PRINCETON COMMUNITY TRAFFIC STUDY

Public Meeting

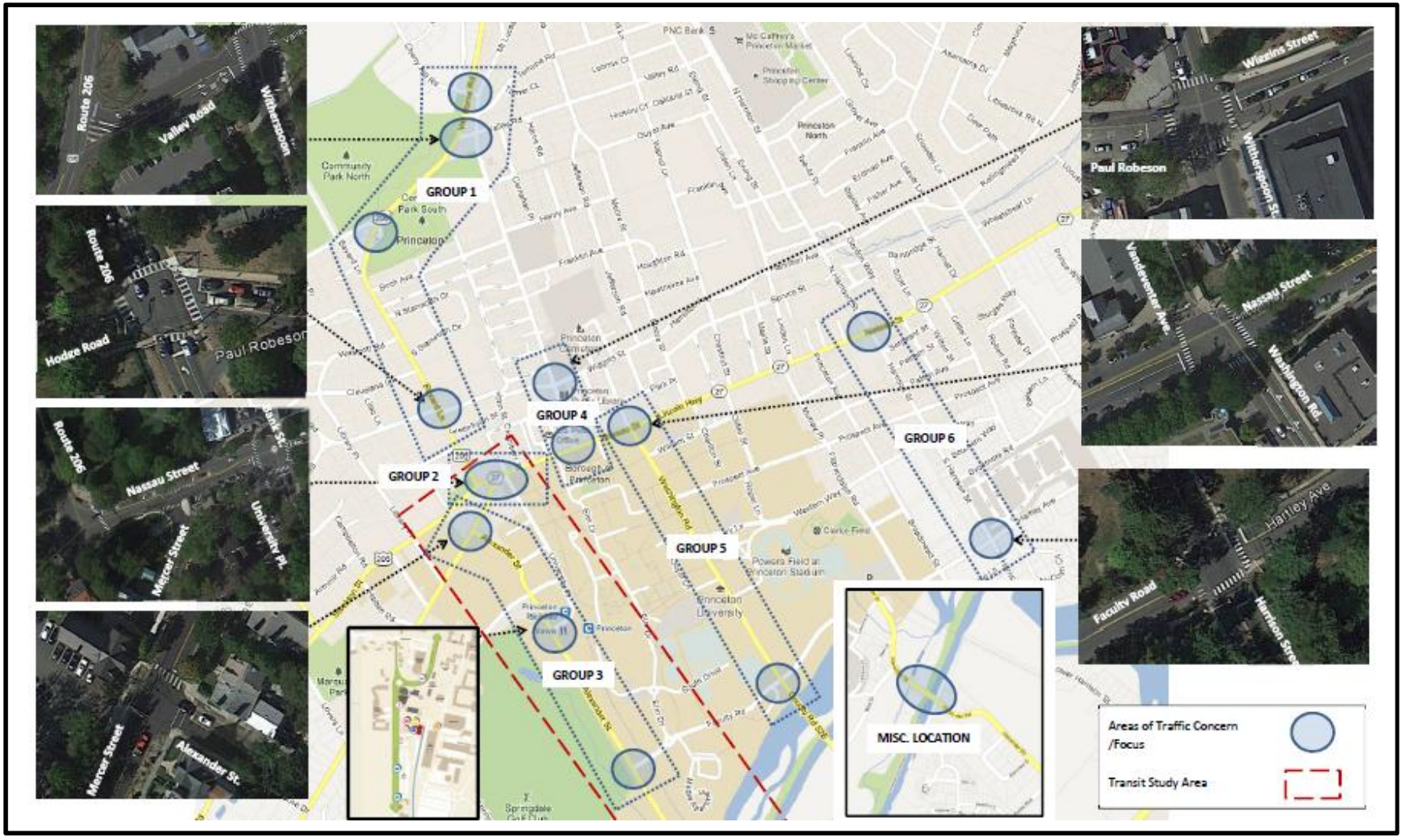
Saturday, November 9th, 2013

Princeton Community Traffic Study – Purpose & Goals

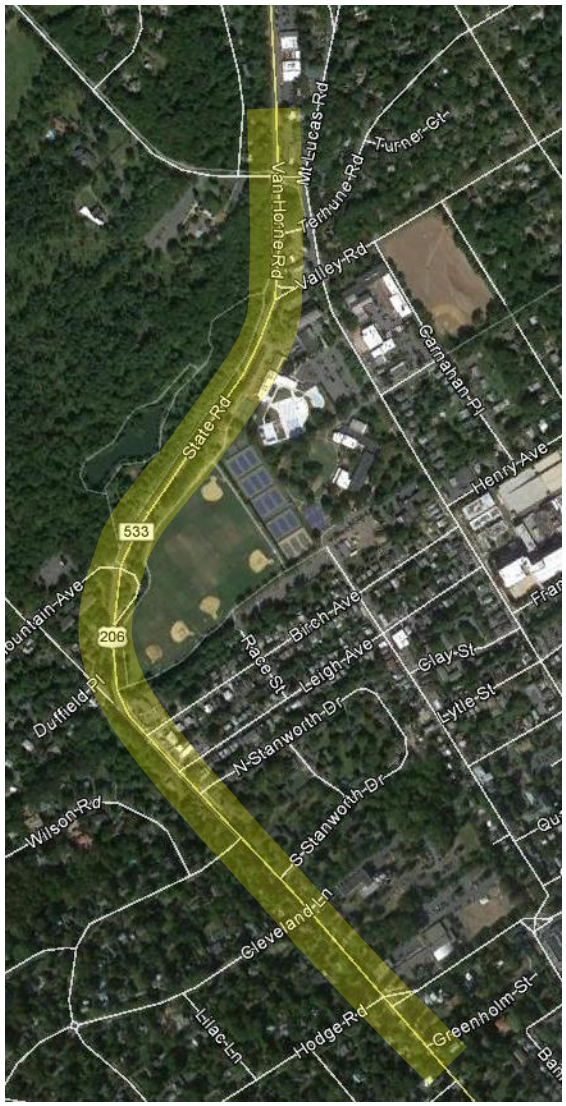
- *Revisit* current traffic issues & concerns
- *Understand* extent of potential future developments – both local & regional
- *Determine Impacts* of future developments on Princeton community
- *Identify Solutions* to mitigate traffic impacts
- *Build Consensus* to improve quality of life through implementation of locally acceptable transportation solutions

Current Traffic Issues & Concerns

Traffic Focus Areas



Bayard Lane Corridor

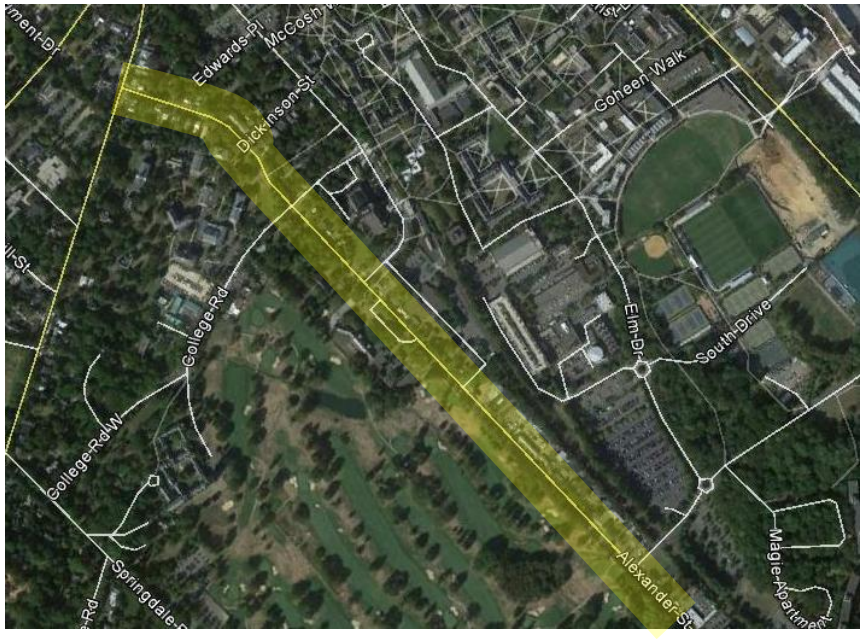


Concerns	Constraints
• Heavy vehicle traffic impacts • Vehicular speeding • Narrow lanes • Lack of bicycle opportunities • Traffic congestion along Route 206 • Pedestrian crossing issues	• Proximity to historic structures/ monument – • Varying nature of Route 206 Transect: In-town residential to civic park to rural residential

Nassau Street & Bayard Lane Core

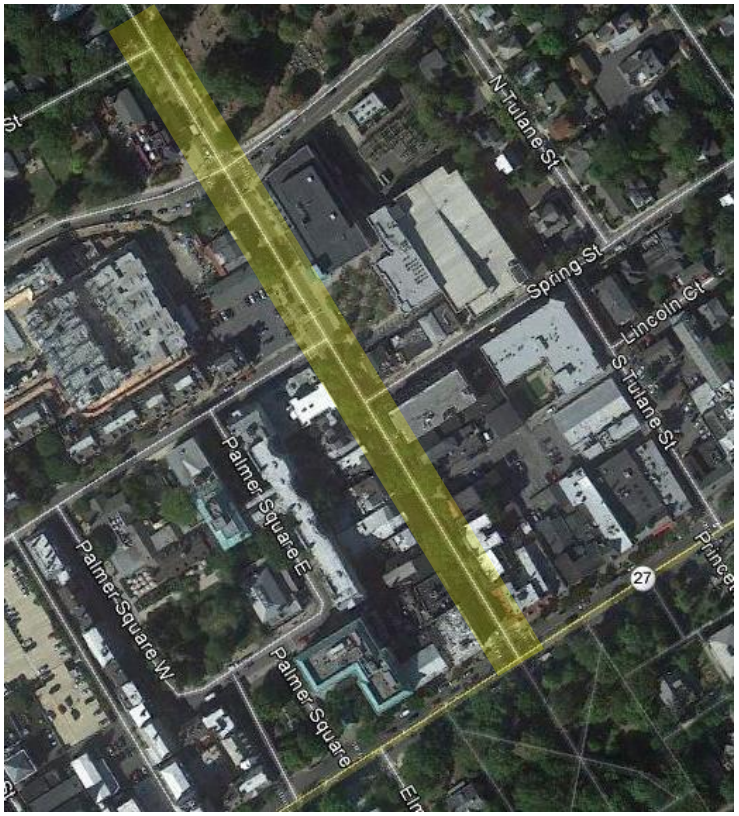
Concerns	Constraints
• Peak period traffic congestion • Confusing intersection geometry • Closely spaced intersections • Lack of signal coordination opportunities • Pedestrian safety • Extent of through traffic • Heavy vehicle/truck traffic - turning radii	• Proximity to historic structures/ monument - no room for expansion and/or for acquiring additional ROW

