NEW HAVEN PEDESTRIAN AND BICYCLE GAP ANALYSIS

City of New Haven, Connecticut

FINAL REPORT

South Central Regional COG

Nelson|Nygaard consulting associates

March, 2009

Acknowledgements

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EXECUTIVE SUMMARY

The South Central Regional Council of Governments (SCRCOG) retained Nelson\Nygaard Consulting Associates to conduct the downtown New Haven Pedestrian and Bicycling Gap Analysis. The project was funded by SCRCOG.

The study area included Yale University, downtown New Haven, and Union Station. The neighborhoods adjacent to the downtown and the wider region were considered as part of the longer term development of a larger bicycle network.

The objective of this project was to develop a short, medium and long term plan to make walking and bicycling safer, easier and more accessible as a transportation alternative in downtown New Haven. The short term plan focused on low-cost, easily constructed solutions to create the beginning structure of a bicycle and pedestrian network. The goal of the short term plan is to integrate bicycling into the existing street network to encourage cycling and educate motorists to share the road space. The medium term plan focuses on improving the pedestrian environment through street conversions and consistent traffic signals. The long term plan further develops the short term ideas with more advanced bicycle facility design, additional lane miles of bicycle facilities, and further improvements to the pedestrian environment.

The project was developed around 5 core ideals:

1. Develop a Functional System- Create a system for everyday riding.

2. Develop a system linking the core assets and destinations of New Haven.

3. Build the network.

4. Use other projects such as the Gateway Community College development, Farmington Canal Line construction, Grand Avenue Bridge opening and the reconstruction of Route 34 to further improve a bicycle and pedestrian system.

5. Improve "Street Smarts" education and enforcement on sharing the road.

With these core ideals in mind, the Study Team conducted extensive field research, including site visits, user surveys (at the State Street Station and on the New Haven Green), examination of motorized and non-motorized networks and evaluated how these systems served area employees, students and residents. Several stakeholder meetings and one public work session were also held, to collect ideas, understand concerns and opportunities and to review draft recommendations.

SHORT TERM STRATEGIES

Among the key challenges facing the study area is developing the initial blueprint for street modifications establishing the streets of New Haven as "shared" spaces. Balancing the transportation hierarchy from a system of streets used to move cars to one where pedestrians and bicyclists are a priority involves physically changing the streets, creating new policies for what happens on the road, and educating all road users on the operation of this new street system.

The Study Team identified a series of short term strategies to support the development of a plan to make the streets of New Haven easier for bicycling and walking. While strategies are listed as independent recommendations, projects and programs are mutually-dependent, as each proposed project and program is realized, that project will strengthen existing efforts and likewise be enhanced with the implementation of subsequent projects. These short term strategies include:

No Right Turn on Red – The Study Team recommends creating a downtown district boundary where motorists are prohibited from making turns during the red light phase. This is especially important for senior citizens and people with disabilities, as these groups take longer to ascend and descend the curb at intersections. This is also an important safety feature for cyclists, especially along bus and truck routes, as they can be unexpectedly overtaken by rear wheels. Some locations in the downtown area already have signs in place, like this one at Crown Street (Figure 1).

Figure 1: No Turn on Red is essential to street safety.

Bike Boxes/Advanced Stop Lines – Many of the streets in downtown New Haven set the stop bar back from the crosswalk to reduce potential conflicts between stopped and turning vehicles; especially long vehicles like buses and trucks. The bicycle box is an advanced stop line, typically marked at 8 to 10 feet away from the crosswalk, or the distance of many stop bars in New Haven. This road treatment is used to create better communication between motorists and bicyclists by placing. Figures 2 and 3 depict bicycle boxes from two angles. Figure 4 show locations for bicycle boxes.

