(3.5) Public Safety in the NMT Environment

Some of the most important factors encouraging and discouraging NMT in a community are the levels of both real and perceived safety afforded pedestrians and bicyclists. This section concerns itself with the public safety issue of primary concern to non-motorists: the number of accidents involving non-motorists and automobiles.

National Trends and International Comparisons. Since accidents involving automobiles and pedal-cyclists began to be officially recorded in 1932, "More than 49,000 pedalcyclists have died in traffic crashes in the United States".[107] Although the number of cyclists killed in traffic accidents declined between 1995 and 2005, from 833 to 784 respectively, fatalities still represented 2 percent of all traffic fatalities and injuries in 2005. According to a similar study, 4,881 pedestrians were killed in traffic accidents in 2005.[108] Combined, pedestrians and bicyclists represented approximately 14% of all traffic fatalities that year. Fourteen percent might sound like a small percentage in some respects, but not when one places it next to the much smaller numbers of pedestrian and bicycle commuters in the United States (2.31% and 0.38% according to the 2000 Census data examined above). Along with these fatalities, 64,000 pedestrians and 45,000 bicyclists were injured in 2005.[109] Non-motorists are disproportionately represented in traffic fatality and injury statistics in the United States.

These high numbers of traffic accidents involving non-motorists have consequences for NMT. For example, researchers John Pucher and Ralph Buehler argue that the rate of accidents and bicycle fatalities explain the marked difference between rates of bicycle commuting in the United States and Canada. Despite colder average temperatures than their American counterparts, bicycle

[107] National Highway Traffic Safety Administration. Traffic safety facts: bicyclists and other cyclists. Retrieved February 4, 2007 from http://www-nrd.nhtsa.dot.gov/pdf/nrd-30/NCSA/TSF2005/BicyclistsTSF05.pdf.
[108] National Highway Traffic Safety Administration. Traffic safety facts: pedestrians. Retrieved February 4, 2007 from http://www-nrd.nhtsa.dot.gov/pdf/nrd-30/NCSA/TSF2005/BicyclistsTSF05.pdf.
[109] Traffic safety facts, Ibid.;

modal share is as much as six times higher in Canadian cities.[110] After analyzing several variables commonly associated with NMT modal splits, fatalities were found to be strongly associated with fewer bicycle trips to work: for every additional cyclist killed per 100,000 cyclists, there are 0.15 percent fewer bike trips to work.[111]

This research confirms the importance of safety efforts that seek to increase the bicycle modal share. The United States has a bicycle fatality rate of 5.74 deaths per 100 million kilometers cycled per year compared to Denmark where the fatality rate is less than 2.0 deaths per 100M kilometers cycled per year.[112] The higher level of safety afforded cyclists in European cities is reflected, at least to some degree, in a much higher cycling modal share.

Data provided by the National Highway Traffic Safety Administration for 2005 substantiates several other characteristics of fatal motorist/non-motorist accidents that are worthy of mention:

1. The vast majority occurred at urban intersections.
2. The majority also occurred at night.
3. Like bicycle traffic fatalities, a significant majority were men who also had higher rates of injury due to traffic accidents.
4. As one might expect, fatalities occur most often during times of higher bicycle usage – namely the summer months of June, July, and August when recreational riding is at its peak.[113]
5. The average age for fatalities among cyclists has shifted upward dramatically (from 22.7 in 1995 to 29 ten years later).

[110] Pucher, J., and R. Buehler. (2006). Why Canadians cycle more than Americans: a comparative analysis of bicycling trends and policies. *Transport Policy* 13, p. 266.
[111] Ibid., p. 276
[112] Ibid., p. 267
[113] National Highway Traffic Safety Administration. Traffic safety facts: pedestrians. Retrieved February 4, 2007 from http://www-nrd.nhtsa.dot.gov/pdf/nrd-30/NCSA/TSF2005/PedestriansTSF05.pdf.

6. Deaths among cyclists, under 16 years of age, has fallen from 34 percent of all pedalcycle fatalities in 1995 to 18 percent in 2005. Nonetheless, nearly 17 percent of victims of fatal accidents were among the youngest riders on the road, ranging in age from 5 to 15.
7. Children accounted for a disproportionate number of traffic injuries (28%). In the State of Michigan, 137 pedestrians died in traffic accidents in 2005.
8. Men, who are much more likely to cycle than women according to other studies, were also much more likely to die while cycling. They experienced a mortality rate that was 7 times that of women.[114]

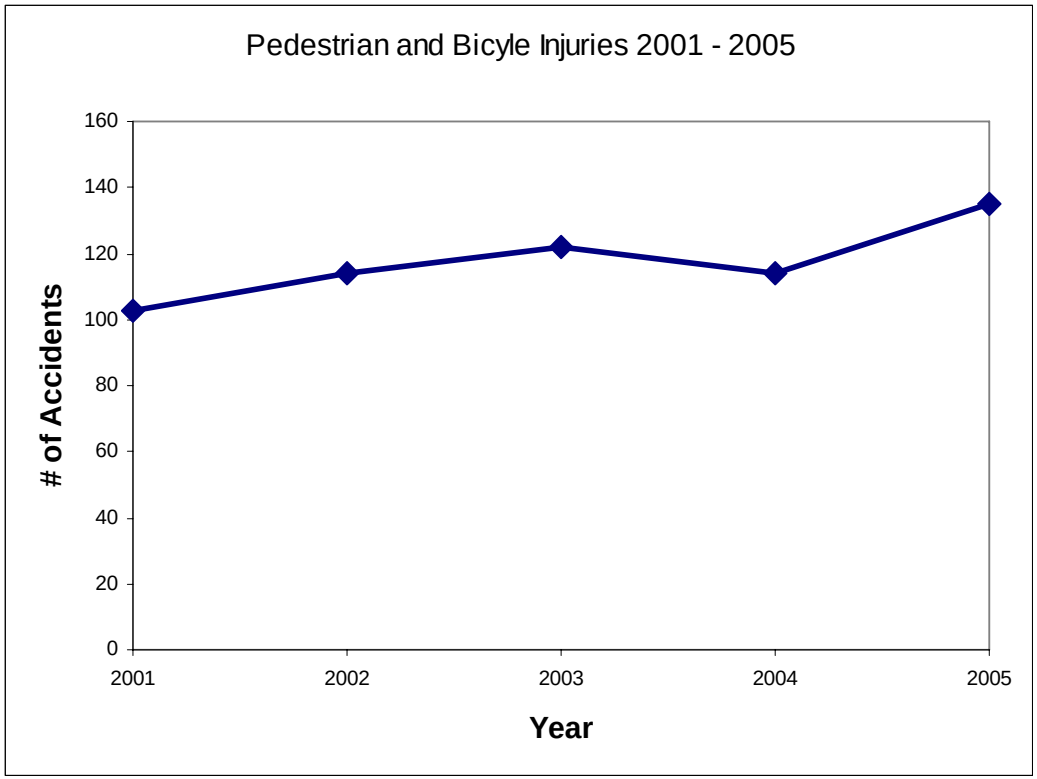
How safe is NMT in Lansing today? Altogether, there have been more than 560 accidents involving pedestrians, bicyclists and Automobiles from 2001 to 2005.[115] Figure 31 (See next page) depicts the number of accidents during this period. Lansing averages around 120 accidents involving non-motorists every year. It should be noted that this number includes a variety of types of accidents including those where fault cannot be determined and/or are not necessarily related to non-motorized travel per se (e.g. a parked coming out of gear and rolling over a mechanics outstretched leg). A slight trend toward an increasing number of accidents appears in the Figure 31, but this could be accounted for by improved reporting of accidents. Again, local knowledge of the NMT environment may contribute to a better understanding of this and other trends.

These accidents are responsible for approximately 521 injuries, split almost equally between pedestrians and bicyclists. As Figure 32 reveals, the severity of injuries suffered by pedestrians and bicyclists are roughly the same. The number of fatal injuries is the one important exception: during the past 5 years, only one bicyclist has been killed in a traffic accident while 5 pedestrians have been killed during the same period.

