EIGHTH AVENUE CORRIDOR PLAN

DRAFT

Prepared for:

Cheyenne Metropolitan Planning Organization
2101 O'Neil Avenue
Cheyenne, Wyoming 82001

Prepared by:

Felsburg Holt & Ullevig
6300 South Syracuse Way, Suite 600
Centennial, Colorado 80111
303/721-1440

Project Manager: Jeff Ream, PE, PTOE
Project Engineer: Janis Christopher, PE

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INTRODUCTION

Project Background

Situated between Lions Park, Frontier Park, The Avenues neighborhood and Moore Haven Heights neighborhood, 8th Avenue serves a variety of vital functions within and beyond the Cheyenne Community. As the host of Cheyenne Frontier Days, Frontier Park attracts a regional crowd, many of whom are visiting Cheyenne for the first time or only visit Cheyenne for that event, so their perception of the road will be based on how it functions under its heaviest traffic loadings. Lions Park is a key community asset that provides a gathering place for Cheyenne residents and hosts city-wide events like Super Day and Fourth of July, so its visitors see 8th Avenue as a key access route to an important City amenity. For the two neighborhoods, 8th Avenue serves as both the northern neighborhood boundary and an important link to the arterial road system, while at the same time it creates a barrier that residents must cross to get to the parks.

These multiple functions bring challenges. On the one hand, the day-to-day traffic loadings from the neighborhood are relatively light – ranging from 500 vehicles per day (vpd) near Hynds to 2,500 vpd near Central - and could easily be accommodated by a typical two-lane collector street, but during Frontier Days and event days at Lions Park the volume swells to 10,000 vpd or more, and functions more as an arterial than a collector road. Furthermore, Carey Avenue, which separates Frontier Park and Lions Park and intersects 8th Avenue at a skew angle, functions as both a park access road and a bypass route for commuters travelling between downtown and the north end of town, so the intersection of 8th Avenue and Carey creates both operational and safety concerns for vehicles, cyclists and pedestrians.

In 2010, representatives of the neighborhood submitted a request to the Cheyenne Metropolitan Planning Organization (MPO) through the City's Neighborhood Traffic Management Program (NTMP) to review conditions on 8th Avenue and develop a set of improvements that would enhance vehicle operations and improve pedestrian safety both along and across the corridor.

To create the vision for 8th Avenue, the Cheyenne Metropolitan Planning Organization (MPO) initiated the 8th Avenue Corridor Plan in 2011. The plan has been a collaborative effort involving the general public, corridor stakeholders, the Wyoming Department of Transportation (WYDOT), FHWA, and the City of Cheyenne. The plan has sought to listen to public values and concerns and translate those into a conceptual plan. This project is anchored in the principles established in *PlanCheyenne* and the application of those principles to this particular location.

Goal and Objectives

The goal of the 8th Avenue Corridor Plan is to create a set of infrastructure improvements that would enhance pedestrian and bicycle safety along the corridor, provide safer areas to cross the roadway, revise the roadway laneage to meet the everyday and event loading needs of the corridor, and improve the 8th Avenue/Carey Avenue intersection to provide a safer and more efficient intersection for vehicle, pedestrian and bicycle traffic.

To support this goal, the project steering committee identified a series of objectives:

1. Involve the public and stakeholders in the planning process.
2. Address needs of all corridor users and travel modes in the plan.
3. Recommend solutions for existing traffic and pedestrian safety issues.
4. Analyze existing and future multimodal intersection operations at the 8th Avenue/Carey Avenue intersection and recommend traffic channelization and/or traffic control enhancements.
5. Identify capital and maintenance costs and sources of funding for future improvements.
6. Provide an implementation plan for recommended improvements, including project prioritization and phasing methods to provide large or small components to match available funding

Study Area

Figure 1 depicts the study area and vicinity. The 8th Avenue corridor is approximately 1 mile long and extends from Hynds Avenue on the west end to Warren Avenue on the east end.

Planning and Public Involvement Process

Project Governance

The project was supervised by a steering committee comprised of representatives of the following agencies:

- Cheyenne Metropolitan Planning Organization (MPO)
- Cheyenne MPO Citizen's Advisory Committee
- Cheyenne Frontier Days
- City of Cheyenne
- Federal Highways Administration
- Wyoming Department of Transportation

The steering committee met three times throughout the project to guide the work of the consultant team, review project information, discuss public and stakeholder involvement efforts, and collaborate to make decisions about plan direction and recommendations.

Figure 1
Vicinity Map

Planning Phases

The project work process generally followed the four phases of PlanCheyenne: Snapshot, Structure, Shape and Build.

The **Snapshot** phase captured current characteristics of the 8th Avenue corridor, including traffic crash history, traffic volumes, intersection traffic operations, and bicycle and pedestrian conditions. The project team assembled corridor mapping, aerial photography and previous studies and reports related to the area.

The **Structure** phase brought a collaborative effort to define the vision for the Corridor Study area. Information gathered during the Snapshot phase and meetings with the project Stakeholder group and Steering Committee helped frame the vision.

Development of the plan occurred in the **Shape** phase. Each of the vision elements in the Structure phase were formed into a series of policies and strategies to be implemented to eventually bring about the vision.

The **Build** phase was used to prioritize corridor strategies and identify action steps toward implementing the plan over time. Potential sources of project funding are identified in this phase.

Public and Stakeholder Involvement

The public and stakeholder involvement process has extended throughout the project, supporting each of the four phases. Activities were coordinated with the following groups:

Technical Advisory Committee – The project team reached out to Cheyenne Frontier Days, the Cheyenne Parks and Recreation Department and local residents to form a technical advisory committee (TAC) of 14 individuals to be involved in the project. The project team sought input from the group early in the project and met again with the TAC to collaborate on the shared vision for the corridor. The group will meet again prior to project completion.

Cheyenne Frontier Days – To gather additional input and feedback on traffic operations and circulation needs during Cheyenne Frontier Days (CFD), the project team met twice with CFD staff and also spent time observing traffic and pedestrian flow before, during and after major events during Frontier Days. The initial meeting provided the project team with insight into how parking operations and pedestrian and traffic circulation functioned during Frontier Days, and helped identify key areas of concern that needed to be addressed in the plan. The site observations allowed the project team to confirm the issues staff had identified, and identify opportunities and constraints along the corridor during those periods of heavy vehicle and pedestrian traffic flow. The final meeting allowed CFD staff an opportunity to review and comment on the preliminary set of improvements that had been identified for the corridor to ensure that the preferred alternative for the roadway would not hinder traffic operations during that event.

General Public – The general public consisted of citizens interested in the future of the corridor who attended the public open houses and made comments on the direction and content of the plan. A total of three open houses were held for the project.

Table 1 provides a summary of all public, stakeholder, and steering committee activities for the project and the planning phase supported by each.

Table 1. Public and Stakeholder Involvement Activities by Phase

Activity and date by Planning Phase			
Snapshot	**Structure**	**Shape**	**Build**
TAC Kickoff Meeting (1/12/12)	TAC Meeting #2 (5/9/12)	TAC Meeting #3 (11/1/12)	MPO Technical Committee Presentation (2/20/13)
CFD Staff Meeting #1 (1/25/12)	Public Open House #2 (6/7/12) (Attendance: **19**)	CFD Staff Meeting #2 (11/7/12)	Planning Commission Presentation (3/4/13)
Public Open House #1 (3/22/12) (Attendance: **64**)		Public Open House #3 (12/4/12) (Attendance: **78**)	
CFD Site Observations (7/28/12)			

As shown, a significant outreach effort accompanied the Snapshot phase to capture input about current corridor conditions and receive comments from citizens, Cheyenne Frontier Days and agencies. This input helped the stakeholder and steering committee groups craft a corridor vision at meetings held during the Structure phase.

The Shape phase was supported by an additional TAC meeting and a public open house, where corridor improvement ideas were presented, discussed and refined.

This draft report will be presented and discussed with individuals, stakeholders and agencies during the Build phase. Plan content will be revised as needed to address comments received and provide information needed by decision-makers to implement the plan.

1.0 SNAPSHOT

1.1 Roadway Network

The primary roadway network within the study area is depicted on **Figure 2** and can be described as follows:

8th Avenue – 8th Avenue is a collector roadway that extends from Hynds Boulevard to Evans Avenue. From Hynds Boulevard to Carey Avenue it has a three lane cross-section plus on-street parking, from Carey Avenue to Central Avenue it has a four lane cross-section plus on-street parking, and from Central Avenue to Evans it has four lanes, a median, left turn lanes and on-street parking on the south side of the street. The posted speed limit is 30 mph.

Hynds Boulevard – Hynds Boulevard is a two-lane, collector roadway that parallels I-25. From Pershing Boulevard to 2nd Avenue it is one way northbound only with the left lane serving as an on-ramp to I-25. North of 2nd Avenue it is a two-way street that serves as the east boundary of The Avenues neighborhood up to 8th Avenue. North of 8th Avenue it serves as the east boundary of Frontier Park before turning east and becoming Kennedy Road, where it serves as the north boundary of both Frontier Park and Lions Park and provides access to Central Avenue (US 85). The posted speed limit is 20 mph between 2nd and 8th Avenues and 30 mph north of 8th Avenue.

Carey Avenue – Carey Avenue is a collector roadway that runs northwest to southeast and connects Kennedy Road with downtown Cheyenne. From Pershing Boulevard north to 2nd Avenue, Carey is one way northbound, so commuters using Carey as an alternative route between the north end and downtown (avoiding Central Avenue), often cut over to Snyder Avenue at 8th Avenue and continue south on Snyder. The posted speed limit is 30 mph through the study area.

Central Avenue/Warren Avenue – Central Avenue/Warren Avenue is a one-way couplet that serves as the primary route into downtown from the north. The two couplet roads come together north of 8th Avenue as Central Avenue, then the road splits at the north end of Lions Park, with Central Avenue continuing to northwest to provide access to I-25, and Yellowstone Road turning north to provide access to the neighborhoods at the north end of the metro area. The posted speed limit is 30 mph south of 8th Avenue and 40 mph north of 8th Avenue.

In addition to the above roadways, The Avenues and Moore Haven Heights neighborhoods, which extend from Hynds Boulevard to Central Avenue and from 8th Avenue to Pershing Boulevard, generally consists of a grid roadway network, with each street serving as a local road that provides access to the properties along that block.

1.2 Current Traffic Conditions

1.2.1 Traffic Volumes

Current traffic volumes in the study area are depicted on **Figure 3**. Daily traffic counts were compiled from information available at the Cheyenne MPO www.plancheyenne.org website and AM and PM peak hour traffic counts were also made available by the Cheyenne MPO. Daily traffic counts were recorded in the area between 2008 and 2011. Peak hour intersection traffic counts were conducted at Carey Avenue in 2010. Counts during Cheyenne Frontier Days were collected in 2008. Traffic count information is included in **Appendix A**.

Figure 2
Roadway Network

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Figure 3

Existing Traffic Conditions

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As shown, traffic volumes on 8th Avenue under typical weekday conditions ranges from 500 vehicles per day (vpd) east of Hynds Boulevard to 3,300 vpd west of Central Avenue, reflecting the general traffic flow toward Central/Warren from the neighborhood. Carey Avenue traffic is approximately 4,800 vpd north of 8th Avenue, while south of 8th Avenue both Carey and Snyder carry between 2,100 and 2,400 vpd, which reflects through traffic destined for downtown using both of those roads as a part of their commuter route.

Figure 3 also includes traffic volumes on the road system during Cheyenne Frontier Days, and indicates that 8th Avenue volumes increase to 10,600 vpd east of Carey Avenue and 9,450 vpd west of 8th Avenue, and Carey Avenue traffic increases to 6,900 vpd. While these volumes are much greater than typical weekday traffic, they do remain at a level that is generally within the capacity of two lane roadways--which, with left turn pockets and traffic signals a key intersections, can accommodate up to 15,000 vpd.

1.2.2 Daily Traffic Operations

Traffic operations within the study area were evaluated according to techniques documented in the Highway Capacity Manual, (Transportation Research Board, 2000) using existing traffic volumes, intersection geometry and signal timing. The signal timing information at each of the existing signalized intersections was provided by the Wyoming Department of Transportation (WYDOT). Level of Service (LOS) is a qualitative measure of traffic operational conditions based on roadway capacity and vehicle delay. LOS is described by a letter designation ranging from A to F, with LOS A representing almost free-flow travel, while LOS F represents congested conditions. For signalized intersections, LOS is calculated for the entire intersection while LOS for unsignalized intersections is calculated for movements which must yield the right-of-way.

The agencies involved in the project each provide standards regarding acceptable intersection LOS. For traffic impact analyses, the City of Cheyenne and WYDOT both consider LOS C or better operations to be acceptable, and the City of Cheyenne further specifies a minimum standard of LOS E for left turns entering the major street at unsignalized intersections.

The results of the intersection LOS analysis are depicted on **Figure 3**. The analysis was conducted for typical weekday conditions. During Frontier Days, Cheyenne police department staff provide manual traffic control at the 8th Avenue/Carey Avenue intersection during the heaviest traffic loadings before and after events at CFD, so an evaluation of those conditions is not possible using HCM techniques. As shown, all intersections and movements currently operate at LOS C or better during both the morning and afternoon peak hours. Level of service worksheets for existing conditions can be found in **Appendix B**.

One operational issue noted several times in public meetings was that the eastbound left turn and the westbound right turn at the 8th Avenue/Warren Avenue intersection conflict with each other; even though each movement can turn into a separate lane on Warren and therefore can turn at the same time, drivers often believe that one movement must yield to the other and act accordingly, thereby increasing delays for both movements.

Travel speed data was also collected on 8th Avenue to assess current compliance with the posted speed limit. The study indicated that 1 in 4 vehicles exceeded the posted speed limit of 30 mph, and the 85th percentile speed (i.e. the travel speed typically used to set roadway speed limits) is 38 mph, so it would appear that excessive speed is an issue on the corridor.

The most frequently received comment during the public meetings for the project concerned the 8th Avenue/Carey Avenue intersection and the need to install a traffic signal to regulate movements and improve safety. In response, the MPO conducted vehicle and pedestrian traffic counts at the intersection, and conducted both a Manual on Uniform Traffic Control Devices (MUTCD) signal warrant analysis and an MUTCD all-way stop warrant analysis to determine if either of those revisions to the traffic control at the intersection are justified.

Table 2 shows the results of the signal warrant evaluation. As the table indicates, current traffic conditions fail to satisfy the eight hour, four hour and peak hour volume warrants, the combination of pedestrian and traffic volume fails to satisfy the pedestrian volume warrant, and the average number of accidents at the intersection over a five year period is lower than the threshold that would suggest the need for a signal for safety-based reasons. Based on these results, it would appear that a traffic signal would not be appropriate for the intersection at this time.

Table 2. 8th Avenue/Carey Avenue Signal Warrant Evaluation

Warrant	Requirements	Extent to Which Warrant is Satisfied	Warrant Met?
8-hour Vehicular Volume A - Minimum Volume	500 vph on major street, and 150 vph on minor street	0 Hours	No
8-hour Vehicular Volume B - Interruption of Traffic	750 vph on major street and 75 vph on minor street	0 Hours	No
4-hour Vehicular Volume	Plotted Graph[1]	0 Hours	No
Peak Hour Vehicular Volume	Plotted Graph[1]	0 Hours	No
4-hour Pedestrian Volume	Plotted Graph[1]	0 Hours	No
Peak Hour Pedestrian Volume	Plotted Graph[1]	0 Hours	No
School Crossing	Schoolchildren crossing needs are principal reason for signal	Not Applicable	
Coordinated Signal System	Maintain vehicle progression with other signals	Not Applicable	
Crash Experience	5 or more crashes within a 12-month period	Avg. of 3 acc./year 1/1/06 – 12/31/10[2]	No
Roadway Network	Both are major routes, >1,000 vph entering the intersection today, and 5-year projections meet Warrants 1, 2 and 3	Neither are major routes, 625 vph entering the intersection during peak hour today	No
Near Railroad Crossing	Within 140 feet of railroad crossing	Not Applicable	

1. Graph results are included in **Appendix C.**
2. Six accidents were recorded in 2006, but three or less were recorded in all other years.

Table 3 shows the results of the all-way stop warrant evaluation based on current traffic, pedestrian and bicycle volumes, and past accident history at the intersection. As the table indicates, current traffic conditions fail to satisfy the volume warrant and the accident history at the intersection does not indicate a pattern of accidents that would be susceptible to correction by all-way stop control, so all-way stop control would not be appropriate for the intersection at this time, either.

Table 3. 8th Avenue/Carey Avenue All-Way Stop Warrant Evaluation

Warrant	Requirements	Extent to Which Warrant is Satisfied	Warrant Met?
Crash Experience	5 or more RT, LT or right angle crashes within a 12-month period	2 or fewer accidents per year of those types between 1/1/06 – 12/31/10	No
8-hour Vehicular Volume	300 vph on major street and 200 vph, ped/hr and bike/hr on minor street	0 Hours	No

1.2.3 Frontier Days Traffic Operations

Traffic operations on 8th Avenue take on a much different form during Cheyenne Frontier Days. The primary parking lots for general admission patrons are accessed from Carey Avenue, the VIP and handicapped lots are accessed from 8th Avenue, and staff and participant parking is located along Hynds Avenue. To minimize traffic conflicts, CFD does not allow access into the general admission lots from northbound Carey Avenue by installing temporary barriers down the middle of that road, and instead routes traffic west on 8th Avenue, north on Hynds, east on Kennedy, then south on Carey, so all lot driveways function as right in/right out accesses. CFD staff also installs barriers to prohibit left turns at Cribbon, Dey and Dillon Avenue, which improves the eastbound traffic flow on 8th Avenue in front of the park.

Although the Frontier Park lots provide several thousand parking spaces, demand is such that the park spaces fill on a regular basis, and as a result many patrons park in The Avenues neighborhood south of 8th Avenue, where on-street parking is free and many residents allow patrons to park on their property for a fee. This neighborhood parking results in significant pedestrian traffic crossing 8th Avenue into the Park, particularly between Carey Avenue and Cribbon Avenue. The Cheyenne police department provides traffic control at the 8th Avenue/Carey Avenue intersection during peak periods before and after events at the park to help moderate the flow of pedestrians, eastbound traffic arriving at CFD on 8th Avenue, and southbound traffic leaving CFD on Carey Avenue, but many other pedestrians cross 8th Avenue at midblock locations further to the west, often walking between the slow moving vehicles on that street. **Figure 4** shows how event traffic flow operates on 8th Avenue during CFD and identifies the typical issues that occur then.