Figure 2: Green pigmented bike box in front of the stop bar

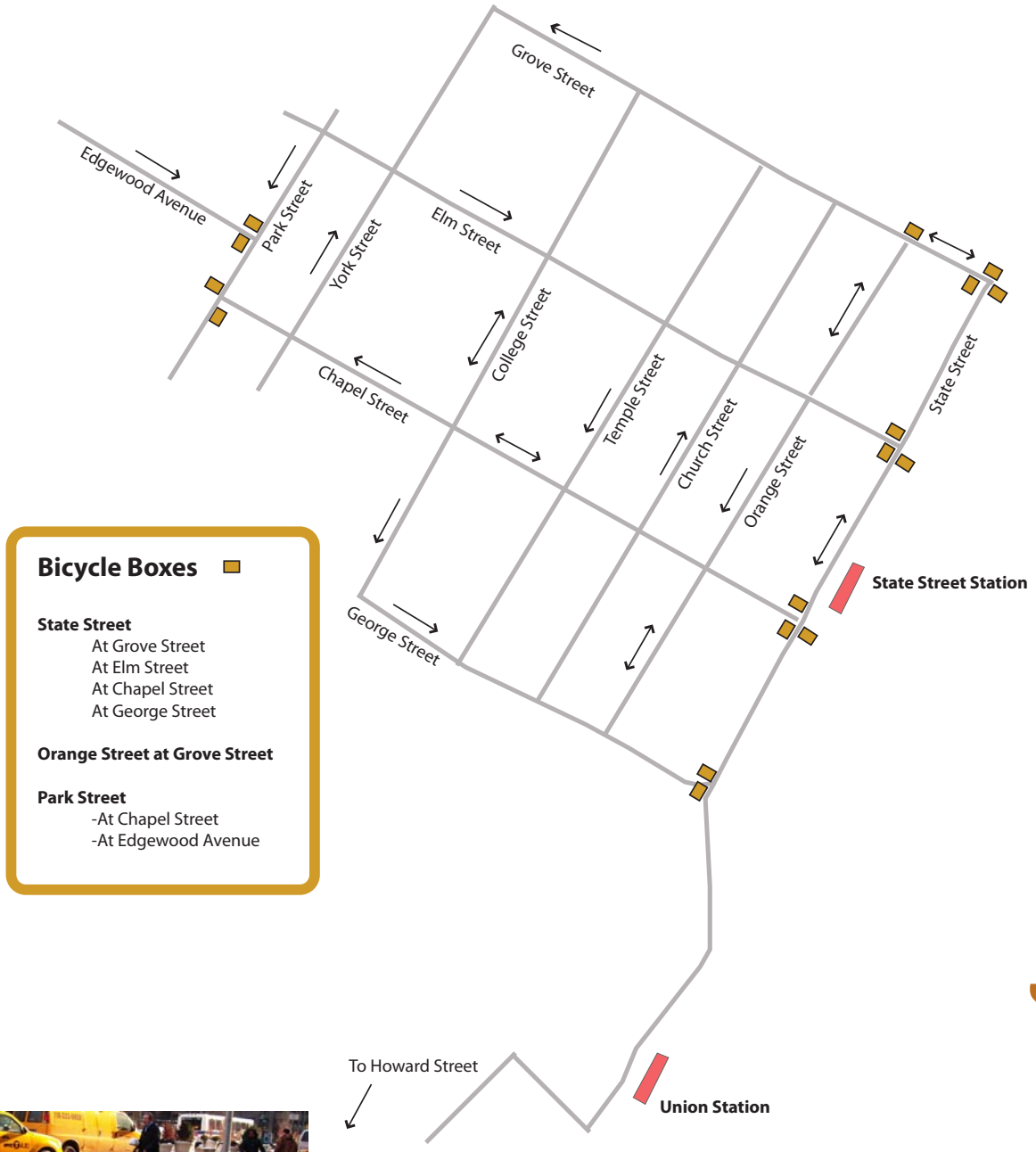
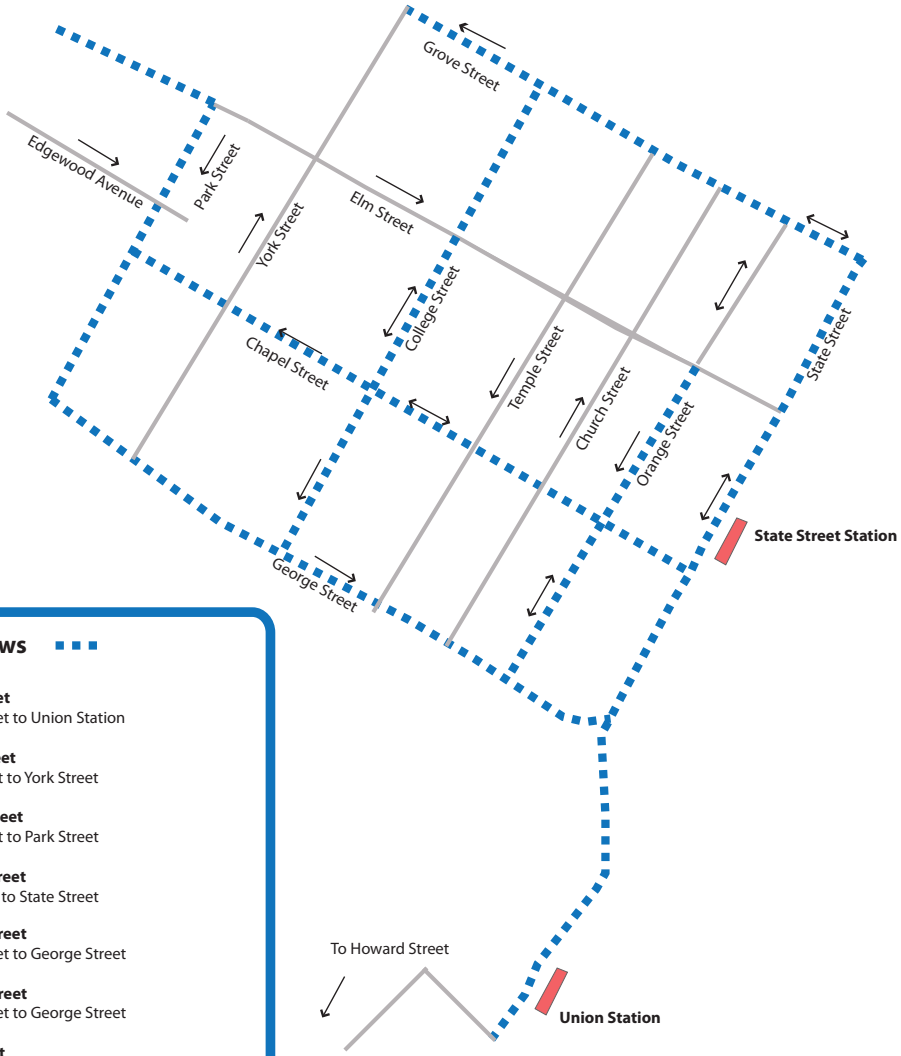