Alexander Street Corridor



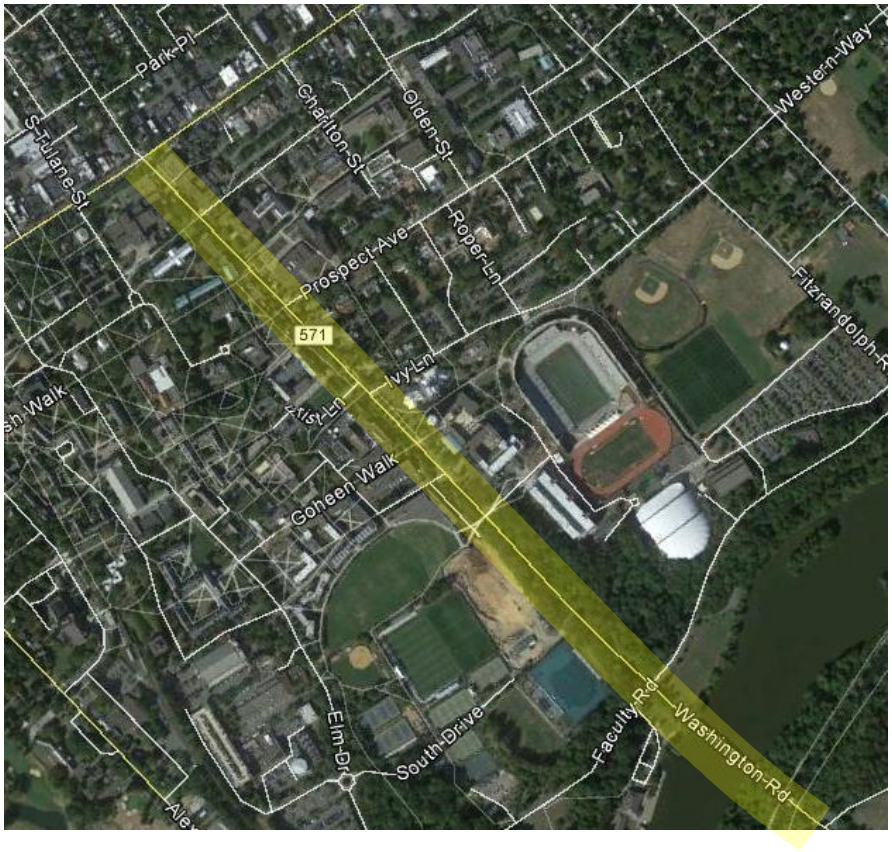
Concerns	Constraints
• Increased levels of traffic • Possible Route 1 traffic actions may further impact traffic • Vehicular speeding	• Potential ROW impacts

Witherspoon Street Corridor



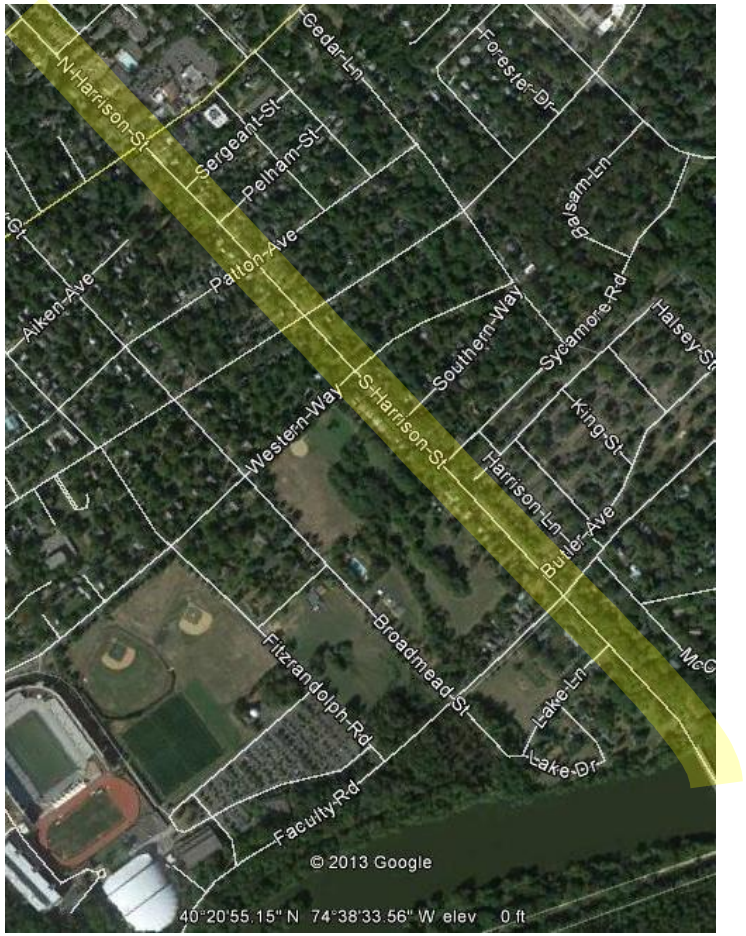
Concerns	Constraints
• Peak hour traffic congestion • Pedestrian safety issues • Vehicular-pedestrian conflicts and impacts on intersection operation	• Proximity to historic structures • On-street parking maneuvers impact traffic flow performance

Washington Road Corridor



Concerns	Constraints
• Peak hour traffic congestion • Vehicular speeding • Pedestrian safety issues • Nassau St. & Washington Road intersection alignment • Impacts of potential Route 1 traffic actions on Washington Rd corridor	• Proximity to historic structures • Proximity to environmentally sensitive area

Harrison Street Corridor

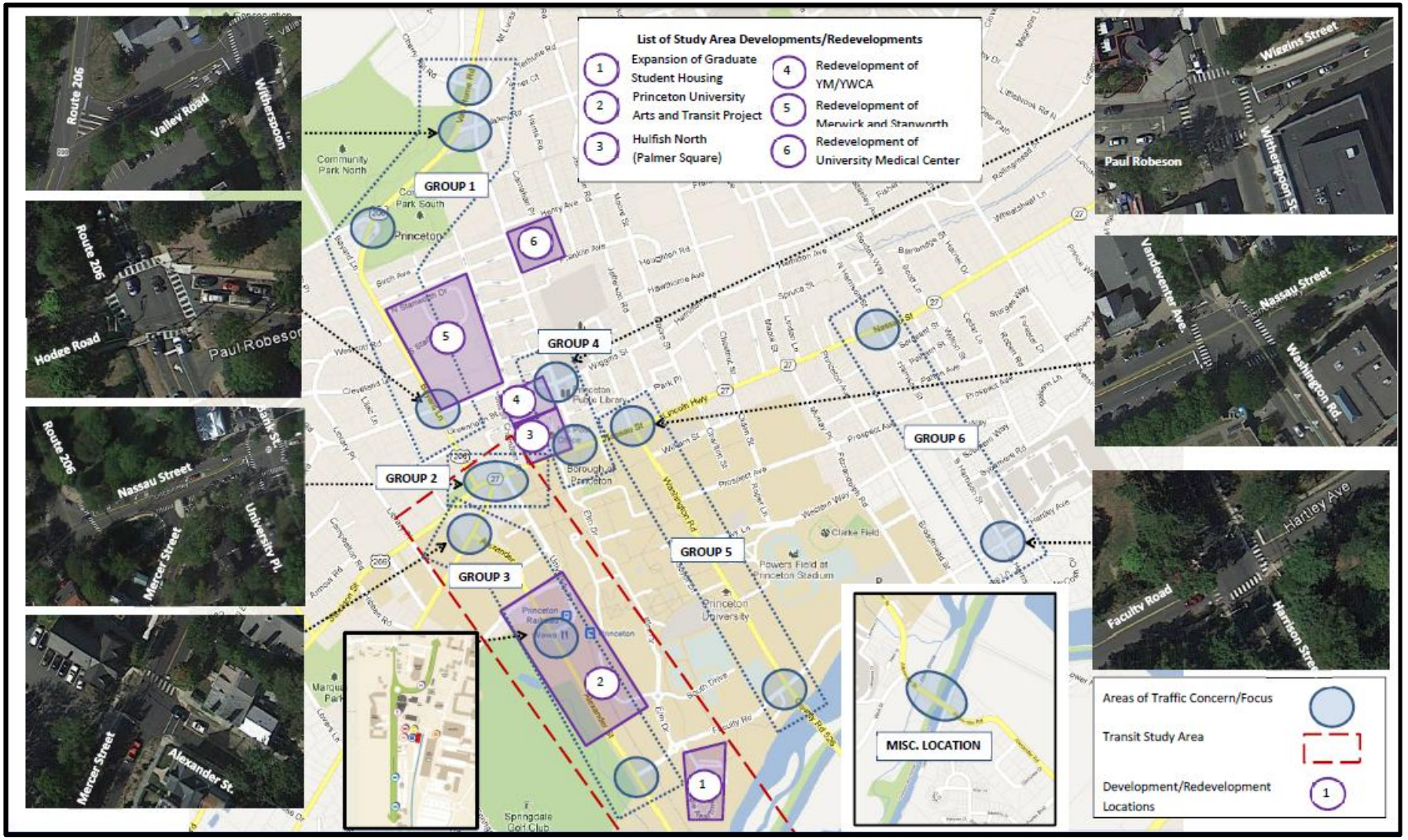


Concerns	Constraints
• Vehicular speeding • Increasing peak hour traffic volumes • Pedestrian safety issues	• No room for expansion and/or for acquiring additional ROW

Potential Future Developments

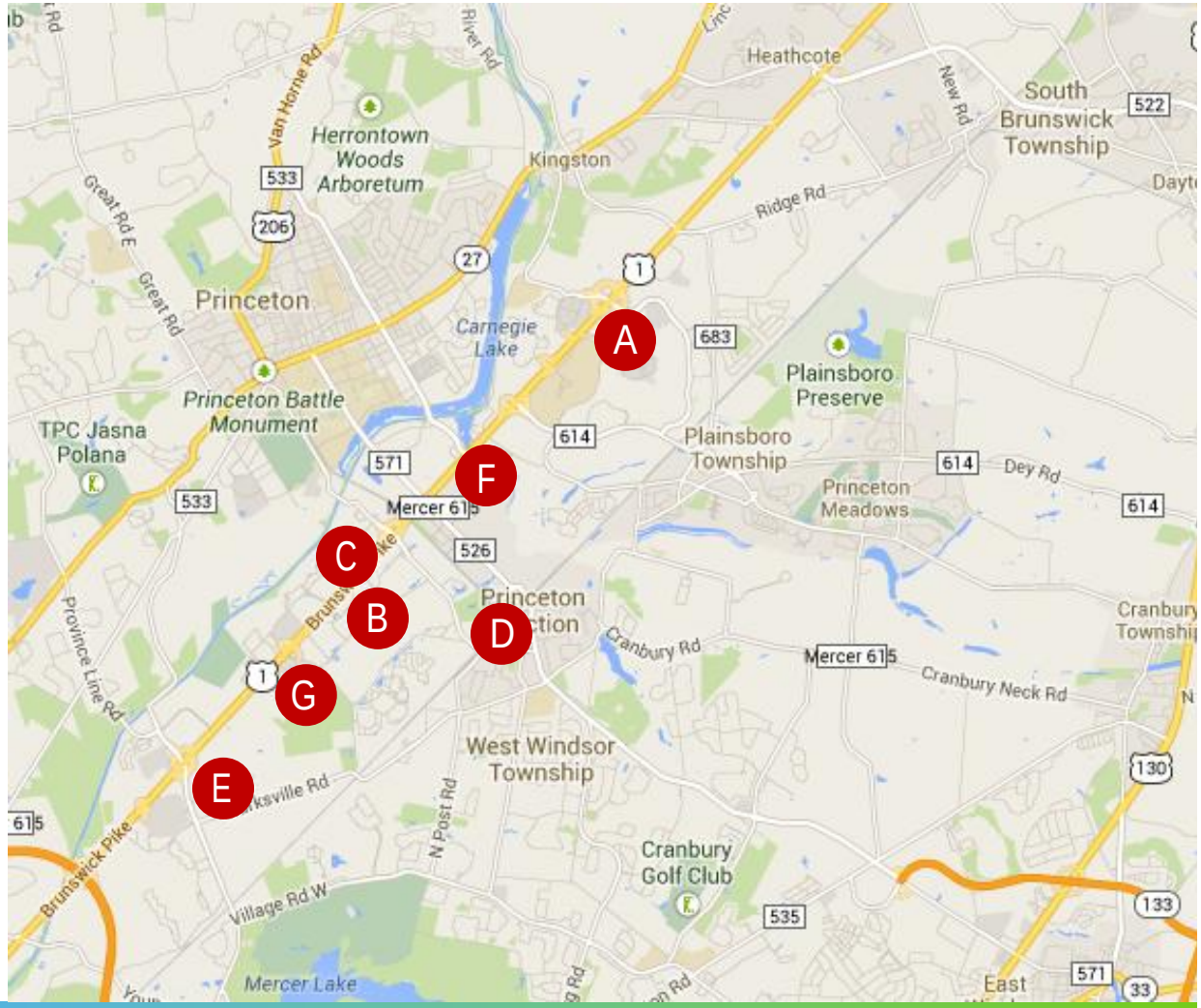
Local & Regional

Local Proposed Developments



Key Potential Regional Developments

- A Princeton / Plainsboro Medical Center
- B Carnegie Center (East)
- C Carnegie Center (West)
- D Princeton Junction Redevelopment
- E Wyeth
- F Sarnoff
- G Greenview

