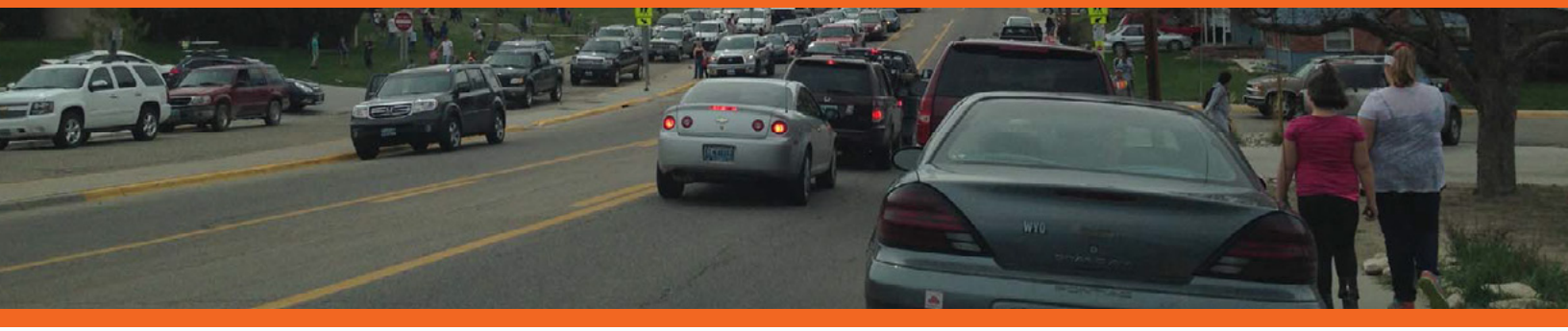
Draft Report

October 2013



15th and 21st Street Subarea Study

KLJ

CASPER AREA
METROPOLITAN PLANNING ORGANIZATION
Casper - Mills - Evansville - Bar Nunn - Natrona County

TABLE OF CONTENTS

TABLE OF CONTENTS

Figures

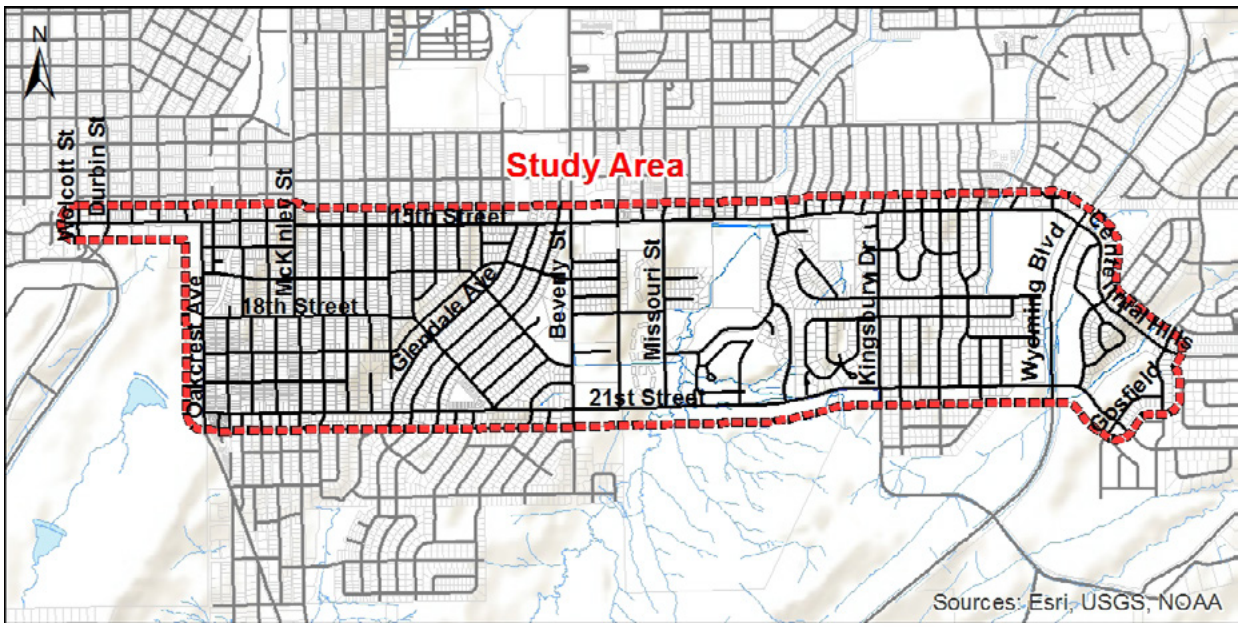
Tables

This page intentionally left blank.

The City of Casper is in a period of growth and prosperity. Private investment is driving development across the metropolitan area, and Casper's exponential growth is no more evident than the area encapsulated by the following two study corridors (illustrated in Figure E.1):

- 15th Street (Centennial Hills Boulevard east of Wyoming Boulevard) between Wolcott Street and Waterford Street
- 21st Street (Centennial Village Drive east of Wyoming Boulevard) between Oakcrest Avenue and Gosfield Street

Figure E.1 – Study Area



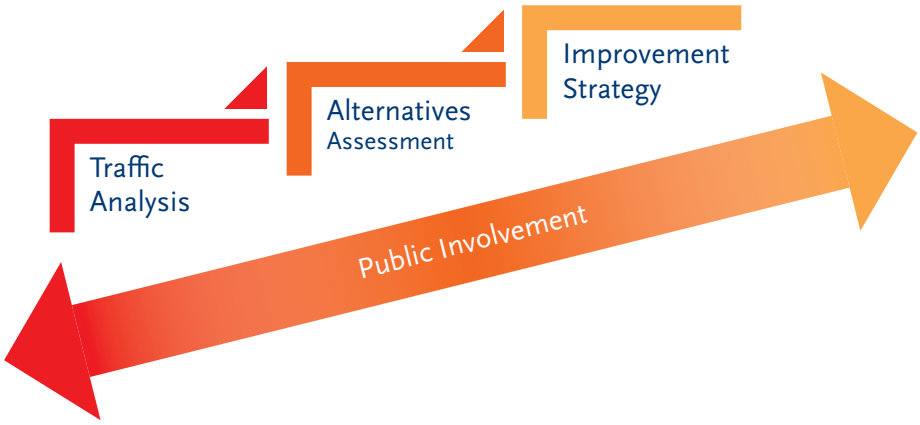
The 15th and 21st Street corridors present a complex mix of competing needs. The corridors are residential in nature with driveways accessing each corridor and multiple schools throughout the study area. Normally, under these circumstances it is desirable to reduce auto-activity to create a pedestrian and bicycle-friendly setting. This is conflicted by the fact that more than 25 percent of Casper's population resides within the study area with minimal alternative land uses. These characteristics create auto-dependency by forcing residents to travel long distances to work, shop and dine. Furthermore, constrained corridor rights-of-way (ROW) complicated efforts to fully accommodate all modes of transportation.

A corridor vision and study goals were developed to appropriately prioritize desired corridor outcomes as identified by local residents and key stakeholders.

> *The vision for the 15th and 21st Street corridors is to develop a multimodal corridor that provides the efficient movement of traffic, operates in an attractive and safe setting for pedestrians and bicyclists of all levels of capability and maintains the character of the surrounding residential neighborhoods.*

To meet study goals, a multifaceted planning approach was developed for this study (illustrated in Figure E.2).

Figure E.2 – Study Approach



First, traffic analysis was completed to identify current and forecasted infrastructure deficiencies. During this phase of the project, the public was involved through a public input meeting to help identify and prioritize infrastructure deficiencies. Figure E.3 illustrates the critical transportation deficiencies that must be mitigated to achieve the corridor vision outlined above. Major deficiencies include congestion at nine bottleneck locations, overrepresented crash patterns at three intersections, nonexistent bicycle facilities throughout the majority of the study area and substandard pedestrian facilities. Additional opportunities for improvement were identified within the body of the report.

Next, based upon the infrastructure deficiencies identified during the traffic analysis phase of the study, several improvement alternatives were evaluated. Alternatives were assessed in collaboration with Casper Metropolitan Planning Organization (MPO) staff, City of Casper staff and the general public. Alternative assessment and justification for recommended improvements are documented in the body of the report.

Finally, once deficiencies were identified and mitigation strategies developed and refined, a final improvement plan was developed and presented to the City Council and Casper MPO committees (MPO Policy Committee, Technical Committee and Citizen's Advisory Committee) for final input and approval.

The final improvement plan included a mix of spot improvements and corridor-wide improvements. Spot improvements, illustrated in Figures E.4-E.6, were segregated into two implementation time frames based upon the following triggers.

» Immediate: Improvement strategies that fall under the Immediate implementation time frame are policy-based strategies that can be implemented with minimal costs. Policy-based strategies are designed to set baseline requirements for residents, developers, stakeholders and decision makers to ensure the corridor vision is achieved in an organized and congruent manner.

» Short-Term: The time period from 2014 (the first applicable construction season) to 2024 (the final construction season prior to the anticipated study area build-out year of 2025).

  Improvements are implemented in this time frame if one of the following triggers are met:

  - Safety improvement triggered by historic crash trends over the past three years. Improvements are triggered if the intersection has a crash rate greater than 1 crash per every 1 million entering vehicles.
  - Capacity improvement triggered by traffic operations deficiencies under existing 2013 and forecasted 2025 traffic conditions. Improvement is triggered if intersection LOS is "D" or worse.
  - Key pedestrian and/or bicycle facilities gaps that can be mitigated without complete road reconstruction

» Long-Term: The time period from 2025 to 2040 (study horizon). This period includes all capacity improvements triggers by traffic operations deficiencies forecasted under 2040 traffic conditions. Improvement is triggered if intersection LOS is "D" or worse.

» Detailed Prioritization: Detailed prioritization of short and long-term spot improvements are sensitive to the improvement location and pace of surrounding development. Therefore, priorities between projects in short-term or long-term timeframes should be in response to development activities. To assist local budgeting efforts, linear growth between 2013, 2025 and 2040 traffic conditions was completed to estimate years when improvements will be triggered.

Dependent upon the type of improvement or deficiency, triggers may be based upon the year traffic volumes are forecasted to meet traffic control warrants or the year intersection or approach traffic operations no longer meet level of service standards. It is important to note trigger years are for planning purposes only, actual growth will not be linear but rather depend upon development activities.

Spot safety improvements are preexisting deficiencies and therefore prioritized for the next construction season (2014). This ensures that safety improvements are implemented prior to improvements predicated upon motorist, pedestrian or bicycle convenience. Actual implementation is dependent upon funding availability and regional priorities.

Unlike spot improvements triggered by specific events, corridor-wide improvement implementation is **Contingent Upon Roadway/ Utility Improvement Schedule,** the reason being that corridor-wide improvements are large-scale cost intensive improvement strategies. Due to the significant scope of these projects, it is critical the improvements be coordinated with planned roadway rehabilitation or underground utility improvement schedules; this prevents unnecessarily redundant construction. Due to the lack of future capital improvement information beyond immediate years in Casper, specific years were not assigned to this period.

Figure E.7 illustrates the corridor-wide improvement plan and includes project costs for each improvement recommended in this study. Costs for the short and long-term periods are provided for both 2013 values and inflated to the middle of the implementation period.

Upon implementation of the recommendations proposed in this study, the corridor vision will be achieved. Specifically, recommendations of the report accommodated each travel mode in the following ways:

Vehicular Traffic: Through a variety of capacity improvements, corridor cross-section revisions, approach realignments and traffic control enhancements, the study provides a strategy for safe and efficient movement of vehicular travel in the study area through study year 2040. Specifically, safety spot improvements are recommended at 3 intersections, congestion mitigation strategies implemented at 9 intersections and the cross-section revisions are recommended throughout the entirety of the study area from two lanes with parking to two lanes with a center left-turn lane.

Pedestrians: The proposed improvement strategy developed in this report alleviates sidewalk gaps, improves existing sidewalks to meet ADA curb ramp, width and sideslope standards and recommends a sidewalk buffer from abutting traffic to increase pedestrian comfort throughout the corridor.

Bicyclists: Bike lanes are recommended throughout the entirety of 15th and 21st Streets within the study area. The only exception being a small section of 21st Street where right-of-way is not available so facilities are routed one block north. Currently only 20% of the 15th and 21st Streets within the study area have bicycle facilities.

Transit: An evaluation of population density was completed to assist in future transit routing decisions. Based upon analysis results, CATC officials can make informed decisions regarding future bus routes and stop locations.

This page intentionally left blank.

Figure E.3 – Study Area Deficiencies

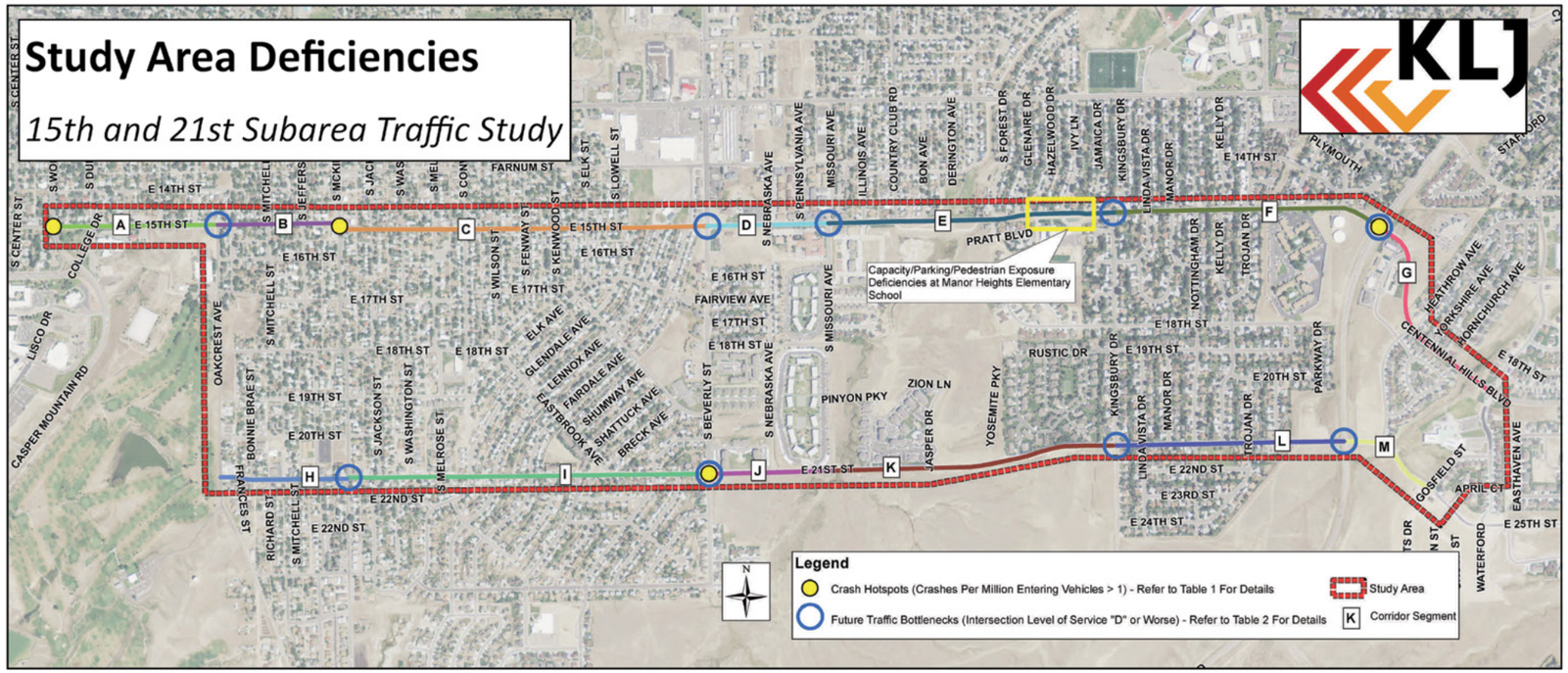
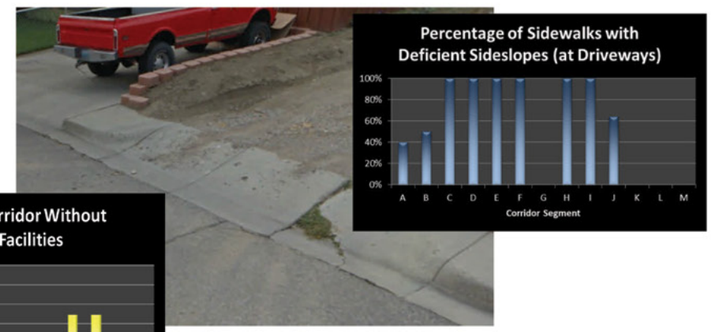
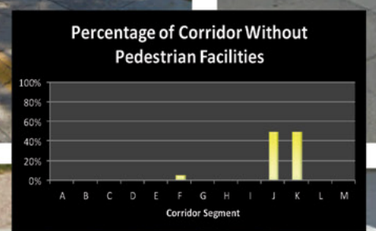
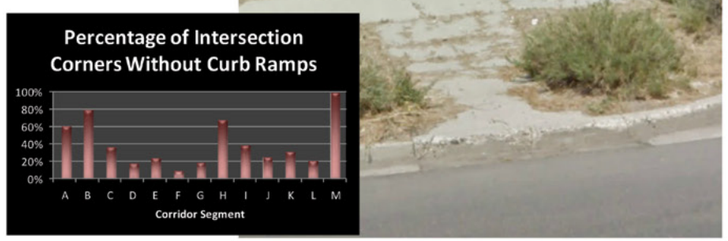


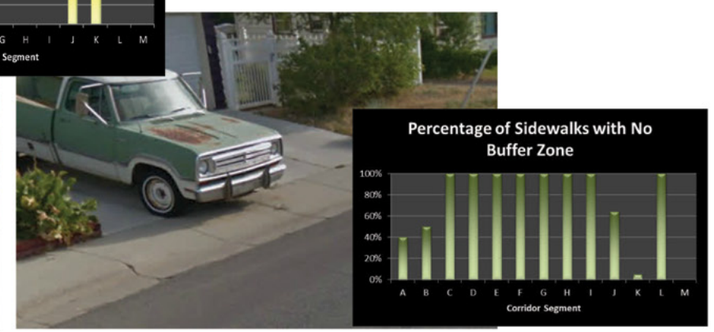
TABLE 1 - Crash Hotspot		
Corridor	Intersection	Overrepresented Crash Pattern
15th Street	Wolcott Street	Angled Crashes (Distributed throughout Approaches)
	McKinley Street	Angled and Sideswipe Crashes (Primarily for Movement Navigating Skewed Intersection and from Kum and Go Parking Lot)
	Wyoming Boulevard	Angled Crashes (Specifically NB Through vs. SB Left-Turn) and Rear-End Crashes (Distributed throughout Approaches)
21th Street	Beverly Street	Crash Patterns Specific to Two-Way Stop Control (Recently Revised to All-Way Stop Control)

TABLE 2 - Traffic Bottlenecks				
Corridor	Intersection	Level of Service		
		2013	2025	2040
15th Street	Oakcrest Avenue	A	C	F
	Beverly Street	B	C	D
	Missouri Avenue	B	C	E
	Kingsbury Drive	A	E	F
	Wyoming Boulevard	B	C	E
21th Street	McKinley Street	B	C	F
	Beverly Street	C	F	F
	Kingsbury Drive	A	C	E
	Wyoming Boulevard	A	C	E









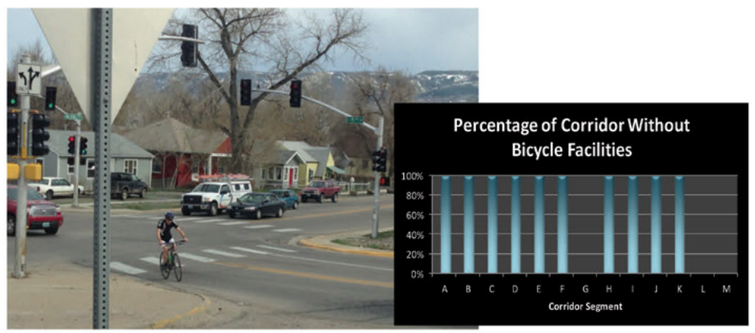
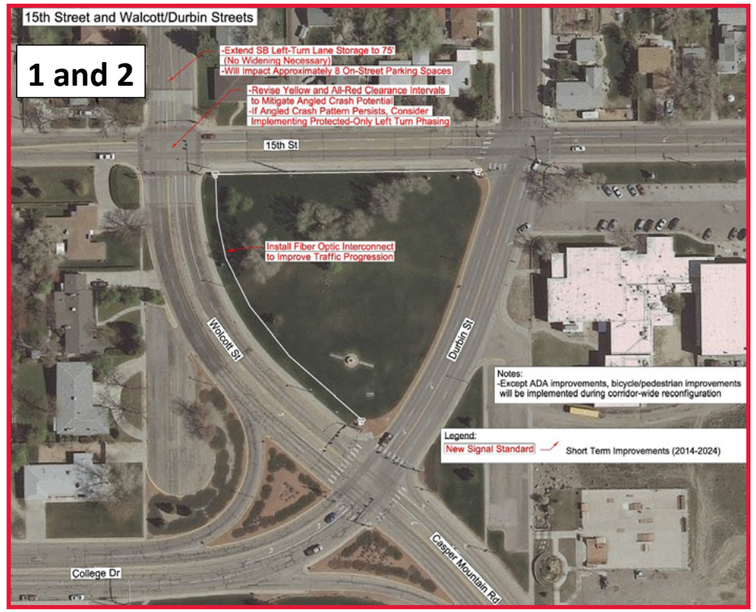
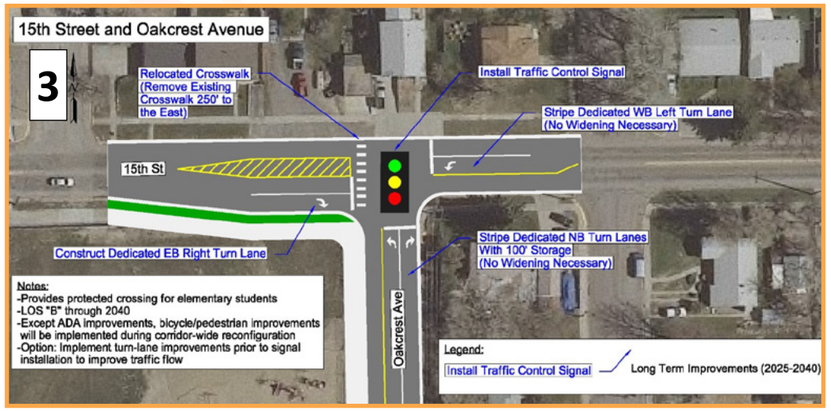
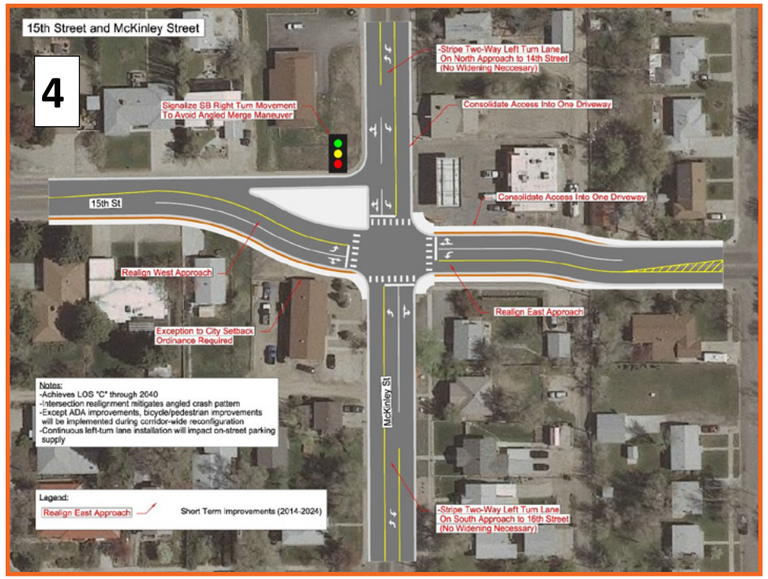
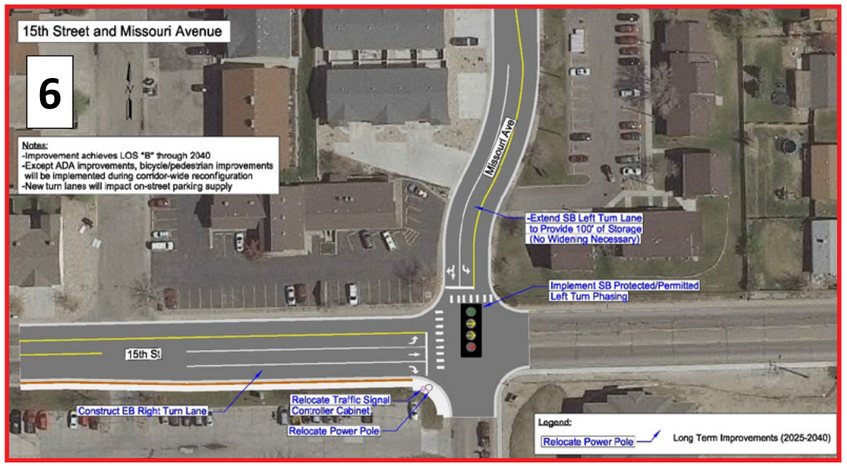


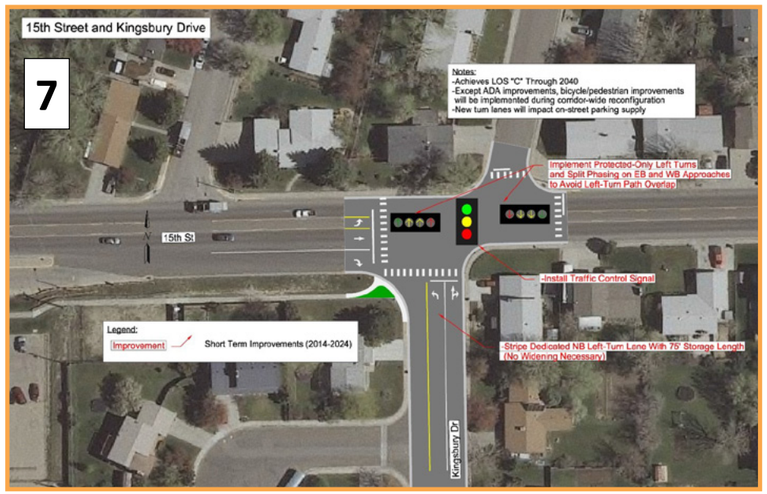
Figure E.4 – Spot Improvement Plan (Page 1 of 2)