[114] National Highway Traffic Safety Administration. Traffic safety facts: pedestrians. Retrieved February 4, 2007 from http://www-nrd.nhtsa.dot.gov/pdf/nrd-30/NCSA/TSF2005/PedestriansTSF05.pdf.; National Highway Traffic Safety Administration. Traffic safety facts: bicyclists and other cyclists. Retrieved February 4, 2007 from http://www-nrd.nhtsa.dot.gov/pdf/nrd-30/NCSA/TSF2005/BicyclistsTSF05.pdf..

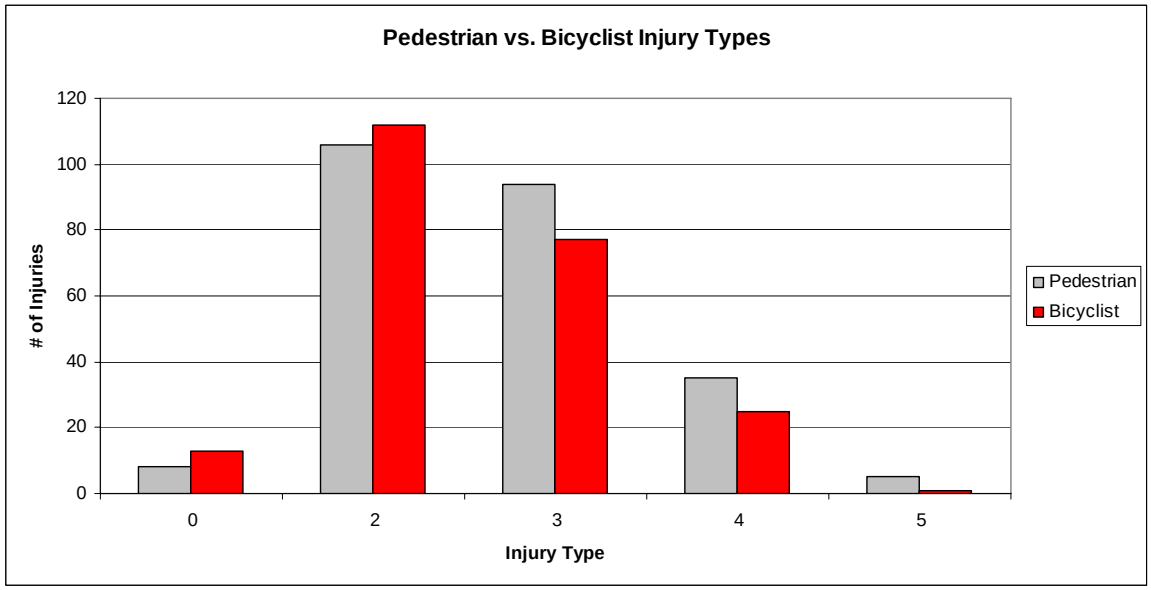
[115] Based on records provided to the Team by the City of Lansing. Records for 2001 were did not include data for the months of October, November, and December. Data entry and analysis performed by the Team.

Figure 31



Source: City of Lansing Non-motorist traffic accident reports, analysis by author

Figure 32



Source: City of Lansing Accident Reports, Analysis/Calculations by the Team

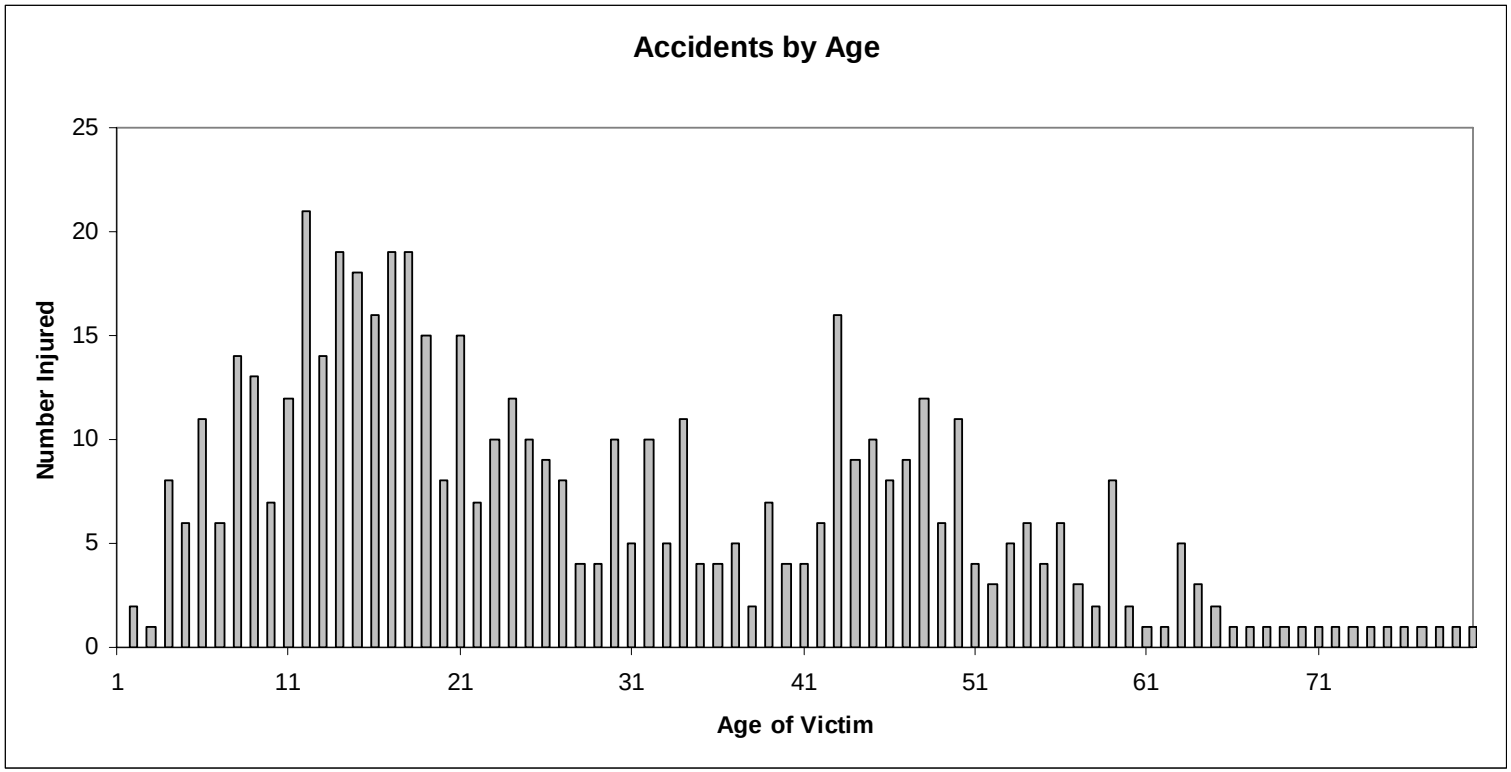
Figure 32 also indicates that pedestrians are slightly more likely to suffer more severe injuries than are bicyclists (categories 4 & 5). For both groups, the number of injury types is distributed somewhat regularly with fewer, more severe injuries and more minor ones (category 2).

