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BATH 18-008

Master Long-Range Transportation Improvements Plan:

Alternatives Analysis

Borough of Bath
Northampton County, Pennsylvania

November 13, 2019

Prepared For:

Borough of Bath
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Bath, PA 18014

Prepared By:

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Introduction and Background

As part of an ongoing effort by the Borough of Bath to be proactive in developing solutions to address significant existing and projected traffic congestion issues, the Borough has retained Keystone Consulting Engineers, Inc. to review traffic control alternatives and develop a Master Long-Range Transportation Improvements Plan (MLRTIP) specific to the Borough. This Plan will identify needed improvements to the roadway network that will provide the most benefit towards reducing traffic congestion while minimizing anticipated project costs, acquisition of property, and disruption to local residents and businesses. This Plan will also serve as a long-range planning tool and necessary pre-requisite for project grant applications.

Since the MLRTIP will require a substantial commitment of resources to complete, a phased approach is recommended which will provide the opportunity to prioritize improvements and implement less costly/disruptive measures first while still maintaining the ability to employ more substantial measures in the future should the currently experienced traffic congestion issues persist or intensify.

PennDOT Coordination and Required Approvals

Since the vast majority of the roadway network located within the Borough is State-owned, KCE and Borough Staff have met on several occasions with PennDOT to discuss the most appropriate scope of improvements for the MLRTIP. Ultimately, it is understood that PennDOT must endorse and ultimately approve any modifications to the roadway network that are proposed as part of the MLRTIP or any of its sub-phases. In light of this, and specifically in light of the Borough's last meeting with the Department on May, 2, 2019, where the Department requested that the Borough prepare a High-Level Alternatives Analysis that comprehensively considers a wide range of mitigation strategies, the following step-by-step process has been followed to arrive at the proposed scope of improvements identified as part of the MLRTIP:

- Step 1 - Identify the traffic congestion problems currently experienced by the Borough's traveling public.

- Step 2 - Identify the probable causes of the existing traffic congestion.

- Step 3 - Identify potential mitigation strategies that consider a broad-spectrum of alternatives, then qualitatively evaluate alternatives based on how each option proposes to address the items identified in Step 2. Identify which options are recommended for further consideration.

- Step 4 –Define a Master Long-Range Transportation Improvements Plan for the Borough of Bath that incorporates the recommended mitigation strategies

identified in Step 3. This plan depicts the ultimate traffic improvements that are expected to alleviate traffic congestion in the Borough for the next 20-years.

- Step 5 – Using the master plan developed in Step 4, identify project phases. Phased implementation will provide the opportunity to prioritize and try less costly/disruptive measures first while still maintaining the ability to employ more substantial measures in the future should the currently experienced traffic congestion issues persist or intensify.

I. Step 1 – Identify Existing Traffic Congestion Problems

The traffic congestion problems experienced by Borough residents and businesses, as well as by the traveling public passing through the Borough, are common occurrences, especially during afternoon peak time period. Excessive queuing has been observed in the locations illustrated in ***Figure 1C***. In these conditions, several signal cycles are needed to clear each respective traffic signal.

II. Step 2 – Identify Probable Causes of Existing Traffic Congestion

The following measures were taken to identify the probable causes of the traffic congestion experienced in the Borough:

- Collection of Traffic Count Data (***see Figure 1A***)

    - Twelve (12 Hours) of turning movement counts and video were collected at the twelve (12) major intersections within the Borough.
    - Inbound/outbound volume counts were collected on the seven (7) major State Highways that provide access to/from the Borough.
    - Volume capture data to verify pass-through traffic and to confirm origin-destination patterns was obtained using Wifi recording devices.
    - Queue counts to determine maximum queue lengths and unmet traffic demand (number of cars still in-queue when the light turns red) were performed.

- Field Visits

    - Field-verification of existing traffic signal operations was performed by KCE staff. This included measuring observed field timings and comparing them to the values depicted on the respective Condition Diagram for each signalized intersection.

    - Various flow-friction factors were determined by general observation of traffic conditions. This included items like queue spillback, single lane

intersection blocking, vehicle "run-around" using de-facto lanes, truck turning maneuvers, mid-block turning, etc.

- Consideration of Borough Staff Testimonials

    - Data collection results and observations were reviewed with Borough Staff to compare with their day-to-day experiences.

Causes of Traffic Congestion

Based on the information obtained from the above measures, the following is a discussion of the factors that are believed to be significant contributors to the traffic congestion experienced in the Borough:

A. Heavy Traffic Volumes - A review of the traffic volumes and movement capacities in the Borough indicate that volumes for certain movements are either nearing capacity or are high enough to consume the majority of the capacity for a given movement (i.e. northbound thru/right movement at Walnut and Northampton Street and the northbound/thru right movement at Walnut and Main Street have v/c ratios of 0.89 and 0.65, respectively, during the 2024 PM Peak Hour projected conditions analysis). While an independently conducted HCM analysis suggests that the traffic volumes alone are not significant enough to cause the observed congestion issues (movement levels-of-service are reported as LOS C or better), the above noted v/c ratios indicate that the traffic volumes are significant enough to produce a greater instability in traffic conditions when considering the cumulative effect of other contributing factors. An example is that of a tractor-trailer turning slowly through a narrow intersection. The slow-moving tractor-trailer causes delay to the upstream traffic that would not otherwise be caused by smaller vehicles. During very light traffic conditions, both the slow-moving tractor trailer and the remainder of the traffic demand behind the tractor-trailer may have time to clear the intersection within the green time allocated for that particular signal phase. However, during heavier traffic conditions the additional delay caused by the slow-moving tractor trailer may be enough to cause the demand traffic volume to exceed capacity. This would result in some vehicles arriving on red that would otherwise have cleared the signal.

B. Close Intersection Spacing / Traffic Flow Patterns - The primary traffic flow patterns in the Borough and the intersection spacing/configuration have been observed to contribute to congested traffic conditions in the Borough, as further described below:

    - There are two main traffic flow paths via Race/Chestnut Streets and SR 512 (Walnut Street) that flow from south to north through the Borough that both

convey approximately 500 veh/hour of traffic during the PM peak hour (***see Figure 1A***).

- In general, during PM peak conditions, the heavy south to north traffic on Chestnut Street acts as a "barrier" that impedes the flow of westbound traffic on Northampton and Main Streets between Chestnut and Walnut streets (The vehicle storage capacity on the roadway segments between Chestnut and Walnut Streets is only 250-feet and 165-feet for Main and Northampton Streets, respectively – this is in part due to the location of the stop bars which have been pulled back to help convey tractor trailers through the confined Borough intersections). This causes congestion and spillback on Northbound Walnut Street, and westbound Main and Northampton Streets.

- *Westbound approach to Main St. / Chestnut Street intersection* - The signing configuration along Main Street at Race and Chestnut Streets provides for free-flow movement of vehicles from Race Street to Chestnut Street. During times of heavy traffic congestion, westbound vehicles are not able to find gaps in the oncoming traffic since the opposing traffic stream is heavy and free-flowing.

- *Westbound approach to Northampton Street / Chestnut Street intersection* – In addition to limited green time allocated to the east/westbound signal phase, the westbound approach is further hindered by westbound left turning traffic that must wait for gaps in the eastbound through traffic stream before completing the left turn maneuver. Since the geometry of this intersection does not allow for westbound through and right turning traffic to "run-around" a stopped vehicle, the queue can quickly grow to spill-back into the adjacent Walnut/Northampton Street intersection and affect upstream traffic conditions. This is further exacerbated if one or more of the queued vehicles is a tractor-trailer.

C. Confined Intersection Geometry - The Borough of Bath was initially established in 1728, and as such contains many historic structures that line the Borough's road network in a traditional style with shallow front yard setbacks and small radii at intersection corners. As a result, certain types of truck traffic have been observed to experience difficulty in negotiating Borough roads, which leads to problems ranging from slowed turning maneuvers to complete blockages at times. These types of occurrences are expected to worsen as the amount of truck traffic continues to increase in the Lehigh Valley and surrounding regions.

D. Left Turns from Single Approach Lanes - Due to the geometric constraints described above, all Borough intersections consist of single-lane approaches from which all turning maneuvers are performed. This results in the potential for

a single left-turning vehicle to block or significantly impede the flow of traffic while waiting for gaps in opposing traffic flow to complete permitted turning maneuvers. Most Borough intersections are wide enough to support the "run-around" of thru-traffic, however, additional delay is still incurred as vehicles must move slower to safely navigate around the waiting left turn vehicle. As previously mentioned, the westbound approach to the Chestnut Street & Northampton Street intersection becomes completely blocked by a waiting left turn vehicle since the intersection geometry does not allow for the run-around of through traffic.

E. Friction from On-Street Parking Maneuvering - Off-street parking is limited in the Borough due to space constraints. On-street parking is permitted on one or both sides of Borough roadways to accommodate the excess parking demand. The excess maneuvering associated with parallel on-street parking, as well as the potential for double-parked vehicles (i.e. delivery vehicles) can serve to further impede the flow of traffic and contribute to traffic congestion in the Borough.

F. Driver Confusion, Frustration and Delay Due to Unorthodox Existing Sign Configuration - The Main Street intersections with Race and Chestnut Streets are unsignalized and are signed to allow for the free-flow movement of northbound and southbound traffic between Race and Chestnut Streets. Further, limited sight distance is available on northbound Race and Southbound Chestnut Streets which further require that traffic be stopped along Main Street to allow for the safe conveyance of traffic. This area appears to be a source of driver confusion and frustration as evidenced by audible vehicle horns which have been witnessed and reported on several occasions. Further, additional delay is incurred as drivers naturally take longer to make decisions during unfamiliar/unorthodox situations.

G. Variable traffic patterns - Recently conducted traffic counts have confirmed that traffic demand varies significantly from one 15-minute interval to the next over the course of an average weekday. Since three of the four existing traffic signals in the Borough are pre-timed with fixed cycle lengths, splits, and offsets, the existing signal system lacks the functionality to adapt to changing traffic conditions.

H. Static Signal Timings - Based on a field-measurements obtained on July 30, 2019, the offset values between the signalized intersections were observed to have drifted approximately 3 to 4 seconds from those indicated on the approved Condition Diagrams. Further, the existing signals are programed as pre-timed and three of the signals have no vehicle detection. This allows for no opportunity for the traffic to respond to vehicle inputs and results in all intersection approaches receiving the same amount of green time, regardless of traffic demand.

III. Step 3 – Identify and Evaluate Potential Mitigation Strategies

In an effort to consider a broad spectrum of alternatives, several potential mitigation strategies have been identified below (***see Figure 2 - Summary of Potential Mitigation Strategies***):

A. Truck Traffic Diversion/Turn Restrictions – In targeting ***congestion cause II.A, II.B, II.C, and II.D***,, per above (Traffic Volumes, Flow Paths/Intersection Spacing, Geometry, and Left Turns, respectively), traffic diversion has been considered as a potential mitigation strategy. Specifically, two types of potential traffic diversion have been identified: 1.) *External* diversion of traffic to alternate roadways *outside* of the Borough, and 2.) *Internal* diversion of traffic to alternate roadways *within* the Borough that are better able to accommodate it.

1. External Diversion – It is our understanding that a "Bath Bypass" consisting of a circular roadway around the Borough has been discussed with local planners for several decades. We also understand that an alternate route for truck traffic between SR 987 (Race Street) and SR 512 in the vicinity of the SR 512/Silvercrest Road intersection has been contemplated and added to the Long-Range Transportation Plan. While implementation of these and other similar projects would completely or partially eliminate the Borough's traffic congestion problems, we also understand that the PennDOT is not in support of this project due to magnitude of anticipated project cost and the unlikelihood of obtaining the necessary funding.

   Recommendation: In light of the above, we believe that external diversion is not a suitable mitigation strategy and should not be relied upon to provide congestion relief for the foreseeable future.

2. Internal Diversion – The Lehigh Valley Planning Commission / Lehigh Valley Transportation Study recently completed the *Bath Multimodal Safety + Parking Analysis*. One of the recommendations of this study was to convert Mill Street into a designated truck route, pending certain improvements to Mill Street as detailed in the study (***see attached study excerpts***). We concur with the study findings that utilization of Mill Street as a truck route would significantly improve traffic operations in the Borough since it would divert trucks away from key downtown intersections via an alternate route to a location where trucks could be more easily accommodated. While this strategy appears feasible for truck traffic traveling from west to east on Mill Street, our independent evaluation of tractor trailer maneuverability has revealed that the southbound right turn from SR 512 onto Mill Street westbound is not

sufficient to accommodate tractor trailer traffic without the acquisition of property. In light of this, internal diversion via Mill Street would require acquisition of property or would require that the route be restricted to eastbound traffic only.

Recommendation: In light of the above, we recommend that Mill Street be improved per the recommendations in the above noted LVPC/LVTS study and used as a truck route in the eastbound direction. We further recommend that the use of Mill Street as a truck route in the westbound direction be evaluated in light of the cost of acquiring the property at the northwest corner of SR 512 and Mill Street to accommodate tractor trailers. If property acquisition costs outweigh the benefits received, an alternate truck route should be evaluated for trucks destined to SR 248 (Race Street).

B. Adaptive Traffic Control Technologies – In targeting ***congestion cause II.G and II.H. (Variable traffic patterns and Signal Timings)***, implementation of adaptive traffic controllers has been identified as a mitigation strategy. Adaptive controllers will allow traffic signals to change responsively to actual traffic demand rather than rely on the existing fixed time-of-day plans that have no ability to change with variable traffic conditions.