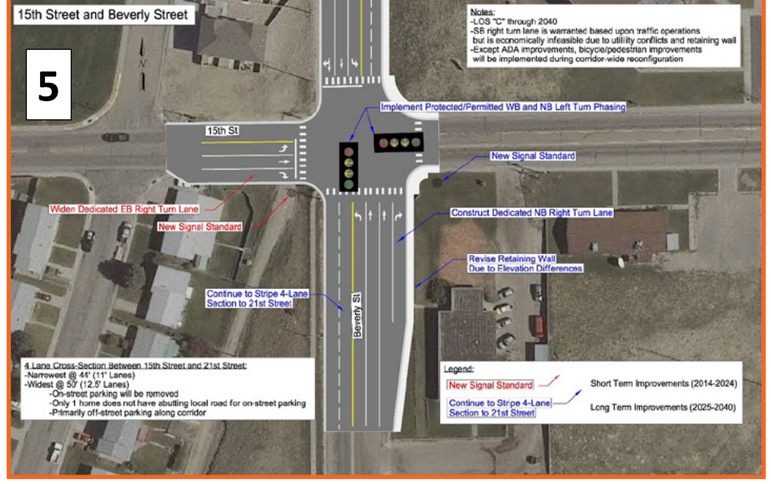


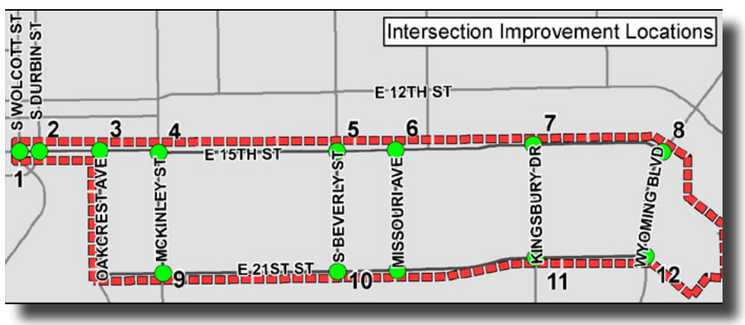


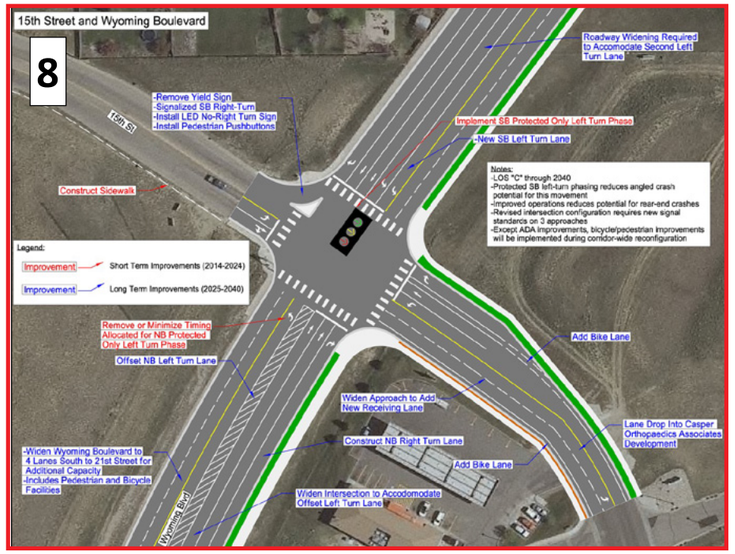


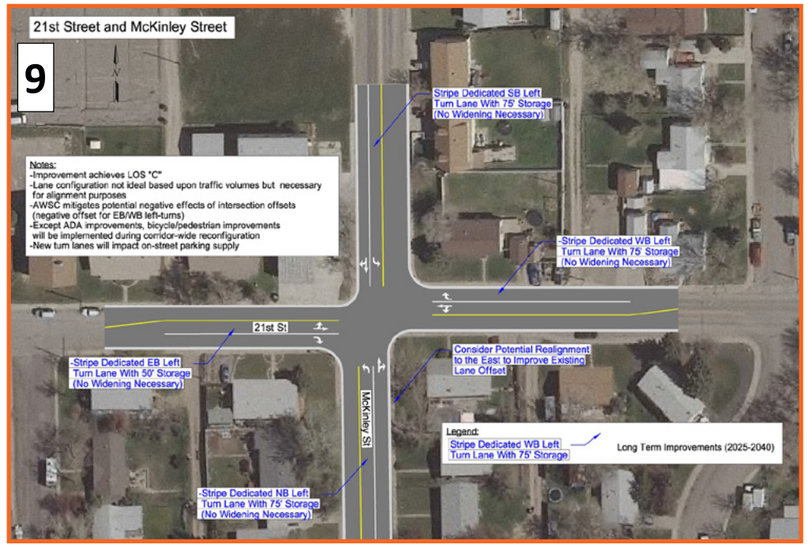


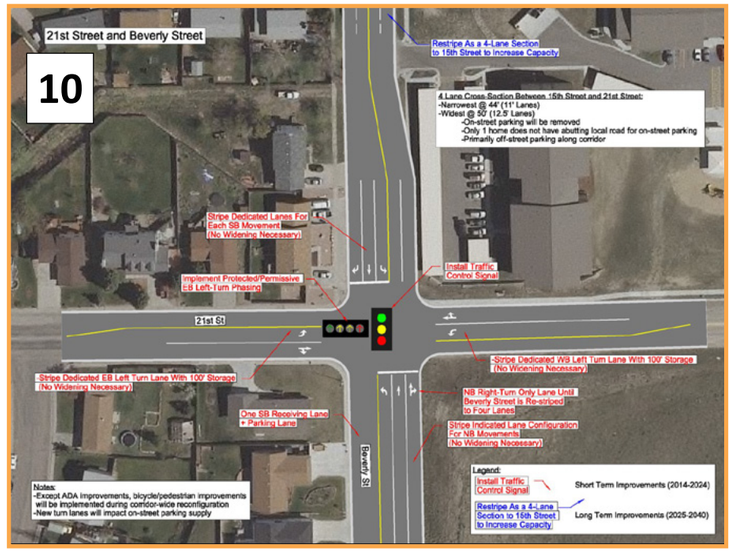


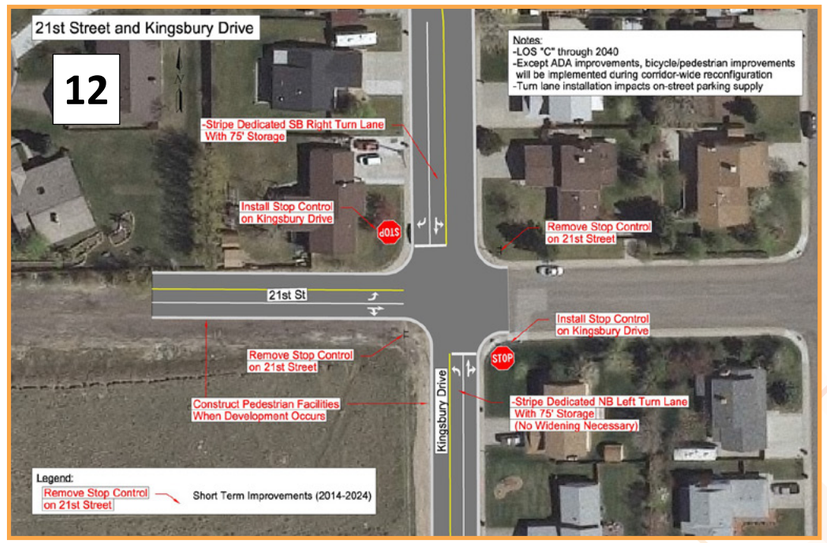


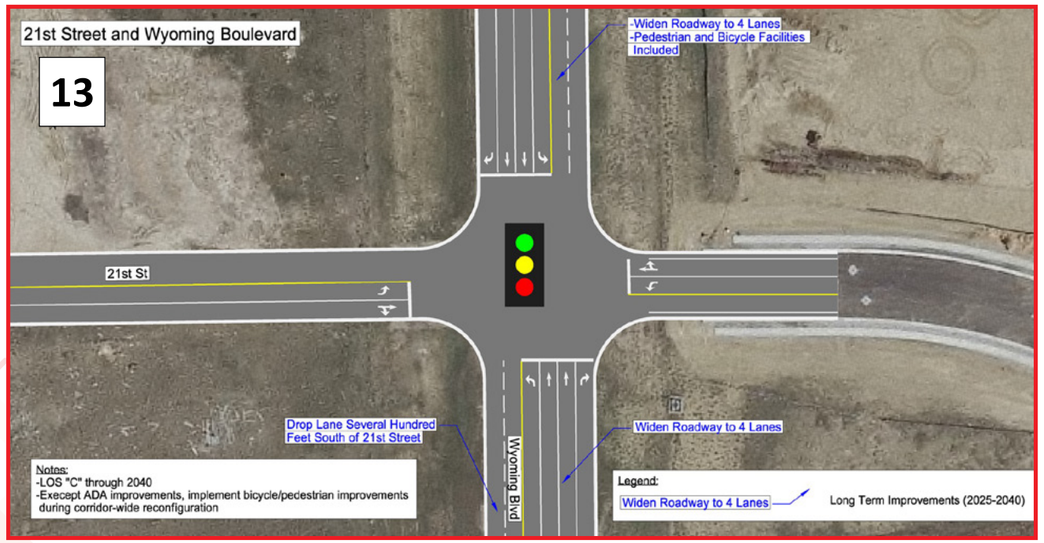



15th Street and Wyoming Boulevard
8
-Remove Yield Sign
-Signalized SB Right-Turn
-Install LED No-Right Turn Sign
-Install Pedestrian Pushbuttons
Roadway Widening Required to Accomodate Second Left Turn Lane
Implement SB Protected Only Left Turn Phase
-New SB Left Turn Lane
Notes:
-LOS "C" through 2040
-Protected SB left-turn phasing reduces angled crash potential for this movement
-Improved operations reduces potential for rear-end crashes
-Revised intersection configuration requires new signal standards on 3 approaches
-Except ADA improvements, bicycle/pedestrian improvements will be implemented during corridor-wide reconfiguration
Construct Sidewalk
Legend:
Improvement
Short Term Improvements (2014-2024)
Improvement
Long Term Improvements (2025-2040)
Remove or Minimize Timing Allocated for NB Protected Only Left Turn Phase
Offset NB Left Turn Lane
Add Bike Lane
Widen Approach to Add New Receiving Lane
Lane Drop Into Casper Orthopaedics Associates Development
-Widen Wyoming Boulevard to 4 Lanes South to 21st Street for Additional Capacity
-Includes Pedestrian and Bicycle Facilities
Construct NB Right Turn Lane
Add Bike Lane
Widen Intersection to Accodomodate Offset Left Turn Lanes
15th St
Wyoming Blvd


21st Street and McKinley Street
9
Stripe Dedicated SB Left Turn Lane With 75' Storage (No Widening Necessary)
Notes:
-Improvement achieves LOS "C"
-Lane configuration not ideal based upon traffic volumes but necessary for alignment purposes
-AWSC mitigates potential negative effects of intersection offsets (negative offset for EB/WB left-turns)
-Except ADA improvements, bicycle/pedestrian improvements will be implemented during corridor-wide reconfiguration
-New turn lanes will impact on-street parking supply
-Stripe Dedicated WB Left Turn Lane With 75' Storage (No Widening Necessary)
21st St
-Stripe Dedicated EB Left Turn Lane With 50' Storage (No Widening Necessary)
Consider Potential Realignment to the East to Improve Existing Lane Offset
McKinley St
Legend:
Stripe Dedicated WB Left Turn Lane With 75' Storage
Long Term Improvements (2025-2040)
-Stripe Dedicated NB Left Turn Lane With 75' Storage (No Widening Necessary)


21st Street and Beverly Street
10
Restripe As a 4-Lane Section to 15th Street to Increase Capacity
4 Lane Cross-Section Between 15th Street and 21st Street:
-Narrowest @ 44' (11' Lanes)
-Widest @ 50' (12.5' Lanes)
-On-street parking will be removed
-Only 1 home does not have abutting local road for on-street parking
-Primarily off-street parking along corridor
Stripe Dedicated Lanes For Each SB Movement (No Widening Necessary)
Implement Protected/Permissive EB Left-Turn Phasing
Install Traffic Control Signal
21st St
-Stripe Dedicated WB Left Turn Lane With 100' Storage (No Widening Necessary)
-Stripe Dedicated EB Left Turn Lane With 100' Storage (No Widening Necessary)
NB Right-Turn Only Lane Until Beverly Street is Re-striped to Four Lanes
One SB Receiving Lane + Parking Lane
Stripe Indicated Lane Configuration For NB Movements (No Widening Necessary)
Beverly St
Notes:
-Except ADA improvements, bicycle/pedestrian improvements will be implemented during corridor-wice reconfiguration
-New turn lanes will impact on-street parking supply
Legend:
Install Traffic Control Signal
Short Term Improvements (2014-2024)
Restripe As a 4-Lane Section to 15th Street to Increase Capacity
Long Term Improvements (2025-2040)


21st Street and Kingsbury Drive
12
Notes:
-LOS "C" through 2040
-Except ADA improvements, bicycle/pedestrian improvements will be implemented during corridor-wide reconfiguration
-Turn lane installation impacts on-street parking supply
-Stripe Dedicated SB Right Turn Lane With 75' Storage
Install Stop Control on Kingsbury Drive
STOP
Remove Stop Control on 21st Street
21st St
Install Stop Control on Kingsbury Drive
Remove Stop Control on 21st Street
STOP
Construct Pedestrian Facilities When Development Occurs
Kingsbury Drive
-Stripe Dedicated NB Left Turn Lane With 75' Storage (No Widening Necessary)
Legend:
Remove Stop Control on 21st Street
Short Term Improvements (2014-2024)


21st Street and Wyoming Boulevard
13
-Widen Roadway to 4 Lanes
-Pedestrian and Bicycle Facilities Included
21st St
Drop Lane Several Hundred Feet South of 21st Street
Widen Roadway to 4 Lanes
Wyoming Blvd
Notes:
-LOS "C" through 2040
-Except ADA improvements, implement bicycle/pedestrian improvements during corridor-wide reconfiguration
Legend:
Widen Roadway to 4 Lanes
Long Term Improvements (2025-2040)

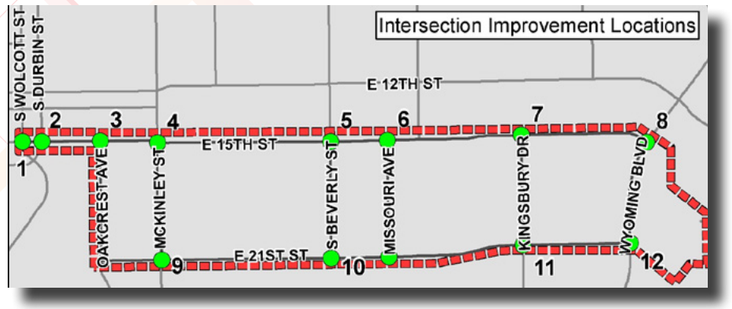
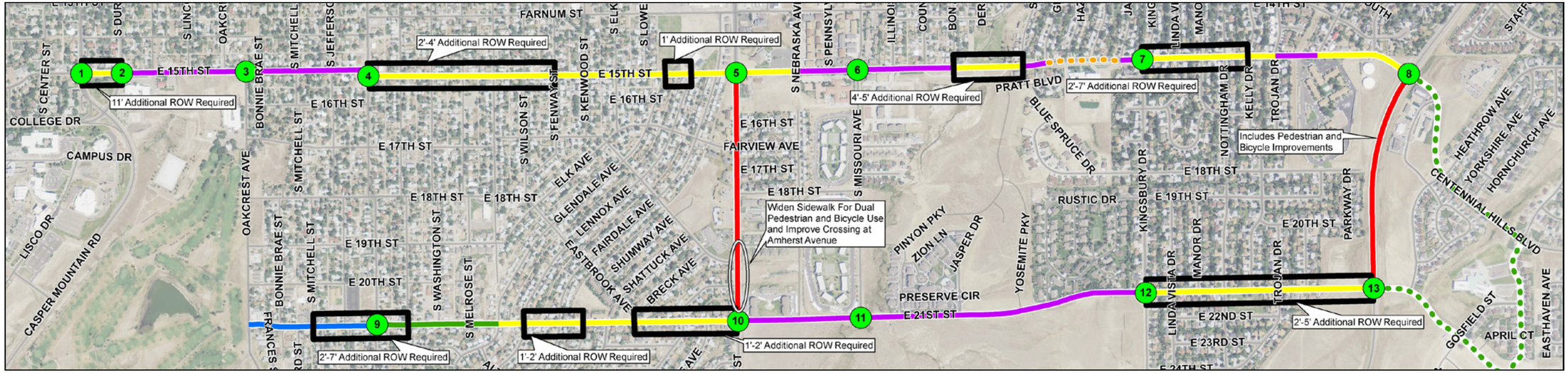

Intersection Improvement Locations
S WOLCOTT ST
S DURBIN ST
E 12TH ST
E 15TH ST
E 21ST ST
OAKCREST AVE
MCKINLEY ST
S BEVERLY ST
MISSOURI AVE
KINGSBURY DR
WYOMING BLVD
1
2
3
4
5
6
7
8
9
10
11
12
N

Figure E.6 – Corridor Improvement Plan

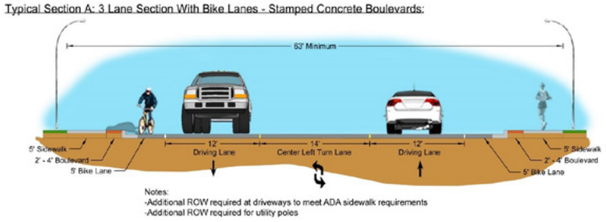


Legend

- Intersection Improvement Locations
- ROW Acquisition Required (No Building Impacts Anticipated)
- Construct Typical Section A
- Construct Typical Section B
- Construct Typical Section C
- Construct Typical Section D
- Widen to 4 Lane Section
- Maintain Existing Cross Section
- School Area Improvements

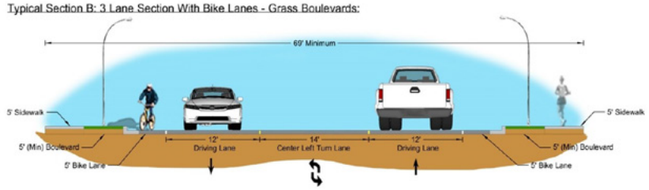
n w e s

Typical Section A: 3 Lane Section With Bike Lanes - Stamped Concrete Boulevards:

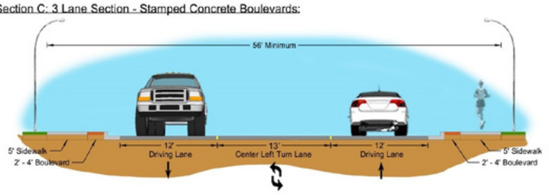


Notes:
-Additional ROW required at driveways to meet ADA sidewalk requirements
-Additional ROW required for utility poles

Typical Section B: 3 Lane Section With Bike Lanes - Grass Boulevards:

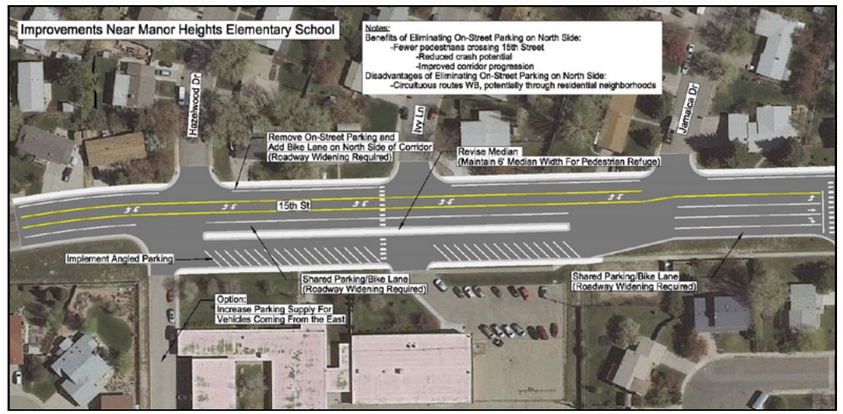


Typical Section C: 3 Lane Section - Stamped Concrete Boulevards:



Typical Section D: 2 Lane Section With Parking

Notes:
-Additional ROW required at driveways to meet ADA sidewalk requirements
-Additional ROW required for utility poles



Implementation Period	Location	Description	2013 Cost	Estimated Trigger Year[2]	Inflated Costs[3]
Immediate	City-Wide	Curb Ramp Implementation and Improvement Policy	*Not Applicable*		
	City-Wide	Snow Removal Policy	*Not Applicable*		
Short Term (2014 - 2024)	15th St and Wolcott St	Turn Lane Striping Improvements, Signal Timing Revisions and Fiber Optic Interconnect	$20,000	2014	$20,000
	15th St and McKinley St	Intersection Realignment, Driveway and Turn Lane Striping Improvements	$425,000	2014	$425,000
	15th St and Wyoming Blvd	Left-Turn Phasing Revisions and Sidewalk Construction	$7,000	2014	$7,000
	21st St and Kingsbury Dr	Stop Sign Reconfiguration and Turn Lane Striping Improvements	$2,000	2014	$2,000
	15th St and Beverly St	Turn Lane Widening Improvement	$40,000	2015	$41,000
	21st St and Beverly St	Traffic Control Signal and Turn Lane Striping Improvements	$205,000	2018	$225,400
	15th St and Kingsbury Dr	Traffic Control Signal and Turn Lane Striping Improvements	$210,000	2023	$260,000
	15th St and Oakcrest Ave	Traffic Control Signal and Turn Lane Widening/Striping Improvements	$200,000	2024	$253,500
		Subtotal	$1,109,000	-	$1,233,900
Long Term (2025 - 2040)	21st St and McKinley St	Turn Lane Striping Improvements	$3,000	2025	$3,900
	15th St and Wyoming Blvd	Turn Lane Construction	$250,000	2028	$348,400
	Wyoming Blvd (15th St - 21st St)	Roadway Widening to 4 Lanes with Pedestrian/Bicycle Facilities	$3,100,000	2028	$4,320,800
	15th St and Beverly St	Signal Phasing and Turn Lane Construction Improvements	$55,000	2028	$76,700
	Beverly St (15th St - 21st St)	Corridor Restriping to 4 Lanes (No Widening Required)	$4,000	2028	$5,600
	15th St and Missouri Ave	Signal Phasing and Turn Lane Construction Improvements	$35,000	2029	$50,000
		Subtotal	$3,447,000	-	$4,805,400
Contingent Upon Roadway/Utility Improvement Schedule[1]	A: 15th St (Wolcott St - Oakcrest Ave)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$1,009,000	-	-
	B: 15th St (Oakcrest Ave - McKinley St)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$748,000	-	-
	C: 15th St (McKinley St - Beverly St)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$2,256,000	-	-
	D: 15th St (Beverly St - Missouri Ave)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$745,000	-	-
	E: 15th St (Missouri Ave - Kingsbury Dr)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$1,782,000	-	-
	F: 15th St (Kingsbury Dr - Wyoming Blvd)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$1,634,000	-	-
	H: 21st St (Oakcrest Ave - McKinley St)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$777,000	-	-
	I: 21st St (McKinley St - Beverly St)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$2,213,000	-	-
	J: 21st St (Beverly St - Missouri Ave)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$753,000	-	-
	K: 21st St (Missouri Ave - Kingsbury Dr)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$1,742,000	-	-
	L: 21st St (Kingsbury Dr - Wyoming Blvd)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$1,398,000	-	-
		Subtotal	$15,057,000	-	-

Note: Signal Timing Improvements Not Included Due to Minimal Overall Costs and Potential to Be Completed by Local Staff
[1]Represent Full Build-Out Corridor Configuration. Must be Consistent with Planned Capital Improvements on Corridor. Due to scope of improvements, costs include reconstruction of the entire corridor.
[2]Estimated year that improvement will be triggered based upon linear traffic growth between 2013, 2025 and 2040 study years.
[3]Costs inflated to estimated trigger year.

KLJ

Proposed Improvement Plan

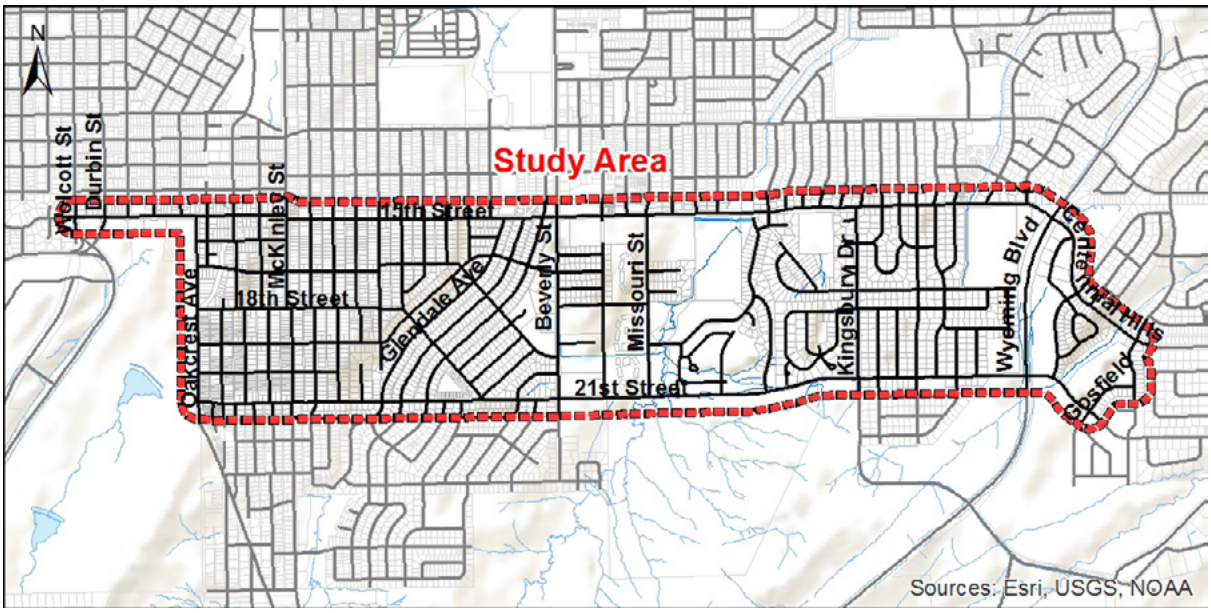
15th and 21st Subarea Traffic Study

STUDY AREA

The City of Casper is in a period of growth and prosperity. Private investment is driving development across the valley, and Casper's exponential growth is no more evident than the area encapsulated by the following two study corridors (illustrated in Figures 1-1):

- 15th Street (Centennial Hills Boulevard east of Wyoming Boulevard) between Wolcott Street and Waterford Street
- 21st Street (Centennial Village Drive east of Wyoming Boulevard) between Oakcrest Avenue and Gosfield Street

Figure 1-1 – Study Area



The study area is approximately three miles long, east to west, and slightly more than one-half mile tall, north to south. The study area covers approximately 1.5 square miles, which is less than 6 percent of the size of Casper. The area, however, is home to some of the highest density residential developments in the city and comprises approximately 25 percent of the city's population. Table 1-1 compares the study area to the City of Casper as a whole in terms of residential development, population and density.

Table 1-1 – Housing Population Data

Location	Total Housing Units	Single Family Units	Multi-Family Units	Approx. Population
City of Casper	24,536	19,482	5,054	55,316
Study Area	5,666	4,736	930	13,599
Percentage	23%	24%	18%	25%

Source: US Census, land ownership parcels and apartment contacts

STUDY VISION AND GOALS

The corridor vision provides the basis for study goals and subsequently improvement decisions. The vision is essentially a statement of desired transportation system capabilities that provide direction for transportation improvement strategies. The vision for the 15th and 21st Street corridors is to develop a multimodal corridor that provides the efficient movement of traffic, operates in an attractive and safe setting for pedestrians and bicyclists of all levels of capability and maintains the character of the surrounding residential neighborhoods.

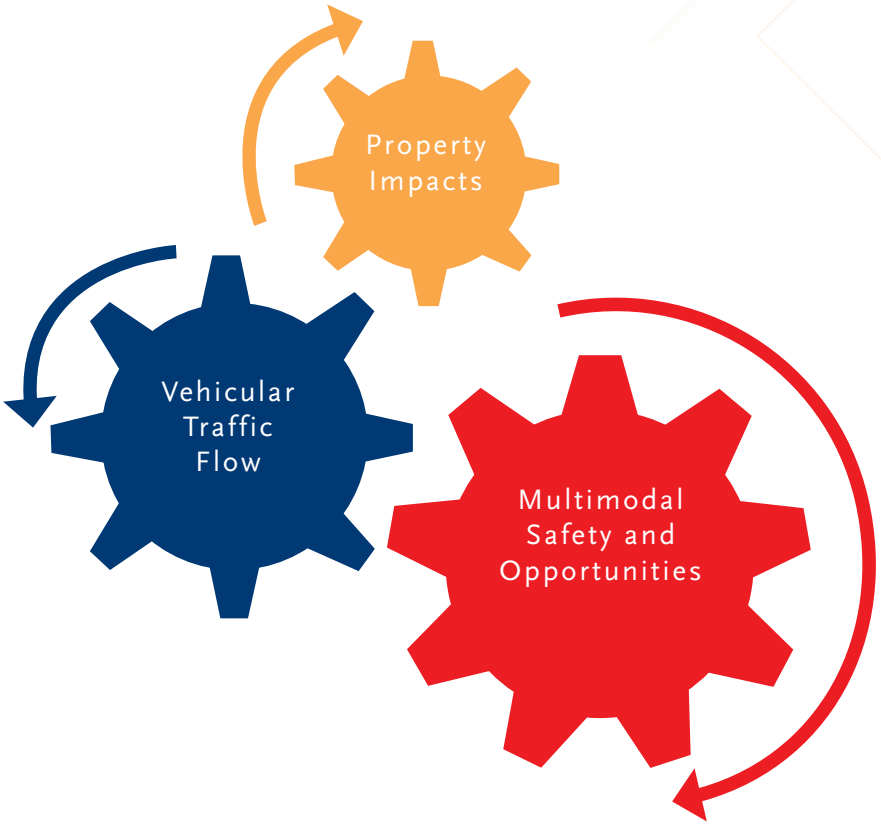
Current federal legislation (MAP-21) places a greater emphasis on performance measures and monitoring. Based upon this emphasis, project goals and objectives were founded on the following SMART growth principles:

- Specific – Sufficient to guide approaches
- Measurable – Quantitative measurement
- Agreed – Consensus among partners
- Realistic – Can be accomplished
- Time-Bound – Identified time frame for accomplishment

Integration of the SMART guidelines within the 15th and 21st Street Subarea Traffic Study provides the following benefits:

- Helps inform and improve the decision making process
- Increased accountability for goals and objectives
- Complies with legislative mandates
- Improves internal organization and management
- Sets benchmarks for internal, local, national and peer urban area comparative evaluation

Figure 1-2 – Study Goals



Goal 1: Develop spot improvements that maintain efficient movement of vehicular traffic through the major residential hub through the horizon year of 2040.

Goal 2: Develop a long-term corridor-wide improvement plan that increases opportunities and appeal of multimodal transportation options such as walking, biking and transit to increase the modal split and increase safety for these modes of travel.

Goal 3: Develop transportation improvement strategies without significant property impacts to the residential corridors.

STUDY APPROACH

To meet Study Goals, a multifaceted evaluation approach was developed for the project (illustrated in Figure 1-3).

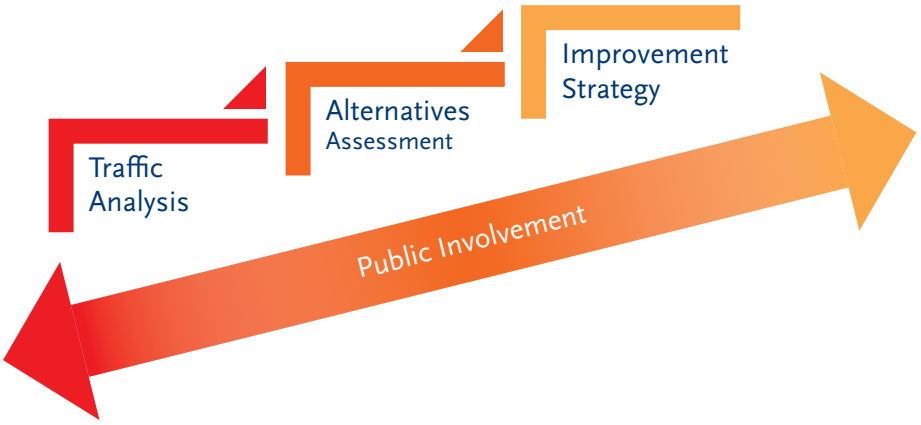
First, traffic analysis was completed to identify current and forecasted infrastructure deficiencies. During this phase, each mode of transportation was evaluated using a variety of tools ranging from observations during field reviews to detailed data analysis using traffic models. During this project phase, the public was involved through a public input meeting to help identify and prioritize infrastructure deficiencies.

Next, based upon the infrastructure deficiencies identified during the traffic analysis phase of the study approach, a myriad of improvement alternatives were evaluated. Alternatives assessment was completed to gauge deficiency mitigation effectiveness and impacts to the surrounding properties. During this project phase, the public was involved through a second public input meeting. The goal of the meeting was to help develop, refine and eliminate improvement strategies to create a final improvement plan.

Finally, once deficiencies were identified and mitigation strategies developed and refined, a final improvement plan was developed and compiled into the draft report. The draft report was then presented to the City Council and Casper Metropolitan Planning

Organization (MPO) committees (MPO Policy Committee, Technical Committee and Citizen's Advisory Committee) for final input and approval. After input was received from the City Council MPO Committees, comments were incorporated into the final corridor study.

Figure 1-3 – Study Approach



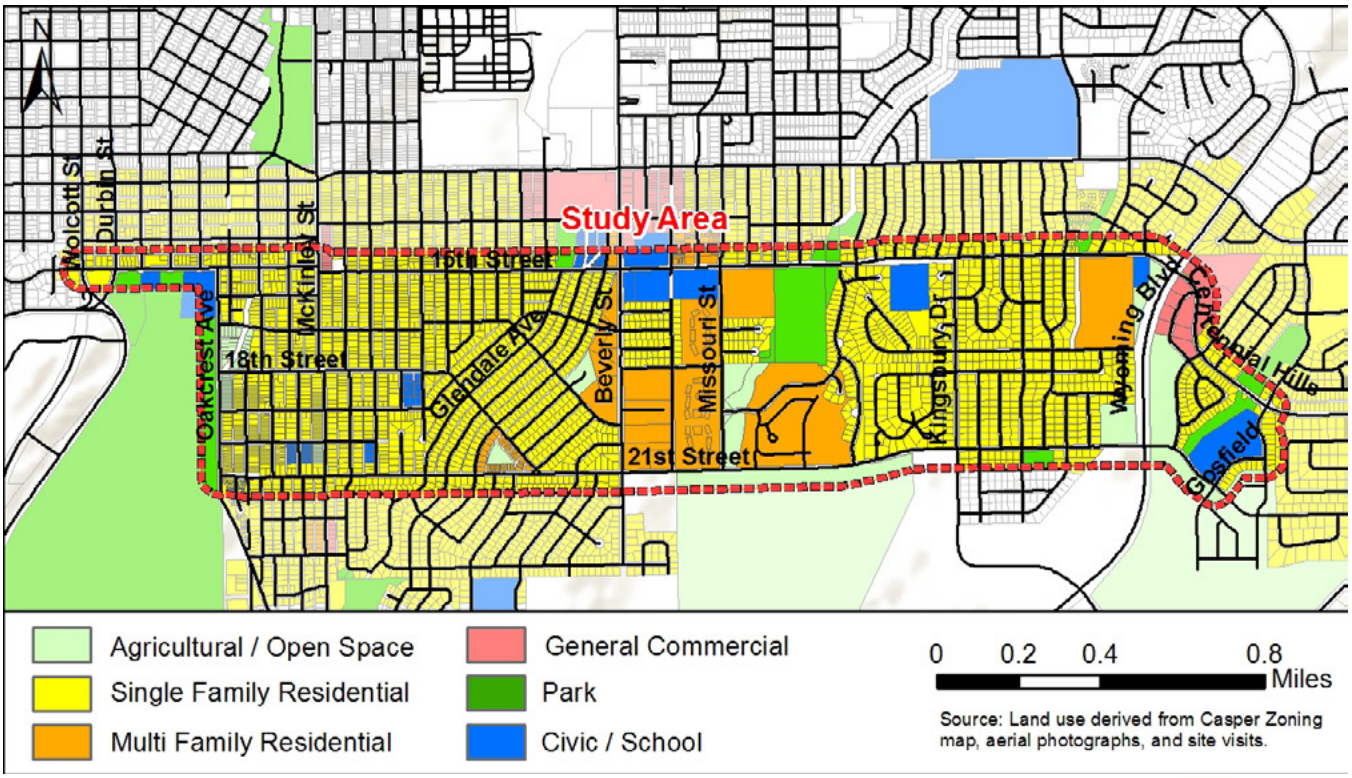
This page intentionally left blank.

