DeKalb Street (US 202 North) Two-Way Traffic Feasibility Study

Municipality of Norristown, Montgomery County, PA

Prepared for:

Prepared by:

McMAHON
TRANSPORTATION ENGINEERS & PLANNERS

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1. Introduction

This report presents a summary of existing and anticipated future transportation conditions, with DeKalb Street converted into a two-way principal arterial, within the 1.5-mile corridor, located in the Municipality of Norristown, Montgomery County, Pennsylvania.

The DeKalb Street Corridor is a critical northbound roadway that serves as a major commuter route, which connects Bridgeport through the Municipality of Norristown. Recent emphasis has been placed on improvements, and the advancement of projects, along other corridors in the area (i.e., Markley Street and Lafayette Street), to the exclusion of important corridors like DeKalb Street. This study provides Norristown with the technical data needed to demonstrate the effectiveness of converting the corridor into two-way traffic flow.

Study Advisory Committee (SAC)

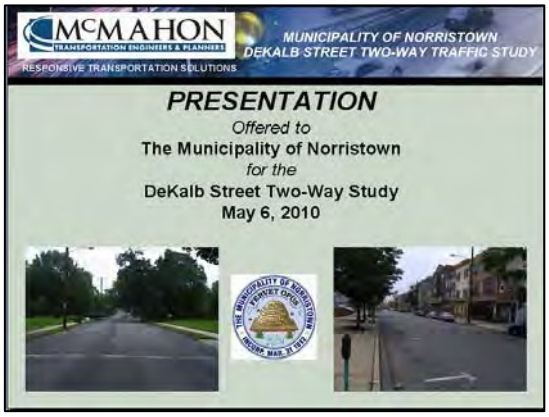
- Norristown Borough
- McMahon Associates, Inc.
- Pennsylvania Department of Transportation (PennDOT)
- Montgomery County Planning Commission (MCPC)
- East Norriton Township
- Norristown Fire Department
- Norristown Police Department
- Greater Valley Forge Transportation Management Association

This project involved extensive data collection, including, both available published data and new field data collection. Available published data, provided by MCPC, included studies in the area which provided existing intersection and roadway traffic volume counts and forecasts. In addition, this available data was supplemented with new intersection turning movement counts conducted during the peak commuter periods, which were then analyzed with a traffic simulation-based program. The existing analysis was then utilized to determine the capacity/level-of-service (LOS) results for the corridor, and to investigate needed changes to improve overall safety and capacity. Additionally, a recommended set of improvements were determined based upon projected future 2019 design-year traffic volumes to enable two-way traffic flow along the corridor.

PROCESS

The goal of this project is to achieve a comprehensive corridor improvement plan that is both beneficial and effective in meeting the municipality's needs, therefore numerous team and public meetings were held. As the corridor included commercial and residential areas, special attention was focused on their sometimes-differing design and operational issues in developing recommended improvements. The consulting team completed this study in close coordination with the project's Study Advisory Committee (SAC). In doing so, four project meetings were held to:

- Outline the project goals and objectives
- Identify local key issues
- Review study findings and recommendations
- Build project consensus among SAC members
- Direct public outreach efforts



In addition, the Pennsylvania Department of Transportation (PennDOT) was consulted throughout the process with regard to the preferred improvement alternatives.

The consulting team also met three times with the Public during the study process in order to explain the project, identify initial transportation concerns/issues, and present draft roadway recommendations to solicit feedback prior to finalizing the study recommendations. The public meetings were held on March 18th, May 6th, and November 4th, 2010 at the Montgomery County Human Services Center at 6:30 in the evening. A formal presentation was given, boards were displayed depicting the relevant information, comment forms were distributed to the public, and the feedback collected was incorporated into the recommended improvements. Copies of sign-in sheets and comment forms held with the SAC, as well as the public throughout the course of the project have been included in **Appendix A**.

It is the consultant team's understanding that the intent of the DeKalb Street (US 202 North) corridor study is to determine the feasibility of converting DeKalb Street to two-way traffic flow, develop a list of transportation improvements which will ensure efficient two-way traffic flow, while establishing traffic calming measures and maximizing vehicular and pedestrian safety.

2. Existing Transportation Setting

The DeKalb Street study corridor extends from Lafayette Street to Johnson Highway in the Municipality of Norristown, Montgomery County (**see Figure 1**). The corridor is approximately 1.5 miles long, and changes from commercial lane uses in the southern section to a residential setting in the northern section. Each has different transportation issues, but together they form a united corridor image. DeKalb Street is a two-lane, urban roadway with on-street parking and no auxiliary lanes at the cross-street intersections. There are 20 key intersections along the corridor; 12 unsignalized intersections, 7 signalized intersections, and 1 controlled by a flasher. A number of locations along the corridor currently experience delay and congestion.

DeKalb Street provides local access to area roadways and adjacent traffic generators, as well as regional and interstate access via junctions with the Pennsylvania Turnpike (Interstate 276) and the Schuylkill Expressway (Interstate 76).

Figure 1: Study Area Figure

LEGEND

- SIGNALIZED
- STOP CONTROLLED
- FLASHER

STUDY INTERSECTIONS

The SAC identified 20 key intersections for evaluation as part of this study. **Table 1** lists the study intersections and their current operating characteristics.

Table 1. Study Intersections

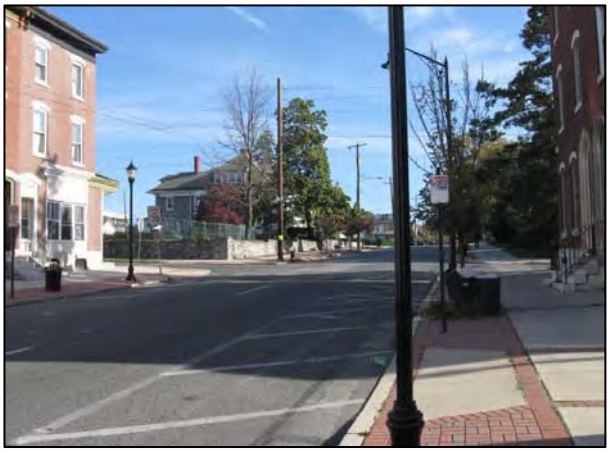
Roadway	Intersection Type	Ownership	Functional Classification	Average Daily Traffic	Travel Lanes Per Direction
DeKalb Street	-	State (S.R. 0202)	Principal Arterial	7,590[2]	2 (NB)
Lafayette Street	Signalized	Norristown	Minor Arterial	5,516[1]	1 (EB & WB)
Main Street	Signalized	Norristown	Principal Arterial	14,930[1]	1 (EB & WB)
Penn Street	Unsignalized	Norristown	Local	N/A	1 (WB)
Airy Street	Signalized	State (S.R. 3009)	Minor Arterial	6,600-8,400[3]	2 (WB)
Marshall Street	Signalized	Norristown	Local	4,700-6,400[3]	1 (EB & WB)
Chestnut Street	Signalized	Norristown	Local	N/A	1 (EB)
Oak Street	Unsignalized	Norristown	Minor Arterial	6,982[1]	1 (WB)
Jacoby Street	Unsignalized	Norristown	Local	N/A	1 (EB)
Elm Street	Flasher	Norristown	Local	N/A	1 (WB)
Spruce Street	Unsignalized	Norristown	Local	N/A	1 (EB & WB)
Basin Street	Unsignalized	Norristown	Local	N/A	1 (EB & WB)
Wood Street	Unsignalized	Norristown	Local	N/A	1 (EB & WB)
Fornance Street	Signalized	Norristown	Local	9,000	1 (EB & WB)
Freedley Street	Unsignalized	Norristown	Local	N/A	1 (EB & WB)
Summit Street	Unsignalized	Norristown	Local	N/A	1 (EB & WB)
Brown Street	Unsignalized	Norristown	Local	N/A	1 (EB & WB)
Roberts Street	Unsignalized	Norristown	Local	N/A	1 (EB & WB)
Logan Street	Unsignalized	Norristown	Local	N/A	1 (EB & WB)
Carriage Lane	Unsignalized	Norristown	Local	N/A	1 (EB & WB)
Johnson Highway	Signalized	State (S.R. 3017)	Principal Arterial	13,755[2]	1 (EB & WB)

1 – Source: PennDOT Internet Traffic Monitoring System (iTMS) website
2 – Daily traffic volumes were collected in 2009-2010
3 - Data taken from studies conducted in 1992 and 1994 by DVRPC

PUBLIC TRANSIT

The Southeastern Pennsylvania Transportation Authority (SEPTA) presently provides bus service along DeKalb Street with routes connecting to Plymouth Meeting Mall and Willow Grove Mall. Bus Route 98 currently provides stop locations at:

- Airy Street
- Marshall Street
- Oak Street
- Elm Street
- Basin Street
- Fornance Street
- Freedley Street
- Logan Street
- Johnson Highway



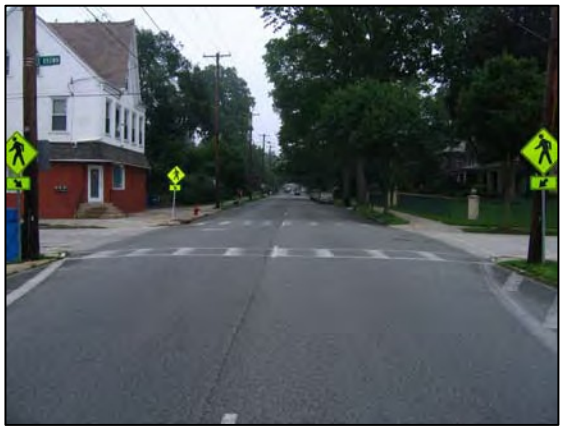
Additionally, Bus Routes 97 and 99 utilize DeKalb Street in the downtown area (between Main Street and Lafayette Street).