Recommendation: While we understand that adaptive controllers are not effective during oversaturated conditions, we believe that adaptive operation will shorten the *duration* of oversaturation and also improve the quality of traffic flow during undersaturated conditions. In that regard, the Borough of Bath has submitted a TE-153 application for approval to implement adaptive controllers in the Borough. However, as suggested by the Department and an interim step prior to implementing full adaptive traffic control, the intersections should be upgraded to include detection capabilities, new ATC type controllers, and broad-band radio communications. While these interim measures don't directly account for the observed variability in traffic demand, they will provide a level of dynamic functionality that the existing pre-timed signals are not capable of. Following implementation of the interim signal measures, the high-resolution data provided by the new ATC controllers can be used to further evaluate the need for full adaptive traffic control.

C. Provision of Left-Turn Lanes - In targeting ***congestion cause II.B. and II.D. (close intersection spacing, and left turns from single approach lanes, respectively)***, provision of center turn lanes has been identified as a potential mitigation strategy. Since the volume of left turning vehicles typically averages between only 1 to 2 vehicles per approach per cycle, the installation of even minimum length left-turn lanes is expected to provide a significant benefit to traffic flow as

left-turning vehicles would be able to wait for a gap in opposing traffic without impeding the flow of traffic in the adjacent through lane. However, a drawback to this strategy would be the required relocation of on-street parking to off-street locations since the entire curb-to-curb pavement width would be needed to accommodate the necessary pavement markings. Also, the provision of left turn lanes would negatively impact the ability of tractor-trailers to negotiate turning movements at Borough intersections.

Recommendation: While the provision of left turn lanes would provide a measurable benefit to traffic flow and should be pursued, these benefits should be carefully weighed against the above noted drawbacks during the improvement options development process. Potential workarounds to be explored include property acquisition to improve intersection geometry and the repurposing/reconfiguration of nearby paved areas to accommodate off-street parking demand.

D. Implementation of One-Way Traffic Patterns - In targeting ***congestion causes II.A, II.B, II.D, II.F, II.H (Traffic Volumes, Flow Paths/Intersection Spacing, Geometry, Left Turns, Existing Sign Configurations, and Signal Timings, respectively)***, provision one-way traffic patterns has been considered as a potential mitigation strategy.

Potential benefits to one-way traffic patterns in the Borough of Bath would include the following:

1. Left turn conflicts eliminated – this results in greater capacity/efficiency as well as reduced crash potential.
2. Better progression due to one-way signal coordination.
3. Would allow existing parking spaces to be preserved.
4. Heavy vehicle turns onto a two-lane, one-way street would be easier to accommodate.

Potential disadvantages to one-way traffic patterns would include the following:

1. Increased Vehicle-Miles traveled due to more circuitous travel routes
2. Increased potential for driver confusion, especially for drivers unfamiliar with the area.
3. Perceived negative benefit to local businesses
4. Left turns from two-lane, one-way roadways would become more difficult to negotiate for truck traffic.

Recommendation: We believe that one-way streets would provide many advantages to Borough traffic that would be otherwise unattainable without

significant property acquisition and construction efforts. However, due to the above noted disadvantages, we further recommend that one-way streets be implemented only if the results of a forthcoming quantified traffic analysis indicate a *significant* travel-time reduction as compared to two-way traffic flow.

E. Provision of Roundabouts - In targeting ***congestion cause II.A, II.B, II.D, II.F, II.G, and II.H (Traffic Volumes, Flow Paths/Intersection Spacing, Left Turns, Existing Sign Configurations, Variable Traffic Patterns, and Signal Timings, respectively)***, provision of roundabouts has been identified as a potential mitigation strategy, however, has not been seriously considered since provision of roundabouts would require extensive property acquisition to be able to provide roundabouts capable of supporting tractor-trailer traffic.

Recommendation: In General, roundabouts should not be considered as a mitigation strategy in the Borough of Bath due to the constraints of limited right-of-way and the presence of tractor trailer traffic.

F. Implementation of Travel Demand Management (TDM) Strategies – In targeting ***congestion causes II.A, (Traffic Volumes)***, travel demand management has been considered as a potential mitigation strategy. In general, TDM is the application of strategies and policies to reduce travel demand, or to redistribute this demand in space or in time. Examples of TDM would include staggering shift times, providing carpooling incentives, enhancements in public transportation, etc.

Recommendation: Since data collection efforts suggest that over 90% of the Borough's traffic originates from or is destined to locations outside of the Borough and is therefore beyond the Borough's control, TDM is not recommended as a mitigation strategy for the Borough of Bath.

G. Provision of Intersection Geometry Improvements – In targeting ***congestion cause II.C, (Intersection Geometry)***, corner radii improvements have been considered as a potential mitigation strategy. While improving every intersection corner radius to improve truck traffic flow appears to be impractical since it would require extensive property acquisition and building demolition, improving certain key radii in conjunction with truck route diversions would seem to result in a reasonable compromise between the quality of traffic flow and the preservation of existing structures.

Recommendation: In light of the above, corner radii improvements should be considered where deemed necessary based on designated truck routes within the Borough.

IV. Step 4 – Develop a Master Long-Range Transportation Improvements Plan for the Borough of Bath

The above recommended mitigation strategies have been considered and coordinated into a single Master Long-Range Master Transportation Improvements Plan in a manner that addresses the causes of congestion indicated in Step 2 and that allows for phasing of improvements. The specific plan elements and anticipated benefits are described below and are illustrated on the attached concept plan (***See Figure 3C***):

A. Truck Traffic Routes and Restrictions

1. Mill Street between Race Street and SR 512 should be reconstructed to accommodate truck traffic (the existing bridge is currently being reconstructed to accommodate truck traffic).

2. Signage should be implemented to prohibit trucks over a certain length (length restriction to-be-determined) from traveling northbound on Race Street between Mill Road and Main Street. Trucks would be redirected to points north and east via Mill Road and SR 512. This will require that the Department prepare an engineering study to justify the proposed truck restriction and install appropriate signage.

3. Proposed truck routes through the Borough have been determined based on the following criteria and have been graphically illustrated in the attached Truck Routing Diagrams (***See Figures 4A – 4G***):

    i. Existing truck origins and destinations based on daily truck volumes (see Daily Truck Volume Map)
    ii. Ability of roadways and intersections to adequately convey tractor-trailer traffic (i.e. roadway width, size of radii, etc.).
    iii. Ability to acquire the needed property to construct improvements to facilitate truck traffic (i.e. Mill Street diversion, corner radii improvements).
    iv. The presence of a suitable alternate truck route (if restrictions are proposed).

4. The truck routes illustrated in Figures 4A – 4G would need to be delineated with appropriate truck routing and restriction signage.

B. Adaptive Traffic Control Technologies

1. Adaptive Traffic Control Technologies should be implemented at the four signalized intersections in the Borough. This will allow for the efficient and

dynamic allocation of green time to serve the highly variable traffic demand observed in the manual traffic counts.

C. Provision of Left Turn Lanes

1. Left Turn lanes should be provided at the following locations to alleviate traffic congestion caused by single left-turning vehicles blocking or impeding flow of adjacent through traffic:

    i. Walnut and Main Streets (northbound, westbound, and southbound approaches)
    ii. Walnut and Northampton Streets (northbound, westbound, and southbound approaches)
    iii. Northampton Street and Chestnut Street (eastbound and westbound approaches - only during Phase 2)

2. Provision of the above noted left turn lanes will result in the loss of approximately 81 on-street parking spaces. The proposed parking areas depicted on the plan provide 91 new off-street spaces for a net gain of about 10 spaces.

3. Provision of off-street parking spaces will require coordination and possible acquisition with the affected property owners

D. Implementation of One-Way Traffic Patterns

A counter-clockwise one-way traffic pattern is recommended along the following roadways:

1. Main Street between Northampton Street and Chestnut Street
2. Chestnut Street between Main Street and Northampton Street
3. Northampton Street between Chestnut Street and Main Street

In addition to the applicable general benefits listed in Section III.D., the following specific benefits are anticipated by the implementation of the above one-way traffic pattern:

1. The westbound spillback on Main and Northampton Streets between Walnut and Chestnut streets will be minimized or eliminated as follows:

    i. The westbound movement on Main Street will be able to make a free-flowing right turn onto the easternmost travel lane on Chestnut Street (2-lanes northbound). Similarly, the eastbound movement on Main Street will be able to make a free-flowing left turn into the westernmost travel

lane on Chestnut Street. As shown in ***Figure 3C***, The provision of free-flowing movement will require the construction of a channelizing island and is anticipated to eliminate eastbound spillback on Main Street during normal peak traffic conditions.

ii. Due to the confined geometry at the Main Street / Chestnut Street intersection, the above mentioned free flowing right turn would not support tractor-trailer movements. In light of this, and as discussed above, truck traffic would be directed to the routes delineated in ***Figures 4A – 4G***.

iii. Since left turns would no-longer be permitted from Northampton Street onto Chestnut Street, the delay and queueing associated with the existing permissive left turn movement would be eliminated. Further, since Northampton Street west of Chestnut Street would be one-way (2-lanes westbound), two westbound through lanes could be provided at the Northampton / Chestnut Street intersection to increase capacity and further reduce vehicle queues.

2. On-street parking in the vicinity of one-way streets is largely un-affected.

3. The proposed one-way pattern on westbound Northampton Street allows for additional roadway width to accommodate southbound left turning vehicles from Chestnut Street onto westbound Northampton Street (note: consideration was given to relocating all southbound truck traffic to southbound SR 512, and then providing access to Race Street via Mill Street, however, this would require the razing of the historic property at the northeast corner of the Walnut Street / Mill Street intersection – The proposed one-way pattern provides an alternate truck route that preserves existing historic structure).

4. The proposed one-way pattern eliminates the confusing and frustrating signage configuration at the Main Street intersections with Race and Chestnut Streets. Right-turns into the one-way pattern from Race Street are accommodated by a simple yield right turn similar to that of a roundabout.

5. The PennDOT programmed improvements to the Main Street and Northampton Street Intersection are complimentary to transitioning to a one-way pattern. With some minor island and striping adjustments, the two-way western approach of Main Street splits into one-way operation in a manner similar to that of a roundabout.

Implementation of the above described one-way pattern will result in the following required improvements:

1. Acquisition of the entire property at the southwest corner of Main/Race Street intersection, and associated radius improvements to accommodate southbound trucks destined to Race Street.

2. Radius improvements at the southeast corner of the Main/Race Street intersection. Some minor property acquisition will be required, however, the existing structure will remain.

3. Radius improvements at the northeast corner of the Walnut/Main Street intersection. This improvement will require property acquisition, utility relocation, and reconfiguration of the retail parking area, however the existing businesses will remain.

4. Reconfiguration of the internal island and striping at the intersection of Main/Northampton Streets.

5. Radius improvements at the northwest corner of the Northampton/Chestnut Street intersection. Some minor property acquisition may be required however the existing structure will remain.

6. Construction of a curbed channelizing island at the intersection of Main and Chestnut Streets.

7. General striping and signage modifications.

E. Additional Intersection Radius Improvements (not associated with the proposed one-way traffic pattern)

In an effort to maintain and/or improve truck mobility through the Borough, the following Intersection radius improvements are proposed (***see Figures 3C & 4A – 4G***):

1. Acquisition of the entire property at the southeast corner of the Walnut/Northampton Street intersection, and associated radius improvements to accommodate trucks with destinations to the east on Northampton Street (SR 248).

2. Potential acquisition of the entire properties at the southeast and southwest corners of the Walnut/Main Street intersection, and associated radius improvements to accommodate trucks with destinations to the south on Walnut Street and to the east on Main Street. These improvements may not be needed

depending on the suitability of the other Borough improvements to adequately convey tractor trailer traffic, but should be subject to further consideration.

3. Radius improvements at the northeast corner of the Walnut/Northampton Street intersection. Some property acquisition may be required however the existing structure will remain.

V. Step 5 – Identify Project Phases

The above identified MLRTIP has been divided into phases that consecutively build on each other towards the completion of the entire Plan. Depending on the availability of project funding and the general consensus of the Department and the Borough regarding the timeliness of the need to implement various portions of the MLRTIP, the project phases could be broken up differently or the project could be constructed as a single project without phasing.

The proposed project phases have been delineated in the attached Concept Plans (***See Figures 3A, 3B, and 3C***).