Figure 4: Locations for Bicycle Boxes

Figure 3: Green pigmented bike box at approach to intersection

Shared Streets – In support of the study's objectives to create a bicycle network in downtown New Haven, a system of shared streets will be developed to guide bicyclists while instructing motorists to share the road space. These streets will be demarcated with bicycle symbols and chevrons or bicycle lanes indicating the presence of bicycles and the direction of travel, as shown in Figure 5 and 6.

Figure 5: Shared street marking: Bicycle symbol with chevrons showing direction.



Sharrows

State Street
Grove Street to Union Station

Grove Street
State Street to York Street

Chapel Street
State Street to Park Street

George Street
Park Street to State Street

Orange Street
Grove Street to George Street

College Street
Grove Street to George Street

Park Street
Elm Street/Broadway to George Street

Figure 6: Shared street marking: Outside of door zone.

Figure 7: Locations for Sharrows

MEDIUM TERM STRATEGIES

In the medium term, the study identifies improvements to the street network with an eye toward the pedestrian and motorist. From a safety perspective, motor vehicle speed is the leading determinant of severity of injury should a crash occur. There are numerous ways to bring down motor vehicle speed outside of changing the regulatory speed limit by improving the roadbed for pedestrians and bicyclists. The medium term strategies were developed to enhance the strategies defined in the short term while setting the groundwork for the ideas defined in the long term strategies. The medium term strategies include:

Study Concurrent Signal Timing and Leading Pedestrian Intervals – In conjunction with developing a network for bicyclists, planning to "close the gaps" in the pedestrian environment was essential in this project. Outside of existing sidewalk and curb infrastructure, the most important aspects for pedestrians in crossing an intersection is having enough time to cross the street and motorists yielding to pedestrians.

Concurrent signal timing allows people to cross the street in the same direction as motorist during the green light phase. This signal series can be augmented by a leading pedestrian interval, wherein there is an all red/stop phase for motorists while pedestrians can begin crossing in tandem with motorists when the light turns green. This additional amount of time for pedestrians can be on any length, though should be a minimum of 3-5 seconds in order for pedestrians to successfully descend the curb.

1-way to 2-way Street Conversions – Preliminary analysis suggests that changing the direction of select streets from one-way to two-way will improve the street environment for all users. Two-way streets are better than one-way streets in getting motorists to desired destinations at safe speeds, bicyclists to destinations without riding on sidewalks or against traffic, and pedestrians to safely cross the street as motorists pay closer attention to traffic.

The following streets were considered priorities for conversion from 1-way to 2-way:

College Street – From the New Haven Green to Chapel Street

Church Street – From Chapel Street to Route 34

LONG TERM STRATEGIES

In the long term, this study identifies a series of projects that will help transition the road network to an integrated multi-modal system that is comfortable for users of all experience levels. The proposed network will create a backbone for future local and regional linkages, further transforming downtown New Haven into a first class bicycling and walking town.

The following issues are considered for a long term strategy:

Connect to Farmington Canal Line – The idea of connecting the Farmington Canal Line Greenway with new bicycle facilities is integral in this effort to create a bicycle facility from New Haven harbor to Hamden. Creating the final connections for this recreational and commuting facility is essential in developing a multi-modal approach to sustainable, local and regional transportation.

Create Cycle Tracks – It is proposed to modify the short-term sharrows along State and Grove Streets to protected bicycle facilities in the long term. Elm Street will be added to this list. The cycle tracks use a physical barrier to keep motorists from encroaching on the road space reserved for cyclists, as seen in Figure 8. Figure 9 shows the proposed cycle track routes.

Figure 8: One-way cycle track

IMPLEMENTATION

Implementation of the proposed strategies and programs is a tiered system scheduled in short, medium, and long term improvements. The short term improvements were developed to be implementable in the 2009-2010 construction years. The medium term improvements can be considered concurrently. The signal upgrade program within the medium term improvements, requires significant study regarding the feasibilitity of changing each light within the entire network. Funding and financing the long term improvements will require leveraging additional public sources of funding for transportation infrastructure as these are expensive infrastructure improvements that would also need additional study for the overall feasibility. Public-private partnerships should be pursued wherever feasible to gain additional sources of revenue.

Figure 9: Locations for cycle tracks

PUBLIC INPUT

This section summarizes public input for the New Haven Pedestrian and Bicycle Gap Analysis project. A Technical Advisory Committee (TAC) of stakeholders met at the beginning of the project to discuss the direct of the work as well as the outreach effort. The TAC of stakeholders went on a walk through of downtown New Haven to point out issues and opportunities from various perspectives. This input was invaluable in determining the course of the project and refining the project scope.

The project team conducted intercept surveys at State Street station and along the downtown green. An Open House was held after initial fieldwork was finished so attendees could comment on the preliminary ideas and continue to develop recommendations that resonated with the community.

