

Introduction

The bicycle is considered an important mode in developing a true “multi-modal” approach to the Strip District plan. Bicycles can facilitate commuter, recreational and local in-Strip District movements. Recognizing that, the concept of a Cycle Way was developed. Two of the challenges are how to expand the bicycle offerings available to current and future riders and to provide safe accommodations that will attract a wide variety of users and experience levels. As the analysis and the planning advanced, the Design Team kept in mind the distinction between recreational riders and utilitarian (commuter) ones. To help the Design Team better understand the Strip District’s current conditions, a bicycle tour was conducted to assess the existing bike facilities and key corridors within the study area.

Cycle Alternatives

Based on the tour and stakeholder feedback, a series of cycle options were developed and tested during the charrette. In addition to shared lane markings (sharrows) and marked, on-street bike lanes, the concept of incorporating a cycle track was introduced. The cycle track is an exclusive bicycle facility with a buffer - a barrier or raised median - to separate it from auto traffic. During the charrette, the Design Team tested several configurations for the cycle track.

Alternatives Tested

Full Cycle Track on Penn

A full cycle track on Penn Avenue would allow for bi-directional bicycle movement within the corridor. It also provides increased accessibility to street-level retail on Penn Avenue as it is easier to change modes from bicycle to pedestrian. This increased access could lead to increased ridership on the cycle track. To install a full, two-way cycle track would require the removal of one parking lane and one travel lane, thus leaving one travel lane and one parking lane on Penn Avenue. This concept was evaluated and dismissed for the following reasons:



Penn Avenue Looking inbound

- The loss of one travel lane would negatively impact traffic flow and operations in the District, particularly for large delivery vehicles and during the AM peak hour with inbound commuting.
- The loss of one parking lane was identified as a concern from business owners who indicated parking is a premium within the Strip District and would negatively impact their deliveries and customers (particularly those purchasing in bulk quantities). Currently, delivery drivers double-park in the travel lanes on Penn Avenue since the on-street parking is fully-utilized. This pattern is expected to continue, even if there was only one travel lane, negatively impacting traffic operations.
- The loss of any on-street parking is also a concern because the parking currently provides a physical barrier between the roadside pedestrian environment and the street, and keeps pedestrian activity better constrained from spilling into the street. However, the implementation of a cycle track would remove this physical barrier on one side of the street. While a cycle track would still provide a buffer between the sidewalk and vehicle travel lanes, the lesser usage of this facility compared to the vehicle travel lanes would make pedestrian

spillover into the cycle track and towards the street likely; this spillover would not only result in the loss of the effective buffer to vehicle traffic, but would also result in bicycle-pedestrian conflicts within the facility intended for exclusive bicycle use.

Contra-flow Cycle Track on Penn

Given the limited public right-of-way width on Penn Avenue, a contra-flow, one-way cycle track was also tested. Although, a contra-flow cycle track does not require as much right-of-way as a full cycle track, one lane of parking would still need to be removed. An option of providing two travel lanes and one parking lane during the AM peak was considered to maximize traffic flow. At times outside of the AM peak, one travel lane and two parking lane would be provided. A second option of eliminating the buffer area was also considered. These concepts were evaluated and dismissed for the following reasons:



Example of a Contra-flow Bike Lane (Eugene, OR)

- Similar to the previous discussion, if drivers double-park in the only travel lane during off-AM peaks, the Penn Avenue roadway network would be essentially gridlocked until the vehicle was moved and the network recovered.
- For a cycle track to function as an exclusive bicycle facility within an urban network, physical separation would be needed, otherwise drivers would park and block the facility. Even if only for a quick stop or delivery, the safety and integrity of the facility would be compromised.
- A contraflow cycle track on Penn Avenue may encourage wrong-way cycling within the cycle track, which would result in conflicts between bicyclists.
- This concept did not include adding an exclusive in-street facility for bicyclists in the opposing direction, either on Penn Avenue or other road parallel to Penn Avenue.

Use of the East Busway for Through Bicycle Trips

During the charrette, the use of the East Busway for through bicycle trips was explored. This would be one of the most efficient ways to provide a safe, fast and separated system. This would take place between the Neville Street ramp and Downtown (with intermediate connection points possible at Herron Avenue and 26th Street. However, this would likely require continuous paved shoulders at least four feet wide along the entire Busway. This would limit the potential interaction of bicycles and high-speed buses in shared lanes. While much of the East Busway does have paved shoulders of sufficient width, there are a number of constrained sections where the shoulders disappear. Widening the Busway to add paved shoulders in these constrained sections would be cost-prohibitive. Therefore, without an agreement to allow bicycles to operate on the Busway on paved shoulders or in shared lanes, it will not be feasible to use the Busway for bicycle travel. The City should engage the Port Authority in a discussion for this option.

