

MEMORANDUM

To: Justin Poulos, Streetworks Development (SWD)

From: Adam Gibson, P.E.
Lisa Juan, P.E. (MA)

Date: December 12, 2022

Subject: Preliminary Traffic Engineering Assessment
One Westfield Place Transit Oriented Development (TOD)
Town of Westfield
Union County, New Jersey

EXECUTIVE SUMMARY

This preliminary traffic study will be submitted for review to the Authorities Having Jurisdiction and may be subject to change based on comments from the same.

One Westfield Place is a proposed Transit Oriented Development (TOD) that will consist of a mix of retail/restaurant, residential, and office uses spread across three (3) general areas (“zones”) in the vicinity of the Westfield Train Station. The zones are made up of the former Lord & Taylor property, along with parcels that the Town of Westfield (Town) determined would be beneficial to have redeveloped in June 2020. This proposed redevelopment, including elements of a new mobility hub within the North Zone and South Zone (immediately adjacent to the train station), will provide balanced transportation options and support a diverse, mixed-use downtown neighborhood. The three (3) zones are described below with the associated land use types.

The West Zone is comprised of multiple lots located along the north and south sides of North Avenue/CR 610, bounded to the east by Broad Street, to the west by Charles Street, and to the south by the railroad tracks. The West Zone will consist of approximately 13,300 square feet of commercial retail, 188 residential dwelling units (mix of townhomes, multi-family, and age restricted 55+), 40,000 square feet of general office space, 60,000 square feet of medical office space, and associated parking for each land use. The existing Lord & Taylor building will be repurposed (for the office and medical office uses) as part of the proposed development.

The North Zone is located along the south side of North Avenue/Route 28, bounded to the east by Central Avenue, to the west by Elm Street, and to the south by the railroad tracks, and where it is proposed to redevelop the existing surface parking lots (Lot 2 and Lot 8). The existing commercial buildings and employee/customer parking will remain. The proposed redevelopment will include creating public open space (Town Square) opposite Elm Street’s intersection with North Avenue. The North Zone will include a +/-300 space parking garage (265 public parking spaces and 35 residential parking spaces) located adjacent to the loft residential building (which will contain 35 dwelling units and 2,100 square feet of commercial retail) and approximately 68 public surface lot parking spaces.

The South Zone is located along the north side of South Avenue/CR 610, bounded to the east by Central Avenue, to the west by Summit Avenue, and to the north by the railroad tracks, and where it is proposed to redevelop the existing surface parking lots (Lot 3). The proposed redevelopment will include creating public open space (Town Green) opposite the intersection of Summit Avenue with South Avenue, and general office buildings (210,000 square feet) with retail (12,000 square feet) and associated garage parking. The South Zone will also include a +/-200 space public parking garage and up to 100 public surface lot parking spaces. The parking garages associated with the office/retail buildings will provide public parking on nights, weekends, and holidays.

Based on local and industry data, the proposed development, which will eliminate the as-of-right permitted retail use of the Lord & Taylor building, will generate a net increase of 281 vehicles during the busiest hour, PM peak hour. These additional new trips, which will be divided between the three zones, West Zone, North Zone, and South Zone, will be dispersed to the study area roadways and intersections. Significant traffic control, safety, pedestrian and bicycle improvements are proposed to offset the addition of this traffic to the surrounding roadways. The results of the detailed intersection analyses conducted for this study indicate that, with the proposed improvements and the additional Project traffic, the study intersections will generally operate at LOS D or better during both the weekday AM and PM peak hours and Saturday Midday peak hour.

The unsignalized site access points to the West Zone, North Zone, and South Zone will have adequate capacity to accommodate entering and exiting traffic without interfering with passing traffic. The site access and internal circulation via the signalized intersections at the North Zone and South Zone will continue to be evaluated and refined, in coordination with the Applicant and Town, to provide efficient vehicular flows and sufficient space for all modes of transportation.

Signal timing modifications at several study intersections will generally improve the operating conditions but will not resolve all the operational issues. Additional capacity would be beneficial at select intersections to improve traffic flows through the area; however, the right-of-way is limited and the Town's desire to create a more pedestrian/bicycle-friendly downtown may make these types of improvements infeasible. The extension of turn lane lengths would be beneficial, but the feasibility needs to be further evaluated based upon available right-of-way and desire to maintain on-street parking. Where physical improvements to an intersection may not be feasible, alternative analysis was performed and a focus on improving the pedestrian and bicycle infrastructure/safety were prioritized.

A summary of the recommended mitigations is provided below. Coordination with other stakeholders will be necessary to discuss the operating conditions of intersections that are maintained by either Union County or New Jersey Department of Transportation (NJDOT). For example, the proposed traffic signal at the intersections of Intersection ID #9. North Avenue & Clark Street and Intersection ID #14. Prospect Street & Broad Street will need to be coordinated with Union County and the roundabout at Intersection ID #3. Route 28 & South Avenue will need to be coordinated with NJDOT.

- Expanded Multi-Use Trail along Route 28
 - Proposed multi-use trail expansion from 8.0 feet to 14.0 feet.
 - Evaluate the need for additional pedestrian-friendly lighting beneath the overpass.
 - Provide connection from existing multi-use trail to future bicycle/pedestrian infrastructure along North Avenue and South Avenue.
 - Provide signing, marking, and intersection control at the connection to the existing multi-use trail.
- Intersection ID #1. Crossway Place/Scotch Plains Avenue & South Avenue
 - Modify signal timings.
- Intersection ID #4. Summit Avenue & South Avenue
 - Modify signal phase for an exclusive eastbound left-turn phase, convert the eastbound approach to consist of an exclusive eastbound left-turn lane and shared eastbound through/right-turn lane, install an exclusive westbound left-turn lane, and remove the northbound and southbound split-phase operation.
 - Road diet along South Avenue from traffic circle/roundabout to Central Avenue, which would reduce the number of westbound lanes from two (2) to one (1).
 - Implement a leading pedestrian interval (LPI), which gives pedestrian the opportunity to enter the crosswalk before vehicles.
- Intersection ID #5. South Avenue & Boulevard
 - Road diet along South Avenue from traffic circle/roundabout to Central Avenue.
- Intersection ID #6. South Avenue & Eastern Site Driveway
 - Install a new traffic signal.
 - Implement a LPI.
 - This intersection will include signal coordination with Intersection ID #4. South Avenue & Summit Avenue and Intersection ID #7 Ross Place & Central Avenue & South Avenue.
 - As part of the road diet, reduce the westbound through travel lanes from two to one, with the outside most travel lane used as a right-turn lane into the site.
- Intersection ID #7. Ross Place & Central Avenue & South Avenue
 - Maintain existing intersection lane geometry.
 - Modify signal timings.
 - Restrict westbound right-turn on red movement.
 - Add high-visibility crosswalks.
 - Construct curb extension at the corner of South Avenue & Ross Place to shorten the pedestrian crossing distance.
 - Adjust the pedestrian signal phasing so pedestrians cross Ross Place when South Avenue has a green light.
- Intersection ID #8. Crossway Place/Edgewood Avenue & North Avenue
 - Modify signal timings.
- Intersection ID #9. North Avenue & Clark Street
 - Construct curb extensions with ADA-compliant ramps at the northeast and northwest corner at Clark Street. This treatment will shorten the pedestrian crossing distance.
 - Install a new traffic signal.
 - This intersection will include signal coordination with Intersection ID#11. Route 28/Broad Street & North Avenue.
 - Restrict the westbound right-turn on red movement.

- Implement a LPI.
- Intersection ID #11. Route 28/Broad Street & North Avenue
 - Stripe the shoulders along the eastbound right-turn lane, slip ramp to narrow down the travel lane.
 - Use high visibility crosswalk markings.
 - Provide pedestrian crossing warning signs on both side of the slip ramp. RRFBs could be provided to further enhance safety at the crossings.
 - Declutter and/or relocate existing signs as much as possible. For example, the yield sign at the southern end could be relocated further south such that it is placed adjacent to the yield markings.
 - Modify signal timings.
 - Install a no right turn for trucks sign at the northeast corner for westbound right-turn truck movements.
- Intersection ID #12. North Avenue & Elm Street
 - Maintain existing intersection lane geometry, however, convert to a typical four-legged intersection.
 - Modify signal timings.
 - Upgrade pedestrian crosswalk signals as part of traffic signal redesign.
 - Implement a LPI.
- Intersection ID #13. Central Avenue & North Avenue
 - Maintain existing intersection lane geometry.
 - Modify signal timings.
 - Add high-visibility crosswalks.
 - Add ADA curb ramps and pedestrian signals.
- Intersection ID #14. Prospect Street & Broad Street
 - Install a new traffic signal.
 - Construct curb extensions on the east leg of the intersection (Prospect Street).
- Intersection ID #16. Central Avenue & Broad Street
 - Install a flashing yellow arrow (FYA) for westbound left-turn movements (Broad Street to Central Avenue).
- Intersection ID #17. Broad Street & Mountain Avenue
 - Modify signal timings with a FYA for eastbound left-turn movements (Broad Street to Mountain Avenue).
- Intersection ID #23. North Avenue & Eastern North Zone Parking Site Driveway
 - New driveway for only right-turn in/right-turn out movements.

INTRODUCTION

Kimley-Horn prepared this memorandum to detail the results of the Traffic Engineering Assessment for the proposed redevelopment (One Westfield Place) in the Town of Westfield (Town), Union County, New Jersey. One Westfield Place is a proposed Transit Oriented Development (TOD) that will consist of a mix of commercial, residential, and office uses spread across three (3) zones in the vicinity of the Westfield Train Station and the former Lord & Taylor department store building. The zones are made up of parcels that the Town of Westfield declared as an area in need of redevelopment in June 2020. This proposed redevelopment, including elements of a new mobility hub within the North Zone and South Zone, will provide balanced transportation options and support a diverse, mixed-use downtown neighborhood.

The scope of this Traffic Engineering Assessment was developed as part of on-going coordination with the Town of Westfield's Traffic Engineering Professional (WSP).

PROJECT DESCRIPTION

The proposed redevelopment is a mix of commercial, residential, and office uses spread across three (3) zones in the vicinity of the Westfield Train Station and the former Lord & Taylor department store building. The three (3) zones are listed below with the associated land use types. This proposed redevelopment, including elements of a new mobility hub within the North Zone and South Zone, will provide balanced transportation options and support a diverse, mixed-use downtown neighborhood as shown in the concept plan in [Appendix A](#).

- West Zone – commercial retail (13.3 ksf), residential (188 dus), and office (40 ksf general and 60 ksf medical office)
- North Zone – residential (35 dus) and retail (2.1 ksf)
- South Zone – commercial retail (12 ksf) and office (210 ksf general)

This proposed redevelopment is being planned to provide balanced transportation options, including elements of a new mobility hub within the North Zone and South Zone. Vehicle trips may shift to walking, cycling, or taking public transit especially because the downtown redevelopment key principles include the development of great streets and fostering a unique, organic, urban environment with an emphasis on green environments and state-of-the-art green technologies.

EXISTING CONDITIONS

Study Area

The West Zone is comprised of multiple lots located along the north and south sides of North Avenue/CR 610, bounded to the east by Broad Street, to the west by Charles Street, and to the south by the railroad tracks. There are multifamily residential, which is age-restricted to 55+, including 21 affordable units, office building (general office and medical office building) with retail, and associated parking garage located on the south side of North Avenue/CR 610 and will redevelop the former Lord & Taylor department store. There is multifamily residential, including six (6) affordable units, located at the northeast corner of North Avenue/CR 610 & Clark Street. The townhouses, which are age-restricted to 55+, including three (3) affordable units, are located on the north side of North Avenue/CR 610, directly across from the Lord & Taylor department store.

The North Zone is located along the south side of North Avenue/Route 28, bounded to the east by Central Avenue, to the west by Elm Street, and to the south by the railroad tracks and will redevelop the existing surface parking lots (Lot 2 and Lot 8). The existing commercial buildings and employee/customer parking will remain. The proposed redevelopment will include creating public open space (Town Square) at the intersection with Elm Street. The loft residential, including six (6) affordable units and retail are located at the southwest corner of North Avenue/Route 28 & Central Avenue. The North Zone will also include a +/-300 space parking garage (265 public parking spaces and 35 residential parking spaces) located adjacent to the loft residential building and approximately 68 public surface lot parking spaces.

The South Zone is located along the north side of South Avenue/CR 610, bounded to the east by Central Avenue, to the west by Summit Avenue, and to the north by the railroad tracks and will redevelop the existing surface parking lots (Lot 3). The proposed redevelopment will include creating public open space (Town Green) at the intersection with Summit Avenue and the office buildings with retail and associated garage parking. The South Zone will also include a +/-200 space public parking garage and up to 100 public surface lot parking spaces. The parking garages associated with the office/retail buildings will provide public parking on nights, weekends, and holidays.