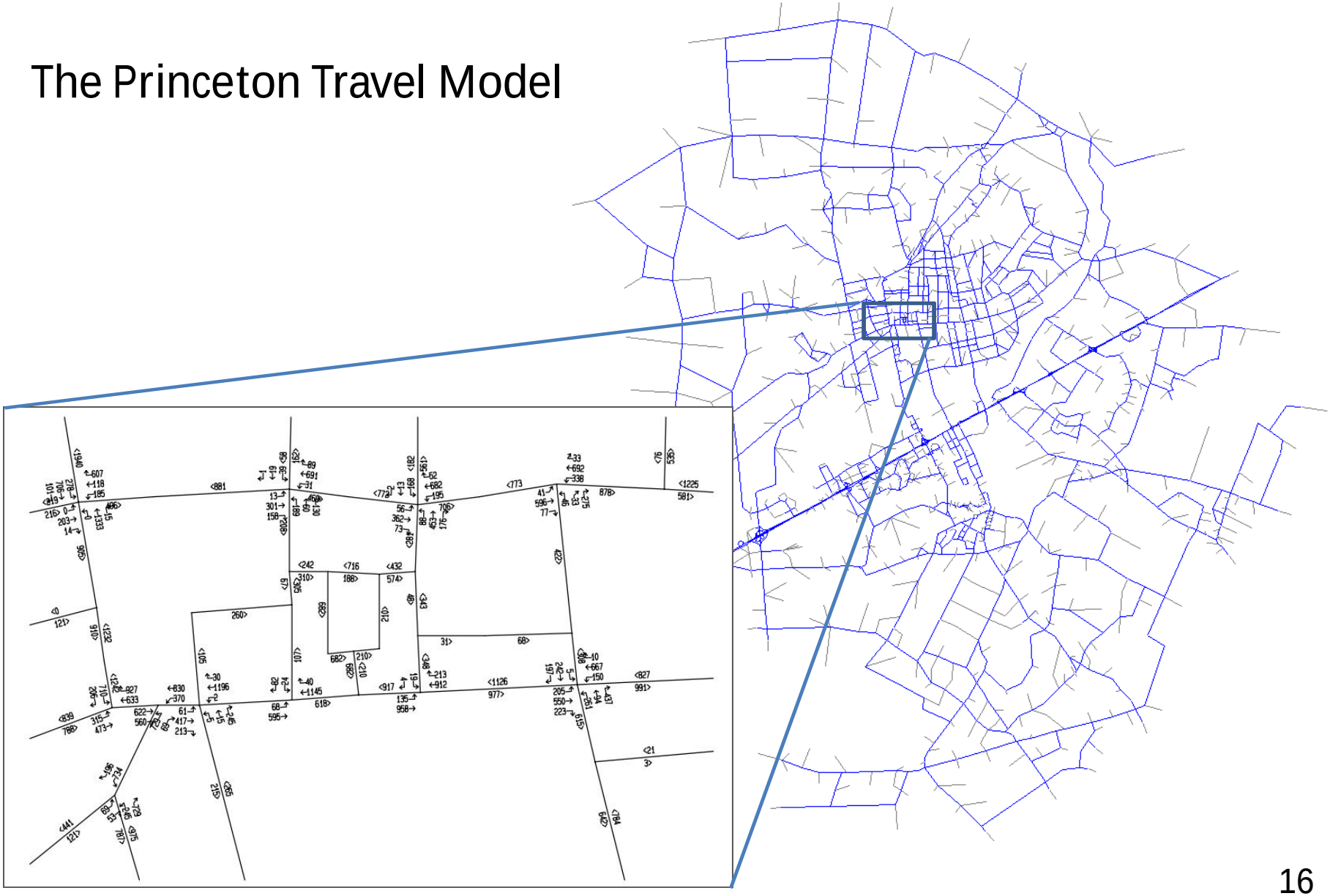


Impacts due to Future Developments

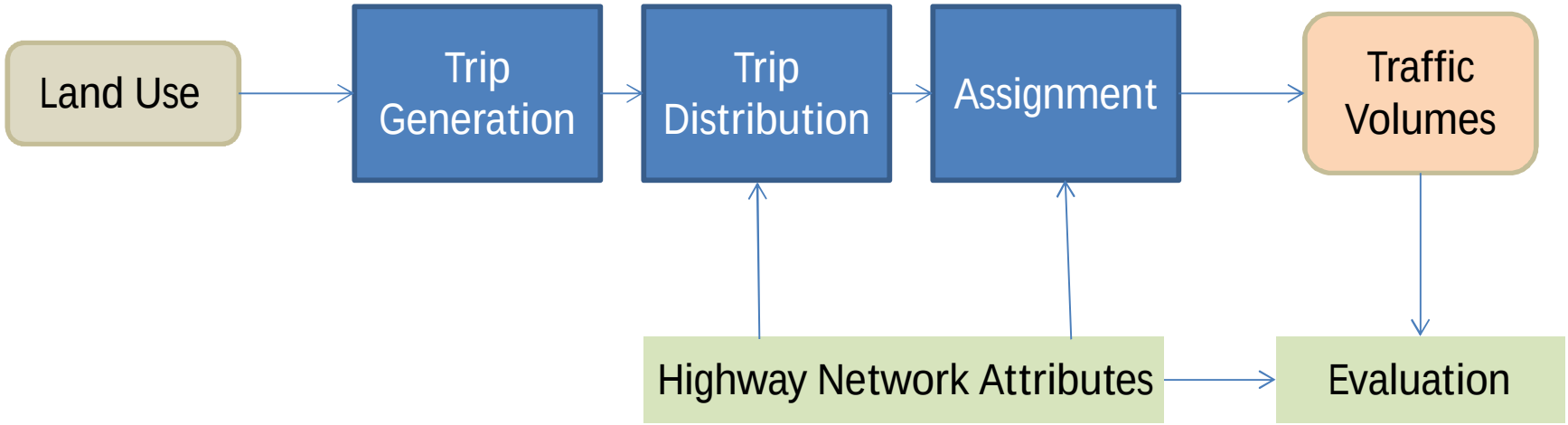
TOOL # 1 –
The Princeton Travel Model

- Covers Princeton, West Windsor, portions of Plainsboro and Montgomery
- Comprehensive land use and development inventory maintained on an ongoing basis
- Applications include:
  - Roadway assessments (Princeton and West Windsor)
  - NJDOT Penns Neck planning
  - West Windsor / Princeton Junction planning