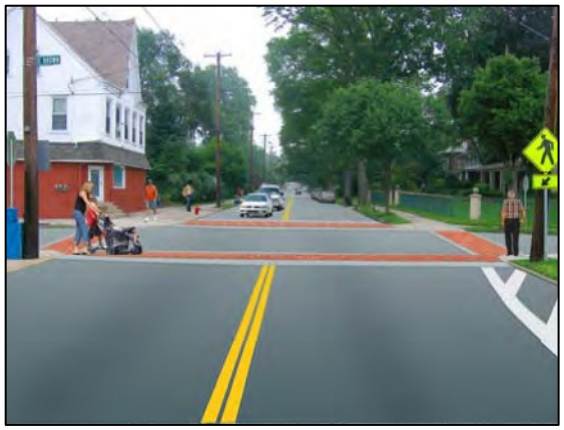
According to SEPTA's Fiscal Year 2011 Annual Service Plan, annual ridership for Bus Route 98 was approximately 348,730 passengers, for Bus Route 973 approximately 175,130 passengers, and for Bus Route 99 approximately 443,400 passengers.

Any improvements to the traffic flow along DeKalb Street should be discussed with SEPTA and adjustments to the bus routes to and from the Norristown Transportation Center will be analyzed in more detail.

PEDESTRIAN AND BICYCLE TRAFFIC

Pedestrian and bicycle traffic are presently accommodated along DeKalb Street via signage, sidewalks, painted crosswalks, and textured crosswalks. A significant amount of pedestrians were observed along the corridor due to the retail stores, churches, offices, and schools located along the corridor. Pedestrian traffic counts are provided in **Appendix B**.





Techniques that can help improve pedestrian conditions include enhancing the visibility of the crosswalk markings with a raised or textured crosswalk. Raised crosswalks can also reduce vehicle speeds.

VEHICULAR TRAFFIC VOLUMES

The highest daily traffic volumes intersecting DeKalb Street are experienced along Lafayette Street, Main Street, Airy Street, and Johnson Highway. Table 1 shown above also shows daily traffic volumes along many of the intersecting roadways within the study area. Daily traffic counts and peak hour intersection traffic count data is provided in **Appendix C**.

Traffic counts were performed at twenty intersections for an 11-hour weekday period (7:00 AM to 6:00 PM). Traffic volumes during the weekday commuter periods, or "rush hours", represent the peak traffic volumes along the corridor. Specifically, the commuter peak periods for DeKalb Street generally occurred in the morning (7:00 AM to 10:00 AM), midday (11:00 AM to 2:00 PM) and again in the late afternoon (4:00 PM to 6:00 PM), and are the focus of this study. **Figures 2, 3, and 4** illustrate the existing weekday morning, weekday midday, and afternoon peak hour traffic volumes at each of the study intersections.

Varying directional flows are apparent along the corridor, with the majority of traffic destined to U.S. Route 202 South (over the Dannehower Bridge and DeKalb Street Bridge) during the weekday morning commute, and then destined to U.S. Route 202 North during the weekday afternoon commute.

Figure 2. 2009 Existing Weekday Morning Peak Hour Traffic Volumes

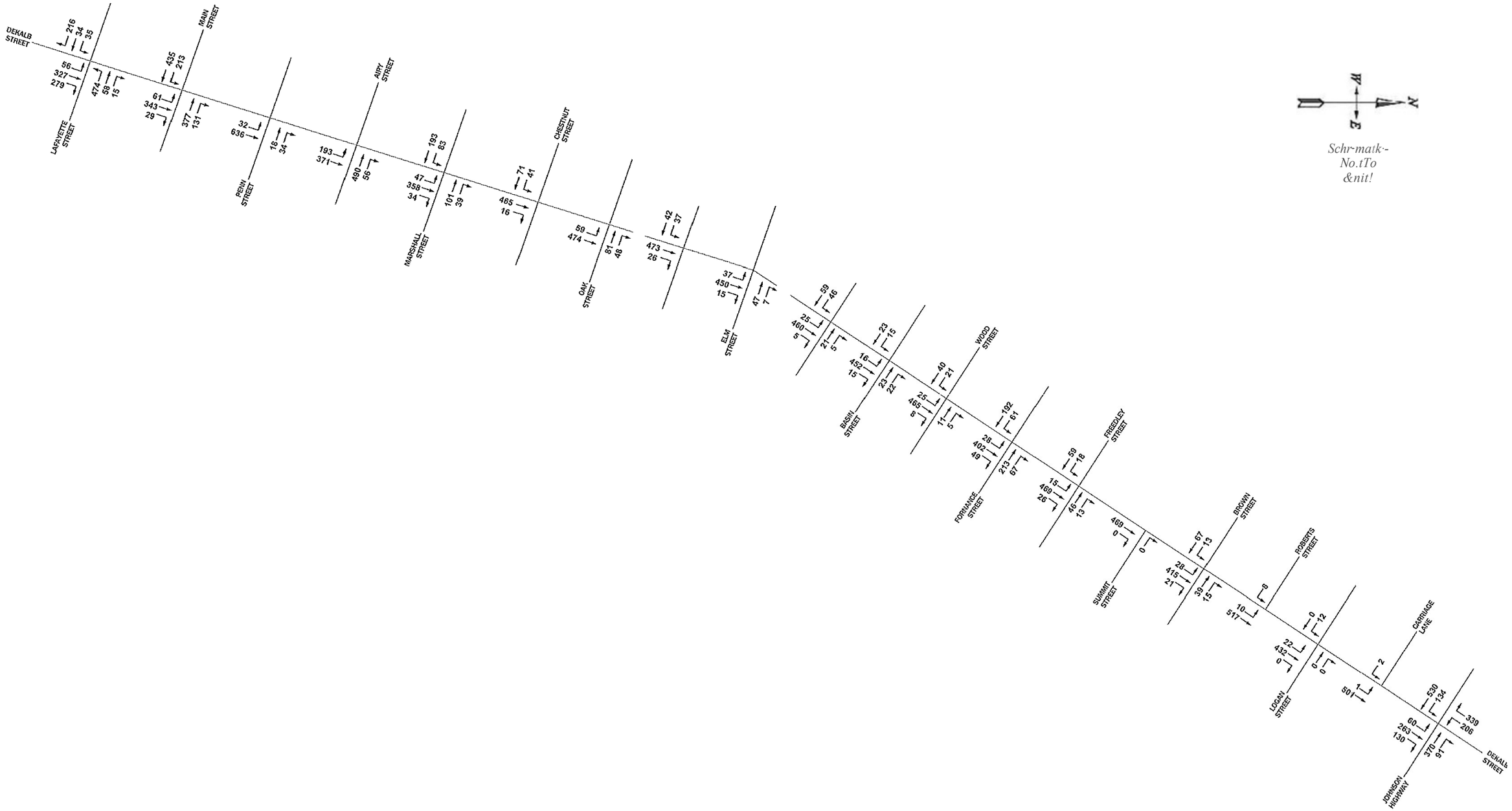


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Figure 3. 2009 Existing Weekday Midday Peak Hour Traffic Volumes

