N Street Protected Bikeway

The ***N Street Protected Bikeway*** project was identified in the *2005 City of Lincoln Downtown Master Plan* and the *2012 Downtown Master Plan Update* as the completion of the "last mile" of bike trails through the Downtown. The *Master Plan Update* identified the ***N Street Protected Bikeway*** as a priority project. The bikeway will connect the Jamaica North Trail, at approximately 7th & N Streets, to the Billy Wolff Trail, at 22nd & N Streets. Construction is planned for the spring of 2014

Rendering of N Street Protected Bikeway, looking west along the south side of N Street, toward 14th Street

What might it look like?

Drawings on pages 2 – 4 will help readers visualize placement of the bikeway.

What are the economic and safety impacts of protected bikeways?

Pages 5 – 13 are excerpts from research and documentation provided by Alta Planning & Design, Portland, OR, in their capacity as a consultant to the City of Lincoln.

N Street Protected Bikeway Design Alternatives

Lincoln, NE

May 2013

Alta Planning + Design
Olsson Associates

Alternative 1

Stormwater planters as a buffer between parking and the cycle track between 10th and 17th.

- Integrates green street features in the urban environment.
- 3-4' wide parking egress for drivers exiting vehicles.
- Each planter overflows into the adjacent downhill planter.
- In major storm events, water overflows into the existing storm system

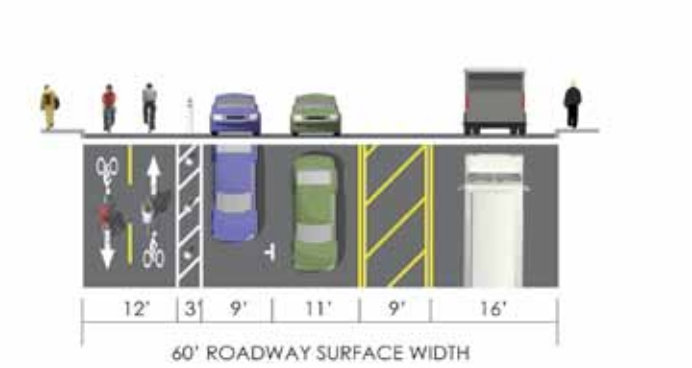
Center turn lane converted to a cycle track between 18th and Antelope Valley Parkway.

Raised cycle track between Antelope Valley Parkway and 22nd.

Alternative 1

Cycle Track with Curb Barrier
9th St to 10th St

Cycle Track with Parking Buffer
17th St to 18th St



Cycle Track with Stormwater Planters
10th St to 16th St

Cycle Track with Parking Buffer
18th St to Antelope Valley Pkwy

Cycle Track with Stormwater Planters
16th St to 17th St

Raised Cycle Track
Antelope Valley Pkwy to 22nd

N Street Cycle Track Task 1.3: Economic and Safety Impacts of Protected Bikeways

Background

Research shows that perceived comfort and safety are major factors holding back prospective cyclists, and building protected bikeway facilities is one method to encouraging new people to try bicycling. But because few protected bikeways have existed in North America until recently, there has been little data available to estimate their impact on bicycling rates and safety, and on economic activity and surrounding land uses. Early research in the 1970s had few protected bikeways to study, so sidewalks, off-street paths and even dirt trails were examined for safety when compared with riding within the travel lane. These facilities had no bicycle specific treatments and had a number of disadvantages when compared with a cycle track. They were not found to have good safety performance and development of protected bikeways ceased in the United States.

As interest in bicycling and growth in traditional bicycle infrastructure has increased across North America over the last decade, cities have responded by attempting to increase the quality of their bicycle facilities to provide better comfort and perceived safety. In general, recent studies find that protected bikeways increase safety for bicyclists and other road users, and often induce higher bicycle traffic volumes. While most evaluations of cycle tracks include safety, few have examined economic impacts on nearby neighborhoods. Studies on the economic impacts of protected bikeways have generally found concerns from local businesses about freight access, but reduced storefront vacancy rates after protected bikeway construction (New York). Both increased considerably (New York) and slightly decreased (Vancouver, BC) retail sales have been observed after cycle track installation.

