

# Lincoln Avenue (CR 655) Corridor Improvement Study

City of Vineland, Cumberland County, NJ



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Prepared for



June 2019  
McMahon Project Number #E18731.11

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The preparation of this report has been financed in part by the U.S. Department of Transportation, Federal Highway Administration. This document is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents of its use thereof.

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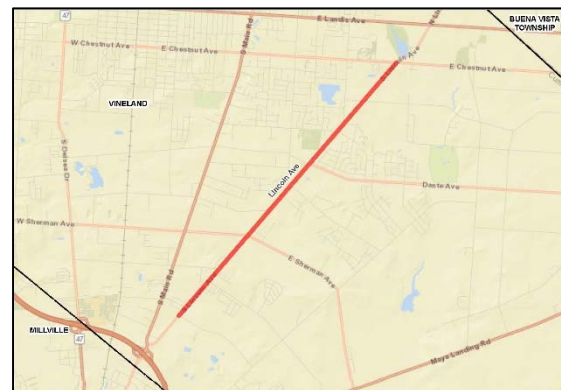
# Project Overview

## Background

In December 2018, the County of Cumberland initiated the *Lincoln Avenue Corridor Improvement Study* to address existing issues with vehicular transportation from Sheridan Avenue to Chestnut Avenue within the City of Vineland and to recommend improvements to manage the traffic flow with a focus on safety improvements at individual intersections. The study was completed in May 2019.

## Study Area

The study area for this project includes a 4.2-mile stretch of Lincoln Avenue, which is located in the City of Vineland, extending from Sheridan Avenue to Chestnut Avenue. Lincoln Avenue (CR 655), under the jurisdiction of Cumberland County, is primarily a two-lane road that is classified as an Urban Minor Arterial by the New Jersey Department of Transportation (NJDOT). Throughout the corridor, Lincoln Avenue supports a variety of agricultural, industrial, commercial, residential, and community land uses.



Location Map

Lincoln Avenue has the third-highest accident rate per mile, according to 2010 data cited in the Cumberland County Transportation Plan dated April 8, 2013 (the County Transportation Plan). Certain intersections within the study area have particularly significant crash rates. In particular, the intersections of Lincoln Avenue with Chestnut Avenue, Sherman Avenue, Menantico Road and Magnolia Road rank 25<sup>th</sup>, 67<sup>th</sup>, 99<sup>th</sup> and 102<sup>nd</sup> in the County, in 2011, 2012 and 2013 according to Rutgers University Plan4Safety data compiled by the South Jersey Transportation Planning Organization (SJTPO). Additionally, the intersection of Brewster Road and Lincoln Avenue ranked 19<sup>th</sup> in the City for the highest number of crashes, according to the City of Vineland Master Plan Circulation Element dated May 27, 2009 (the City Master Plan).

## Goals and Objectives

Given the existing safety concerns and increasing traffic resulting from the ongoing redevelopment along and near Lincoln Avenue, the County wishes to improve Lincoln Avenue to enhance safety and accommodate economic growth. The goal of this study is to enhance the safety and efficiency of all users of Lincoln Avenue by identifying specific safety-related improvements. Specific objectives include:

- Identification of transportation problems and development of locally acceptable solutions.
- Identify necessary improvements to upgrade traffic control devices and provide pedestrian accommodations in compliance with the Americans with Disabilities Act (ADA).
- Development of conceptual plans and cost estimates to be advanced through NJDOT, Cumberland County and/or the City of Vineland.
- Provide the County with a comprehensive corridor improvement plan for Lincoln Avenue.

## Methodology/Process

Based on traffic volume data collected, field inventory and observations, sight distance evaluations, and crash data from the NJDOT crash database, the project team determined the present issues and what travel conditions and intersection operations will be like in the future.

The team also evaluated recommendations proposed by other related studies, including the City of Vineland Master Plan and Cumberland County Transportation Plan, for potential inclusion in the proposed corridor improvement.

After reviewing the results of the analyses, the project team identified the need for improvements along the entire corridor and at specific critical locations and developed conceptual improvements that could be implemented by the County to enhance safety and traffic operations. Additional recommendations include potential changes to land use policies to support vehicular circulation and pedestrian safety, that might be incorporated into County and municipal master plans.

## Key Issues

Key issues and observations associated with travel conditions and safety included the following:

#### *Travel Patterns:*

- Lincoln Avenue carries over 14,000 vehicles per day.
- Significant delay and congestion occur at heavily-trafficked intersections.

#### *Traffic Safety:*

- In total, 359 reportable crashes occurred within this study area.
- The incidence of crashes is highest at Dante Avenue (20%), which has the highest volume of vehicles traveling through it, followed by Sherman Avenue (18%) and Brewster Road (17%).

#### *Roadway Pavement/Drainage*

- Pavement is generally in fair to poor condition, except the recently resurfaced segment of Lincoln Avenue between the Lincoln Avenue Middle School.
- Curb is generally not present, but some sections of concrete and asphalt curb have been constructed and are in fair condition.
- Minor areas of ponding and poor gutter flow.
- Significant drainage problem near Brewster Avenue, where standing water was observed in drainage facilities and a general lack of positive drainage is evident.
- Faded pavement markings.
- Corrugated metal pipe (CMP) is present along Lincoln Avenue north of Hope Street. It has been replaced by the County south of Hope Street. Certain CMP joints along Lincoln Avenue have failed and these segments have been repaired or upgraded by the County. The County has inspected portions of this CMP system with closed-circuit video and observed numerous failing joints between CMP sections, indicating the CMP system is approaching the end of its service life.

#### *Traffic Control Devices/Signage:*

- Traffic signal phasing and timings do not appear to optimally accommodate the existing traffic. Pedestrian clearance intervals may not be adequate.
- Traffic signs are generally in good to fair condition along the corridor and appear to meet the requirements of the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD). although some are faded and may not meet retroreflectivity standards.

#### *Pedestrian and bicyclist Accommodations:*

- Sidewalks are generally not present along the corridor, although certain sections have been added incrementally as part of the redevelopment of adjacent properties. Therefore, there is a general lack of sidewalk connectivity along the corridor.
- Many of the curb ramps provided along the corridor do not meet the current standards of the ADA.
- No specific bicyclist accommodations are present along Lincoln Avenue. However, the paved shoulders along Lincoln Avenue are generally adequate to accommodate bicyclist travel.

- Pedestrian accommodations exist at the signalized intersections along the corridor. At the Dante Avenue and Sherman Avenue intersections, the curb ramps, pedestrian push button locations and pedestrian signals do not comply with current standards. The signal equipment at Chestnut Avenue has been reconstructed more recently, and the pedestrian accommodations at this intersection appear to comply with current standards.

## Recommendations

To enhance safety, improve capacity and extend the life of the pavement and drainage facilities along Lincoln Avenue, improvement recommendations were developed with general input from the County. These findings and conclusions update and build upon previous regional and City planning efforts. As part of these efforts, four (4) improvement alternatives were developed:

- **Alternative 1 (Corridor Drainage Improvements)**, replacement of the corrugated metal pipe along Lincoln Avenue within the study area.
- **Alternative 2 (Butler Road Signalization)**, construction of a traffic signal at the intersection of Butler Avenue.
- **Alternative 3A (Roundabouts at both Brewster and Magnolia Roads)**, construction of two (2) 150-foot modern roundabouts at both the Brewster Road and Magnolia Road intersections with Lincoln Avenue.
- **Alternative 3B (Widening and Realignment at Magnolia Road)**, construction of one (1) 150-foot modern roundabout at Brewster Avenue and the widening and realignment of Magnolia Road to include left-turn lanes along the Magnolia Road approaches.
- **Alternative 4 (Corridor Resurfacing)**, pavement resurfacing to extend the pavement surface life; enhance pavement markings; implement exclusive left and right-turn lanes at various locations; improve the existing traffic signal operations at Dante Avenue and Sherman Avenue with auxiliary lane improvements, signal phasing and timing improvements; and the upgrade of pedestrian accommodations along the corridor, including curb ramps, pedestrian push buttons and pedestrian signals.

These recommendations can be implemented by the County as part of a capital improvement program for Lincoln Avenue.

Other corridor-wide key features of the improvement plan include the following:

- **Improved Access Management** – Recommendations will be made to improve access along the Lincoln Avenue corridor and at specific locations. Cross-access easements between properties should be encouraged to limit the number of direct accesses to/from Lincoln Avenue. Accesses that are permitted should be limited to restricted (i.e. right-in/right-out) movements only where feasible. Vehicular left-turn entry and exit movements should be planned to occur on the side streets to reduce conflicts with turning movements and traffic queues at congested locations along Lincoln Avenue.
- **Improved Pedestrian Connections** - it is recommended that sidewalk connections be provided to fill the minor gaps along Lincoln Avenue from Butler Avenue to the Lincoln Avenue Middle School and between Pennsylvania Avenue and Brandywine Drive. Additionally, it is recommended that an enhanced sidewalk network be constructed as part of any new development along Lincoln Avenue, as feasible.

These recommendations can be incorporated by the County and City into their planning documents and incorporated into the redevelopment of properties along the corridor.





# 1 | Introduction

## Study Purpose/Goals

The Lincoln Avenue Corridor Improvement Study focuses on the transportation infrastructure needs of this area, which includes vehicular and pedestrian safety, from Sheridan Avenue to Chestnut Avenue, within the City of Vineland.