VI. Conclusion

In light of the above analysis and supporting documentation contained in this report, we believe that above described MLRTIP should be further pursued. In that regard, we recommend that proposed MLRTIP be studied in further detail as part of a Traffic Impact Study prior to final acceptance by the Borough and PennDOT. Specifically, the study should include the following:

- Existing, No- Build, and Build Analyses (5 and 20-year projections) for the MLRTIP
- Macro-analysis using HCM 2010 methodologies and Synchro v. 10 (LOS and 95th Percentile Back of Queue)
- Micro-simulation analysis using SimTraffic (travel time comparison)
- Geometric Review of Proposed intersection Improvements (identifying property acquisitions required)

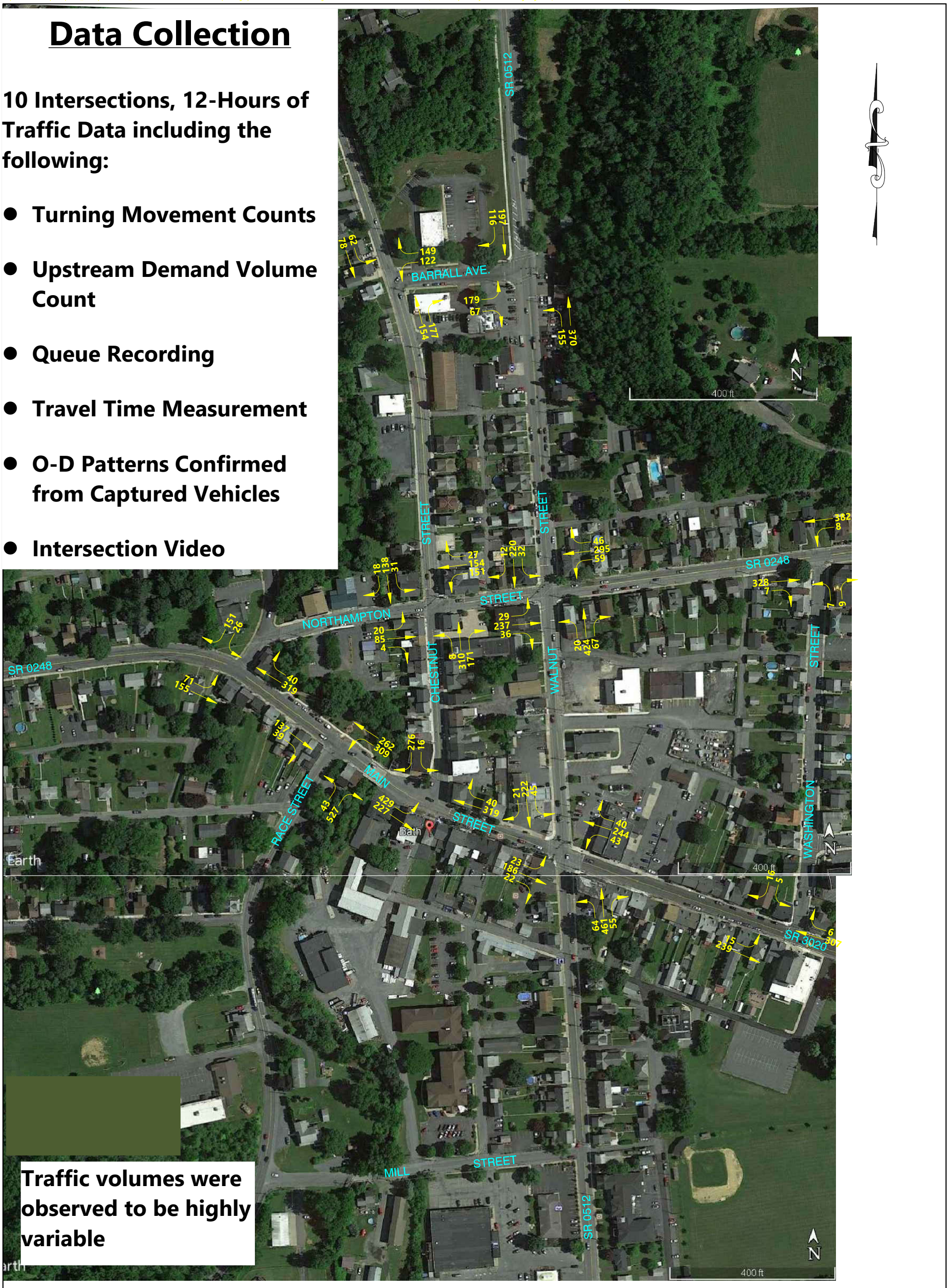
In addition to preparation of the above Traffic and Preliminary design study, we also recommend further consideration and coordination with the *Bath Multimodal Safety + Parking Analysis* prepared by the Lehigh Valley Planning Commission.

The Borough and KCE look forward to further dialogue with PennDOT, and the LVPC as we collectively work towards improving mobility in the Borough of Bath.

Data Collection

10 Intersections, 12-Hours of Traffic Data including the following:

- **Turning Movement Counts**
- **Upstream Demand Volume Count**
- **Queue Recording**
- **Travel Time Measurement**
- **O-D Patterns Confirmed from Captured Vehicles**
- **Intersection Video**



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CHECKED BY:			BOROUGH OF BATH NORTHAMPTON COUNTY, PENNSYLVANIA
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SCALE:	1"=80'		
JOB NUMBER:	BATH-18-008		
SHEET:	1 OF 1		

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FIGURE 1A

DESIGNED BY:		REVISIONS	DAILY TRUCK VOLUMES
DRAWN BY:	GJG	NO. DATE DESCRIPTION	2019 ENGINEERING AND TRAFFIC SURVEY
CHECKED BY:			BOROUGH OF BATH
DATE:	11/05/19		NORTHAMPTON COUNTY, PENNSYLVANIA
SCALE:	1"=80'		GRAPHIC SCALE 80' 0 40' 80' 160' SCALE: 1" = 80'
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SHEET:	1 OF 1		

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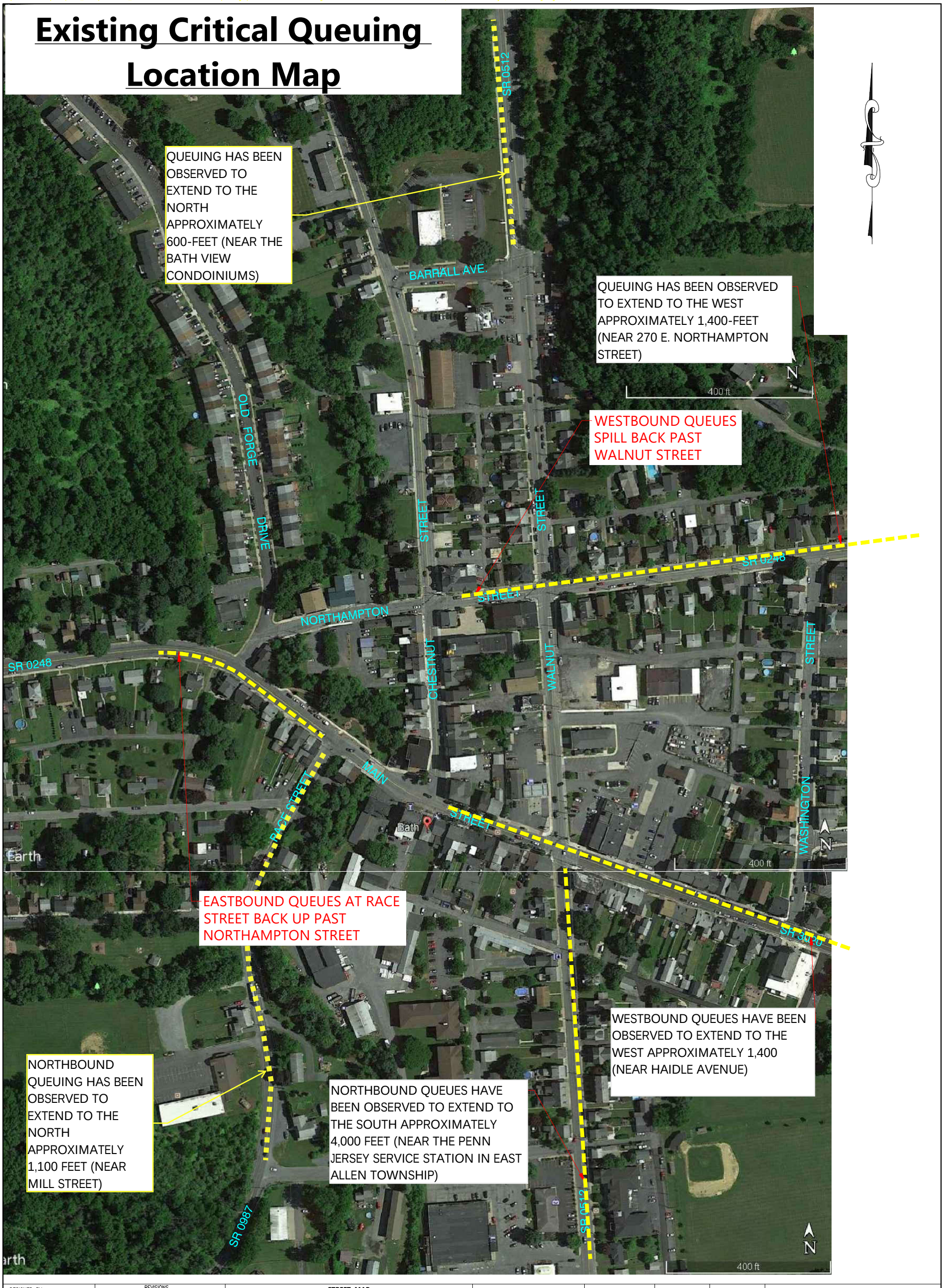
FIGURE 1B

Existing Critical Queuing Location Map



DESIGNED BY:		STREET MAP
DRAWN BY:	STP	2019 ENGINEERING AND TRAFFIC SURVEY
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DATE:	3/21/19	BOROUGH OF BATH
SCALE:	1"=80'	NORTHAMPTON COUNTY, PENNSYLVANIA
JOB NUMBER:	BATH-18-008	
SHEET:	1 OF 1	

REVISIONS

NO.	DATE	DESCRIPTION

GRAPHIC SCALE
80' 0 40' 80' 160'
SCALE: 1" = 80'
SLANTED TEXT INDICATES EXISTING FEATURES
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FIGURE 1C

FIGURE 2

Borough of Bath - Long-Range Transportation Improvement Plan

Summary of Potential Mitigation Strategies[1]

Probable Causes of Existing Traffic Congestion (See Section II)		Potential Mitigation Strategies Considered (See Section III)						
		III.A.	III.B.	III.C.	III.D.	III.E.	III.F.	III.G.
		Truck Traffic Diversion/Turn Restrictions	Adaptive Traffic Control Technologies	Provision of Left-Turn Lanes	Implementation of One-Way Traffic Patterns	Provision of Roundabouts	Impelmentation of TDM Strategies	Provision of Intersection Geometry Improvements
II.A.	Heavy Traffic Volumes	Recommended		Recommended	Recommended	Not Recommended	Not Recommended	
II.B.	Close Intersection Spacing / Traffic Flow Patterns	Recommended		Recommended	Recommended	Not Recommended		
II.C.	Confined Intersection Geometry	Recommended						Recommended
II.D.	Left Turns from Single Lane Approaches	Recommended		Recommended	Recommended	Not Recommended		
II.E.	Friction from On-Street Parking Manuevers							
II.F.	Driver Confusion/Frustration Due to Existing Sign Configuration				Recommended	Not Recommended		
II.G.	Variable Traffic Patterns		Recommended			Not Recommended		
II.H.	Static Signal Timings		Recommended		Recommended	Not Recommended		

Notes:

1. **"Recommended"** indicates that a potential mitigation strategy is both effective and recommended for use in the Borough of Bath; **"Not Recommended"** indicates that a potential mitigation strategy would be effective, but is not recommended for implementation due to reasons discussed in Section III of this report; Shaded cells indicate that a potential mitigation strategy is not expected to be effective and has therefore not been considered.

PHASE 1A IMPROVEMENTS

- INSTALL VEHICLE DETECTION
- SIGNAL CONTROLLER UPGRADES
- INSTALL RADIO COMMUNICATIONS
- PROVIDE NORTHBOUND AND SOUTHBOUND LEFT TURN LANES AT WALNUT AND MAIN STREET INTERSECTION
- PROVIDE CHANNELIZATION AND PARKING REMOVAL AT MAIN AND CHESTNUT INTERSECTION