The Cycle Way Plan Features

Because both parking and travel lanes are important features along Penn Avenue, the designated use of the public rights-of-way must be balanced. Proposed recommendations must account for the existing access issues, particularly related to parking for customers, deliveries, and employees. Work will need to continue for the pedestrian realm and the value of access. After assessing the aforementioned options and considering the input received from the public and stakeholders at the charrette, the recommendations for the Cycle Way are as follows (see Figure 1):

- An exclusive bikeway would be provided on Railroad Street consistent with the proposal from the Allegheny Riverfront Green Boulevard (see Figure 2 for typical section).
- New east-west connections from Liberty and Penn Avenues would be provided to Railroad Street.
 - 21st Street contra-flow cycle track between Liberty Avenue and Smallman Street. This would provide a connection for bicyclists between the existing transit stop / potential incline station adjacent to the Liberty Avenue/21 Street intersection and the bicycle facilities running parallel to Liberty Avenue. This section would not result in the loss of existing on-street parking if one travel lane is maintained, but would if two travel lanes were provided.
 - 21st Street bike boulevard between Smallman Street and the riverfront.
 - 32nd Street contra-flow bike lane between Liberty and Penn Avenues, which can be accomplished by narrowing the existing lanes.
 - 32nd Street bike boulevard between Penn Avenue and the riverfront.
- Penn Avenue, north of 32nd Street: Uphill bike lane and downhill shared lane markings. This would require removal of existing on-street parking on one side of the street.
- Liberty Avenue, north of 32nd Street: Bike lanes between 32nd Street and Herron Avenue, and buffered bike lanes between Herron Avenue and 40th Street.
- Liberty Avenue, north of 40th Street: Uphill bike lane and downhill shared lane markings.
- The existing shared lane markings would remain throughout, but optionally, their visibility could be enhanced within the heart of the Penn Avenue corridor between 16th and 21st Streets. This potential enhancement would be done by using a green stripe in the center of the travel lane with the shared lane markings on top of the green stripe, or alternatively by re-applying each shared lane marking over a green colored rectangle.
- Bike corrals along roadway corridors and clustered at key destinations.
- Strip District cycle way-finding signage.



Clustered "bike corral" on Pittsburgh's South Side



Cycle Way Plan



The Cycle Way Plan Benefits

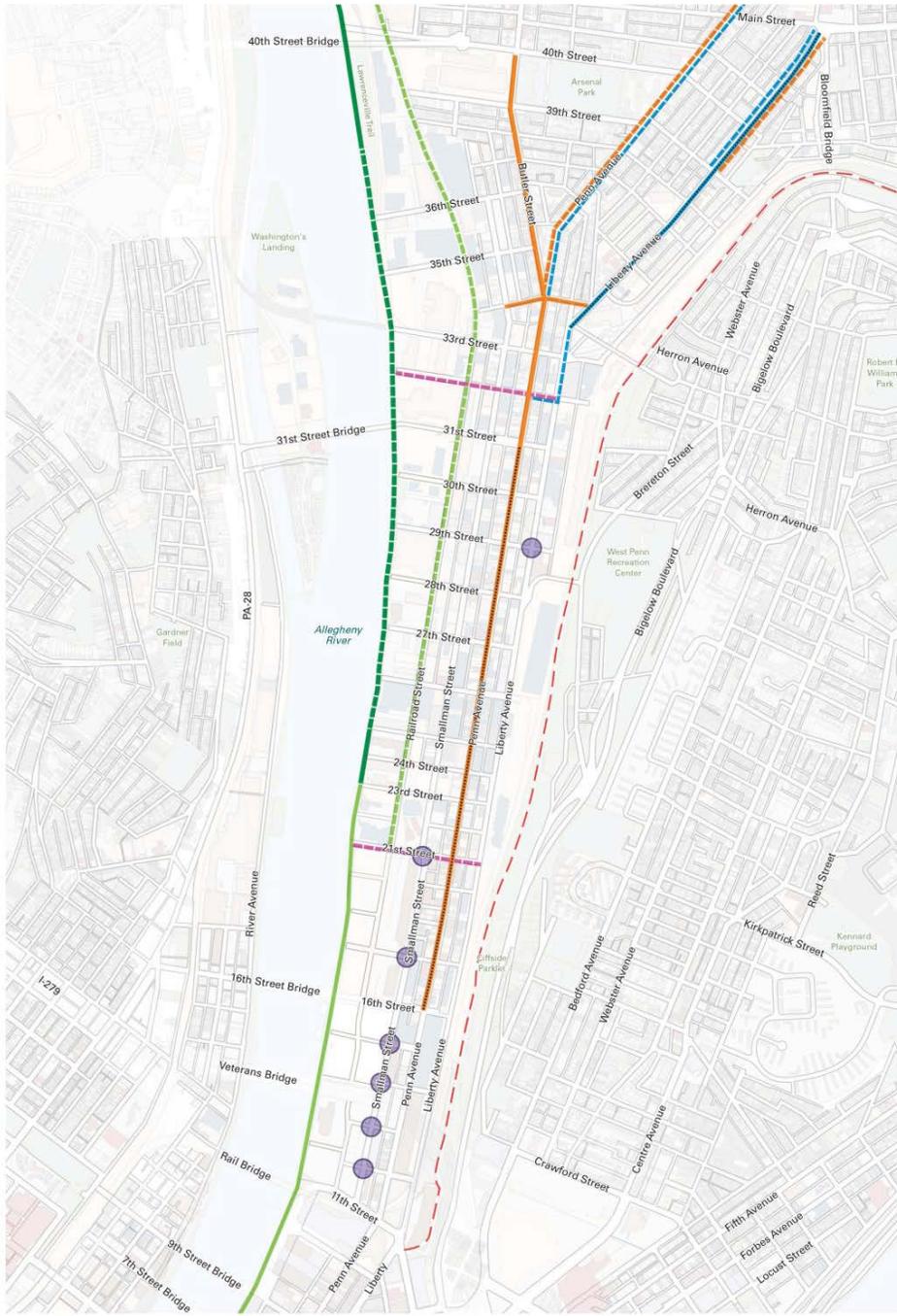
The Cycle Way is a critical element of the complete system of streets in the Strip District. It offers the full range of bicyclists an exclusive facility that is complemented by a variety of bicycle facility types that traverse the Strip District and connect to the Cycle Way corridor on Railroad Street. Benefits of the Cycle Way include:

- Having a separate facility decreases conflicts.
- Allowing priority for faster north-south travel.
- Offering easy navigation through the Strip District for regular bicyclists and visitors.
- Providing facilities that cater to a variety of bicycle users and abilities.
- Improving connectivity between designated facilities and to the primary north-south Cycle Way.
- Including more and enhanced facilities and bike racks that encourage bicycling.
- Reducing negative impacts of auto trips.

Cycle Way Plan



Figure 1: Proposed Cycle Way Plan



BICYCLE NETWORK



Cycle Way

- EXISTING BIKE LANES
- PROPOSED BIKE LANES
- EXISTING SHARED LANE MARKINGS
- PROPOSED ENHANCED SHARED LANE MARKINGS
- EXISTING PAVED TRAIL
- PROPOSED PAVED TRAIL
- EXISTING UNPAVED TRAIL
- PROPOSED UNPAVED TRAIL
- PROPOSED BIKE LANES BUFFERED
- PROPOSED BIKE BOULEVARD
- PROPOSED BUS/BICYCLE WAY
- ENHANCED PEDESTRIAN TREATMENTS



400 0 400 800 1,600'

FEBRUARY 2013

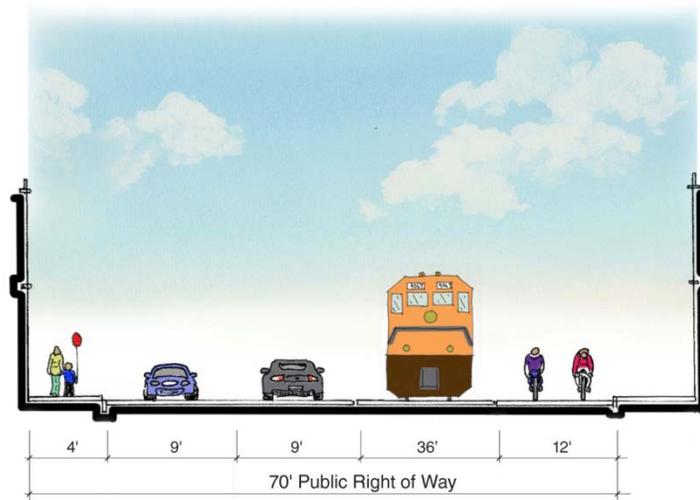


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Figure 2: Proposed Railroad Street Typical Section



Modeling Overview

In addition to motor vehicle traffic capacity, parking, and access to sites, the potential for increased bicycle ridership was considered in the analysis of various bicycle facilities. This includes the potential for mode shift to bicycles (using bikes for commuting, shopping, or other utilitarian trips) from other modes and induced recreational trips.

The Strip District Corridor represents approximately 26,000 east-west vehicle trips per day. However, the potential travel shed for bicyclists through the corridor is much greater than simply these motor vehicle trips currently represented on the roadways in the Strip District. The draw area for bicyclists through the Strip District includes the numerous neighborhoods outside of the Strip District including Lawrenceville, Bloomfield, Garfield, Highland Park, Friendship, South Liberty and Stanton Heights. Because of the span of the bicycle travel shed, there is potential for some of the motor vehicle trips from Bedford Dwellings, the Hill (Polish, Upper, and Middle), and Terrace Village neighborhoods to be shifted to bicycle trips through the Strip District. Consequently, total potential trip pool from which mode shift could be considered was 52,000 trips. This is intended to capture through trips and short distance trips within the Strip District.