1.3 Traffic Safety

Historic traffic accident records were consulted to develop a picture of the reported crashes that occurred along 8th Avenue between Hynds Boulevard and Warren Avenue over the five year time period between 2007 and 2011. A total of 53 crashes were recorded during that time period, with 23 occurring at the Warren Avenue intersection. **Table 4** provides a summary of these intersections and the crashes reported at each. In addition to the total number of crashes, a rate per Million Entering Vehicles (MEV) is provided. The crash rate provides a means of comparing intersection safety performance across the corridor and the region.

Figure 4

Traffic Operations and Issues During Cheyenne Frontier Days

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Table 4. Five-Year Accident History for the 8th Avenue Corridor, 2007-2011

Location	Property Damage Only	Injury Crashes	Total Crashes	Crash Rate per MEV
Hynds Boulevard	2	0	2	0.16
Dey Avenue	0	0	0	0.00
Snyder Avenue	1	1	2	0.28
Carey Avenue	3	8	11	0.87
Central Avenue	11	2	13	0.51
Warren Avenue	14	7	21	0.54
Total	**33**	**20**	**53**	

As shown, the top crash rate intersection found between 2006 and 2010 was the Carey Avenue intersection at 0.87 crashes/MEV. A preliminary review of the crash history at that intersection revealed that five out of the 11 crashes involved northbound or southbound traffic (two southbound collisions with cross traffic on 8th Avenue and three northbound collisions with cross traffic). The skewed angle of approach for those movements, plus the presence of a channelized southbound right turn that has no deceleration lane may be a contributing factor to the accidents there.

1.3.1 Bicycle / Pedestrian Crashes

A total of four crashes involving a pedestrian or bicycle were reported along the corridor between 2007 and 2011. One pedestrian crash occurred at the Hynds intersection while the other three occurred at the Carey intersection (two involved pedestrians and one involved a bicycle). The three accidents involving pedestrians occurred at night, while the bicycle accident occurred during the day.

1.4 *Transit and Non-motorized Travel Modes*

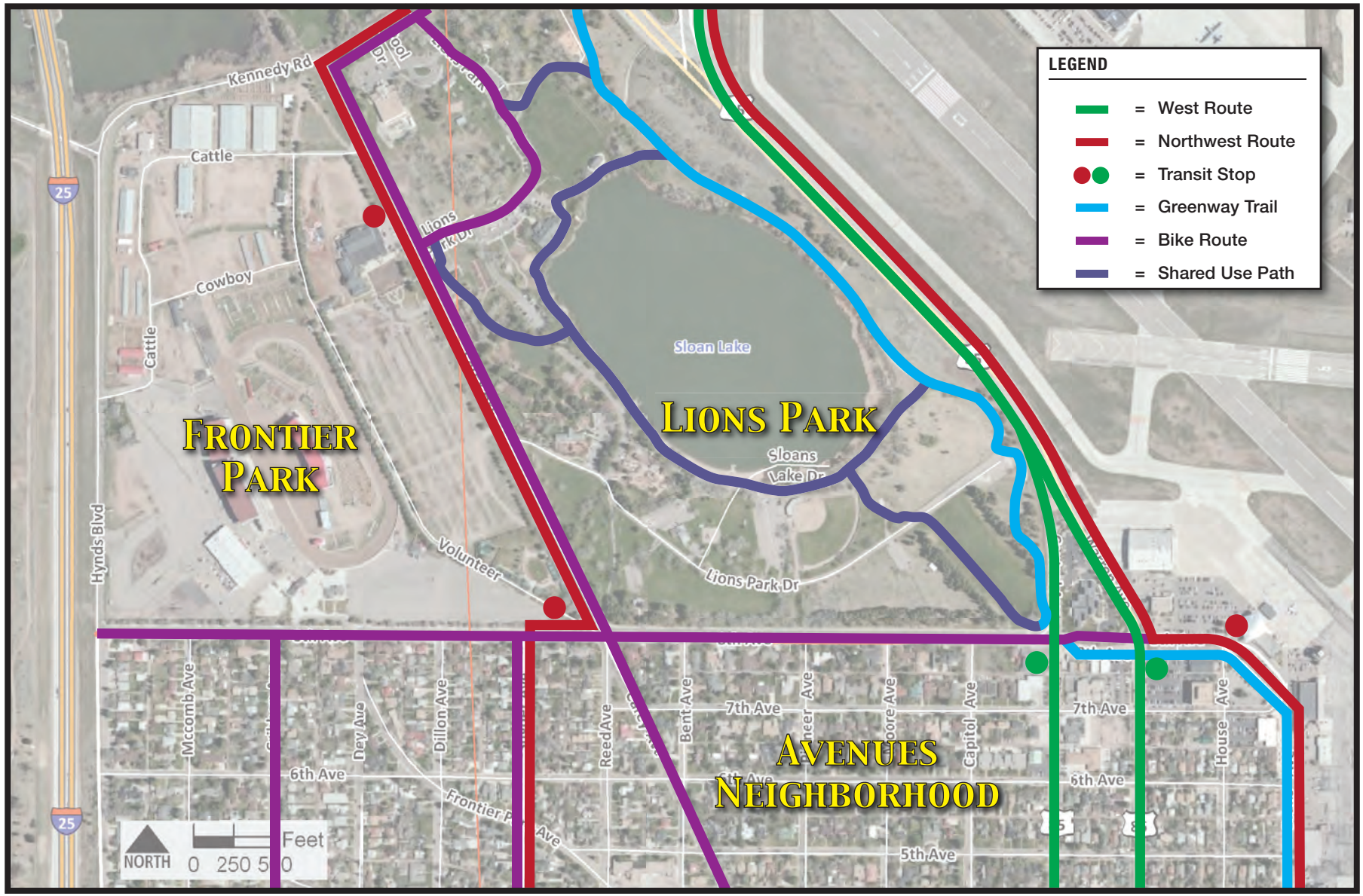
8th Avenue accommodates a healthy demand for travel by modes other than auto, primarily bicycling and walking. The current state of travel by these modes is described as follows.

1.4.1 Transit

Currently, the Cheyenne Transit Program (CTP) operates a fixed-route and ADA complementary paratransit services throughout the City of Cheyenne. While no CTP routes travel along the length of 8th Avenue through the study area, the West Route travels southbound on Carey Avenue and Snyder Avenue, including a stop at the 8th Avenue/Carey Avenue intersection, and northbound on Evans Avenue and Warren Avenue, with a stop at 8th Avenue/Warren Avenue. Additionally, the Northwest route crosses the corridor southbound on Central Avenue and northbound on Warren Avenue, with stops at both 8th/Central and 8th/Warren. CTP's fixed route and paratransit services operate Monday through Friday, 6:00 a.m. to 7:00 p.m. and Saturdays 10:00 a.m. to 5:00 p.m. **Figure 5** shows the bus routes and stops.

Figure 5

Existing Transit and Non-Motorized Network



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During Cheyenne Frontier Days, shuttle buses transport patrons between the remote parking lots south of Missile Drive on the west side of I-25 and the Frontier Park main entrance between Cribbon Avenue and Dey Avenue. These buses enter 8th Avenue from Hynds and travel east to Dey, where CFD staff stops eastbound traffic on 8th Avenue so the buses can turn left into the bus turnaround area at the main entrance for drop off and pick up. When the buses are loaded, staff stops eastbound traffic a second time so the bus can turn right onto 8th Avenue and return to the remote parking area via Hynds Boulevard.

1.4.2 Bicycle Transportation

As shown on **Figure 3**, between 50 and 80 cyclists use 8th Avenue and Carey Avenue on a daily basis, making the study area a popular cycling location. Aside from some trails in Lions Park, the only dedicated bicycle facility in the study area is the Cheyenne Greenway trail on the east end of the study area, which travels down the east side of Lions Park, crosses 8th Avenue at Central, then continues east on the south side of 8th Avenue to Evans, where it turns south ends at Pershing. The trail consists of a well-defined 10-foot concrete path/sidewalk through the park and east of Warren, but the sidewalk section between Central and Warren has street light poles and driveway curb cuts within it that make it less than well-defined.

The Greater Cheyenne Greenways Plan (1992) identifies 8th Avenue, Carey Avenue and Cribbon Avenue as designated bicycle routes. Currently, none of those roadways include designated bicycle facilities, however, and the Cheyenne Area On-Street Bicycle and Greenways Plan Update (2012) gives all three a bike quality score of 2 (out of 4), indicating each could use enhancements to create a more inviting bicycle environment. The Cheyenne Area On-Street Bicycle and Greenways Plan Update has identified on-street bicycle lanes for both Carey Avenue and 8th Avenue, has identified Cribbon Avenue as a bicycle boulevard, and has identified shared lane markings (a.k.a., sharrows) for Snyder Avenue.

Figure 5 shows the bicycle facilities in the study area.

1.4.3 Pedestrian Travel

As shown on **Figure 3**, between 70 and 100 pedestrians walk along 8th Avenue and Carey Avenue on a daily basis, and Lions Park is a popular recreation area for residents living in The Avenues neighborhood, so pedestrian travel is a key component of travel in the study area. Sidewalks are available on both sides of 8th Avenue, but the south side sidewalk is narrow (approximately 3.5 feet wide), and in many places tree roots and soil settlement has created an uneven walking surface that is in need of repair. The north side sidewalk is 10 feet wide and is in good condition, but during Cheyenne Frontier Days the section along Frontier Park experiences heavy pedestrian traffic and could benefit from some additional widening. Furthermore, at the Carey Avenue intersection, the sidewalks from both directions turn north onto Carey, but then stop at the pillars that define the entrance to Frontier and Lions Park and do not continue on the other side of them, leaving pedestrians with no option other than to walk in the roadway around the pillars, then walk on the grass north of there.

While a striped crosswalk across 8th Avenue is provided at Dey Avenue near the Cheyenne Frontier Days main entrance, there are no other formal pedestrian crossing locations along the corridor. The NTMP application submitted to the City specifically identified the need for a safe crossing into Lions Park from the south side of the street, citing the City-wide events that take place there and the use of the park by residents and visitors to the community. With limited parking in the park, many of these visitors park in the neighborhood on the south side of 8th Avenue, necessitating crossing that roadway. This was also a common comment received in the public meetings for the project.

1.5 Corridor Design Elements

There are three distinct sections of 8th Avenue with differing physical characteristics that adapt to the changing context of surrounding land use. Such characteristics include curb-to-curb width, number of travel lanes, number of private accesses, median type and sidewalk provision. **Table 5** provides a summary of physical characteristics of the three segments.

Table 5. Characteristics of 8th Avenue

Segment	Curb-to-curb width (feet)	Number of Travel Lanes	# of Private Accesses		Median Type	Sidewalk
			South side	North side		
Hynds Blvd to Carey Avenue	53	2	6	5	Two-Way Left Turn	10' north 3.5' south
Carey Avenue to Central Avenue	60	4	15	0	None	10' north 3.5' south
Central Avenue to Warren Avenue	76-102	4	2	1	Landscaped Median	5' north 10' south

As shown in **Table 5**, 8th Avenue is narrower between Hynds and Carey Avenue than between Carey and Central, and along both sections the south sidewalk is very narrow. Furthermore, the back of the south sidewalk is at the edge of the right-of-way (ROW) on both segments, so any widening of that facility would need to occur to the north, into the travel way.

Even without widening the south sidewalk, the 53-foot road width between Hynds and Carey is only wide enough for two 11-foot travel lanes, a 12-foot center turn lane, an 8-foot parking lane on the south side and an 11-foot parking lane/lot access lane into Frontier Park, and is not wide enough for bike lanes in addition to those elements. East of Carey, however, a five-foot sidewalk would leave 58 feet of curb-to-curb width, which is sufficient for a 12-foot center turn lane, two 11-foot travel lanes, 5-foot bike lanes in each direction, and 7-foot parking lanes on both sides of the road.

1.6 Aesthetics

Currently, the 8th Avenue cross-section between Hynds and Central is wide, straight, curb-to-curb asphalt with attached sidewalks. The 8th Avenue/Carey Avenue intersection includes a brick wall, historic brick columns, and planter beds on the north side of the intersection but the vegetation surrounding those features overwhelms and hides them. Between Central and Warren, 8th Avenue has a median with low-lying bushes, plants and mulch.

Since 8th Avenue serves as the primary entry route to Frontier Park and Lions Park, the technical advisory committee expressed interest in constructing improvements between Central and Carey that would enhance the aesthetic appeal of the roadway and build upon the natural environment of Lions Park, as well constructing improvements to the Carey Avenue intersection that would enhance the brick walls and columns at that location and create a sense of arrival at the parks.

1.7 Future Conditions

In addition to reviewing existing conditions, the Snapshot phase provided a look at anticipated future conditions in the corridor in order to identify appropriate long term planning strategies to be included in the plan. The future evaluation focused on future land use and roadway network, traffic volume forecasts and traffic operations.

1.7.1 Land Use and Roadway Network

The PlanCheyenne process completed by the Cheyenne MPO in 2006 envisioned the future roadway network and land use throughout the Cheyenne Metropolitan area. The 8th Avenue corridor, located as it is just north of the downtown area, is already fully built out. While some changes in land use are anticipated on the east end of the corridor along Central and Warren – most notably the redevelopment of the block between 6th and 7th Avenues into a town center – the area in general represents an area of stability and therefore is not anticipated to experience significant changes in land use or increases in density.

1.7.2 Traffic Forecasts

The PlanCheyenne effort included development of a regional travel demand model for the Cheyenne area. The model, maintained by WYDOT in the TransCAD software platform, provides Year 2030 traffic forecasts based on the land use assumptions included in PlanCheyenne. The Cheyenne MPO requested that traffic analyses in this corridor plan be based upon forecasted Year 2035 traffic conditions, an approximate 23-year planning horizon relative to current conditions.

Forecasts for the corridor from the travel demand model indicate that traffic volumes are anticipated to grow by 1.2 percent per year until 2035, a growth rate that is consistent with past growth in the area. **Figure 6** presents the 2035 daily traffic volume forecasts for the study area. As shown, on a daily basis traffic volumes on 8th Avenue range from 700 vpd east of Hynds to 4,400 vpd west of Central, while Carey Avenue traffic ranges from 2,300 vpd south of 8th Avenue to 6,500 vpd north of 8th Avenue. During Frontier Days and other event conditions, traffic on 8th Avenue ranges from 10,000 to 11,200 vpd. All of these traffic forecasts are within the 15,000 vpd capacity of a two-lane roadway with a center left turn lane.

Figure 7

Key Planning Considerations for the Corridor

1. Narrow sidewalk on the south side of 8th Avenue
2. Carey Avenue bike route is a part of the Greenways Plan
3. Snyder/Carey is used as a cut-through route to avoid Central/Warren
4. Sidewalks end at pillars
5. Carey Avenue/8th Avenue intersection
   - skewed alignment creates sight distance issues
   - close proximity of Reed Avenue and Snyder Avenue impacts operations
   - moderately high accident history given relatively low daily traffic volumes
   - landscape design should maintain or enhance gateway to the parks
6. 85th percentile speed of 38mph exceeds posted speed of 30mph
7. Typical daily traffic volume (2,600-3,300 ADT) warrants 2 lanes, not 4 lanes
8. Improvements must also consider higher traffic loading during Frontier Days & major events in Lions Park
9. Popular pedestrian and bike route between Central Avenue and Hynds Avenue
10. Maintain efficient vehicular connection to City & Regional road system
11. Enhance non-motorized facilities connection of the Greater Cheyenne Greenways
12. No formal pedestrian crossings from the neighborhood into Lions Park
13. Area will be re-developed as a neighborhood center which will increase activity

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1.7.3 Traffic Operations

Traffic operations were evaluated at the 8th/Carey, 8th Central and 8th/Warren intersections under 2035 AM and PM peak hour traffic conditions. The results of the evaluation are shown on **Figure 6**. As shown, all movements at the unsignalized 8th/Carey intersection would operate at LOS C or better during peak hours, the 8th/Central intersection would operate at LOS A during both peak hours, and the 8th/Warren intersection would operate at LOS B in the morning and LOS D in the afternoon. The primary issue in the afternoon at 8th/Warren is the capacity constraints created by the conflicting eastbound left turn and westbound right turn movements; volumes are high enough for both movements that the westbound right turn operates at LOS F. Converting the eastbound left turn to a protected only movement and striping the westbound approach for a though lane, a shared through/right turn lane and a right turn lane would address the left turn issue and improve operations there to LOS C.

At the 8th/Carey intersection, although all movements operate at adequate levels of service, concerns have been expressed about the vehicle-pedestrian conflict created by the southbound right turn pocket, the confusing alignment of the southbound through lane and left turn lane, the angle of vehicles making a northbound right turn, and the confusion created by the outside westbound lane becoming a right turn lane at the intersection. To address these concerns, the intersection was analyzed with a more compressed geometry that consisted of a left turn lane and a shared through/right turn lane on both 8th Avenue approaches and a single left/through/right lane on both Carey Avenue approaches. With this geometry, all movements would continue to operate at LOS C or better during both peak periods.

1.8 Key Planning Considerations

In summary of the Snapshot phase, key planning considerations for the 8th Avenue Corridor are provided on **Figure 7.**

Figure 6

2035 Traffic Conditions

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2.0 STRUCTURE

The findings of the Snapshot phase provided a foundation for the project team to develop the framework for a shared corridor vision in cooperation with the project steering committee and stakeholder group. The groups arrived at a shared corridor vision, which is summarized in this section in four components: Transit and Non-motorized Transportation; Traffic Safety and Operations; Beautification; and Implementation.

2.1 Transit and Non-Motorized Transportation

- Ensure adequate and safe pedestrian crossings of 8th Avenue to both Frontier Park and Lions Park.
- Provide a safe, accessible and continuous connection along the entire length of the corridor with sufficient width to accommodate pedestrian demand.
- Provide sufficient sidewalk width along Frontier Park to accommodate high pedestrian traffic volumes during Cheyenne Frontier Days.
- Enhance the greenway system connections between Lions Park and Evans Avenue.