PHASE 1B IMPROVEMENTS

- INSTALL PEDESTRIAN SIGNALS, ADA RAMPS, AND CROSSWALKS
- INSTALL ADAPTIVE TRAFFIC CONTROLLERS

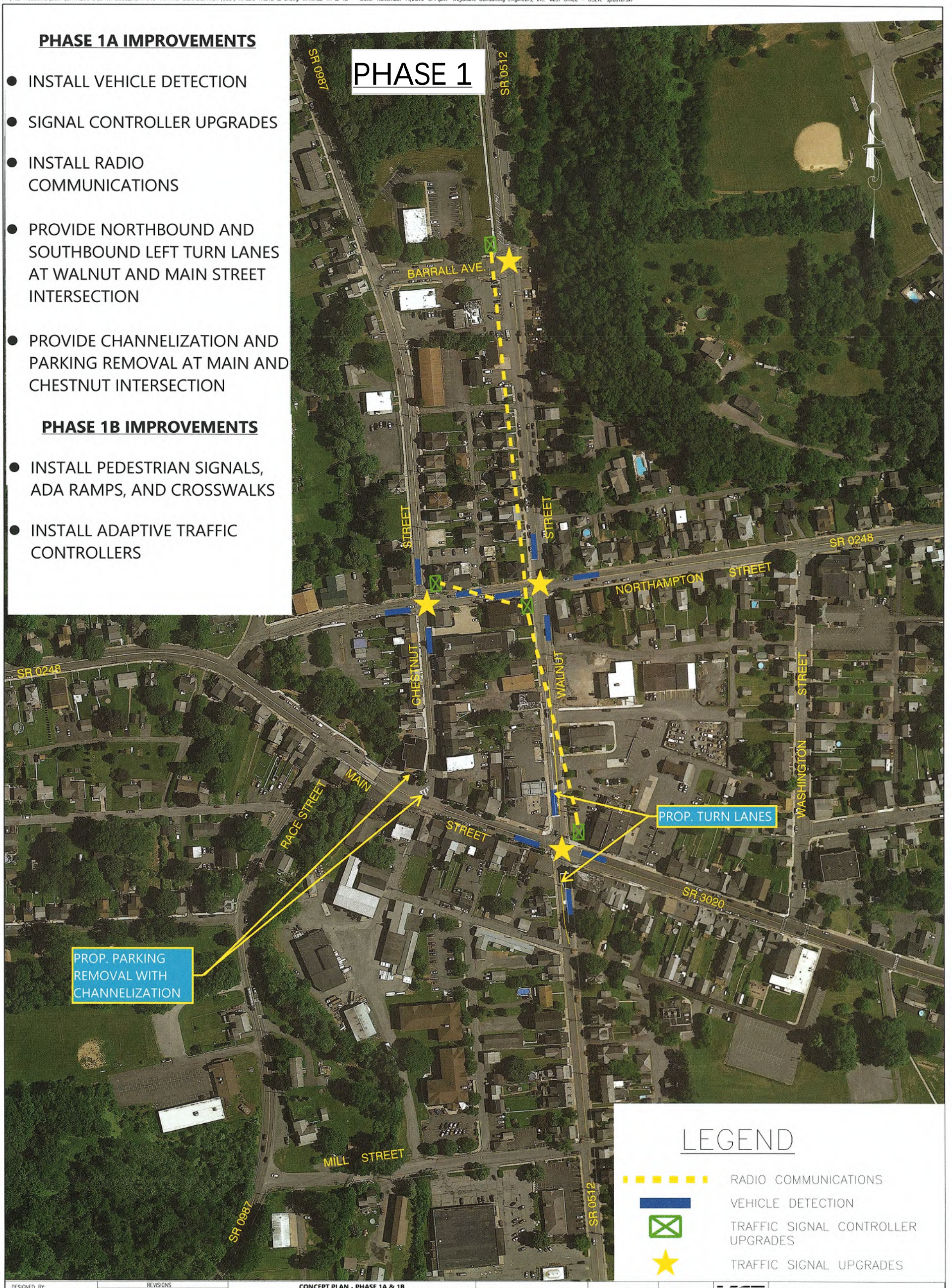

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FIGURE 3A

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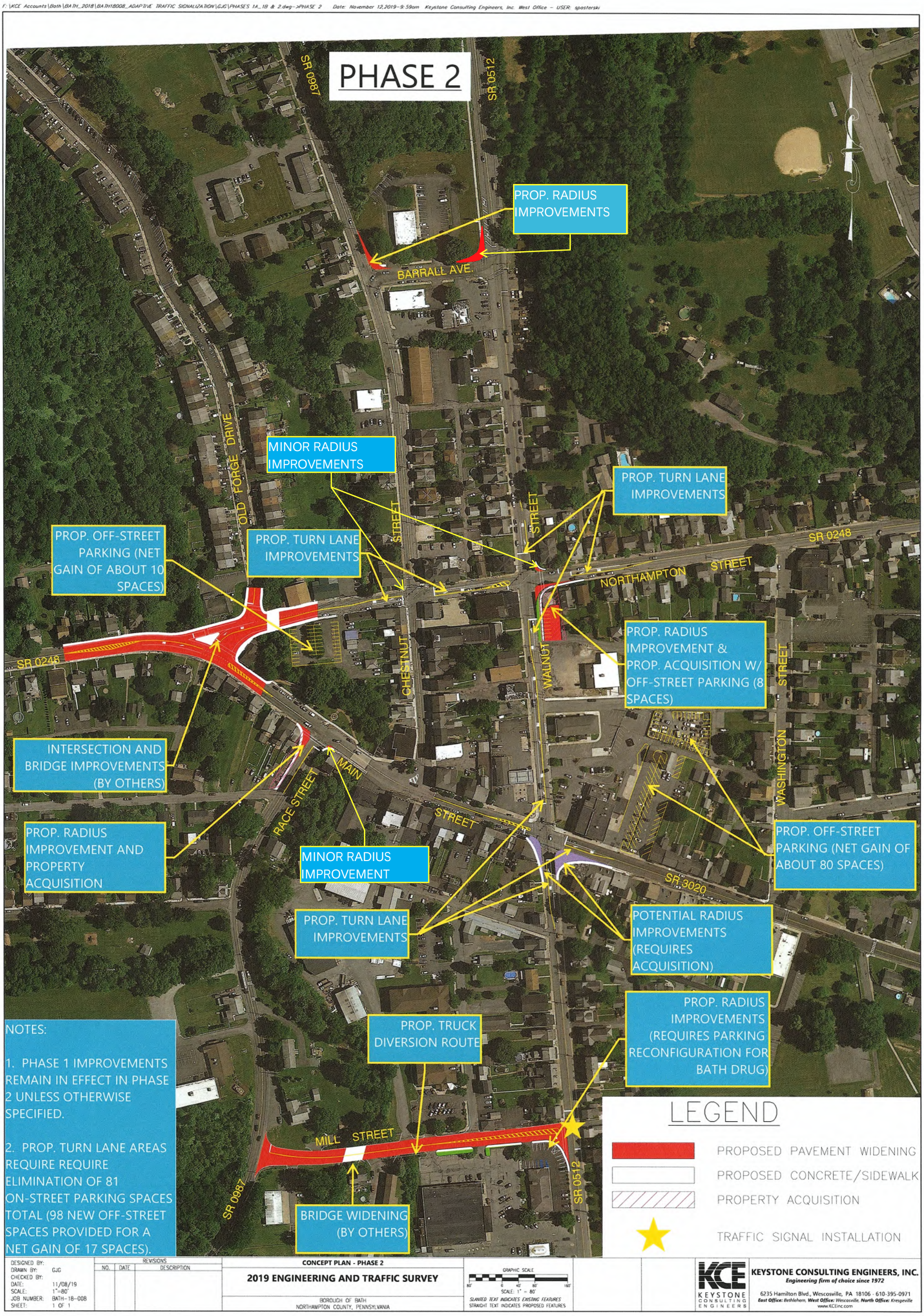

FIGURE 3B

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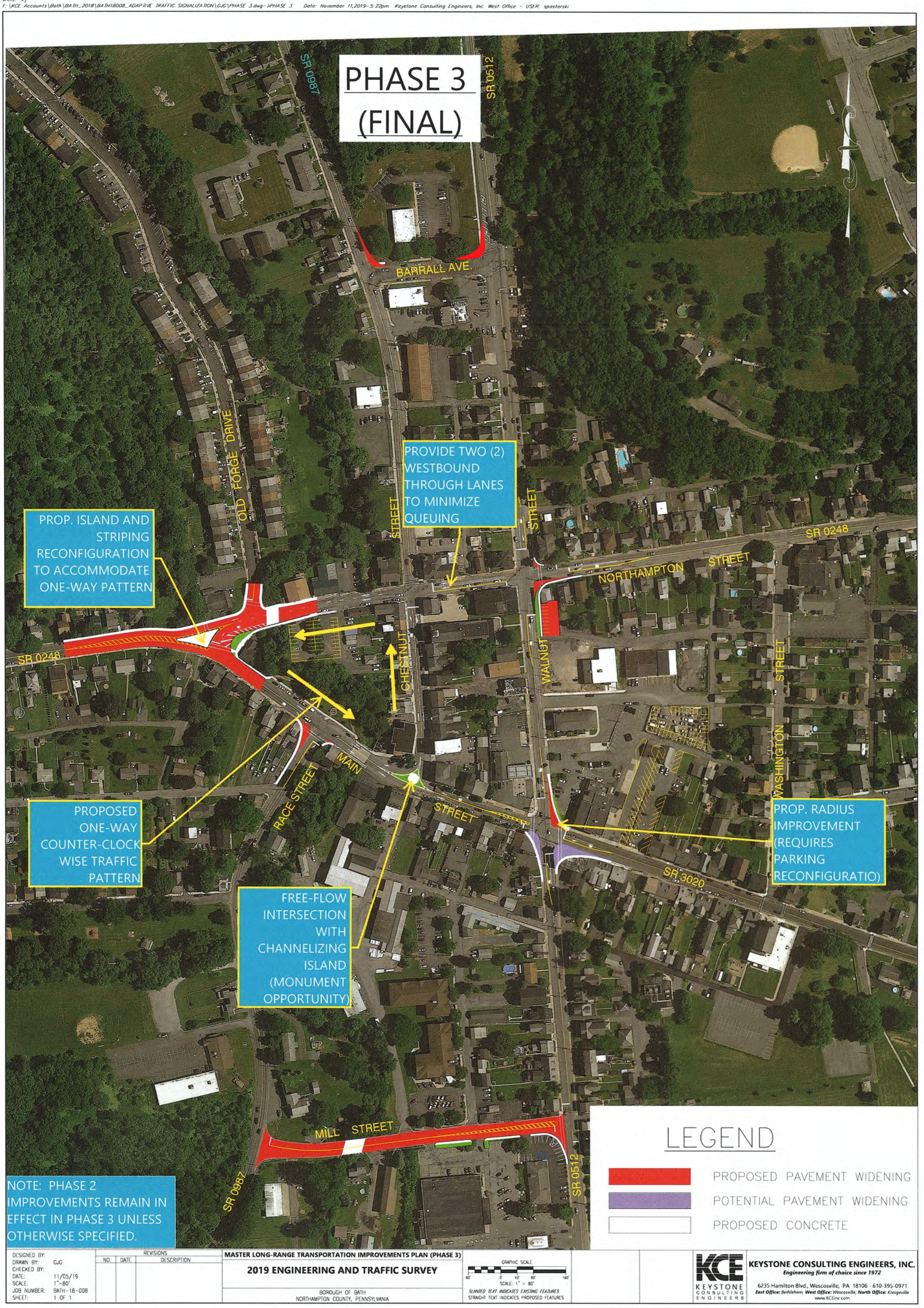

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SCALE: 1"=80'		GRAPHIC SCALE 80' 0 40' 80' 160' SCALE: 1" = 80'	www.KCEinc.com
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FIGURE 3C

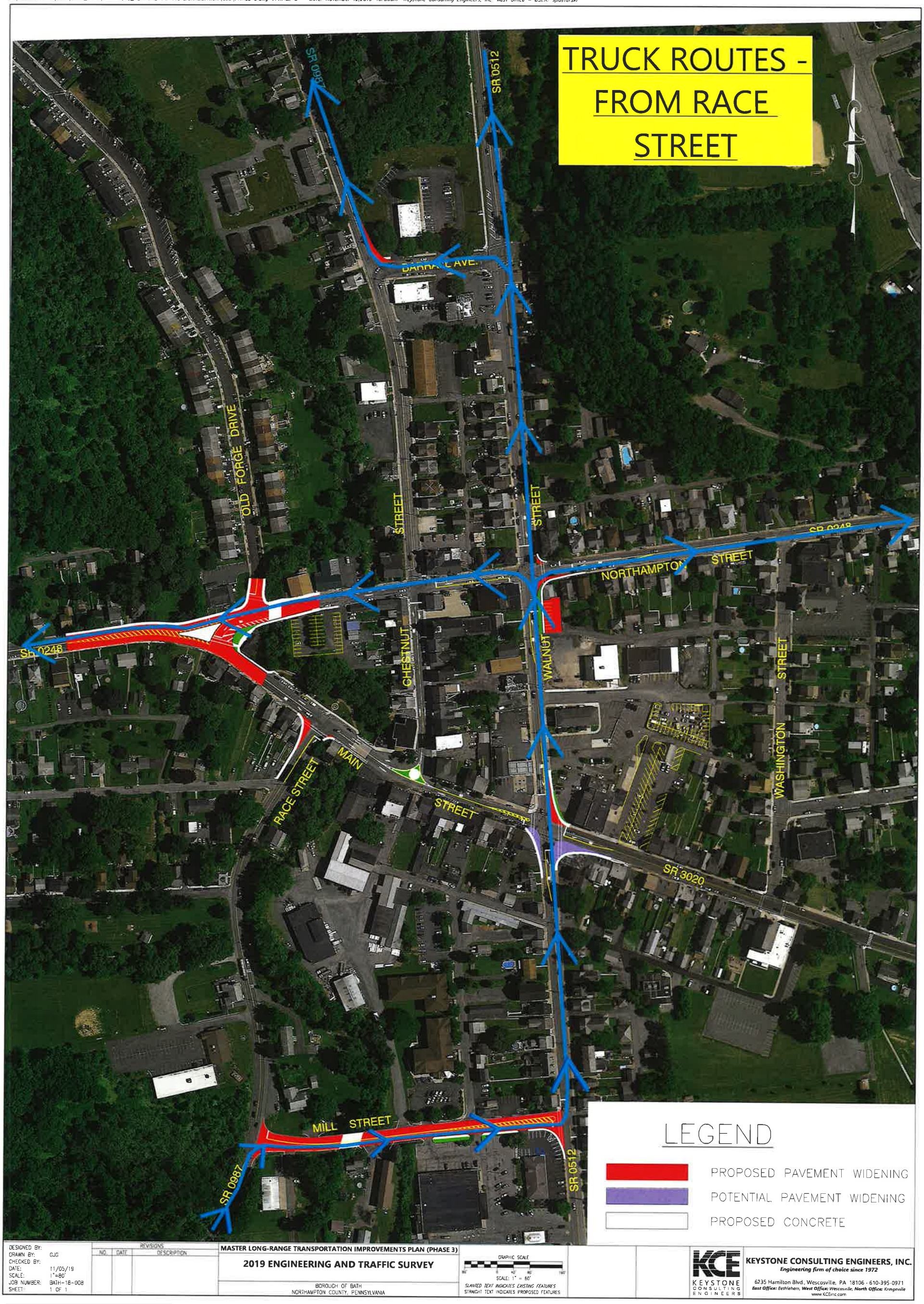

FIGURE 4A

TRUCK ROUTES - FROM WALNUT STREET (SOUTH)

SR 0987
SR 0512
OLD FORGE DRIVE
STREET
STREET
NORTHAMPTON STREET
CHESTNUT STREET
WALNUT STREET
WASHINGTON STREET
RACE STREET
MAIN STREET
SR 3020
MILL STREET
SR 0987

LEGEND

- PROPOSED PAVEMENT WIDENING
- POTENTIAL PAVEMENT WIDENING
- PROPOSED CONCRETE

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JOB NUMBER	BATH-18-008		
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FIGURE 4B