The objectives are to identify improvement alternatives that will improve the safety of motorists by reducing the frequency and severity of crashes along the corridor, and to accommodate the existing and future demands of vehicular and pedestrian traffic anticipated in the area, due both to increased development along the corridor, as well as general background growth from increased development throughout the larger region.

Traffic analysis results show that many intersections along Lincoln Avenue operate at or exceed their capacity, while many intersections warrant a traffic signal based on existing volumes and/or crash patterns. By the design year 2040, traffic volumes are expected to continue to increase, resulting in degraded traffic operations, particularly during peak commuter periods.

Lincoln Avenue has the third-highest accident rate per mile within the County, according to 2010 data cited in the Cumberland County Transportation Plan. More recent crash data obtained for this study from 2014 to 2018 shows a total of 359 reportable crashes within the study area. The incidence of crashes is highest at Dante Avenue (20%), which has the highest volume of vehicles traveling through it, followed by Sherman Avenue (18%) and Brewster Road (17%). The overrepresentation of same-direction, rear-end crashes, as well as angle crashes can be attributed to high speeds, high volumes, and lengthy vehicle queues.

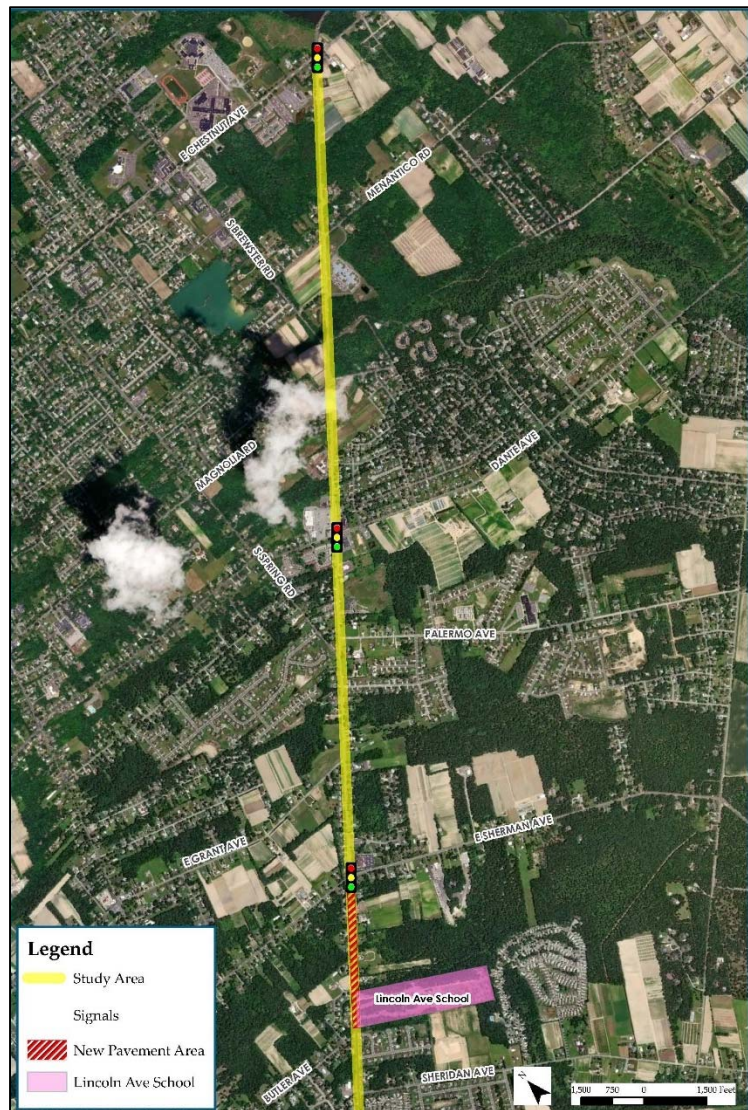
## Background

Lincoln Avenue is a significant part of the Cumberland County roadway network; as it conveys traffic between nearby residential, agricultural and industrial land uses and from these locations to the northeast and southwest. The road is an important conduit between eastern Vineland and NJ Route 55 via its interchange with South Main Road (CR 555). It also provides a link between Millville City and eastern Vineland to Buena Borough and points to the northeast via NJ Route 54. The study area for this project extends from Sheridan Avenue northeast along Lincoln Avenue to Chestnut Avenue in the City of Vineland.

Lincoln Avenue, between Sheridan Avenue and Chestnut Avenue, is roughly a 4.2-mile-long corridor that traverses the City of Vineland, with approximately 20 intersections of which 3 are signalized. Carrying over 14,000 vehicles per day,

Lincoln Avenue is a vitally important roadway that provides regional traffic flow and connectivity across the City of Vineland and across Cumberland County.

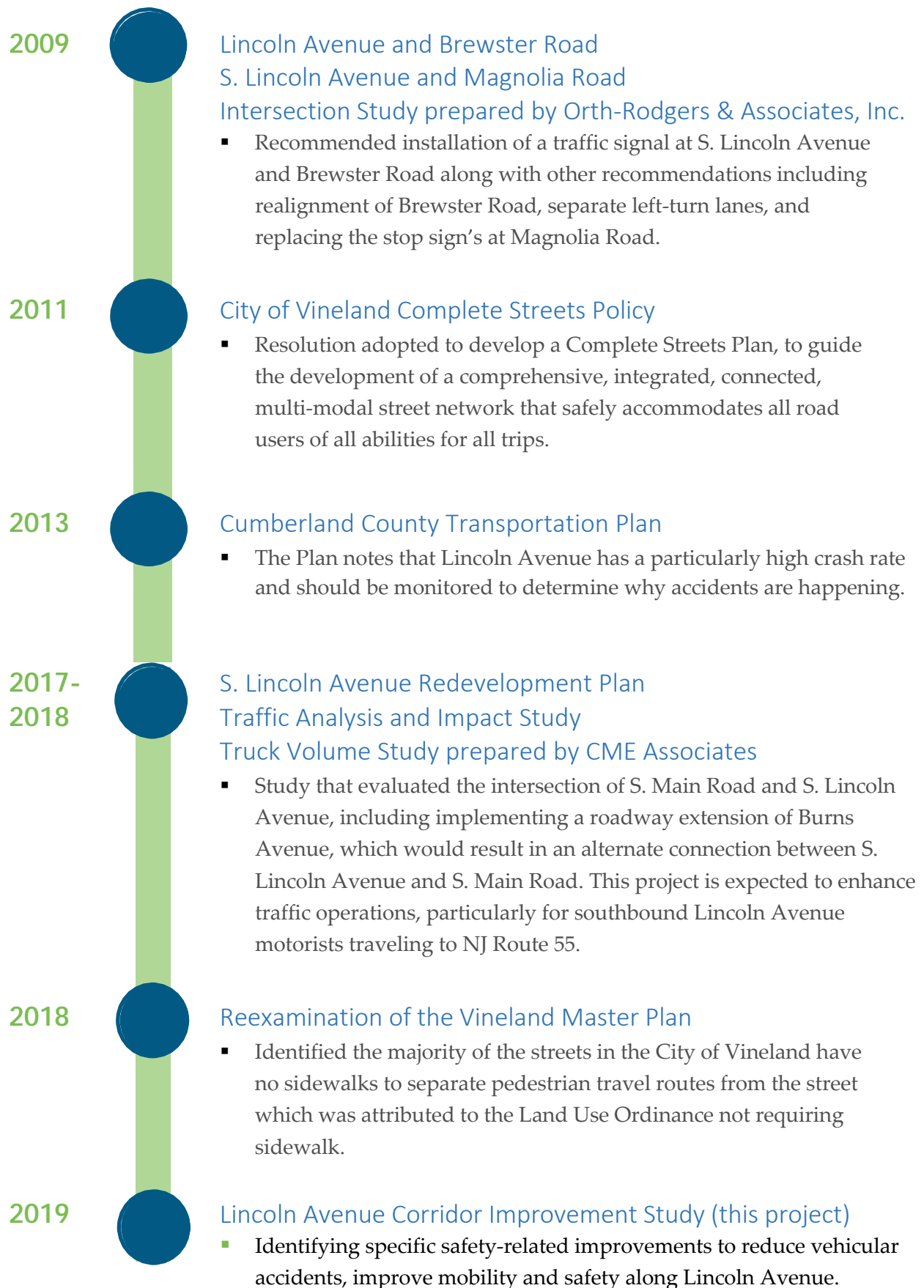
There have been several recent land development projects completed along Lincoln Avenue and in the surround area, including the Lincoln Avenue Middle School and a residential development near the school to the northeast. Additional development is planned in the area, including a Northeast Precast production facility along Lincoln Avenue to the south of the study area.



Lincoln Avenue	
<b>Limits</b>	Sheridan Avenue to Chestnut Avenue
<b>Length</b>	4.2 miles
<b>Classification / Typology</b>	Urban Minor Arterial
<b>ADT</b>	14,040
<b>Average Daily Truck %</b>	11%
<b>Posted Speed Limit</b>	50 MPH generally, 40 MPH near Dante Avenue

### Previous Plans

This Lincoln Avenue Corridor Study builds on previous regional and City planning efforts, which have focused on addressing crash patterns and improving traffic flow. These prior studies and timeframes are listed below. This study builds upon those efforts by focusing on the need for specific safety improvements within the study area of Lincoln Avenue. Some of these improvements can be implemented as a capital improvement program and others as development and redevelopment occur. The following figure depicts some of the previous planning efforts affecting Lincoln Avenue.