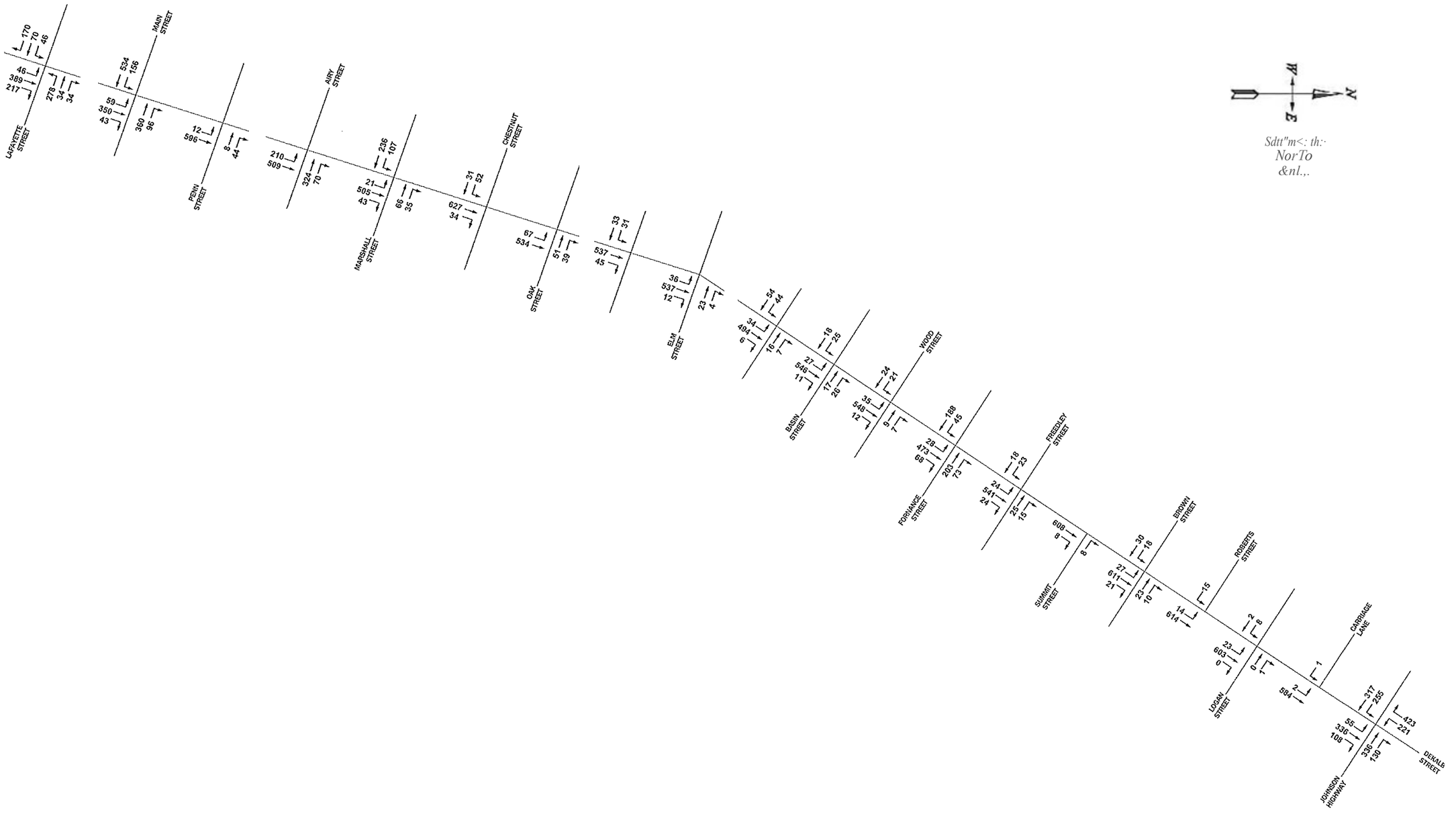
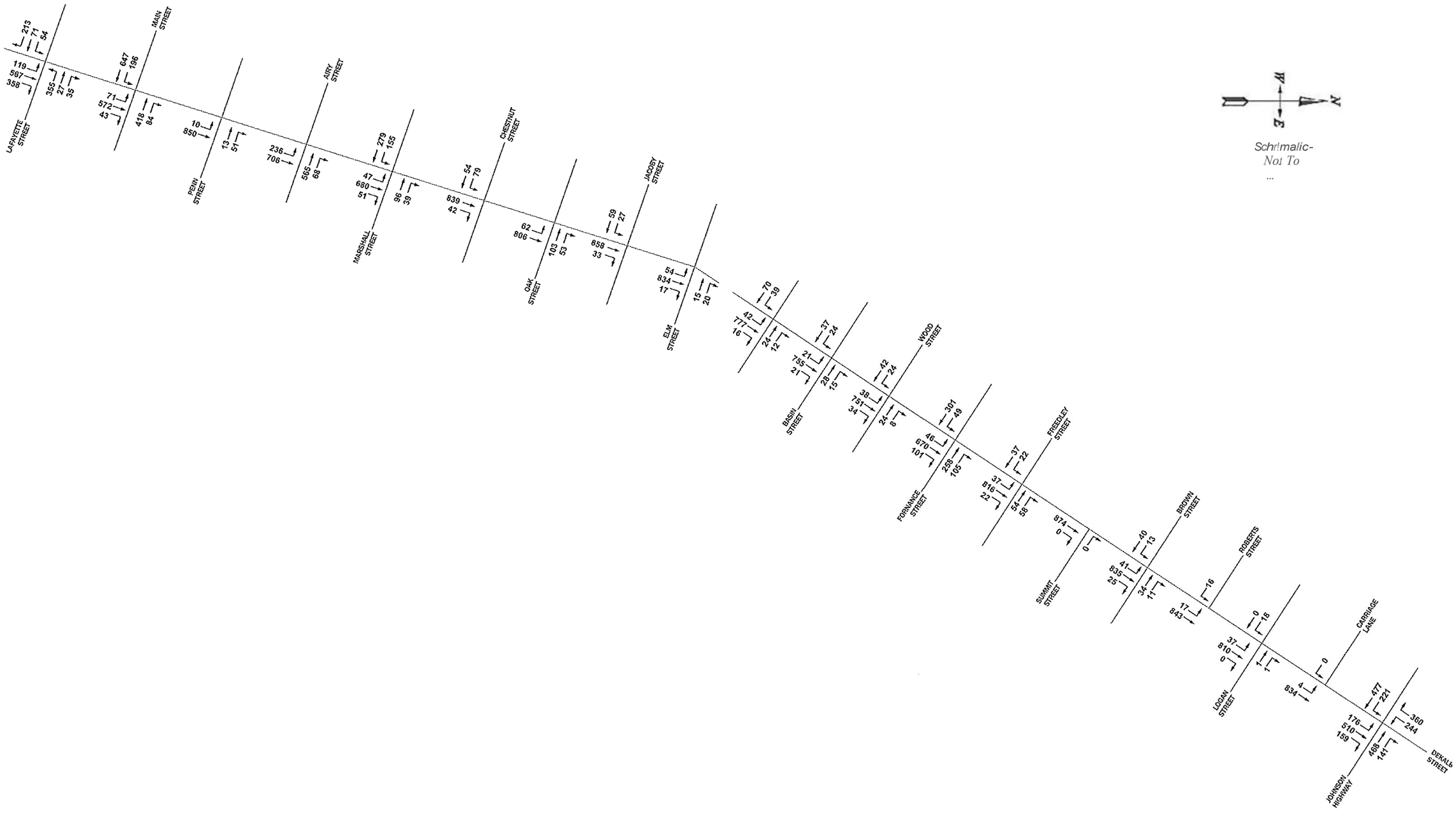


Figure 4. 2009 Existing Weekday Afternoon Peak Hour Traffic Volumes



TRAFFIC OPERATIONS

The peak hour traffic volumes at the study intersections along DeKalb Street were analyzed to determine the current 2009 operating conditions, in accordance with the standard capacity/level-of-service analysis techniques contained in the current *Highway Capacity Manual (2000)*[(1)]. By definition, capacity represents "the maximum rate of flow that can reasonably be expected to pass a point on a uniform section of a lane or roadway under prevailing roadway, traffic, and control conditions." The level of functioning of an intersection or a uniform section of a lane or roadway can be expressed in terms of levels of service. Level of service (LOS) is defined as "a qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers". Such measures include "speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety."

These standard capacity/level-of-service analysis techniques, which calculate control delay per vehicle, are more thoroughly described in the following sections for both unsignalized and signalized intersections, as well the correlation between control delay per vehicle and the respective levels of service for each intersection type.

a. Unsignalized Intersections

At unsignalized intersections, the methodology for evaluating the relative functioning of intersections controlled by stop or yield signs are based on several assumptions, including:

- Major street flows are not affected by the minor (stop-sign controlled) street movements
- Left turns from the major street to the minor street are influenced only by opposing major street through flow
- Minor street left turns are impeded by all major street traffic plus opposing minor street traffic
- Minor street through traffic is impeded by all major street traffic
- Minor street right turns are impeded only by the major street traffic coming from the left

The concept of stop-controlled or yield-controlled intersection analysis is based on the estimate of average control delay on minor streets. The analysis relies on three elements: the size and distribution of gaps in the major traffic stream, the usefulness of these gaps to the minor stream drivers, and the relative priority of the various traffic streams at the intersection. The results of the analysis provide an estimate of average control delay for the various critical movements at the unsignalized intersections.

(1) Transportation Research Board, Special Report 209, Highway Capacity Manual, published by the Transportation Research Board, Washington, DC, Updated 2000.

b. Signalized Intersections

At signalized intersections, an additional element must be considered: traffic signal time allocation. Level of service is based primarily on the average control delay per vehicle for various movements within the intersection; however, volume/capacity relationships also affect level of service. Thus, both delay and volume/capacity must be considered to evaluate the overall operation of a signalized intersection.

Correlation between average control delay per vehicle and the respective levels of service are provided for unsignalized and signalized intersections in **Appendix D**.

EXISTING TRAFFIC OPERATING CONDITIONS

The existing weekday morning, weekday midday, and weekday afternoon peak hour traffic volumes were subject to the detailed capacity/level-of-service analysis methodologies previously described. The results of the analysis indicate that, overall, the corridor functions acceptably with desirable levels of service during the commuter peak hours. However, the analysis reveals some areas of congestion; for instance, the DeKalb Street intersection with Lafayette Street, operates with delay (LOS E or F) during the weekday commuter peak hours. Furthermore, a few individual movements at other intersections currently operate with delay during the peak hours. **Figure 5** summarizes the level of service conditions at each of the twenty (20) intersections during the existing weekday peak hours. In addition, **Appendix E** contains the detailed capacity/level-of-service worksheets.

BUSINESS AND NEIGHBORHOOD TRAFFIC CONCERNS

During the public meetings, the business owners and residents along the corridor expressed their issues with the existing transportation conditions, as well their concern for the future effects of two-way traffic flow along the corridor.

Business owners' main concerns with the current one-way traffic flow are associated with access and circulation. There is no access to downtown Norristown from the north. The current one-way flow of the corridor, quickly gets vehicles through Norristown, however does not allow for any opportunities for pass-by trips to the retail stores.

The neighborhood residents reported high speeds along the corridor, resulting in accidents, and difficulty getting out of their residential driveways. The posted speed limit is 25 mph from Lafayette Street to Elm Street and changes to 35 mph from Elm Street to Johnson Highway. Speed data collected along DeKalb Street, near Basin Street, shows an 85th percentile speed of 40 mph; however several vehicles were shown to be traveling between 50 and 55 mph.

ADVANTAGES AND DISADVANTAGES OF TWO-WAY TRAFFIC FLOW

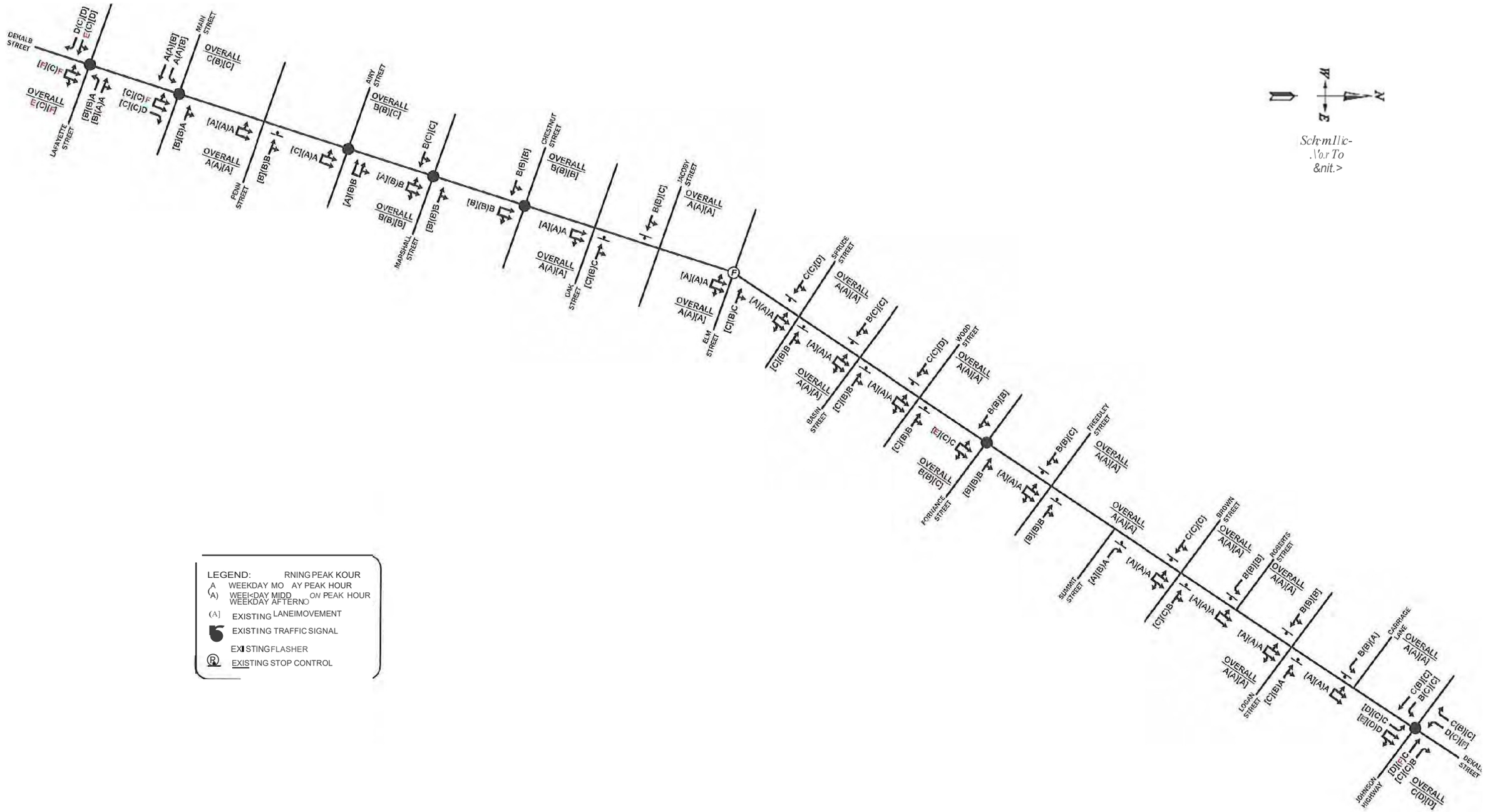
The one-way network of DeKalb Street was originally designed for a quick commute through Norristown. However, today there are many benefits of two-way traffic flow. A number of advantages and disadvantages are discussed in **Table 2**.