TRUCK ROUTES - FROM MAIN STREET (EAST)

SR 0987
SR 0512
SR 0248
SR 3020
OLD FORGE DRIVE
CHESTNUT STREET
WALNUT STREET
WASHINGTON STREET
NORTHAMPTON STREET
RACE STREET
MAIN STREET
MILL STREET

LEGEND

- PROPOSED PAVEMENT WIDENING
- POTENTIAL PAVEMENT WIDENING
- PROPOSED CONCRETE

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2019 ENGINEERING AND TRAFFIC SURVEY

BOROUGH OF BATH
NORTHAMPTON COUNTY, PENNSYLVANIA

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FIGURE 4C

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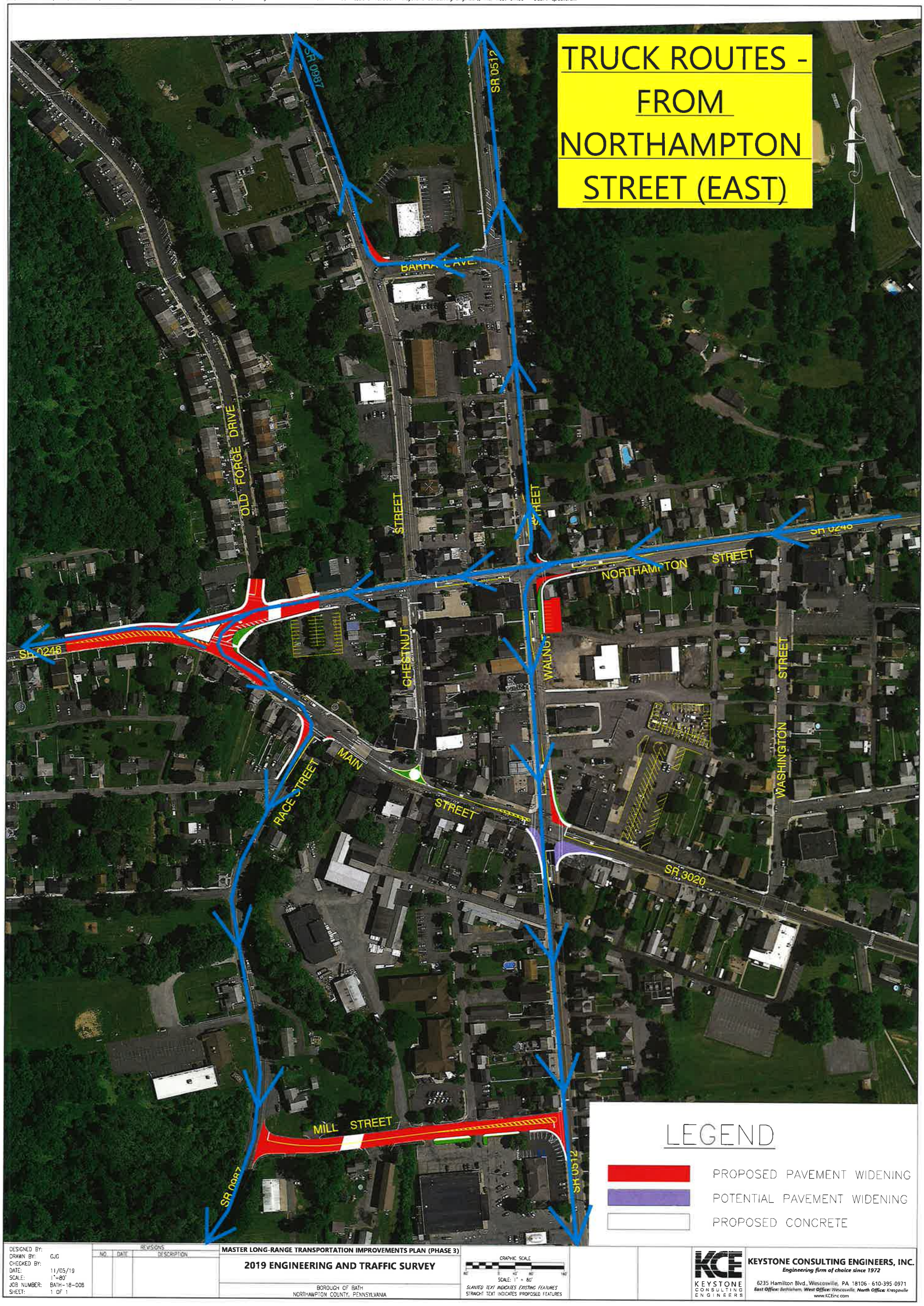

FIGURE 4D

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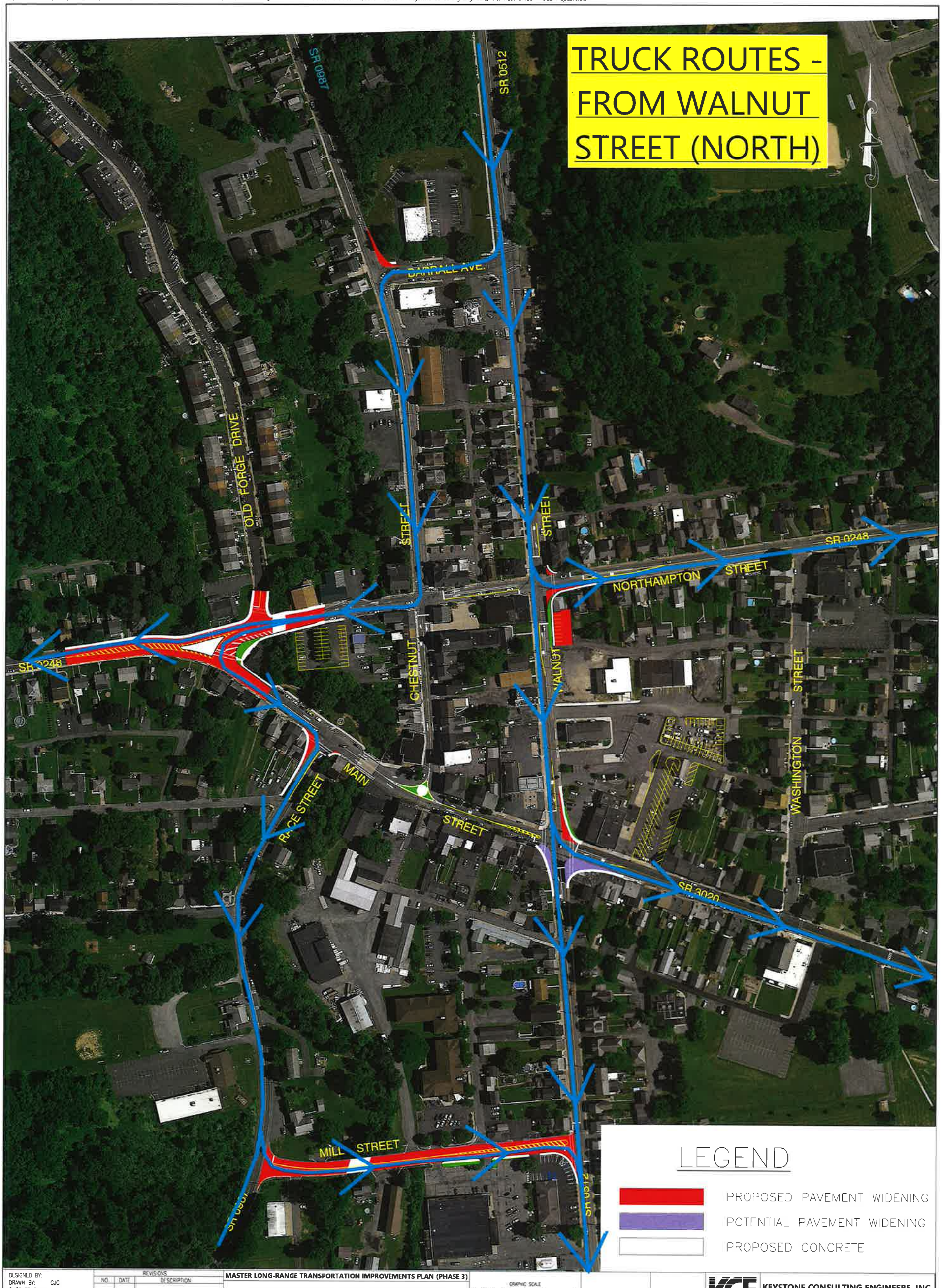

FIGURE 4E

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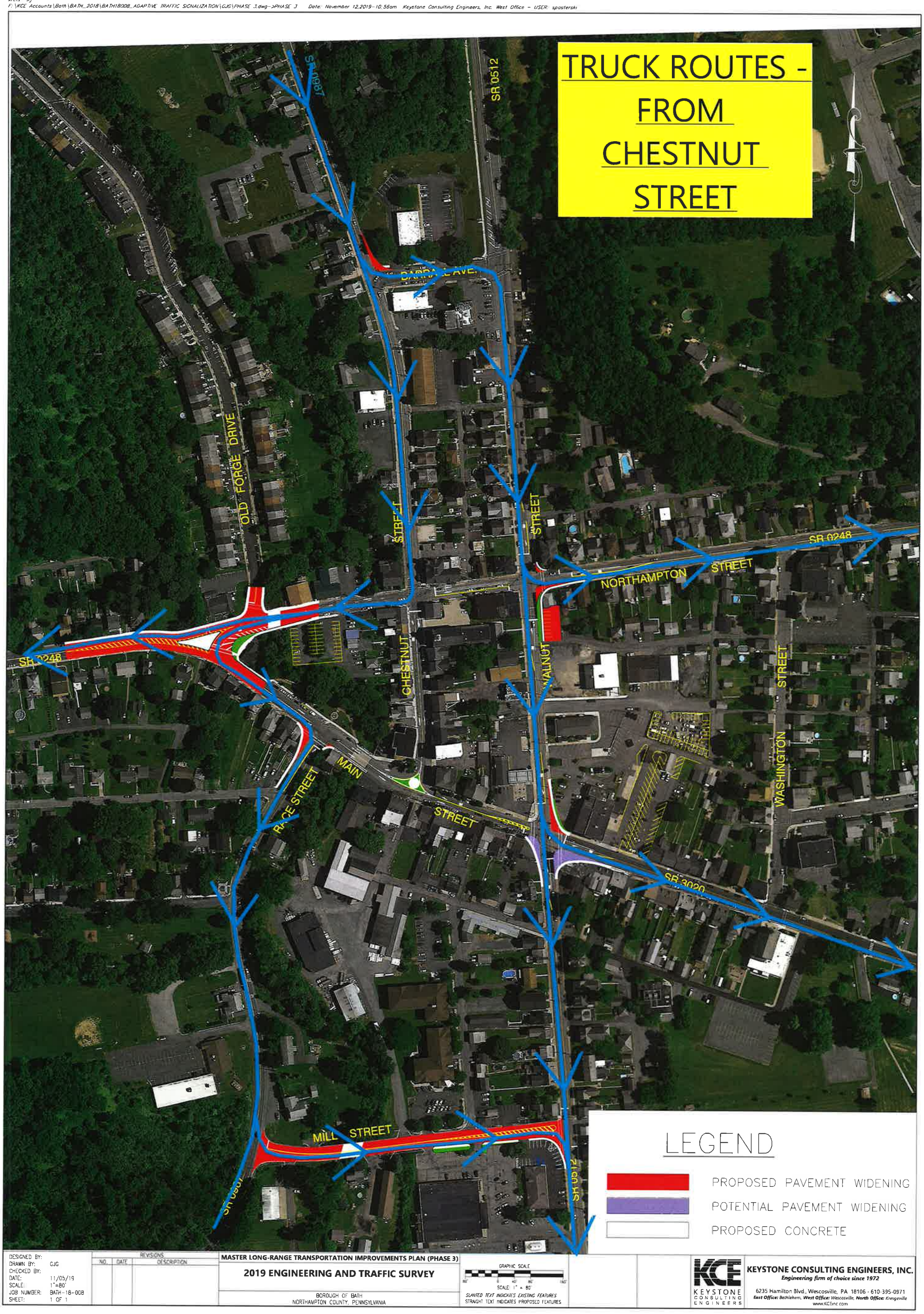