2.2 Traffic Safety & Operations

- Improve the safety and efficiency of traffic movements along 8th Avenue.
- Build a roadway cross section that enhances travel efficiency on a daily basis, yet maintains adequate capacity and functionality during Cheyenne Frontier Days and during events at Lions Park.
- Construct improvements that help moderate the speed on 8th Avenue to conform to the 30 mph speed limit.
- Provide peak hour intersection operations at LOS D as a minimum level of service and LOS C desired through the Year 2035.
- Provide street lighting where appropriate.

2.3 Beautification

- Enhance the roadway environment within the right-of-way to complement the surrounding environment.
- Enhance the gateway features at the Carey Avenue intersection to create a sense of arrival to Frontier Park and Lions Park.
- Create a corridor that the surrounding neighborhoods and businesses take pride in.
- Develop strategies for maintenance of public areas.

2.4 Implementation

- Preserve the ability to implement various improvement elements as funding becomes available.
- Provide a sustainable and well-maintained streetscape for many years.
- Develop the corridor in a fiscally responsible manner.

3.0 SHAPE

The Shape phase adds to the shared corridor vision by recommending strategies and tools that may be applied to the corridor to fulfill the elements of the vision. Strategies and tools are identified in three primary areas; Transit and Non-motorized Travel, Traffic Safety and Operations, and Beautification.

3.1 Transit and Non-motorized Travel

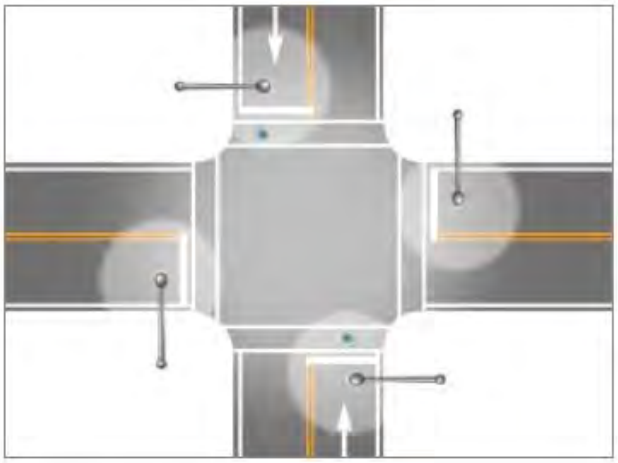
Transit and non-motorized travel strategies and tools are summarized in the following sections. **Table 6** describes strategies and tools to be used at the network level.

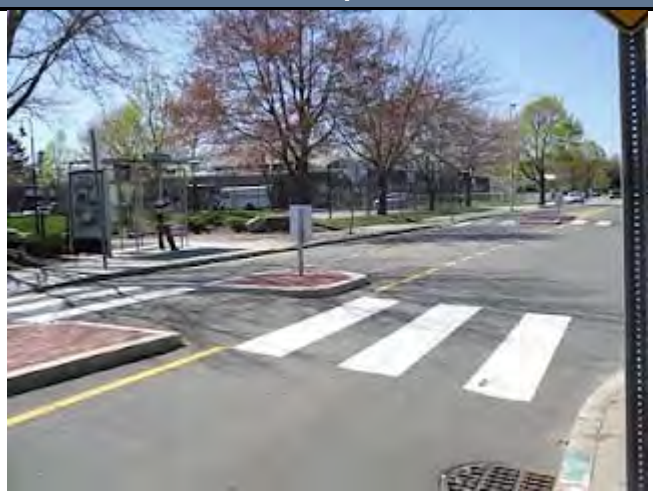
Table 6. Transit and Non-motorized Network Strategies and Tools

Strategy/Tool	Example
Enhance Sidewalks: As stated in the *Cheyenne Metropolitan Area Pedestrian Plan* (2010), "Sidewalks are the most fundamental element of the walking network, as they provide an area for pedestrian travel that is separated from vehicle traffic." Widening the sidewalks along 8th Avenue to better accommodate pedestrian demands will improve pedestrian safety and enhance pedestrian travel through the corridor.	
Incorporate the on-street bicycle network plans: Adding bike lanes to 8th Avenue and buffered bike lanes (see photo) to Carey Avenue has been identified in the *Cheyenne Area On-Street Bicycle Plan and Greenway Plan Update* (June 2012).	

Table 7 identifies strategies and tools specifically targeted toward improving pedestrian crossings of 8th Avenue.

Table 7. Pedestrian Crossing Enhancement Strategies and Tools

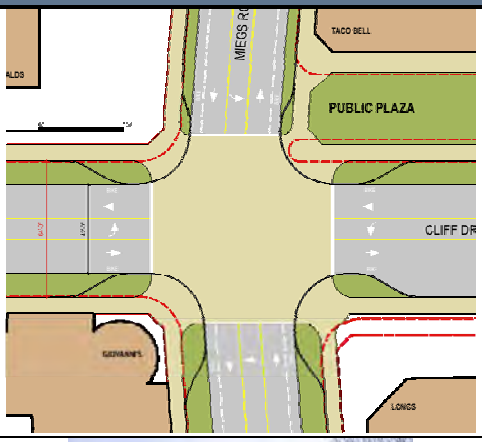
Strategy/Tool	Example
Improve Visibility at Crossings	
High-visibility crosswalks: High visibility crosswalks have the potential to improve driver awareness of pedestrians, as well as increasing use of the crosswalk by pedestrians, which would be beneficial for the Greenways trail crossings at Central and Warren. A number of treatments may be used to increase visibility, including colors (see photo), textured pavement, skip striping, and in-roadway warning lights.	
Provide Luminaires: Intersection lighting may be used to illuminate pedestrian paths and increase visibility at night. (see photo).	
Provide signage and flashing lights at key crossings: Providing a rapid rectangular flashing beacon at key unsignalized intersection crossings will improve pedestrian safety and enforce that vehicles must yield to pedestrians.	

Strategy/Tool	Example
Provide pedestrian refuge islands at key crossings. Providing a pedestrian refuge island in the median allows pedestrians to cross one direction of traffic and safely wait for a gap in traffic in the other direction before completing their crossing	
Enhance Street Corners	
Provide corner refuge area: Provide an adequate refuge area for pedestrians to wait before crossing the intersection. This could be either paved or striped	
	

3.2 Traffic Safety and Operations

The project team developed a series of strategies and tools for addressing traffic safety and operations based on the issues identified in the Snapshot phase. **Table 8** outlines strategies and tools for increasing roadway and improving intersection operations.

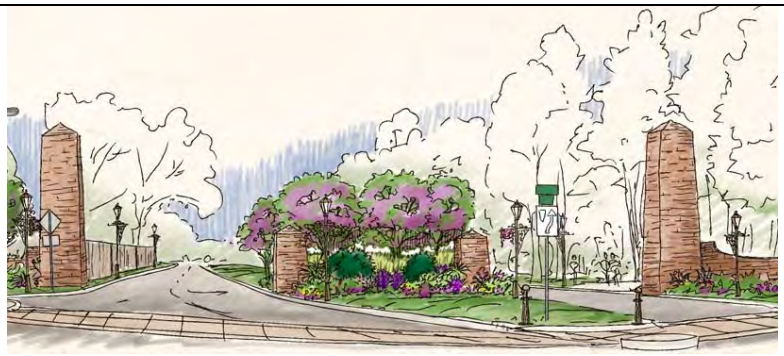
Table 8. Roadway and Intersection Operations – Strategies and Tools

Strategy/Tool	Description/Example
Intersection Enhancements: Intersection enhancements can significantly improve traffic operations at the 8th/Carey Intersection. Such enhancements may consist of reducing approach laneage at the intersection, correcting geometric and lane alignment deficiencies, closing Reed Avenue and possible signalization of the intersection.	
Lane Reduction on 8th Avenue: Reducing the cross-section of 8th Avenue from four lanes to three between Central and Carey would provide sufficient capacity for daily and event traffic demands, enable left turn pockets to be constructed to improve safety for vehicles turning into the neighborhood, potentially reduce travel speed on that section, and enable the construction of on-street bike lanes.	
Raised Median on 8th Avenue. Installing a raised median along 8th Avenue between Carey and Capitol Avenues would help reduce travel speeds on that road segment	

3.3 Beautification

The project team developed a series of strategies and tools for addressing beautifications based on the issues identified in the Snapshot phase. **Table 9** outlines strategies and tools for improving the aesthetics along the 8th Avenue corridor.

Table 9. Beautification Strategies and Tools

Strategy/Tool	Examples / Description
Frontier Park Entry. Widen the pedestrian space around the Frontier Park entry point at Carey Avenue to create a more inviting environment.	
Carey Avenue Entry. Improve the landscaping around the pillars and walls that mark the vehicle entry point to Frontier Park and Lions Park to create a better sense of arrival to the parks	
Lions Park Entry. Open up the Lions Park entry point at Carey Avenue and revise the sidewalk and walkway to steer pedestrians into Lions Park rather than directing them along Carey Avenue	

Strategy/Tool	Examples / Description
Median Enhancements. Install a grass and tree median between Carey and Capitol on 8th Avenue to create a landscaped transition between the neighborhood and Lions Park.	
Maintenance Strategies	▪ Use xeric and low-water plantings ▪ Use long-lasting and low-maintenance materials for paving, street furnishings, and lights ▪ Consider the development of a Business Improvement District to help consolidate and fund maintenance of public areas

4.0 BUILD

The Build phase of the 8th Avenue Corridor Plan provides recommendations for implementing the strategies and tools outlined in the Shape phase, and highlights opportunities to do so. The recommendations are organized according to the segments identified in Section 1.5 of Snapshot section.

4.1 Segment 1: Hynds Boulevard to Carey Avenue

8th Avenue between Hynds Boulevard and Carey Avenue generally does not need revisions to the existing three-lane roadway cross section, but several pedestrian and bicycle enhancements have been identified to improve the multi-modal function of the segment. Since this segment includes main entrance to Cheyenne Frontier Days, a key consideration in these recommendations is to provide facilities that enhance access and egress to Frontier Park, as well as maintain the ability of CFD staff to operate their shuttle buses in an efficient manner.

4.1.1 Segment Recommendations

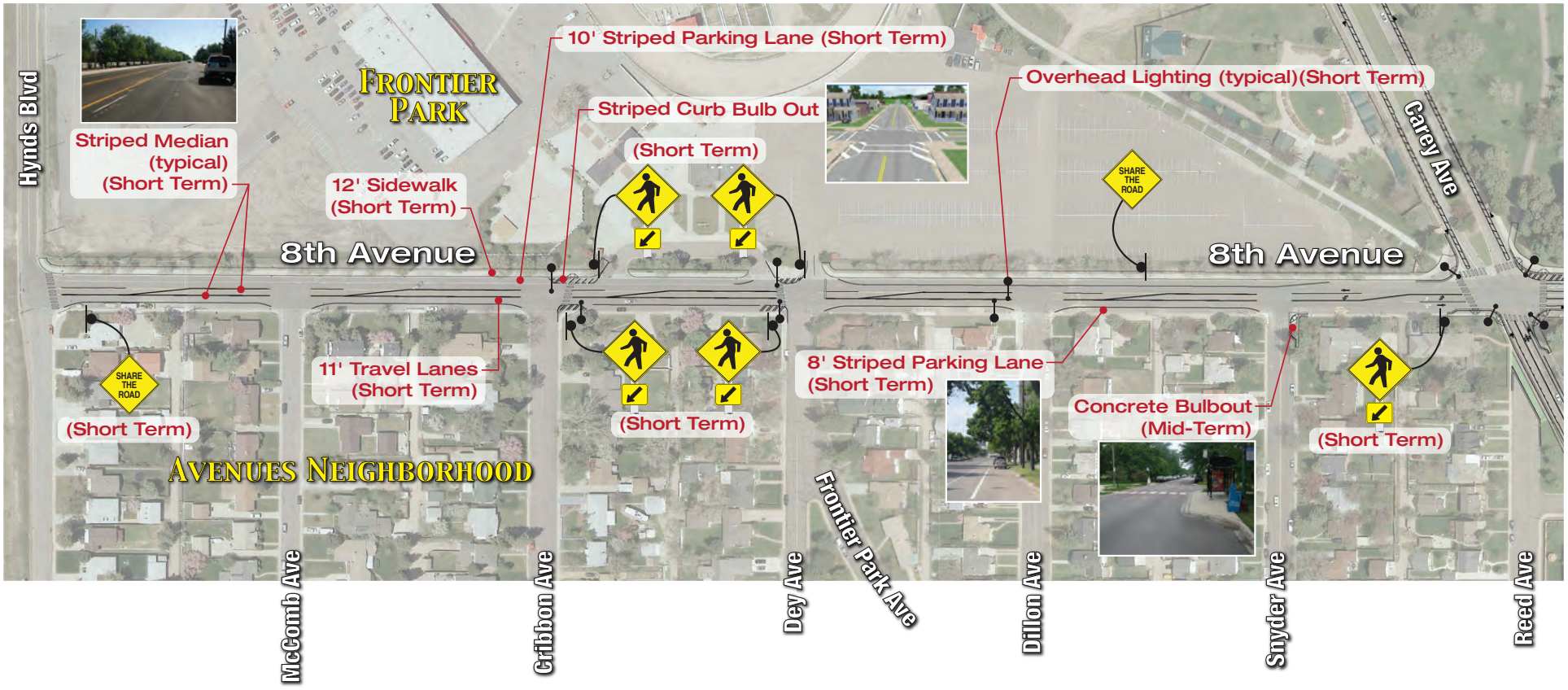
Figure 8 depicts the recommendations for corridor segment 1, between Hynds Boulevard and Carey Avenue. Consistent with the Shape phase, recommendations are provided in the categories of transit and nonmotorized travel, traffic operations and safety, and beautification. Descriptions of the recommendations and opportunities by category are provided as follows.

Transit and Non-motorized Travel – No specific transit recommendations are provided for this or any other segment of 8th Avenue. However, with the Frontier Park main entrance and bus pullout located along this segment, it is important to maintain flexibility in the roadway cross section so that Cheyenne Frontier Days can operate their shuttle bus services as they see fit, and other coach services can continue to use the north curb face for drop-off and pick up during that event.

Several enhancements to the non-motorized network have been identified for the segment. First, the north sidewalk would be widened to 12 feet to accommodate the high pedestrian volumes that use that sidewalk throughout Frontier Days. Second, crosswalks with striped pedestrian bulbouts on both sides of the road would be constructed on the east leg of the Cribbon Avenue intersection and the west leg of the Dey Avenue intersection (where a sidewalk is currently striped) to facilitate pedestrians crossing between the neighborhood and the Frontier Park main entrance. Both crossings would also include crossing signage to alert vehicles to their presence and overhead lighting to improve safety when events let out after dark. A cross walk would also be provided across the east leg of the Hynds Boulevard intersection. Finally, the roadway cross section is not wide enough to construct bike lanes in each direction, so bicyclist would need to either use the travel lane or adjacent parking lane when travelling on this segment. Thus, Share The Road signs would be installed at either end of the segment to alert vehicles to the presence of bicycles in the travel way.

Figure 8

Segment 1: Recommended Roadway Improvements



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Traffic Operations and Safety – The basic three lane cross section for this segment is retained in the corridor recommendation. Because the old four-lane striping continues to show through pavement (a.k.a., "ghosting") the road surface would be milled down and a new asphalt surface would be installed. A white stripe would be added to define an 8-foot on-street parking lane along the south side of the road and establish the edge of the 11-foot eastbound travel lane. The center two-way left turn area would be restriped to provide a 12-foot median with left turn lanes at each intersection. The white stripe for the north side parking/turn lane would be relocated to define the outside edge of the 11-foot westbound travel lane, leaving 10-11 feet for the north side parking/turn lane. Finally, a concrete curb bulb out would be constructed on the southeast corner of the Snyder Avenue intersection to channelize the northbound right turn movement further to the west and improve sight lines for that movement. The bulb out would also provide more room for Frontier Days patrons to dwell before crossing 8th Avenue.

Beautification –The limited right-of-way provides few opportunities for beatification enhancements along this segment. In that sense it is important to maintain the row of trees along the north side of the street when the north sidewalk is widened. Any trees that are displaced during that widening should be relocated or replaced, if necessary.

4.1.2 Prioritization

A priority has been identified for each recommendation depicted on **Figure 8**. Because the nature of the improvements are relatively low-cost and would all be constructed within the available right-of-way, all have been identified as either near-term improvements or mid-term improvements. The priorities are based on the urgency of the need being addressed, steering committee discussion, and public and stakeholder input. The priority information indicates the 'start time' for each recommendation or opportunity. For example, it is recommended that the roadway re-striping and pedestrian crossing improvements be pursued in the near term timeline, but the curb bulb out at Snyder could be delayed until the mid-term, if desired.

4.1.3 Alternate Roadway Section

While the improvements in **Figure 8** represent relatively low-cost improvements that can be implemented in the near to mid-term, they may be somewhat ineffective in addressing speeding issues on 8th Avenue because they lack any raised features within the roadway that alert drivers to their travel speed. To better address speeding issues, an alternative roadway section for segment 1 was developed that includes a raised median with grass and trees at the west end of the corridor between McComb Avenue and the alley between McComb and Hynds Boulevard. This median could include signage identifying 8th Avenue as an entrance point to the neighborhood and/or the parks, and provide a sense of arrival to the area. It would be located such that it does not prohibit left turn access to the alley, nor would it impact CFD bus shuttle and transit coach operations. **Figure 10** shows a conceptual rendering of a median at that location, which includes an entry sign for The Avenues neighborhood.

Figure 9. Conceptual Median and Entry Signage east of Hynds Boulevard

Medians can also increase both pedestrian and motor vehicle safety on a roadway. They do this by allowing pedestrians to cross one direction of traffic at a time, allowing them to focus on just one lane rather than having to anticipate traffic from both directions. Medians also provide a space to install improved lighting at pedestrian crossing locations, and improved lighting has been shown to reduce nighttime pedestrian fatalities at crossings by 78 percent. Raised medians also:

- Reduce motor vehicle crashes by 15 percent.
- Decrease delays (>30%) for motorists.
- Increase capacity (>30%) of roadways.
- Reduce vehicle speeds on the roadway.
- Provide space for landscaping within the right-of-way.
- Reduce the visual impact of the roadway for properties along the street.
- Landscaped medians absorb heat rather than reflect it as pavement does, and thus reduce the heat impact of the roadway on the surrounding area.
- Deciduous trees in a median shade the roadway in the summer and further reduce the heat impact. Because they lose their leaves, they allow sunlight to melt snow on the roadway in the winter.