Table 2. Impacts of Two-Way Traffic Flow

Advantages	Disadvantages
Improved Mobility-Shorter Trip Distances	Increase of Traffic volumes
Slower Traffic Speeds	Loss of On-Street Parking
Increased Exposure and Access to Businesses	Potential Increase in Other Type Accidents
Decrease in Angle-Type Accidents	Decrease in Traffic Flow
Safer for Pedestrians	

Converting DeKalb Street to two-way traffic flow would reduce the traffic speeds since it would establish opposing flows in the opposite, adjacent lane. Drivers would experience additional 'friction' with the bi-directional traffic flow. The advantages for the business areas include heavier traffic volumes in downtown Norristown, increasing the opportunity that motorists will notice the store.

Figure 5: 2009 Existing LOS



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CRASH DATA

Crash data was obtained from PennDOT for DeKalb Street from Lafayette Street to Johnson Highway, spanning approximately 1.5 miles of roadway. The data covers a span of five years from January 1, 2004 to December 31, 2009.

During the five years, a total of 266 crashes occurred along the corridor, resulting in 53 crashes per year along the 1.5 miles of roadway, including 1 fatality. A summary of the crash types and locations has been provided in **Figure 6** below.

As can be seen, the majority of the crashes occur at the signalized intersection of DeKalb Street and Fornance Street. A review of the PennDOT data at this intersection shows that the majority of these crashes are caused by drivers traveling northbound along DeKalb Street and running through a red light.

The accidents along the corridor were mainly angle-type crashes and caused when vehicles pulled out too soon from the side street and were hit by vehicles traveling north along DeKalb Street.

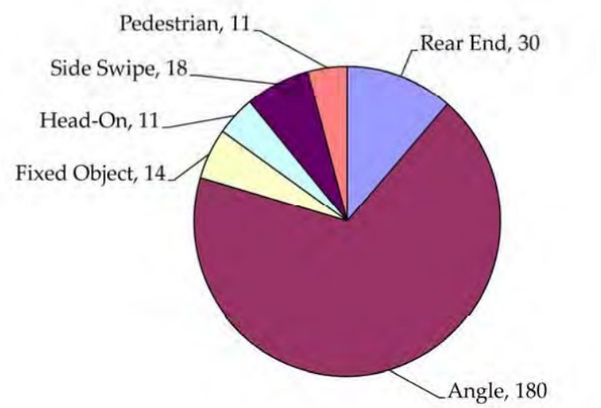
Figure 6: Crash Summary

Total Number of Reportable Crashes

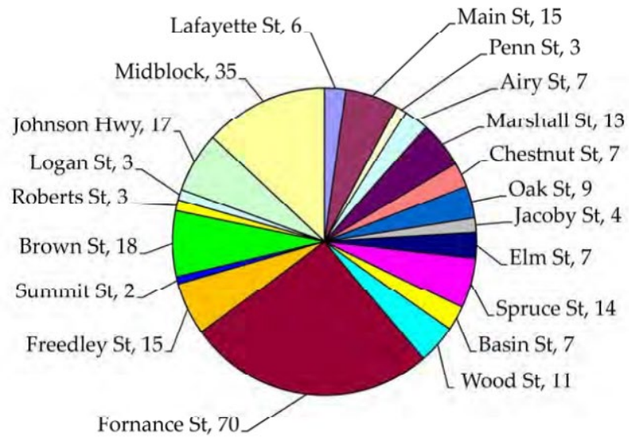
January 1, 2004 to December 31, 2008

Intersection	Traffic Control	Total Reportable Crashes	Frequency of Crashes (Number per Year)
DeKalb Street and Lafayette Street	Signal	6	1.2
DeKalb Street and Main Street	Signal	15	3.0
DeKalb Street and Penn Street	Stop	3	0.6
DeKalb Street and Airy Street	Signal	7	1.4
DeKalb Street and Marshall Street	Signal	13 * 1 major injury	2.6
DeKalb Street and Chestnut Street	Signal	7	1.4
DeKalb Street and Oak Street	Stop	9	1.8
DeKalb Street and Jacoby Street	Stop	4	0.8
DeKalb Street and Elm Street	Flasher	7 * 1 major injury	1.4
DeKalb Street and Spruce Street	Stop	14 * 1 major injury	2.8
DeKalb Street and Basin Street	Stop	7	1.4
DeKalb Street and Wood Street	Stop	11	2.2
DeKalb Street and Fornance Street	Signal	70 * 1 major injury * 1 fatality	14
DeKalb Street and Freedley Street	Stop	15	3.0
DeKalb Street and Summit Street	Stop	2	0.4
DeKalb Street and Brown Street	Stop	18 * 1 major injury	3.6
DeKalb Street and Roberts Street	Stop	3	0.6
DeKalb Street and Logan Street	Stop	3	0.6
DeKalb Street and Carriage Lane	Stop	0	0.0
DeKalb Street and Johnson Highway	Signal	17	3.4
Midblock	-	35 * 2 major injuries	7.0
Total	**---**	**266**	**53.2**

Crash Types



Crash Locations

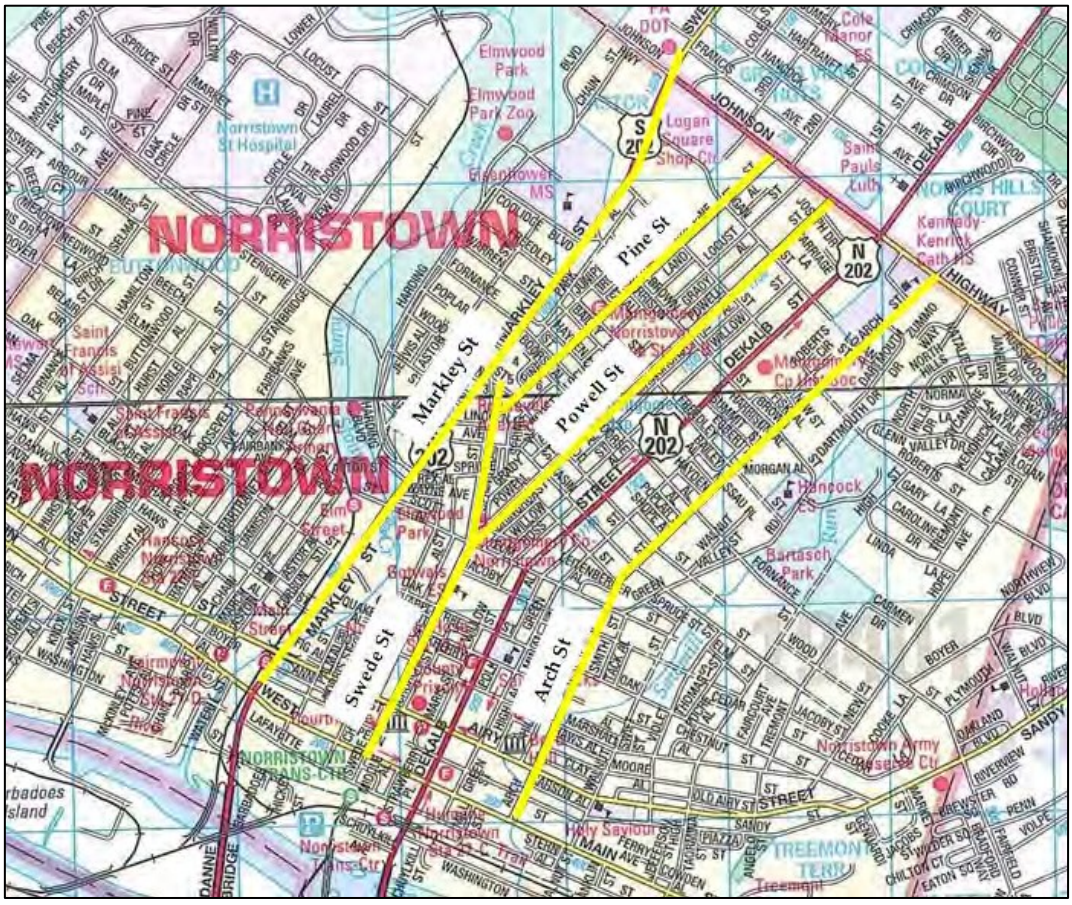


PARALLEL ROADWAYS

Parallel roadways to a transportation corridor provide alternative routes for motorists, particularly for local traffic, and also traffic that wants to travel southbound through Norristown. Markley Street is a major north-south roadway parallel to DeKalb Street; however, there are a number of other collector roadways and local roadways that provide intermittent parallel routes to get to downtown Norristown (**see Figure 7**). These parallel roadways are significant since traffic will be diverted to and from these roadways with two-way traffic flow along DeKalb Street.