The following 17 existing intersections were identified for study (existing intersection traffic control) based upon discussions and agreements with the Town:

- Intersection ID #1. Crossway Place/Scotch Plains Avenue & South Avenue (traffic signal)
- Intersection ID #2. Broad Street & South Avenue (traffic signal)
- Intersection ID #3. Route 28 & South Avenue (Yield control roundabout)
- Intersection ID #4. Summit Avenue & South Avenue (traffic signal)
- Intersection ID #5. South Avenue & Boulevard (STOP control)
- Intersection ID #6. South Avenue & Lot #3 East Driveway (STOP control)
- Intersection ID #7. Ross Place & Central Avenue & South Avenue (traffic signal)
- Intersection ID #8. Crossway Place/Edgewood Avenue & North Avenue (traffic signal)
- Intersection ID #9. North Avenue & Clark Street (STOP control)
- Intersection ID #10. Clark Street & Ferris Place (STOP control)
- Intersection ID #11. Route 28/Broad Street & North Avenue (traffic signal)
- Intersection ID #12. North Avenue & Elm Street (traffic signal)
- Intersection ID #13. Central Avenue & North Avenue (traffic signal)
- Intersection ID #14. Prospect Street & Broad Street (STOP control)
- Intersection ID #15. Elm Street & Broad Street (traffic signal)
- Intersection ID #16. Central Avenue & Broad Street (traffic signal)
- Intersection ID #17. Broad Street & Mountain Avenue (traffic signal)

Intersection capacity analyses were performed at study intersections for weekday AM and PM peak hours and Saturday Midday peak hour under existing, future no-build and future build-out conditions (the year 2027).

Data Collection

Traffic volumes used in this study included a combination of data provided from StreetLight Data (StreetLight) and collected turning movement counts (TMCs). The existing conditions analyses were based on the existing traffic volumes, existing lane uses, and existing traffic controls at the study area intersections.

Historical automated traffic recorder (ATR) data from NJDOT's Traffic Count Stations were reviewed to understand the peak characteristics during the weekday AM and PM peak hours. The historical counts identified that the typical commuter peak periods were within 7:00 – 9:00 AM and 4:00 – 6:00 PM as shown in [Appendix B](#).

Weekday

StreetLight is an online platform for transportation analytics and traffic counts based upon crowdsourced mobile device data. StreetLight samples from cell phone apps that use location-based services. Rather than collecting counts for a single day, StreetLight can aggregate and average data across several months. This analysis began during the COVID-19 pandemic. Therefore, StreetLight was queried for four (4) months in 2019 on a typical weekday (Tuesday, Wednesday, or Thursday) AM peak period (7:00– 8:00 AM and 8:00– 9:00 AM) and PM peak period (4:00– 5:00 PM and 5:00– 6:00 PM). Two (2) of the months queried were in the Spring (March and April) and the other two (2) months were in the Fall (September and October) while school was in session. Based upon the data queried, the network AM peak hour was identified as 7:00 – 8:00 AM and the PM peak hour was identified as 5:00 – 6:00 PM. Daily count data, such as 48-Hour Volume Counts from the NJDOT Traffic Count Stations and historical peak hour TMCs provided by the Town of Westfield in the study area were utilized as calibration data inputs in StreetLight. The daily count and historical peak hour TMC data was used by the StreetLight algorithm to calibrate volume estimates internally. After obtaining the raw 2019 TMCs from StreetLight, post-processing outside of StreetLight was conducted to obtain (pre-COVID-19) 2021 TMCs. The following adjustments were made:

- The NJDOT Traffic Count Stations data provided sub-daily count data (provided in 1-hour bins for some or all locations); these hourly volumes were grown to the year 2021. These volumes were held fixed, if available for study area intersections, similarly to the historic TMCs.
- The remaining study area intersection volumes were derived by proportionally adjusting the 2019 StreetLight TMCs to balance with the fixed historic count data at all available locations. In this way, the StreetLight volumes were used as a “starting point” for traffic volumes but adjusted to align with known, historical volumes.
- If no historic TMC data was available, the StreetLight volumes were utilized at all intersections but balanced to be held fixed with the available midblock hourly data from NJDOT.

The traffic volume data at the following study intersections were based upon StreetLight.

- Intersection ID #1. Crossway Place/Scotch Plains Avenue & South Avenue (traffic signal)
- Intersection ID #2. Broad Street & South Avenue (traffic signal)
- Intersection ID #7. Ross Place & Central Avenue & South Avenue (traffic signal)
- Intersection ID #8. Crossway Place/Edgewood Avenue & North Avenue (traffic signal)
- Intersection ID #13. Central Avenue & North Avenue (traffic signal)
- Intersection ID #14. Prospect Street & Broad Street (STOP control)
- Intersection ID #15. Elm Street & Broad Street (traffic signal)
- Intersection ID #16. Central Avenue & Broad Street (traffic signal)
- Intersection ID #17. Broad Street & Mountain Avenue (traffic signal)

StreetLight provides hourly volume data thus, a peak-hour factor (PHF), which relies on a 15-minute breakdown of volumes, could not be calculated by StreetLight at the time this data was queried. Industry PHF defaults of 0.92 and 0.95 were used for the existing conditions and future conditions, respectively. StreetLight does not provide vehicle classifications; thus, heavy vehicle percentages (HV%) could not be calculated from the raw data. The HV% was calculated by averaging the HV% utilizing the existing traffic volumes based upon current TMCs – a 5 percent (5%) HV% was assumed for the AM peak hour and a 2 percent (2%) HV% was assumed for the PM peak hour.

Manual TMCs were conducted on Wednesday, November 21, 2021, between 7:00 – 9:00 AM and 4:00 – 6:00 PM at the following study intersections. The PHF and HV% were based on existing counts.

- Intersection ID #3. Route 28 & South Avenue (Yield control roundabout)
- Intersection ID #11. Route 28/Broad Street & North Avenue (traffic signal)

Manual TMCs were conducted on Tuesday, April 5, 2022, between 6:00 – 10:00 AM and 3:00 – 7:00 PM at the following study intersections. The PHF and HV% were based on existing counts.

- Intersection ID #4. Summit Avenue & South Avenue (traffic signal)
- Intersection ID #5. South Avenue & Boulevard (STOP control)
- Intersection ID #6. South Avenue & Lot #3 East Driveway (STOP control)
- Intersection ID #12. North Avenue & Elm Street (traffic signal)

TMC data for the following intersections were based on the *Proposed Mixed-Use Development Traffic & Parking Assessment Report*, prepared by Stonefield Engineering (April 26, 2022). Traffic counts for these intersections were conducted on Thursday, October 21, 2021, from 7:00 – 9:00 AM and 4:00 – 7:00 PM.

- Intersection ID #9. North Avenue & Clark Street (STOP control)
- Intersection ID #10. Clark Street & Ferris Place (STOP control)

Saturday

Manual TMCs were conducted on Saturday, June 18, 2022, between 11:00 AM – 2:00 PM at the following study intersections. The PHF and HV% were based on existing counts. The traffic counts are included in **Appendix B**.

Additionally, the TMC data for one (1) intersection (North Avenue & Clark Street) was based upon data from the *Proposed Mixed-Use Development Traffic & Parking Assessment Report*, prepared by Stonefield Engineering (April 26, 2022). The traffic count for this intersection was conducted on Saturday, October 16, 2022, from 11:00 AM – 2:00 PM. **Figure 1** illustrates the study intersections.

- Intersection ID #1. Crossway Place/Scotch Plains Avenue & South Avenue (traffic signal)
- Intersection ID #2. Broad Street & South Avenue (traffic signal)
- Intersection ID #3. Route 28 & South Avenue (Yield control roundabout)
- Intersection ID #4. Summit Avenue & South Avenue (traffic signal)
- Intersection ID #5. South Avenue & Boulevard (STOP control)
- Intersection ID #6. South Avenue & Lot #3 East Driveway (STOP control)
- Intersection ID #7. Ross Place & Central Avenue & South Avenue (traffic signal)
- Intersection ID #8. Crossway Place/Edgewood Avenue & North Avenue (traffic signal)
- Intersection ID #9. North Avenue & Clark Street (STOP control) ¹
- Intersection ID #10. Clark Street & Ferris Place (STOP control)
- Intersection ID #11. Route 28/Broad Street & North Avenue (traffic signal)
- Intersection ID #12. North Avenue & Elm Street (traffic signal)
- Intersection ID #13. Central Avenue & North Avenue (traffic signal)
- Intersection ID #14. Prospect Street & Broad Street (STOP control)
- Intersection ID #15. Elm Street & Broad Street (traffic signal)
- Intersection ID #16. Central Avenue & Broad Street (traffic signal)
- Intersection ID #17. Broad Street & Mountain Avenue (traffic signal)

Additional data was collected at existing site driveways to the parcels where the proposed development will occur. These volumes were used to estimate the amount of traffic generated by the existing parcels.

- North Avenue & L&T Parking Lot (west of Clark Street) (STOP control)
- North Avenue & L&T Parking Lot (east of Charles Street) (STOP control)
- North Avenue & Columbia Bank Driveway (STOP control)
- North Avenue & Limani Seafood Grill Driveway (STOP control)
- North Avenue & Verizon Driveway (STOP control)
- South Avenue & Lot #3 Driveway west of Summit Avenue Driveway (STOP control)

¹ Per the *Proposed Mixed-Use Development Traffic & Parking Assessment Report*, prepared by Stonefield Engineering, dated April 26, 2022

Figure 2 presents the existing peak hour background traffic volumes during the weekday AM and PM peak hours and **Figure 3** presents the existing Saturday Midday peak hour.

FUTURE BACKGROUND TRAFFIC

Future background traffic conditions are defined as expected traffic conditions on the roadway network in the year 2027 without the construction of the proposed redevelopment. Future background traffic volumes used in the analysis are the sum of the existing traffic, an additional amount of traffic generated by growth in the study area, and committed development traffic in the Town of Westfield. Additionally, since the Lord & Taylor building (~143,000 square feet) could be re-occupied with another department store as an “as-of-right” use, these trips were also included as background traffic and the analysis was used as the reference point for which the proposed redevelopment was compared. **Figure 4** presents the 2027 peak hour background traffic volumes during the weekday AM and PM peak hours and **Figure 5** presents the Saturday Midday peak hour.

Background Area Growth

A background growth rate was applied to existing traffic volumes to project traffic volumes in the year 2027. The growth rate was developed based on the sociodemographic projections from the North Jersey Transportation Planning Authority (NJTPA) for 2035 along with NJTPA’s regional travel model (North Jersey Regional Transportation Model Enhanced) as documented in the *Town of Westfield Unified Land Use + Circulation Element (ULUC)*, June 2021. A compounded annual growth rate (CAGR) of 0.26 percent (0.26%) per year between 2021 and 2027 or 2022 and 2027 was applied to the existing traffic volumes.

Committed Development

The *Town of Westfield ULUC* (June 2021) created a Buildout Analysis, which was intended to show how development could affect the downtown as a whole and different areas of the downtown in particular. The following committed development projects were included in the analysis and can be found in **Appendix C**.

- The Parker (439 West Broad St)
 - 31-dwelling units
- The Bentley (501 South Ave West)
 - 30-dwelling units and 7,055 sf of retail/restaurant
- 409 Westfield Avenue (adjacent to “Roots Building”)
 - 3-dwelling units and 2,100 sf of restaurant
- Former Jolly Trolley (411 North Ave West)
 - 20-dwelling units and 1,200 sf of restaurant
- Flatiron Building (44 Elm St)
 - 2-dwelling units and 1,300 sf of retail/restaurant
- 226 North Avenue West
 - 4-dwelling units and 5,070 sf of retail/restaurant
- 333 Central Avenue
 - 70-dwelling units

- Savannah Condos (111 Prospect St)²
 - 53-dwelling units
- The Sophia (located in the southwest corner of Prospect Street & Ferris Place, also designated as Block 2504, Lot 12, 13, and 13 as depicted on the Township of Westfield Tax Map)
 - 64-dwelling units and 500 square feet of first-floor retail space
- Westfield Crossing (located at South Avenue, Block 3307, Lots 1 and 2)
 - 193-dwelling units
- “Adonis” Development (located along the south side of North Avenue in the vicinity of Euclid Avenue)
 - 30-dwelling units
- “Steam Needle” Development (located along the south side of North Avenue in the vicinity of Euclid Avenue)
 - 15-dwelling units

Lord & Taylor As-of-Right Use

Trip generation calculations for the Lord & Taylor as-of-right use were performed using the Institute of Transportation Engineers' (ITE) *Trip Generation Manual, 11th Edition*. The trip generation for the department store as-of-right use was estimated using ITE Land Use Code (LUC) 875 (Department Store) for the weekday AM and PM peak hours and Saturday Midday peak hour. The trip generation for the as-of-right use was projected to be 64 new trips during the AM peak hour, 211 trips during the PM peak hour, and 378 trips during the Saturday Midday peak hour. The detailed worksheets are included in [Appendix E](#).

² While not recently approved, Savannah Condos is the most recent development to occur in the downtown study area prior to 2015 and is unlikely to change

PROJECT TRAFFIC

Project traffic used in this analysis is defined as:

- the redistribution of vehicle trips associated with the commuter parking lots being redeveloped;
- vehicle trips expected to be generated by the project; and
- the distribution and assignment of that traffic over the study roadway network.

Public Parking Lots

The proposed redevelopment will modify how the surface parking lots exist today, which will impact users such as Commuters, Employees, and Shoppers. It is anticipated that as part of this redevelopment, the Town will construct two (2) public garages; one (1) in the North Zone, located at the southwest corner of North Avenue/Route 28 & Central Avenue, and one (1) in the South Zone, located at the northwest corner of South Avenue & Summit Avenue.