Both TAC, survey responders, and Open House attendees offered strong support for the goals of the project. There is clear support for improvements to the street, especially to connect to the train stations areas. There was overwhleming support for establishing a safe network for bicycling downtown from people currently riding to people who would ride if the streets were changed.

The input from the TAC, survey responders and Open House attendees were incorporated into the conceptual plan recommendations. Attachment 1 contains the information from the surveys. Figure 10 shows workshop and walking tour participants.

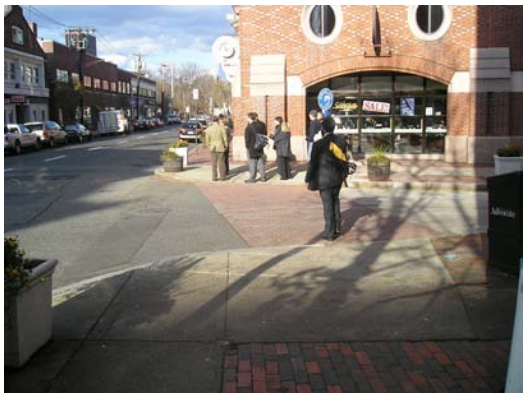


Figure 10: Workshop and Walking Tour

EXISTING CONDITIONS

The Nelson\Nygaard Study Team conducted an existing conditions inventory to examine and assess "gaps" in the pedestrian and bicycling networks in downtown New Haven. Three site visits were conducted to gather information on street operations and functionality in the downtown area and Union Station. The results of the site visits are graphically represented in Figure 11.

Gaps in the pedestrian environment were defined as areas in the existing infrastructure that impede walking as well as areas where the operations of the street create an uninviting environment for walking. Physical and perceived lapses in the walking environment can be equally daunting for pedestrians, especially children, the elderly, and people with visual and mobility impairments.

Figure 12: Standard pedestrian crossing in New Haven.

The walking environment in New Haven is pleasant, with sidewalks of good width and pedestrian ramps at every corner that are flush with the street and meet the standards of the Americans with Disabilities Act (ADA). Several streets, most notably State Street, Elm Street and Grove Street carry large volumes of traffic, frequently at high rates of speed; making them less inviting to cross than other streets in the downtown area. The key critical challenges to improving walking in New Haven are almost exclusively with the current traffic signals and lack of consistent pedestrian signals. There are 5 intersections without pedestrian signals, they are:

- Temple Street at Grove Street
- Orange Street at Elm Street
- High Street at Chapel Street
- High Street at Crown Street
- College Street at Crown Street

In most instances, traffic signals in New Haven are actuated, exclusive phasing; requiring a pedestrian to push a button to activate a pedestrian signal, see Figure 12. Once the pedestrian phase begins, traffic is stopped in all directions, making it possible to cross the street in any direction. This style of phasing has been shown to work well in areas with high pedestrian volumes and high rates of crashes between pedestrians and motor vehicles, but can cause frustrations as well. This is especially true at State Street where a pedestrian can be delayed almost two minutes depending on when he/she pushes the button in the overall cycle phase.