- **Markley Street (US 202)** – a two-lane principal arterial roadway that parallels DeKalb Street on the west side of the corridor.
- **Arch Street** – a two-lane collector roadway that parallels DeKalb Street on the east side of the corridor.
- **Powell Street**– is a two-lane local roadway that intersects with Johnson Highway and parallels the corridor on the west side until it terminates at Elm Street.
- **Swede Street** – is a two-lane collector roadway that intersects Markley Street and continues parallels DeKalb Street on the west side until it terminates at Lafayette Street. Swede Street has one-way traffic flow, southbound, from Airy Street to Lafayette Street.
- **Pine Street** – is a two-lane local roadway that parallels the corridor on the west side, and intersects Johnson Highway and Swede Street.

Figure 7: Parallel Roadways



3. Future Transportation Setting

FUTURE TRAFFIC PROJECTIONS

This section of the report summarizes the process and methodology in forecasting peak hour turning movement volumes at intersections along the corridor for a projected future year 2019 no-build (without roadway improvements) conditions. Known improvements proposed in the Delaware Valley Regional Planning Commission's (DVRPC) latest Transportation Improvement Program (TIP), as well as improvements proposed by developers, were included in the model utilized to forecast future peak hour turning movement volumes at intersections.

Due to the significant level of improvements anticipated to occur over the next several years, the SAC recommended 2019 as the future design year for this study. As such, the existing traffic volumes were increased to reflect regional and local traffic growth anticipated to occur along the study corridor and surrounding area.

First, a regional traffic growth rate of 1.55 percent per year for 10 years was applied to the existing (2009) traffic volumes to reflect natural regional traffic growth through 2019. This annual regional traffic growth rate is consistent with data contained in PennDOT's Bureau of Planning and Research for similar roadways in Montgomery County.

Second, local traffic growth was accounted for by adding traffic associated with known future/planned developments. Traffic associated with 2 developments identified by the study area municipalities, and which are considered to be of significance to the corridor and study area traffic conditions, were specifically included in the traffic growth projections. Accordingly, the following developments were identified and included in the future traffic volume projections:

- *Waterworks Age-Qualified Residential Development* –66 age-qualified units, located on the northeast corner of the intersection of Johnson Highway and DeKalb Street in East Norriton Township.

- *Townhome/Condominium Development* - 12 townhome/condominium units with an 11 space parking lot at the rear of the property, with access on Leitenberger Alley.

PROGRAMMED TRANSPORTATION IMPROVEMENTS

Transportation improvements detailed under the future 2019 design year include all projects which are in, or are imminent for, construction along the corridor, as well as projects which are programmed for funding for one of the latter stages of a project's development which indicates a serious commitment to the project. The known or programmed transportation improvements incorporated into the forecasts for the corridor are from the DVRPC's Transportation Improvement Program.

A summary of the major identified regional improvements, included in the future traffic projections, is as follows:

- **MPMS #16665–US 202 Markley St Southbound (Section 500)** –Pre-construction phases of the Markley Street rehabilitation project for Section 500 of US 202 from Main Street to Johnson Highway.

    - **MPMS #80021-US 202 Markley St Improvements (Section 510**) – Reconstruction and signal improvements to Route US 202 from Main Street to Harding Boulevard.
    - **MPMS #80022-US 202 Markley St Improvements (Section 520) -** Reconstruction and signal improvements to Route US 202 form Harding Boulevard to Johnson Highway. Widening for one northbound lane, one southbound lane, and a center two-way left-turn lane.

- **MPMS #57858-Lafayette St Extension (MG1) -** Extending Lafayette Street past its current terminus at Ford Street to Conshohocken Road, and building slip-ramps at that point to connect Lafayette Street with the Pennsylvania Turnpike.

    - **MPMS #87392-Lafayette St Extension (MGL)** – Improve the roadways around the new Lafayette Street/I-276 Turnpike EZ-Pass only interchange.
    - **MPMS #79863-Lafayette St, Ford St to Conshohocken Rd Extension (MGP)** – Extend Lafayette Street as a four lane roadway on a new alignment to tie into a new PA Turnpike interchange.
    - **MPMS #79864-Lafayette St, Barbados St to Ford St Widening (MGN)** – Reconstruct and widen existing Lafayette Street from 2 to 4 lanes between Barbados and Ford Streets, as well as provide turn lanes and upgrade signals.

- **MPMS #63486-US 202, Johnson Hwy to Township Line Rd (61S)** – Widening for US 202 for approximately 1.8 miles from two lanes to give lanes including a center turn lane. Traffic signal equipment will be replaces at the intersections with Johnson Highway, Germantown Pike and Township Line Road.

All of the transportation improvements projects mentioned above must be completed before construction on the DeKalb Street project can begin, which can be between 2018 and 2020.

FUTURE TWO-WAY TRAFFIC VOLUMES

The new traffic associated with the Waterworks Age-Qualified Residential Development Traffic was obtained from the Traffic Impact Study, dated April 5, 2006, prepared by Traffic Planning & Design, Inc. However, the traffic associated with the 12-unit townhome/condominium development was estimated utilizing trip generation data contained in the Institute of Transportation Engineers publication, Trip Generation, 8th Edition. Specifically, the traffic generation for both of these future developments was added to existing traffic volumes in addition to regional traffic growth projections (**Appendix F).**

Previous studies, conducted by DVRPC, were obtained which included traffic count data for the intersections along Markley Street, as well as other roadways in the area. To reflect two-way traffic flow along DeKalb Street, from Lafayette Street to Johnson Highway, the existing traffic flow of the surrounding roadway network was analyzed.

Traffic from the appropriate parallel roadways was diverted to southbound DeKalb Street, and adjustments were made to the traffic currently utilizing the side streets. It was assumed one lane of travel would be provided in each direction of the DeKalb Street corridor. All other parallel and intersecting roadways in the area were left unchanged.

The estimated 2019 future weekday morning, weekday midday, and weekday afternoon peak hour traffic volumes at each study intersection are provided in **Figures 8, 9, and 10**.