The alternative also includes an additional signed, striped and lighted pedestrian crossing on the west side of Dillon Avenue to further facilitate pedestrian travel during Frontier Days. **Figure D-1** in **Appendix D** shows the alternate roadway section with both additional enhancements.

4.2 Segment 2: Carey Avenue to Central Avenue

4.2.1 Segment Recommendations

Figure 11 shows the recommendations for corridor segment 2 between Carey Avenue and Central Avenue, including the Carey Avenue intersection (**Figure 12**). Descriptions of the recommendations and opportunities by the category identified in the Shape section are provided as follows.

Transit and Non-motorized Travel – As with segment 1, no specific transit recommendations are provided for this segment. A major need identified for this portion of the corridor is widening the sidewalk on the south side of 8th Avenue, from its current 3.5-foot width to 5 feet, and providing a pedestrian crossing on the west side of Pioneer Avenue to facilitate pedestrian travel between the neighborhood and Lions Park. That crossing would include a raised curb bulb out on the south side of the road, a pedestrian refuge island in the median of 8th Avenue, a striped pedestrian refuge area in the parking lane on the north side of 8th Avenue, pedestrian-activated rapid flashing rectangular beacon signage, and overhead lighting (**Figure 10** shows a conceptual rendering of the pedestrian crossing). Finally, bike lanes would be provided in both directions of 8th Avenue between Central Avenue and Carey Avenue and in both directions of Carey Avenue south of 8th Avenue, while buffered bike lanes would be provided in both directions of Carey Avenue north of 8th Avenue. These bicycle facilities would complete those portions of the Cheyenne Area On-Street Bicycle and Greenways Plan Update.

Figure 10. Conceptual Pedestrian Crossing at Pioneer Avenue

Figure 11

Segment 2: Recommended Roadway Improvements

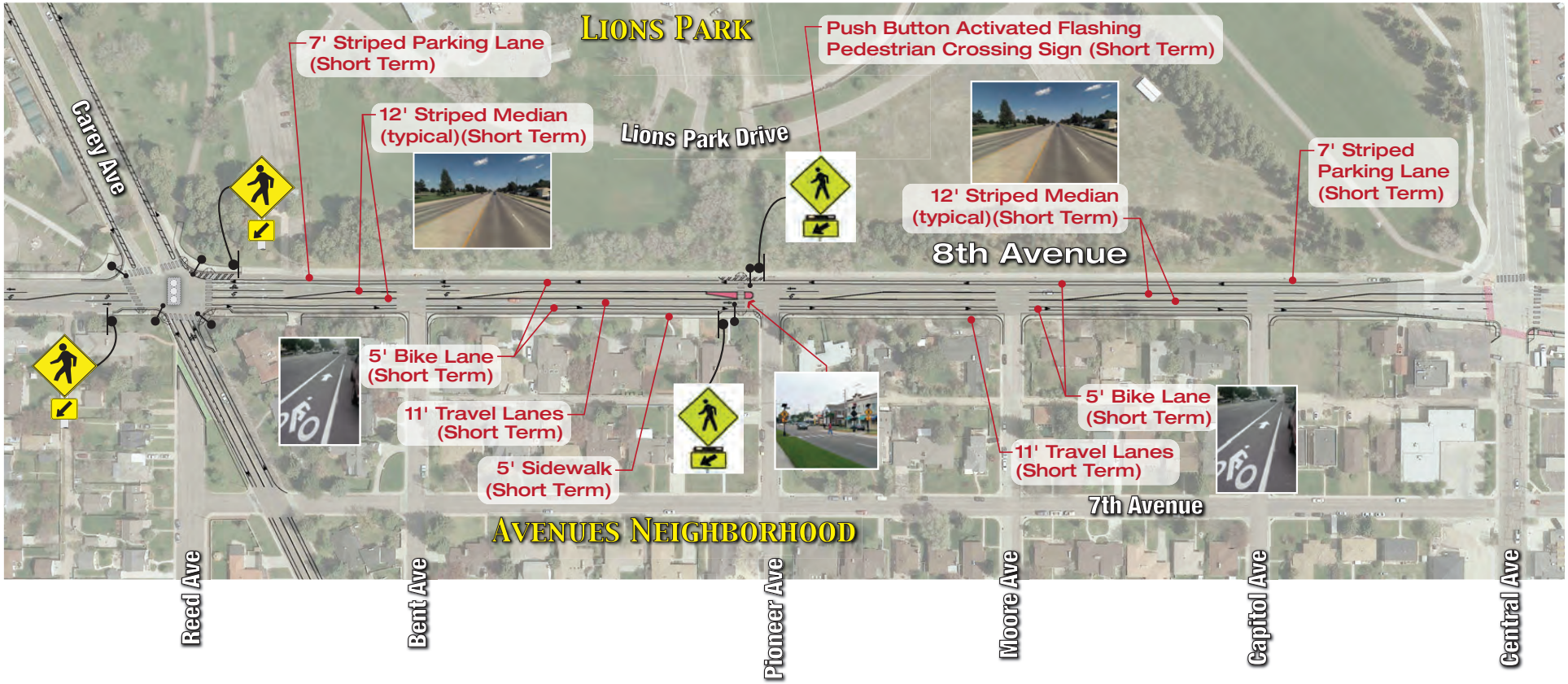

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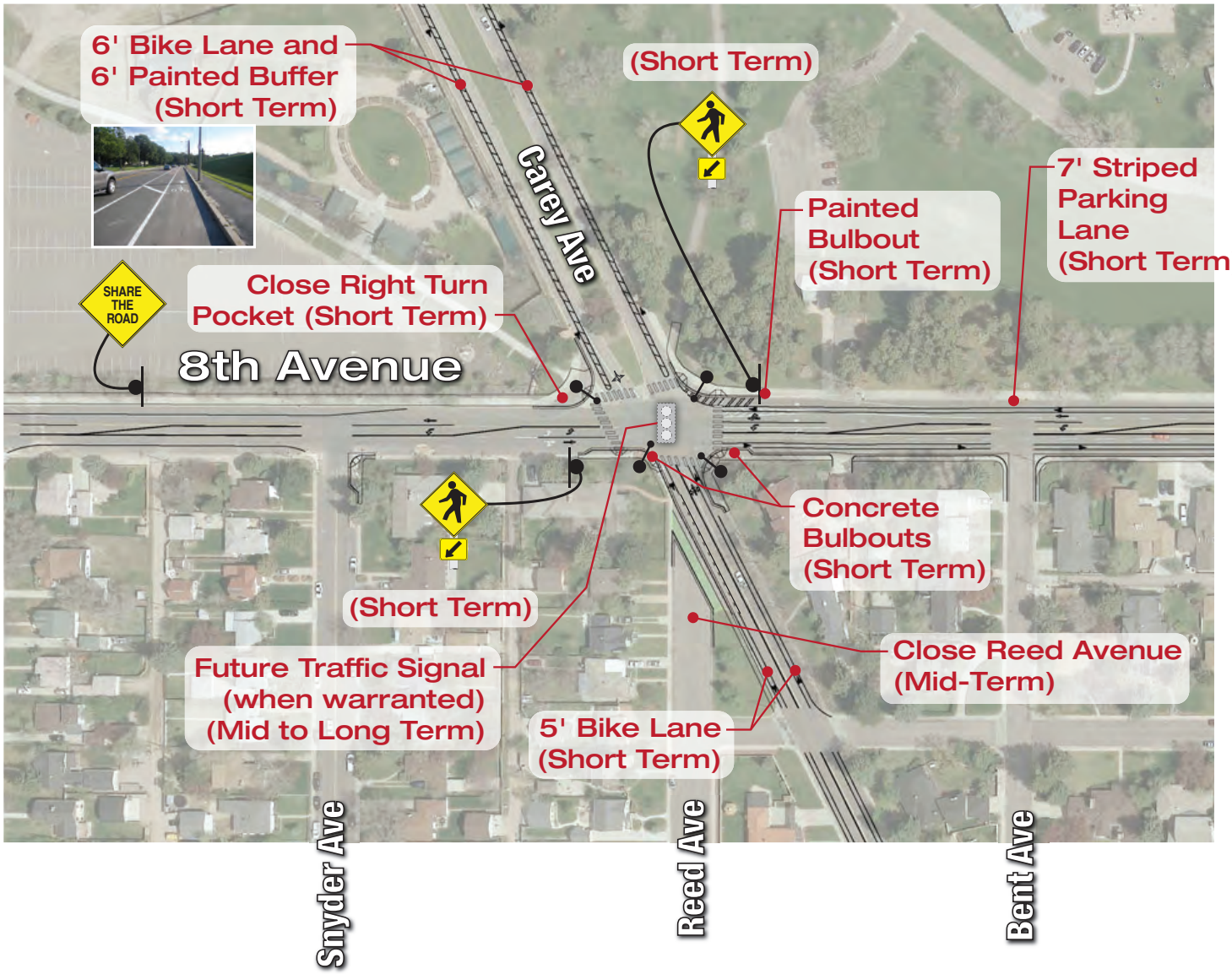
Figure 12

Segment: Carey Intersection Recommended Option



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At the Carey Avenue intersection, concrete curb bulb outs that extend to the edge of the parking lane would be constructed on the southeast and southwest corner to provide additional dwelling area for pedestrians and channelize the northbound right turn movement further to the west and improve sight lines for that movement. Additionally, the southbound channelized right turn would be removed to provide additional dwelling space for pedestrians, a striped bulbout would be installed in the parking lane on the northeast corner of the intersection, crosswalks would be striped across all four intersection approaches, and pedestrian signage and overhead lighting would be installed to improve visibility and awareness. Finally, rather than terminating at the pillars, the sidewalk on the northeast corner would end at the entrance path to Lions Park and the sidewalk on the northwest side would end just north of the entrance path to Frontier Park.

Traffic Operations and Safety – There are two significant changes to the roadway on this segment. The first would be to reduce the laneage on 8th Avenue from four travel lanes to three. Because of concerns that the same roadway striping "ghosting" issues would occur here as they have on segment 1, the road surface would be milled down and a new asphalt surface would be installed. A 7-foot on-street parking lane would be striped along the south side of the road, followed by a 5-foot bike lane that would establish the outside edge of an 11-foot eastbound travel lane. A 12-foot median with left turn lanes at each intersection would be striped in the middle of the roadway, followed by an 11-foot westbound travel lane, a 5-foot bike lane, and a 7-foot parking lane on the north side of the street.. An additional concrete bulbout extending out to the edge of the parking lane would be constructed at the new pedestrian crossing at Pioneer Avenue to reduce the crossing distance at that location.

All of the improvements on the north side of 8th Avenue would be painted, rather than raised above the travel way, to maintain the flexibility of converting the westbound direction back to two travel lanes should conditions during Cheyenne Frontier Days or during events at Lions Park indicate that an additional lane is necessary.

The second significant change for this segment is revisions to the approach laneage at the Carey Avenue intersection. In addition to installing bulb outs on three corners and removing the southbound channelized right turn on the fourth, buffered bike lanes would replace the outer southbound travel lane Carey Avenue, leaving the southbound approach as a single lane. The 8th Avenue lane reduction plus the painted bulbout on the northeast corner would remove the existing right turn lane, leaving a left turn lane and a shared through/right turn lane on that approach. Bike lanes plus the concrete bulb out on the southeast corner of the intersection would remove the informal right turn there and result in a single lane approach northbound. Additionally, the north end of Reed Avenue would be closed to clarify the southbound laneage there (**Figure 13** shows a rendering of the Reed Avenue closure). The concrete bulbout on the southwest corner would be constructed in the existing parking lane only, so the eastbound approach channelization would remain as a left turn lane and shared through/right turn lane. The end result of these changes would be an intersection with fewer lanes on three of the four approaches, which should decrease driver confusion and indecision at that location and improve vehicle and pedestrian safety.

Figure 13. Conceptual Closure of Reed Avenue, south of 8th Avenue (looking south)

It should also be noted that during the initial alternatives development process, two options that involved significant redevelopment of the Carey Avenue intersection were developed. One alternative realigned Carey through Frontier Park's Indian Village area so that it formed the north leg of the Snyder Avenue intersection. A second alternative constructed a roundabout at the current intersection location. Both alternatives involved the purchase of additional right-of-way and were anticipated to have significant construction cost and were therefore dropped from further consideration. Appendix E shows the two conceptual designs.

Carey Avenue Traffic Control. As documented in Section 1.2.2 of this report, during the public meetings for this project, many comments were received regarding the need to install a traffic signal to regulate movements and improve safety at the Carey Avenue intersection. However, current traffic conditions fail to satisfy the eight hour, four hour and peak hour volume warrants, the combination of pedestrian and traffic volume fails to satisfy the pedestrian volume warrant, and the average number of accidents at the intersection over a five year period is lower than the threshold that would suggest the need for a signal for safety-based reasons, so a traffic signal has not been identified as a near term improvement in the recommended roadway option. It has, however, been retained in the plan as a potential long-term solution to traffic issues there, once traffic conditions or accident patterns satisfy MUTCD requirements.

Similarly, current traffic conditions fail to satisfy the MUTCD all-way stop volume warrant and the accident history at the intersection does not indicate a pattern of accidents that would be susceptible to correction by all-way stop control, so a four-way stop at that location has not been identified as a near-term solution in the recommended roadway option. However, it, too, remains as a potential mid-term or long-term solution to traffic issues there once traffic conditions or accident patterns satisfy MUTCD requirements.

Drainage – A key consideration applicable to all recommendations in Segment 2 is the need to consider drainage needs and improvements along with any transportation improvements. In particular, widening the sidewalk on the south side of the road would need to occur to the north, into the existing parking lane, to avoid property impacts. This improvement, along with the curb bulb outs at the Carey intersection and the new pedestrian crossing at Pioneer would require relocating the existing storm drain entrances along the south curb line.

Beautification – Beautification improvements for the corridor are primarily focused around the Carey Avenue intersection, where the historic pillars and wall on the north side of the intersection, the Frontier Park entrance and an entrance to Lions Park provide the opportunity to create an enhanced gateway to the park area.

At the Frontier Park entrance, the current pathway leading into the park from the intersection is narrow and the current landscaping is overgrown, which hides the brick pillars and walls and encroaches upon both the pathway and sign that arches over the entrance. The recommendations convert the area where the southbound right turn lane was into a pedestrian plaza and the trees and bushes that hid the walls and overhead sign are replaced with lower profile plantings, which opens up the corner and enhances the park entry. **Figure 14** shows a conceptual rendering of the improvements.

Figure 14. Conceptual Improvements to the Frontier Park Entrance at Carey Avenue

Similarly, in the median and on both sides of Carey Avenue north of 8th Avenue the current trees and shrubs have grown to a height where they encroach upon the historic pillars and walls that frame the roadway. The recommendation replaces those trees and shrub with lower profile plantings that enhance those features rather than hide them. Additionally, the portion of the sidewalks that run north along Carey from the intersection (straight into the pillars on both sides of the street) would be replaced with grass and landscaping, with the west side sidewalk/pedestrian plaza routed into Frontier Park and the east side sidewalk routed into Lions Park. **Figure 15** shows a conceptual rendering of the improvements to the Carey Avenue entranceway.

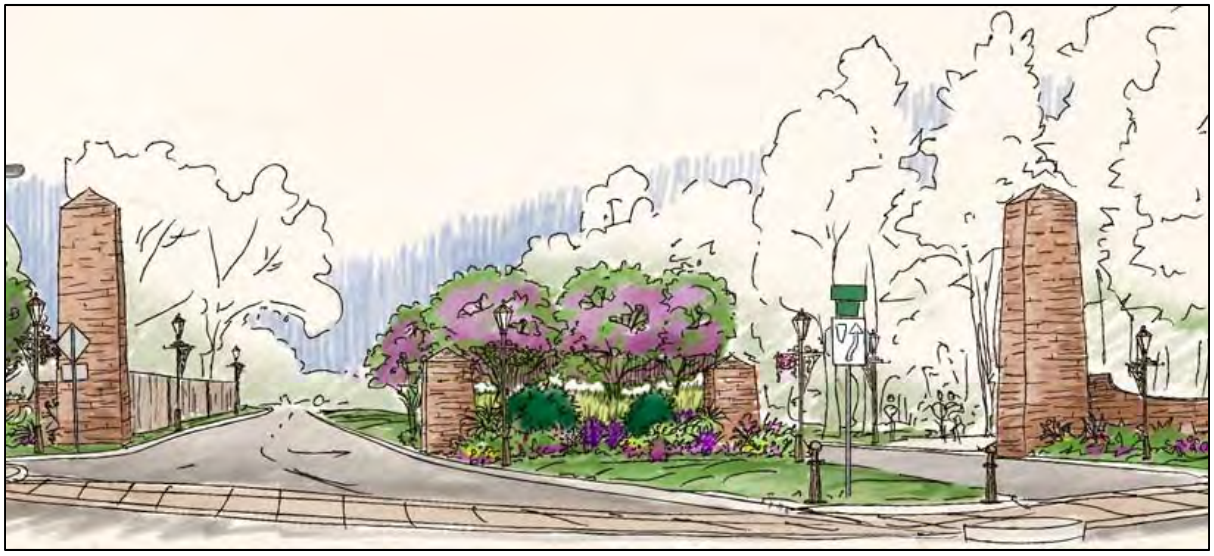

Figure 15. Conceptual Improvements to the Frontier Park Entrance at Carey Avenue

On the northeast corner of the intersection, an asphalt path leads into Lions Park, but the existing landscaping does little to suggest the area is an entry point to the park. The recommendation includes extending the brick wall next to the Carey Avenue pillar east to the pathway, and constructing a similar wall with a park sign on the other side of the path, so that the path becomes a featured entry point into the park. Low profile plantings are included at the base of the walls to provide color and blend into the landscaping along the walls and pillars in the median and on the west side of Carey in front of Frontier Park. **Figure 16** shows a conceptual rendering of the improvements to the Lions Park corner.