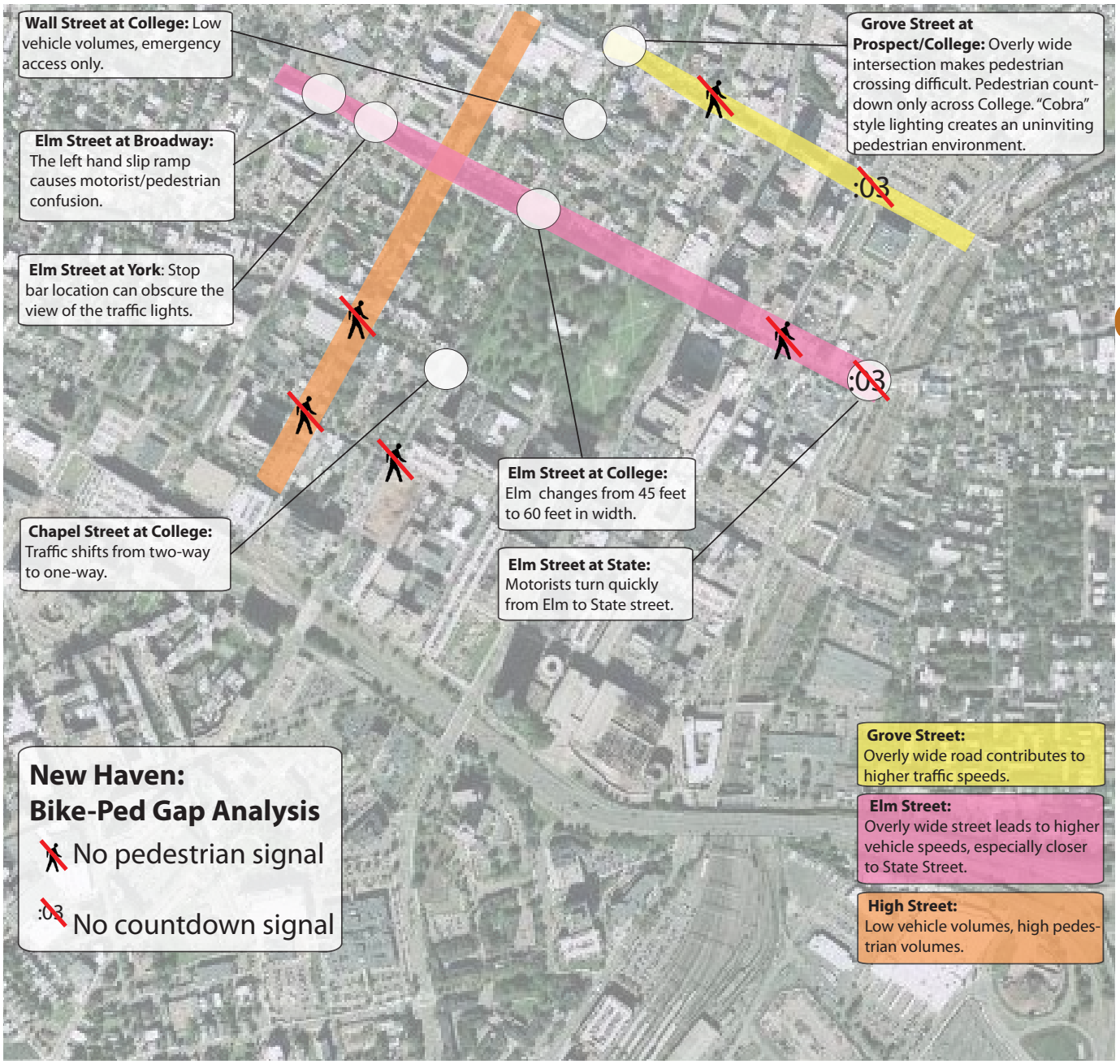


Figure 11: Existing Conditions

New Haven is a great place for bicycling as it is generally flat and areas of interest are close together. The bicycle racks around Yale University and at Union Station were full, even in the winter. With the exception of Elm Street, cyclists appeared comfortable sharing the road with motorists as no cases of cyclists riding on the sidewalk were observed during field work.

The streets in downtown New Haven are all wide enough to accommodate bicycle lanes or shared street markings. The critical challenge in creating a bicycle network in the study area is the existing street network of primarily one-way streets. Unless cyclists ride against traffic, they are forced to take circuitous routes to their destination because of the one-way streets. In addition, one-way streets tend to have faster motor vehicle traffic than two-way streets, creating a potentially dangerous situation for both pedestrians and motorists. Figures 13-21 depict some bicycling conditions in New Haven.

Figures 14: People ride throughout the winter.

Figures 15: Existing streets are wide enough for bicycle facilities.

Figures 13: Bicyclists on sidewalks are common at Yale.

Figures 16: Bike parking at Yale.

Figures 17: The Art and Architecture Building

Figures 18: Downtown sheltered parking

Figures 19: Science Hill

Figures 20: Grad Tower

Figures 21: Near Union Station

Figures 22: Behind the parking garage at Union Station

CONCEPTUAL PLAN

The most consistent theme from the public outreach and existing conditions analysis (including the open houses, surveys, technical advisory committee and site visits) was the interest in creating a livable streets network through downtown New Haven and to Union Station. This was expressed in terms of creating bicycle lanes and routes, providing pedestrians with more time to cross the street, and slowing down motor vehicles with traffic calming measures like making 1-way streets into 2-way streets.

The conceptual plan explores these approaches as short, medium and long term potential strategies. Each of these strategies is meant to meet one or more of the core ideals for the project.

The 5 core ideals are:

1. Develop a Functional System- Create a system for everyday riding.

2. Develop a system linking the core assets and destinations of New Haven.

3. Build the network.

4. Use other projects such as the Gateway Community College development, Farmington Canal Line construction, Grand Avenue Bridge opening and the reconstruction of Route 34 to further improve a bicycle and pedestrian system.

5. Improve "Street Smarts" education and en-

SHORT TERM RECOMMENDATIONS

The short term recommendations of the concept plan are focused on creatings a functional system for everyday riding, liking the core assets of New Haven and laying the framework for a bicyle and pedestrian network. Figure 23 depicts the locations and treatments for the short term recommendations. The recommendations are:

1. Create "No Right Turn on Red" zones in downtown New Haven to improve pedestrian and cyclist safety.

2. Develop a system of Sharrows/Shared Streets to encourage cycling and expand on the "Street Smarts" program.

3. Stripe Bike Boxes, or advanced stop lines, at key locations to create better visual communication between cyclists and motorists.

