridor on a regular basis throughout the day.

Since freight movement in the Dorchester Road Corridor includes travel on other important roadways that connect with Dorchester Road, this corridor also includes Azalea Drive and Leeds Avenue. This network of roadways connects the lower Neck area (via Meeting Street Road and King Street Extension) to both I-26 and I-526.

Azalea Drive is an urban collector street with five lanes. Azalea is currently posted as 45 MPH from Leeds Avenue to Cosgrove and is currently posted at 35 MPH from Cosgrove Avenue to King Street. Average daily traffic along Azalea Drive ranges from 8,400 to 12,650 vehicles. In 2010, the roadway carried a range of 6 percent to 21 percent trucks.

Leeds Avenue is an urban collector street with a five lane cross section. Leeds Avenue is currently posted at 40 MPH. Average daily traffic along Leeds Avenue ranges from 7,800 to 16,800 vehicles. In 2010, the types of trucks observed in this corridor included light trucks, buses, and heavy trucks and ranged from 11 percent to 81 percent trucks out of the total traffic counts.

To make the Dorchester Road a more “complete corridor” the following are recommended:

- Azalea Drive is designed to function as a Through Route. This route would be designed and signed to encourage truck traffic more regional in nature by both designing for safe, efficient movements, and utilizing access management techniques.
- Dorchester Road is designed to function as a Local Connector to Freight Intensive Activity Center. It is envisioned that Dorchester Road be designed for and function as a roadway for all users.
- Leeds Avenue is recommended to be designed to function as a Regional Arterial Stem. Leeds Avenue should be designed and signed to allow both local and regional trucks to smoothly connect across Dorchester Road and Azalea Drive, and access I-526.
- Establish a better east-west connection using Misroon Avenue, designed to be a Local Connector to Freight Intensive Activity Center.

**AZALEA DRIVE**

As part of the regional movement of goods, Azalea Drive serves as a principal route for the movement of freight and other goods. There are predominantly industrial and other businesses that generate freight vehicles along Azalea Drive south of Cosgrove Avenue. This makes Azalea a Regional Arterial Stem, and a Local Connector to Intensive Freight Intensive Activity Centers. North of Cosgrove Avenue, Azalea Drive becomes much more conducive to through truck movements. There are few driveways and other obstructions to through traffic on Azalea. There are also fewer conflicts with other users of the roadway (pedestrians, bicycles, housing) that are more prevalent on Dorchester Road.

**LEEDS AVENUE**

Leeds Avenue connects perpendicularly with Dorchester Road and Azalea Drive to I-526. This connection provides an alternative route to the interstate system from the Dorchester Road-I-526 connection. Leeds Avenue is home to the CARTA maintenance shed for all CARTA buses, so this corridor will continue to support regional bus movements. This is also the location for Charleston County Public Works departments, a regional origin and destination for work trucks and supply trucks throughout the day.

**DORCHESTER ROAD**

Dorchester Road connects Rivers Avenue through interchanges with both I-26 and I-526 on to the proximity of the Charleston International Airport. The nature of this roadway ranges from local urban at the intersection with Rivers Avenue to suburban shopping centers and neighborhoods as it passes under I-26 and then more commercial as it gets closer to Leeds Avenue and I-526.

Freight activity on Dorchester Road would include local deliveries to retail stores and other local service trucks. Otherwise, it would be desirable to limit through or regional truck movements on this roadway. This would enhance the safety and efficiency for other roadway users, specifically pedestrians and bicyclists and transit users. Dorchester Road is also included in the regional premium transit network for increased bus, streetcar or other regional transit service. Roadway improvements for Dorchester Road should include transit design elements throughout.

Figure 7.18 depicts the improvements that are recommended to complete the Dorchester Road Corridor.
A Master Plan for the Neck Area of Charleston and North Charleston

**Dorchester Road Corridor**

**Recommended Road Improvements**

Misroon Avenue currently connects S.T. Simmons Street and State Route 10. It is recommended that this road be extended to fully connect Carner Avenue, intersect with Rivers Avenue, and fully connect with Azalea Drive. This east-west connectivity would be designed to allow freight trucks to pass through to access Azalea Drive and I-26 more quickly and safely. This connection is not imperative to the completion of this corridor, but would benefit the connectivity goals for all users of the system, as depicted in Figure 7.18.

In summary, the complete Dorchester Road Corridor should be redesigned to encourage heavier freight movements and regional movements through Azalea Drive and Leeds Avenue to most efficiently reach I-26 or I-526. Freight on Dorchester Road should be limited as much as possible to local deliveries or other short distance trips for trucks. Dorchester Road should be designed to accommodate more than encourage freight vehicles and focus more on the balanced needs of local deliveries, autos, pedestrians, bicyclists and transit users.