1 Economic Impacts of cycle tracks

Studies of protected bikeways have shown many potential positive economic impacts, including regional benefits such as increasing bicycle traffic volumes, overall corridor traffic capacity, and even potential benefits to retail sales and demand for commercial property.

Some concerns about potential negative impacts of protected bikeways still persist. Perceptual surveys have found business concerns about delivery access along protected bikeway corridors exist before and after installation of a cycle track.

1.1 Minneapolis, MN[1]

Minneapolis, Minnesota converted a one-way couplet on Hennepin and 1st Avenues in downtown to two-way streets in 2009, and added a protected bikeway along Hennepin Avenue. Evaluation of the project corridor, including the nearby Nicollet Mall, showed increased bicycle traffic volumes of 43% within 6 months of the conversion. Even after reconfiguring the street to include a cycle track, the street redesign increased efficiency for motor vehicles as well, accommodating an 8.7% increase in average daily traffic (ADT) on Hennepin Avenue. Traffic operation level of service was maintained at previous levels despite the increase in volumes. Together, these results indicate benefits to the local and regional economy in terms of more efficient transportation capacity for businesses and residents.

Figure 1: Cycle track along First Avenue in Minneapolis, MN

Although several parking spaces were removed as part of the street redesign, parking meter revenues showed that overall parking usage was maintained. On-street parking meter collections in the area of the corridor (downtown Minneapolis' Warehouse District) grew from $9,162 in one week during June 2009 before the project to $10,332 in one week during June 2010 after the project. The Minneapolis Department of Public Works concluded the project had met its goal of maintaining capacity and improving access and circulation.

[1] Minneapolis Department of Public Works. *Hennepin Avenue and 1st Avenue Two-Way Conversion Evaluation Report*. 2010. Retrieved April 2, 2013 from http://www.ci.minneapolis.mn.us/www/groups/public/@publicworks/documents/images/wcms1p-085710.pdf.

1.2 New York City, NY[2,3]

New York City has implemented a number of protected bikeways in recent years, and has conducted extensive observations before and after construction in order to document their impacts.

In Brooklyn in 2010, New York City Department of Transportation (NYCDOT) reduced the number of travel lanes on Prospect Park West from three to two in order to add a two-way cycle track adjacent to Prospect Park. The conversion increased the overall traffic capacity of the street, with combined vehicle and bicycle traffic volumes increasing 13% and 9% during the AM and PM peak hours. Bicycle traffic volumes roughly tripled on weekdays and doubled on weekends. Project improvements along Prospect Park West included two new loading zones and additional striping to improve ease of freight access for local businesses.

Figure 2: Prospect Park West two-way cycle track (NYCDOT).

In Manhattan, NYCDOT installed a pair of the one-way cycle tracks on 8th and 9th Avenues. Afterward, analysis of sales tax receipts showed an increase in retail sales of 49% along 9th Avenue, compared to a 3% average increase across Manhattan overall.

Also in Manhattan, protected bike lanes were installed along First and Second Avenues as part of a street redesign that also created dedicated bus lanes. Bicycle traffic volumes along the corridor increased as much as 177% after construction. Demand for commercial property along First and Second also increased

[2] New York City Department of Transportation. *Prospect Park West Bicycle Path and Traffic Calming Update*. 2011. Retrieved April 3, 2013 from http://www.nyc.gov/html/dot/downloads/pdf/20110120_ppw_data.pdf.

[3] New York City Department of Transportation. *Measuring the Street*. 2012. Retrieved April 3, 2013 from http://www.nyc.gov/html/dot/downloads/pdf/2012-10-measuring-the-street.pdf.

significantly after the project, with commercial vacancies decreasing 47% compared to a 2% average increase across Manhattan overall.