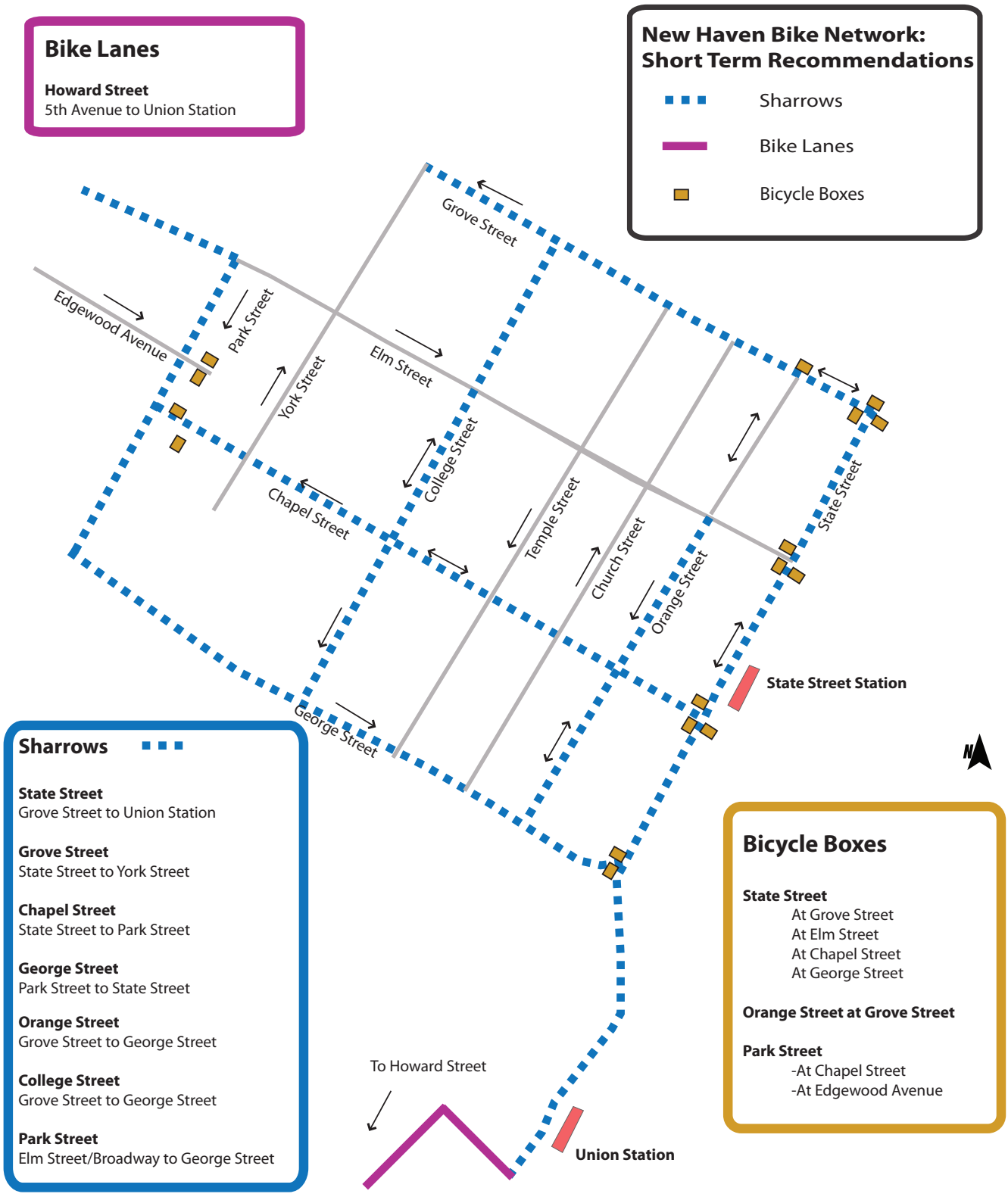


Figure 23: Short Term Recommendations

MEDIUM TERM RECOMMENDATIONS

The medium term recommendations continue the core ideals by expanding the bicycle network, creating dedicated, protected space for bicyling, and developing a more enjoyable pedestrian environment by slowing down motor vehicles and establishing a predictable system of pedestrian signals.

The medium term recommendations consist of studying concurrent signal timing and using the expansion of the Gateway Community College to help facilitate the one-way to two-way street conversions at:

1. College Street: From Chapel Street to Route 34.

2. Church Street: From Chapel Street to Route 34.

The medium term recommendations are not shown graphically, as they currently consist primarily of studies to determine the feasibility of these proposals. However, the potential costs associated with implementing the street conversions is included in the "cost and materials" section.

Studies to determine if a concurrent signal timing would work at certain intersection, along corridors, or throughout downtown New Haven are no small undertaking. This is in part because a new, concurrent system requires the signals to work in sequence with each other. Creating a network that works efficiently at various times of day and day of the week would require balancing each signal within the network, potentially developing an entirely new system.

LONG TERM RECOMMENDATIONS

The long term recommendations build on the short and medium term recommendations to fill in additional gaps in the cycling and pedestrian networks. The proposed network will create a backbone for future local and regional linkages, further transforming downtown New Haven into a first class bicycling and walking town.

The long term recommendations consist of two main goals:

1. Create physically separated, on-street cycle tracks to replace the bicycle lanes on State Street and Grove Street; and add new cycle tracks to Elm Street.

2. Create a new connection to the Farmington Canal Line. This would create a greenway route from New Haven harbor to Hamden. Developing networks of bicycle facilities between neighborhoods, towns and regions helps to integrate bicycling into the overall transportation system.

Figure 24: Long Term Recommendations

IMPLEMENTATION

This report presents and describes a variety of strategies that can be used to improve the streets of New Haven for bicycling and walking. Implementation of these long term strategies will depend greatly on raising additional funds in the future. A 5 year schedule for implementation is shown in Figure 25.