Other characteristics of the distribution of NMT accidents in Lansing correspond with the national data mentioned above. Specific findings for Lansing are as follows:

1. In Lansing, men are more likely to be involved in accidents than women. In fact, 66% of accidents involved men whereas only 34% involved women.
2. While the average age of NMT accident victims was 42, the distribution of ages and accidents does not follow a normal "bell-shaped" curve (See Figure 33, next page). Rather, larger numbers of victims were concentrated between the ages of 10 and 20, and then again between the ages of forty and fifty. This bi-modal distribution could reflect a higher than average number of pedestrians and bicyclists within these two age cohorts or it could reflect certain attributes of both groups that predispose them to higher incidence of accidents when they are walking and bicycling. In all likelihood, it is some combination of the two.
3. Unlike national accident statistics, most accidents in Lansing occurred away from intersections. In fact, only 43% of accidents occurred at intersections. As Figure 34 (See below) demonstrates, pedestrians and bicyclists are, however, not evenly represented in these two sets of accidents. Pedestrians were more likely to be involved in accidents away from intersections (55% of the 320 accidents away from intersections involved pedestrians). On the other hand, bicyclists were more likely to be involved in accidents at intersections (bicyclists were involved in nearly 60% of accidents at intersections).[116]

[116] Based on records provided to the Team by the City of Lansing. All calculations by the Team.

Figure 33



Source: City of Lansing Accident Reports 2001 - 2005, Analysis/Calculations by the Team

Figure 34

Source: City of Lansing Accident Reports 2001 - 2005, Analysis/Calculations by the Team

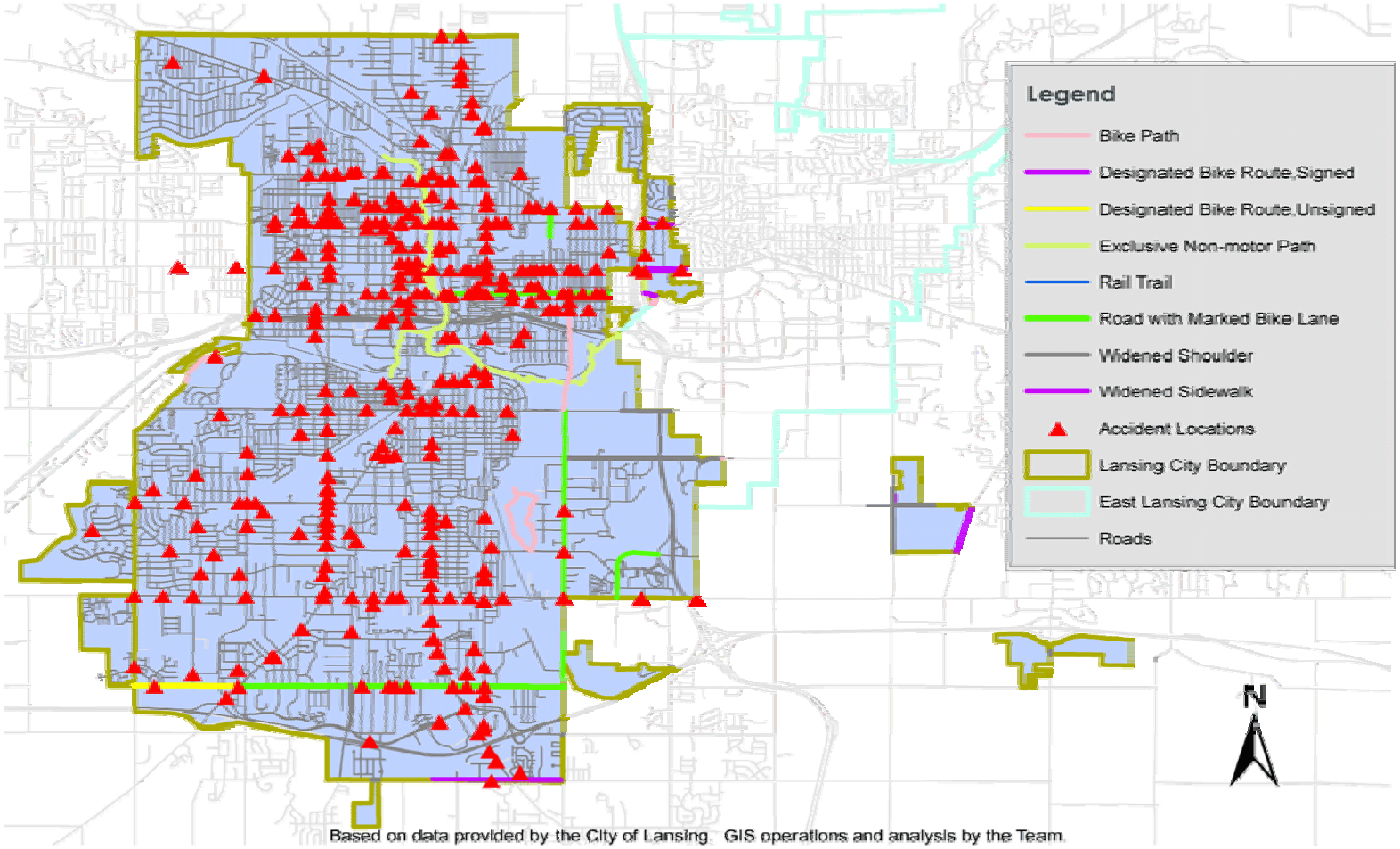
The locations of NMT accidents are depicted in several GIS maps: *Existing Conditions: Locations of Non-motorist/Motorist Accidents (2001 – 2005)*, and *Existing Conditions: Locations of Bicycle Accidents on Roads with Marked Bike Lanes*, *Existing Conditions: NMT Accidents along Cedar Street (2001 – 2005)* and *Existing Conditions: Connectivity and NMT Accidents*. The first map shows that NMT accidents, taken altogether, are distributed throughout the city without any particular neighborhood or district

concentrations. A closer look, however, reveals that many accidents occur along major urban arterials including Martin Luther King Jr. and Cedar Street where 58 accidents involved pedestrians and bicyclists between 2001 and 2005.[117] As in other cases, these 58 accidents occurred along a relatively busy street (5 lanes of in some places), with relatively high speed limits for an urban thoroughfare (35 MPH), and no on-road bicycle facilities. As the final map in this series demonstrates, many of these 58 accidents happened in areas along Cedar characterized by "higher" connectivity, tightly gridded neighborhoods.