The Princeton Travel Model

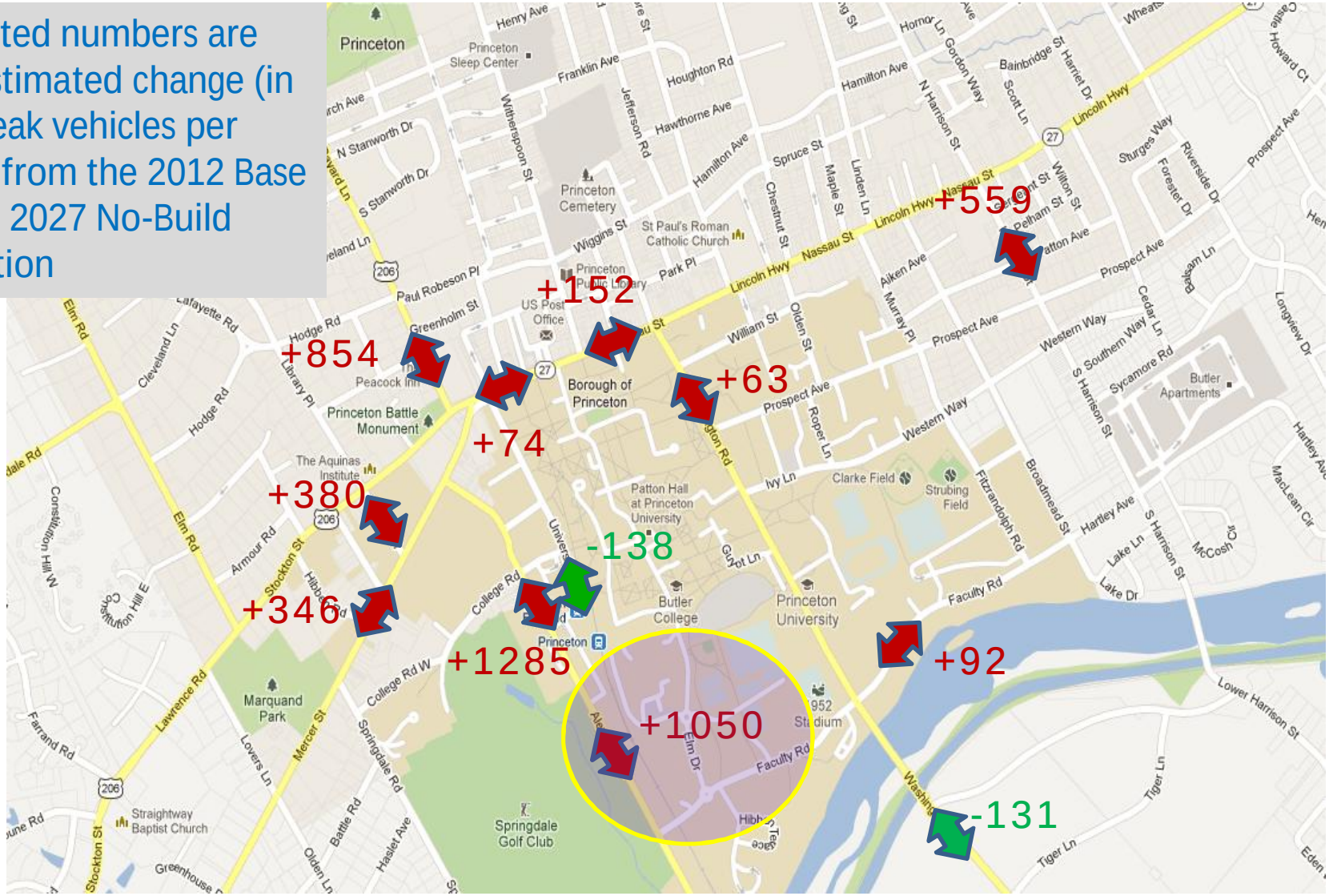


The Traffic Modeling Process



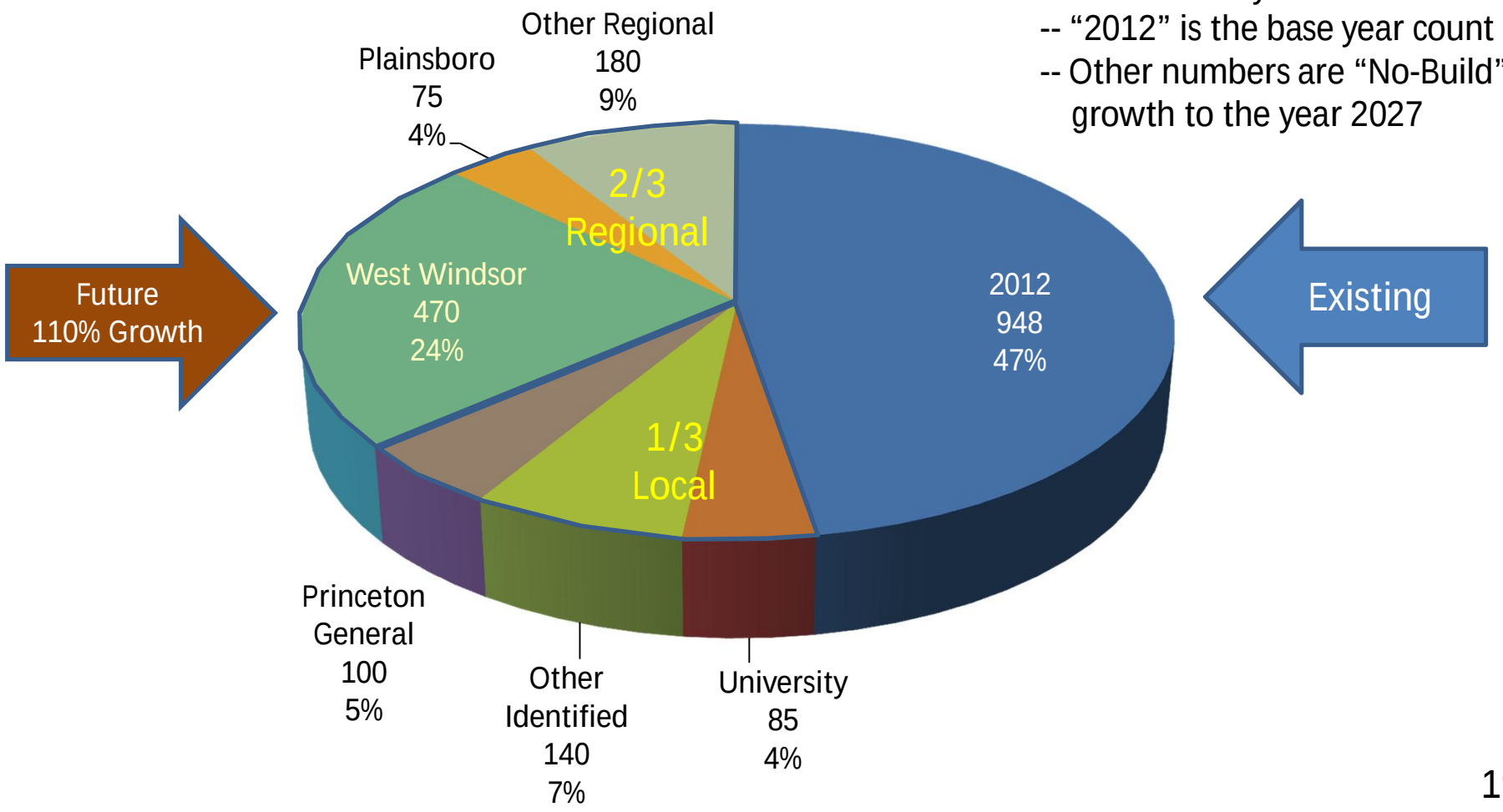
TRAFFIC VOLUME CHANGE: Existing to No-Build

Indicated numbers are the estimated change (in PM peak vehicles per hour) from the 2012 Base to the 2027 No-Build condition



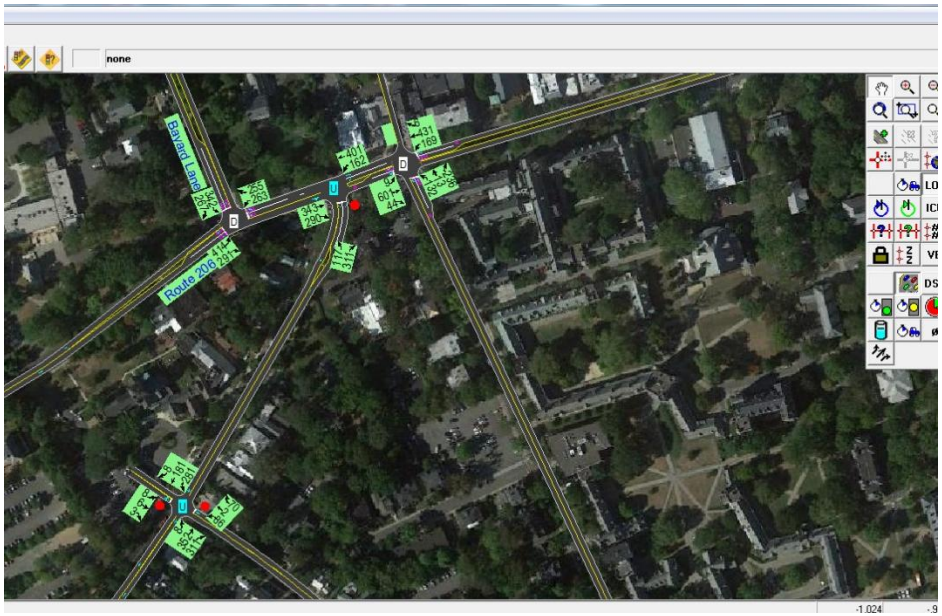
Future Traffic Volume Growth Composition– Local vs. Regional

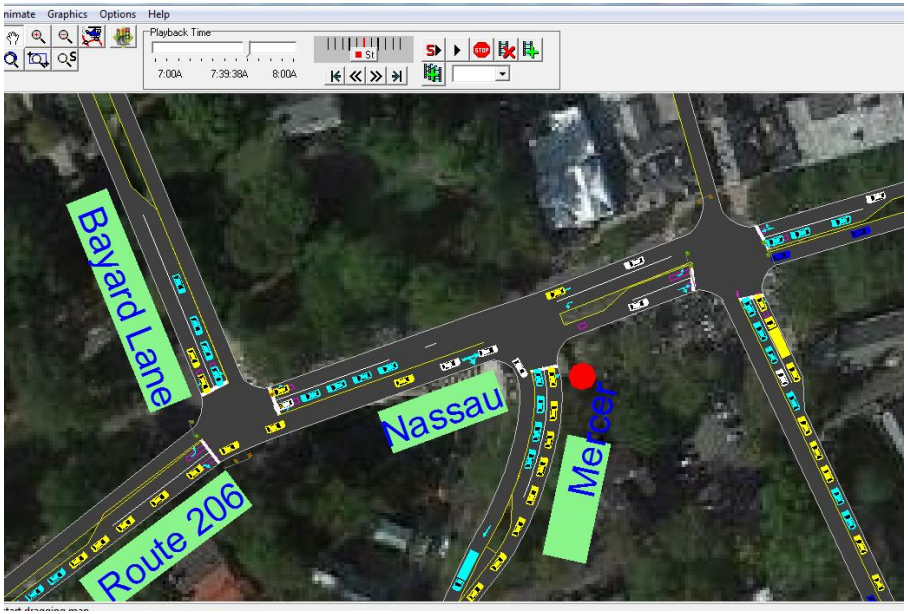
All numbers are PM Peak Hour, 2-directional volume on Alexander, north of Faculty Road
-- "2012" is the base year count
-- Other numbers are "No-Build" growth to the year 2027



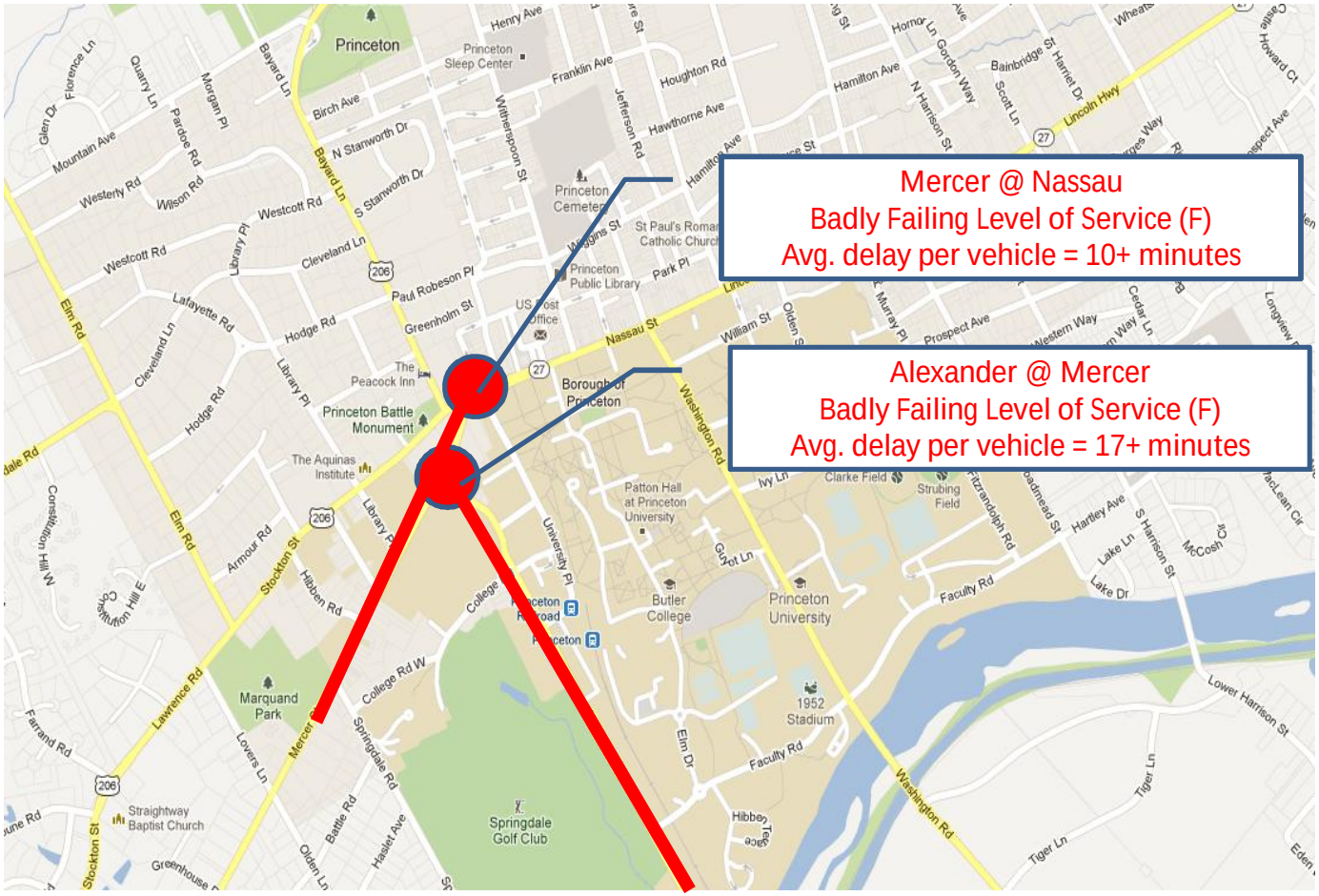
TOOL # 2 – Princeton Micro-Simulation Model

- Conducts detailed traffic performance analysis using estimated future volumes
- Provides intersection performance and vehicular delay information
- Simulates traffic circulation – identifies congestion areas, traffic backups





Snapshot of Micro-Simulation Model Findings:
Looking Only 5-Year in Future (2017) – PM Peak Hour Operation
(Not Even 15-Year Future Outlook (2027) as in Travel Demand Model)