TRAFFIC PATTERNS

Land use is the basis for all basic travel needs within a community. People need to travel from homes to work, shopping, health care, educational and recreational facilities. Land use patterns and transportation systems must work together to support a high quality of life and economic growth in Casper.

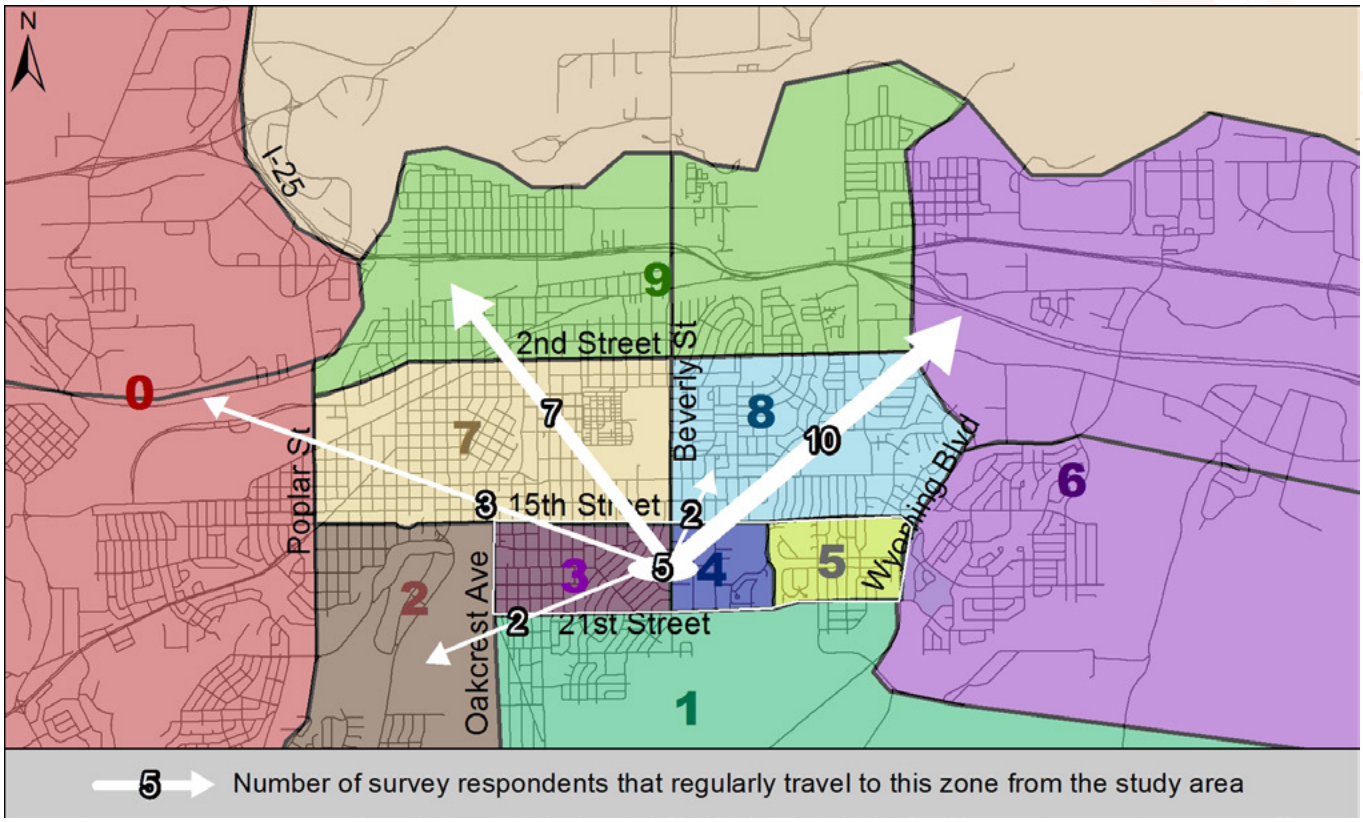
As mentioned previously, the study area land uses are unbalanced between residential and commercial or employment uses. The study area is mostly a bedroom community where people live but do not work. Figure 2-1 is a map of the study area's existing land uses.

Figure 2-1 – Existing Land Use



As part of a travel survey, Casper was divided into 10 zones and study area residents were asked which zones they travel to for work and other trips. The respondents living in the study area indicated that the most frequently traveled portions of Casper included the Downtown zone and the zone east of Wyoming Boulevard which is home to the Eastridge Mall, Walmart and other commercial land uses. Figure 2-2 illustrates the survey zones and trip destinations from the study area.

Figure 2-2 – Travel Zones and Trips from the Study Area

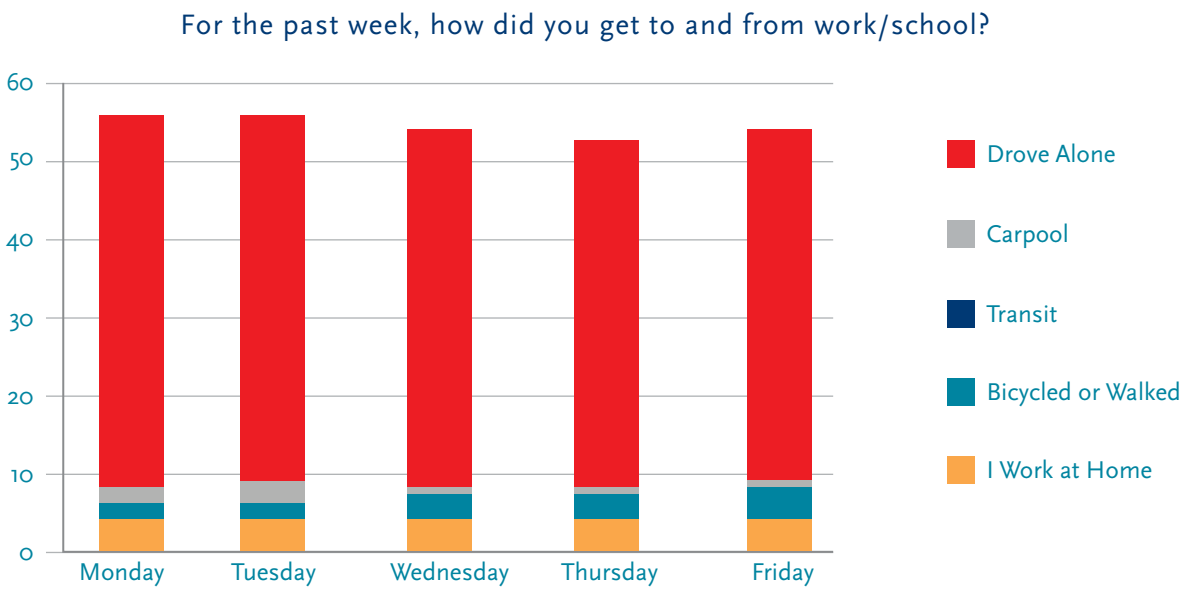


The travel survey highlights the auto-dependency created by lack of land use diversity in the study area. With such a large residential-to-commercial imbalance, residents' employment and shopping opportunities are located outside of the study area, which leads to relatively long commutes. This also creates a heavier burden on roadways than others areas with more local jobs, because trips are longer and commuters will travel on several routes rather than one or two to arrive at their destination. This development trend is relatively common in Casper where the mean travel time to work is 18.4 (US Census Bureau data) minutes although the overall area of the city is relatively compact.

MODE SPLIT

Mode of travel is an important transportation indicator. People value a balanced transportation system where one can choose between travel modes. Across the United States, a trend of ever increasing percentages of workers driving in single occupant vehicles has created inefficiencies in the use of roadway and transit system such that traffic congestion is a growing concern. In Casper, transit rider-ship comprises the lowest percentage of mode share at less than 1 percent. According to Census Bureau data, commuters that drove alone represent the highest percentage of travelers comprising more than 81 percent city-wide. This value eclipses national averages while percentage of residents utilizing transit, walking, biking or working from home are below national averages. Results from the travel survey indicate much of the same within the study area as illustrated in Figure 2-3.

Figure 2 3 – Travel Mode Responses to Travel Survey

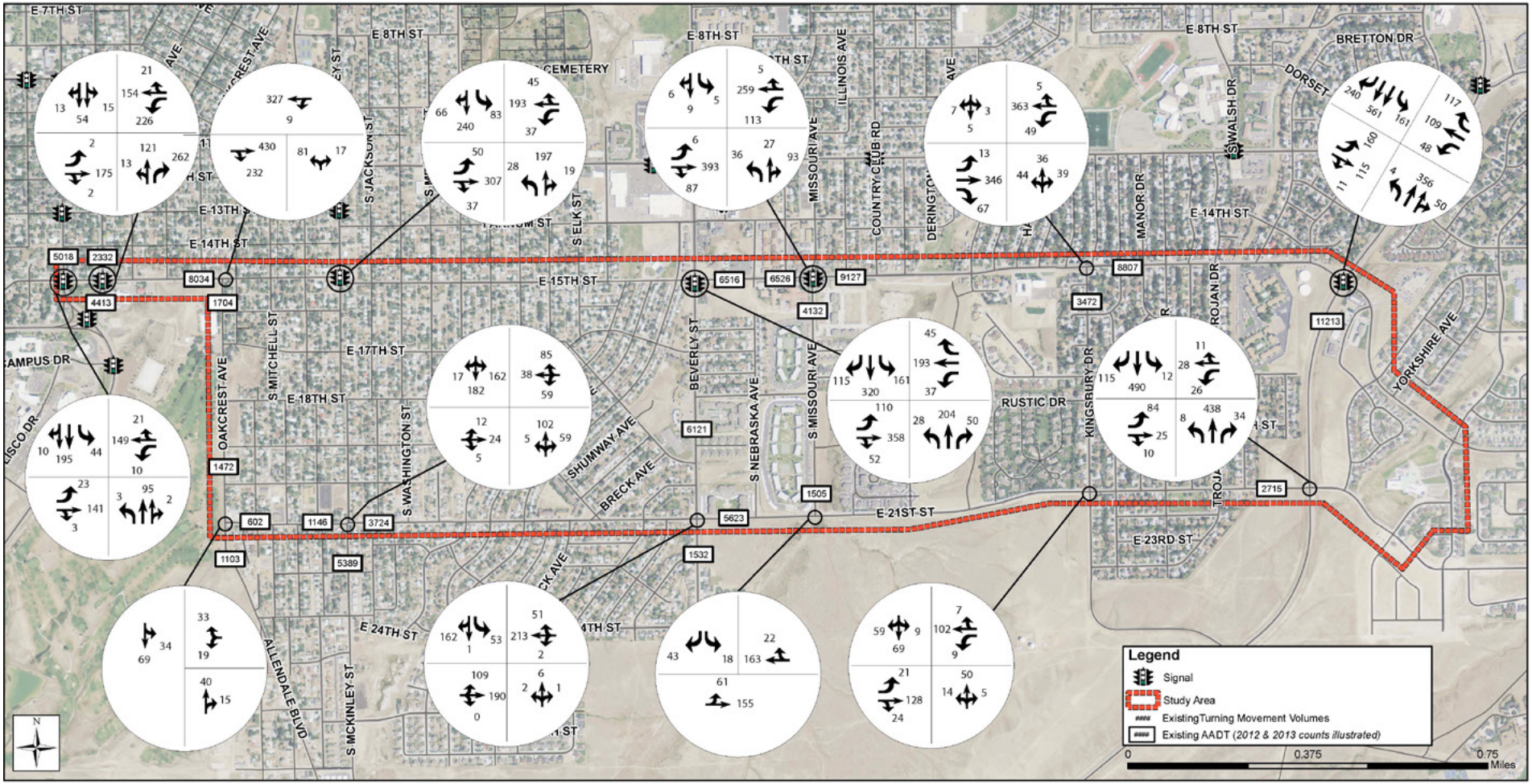


Source: Casper 15th and 21st Street Study Survey

TRAFFIC VOLUMES

To evaluate current traffic volumes on area roadways, PM peak hour turning movement counts were collected in April and May 2013. This data was supplemented by the most recent Annual Average Daily Traffic (AADT) counts from the Casper MPO database. Refer to Figure 2-4 for AADT values and 2013 PM peak hour turning movement counts at all major intersections in the study area. As illustrated by Figure 2-4, traffic volumes on 15th Street are much greater than 21st Street. Specifically, 15th Street carries between 4,000 to 9,000 vehicles per day versus 600 to 5,600 on 21st Street (within study limits).

Figure 2-4 – Existing Traffic Volumes



TRAFFIC FORECASTS

Process

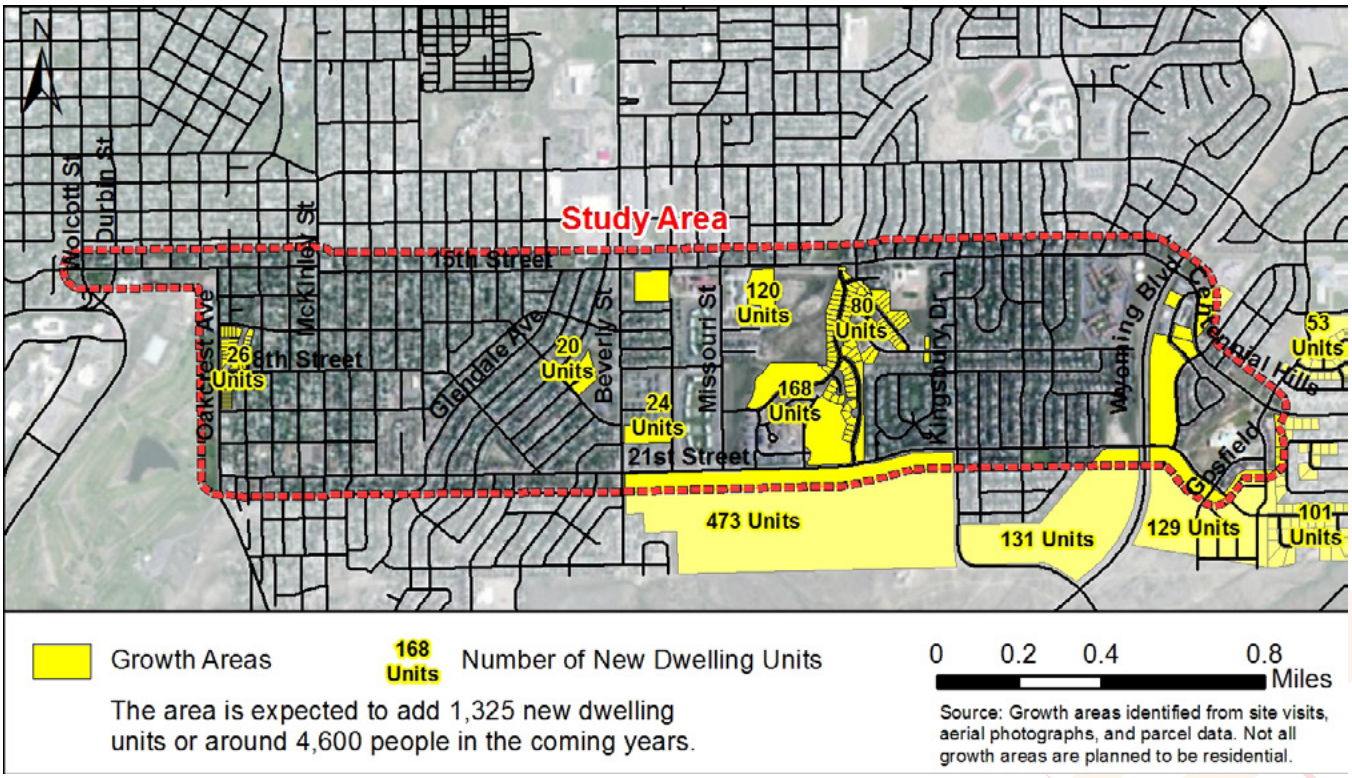
Traffic forecasts were developed to evaluate future travel demand needs; forecasts were developed for the horizon years of 2025 and 2040 to determine short-term and long-term congestion mitigation requirements. The following four-step approach was used to develop traffic forecasts. This process is similar in many aspects to the four-step modeling approach used for regional travel demand modeling.

- Identify local growth areas, anticipated land uses and projected period of development
- Calculate trip generation for growth areas
- Distribute generated trips throughout the transportation network
- Estimate background growth for regional traffic traveling through the network

Local Traffic Growth

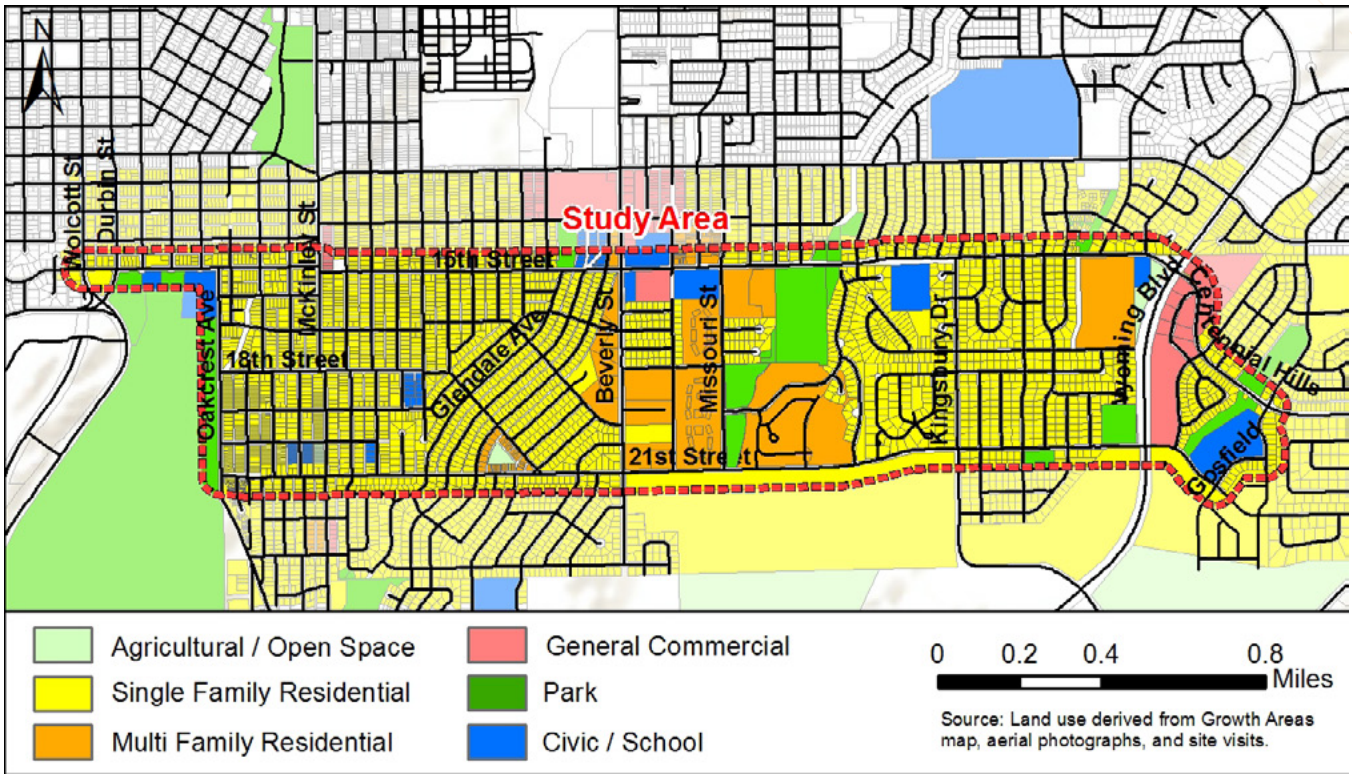
New growth areas were identified by site visits, speaking with local officials, aerial photographs and recent trends. Several residential building projects are currently underway in the study area, including: the Preserve adding 168 multi-family units, 60 single family homes under construction at the southeast corner of 21st and Beverly with another 250 units platted and several single family homes under construction south of Summit Elementary. It is estimated a total of 1,325 new dwelling units will be constructed in the study period, adding approximately 4,600 people. With many of these units already under construction and the area prime for expansion, it was assumed that all local growth would occur by year 2025. Figure 2-5 illustrates the projected growth areas.

Figure 2-5 – Future Growth Areas



In addition to residential uses, there are isolated areas of alternative use. This include parcels immediately east of Wyoming Boulevard where several commercial properties are planned and four acres south of 15th Street east of Beverly where a church was assumed due to neighboring land uses. Scattered areas of park land were also assumed. Similar to residential development, it is projected the alternative land uses will be developed prior to 2025. The planned combination of residential and alternative land uses will bring the study area to full build-out. The full build-out land use map can be reviewed in Figure 2-6.

Figure 2-6 – Future Land Use



Trip Generation

Once growth areas and land uses were identified, trip generation rates were determined using the Trip Generation Manual (TGM) produced by the Institute of Transportation Engineers (ITE). The TGM provides not only generation rates for a wide range of land uses but also provides insight into anticipated directional distribution and percentage of pass-by trips versus new trips to the area generated by a particular development. Assumptions regarding non-residential land use sizes were developed based upon a survey of typical sizes in Casper and surrounding areas. Trip generation rates can be reviewed in Table 2-1. Using TGM rates and distributions, the planned growth in the study area will generate approximately 20,000 new trips per day and 1,007 entering and 736 exiting trips in the peak hour.

Table 2-1 – Trip Generation Rates

Description (ITE Code)	Forecasted Units	Units Description	Total Generated Trips				
			Daily	Peak Hour			
				Total	In	Out	Pass-By
Single Family detached (210)	1017	Dwelling Units	9,733	1,027	647	380	0
Multi-family apartments (220)	308	Dwelling Units	2,048	191	124	67	0
Church (560)	25	1,000 Square Feet	228	14	7	7	0
Medical-dental office (720)	32	1,000 Square Feet	1,156	111	30	81	0
Shopping center (820)	100	1,000 Square Feet	4,294	373	146	152	75
Fast Food with Drive thru (934)	6	1,000 Square Feet	2,977	203	53	49	102
		Total	20,436	1,919	1,007	736	176

Trip Distribution

Once trip generation was completed, trips were assigned to the various developments throughout the study area. Origins/destinations outside the study area were then estimated to distribute volumes throughout the transportation system. Origins/destinations were estimated using a combination of the following travel pattern information and insight:

- 2013 traffic counts
- Travel survey results
- Local area knowledge
- Planning judgment

Background Traffic Growth

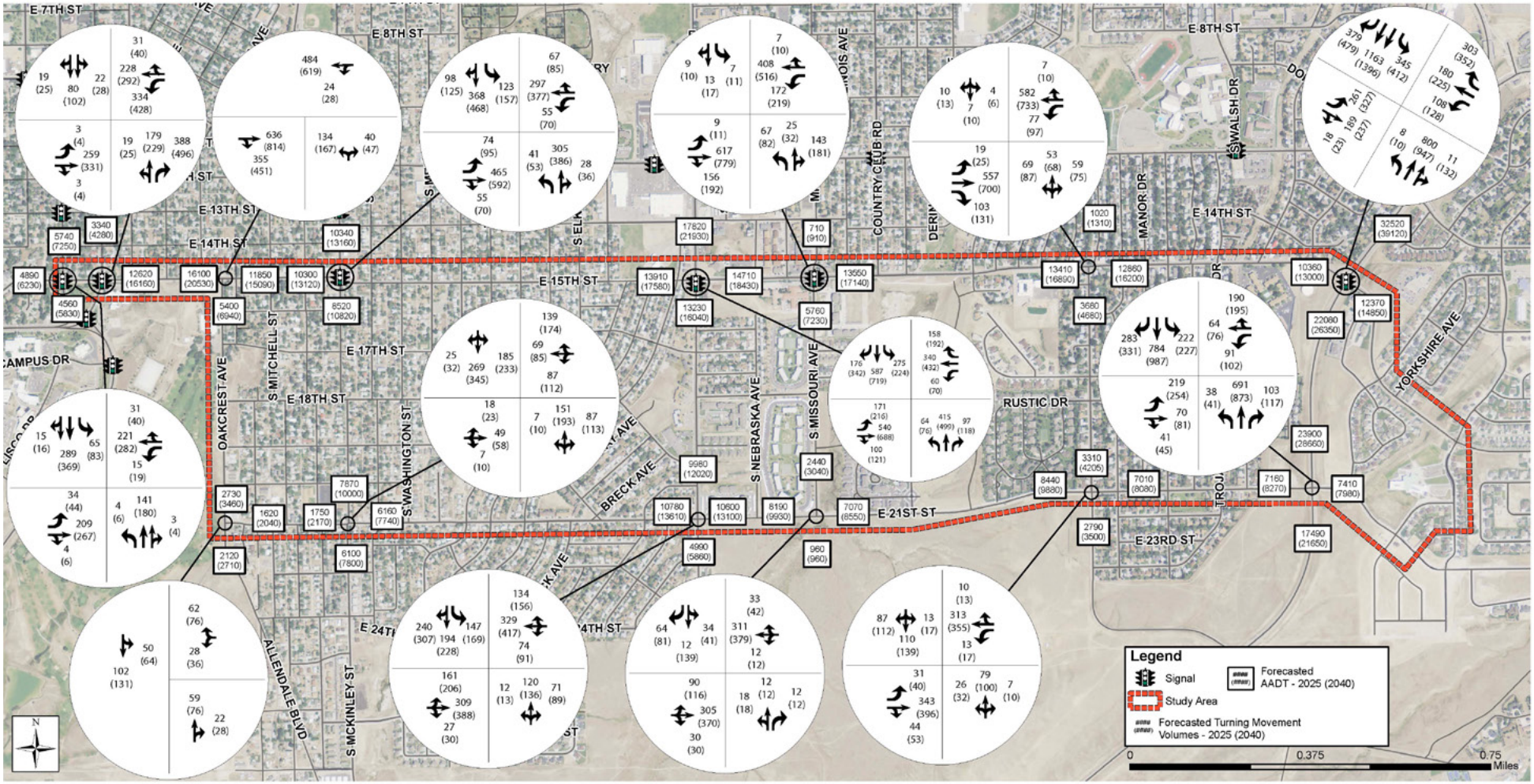
Functionally classified roadways such as 15th Street and 21st Street (collectors) carry more than just local traffic. These roads also carry regional traffic through the transportation network with origins and destinations outside the study area. This type of regional traffic that is not directly attributable to growth within the study area is commonly referred to as background growth.

Currently the Casper MPO is in the process of updating their travel demand model to forecast regional traffic throughout the metropolitan area to the horizon year of 2040. In absence of this data, the following information was reviewed to develop background traffic growth along 15th and 21st Streets:

- 2030 Travel Demand Model Results (most recent metropolitan-wide forecasts available)
- Traffic Growth Throughout Casper using Historic AADT Volumes
- Traffic Growth Throughout the Study Area using Historic AADT Volumes

Based upon a review of historic and forecasted traffic growth through the study area and city, it was assumed the background growth rate would be approximately 3.3 percent annually between 2013 and 2025. By 2025, the study area and much of the surrounding areas will be fully built-out, limiting the background traffic growth potential within the study area. Therefore, between 2025 and 2040, a reduced background traffic growth rate of 1.65 percent was assumed. The background traffic growth rates were assigned to each roadway functionally classified collector or arterial as these roadways are responsible for carrying regional traffic through the transportation network. Refer to Figure 2-7 for an illustration of forecasted AADTs and turning movement counts for 2025 and 2040.

Figure 2-7 – Future Traffic Volumes

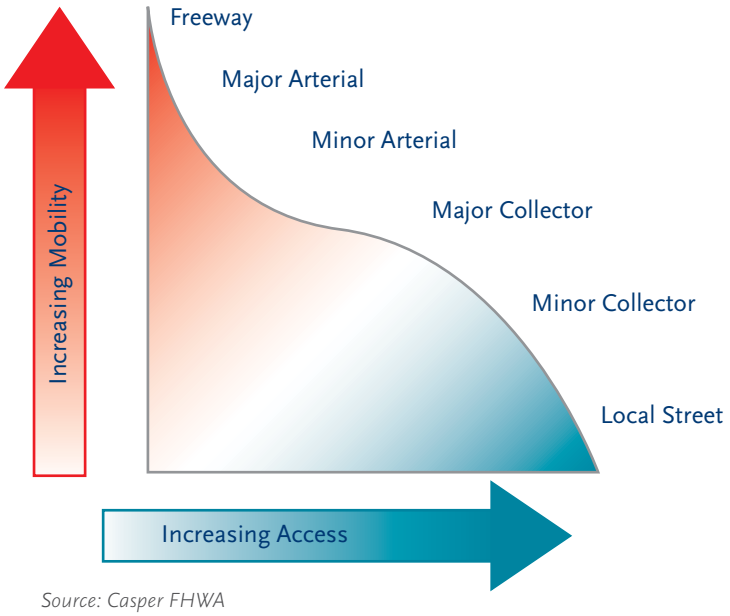


FUNCTIONAL CLASSIFICATION AND ACCESS MANAGEMENT

Roadway networks must play a dual role in providing access to property and travel mobility. Access is a fixed need for every area served by the roadway system. Mobility is provided at varying levels of service, and is reflected in operating speeds and travel times. Local facilities emphasize the land access function and are typically represented by a residential street. Arterials emphasize a high level of mobility for through movements. Collectors offer a compromise between both functions (refer to Figure 3-1).

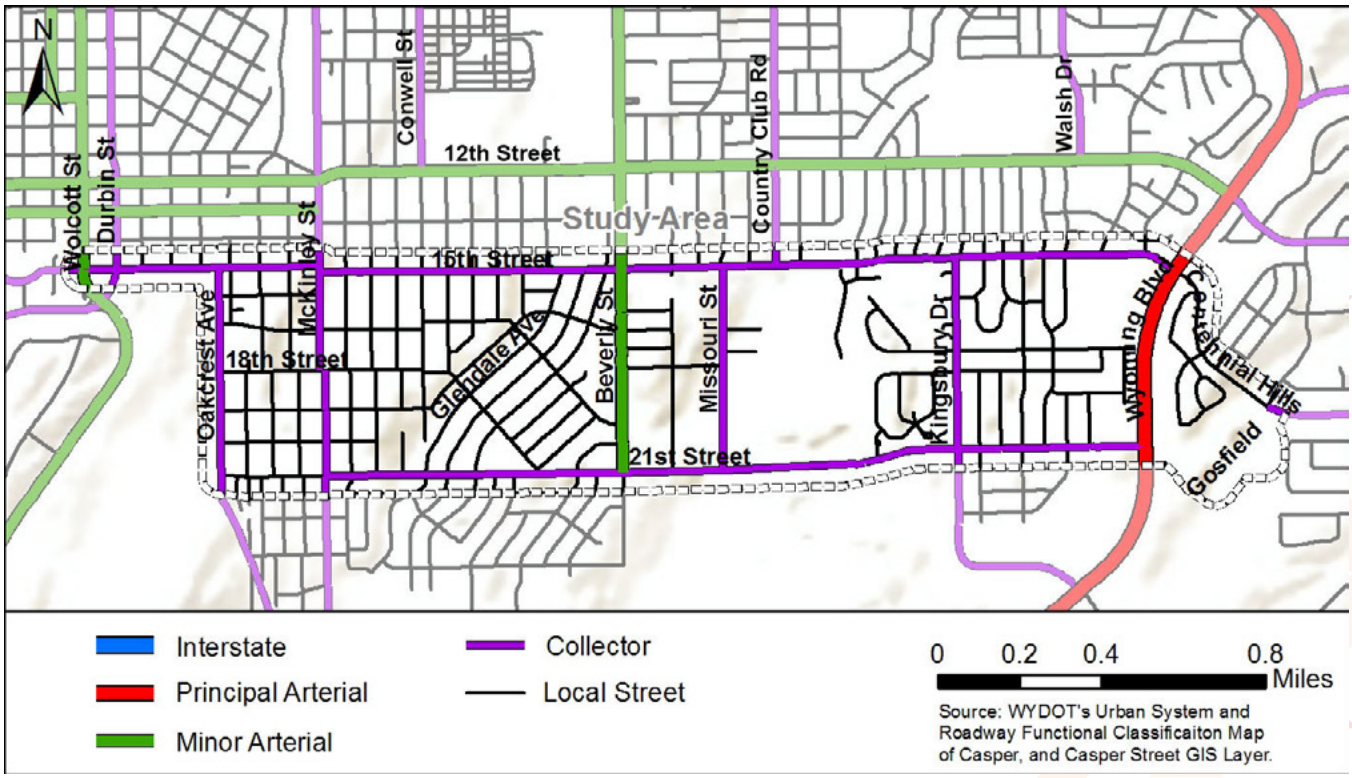
The current functional classification map can be reviewed in Figure 3-2. As illustrated in the figure, the study area encapsulates multiple arterials, collectors and local roads. From a residential standpoint, most people prefer to live along quiet streets with frequent land access points (driveways). At the same time, residents typically desire a relatively direct drive path at relatively high speed to their destination.