## 2 | Existing Conditions

### Existing Issues

There are several existing constraints to an efficient and safe transportation system within the vicinity of the Lincoln Avenue Corridor:

#### Vehicular Transportation Issues

From a vehicular perspective, the limited two-lane cross-section, in conjunction with the close spacing of multiple, heavily-trafficked intersections, results in significant delay and heavy traffic congestion, most notably during the commuter peak hour periods.

Lincoln Avenue has the third-highest accident rate per mile, according to 2010 data cited in the Cumberland County Transportation Plan. Many intersections within the study area have significant crash rates due to skewed intersection approaches with limited sight distance, high speeds, high volumes, and lengthy vehicle queues.



As noted above, traffic queues at the unsignalized intersections in the study area often result in high delays along the side streets. Given the increasing traffic volumes along Lincoln Avenue, the number of acceptable gaps in traffic for entrance from the side streets is decreasing. Many of the stop-controlled intersections along the corridor warrant the installation of a traffic signal. However, not all intersections that warrant signalization should be signalized. The construction of one traffic signal along a corridor can provide additional gaps along the corridor to permit traffic at nearby intersections.

## Roadway Pavement/Drainage Issues

The existing asphalt pavement in the study area is in fair to poor condition, with some areas exhibiting extensive rutting, cracking and potholes. Curb is deteriorated or is not present along agricultural properties along Lincoln Avenue through the project area, allowing sediment runoff from agricultural properties to accumulate on the pavement and in the stormwater drainage systems. Additionally, ponding is present along the intersections of Lincoln Avenue with Sheridan Avenue and Joyce Lane. Poor gutter flow was observed near the inlets at the low point of Lincoln Avenue between Menantico Road and Chestnut Avenue.



## Existing Pedestrian/Bicycle Network Issues

From a pedestrian and bicyclist perspective, minimal accommodations are currently provided within the study area to encourage walking and biking. While sidewalks are provided along Lincoln Avenue within the southern portion of the study area (south of Dante Avenue), there is little connectivity. Furthermore, sidewalk is only provided along the site frontage of the new Lincoln Avenue Middle School, with no connection to the adjacent residential neighborhoods along Butler Avenue. The existing pedestrian accommodations are highlighted in **Figure 1**. Note that this generally includes sidewalks within relatively new residential, school, or retail developments. Although formal bicycle facilities are not provided along Lincoln Avenue, the paved shoulders along Lincoln Avenue are generally adequate to accommodate bicyclist travel.





**FIGURE 1**  
Existing Pedestrian Connections



### Existing Traffic Volumes

In order to accurately document existing multimodal transportation volumes within this study area, turning movement counts were conducted during the weekday morning (7:00 AM to 9:00 AM) and weekday afternoon (4:00 AM to 6:00 PM) commuter peak hour periods at the following intersections along Lincoln Avenue:

- Chestnut Avenue
- Menantico Road <sup>(1)</sup>
- Brewster Road <sup>(1)</sup>
- Magnolia Road <sup>(1)</sup>
- Dante Avenue
- Spring Road
- Sherman Avenue
- Butler Avenue <sup>(1)</sup>
- Pennsylvania Avenue <sup>(1)</sup>

(1) The count period was extended at these locations to provide a full 12-hour count to support traffic signal warrant analyses.

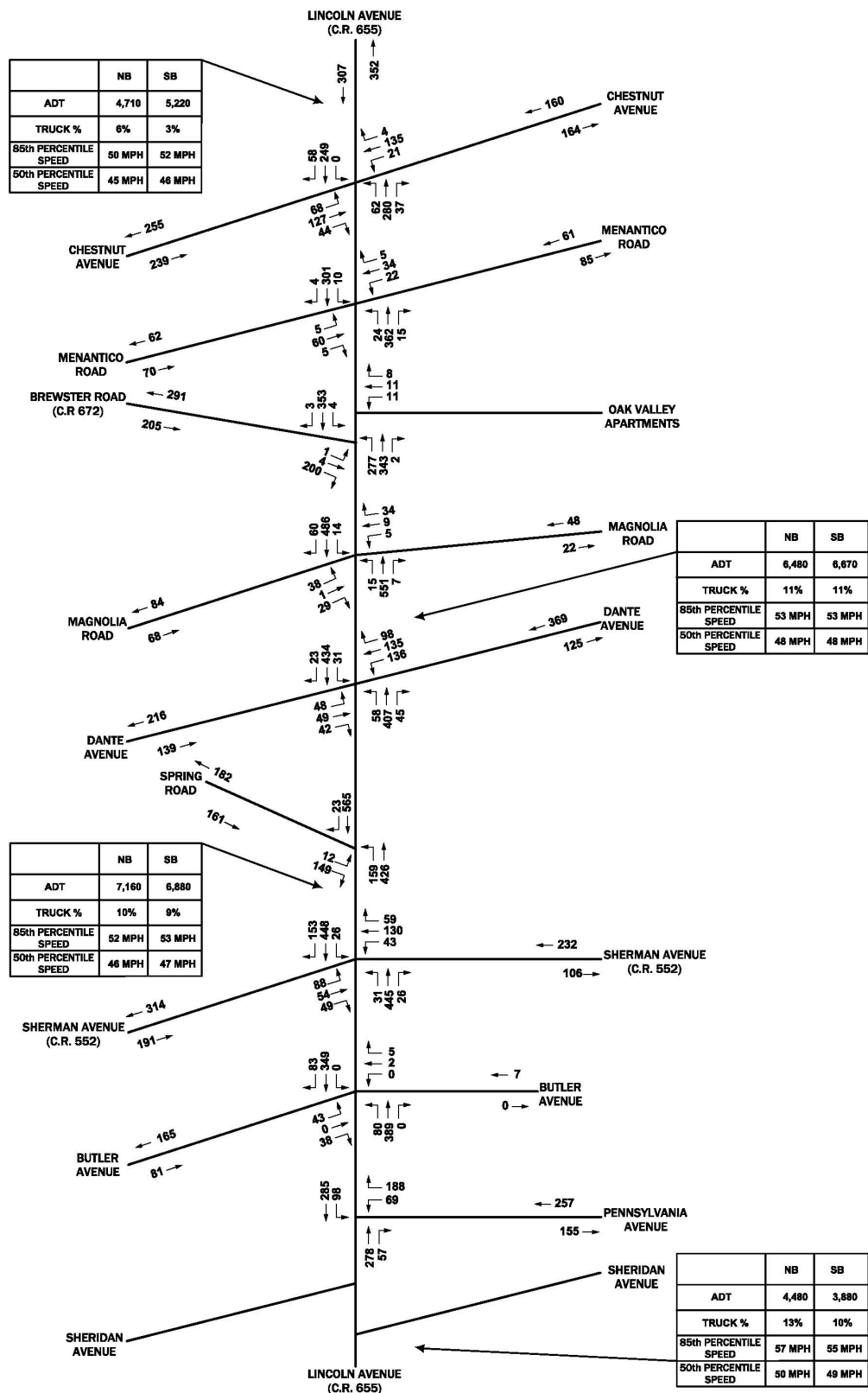
These multimodal counts, including counts of passenger vehicles, heavy vehicles, and pedestrians, were done on a typical midweek day in December 2018. The traffic counts were tabulated by 15-minute periods to establish the four highest consecutive 15-minute periods and provided in **Appendix A**. These periods constitute the weekday morning and weekday afternoon peak hours, which serve as the basis for this analysis.

Daily traffic counts were also completed at four (4) locations along Lincoln Avenue for seven (7) consecutive days to collect traffic volumes, speed, and vehicle classification data. The daily traffic count data is provided in **Appendix B**.

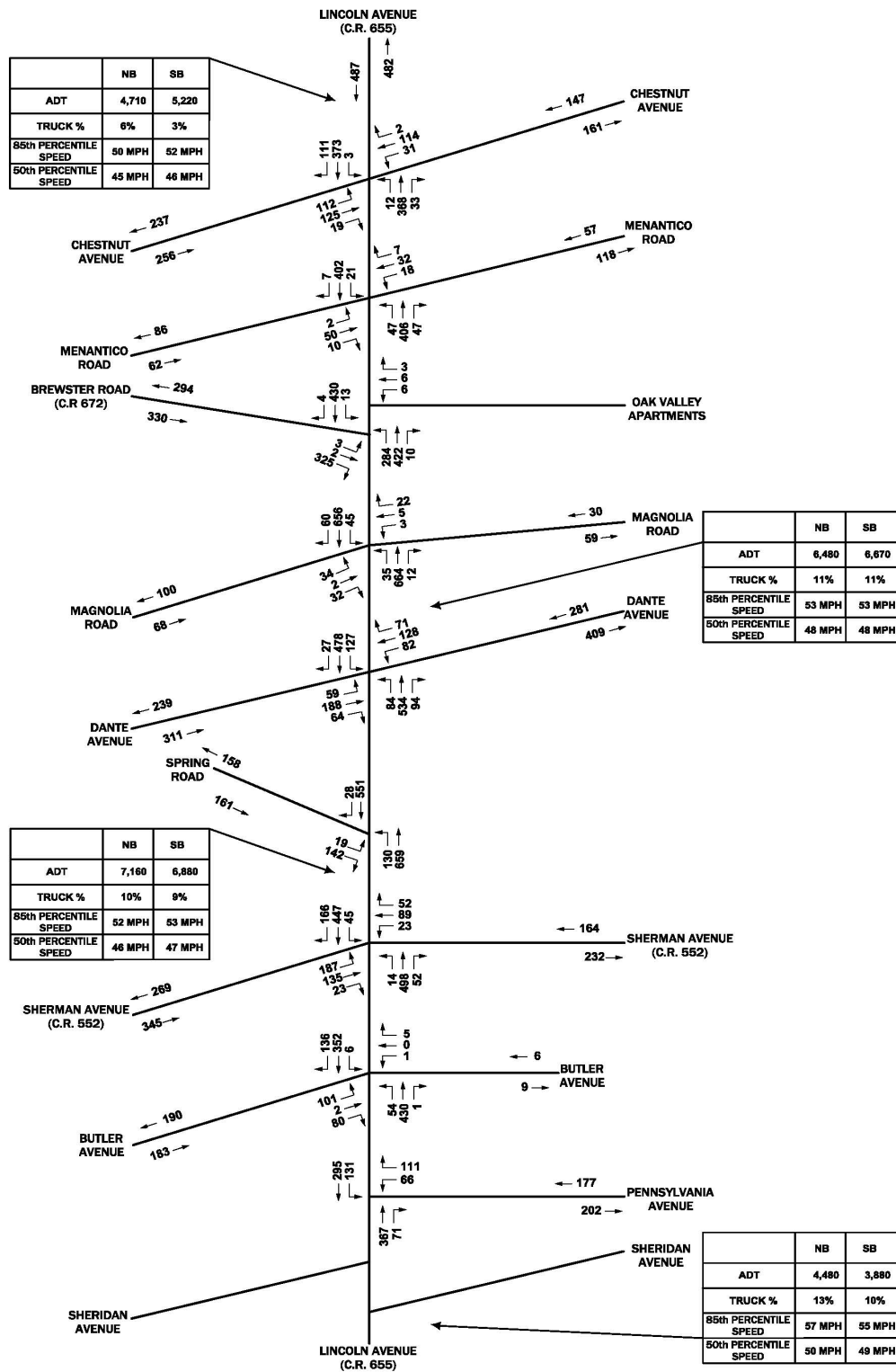
**Figures 2 and 3** illustrate the existing weekday morning and weekday afternoon peak hour vehicular traffic volumes at the study area intersections and along the corridor.