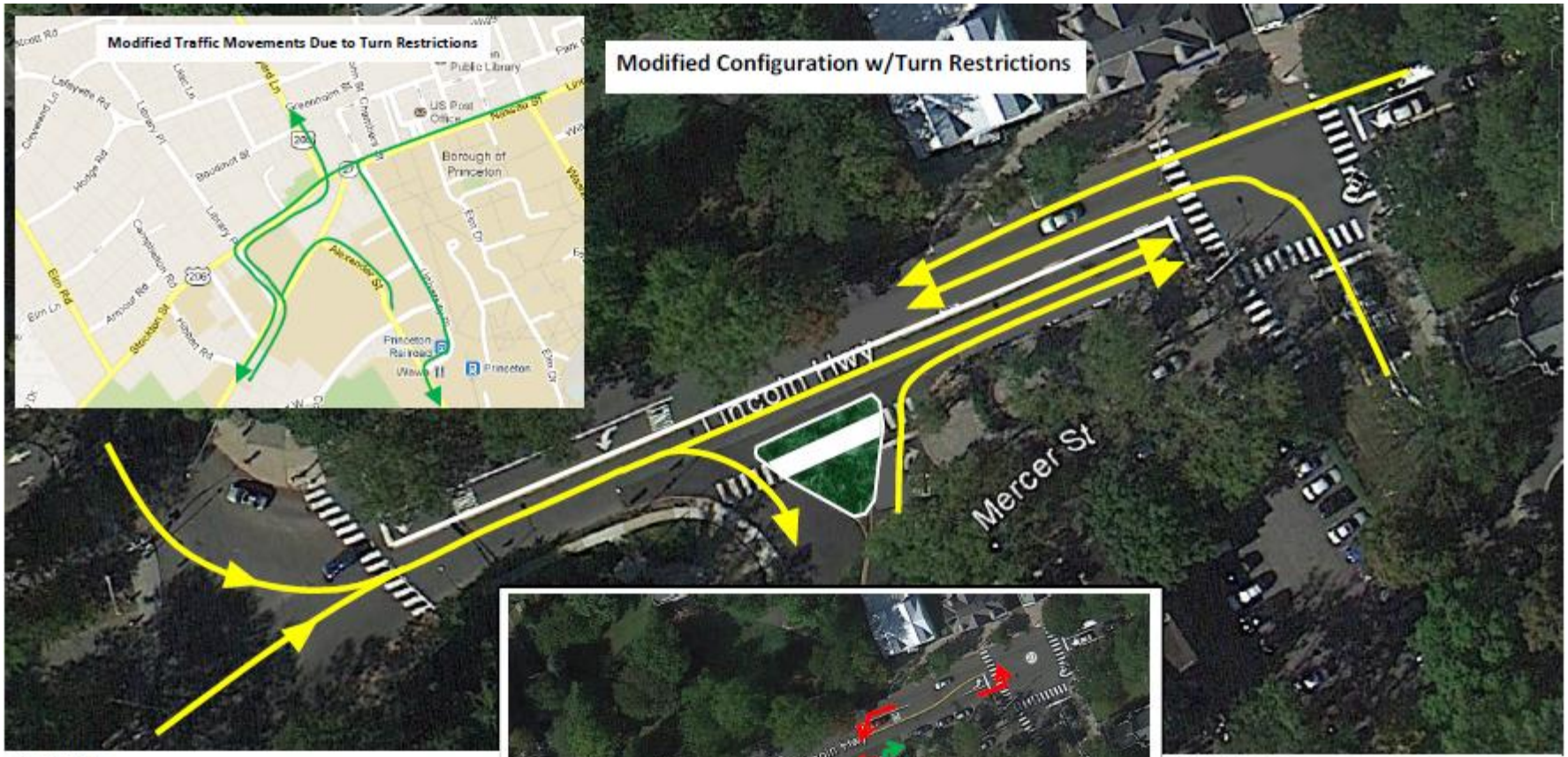


Bottom Line….

- With future growth, traffic conditions will only worsen
  - Some traffic pattern shifts may happen but in general conditions will deteriorate significantly
  - Look back: How are traffic conditions today compared to late 1990's?
- Deteriorating traffic conditions directly impact quality of life and transportation safety
- "Do Nothing" will not make the problems go away and cannot be a solution
- There is not much room and willingness to accommodate capacity expansion solutions
  - Several historic structures and monuments in the immediate vicinity
  - Pedestrian and non-motorized mode friendly atmosphere
- Thus, identifying context sensitive and multimodal friendly transportation improvements (without much right-of-way impacts) is the best way to improve traffic conditions

Identify Context Sensitive Solutions

Turn Restrictions



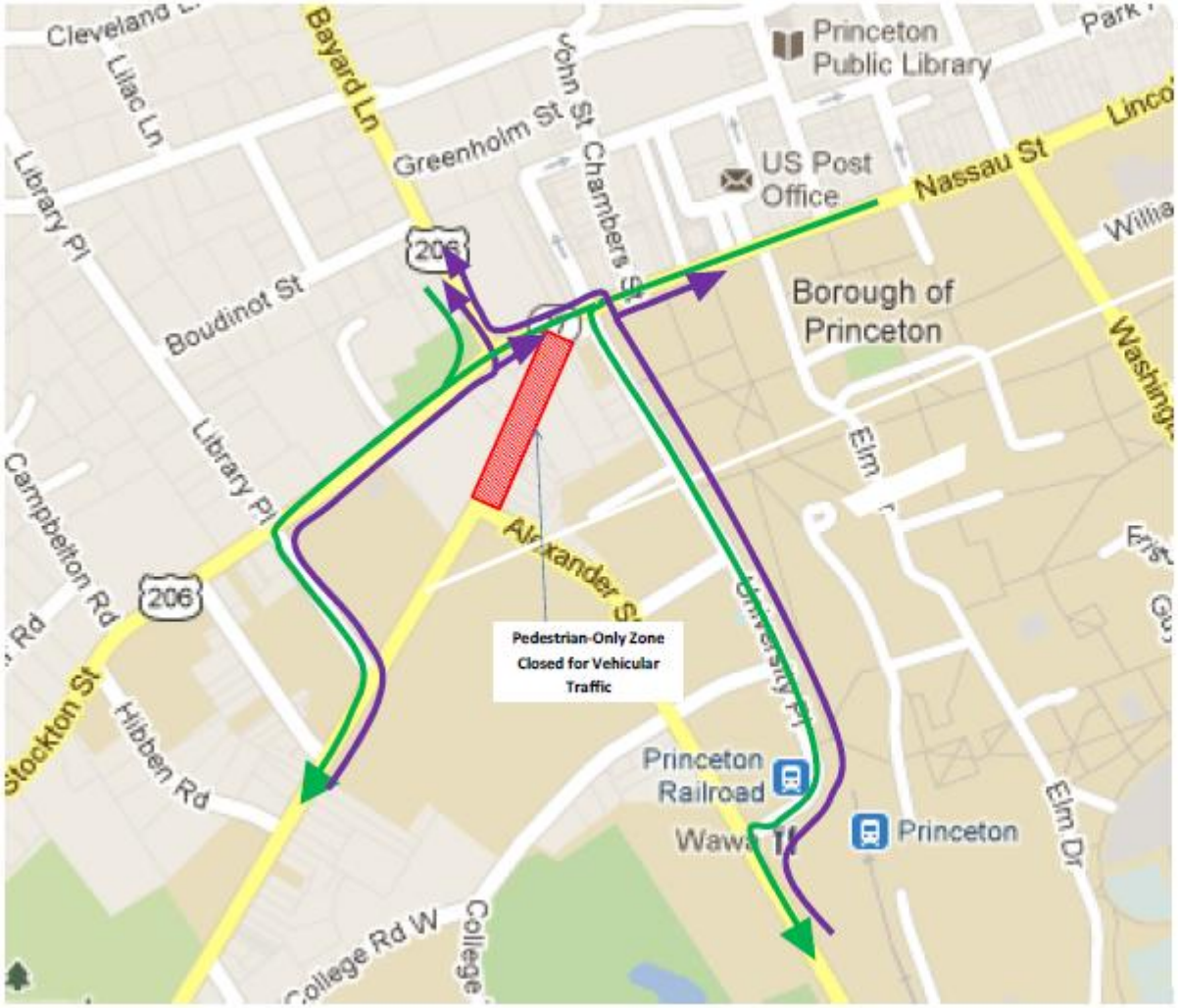
ADVANTAGES

- Less vehicular conflicts and improved traffic flow
- Better signal coordination opportunity and reduced congestion
- Less backups impacting closely spaced intersections
- Well defined traffic movements
- Wider island at Mercer Street for pedestrian crossing convenience
- Easy to implement

DISADVANTAGES

- Modified (and slightly longer) routing for some vehicles
- Elimination of few on on-street parking spaces
- May have some impacts on the intersection of Route 206 & Library Place

Roadway Segment Closure



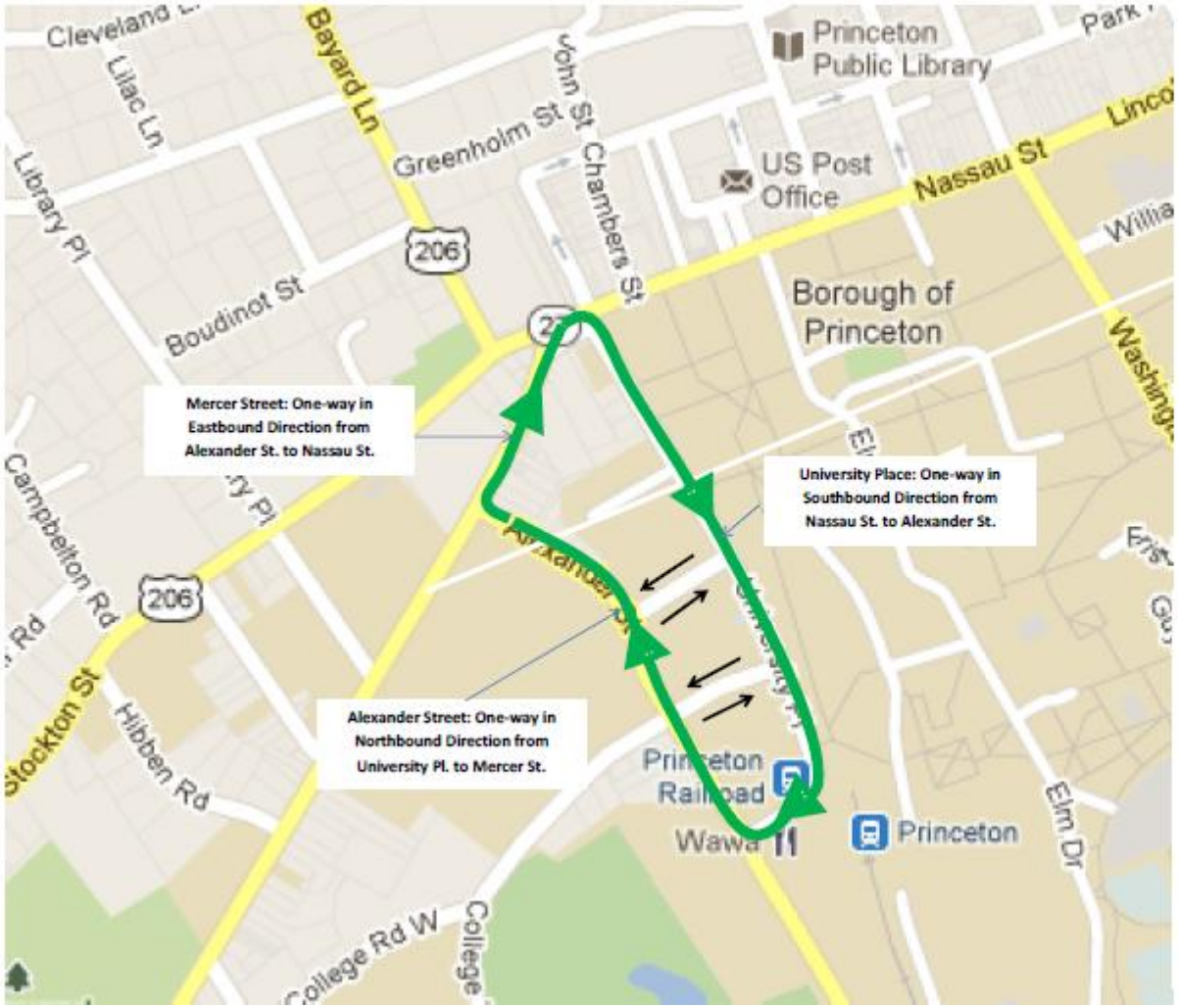
ADVANTAGES

- Less vehicular conflicts and improved traffic flow on Nassau St.
- Elimination of many vehicular conflict points - less spillback impacts at closely spaced intersections on Nassau Street
- Eastbound on-street parking (3 spaces) on Nassau Street between Mercer St. and University Pl. can be replaced by a travel lane facilitating further circulation improvements
- Better signal coordination opportunity for Bayard/Nassau and Nassau/University intersections and reduced congestion
- Alexander St. and Mercer St. intersection becomes a control-free intersection
- Minimal routing impacts for key destinations
- Improved pedestrian experience along Nassau Street
- Opportunity to create a pedestrian-only zone for variety of uses