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FIGURE 4F

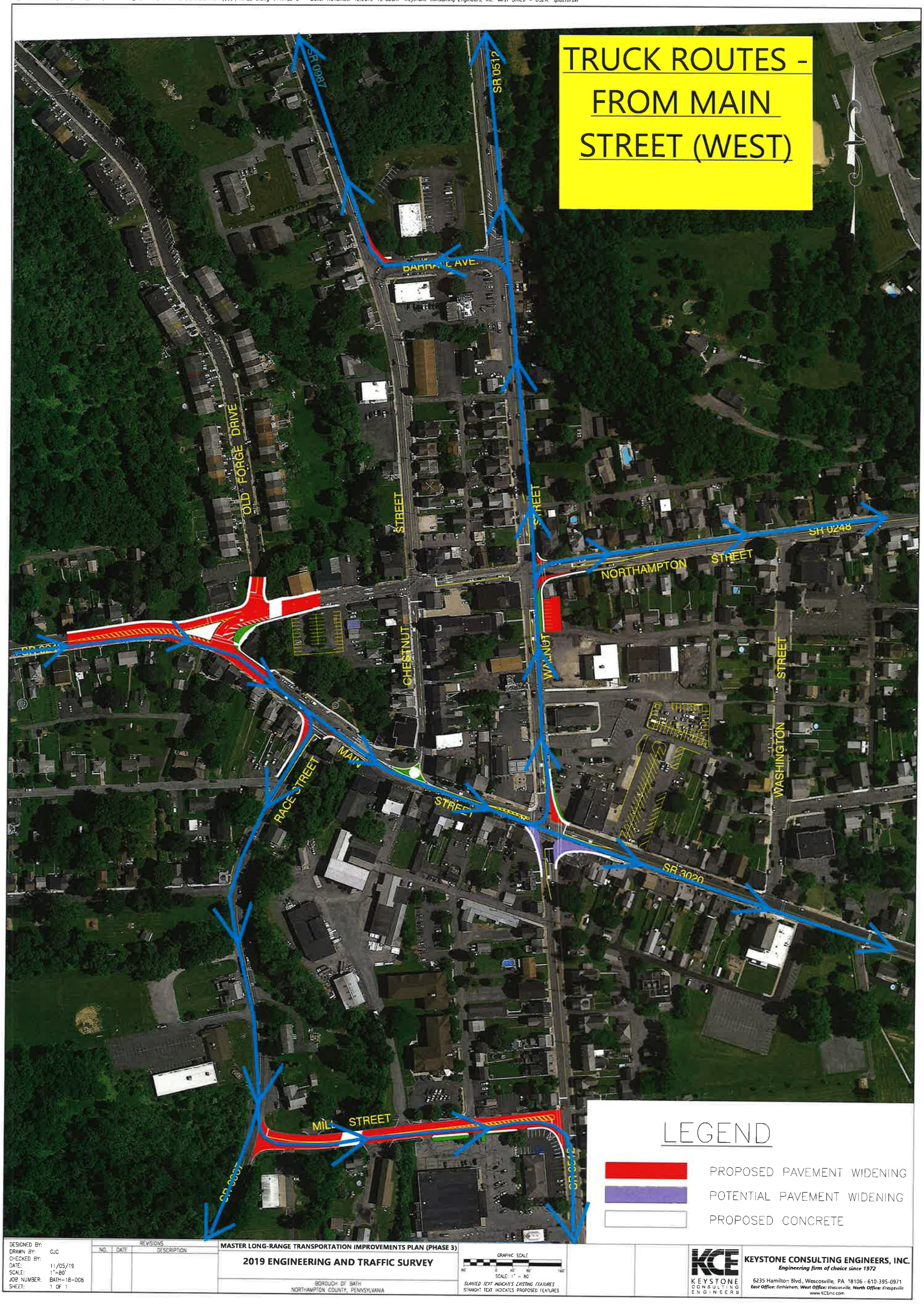


FIGURE 4G

BATH MULTIMODAL SAFETY + PARKING ANALYSIS

LVPC Lehigh Valley Planning Commission

LVTS Lehigh Valley Transportation Study

- EXCERPTS -

PROJECT REPORT

DRAFT

PHASE II

ANALYSIS + RECOMMENDATIONS

Analysis reveals that several hurdles must be cleared for the Borough to improve safety and connectivity for multimodal users, increase parking efficiency and prepare for the future. These hurdles include traffic congestion downtown, an unclear plan for identifying available parking and the lack of an overall strategy for helping the borough highlight its historic character while accommodating future growth. Addressing such complex challenges will require a comprehensive strategy that has the full backing of Bath Council and residents.

This section will outline a series of short-term, mid-term and long-term strategies that may be implemented one at a time or in any number of combinations considered most appropriate and feasible by the Borough. These recommendations have been designed following LVPC analysis and concurrent discussions held with Northampton County, PennDOT District 5-0, Bath Borough Council and Borough Manager Bradford Flynn, and residents in attendance at public meetings.

SHORT-TERM STRATEGIES (low-cost, feasible within one year)

1a. Form a steering committee for transportation decisions affecting Borough

This is an essential first step in establishing an inclusive and safe Borough for all users. The committee should include stakeholders such as Northampton County and Northampton Area School District representatives, Bath Business Community Partnership, business owners. It should meet to discuss strategies and responsibilities for implementing recommendations of this report or as determined necessary by the group. The committee should be considered a resource during the development of relevant plans and provide ongoing monitoring of transportation issues.

1b. Design and adopt an Active Transportation plan and local bike strategy/study

This process should seek to identify shortcomings and opportunities in achieving complete connectivity and accessibility of the street network for residents and visitors. The plan should utilize a steering committee to identify specific goals, outline responsibilities, and channel efforts into projects that contribute to a long-term vision. The transportation plan should build on values developed in the Borough's comprehensive plan while supporting the regional comprehensive plan.

1c. Design and adopt a Complete Streets Policy

This policy approach is nationally recognized and therefore encourages the Borough's participation in a nationwide commitment to inclusive streets. This policy should supplement, or be integrated into, the comprehensive and active transportation plans. When values supporting complete streets are formally established, chances are increased when trying to secure funding and public/private backing for improvements that would uphold them. The development of a policy is a relatively low-demand task which could also be developed by the steering committee. Some of the top-recognized policies by Smart Growth America are only 2-3 pages in length. Further details on this program and document guidelines can be found at the following link - http://completestreets.org.

1d. Monitor effects following the December 2017 adoption of Ordinance No. 2017-674

In late 2017 Bath Council adopted Ordinance No. 2017-674 which permits a selection of parcels (defined by earlier ordinance No. 2013-628 as the 'parking overlay district') the option of introducing a second 'mixed use'. This would most commonly be implemented as a building with commercial use on the ground level and a residential use above. The parcels to be affected are currently zoned as either: 1) Commercial Neighborhood, or 2) Commercial Highway w/ Residential (see map on p.23). Prior to Ordinance No. 2017-674, the existing uses in the 'parking overlay district' were subject to the off-street parking requirements established under Zoning Article XVII. In this article, off-street parking spaces are required based primarily on a system of *x* number of spaces per *x* sq. ft. of the use total floor area. This is outlined in the chart on the following page. Ordinance No. 2013-628 however, lifts the requirement of new mixed uses in the 'parking overlay district' from accommodating *additional* off-street parking spaces beyond those spaces which had existed as of January 1, 2013.

Without the imposition of Article XVII parking requirements (considered to be atypically high for an urban area), new 'parking overlay district' uses can more easily contribute to increasing the local economy in spite of the spatial constraints of the downtown area. This will, in effect, support development and economic growth without placing additional burden on the road network to accommodate more parking spaces.

It is understood that the Borough plans to take a conservative approach in issuing a small selection of permits for new 'mixed uses' in the 'parking overlay district' in phases. The LVPC supports this approach and recommends periodic monitoring so that both the physical and behavioral effects of Ordinance No. 2017-674 on the road network can inform strategies for further future development.

EXISTING AND PROPOSED BATH ZONING COMPARISON

Existing Zoning Category	New Zoning Overlay	Parking Requirements
Commercial Neighborhood	**Mixed Use**	***Off*-street parking - Article XVII**
Permitted Uses	Permitted Uses	Parking Spaces required
Single-family detached	Single, non-resi. use on second floor	
Single-family semi-detached	Single non-resi. 1st floor/resi. 2nd floor	
Single-family attached		2.5 per family or unit
Multi-family		2.5 per family or unit
Drug Stores	✓	1 per 150 sq. ft. of floor area
Flower shops	✓	1 per 150 sq. ft. of floor area
Baked goods (retail)	✓	1 per 150 sq. ft. of floor area
Gift stores	✓	1 per 150 sq. ft. of floor area
Apparel/jewelry/etc stores	✓	1 per 150 sq. ft. of floor area
Barber + beauty shops	✓	1 per 150 sq. ft. of floor area
Business + professional offices	✓	1 per 200 sq. ft of floor area
Small appliance sale/repair	✓	1 per 150 sq. ft. of floor area
Municipal bldgs./public facilities		1 per 200 sq. ft of floor area
Delis	✓	1 per 150 sq. ft. of floor area
Conversions		
Bank and fiduciary institutions		1 per 250 sq. ft. of floor area
Eating/drinking establishments	✓	1 per 3 seats 1 per 2 FT empl.
Garden supply center		1 per 150 sq. ft. of floor area
Medical and dental clinic	✓	3 for each doctor or dentist
Bed + breakfast	✓	1 per unit + 1 per 2 employees
Public swimming pool		1 per 200 sq. ft. of floor area
Internal vending machines		
All similar uses		

Existing Zoning Category	New Zoning Overlay	Parking Requirements
Commercial Highway - w/ Resi.	**Mixed use**	***Off*-street parking - Article XVII**
Permitted Uses	Permitted Uses	Parking Spaces required
Residential uses		
Baked goods (retail)	✓	1 per 150 sq. ft. of floor area
Flower shops	✓	1 per 150 sq. ft. of floor area
Child day care center		
Gift shops	✓	1 per 150 sq. ft. of floor area
Apparel/jewelry shop, etc	✓	1 per 150 sq. ft. of floor area
Beauty shops	✓	1 per 150 sq. ft. of floor area
Small appliance sale and repair	✓	1 per 150 sq. ft. of floor area
Graphic arts printing + repro.shop		1 per 150 sq. ft. of floor area
Vending machines		
Businesses + professional offices	✓	1 per 200 sq. ft. of floor area
Delis	✓	1 per 150 sq. ft. of floor area
Meat + poultry markets		1 per 150 sq. ft. of floor area
Household supply store		1 per 150 sq. ft. of floor area
Dry cleaner + laundromats		1 for each 3 washing machines
Radio and tv stations		
Veterinary hospitals		
Bed and breakfast	✓	1 per unit and 1 per 2 employees
Ggrocery/convenience stores		
Drug stores	✓	1 per 150 sq. ft. of floor area
Eating/drinking establishment	✓	1 per 3 seats + 1 per 2 FT employees
Drive-through restaurant		1 per 3 seats + 1 per 2 FT employees
Furniture store		1 per 150 sq. ft. of floor area
Hardware, plumbing store		1 per 150 sq. ft. of floor area
Bank + fiduciary w/ drive-through		1 per 250 sq. ft. of floor area
Public garages + lots		Customer vehicles + 1 per employee on maximum work shift
Car wash		
Auto. service centers + stores		1 per 300 sq. ft. of floor area
Internal amusement devices		
Social building		1 per 200 sq. ft. of floor area
Medical + dental clinics	✓	3 for each doctor or dentist
Liquor stores + beer distributors		1 per 150 sq. ft. of floor area
Department or discount stores		1 per 150 sq. ft. of floor area
Movie theaters		1 per 100 sq. ft. of floor area or per 4 persons using facility at peak hour
High-rise or high-density apts.		2.5 per family or unit
Hotels + motels		1 per unit and 1 for every 2 employees
Automobile sales		1 per 300 sq. ft. of floor area
Sports arena		
Retail outlet		1 per 100 sq. ft. of floor area
Supermarkets		1 per 100 sq. ft. of floor area

The ‘parking overlay district’ adopted by the Borough overlays 71 parcels currently zoned for one of two separate uses (see map on p.23) - ‘Commercial Neighborhoods’ (table above) and ‘Commercial Highway with Residential’ (table to the right).

Column 1 in each table lists uses currently permitted under a particular zoning category. Column 3 shows the amount of off-street parking spaces as required by Article XVII for each permitted use.

Column 2 identifies which ‘mixed uses’ are now permitted (by Ordinance No. 2017-674) to be potentially implemented as a second use by the 71 ‘parking overlay district’ parcels. New uses in this column would be exempt from the parking requirements of Column 3, and would utilize only the parking spaces of the Column 1 uses they overlay which had existed as of January 1, 2013.

Source- Bath Borough

SHORT-TERM STRATEGIES (low to moderate cost, feasible within one year)

1e. Coordinate with a Local Technical Assistance Program (LTAP) tech assist

A tech assist is an expert on technical aspects of transportation issues who provides a complimentary service through Pennsylvania Department of Transportation's Local Technical Assistance Program. While the LVPC readily volunteers involvement in future transportation and planning-related discussions, a tech assist should be utilized as a primary source for specific technical advice relating to safety and/or engineering concerns for planned projects.

1f. Delineate existing parking spaces

On-street parking spaces are currently not fully maximized in high-demand areas, in part because parking space boundaries are sometimes unclear. Clear striping is necessary for all available on-street public parking spaces. This step should ideally be accompanied with the creation of a public borough parking map and improved signage to inform vehicle owners of the location of parking spaces and their conditions for use.

1g. Introduce more paid parking

While the number of parking spaces in the borough has been shown through this study to sufficiently meet demand, paid parking in strategic areas could provide an economic benefit by boosting essential borough funds. It could also dissuade negative parking behavior by residents who abuse the ease of parking on-street for free instead of walking short distances or using private lots. In addition, visitors who pay for parking typically make the most of their visit by staying longer and potentially spending at local businesses.