Figure 16. Conceptual Improvements to the Frontier Park Entrance at Carey Avenue

4.2.2 Prioritization

A priority has been identified for each recommendation depicted on **Figures 11 and 12**. Because the nature of the improvements are relatively low-cost and would be constructed within the available right-of-way, all have been identified as either near-term improvements or mid-term improvements. The priorities are based on the urgency of the need being addressed, steering committee discussion, and public and stakeholder input. It is recommended that the roadway re-striping, pedestrian crossing improvements and curb bulb outs be pursued in the near term timeline, while the Reed Avenue closure and landscaping enhancements to the Carey intersection could be delayed until the mid-term, if desired.

4.2.3 Alternate Roadway Section

As with segment 1, the improvements identified for segment 2 represent relatively low-cost improvements that can be implemented in the near to mid-term, but they may be somewhat ineffective in addressing speeding issues on 8th Avenue because aside from the pedestrian refuge island at Pioneer, they lack any raised features within the roadway that alert drivers to their travel speed. To better address speeding issues, an alternative roadway section for segment 2 was developed that includes several features designed to reduce travel speeds.

The first such feature is replacing the striped curb bulbs along the north side of 8th Avenue with concrete curb bulbs--at the Carey Avenue intersection, at the pedestrian crossing at Pioneer Avenue and at a new signed and striped pedestrian crossing at Capitol Avenue. Observations of traffic volumes and patterns during Frontier Days suggest that the roadway would function adequately with only one lane in that direction under event traffic conditions, and should that be the case, raised curb bulbs that extend across the parking lane at the above locations would not only provide a sense of narrowing the roadway to drivers, they would also help alert drivers to the presence of the pedestrian crossings, both of which should help to reduce travel speeds. These bulb outs have further benefits in that they increase the pedestrian dwelling area and improve safety at each crossing.

Second, the alternative section includes a raised median with grass and trees between each intersection from Capitol Avenue to Carey Avenue. This median would be constructed to provide left turn lanes at each street, and the median at Capitol Avenue could include signage identifying 8th Avenue as an entrance point to the neighborhood and/or the parks, providing a sense of arrival to the area. **Figure 17** shows a conceptual rendering of the median at the Moore Avenue intersection.

Figure 17. Conceptual Grass and Tree Median west of Moore Avenue

In addition to helping to reduce travel speeds, medians can increase both pedestrian and motor vehicle safety on a roadway. They do this by allowing pedestrians to cross one direction of traffic at a time, allowing them to focus on just one lane rather than having to anticipate traffic from both directions. Medians also provide a space to install improved lighting at pedestrian crossing locations, and improved lighting has been shown to reduce nighttime pedestrian fatalities at crossings by 78 percent. Raised medians also:

- Reduce motor vehicle crashes by 15 percent.
- Decrease delays (>30%) for motorists.
- Increase capacity (>30%) of roadways.
- Provide space for landscaping within the right-of-way.
- Reduce the visual impact of the roadway for properties along the street.
- Landscaped medians absorb heat rather than reflect it as pavement does, and thus reduce the heat impact of the roadway on the surrounding area.
- Deciduous trees in a median shade the roadway in the summer and further reduce the heat impact. Because they lose their leaves, they allow sunlight to melt snow on the roadway in the winter.

The most significant impact of the median is that it would prevent direct left turn access into the driveways for four properties between Bent and Pioneer Avenues, two properties between Pioneer and Moore Avenues, and two properties between Moore and Capitol Avenues. Vehicles accessing those properties from the east could either U-turn around the median or enter the neighborhood on 7th Avenue and drive north to 8th Avenue on the first street west of their property.

The alternative design also includes a signed, striped and lighted pedestrian crossing on the west side of Capitol Avenue to further facilitate pedestrian travel between the neighborhood and Lions Park. **Figures D-2** and **D-3** in **Appendix D** show the alternative segment and intersection design.

4.3 Segment 3: Central Avenue to Warren Avenue

4.3.1 Segment Recommendations and Opportunities

Figure 18 shows the recommendations for corridor segment 3 between Central Avenue and Warren Avenue. Descriptions of the recommendations and opportunities by the category identified in the Shape section are provided as follows.

Transit and Non-motorized Travel – As with segments 1 and 2, no specific transit recommendations are provided for this segment. The primary non-motorized recommendations for this segment are related to enhancing the greenways trail connection between Lions Park and Evans Avenue. Painted and/or textured sidewalks have been identified for the west and south legs of the 8th Avenue/Central Avenue intersection, and widening the south sidewalk between Central and Warren has been identified to better establish that segment as a section of the greenways trail and allow pedestrians and bicyclists to avoid the signage and street light poles that are embedded in the sidewalk there.

Figure 18

Segment 3: Recommended Roadway Improvements

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Traffic Operations and Safety – The revisions to the south curb line between Central and Warren Avenues described above would also improve the outside lane alignment for eastbound vehicle traffic. Additionally, revising the traffic signal phasing at the 8th Avenue/Warren Avenue intersection to include a protected plus permitted left turn phase (left turn green arrow, followed by a flashing yellow arrow where vehicles can turn left turn when gaps in the westbound direction permit it) has been identified to help reduce traffic delays and queuing for that movement. Adding skip striping to the eastbound left turn movement that channelizes vehicles into the left-most northbound lane on Warren would also improve intersection performance, as it would allow some left turning vehicles to move simultaneously with westbound right turns, which turn into the right-most lane on Warren.

Beautification – No beautification improvements have been identified for segment 3. The City should continue to provide regular maintenance to the landscaping in the existing median on this segment.

4.3.2 Prioritization

A priority has been identified for each recommendation depicted on **Figure 18**. Because the nature of the improvements are relatively low-cost and would all be constructed within the available right-of-way, all have been identified as near-term improvements. The revisions to the signal phasing at the Warren intersection should be tied into WYDOT's next signal re-timing effort in the area.

4.3.3 Long-Term Traffic Signal Revisions

No additional enhancements to the roadway cross section or non-motorized system have been identified for segment 3. However, as traffic volumes grow, the City should monitor traffic volumes and delay at the 8th Avenue/Warren Avenue intersection, particularly the eastbound left turn and westbound right turn. If delays and/or queues become problematic for either movement, it may become prudent to revise the westbound approach channelization from two through lanes and a right turn lane to a through lane, a shared through/right turn lane and a right turn lane, and the traffic signal phasing should be revised to provide a protected only phase for the eastbound left turn movement. Such improvements should reduce the delays and queuing in the eastbound and westbound directions to a manageable level.

4.4 Improvement Costs and Potential Funding Sources

4.4.1 Improvement Costs

Table 10 summarizes the anticipated costs associated with the recommended improvements included in the plan. As shown, the full 8th Avenue Corridor Plan could be implemented for a cost of approximately $1.739 million.

Table 10. 8th Avenue Corridor Plan Recommended Improvement Costs

Improvement Category	Cost
Removals	
Roadway Surface	$50,000
Curb, Gutter, Sidewalk	$40,000
New Construction	
Roadway Overlay	$361,000
Curb, Gutter, Sidewalk	$186,000
Drainage	$81,000
Street Lighting	$100,000
Signing, Striping and Pedestrian Crossing Improvement	
Roadway Signing and Striping	$13,000
Pedestrian Crossing Features	$54,000
Urban Design and Landscaping Elements	
8th Avenue and Reed Avenue Landscaping	$25,000
Carey Avenue, Frontier Park and Lions Park Entry Features	$116,000
Other Items	
Utilities	$38,000
Mobilization	$49,000
Construction Traffic Control	$65,000
Engineering Design	$127,000
Construction Management	$190,000
Contingencies	$244,000
Total	**$1,739,000**

Because the full plan includes many elements that can be constructed independent of each other, the option is available to initially construct a smaller subset of improvements that address the most pressing needs along the corridor, and then construct the remaining items at a later date, when more funding is secured. Since the NTMP application specifically requested an improved pedestrian crossing between the neighborhood and Lions Park, and addressing traffic operations at the Carey intersection were the most common theme from the public involvement portion of the project, it would appear that those items represent the most pressing needs along the corridor and should be constructed first. Table 11 summarizes the costs associated with these Phase 1 improvements, namely:

- Install the pedestrian-activated crosswalk at Pioneer Avenue. Revising the laneage from four lanes to three on 8th Avenue would not be a part of the initial improvements, so neither the median refuge island nor the concrete bulbout on the south side of the road would be a part of the Phase 1 construction; thus, this crossing would only consist of painted bulbouts in the parking lane on both sides of the road, crossing striping and the pedestrian-activated crossing signs;
- Install a concrete bulbout on the northwest corner of the Carey intersection and close the channelized right turn there. This bulbout would be constructed to the final configuration identified in the recommended plan, and thus would not require any further modification when the remaining recommended improvements are constructed. The bicycle lanes on Carey have not been included in the Phase 1 improvements, so the southbound approach would still have two lanes (a left turn lane and a through/right turn lane).

- Install concrete bulbouts on the southeast and southwest corner of the Carey intersection. These bulbouts will improve the northbound right turn channelization and increase the pedestrian dwelling areas on those corners during Frontier Days and event days at Lions Park. They would also be constructed to their final configurations identified in the recommended plan, and thus would not require any further modification when the remaining recommended improvements are constructed.
- Install crosswalks on the east, west and south sides of the Carey intersection, and crossing signage on the east and west side of the intersection. This includes a new curb ramp on the northeast corner of the intersection to accommodate the east side crosswalk.

As indicated, these Phase 1 improvements could be implemented for a cost of approximately $102,000.

Table 11. 8th Avenue Corridor Plan Phase 1 (Near Term) Improvement Costs

Improvement Category	Cost
Carey Avenue Intersection Improvements	
Removals	
Roadway Surface	$2,120
Curb, Gutter, Sidewalk	$2,780
New Construction	
Roadway Overlay	$6,500
Curb, Gutter, Sidewalk	$17,800
Relocate Drain Inlets	$3,000
Signing, Striping and Pedestrian Crossing Improvements	
Pedestrian Crossing Striping and Signing	$12,560
Pioneer Crossing Improvements	
Removals	
Roadway Surface	$60
Curb, Gutter, Sidewalk	$430
New Construction	
Roadway Overlay	$650
Curb, Gutter, Sidewalk	$1,750
Signing, Striping and Pedestrian Crossing Improvements	
Pedestrian Crossing Striping and Signing	$12,700
Other Items	
Utilities	$2,000
Mobilization	$3,200
Construction Traffic Control	$2,870
Engineering Design	$8,000
Construction Management	$12,000
Contingencies	$12,800
Total	**$102,000**

Finally, as noted above, an alternate roadway design has been developed with additional physical features introduced into the roadway to better address speeding issues on 8th Avenue. **Table 12** summarizes the costs associated with these alternative long-term improvements. As shown, those additional improvements could be implemented for an additional $892,000, for a total cost of $2.631 million. This costs assumes that the recommended improvements would be constructed in the short term, then the additional enhancements would be added at a later date.

Table 12. 8th Avenue Corridor Plan Alternate Long-Term Improvement Costs

Improvement Category	Cost
Removals	
Roadway Surface	$10,000
Curb, Gutter, Sidewalk	$8,000
New Construction	
Roadway Overlay	$34,000
Curb, Gutter, Sidewalk	$70,000
Drainage	$14,000
Street Lighting	$9,000
Signing, Striping, Pedestrian Crossing and Traffic Signal Improvements	
Roadway Signing and Striping	$9,000
Pedestrian Crossing Features	$44,000
Traffic Signal	$250,000
Urban Design and Landscaping Elements	
Median Landscaping	$35,000
Other Items	
Utilities	$34,000
Mobilization	$27,000
Construction Traffic Control	$44,000
Engineering Design	$69,000
Construction Management	$103,000
Contingencies	$132,000
Total	**$892,000**

4.4.2 Funding Sources

Funding for the improvements included in the 8th Avenue Corridor Plan has not yet been identified. Therefore, implementation of the 8th Avenue Corridor Plan will depend on receiving funding from a broad base of sources. A number of potential funding sources are highlighted as follows for further consideration. The adopted PlanCheyenne document was used as a reference.

Grant Programs – A growing list of grant programs are available for transportation and community enhancement projects. Grants are typically awarded through a competitive application process. Recent federal grant programs include a series of TIGER grants, and highway safety grant programs are ongoing. Winning projects tend to demonstrate a high level of local commitment to the project and show clear transportation benefits.

5th Penny Optional Sales and Use Tax - The City of Cheyenne has utilized a one cent sales tax to fund improvement, operation and maintenance of the transportation system since 1978. A portion of this revenue source could be dedicated to the 8th Avenue Corridor Plan improvements.

Taxing Mechanisms – Laramie County has the ability to impose a 6th penny sales tax to fund specific, well defined projects. To utilize this funding source, county commissioners must include a project on the ballot and the ballot measure must pass with a majority vote.

State Highway Funding - The State of Wyoming allocates funds from the State's 4th penny tax to each WYDOT District, and individual projects are selected for funding based on public involvement, engineering studies, and the collective judgment of the Transportation Commission and WYDOT. The improvements identified for segment 3 between Central Avenue and Warren Avenue affect state highways and therefore may be eligible for these funds.

Surface Transportation Program (STP) – The Surface Transportation Program consists of federal funding administered by the State of Wyoming. The STP provides flexible funding that may be used by States and localities for projects on any Federal-aid highway. As above, the improvements identified for segment 3 between Central Avenue and Warren Avenue affect state highways and therefore may be eligible for these funds.

APPENDIX A TRAFFIC COUNTS

Cheyenne MPO
2101 O'Neil Ave
Cheyenne WY 82001

Counter Board: 64
Counted By: Carrol
Weather: Clear
Other: Cheyenne Counts 2007

File Name : 8THAVE~2
Site Code : 00000235
Start Date : 5/15/2007
Page No : 1

Groups Printed- Unshifted

	Warren Ave. From North					8th Ave. From East					Warren Ave. From South					8th Ave. From West					
Start Time	Rt	Thru	Left	Ped	App. Total	Rt	Thru	Left	Ped	App. Total	Rt	Thru	Left	Ped	App. Total	Rt	Thru	Left	Ped	App. Total	Int. Total
Factor	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		
07:00 AM	0	0	0	0	0	54	2	0	0	56	6	105	0	0	111	0	24	15	0	39	206
07:15 AM	0	0	0	0	0	61	3	0	0	64	3	145	6	1	155	0	31	4	0	35	254
07:30 AM	0	0	0	1	1	39	6	0	0	45	5	124	1	0	130	0	52	13	1	66	242
07:45 AM	0	0	0	0	0	55	11	0	0	66	4	188	5	1	198	0	57	12	0	69	333
Total	0	0	0	1	1	209	22	0	0	231	18	562	12	2	594	0	164	44	1	209	1035
08:00 AM	0	0	0	1	1	46	9	0	0	55	1	161	4	0	166	0	42	11	0	53	275
08:15 AM	0	0	0	0	0	35	13	0	5	53	4	117	4	0	125	0	38	11	0	49	227
08:30 AM	0	0	0	0	0	46	15	0	1	62	13	127	6	0	146	0	35	12	0	47	255
08:45 AM	0	0	0	1	1	43	21	0	1	65	12	137	3	1	153	0	40	20	0	60	279
Total	0	0	0	2	2	170	58	0	7	235	30	542	17	1	590	0	155	54	0	209	1036
BREAK																					
11:00 AM	0	0	0	0	0	75	12	0	1	88	18	193	5	1	217	0	32	24	0	56	361
11:15 AM	0	0	0	2	2	67	17	0	0	84	11	214	5	0	230	0	41	19	0	60	376
11:30 AM	0	0	0	1	1	77	19	0	0	96	14	203	10	1	228	0	49	23	1	73	398
11:45 AM	0	0	0	1	1	93	13	0	0	106	7	186	4	0	197	0	37	19	0	56	360
Total	0	0	0	4	4	312	61	0	1	374	50	796	24	2	872	0	159	85	1	245	1495
12:00 PM	0	0	0	3	3	139	21	0	0	160	9	252	4	1	266	0	46	23	1	70	499
12:15 PM	0	0	0	1	1	80	10	0	0	90	13	161	3	0	177	0	48	26	0	74	342
12:30 PM	0	0	0	1	1	126	20	0	1	147	4	154	2	1	161	0	40	28	0	68	377
12:45 PM	0	0	0	0	0	78	13	0	0	91	12	221	6	2	241	0	70	25	2	97	429
Total	0	0	0	5	5	423	64	0	1	488	38	788	15	4	845	0	204	102	3	309	1647
BREAK																					
03:00 PM	0	0	0	3	3	74	12	0	0	86	10	198	3	0	211	0	55	17	1	73	373
03:15 PM	0	0	0	3	3	84	15	0	1	100	7	217	3	2	229	0	52	17	0	69	401
03:30 PM	0	0	0	0	0	85	19	0	0	104	15	216	9	1	241	0	64	20	0	84	429
03:45 PM	0	0	0	0	0	93	24	0	1	118	15	221	6	0	242	0	46	19	0	65	425
Total	0	0	0	6	6	336	70	0	2	408	47	852	21	3	923	0	217	73	1	291	1628
04:00 PM	0	0	0	1	1	89	20	0	0	109	16	228	10	0	254	0	54	17	0	71	435
04:15 PM	0	0	0	0	0	91	18	0	0	109	14	218	6	0	238	0	54	28	0	82	429
04:30 PM	0	0	0	0	0	84	18	0	0	102	14	248	7	1	270	0	43	36	0	79	451
04:45 PM	0	0	0	0	0	79	19	0	0	98	4	286	10	0	300	0	58	29	0	87	485
Total	0	0	0	1	1	343	75	0	0	418	48	980	33	1	1062	0	209	110	0	319	1800
05:00 PM	0	0	0	2	2	159	23	0	2	184	11	331	7	2	351	0	60	31	1	92	629
05:15 PM	0	0	0	1	1	115	16	0	3	134	6	314	11	0	331	0	63	36	0	99	565
05:30 PM	0	0	0	0	0	70	24	0	0	94	7	249	5	1	262	0	43	33	0	76	432
05:45 PM	0	0	0	1	1	60	16	0	0	76	3	199	9	0	211	0	34	23	0	57	345
Total	0	0	0	4	4	404	79	0	5	488	27	1093	32	3	1155	0	200	123	1	324	1971
Grand Total	0	0	0	23	23	2197	429	0	16	2642	258	5613	154	16	6041	0	1308	591	7	1906	10612
Apprch %	0.0	0.0	0.0	100.0		83.2	16.2	0.0	0.6		4.3	92.9	2.5	0.3		0.0	68.6	31.0	0.4		
Total %	0.0	0.0	0.0	0.2	0.2	20.7	4.0	0.0	0.2	24.9	2.4	52.9	1.5	0.2	56.9	0.0	12.3	5.6	0.1	18.0	