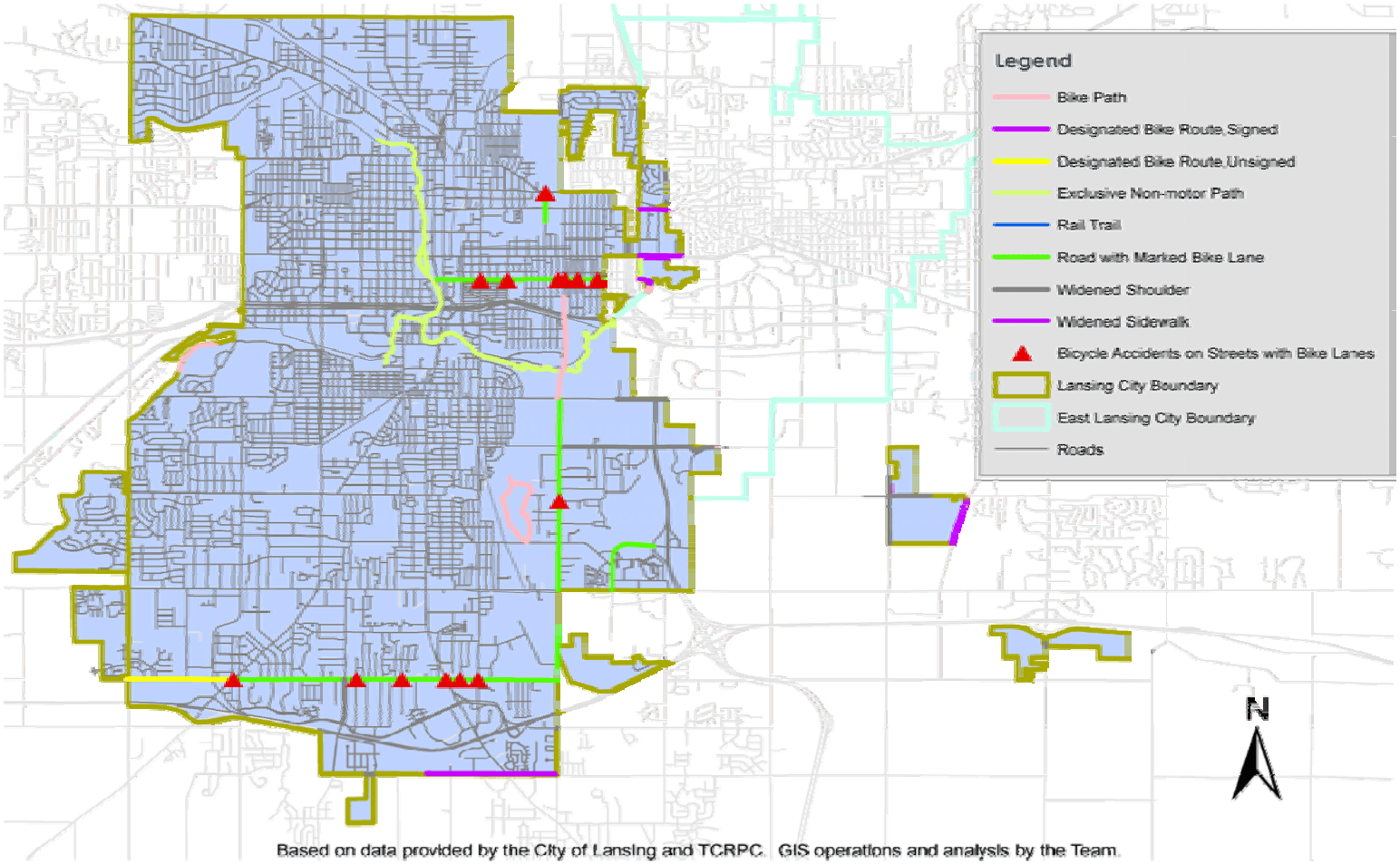
On the other hand, streets with NMT facilities as identified by the Tri-County Planning Commission had 48 traffic accidents involving pedestrians and bicyclists.[118] Some of the roads included in this set are similar to Cedar in terms of traffic speeds and number of lanes. And yet there were roughly 20% fewer non-motorist traffic accidents along these roads where NMT facilities have been provided for pedestrians and bicyclists.[119] On Kalamazoo Avenue, where marked bikes lanes run from downtown Lansing to the edge of East Lansing, only 6 traffic accidents involving bicyclists have occurred over the past 5 years.

[117] Based on accident report data provided by the City of Lansing. Calculations and analysis by the Team.
[118] Based on accident reports provided by the City of Lansing, and GIS data provided by the TCRPC. Calculations and interpretation performed by the Team.
[119] Calculation by the Team based on accident report data; 58% - 48%/ 58%

Existing Conditions: Locations of Non-Motorist/Motorist Accidents (2001 - 2005)

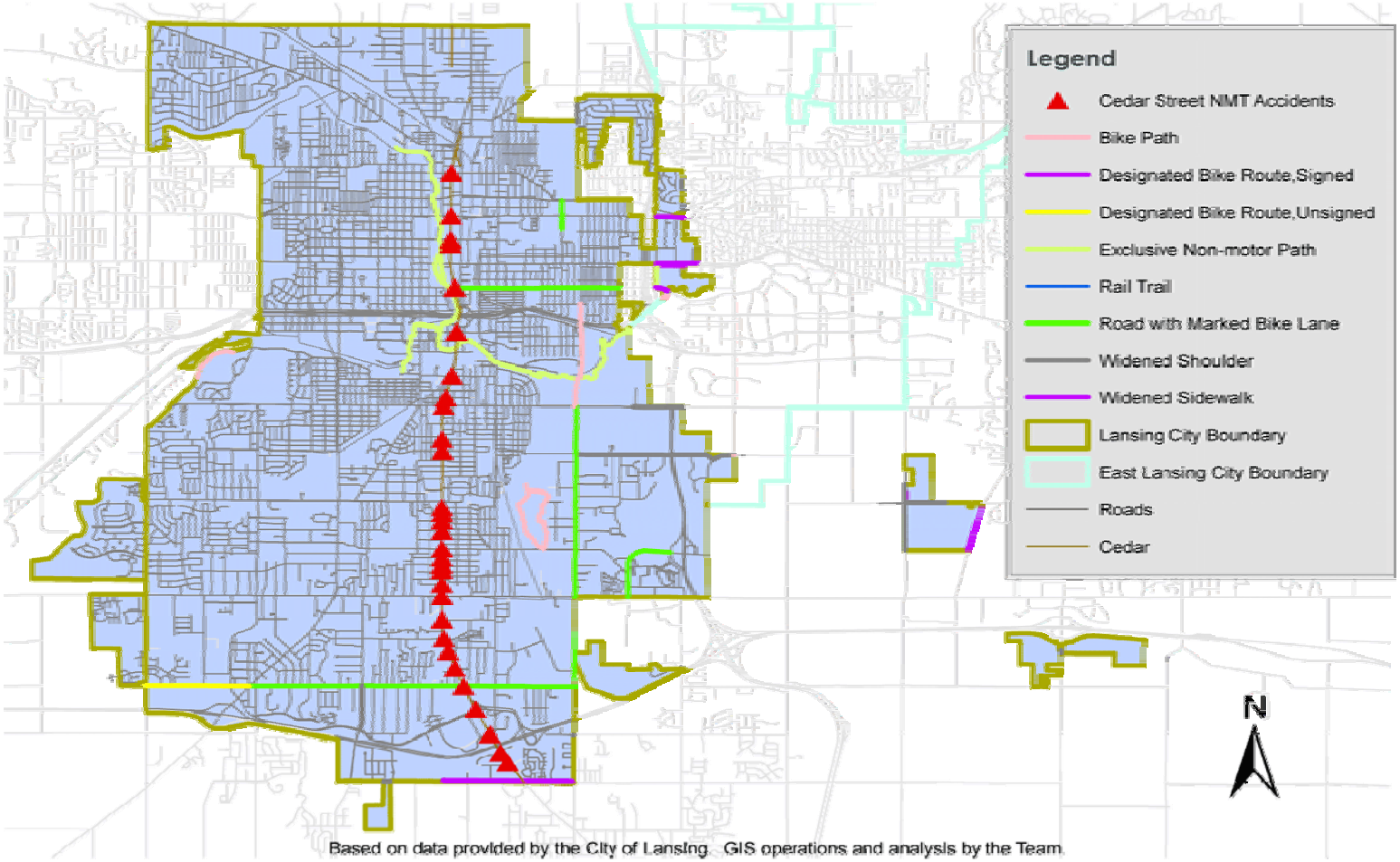


Existing Conditions: Locations of Bicycle Accidents on Roads with Marked Bike Lanes