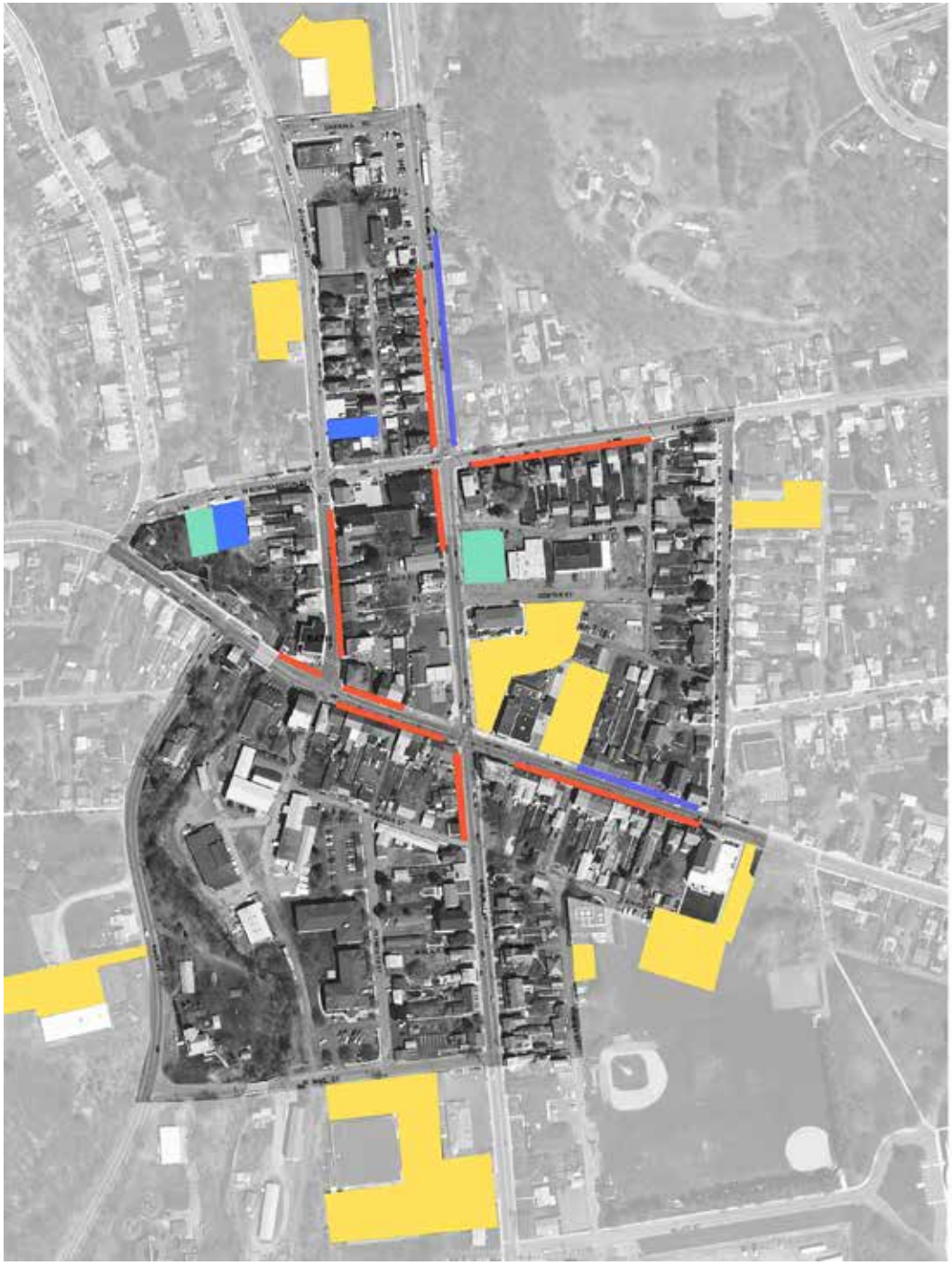
Paid parking could be implemented through meters, paid hourly lots, or through permits in high-demand areas. The Borough is currently developing new public parking permit areas in select locations to accompany a newly established parking enforcement program. Technology should also be a consideration as some parking apps (like MobileNow) have been successfully implemented in our region. An app aids in advertising available spaces in advance so that less time is spent by drivers on the road searching for 'the right space'. An option of how parking spaces might be allocated can be referenced on the following page but a strategy should be fully discussed and developed through the previously recommended steering committee. The west side of South Walnut Street, south of Main Street, for example, has 20 available on-street parking spaces which are rarely used due to safety concerns and lack of striping. Installing meters and formalizing these spaces would increase driver confidence in utilizing them and be likely to generate capital because of their proximity to central businesses and services.

1h. Small-scale urban design treatments

The study area currently benefits from historic character established through architectural details but a lack of consistency and maintenance can cause these to be overlooked. A few, small urban design treatments can improve aesthetic appeal and, in effect, make walking a desirable and natural option in the heart of the Borough. Some options might include the addition of benches and planters, or the incorporation of a landmark sign or mural to convey a sense of arrival and pride in the historic district. The overall impact of these improvements is visualized in several renderings starting on page 59.

1i. Generate discussions about pedestrian and cyclist policies for the future Bath comprehensive plan update.

The current Bath Comprehensive Plan dates back to 1978, making certain aspects of the plan severely outdated. It is expected that the comprehensive plan will be updated as soon as possible. While some of the existing policies surrounding transportation topics still ring true, informal discussions should be taking place in the near future for how to plan for and boost policies that will encourage and facilitate multimodalism in the Borough. This will allow for early buy-in from the community and give time for stakeholders to provide expertise and feedback when designing policy changes to be implemented in the next Borough comprehensive plan update.



POTENTIAL PARKING DESIGNATION

- Public or private with flexible Use
- Metered on-street (7 a.m. - 10 p.m.)
- Paid lot (hourly)
- Residential permit required (5 p.m. - 7 a.m.)

This map illustrates one of many potential options for how parking in the borough might be designated in order to: 1) generate income; 2) increase parking efficiency and flexibility by encouraging existing parking lots to accommodate different parking needs at different times of the day, and 3) challenge the perception that parking in urban areas should be a free service. Parking spaces do, in fact, bear costs, particularly including those based on environmental impact.

MID-TERM STRATEGIES (some moderately higher cost, feasible from 1-5 years)

2a. Evaluate the impact of new Borough building parking facility

The new location of the borough offices (in construction phase at the time of this document) intends to feature a parking lot with 35+ parking spaces. This is anticipated to offset some of the perceived high parking demand in the study area. It is recommended that following construction completion and a period of normal occupation and building operation, that the effect of the new parking lot be analyzed in comparison to general parking demands in the borough.

2b. Evaluate the impact of police department changes on annual tickets/accidents

Following a decision voted by Bath Council in July 2017, the local police department is anticipated to be replaced with state police service in early 2019. It is recommended that the borough compare the number of monthly and annual parking tickets issued and number of vehicle-related accidents before and after this transition takes place. Analysis may bring attention to areas requiring heavier intervention or enhanced safety measures.

2c. Monitor any changes in traffic demand/delay associated with signal timings ahead of next scheduled analysis by PennDOT

The LVPC recommends that the borough periodically monitor typical traffic conditions at current signalized intersections lights so that any significant changes can be reported to PennDOT prior to their regularly scheduled analysis of the Borough's signal timings. This is scheduled to take place in approximately three years (2021).

2d. Formal connection of Delaware & Lehigh Trail to Bath

The development of the Delaware & Lehigh (D&L) Trail into Bath has been anticipated for a long time and will be a key component in creating connectivity to areas already benefitting from the trail. Designs for the trail head at Mill Street are currently being engineered and a trail building is anticipated as early as 2018. The LVPC supports this expansion as part of recommendations to increase connectivity for all road users in both Lehigh and Northampton counties. The trail will provide access to recreational opportunities for Bath residents and attract outside visitors to visit Bath as potential patrons of businesses or tourists of its historic attractions. Furthermore, it will provide an economic return on environment. With the finished trail, cyclists leaving Bath could expect to access the surrounding towns as follows:

14 minutes to Borough of Chapman
31 minutes to Borough of Nazareth
45 minutes to Borough of Catasauqua
55 minutes to City of Bethlehem
61 minutes to City of Easton
68 minutes to City of Allentown

2e. Designate truck routes in partnership with PennDOT and the LVPC

If the borough wishes to alter existing designated truck routes as visualized in this document, consultation with PennDOT and the LVPC will be required in order to secure permission and to plan the transition to the new routes.

2f. Mid-scale urban design treatments and speed treatments
The borough features unique historical architecture, but a lack of visual consistency and property maintenance can result in this asset being overlooked. A few mid-scale urban design treatments to the street would magnify the charm of the Borough's historic identity, while improving the safety of the streets. These may be installed in combination or independently of the recommended small-scale urban design treatments. Some might include an increase in frequency of street lights, repair of sidewalks, and the painting or imprinting of textured pavers at crosswalk locations for higher visibility to drivers approaching from a distance. A sample of these treatments has been visualized and explained in further detail starting on page 59.

Drivers who speed are more likely to cause unnecessary accidents, close calls and damage to property in Bath. Because of reported bottlenecking at signalized intersections during peak travel time, speeding is primarily reported to be observed taking place just beyond the bottlenecks and on residential roads being used to bypass the traffic just adjacent to the study area. The frustrating conditions which periodically cause this driving behavior are due to a variety of reasons and have been addressed throughout this report. It is recommended however, that speed-calming strategies be incorporated throughout the study area to train the driver to appropriately maneuver through the road network. These can take the form of speed tables, pavement bulb-outs, more prominent signage and LED pedestrian crossings as a sample of many methods that can be used to calm traffic in areas most vulnerable to accidents. Visualizations in this report show how some of these may be implemented. If the Borough does wish to implement the strategies, the Lehigh Valley Planning Commission can offer to conduct a speed and delay run both before and after the improvements to establish a baseline of traffic operating conditions. This would need to take place during the school year at both a.m. and p.m. peak travel periods.

LONG-TERM STRATEGIES (some higher cost investment, feasible from 5-10 years)

3a. Convert Mill Street into a designated truck route
Following anticipated work to improve Bridge 115 at the west end of Mill Street, the road will be able to safely support weight loads of freight vehicles, many of which are currently using it as a bypass route, despite its weight restriction. Northampton County owns the bridge and is funding the work expected to begin in 2018. It is recommended that the bridge improvements be accompanied by comprehensive improvements along the rest of Mill Street to enable safe, multimodal access. Improvements would include completed sidewalks along the north and south sides of the street, shared lane markings and increased street lighting. The success of the overall recommendation however, would be conditional upon the installation of signalized intersections with coordinated traffic lights and pedestrian crossings at the street's east and west ends.

At 40' wide, Mill Street is the widest road within the study area, making it the most physically desirable option for trucks seeking alternate routes to reach Routes 512 or 248. This option would remove a portion of truck traffic from utilizing South Chestnut, the narrowest road in the study area, and an area prone to congestion at peak travel periods. The intersection of S. Chestnut Street and Northampton Street had the highest number of crashes in 2016. Furthermore, the small turning radii for trucks turning from S. Chestnut Street onto Northampton Street increases the likeliness of property and sidewalk damage to occur.

Ideal scenarios would allow for the widening of roads in the central district to improve the driving conditions for large vehicles. However this is not feasible given the limited or nonexistent setbacks of the fronting properties. The properties along Mill Street benefit from larger setbacks, making it the route of least impact on residences and infrastructure. Essentially, the truck traffic congestion from key downtown intersections would be redirected through a non-central area that could more safely accommodate it.

PennDOT has informally supported the proposal with the caveat that the borough manage maintenance of the bridge. All Mill Street improvements would be required to meet PennDOT standards, thereby elevating the safety level of the street from its current condition.

Without professional engineer analysis, it is estimated that the turning radii at Mill Street's eastern intersection with S. Walnut Street can sufficiently accommodate trucks without the need to impede on the property at the northwestern corner. The borough has informally confirmed that a nearby property on South Walnut Street, between Mill Street and Main Street, has been offered to the borough for full ownership. Should the development of Mill Street under this proposal reveal potential imposition on the corner property at Mill Street, the Borough could potentially offer space in the new property in exchange.

This overall recommendation is also desirable since the Nor-Bath Trail is already planned for connection to Bath via Mill Street. As such, improvements will increase the safety of cyclists who wish to access Bath via the trail. A rendering of this recommendation can be found on page 63. The recommended truck and vehicle routes of the borough overall can be found on pages 64-65.

3b. Monitor Bridge 248 rerouting effects

In 2019, PennDOT will begin work along West Northampton Street as part of a Bridge 248 rerouting project. The project is designed to make improvements to the bridge so that it is no longer weight-restricted as well as straighten the west end of West Northampton Street so that it flows directly onto West Main Street. This will eliminate an extra turn for tractor trailers using S. Chestnut in order to access Rte 248. Although PennDOT is expected to conduct its own post-project analysis, the Borough should also regularly monitor impacts of the project 3-6 months after completion, and before proceeding with other recommendations in this report that would rely on the overall success of the rerouting.

OTHER CONSIDERATIONS

Future structure opportunity –

The Borough's anticipated acquisition of a property along South Walnut Street will result in a space with a potential mix of uses. This is an opportunity to coordinate the use of the building with the economic goals of theBorough, or to satisfy other particular community needs. Appropriate parking spaces and multimodal access will need to be planned to accommodate the potential users of that building.

Future structure consideration –

The building which currently houses the Borough offices will soon be vacated following the completion of the new facility on North Walnut Street. The future of the old building is unknown and may accommodate potential uses ranging from new office space to apartments. The use may have additional impact on parking demand and solutions should be considered early on in the planning stage.

Potential informal test programming consideration -

Consideration should be given to closing a portion of a street in the downtown area to vehicle traffic on a test periodic basis (4 Sunday afternoons a year, for example) to facilitate community street events that celebrate Borough history and increase tourism. This will transform the perception of Bath to that of a pedestrian and bicycle-friendly destination, provide opportunity for cross-boundary partnerships to design events, support local business and increase visibility and support of the Borough by potential public and private partners.

OTHER CONSIDERATIONS

Potential temporary built and programming change -
The Borough may wish to experiment with the adoption of a parklet on Main Street. A parklet is essentially a parking space that can temporarily host removable structures, such as benches, tables or planters to enhance street vitality. Since there is virtually no building setback on the north or south sides of Main Street, there is little opportunity for pedestrian engagement with the street.The conversion of one parking space into a parklet would extend a portion of the sidewalk, provide programming opportunities and encourage people to linger. It could be hosted and designed by a variety of organizations or local artists (potentially awarded through a competition), feature pop-up events, or simply provide a space for landscaping treatments to beautify the street. A parklet should be installed in compliance with zoning regulations and with permission from the owner of the road. Some successful examples can be seen below.