**Cosgrove Avenue Corridor**

Cosgrove Avenue is an urban collector with cross sections of five and six lanes and is currently posted at 35 MPH. Average daily traffic along Cosgrove ranges from 8,300 to 16,000 vehicles.

In addition to vehicular traffic, this is also a heavily used transit route. Coupled with the transit service, pedestrians and bicycles traverse this corridor on a regular basis throughout the day.

Land uses on Cosgrove Avenue include residential and commercial. While adjacent land uses are not high generators of freight vehicles, Cosgrove is a principal connector between north-south routes and I-26. This connection will increase in importance on a regional level as the Navy Yard redevelopment progresses. This area, formerly Naval Base Charleston, is planned for a range of redevelopment options from a mixed use, new urban community to rail intermodal activities at the ICTF site. Additionally, the SCPR master plan calls for Cosgrove Avenue to be extended past Spruill Avenue into the Naval Base, connecting with McMillan Avenue by a flyover above proposed rail track extensions coming north out of the ICTF.

Regardless of the eventual development, this site will generate a minimum of local delivery trucks to a maximum of regional and/or interstate freight trucks. Also connected to I-26 via Cosgrove Avenue are the Clemson Restoration Institute (CURI) and the Federal Law Enforcement Training Center (FLETC). Both operations generate traffic and expect to grow in activity in coming years. CURI will house a state of the practice offshore wind turbine testing facility and spin off industrial activities on the site, generating auto and truck trips.

Few parallel routes exist to support a multi-roadway corridor to complete the
Cosgrove Avenue Corridor. This roadway will function much like a local connector to intensive freight hubs as described above. Cosgrove Avenue should be considered a Through Route roadway and should be maintained as such for the foreseeable future. This route will continue to serve as a principal connection to both I-26 and the West Ashley portion of the Charleston region.

Figure 7.20 depicts improvements that are recommended to complete the Cosgrove Avenue Corridor.

Virginia Avenue Corridor
Options are a key element of sustainable transportation networks. If people and goods are limited by route options, the network will quickly suffer inefficiencies when incidents, such as traffic accidents or blocked rail crossings, occur.

Virginia Avenue is the northeastern connection from the Navy Yard area to the Interstate System. While Cosgrove Avenue provides interstate access (I-26) to proposed developments, CURI, and FLETC, Virginia Avenue provides that connection to I-526. Similar to Cosgrove Avenue, Virginia Avenue serves as a critical primary and secondary route for vehicles accessing the Interstate System from the Neck area, particularly in cases of incidents or roadblocks elsewhere.

Virginia Avenue presents an interesting balance in roadway design. It is an urban collector street with a five lane section and is currently posted at 45 MPH. Average daily traffic along Virginia Avenue ranges from 7,000 to 8,800 vehicles. In 2010, the roadways carried a range of 11 percent to 32 percent trucks of the total traffic volume. The types of trucks observed in this corridor include light trucks, buses and heavy trucks. There is also an active rail line that parallels Virginia Avenue, presenting grade separation challenges with the connection to Naval Base Charleston. There is also a historic residential community to the West of Virginia Avenue, known as Olde North Charleston and Park Circle. East Montague Avenue has been successfully redeveloped into an active retail and restaurant district within this community. Balancing the needs of this residential community with the industrial uses of the riverfront and redeveloping Navy Yard has been carefully weighed in this analysis. Currently, this roadway has excess capacity and has available right of way for design modifications.

The future Intermodal Container Transfer Facility will play an important role in the evolution of the Virginia Avenue corridor. Although it will have an impact on traffic patterns, it will also be an economic driver that attracts a variety of goods and service providers that cater to the daily needs of the people that will be using and working at the ICTF. Additionally, affiliated or synergistic businesses and industry are likely to spring up in areas adjacent to the ICTF where the close proximity can provide a competitive advantage.

In the short term, few enhancements are needed to complete this corridor. The five lanes of travel currently accommodate all users of the roadway. Figure 7.21 depicts the recommended improvements to Virginia Avenue to complete this Through Route corridor.
US 52 / US 78 – RIVERS AVENUE CORRIDOR

US 52, also known as Rivers Avenue, has served the Neck area since before the introduction of the Interstate System. This roadway was planned and designed to serve as the spine of the region. Rivers Avenue has functioned as a typical suburban roadway, lined with suburban strip malls and other retail and service outlets. This connects I-526 and a CSX Transportation rail intermodal terminal in the “Iron Dog District” of North Charleston. It also provides the primary non-interstate highway route through North Charleston to Charleston. Moving north to south, Rivers Avenue becomes less suburban and more industrial inside of the I-526 loop.