Implemention Schedule for Recommendations

Short Term

No Right Turn on Red

Bike Boxes

State Street at Chapel Street	(3 directions)
State Street at George Street	(2 directions)
State Street at Elm Street	(3 directions)
State Street at Grove Street	(3 directions)
Orange Street at Grove Street	(2 directions)
Park Street at Chapel Street	(2 directions)
Park Street at Edgewood Street	(2 directions)

Sharrows and Bike Lanes

State Street: From Grove Street to Union Station
Grove Street: From State Street to York Street
Chapel Street: From State Street to Park Street
George Street: From Park Street to State Street
Orange Street: From Grove Street to George Street
College Street: From Grove Street to George Street
Park Street: From Elm Street/Broadway to George Street
Howard Avenue: From 5th Street to Union Station

Medium Term

Study Concurrent Signal Phasing

One-to-Two Way Street Conversions (leverage with Gateway Community College)
College Street: From Chapel Street to Route 34
Church Street: From Chapel Street to Route 34

Long Term

Connect to Farmington Canal Line

Cycle-Tracks

State Street: From Grove Street to Union Station
Grove Street: From State Street to York Street
Elm Street: From York Street to State Street

Figure 25: Implementation Schedule

COST AND MATERIALS PLAN

The project team endeavored to flesh out a realistic plan that could be implemented both immediately and down the road. The costs and materials associated with the short, medium and long term strategies are shown here in Figures 26-28.

Street Name:	State Street					
Facility Type:	Shared Lane					
From:	Grove Street					
To:	Union Station					
Length (LF):		4800	# of Blocks:	10		
One/Two Way	Two-way					
Item	**QTY**		**Unit Cost**	**Cost ($)**	**Note:**	
Shared Lane Symbol, On Street		40	$200	$8,000	On both sides of State Street	
Sign Post, two signs		20	$250	$5,000	Shared Lane/Share the Road	
Bike Boxes						
	Grove	2	$1,000	$2,000		
	Elm	3	$1,000	$3,000		
	Chapel	3	$1,000	$3,000		
	George	2	$1,000	$2,000		
					Segment Total:	$23,000

Street Name:	Grove Street					
Facility Type:	Shared Lane					
From:	State Street					
To:	York Street					
Length (LF):		2,775	# of Blocks:	7		
One/Two Way	One-way westbound after Orange Street					
Item	**QTY**		**Unit Cost**	**Cost ($)**	**Note:**	
Shared Lane Symbol, On Street		16	$200	$3,200		
Sign Post, two signs		8	$250	$2,000	Shared Lane/Share the Road	
Bike Boxes						
	Orange	2	$1,000	$2,000		
					Segment Total:	$7,200
(Grove Street has additional markings and signs for the one block section it is two-way).						

Figures 26: Short Term Cost and Materials

Street Name:	Chapel Street				
Facility Type:	Shared Lane				
From:	State Street				
To:	Park Street				
Length (LF):	3,300	# of Blocks:	7		
One/Two Way	Two-way to College				
Item	**QTY**	**Unit Cost**	**Cost ($)**	**Note:**	
Shared Lane Symbol, On Street	20	$200	$4,000		
Sign Post, two signs	10	$250	$2,500	Shared Lane/Share the Road	
Bike Box: Park	2	$1,000	$2,000		
				Segment Total:	$8,500

Street Name:	George Street				
Facility Type:	Shared Lane				
From:	State Street				
To:	Park Street				
Length (LF):	3,300	# of Blocks:	6		
One/Two Way	One-way eastbound				
Item	**QTY**	**Unit Cost**	**Cost ($)**	**Note:**	
Shared Lane Symbol, On Street	12	$200	$2,400		
Sign Post, two signs	6	$250	$1,500	Shared Lane/Share the Road	
				Segment Total:	$3,900

Street Name:	Park Street				
Facility Type:	Shared Street				
From:	Elm Street/Broadway				
To:	George Street				
Length (LF):	1,918	# of Blocks:	5		
One/Two Way	One-way southbound				
Item	**QTY**	**Unit Cost**	**Cost ($)**	**Note:**	
Shared Lane Symbol, On Street	10	$200	$2,000		
Sign Post, two signs	5	$250	$1,250		
Bike Box	2	$1,000	$2,000		
				Segment Total:	$5,250

Figures 26: Short Term Cost and Materials

Street Name:	College Street				
Facility Type:	Shared Street				
From:	Grove Street				
To:	George Street				
Length (LF):		2745	# of Blocks:	5	
One/Two Way	Two-way until Chapel				
Item	**QTY**		**Unit Cost**	**Cost ($)**	**Note:**
Shared Lane Symbol, On Street		12	$1,000	$12,000	
Sign Post, two signs		8	$250	$2,000	Shared Lane/Share the Road
				Segment Total:	$14,000

Street Name:	Howard Avenue				
Facility Type:	Bicycle Lane				
From:	5th Street				
To:	Union Station				
Length (LF):		4291	# of Blocks:	12	
One/Two Way	Two Way				
Item	**QTY**		**Unit Cost**	**Cost ($)**	**Note:**
Bicycle Lane Symbol, On-Street		48	$200	$9,600	
Striping		8582	$1	$8,582	Bike Lane
Sign Post, Two Signs		24	$250	$6,000	Bike Lane
Delineate Parking Lane		8582	$1	$8,582	Solid White Line
				Segment Total:	$32,764