Cheyenne MPO
2101 O'Neil Ave
Cheyenne WY 82001

Counter Board: 64
Counted By: Carrol
Weather: Clear
Other: Cheyenne Counts 2007

File Name : 8THAVE~1
Site Code : 00000227
Start Date : 5/9/2007
Page No : 1

Groups Printed- Unshifted

	Central Ave. From North					8th Ave. From East					From South					8th Ave. From West					
Start Time	Rt	Thru	Left	Ped	App. Total	Rt	Thru	Left	Ped	App. Total	Rt	Thru	Left	Ped	App. Total	Rt	Thru	Left	Ped	App. Total	Int. Total
Factor	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		
07:00 AM	7	126	26	0	159	0	2	1	0	3	0	0	0	0	0	3	7	0	1	11	173
07:15 AM	7	185	35	2	229	0	7	0	0	7	0	0	0	0	0	5	10	0	1	16	252
07:30 AM	8	214	34	0	256	0	7	5	0	12	0	0	0	1	1	8	23	0	1	32	301
07:45 AM	10	282	54	0	346	0	13	9	0	22	0	0	0	0	0	7	23	0	1	31	399
Total	32	807	149	2	990	0	29	15	0	44	0	0	0	1	1	23	63	0	4	90	1125
08:00 AM	6	191	30	0	227	0	5	6	0	11	0	0	0	1	1	4	17	0	0	21	260
08:15 AM	8	203	32	0	243	0	10	4	0	14	0	0	0	0	0	6	23	0	0	29	286
08:30 AM	10	135	42	0	187	0	8	6	0	14	0	0	0	0	0	2	21	0	0	23	224
08:45 AM	16	161	50	3	230	0	14	10	0	24	0	0	0	0	0	4	15	0	2	21	275
Total	40	690	154	3	887	0	37	26	0	63	0	0	0	1	1	16	76	0	2	94	1045
BREAK																					
11:00 AM	7	175	33	1	216	0	17	8	0	25	0	0	0	0	0	8	16	0	1	25	266
11:15 AM	14	168	35	1	218	0	16	12	0	28	0	0	0	1	1	9	25	0	1	35	282
11:30 AM	14	232	56	0	302	0	10	12	0	22	0	0	0	0	0	15	19	0	2	36	360
11:45 AM	12	208	46	4	270	0	11	7	0	18	0	0	0	0	0	11	34	0	1	46	334
Total	47	783	170	6	1006	0	54	39	0	93	0	0	0	1	1	43	94	0	5	142	1242
12:00 PM	25	216	39	1	281	0	11	10	0	21	0	0	0	1	1	5	15	0	3	23	326
12:15 PM	16	210	47	0	273	0	16	11	0	27	0	0	0	0	0	16	28	0	3	47	347
12:30 PM	19	209	41	0	269	0	11	13	0	24	0	0	0	2	2	8	24	0	0	32	327
12:45 PM	13	257	54	0	324	0	12	10	0	22	0	0	0	1	1	16	36	0	0	52	399
Total	73	892	181	1	1147	0	50	44	0	94	0	0	0	4	4	45	103	0	6	154	1399
BREAK																					
03:00 PM	14	216	48	4	282	0	19	9	0	28	0	0	0	2	2	9	30	0	2	41	353
03:15 PM	15	227	36	0	278	0	11	7	0	18	0	0	0	3	3	13	22	0	3	38	337
03:30 PM	25	236	45	3	309	0	14	6	0	20	0	0	0	0	0	14	30	0	1	45	374
03:45 PM	20	235	42	2	299	0	14	5	0	19	0	0	0	0	0	5	26	0	0	31	349
Total	74	914	171	9	1168	0	58	27	0	85	0	0	0	5	5	41	108	0	6	155	1413
04:00 PM	19	219	51	0	289	0	20	7	0	27	0	0	0	0	0	9	24	0	0	33	349
04:15 PM	22	220	45	0	287	0	18	6	0	24	0	0	0	0	0	11	27	0	1	39	350
04:30 PM	23	222	46	0	291	0	19	10	0	29	0	0	0	0	0	10	26	0	1	37	357
04:45 PM	21	186	47	1	255	0	22	6	0	28	0	0	0	1	1	10	28	0	5	43	327
Total	85	847	189	1	1122	0	79	29	0	108	0	0	0	1	1	40	105	0	7	152	1383
05:00 PM	22	244	55	3	324	0	27	10	2	39	0	0	0	0	0	9	37	0	1	47	410
05:15 PM	24	177	37	0	238	0	29	11	0	40	0	0	0	0	0	11	35	0	1	47	325
05:30 PM	16	193	36	1	246	0	25	7	0	32	0	0	0	0	0	7	35	0	1	43	321
05:45 PM	26	154	27	1	208	0	20	4	1	25	0	0	0	0	0	9	18	0	0	27	260
Total	88	768	155	5	1016	0	101	32	3	136	0	0	0	0	0	36	125	0	3	164	1316
Grand Total	439	5701	1169	27	7336	0	408	212	3	623	0	0	0	13	13	244	674	0	33	951	8923
Apprch %	6.0	77.7	15.9	0.4		0.0	65.5	34.0	0.5		0.0	0.0	0.0	100.0		25.7	70.9	0.0	3.5		
Total %	4.9	63.9	13.1	0.3	82.2	0.0	4.6	2.4	0.0	7.0	0.0	0.0	0.0	0.1	0.1	2.7	7.6	0.0	0.4	10.7	

Cheyenne MPO
2101 O'Neil Ave
Cheyenne WY 82001

Counter:
Counted By: JSims
Weather: Sunny
Other:

File Name : CAREY&~1
Site Code : 00444444
Start Date : 8/19/2010
Page No : 1

Groups Printed- Vehicles

	Carey Ave From North				8th Ave From East				Carey Ave From South				8th Ave From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:00 AM	14	4	1	0	1	8	1	0	2	6	1	0	1	10	6	0	55
07:15 AM	14	5	3	0	7	10	0	0	0	10	1	0	0	11	12	0	73
07:30 AM	15	6	0	0	3	13	1	0	0	6	1	0	0	9	12	0	66
07:45 AM	18	10	3	0	8	9	1	0	3	14	1	0	0	14	20	0	101
Total	61	25	7	0	19	40	3	0	5	36	4	0	1	44	50	0	295
08:00 AM	15	8	1	0	2	8	3	0	2	4	1	0	1	11	12	0	68
08:15 AM	16	3	1	0	8	8	0	0	2	4	2	0	0	18	21	0	83
08:30 AM	11	9	3	0	3	7	1	0	2	8	0	0	0	9	11	0	64
08:45 AM	14	9	6	0	8	10	4	0	4	14	5	0	1	24	16	0	115
Total	56	29	11	0	21	33	8	0	10	30	8	0	2	62	60	0	330
11:00 AM	21	7	8	0	9	12	3	0	5	14	0	0	0	16	17	0	112
11:15 AM	21	8	11	0	6	12	2	0	7	16	2	0	2	18	19	0	124
11:30 AM	27	11	2	0	8	14	2	0	6	13	0	0	0	17	26	0	126
11:45 AM	31	18	12	0	10	11	4	0	8	29	0	0	2	15	13	0	153
Total	100	44	33	0	33	49	11	0	26	72	2	0	4	66	75	0	515
12:00 PM	25	14	5	0	7	11	3	0	8	26	2	0	0	13	23	0	137
12:15 PM	22	12	8	0	6	15	5	0	5	23	0	0	1	19	25	0	141
12:30 PM	26	11	10	0	6	12	6	0	8	20	2	0	2	20	27	0	150
12:45 PM	20	12	7	0	5	9	4	0	3	15	1	0	3	21	19	0	119
Total	93	49	30	0	24	47	18	0	24	84	5	0	6	73	94	0	547
03:00 PM	29	12	9	0	10	8	3	0	2	15	1	0	0	19	16	0	124
03:15 PM	23	13	9	0	5	17	2	0	4	13	1	0	0	16	15	0	118
03:30 PM	24	14	8	0	11	15	1	0	6	22	0	0	1	14	18	0	134
03:45 PM	27	10	4	0	8	16	2	0	5	17	1	0	2	17	19	0	128
Total	103	49	30	0	34	56	8	0	17	67	3	0	3	66	68	0	504
04:00 PM	30	6	7	0	10	16	4	0	3	13	1	0	0	26	14	0	130
04:15 PM	27	11	8	0	13	20	3	0	6	20	1	0	0	19	21	0	149
04:30 PM	26	16	16	0	8	19	5	0	2	17	2	0	3	18	20	0	152
04:45 PM	12	19	5	0	6	16	4	0	3	17	2	0	0	13	28	0	125
Total	95	52	36	0	37	71	16	0	14	67	6	0	3	76	83	0	556
05:00 PM	35	14	18	0	16	22	3	0	5	28	2	0	3	15	26	0	187
05:15 PM	32	11	7	0	8	15	5	0	7	24	1	0	1	21	20	0	152
05:30 PM	29	12	10	0	7	15	4	0	6	20	2	0	2	17	23	0	147
05:45 PM	24	13	15	0	10	14	4	0	4	18	1	0	1	15	19	0	138
Total	120	50	50	0	41	66	16	0	22	90	6	0	7	68	88	0	624
Grand Total	628	298	197	0	209	362	80	0	118	446	34	0	26	455	518	0	3371
Apprch %	55.9	26.5	17.5	0.0	32.1	55.6	12.3	0.0	19.7	74.6	5.7	0.0	2.6	45.5	51.9	0.0	
Total %	18.6	8.8	5.8	0.0	6.2	10.7	2.4	0.0	3.5	13.2	1.0	0.0	0.8	13.5	15.4	0.0	

Cheyenne MPO
2101 O'Neil Ave
Cheyenne WY 82001

Counter:
Counted By: JSims
Weather: Sunny
Other:

File Name : CAREY&~1
Site Code : 00444444
Start Date : 8/19/2010
Page No : 1

Groups Printed- Pedestrians

	Carey Ave From North				8th Ave From East				Carey Ave From South				8th Ave From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:00 AM	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	3
07:15 AM	1	1	5	0	0	1	0	0	0	2	0	0	0	0	1	0	11
07:30 AM	0	0	1	0	1	0	0	0	0	1	0	0	0	2	0	0	5
07:45 AM	0	2	2	0	2	2	0	0	0	3	0	0	0	2	1	0	14
Total	1	3	8	0	3	5	0	0	0	6	0	0	0	5	2	0	33
08:00 AM	0	1	6	0	4	0	0	0	0	0	0	0	0	1	0	0	12
08:15 AM	0	0	3	0	0	2	0	0	0	0	0	0	0	0	0	0	5
08:30 AM	1	1	2	0	0	3	0	0	0	2	0	0	0	0	0	0	9
08:45 AM	0	1	2	0	1	1	0	0	0	1	0	0	0	1	1	0	8
Total	1	3	13	0	5	6	0	0	0	3	0	0	0	2	1	0	34
11:00 AM	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
11:15 AM	0	0	0	0	1	0	0	0	0	3	2	0	0	0	0	0	6
11:30 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	2
11:45 AM	0	0	0	0	0	1	0	0	0	2	0	0	0	0	0	0	3
Total	0	4	0	0	1	1	0	0	0	6	2	0	0	1	0	0	15
12:00 PM	0	3	0	0	0	2	0	0	0	0	0	0	0	5	0	0	10
12:15 PM	0	2	0	0	4	4	0	0	0	0	0	0	0	3	0	0	13
12:30 PM	0	3	0	0	0	2	0	0	0	2	0	0	0	1	1	0	9
12:45 PM	0	1	0	0	2	0	0	0	0	0	1	0	0	2	0	0	6
Total	0	9	0	0	6	8	0	0	0	2	1	0	0	11	1	0	38
03:00 PM	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
03:15 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
03:30 PM	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3
03:45 PM	0	1	0	0	0	0	0	0	0	5	0	0	0	1	0	0	7
Total	0	1	1	0	1	3	0	0	0	5	0	0	0	1	0	0	12
04:00 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	3
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
04:30 PM	0	3	1	0	0	2	0	0	0	1	0	0	0	0	0	0	7
04:45 PM	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2
Total	0	3	1	0	2	3	0	0	0	1	0	0	0	4	0	0	14
05:00 PM	0	7	0	0	0	3	0	0	0	0	0	0	0	0	0	0	10
05:30 PM	0	4	2	0	1	0	0	0	0	1	1	0	0	1	1	0	11
05:45 PM	0	3	0	0	0	2	0	0	0	0	0	0	0	1	0	0	6
Total	0	14	2	0	1	5	0	0	0	1	1	0	0	2	1	0	27
Grand Total	2	37	25	0	19	31	0	0	0	24	4	0	0	26	5	0	173
Apprch %	3.1	57.8	39.1	0.0	38.0	62.0	0.0	0.0	0.0	85.7	14.3	0.0	0.0	83.9	16.1	0.0	
Total %	1.2	21.4	14.5	0.0	11.0	17.9	0.0	0.0	0.0	13.9	2.3	0.0	0.0	15.0	2.9	0.0	

Cheyenne MPO
2101 O'Neil Ave
Cheyenne WY 82001

Counter:
Counted By: JSims
Weather: Sunny
Other:

File Name : CAREY&~1
Site Code : 00444444
Start Date : 8/19/2010
Page No : 1

Groups Printed- Bikes

	Carey Ave From North				8th Ave From East				Carey Ave From South				8th Ave From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:00 AM	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
07:15 AM	1	0	0	0	2	1	0	0	0	2	0	0	0	1	0	0	7
07:45 AM	0	1	0	0	1	0	0	0	0	3	0	0	0	1	0	0	6
Total	1	3	0	0	3	1	0	0	0	5	0	0	0	2	0	0	15
08:00 AM	0	1	0	0	0	0	0	0	0	3	0	0	0	2	0	0	6
08:15 AM	2	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	5
08:45 AM	0	0	0	0	2	2	0	0	0	0	0	0	0	1	0	0	5
Total	2	2	0	0	3	2	0	0	0	3	0	0	0	4	0	0	16
11:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
11:15 AM	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
11:30 AM	0	0	0	0	1	2	0	0	0	0	0	0	0	1	0	0	4
11:45 AM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Total	0	3	0	0	1	3	0	0	0	0	0	0	0	1	0	0	8
12:00 PM	0	0	0	0	0	1	0	0	0	2	0	0	0	2	0	0	5
12:15 PM	0	2	0	0	1	0	0	0	0	0	0	0	0	1	0	0	4
12:30 PM	0	0	0	0	0	1	0	0	0	1	0	0	0	3	0	0	5
12:45 PM	0	1	0	0	1	0	0	0	0	2	0	0	0	1	0	0	5
Total	0	3	0	0	2	2	0	0	0	5	0	0	0	7	0	0	19
03:00 PM	0	1	3	0	0	1	0	0	0	0	0	0	0	0	0	0	5
03:15 PM	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4
03:30 PM	0	0	0	0	2	3	0	0	0	1	0	0	0	0	0	0	6
03:45 PM	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	2
Total	0	1	4	0	2	4	0	0	4	2	0	0	0	0	0	0	17
04:00 PM	0	0	0	0	0	1	0	0	0	2	0	0	0	3	0	0	6
04:15 PM	0	0	0	0	0	0	0	0	0	3	0	0	0	3	0	0	6
04:30 PM	0	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0	4
04:45 PM	0	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	7
Total	0	3	3	0	0	5	0	0	0	6	0	0	0	6	0	0	23
05:00 PM	1	3	0	0	0	4	0	0	0	1	0	0	1	1	0	0	11
05:15 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
05:30 PM	2	0	1	0	0	5	0	0	0	1	0	0	0	2	0	0	11
05:45 PM	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	4
Total	3	5	1	0	0	10	0	0	0	3	0	0	2	3	0	0	27
Grand Total	6	20	8	0	11	27	0	0	4	24	0	0	2	23	0	0	125
Apprch %	17.6	58.8	23.5	0.0	28.9	71.1	0.0	0.0	14.3	85.7	0.0	0.0	8.0	92.0	0.0	0.0	
Total %	4.8	16.0	6.4	0.0	8.8	21.6	0.0	0.0	3.2	19.2	0.0	0.0	1.6	18.4	0.0	0.0	

Cheyenne MPO
2101 O'Neil Ave
Cheyenne WY 82001

Counter:
Counted By:JSims
Weather:Cloudy 80*
Other:

File Name : CAREY&~2
Site Code : 00081507
Start Date : 8/15/2007
Page No : 1

Groups Printed- All Vehicles

	Carey Ave From North				8th Ave From East				Carey Ave From South				8th Ave From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
11:00 AM	13	16	6	4	7	11	1	1	8	21	1	1	0	17	15	0	122
11:15 AM	16	4	6	0	5	18	1	2	6	21	1	1	0	9	13	2	105
11:30 AM	27	18	6	4	2	14	3	0	7	22	1	0	1	12	14	0	131
11:45 AM	18	15	12	0	5	17	7	2	6	22	1	0	0	7	16	0	128
Total	74	53	30	8	19	60	12	5	27	86	4	2	1	45	58	2	486
12:00 PM	32	15	13	0	12	11	6	0	7	25	2	0	0	17	15	4	159
12:15 PM	14	17	8	0	9	18	4	0	9	21	0	0	1	15	16	0	132
12:30 PM	18	13	5	2	12	5	1	2	5	15	2	0	3	18	22	0	123
12:45 PM	26	24	7	4	8	12	6	2	5	13	2	0	1	21	14	0	145
Total	90	69	33	6	41	46	17	4	26	74	6	0	5	71	67	4	559
04:00 PM	22	16	8	0	8	12	3	0	5	17	0	0	2	15	21	0	129
04:15 PM	19	7	8	0	11	23	2	2	5	19	3	0	2	20	18	2	141
04:30 PM	33	18	15	0	11	12	3	0	4	14	0	0	1	17	20	0	148
04:45 PM	20	11	5	2	13	22	1	0	3	14	0	0	1	26	22	0	140
Total	94	52	36	2	43	69	9	2	17	64	3	0	6	78	81	2	558
05:00 PM	29	21	12	0	10	16	2	0	8	34	1	0	1	8	20	2	164
05:15 PM	18	15	6	0	10	18	2	2	5	25	0	0	2	11	17	3	134
05:30 PM	20	10	2	1	12	13	1	0	6	29	0	0	0	16	18	0	128
05:45 PM	10	9	10	0	12	10	4	0	5	20	0	1	0	8	19	1	109
Total	77	55	30	1	44	57	9	2	24	108	1	1	3	43	74	6	535
Grand Total	335	229	129	17	147	232	47	13	94	332	14	3	15	237	280	14	2138
Apprch %	47.2	32.3	18.2	2.4	33.5	52.8	10.7	3.0	21.2	74.9	3.2	0.7	2.7	43.4	51.3	2.6	
Total %	15.7	10.7	6.0	0.8	6.9	10.9	2.2	0.6	4.4	15.5	0.7	0.1	0.7	11.1	13.1	0.7	