Figure 3-1 – Roadway Functional Hierarchy



Source: Casper FHWA

Figure 3-2 – Existing Functional Classification of Streets



As it stands today, 15th and 21st Streets currently serve conflicting goals of carrying regional traffic through the area while providing direct access to residential homes (refer to Figure 3-3). Both 15th and 21st Street are essentially designed as local roads in terms of access control and an arterial in terms of current and forecasted travel demand.

Figure 3-3 – Example of Driveways Accessing 21st Street

Multiple studies have demonstrated the detrimental effects dense access spacing can have on the transportation system. Specifically, one such study found that every unsignalized driveway increases the corridor crash rate by approximately two percent. Another study found that the increased friction caused by dense access spacing can reduce corridor progression by an average of 2.5 miles per hour for every 10 access points per mile.

According to the Wyoming Department of Transportation, urban collector roadways similar to 15th and 21st Street should have the following access restrictions:

- Access should be restricted other than public streets. Direct access to abutting property will be from the side roads.
- Public streets should be spaced no closer than 330 feet.
- Signalized intersections should be evenly spaced with a minimum spacing of 1,320 feet.

Enforcing WYDOT access spacing standards would require one of the following alternatives:

- Restrict connectivity and reclassify 15th and 21st Streets as local roads: this alternative was deemed infeasible as it would increase stress onto adjacent collectors and arterials, resulting in increased network-wide congestion and circuitous routes for local residents.
- Remove private driveways onto 15th and 21st Streets: this alternative was deemed infeasible due to widespread impacts to local homes along the corridor. For example, 15 homes would be directly impacted in the quarter mile between Oakcrest Avenue and McKinley Street on 15th Street.

For these reasons, access management strategies were not studied in detail as part of this study.

Negative effects posed by dense access spacing is mitigated in part by the fact that nearly all access points onto the corridor were single family homes producing minimal daily traffic volumes. As the corridor builds out, access management considerations should be given to major traffic generators such as planned multi-family and commercial developments.

PAVEMENT MARKINGS

The study area includes a variety of pavement markings from bike lanes to turn lane markings Although current markings meeting standards set forth in the Manual on Uniform Traffic Control Devices (MUTCD), the following opportunities for improvement exist within the study area:

- Currently almost ¾ of the study area is without a two-way left-turn lane (TWLTL – refer to Figure 3-4). TWLTLs increase corridor capacity and reduce potential for serious crashes along a corridor by an average of 20 percent by removing slow-moving vehicles or stopped vehicles from the traffic stream.
- Areas with TWLTL are as narrow as 9 feet. National design standards prescribe TWLTL widths of 14 feet but allow 12 feet in areas where ROW is constrained. Narrow TWLTLs limit separation from adjacent lanes and maneuverability within the lane itself.

» Several intersections include narrow turn lanes. In particular, the intersection of 15th Street with Beverly Street includes an eastbound right-turn lane that is 6 feet wide (refer to Figure 3-5). This is not wide enough for any normal sized vehicle to use the lane.

Figure 3-4 – Example of TWLTL Variation

Figure 3-5 – Narrow Turn Lane at 15th Street and Beverly Intersection

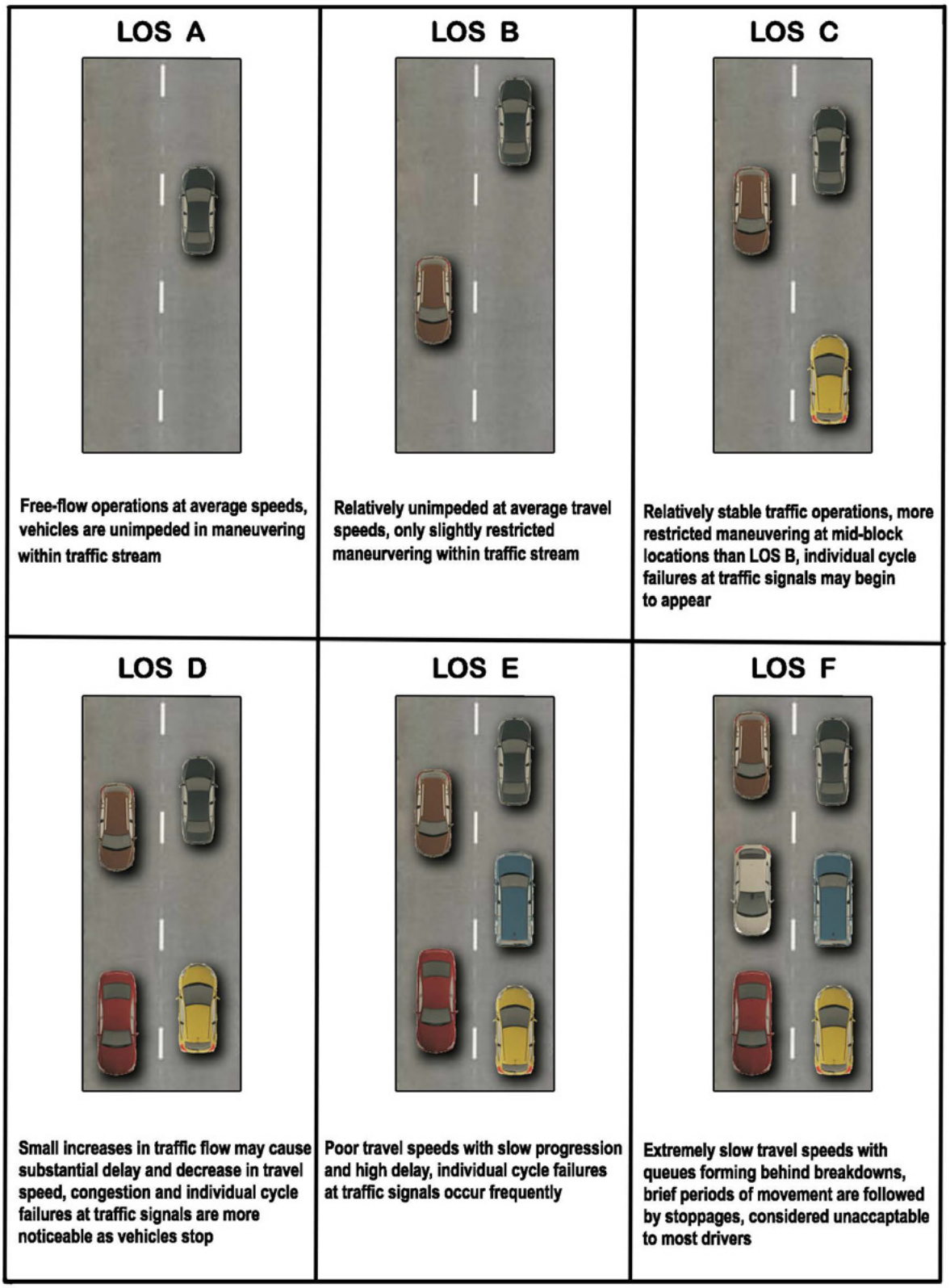
TRAFFIC OPERATIONS

Capacity analysis was conducted to determine intersection and corridor level of service (LOS). Level of service is a term used to describe operational performance of transportation infrastructure elements. Essentially, LOS is a grade value that corresponds to specific traffic characteristics within a given system. For example, at intersections, a LOS is a function of average vehicle delay whereas LOS for a roadway section is defined by the average travel speed. According to WYDOT standards, a LOS "A" or "B" is desirable with LOS "C" being the minimum acceptable threshold value. Similarly, WYDOT specifies that LOS "D," "E" and "F" correspond to unacceptably deficient traffic conditions. Refer to Table 3-1 for a breakdown of intersection LOS threshold values and Figure 3-6 for a graphical representation of corridor LOS.

Table 3-1 – Highway Capacity Manual Level of Service Thresholds

Control Delay (sec/veh)		Volume < Capacity	Volume > Capacity
Unsignalized	Signalized		
≤ 10	≤ 10	A	F
> 10-15	> 10-20	B	F
> 15-25	> 20-35	C	F
> 25-35	> 35-55	D	F
> 35-50	> 55-80	E	F
> 50	> 80	F	F

Figure 3-6 – Corridor Level of Service Definition



Figures 3-7, 3-8 and 3-9 depict the existing 2013 and forecasted 2025 and 2040 intersection and corridor peak hour LOS. As illustrated in the figures below, under current conditions, acceptable traffic operations are experienced even under the highest traveled periods. During forecasted traffic scenarios, volumes begin to exceed capacity and traffic congestion occurs.

Figure 3-7 – 2013 Traffic Operations

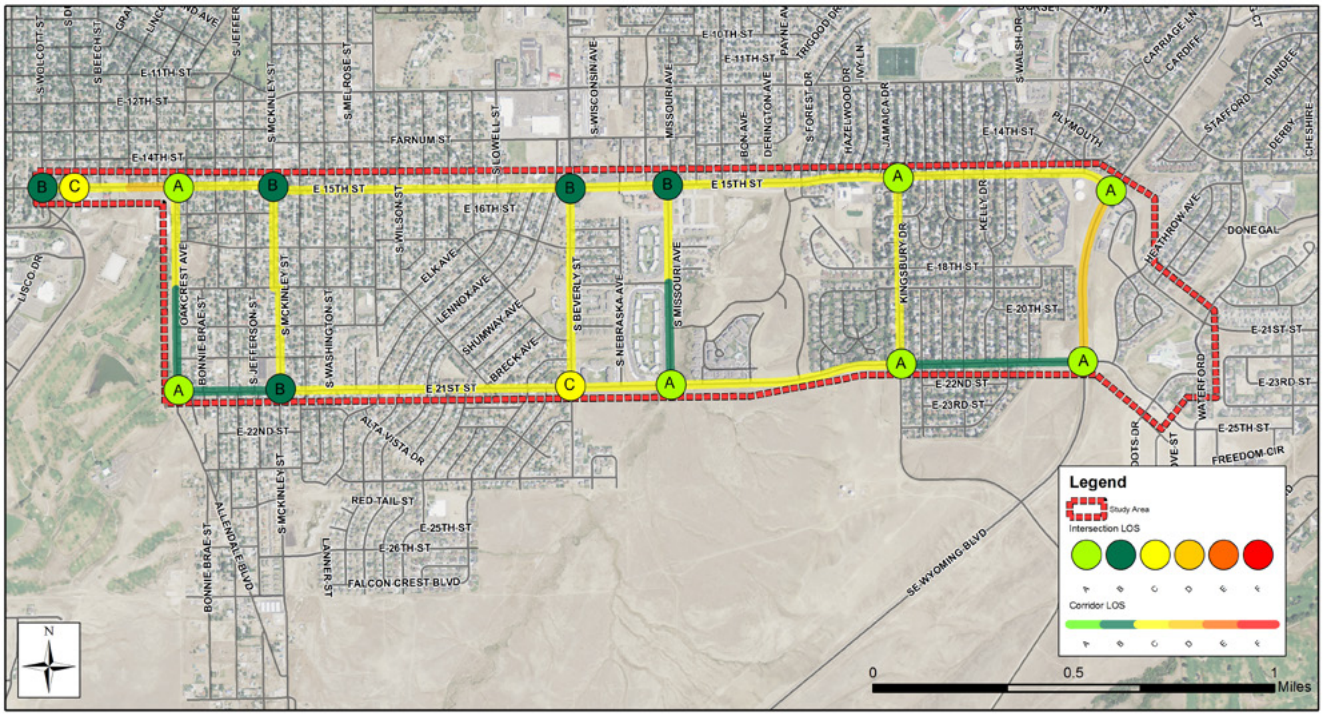


Figure 3-8 – 2025 Traffic Operations

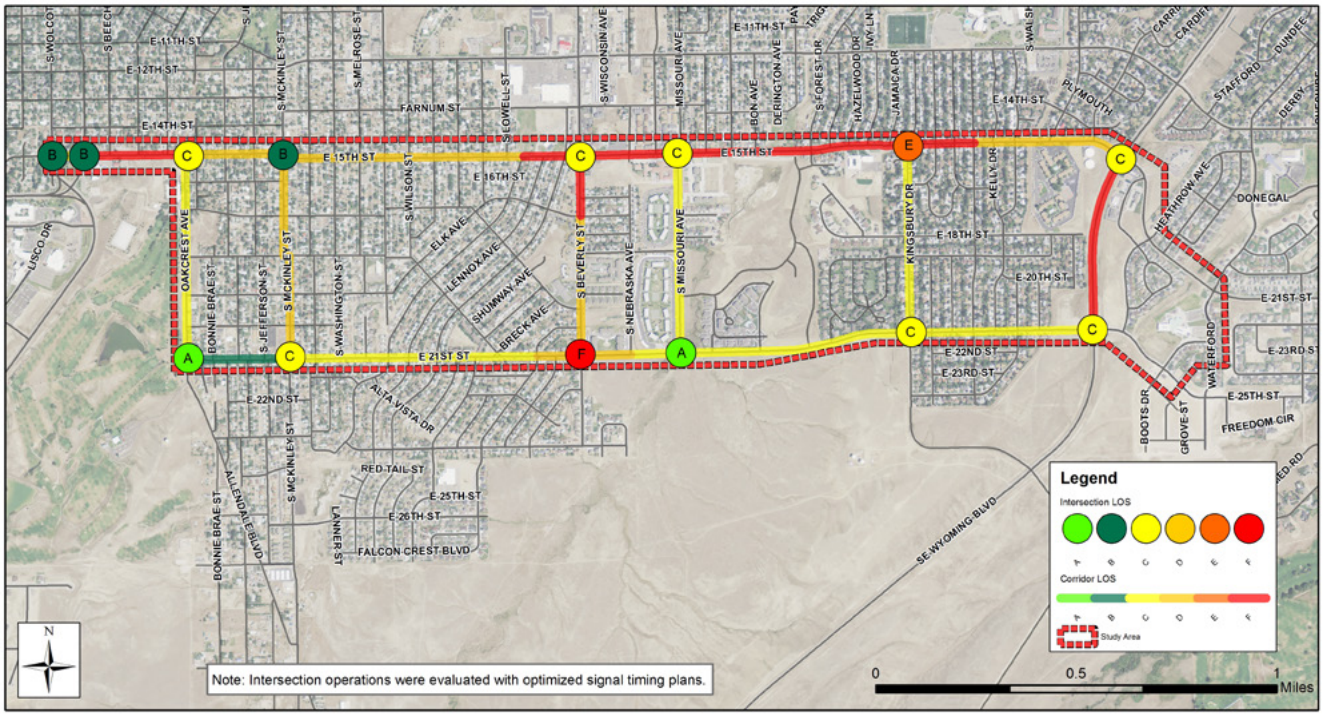
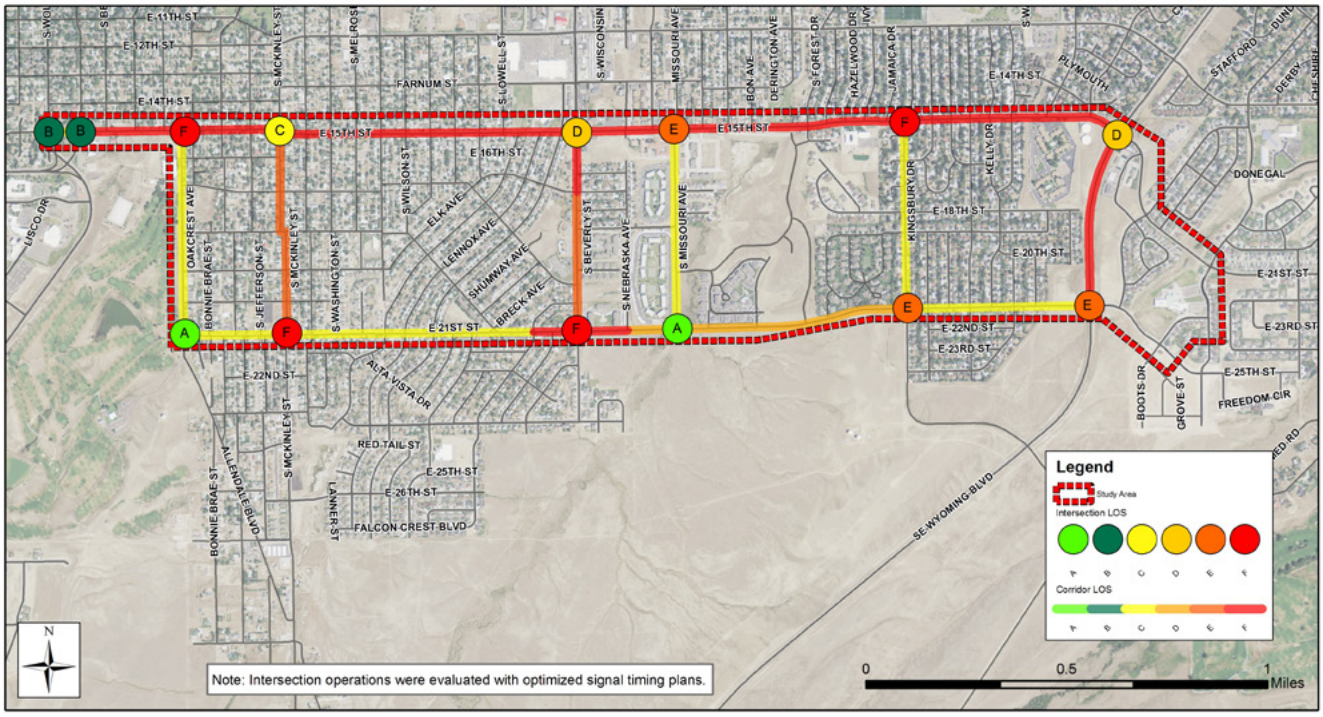


Figure 3-9 – 2040 Traffic Operations



Although deficient operations are forecasted throughout 15th Street, the traffic forecasting methodology does not consider the effects that congestion have on trip diversion similar to how a travel demand model would. For example, if significant levels of congestion are incurred by motorists along 15th Street, it is likely that some motorists will find alternative travel routes to regional destinations. This is particularly true on 15th Street where an east-west arterial exists three blocks north (12th Avenue North).

Bottlenecks occur at major intersections where east-west traffic competes with high volumes of north-south traffic. Mitigating congestion caused by intersection bottlenecks may have a profound effect on corridor capacity, progression and operations. The following bottlenecks are forecasted within the study area:

- 15th Street and Oakcrest Avenue by the year 2040.
- 15th Street and Beverly Street by the year 2040.
- 15th Street and Missouri Avenue by the year 2040.
- 15th Street and Kingsbury Drive by the year 2025.
- 15th Street and Wyoming Boulevard by the year 2040.
- 21st Street and McKinley Street by the year 2040.
- 21st Street and Beverly Street by the year 2025.
- 21st Street and Kingsbury Drive by the year 2040.

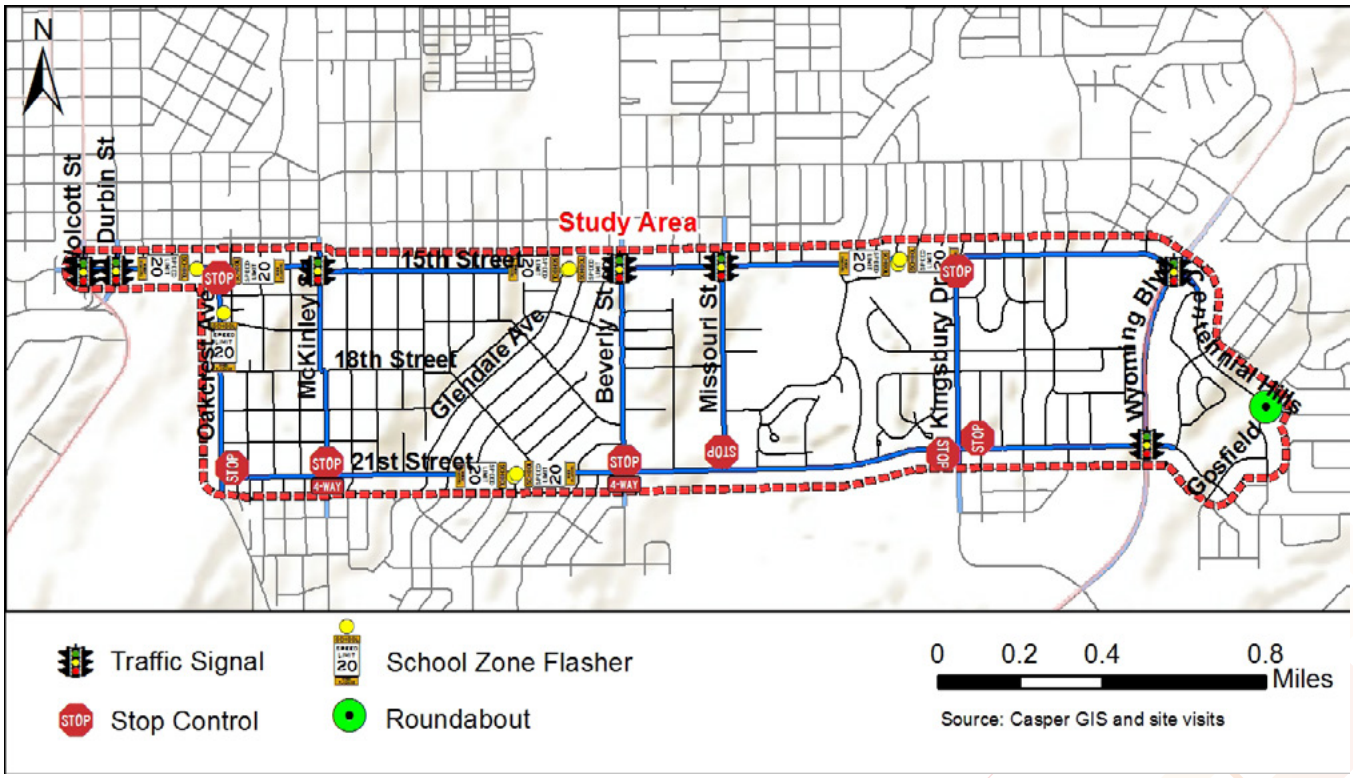
Under optimal timing plans, the intersections of 15th Street with Wolcott Street and Durbin Street and Wolcott Street are not forecasted to bottleneck by year 2040. These intersections and the signalized intersection at Wolcott Street and College Drive are all within a 480 foot proximity. Congestion between the signals is anticipated if timing plans are not periodically updated and coordinated to provide progression between the intersections. As traffic volumes increase, this may result in spillback and queue blockages between the intersections.

TRAFFIC CONTROL

Every study intersection has stop control on the north/south approaches with the exception of the following intersections (refer to Figure 3-10):

- 15th Street and Wolcott Street – Traffic Control Signal
- 15th Street and Durbin Street – Traffic Control Signal
- 15th Street and McKinley Street – Traffic Control Signal
- 15th Street and Beverly Street – Traffic Control Signal
- 15th Street and Missouri Street – Traffic Control Signal
- 15th Street and Wyoming Boulevard – Traffic Control Signal
- Centennial Hills Boulevard and Waterford Street – Roundabout
- 21st Street and McKinley Street – All-Way Stop Control
- 15th Street and Beverly Street – All-Way Stop Control
- 21st Street and Kingsbury Drive – Two-Way Stop Control on 21st Street Approaches
- 21st Street and Wyoming Boulevard – Traffic Control Signal

Figure 3-10 – Existing Traffic Control



Selecting the appropriate traffic control device requires consideration of traffic patterns, volumes, roadway geometrics and lane configurations. The 2009 Manual on Uniform Traffic Control Devices (MUTCD) published by the Federal Highway Administration was used to guide these decisions. The MUTCD includes standards for all-way stop control, traffic control signals and pedestrian hybrid beacons. The MUTCD does not have warrants for roundabouts or pedestrian beacons. These traffic control measures will,

however, be evaluated for safety and traffic operations benefits during the alternatives analysis portion of the study to ensure the proper traffic control device is installed at each study intersection.

Traffic Control Signals

The MUTCD traffic signal control standards include warrants for varying roadway contexts ranging from railroad grade crossings to school zones. Warrants also include varying data thresholds ranging from pedestrian and vehicular volumes to crash frequency. Typically right-turning traffic is not included in warrant analysis. The rationale for this practice is the movements are usually made relatively easily, have minimal conflicts and therefore do not require a traffic signal to minimize delay or improve safety. As a result, unless right-turn movements experienced motorist delay exceeding the WYDOT standard LOS "C" threshold, this movement was not considered in the warrant analysis.

Under 2013 traffic conditions, no unsignalized intersections meet warrants for a new traffic signal. Three intersections under stop control meet traffic control signal warrants based upon traffic volume warrants in the future. The intersections include:

- 15th Street and Oakcrest Avenue – Traffic signals estimated to be warranted by 2024
- 15th Street and Kingsbury Drive – Traffic signals estimated to be warranted by 2023
- 21st Street and Beverly Street – Traffic signals estimated to be warranted by 2018

The estimated year each intersection will warrant a signal is based upon linear growth between 2013 and 2025 traffic conditions. It is important to note that the years are for planning purposes only, actual growth will not be linear but rather depend upon development activities.

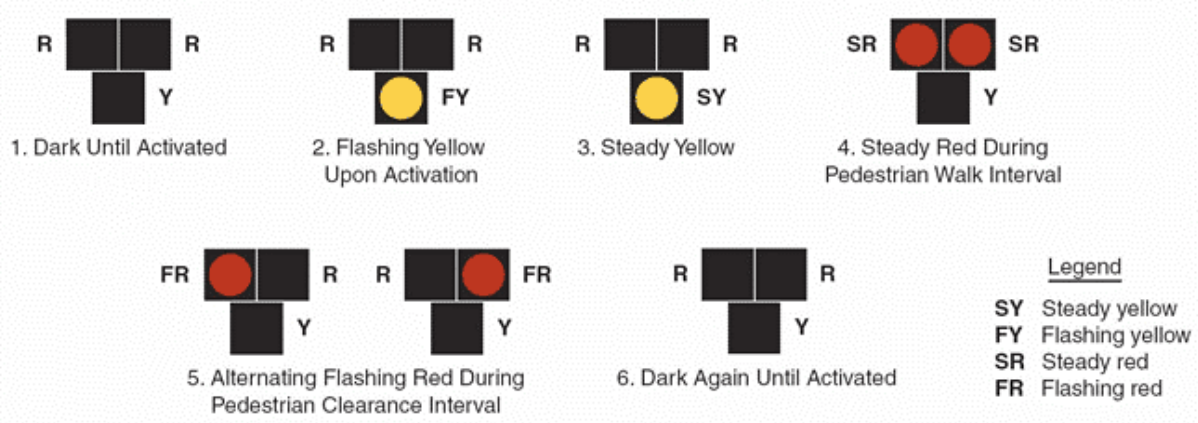
All-Way Stop Control

The MUTCD includes All-Way Stop Control (AWSC) warrants based upon traffic volumes, motorist delay and crash frequency as well as one warrant that considers a combination of the two. No intersections currently under two-way stop control meet AWSC warrants. The intersection of 21st Street and McKinley Street is currently under AWSC but does not meet volume warrants. However, the alignment of the intersection creates overlapping turning movements, increasing the potential for angled and head-on crashes without AWSC, therefore an AWSC is recommended to remain.

Pedestrian Hybrid Beacons

A pedestrian hybrid beacon (PHB) is a special type of beacon used to warn and control traffic at an unsignalized location to assist pedestrians in crossing a street or highway at a marked crosswalk. MUTCD standards for this type of traffic control require consideration of vehicular traffic volumes, pedestrian crossing volumes and crosswalk lengths. Refer to Figure 3-11 for an outline of PHB operations.

Figure 3-11 – Pedestrian Hybrid Beacon Operation



Source: MUTCD

The crosswalk abutting Manor Heights Elementary School across 15th Street meets warrants for installation of a PHB. However, this crossing is currently controlled by a crossing guard. A crossing guard adequately provides safe passage for pedestrians at this crossing due to the short periods of peak pedestrian activity (directly before and after school begins).

Figure 3-12 – School Zone Flashing Beacon

Pedestrian Flashing Beacons

As illustrated in Figure 3-10, there are eight total flashing beacon systems on 15th and 21st Street. The flashing beacons throughout the corridors are utilized to highlight speed reduction zones during peak school pedestrian periods. The existing flashing beacons are consistently applied at areas surrounding schools where student activity is frequent. Casual observations indicate these roadside devices successfully reduce speeds when activated. Therefore it is recommended that the existing beacon systems remain in-place. Figure 3-11 illustrates an example of a flashing beacon unit approaching Manor Heights Elementary School.

In addition to highlighting speed zone reductions, flashing beacons may be utilized at pedestrian crosswalks to enhance pedestrian visibility and induce vehicle stoppages. As previously noted, the MUTCD does have warrants for these types of traffic control. However, due to the construction, maintenance and operating costs, installation of these types of control should be judiciously selected. Additionally, installation of traffic control devices at unjustified locations results in reduced motorist compliance.

Two-Way Stop Control

The MUTCD guidance for installation of Two-Way Stop Control (TWSC) installation is based upon either traffic volume thresholds, sight distance limitations or crash frequency thresholds. Currently each TWSC intersection meets one or more TWSC warrant.

Roundabouts

There is currently one roundabout at the intersection of Centennial Hills Boulevard and Waterford Street (refer to Figure 3-13). Roundabouts offer a traffic control measure that not only offer potential traffic operational benefits when implemented at the proper location, but also offer the following safety benefits:

- Roundabouts have fewer vehicular conflict points in comparison to conventional intersections. The potential for high-severity conflicts, such as right angle and left-turn head-on crashes, is greatly reduced with roundabout use.
- Low speeds generally associated with roundabouts allow drivers more time to react to potential conflicts, also helping to improve the safety performance of roundabouts. Low vehicle speeds help reduce crash severity, making fatalities and serious injuries for vehicles and pedestrians uncommon at roundabouts.
- Pedestrians need only cross one direction of traffic at a time at each approach as they traverse roundabouts (i.e., crossing in two stages) as compared with the existing traditional intersections, reducing exposure and delay by reducing vehicular gap requirements.