Inventory and Access

The North Zone consists of Lot 2, which is Pay Station Parking: Maximum of 4 hours, and Lot 8, which is a combination of Permit Parking for Employees and Commuters, and Reserved Business Parking (for the existing businesses located in this area and their customers/Shoppers).

The South Zone consists of Lot 3, which is a combination of Permit Parking for Commuters and 12-Hour Parking: Numbered Spaces.

The number of existing parking spaces/supply has been compiled based on recent data collection efforts in April 2022 and the *Town of Westfield Public Parking Plan* (dated September 20, 2022 as developed by THA).

Parking will be modified for Lot 2 and Lot 8 in the North Zone and for Lot 3 in the South Zone. The *Westfield Public Parking Plan* includes both Primary and Contingency strategies to replace the parking spaces being displaced as part of the redevelopment. Per Town staff, it is intended the number of commuter parking spaces in the North Zone and South Zone will be replaced one-for-one within the Town.

The redevelopment site access to the lots in the North Zone and South Zone is summarized below.

- North Zone: North Avenue & Elm Street – existing signalized full-access driveway
- North Zone: North Avenue & Limani Seafood Grill Driveway – existing ingress only driveway
- North Zone: North Avenue & Verizon Driveway – existing full-access driveway
- North Zone: North Avenue & west of Central Avenue Driveway – proposed right-in/right-out (RIRO) only driveway
- South Zone: South Avenue & Lot 3 East Driveway – existing full-access driveway
- South Zone: South Avenue & Summit Avenue – existing signalized full-access driveway

As part of the redevelopment, the current site plan (**Appendix A**) indicates the net change of commuter/public parking spaces/supply within the North Zone and South Zone. There are on-going discussions between the Town and the Applicant regarding the future number of commuter parking spaces in these areas.

The Town provided geodata to review the origin-destination (O-D) data for the commuter lot permits located at Lot 8, which is in the North Zone (south of North Avenue) and Lot 3, which is in the South Zone (north of South Avenue). The information was used to determine potential travel routes between those origins and the commuter lots. Based upon the geodata for Lot 8 (North Zone), approximately 57 percent (57%) of the trips are coming to/from the residential areas south of the tracks and 43 percent (43%) of the trips are coming to/from the residential areas north of the tracks. Based upon the geodata for Lot 3 (South Zone), approximately 10 percent (10%) of the trips are coming to/from the residential areas south of the tracks and 90 percent (90%) of the trips are coming to/from the residential areas north of the tracks. The distribution for commuter trips associated with Lot 8 (North Zone) and Lot 3 (South Zone) are illustrated in [Figure 4](#) and [Figure 5](#), respectively. The geodata was utilized to understand the routes commuters may travel between the train station and their home. The general distribution for Lot 8 (North Zone) and Lot 3 (South Zone) for commuter travel patterns is shown in [Appendix D](#).

Weekday

A comparison of recent parking occupancy data and data collected previously on Tuesday, June 6, 2019, as part of the *Town of Westfield Master Plan Re-Examination Parking Planning Plan Element* (November 2019) was performed to understand the current trend in parking occupancy due to the ongoing effects of the COVID-19 pandemic. Recent parking occupancy data collected for Lot 2, Lot 3, and Lot 8 occurred on Tuesday, April 5, 2022, from 10:00 AM to 8:00 PM and was collected at 2-hour intervals to be consistent with the previous data collection efforts. Overall, the parking occupancy trended lower in April 2022 between 10:00 AM and 4:00 PM, while the parking occupancy at 6:00 PM was very similar to the previous data collected and the parking occupancy at 8:00 PM was higher. The data comparison for Lot 2, Lot 3, and Lot 8 is shown in [Appendix D](#).

On the same day of the parking occupancy data collection efforts (Tuesday, April 5, 2022), TMCs were collected at the individual commuter parking lot driveways (Lot 2, Lot 3, and Lot 8) to understand the number of commuter and public trips being generated currently. The TMCs were collected from 6:00 AM – 10:00 AM and 3:00 PM – 7:00 PM. The data utilized in this study was 7:00 AM – 8:00 AM and 5:00 PM – 6:00 PM to be consistent with the analysis time period for other data collection efforts associated with this project. Since the parking occupancy trended lower when compared between post-pandemic (April 2022) and pre-pandemic (June 2019), the TMCs at the individual commuter parking lots were scaled by a factor of 1.11 for both AM and PM peak hours to adjust the volumes to pre-pandemic levels. This factor represented the average difference in parking occupancy among the data collection intervals between 10:00 AM and 6:00 PM.

To account for the redevelopment of public parking lot spaces, the TMCs at the individual commuter parking lot driveways were scaled accordingly. The additional trips associated with the increase in commuter parking spaces in the North Zone were evenly split between the residential areas located north and south of the railroad tracks as shown in [Figure 6](#) and [Figure 7](#). The net change in trips associated with the decrease in commuter parking spaces in the South Zone were removed from the driveways and study area intersections based upon the geodata provided by the Town and the routes commuters may travel between the train station and their home as shown in [Figure 8](#). The calculation

of the TMCs at the individual commuter parking lot driveways with the factors described above is included in [Appendix D](#).

Saturday

Trips being generated to/from the commuter lots on a Saturday were assumed to remain unchanged in the build conditions since the number of available parking spaces in these lots will be similar to or greater than the existing conditions. Additionally, the user of these parking spaces on a weekend is associated more with public use versus commuter use. In the build conditions, the assignment of these trips may be redistributed to another site driveway due to the reconfiguration of the site driveways (e.g., North Avenue & Columbia Bank Driveway (right-out only driveway located east of North Avenue & Elm Street) trips were redistributed to North Avenue & Elm Street).

Project Access

Based upon the concept plan provided in [Appendix A](#), access to the proposed redevelopment (by zone) is listed below. Each of the site access points should be coordinated with the approving jurisdiction.

- West Zone – Multifamily Residential: Access will be provided by one (1) full-access driveway located along North Avenue, west of Broad Street.
- West Zone – Office Building & Multifamily Residential: Access will be provided by two (2) full-access driveways along North Avenue/CR 610, west of Clark Street and east of Charles Street.
 - The existing Lord & Taylor driveway along North Avenue, immediately east of Charles Street, will be closed and the other two (2) existing accesses will remain.
- West Zone – Townhouses: Access will be provided by one (1) full-access driveway located along Clark Street, north of North Avenue/CR 610.
- North Zone: Access will be provided by one (1) full-access driveway at the signalized intersection of North Avenue/Route 28 & Elm Street and one (1) RIRO only driveway proposed along North Avenue/Route 28, west of Central Avenue.
 - The intersection of North Avenue & Columbia Bank Driveway (right-out only driveway) will be closed and the other two (2) existing accesses near the Verizon store will remain.
- South Zone: Access will be provided by one (1) full-access driveway at the existing signalized intersection of South Avenue & Summit Avenue, one (1) right-out only driveway proposed along South Avenue, east of Summit Avenue, and one (1) existing full-access driveway that is proposed to be signalized along South Avenue, west of Central Avenue.
 - The existing site driveway at the intersection of South Avenue & Boulevard is anticipated for non-vehicular modes of travel (e.g., pedestrian, bicycle, scooter, etc.), emergency vehicles, and delivery vehicles during events at this plaza. This access is not intended to be primary access for passenger vehicles.
 - The existing site driveway at the intersection of South Avenue & Lot 3 East Driveway is proposed to be signalized to better facilitate vehicles associated with the office buildings to utilize this access over the access at Summit Avenue. Utilizing this

additional access will improve the operational efficiency of vehicles accessing the public parking garage and for pick-up/drop-off of passengers at the train station.

The traffic circulation, pick-up/drop-off locations, parking garage access and operations, bicycle parking, etc. within the North Zone and South Zone are continuing to evolve in coordination with the Town.

Trip Generation

Trip generation calculations for the proposed redevelopment were performed using the ITE *Trip Generation Manual, 11th Edition*, and NJDOT's Highway Access Permit System (HAPS) which is based upon the ITE's *Trip Generation Manual, 10th Edition*. The trip generation for the proposed redevelopment was estimated using ITE Land Use Code (LUC) 215 (Single-Family Attached Housing), 221 (Multifamily Housing Mid-Rise), 710 (General Office Building), 720 (Medical-Dental Office), 822 (Strip Retail Plaza <40ksf), and 931 (Fine Dining Restaurant)³ for the weekday AM and PM peak hours and Saturday MIDDAY peak hour. The multifamily residential units in the West Zone and North Zone include affordable housing and/or age restricted (55+) units. However, as a conservative approach, the residential trip generation rates for LUC 221 (Multifamily Housing Mid-Rise) were used since these rates are higher than the rates for LUC 223 (Affordable Housing) and LUC 252 (Senior Adult Housing – Multifamily).

For the commercial retail land uses within the redevelopment, the trip generation was based upon "Street Retail" (LUC 822) and Restaurant (LUC 931). These land uses were chosen to be consistent with the land use types identified in the *Shared Parking Analysis Technical Memorandum*, prepared by DESMAN (July 28, 2021). Street Retail was defined as traditional goods and services.

Multimodal Reduction

A multimodal (e.g., public transit, bicycle, pedestrian, worked at home, etc.) factor was identified based on US Census *Means of Transportation to Work* data for Census Tract 366 and *Planning for Transit-Friendly Land Use A Handbook for New Jersey Communities*. The Census Tract 366 data indicated approximately 2.2 percent (2.2%) walked and 6 percent (6%) worked at home for the 2019 5-Year Estimates. Per the *Planning for Transit-Friendly Land Use A Handbook for New Jersey Communities*, the percent reduction at a 'Transit Node' for office use is 25 percent (25%), non-residential (non-office) use is 15 percent (15%), and residential use is 30 percent (30%).

It is projected that a portion of employees, residents, and visitors will choose to walk, bike, or take public transit to the proposed redevelopment due to the availability/planned availability of sidewalks and bicycle facilities, NJ TRANSIT bus routes (Route 59 and Route 113) in the vicinity, and the proximity of the Westfield Train Station (Raritan Valley Line). Per the NJ TRANSIT website, the Raritan Valley Line provides weekday service from High Bridge, Raritan, and Plainfield to Newark Penn Station, with trains extended to/from New York during midday and evening hours. On weekends and holidays, service operates between Raritan and Newark Penn Station, with connecting service

³ The ITE's *Trip Generation Manual, 10th Edition*, LUC 931 is Quality Restaurant.

to/from New York. Between 6:30 AM and 9:30 AM, there are seven (7) trains heading towards NYC which stop in Westfield and three (3) trains heading toward Raritan which stop in Westfield. Between 4:00 PM and 7:30 PM, there are five (5) trains heading toward NYC and six (6) trains heading toward Raritan. There are 13 stops between High Bridge and Westfield and seven (7) stops between Westfield and New York Penn Station. The municipalities located in New Jersey with a stop along the Raritan Valley Line (excluding Hoboken), west and east of Westfield, have a combined working age (18+) population of approximately 465,000 people (Source: US Census Bureau, Census 2020). This data supports the use of NJ TRANSIT train trips.

The general office (LUC 710) and residential (LUC 215 and LUC 221) land uses utilized the setting/location of “dense multi-use urban” and land use subcategory of “close to rail transit,” if these variables were provided in the ITE *Trip Generation Manual, 11th Edition*. The trip generation rates provided by ITE when using these variables already considers the effect of non-vehicular modes of transportation; thus, a separate multimodal factor was not applied for these land uses. It should be noted that the trip generation for the North Zone Lofts Residential was based upon NJDOT’s HAPS since this portion of the redevelopment will directly access a State roadway and will need to follow NJDOT methodology. The HAPS data does not provide the setting/location and land use subcategory variables; thus, the previously described multimodal factors were applied to this residential use in the North Zone. Additionally, ITE does not provide the setting/location and land use subcategory variables for the medical office (LUC 720) and commercial retail land uses (LUC 822 and LUC 931). Therefore, the general urban/suburban setting/location variable was utilized along with applying the previously described multimodal factors.

The ITE *Trip Generation Manual, 11th Edition*, LUC 215 (Single-Family Attached Housing) and LUC 221 (Multifamily Housing Mid-Rise) do not include trip rates for a Saturday time period with “dense multi-use urban” as the Setting/Location. Thus, the trip rate for the Saturday time period was proportioned by using the average trip rate of the weekday AM and PM peak hour of adjacent street with “dense/multi-use urban” over the trip rate of the weekday AM and PM peak hour of adjacent street with “general urban/suburban”. Then, the calculated average trip rate for the AM and PM peak hour of adjacent street was multiplied by the Saturday average rate with “general urban/suburban” as the Setting/Location to determine the trip rate for the Saturday time period with “dense multi-use urban.” The calculations for the Saturday trip rate under “dense multi-use urban” are included in [Appendix E](#).

The following multimodal factors were applied to the different land uses based upon a combination of the sources identified above.