Cheyenne MPO
2101 O'Neil Ave
Cheyenne WY 82001

Counter:
Counted By:JSims
Weather:Cloudy 80*
Other:

File Name : CAREY&~2
Site Code : 00081507
Start Date : 8/15/2007
Page No : 1

Groups Printed- Bikes

	Carey Ave From North				8th Ave From East				Carey Ave From South				8th Ave From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
11:15 AM	0	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	3
11:45 AM	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	0	1	0	1	1	0	0	0	1	0	0	0	0	0	0	4
12:00 PM	3	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	4
12:15 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
12:30 PM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
12:45 PM	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	3
Total	3	1	0	0	1	2	0	0	0	0	0	0	0	0	2	0	9
04:00 PM	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	3
04:15 PM	1	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	4
04:30 PM	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	3
04:45 PM	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	2
Total	2	2	1	0	3	1	0	0	1	1	0	0	1	0	0	0	12
05:00 PM	2	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	5
05:15 PM	1	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	4
05:30 PM	0	2	0	0	0	0	1	0	0	2	1	0	0	0	2	0	8
05:45 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
Total	3	2	1	0	2	0	1	0	0	6	1	0	0	0	3	0	19
Grand Total	8	5	3	0	7	4	1	0	1	8	1	0	1	0	5	0	44
Apprch %	50.0	31.3	18.8	0.0	58.3	33.3	8.3	0.0	10.0	80.0	10.0	0.0	16.7	0.0	83.3	0.0	
Total %	18.2	11.4	6.8	0.0	15.9	9.1	2.3	0.0	2.3	18.2	2.3	0.0	2.3	0.0	11.4	0.0	

APPENDIX B EXISTING CONDITIONS LEVEL OF SERVICE ANALYSES

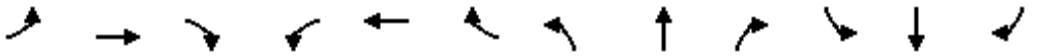
HCM Unsignalized Intersection Capacity Analysis
3: Carey Avenue & 8th Avenue

2/4/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	60	65	5	10	35	20	10	30	10	10	30	55
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	65	71	5	11	38	22	11	33	11	11	33	60
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												3
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	60			76			280	285	73	288	266	38
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	60			76			280	285	73	288	266	38
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			99			98	95	99	98	95	94
cM capacity (veh/h)	1544			1523			585	593	988	606	608	1034

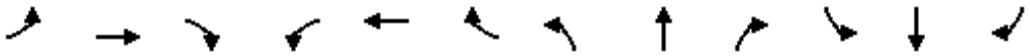
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	SB 1	SB 2
Volume Total	65	76	11	38	22	54	11	92
Volume Left	65	0	11	0	0	11	11	0
Volume Right	0	5	0	0	22	11	0	60
cSH	1544	1700	1523	1700	1700	643	606	1598
Volume to Capacity	0.04	0.04	0.01	0.02	0.01	0.08	0.02	0.06
Queue Length 95th (ft)	3	0	1	0	0	7	1	5
Control Delay (s)	7.4	0.0	7.4	0.0	0.0	11.1	11.0	9.6
Lane LOS	A		A			B	B	A
Approach Delay (s)	3.4		1.1			11.1	9.8	
Approach LOS						B	A	

Intersection Summary				
Average Delay	5.9			
Intersection Capacity Utilization	26.1%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	85	25	20	35	0	0	0	0	155	935	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0					4.0	4.0	4.0
Lane Util. Factor		0.95			0.95					1.00	0.95	1.00
Frt		0.97			1.00					1.00	1.00	0.85
Flt Protected		1.00			0.98					0.95	1.00	1.00
Satd. Flow (prot)		3419			3475					1770	3539	1583
Flt Permitted		1.00			0.82					0.95	1.00	1.00
Satd. Flow (perm)		3419			2907					1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	92	27	22	38	0	0	0	0	168	1016	38
RTOR Reduction (vph)	0	24	0	0	0	0	0	0	0	0	0	9
Lane Group Flow (vph)	0	95	0	0	60	0	0	0	0	168	1016	29
Turn Type		NA		Perm	NA					Perm	NA	Perm
Protected Phases		4			8						6	
Permitted Phases				8						6		6
Actuated Green, G (s)		6.0			6.0					46.0	46.0	46.0
Effective Green, g (s)		6.0			6.0					46.0	46.0	46.0
Actuated g/C Ratio		0.10			0.10					0.77	0.77	0.77
Clearance Time (s)		4.0			4.0					4.0	4.0	4.0
Vehicle Extension (s)		3.0			3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		341			290					1357	2713	1213
v/s Ratio Prot		c0.03									c0.29	
v/s Ratio Perm					0.02					0.09		0.02
v/c Ratio		0.28			0.21					0.12	0.37	0.02
Uniform Delay, d1		25.0			24.8					1.8	2.3	1.7
Progression Factor		1.00			0.56					1.00	1.00	1.00
Incremental Delay, d2		0.4			0.4					0.2	0.4	0.0
Delay (s)		25.4			14.3					2.0	2.7	1.7
Level of Service		C			B					A	A	A
Approach Delay (s)		25.4			14.3			0.0			2.6	
Approach LOS		C			B			A			A	

Intersection Summary			
HCM 2000 Control Delay	5.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	40.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



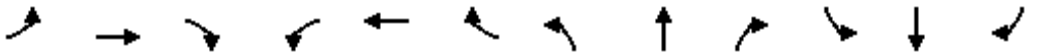
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	45	195	0	0	35	210	20	650	15	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0		4.0				
Lane Util. Factor	1.00	0.95			0.95	1.00		0.95				
Frt	1.00	1.00			1.00	0.85		1.00				
Flt Protected	0.95	1.00			1.00	1.00		1.00				
Satd. Flow (prot)	1770	3539			3539	1583		3523				
Flt Permitted	0.73	1.00			1.00	1.00		1.00				
Satd. Flow (perm)	1362	3539			3539	1583		3523				
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	49	212	0	0	38	228	22	707	16	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	180	0	2	0	0	0	0
Lane Group Flow (vph)	49	212	0	0	38	48	0	743	0	0	0	0
Turn Type	Perm	NA			NA	Perm	Perm	NA				
Protected Phases		4			8			2				
Permitted Phases	4					8	2					
Actuated Green, G (s)	9.3	9.3			9.3	9.3		42.7				
Effective Green, g (s)	9.3	9.3			9.3	9.3		42.7				
Actuated g/C Ratio	0.16	0.16			0.16	0.16		0.71				
Clearance Time (s)	4.0	4.0			4.0	4.0		4.0				
Vehicle Extension (s)	3.0	3.0			3.0	3.0		3.0				
Lane Grp Cap (vph)	211	548			548	245		2507				
v/s Ratio Prot		c0.06			0.01							
v/s Ratio Perm	0.04					0.03		0.21				
v/c Ratio	0.23	0.39			0.07	0.20		0.30				
Uniform Delay, d1	22.2	22.8			21.7	22.1		3.2				
Progression Factor	1.23	1.19			1.00	1.00		1.00				
Incremental Delay, d2	0.6	0.5			0.1	0.4		0.3				
Delay (s)	27.8	27.6			21.7	22.5		3.5				
Level of Service	C	C			C	C		A				
Approach Delay (s)		27.6			22.4			3.5			0.0	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	12.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	45.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	90	70	5	15	65	40	5	90	20	50	50	120
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	98	76	5	16	71	43	5	98	22	54	54	130
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												3
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	114			82			405	421	79	446	380	71
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	114			82			405	421	79	446	380	71
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	93			99			99	80	98	87	89	87
cM capacity (veh/h)	1475			1516			418	484	982	407	510	992

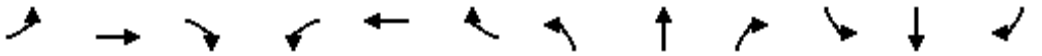
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	SB 1	SB 2
Volume Total	98	82	16	71	43	125	54	185
Volume Left	98	0	16	0	0	5	54	0
Volume Right	0	5	0	0	43	22	0	130
cSH	1475	1700	1516	1700	1700	527	407	1405
Volume to Capacity	0.07	0.05	0.01	0.04	0.03	0.24	0.13	0.13
Queue Length 95th (ft)	5	0	1	0	0	23	11	11
Control Delay (s)	7.6	0.0	7.4	0.0	0.0	14.0	15.2	10.3
Lane LOS	A		A			B	C	B
Approach Delay (s)	4.2		0.9			14.0	11.4	
Approach LOS						B	B	

Intersection Summary				
Average Delay	7.9			
Intersection Capacity Utilization	28.4%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	130	40	35	85	0	0	0	0	220	915	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0					4.0	4.0	4.0
Lane Util. Factor		0.95			0.95					1.00	0.95	1.00
Frt		0.96			1.00					1.00	1.00	0.85
Flt Protected		1.00			0.99					0.95	1.00	1.00
Satd. Flow (prot)		3415			3488					1770	3539	1583
Flt Permitted		1.00			0.82					0.95	1.00	1.00
Satd. Flow (perm)		3415			2907					1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	141	43	38	92	0	0	0	0	239	995	98
RTOR Reduction (vph)	0	37	0	0	0	0	0	0	0	0	0	26
Lane Group Flow (vph)	0	147	0	0	130	0	0	0	0	239	995	72
Turn Type		NA		Perm	NA					Perm	NA	Perm
Protected Phases		4			8						6	
Permitted Phases				8						6		6
Actuated Green, G (s)		7.9			7.9					44.1	44.1	44.1
Effective Green, g (s)		7.9			7.9					44.1	44.1	44.1
Actuated g/C Ratio		0.13			0.13					0.74	0.74	0.74
Clearance Time (s)		4.0			4.0					4.0	4.0	4.0
Vehicle Extension (s)		3.0			3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		449			382					1300	2601	1163
v/s Ratio Prot		0.04									c0.28	
v/s Ratio Perm					c0.04					0.14		0.05
v/c Ratio		0.33			0.34					0.18	0.38	0.06
Uniform Delay, d1		23.6			23.7					2.4	2.9	2.2
Progression Factor		1.00			0.74					1.00	1.00	1.00
Incremental Delay, d2		0.4			0.5					0.3	0.4	0.1
Delay (s)		24.1			18.1					2.7	3.4	2.3
Level of Service		C			B					A	A	A
Approach Delay (s)		24.1			18.1			0.0			3.2	
Approach LOS		C			B			A			A	

Intersection Summary			
HCM 2000 Control Delay	6.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	43.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	130	220	0	0	80	460	40	1240	35	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0		4.0				
Lane Util. Factor	1.00	0.95			0.95	1.00		0.95				
Frt	1.00	1.00			1.00	0.85		1.00				
Flt Protected	0.95	1.00			1.00	1.00		1.00				
Satd. Flow (prot)	1770	3539			3539	1583		3520				
Flt Permitted	0.70	1.00			1.00	1.00		1.00				
Satd. Flow (perm)	1300	3539			3539	1583		3520				
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	141	239	0	0	87	500	43	1348	38	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	24	0	3	0	0	0	0
Lane Group Flow (vph)	141	239	0	0	87	476	0	1426	0	0	0	0
Turn Type	Perm	NA			NA	Perm	Perm	NA				
Protected Phases		4			8			2				
Permitted Phases	4					8	2					
Actuated Green, G (s)	19.5	19.5			19.5	19.5		32.5				
Effective Green, g (s)	19.5	19.5			19.5	19.5		32.5				
Actuated g/C Ratio	0.32	0.32			0.32	0.32		0.54				
Clearance Time (s)	4.0	4.0			4.0	4.0		4.0				
Vehicle Extension (s)	3.0	3.0			3.0	3.0		3.0				
Lane Grp Cap (vph)	422	1150			1150	514		1906				
v/s Ratio Prot		0.07			0.02							
v/s Ratio Perm	0.11					c0.30		0.41				
v/c Ratio	0.33	0.21			0.08	0.93		0.75				
Uniform Delay, d1	15.3	14.7			14.0	19.5		10.6				
Progression Factor	1.23	1.22			1.00	1.00		1.00				
Incremental Delay, d2	0.5	0.1			0.0	22.6		2.7				
Delay (s)	19.4	18.0			14.0	42.2		13.3				
Level of Service	B	B			B	D		B				
Approach Delay (s)		18.5			38.0			13.3			0.0	
Approach LOS		B			D			B			A	

Intersection Summary			
HCM 2000 Control Delay	20.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX C 8TH AVENUE/CAREY AVENUE SIGNAL WARRANT AND ALL WAY STOP WARRANT EVALUATION

Warrant 1 - Eight-Hour Vehicular Volume (Condition B)

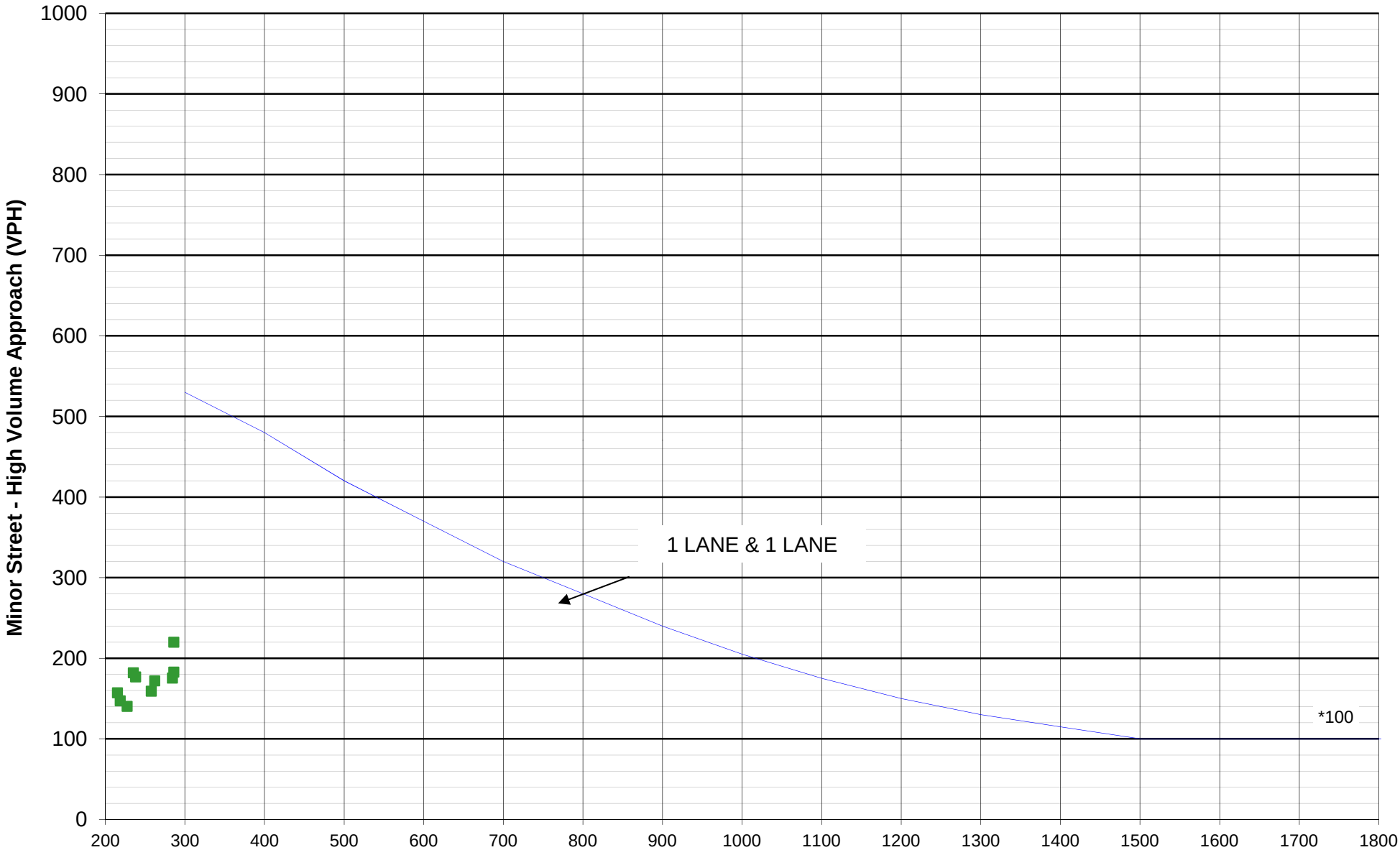
Time Begins	8th Avenue			Carey
	Eastbound	Westbound	Total	Southbound
12:00 AM	9	9	18	10
1:00 AM	6	6	12	7
2:00 AM	2	2	4	2
3:00 AM	2	2	4	2
4:00 AM	6	6	12	7
5:00 AM	22	22	43	24
6:00 AM	58	48	106	65
7:00 AM	95	62	157	93
8:00 AM	124	62	186	96
9:00 AM	75	140	215	157
10:00 AM	72	123	195	138
11:00 AM	145	93	238	177
12:00 PM	173	89	262	172
1:00 PM	131	87	219	147
2:00 PM	108	75	184	122
3:00 PM	137	98	235	182
4:00 PM	162	124	286	183
5:00 PM	163	123	286	220
6:00 PM	156	128	284	176
7:00 PM	142	116	258	159
8:00 PM	125	102	227	140
9:00 PM	87	87	174	98
10:00 PM	52	52	105	59
11:00 PM	38	38	77	43
Total	**2,091**	**1,694**	**3,786**	**2,481**