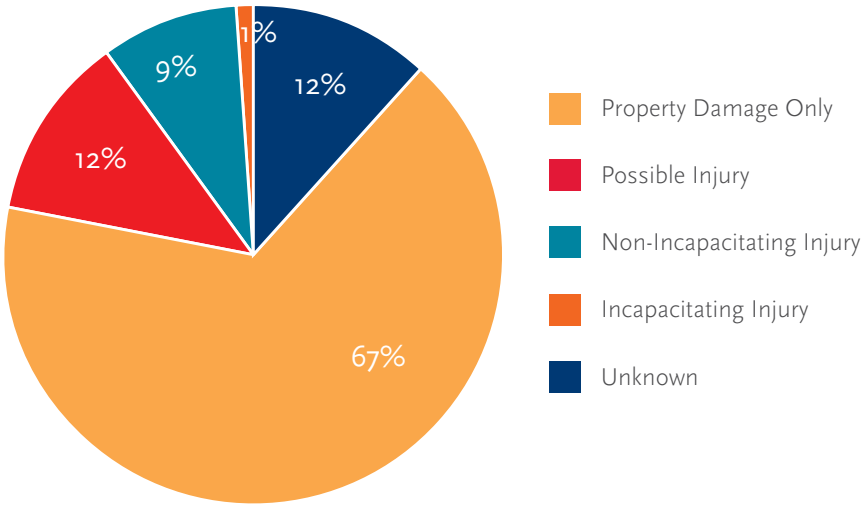
Figure 3-13 – Roundabout at the Intersection of Centennial Hills Boulevard and Waterfront Street

CRASH DATA

Transportation safety is a key component of any transportation system. Top priority is given to funding roadway improvements to reduce crashes and correct hazardous situations. According to WYDOT, 382 traffic crashes occurred in the study area between January 1, 2010 and April 30, 2013. After a review of crash data throughout the study area, the following trends were identified:

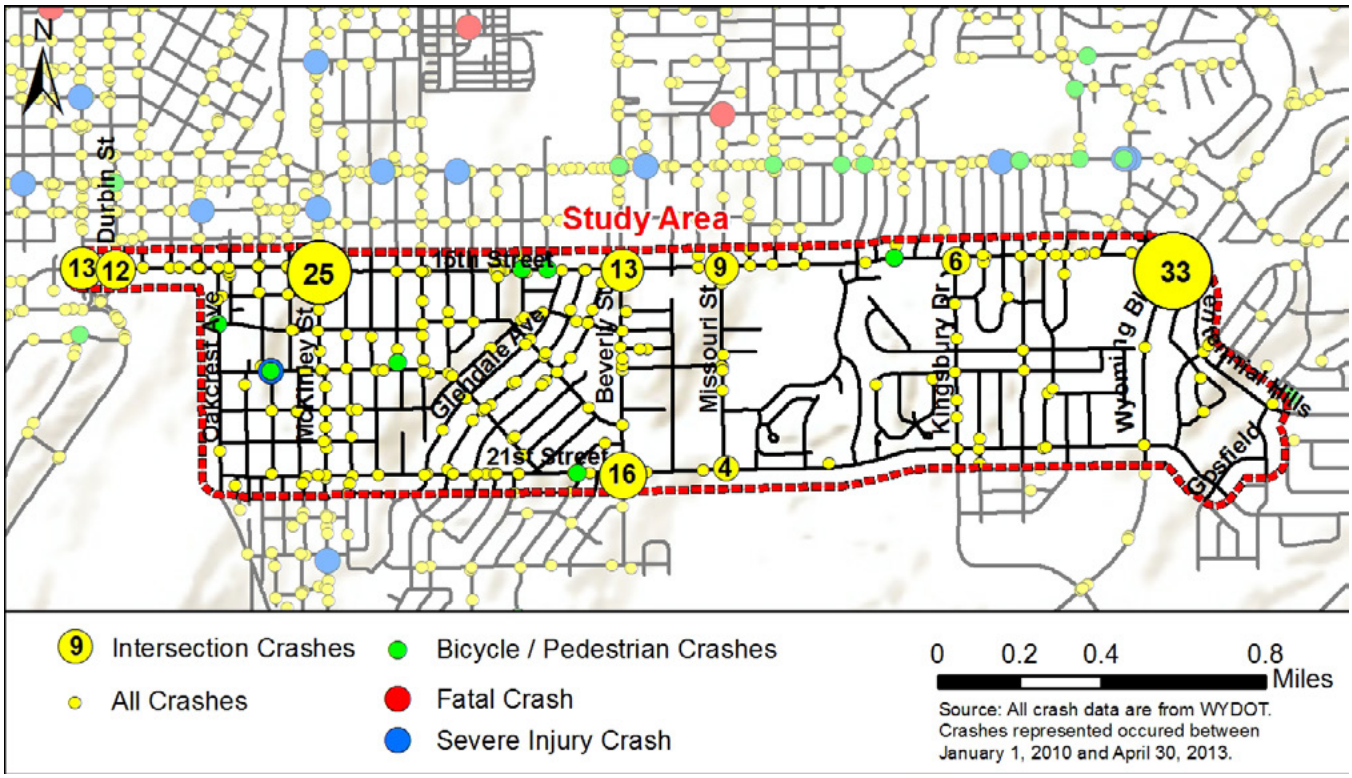
- Winter months experienced 53 percent more crashes than summer months. This trend common in areas that experience frequent snowfall and icy road conditions similar to Casper.
- 1/5 of crashes resulted in a confirmed injury or worse. This includes 2 incapacitating injuries and 0 fatalities (refer to Figure 3-14).
- In the last three years, five pedestrians or cyclists were hit by vehicles on 15th and 21st Streets, all resulting in injuries.
- More than 1/5 of all crashes occurred between a traveling vehicle and a parked car.

Figure 3-14 – Crash Severity



Crashes tend to cluster around intersections where conflict points exist. Conflict points are locations where vehicles cross travel paths. Figure 3-15 is a map of intersections in the study area with the most crashes over the 40-month period. Within the study area, 55 percent of all crashes occurred at intersections.

Figure 3-15 – Crash Clusters



To identify overrepresented crash locations within the study area, a two-phase approach was adopted. First, crash frequency was studied to identify locations with the highest number of crashes. This is the most straightforward approach to determining locations susceptible to crashes. This approach, however, ignores the rate at which crashes occur. Typically, intersections with a high number of crashes also carry high levels of traffic. Many times, a low volume location may have fewer overall crashes but on a per-car basis have a much higher susceptibility to crashes. Therefore, it is beneficial to identify which locations in the study area experience a statistically high crash rate. Table 3-2 illustrates the crash rates per million entering vehicles (MEV) for any intersection with more than 10 crashes over the 40-month period analyzed.

Table 3-2 – Intersection Crash Rates

Location	Number of Collisions	Crash Rate (MEV)	Collision Type [1]							Collision Severity [2]			
			HO	RA	RE	SS - Same	SS - Opp	LT	O	Fatal	InjA	InjB	PDO
15th St and Wolcott St	13	1.4	-	9	3	-	1	-	-	-	-	5	8
15th St and Durbin St	12	0.93	1	2	7	-	1	-	1	-	-	-	12
15th St and McKinley St	25	1.57	1	6	12	2	-	-	4	-	-	6	19
15th St and Beverly St	13	0.62	-	6	4	-	3	-	-	-	1	-	12
15th St and Wyoming Blvd	33	1.37	2	14	13	-	1	-	3	-	-	6	27
21st St and Beverly St	16	1.4	-	13	2	-	-	-	1	-	-	3	13
Collision Type [1]: HO - Head On, RA - Right Angle, RE - Rear End, SS-Same - Sideswipe Same Direction, SS-Opp - Sideswipe Opposite Direction, LT - Left Turn, O - Other													
Collision Severity [2]: Fatal - Fatality, InjA - Incapacitating Injury, InjB - Non-Incapacitating Injury (Includes Possible Injury), PDO - Property Damage Only (Includes Unknown)													

Four intersections experienced crash rates greater than 1 crash per million entering vehicle with a crash rate as high as 1.57 at the intersection of 15th Street and McKinley Street. Further analysis of the four intersections indicated the following trends:

15th Street and Wolcott Street: The intersection of 15th Street with Wolcott Street experiences high angled crash rates relative to the study area. Crash patterns did not indicate any overrepresentation at any specific intersection approach. Furthermore, field reviews did not indicate any particular trends that would lead to increased angled crash susceptibility. Signal timing and phasing improvements can be considered to respond to crash trends such as yellow change and red clearance interval revisions and protected left-turn phasing.

15th Street and McKinley Street: Crash data indicates a higher than average susceptibility for angled, sideswipe and rear-end crashes compared to other intersections along the corridor. Casual observations of the intersection indicate the following characteristics as major contributing factors to this trend:

- East Approach Intersection Skew and Vertical Alignment: The east approach intersection skew and vertical alignment limit sight distance for eastbound motorists and forces unusual turning paths. Two-thirds of the rear-end crashes occur on the eastbound approach.
- Kum & Go Driveway: The Kum & Go gas station has more than 200 feet of total driveway frontage at this intersection. This makes ingress/egress vehicular movements in the gas station unpredictable.

Figure 3-16 – Eastbound Visibility at the Intersection of 15th Street and McKinley Street

15th Street and Wyoming Boulevard: Crash data indicates susceptibility to angled crashes, particularly on Wyoming Boulevard. In fact, 46 percent of such crashes occurred between northbound through traffic and southbound left-turning traffic. A field review indicated the following contributing factors to this crash trend:

- Southbound traffic currently does not have a protected only phase.
- Northbound traffic currently travels at high speeds due to high posted speeds and lack of congestion and conflicts on this section of Wyoming Boulevard.

This intersection also experiences susceptibility to rear-end crashes. However, rear-end crashes are prevalent at signalized intersections, particularly at intersections with high speeds and volumes. Crash data did not indicate any trends for specific intersection approaches. Additionally, site reviews did not indicate any design characteristics that make this intersection increasingly prone to rear-end crashes.

21st Street and Beverly Street: Crash data indicates that right-angle (minor street collision with mainline traffic) crashes were prevalent at this intersection prior to 2012 when AWSC was installed. In fact, this intersection experienced the most angled crashes out of any study intersection with 10 in a 32-month sample. Recent installation of AWSC minimizes the potential for this type of crash. Although the sample size is minimal, the crash potential has significantly been reduced at this intersection after installation of AWSC.

15th Street and Kingsbury Drive: Although this intersection has not experienced the same crash rates as the four intersections previously discussed, the current design of the intersection lends itself to increased crash frequency as traffic volumes increase. Specifically, the skew of the intersection creates a negative offset between the eastbound and westbound left-turn movement. The negative offset creates a head-on crash conflict point if the two opposing movements were to occur simultaneously (refer to Figure 3-17).

Figure 3-17 –Negatively Offset Turn-Lanes at the Intersection of 15th Street and Kingsbury Drive

PEDESTRIAN AND BICYCLE NETWORK

In urban areas, walking and biking is an important component of the transportation system. Enhancing the ability for travelers to walk or bike involves not only providing the infrastructure but also linking urban design, streetscapes and land use to encourage walking and biking. Safety is also critical when developing an appealing pedestrian and bicycle network. According to national studies, pedestrians represent a disproportionate percentage of road-related fatalities.

Figure 3-18 and 3-19 illustrate the existing pedestrian and bicycle facilities in the study area. The majority of walking and cycling that occurs in the study area is recreational or school related. The results of the transportation survey showed that only 4 percent of residents walked or cycled to work.

Figure 3-18 – Existing Pedestrian Facilities

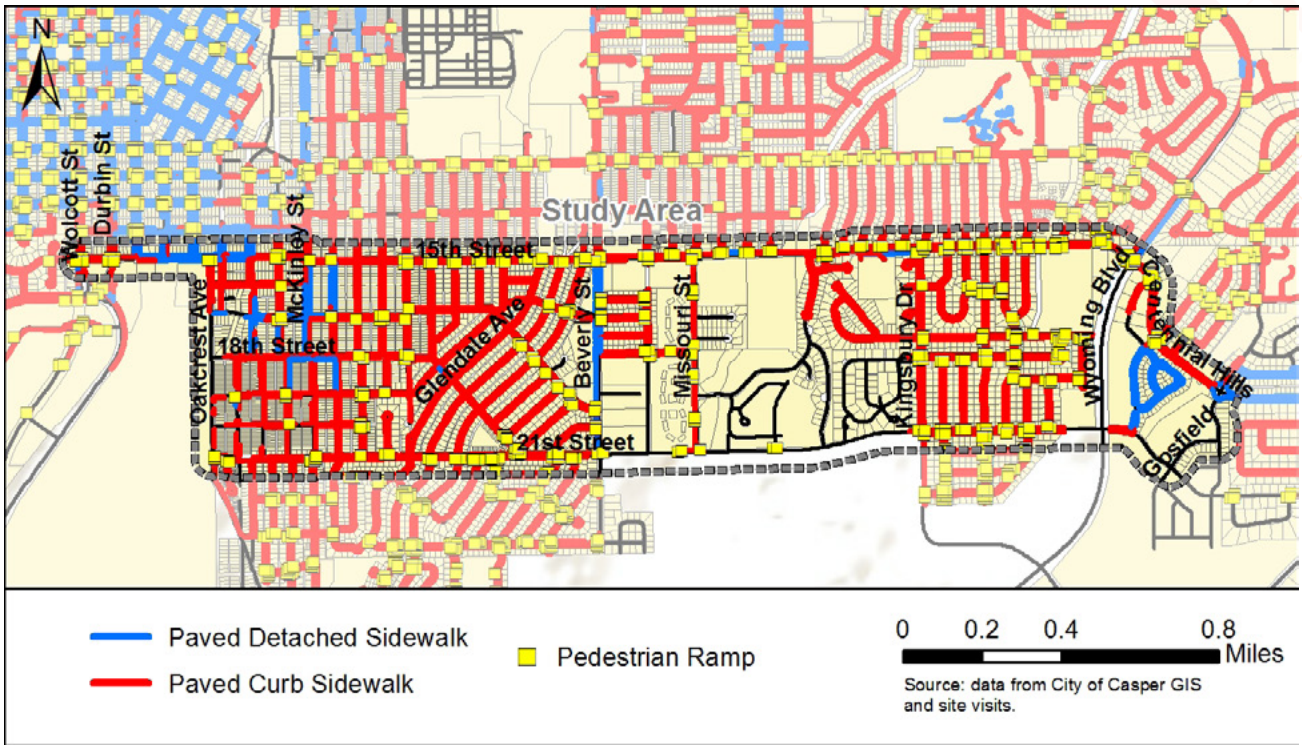
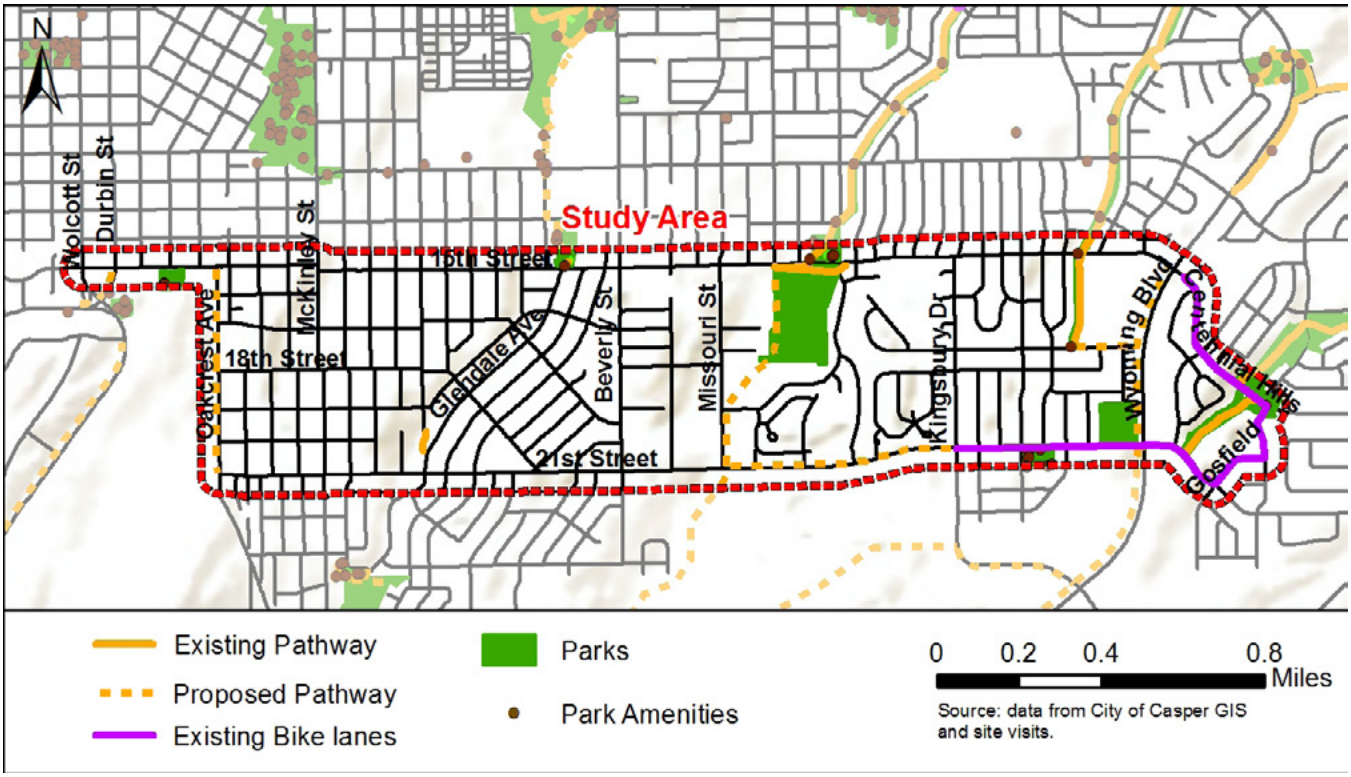


Figure 3-19 – Existing Bicycle Facilities



After a review of the existing pedestrian and bicycle facilities throughout the study area, the following deficiencies were identified:

Pedestrian and Bicycle Facility Availability: 80 percent of the 15th and 21st Street study corridors have no bicycle facilities (refer to Figure 3-19). This limits bicycle mobility and connectivity throughout the study area. The remaining 20 percent of the corridor has on-street bike lanes. There are also a variety of bicycle facilities that intersect 15th and 21st Streets as illustrated in Figure 3-18.

On the other hand, only 8 percent of the study corridors do not have pedestrian facilities on both sides of the corridor. Where sidewalks are only available on one side of the street, pedestrians are forced to cross the busy corridor at unprotected locations.

Sidewalk Conditions: Although sidewalks are readily available along each corridor, many areas of sidewalks in poor conditions create potential trip hazards and complication for pedestrians in wheelchairs (refer to Figure 3-21).

Limited Pedestrian Accessibility: The sidewalks along the corridor are not compliant with multiple Americans with Disabilities Act (ADA) standards.

- More than 1/3 of the intersection sidewalk crossings do not have curb ramps (refer to Figure 3-22). Furthermore, many of the existing curb ramps are not compliant with current detectable warning panel and sideslope requirements.
- More than 3/5 of the study corridors have deficient sideslopes at driveways (2 percent maximum cross-slope). Steep grades at driveways potentially draw pedestrians in wheelchairs into the street (refer to Figure 3-23).
- Although measuring the sidewalk width throughout the study area was beyond the scope of this study, casual observations indicate that throughout much of the study area, ADA sidewalk width standards are not met. ADA standards prescribe 3 feet wide sidewalks with areas of 5-foot wide sidewalk every 200 feet to allow two opposing pedestrians in wheelchairs to pass one another. Although the 3-foot minimum width is met throughout the study area, the 5-foot crossing area is not along many corridor blocks.

Pedestrian Comfort: A person's decision to walk is influenced by many factors, including distance, perceived safety and comfort, convenience and visual interest of the route. When sidewalks abut the roadway, pedestrians feel exposed and

Figure 3-20 – Example of Area without Bicycle Facility

Figure 3-21 – Example of Deteriorated Sidewalk

Figure 3-22 – Example of Nonexistent Curb Ramp

Figure 3-23 – Example of Substandard ADA Sidewalk Sideslope

vulnerable when walking directly adjacent to the travel lane (refer to Figure 3-24).

Vehicle noise, exhaust and the sensation of passing vehicles reduce pedestrian comfort. Factors that improve pedestrian comfort include a separation from moving traffic and a reduction in speed. Currently over ¾ of the sidewalks along the corridor do not have any sort of buffer zone. Furthermore, in most areas the sidewalk is only protected by a mountable curb. These types of sidewalk are more susceptible to roadway departure crashes than sidewalks with raised curbs. Sidewalks without buffer and with mountable curbs are also more likely to have snow or debris, which create obstacles to pedestrians. The mountable curbs also allow motorists to park on sidewalks which is common throughout the study area (refer to Figure 3-25).

Pedestrian Crossings: Pedestrians traversing 15th and 21st Street within the study area are low. Current demand is primarily serviced by the existing traffic control signals or AWSC which are conveniently spaced along the two corridors. There are two crossings, however, that experience elevated pedestrian volumes relative to the rest of the study area but do not have mainline traffic control.

- Grant Elementary School: currently controlled with crosswalk markings and signage (refer to Figure 3-26).
- Manor Heights Elementary School: currently controlled with crosswalk markings signage and crossing guard during peak periods of the day (refer to Figure 3-27).

Figure 3-24 – Example of Sidewalk Without Buffer Zone

Figure 3-25 – Example of Vehicle Parked on Sidewalk

Figure 3-26 – Manor Heights Elementary School 15th Street Crosswalk

Figure 3-27 – Grant Elementary School 15th Street Crosswalk

TRANSIT

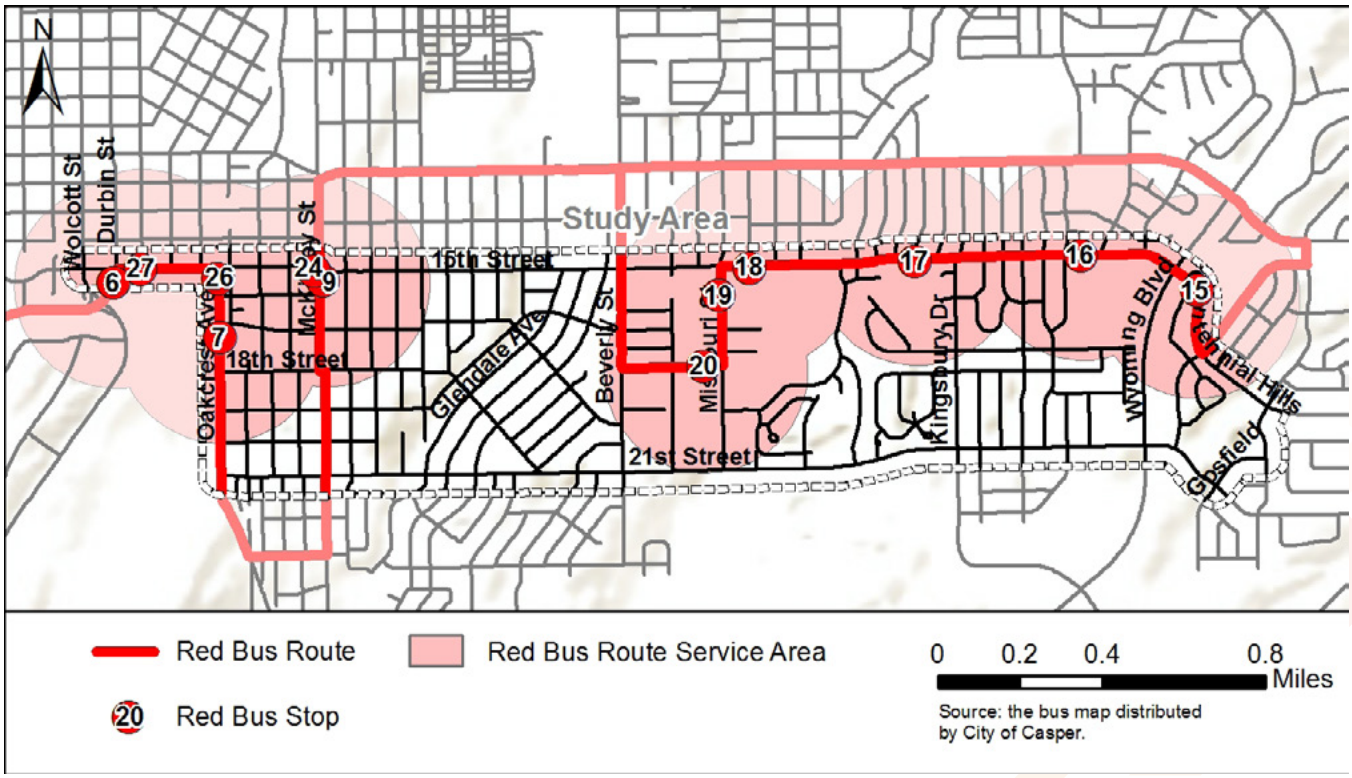
Public transit has been in service in Casper for more than 30 years. Transit has been increasingly recognized as an element of livability and economic progress in cities. Transit is often considered a basic public service and a means of reducing traffic congestion and parking demand in high-density areas. In the study area, where auto-ownership rates are very high, transit serves primarily a social service function. Riders are predominantly those who are physically or economically unable to travel by private automobile, such as children, elderly persons, persons with disabilities and low-income families.

Figure 3-28 – Example of Bus on 15th Street

Casper is served by two bussing systems. A fixed route service runs six color-coded bus routes through the Casper area called The Bus (refer to Figure 3-28), and a paratransit or dial-a-ride service called CATC picks passengers up at their location. The study area is served by the Red bus route. The Red bus route makes a loop from the transfer station on Beech Street through the study area and back in less than one hour. More information is found at catcbus.com.

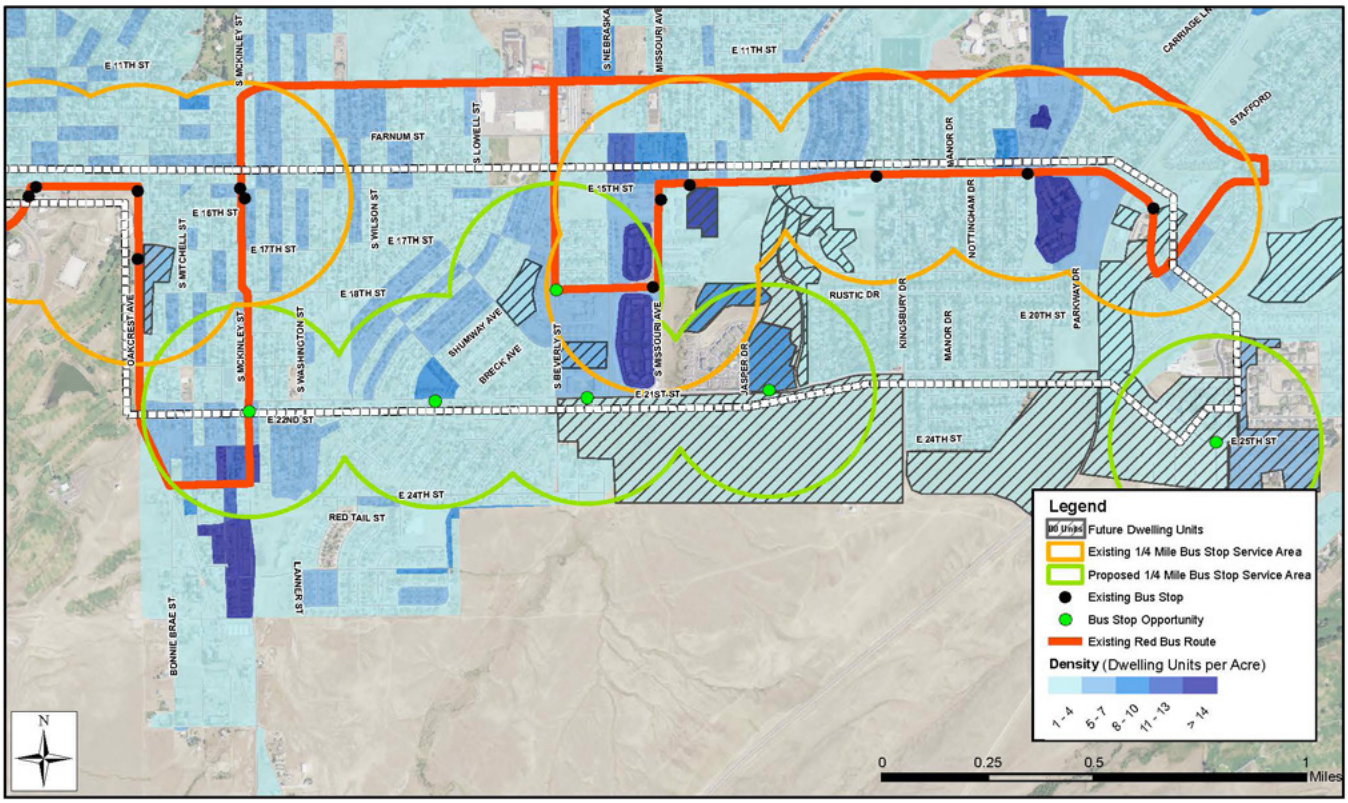
The Red bus route with existing stop locations can be reviewed in Figure 3-29. This figure also highlights a ¼ mile service area around each stop. Studies have found that ¼ mile is the distance the average transit user is willing to walk to access transit. Due to lack of corridor capacity, bus stops gridlock 15th Street. Analysis of bus turn-outs was considered, however turn-outs were discarded due to anticipated right-of-way impacts along the constrained corridor.

Figure 3-29 – Existing Transit Service in Study Area



Studies have found a direct correlation between transit demand and residential density measured in dwelling units per acre. ITE indicates that 4-5 dwelling units per acre provide enough demand to warrant a local bus stop on an hourly basis. Based upon this guideline, future bus stop opportunities were identified along the 15th and 21st Street corridors for 2025 full build-out in Figure 3-30. New or revised bus routes and stops requires detailed consideration of available transit staff, busses and funding. This level of transit analysis was beyond the scope of this report. However, Figure 3-30 can be used to guide future transit route and stop planning efforts.

Figure 3-30 – Future Transit Demand Under Full Build-Out Conditions



FREIGHT

Freight is defined as the movement of goods. The efficient movement of freight is a fundamental prerequisite for a strong and vibrant economy. The study area experiences minimal levels of freight movement due to the nature of land uses abutting 15th and 21st Streets. Residential areas do not generate truck traffic like commercial or industrial areas.

PAVEMENT CONDITIONS

Every street in the study area is paved with asphalt concrete. The asphalt condition varies slightly throughout the area, but the overall condition is very good. A Pavement Surface Evaluation and Rating (PASER) evaluation was beyond the scope of this report, but all major roads were driven and visually inspected. Although transverse cracking, longitudinal cracking (refer to Figure 3-30) and patching were noted at isolated locations throughout the study area, there were no major deficiencies that would have led to a low PASER rating.

Due to minimal truck loads along the corridor, pavement surfacing is anticipated to experience life cycles in excess of 20 years. The City should continue existing maintenance activities (i.e. seal coats and overlays) to preserve the structural fortitude of the roadways and maintain acceptable ride quality for motorists. Studies have found maintaining pavement through rehabilitation techniques has the potential to be 6 to 14 times more cost effective than rebuilding a deteriorated road. Using a 20-year average life cycle, structural overlays should be completed every 15 years to minimize the potential for severe pavement deteriorate that would require costly reconstruction to rehabilitate. This would require that nearly 0.4 miles of 15th or 21st Street would need to be rehabilitated each year. Developing pavement management plans for the corridor is currently completed by City of Casper staff and is beyond the scope of this report.