Currently, the City of Bethlehem has guidelines and an application for parklets, which may be a useful resource.

Milwaukee Parklet - Photo by City of South Milwaukee

Cincinnati Parklet - Photo by Alexandra Taylor

The Lehigh Valley Planning Commission policies relevant to and consistent with report recommendations:

Regional Comprehensive Plan (updated 2005)

- Policy (p.72) Planning and design of road improvements should be given careful consideration to potential negative impacts on established neighborhoods and communities.
- Policy (p.71) Give high priority to projects that upgrade unsafe roads and intersections, rehabilitate or replace defunct bridge, and upgrade existing highways that are deficient.
- Policy (p.72) The LVPC will support strategies for transportation management, intelligent transportation systems, access management practices, and context sensitive design in situations consistent with this plan.
- Policy (p.72) Improve sidewalk, trail, and local street connectivity to reduce the number of vehicle trips taken on the major highway network.
- Policy (p.82) Promote transportation infrastructure improvements such as shoulder improvements, sidewalks, and crosswalks to resolve bicycle and pedestrian safety issues. The appropriateness of bicycle facilities should be considered as part of all road projects.
- Policy (p.82) Support the development of regulations in local municipalities that mandate construction of sidewalks and pathways to serve pedestrian and other non-motorized traffic.
- Policy (p.82) Promote the construction of missing links in the bicycle and pedestrian networks.
- Policy (p.82) Support future development patterns conducive to non-motorized travel.
- Policy (p.82) Provide safe, convenient bicycle parking and storage facilities in urban areas.
- Policy (p.82) PENNDOT should adopt bicycle and pedetrian design and performance standards; consideration of pedestrians and bicyclists should be given when designing and locating traffic control devices, signs and crosswalks."
- Policy (p.61) Neighborhoods with substantial amounts of older housing and structures that require upgrading should be revitalized by cooperative efforts of public and private institutions.
- Policy (p.61) Adequate government services should support neighborhood rehabilitation programs. The scattered demolition of unusable units should be undertaken where appropriate to provide a decent living environment.

MoveLV Long Range Transportation Plan (2015)

Goal 2 (p.94) Provide a safe, well-maintained road network that facilitates the movement of traffic.
Goal 3 (p.96) Improve mobility and to provide access to major traffic generators.
Goal 4 (p.98) Promote economy and efficiency in highway, road and right-of-way planning, design and function.
Goal 5 (p.100) Construct transportation improvements that are compatible with the built and natural environments.
Goal 14 (p.118) Support bicycle and pedestrian activity and to provide safe access to the transportation system for cyclists and pedestrians in the Lehigh Valley.

- Policy: Promote transportation improvement projects, such as road diets, shoulder improvements, sidewalks and crosswalks, to resolve bicycle and pedestrian safety issues. Appropriateness of bicycle and pedestrian facilities should be considered as part of all road projects.
- Policy: Encourage specialized bicycle and pedestrian design techniques to facilitate convenient access to transit in areas recommended for urban development.
- Policy: Support municipal regulations that mandate construction of sidewalks and pathways to serve pedestrian and other non-motorized traffic.
- Policy: Support the construction of rails-to-trails projects for use in both recreation and transportation.
- Policy: Promote the construction of missing links in the bicycle and pedestrian networks.
- Policy: Support the future development patterns conducive to non-motorized travel.
- Policy: Promote bicycle sharing where appropriate and provide safe, convenient bicycle parking and storage facilities in key areas.
- Policy: PennDOT should adopt bicycle and pedestrian design and performance standards. Consideration of pedestrians and bicyclists should be given when designing and locating traffic control devices, signs and crosswalks.
- Policy: Support the creation and maintenance of citizen traffic advisory committees to monitor and advocate for multimodalism.

Urban Design Proposal 1 (South Chestnut Street)

This 'before' image shows the condition of South Chestnut Street upon entering from West Main Street. Parallel parking is permitted on the east side of the street, however without striped spaces, vehicles aren't able to make the most of the street length. The sidewalks experience narrowing in many places, forcing pedestrians to navigate around various obstructions. The street is particularly dark at night and could greatly benefit from additional lighting. Because the front of most buildings extend almost directly to the sidewalk, and the cartway width is relatively narrow, the driving experience can feel constrictive for two lanes of traffic. South Chestnut Street is at the heart of the historic district and features attractive architectural details, yet lacks a strong theme of thoughtful urban design details that could make it truly stand out. Finally, the street provides a low comfort level for pedestrians, making it a place to pass through only out of necessity instead of as a desirable destination. Some of the ways these challenges can be overcome are explained and illustrated on the following page.

- A striped pedestrian crossing with flashing sign increases driver awareness and pedestrian access and confidence.
- Clearly striped parking spaces maximize street space while paid meters disincentivize parking in a high-demand location.
- Shared land markings visibly convey that cyclists are welcome to use the street.
- A previously non-descript blank wall has the opportunity to feature local artists or reiterate the sense of arrival in the historic district.
- Additional street lights increase night illumination and safe driving and walking conditions.

Urban Design Proposal 2 (intersection of West Main Street + South Chestnut

This ‘before’ image reveals an unusually wide turning radius for left-turning vehicles onto South Chestnut Street (on the left). Without signals or distinct sign elements to control the intersection, drivers are prone to maintain or increase acceleration at this turn. This increases the likeliness of unsafe interactions to occur. The unusual arrangement of stops vs. free-flowing traffic often causes confusion for drivers about when it is safe to continue driving west on Main Street and limits the confidence for pedestrians trying to determine when it is their turn. The pedestrian crossing lines are faded, reducing driver awareness that pedestrians have a right to cross at these areas. Parking space lines are also fading away on both streets, potentially reducing the usable parking space. South Chestnut Street is particularly dark in the evening. This creates unsafe conditions with various fixtures interrupting sidewalk flow, and discourages people from interacting comfortably with the street at different times of the day. The existing trees and historic light fixtures along West Main Street make the area feel welcoming however this charm isn’t extended to South Chestnut Street and causes a lack of visual cohesion of “place”.

Some of the ways these challenges can be improved are explained and illustrated on the following page. Through a combination of improvements, the urban design proposal addresses issues of speeding, parking, pedestrian safety and place-making. These may be implemented incrementally over time.

- The extension + widening of South Chestnut Street's western sidewalk better accommodates uninterrupted walking.
- Clear pavement markings mean that, even from a distance, drivers understand how to interact with the upcoming intersection.
- A gateway sign shows a sense of arrival to the borough and emphasizes local pride in Bath's history.
- Clearly striped parking spaces maximize on-street space and paid meters disincentivize parking in a high-demand area.
- Seating options encourage people to use the street comfortably and to take their time.
- Additional street lights better illuminate the area at night and increase safety for drivers and pedestrians.
- Small, relatively low-maintenance landscaping treatments create a sense of warmth and welcoming.
- The addition of a historic sign marker clearly identify points of interest for visitors and residents.
- A blinking red or yellow light forces drivers to slow down and creates more controlled vehicle flow from both directions.

Urban Design Proposal 3 (Mill Street)

This ‘before’ image shows the condition of Mill Street looking east towards its intersection with South Walnut Street. It is a relatively wide road with significant set-backs from the surrounding buildings. Combining this with a lack of street markings, drivers are prone to speeding through. In spite of the west end of Mill Street featuring a weight-restricted bridge, freight vehicles often utilize the street in order to bypass heavy traffic at the Main Street and South Chestnut Street intersections. The current sidewalks only accommodate pedestrians at the east end of the street. People who will enter or exit the Borough from the future D&L Trail head on the west end would find the walk uncomfortable. The most prominent building along this street is a home for elderly residents. Those who cross the street to the grocery store must do so without the safety reassurance of a formal pedestrian crossing.

Some of the ways these challenges can be improved are explained and illustrated on the following page. The visualization demonstrates a combination of strategies for improving the overall atmosphere and streetscape of this important connecting road in southern Bath.

- The extension of sidewalks on both sides of the street encourage pedestrians to access the street as part of a variety of possible routes.
- Embedded LED lights and a flashing pedestrian sign at the crosswalk increase driver alertness.
- A slight bump out and clearly posted speed limit sign signal drivers to pass through with more caution.
- Shared lane markings promote the usage of the street by cyclists and increase driver awareness.
- Additional street lights better illuminate the area at night and increase safety levels for both drivers and pedestrians.
- A historic light fixture and sign posting directs trail users and drivers toward historic sites or points of interest.

RECOMMENDATION SUMMARY TABLE

Scale	#	Implementation Strategy	Potential benefits	Cost	Potential funding sources
Short-term 0-1 year	**1a.**	Formation of transportation steering committee.	Establish long-term strategies and partnerships for implementing recommendations, enforcing ordinances relating to safety, sidewalks, streets and parking.	$	Borough
	1b.	Design and adopt Complete Streets Policy in the comprehensive plan update, reinforce through zoning ordinance, street code amendments.	Establish commitment to national movement. Secure a foundation of values to inform future changes affecting the transportation network; incorporate or enhance ordinances which are relevant to multimodalism.	$$	Borough
	1c.	Design and adopt an Active Transportation Plan, and local bike strategy and study.	Align the long-term goals of the borough with regional planning efforts.	$	Borough
	1d.	Monitor effects of Ordinance No. 2017-674	Identify the economic effectiveness and road network impact of new, mixed uses adopted by 'parking overlay district' parcels under this ordinance.	$	Borough
	1e.	Coordinate with LTAP tech assist for complimentary project advice.	Secure technical advice for safety and engineering concerns for future transportation-related projects.	$	LTAP, LVPC
	1f.	Delineation of existing on-street parking spaces.	Easier identification of where is appropriate to park.	$	Borough, PennDOT (permitting, engineering)
	1g.	Introduce more paid parking.	Generate capital for borough, dis-incentivize use of vehicles for short, local trips, utilizing parking technologies like the MobileNow app. Increase efficiency of overall parking space usage.	$	Borough, Northampton County
	1h.	Small-scale urban design strategies.	Improve placemaking by enhancing the charm and usability of streets for pedestrians (installation of benches, planters, increased lighting, incorporation of new signage or murals, design of 'placemaking pockets').	$$	Borough, local community interest groups, schools, KCP
	1i.	Generate discussions on policy amendments to Bath comprehensive plan.	Secure stakeholder expertise and early community buy-in for necessary boost to multimodal policies for a future borough comprehensive plan update.	$	Borough
Mid-term 1-5 years	**2a.**	Evaluation of new borough building parking lot effectiveness.	Identify whether the new parking lot has aided in offsetting downtown parking pressure.	$	Borough
	2b.	Evaluation of impact of police department changes on annual tickets/collisions.	Identify impacts of 2019 police agency transferal on the occurrence of parking and speeding tickets issued, and the number and location of vehicle collisions. Carry out a strategy of police checkpoint days to identify vulnerable areas needing reinforcement.	$	Borough, Police Agency
	2c.	Monitor trends and changes in traffic demand associated with signal timings.	Identify whether timings are appropriate (prior to the next scheduled PennDOT analysis) with current volumes and left turns at peak periods so that adjustments can be recommended to PennDOT based on long-term observation and analysis.	$	Green Light Go, ARLE

	2d.	Formal connection of D&L Trail to Bath through Mill Street trailhead.	Attract more visitors through cycling or walking and increase regional connectivity.	$$	DCNR Community Grants and Community Conservation
	2e.	Designate truck routes in partnership with the LVPC and PennDOT.	Establish clarity for drivers, reduce property damage, improve safety in vulnerable areas which are being used as informal bypass routes.	$$	PennDOT, LVPC,
	2f.	Mid-scale urban design and speed treatment strategies to S. Chestnut Street.	Increase visibility for drivers, safety for pedestrians/cyclists through elements like new crosswalk markings and increased lighting, speed tables where relevant, etc. Install a gateway sign to the historic district to strengthen identity, design 'placemaking pockets' to encourage walkability and informal programming.	$$$	TASA, CDBG, ARLE, KCP
Long-term 5-10 years	**3a.**	Convert Mill Street to truck route alternative, improvement of Bridge 115 and incorporation of pedestrian improvements.	Ease pressure of large vehicle volume on historic district. Facilitate safe passage of large vehicles, cyclists and pedestrians, enhance connectivity with D&L Trail, encourage active lifestyles.	$$$	Multimodal Transportation Fund, ARLE, FTA
	3b.	Monitor Bridge 248 re-routing effects following PennDOT work.	Identify whether speeds, turning damage has been reduced for large vehicles through road adjustment.	$	Borough

$ - low cost

$$ - moderate cost

$$$ - higher cost

Funding Partner + Program Websites

(ARLE) Automated Red Light Enforcement Program - dot.state.pa.us
(CDBG) Community Development Block Grant - dced.pa.gov
Complete Streets - smartgrowthamerica.org
(DCNR) PA Department of Conservation and Natural Resources - dcnr.pa.gov
(FTA) Federal Transit Administration - transit.dot.gov
Green Light-Go Program - dot.state.pa.us
(KCP) Keystone Communities Program - dced.pa.gov
(LTAP) PennDOT Local Technical Assistance Program - dot7.state.pa.us
(LVPC) Lehigh Valley Planning Commission - lvpc.org
Mobile Now - mobile-now.us
Multimodal Transportation Fund - dced.pa.gov
Northampton County - northamptoncounty.org
(PennDOT) Pennsylvania Department of Transportation - penndot.gov
(TASA) Transportation Alternatives Set Aside Program - penndot.gov
(USDOT) U.S. Department of Transportation - transportation.gov