- Residential Multimodal Factor (for North Zone Lofts Residential only): 38.2 percent (38.2%) (combination of walking (2.2%), working at home (6%), and taking public transit (30%))
- Retail Multimodal Factor: 17.2 percent (17.2%) (combination of walking (2.2%) and taking public transit (15%))

- Medical Office Multimodal Factor: 28.2 percent (28.2%) (combination of walking (2.2%), working at home (6%), and taking public transit (20%))⁴

Internal Capture and Community Capture

A portion of the trips generated by the proposed redevelopment is expected to be captured internally within each zone. Internal capture trips for each zone were determined based upon the methodology contained in the ITE’s, *Trip Generation Handbook, 3rd Edition* for the weekday AM and PM peak periods. The Saturday Midday peak period was based upon the PM peak period rates and the three (3) time periods are summarized in **Table 1**.

Table 1. Internal Capture Rates

Time Period	West Zone	North Zone	South Zone
AM Peak Hour	7.0%	13.3%	8.0%
PM Peak Hour	14.5%	16.7%	6.9%
Saturday Midday Peak Hour	20.2%	14.3%	15.7%

Furthermore, a community capture rate of 6.07 percent (6.07%) during the weekday AM peak hour and 7.37 percent (7.37%) during the weekday PM peak hour was applied to account for trips between the three (3) zones and the downtown area (residences, places of employment, and businesses). The Saturday Midday peak hour community capture rate was based upon an average of the weekday AM and PM peak hours, which is calculated to 6.72 percent (6.72%). The weekday AM and PM peak hours community capture rates were based upon the Mixed-Use Trip Generation Model ITE/EPA documented in the *Town of Westfield ULUC* (June 2021).

Pass-by Capture

Pass-by trips represent site patrons who would already be traveling along study roadways whose primary destination is somewhere other than the site. The pass-by rates were applied only to the retail land uses and were based upon the NJDOT’s approved pass-by rates, which are based upon the ITE’s, *Trip Generation Handbook, 3rd Edition*. The average pass-by rate for the retail land use is 34 percent (34%) and the restaurant land use is 44 percent (44%) during the weekday AM and PM peak hours and Saturday Midday peak hour. However, as a conservative analysis for the restaurant land use, the pass-by rate of 10 percent (10%) was utilized instead of the 44 percent (44%)

Net, New Project Trips

Net, new project trips are equal to the gross project trips minus the multimodal reduction factor, internal/community capture, and pass-by capture. The net, new project trips represent the additional vehicles on the roadway network. The project’s trip generation for the entire redevelopment during the

⁴ The calculation of 20.0% is the average of the public transit for office use (25.0%) and non-office (15.0%)

weekday AM and PM peak hours and Saturday Midday peak hour is shown in **Table 2**. As shown in **Table 2**, the proposed redevelopment is expected to generate 374 net, new trips during the weekday AM peak hour, 492 net, new trips during the weekday PM peak hour, and 279 net, new trips during the Saturday midday peak hour. The detailed worksheets are included in **Appendix E**.

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Table 2. Proposed Net, New Trip Generation

Land Use (ITE Code)	Scale	AM Peak Hour			PM Peak Hour			Saturday Midday Peak Hour		
		Net External Trips	Entering Trips	Exiting Trips	Net External Trips	Entering Trips	Exiting Trips	Net External Trips	Entering Trips	Exiting Trips
West Zone										
Single-Family Attached Housing (215) ¹	16 dus	6	2	4	4	2	2	4	2	2
Multifamily Housing (Mid-Rise) (221) ²	138 dus	32	5	27	23	18	5	24	12	12
Multifamily Housing (Mid-Rise) (221) ³	34 dus	8	1	7	6	4	2	6	4	2
General Office Building (710) ⁴	40,000 sf	49	43	6	37	6	31	7	1	6
Medical-Dental Office Building (720) ⁵	60,000 sf	96	77	19	151	45	106	113	65	48
Strip Retail Plaza (822) ⁶	2,500 sf	3	2	1	8	4	4	3	2	1
Fine Dining Restaurant (931) ⁷	10,800 sf	4	2	2	41	30	11	38	24	14
West Zone Net, New Project Trips		198	132	66	270	109	161	195	110	85
North Zone										
Multifamily Housing (Mid-Rise) (221) ⁸	35 dus	5	2	3	6	3	3	6	3	3
Quality Restaurant (931) ⁹	2,100 sf	4	2	2	10	5	5	13	8	5
North Zone Net, New Project Trips		9	4	5	16	8	8	19	11	8
South Zone										
General Office Building (710) ¹⁰	210,000 sf	158	141	17	166	26	140	32	2	30
Strip Retail Plaza <40ksf (822) ¹¹	9,000 sf	8	5	3	30	15	15	24	12	12
Fine Dining Restaurant (931) ¹²	3,000 sf	1	1	0	10	7	3	9	6	3
South Zone Net, New Project Trips		167	147	20	206	48	158	65	20	45
Total Net, New Project Trips		374	283	91	492	165	327	279	141	138

¹ Multimodal Factor – ITE Trip Generation Manual, 11th Edition Setting/Location of dense multi-use urban | Community Capture

² Multimodal Factor – ITE Trip Generation Manual, 11th Edition Setting/Location of dense multi-use urban and land use subcategory of close to rail transit | Community Capture

³ Multimodal Factor – ITE Trip Generation Manual, 11th Edition Setting/Location of dense multi-use urban and land use subcategory of close to rail transit | Community Capture

⁴ Multimodal Factor – ITE Trip Generation Manual, 11th Edition Setting/Location of dense multi-use urban | Community Capture

⁵ Multimodal Factor – NJ TRANSIT and Means of Transportation to Work | Community Capture

⁶ Multimodal Factor – NJ TRANSIT and Means of Transportation to Work | Community Capture | Pass-By

⁷ Multimodal Factor – NJ TRANSIT and Means of Transportation to Work | Community Capture | Pass-By

⁸ NJDOT's HAPS | Multimodal Factor – NJ TRANSIT and Means of Transportation to Work | Community Capture

⁹ NJDOT's HAPS | Multimodal Factor – NJ TRANSIT and Means of Transportation to Work | Community Capture | Pass-By

¹⁰ Multimodal Factor – ITE Trip Generation Manual, 11th Edition Setting/Location of dense multi-use urban | Community Capture

¹¹ Multimodal Factor – NJ TRANSIT and Means of Transportation to Work | Community Capture | Pass-By

¹² Multimodal Factor – NJ TRANSIT and Means of Transportation to Work | Community Capture | Pass-By

For comparison purposes, **Table 3** summarizes the project’s trip generation potential for the Lord & Taylor redevelopment site during the weekday AM and PM peak hours and Saturday Midday peak hour versus the as-of-right Department Store use. As shown in **Table 3**, the proposed redevelopment for Lord & Taylor (143,836 sf) is expected to generate an additional 310 net, new trips during the weekday AM peak hour, an additional 281 net, new trips during the weekday PM peak hour, and a reduction of 99 net, new trips during the Saturday Midday peak hour compared to the trip generation potential if a new department store re-occupied the Lord & Taylor building.

Table 3. Proposed Net, New Project Trips for Lord & Taylor

Land Use (ITE Code)	Scale	AM Peak Hour			PM Peak Hour			Saturday Midday Peak Hour		
		Net External Trips	Entering Trips	Exiting Trips	Net External Trips	Entering Trips	Exiting Trips	Net External Trips	Entering Trips	Exiting Trips
Previously Approved Development										
Department Store (875) ¹	143,836 sf	64	41	23	211	106	106	378	200	178
Proposed Development										
Proposed Development ²		374	283	91	492	165	327	279	141	138
Total Net, New Project Trips		+310	+242	+68	+281	+59	+221	-99	-59	-40

¹ Multimodal Factor – NJ TRANSIT and Means of Transportation to Work | Community Capture

² Total Net, New Project Trips of the Proposed Development as shown in Table 2.

Trip Distribution and Assignment

Site generated trips were assigned to the study area intersections based upon the existing roadway network surrounding the site, proposed site access, and a review of the nearby municipal populations. Primary trip distribution percentages were calculated using a gravity model, dividing each surrounding municipality’s population (US Census Bureau, Census 2010) by the squared distance from the center of the municipality to the proposed site. Google Maps was used to identify routes vehicles may take to and from the project site. Reviewing aerial views of the surrounding municipalities revealed areas of high concentrations of housing units. Routes were traced from those areas to the project site with an emphasis on minimizing distance, travel time, and delays due to potential traffic congestion or traffic control.

The distribution of pass-by trips and subsequent assignment to the road network was based upon the existing directional distribution of trips on study roadways during each period of study. The distributions are summarized in **Table 4**.

Table 4. Distribution Percentages

Directions (To/From)	Primary Trip Percentage	Pass-By Trip Percentage
North	20%	--
South	25%	--
East	25%	50% ¹
West	30%	50% ¹

¹ The pass-by trip distribution for the West Zone and South Zone To/From the West is 50% and To/From the East is 50%.

The project’s net, new trip distribution and trip assignment during the weekday AM and PM peak hours and Saturday Midday peak hour for each zone/redevelopment area are presented in the following figures:

- **Figure 16 to Figure 18:** West Zone Residential (Int. ID# 21)
- **Figure 19 to Figure 21:** West Zone Office, Residential, and Retail (Int. ID# 19 & 20)
- **Figure 22 to Figure 24:** West Zone Townhouses (Int. ID# 22)
- **Figure 25 to Figure 27:** North Zone Residential Lofts and Retail (Int. ID# 12 & 23)
- **Figure 28 to Figure 30:** South Zone Office and Retail (Int. ID# 4, 5, 6 & 18)
- **Figure 31 to Figure 32:** Site Generated

Figure 33 and **Figure 34** present the total traffic conditions, which is defined as the expected traffic conditions in the year 2027 after the opening of the project for the weekday AM and PM peak hours and Saturday Midday peak hour, respectively.

CAPACITY ANALYSIS

Capacity analyses were performed for the AM and PM peak hours at the study intersections to determine the operating characteristics at the signalized and unsignalized intersections of the adjacent street network and to evaluate the impacts of the proposed redevelopment. These analyses were performed according to the methodologies contained in the *Highway Capacity Manual (HCM)*, 6th Edition, using Synchro Version 11 software. HCM 6th Edition Two-Way Stop Controlled (TWSC) procedures were used to analyze the operations at the unsignalized intersections. SIDRA roundabout analysis software was used to evaluate the operating conditions of the roundabout at Route 28 & South Avenue. Capacity is defined as the maximum number of vehicles that can pass over a particular road segment, or through a particular intersection, within a specified period of time under prevailing operational, geometric, and controlling conditions within a set time duration.

The HCM defines Level of Service (LOS) as a “quantitative stratification of a performance measure or measures representing the quality of service” and is used to “translate complex numerical performance results into a simple A-F system representative of travelers’ perceptions of the quality of service provided by a facility or service”. The HCM defines six levels of service, LOS A through LOS F, with A having the best operating conditions from the traveler’s perspective and F having the worst. However, it must be understood that “the LOS letter result hides much of the complexity of facility performance”, and that “the appropriate LOS for a given system element in the community is a decision for local policy makers”. According to the HCM, “for cost, environmental impact, and other reasons, roadways are typically designed not to provide LOS A conditions during peak periods but instead to provide some lower LOS that balances individual travelers’ desires against society’s desires and financial resources. Nevertheless, during low-volume periods of the day, a system element may operate at LOS A.”

LOS for a two-way stop-controlled (TWSC) intersection is determined by the control delay at the side-street approaches. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. With respect to field measurements, control delay is defined as the total elapsed time from the time a vehicle stops at the end of the queue to the time the vehicle departs from the stop line. It is typical for stop sign-controlled side streets and driveways intersecting major streets to experience long delays during peak hours, particularly for left-turn movements. The majority of the traffic moving through the intersection on the major street experiences little or no delay. The LOS thresholds for unsignalized intersections are summarized in [Table 5](#).

LOS for signalized intersections is reported for the intersection as a whole and for the individual movements and approaches. One or more movements at an intersection may experience a low level-of-service, while the intersection as a whole may operate acceptably. The LOS thresholds for signalized intersections are summarized in [Table 6](#).

Table 5. Level of Service Control Delay Thresholds for Unsignalized Intersections

Level of Service	Average Control Delay per Vehicle (sec/veh)	
A	≤ 10	Short Delays
B	> 10 – 15	
C	> 15 – 25	
D	> 25 – 35	Moderate Delays
E	> 35 – 50	
F	> 50	Long Delays

Table 6. Level-of-Service Control Delay Thresholds for Signalized Intersections

Level of Service	Average Control Delay per Vehicle (sec/veh)
A	≤ 10
B	> 10 – 20
C	> 20 – 35
D	> 35 – 55
E	> 55 – 80
F	> 80

Capacity analyses were performed for the following traffic condition scenarios:

- Existing Traffic Conditions
- 2027 No-Build Conditions (Build-out year without redevelopment but with occupied Lord & Taylor with as-of-right Department Store use)
- 2027 Build Conditions (Build-out year with proposed development)
- 2027 Build Conditions + Mitigation (Build-out year with proposed development)

Traffic signal timing information and data were obtained from multiple sources for the signalized intersections, which were used in the development of the no-build and build-out conditions Synchro network. Capacity analysis reports generated by Synchro Version 11 software are included in **Appendix F** for Existing Conditions, 2027 No-Build Conditions, 2027 Build Conditions, and 2027 Build + Mitigation Conditions.