Rivers Avenue is an urban principal arterial with varying sections of five and six lanes. This roadway is currently posted at 45 MPH near the interchange with I-526 and is reduced to 35 MPH in the Iron Dog District (near Durant Avenue) and south. Average daily traffic along Rivers Avenue ranges from 3,800 to 25,800 vehicles. In 2010, the roadways carried a range of 2 percent to 17 percent truck as total of traffic volumes. Currently, the Rivers Avenue portion of US 52 crosses an overpass onto US 78, also known as the King Street Extension. It is recommended that this connection be enhanced to continue along US 52/Carner Avenue/Meeting Street Road. This road then merges with Meeting Street and continues into Downtown Charleston. This would repair the singular connection through the two cities for all users and improve the connectivity for regional transit, as proposed in the transit network of the Neck Area Master Plan.

Rivers Avenue is also the highest ranking ridership route in the CARTA bus system. These riders represent a community of commuters and shoppers who choose transit over driving for a list of reasons, including auto ownership, ability to drive, and access to jobs and services.

Like the Dorchester Road Corridor, the Rivers Avenue Corridor presents the challenge of balancing commercial activity that generates freight vehicles but also provides access to transit, bicycle, pedestrian and auto traffic as well. To complete the context of the Rivers Avenue Corridor, both McMillan Avenue and Spruill Avenue have been included in the corridor level analysis.

Spruill Avenue is an urban collector street with varying sections of two to five lanes and is currently posted at either 35MPH or 40 MPH. Average daily traffic along Spruill ranges from 9,700 to 11,200 vehicles.

In addition to vehicular traffic, this is also a heavily used transit route. Coupled with the transit service, pedestrians and bicycles traverse this corridor on a regular basis throughout the day.

McMillan Avenue is an urban collector street with varying cross sections of four to five lanes and is currently posted at 30 MPH. Average daily traffic along McMillan Avenue is 10,600 vehicles.

For the purpose of completing this corridor, it is recommended that Rivers Avenue be designed as a Local Connector to Freight Intensive Activity Center, balancing transport needs for all users. The parallel routes of Spruill Avenue and King Street are recommended for the route type Local Connector to Non-Freight Intensive Activity Centers, providing one route for freight and alternatives for non-freight users, enhancing connectivity by modes and safety improvements.

Figure 7.22 depicts the improvements recommended to complete the US 52/Rivers Avenue Corridor for all users.

Montague Avenue

Montague currently serves as the principal east-west connector inside of I-526 through the City of North Charleston. The character of this road varies from one end to the other. At the western end of Montague, near the interchange with I-526, land uses are more industrial in nature, supporting local industry and the Charleston International Airport. Average traffic volumes in this area are in the range of 15,000 vehicles per day. Closer to the interchange with I-26, West Montague becomes much more congested as the land uses include both local industry as well as retail and services near the Tanger Factory Outlet Center. Average daily volumes in this area are close to 30,000 vehicles per day.
On the eastern side of the I-26 interchange, East Montague is industrial in nature as this road is the principal connection to the Norfolk Southern rail intermodal terminal. Beyond that, though, the road quickly drops to a slower, more residential community. Traffic volumes, too, decrease as the road continues eastward.

Montague Avenue will continue to play a role in the Neck area freight mobility network, but it is recommended that the current character be reinforced with design and policy elements to do so. It is recommended that West Montague be categorized as a Through Route for the purpose of design and resurfacing to support commercial vehicle movements through this region. Through Route characteristics are recommended for East Montague from I-26 to Rivers Avenue, providing safe mobility for trucks accessing the Norfolk Southern rail intermodal terminal, Rivers Avenue and the CSX rail intermodal terminal, and I-26. East of Rivers Avenue, it is recommended that East Montague be categorized as a Local Connector to Non-Industrial Intensive Activity Centers with such features as narrow lanes, bicycle lanes, and on-street parking where appropriate. Figure 7.23 depicts the improvements recommended to complete the Montague Avenue Corridor.