DISADVANTAGES

- Modified routing for some vehicles
- Elimination of few on-street parking spaces
- May have some impacts on the intersection of Route 206 & Library Place
- Access to properties along the closed section of Mercer Street needs to be resolved

One-way Pair Operation



ADVANTAGES

- Well defined and streamlined traffic movements with an "All-Right-Turn" one-way loop - improved traffic flow
- Major performance improvement for University Pl. & Nassau Street signalized intersection – signal operation only for Nassau St. movements (due to left turns from Nassau St.)
- Eastbound on-street parking (3 spaces) on Nassau Street between Mercer St. and University Pl. can be replaced by a travel lane facilitating further circulation improvements for this one-way loop
- Better signal coordination opportunity for Bayard/Nassau and Nassau/University intersections and reduced congestion
- Elimination of many vehicular conflict points - less spillback impacts at closely spaced intersections on Nassau Street
- Improved performance for the proposed roundabout at Alexander St. and University Pl. intersection
- Improved performance at Alexander St. and Mercer St. intersection – stop controlled approach of Alexander St. needs to yield only to one directional traffic on Mercer St.
- Minimal routing impacts for key destinations
- Improved pedestrian crossing safety – pedestrians need to look out for one directional traffic only
- Reverse direction loop could be dedicated to potential transit

DISADVANTAGES

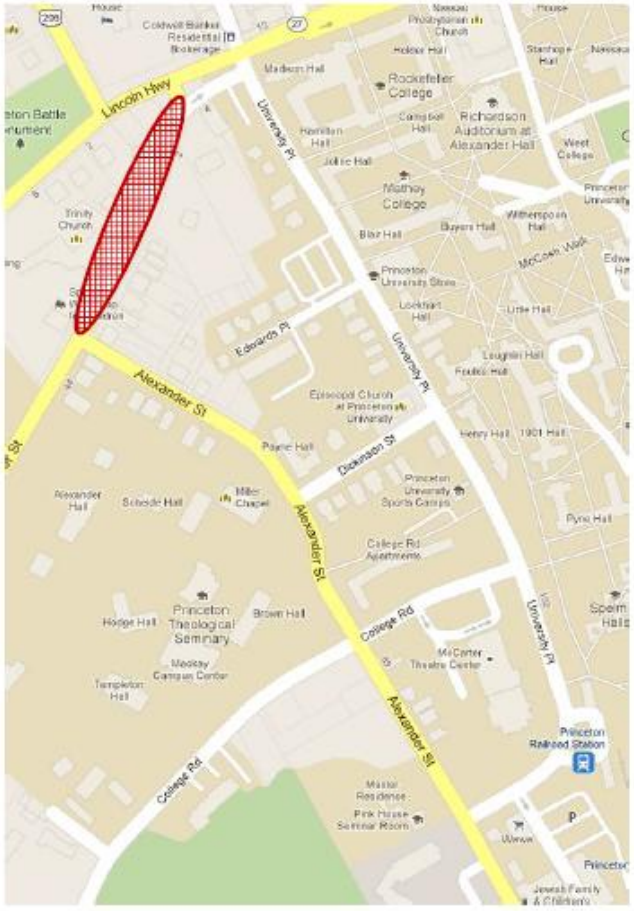
- Modified and circuitous routing for some vehicles
- Elimination of few on-street parking spaces
- May have some impacts on the intersection of Route 206 & Library Place

Overview of Travel Demand Modeling Scenarios

Modeled Scenario	Base Model	Network Updates	Land Use Updates
1. 2012 Base Condition	2006 Base Model	• Available 2012 Traffic Count Data • Any roadway improvement projects completed since 2006	• Relocation of the University Medical Center
2. 2027 No-Build Condition	2012 Base Condition	• Roadway improvements related to the Princeton University Arts and Transit Project	• All new developments/redevelopments identified in the RFP o Expansion of Graduate Hosing (Hibben-Magie) o Princeton University Arts and Transit Project o Hulfish North (Palmer Square) Redevelopment o Redevelopment of YM/YWCA o Redevelopment of Merwick and Stanworth o Redevelopment of University Medical Center
3. Improvement Package 1: Street Closures	2027 No-Build Condition	• Mercer Street closed in both directions between Alexander Street and Nassau Street • Witherspoon Street closed in both directions between Nassau Street and Spring Street • Left turn from Nassau Street onto Bank Street prohibited	• None: same as in 2027 No-Build Condition
4. Improvement Package 2: One-way Loop in Clockwise Direction	2027 No-Build Condition	• Mercer Street one-way in eastbound direction from Alexander Street to Nassau Street • University Place one-way in southbound direction from Nassau Street to Alexander Street • Alexander Street one-way in northbound direction from University Place to Mercer Street • Left turns from Nassau Street on to Bank Street prohibited • Witherspoon Street one-way in northbound direction from Nassau Street to Spring Street • Signal at Nassau Street and Witherspoon Street converted to pedestrian signal only	• None: same as in 2027 No-Build Condition
5. Improvement Package 3: One-way Loop in Counterclockwise Direction	2027 No-Build Condition	• Mercer Street one-way in westbound direction from Nassau Street to Alexander Street • University Place one-way in northbound direction from Alexander Street to Nassau Street • Alexander Street one-way in southbound direction from Mercer Street to University Place • Left turns from Nassau Street on to Bank Street prohibited • Witherspoon Street one-way in northbound direction from Nassau Street to Spring Street • Signal at Nassau Street and Witherspoon Street converted to pedestrian signal only	• None: same as in 2027 No-Build Condition
6. Stand-alone Improvement Run: Either Clockwise or Counterclockwise One-Way Loop	Either Improvement Package 2 or Improvement Package 3	• Same actions as in either Package 2 or Package 3 except: o Replace Witherspoon Street one-way conversion with current two-way operation o Fully functional traffic signal at Nassau Street and Witherspoon Street intersection	• None: same as in 2027 No-Build Condition

Improvement Package # 1 – Mercer Street Closure for Through Traffic

(Between Nassau Street and Alexander Street)



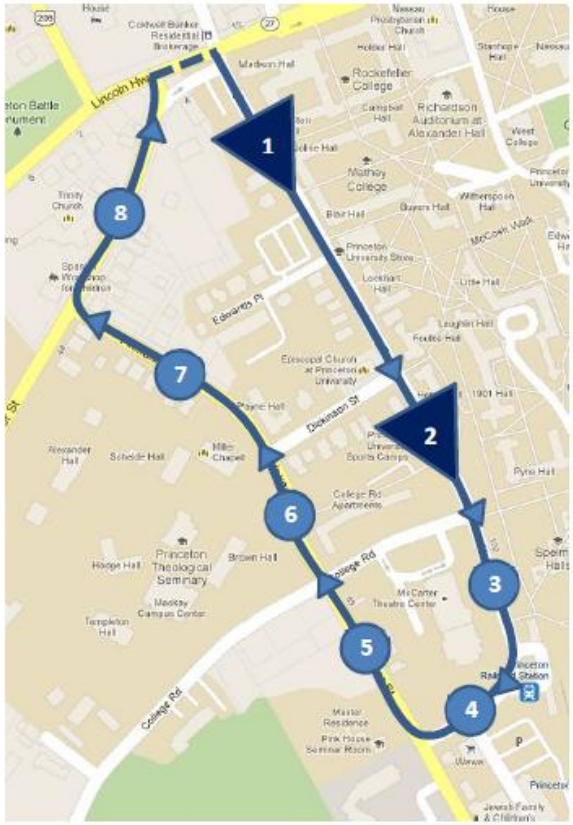
OPTION 1

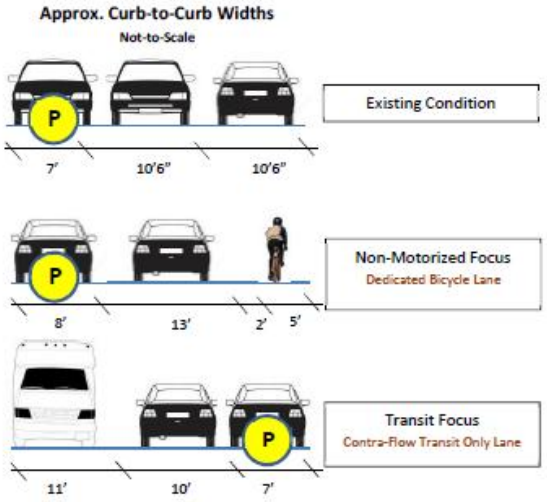
OPTION 2

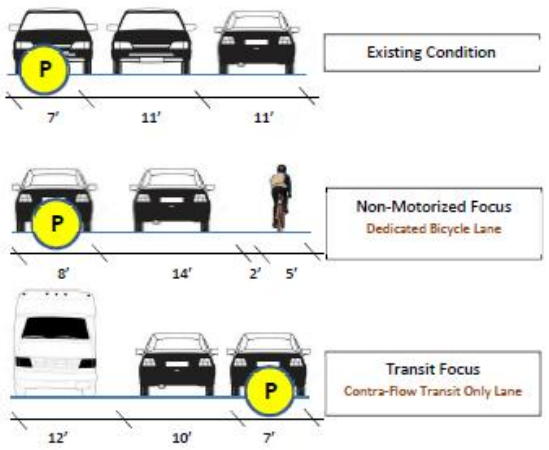
Improvement Package # 1 – Witherspoon Street Closure

(Between Nassau Street and Spring Street)

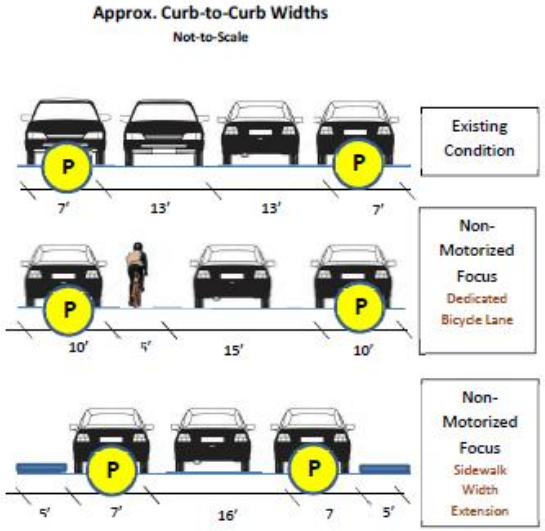
Improvement Package # 2 – Clockwise One-Way Loop