### Existing Weekday Morning Peak Hour Traffic Volumes



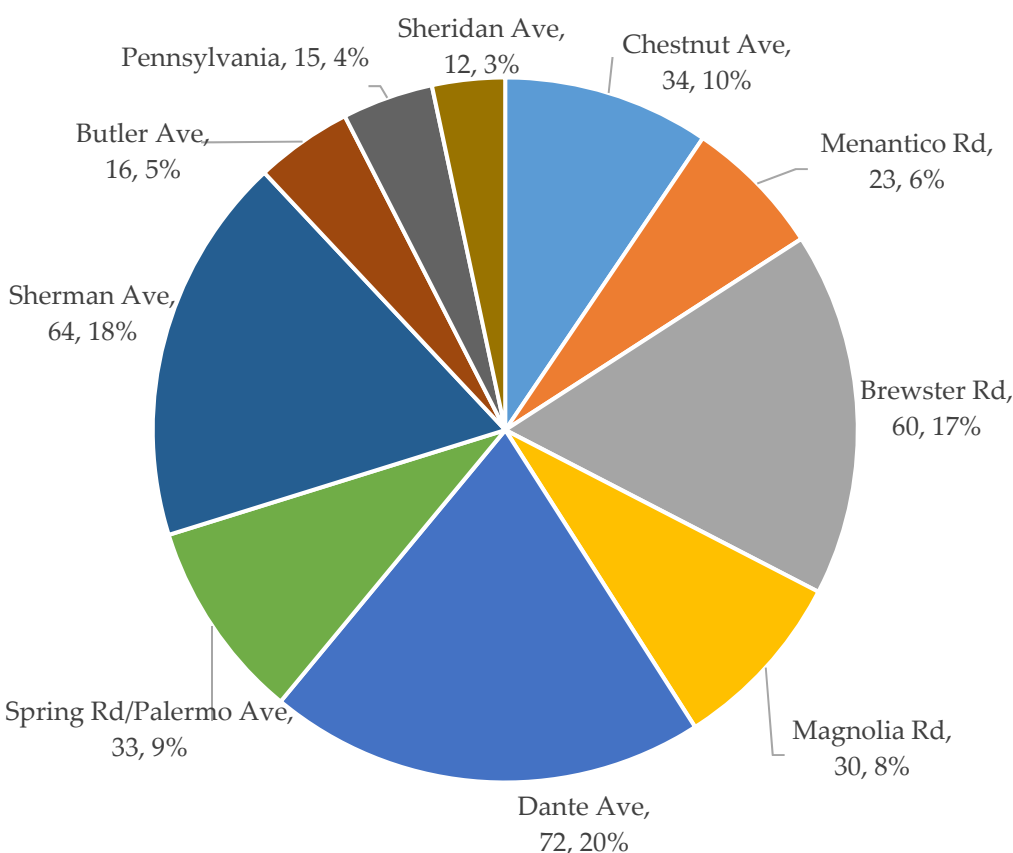
**FIGURE 3**  
Existing Weekday Afternoon Peak Hour Traffic Volumes



## Crash Data

Depicted in **Figure 4** is a summary of the reportable crashes that occurred within the study area from 2014 through 2018. In total, 359 reportable crashes occurred within this study area. The incidence of crashes is highest at Dante Avenue (20%), which has the highest volume of vehicles traveling through it, followed by Sherman Avenue (18%) and Brewster Road (17%).

**FIGURE 4**  
Crash History by Location



The largest percentage of the total crashes at these locations were rear-end crashes. The crashes at Dante Avenue primarily occurred along southbound Lincoln Avenue approaching the traffic signal and were caused by motorists not paying attention, in addition to the wet roadway. The rear-end type crashes at the intersection with Sherman Avenue occurred along both Lincoln Avenue approaches cause by congestion and motorists not paying attention to the stopped vehicles in the queue. The majority of the rear-end crashes that occurred at Brewster Road occurred along the eastbound stop-controlled approach due to the high traffic volume and congestion.

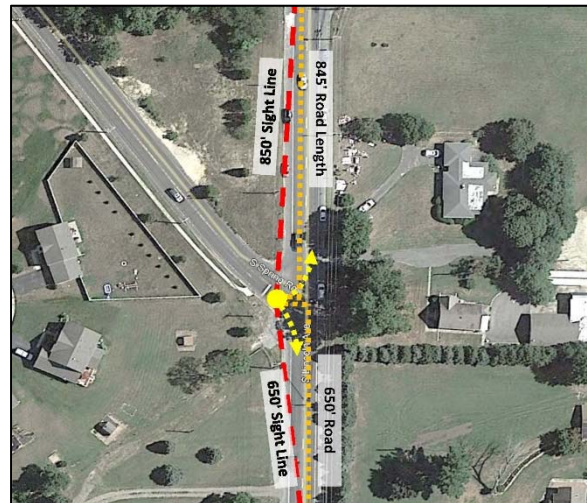
Collision diagrams depicting the type of crash, severity, weather, time of day, road surface, and light condition for sections of Lincoln Avenue are summarized and provided in **Appendix D**.

## Sight Distance

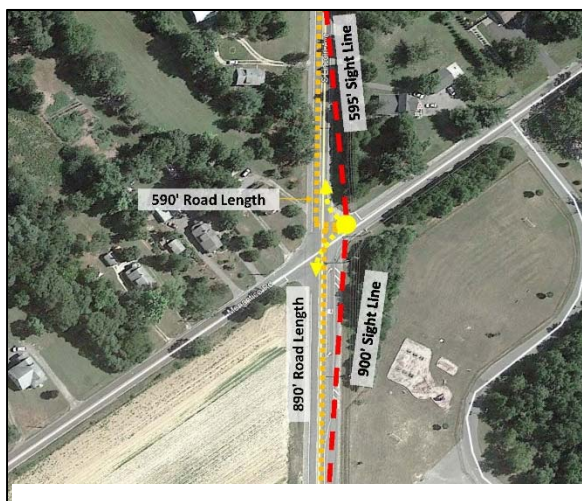
Sight distance evaluations were performed along Lincoln Avenue at Menantico Road, Brewster Road, and Spring Road. These intersections were selected, based on the visual observation of potential sight distance obstructions. The current available sight distances were field-checked, measured, photographed and documented on all approaches of the mentioned intersections to determine if adequate sight distance is provided based on roadway design speed and field conditions. The detailed sight distance evaluation worksheets are provided in **Appendix E**.



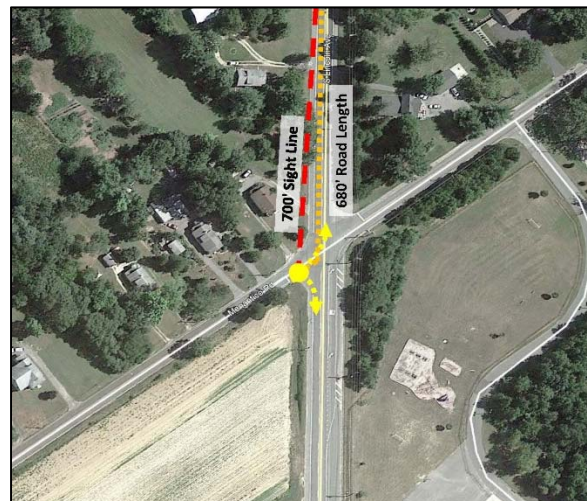
Brewster Road – The northwest quadrant contains vegetation but does not impact the clear zone. However, the skewed angle complicates the task of identifying oncoming vehicles and gaps for motorists turning onto Lincoln Avenue.