1.3 Portland, OR[4]

In 2009, the Portland Bureau of Transportation (PBOT) installed a parking-protected cycle track by removing one of three travel lanes on Broadway in the University District. Analysis after completion of the project found no significant changes in service for motor vehicles, with LOS A maintained at all four signalized intersection along the project corridor. Less than a mile to the north, PBOT removed one of two travel lanes along the Stark Street and Oak Street one-way couplet to create an east-west pair of buffered bike lanes. One year later in 2010, bicycle traffic volumes at locations along corridor had increased 77% to 271%.

Figure 3: Parking protected cycle track near PSU

Despite the increase in bicyclists along Stark and Oak Streets and although few to no parking spaces were removed as part of the project, a survey of local businesses found that business owners and managers were concerned about the effect of the bike lanes upon their business. 51% of businesses thought the buffered bike lanes made deliveries more challenging, and 43% thought the lanes made parking more difficult for their customers. However, businesses also estimated that customers accessed their business by biking, walking or taking transit (48%) more than driving (46%). Only 9% of businesses disagreed that the buffered bike lanes were an important part of the downtown bicycle network.

[4] Jennifer Dill, Nathan McNeil & Christopher Monsere. Portland State University, for the Portland Bureau of Transportation. *Evaluation of Innovative Bicycle Facilities*. Retrieved April 2, 2013 from http://www.its.pdx.edu/upload_docs/1297701181.pdf.

1.4 Vancouver, BC[5]

In 2010, the City of Vancouver installed two-way cycle tracks on Hornby and Dunsmuir Streets to increase connectivity for bicyclists at two major entrances to downtown. Within 6 months, bicycle traffic volumes on Hornby had increased by 60 to 80%. Impacts on vehicle traffic were found to be negligible, and in total, combined traffic volumes on the streets increased due to the increase in cyclists.

Design of the cycle tracks considered potential impacts to existing properties and land uses, and included the mitigating treatments such as the creation or relocation of loading zones.

City of Vancouver undertook a preliminary analysis to assess the potential economic impacts of the new bicycle facilities in 2011. The Vancouver Economic Development Commission (VECD) hired a team of three transportation and business consultants to complete an economic impact study over three months between May and July 2011, which sent surveys to ground-floor businesses and property owners along Hornby and Dunsmuir Streets, as well as two other comparison streets with similar traffic volumes and land use mix.

Figure 4: Hornby Street in Vancouver

While the study measured minor negative sales growth at Hornby and Dunsmuir Street businesses, numerous factors limited its significance. Because hard financial data – such as local sales tax receipts used in economic impact studies in New York City – was unavailable, the study was limited to using perceptual surveys of local businesses to estimate potential economic impact. While some businesses reported declining sales, others reported increases; the study authors also noted the results of the analysis could be clouded by response bias where negatively impacted businesses were more likely to respond to the survey compared to unaffected or positively affected businesses.

The study also identified numerous factors affecting the business climate that could confound the results of the business survey, including:

- *The 2008-2009 national economic downturn;*
- *Increased parking rates due to the introduction of the harmonized sales tax (HST) in July 2010 and the 14% tax increase for off-street paid parking implemented by TransLink;*
- *Road closures and access changes due to the 2010 Winter Olympics;*
- *The opening of the Canada Line rapid transit system in August 2009;*
- *The fuel tax increase of January 2010;*

[5] Vancouver Economic Development Commission. *Business Impact Study Report, Downtown Separated Bicycle Lanes*. 2011. Retrieved April 4, 2013 from http://bettercities.net/sites/default/files/penv3-BusinessImpactStudyReportDowntownSeparatedBicycleLanes.pdf.

- *Downtown construction that has altered traffic patterns;*
- *Filming activity in the downtown core;*
- *The re-introduction of buses on Granville St.; and*
- *Stricter impaired driving rules.*

Other factors limiting the study included the short timeline of the evaluation. Both cycle tracks had been in place for less than a year when the surveys were conducted. The short time period over which survey data was collected – just two months – only captured a snapshot of the annual business cycle. The timing of the installation of one of the cycle tracks – December 2010 – also intersected with the end of the holiday shopping season, while businesses were surveyed just a few months later in the spring.