Per the *New Jersey Administrative Code 16:47, Appendix F*, movements at signalized intersections accessing a State Highway (e.g., Route 28) that operate at LOS E or better in the No-Build condition may experience an increase in delay of up to 25 percent (25%) of the difference between the No-

Build delay and maximum delay considered LOS E (80 seconds for signalized and 50 seconds for unsignalized). No increase in volume-to-capacity (v/c) ratio is permitted for movements operating at LOS F under the no-build conditions.

According to the Land Development Standards of [Union County](#), the County references the ITE's *Traffic Access and Impact Studies for Site Development* resource, which indicates that the intersection LOS should be LOS D and that any intersection which currently operates worse than LOS D should require mitigation back to the non-project operating conditions.

Per the *Town of Westfield ULUC* (June 2021), *Appendix A*, "an intersection with an overall LOS D or lower is generally considered as operating acceptably, while LOS E and F indicate conditions that are at or above capacity and experience excessive delays. However, it is critical to understand the limitations of using LOS as a performance metric. As an auto-oriented metric, LOS does not fully describe the value and function of a street or intersection that needs to serve multiple users – including pedestrians, bicyclists, and transit users – and is often at odds with community goals related to walkability, place-making, and urban design. Even the Highway Capacity Manual emphasizes that LOS is a part of a bigger picture and neither LOS nor any other single performance measure tells the full story of roadway performance. Furthermore, there is growing recognition that a certain level of congestion is acceptable, particularly in vibrant transit-friendly communities, and that congestion mitigation must be balanced with Westfield's other multimodal travel and community goals."

The 95th percentile queue length, provided via Synchro, is defined as the queue length that has only a 5 percent (5%) probability of being exceeded during the analysis time period. The mean queue length is a more accurate characterization of what the average driver would experience.

Existing Conditions

The existing conditions analyses were based on the existing traffic volumes with existing lane use and traffic controls at the study area intersections. The PHF for the existing conditions was 0.92 for the AM and PM peak hours. The PHF for the Saturday Midday peak hour was based upon the TMC data collected. The results of the existing intersection capacity analyses are summarized in **Table 7** for Existing AM peak hour, **Table 8** for Existing PM peak hour, and **Table 9** for Existing Saturday Midday peak hour attached to this memorandum. Analysis results show the level of service and delay information for each movement, approach, and overall intersection. **Appendix F** includes the intersection capacity analysis worksheets.

For the intersection of North Avenue & Clark Street, field data collected and utilized as part of the intersection analysis for The Sophia project was incorporated into the analysis for this project. In addition to the TMC data collected, vehicular gap acceptance observations and data were collected during the AM, PM, and Saturday peak periods to determine local operator characteristics at this intersection. This information was utilized to determine the critical gap, which is the minimum time-gap in traffic that a motorist will accept to complete a turning movement. The gap acceptance analysis indicated that left-turning vehicles require a critical gap of 4.4 seconds and right-turning vehicles require a critical gap of 4.3 seconds. These values were utilized in the unsignalized intersection capacity analyses for this intersection.

During the weekday AM and PM peak hours and Saturday Midday peak hour, the study intersections operate at an overall intersection LOS C or better. However, there are individual movements that perform at LOS E or LOS F at the following intersections.

- Intersection ID #1. Crossway Place/Scotch Plains Avenue & South Avenue
 - Southbound left-turn movement during the AM peak hour
- Intersection ID #3. Route 28 & South Avenue
 - Eastbound approach during the AM peak hour
- Intersection ID #4. Summit Avenue & South Avenue
 - Northbound left-turn movement and approach during the AM peak hour
- Intersection ID #9. North Avenue & Clark Street
 - Southbound left-turn movement during the PM peak hour
- Intersection ID #14. Prospect Street & Broad Street
 - Northbound approach during the weekday AM and PM peak hours and Saturday Midday peak hour
 - Southbound approach during the PM peak hour
- Intersection ID #17. Broad Street & Mountain Avenue
 - Eastbound left-turn during the weekday AM peak hour
 - Westbound approach during the PM peak hour

2027 No-Build Conditions

The 2027 no-build conditions analyses were based on the future no-build traffic volumes with occupied Lord & Taylor with as of-right Department Store use with existing lane use and traffic controls at the study area intersections. The PHF for the 2027 no-build conditions was 0.95 for the AM and PM peak hours. The PHF for the Saturday Midday peak hour was based upon the TMC data collected. The results of the 2027 no-build intersection capacity analyses are summarized in **Table 7** for No-Build AM peak hour, **Table 8** for No-Build PM peak hour, and **Table 9** for No-Build Saturday Midday peak hour attached to this memorandum. Analysis results show the level of service and delay information for each movement, approach, and overall intersection. **Appendix F** includes the intersection capacity analysis worksheets.

During the weekday AM and PM peak hours and Saturday Midday peak hour, the study intersections operate at an overall intersection LOS D or better, with the exception of the roundabout at Route 28 & South Avenue during the AM and PM peak hours. However, there are individual movements that perform at LOS E or LOS F at the following intersections.

- Intersection ID #1. Crossway Place/Scotch Plains Avenue & South Avenue
 - Southbound left-turn movement during the AM peak hour
- Intersection ID #3. Route 28 & South Avenue
 - Eastbound approach during the AM and PM peak hours
- Intersection ID #4. Summit Avenue & South Avenue
 - Northbound left-turn movement and approach during the AM peak hour
- Intersection ID #7. Ross Place & Central Avenue & South Avenue
 - Northbound left-turn during the PM peak hour
 - Southbound left-turn during the Saturday Midday peak hour
- Intersection ID #9. North Avenue & Clark Street
 - Southbound left-turn and approach during the PM peak hour
- Intersection ID #11. Route 28/Broad Street & North Avenue
 - Northbound left-turn movement during the PM peak hour
- Intersection ID #13. Central Avenue & North Avenue
 - Northbound and westbound approaches during the PM peak hour
- Intersection ID #14. Prospect Street & Broad Street
 - Northbound approach during the weekday AM and PM peak hours and Saturday Midday peak hour
 - Southbound approach during the PM peak hour
- Intersection ID #17. Broad Street & Mountain Avenue
 - Eastbound left-turn during the weekday AM and PM peak hours
 - Westbound approach during the PM peak hour

2027 Build Conditions

Intersection capacity analyses were conducted for future build traffic volumes for the study area intersections in the year 2027. The future build conditions analyses were based on the future build traffic volumes with existing lane uses and traffic controls at the study area intersections. Peak hour factors and heavy vehicle percentages were the same as those used in the future no-build analyses.

The results of the 2027 build intersection capacity analyses are summarized in **Table 7** for Build AM peak hour, **Table 8** for Build PM peak hour, and **Table 9** for Build Saturday Midday peak hour attached to this memorandum. Analysis results show the level of service and delay information for each movement, approach, and overall intersection. **Appendix F** includes the intersection capacity analysis worksheets.

Under build-out conditions, the study intersections operate at an overall intersection LOS D or better, with the exception of the roundabout at Route 28 & South Avenue during the AM peak hour. The individual movements that perform at a LOS E or LOS F, a volume-to-capacity (v/c) greater than 1.0, or exceed *New Jersey Administrative Code 16:47, Appendix F*, operating thresholds at the intersections along a state highway are identified below.

- Intersection ID #1. Crossway Place/Scotch Plains Avenue & South Avenue
 - Southbound left-turn movement during the AM peak hour
- Intersection ID #3. Route 28 & South Avenue
 - Eastbound approach during the AM and PM peak hours
- Intersection ID #4. Summit Avenue & South Avenue
 - Northbound left-turn movement and approach during the AM peak hour
- Intersection ID #6: South Avenue & Eastern South Site Driveway
 - Southbound approach during the PM peak hour
- Intersection ID #7. Ross Place & Central Avenue & South Avenue
 - Northbound left-turn during the PM peak hour
 - Southbound left-turn during the PM peak hour and Saturday Midday peak hour
- Intersection ID #9. North Avenue & Clark Street
 - Southbound left-turn and approach during the AM and PM peak hours
- Intersection ID #11. Route 28/Broad Street & North Avenue
 - Northbound left-turn movement during the AM and PM peak hour
- Intersection ID #13. Central Avenue & North Avenue
 - Northbound and westbound approaches during the PM peak hour
- Intersection ID #14. Prospect Street & Broad Street
 - Northbound approach during the weekday AM and PM peak hours and Saturday Midday peak hour
 - Southbound approach during the PM peak hour
- Intersection ID #16. Central Avenue & Broad Street
 - Eastbound through movement and approach during the PM peak hour
- Intersection ID #17. Broad Street & Mountain Avenue
 - Eastbound left-turn during the weekday AM and PM peak hours
 - Westbound approach during the PM peak hour
- Intersection ID #21: North Avenue & Multifamily Housing Driveway

- Southbound approach during the AM and PM peak hours

2027 Build Mitigated Conditions

Based upon the results of the Build Conditions analysis, the following mitigations and alternatives were considered at the study intersections to improve the intersection operations, site access and circulation, and user experience. The results of the 2027 build mitigated intersection capacity analyses are summarized in **Table 7** for Build Mitigated AM peak hour, **Table 8** for Build Mitigated PM peak hour, and **Table 9** for Build Mitigated Saturday Midday peak hour attached to this memorandum. **Appendix F** includes the intersection capacity analysis worksheets and **Appendix G** includes the intersection capacity analysis alternatives worksheets.

Analysis results show the level of service and delay information for each movement, approach, and overall intersection. Additionally, multimodal streets help to make municipalities more efficient because repurposing street space increases the total street capacity for travel modes while reducing dependency on personal automobile usage. The Town prepared the following documents to promote alternative modes of transportation.

- *Bicycle and Pedestrian Plan* (November 2019): A framework for planning and implementing both short-term and long-term bicycle and pedestrian improvements to make bicycling and walking more comfortable, accessible, and safer for residents and visitors alike.
- *Town of Westfield ULUC* (June 2021): Holistic approach to planning that elevates the focus from singular parcels and intersections to a system of relationships between the use of land and space and the ability to create places and neighborhoods that are enjoyable and enhance the human experience.

Staff at the Alan M. Voorhees Transportation Center (VTC) at Rutgers prepared the following document and it was reviewed by Sustainable Jersey and the North Jersey Transportation Planning Authority (NJTPA).

- *North Avenue Walkable Community Workshop* (2019) Report: Recommendations to promote walking as a means of travel and to improve walkability along North Avenue.

The intersection analyses summaries below, including capacity and vehicle queue lengths, are organized in the following manner.

- Analysis Alternative(s) (if applicable): improvements that will be needed to bring the intersection into compliance per reviewing agencies' standard and improvements that were identified from previous public planning documents the Town prepared.
- Recommended Improvement(s): improvements that are recommended to improve the operating conditions of an intersection, pedestrian and bicycle infrastructure, etc., and will be included in this redevelopment or by others.

Intersection Analysis Summary

- Expanded Multi-Use Trail along Route 28 (Concept plan is shown in [Appendix H.](#))
 - Analysis Alternative/Recommended Improvements (will require NJDOT coordination and approval)
 - Proposed multi-use trail expansion from 8.0 feet to 14.0 feet.
 - Evaluate the need for additional pedestrian-friendly lighting beneath the overpass.
 - Provide connection from existing multi-use trail to future bicycle/pedestrian infrastructure along North Avenue and South Avenue.
 - Provide signing, marking, and intersection control at the connection to the existing multi-use trail.
- Intersection ID #1. Crossway Place/Scotch Plains Avenue & South Avenue
 - Analysis Alternative/Recommended Improvement
 - Modify signal timings.
 - During the AM peak hour, all of the individual movements operate at D or better. The southbound left-turn movement improves to LOS D with a delay of 54.0 seconds per vehicle from LOS E with a delay of 77.3 seconds per vehicle, a decrease of 23.3 seconds per vehicle. The overall intersection operates at LOS C with a delay of 22.5 seconds per vehicle from LOS C with a delay of 24.6 seconds per vehicle, an increase of 2.1 seconds per vehicle.
 - During the PM peak hour, all of the individual movements operate at C or better. The overall intersection improves to LOS B with a delay of 18.7 seconds per vehicle from LOS C with a delay of 22.8 seconds per vehicle, a decrease of 4.1 seconds per vehicle.
 - During the Saturday Midday peak hour, signal timing modifications were not made since the overall intersection operates at LOS B with a delay of 16.5 seconds per vehicle and the individual movements and approaches operate at LOS C or better.
- Intersection ID #3. Route 28 & South Avenue
 - Analysis Alternative (will require NJDOT coordination and approval)
 - Alternatives for the roundabout layout were previously evaluated since the existing roundabout currently experiences operational issues and delays. However, changes to the current layout may not be feasible and will require further discussion with NJDOT. See the *Westfield Roundabout Analysis memo* prepared by Kimley-Horn, dated August 24, 2021, in [Appendix I](#) for additional information. Based on the analysis, Alternative 2 was recommended. This alternative evaluated adding an additional circulating lane on the eastbound approach to the northbound exit, which is the highest volume movement of the intersection. The westbound approach kept the existing lane configuration of an exclusive right and a combined thru/right/U-turn. This alternative also looked at eliminating one of the exit lanes by shortening the right-turn lane at the downstream signalized intersection.