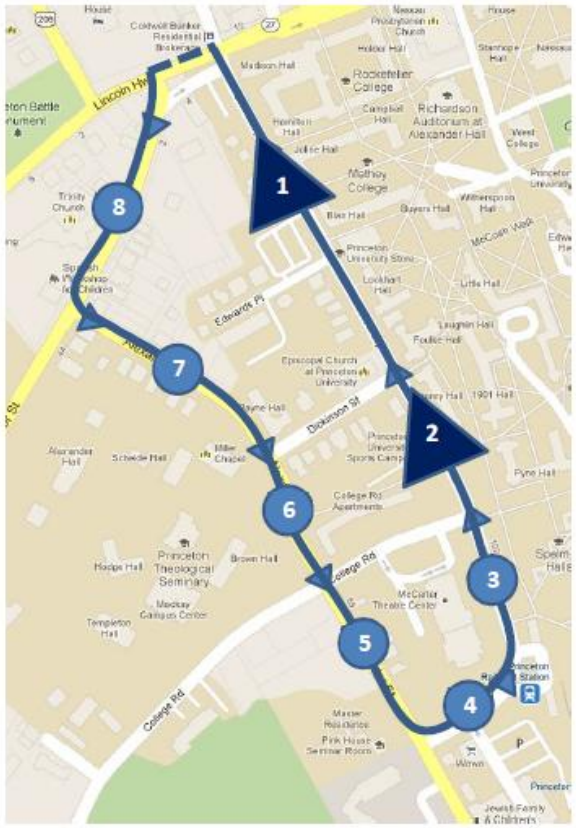


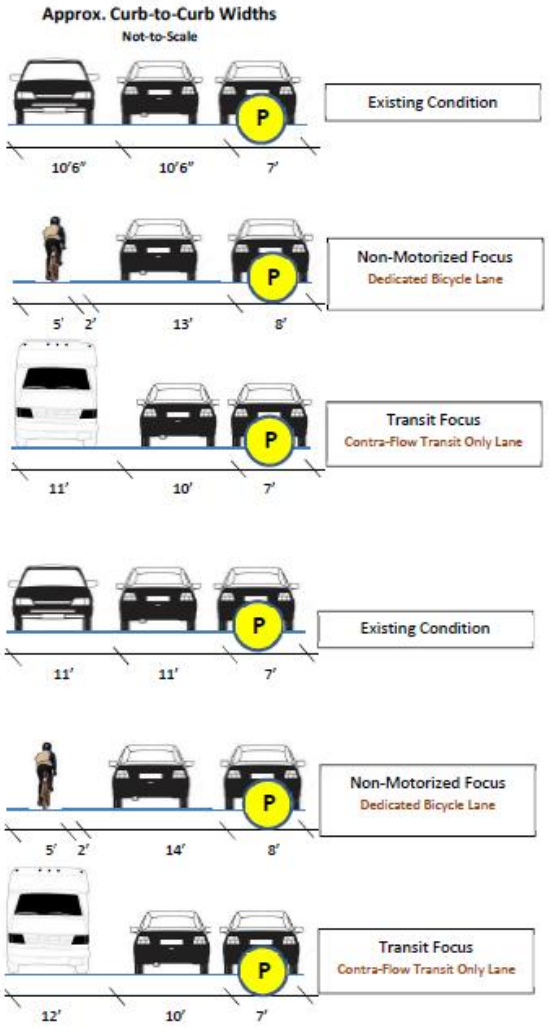


Improvement Package # 2 – Northbound One-Way

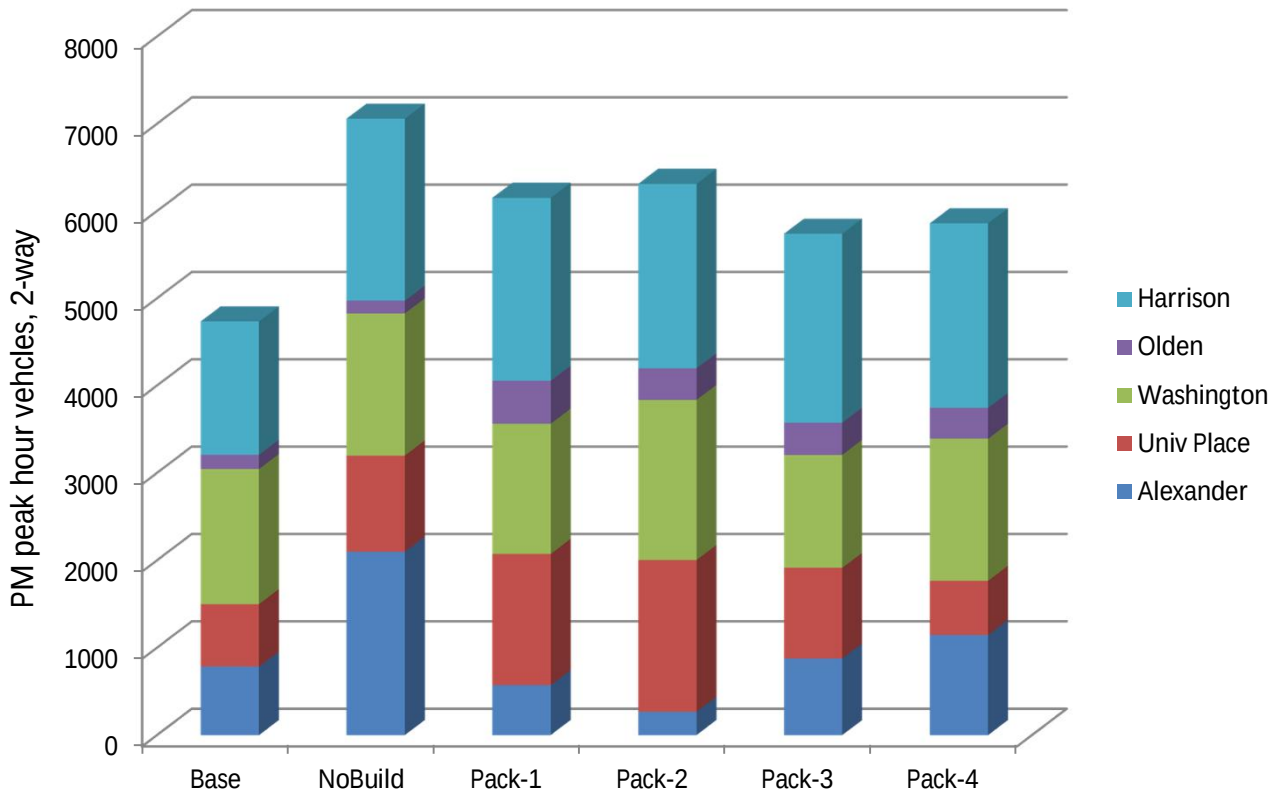


Improvement Package # 3 – Counter-Clockwise One-Way Loop





Traffic Volume* on North/South Streets at Nassau Street



* PM peak hour vehicles, 2-way

Key Observations – Travel Demand

- Forecast peak hour traffic growth is likely to be concentrated along the Alexander Street corridor
  - (2012 Exiting to 2027 No-Build comparison)
- Proposed improvement packages will redistribute future traffic from the Alexander Street corridor to other access corridors,
  - Thereby relieving pressure on the Alexander Street corridor
  - (2027 No-Build to Package 1/2/3/4 comparison)
- Witherspoon Street closure between Nassau St. and Spring St. will have impacts on traffic circulation
  - Vandeventer Avenue and Chambers Street intersections with Nassau Street will be impacted

Key Observations – Travel Demand

- All improvement packages have more or less similar impacts on traffic volume redistribution

- Selection of one-way direction of travel will have localized implications
  - Clockwise one-way loop will involve all right turn movements along the loop
  - Will significantly improve traffic operation along Nassau Street between Bayard Lane and University Place
    - Eliminating several left turns
    - Possibly eliminating the traffic signal at University Pl.
  - Counter-clockwise one-way loop will result in better operation of the proposed roundabout at University Pl. and Alexander St. intersection

- One-way systems lack redundancy
  - Existing: Two streets, two lanes in each direction
  - Proposed: One street, one lane in each direction

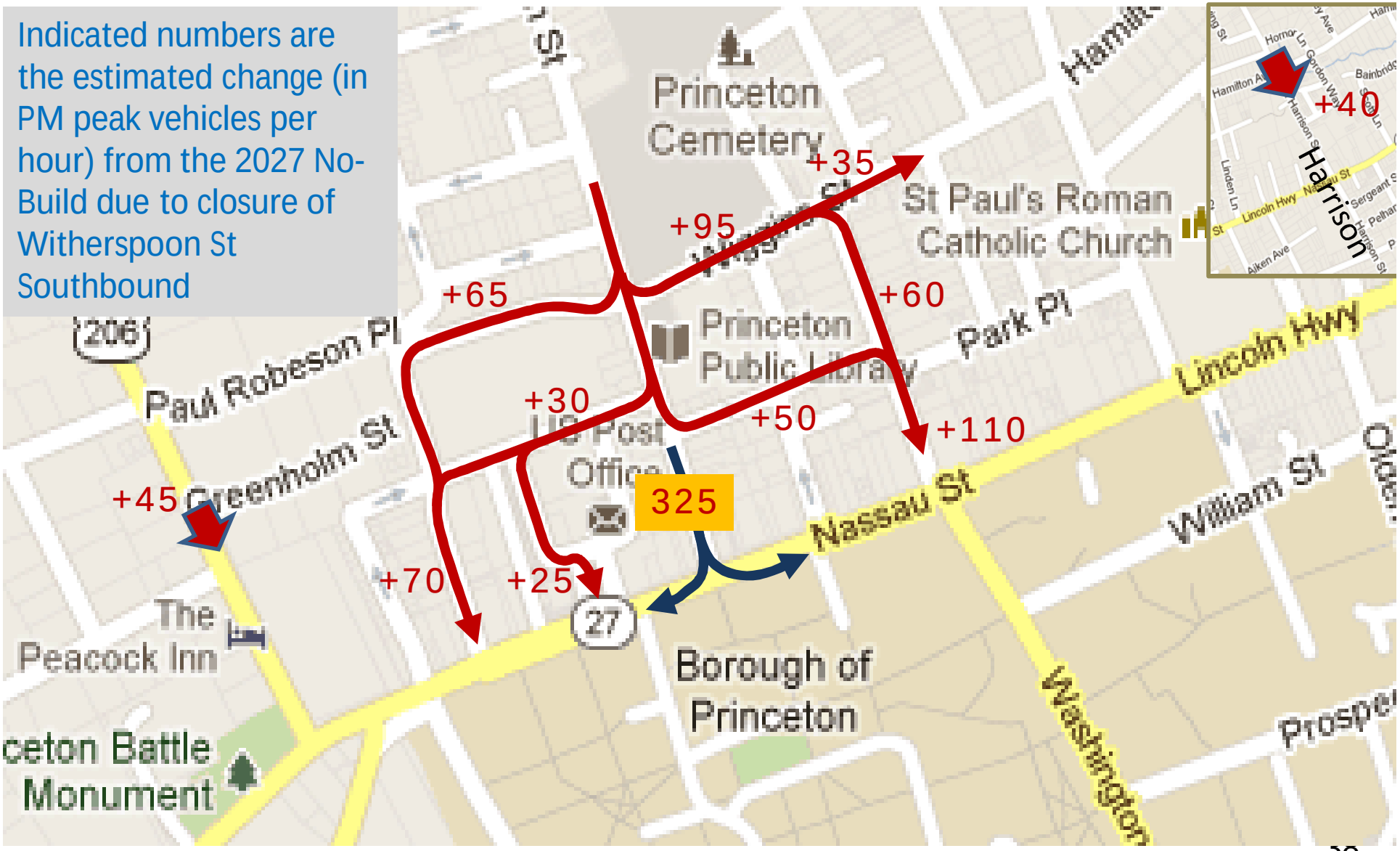
Witherspoon Street
Basic One-way Circulation Review

TRAFFIC VOLUME CHANGE: Close Witherspoon Southbound (AM)

Indicated numbers are the estimated change (in AM peak vehicles per hour) from the 2027 No-Build due to closure of Witherspoon St Southbound

TRAFFIC VOLUME CHANGE: Close Witherspoon Southbound (PM)

Indicated numbers are the estimated change (in PM peak vehicles per hour) from the 2027 No-Build due to closure of Witherspoon St Southbound



Key Findings - Micro-Simulation Performance Review

AM Peak Hour – LOS and Delay Comparisons (Note: Effects of queuing not reflected)