A survey of customers found that impacts to retail traffic caused by changes in vehicle access were likely to be less significant than traffic changes affecting other modes. The study found that "20% of customers on Hornby and Dunsmuir Streets arrived by automobile, compared with 42% by public transit, 32% on foot, and about 8% by bike," implying that access for walking, bicycling and transit customers was likely more important to sales. Comparison of this customer survey to the survey of businesses found that business owners and managers had overestimated how many of their customers arrived by car, and underestimated the importance of other modes.

At the same time as the business survey, the study also surveyed property owners and managers along the same streets. Owners and managers reported a reduction in vacancies, potentially indicating an improved business climate. On Hornby Street, vacancies of 10-11% in 2009 and 2010 dropped to 2% in 2011 after the installation of the cycle track. The study concluded an additional analysis of commercial rents and occupancy rates after several years could produce a more conclusive result, allowing for more time to generate data to measure economic impact.

2 Safety Impacts of Protected Bikeways

Project evaluations of recently installed protected bikeways in the United States and academic studies of well-established protected bikeways in other countries have both shown significant safety benefits to bicyclists and other street users. In addition to crash and injury reductions, protected bikeways have been noted to increase safety through road user behavior changes, such as by reducing sidewalk riding and wrong-way riding by bicyclists. Surveys of all types of road users – bicyclists, pedestrians and drivers – have shown a positive perception of the safety effects of protected bikeways.

2.1 Minneapolis, MN[6]

In Minneapolis, no bicycle-involved crashes were recorded six-month evaluation period after installing a cycle track on the Hennepin Avenue/1st Avenue corridor. In the three years preceding the installation, an average of 12 bicycle-involved crashes per year had been reported in the project corridor. Vehicle crashes in the corridor also decreased from a rate of 167 per year to 152 per year during the same evaluation period. While the six-month crash data observation period after the installation was not long enough to be conclusive, Minneapolis Public Works reported that "the current trend is definitely a benefit" and "a good sign."

2.2 Montreal, QC[7]

While cycle tracks and other protected bikeways have only been widely installed in the United States within the last half decade, Montreal, Quebec, Canada has had a network of cycle tracks on its streets for over 20 years. A study by the Harvard School of Public Health using historical crash data, bicycle counts and other factors compared the risk of bicycling on six streets using cycle tracks to bicycling on reference streets without cycle tracks. The study found bicycle volumes on cycle tracks were 2.5 times higher than on reference streets, while the relative risk of injury while riding on cycle tracks was 0.72 that of riding on other streets.

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[6] Minneapolis Department of Public Works. *Hennepin Avenue and 1st Avenue Two-Way Conversion Evaluation Report*. 2010. Retrieved April 2, 2013 from http://www.ci.minneapolis.mn.us/www/groups/public/@publicworks/documents/images/wcms1p-085710.pdf.

[7] Lusk AC, Furth PG, Morency P, et al. Risk of injury for bicycling on cycle tracks versus in the street. Injury Prevention (2011). Retrieved April 5, 2013 from http://injuryprevention.bmj.com/content/early/2011/02/02/ip.2010.028696.full.pdf?sid=a2ed422a-9dbe-409a-b762-40e0ffbcedc6.

Table 2 RR of injury for cycle tracks compared to similar on-street routes for Montreal, Quebec*