Figure 8. 2019 Future Weekday Morning Peak Hour Two-Way Traffic Volumes

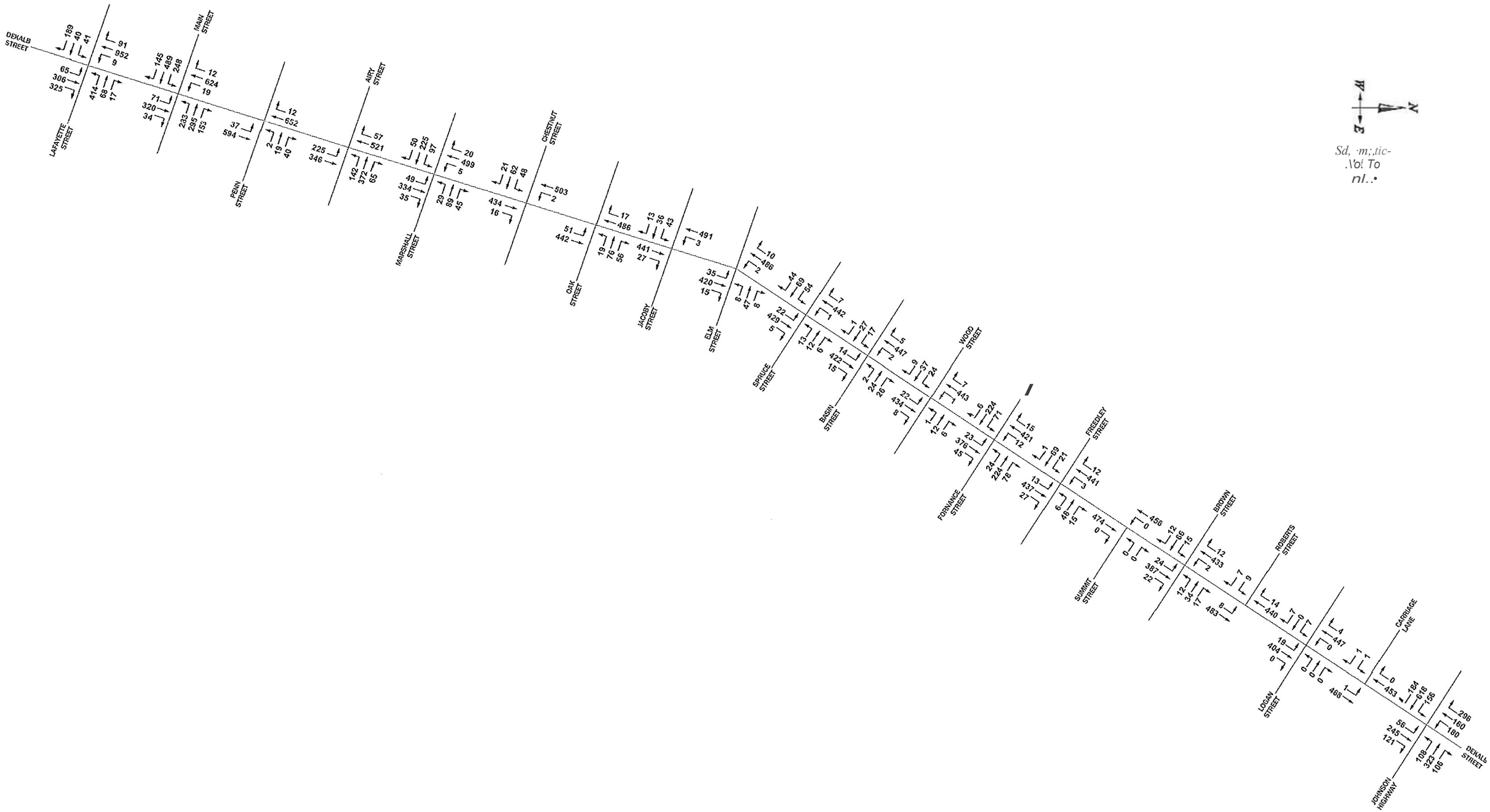


Figure 9. 2019 Future Weekday Midday Peak Hour Two-Way Traffic Volumes

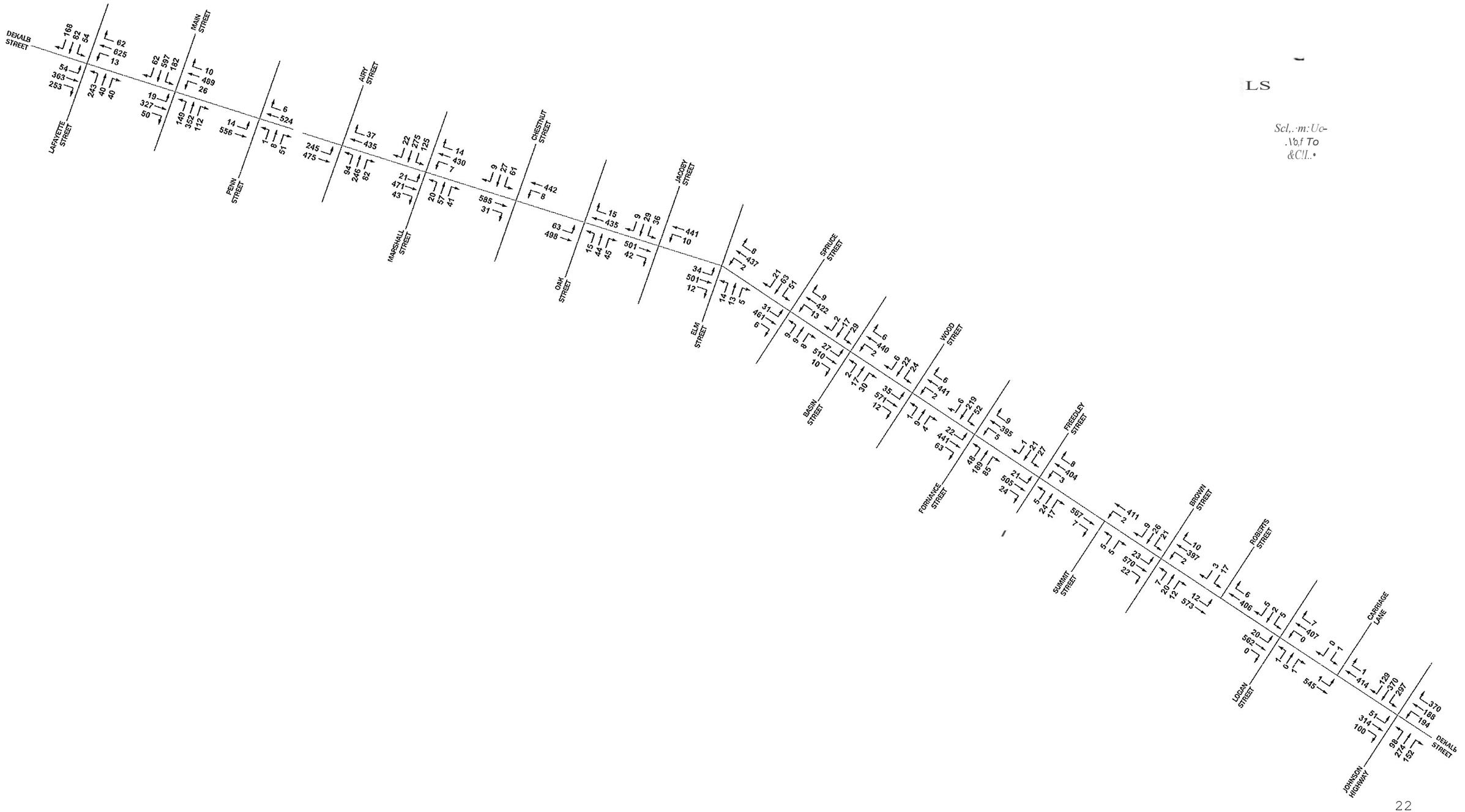
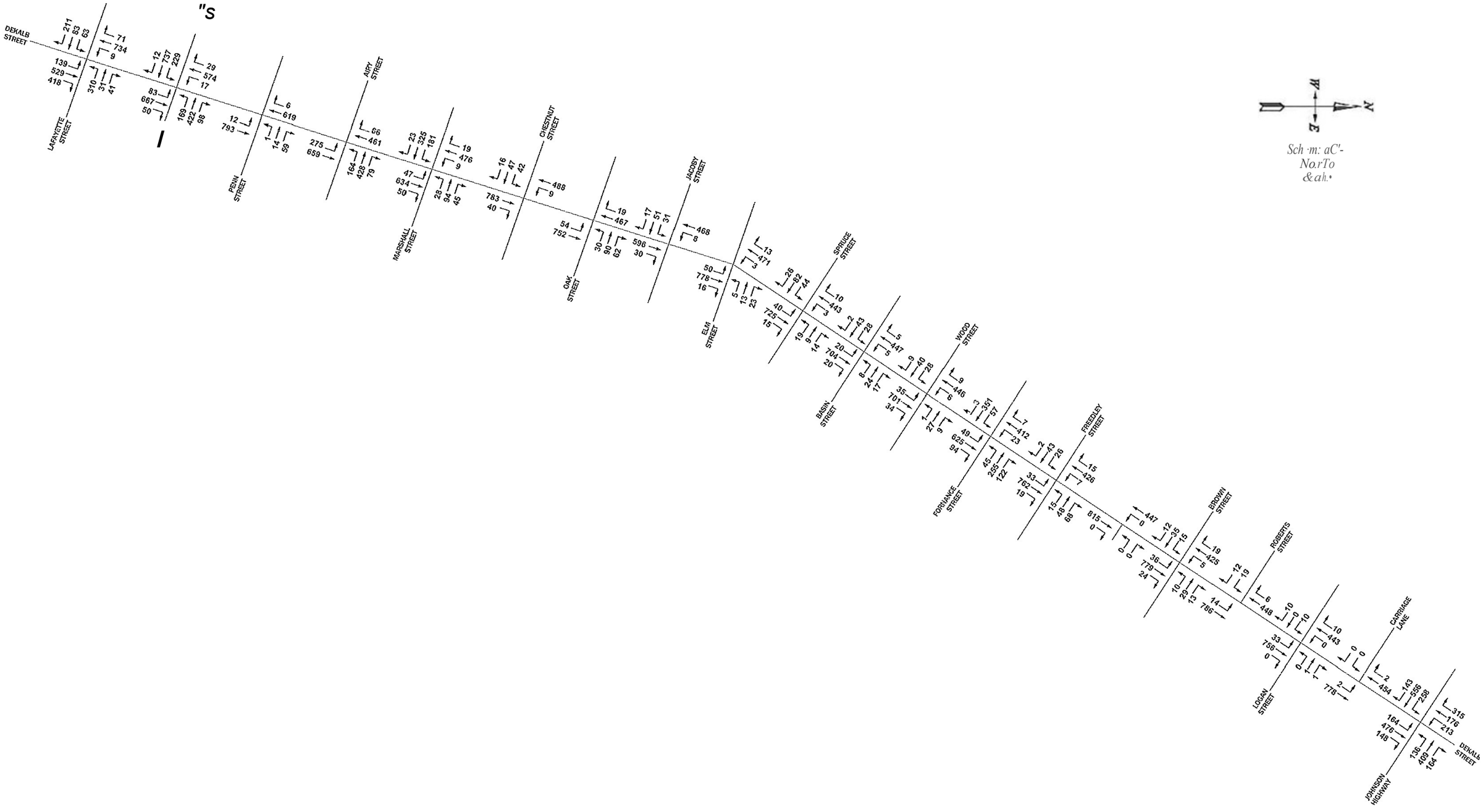


Figure 10. 2019 Future Weekday Afternoon Peak Hour Two-Way Traffic Volumes



FUTURE TWO-WAY TRAFFIC OPERATIONS

The 2019 future traffic analysis evaluates traffic conditions along DeKalb Street, between Lafayette Street and Johnson Highway, with two-way traffic flow, and the investment of needed roadway improvements. **Figure 11** illustrates the future weekday morning, weekday midday, and weekday afternoon peak hour level-of-service analysis results. In addition, **Appendix G** contains the detailed capacity/level-of-service worksheets.