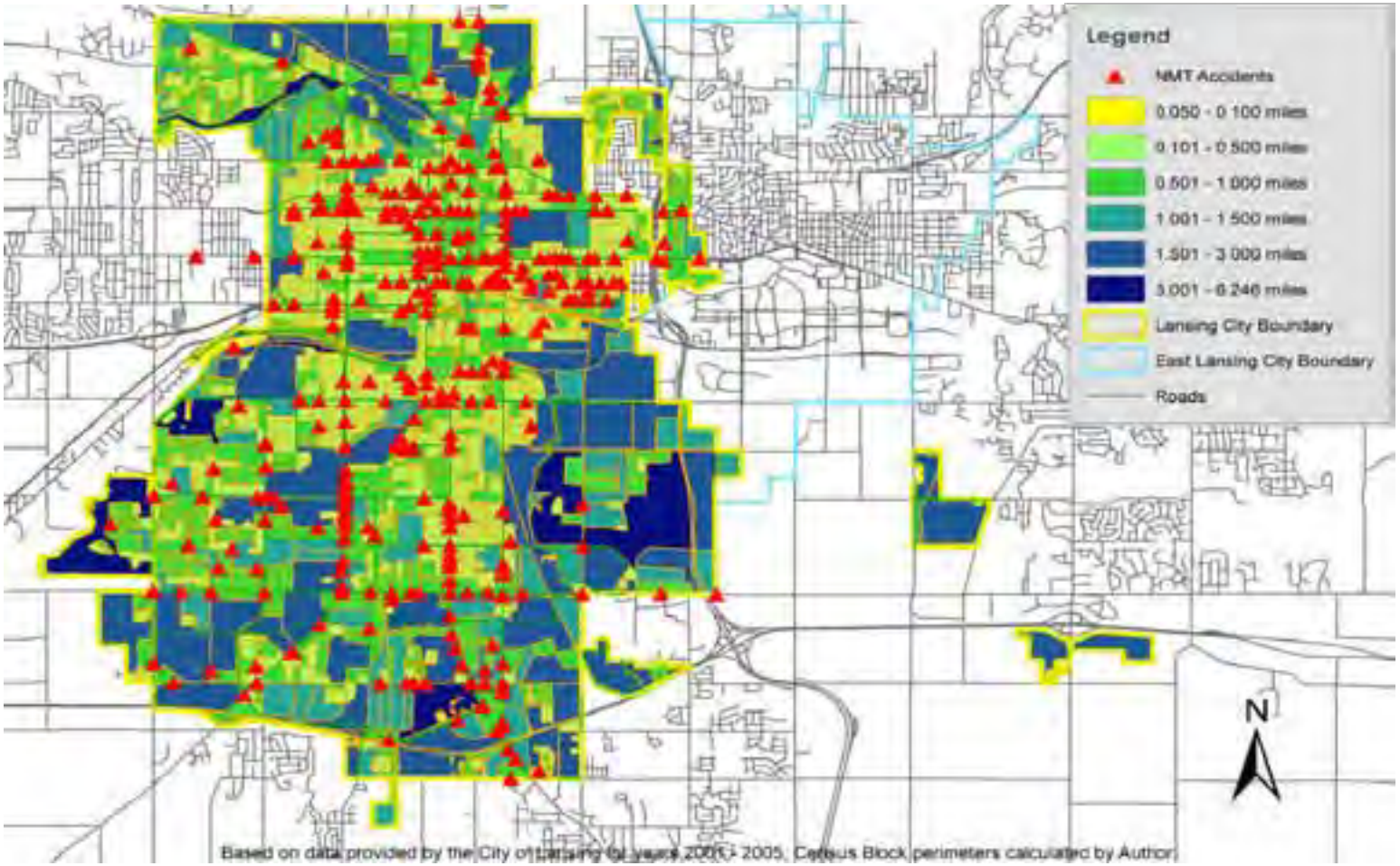


Based on data provided by the City of Lansing and TCRPC. GIS operations and analysis by the Team.

Existing Conditions: NMT Accidents along Cedar Street (2001 - 2005)



Existing Conditions: Connectivity & NMT Accidents



Conclusions. Like most communities throughout the United States, non-motorists in Lansing face significant safety issues. These safety issues can be summarized in the following key points:

1. Despite low non-motorized commuting levels (for more see NMT User Profiles 3.1.A & B), approximately 120 accidents involving non-motorists are reported to occur every year. According to data from the 2000 U.S. Census, only 367 respondents reported bicycling to work and 2,643 reported walking to work. Using these figures as crude indicators for overall utilitarian NMT usage yields a ratio of 1 accident for every 29 individuals who reported that they were non-motorist commuters in the 2000 Census. To some, it may not seem significant that only 1 out of every 30 non-motorist commuters is likely to suffer an injury as the result of a traffic accident over the period of year. But given the severity of these accidents for non-motorists, an incidence rate of this magnitude would certainly seem likely to influence the way non-motorists perceive the NMT environment.

2. The locations of accidents matter. Although the location of non-motorist accidents appears to randomly distributed throughout the city, there appears to be a strong connection between higher traffic volume, higher speed arterials (like Cedar Street) and higher connectivity urban neighborhoods through which they pass. In addition to comprehensively identifying such locations, the Client should use the data collected by the Team to further investigate problem areas/intersections where accidents recur again and again.

3. On a positive note, the few NMT facilities that are in Lansing do seem to make a difference: fewer traffic accidents involving pedestrians and bicyclists occurred in places where NMT facilities were available.

(4.0) Design Guidelines

The purpose of design guidelines is to address issues raised in the existing conditions with policies and programs that achieve established goals and objectives. The design portion of non-motorized transportation plans includes a wide variety of elements depending on the plan, and there are no standard guidelines. However, common guidelines in most non-motorized plans include such things as accessibility elements and universal design. They also include design standards for sidewalks, roads, facilities for bicyclists and pedestrians, and wayfinding mechanisms.

Accessibility. A non-motorized plan meets the needs of all its users including those with disabilities. Accessibility elements include the accommodations provided for people who are not able to fully use the facilities. Accessibility elements involve sidewalks, trails, and street linkages specifically for people with disabilities. They are elements targeted toward a specific user group. Accessibility elements do not necessarily involve attributes intended for the general public that are included in universal design.

Universal Design. Universal Design, according to the Center for Universal Design is "the intent of universal design is to simplify life for everyone by making products, communications, and the built environment more usable by as many people as possible at little or no extra cost. Universal design benefits people of all ages and abilities.[120] The Universal Design concept helps guide design form and function to benefit more people. It is the set of standards that determine the overall form of a project. A non-motorized plan has various aspects of Universal Design. An example of the design standards for sidewalks and roads are standards that say how wide and long a road or sidewalk should be depending on its use. The design guidelines for bicyclists and pedestrians involve such examples as bike racks and bench sizes, shapes and forms.

[120] About Universal Design. Center for Universal Design, College of Design, North Carolina State University. 2007 http://www.design.ncsu.edu/cud/about_ud/about_ud.htm. 5 Feb 2007

Wayfinding Mechanisms. Wayfinding techniques refer to "maps, street numbers, directional signs and other elements as "wayfinding devices". These visual cues may or may not include signs. This narrow description is the current misunderstanding that wayfinding is essentially the same as signage. The two terms are not synonymous. Sign-makers deal with designing, fabricating and installing signs. However, wayfinding used to navigate unfamiliar environments doesn't rely exclusively on signs.[121] The above definition describes the difference between wayfinding and signs. A definition of the term wayfinding should be included in Lansing's non-motorized plan because there is confusion as to what the term actually means. If Lansing plans to use wayfinding techniques in their non-motorized plan, they will need to define it. The term will encompass a whole range of techniques that provide directions for uses of the trail.

Frequently accessible documents One of the documents that should be examined by the mayor's non-motorized transportation task force is *The Federal Highway Administration's (FHWA) guidebook Part II of II: Best Design Guide; Designing Sidewalks and Trails for Access*. This document contains guidelines for designers, engineers and planners in reference to the standards for such things as sidewalks, roads, and bike lanes. Some of the items this document includes are listed below:

- Understanding Sidewalk and Trail Users
- Integrating Pedestrians into the Project Planning Process
- Sidewalk Corridors
- Driveway Crossings
- Providing Information to Pedestrians
- Curb Ramps

[121] Muhlhausen, John. Wayfinding Is Not Signage: Signage Plays An Important Part of Wayfinding –But There's more, (www.signweb.com/ada/contwayfinding0800.html), 2005

- Pedestrian Crossings
- Traffic Calming
- Sidewalk Maintenance and Construction Site Safety
- Sidewalk Assessment
- Trail Planning
- Universal Trail Assessment Process
- Shared-Use Path Design
- Recreation Trail Design
- Trail Crossings
- Specialized Trails
- Trail Maintenance

Another appropriate document that needs to be analyzed by the task force is the *American Association of State Highway Transportation Official's (AASHTO) document "A Policy on Geometric Design of Highways and Streets.*" This book is commonly called the Green Book. These guidelines also deal with above design elements. Some of the issues covered in the AASHTO guide are listed below that are applicable to the non-motorized plans are as follows:

- Shared Roadways
- Designated shared roadways (bike routes)
- Bicycle Lanes
- Shared use Paths
- Design Controls and Criteria

- Elements of Design

The Institute of Transportation Engineers (ITE) created the document *Promoting Sustainable Transportation Through Site Design: An ITE Proposed Recommended Practices*. These are nationally recognized standard documents that are used by designers and engineers for designing streets, sidewalks and trails. A summary of some of the questions covered in the ITE document are below. The guidelines in these documents will help the City of Lansing determine the proper design parameters to utilize.