				Cycle track		Reference street		
Cycle track†	Reference street‡	Limiting cross streets	Length (km)	2-h bike count	EMR-reported injuries§	2-h bike count	EMR-reported injuries§	RR (95% CI)¶
1. Brébeuf	**St Denis (N)**	**Rachel — Laurier**	1.0	1193	37	437	32	**0.42 (0.26 to 0.68)**
2. Rachel	Mont Royal	St Urbain — Marquette	3.5	990	120	613	63	1.18 (0.87 to 1.60)
3. Berri	**St Denis (S)**	**Cherrier — Viger**	1.4	763	74	134	27	**0.48 (0.31 to 0.75)**
4. Maisonneuve	**Both**	**Claremont — Wood**	1.9	547	18	176**	18	**0.32 (0.17 to 0.62)**
	Sherbrooke (W)					*129*	14	*0.30*
	Ste Catherine					*47*	4	*0.39*
5. Christophe Colomb	Both	Gouin — Jarry	3.7	407	64	122	19	1.01 (0.61 to 1.68)
	Saint-Hubert					*45*	9	*0.79*
	Christophe Colomb (S)	Villeray — Rosemont	2.3			*77*	10	*1.21*
6. René Levesque	Sherbrooke (E)	Lorimier — St Hubert	1.3	109	27	130	32	1.01 (0.60 to 1.68)
All			15.1	4009	340	1612	191	**0.72 (0.60 to 0.85)**

*Statistically significant comparisons are shown in **bold**.
†All cycle tracks are two-way on one side of the street.
‡An on-street bike route on a parallel street in close proximity of the cycle track.
§Injuries recorded by emergency medical response (EMR) services between 1 April 1999 and 31 July 2008 for the season 1 April to 15 November.
¶95%CI calculated using the variance of log(RR) based on a Poisson distribution.
**For comparisons having two reference streets, the total number of bicyclists is used from both streets.

Figure 5. Relative risk of injury on cycle tracks (*Injury Prevention*, 2011).