Spring Road – The northwest quadrant contains vegetation but does not impact the clear zone. However, the skewed angle complicates the task of identifying oncoming vehicles and gaps for motorists turning onto Lincoln Avenue.



Menantico Road – The northeastern and southeastern quadrants are clear of obstructions. However, the skewed angle increases the time for vehicles to cross Lincoln Avenue from Menantico Rd; and results in a larger, more potentially confusing intersection.



Menantico Road – The vision triangle is clear of obstructions in the northwestern and southwestern quadrants. However, the skewed angle increases the time to cross Lincoln Avenue; and results in a larger, more potentially confusing intersection.



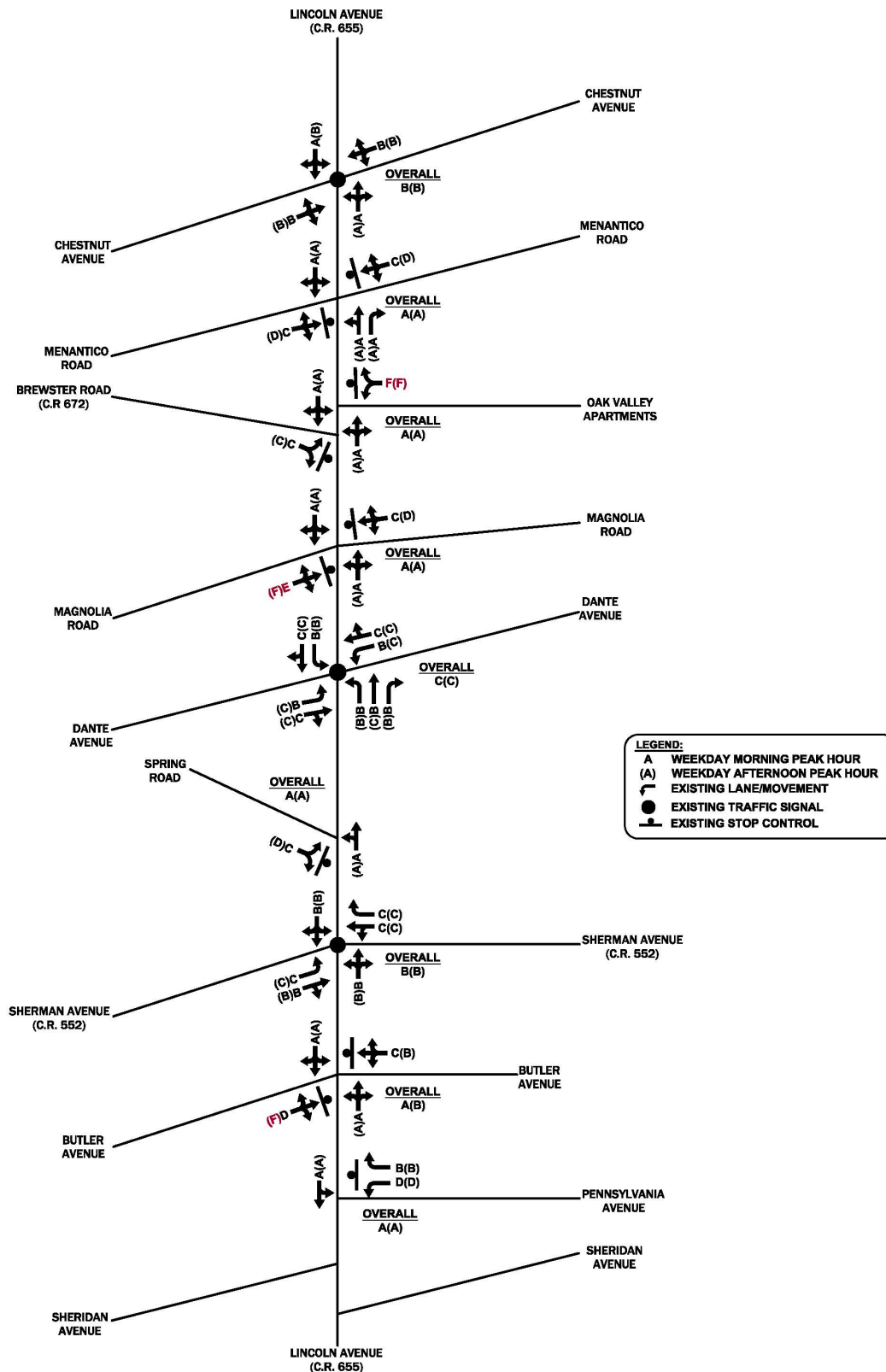
## Existing Traffic Conditions

The vehicular traffic volumes summarized in Figures 2 and 3 were used to perform to capacity / level of service analysis in accordance with the techniques outlined in the Highway Capacity Manual. Level of service (LOS) is the criteria utilized to evaluate the study intersections and roadways in accordance with standard traffic engineering practice. In the surrounding area, NJDOT, and many municipalities, consider LOS A through D as acceptable operating conditions, while LOS E represents conditions approaching capacity and LOS F indicates that traffic volumes exceed capacity. The results of that analysis are summarized in **Figure 5** and the detailed capacity/level of service analysis worksheets are contained in **Appendix C**.

As shown in Figure 5, all the intersections along the Lincoln Avenue corridor currently operate acceptably, with the exception of Magnolia Road and Butler Avenue. The eastbound stop-controlled approach of Magnolia Road operates with delay (LOS E or F) during both the weekday morning and weekday afternoon peak hours; while the eastbound stop-controlled approach of Butler Avenue operates with delay during the weekday afternoon peak hour.

It should be noted that actual conditions are often worse than depicted in the resultant traffic analysis summary figure. The majority of the unsignalized intersections along Lincoln Avenue warrant a traffic signal, since the traffic volume along Lincoln Avenue is so heavy, vehicles on the minor intersecting streets suffer excessive delay or conflict in entering or crossing Lincoln Avenue. In addition, many of the study area intersecting roadways create skewed angles with Lincoln Avenue. The skewed intersection angles create large open pavement areas and make the task of identifying oncoming vehicles and acceptable gaps more difficult for motorists turning onto Lincoln Avenue.

**FIGURE 5**  
Existing Levels-of-Service





## 3 | Future Conditions & Recommendations

This section includes recommendations to accommodate future conditions. The year 2040 was selected as the design year for future conditions to plan for proposed improvements that adequately accommodate traffic during their expected service life.

### Proposed and Anticipated Development

The area within and around the study area is beginning to experience development pressure. Several new developments have recently been constructed, while other projects are already approved or proposed and likely to be open and operational by 2040. These developments will continue to add stress to the existing transportation system. The specific development(s) known at the time of this report are summarized below.

- NorthEast Precast – A new 300,000 square-foot industrial park to be located along Lincoln Avenue adjacent to the NJ Route 55 interchange. The industrial park is projected to increase truck vehicle traffic by 100 trips per day; while employee/visitor traffic could increase by approximately 500 trips per day. The development also includes significant transportation improvements, including the extension of Burns Avenue and a revised design for traffic operations at the intersections of Lincoln Avenue with Main Road and Burns Avenue.

### Recommended Transportation Improvements

A comprehensive listing of all recommendations is provided in this section. Specific deficiencies and corresponding potential safety strategies are identified corridor-wide, as well as at individual critical intersections. The recommended improvement alternatives are presented in the approximate order of construction. We recommend the drainage improvements be constructed first, to allow the soil backfilled along the replaced pipe to settle before final paving. The drainage improvements would be followed by the various intersection improvement projects. The resurfacing of the roadway pavement and ancillary improvements to the corridor would occur last, after the other projects that require pavement reconstruction are complete. The resulting recommended concept designs are illustrated graphically in **Appendix H** and presented in the following table:

### Alternative 1 (Corridor Stormwater & Drainage Improvements)

Location	Specific Deficiencies	Proposed Improvements
Sheridan Ave to Chestnut Ave	Many stormwater drainage inlets do not have bicycle-safe grates or curb pieces that meet NJDOT standards or NJDEP requirements.	Replace grates and curb pieces with material meeting current NJDOT standards.
	The joints of existing corrugated metal pipes are failing, resulting in restricted flow, settlement and limited service life.	Replace existing corrugated metal pipes (CMP) with high-density polyethylene pipe (HDPE) where adequate cover exists, or with reinforced concrete pipes (RCP) or ductile iron pipes (DIP) where cover is limited.

### Alternative 2 (Butler Road signalization)

Location	Specific Deficiencies	Proposed Improvements
Lincoln Ave & Butler Ave	There is a traffic capacity problem at this intersection. Based on the existing traffic volumes, a traffic signal is warranted.	Install a traffic signal.
	There is significant delay and congestion along the eastbound Butler Avenue approach.	Widen Butler Avenue to provide an exclusive eastbound Butler Avenue left-turn lane, implement protected and permitted left turn phasing.
	The high percentage of left-turn movements along Lincoln Avenue results in a conflict between the high-speed through traffic and vehicles slowing to turn.	Provide exclusive left-turn lanes along the Lincoln Avenue approaches.
	Right-turning vehicles account for a high percentage of traffic along the southbound Lincoln Avenue approach.	Restripe to provide an exclusive southbound Lincoln Avenue right-turn lane and implement an overlapping protected phase for these movements concurrent with the protected phase for Butler Avenue left turns.
	There are short gaps in the sidewalk network nearby and substandard curb ramps at the intersection.	Extend sidewalk network along Butler Avenue and Lincoln Avenue, upgrade curb ramps and provide pedestrian accommodations at the signal as needed.