These estimated trip numbers are likely conservative. The bicycling and walking that occurs through the Strip District now is greater than one would likely expect if not aware of the local context (the presence of neighborhoods and the locations of bridges across the river). Another reason is that the Strip District itself is a collection of destinations for bicyclists and pedestrians. Once one is in the Strip District, it is very likely that many people would use bikes or walking to access multiple destinations in the District on any given visit. The day of week variation for non-motorized transportation was considered to be relatively even with only a slight increase in trips on weekends. In addition, there is a bike share program currently in the planning stages and expected to be implemented by 2014. This is part of a City-wide program with a goal of implementing 50 bike stations, including several stations in the Strip District and Lawrenceville areas, with 500 bikes located throughout the City. The bike share program will further encourage cycling in the Strip District. Given the destination nature of the Strip District, this assumption likely contributes to an underestimation of trips.

Figure 3: A Bike Share Kiosk (Denver, CO)



A series of models was used to predict volumes along the various facilities in the Strip District. One model was used to predict utilitarian trips (i.e. destination based trips). This utilitarian trip model considers commercial density, residential density, average trip length, and the quality of the facility being provided. Recreational trips were modeled separately. In addition, the recreational models include considerations of length of the facility, aesthetics, points of interests, and population within a draw area. The modeling effort also assumed ideal, built-out facilities. This means appropriate lighting and paved surfaces. In addition, these models will result in an attractive facility, fronting an interesting vista, drawing users from a less aesthetically attractive facility. This tends to shift users from in-street facilities to shared use paths.

The modeling process was initiated during the charrette and then further refined as the project developed. A summary table of trips predicted by street is provided in Table 1. It should be noted that the distribution of the trips was based upon initial modeling calculations, then consideration of the various bicycle facility types. For instance recreational trips were shifted from Liberty Avenue to Penn Avenue to reflect the relative level of bicycle accommodation on each of the roadways. Further shifts in both recreational and utilitarian trips were made from the riverfront Green Way to the Cycle Way to account for the much longer-term implementation of the riverfront Green Way. This is due to the lack of contiguous riverfront right-of-way and the need for expensive river bank reconstruction within some sections to accommodate a naturalized trail. In the absence of a complete and connected Green Way facility, 33% of the recreational trips and 75% of the utilitarian trips were shifted from the Green Way to the Cycle Way.

Table 1: Weekday Mode Shift Modeling Summary

Roadway	Facility Type	Weekday Trips			
		Recreational	Utilitarian	Daily	Annual*
Liberty	Shared Lanes	16	34	50	19,700
Penn	Shared Lanes, Wide Sidewalks	172	286	458	183,500
Smallman	Shared Lanes	80	148	228	91,400
Railroad	Separated Facility	672	443	1,115	447,100
“Green” Way	Shared Use Path	611	127	738	296,000
Total		1,551	1,038	2,589	1,037,700

*Daily counts are for a weekday, assumed to be 13% of weekly traffic. Assumed 52.14 weeks per year.

The Allegheny Riverfront Green Boulevard Transportation Summary predicted 535,700 – 795,500 trips per year on the Green Boulevard facility (Cycle Way on Railroad Street). The results of Table 1 projected as part of this project provide a slightly lower, more conservative projection compared to the lower range of the Green Boulevard study values. This is intuitively reasonable as this Strip District study assumes a shorter facility and a distribution of trips over several improved corridors.

A supplemental analysis was performed incorporating a cycle track on Penn Avenue. Its inclusion on Penn Avenue would not greatly increase the number of non-motorized users through the corridor. This is because of the presumption of two high level bicycling facilities already being provided along the corridor (the separated “Cycle Way” on Railroad Street and the “Green Way”). However, redistribution of utilitarian trips among the roadways within the corridor is likely. The results of this supplemental analysis are shown in Table 2.

Table 2: Weekday Mode Shift Modeling Summary for Cycle Track on Penn Avenue

Roadway	Facility Type	Weekday Trips			
		Recreational	Utilitarian	Daily	Annual*
Liberty	Shared Lanes	13	27	39	15,800
Penn	Cycle-track, Wide Sidewalks	200	415	615	246,600
Smallman	Shared Lanes	80	89	169	67,700
Railroad	Separated Facility	678	427	1,105	443,100
“Green” Way	Shared Use Path	623	121	744	298,400
Total		1,594	1,079	2,672	1,071,600

*Daily counts are for a weekday, assumed to be 13% of weekly traffic. Assumed 52.14 weeks per year.