- During the AM peak hour, the overall intersection improves to LOS C with a delay of 15.3 seconds per vehicle from LOS E with a delay of 39.0 seconds per vehicle, a decrease of 23.7 seconds per vehicle.
 - During the PM peak hour, the overall intersection improves to LOS B with a delay of 12.9 seconds per vehicle from LOS D with a delay of 25.8 seconds per vehicle, a decrease of 12.9 seconds per vehicle.
 - During the Saturday Midday peak hour, the overall intersection improves to LOS A with a delay of 8.6 seconds per vehicle from LOS B with a delay of 12.1 seconds per vehicle, a decrease of 3.5 seconds per vehicle.
 - Intersection ID #4. Summit Avenue & South Avenue
 - Analysis Alternative/Recommended Improvements (will require Union County coordination and approval)
 - Modify signal phase for an exclusive eastbound left-turn phase, convert the eastbound approach to consist of an exclusive eastbound left-turn lane and shared eastbound through/right-turn lane, install an exclusive westbound left-turn lane, and remove the northbound and southbound split-phase operation. Road diet along South Avenue from traffic circle/roundabout to Central Avenue, which would reduce the number of westbound lanes from two (2) to one (1). Implement a leading pedestrian interval (LPI), which gives pedestrian the opportunity to enter the crosswalk before vehicles.
 - During all three (3) peak hours, the individual movements and approaches operate at LOS D or better.
 - During the AM peak hour, the northbound approach improves to LOS D with a delay of 42.7 seconds per vehicle from a LOS E with a delay of 63.1 seconds per vehicle, a decrease of 20.4 seconds per vehicle. The overall intersection operates at LOS C with a delay of 23.0 seconds per vehicle from LOS C with a delay of 21.1 seconds per vehicle, an increase of 1.9 seconds per vehicle.
 - During the PM peak hour, the overall intersection operates at LOS B with a delay of 16.9 to seconds per vehicle from LOS B with a delay of 16.5 seconds per vehicle, an increase of 0.4 seconds per vehicle.
 - During the Saturday Midday peak hour, the overall intersection operates at LOS B with a delay of 17.2 seconds per vehicle from LOS B with a delay of 12.4 seconds per vehicle, an increase of 4.8 seconds per vehicle.
 - Install a bike box on Summit Avenue since a northbound one-way bicycle lane is identified in the *Bicycle and Pedestrian Plan* (November 2019). The bike box provides bicyclists with a safe and visible way to get ahead of queuing traffic during the red signal phase.
 - Intersection ID #5. South Avenue & Boulevard
 - Analysis Alternative/Recommended Improvement (will require Union County coordination and approval)
 - The northbound approach on Boulevard will maintain existing lane geometry. The existing southbound outbound only driveway is planned to be used by non-vehicular modes (e.g., pedestrian, bicycle, scooter, etc.), emergency

vehicles, and potentially delivery vehicles associated with events along this plaza. This access is not intended to be primary access for passenger vehicles. In an effort to improve pedestrian and bicycle safety, the number of westbound travel lanes will be decreased to one (1) to allow for on-street parking to be added and a median where additional rectangular rapid flashing beacons (RRFB) signs will be installed. This intersection will also be designed to provide a bicycle connection between the South Zone and the one-way bike lane along Boulevard.

- During the AM peak hour, the northbound approach (STOP control) operates at LOS E with a delay of 36.7 seconds per vehicle.
- During the PM peak hour, the northbound approach (STOP control) operates at LOS D with a delay of 28.7 seconds per vehicle.
- During the Saturday Midday peak hour, the northbound approach (STOP control) operates at LOS D with a delay of 28.4 seconds per vehicle.
- Intersection ID #6. South Avenue & Eastern Site Driveway
 - Analysis Alternatives (will require Union County coordination and approval)
 - Maintain existing intersection lane geometry and remain as unsignalized
 - During the AM peak hour, the southbound approach (STOP control) operates at LOS D with a delay of 25.6 seconds per vehicle.
 - During the PM peak hour, the southbound approach (STOP control) operates at LOS E with a delay of 37.8 seconds per vehicle.
 - During the Saturday Midday peak hour, the southbound approach (STOP control) operates at LOS D with a delay of 26.5 seconds per vehicle.
 - A preliminary traffic signal warrant analysis was conducted. During the AM and PM, and Saturday Midday peak hours (3-hours of volume only), this unsignalized intersection does warrant a traffic signal. Therefore, further evaluation is recommended to determine if this intersection meets the signal warrant criteria per the Manual on Uniform Traffic Control Devices (MUTCD) for Warrant 1 – Eight-Hour Vehicular Volume and/or Warrant 2 – Four-Hour Vehicular Volume. If signalized, this intersection should be interconnected with Intersection ID #4. South Avenue & Summit Avenue and Intersection ID #7 Ross Place & Central Avenue & South Avenue. (Signal warrant analysis is included in [Appendix J](#)). Implement a LPI.
 - During the AM peak hour, the southbound approach improves to LOS B with a delay of 18.7 seconds per vehicle from LOS D with a delay of 25.6 seconds per vehicle, a decrease of 6.9 seconds per vehicle. The overall intersection operates at LOS B with a delay of 11.9 seconds per vehicle.
 - During the PM peak hour, the southbound approach improves to LOS C with a delay of 27.0 seconds per vehicle from LOS E with a delay of 37.8 seconds per vehicle, a decrease of 10.8 seconds per vehicle. The overall intersection operates at LOS B with a delay of 13.7 seconds per vehicle

- During the Saturday Midday peak hour, the southbound approach improves to LOS B with a delay of 15.6 seconds per vehicle from LOS D with a delay of 26.5 seconds per vehicle, a decrease of 10.9 seconds per vehicle. The overall intersection operates at LOS B with a delay of 10.0 seconds per vehicle.
 - Recommended Improvement (will require Union County coordination and approval)
 - Install a new traffic signal.
 - This intersection will include signal coordination with Intersection ID #4. South Avenue & Summit Avenue and Intersection ID #7 Ross Place & Central Avenue & South Avenue.
 - As part of the road diet, reduce the westbound through travel lanes from two to one, with the outside most travel lane used as a right-turn lane into the site.
 - Intersection ID #7. Ross Place & Central Avenue & South Avenue
 - Analysis Alternative (will require Union County coordination and approval)
 - Maintain existing intersection lane geometry and modify signal timings while restricting the westbound right-turn on red movement. The restriction of the westbound right-turn on red improves pedestrian safety there will be no conflicts with pedestrians trying to cross the east leg of the intersection.
 - During the AM peak hour, the overall intersection operates at LOS C with a delay of 28.9 seconds per vehicle from LOS C with a delay of 29.1 seconds per vehicle, a decrease of 0.2 seconds per vehicle. The westbound right-turn lane operates at LOS C with a delay of 25.2 seconds per vehicle from LOS A with a delay of 5.1 seconds per vehicle, an increase of 20.1 seconds per vehicle. The northbound through operates at LOS E with a delay of 59.0 seconds per vehicle from LOS D with a delay of 50.7 seconds per vehicle, an increase of 8.3 seconds per vehicle.
 - During the PM peak hour, the overall intersection improves to LOS D with a delay of 40.0 seconds per vehicle from LOS D with a delay of 40.5 seconds per vehicle, a decrease of 0.5 seconds per vehicle. The westbound right-turn lane operates at LOS C with a delay of 27.5 seconds per vehicle from LOS B with a delay of 10.2 seconds per vehicle, an increase of 17.3 seconds per vehicle. The northbound approach improves to LOS D with a delay of 53.3 seconds per vehicle from LOS E with a delay of 57.7 seconds per vehicle, a decrease of 4.4 seconds per vehicle.
 - During the Saturday Midday peak hour, the overall intersection improves to LOS C with a delay of 29.9 seconds per vehicle from LOS C with a delay of 33.8 seconds per vehicle, a decrease of 3.9 seconds per vehicle. The westbound right-turn lane operates at LOS C with a delay of 29.2 seconds per vehicle from LOS A with a delay of 7.9 seconds per delay, an increase of 21.3 seconds per delay. The southbound left-turn improves to LOS D with a delay of 43.2 seconds per vehicle from a LOS F with a delay of 114.6 seconds per vehicle, a decrease of 71.4 seconds per vehicle.

- As recommended in the *Bicycle and Pedestrian Plan* (November 2019), remove the westbound right-turn lane and convert the westbound through lane to a shared westbound through/right-turn lane. Restrict westbound right-turn on red movement. The removal of the westbound right-turn lane will shorten the pedestrian crossing distance and provide better sight lines of pedestrians for motorist making a westbound right turn.
 - During the AM peak hour, the overall intersection operates at LOS C with a delay of 30.9 seconds per vehicle from LOS C with a delay of 29.1 seconds per vehicle, an increase of 1.8 seconds per vehicle. The westbound approach operates at LOS D with a delay of 35.3 seconds per vehicle from LOS C with a delay of 23.4 seconds per vehicle, an increase of 11.9 seconds per vehicle.
 - During the PM peak hour, the overall intersection operates at LOS D with a delay of 53.3 seconds per vehicle from LOS D with a delay of 40.5 seconds per vehicle, an increase of 12.8 seconds per vehicle. The westbound approach operates at LOS E with a delay of 76.9 seconds per vehicle from LOS C with a delay of 27.0 seconds per vehicle, an increase of 49.9 seconds per vehicle. The northbound approach improves to LOS D with a delay of 53.4 seconds per vehicle from LOS E with a delay of 57.7 seconds per vehicle, a decrease of 4.3 seconds per vehicle.
 - During the Saturday Midday peak hour, the overall intersection operates at LOS D with a delay of 41.2 seconds per vehicle from LOS C with a delay of 33.8 seconds per vehicle, an increase of 7.4 seconds per vehicle. The westbound approach operates at LOS E with a delay of 70.2 seconds per vehicle from LOS C with a delay of 20.4 seconds per vehicle, an increase of 49.8 seconds per vehicle. The southbound left-turn improves to LOS D with a delay of 43.2 seconds per vehicle from LOS F with a delay of 114.6 seconds per vehicle, a decrease of 71.4 seconds per vehicle.
- Maintain existing intersection lane geometry and modify signal timings (changed cycle length to 100 seconds) while restricting the westbound right-turn on red movement. The restriction of the westbound right-turn on red improves pedestrian safety since there will be no conflicts with pedestrians trying to cross the east leg of the intersection.
 - During the AM peak hour, the overall intersection operates at LOS C with a delay of 30.0 seconds per vehicle from LOS C with a delay of 29.1 seconds per vehicle, an increase of 0.9 seconds per vehicle. The westbound right-turn lane operates at LOS C with a delay of 27.3 seconds per vehicle from LOS A with a delay of 5.1 seconds per vehicle, an increase of 22.2 seconds per vehicle. The northbound through operates at LOS D with a delay of 49.9 seconds per vehicle from LOS D with a delay of 50.7 seconds per vehicle, a decrease of 0.8 seconds per vehicle. All of the movements operate at LOS D or better.

- During the PM peak hour, the overall intersection improves to LOS D with a delay of 42.5 seconds per vehicle from LOS D with a delay of 40.5 seconds per vehicle, a decrease of 2.0 seconds per vehicle. The westbound right-turn lane operates at LOS C with a delay of 30.3 seconds per vehicle from LOS B with a delay of 10.2 seconds per vehicle, an increase of 20.1 seconds per vehicle. The northbound approach improves to LOS D with a delay of 49.9 seconds per vehicle from LOS E with a delay of 57.7 seconds per vehicle, a decrease of 7.8 seconds per vehicle. All of the movements operate at LOS D or better except at the southbound through movement.
- During the Saturday Midday peak hour, the overall intersection improves to LOS C with a delay of 32.5 seconds per vehicle from LOS C with a delay of 33.8 seconds per vehicle, a decrease of 1.3 seconds per vehicle. The westbound right-turn lane operates at LOS C with a delay of 31.8 seconds per vehicle from LOS A with a delay of 7.9 seconds per delay, an increase of 23.9 seconds per delay. The southbound left-turn improves to LOS D with a delay of 40.9 seconds per vehicle from a LOS F with a delay of 114.6 seconds per vehicle, a decrease of 73.7 seconds per vehicle. All of the movements operate at LOS D or better.
- Recommended Improvements (Concept plan is shown in [Appendix H.](#))
 - Maintain existing intersection lane geometry.
 - Modify signal timings.
 - Restrict westbound right-turn on red movement.
 - Add high-visibility crosswalks.
 - Construct curb extension at the corner of South Avenue & Ross Place to shorten the pedestrian crossing distance.
 - Adjust the pedestrian signal phasing so pedestrians cross Ross Place when South Avenue has a green light.
- Intersection ID #8. Crossway Place/Edgewood Avenue & North Avenue
 - Analysis Alternative/Recommended Improvement (will require Union County coordination and approval)
 - Modify signal timings.
 - During the AM peak hour, all of the individual movements operate at C or better. The overall intersection operates at LOS C with a delay of 22.8 seconds per vehicle from LOS C with a delay of 21.6 seconds per vehicle, an increase of 1.2 seconds per vehicle.
 - During the PM peak hour, all of the individual movements operate at C or better. The overall intersection improves to LOS B with a delay of 19.0 seconds per vehicle from LOS C with a delay of 21.2 seconds per vehicle, a decrease of 2.2 seconds per vehicle.
 - During the Saturday Midday peak hour, signal timing modifications were not made since the overall intersection operates at LOS B with a delay of 12.8 seconds per vehicle and the individual movements and approaches operate at LOS C or better.