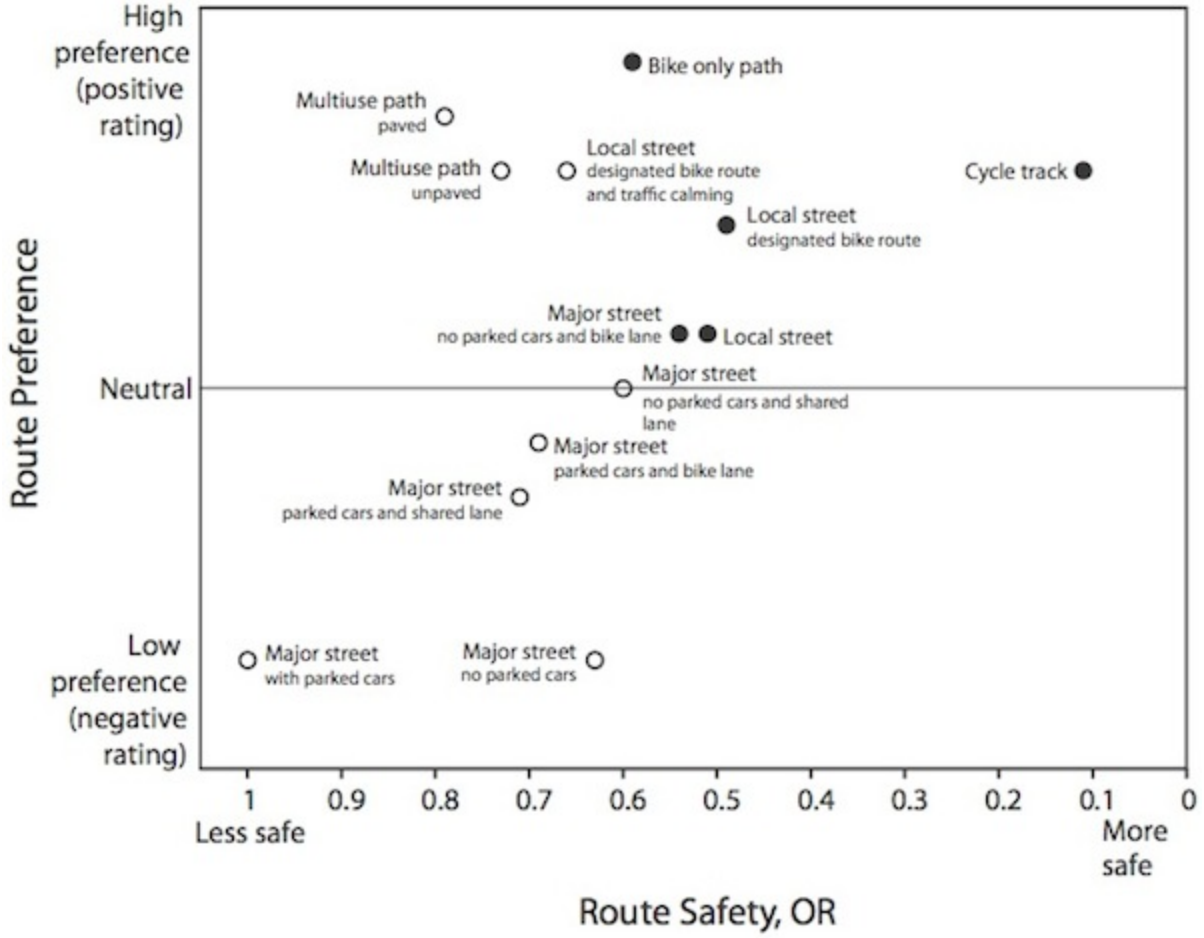

Figure 6: The x-axis on the bottom reflects the route-safety findings ("cycle tracks" have 10 percent of the risk of major streets with parked cars) (Injury Prevention, 2011).

2.3 New York City, NY[8,9]

New York City has observed significant safety improvements along the streets where it has installed protected bikeways. On Prospect Park West in Brooklyn, NYCDOT compared six months of crash data after the installation of a two-way cycle track to crashes observed in the three years before the project. Analysis found the overall crash rate decreased 16% and overall injuries resulting from crashes fell by 20%, with no reported bicycle or pedestrian injuries during the six month observation period.

Compliance with speed limits and other traffic laws by Prospect Park West street users also improved significantly. After the project, one in four vehicles on average was observed breaking the speed limit, compared to three in four vehicles before the project. Before the construction of a protected bikeway, nearly half of all bicyclists (46%) chose to ride illegally on the sidewalk rather than riding in the street. After the cycle track was installed, only 3% of bicyclists on the street were observed riding on the sidewalk, with many of those remaining being children who are legally allowed to use the sidewalk while bicycling.

Protected bikeways in Manhattan showed similar safety improvements. Injuries to street users on 8th and 9th Avenues decreased by 35% and 58%, respectively, after cycle tracks were installed. On First and Second Avenues, injury crashes decreased 37%.

2.4 Portland, OR[10]

Surveys of street users along the Broadway cycle track found wide support for the facility among bicyclists, motorists and pedestrians. Over 70% cyclists said the cycle track was safer and easier than the unprotected bike lane that had previously existed in the project area. Before the installation of the cycle track, 12% of bicyclists observed rode in travel lanes instead of using the available unprotected bicycle lane. Afterward, 98% of bicyclists observed used the cycle track. Buffered from moving traffic by parked cars, only 36% of bicyclists surveyed were concerned with being "doored" while using the cycle track compared to 95% who said they were concerned while using a regular bike lane.

A plurality of motorists agreed that the Broadway cycle track made driving safer and calmer. The largest group of motorists (the "plurality") said driving was now safer and calmer. Among pedestrians, 59% thought the addition of the cycle track improved walking environment on the sidewalk adjacent to the cycle track.

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[8] New York City Department of Transportation. *Prospect Park West Bicycle Path and Traffic Calming Update*. 2011. Retrieved April 3, 2013 from http://www.nyc.gov/html/dot/downloads/pdf/20110120_ppw_data.pdf.

[9] New York City Department of Transportation. *Measuring the Street*. 2012. Retrieved April 3, 2013 from http://www.nyc.gov/html/dot/downloads/pdf/2012-10-measuring-the-street.pdf.

[10] Dill, Jennifer; McNeil, Nathan & Monsere, Christopher. Portland State University, for the Portland Bureau of Transportation. *Evaluation of Innovative Bicycle Facilities*. Retrieved April 2, 2013 from http://www.its.pdx.edu/upload_docs/1297701181.pdf.