### Alternative 3A (Roundabouts at Brewster and Magnolia Roads)

Location	Specific Deficiencies	Proposed Improvements
Lincoln Ave & Brewster Rd	There is a traffic capacity problem at this intersection. Based on the existing traffic volumes, a traffic signal is warranted.	Construct a 150-foot modern roundabout to improve the operation of the intersection by reducing delay to the Brewster Road movement, as well as the critical northbound Lincoln Avenue left-turn movement.
	There is significant delay and congestion along the Brewster Road and Oak Valley approaches	
	The high percentage of left-turn movements along Lincoln Avenue results in a conflict between the high-speed through traffic and vehicles slowing to turn.	
	There is a significant pattern of rear-end and angle/turning movement crashes.	
	Brewster Road intersects Lincoln Avenue at a severe skew.	
Lincoln Ave & Magnolia Rd	There is a traffic capacity problem at this intersection. Based on the existing traffic volumes, a traffic signal is warranted.	Construct a 150-foot modern roundabout to improve the operation of the intersection by reducing delay to the Magnolia Road movements.
	There is significant delay and congestion along the eastbound Magnolia Road approach.	
	Magnolia Road intersects Lincoln Avenue at a severe skew.	
	There is a high rate of rear-end and angle/turning movement crashes.	

### Alternative 3B (Roundabout at Brewster Road, Widening & Realignment of Magnolia Road)

Location	Specific Deficiencies	Proposed Improvements
Lincoln Ave & Brewster Rd	See deficiencies of Alternative 3A above.	See roundabout improvements of Alternative 3A above.
Lincoln Ave & Magnolia Rd	There is a traffic capacity problem at this intersection. Based on the existing traffic volumes, a traffic signal is warranted.	To mitigate the conflict between the through traffic and vehicles slowing to turn, implement exclusive left-turn lanes along Magnolia Road approaches.
	There is significant delay and congestion along the eastbound Magnolia Road approach.	
	Magnolia Road intersects Lincoln Avenue at a severe skew.	Widen and realign Magnolia Road.
	There is a high rate of rear-end and angle/turning movement crashes.	Install advanced Traffic Control signs (Stop Ahead) (W3-1) along Magnolia Road approaches located at least 125 feet from the intersection.  Install Intersection Advanced Warning Signs (W2-1) along Lincoln Ave approaches located at least 250 feet from the intersection.

### Alternative 4 (Corridor Resurfacing)

Location	Specific Deficiencies	Proposed Improvements
Sheridan Ave to Chestnut Ave	Pavement surface is in fair condition, but increased cracks are forming and significant areas of rutting have formed. Additionally, the existing pavement does not accommodate the proposed auxiliary lanes and other operational improvements.	Resurface pavement including milling and overlay with limited base repairs (excluding new pavement from Lincoln Avenue School to Sherman Avenue).
	The traffic signals along the corridor are not coordinated, resulting in increased travel times and more stops for through traffic along Lincoln Avenue, potentially increasing the risk of rear-end crashes.	Install a GPS time clock in each signal to maintain the correct time of day so the optimized signal programs won't drift and implement coordinated signal timing directives to reduce corridor travel times. Although the traffic signals along the corridor are spaced far enough apart that coordination that the travel time improvement may not be noticed, it will still provide a low-cost safety improvement.

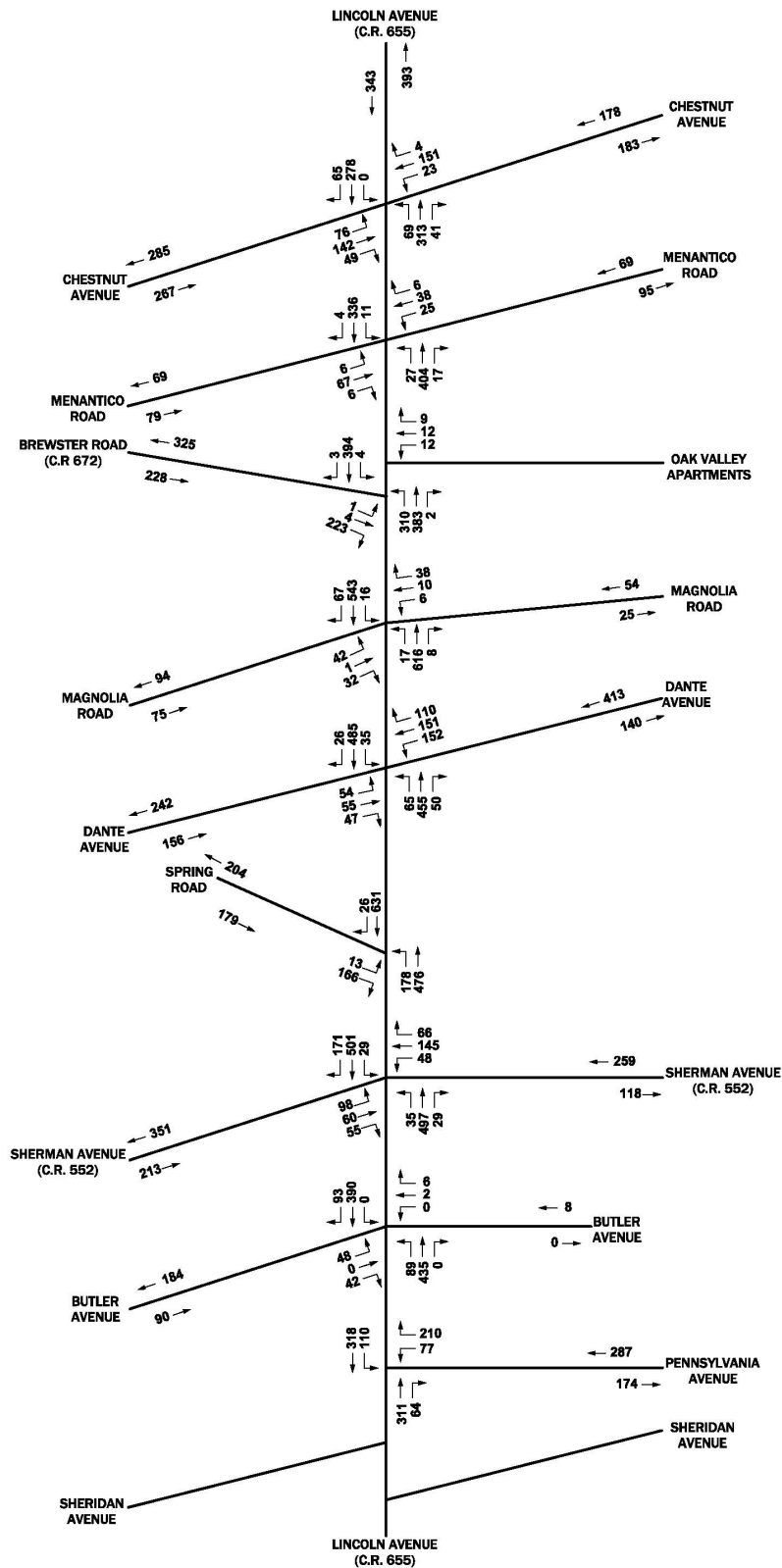
	A significant pattern of rear-end and angle/turning crashes occurs at signalized intersections along Lincoln Avenue. This is also a corridor with high vehicle speeds.	Install reflectorized backplates with yellow borders to enhance signal visibility and driver awareness.
	The traffic signals along the corridor operate on a single timing schedule for all time periods.	Optimize traffic signal timings and develop separate timing plans for various times of day to reflect the unique traffic patterns throughout the day and the week.
<b>Lincoln Ave &amp; Chestnut Ave</b>	The traffic signal cycle length is very short. There are significant occurrences of angle/turning movement crashes, which may be a result of inadequate time for motorists to accomplish turning maneuvers.	Extend traffic signal cycle length to accommodate the current traffic demands and provide adequate green time for turning movements.
<b>Lincoln Ave &amp; Menantico Rd</b>	Based on the existing traffic volumes, a traffic signal is warranted, but delays at this intersection are within the typically acceptable range. There is minor delay and congestion along both Magnolia Road approaches.	No capacity improvements are currently proposed, but the need for these improvements should be monitored in the future.
	The skewed angle increases the time for vehicles to cross Lincoln Avenue from Menantico Rd and results in a larger, more potentially confusing intersection.	<p>Install advanced Traffic Control signs (Stop Ahead) (W3-1) along Menantico Road approaches, at least 125 feet from the intersection.</p> <p>Install Intersection Advanced Warning Signs (W2-3) along the Lincoln Ave approaches, at least 250 feet from the intersection.</p>
<b>Lincoln Ave &amp; Dante Ave</b>	Queuing vehicles spill back from auxiliary lanes along Lincoln Avenue due to the high volume of turning movements.	Increase the left and right-turn storage lengths along the Lincoln Avenue approaches.
	The curb ramps, pedestrian push button locations and pedestrian signals to not meet current standards.	Reconstruct the curb ramps and install pedestrian push buttons along landings, using additional pedestal and stub poles as needed, upgrade pedestrian signal heads to provide countdown indications.
	There is significant rutting along the Lincoln Avenue approaches to Dante Avenue, which can contribute to skidding conditions during precipitation.	Resurface the pavement along Lincoln Avenue.