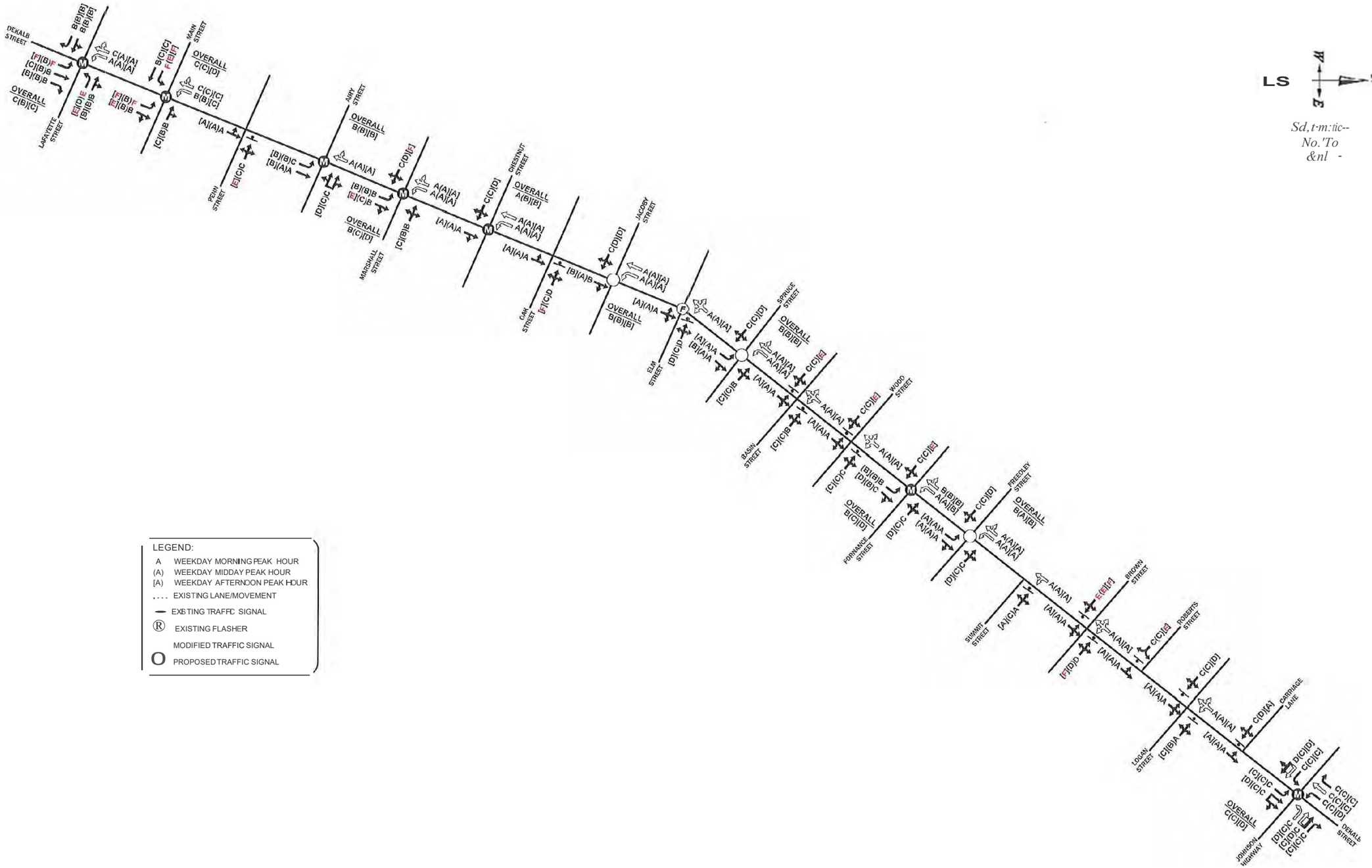
In summary, with the recommended improvements described below, the 20 intersections along the corridor operate at acceptable overall LOS (LOS D or better) traffic conditions during the weekday morning, weekday midday, and weekday afternoon peak hours. The most highly congested intersections along DeKalb Street occurred at Lafayette Street and Main Street. As a result, multiple improvement scenarios were explored with the SAC to determine the most feasible outcome. The scenarios included various traffic signal phasing modifications, widening of the intersections and many different lane configurations. After several discussions with the SAC and PennDOT, it was decided to continue to restrict the eastbound right-turn movement and the westbound left-turn movement at Main Street, to go south on DeKalb Street. A complete inventory of the recommended improvements along the corridor is described in **Table 3**.

Traffic simulation models were used to evaluate the improvement scenarios for Lafayette Street and Main Street, as well as the entire DeKalb Street corridor. **Figures 12 and 13** illustrate the simulation model for the recommended improvements at Lafayette Street and Main Street.

Figure 12: DeKalb St and Lafayette St

Figure 13: DeKalb St and Main St

Figure 11: 2019 Future LOS



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4. Recommended Improvements

Based on the projected two-way volumes along the DeKalb Street corridor under 2019 future conditions, it is evident that improvements will be required to remedy congested conditions. Numerous warrant analyses and improvement scenarios were investigated along the corridor.

IMPROVEMENTS INVESTIGATED

Recognizing the limitations along the corridor that render many of the conventional improvements impractical and in many cases undesirable (i.e., roadway widening), various improvement concepts were investigated and analyzed. The improvements investigated include:

- Performing traffic signal warrant analysis for additional signals needed,
- Modifying traffic signal timings at existing signalized intersections,
- Coordinating all traffic signals along the corridor for smoother traffic flow,
- Left and right-turn lane warrant analyses to determine if separate turn lanes are needed at the unsignalized and signalized intersections,
- Performing vehicle queue analysis to avoid 'gridlock' conditions,
- Evaluating current on-street parking to determine if spaces need to be removed,
- Restricting turning movements at certain intersections to avoid high delays and undesirable LOS results, and
- Re-striping the roadway within the existing right-of-way to provide for two-way traffic flow.

Roadway widening was not considered for this analysis due to the limited right-of-way. The recommended improvements presented in this report represent the improvements considered by the Study Advisory Committee and PennDOT as the most desirable option.

ROADWAY CROSS-SECTION

Currently, the DeKalb Street corridor, between Lafayette Street and Johnson Highway, typically has two lanes of travel northbound, with an eight-foot on-street parking area on either side.

As the corridor experiences a range of traffic volumes with various traffic control devices (sign, signal, flasher), it is recommended that two different cross-sections be utilized. At the unsignalized intersections, a two-lane cross-section with eight-feet designated for on-street parking on either side is recommended to be provided **(see Figure 14).** At the signalized intersections, it is recommended that several parking spaces be eliminated to provide one travel lane per direction with auxiliary left-turn lanes provided **(see Figure 15).**

Figure 14: Typical Unsignalized Intersection

TWO-LANE CROSS-SECTION WITH ON-STREET PARKING

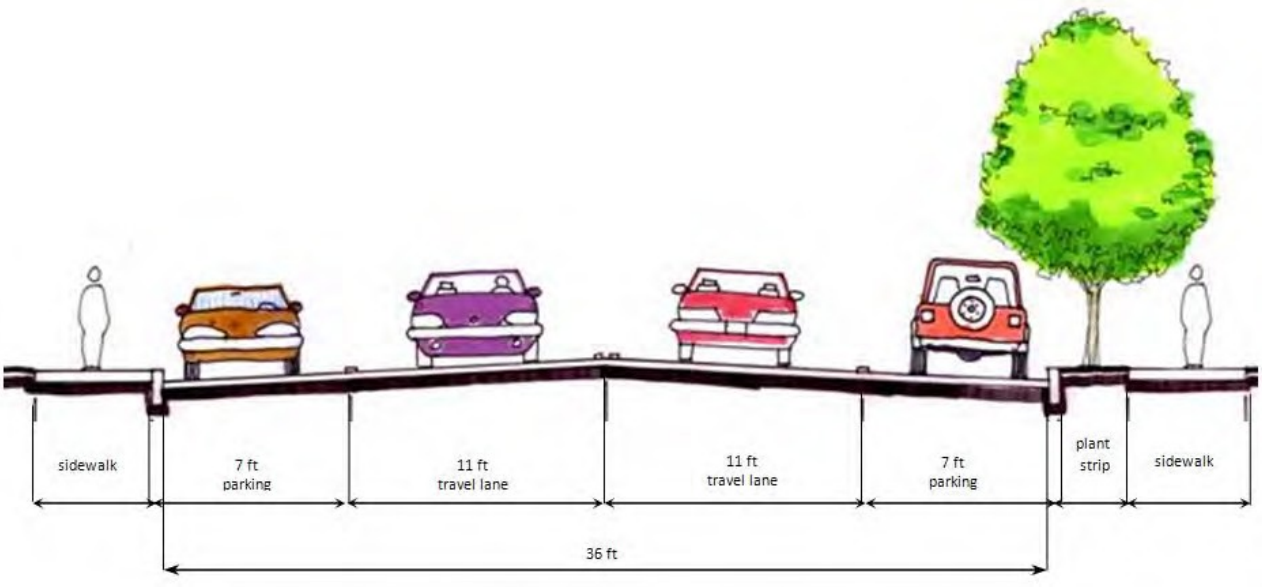
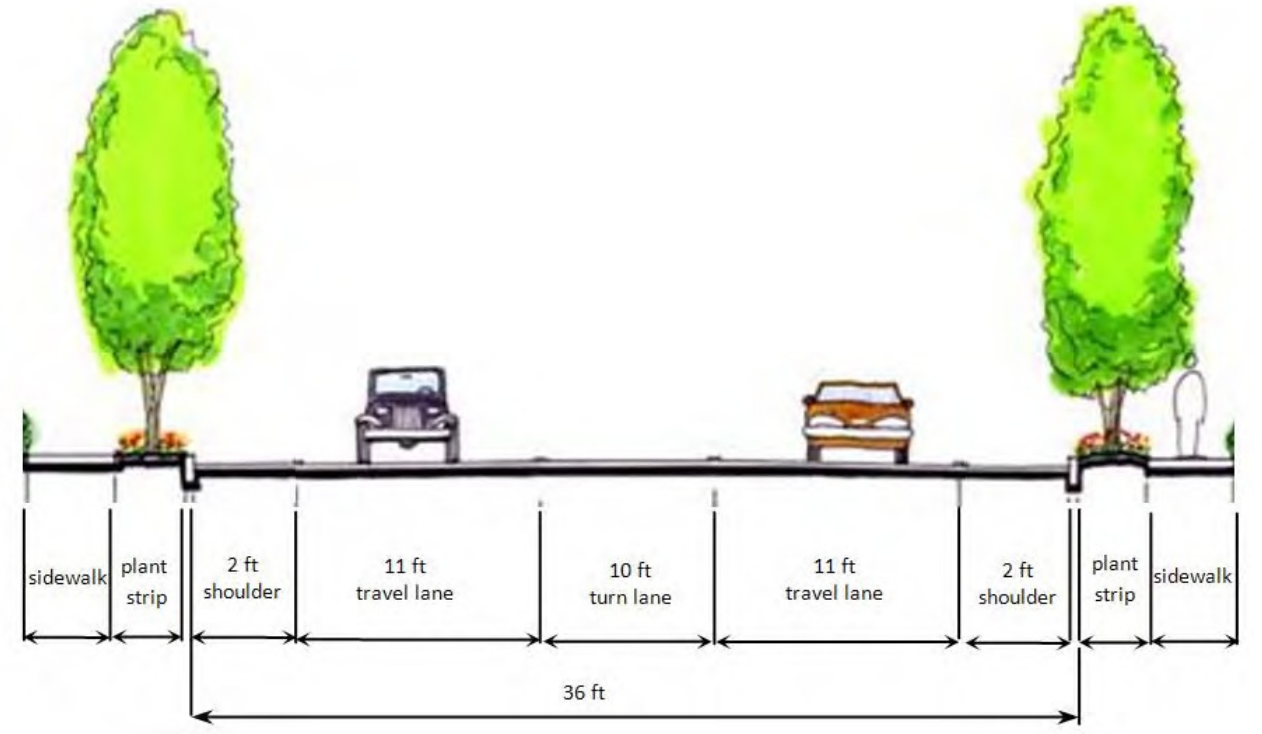


Figure 15: Typical signalized Intersection

THREE-LANE CROSS-SECTION



RECOMMENDED IMPROVEMENTS

In order to tackle the traffic operating conditions along the DeKalb Street corridor in the Municipality of Norristown, it is recommended to re-stripe DeKalb Street to provide one travel lane per direction, provide turning lane improvements at signalized intersections, install additional traffic signals, as well as modifications to the existing signals. Conceptual improvement plans illustrating these improvements at selected intersections are shown in **Figures 16, 17, and 18**, while **Table 3** provides a summary of the recommended intersection improvements, and the associated design and construction costs. Figure 16 illustrates the proposed improvements to the downtown area of Norristown (DeKalb Street at Lafayette Street and Main Street). Figure 17 demonstrates the typical improvements recommended at the signalized (three-lane cross-section) and unsignalized (two-lane cross-section) intersections, while Figure 18 illustrates the recommended improvements at DeKalb Street and Johnson Highway.