Figure 3-31 – Example of Longitudinal Cracking in Study Area

PARKING

Parking is an essential complement to transportation systems and land development. The number of spaces varies widely among activities in each community, reflecting the size, intensity and location of specific land uses; availability of alternatives means of travel; and community attitudes about environmental quality and economic development.

On-street parking exists throughout the majority of 15th and 21st Streets due to the abutting residential land use. Parallel parking maneuvers along each corridor reduce capacity on these widely-traveled roads by temporarily stopping traffic while a motorist parks. Parking alongside a road with high traffic volumes not only increases crash potential between motorists and parked cars (more than 20 percent of all corridor crashes included a parked vehicle), but aggressive motorists attempting to pass vehicles attempting to park may introduce head-on crash conflicts.

On -street parking use along the corridor is low, particularly throughout the more traveled areas of the study corridors. In the more traveled areas of the corridor, abutting residential properties often opt for wider driveways to accommodate parking needs. The residential area of 21st Street between Oakcrest and Beverly currently experiences moderate traffic volumes and higher parking rates.

The section of 15th Street adjacent to Manor Heights Elementary School experiences the highest parking demand in the study area. Parking demand at this location is primarily segregated to periods when motorists pick up/drop off students. During these periods, vehicles line 15th Street to pick up students (refer to Figure 3-31). This includes motorists parking on the north side of the road where students are forced to cross the street to meet the vehicle. Although a crossing guard is present during these peak periods, this behavior increases pedestrian exposure by forcing pedestrians to cross the street rather than being picked up on-site. Furthermore, the crossing guard stops traffic on 15th Street, creating a gridlock during periods of peak pedestrian demand. Fortunately, the peak afternoon period does not coincide with peak commuter traffic and the AM peak pedestrian period is dispersed during a wider time period compared to the PM peak hour.

Figure 3-32 – Parking Demand at Manor Heights Elementary School

SUMMARY OF DEFICIENCIES

This chapter includes a wide variety of transportation infrastructure deficiencies. Figure 3-33 summarizes the major deficiencies that could be improved to ensure a safe and efficient transportation system for every mode of travel along the study corridors.

Figure 3-33 – Study Area Deficiencies

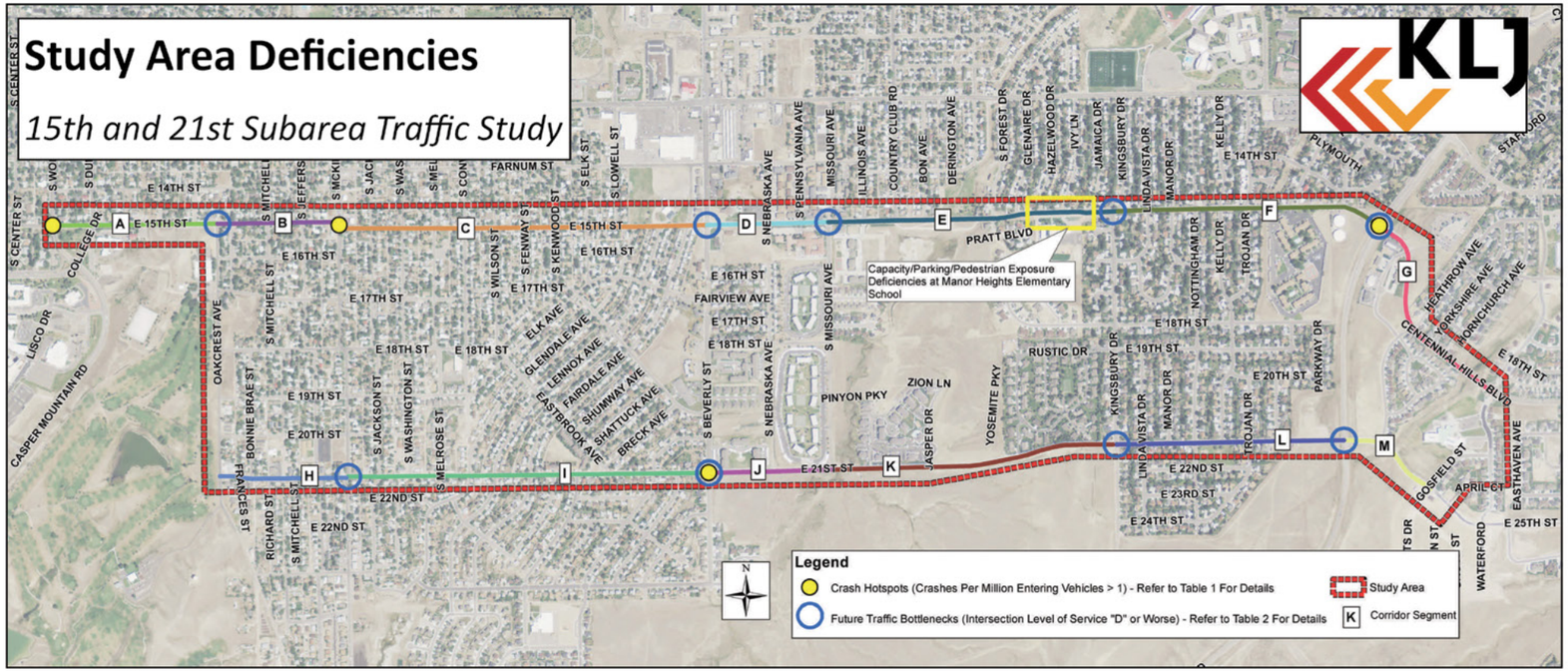
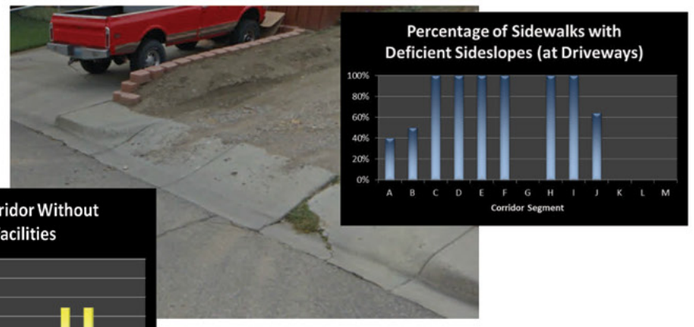
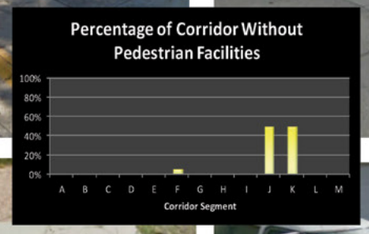
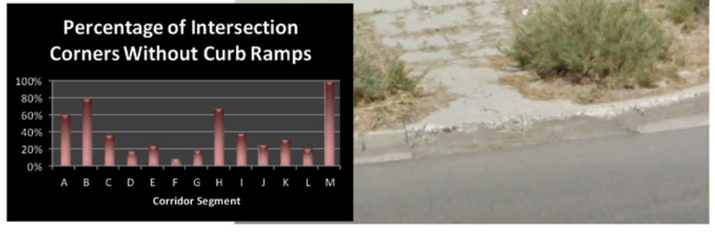


TABLE 1 - Crash Hotspot		
Corridor	Intersection	Overrepresented Crash Pattern
15th Street	Wolcott Street	Angled Crashes (Distributed throughout Approaches)
	McKinley Street	Angled and Sideswipe Crashes (Primarily for Movement Navigating Skewed Intersection and from Kum and Go Parking Lot)
	Wyoming Boulevard	Angled Crashes (Specifically NB Through vs. SB Left-Turn) and Rear-End Crashes (Distributed throughout Approaches)
21th Street	Beverly Street	Crash Patterns Specific to Two-Way Stop Control (Recently Revised to All-Way Stop Control)

TABLE 2 - Traffic Bottlenecks				
Corridor	Intersection	Level of Service		
		2013	2025	2040
15th Street	Oakcrest Avenue	A	C	F
	Beverly Street	B	C	D
	Missouri Avenue	B	C	E
	Kingsbury Drive	A	E	F
	Wyoming Boulevard	B	C	E
21th Street	McKinley Street	B	C	F
	Beverly Street	C	F	F
	Kingsbury Drive	A	C	E
	Wyoming Boulevard	A	C	E







This page intentionally left blank.

IMPLEMENTATION SCHEDULE

An implementation schedule is a tool designed to guide future capital improvement decisions. To develop a functional schedule, specific implementation triggers were developed and correlated with implementation time frames. Implementation time frames are noted below:

- Immediate: Improvement strategies that fall under the Immediate implementation time frame are policy-based strategies that can be implemented with minimal costs. Policy-based strategies are designed to set baseline requirements for residents, developers, stakeholders and decision makers to ensure the corridor vision is achieved in an organized and congruent manner.
- Short-Term: The time period from 2014 (the first applicable construction season) to 2024 (the final construction season prior to the anticipated study area build-out year of 2025). Improvements are implemented in this time frame if one of the following triggers are met:
  - Safety improvement triggered by historic crash trends over the past three years. Improvements are triggered if the intersection has a crash rate greater than 1 crash per every 1 million entering vehicles.
  - Capacity improvement triggered by traffic operations deficiencies under existing 2013 and forecasted 2025 traffic conditions. Improvement is triggered if intersection LOS is "D" or worse.
  - Key pedestrian and/or bicycle facilities gaps that can be mitigated without complete road reconstruction.
- Long-Term: The time period from 2025 to 2040 (study horizon). This period includes all capacity improvements triggers by traffic operations deficiencies forecasted under 2040 traffic conditions. Improvement is triggered if intersection LOS is "D" or worse.
- Contingent Upon Roadway/Utility Improvement Schedule: This category pertains to large-scale, cost intensive corridor-wide improvement strategies. Due to the significant scope of these projects, it is critical these improvements be coordinated with planned roadway rehabilitation or underground utility improvement schedules. This prevents unnecessarily redundant construction. Due to the lack of future capital improvement information beyond immediate years in Casper, specific years were not assigned to this period.
- Detailed Prioritization: Detailed prioritization of short and long-term spot improvements are sensitive to the improvement location and pace of surrounding development. Therefore, priorities between projects in the short-term or in the long-term timeframes should be in response to development activities. To assist local budgeting efforts, linear growth between 2013, 2025 and 2040 traffic conditions was completed to estimate years when improvements will be triggered.

  Dependent upon the type of improvement or deficiency, triggers may be based upon the year traffic volumes are forecasted to meet traffic control warrants or the year intersection or approach traffic operations no longer meet level of service standards. It is important to note trigger years are for planning purposes only, actual growth will not be linear but rather depend upon development activities.

  Spot safety improvements are preexisting deficiencies and therefore prioritized for the next construction season (2014). This ensures that safety improvements are implemented prior to improvements predicated upon motorist, pedestrian or bicycle convenience. Actual implementation is dependent upon funding availability and regional priorities.

CORRIDOR-WIDE IMPROVEMENTS

The following three corridor-wide alternatives were studied as part of this study:

Figure 4-1 – Alternative 1: Do Nothing

Figure 4-2 – Alternative 2: Four-Lane Section with Improved Pedestrian Facilities

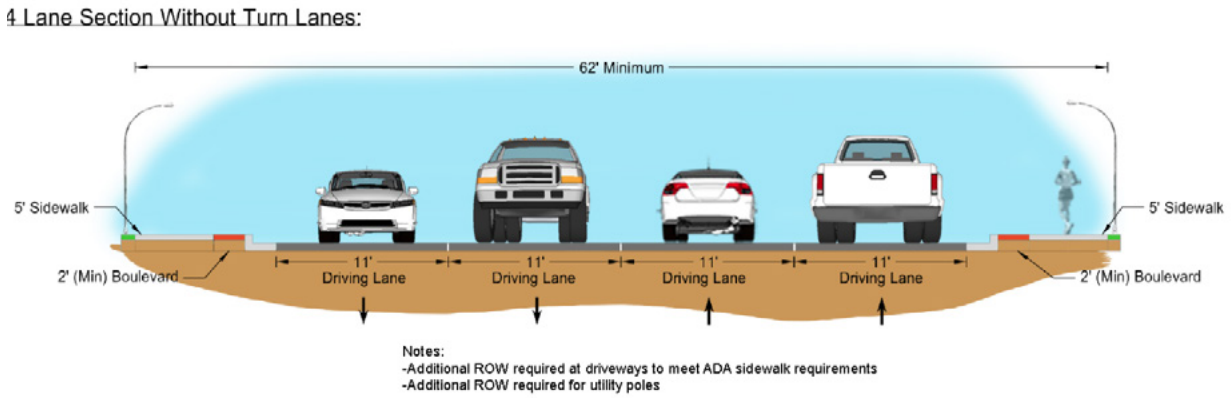
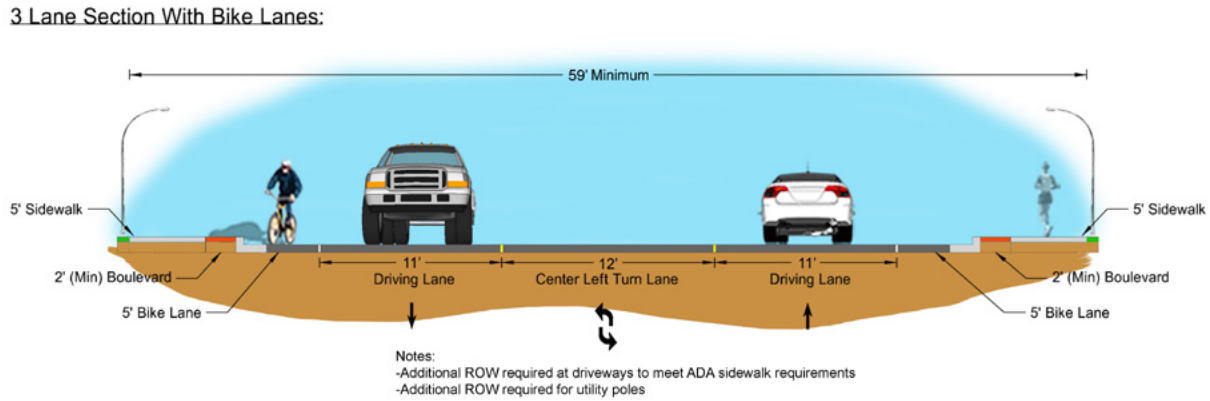


Figure 4-3 – Alternative 3: Three-Lane Section with Bike Lanes and Improved Pedestrian Facilities



Due to the constrained roadway ROW and low traffic volumes generated by residential driveways along the corridor, an alternative with a raised median was discarded early in the analysis process. Providing a median wide enough to be used as a pedestrian refuge island would either impact buildings or eliminate the potential to implement bike lanes, TWLTL or additional through lanes. Bike lanes, TWLTL and additional through lanes were prioritized over implementation of a median.

After a detailed review of each alternative with MPO staff, City of Casper staff and the general public, Alternative 3 was ultimately recommended for the following reasons:

- Capacity: As documented in the Transportation Deficiencies Chapter, Alternative 1 (Do Nothing) will experience significant operational deficiencies moving into the future. Although the corridors will be congested during peak hours, bottleneck mitigation will be capable of maintaining acceptable levels of progression and operations through the study horizon without additional through lanes. Furthermore, due to the high density of access points along the corridor, providing a four-lane section (Alternative 2) without a TWLTL is limited in effectiveness during peak periods of the day compared to a three-lane section (Alternative 3). Bottleneck mitigation strategies will be discussed in the following section.
- Corridor Character: Adding through lane capacity (Alternative 2 – 4-Lane Section) on these corridors will promote increased traffic volumes and speeds on the study corridors. This contradicts the purpose and function of the collector classification of 15th and 21st Street. Providing regional mobility is the responsibility of arterial corridors. According to the Federal Highway Administration (FHWA), arterial spacing in urban settings should be 0.5 to 1 mile. Currently 12th Street, an east-west arterial, exists three blocks north of 15th Street. Furthermore, according to input received from the public, attracting regional volumes onto 15th and 21st Streets is undesirable due to the residential and school land uses abutting the corridor.

  Building and tree impacts can be avoided with both Alternative 2 (4-Lane Section) and 3 (3-Lane Section) by narrowing boulevards along the corridor. The specific boulevard width at each tree and house would need to be developed during the project development phase.
- Safety: As documented in the Transportation Deficiencies Chapter, the current design of the study corridors lends itself to various crash trends that would be alleviated upon implementation of either Alternatives 2 (4-Lane Section) or 3 (3-Lane Section). Specifically, Alternatives 2 (4-Lane Section) and 3 (3-Lane Section) address multiple pedestrian safety deficiencies through implementation of a buffer zone with a raised curb. What separates Alternatives 2 (4-Lane Section) and 3 (3-Lane Section) in terms of safety is the presence of a TWLTL. Implementation of a TWLTL (Alternative 3) has been proven to reduce serious crashes by 37 percent compared to configurations with four through lanes and no TWLTL analogous to Alternative 2 (4-Lane Section).
- Pedestrian Accessibility and Comfort: As documented in the Transportation Deficiencies Chapter, Alternative 1 (Do Nothing) currently does not meet multiple ADA standards and instills pedestrian discomfort due to the lack of protection from traffic. Both Alternatives 2 (4-Lane Section) and 3 (3-Lane Section) include improvements aimed at mitigating ADA deficiencies and include a buffer zone to increase pedestrian comfort along the corridor.
- Bicycle Mobility and Connectivity: 80 percent of the two study corridors have no bicycle facilities. Alternatives 1 (Do Nothing) and 2 (4-Lane Section) do not address this deficiency. Alternative 3 (3-Lane Section), on the other hand, provides bicycle facilities throughout the entirety of each corridor with the exception of a 0.4-mile section of 21st Street where building impacts would be generated through implementation of bike lanes. For this potentially impacted section of 21st Street, bicycle facilities are recommended one block north on 20th Street.
  Refer to Figure 4-4 on page 45 for an illustration of the proposed bicycle network layout. The figure includes planned bicycle facilities proposed in the Casper Area Trails, Path and Bikeway Plan. Slight deviations from the Casper Area Trails, Path and Bikeway Plan were necessary where capacity improvements conflicted with planned bicycle improvements. Where conflicts occurred, alternative bicycle facilities were proposed to maintain the same level of planned bicycle connectivity and mobility.
- Parking: Both Alternatives 2 (4-Lane Section) and 3 (3-Lane Section) require that on-street parking be removed throughout the entirety of both 15th Street and 21st Street corridors. As noted in the Transportation Deficiencies Chapter, on-street parking

spaces are infrequently used yet contribute to more than 20 percent of all crashes in the study area. Parking maneuvers also reduce corridor capacity.

To further illustrate why Alternative 3 (3-lane section) is recommended, grade values were developed for each corridor alternative (refer to Table 4-1). The alternative that offers the greatest improvement in a particular category is assigned a grade value of A and the alternative providing the least or no benefit is assigned a grade of F. The middle alternative is given a grade of B, C, D, or E depending on how it compares to the first two alternatives. Finally, number values were associated to grades and averaged to determine the overall grade. The grade values are arbitrary. The purpose of the grade values is to highlight relative benefits between the three potential alternatives.

Table 4-1 – Cross-Section Alternative Comparison

Alternative	1: Do Nothing	2: Four-Lane Section with Improved Pedestrian Facilities	3: Three-Lane Section with Bike Lanes and Improvement Pedestrian Facilities
Capacity	F	A	B
Corridor Character	A	F	B
Safety	F	B	A
Pedestrian Accessibility and Comfort	F	A	A
Bicycle Mobility and Connectivity	F	F	A
Parking	A	F	F
Overall	E	D	B

The existing cross-section, roadway surface and ROW widths vary almost every block along 15th and 21st Streets. On certain sections of the corridor, grass boulevards could be provided whereas other sections are limited to narrow stamped concrete buffers. Figure 4-5 on page 44 illustrates the corridor cross-section layout for the study area.

Finally, due to the scope, cost and impacts required to implement corridor-wide improvements, these recommendations fall under the implementation category Contingent Upon Roadway/Utility Improvement Schedule. In other words, the corridor-wide improvements will be coordinated with planned roadway and underground utility improvements and will not have a time frame for implementation recommended in the report.

In summary, implementation of the proposed 3-lane cross-section improves vehicular safety and capacity, alleviates sidewalk gaps, improves existing sidewalks to meet ADA curb ramp, width and sideslope standards, increases pedestrian comfort through implementation of a sidewalk buffer from abutting traffic and increases the percentage of 15th and 21st Street corridors with bicycle facilities from 20 to 100 percent.

15th Street at Manor Heights Elementary School

Removing on-street parking adjacent to Manor Heights Elementary School without increasing parking supply elsewhere would likely result in motorists parking on adjacent side-streets. This behavior would not only be inconvenient for abutting residents but also force pedestrians to cross 15th Street and other roadways increasing overall pedestrian exposure to traffic. To prevent this behavior, it is recommended the following spot improvements be considered at this location (refer to Figure 4-5 on page 40):

- Remove westbound on-street parking
- Implement bike lane on the north side of 15th Street
- Implement combined shared biking/parking lane on the south side of 15th Street.
- Convert the parallel parking on the school frontage road from parallel to angled parking.

These improvements provide the following benefits:

- Minimal decrease in overall parking supply.
- Reduced number of pedestrians crossing 15th Street. This will not only increase safety by reducing pedestrian exposure, but will also increase corridor capacity by limiting the amount of time that school crossing guards stop traffic.

This improvement strategy will be inconvenient for westbound motorists as there will no longer be a parking lane for this movement. The school should consider increasing the on-site parking supply to accommodate the movement.

Alternative parking configurations can be considered (i.e. on-street circulatory roadway south of the school, increase on-site parking supply, etc.). However, reducing pedestrian exposure across 15th Street should be the primary objective. Studies have found that pedestrians of the ages associated with Manor Heights Elementary are at an increased threat for vehicle-pedestrian crashes. A full transportation study at Manor Heights Elementary may be appropriate.

Curb Ramp Improvement Policy

As noted in the Transportation Deficiencies chapter, more than 1/3 of the intersection sidewalk crossings do not have curb ramps. Furthermore, many of the existing curb ramps are not compliant with current detectable warning panel and sideslope requirements. Depending upon funding availability and regional priorities, corridor-wide improvements that include curb ramp improvements may not be implemented for many years. To accommodate disabled pedestrians throughout the corridor, it is recommended that a rotating curb ramp construction and rehabilitation fund be developed. Details of this specific fund or the policy in general must consider regional priorities and are beyond the scope of this report. As a policy improvement, this strategy falls under the "Immediate" implementation period.

Snow Removal Policy

Currently the Casper City Municipal Code doesn't specify snow removal requirements. It is recommended policies be considered that address snow removal responsibilities and penalties for noncompliance. This helps ensure pedestrian accessibility and mobility year-round. As a policy improvement, this strategy falls under the "Immediate" implementation period.

Figure 4-4 – Future Bicycle Facilities

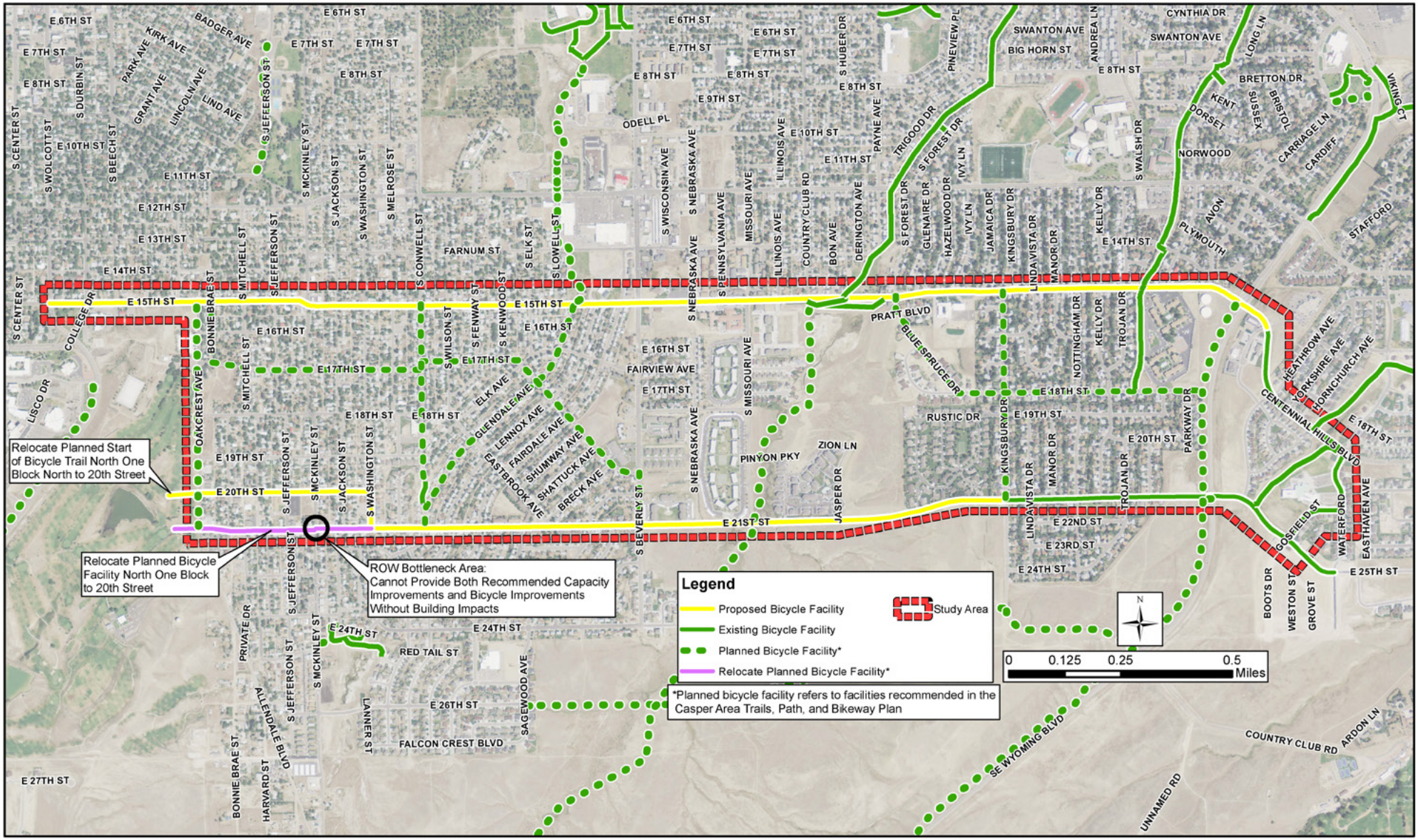
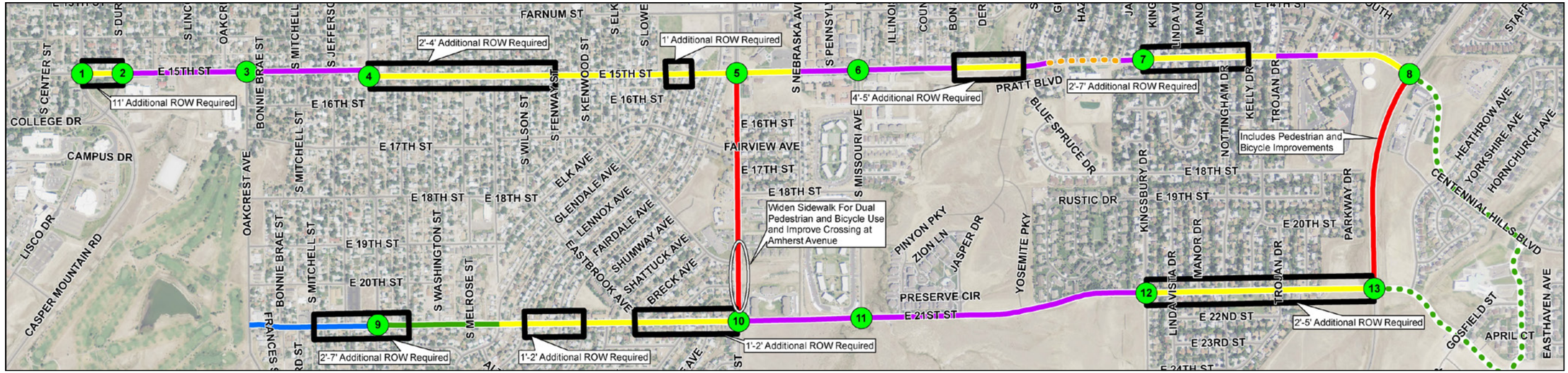


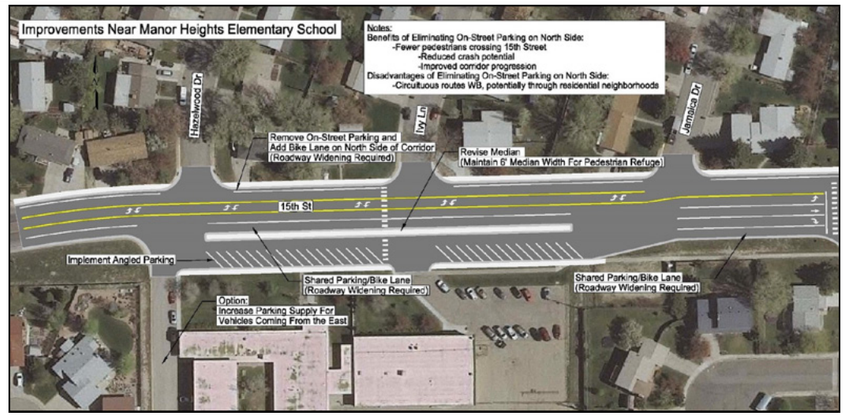
Figure 4-5 – Corridor Improvement Plan



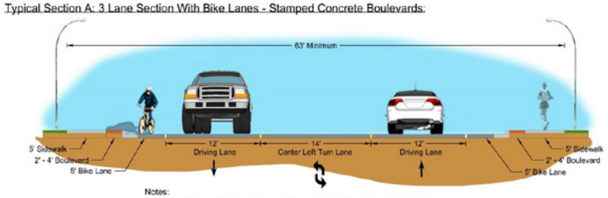
Legend

- Intersection Improvement Locations
- ROW Acquisition Required (No Building Impacts Anticipated)
- Construct Typical Section A
- Construct Typical Section B
- Construct Typical Section C
- Construct Typical Section D
- Widen to 4 Lane Section
- Maintain Existing Cross Section
- School Area Improvements

n
w e
s

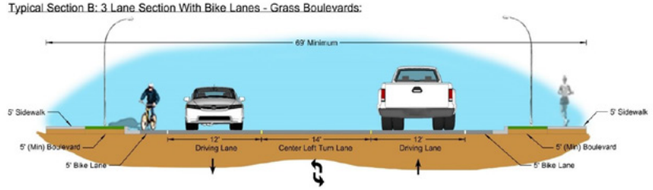


Typical Section A: 3 Lane Section With Bike Lanes - Stamped Concrete Boulevards:

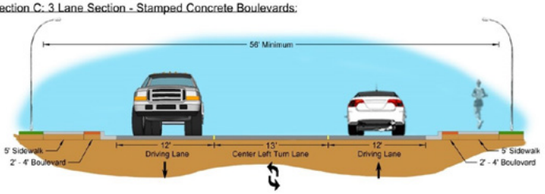


Notes:
-Additional ROW required at driveways to meet ADA sidewalk requirements
-Additional ROW required for utility poles

Typical Section B: 3 Lane Section With Bike Lanes - Grass Boulevards:



Typical Section C: 3 Lane Section - Stamped Concrete Boulevards:



Typical Section D: 2 Lane Section With Parking

Notes:
-Additional ROW required at driveways to meet ADA sidewalk requirements
-Additional ROW required for utility poles

KLJ

Proposed Improvement Plan

15th and 21st Subarea Traffic Study

Implementation Period	Location	Description	2013 Cost
Immediate	City-Wide	Curb Ramp Implementation and Improvement Policy	*Not Applicable*
	City-Wide	Snow Removal Policy	*Not Applicable*
Contingent Upon Roadway/Utility Improvement Schedule[1]	A: 15th St (Wolcott St - Oakcrest Ave)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$1,009,000
	B: 15th St (Oakcrest Ave - McKinley St)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$748,000
	C: 15th St (McKinley St - Beverly St)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$2,256,000
	D: 15th St (Beverly St - Missouri Ave)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$745,000
	E: 15th St (Missouri Ave - Kingsbury Dr)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$1,782,000
	F: 15th St (Kingsbury Dr - Wyoming Blvd)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$1,634,000
	H: 21st St (Oakcrest Ave - McKinley St)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$777,000
	I: 21st St (McKinley St - Beverly St)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$2,213,000
	J: 21st St (Beverly St - Missouri Ave)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$753,000
	K: 21st St (Missouri Ave - Kingsbury Dr)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$1,742,000
	L: 21st St (Kingsbury Dr - Wyoming Blvd)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$1,398,000
		Subtotal	$15,057,000

This page intentionally left blank.