		AM Peak Hour											
Intersection	Control	2017 Baseline Analysis		2017 Mercer Closed Analysis		2017 Alexander & University Clockwise One-way Loop Analysis		2017 Alexander & University Clockwise One-way Loop Updated* Analysis		2017 Alexander & University Counterclockwise One-way Loop Analysis		2017 Alexander & University Counterclockwise One-way Loop Updated** Analysis	
		LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
NASSAU CORE AREA													
Nassau & Bayard	Signal	D	49.6	C	27.1	C	28.7	C	29.0	D	39.5	D	39.5
Nassau & Mercer	Stop	F	80.5	-	-	F	216.3	C	24.9	C	19.4	C	15.5
Nassau & University	Signal	C	21.7	B	14.5	A	8.4	C	24.6	C	20.5	B	12.8
ALEXANDER CORRIDOR													
Alexander & Mercer	Stop	F	434.9	A	-	D	34.4	D	34.4	A	-	A	-
Alexander & College	Stop	D	34.6	C	17.8	B	11.8	B	11.8	E	39.9	E	39.9
Alexander & University	Roundabout	C	-	D	-	F	-	F	-	A	-	A	-

*Signal shifted from Nassau/University to Nassau/Mercer

** University Place to Mercer Street flows bypass Nassau Street

PM Peak Hour – LOS and Delay Comparisons (Note: Effects of queuing not reflected)

		PM Peak Hour													
Intersection	Control	2017 Baseline Analysis		2017 Mercer Closed Analysis		2017 Alexander & University Clockwise One-way Loop Analysis		2017 Alexander & University Clockwise One-way Loop Updated* Analysis		2017 Alexander & University Counterclockwise One-way Loop Analysis		2017 Alexander & University Counterclockwise One-way Loop Updated** Analysis	
		LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
NASSAU CORE AREA													
Nassau & Bayard	Signal	C	28.2	C	28.8	C	20.2	B	17.6	C	32	C	32
Nassau & Mercer	Stop	F	1031.3	-	-	C	20.1	B	14	D	30.3	C	16.3
Nassau & University	Signal	B	15.4	B	18.4	A	3.2	B	12.5	C	27.1	C	28.1
ALEXANDER CORRIDOR													
Alexander & Mercer	Stop	F	600.4	A	-	C	16.4	C	16.4	A	-	A	-
Alexander & College	Stop	E	36.6	C	22.9	E	45.7	E	45.7	D	30.5	D	30.5
Alexander & University	Roundabout	B	-	C	-	D	-	D	-	A	-	A	-

*Signal shifted from Nassau/University to Nassau/Mercer

** University Place to Mercer Street flows bypass Nassau Street

Recap….

- With future growth, traffic conditions will only worsen
  - Some traffic pattern shifts may happen but in general conditions will deteriorate significantly
  - Look back: How are traffic conditions today compared to late 1990's?
- Deteriorating traffic conditions directly impact quality of life and transportation safety
- "Do Nothing" will not make the problems go away and cannot be a solution
- There is not much room and willingness to accommodate capacity expansion solutions
  - Several historic structures and monuments in the immediate vicinity
  - Pedestrian and non-motorized mode friendly atmosphere
- Thus, implementing context sensitive and multimodal friendly transportation improvements (without much right-of-way impacts) is the best way to improve traffic conditions

Discussion/Questions

Responses to Task Force Questions

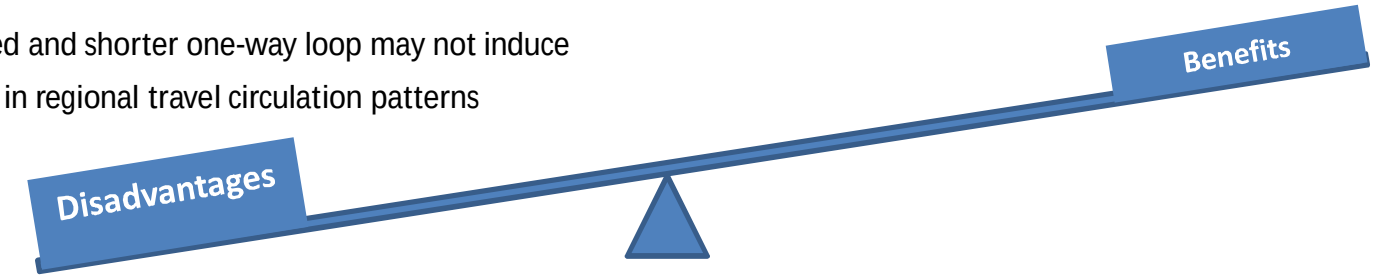
Question # 1: Can one-way loop be modified to use College Road or Dickinson Street?

Disadvantages

- Expected traffic circulation improvements within the core area (Nassau Street between Bayard Lane and University Place) can not be achieved
- Expected performance improvement for the intersection of Mercer Street & Alexander Street can not be achieved
- Potential for a dedicated transit lane on University place is diminished
- Potential for multimodal opportunities is diminished
- May add significant confusion and traffic circling for unfamiliar drivers
- Modified and shorter one-way loop may not induce change in regional travel circulation patterns

Benefits

- Mercer Street remains two-way
- Current access is maintained for parts of Alexander Street and University Place
- No additional traffic volumes on streets connecting Mercer Street and Rt. 206



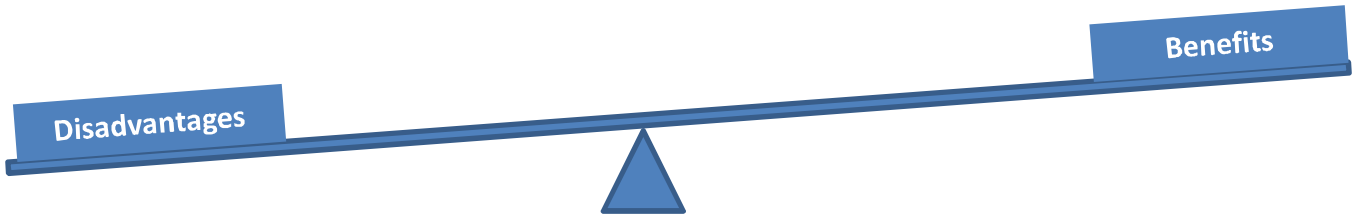
Question # 2: Can two-way traffic be maintained on Mercer Street with one-way loop schemes?

Disadvantages

- Expected traffic circulation improvements within the core area (Nassau Street between Bayard Lane and University Place) are significantly minimized
- Expected performance improvement for the intersection of Mercer Street & Alexander Street can not be achieved
- Potential for multimodal opportunities is diminished

Benefits

- Mercer Street remains two-way
- No additional traffic volumes on streets connecting Mercer Street and Rt. 206



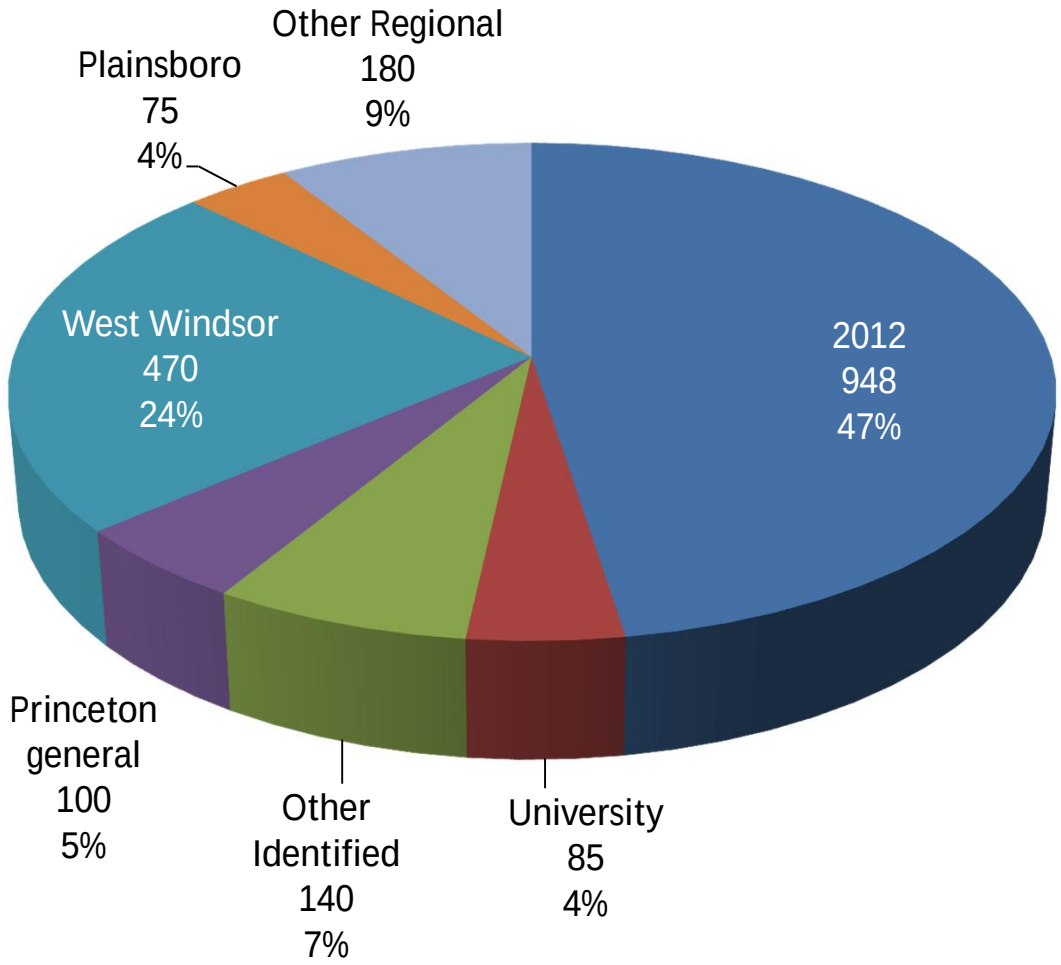
Question # 3: Can one-way loop be reversed in the AM & PM?

- NOT RECOMMENDED
  - Very difficult to implement and enforce
  - Will require complex striping and signing schemes, which will result in driver confusion
  - Will necessitate major signal architecture changes for Nassau Street and University Place intersection
  - Not recommended due to traffic safety issues

Question # 4: Is there a difference between AM and PM peak? Why was PM peak chosen?

- Both peaks were analyzed, only one was presented to simplify the discussion
- PM peak contains more retail and university trips
- AM and PM peaks show similar directional traffic variations

Question # 5: Can the estimated change in traffic volumes be separated into two components – local vs. regional?



All numbers are PM Peak Hour, 2-directional volume on Alexander, north of Faculty Road

-- "2012" is the base year count

-- Other numbers are "No-Build" growth to the year 2027

Question # 6: Would counter-clockwise loop make traffic circulation easier?

Clockwise Loop Benefits and Disadvantages

- Significant traffic performance improvement potential for the core area (Nassau Street between Bayard Lane and University Place)
- Potential for multimodal opportunities
- Opportunity for dedicated transit lane
- All right turn movements – easier from circulation point of view
- Better circulation benefits during PM peak vs. AM peak
- Significant performance deterioration likely at the proposed new roundabout at University & Alexander
- Reduces redundancy (conversion of 2 two-way streets into single one-way loop)

Counter-Clockwise Loop Benefits and Disadvantages

- Significant traffic performance improvement at the proposed new roundabout at University Place and Alexander Street
- Potential for multimodal opportunities
- Opportunity for dedicated transit lane
- All left turn movements – need to yield to major opposing flows on Nassau Street
- Better circulation benefits during AM peak vs. PM peak
- Significant performance impact on Nassau Street core area (between Bayard Lane and University Place)
- Reduces redundancy (conversion of 2 two-way streets into single one-way loop)

Question # 7: What will be the impacts of future transit options on peak hour traffic?

- Not Assessed as a part of this study
  - Depends on the type of transit option selected
  - Depends on the capacity of the selected transit option
  - Depends on the final alignment for the selected transit option
  - Depends on the frequency and schedule of operation
  - Depends on the overall travel time and attractiveness of transit option
  - Depends on the proportion of local traffic (which may use transit) vs. regional traffic (will not use local transit)

  - *However the experience is, unless a transit option is connecting very high density and complementary generation-attraction nodes, the likely mode share for transit will not have significant impacts on vehicular traffic mode and performance*