Figures 26: Short Term Cost and Materials

New Haven Pedestrian and Bicycle Gap Analysis; Short Term Implementatic

Location	**Estimated Cost**
State Street	$23,000
Grove Street	$7,200
Chapel Street	$8,500
George Street	$3,900
Park Street	$5,250
Orange Street	$6,400
College Street	$14,000
Park Street	$54,250
Howard Avenue	$32,764
Total:	$155,264

COST AND MATERIALS PLAN:

MEDIUM TERM

Street Name:	College Street				
Facility Type:	One-way to Two-way Conversion				
From:	New Haven Green				
To:	Chapel Street				
Length (LF):	1,351	# of Blocks:	4		
One/Two Way	Two-way				
Item	**QTY**	**Unit Cost**	**Cost ($)**	**Note:**	
Traffic Signal Upgrade (including signing, striping and equipment upgrade)	4	$100,000	$400,000		
Contingencies (25% Approx.)			$ 100,000		
Engineering/Design (10% approx.)			$ 40,000		
				Segment Total:	$540,000

Street Name:	Church Street				
Facility Type:	One-way to Two-way Conversion				
From:	College Street				
To:	Route 34				
Length (LF):	1,463	# of Blocks:	4		
One/Two Way	Two-way				
Item	**QTY**	**Unit Cost**	**Cost ($)**	**Note:**	
Traffic Signal Upgrade (including signing, striping and equipment upgrade)	4	$100,000	$400,000		
Contingencies (25% Approx.)			$ 100,000		
Engineering/Design (10% approx.)			$ 40,000		
				Segment Total:	$540,000

Figures 27: Medium Term Cost and Materials - Does not include the cost of studying new signal timing configurations.

COST AND MATERIALS PLAN:

LONG TERM

Street Name:	State Street			
Facility Type:	Two 8 Foot Protected Cycle-Tracks			
From:	Grove Street			
To:	Union Station			
Length (LF):	4800	# of Blocks:	10	
One/Two Way	Two-Way			
Item	**QTY**	**Unit Cost**	**Cost ($)**	**Note:**
Bicycle Lane Symbol, On-Street	40	$200	$8,000	
Striping	9600	$1	$9,600	Bike Lane
Striping	9600	$1	$9,600	Zebra Buffer
Sign Post, Two Signs	20	$250	$5,000	Bike Lane
Delineate Parking Lane	0	$1	$0	Solid White Line
Bollards	100	$250	$25,000	Flexible; 5 per block per side
Bike Signals	20	$2,100	$42,000	Bike Heads
Median Tips at Intersections*	**20**	$752	$15,040	2 per block per side
			Segment Total:	$114,240

*Assumes a 4 foot by 4 foot facility; calculation based on $35 lf for curbing and $12 lf for concrete

Street Name:	Grove Street			
Facility Type:	12 Foot Bi-directional Protected Cycle-Tracks			
From:	State Street			
To:	York Street			
Length (LF):	2,775	# of Blocks:	7	
One/Two Way	Two-Way Until Orange Street			
Item	**QTY**	**Unit Cost**	**Cost ($)**	**Note:**
Bicycle Lane Symbol, On-Street	14	$200	$2,800	
Striping	2,775	$1	$2,775	Bike Lane
Striping	2,775	$1		Zebra Buffer
Sign Post, Two Signs	7	$250	$1,750	Bike Lane
Delineate Parking Lane	0	$1	$0	Solid White Line
Bollards	35	$250	$8,750	Flexible; 5 per block per side
Bike Signals	14	$2,100	$29,400	Bike Heads
Median Tips at Intersections*	14	$752	$10,528	2 per block
			Segment Total:	$56,003

*Assumes a 4 foot by 4 foot facility; calculation based on $35 lf for curbing and $12 lf for concrete

Figures 28: Long Term Cost and Materials

COST AND MATERIALS PLAN:

LONG TERM

Street Name:	Elm Street			
Facility Type:	10 Foot Protected Cycle-Track			
From:	York Street			
To:	State Street			
Length (LF):	2,775	# of Blocks:	6	
One/Two Way				
Item	**QTY**	**Unit Cost**	**Cost ($)**	**Note:**
Bicycle Lane Symbol, On-Street	12	$200	$2,400	
Striping	2,775	$1	$2,775	Bike Lane
Striping	2,775	$1	$2,775	Zebra Buffer
Sign Post, Two Signs	6	$250	$1,500	Bike Lane
Delineate Parking Lane	0	$1	$0	Solid White Line
Bollards	30	$250	$7,500	Flexible; 5 per block
Bike Signals	6	$2,100	$12,600	Bike Head
Median Tips*	12	$752	$9,024	2 per block
			Segment Total:	$38,574
*Assumes a 4 foot by 4 foot facility; calculation based on $35 lf for curbing and $12 lf for concrete				

Grand Total for Long Term Implementation = $208,817

Figures 28: Long Term Cost and Materials