SPOT IMPROVEMENTS

Spot improvements were developed to mitigate congestion bottlenecks and crash prone sites. Spot improvements were developed using the following considerations:

Implementation Schedule: Timely implementation of spot improvements provides acceptable area-wide traffic operations through the 2040 horizon year. Due to the unknown implementation schedule for corridor-wide improvement strategies, spot improvements are developed assuming corridor-wide improvements have yet to be implemented.

Spot Improvement Scope: Deficiencies that will be addressed via corridor-wide improvements are not discussed within the spot improvement section. For example, curb ramp deficiencies will not be discussed as they are addressed above. However, curb ramp improvements will be required if federal funding is used at any of the spot improvement locations.

Parking Impacts: Many of the spot capacity improvements revolve around low impact turn-lane improvements that can either be implemented via new pavement striping or through a minor roadway widening project. Turn lane improvements will impact on-street parking. However, the on-street parking is minimal adjacent to these major intersections due to the potential for conflicts with queued vehicles. Therefore, the number of removed parking spaces is not estimated in the analysis below because it portrayed misleading parking impacts. If maintaining parking is critical at any of the spot improvement locations, additional roadway widening will be required.

Turn Lane Lengths: Without additional through lanes implemented through the corridor, long queues for through traffic will be unavoidable. Providing turn lanes long enough to bypass forecasted through-lane queue lengths was not considered due to resulting conflicts with upstream intersections. Therefore, turn lane lengths were based upon forecasted queue 2040 95th percentile lengths for the corresponding turning movement.

15th Street and Wolcott Street

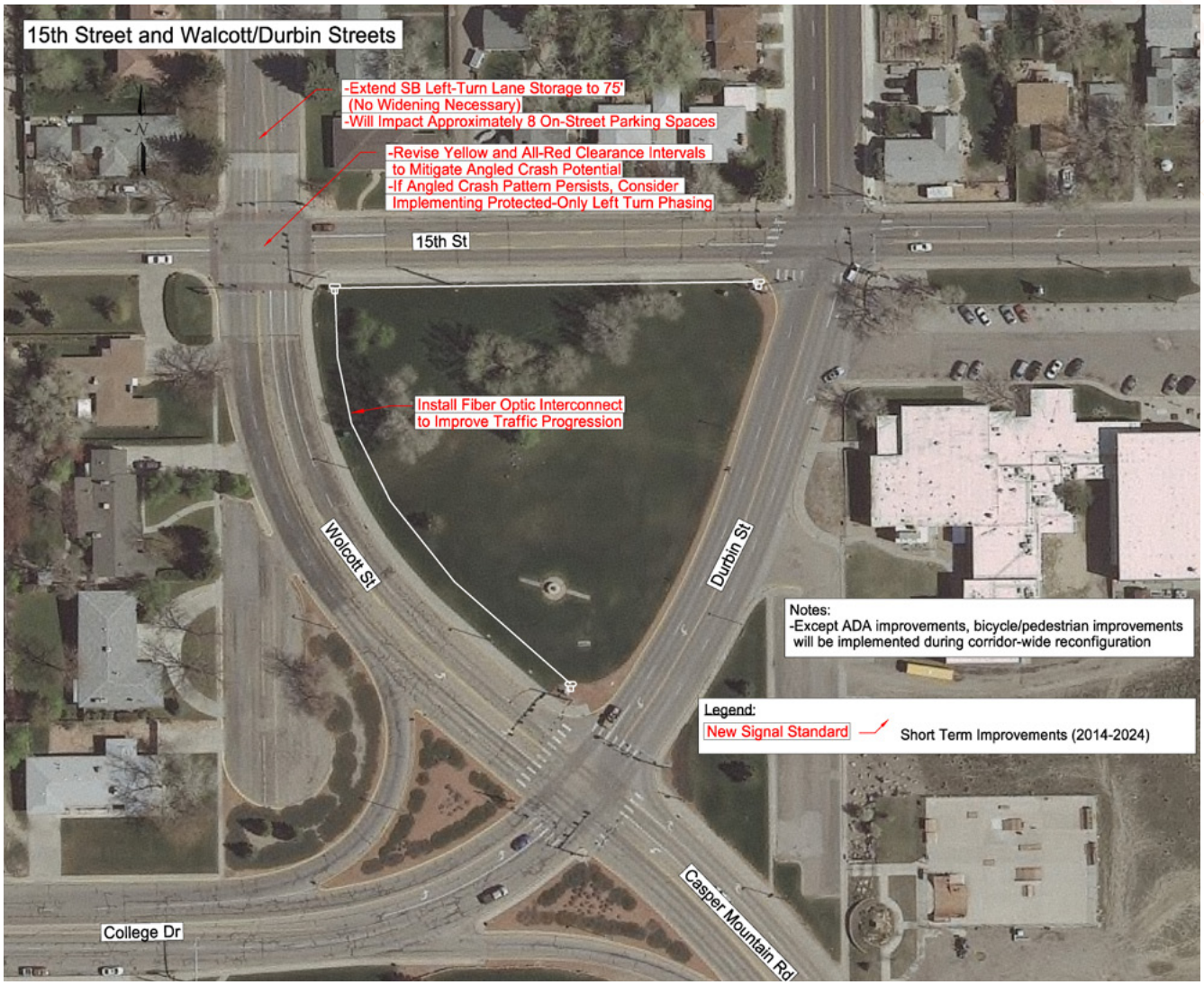
Short-Term (2014-2024): Consider revising yellow change and all red clearance intervals to provide additional time for motorists traveling through the intersection. This improvement will potentially reduce angled crashes susceptibility. If the angled crash trend persists after updating the change and clearance intervals, it is recommended that protected left-turn phasing be considered to alleviate this conflict. Installing a protected only left-turn phase reduced the intersection LOS from "B" to "C" under 2040 traffic conditions by increasing the number of phases and signal lost time.

The intersections of 15th Street with Wolcott and Durbin Streets and the intersection of Wolcott Street and College Drive are all within a 480-foot proximity. To improve traffic progression between the three closely-spaced intersections, it is recommended that fiber optic interconnect and coordination plans be devised between the three locations.

It is also recommended that the southbound left-turn lane storage length on Wolcott Street be extended to a minimum of 75 feet (no widening necessary) to prevent left-turning traffic from spilling back onto adjacent through lanes.

Estimated Year Improvement is Triggered: 2014

Figure 4-6 – 15th Street and Wolcott Street Intersection Spot Improvement Plan



15th Street and Durbin Street

No capacity or safety improvement triggered through 2040.

15th Street and Oakcrest Avenue

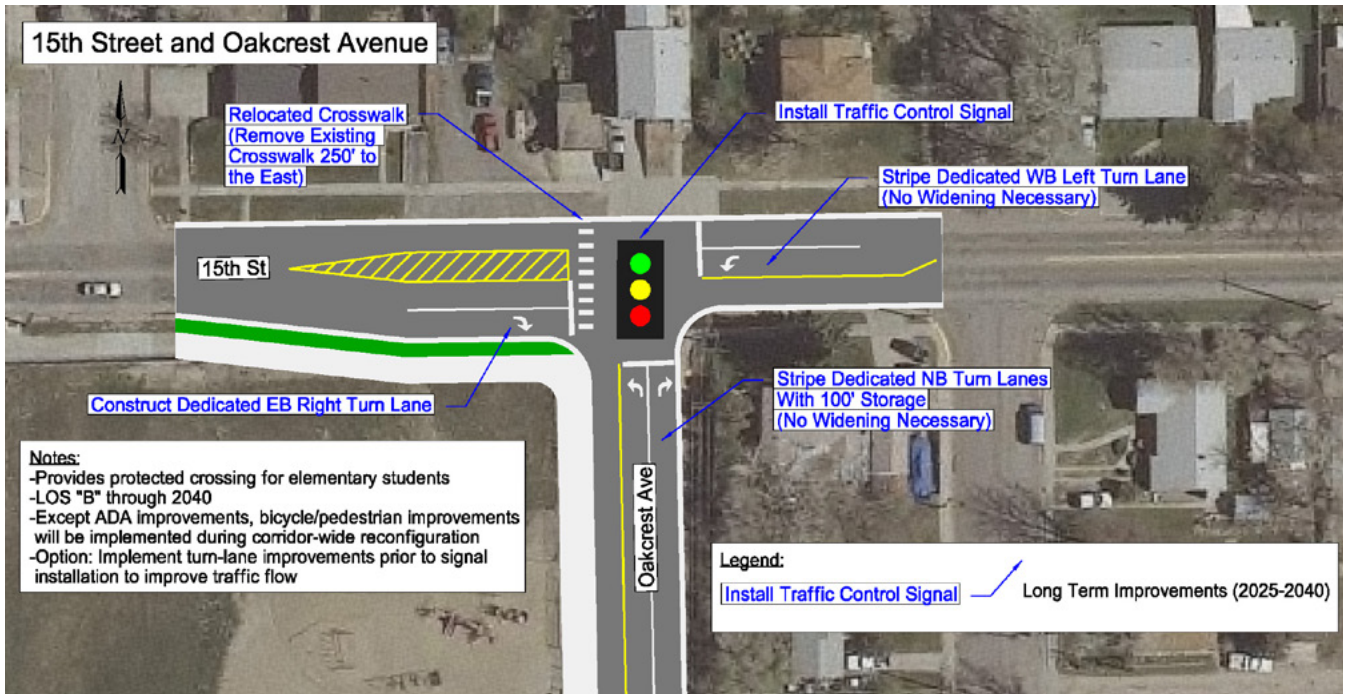
Short-Term (2014-2024): Widen intersection to include eastbound right-turn lane, stripe westbound left-turn lane and northbound left-turn lane (no widening necessary) and install a traffic control signal. This recommendation improves the LOS from "C" to "A" and "F" to "B" under 2025 and 2040 traffic conditions, respectively.

Implementation of a traffic control signal at this location also provides a protected 15th Street crossing for pedestrians originating north of Grant Elementary School.

Estimated Year Improvement is Triggered: 2024

Note: Roundabout discarded at this intersection for multiple reasons. The primary reason being that a single-lane roundabout cannot carry the forecasted capacity at this intersection and a multilane roundabout will not operate effectively on a single-lane roadway.

Figure 4-7 – 15th Street and Oakcrest Avenue Intersection Spot Improvement Plan



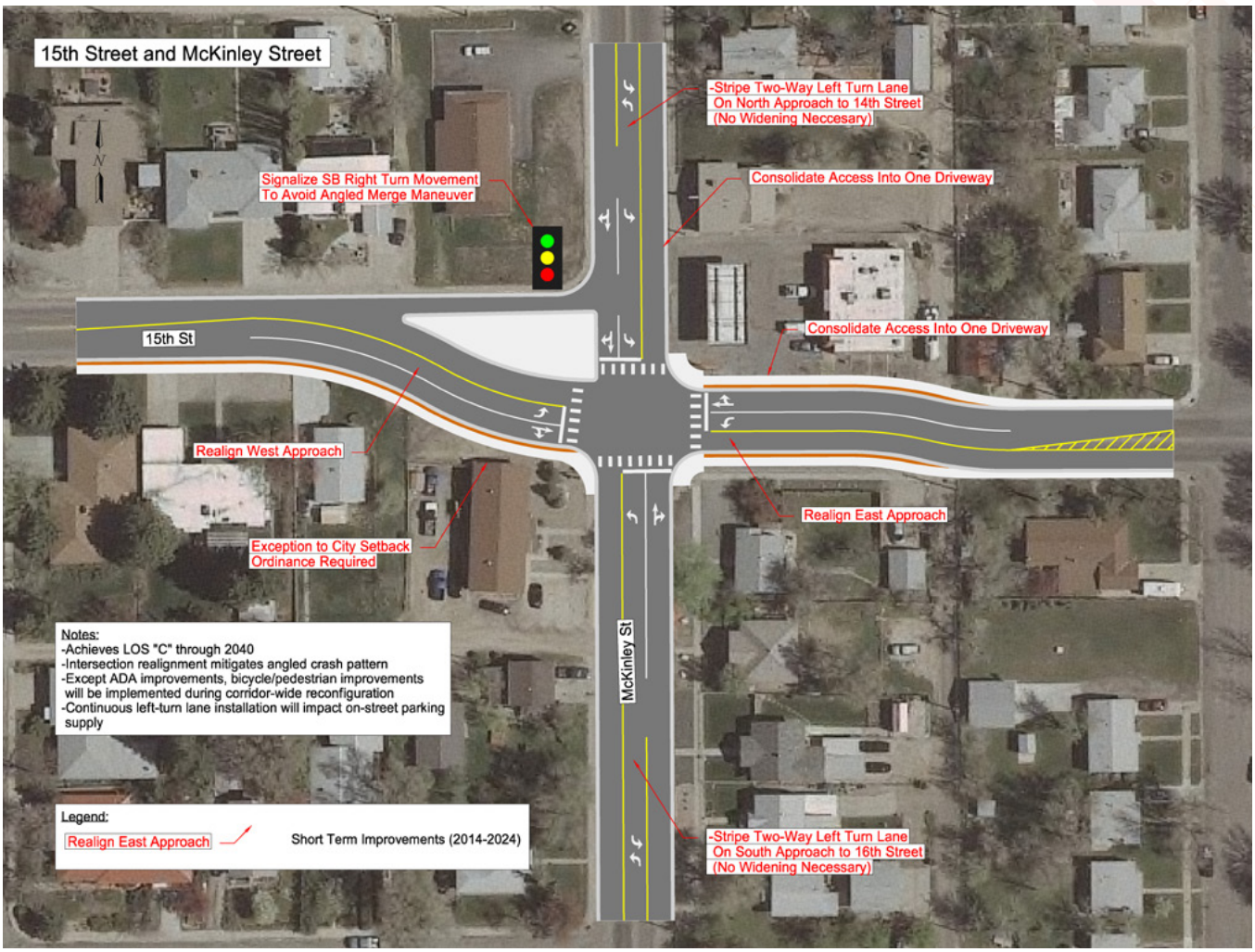
15th Street and Mckinley Street

Short-Term (2014-2024): The following improvements are recommended at this intersection:

- Realign intersection to eliminate sweeping turning maneuvers to reduce angled crash susceptibility, and increase intersection visibility on the east intersection approach to reduce read-end crash susceptibility.
- Shorten Kum & Go driveways and separate from the intersection to reduce potential for conflicts into/out of this property.
- Convert north and south left-turn lanes into TWLTLs north to 14th Street and south to 16th Street. This improvement will prevent queue blockages between the left-turn and combined through/right-turn lanes.

Estimated Year Improvement is Triggered: 2014

Figure 4-8 – 15th Street and McKinley Street Intersection Spot Improvement Plan



15th Street and Beverly Street

Short-Term (2014-2024): Widen eastbound right-turn lane from 6 feet to 12 feet to allow vehicle access (improves intersection LOS from "D" to "C" under 2025 traffic conditions).

Estimated Year Improvement is Triggered: 2015

Long-Term (2025-2040): Convert northbound right-turn lane into a through lane and construct new right-turn lane (widening and retaining wall necessary). Additionally, it is recommended that four-lane striping be continued on Beverly Street from 15th Street to 21st Street. Beverly Street is currently striped in this fashion as far as 180 feet south of the intersection. Providing multiple through lanes on Beverly Street (minor arterial) improves the intersection LOS from "D" to "C" under 2040 traffic conditions. With only turn lane improvements and without the additional northbound/southbound through lane, a LOS "C" cannot be achieved under 2040 traffic conditions.

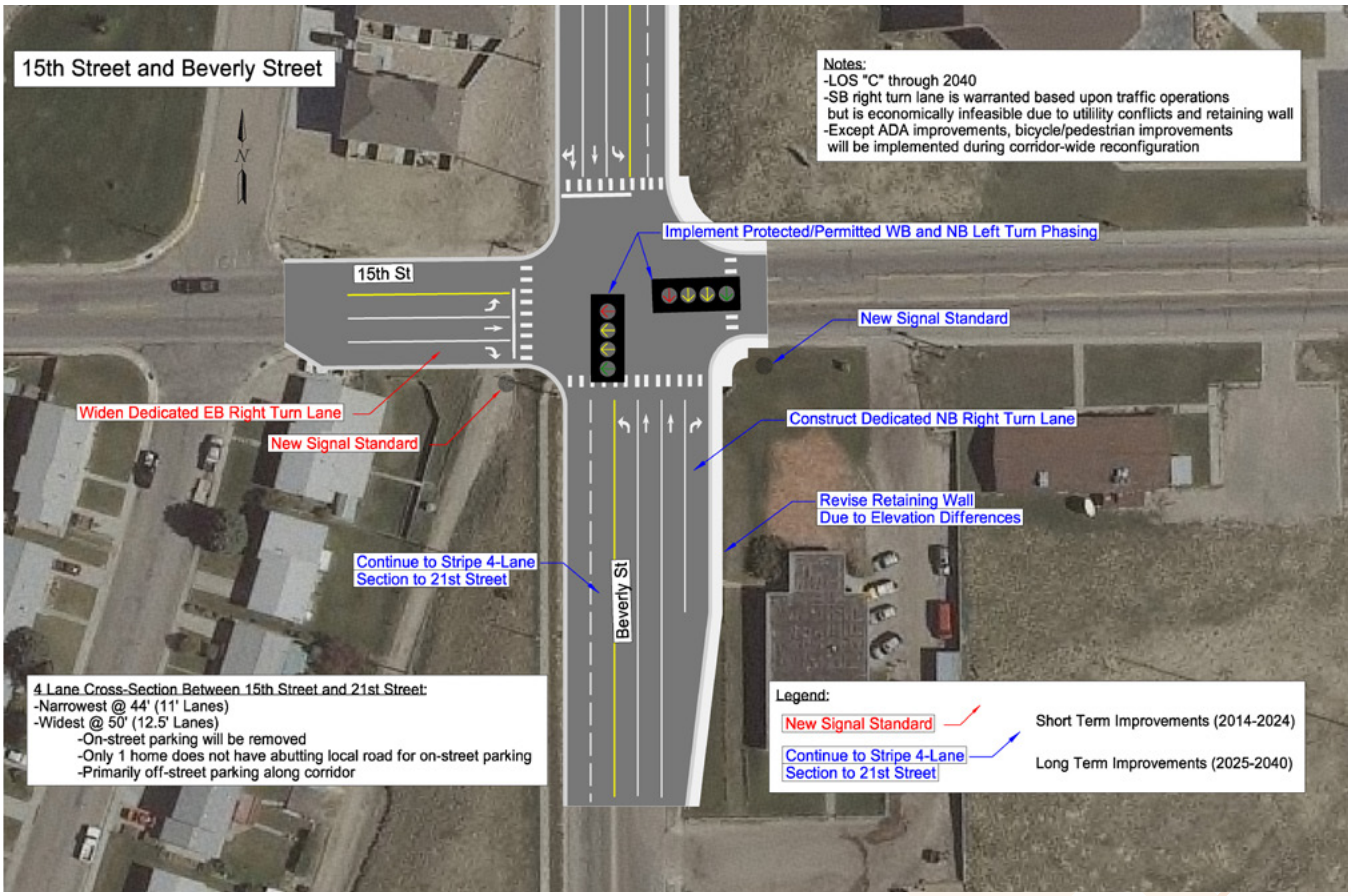
Striping Beverly Street as a four-lane section would require all on-street parking to be removed between 15th Street and 21st Street unless widening is considered. However, the majority of parking along this corridor is currently serviced by off-street parking lots or on-street parking on intersecting side-streets. Only one residential home is not serviced with parking by an abutting side-street or off-street parking.

Additionally, it is recommended the northbound left-turn lane and westbound left-turn lane receive protected/permitted left-turn phasing to improve operations and reduce queue lengths for these movements.

Estimated Year Improvement is Triggered: 2028

Note: If Beverly Street is converted to a four-lane corridor, it is desirable to install a southbound right-turn lane for traffic operations purposes. However, the steep grade, presence of power lines and presence of apartment buildings on the northwest quadrant of the intersection makes the constructability of this right-turn lane cost prohibitive based on the results of a benefit to cost analysis. The intersection operates at LOS "C" without this right-turn lane.

Figure 4-9 – 15th Street and Beverly Street Intersection Spot Improvement Plan

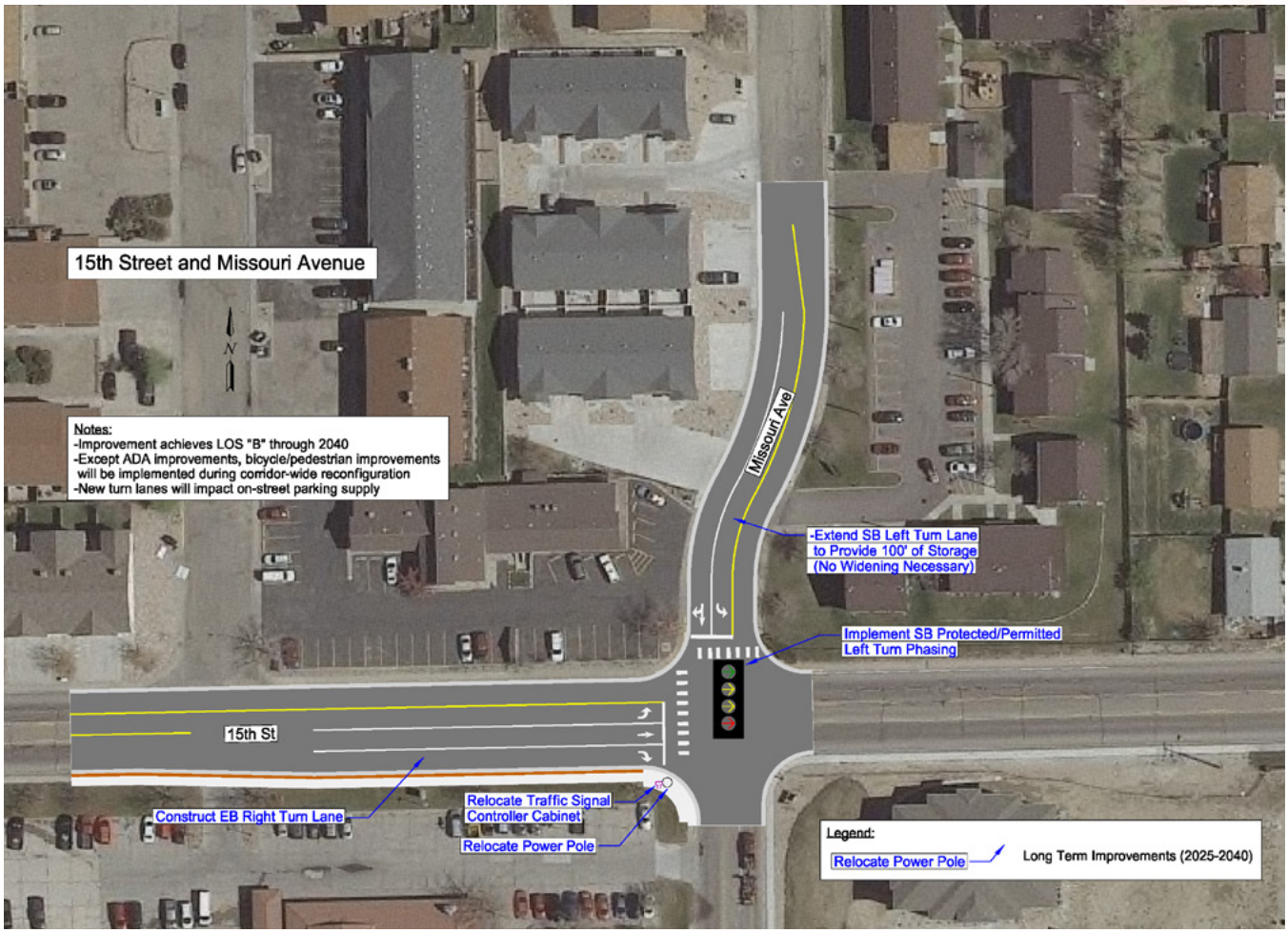


15th Street and Missouri Avenue

Long-Term (2025-2040): Construct an eastbound right-turn lane (widening required) and stripe a northbound right-turn lane within the existing roadway footprint. Additionally, it is recommended that the southbound left-turn lane receive protected/permitted left-turn phasing to improve operations and reduce queue lengths for this movement. The proposed combination of improvements reduces the LOS from "E" to "B" under 2040 traffic conditions.

Estimated Year Improvement is Triggered: 2029

Figure 4-10 – 15th Street and Missouri Avenue Intersection Spot Improvement Plan



15th Street and Kingsbury Drive

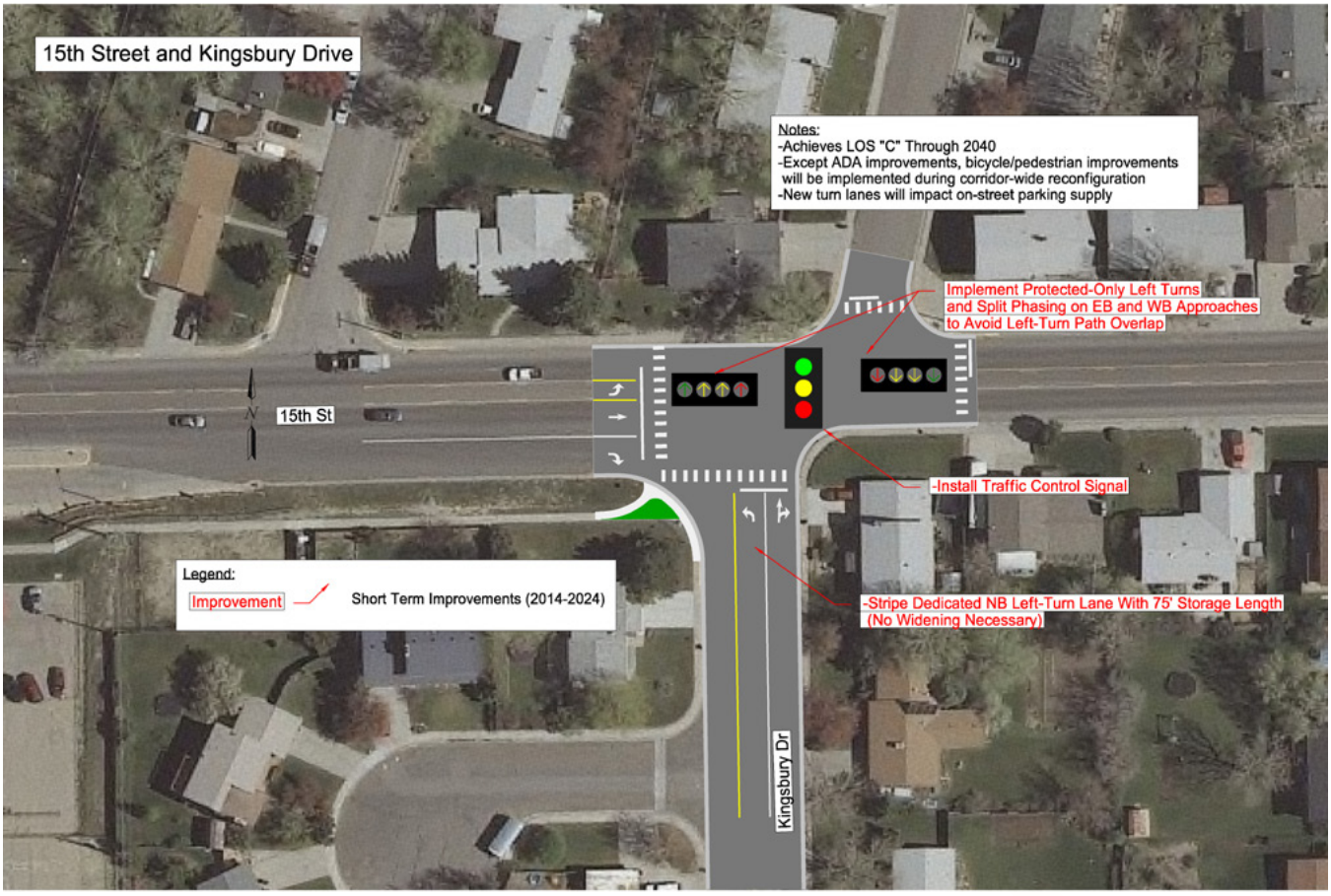
Short-Term (2014-2024): Stripe northbound left-turn lane within the existing footprint of the roadway and install an actuated traffic signal. Traffic signal should have protected eastbound and westbound left-turn phases and split phasing. Proposed left-turn operations will prevent overlapping left-turn phases caused by the intersection skew that may result in head-on collisions. Proposed combination of recommendations improves LOS from "E" to "B" under 2025 traffic conditions and "F" to "C" under 2040 traffic conditions.

It is recommended that the south sidewalk of the west approach is realigned to provide a more perpendicular south crosswalk and provide a connection to the cross the west approach.

Note: Roadway realignment or a roundabout at this intersection would result in multiple building impacts surrounding the intersection and were therefore discarded.

Estimated Year Improvement is Triggered: 2023

Figure 4-11 – 15th Street and Kingsbury Drive Intersection Spot Improvement Plan



15th Street and Wyoming Boulevard

Short-Term (2014-2024): Implement protected-only left-turn phase for southbound traffic to reduce susceptibility to angled crashes between this movement and northbound through traffic. To mitigate operational deficiencies resulting from removal of the southbound left-turn permitted phase, it is recommend the northbound protected-only phase be removed or minimized. This movement has minimal traffic volumes and a lower crash potential due to the lower volumes on this approach and lower conflict speeds (based upon casual field observations).

It is also recommended that sidewalk be constructed along the south side of 15th Street between Wyoming Boulevard and Carriage Lane to mitigate the current gap.

Estimated Year Improvement is Triggered: 2014

Long-Term (2025-2040): The following combination of improvements results in a reduced LOS of "D" to "C" under 2040 traffic conditions.