- Guideline applicability by stage in the site design process
- Site layout
- Site Infrastructure design
- Road and sidewalk widths
- Site amenities
- Pedestrian friendliness of sites

Which set of guidelines to use. Design guidelines and standards are by no means limited to the documents listed above. The city has no uniform set of standards. However, Lansing should analyze these models to see if they are applicable to the project as it is finally conceived. Once the documents have been examined, Lansing can determine which guidelines are appropriate for a project and when to use them. The design guideline information is extensive and should be analyzed according to a city's specific needs. Furthermore, a source of funding for the projects should be identified. This source will often dictate the type of design guidelines that the city will use as it applies for grant to construct the facility.

How can Design Guidelines be applied to Lansing? The design guidelines from specific non-motorized plans and documents can be applied to Lansing in several different ways. One of the most direct ways that design standards can be applied to Lansing is to examine their existing conditions. Certain assests and amenities in Lansing can be analyzed according to these guides from other non-motorized plans. For example, the city of Portland and Madison Wisconsin are considered national leaders in non-motorized transportation. With the GIS map of bike racks in the city, Lansing city staff can determine where more can be placed and what type of bike rack should be used. Another way a design guideline could be applied to Lansing is when a road is to be reconstructed; bike lane and sidewalk width standards could be integrated into the new road.

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   Bureau of Transportation Statistics. *Omnibus Survey – Household Survey Bicycle Travel during 2002 (November 2001 – October 2002)*. Retrieved February 4, 2007, from http://www.bts.gov/publications/omnistats/volume_02_issue_06/html/entire.html.

   This U.S. Bureau of Transportation Statistics (BTS) report contains results from the Omnibus Household Survey conducted between November 2001 and October 2002. Among the findings, the BTS notes that 9 out of 10 [ride bicycles] mainly for recreation (54 percent) or for exercise (33 percent)", while only about "6 percent of adult bicyclists commute by bicycling to school or work or bicycle as part of their job" (p. 1). This emphasizes the importance of planning and designing for recreational cyclists.

2. **National Highway Traffic Safety Administration. Traffic safety facts: bicyclists and other cyclists. Retrieved February 4, 2007 from http://www-nrd.nhtsa.dot.gov/pdf/nrd-30/NCSA/TSF2005/BicyclistsTSF05.pdf.**

   Road-sharing between automobiles and bicycles has had conflicting history throughout the 20th century. In fact, the first automobile crash recorded occurred in New York City in 1896 and involved an automobile and a pedalcycle. Since such accidents began to be officially recorded in 1932, "More than 49,000 pedalcyclists have died in traffic crashes in the United States" (no page).

3. **Dill, J. and T. Carr. (2003). *Bicycle commuting and facilities in major U.S. cities: if you build them, commuters will use them – another look*. TRB 2003 Annual Meeting CD-ROM 1-9.**

   A growing body of research documents various phenomena influencing levels of bicycle commuting. Dill and Carr undertake the question of bicycle facility availability and its affect on levels of bicycle ridership. Despite a general lack of consensus among many researchers, this article substantiates an earlier study by Nelson and Allen which concluded that "Higher levels of bicycle infrastructure are positively and significantly correlated with higher rates of bicycle commuting" (p. 7). This correlation, the authors have cautioned, should not be misconstrued as directional causation: it may be the case that more bicycle facilities encourage greater levels of usage, or it may be the case that cyclists are drawn to communities endowed with more bicycle facilities.

4. **Targa, F. and K. J. Clifton. (2005). Built environment and non-motorized travel: Evidence from Baltimore City using the NHTS. *Journal of Transportation and Statistics*, 8.3, 55-70. Retrieved February 12, 2007, from http://www.wam.umd.edu/~ftarga/downloads/Papers/Targa-Clifton-2005.pdf**

Planners and other proponents of higher density, neo-traditional, and new urbanist city design often identify travel behavior as one of the most significant issues affecting the viability of existing and future higher urban development. The automobile, so the argument goes, has facilitated ever increasing dispersion of households throughout an ever widening metropolitan area. Auto-centric planning has been linked with aggravating "existing transportation problems in urban areas, such as traffic congestions, air quality, energy consumption, livability, and public health" (p. 56). In order to address these problems, it has been argued that greater emphasis be placed on other modes of transportation including public and non-motorized transportation. Targa and Clifton seek empirical evidence for these assumptions through an analysis of data collected in the 2001 National Household Travel Survey (NHTS).

5. Shriver, K. (1997). Influence of environmental design on pedestrian travel behavior in four Austin neighborhoods. Transportation Research Record 961076, TRB, National Research Council, Washington, D.C., 1997, 64-75.

Katherine Shriver surveyed pedestrians in four neighborhoods in Austin, Texas, to assess the impact of the built environment on pedestrian travel behavior. Each neighborhood represented was selected to represent two distinct urban development patterns—modern and traditional neighborhoods. Differences in transportation systems, land use, and urban design set these two patterns apart from one another. For example, traditional neighborhoods are built on grids with shorter blocks, more intersections, and straighter streets that do not terminate in cul-de-sacs (p. 65). Pedestrian travel routes within traditional neighborhoods can be more direct than their modern counterparts, which possess winding, discontinuous streets that terminate in t-intersections and cul-de-sacs. The modern neighborhoods used in this study actually had "32 percent fewer four-way intersections and half the street connections to arterials at neighborhood borders" (p. 67).

6. Baltes, M. (1996). Factors influencing nondiscretionary work trips by bicycle determined from 1990 U.S. Census metropolitan statistical area data. Transportation Research Record 1538, TRB, National Research Council, Washington, D.C., 96-101. Retrieved February 12, 2007 from http://www.enhancements.org/download/trb/1538-013.PDF.

Despite the belief that bicycle commuting can contribute to efforts to mitigate negative consequences of automobile travel, such trips accounted for only 0.28 to 1.03 percent of total vehicle miles traveled between 1990 and 1991 (p. 96). According to Baltes, however, this relatively tiny modal share is actually increasing. This researcher investigates possible explanations for these modest gains as demonstrated by data collected in the 1990 Census.

Using step-wise regression to measure the influence of multiple factors on bicycle trips to work, Baltes finds a "strong inverse relationship between not having a vehicle available and bicycling to work"; measures of income and poverty levels were not significantly correlated with bicycle commuting to work except in the "western" region; urban areas with higher residential densities and large populations of college students (pp. 100-101).

7. Nelson, A., and D. Allen. (1997). "If you build them, commuters will use them: association between bicycle facilities and bicycle commuting". *Transportation Research Record 1578*, TRB, National Research Council, Washington, D.C., 79-83. Retrieved February 12, 2007 from http://www.enhancements.org/download/trb/1578-10.PDF.

In addressing the rather obvious fact that the absence of bicycle facilities reduces opportunities for people to commute using bicycles, Nelson hypothesizes a positive association between bike facilities and levels of bicycle commuting (p. 80). Among several variables including number of college students, terrain topography, and weather, a regression reveals that *bikeway density* (number of bicycle pathway miles per 100,000 residents) is strongly associated with higher levels of bicycle commuting. Nelson is quick to point out, however, that this relationship is one of association and not directional causation (p. 82). As he puts it, it remains unclear whether the presence and activities of bicyclists within a community cause the construction of more bike facilities or the construction of more bicycle facilities encourage people to use them.