- Intersection ID #9. North Avenue & Clark Street
 - Analysis Alternative/Recommended Improvement (will require Union County coordination and approval)
 - A preliminary traffic signal warrant analysis was conducted. During the AM and PM, and Saturday Midday peak hours (3-hours of volume only), this unsignalized intersection does warrant a traffic signal. Therefore, further evaluation is recommended to determine if this intersection meets the signal warrant criteria per the Manual on Uniform Traffic Control Devices (MUTCD) for Warrant 1 – Eight-Hour Vehicular Volume and/or Warrant 2 – Four-Hour Vehicular Volume. If signalized, this intersection should be interconnected with Intersection ID#11. Route 28/Broad Street & North Avenue. Per the *Bicycle and Pedestrian Plan* (November 2019), construct curb extensions with ADA-compliant ramps at the northeast and northwest corners at Clark Street. This treatment will shorten the pedestrian crossing distance. Restrict the westbound right-turn on red movement and implement a LPI. (Signal warrant analysis is included in [Appendix J](#)).
 - During the AM peak hour, the overall intersection operates at LOS B with a delay of 17.7 seconds per vehicle. The southbound approach improves to LOS D with a delay of 41.5 seconds per vehicle from LOS E with a delay of 40.2 seconds per vehicle, a decrease of 1.5 seconds per vehicle.
 - During the PM peak hour, the overall intersection operates at LOS B with a delay of 18.4 seconds per vehicle. The southbound approach improves to LOS D with a delay of 43.1 seconds per vehicle from LOS F with a delay of 70.7 seconds per vehicle, a decrease of 27.6 seconds per vehicle.
 - During the Saturday Midday peak hour, the overall intersection operates at LOS B with a delay of 15.6 seconds per vehicle. The southbound approach operates at LOS C with a delay of 33.1 seconds per vehicle from LOS C with a delay of 23.0 seconds per vehicle, a decrease of 10.1 seconds per vehicle.
 - Recommended Improvements (Concept plan is shown in [Appendix H](#).)
 - Construct curb extensions with ADA-compliant ramps at the northeast and northwest at Clark Street. This treatment will shorten the pedestrian crossing distance.
 - Install a new traffic signal.
 - This intersection will include signal coordination with Intersection ID#11. Route 28/Broad Street & North Avenue.
 - Restrict the westbound right-turn on red movement.
 - Implement a LPI.
 - Intersection ID #11. Route 28/Broad Street & North Avenue
 - Analysis Alternatives (will require NJDOT coordination and approval)
 - Per the *Bicycle and Pedestrian Plan* (November 2019), remove the eastbound right-turn slip lane and bring this movement under signal control. Typically, a slip lane enables high speed turns. This improvement will create

additional delay for motorists making this movement and also impact the existing WWI Memorial.

- During the AM peak hour, the eastbound approach operates at LOS B with a delay of 14.3 seconds per vehicle from LOS B with a delay of 14.6 seconds per vehicle, a decrease of 0.3 seconds per vehicle. The overall intersection operates at LOS C with a delay of 28.5 seconds from LOS C with a delay of 29.5 seconds per vehicle, a decrease of 1.0 second per vehicle.
 - During the PM peak hour, the eastbound approach operates at LOS B with a delay of 11.1 seconds per vehicle from LOS B with a delay of 12.2 seconds per vehicle, a decrease of 1.1 seconds per vehicle. The northbound left-turn improves to LOS D with a delay of 44.4 seconds per vehicle from LOS F with a delay of 82.8 seconds per vehicle, a decrease of 38.4 seconds per vehicle. The overall intersection operates at LOS C with a delay of 25.4 seconds from LOS C with a delay of 28.4 seconds per vehicle, a decrease of 3.0 seconds per vehicle.
 - During the Saturday Midday peak hour, the eastbound approach operates at LOS A with a delay of 7.6 seconds per vehicle from LOS A with a delay of 9.3 seconds per vehicle, a decrease of 1.7 seconds per vehicle. The overall intersection improves to LOS C with a delay of 23.9 seconds from LOS C with a delay of 20.1 seconds per vehicle, an increase of 3.8 seconds per vehicle.
- Recommended Improvements (Concept plan is shown in [Appendix H.](#))
 - Stripe the shoulders along the eastbound right-turn lane, slip ramp to narrow down the travel lane.
 - Use high visibility crosswalk markings.
 - Provide pedestrian crossing warning signs on both side of the slip ramp. RRFBs could be provided to further enhance safety at the crossings.
 - Declutter and/or relocate existing signs as much as possible. For example, the yield sign at the southern end could be relocated further south such that it is placed adjacent to the yield markings.
 - Modify signal timings.
 - Install a no right turn for trucks sign at the northeast corner for westbound right-turn truck movements.
 - During the AM peak hour, the northbound left-turn improves to LOS C with a delay of 32.3 seconds per vehicle from LOS E with a delay of 61.4 seconds per vehicle, a decrease of 29.1 seconds per vehicle. The overall intersection operates at LOS C with a delay of 29.1 seconds from LOS C with a delay of 29.5 seconds per vehicle, a decrease of 0.4 seconds per vehicle.
 - During the PM peak hour, the northbound left-turn lanes improves to LOS D with a delay of 44.4 seconds per vehicle from LOS F with a delay of 82.8 seconds per vehicle, a decrease of 38.4 seconds per vehicle. The overall intersection operates at LOS C with a delay of

- 25.9 seconds from LOS C with a delay of 28.4 seconds per vehicle, a decrease of 2.5 seconds per vehicle.
 - During the Saturday Midday peak hour, the overall intersection operates at LOS C with a delay of 24.2 seconds from LOS C with a delay of 20.1 seconds per vehicle, an increase of 4.1 seconds per vehicle.
 - Intersection ID #12. North Avenue & Elm Street
 - Analysis Alternative/Recommended Improvements (will require NJDOT coordination and approval)
 - Maintain existing intersection lane geometry, however, convert to a typical four-legged intersection, and modify signal timings.
 - During the AM peak hour, the individual movements and approaches operate at LOS D or better. The overall intersection operates at LOS B with a delay of 12.1 seconds per vehicle.
 - During the PM peak hour, the individual movements and approaches operate at LOS D or better. The overall intersection operates at LOS B with a delay of 18.6 seconds per vehicle.
 - During the Saturday Midday peak hour, the individual movements and approaches operate at LOS D or better. The overall intersection operates at LOS B with a delay of 13.6 seconds per vehicle.
 - Modify the existing traffic signal and pavement markings.
 - Based upon field observations, eastbound vehicles consistently are trapped within the intersection or run a red light due to poor placement of traffic signal heads and short clearance intervals. This situation creates unsafe vehicle-vehicle and vehicle-pedestrian conflict points.
 - It is recommended to redesign the intersection from the split inbound and outbound lanes to have a single curb cut that is directly aligned with Elm Street. This consolidation of curb cuts and alignment of the train station access lane will allow for the traffic signal to be redesigned.
 - Upgrade pedestrian crosswalk signals as part of traffic signal redesign and implement a LPI.
 - Intersection ID #13. Central Avenue & North Avenue
 - Analysis Alternatives (will require NJDOT coordination and approval)
 - Maintain existing intersection lane geometry with signal timing modifications.
 - During the AM peak hour, the overall intersection operates at LOS C with a delay of 29.4 seconds per vehicle.
 - During the PM peak hour, the overall intersection operates at LOS D with a delay of 45.6 seconds per vehicle.
 - During the Saturday Midday peak hour, the overall intersection operates at LOS C with a delay of 28.7 seconds per vehicle.
 - Construct a westbound left-turn lane and signal timing modifications; however, the right-of-way is limited at this location for additional roadway capacity. The addition of the westbound left-turn lane could be included by widening the WB approach through narrowing the existing sidewalk by removing the furnishing zone. This type of improvement does not advance

the Town's goal of promoting a walkable community. This improvement alternative is identified due to the NJDOT analysis methodology requirements per the *Access Management Code*.

- During the AM peak hour, westbound approach improves to LOS B with a delay of 19.5 seconds per vehicle from LOS C with a delay of 23.3 seconds per vehicle, a decrease of 3.8 seconds per vehicle. The overall intersection operates at LOS C with a delay of 27.7 seconds per vehicle from LOS C with a delay of 26.1 seconds per vehicle, an increase of 1.6 seconds per vehicle.
- During the PM peak hour, westbound approach improves to LOS C with a delay of 23.8 seconds per vehicle from LOS E with a delay of 68.9 seconds per vehicle, a decrease of 45.1 seconds per vehicle. The overall intersection improves to LOS D with a delay of 36.3 seconds per vehicle from LOS D with a delay of 52.1 seconds per vehicle, a decrease of 15.8 seconds per vehicle
- During the Saturday Midday peak hour, westbound approach improves to LOS B with a delay of 17.5 seconds per vehicle from LOS C with a delay of 24.3 seconds per vehicle, a decrease of 6.8 seconds per vehicle. The overall intersection operates at LOS C with a delay of 26.6 seconds per vehicle from LOS C with a delay of 24.6 seconds per vehicle, an increase of 2.0 seconds per vehicle.
- Recommended Improvements (Concept plan is shown in [Appendix H](#).)
 - Maintain existing intersection lane geometry.
 - Modify signal timings.
 - Add high-visibility crosswalks.
 - Add ADA curb ramps and pedestrian signals.
- Intersection ID #14. Prospect Street & Broad Street
 - Analysis Alternative/Recommended Improvements (will require Union County coordination and approval)
 - A preliminary traffic signal warrant analysis was conducted. During the AM and PM peak hours (2-hours of volume only), this unsignalized intersection does warrant a traffic signal. Therefore, further evaluation is recommended to determine if this intersection meets the signal warrant criteria per the Manual on Uniform Traffic Control Devices (MUTCD) for Warrant 1 – Eight-Hour Vehicular Volume and/or Warrant 2 – Four-Hour Vehicular Volume. (Signal warrant analysis is included in [Appendix J](#)).
 - The nearest signalized intersections are located approximately 345 feet to the south, Route 28/Broad Street & North Avenue, and approximately 500 feet to the north, Elm Street & Broad Street.
 - Broad Street is County Road 509; therefore, a discussion with Union County will be needed to determine the feasibility of installing a new traffic signal.
 - The Town of Westfield *Bicycle and Pedestrian Plan* (November 2019) and *Town of Westfield ULUC* (June 2021) identified that this

intersection may benefit from a traffic signal to better facilitate traffic flow and increase pedestrian safety.

- Additionally, the *Proposed Mixed-Use Development Traffic & Parking Assessment Report*, prepared by Stonefield Engineering (April 26, 2022) prepared a signal warrant analysis and it was determined that the intersection does meet the warrant criteria/minimum thresholds for signalization per Warrant 1 – Eight-Hour Vehicular Volume and/or Warrant 2 – Four-Hour Vehicular Volume.
- During the AM peak hour, the northbound approach improves to LOS C with a delay of 22.1 seconds per vehicle from LOS E with a delay of 44.2 seconds per vehicle, a decrease of 22.1 seconds per vehicle. The overall intersection operates at LOS A with a delay of 5.3 seconds per vehicle.
- During the PM peak hour, the northbound approach improves to LOS C with a delay of 24.0 seconds per vehicle from LOS F with a delay of 170.8 seconds per vehicle, a decrease of 146.8 seconds per vehicle. The southbound approach improves to LOS B with a delay of 13.1 seconds per vehicle from LOS F with a delay of 126.7 seconds per vehicle, a decrease of 113.6 seconds per vehicle. The overall intersection operates at LOS A with a delay of 6.4 seconds per vehicle.
- During the Saturday Midday peak hour, the northbound approach improves to LOS B with a delay of 17.6 seconds per vehicle from LOS F with a delay of 53.4 seconds per vehicle, a decrease of 35.8 seconds per vehicle. The overall intersection operates at LOS A with a delay of 5.8 seconds per vehicle.
 - It is also recommended to construct curb extensions on the east leg of the intersection (Prospect Street), which will visually and physically narrow the roadway and shorten the pedestrian crossing distances. The concept plan illustrating this improvement is provided in [Appendix H](#).
- Intersection ID #16. Central Avenue & Broad Street
 - Analysis Alternative/Recommended Improvement (will require Union County coordination and approval)
 - Install a flashing yellow arrow (FYA) for westbound left-turn movements (Broad Street to Central Avenue), which means when the FYA is illuminated, a vehicle is allowed to cautiously enter an intersection only to make the turn indicated by the arrow, but the driver must first yield to oncoming traffic and pedestrians, then proceed with caution. This improvement will require replacing three (3) three-section signal heads with three (3) four-section signal heads.
 - This intersection is clustered with Intersection ID#17. Broad Street & Mountain Avenue, meaning both intersections operate under a single traffic signal controller.
 - During the AM peak hour, the eastbound approach improves to LOS A with a delay of 6.2 seconds per vehicle from LOS D with a delay of 49.5 seconds per vehicle, a decrease of 43.3 seconds per vehicle.