Lincoln Ave & Spring Rd	The skewed angle of the Spring Road approach complicates the task of identifying oncoming vehicles and acceptable gaps for motorists turning onto Lincoln Avenue.	Realignment of Spring Road may be considered as a potential future improvement at this intersection.
	A significant pattern of rear-end and angle/turning movement crashes occurs along Lincoln Avenue.	Provide an exclusive left-turn lane along northbound Lincoln Avenue to mitigate the conflict between the high speed through traffic and vehicles slowing to turn.
Lincoln Ave & Sherman Ave	The curb ramps, pedestrian push button locations and pedestrian signals to not meet current standards.	Reconstruct the curb ramps and install pedestrian push buttons along landings, using additional pedestal and stub poles as needed, upgrade pedestrian signal heads to provide countdown indications.
	Right-turning vehicles account for a high percentage of traffic along the southbound Lincoln Avenue approach, often using the shoulder as a de facto turn lane.	Widen the southbound Lincoln Avenue approach to provide an exclusive right-turn lane and implement a right-turn overlap phase.
	The Sherman Avenue approaches provide different left turn configurations, including a dedicated left turn lane along the eastbound approach and a shared left-turn and through travel lane along the westbound approach, possibly contributing to motorist confusion. This condition may be exacerbated by the skewed Sherman Avenue approaches. Additionally, the eastbound left turn lane length is inadequate to accommodate the expected future demand.	Widen the eastbound Sherman Avenue approach to extend the left-turn lane and modify the striping and pavement markings within the existing pavement to provide a left-turn lane along the westbound Sherman Avenue approach.
Lincoln Ave & Pennsylvania Ave	There is a traffic capacity problem at this intersection. Based on the existing traffic volumes, a traffic signal is warranted.	The proposed traffic signal at Butler Avenue, approximately 1,000 feet north of Pennsylvania Avenue, should produce routine gaps in the Lincoln Avenue traffic flow that are of adequate length for vehicles to safely turn from Pennsylvania Avenue to Lincoln Avenue.
	The high percentage of left turn movements along southbound Lincoln Avenue results in a conflict between the high speed through traffic and vehicles slowing to turn.	Provide an exclusive left-turn lane along southbound Lincoln Avenue.
	There are short gaps in the sidewalk network nearby.	Extend the sidewalk network to close the gaps between Pennsylvania Avenue and Butler Avenue.

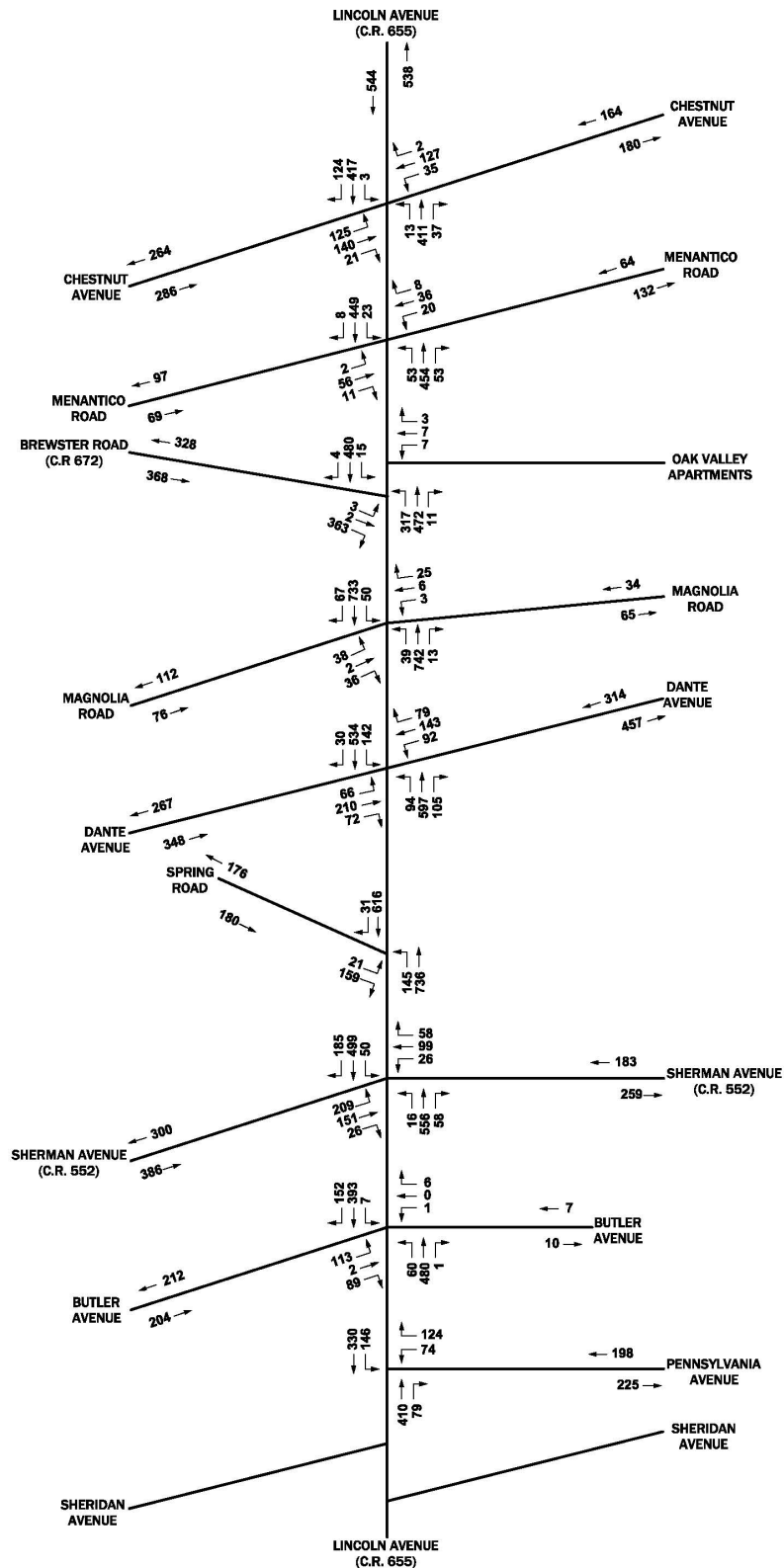
## Future Traffic Volumes

In order to determine future 2040 future weekday morning and weekday afternoon peak hour traffic volumes, an annual traffic growth rate of 0.50 percent per year was applied to existing traffic volumes to reflect regional traffic growth. This growth rate was based on information provided by SJTPO based on their travel demand model. The resulting 2040 future weekday morning and weekday afternoon peak hour traffic volumes are illustrated in **Figures 6 and 7**.

**FIGURE 6**  
2040 Future Weekday Morning Peak Hour Traffic Volumes



**FIGURE 7**  
2040 Future Weekday Afternoon Peak Hour Traffic Volumes



### Future Traffic Conditions No Build

The future 2040 weekday morning and weekday afternoon peak hour traffic volumes presented in Figures 6 and 7 were subjected to the detailed capacity and level of service analysis methodology described previously. The results of that analysis are summarized in **Figure 8** and the detailed capacity/level of service analysis worksheets are contained in **Appendix F**.

Based on the analyses and evaluations conducted for the Lincoln Avenue corridor under the future, no build conditions, capacity deficiencies were identified for the individual study area intersections. As shown in Figure 8, every intersection controlled by a stop sign operates with delay along the side street approach.

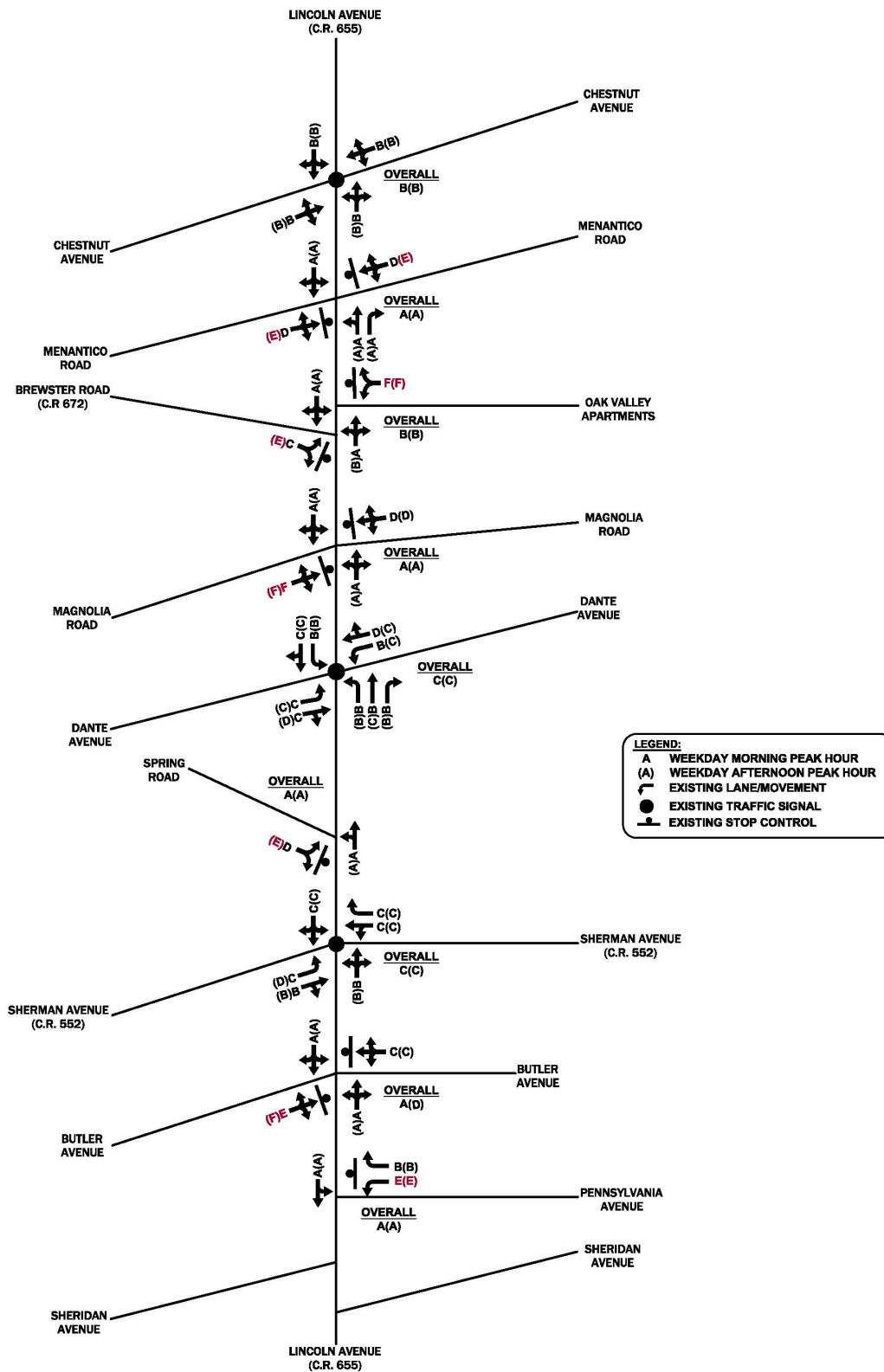
### Future Traffic Conditions with Improvement Alternatives