8. Pucher, J., and R. Buehler. (2006). "Why Canadians cycle more than Americans: a comparative analysis of bicycling trends and policies". *Transport Policy* 13, 265-279.

John Pucher and Ralph Buehler explore explanations for the marked difference between rates of bicycle commuting in United States and Canada. Despite colder average temperatures than their American counterparts, bicycle modal share is as much as six times higher in Canadian cities (p. 266). Using a regression, Pucher and Buehler model factors that contribute most significantly to this modal split. Independent variables included price of gas per liter, cars per capita, precipitation, cycling fatality rate, distance of work trips, and temperature. Of these variables, all but temperature were strongly or moderately correlated with bike share of work trips. The direction of these relationships was, furthermore, as anticipated. The regression had an R squared value of roughly 0.60 indicating that the variables included in the model accounted for nearly 60 percent of the variation in the share of bicycle trips to work (p. 275). Coefficients for all variables other than temperature and cars per capita were significant. In the case of gasoline prices, the model predicts each 10 cent increase in the price of a liter of gasoline is accompanied by 0.3 percent increase in bicycle trips to work.

9. Rose, G. (2004). Using a "Ride to Work" Day Event as a Travel Behavior Change initiative. TRB 2004 Annual Meeting, 1-17.

"Ride to Work" is an annual event organized by Bicycle Victoria in Australia; their goal is to promote riding to and from work. The program informs participants about the existing cycling infrastructure that is available to them and at the same time informing workplaces and employers about making the place of work more "bike friendly". This yearly event attracts thousands of participants and shows much potential in playing an active role in stimulating travel behavior change.

Studies have shown that the program does in fact work. In a study conducted after the 2001 *Ride to Work Day* in Washington DC, sixteen percent of riders had not commuted by bike before they participated in the event. In addition, of that sixteen percent, just under one-third started to ride to work after the event. This suggests that the program was successful in making aware new modes of non-motorized

transportation. The event was also successful in using the bike for non-work trips with two percent of respondents stating that they started to ride their bikes for non work trips after participating in the RTWD (Rose 5).

This program could prove helpful to the City of Lansing because "Ride to Work" does not rely on or require any additional transportation, infrastructure or even improvements in service of public transport services. All it takes in a well thought out and intensive marketing campaign and an increase in citizen input to produce a Lansing specific approach to achieving travel behavior change by "Ride to Work" participants. If implemented correctly the program can facilitate changes within Lansing's existing transportation and land-use systems and in-turn help minimize the negative effects of car travel.

NMT Plans Reviewed

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Glossary of NMT Terms

This glossary is a combination of terms provided by the International Bicycle Fund (www.ibike.org), an independent, non-profit organization, whose primary purpose is to promote bicycle transportation. Other terms where collected from Google Definitions (www.google.com).

American Association of State Highway Transportation Officials (AASHTO) - The AASHTO develops and publishes design standards and guidelines for such things as bridges, highways, urban roads and other transportation structures. One of its documents is, "Guide For Development of New Bicycle Facilities." This document is frequently referred to as "AASHTO". A more comprehensive AASHTO document is the "Green Book". It is the bible for road design, except it omits standards for bicycle friendly roadways. It is currently being revised to include more of a bicycle-friendly message.

Access - A bicyclist's general ability to travel to destinations in his or her community. Because this generally requires using an infrastructure designed for automobiles it implies an evaluation of how bicycle-friendly the road infrastructure is.

1. Opportunities to get to and from a non-motorized facility.
2. The right to use Forest Service and DNR roads and trails, and similar unpaved backcountry roads and trails, for bicycling.
3. A wide variety of legislative and government rule-making mechanisms can threaten access.

Accidents - See "Crash".

Activity Center - A public or private facility which acts as a trip generator.

Americans with Disabilities Act (ADA) - Requirements for ensuring equal opportunity for persons with disabilities in employment, State and local government services, public accommodations, commercial facilities, transportation and accessibility.

Alignment - The "line" which a facility follows.

Amenity (Factor) - Any design feature of a bicycle facility over and above what is deemed a basically safe design which induces greater use. Example: weather protected parking and scenic view points.

Attractiveness - The scenic and aesthetic value of a facility.

BAC - Bicycle Advisory Committee or Bicycle Action Committee - Bicycle Advisory Committees are usually part of government, advising at the municipal, county or state level. Bicycle Action Committee is usually part of non-governmental organizations -- activist clubs, coalitions, federations, etc.

Barriers To Travel - Barriers usually refers to natural (hills, lakes, rivers) or man-made (freeways, bridges without sidewalks, neighborhood traffic control devices) obstacles to through traffic or access.

Bicycle Access - The ability of bicyclists to have access to roads and trails. See"Access".

Bicycle Facility - A general term denoting improvements and provisions made by public agencies to accommodate or encourage bicycling, including parking facilities (Class I, II, III), maps, and all bikeways (Class I, II, III, IV). See "Classification Of Bicycle Facilities" And "Classification Of Bicycle Parking".

Bicycle Transportation Specialist (BTS) - A person trained in the planning and implementing facilities and programs specifically for bicycle traffic and bicyclists.

Bikeway - Generic term for any of several classifications of bicycle facilities.

Bollards - Wood or metal posts that engineers like to put in the middle of bike paths to restrict access of motor vehicles.

Capacity - Maximum number of bicycle which has a reasonable expectation of passing a given point, during a given period, under existing facility conditions.

Chicane - Fixed objects projecting into the travel lane, such as curbing or fencing, requiring the user to weave a tight course between them.

Chip Seal - A chip seal are an inexpensive alternative to an asphalt overlay for road repair. Tar is put down and then rock chips or gravel are spread over and pressed in. The result is a very rough surface.

Classification of Bicycle Facilities

- **Separate Facility** (a.k.a. Class I) - A non-motorized facility, paved or unpaved, physically separated from motorized vehicular traffic by an open space or barrier. Also called Bicycle Path, Bike Trail, Non-motorized Trail, Multi-purpose Trail or some combination thereof.
- **Bike Lane** (a.k.a. Class II) - A portion of a roadway that is designated by striping, signing and pavement markings for the preferential or exclusive use of bicyclists. Most often these are done in couplets, each one being one way and adjacent to the outside through travel lane. Also called Bicycle Lanes.
- **Bike Route** (a.k.a. Class III) - A segment of road designated by the jurisdiction having authority, with appropriate directional and informational markers, but without striping, signing and pavement markings for the preferential or exclusive use of bicyclists. Also called Bicycle Route.
- **Bike Friendly** (a.k.a. Class IV) - A roadway not designated by directional and informational markers, striping, signing nor pavement markings for the preferential or exclusive use of bicyclists, but containing appropriate bicycle-friendly design standards such as wide-curb lanes and bicycle safe drain grates.

Classification of Bicycle Parking Facilities

- **Long Term Parking** (a.k.a. Class I) - Bicycle parking facility intended for long-term parking and protected against theft of the entire bicycle and its components and accessories. Three common ways of providing Class I bicycle parking are:
  - fully enclosed lockers accessible only by the user;
  - A continuously monitored facility that provides at least Class II bicycle parking facilities;
  - A restricted access facilities in which Class II racks are provided and access is restricted only to the owners of the bicycles stored therein.
- **Medium Term Parking** (a.k.a. Class II) - Bicycle parking facility intended for medium- or short-term parking and consisting of a stationary object in which the user can lock the frame and both wheels with a user-provided lock. The facility should be designed to protect the lock from physical assault.
- **Short Term Parking** (a.k.a. Class III) - Bicycle parking facility intended for short-term parking, consisting of a stationary object to which the user can lock the frame and both wheels with a user-provided 6 foot cable (or chain) and lock.

Clearance

- **Lateral** - Width required for safe passage of a bicycle as measured in a horizontal plane.
- **Vertical** - Height necessary for the safe passage of a bicycle as measured in a vertical plane.

Climatological Elements - Weather as it affects bicycling in either a positive or negative manner, including temperature, precipitation, humidity and wind.