- The overall intersection improves to LOS A with a delay of 7.6 seconds per vehicle from LOS C with a delay of 30.0 seconds per vehicle, a decrease of 22.4 seconds per vehicle.
- During the PM peak hour, the eastbound approach improves to LOS B with a delay of 12.9 seconds per vehicle from LOS E with a delay of 63.0 seconds per vehicle, a decrease of 50.1 seconds per vehicle. The overall intersection improves to LOS A with a delay of 9.1 seconds per vehicle from LOS D with a delay of 36.9 seconds per vehicle, a decrease of 27.8 seconds per vehicle.
 - During the Saturday Midday peak hour, the overall intersection improves to LOS A with a delay of 4.9 seconds per vehicle from LOS B with a delay of 15.2 seconds per vehicle, a decrease of 10.3 seconds per vehicle.
- Intersection ID #17. Broad Street & Mountain Avenue
 - Analysis Alternative/Recommended Improvements (will require Union County coordination and approval)
 - Modify signal timings with a FYA for eastbound left-turn movements (Broad Street to Mountain Avenue), which means when the FYA is illuminated, a vehicle is allowed to cautiously enter an intersection only to make the turn indicated by the arrow, but the driver must first yield to oncoming traffic and pedestrians, then proceed with caution. This improvement will require replacing three (3) three-section signal heads with three (3) four-section signal heads.
 - This intersection is clustered with Intersection ID# 16. Central Avenue & Broad Street, meaning both intersections operate under a single traffic signal controller.
 - During the AM peak hour, the eastbound approach improves to LOS A with a delay of 6.2 seconds per vehicle from LOS D with a delay of 49.5 seconds, a decrease of 43.3 seconds per vehicle. The overall intersection improves to LOS A with a delay of 7.6 seconds per vehicle from LOS C with a delay of 30.0 seconds per vehicle, a decrease of 22.4 seconds per vehicle.
 - During the PM peak hour, the eastbound approach improves to LOS A with a delay of 3.5 seconds per vehicle from LOS C with a delay of 34.8 seconds, a decrease of 31.3 seconds per vehicle. The westbound approach improves to LOS B with a delay of 12.0 seconds per vehicle from LOS E with a delay of 68.1 seconds per vehicle, a decrease 56.1 seconds per vehicle. The overall intersection improves to LOS A with a delay of 6.6 seconds per vehicle from LOS D with a delay of 37.4 seconds per vehicle, a decrease of 30.8 seconds per vehicle.
 - During the Saturday Midday peak hour, the overall intersection improves to LOS A with a delay of 4.1 seconds per vehicle from LOS B with a delay of 12.3 seconds per vehicle, a decrease of 8.2 seconds per vehicle.

- Restripe pavement markings in the westbound direction to delineate two (2) westbound lanes. Please note that currently the westbound direction operates as two (2) lanes without the striping and this recommendation is simply to formalize the current behavior observed.
- Intersection ID #23. North Avenue & Eastern North Zone Parking Site Driveway
 - Analysis Alternative/Recommended Improvement (will require NJDOT coordination and approval)
 - Design driveway to allow for only right-turn in/right-turn out movements.
 - During the AM peak hour, the northbound right-turn (STOP control) operates at LOS B with a delay of 10.4 seconds per vehicle.
 - During the PM peak hour, the northbound right-turn (STOP control) operates at LOS B with a delay of 10.5 seconds per vehicle.
 - During the Saturday Midday peak hour, the northbound right-turn (STOP control) operates at LOS B with a delay of 10.3 seconds per vehicle.
- Road diet along North Avenue/Route 28 from Broad Street to Elmer Street and South Avenue from traffic circle/roundabout to Central Avenue. The road diet along North Avenue would reduce the number of eastbound and westbound lanes from two (2) to one (1), with exclusive left-turn lanes at appropriate intersections. The road diet along South Avenue would reduce the number of westbound lanes from two (2) to one (1) with exclusive turn lanes at appropriate intersections.

North Avenue

- Intersection ID #12. North Avenue & Elm Street
 - During the AM peak hour, the individual movements and approaches operate at LOS D or better. The eastbound approach operates at LOS B with a delay of 11.6 seconds per vehicle from LOS B with a delay of 10.2 seconds per vehicle, an increase of 1.4 seconds per vehicle. The westbound approach operates at LOS B with a delay of 13.5 seconds per vehicle from LOS A with a delay of 7.9 seconds per vehicle. The overall intersection operates at LOS B with a delay of 15.7 seconds per vehicle from LOS B with a delay of 11.0 seconds per vehicle, an increase of 4.7 seconds per vehicle. The eastbound approach queue increases from 160 feet to 300 feet and the westbound approach queue increases from 175 feet to 430 feet.
 - During the PM peak hour, the individual movements and approaches operate at LOS D or better. The eastbound approach operates at LOS B with a delay of 14.6 seconds per vehicle from LOS B with a delay of 13.3 seconds per vehicle, an increase of 1.3 seconds per vehicle. The westbound approach operates at LOS C with a delay of 30.9 seconds per vehicle from LOS B with a delay of 14.1 seconds per vehicle, an increase of 16.8 seconds per vehicle. The overall intersection operates at LOS C with a delay of 27.3 seconds per vehicle from LOS B with a delay of 14.9 seconds per vehicle, an increase of 12.4 seconds per vehicle. The eastbound approach queue increases from 100 feet to 265 feet and the westbound approach queue increases from 130 feet to 740 feet.
 - During the Saturday Midday peak hour, the individual movements and approaches operate at LOS D or better. The eastbound approach operates at LOS A with a delay of 9.4 seconds per vehicle from LOS A with a delay of 9.6 seconds per vehicle, a decrease of 0.2 seconds per vehicle. The westbound approach operates at LOS B with a delay of 11.0 seconds per vehicle from LOS B with a delay of 11.8 seconds per vehicle, a decrease of 0.8 seconds per vehicle. The overall intersection operates at LOS B with a delay of 15.3 seconds per vehicle from LOS B with a delay of 12.1 seconds per vehicle, an increase of 3.2 seconds per vehicle. The eastbound approach queue increases from 100 feet to 210 feet and the westbound approach queue increases from 160 feet to 310 feet.
- Intersection ID #13. Central Avenue & North Avenue
 - During the AM peak hour, the westbound approach operates at LOS C with a delay of 27.2 seconds per vehicle. The eastbound approach operates at LOS E with a delay of 69.5 seconds per vehicle from LOS B with a delay of 16.6 seconds per vehicle. The overall intersection operates at LOS D with a delay of 38.1 seconds per vehicle from LOS C with a delay of 26.1 seconds per vehicle, an increase of 12.0 seconds per vehicle. The eastbound approach queue increases from 70 feet to 610 feet and the westbound approach queue increases from 175 feet to 435 feet.
 - During the PM peak hour, the eastbound approach operates at LOS F with a delay 105.5 seconds per vehicle from LOS C with a delay of 20.1 seconds per vehicle. The westbound approach operates at LOS D with a delay of

42.9 seconds per vehicle from LOS E with a delay of 68.9 seconds per vehicle. The overall intersection operates at LOS E with a delay of 66.9 seconds per vehicle from LOS D with a delay of 52.1 seconds per vehicle, an increase 14.8 seconds per vehicle. The eastbound approach queue increases from 110 feet to 765 feet and the westbound approach queue increases from 345 feet to 675 feet.

- During the Saturday Midday peak hour, the eastbound approach operates at LOS D with a delay of 49.6 seconds per vehicle from LOS C with a delay of 22.1 seconds per vehicle. The westbound approach operates at LOS C with a delay of 24.3 seconds per vehicle. The overall intersection operates at LOS C with a delay of 33.7 seconds per vehicle from LOS C with a delay of 24.6 seconds per vehicle, an increase 9.1 seconds per vehicle. The eastbound approach queue increases from 115 feet to 600 feet and the westbound approach queue increases from 200 feet to 415 feet.
- Intersection ID #23. Eastern North Zone Parking Site Driveway & North Avenue
 - During the AM peak hour, the northbound right-turn (STOP control) operates at LOS B with a delay of 12.7 seconds per vehicle from LOS B with a delay of 10.4 seconds per vehicle, an increase of 2.3 seconds per vehicle.
 - During the PM peak hour, the northbound right-turn (STOP control) operates at LOS B with a delay of 12.8 seconds per vehicle from LOS B with a delay of 10.5 seconds per vehicle, an increase of 2.3 seconds per vehicle.
 - During the Saturday Midday peak hour, the northbound right-turn (STOP control) operates at LOS B with a delay of 10.3 seconds per vehicle.

South Avenue

- Intersection ID #4. Summit Avenue & South Avenue
 - During the AM peak hour, the northbound approach improves to LOS D with a delay of 42.7 seconds per vehicle from a LOS E with a delay of 63.1 seconds per vehicle, a decrease of 20.4 seconds per vehicle. The overall intersection operates at LOS C with a delay of 23.0 seconds per vehicle from LOS C with a delay of 21.1 seconds per vehicle, an increase of 1.9 seconds per vehicle.
 - During the PM peak hour, the overall intersection operates at LOS B with a delay of 16.9 to seconds per vehicle from LOS B with a delay of 16.5 seconds per vehicle, an increase of 0.4 seconds per vehicle.
 - During the Saturday Midday peak hour, the overall intersection operates at LOS B with a delay of 17.2 seconds per vehicle from LOS B with a delay of 12.4 seconds per vehicle, an increase of 4.8 seconds per vehicle.
- Intersection ID #5. South Avenue & Boulevard
 - During the AM peak hour, the northbound approach (STOP control) operates at LOS E with a delay of 36.7 seconds per vehicle.
 - During the PM peak hour, the northbound approach (STOP control) operates at LOS D with a delay of 28.7 seconds per vehicle.
 - During the Saturday Midday peak hour, the northbound approach (STOP control) operates at LOS D with a delay of 28.4 seconds per vehicle.
- Intersection ID #6. South Avenue & Eastern South Site Driveway

- During the AM peak hour, the southbound approach improves to LOS B with a delay of 18.7 seconds per vehicle from LOS D with a delay of 25.6 seconds per vehicle, a decrease of 6.9 seconds per vehicle. The overall intersection operates at LOS B with a delay of 11.9 seconds per vehicle.
- During the PM peak hour, the southbound approach improves to LOS C with a delay of 27.0 seconds per vehicle from LOS E with a delay of 37.8 seconds per vehicle, a decrease of 10.8 seconds per vehicle. The overall intersection operates at LOS B with a delay of 13.7 seconds per vehicle
- During the Saturday Midday peak hour, the southbound approach improves to LOS B with a delay of 15.6 seconds per vehicle from LOS D with a delay of 26.5 seconds per vehicle, a decrease of 10.9 seconds per vehicle. The overall intersection operates at LOS B with a delay of 10.0 seconds per vehicle.
- Intersection ID #18. South Avenue & South Zone Exit Out
 - During the AM peak hour, the southbound approach (STOP control) operates at LOS E with a delay of 12.2 seconds per vehicle.
 - During the PM peak hour, the southbound approach (STOP control) operates at LOS B with a delay of 14.6 seconds per vehicle.
 - During the Saturday Midday peak hour, the southbound approach (STOP control) operates at LOS B with a delay of 12.5 seconds per vehicle.

CONCLUSIONS AND RECOMMENDATIONS

The results of the analysis with the mitigations identified and the recommended improvements indicate during the weekday AM and PM peak hours and Saturday Midday peak hours, the study intersections are expected to operate at an overall intersection LOS D or better with the proposed redevelopment, except at the roundabout at Route 28 & South Avenue.

In general, the unsignalized site access points to the West Zone, North Zone, and South Zone are adequate and operate as expected given the minor street (site driveway) stop-controlled intersection control. The egress movements at the site access locations may experience moderate to long delays due to the level of traffic volumes along the major street approaches. The site access and circulation via the signalized intersections at the North Zone and South Zone will continue to be evaluated and refined, in coordination with the Applicant and Town, to provide efficient vehicular flows and sufficient space for all modes of transportation.

Signal timing modifications at several study intersections will generally improve the operating conditions but will not resolve all the operational issues. Additional capacity is needed at select intersections to improve traffic flows through the area; however, the right-of-way is limited and the Town's desire to create a more pedestrian/bicycle-friendly downtown may make these types of improvements infeasible. The extension of turn lane lengths would be beneficial, but the feasibility needs to be further evaluated based upon available right-of-way. Where physical improvements to an intersection may not be feasible, alternative analysis was performed and a focus on improving the pedestrian and bicycle infrastructure/safety were prioritized.

Coordination with other stakeholders will be necessary to discuss the operating conditions of intersections that are maintained by either Union County or New Jersey Department of Transportation (NJDOT). For example, the proposed traffic signal at the intersections of Intersection ID #9. North Avenue & Clark Street and Intersection ID #14. Prospect Street & Broad Street would need to be coordinated with Union County and the roundabout at Intersection ID #3. Route 28 & South Avenue would need to be coordinated with NJDOT.

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