Condition met (major street > 500 and minor street > 150)

Warrant 2, Four Hour Vehicular Volume, 8th Avenue/Carey Avenue

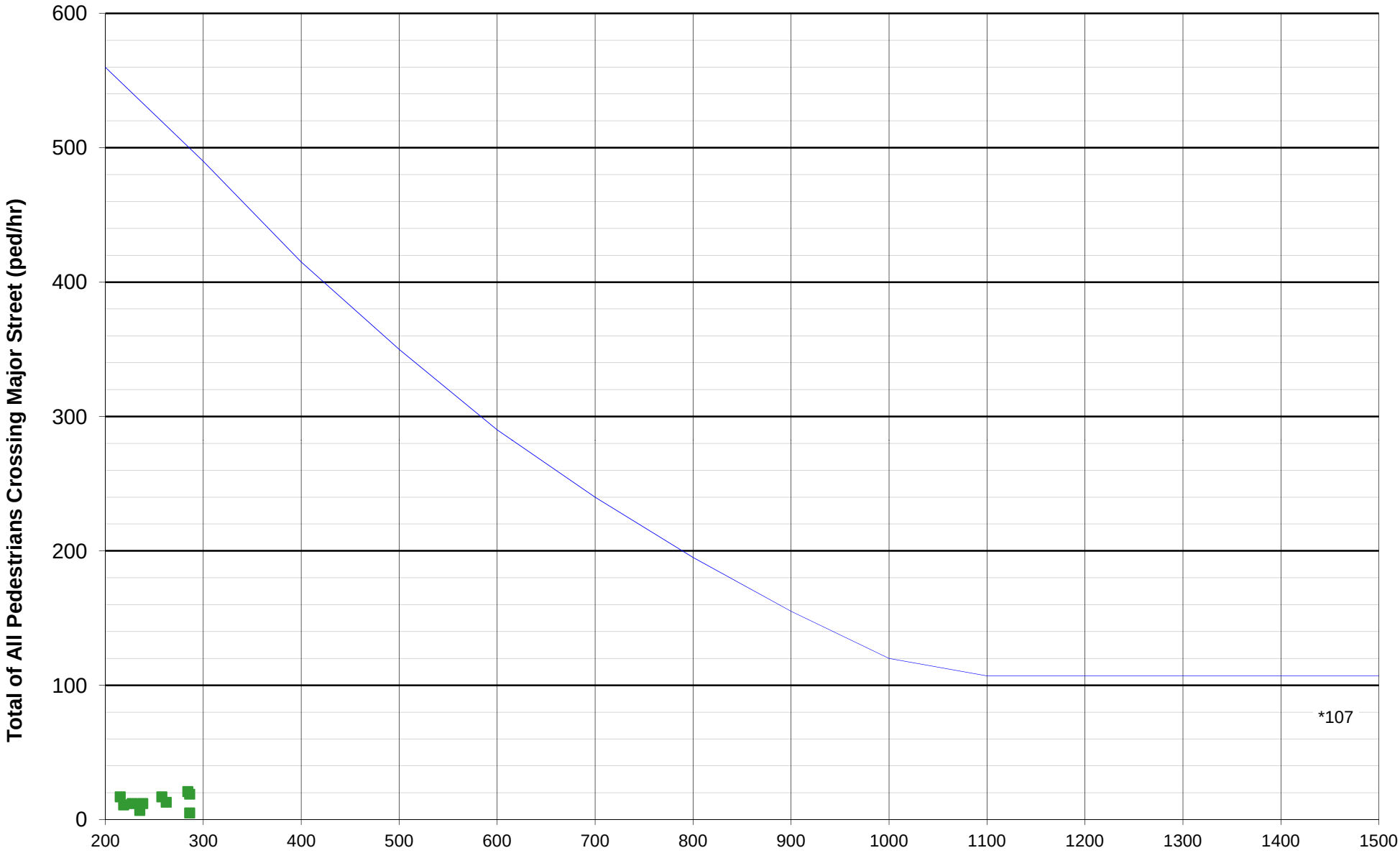
*Note: 80 vph applies as the lower threshold volume for a minor street approach with one lane.

Warrant 3, Peak Hour Vehicular Volume, 8th Avenue/Carey Avenue



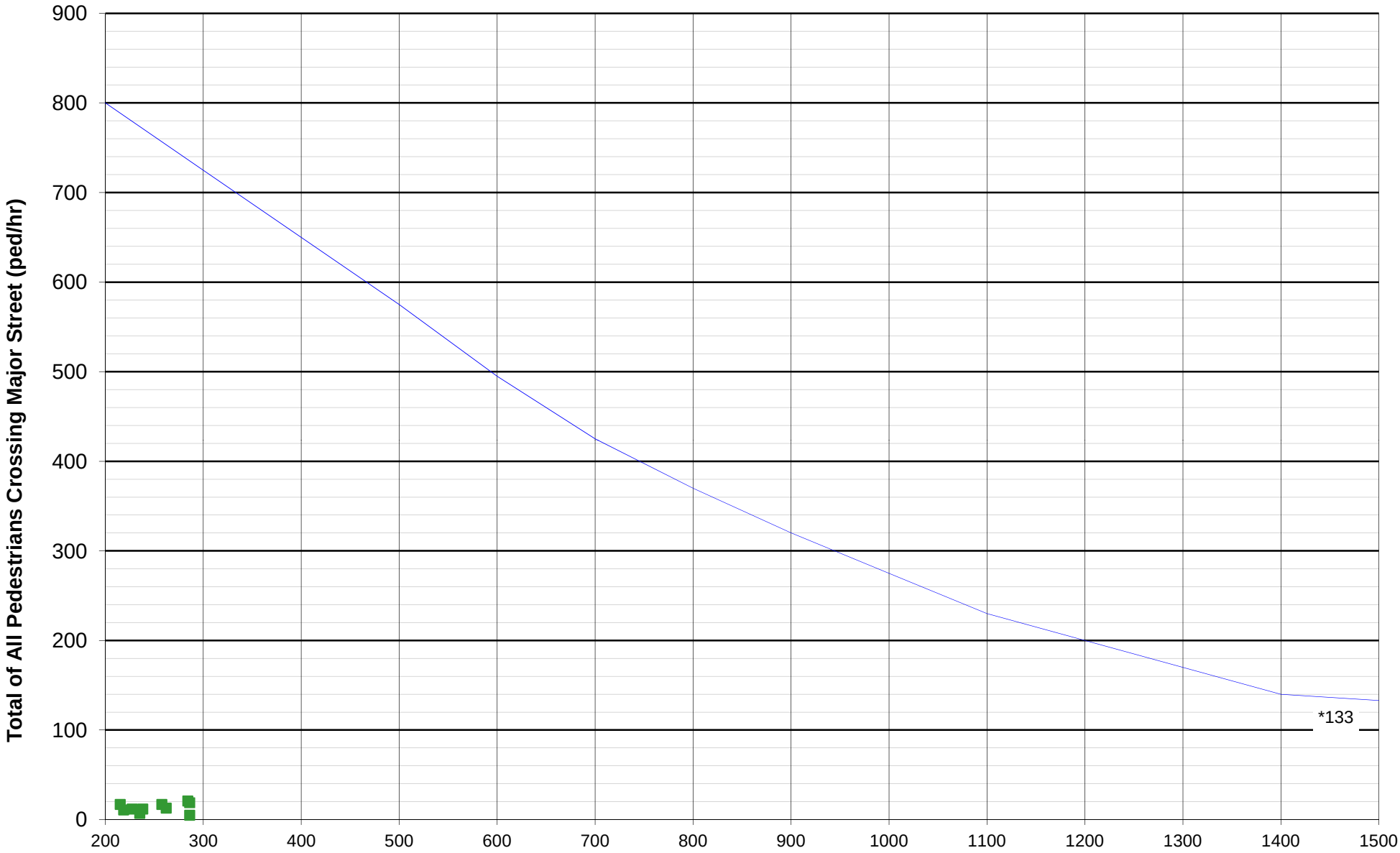
*Note: 100 vph applies as the lower threshold volume for a minor street approach with one lane.

Warrant 4A. Pedestrian Four-Hour Volume, 8th Avenue/Carey Avenue



*Note: 107 ped/hr applies as the lower threshold volume for pedestrians crossing the major street.

Warrant 4B. Pedestrian Peak Hour Volume, 8th Avenue/Carey Avenue



*Note: 133 ped/hr applies as the lower threshold volume for pedestrians crossing the major street.

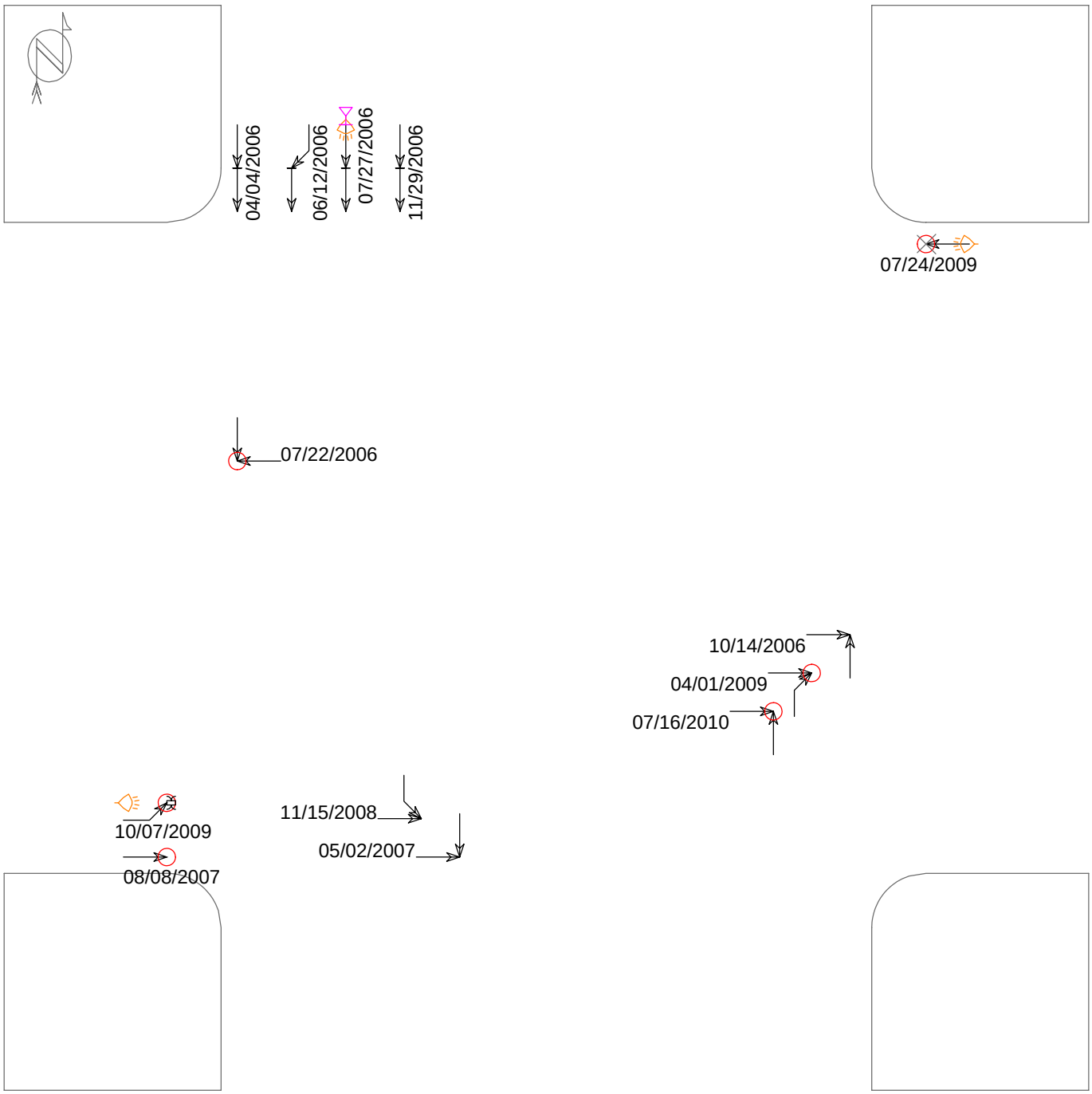
All-Way Stop Warrant

	8th Avenue			Carey			
Time Begins	**Eastbound**	**Westbound**	**Total**	**Southbound**	**Northbound**	**Pedestrians**	**Total**
12:00 AM	9	9	18	10	5		15
1:00 AM	6	6	12	7	4		10
2:00 AM	2	2	4	2	1		4
3:00 AM	2	2	4	2	1		4
4:00 AM	6	6	12	7	4		11
5:00 AM	22	22	43	24	13		37
6:00 AM	58	48	106	65	35		100
7:00 AM	95	62	157	93	45	18	156
8:00 AM	124	62	186	96	48	20	164
9:00 AM	75	140	215	157	84	17	258
10:00 AM	72	123	195	138	74	14	226
11:00 AM	145	93	238	177	100	12	289
12:00 PM	173	89	262	172	113	13	298
1:00 PM	131	87	219	147	78	11	237
2:00 PM	108	75	184	122	65	9	196
3:00 PM	137	98	235	182	87	7	276
4:00 PM	162	124	286	183	87	5	275
5:00 PM	163	123	286	220	118	19	357
6:00 PM	156	128	284	176	94	21	290
7:00 PM	142	116	258	159	85	17	261
8:00 PM	125	102	227	140	75	12	227
9:00 PM	87	87	174	98	52		150
10:00 PM	52	52	105	59	31		90
11:00 PM	38	38	77	43	23		66
Total	**2,091**	**1,694**	**3,786**	**2,481**	**1,321**	**195**	**3,996**

Condition met (major street > 300 and minor street > 200)

14 Accidents

8th Ave & Carey Ave
01/01/06 - 12/31/10



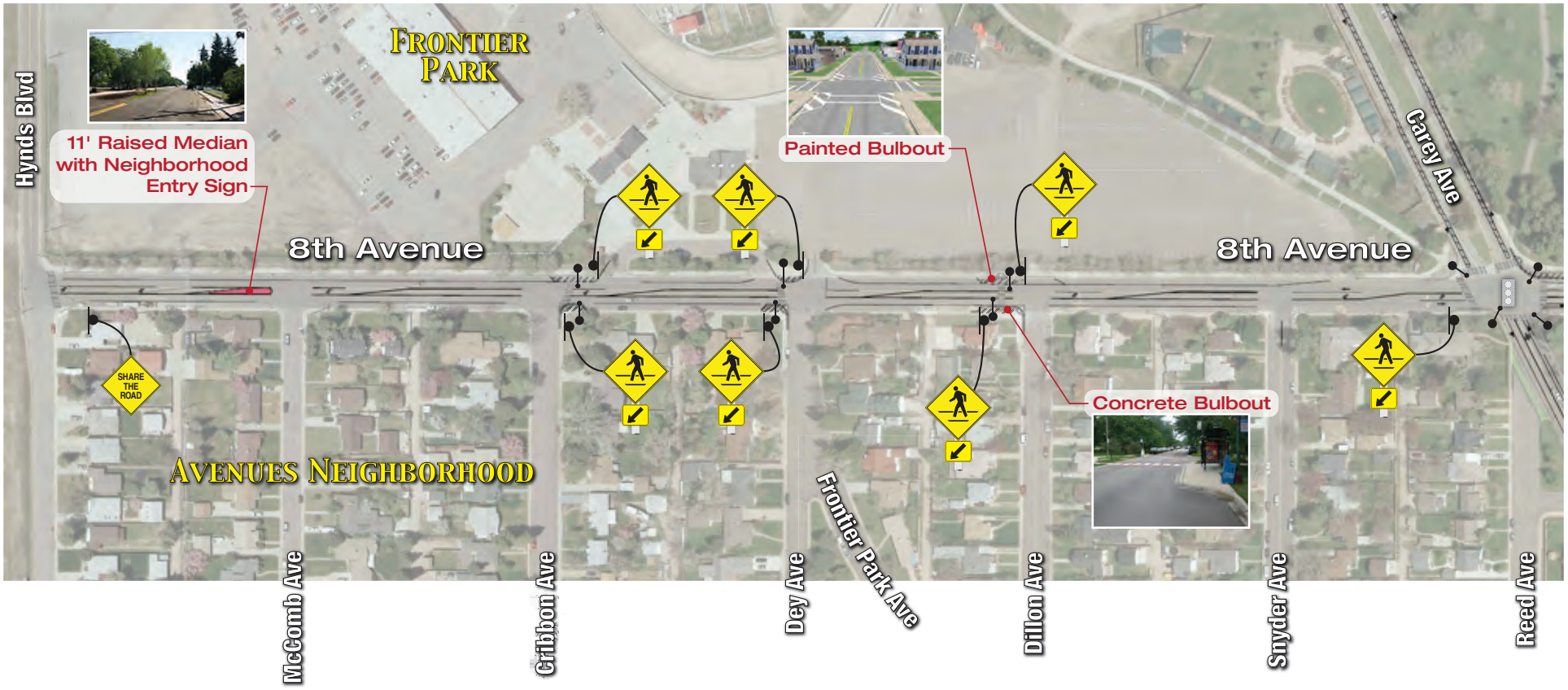
(clear filter), (1) accidents with insufficient data for display

Straight	Parked	Pedestrian	Fixed objects:
Stopped	Erratic	Bicycle	General, Pole
Unknown	Out of control	Injury	Signal, Curb
Backing	Right turn	Fatality	Tree, Animal
Overtaking	Left turn	Nighttime	3rd vehicle
Sideswipe	U-turn	DUI	Extra data

APPENDIX D ALTERNATE ROADWAY SECTIONS

Figure D-1

Segment 1: Alternate Long Term Roadway Option



N W E S

DRAFT

Not to Scale

FELSBURG HOLT & ULLEVIG

8th Avenue Corridor Plan

Figure D-2

Segment 2: Alternate Long Term Roadway Option

N W E S

DRAFT

Not to Scale

FELSBURG HOLT & ULLEVIG

Figure D-3

Segment: Carey Avenue Intersection Alternate Long Term Option

N
W E
S

DRAFT

Not to Scale

FELSBURG HOLT & ULLEVIG

APPENDIX E OTHER CAREY AVENUE INTERSECTION ALIGNMENT ALTERNATIVES CONSIDERED