Council of Government (COG) - See MPO

Cone of Vision - The area of roadway and roadside visible to a cyclist when riding seated, with hands on the handlebars and eyes in the direction of travel.

Continuity - Pertaining to: Physical continuousness of a route or facility. Consistency in level of riding difficulty of a route or facility. Consistency in class of a route or facility.

Crash or Collision - A crash or collision, in fact reflect a mistake or combination of mistakes and are, as such, not "accidents". In terms of the bicyclist, collisions may involve the ground, a fixed object (e.g. a tree or bollard), a pedestrian, another cyclist, a parked or moving motor vehicle or an animal. They usually involve a mistake(s) on the part of users and/or the facility designers.

Cross Section - Diagrammatic presentation of the right-of-way profile which is at right angles to the centerline at a given location.

Delays - Interfering with continuous progress.

Design speed - A speed determined for design and correlation of physical features of a bikeway that influence bicycle operation. It is the maximum safe speed that can be maintained over a specified section of bikeway when conditions are so favorable that design features of the bikeway govern.

Determinants - Data and facts which govern the location and design of a facility.

Directness - An evaluation of how efficient a route is, or an evaluation of the alignment of a facility.

DOT - Department of Transportation - Historical call the Highway Dept, Roads Dept, or Public Works Dept and focused primarily on SOV needs on the roads under their jurisdiction, now-a-days they usually give at least a little attention to the needs of alternative modes of transportation as well.

Effective Cycling - Effective Cycling is a comprehensive bicycle safety education program sponsored by the League of American Bicyclists. Email: bikeleague@bikeleague.org. Internet: www.bikeleague.org. The Canadian equivalent is called "Can-Bike".

Employment Hub - A high density area of business and/or commercial establishments.

Engineering Study - The process of gathering, compiling and studying relative information for the purpose of producing a conclusion concerning a given problem. Likewise applies to Planning Study, Location Study, etc.

Geometrics - As related to bikeways, it is the proportional measurement of materials and land use which comprises the physical design of the facility.

GIS - Global Information System

GPS - Global Position System

Grade Separation - Vertical isolation of travel ways through use of a structure so that traffic crosses without interference. Spatial separation of two facilities.

Intermodial Transfer Point - Any location at which a user changes from on transportation mode to another.

Level of Service - In bikeway operation, this is a qualitative measure indicating the effect of factors such as speed, travel time, safety, travel interruptions and maneuverability.

Lobbying - The process of educating an official, elected or appointed, on your point of view. It is best viewed as a long-term process where long-term goals should not be sacrificed for short-term gains.

Master Plans - Master plans generally extend five or ten years into the future and guide an agency's normal, non-emergency activities. Plans set priorities for allocating staff resources and spending money. Typical types of master plans that will include some kind of bicycle element include transportation plans, open space plans and park plans. Master plans that may substantially affect cycling are land use plans and zoning plans.

Minimum Energy Path - The route between two given points requiring the least amount of energy for a cyclist to traverse.

MPO - Metropolitan Planning Organization - Usually a multi-jurisdiction or regional, long range planning coordination organ.

Multi-Modal Travel - A trip that involves more than one mode of travel (in addition to pedestrian) is multi-modal travel. Generally, for bicycling this has come to mean being able arrive at a station and to travel along with one's bicycle on transit, ferry or rail service.

Manual on Uniform Traffic Control Device (MUTCD) - A manual with specification on signage, signals and other traffic control devices, for the USA.

National Highway Traffic Safety Administration (NHTSA) - A division of the USDOT that is responsible for making road travel safer.

Origin-Destination Study (ODS) - A survey of facility users made to determine trip frequency and termini.

Overlay - New layer of asphalt put down on an existing road as restoration.

Parameters - Set of physical components whose values determine the characteristics or behavior of a system.

Pavement Markings - Painted or applied line(s) or legend placed on any travel surface for regulating, guiding or warning traffic.

Public Hearing - Public hearings are highly visible meetings where the public can give testimony to public officials holding the meeting. They are an opportunity for proponents and opponents to show the strength of their position by mustering the troops. They are not a substitute for longer term lobbying and working relations with the officials.

Railbanking - Railbanking is one mechanism for converting rail corridors that are not currently being used as active railroads to other purposes without actually "abandoning" the line. It is a procedure and series of agreements where the railroad puts the corridor into "savings" with a local government which "lends" it out and allows the public intermediate use of the corridor. Under the agreement it is understood that should the railroad want to use the corridor again for a railroad they can "withdraw" the corridor from the "bank." The law providing for railbanking was upheld unanimously by the United States Supreme Court in 1990.

Rails-To-Trails - The conversion of abandoned railroad right-of-ways to non-motorized trails. Such trails may be public or private; free or requiring a user fee. In the USA, much of this effort is being spearheaded by the Rails-To-Trails Conservancy.

Raised Traffic Devices - The ceramic disks and bars that are glued to pavement to channel traffic. Also known as "buttons," "turtles" and "slugs," depending upon their shape.

RFP - Request for Proposal

RFQ - Request for Qualifications

Right-Of-Way - A term denoting land, property or interest therein, usually in a strip, publicly acquired for or devoted to transportation or utility purposes. The designation of who has preference when two vehicles approach a single point. See "Rules of the Road."

Rules of the Road - That portion of a vehicle law which contains regulations governing the operation of vehicular and pedestrian traffic. Theoretically, to improve safety and efficiency, these are uniform for a large area. If laws are different in different jurisdictions good drivers in one place can become dangerous simply by crossing a political boundary. Among the important tasks of the rules of the road is to eliminate ambiguity. In every traffic situation the combination of facility design and traffic laws should make it unambiguous who has the right-of-way.

Safety - Relating to the threat of crashes or collisions. See "Crash".

Security - Personal well-being and the safekeeping of property.

Shy Distance - A space along side or above a facility to any fixed object (trees, limbs, poles, signs, beams, walls, fences, guard rails or drop-off.)

Sidepath Laws - Laws that require bicycles to use paths adjacent to roadways when separated facilities are provided, regardless of their level of safety or convenience. Many of these laws have been repealed, but there are periodically local attempts to enact new ones.

Sight Distance - A measurement of the user's visibility, unobstructed by objects, along the normal travel path to the furthest point of the roadway surface.

SOV- Single Occupancy Vehicle - Motor-vehicle with only a driver and no passengers.

Stopping Sight Distance - The total distance traveled from the instant a vehicle operator sights an object to the time the vehicle comes to rest. Perception time, plus reaction time and braking distances equal stopping sight distance.

Terminus - The ends of a trip. A trip's beginning and its end location is known as a terminus.

Traffic Calming / Traffic Diet - This is a form of "traffic management" and involves actions to reduce and slow motor vehicle traffic, usually in residential neighborhoods. Techniques for traffic calming include; preventing through traffic, installing traffic circles, narrowing the street, using a rougher road surface, planting street trees, or building speed bumps.

Traffic Control Device - Signs, signals or other fixtures, whether permanent or temporary, places on or adjacent to a travelway by authority of a public body having jurisdiction to regulate, warn or guide traffic.

Traffic Flow Pattern - Graphic presentation of vehicular and / or pedestrian movement for a given time on a given street.

TRB - Transportation Research Board - A division of the National Research Council, which serves as an independent adviser to the federal government and others on scientific and technical questions of national importance. They promote research and innovation in transportation. They have standing committees to address bicycle and pedestrian issues.

Travel Generators - Particular areas or locations that offer trip destination points to the utilitarian cyclists: For example libraries, schools, recreation areas and work centers.

Use Conflicts - Encounters with other traffic on a facility that cause delays or in extreme cases, collisions. Often referring to real or perceived conflicts between users of different modes.

Volume - The given number of vehicles that pass a given point for a given amount of time (hour, day, year.)

Warrant - A minimum requirement for justifying the authorization of a traffic control device, for example; traffic volume, accident statistics and existing design.

Tools