Capacity analyses were conducted for the study area intersections with the recommended improvements assumed to be in place. The results of that analysis are summarized in **Figure 9** and the detailed capacity/level of service analysis worksheets are contained in **Appendix G**.

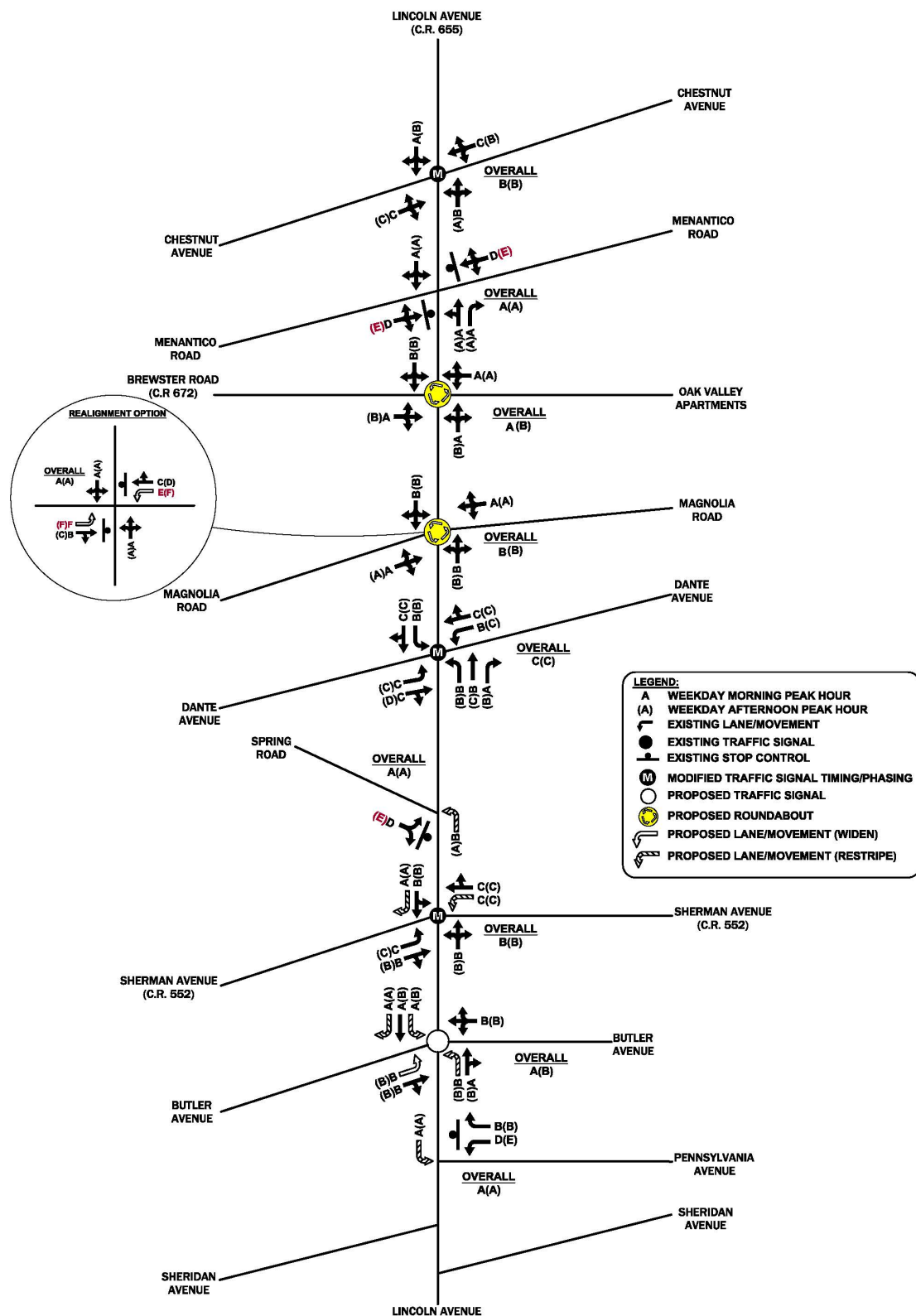
With the implementation of the recommended improvements, a significant reduction in delay is expected for overall traffic flows at the critical study area intersections, as well as along the Lincoln Avenue corridor in general. Additionally, the improvements identified will also reduce the number of crashes occurring within the study area, thereby enhancing the safety and efficiency of all users of Lincoln Avenue.



**FIGURE 8**  
Future 2040 No Build Levels-of-Service



**FIGURE 9**  
Future 2040 Levels-of-Service with Improvement Alternatives





## 4 | Conclusions and Recommendations

The Lincoln Avenue Corridor Improvement Study was conducted to generate recommendations and improvements for roadway segments and specific intersections demonstrating a history of, or potential for, high crash rates and heavy traffic congestion. In summary, based on existing conditions, as well as projected future traffic volumes, several significant transportation infrastructure improvements are recommended to enhance the safety and efficiency of the transportation system along Lincoln Avenue. All of the recommendations fall under the roadway jurisdiction of Cumberland County or the City of Vineland.

### Next Steps

There has been significant regional collaboration in the development of this improvement plan. It is recommended that this collaboration continue to guide future developments and projects, and encourage the implementation of this plan over time.

Many of the recommendations contained within this report can be implemented through routine maintenance, such as maintaining signs, pavement conditions, and roadway markings, while others will take more time and investment.

Some of the recommendations may require sizable capital investment to obtain a long-term safety benefit, such as the proposed roundabouts and roadway realignments. It is understood that these larger projects may not occur for several years due to the needed designs, funding, and right-of-way acquisitions. However, steps can be taken now to support the overall implementation of the program. Over time, these smaller steps will result in noticeable improvements to the transportation system along Lincoln Avenue.

Finally, it is recommended that the County and City continue to work with developers and affected property owners as new development and redevelopment occur along the corridor to enforce the vision and recommendations outlined in this report. This includes the provision of sidewalks along properties, connecting these sidewalks to existing, nearby sidewalks where appropriate and feasible, acquiring the necessary right-of-way dedications needed to support roadway widening and realignment, limiting driveway access along Lincoln Avenue and instead providing driveway access along the adjacent streets to ultimately improve access management along the corridor.



## 5 | Project Cost Estimates

The table below presents the total cost estimate for each improvement alternative, including the expected costs of design, right-of-way, utility relocation, construction, and inspection. The detailed cost estimates are provided in **Appendix I**.

As previously noted, these improvement alternatives comprise a recommended improvement program including four (4) individual projects. They are generally presented in the recommended order of construction, with drainage improvements occurring first, followed by the intersection improvement projects and concluding with the resurfacing and other ancillary improvements to the corridor.

To implement the recommended improvement program, we anticipate the County will seek additional sources of funding to supplement County funds, including State and Federal grant funding and local cost-sharing with the City of Vineland for improvements to roadways under City jurisdiction. For the County's consideration, various potential sources of funding for each project are included in the table below:

Improvement Alternative	Location Along Corridor	Improvement	Estimated Cost	Potential funding sources
1	Entire Corridor	Corridor Drainage Improvements	\$2,742,400.00	Local Freight Impact Fund Grant Program (State), County Aid (State)
2	Butler Road	Signalization	\$855,200.00	City cost-sharing, County Aid (State)
3A	Brewster Road and Magnolia Road	Roundabouts	\$5,031,600.00	Federal Highway Safety Improvement Program, City cost-sharing
3B		Roundabout and Widening / Realignment	\$4,123,800.00	
4	Entire Corridor	Corridor Resurfacing and Signalized Intersection Improvements	\$3,912,000.00	Local Freight Impact Fund Grant Program (State), County Aid (State)
<b>Total Program Cost Including Alternatives 1, 2, 3A and 4:</b>			<b>\$12,541,200.00</b>	
<b>Total Program Cost Including Alternatives 1, 2, 3B and 4:</b>			<b>\$11,633,400.00</b>	