The western side of the Neck area is experiencing land use development more in line with mixed use, residential, and service-based uses. While generalized, these land uses suggest the current make up of roadways and railways are inverted from what would be considered most appropriate given their surrounding contexts. The capacity for substantial new growth is on the western side and the potential for stable, gradual growth is on the eastern side. The bulk of roadway capacity, however, is on Meeting Street on the eastern side and only two roadway lanes provide access to potential growth areas on the western side. There is little argument in the community that these roadways are in disrepair and are poorly connected to local origins and destinations within the Neck area. In addition to roadway right of way, rail right of way is misaligned with development and connectivity potential. Currently three railroad tracks run through this portion of the Neck area. Those tracks currently serve industrial sites within the Neck Area as well as the Columbus Street Port Terminal. It is recommended that the rail rights of way be preserved, but realigned.

**Major Infrastructure Construction for Regional Freight Mobility**

While the improvements and recommendations presented above offer near and mid-term solutions for regional freight mobility, major investment in infrastructure was also considered as part of the Neck Area Master Plan. Understanding the limitations of available infrastructure funding, it was appropriate to evaluate scenarios of using available roadways for an improved network as well as a bold approach to making regional connections to solve the challenges of the Neck area.

It should be understood that this is a planning level proposal of infrastructure improvement, realignment and construction. Detailed planning, alternatives analyses, and engineering level studies are necessary to progress any element of this concept plan into a programming phase. No costs have been attached to this concept at this level of planning.

**NEW FREIGHT MOBILITY NETWORK - CONCEPTUAL**

The presented freight mobility network consists of several key elements needed for its success. First and foremost, this concept strives to reorganize freight traffic towards the eastern corridor of the Neck area, spanning as far southeast as Morrison Drive and the Columbus Street Terminal and as far northwest as the Port Access Road near the border of Charleston and North Charleston. The Port Access Road, in particular, provides dedicated access to I-26 for Navy Base traffic, keeping freight traffic off local neighborhood roadways. This reorganization was based both on available rights-of-way as well as land uses and would then allow for all other modes of travel to be focused on routes through central and western Neck areas. The eastern banks of the Neck area are populated with such industries as Kinder-Morgan, Pepsi Bottling, CNC Terminal of the State Ports Authority, MacAlloy site, Federal Law Enforcement Training Center, and the Clemson University Restoration Institute. These uses are in operation or are under construction, and are expected to continue supporting the regional economy through job growth and supportive development.
Key elements of the proposed freight network include:

- A two lane, limited access Through Route be constructed in place of the easternmost right of way of the existing Meeting Street;
- All three rail lines be shifted eastward as close to the above two lane, limited access roadway;
- A natural buffer on the west and/or east side of this combined right of way (buffering both the two lane Through Route and the rail lines);
- Reconstruct the existing King Street Corridor into a four or five lane section as a Local Connector to Freight Intensive Activity Center, continuing the recommended US 52/US 78 corridor through North Charleston and beyond;
- Interstate access from the two lane facility in the proximity of the proposed Port Access Road, separating through truck trips from local routes;
- Continuous connectivity of the two lane facility through the Navy Yard through to Virginia Avenue with defined westbound connection to Cosgrove Avenue, allowing interstate highway access to both the west and north; and
- New single ICTF site that will ensure dual and equal access for both CSX and Norfolk Southern to all port facility operations.

*Figure 7.24* illustrates how as applied in the context of the land use and transportation goals of the Neck Area Master Plan, this concept plan accomplishes and reinforces a series of goals for the region.

**Implementing the Freight Mobility Plan**

It is clearly understood by the planning team, through stakeholder meetings, charrettes, and focus groups held during the development of the Neck Area Master Plan that truck movements are critical to the success of many businesses in the Charleston region. With the expansion of the Port of Charleston and support for the transportation and logistics industry to help move goods on the land side, the efficient movement of trucks through the Charleston region should be on the agenda of local and state policymakers.

The Neck Area Master Plan addresses this issue on both the operational (infrastructure) and development (land use) sides of transportation management. While improvements can be made to existing roadways and techniques such as zoning and building codes can support desired development, the region must continue to monitor the performance of the freight mobility network.

Federal MAP-21 legislation provides support for the integration of freight planning and freight accommodations in transportation planning and finance. This suggests to all planners that the federal funding sources recognize the connection between infrastructure investment and economic development. For the Charleston
region, and South Carolina as a whole, transportation infrastructure connects the goods into and out of the Port of Charleston to areas ripe for economic development and job growth. With regional goals of continuing to support economic development, improving our natural environment and air quality, the provision of a transportation network that includes multiple routes for rubber tire vehicles and supports rail connections where possible is imperative.

It is suggested that local planners with BCDCOG engage City, County, and State leaders to identify opportunities to prioritize the suggested short term projects for implementation. Some are possible in the already funded resurfacing programs. Others, required more interagency coordination and funding, should begin to appear on project lists, both for state and federal funding programs but also local option sales tax programs.