Figure 16: Downtown Area

LAFAYETTE STREET AND MAIN STREET INTERSECTION IMPROVEMENTS

Figure 17: Typical Signalized and Unsignalized Intersection

Figure 18: Johnson Highway Intersection Improvements

Table 3. Intersection Improvement Summary

Intersecting Roadway	Improvements	Total Project Cost
Lafayette Street	• Coordinate traffic signal timings with Main Street and modify to a two-phase system. • Remove right-turn channelization along eastbound Lafayette Street (PennDOT) • Restripe to provide a separate northbound left-turn lane, through lane, and right-turn lane along DeKalb Street. • Restripe to provide a separate southbound left-turn lane and a shared through/right-turn lane along DeKalb Street. • Parking restrictions.	• $244,795
Main Street	• Coordinate traffic signal timings with Lafayette Street and modify to a two-phase system. • Restripe to provide a separate left-turn lane and a shared through/right-turn lane along northbound and southbound DeKalb Street. • Continue to restrict westbound left-turns and eastbound right-turns along Main Street at this intersection. • Parking restrictions.	• $239,469
Penn Street	• Restripe to provide a northbound shared through/left-turn lane and a southbound shared through/right-turn lane along DeKalb Street.	• $51,770
Airy Street	• Coordinate traffic signal timings along DeKalb Street corridor. • Restripe to provide a separate northbound left-turn lane along DeKalb Street. • Restripe to provide a southbound shared through/right-turn lane along DeKalb Street. • Provide pedestrian facilities including high-visibility crosswalks • Parking restrictions.	• $199,164
Marshall Street	• Coordinate traffic signal timings along DeKalb Street corridor. • Restripe to provide a separate left-turn lane and a shared through/right-turn lane along northbound and southbound DeKalb Street. • Parking restrictions.	• $205,801
Chestnut Street	• Coordinate traffic signal timings along DeKalb Street corridor. • Restripe to provide a shared through/right-turn lane along northbound DeKalb Street. • Restripe to provide a separate left-turn lane and through lane along southbound DeKalb Street. • Parking restrictions.	• $172,293
Oak Street	• Restripe to provide a northbound shared through/left-turn lane and a southbound shared through/right-turn lane along DeKalb Street.	• $32,960
Jacoby Street	• Install a traffic signal and coordinate with signals along corridor. • Restripe to provide a shared through/right-turn lane along northbound DeKalb Street. • Restripe to provide a separate left-turn lane and through lane along southbound DeKalb Street. • Parking restrictions.	• $179,043
Elm Street	• Restripe to provide a shared left/through/right-turn lane along northbound and southbound DeKalb Street.	• $33,425

Table 3. Intersection Improvement Summary (continued)

Intersecting Roadway	Improvements	Total Project Cost
Spruce Street	• Install a traffic signal and coordinate with signals along corridor. • Restripe to provide a separate left-turn lane and a shared through/right-turn lane along northbound and southbound DeKalb Street. • Parking restrictions.	• $187,430
Basin Street	• Restripe to provide a shared left/through/right-turn lane along northbound and southbound DeKalb Street.	• $29,753
Wood Street	• Restripe to provide a shared left/through/right-turn lane along northbound and southbound DeKalb Street.	• $33,830
Fornance Street	• Coordinate traffic signal timings along DeKalb Street corridor. • Restripe to provide a separate left-turn lane and a shared through/right-turn lane along northbound and southbound DeKalb Street. • Additional warning signs to improve detection of traffic signal. • Parking restrictions.	• $215,392
Freedley Street	• Install a traffic signal and coordinate with signals along corridor. • Restripe to provide a separate left-turn lane and a shared through/right-turn lane along northbound and southbound DeKalb Street. • Parking restrictions.	• $215,392
Summit Street	• Restripe to provide a northbound shared through/right-turn lane, and a southbound shared through/left-turn lane along DeKalb Street.	• $35,805
Brown Street	• Restripe to provide a shared left/through/right-turn lane along northbound and southbound DeKalb Street.	• $57,749
Roberts Street	• Restripe to provide a northbound shared through/left-turn lane, and a southbound shared through/right-turn lane along DeKalb Street.	• $27,504
Logan Street	• Restripe to provide a shared left/through/right-turn lane along northbound and southbound DeKalb Street.	• $29,317
Carriage Lane	• Restripe to provide a northbound shared through/left-turn lane, and a southbound shared through/right-turn lane along DeKalb Street.	• $26,984
Johnson Highway	• Modify traffic signal timings • Widen all approaches of intersection (PennDOT) • Restripe to provide a separate left-turn lane and dual through lanes along eastbound Johnson Highway, as well as northbound DeKalb Street. • Restripe to provide a separate left-turn lane, dual through lanes, and a separate right-turn lane along westbound Johnson Highway. • Restripe to provide a separate left, through, and right-turn lane along southbound DeKalb Street.	• $348,550
General Project	• Mobilization, Inspector Field Office & Facilities, Maintenance & Protection, CLS Software	• $280,000
Contingencies	• 30%	• $853,900
Total Estimated Cost		• 3,700,325

5. Corridor Recommendations

The recommended improvements that satisfy the future needs to effectively convert the DeKalb Street corridor to two-way traffic flow comprise the recommended improvement plan. An action and implementation plan is also provided to provide guidance for the various stakeholders involved with this project. The Study Advisory Committee, upon review of the various improvement scenarios, impacts to adjacent properties, and receipt of feedback from PennDOT District 6-0 representatives, recommends the improvements summarized in Table 3 above.

ACTION PLAN

Due to the magnitude of the needed improvements along DeKalb Street, numerous resources will need to be identified, mobilized, and synchronized in order to implement these improvements. Therefore, it is important that an action plan be clearly identified and should be put into use immediately in order to lay the groundwork for future implementation.

The action plan, or implementation process, for the DeKalb Street corridor is broken down in four categories: 1) organizational, 2) regulatory, 3) finance, and 4) additional studies/design. Accordingly, the following action plan is recommended for the DeKalb Street study corridor.

1. **Organizational** – Within the project study area, there are many stakeholder and property owners that will need to work in a concerted effort to implement the recommendations of this study so that the DeKalb Street corridor and its surrounding transportation network can effectively serve future traffic demands. A mutual "partnership" among Norristown (including East Norriton and Bridgeport) and stakeholders will be necessary to implement many of the improvements identified for the corridor.

Action Items	Responsible Parties/ Leaders
a. Add transportation improvements to various Long Range Transportation Improvements Plans and local transportation capital improvements plans.	DVRPC, PennDOT, Montgomery County, Norristown
b. Identify key stakeholders along the corridor (i.e. SEPTA) that will be affected by the improvements, review the preferred improvement plan with them, and establish a work plan to accomplish future improvements.	Norristown
c. Promote the improvement plan and study recommendations through the implementation process at public meetings, meetings with stakeholders, by posting study and recommendation on municipal websites, or via media news articles.	DVRPC, PennDOT, Montgomery County, Norristown

2. **Regulatory** – The Municipality of Norristown can adopt new ordinances, revise existing ordinances, and set policies to help achieve a more efficient transportation corridor and supporting network.

Action Items	Responsible Parties/ Leaders
a. Develop official multi-modal maps that show existing roadways and future roadway traffic flow, as well as non-vehicular transportation facilities (i.e. sidewalks, crosswalks).	Norristown
b. Develop more detailed conceptual plans and/or roadway improvement plans that reflect the recommended improvements. These plans can provide a valuable visual tool for presenting improvements to stakeholders.	Norristown
c. Prepare traffic signal permit plans for all existing and proposed signalized intersections.	Norristown
d. Adopt new on-street parking policies given that spaces may need to be eliminated due to turning lanes.	Norristown
e. Consider this improvement plan during land development reviews and highway occupancy reviews to ensure compliance by proposed projects or to ensure that future implementation of the transportation improvements are not encumbered by land development.	PennDOT, Montgomery County, Norristown
f. Coordinate this project with the other programmed transportation improvement programs in the area (i.e. Lafayette Street, Markley Street, and Johnson Highway.)	Norristown

3. **Finance** – Due to the size of the study area and the scope of needed roadway improvements, implementation of these improvements will be expensive. As such, funding support will be needed from multiple sources, including both Federal and State sources.

Action Items	Responsible Parties/ Leaders
a. Add the project to long range transportation improvement plans (DVRPC TIP, PennDOT 12-Year Plan, etc.) and local transportation capital improvement plans to secure funding. Funding may include Federal, State, County, and local sources.	PennDOT, Montgomery County, Norristown
b. Seek grant funding for transportation improvements and new ordinances or revisions, as	Montgomery County, Norristown

available. Grand funding sources could include Federal, State, and County sources.	
c. Consider establishing transportation impact fees to address new development impacts.	Norristown
d. Integrate various improvements such as traffic signal upgrades into development plans.	PennDOT, Norristown, Developers

4. **Additional Studies/Design/Plans** – Additional and more detailed studies will be required as the improvement plan moves forward. The exact type of study will vary depending on the implementation processes, and as such, it is not possible to identify the exact type of studies at this time. Samples of studies that may be required include:

Additional Studies/Design/Plans
a. Feasibility studies for public transit service along the DeKalb Street corridor.
b. Detailed roadway improvement plans and traffic signal permit plans, in accordance with jurisdictional requirements.
c. Speed study to determine recommended posted speed limit.

Also, it is recommended that this study be updated, as needed, to reflect major development activity and implementation of transportation improvements.

This action plan is not intended to be a detailed or exclusive recommendation, but provide a guideline for various corridor stakeholders.