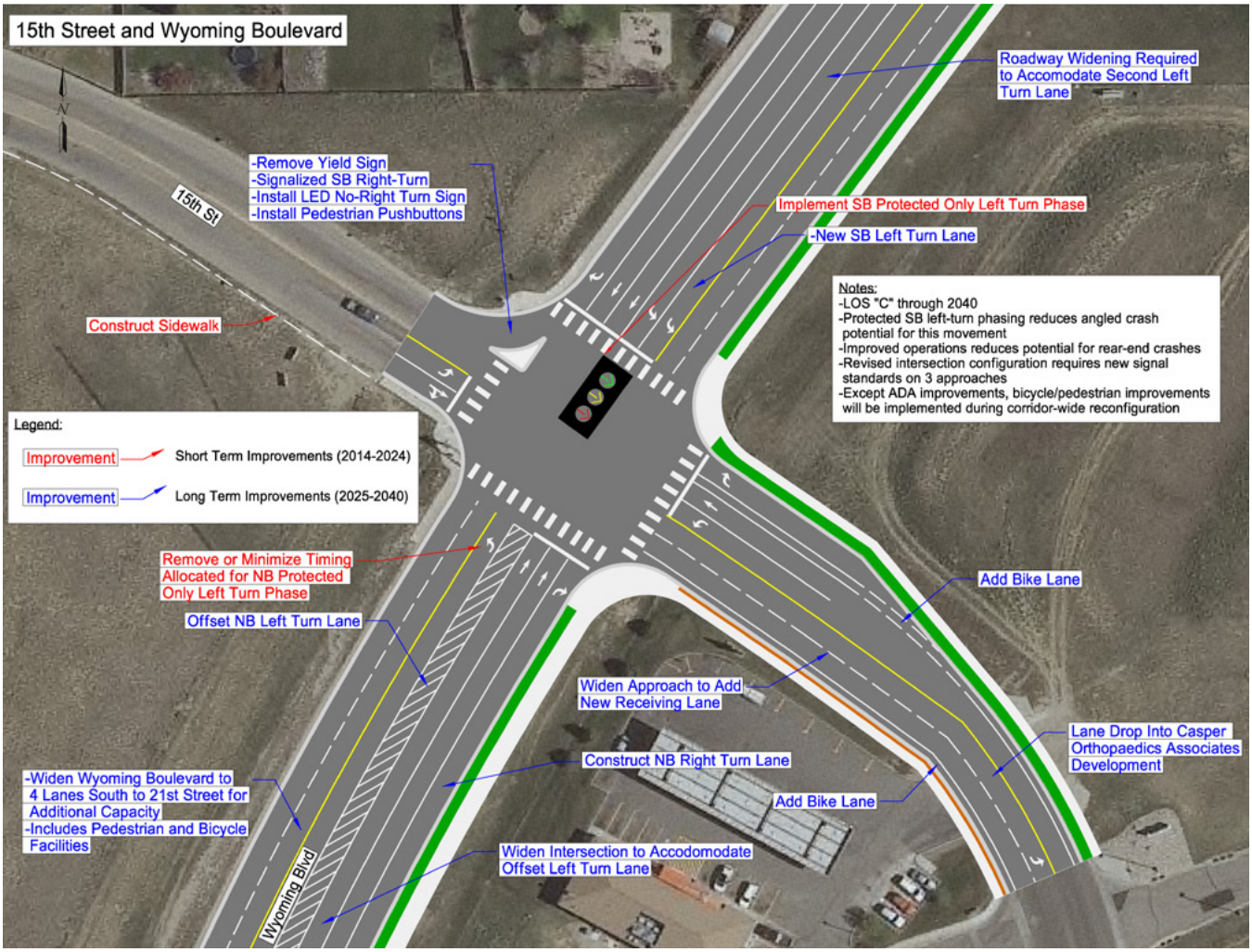
- Construct a northbound right-turn lane (widening required).
- Construct second southbound left-turn lane (widening required). To effectively implement a second southbound left-turn lane, it is critical to develop a second receiving lane on 15th Street. A lane drop immediately downstream of the intersection was not considered due to the potential for poor utilization rates on the dropped lane. This assumption was based upon casual observations of southbound traffic at this intersection that currently experience a lane drop. It is recommended the receiving lane is added on the east approach of this intersection and carried until it is dropped as a left-turn lane into the Casper

Orthopaedic Associates. Casper Orthopaedic Associates is one of the largest non-institutional traffic generators in the study area.

- Construct northbound left-turn offset to prevent negatively offset northbound/southbound left-turn lanes (widening required).
- As noted, casual observations indicate a poor west lane utilization rate due to the impending lane drop south of the intersection. Due to the forecasted future travel demand along this corridor and the bottleneck forecasted at this intersection, widening Wyoming Boulevard to four lanes south to 21st Street is warranted. Recommendations along Wyoming Boulevard were beyond the scope of this report but critical to achieve an acceptable LOS at this intersection (LOS "D" with current lane utilization rates).
- Signalize the southwest-bound channelized right-turn maneuver. Yield controlled channelized right turns commonly experience increased conflict potential between motorists and pedestrians/bicyclists. The reason being is that motorists tend to focus their attention to upstream traffic to identify gaps rather than looking for pedestrians/bicycles. Supplementing the signal with an LED "NO Right Turn" blank out sign provides additional protection when pedestrian actuation occurs on this corner.

Estimated Year Improvement is Triggered: 2028

Figure 4-12 – 15th Street and Wyoming Boulevard Intersection Spot Improvement Plan



21st Street and Oakcrest Avenue

No capacity or safety improvement triggered through 2040.

21st Street and Mckinley Street

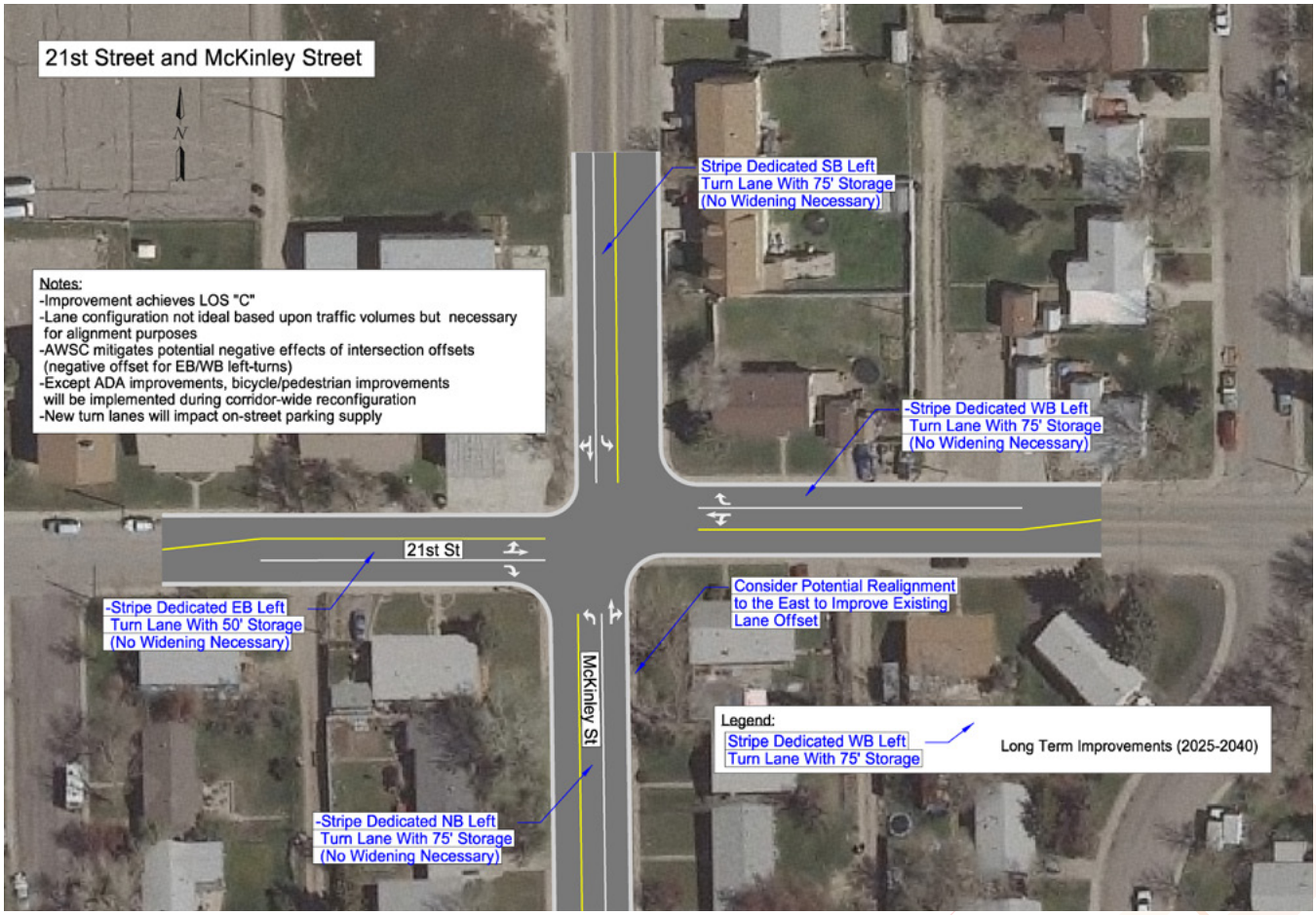
Long-Term (2025-2040): Stripe westbound right-turn lane, northbound left-turn lane, southbound left-turn lane and eastbound right-turn lane (no widening required). The proposed combination of recommendations results in an improved LOS from "F" to "C" under 2040 traffic conditions.

Estimated Year Improvement is Triggered: 2025

Note: Ideal lane configuration based upon traffic demand would include an eastbound left-turn lane (rather than right-turn lane) and northbound right-turn lane (rather than left-turn lane). However, due to the offset of each approach of the intersection, this configuration would result in lane offsets that are beyond FHWA guidance resulting in increased crash potential. Right-of-way acquisition to realign the north and south approach of the intersection would provide further benefits for lane offsets.

Proposed capacity improvements restrict the potential to add bicycle facilities along 21st Street through this intersection without impacting adjacent lanes. As illustrated previously in Figure 4-4, bicycle facilities are rerouted one blocked north to accommodate capacity improvements.

Figure 4-13 – 21st Street and McKinley Street Intersection Spot Improvement Plan



21st Street and Beverly Street

Short-Term (2014-2024): The following combination of recommendations will improve traffic operations from LOS "F" to "B" under 2025 traffic conditions. Furthermore, LOS "C" can be achieved through implementation of proposed improvements through the 2040 study horizon.

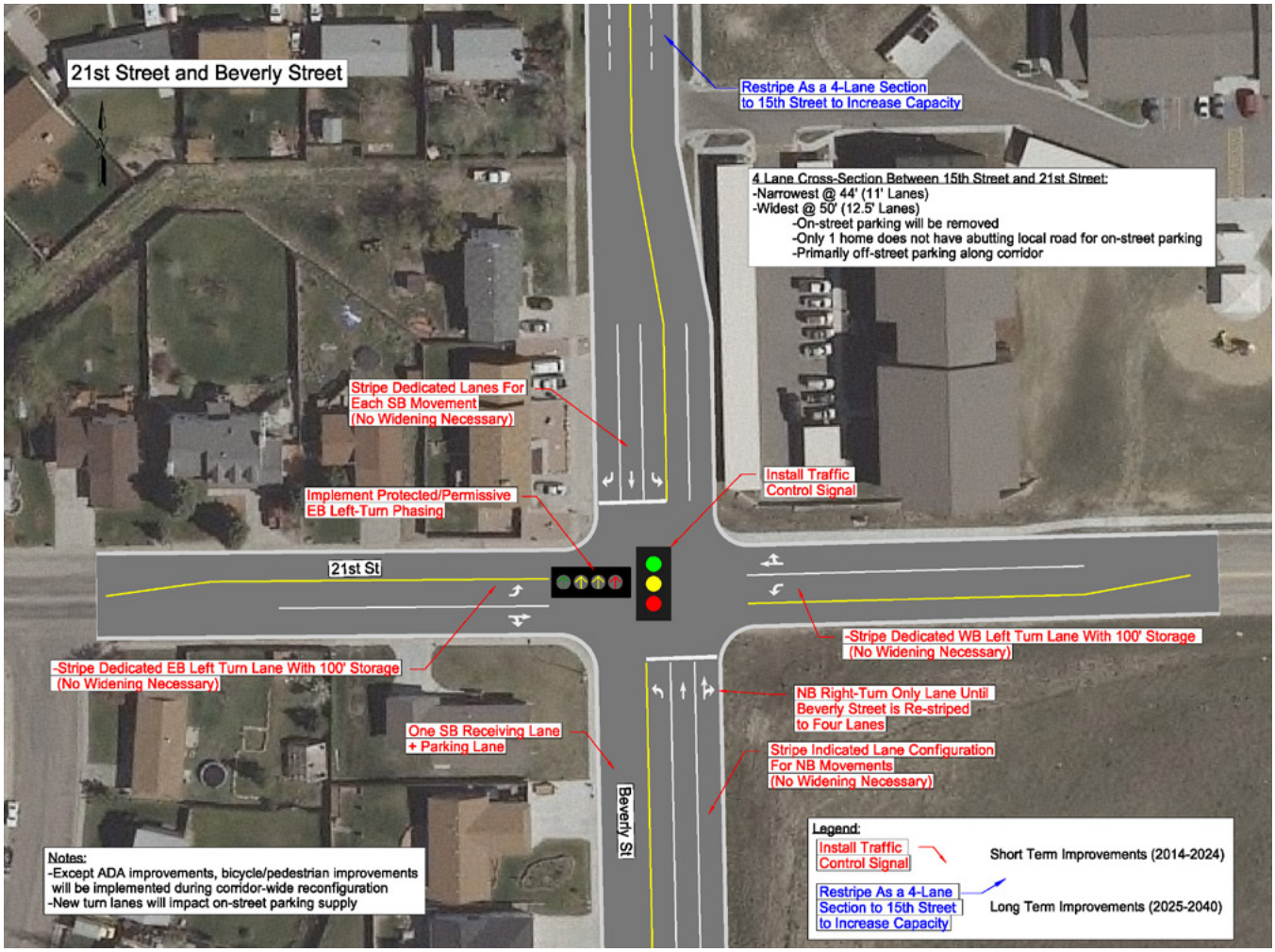
» Install an actuated traffic signal with protected/permitted left-turn phasing on the east approach.

- Restrict on-street parking to accommodate turn lanes.
- Stripe southbound left, through and right-turn lanes (no widening necessary).
- Stripe northbound left, through and right-turn lanes (no widening necessary). The northbound right-turn lane will be converted into a through/right-turn lane once Beverly Street is striped as a four-lane section between 15th and 21st Streets.
- Stripe eastbound left-turn lane (no widening necessary).
- Stripe westbound left-turn lane (no widening necessary).

Estimated Year Improvement is Triggered: 2025

Note: Roundabout discarded because a single lane roundabout did not provide enough capacity (LOS "F"). A hybrid roundabout (two northbound/southbound lanes and one eastbound/westbound lane) was capable of meeting LOS standards (LOS "C"), however, still performed at a lower level than a traffic control signal and would potentially impact buildings surrounding the intersection.

Figure 4-14 – 21st Street and Beverly Street Intersection Spot Improvement Plan



21st Street and Missouri Avenue

No capacity or safety improvement required through 2040.

21st Street and Kingsbury Drive

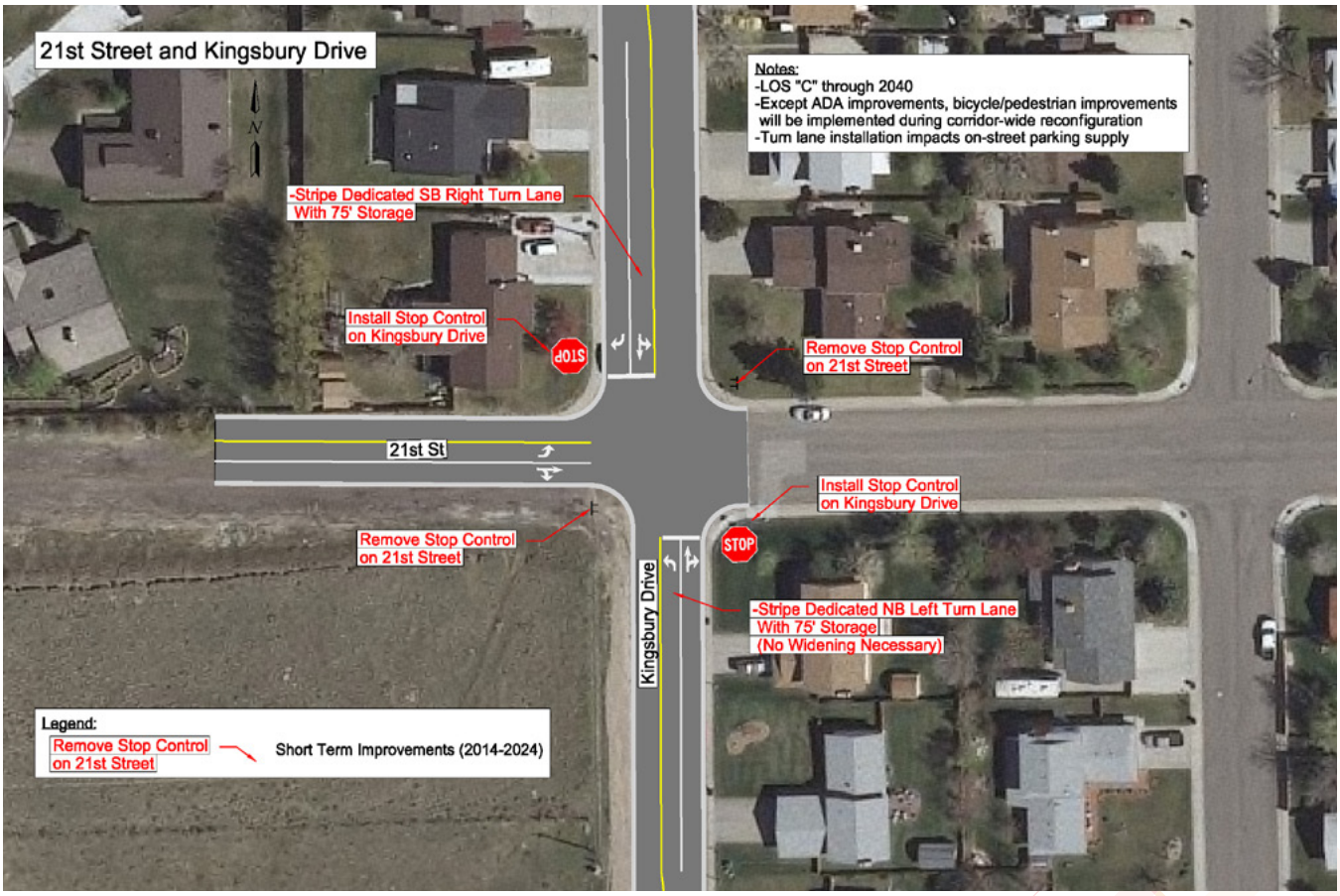
Short-Term (2014-2024): Although this intersection operates at LOS "C" under 2025 traffic conditions with no improvements, implementing the following recommendations improves LOS to "B" and improves corridor-wide progression. Furthermore, these improvements are required to achieve a LOS "C" under 2040 traffic conditions:

- Switch the stop control from eastbound/westbound to northbound/southbound.
- Stripe southbound right-turn lane (no widening required).
- Stripe northbound left-turn lane (no widening required).

Estimated Year Improvement is Triggered: 2014

Note: Sidewalk gaps are present on the southwest quadrant of this intersection. The gaps extend for nearly a mile west and south. Mitigating gaps of this size are beyond the scope of spot improvements. Sidewalks at these locations should occur once development of this property occurs.

Figure 4-15 – 21st Street and Kingsbury Drive Intersection Spot Improvement Plan



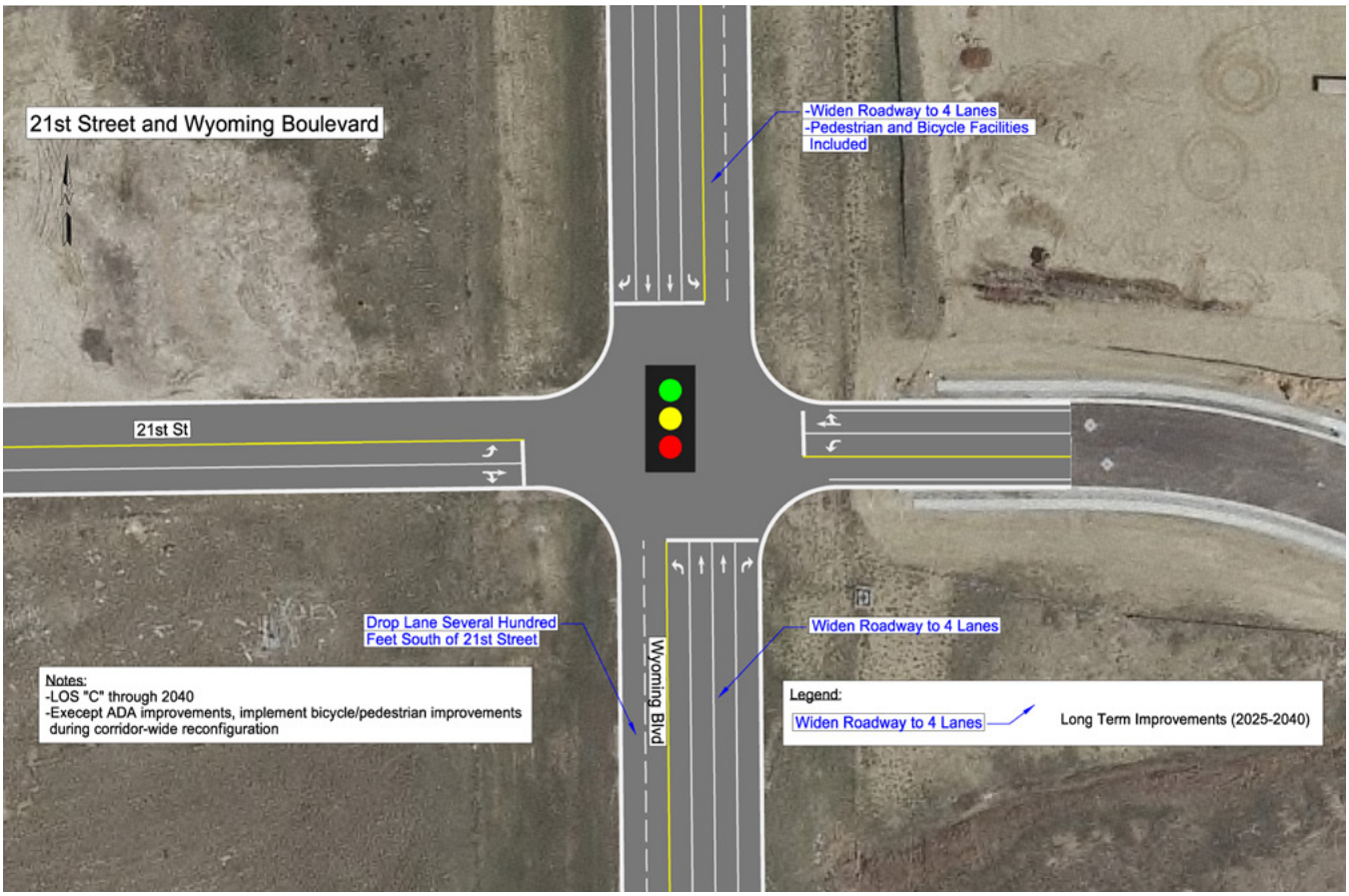
21st Street and Wyoming Boulevard

As noted in the 15th Street and Wyoming Boulevard spot improvement plan, widening Wyoming Boulevard to four lanes between 15th Street and 21st Street is recommended based upon forecasted travel demand. Without this roadway widening, a LOS "E" is forecasted at this intersection under 2040 traffic conditions. Widening the intersection and adding a lane drop several hundred feet south of the intersection on Wyoming Boulevard results in an intersection LOS of "C" under 2040 traffic conditions. This includes consideration of moderate to poor southbound through-lane utilization rates similar to what is currently occurring at 15th Street and

Wyoming Boulevard where a lane drop exists just south of the intersection. Cost estimates for improvements at this intersection will be accounted for in the corridor widening project because no additional recommendations are required at this intersection.

Estimated Year Improvement is Triggered: 2028

Figure 4-16 – 21st Street and Wyoming Boulevard Intersection Spot Improvement Plan



Corridor-Wide Fiber Optic Interconnect

Consideration should be given to installing fiber optic interconnect and coordination plans along 15th Street to improve traffic progression through the corridor. Under the 2040 build scenario there will be seven signalized intersections along the 2.7-mile corridor. Before a decision is made to install interconnect along the corridor, network-wide analysis should be completed to determine the optimal coordination routes. For example, it may be more advantageous to system-wide traffic progression to coordinate Wolcott Drive (seven signalized intersections in one mile) versus 15th Street. Both corridors can be coordinated; however, this limits signal timing flexibility by making the north/south and east/west direction pretimed rather than actuated. Recommendations regarding signal system interconnection were not included in this report because decisions regarding the signals outside of the study area are beyond the scope of this report.

COSTS

Planning level designs were developed for each proposed improvement alternative based upon applicable City of Casper, WYDOT and national design standards. Costs were developed based upon these preliminary designs. Costs for the short and long-term periods are provided for both 2013 values and inflated to the middle of the implementation period in Table 4-2. Inflation values are based upon a review of the past 10 years of historic inflation rates.

Table 4-2 – Proposed Improvement Costs

Implementation Period	Location	Description	2013 Cost	Estimated Trigger Year[2]	Inflated Costs[3]
Immediate	City-Wide	Curb Ramp Implementation and Improvement Policy		Not Applicable	
	City-Wide	Snow Removal Policy		Not Applicable	
Short Term (2014 - 2024)	15th St and Wolcott St	Turn Lane Striping Improvements, Signal Timing Revisions and Fiber Optic Interconnect	$20,000	2014	$20,000
	15th St and McKinley St	Intersection Realignment, Driveway and Turn Lane Striping Improvements	$425,000	2014	$425,000
	15th St and Wyoming Blvd	Left-Turn Phasing Revisions and Sidewalk Construction	$7,000	2014	$7,000
	21st St and Kingsbury Dr	Stop Sign Reconfiguration and Turn Lane Striping Improvements	$2,000	2014	$2,000
	15th St and Beverly St	Turn Lane Widening Improvement	$40,000	2015	$41,000
	21st St and Beverly St	Traffic Control Signal and Turn Lane Striping Improvements	$205,000	2018	$225,400
	15th St and Kingsbury Dr	Traffic Control Signal and Turn Lane Striping Improvements	$210,000	2023	$260,000
	15th St and Oakcrest Ave	Traffic Control Signal and Turn Lane Widening/Striping Improvements	$200,000	2024	$253,500
		Subtotal	$1,109,000	-	$1,233,900
"Long Term (2025 - 2040)"	21st St and McKinley St	Turn Lane Striping Improvements	$3,000	2025	$3,900
	15th St and Wyoming Blvd	Turn Lane Construction	$250,000	2028	$348,400
	Wyoming Blvd (15th St - 21st St)	Roadway Widening to 4 Lanes with Pedestrian/Bicycle Facilities	$3,100,000	2028	$4,320,800
	15th St and Beverly St	Signal Phasing and Turn Lane Construction Improvements	$55,000	2028	$76,700
	Beverly St (15th St - 21st St)	Corridor Restriping to 4 Lanes (No Widening Required)	$4,000	2028	$5,600
	15th St and Missouri Ave	Signal Phasing and Turn Lane Construction Improvements	$35,000	2029	$50,000
		Subtotal	$3,447,000		$4,805,400
Contingent Upon Roadway/Utility Improvement Schedule[1]	A: 15th St (Wolcott St - Oakcrest Ave)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$1,009,000	-	-
	B: 15th St (Oakcrest Ave - McKinley St)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$748,000	-	-
	C: 15th St (McKinley St - Beverly St)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$2,256,000	-	-
	D: 15th St (Beverly St - Missouri Ave)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$745,000	-	-
	E: 15th St (Missouri Ave - Kingsbury Dr)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$1,782,000	-	-
	F: 15th St (Kingsbury Dr - Wyoming Blvd)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$1,634,000	-	-
	H: 21st St (Oakcrest Ave - McKinley St)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$777,000	-	-
	I: 21st St (McKinley St - Beverly St)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$2,213,000	-	-
	J: 21st St (Beverly St - Missouri Ave)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$753,000	-	-
	K: 21st St (Missouri Ave - Kingsbury Dr)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$1,742,000	-	
	L: 21st St (Kingsbury Dr - Wyoming Blvd)	Corridor-Wide Capacity, Pedestrian, Bicycle and ADA Improvements	$1,398,000	-	-
		Subtotal	$15,057,000		-

Note: Signal Timing Improvements Not Included Due to Minimal Overall Costs and Potential to Be Completed by Local Staff

[1]Represent Full Build-Out Corridor Configuration. Must be Consistent with Planned Capital Improvements on Corridor. Due to scope of improvements, costs Include reconstruction of the entire corridor.

[2]Estimated year that improvement will be triggered based upon linear traffic growth between 2013, 2025 and 2040 study years.

[3]Costs inflated to the middle of the implementation period

CONCLUSION

The 15th and 21st Street corridors present a complex mix of competing needs. The corridor is residential in nature with driveways accessing each corridor and multiple schools throughout the study area. Normally, under these circumstances it is desirable to reduce auto-activity to create a pedestrian and bicycle-friendly setting. This is conflicted by the fact that more than 25 percent of Casper's population resides within the study area with minimal alternative land uses. These characteristics breed auto-dependency by forcing residents to travel long distances to work, shop and dine. Furthermore, constrained corridor ROW complicated efforts to fully accommodate all modes of transportation.

A corridor vision and study goals were developed to appropriately prioritize desired corridor outcomes as identified by local residents and key stakeholders.

The vision for the 15th and 21st Street corridors is to develop a multimodal corridor that provides the efficient movement of traffic, operates in an attractive and safe setting for pedestrians and bicyclists of all levels of capability and maintains the character of the surrounding residential neighborhoods.

Upon implementation of the recommendations proposed in the study, the corridor vision will be achieved. Specifically, the recommendations of this report accommodated each travel mode in the following ways:

Vehicular Traffic: Through a variety of capacity improvements, corridor cross-section revisions, approach realignments and traffic control enhancements, this study provides a strategy for safe and efficient movement of vehicular travel in the study area through the study year 2040. Specifically, safety spot improvements are recommended at 3 intersections, congestion mitigation strategies implemented at 9 intersections and the cross-section revisions are recommended throughout the entirety of the study area from two lanes with parking to two lanes with a center left-turn lane.

Pedestrians: The proposed improvement strategy developed in this report alleviates sidewalk gaps, improves existing sidewalks to meet ADA curb ramp, width and sideslope standards and recommends a sidewalk buffer from abutting traffic to increase pedestrian comfort throughout the corridor.

Bicyclists: Bike lanes are recommended throughout the entirety of 15th and 21st Streets within the study area. The only exception being a small section of 21st Street where right-of-way is not available so facilities are routed one block north. Currently only 20 percent of the 15th and 21st Streets within the study area have bicycle facilities.

Transit: An evaluation of population density was completed to assist in future transit routing decisions. Based upon the results of this analysis, CATC officials can make informed decisions regarding future bus routes and stop locations.

ALIGNMENT WITH MAP-21 GOALS

This report was designed to meet the seven performance goals as outlined in MAP-21 where applicable. Not only does this approach comply with legislative mandates, it provides benchmarks for internal, local, national and peer urban area comparative analysis. Below is a summary of how each performance goal was accounted for during the planning process. The seven goals are described below and how each goal was addressed during the study is identified.

Safety – To achieve a significant reduction in traffic fatalities and serious injuries on all public roads.

Recommendations were developed during the study to improve pedestrian, bicycle and vehicular safety throughout the corridor based upon the results of field surveys, historic crash analysis and public input. Improvements ranged from short-term solutions intended to reduce existing crash trends to long-term solutions intended to alleviate all other remaining safety concerns.

Infrastructure Condition – To maintain the highway infrastructure asset system in a state of good repair.

Improvement implementation strategy was developed to coordinate construction with future infrastructure rehabilitation projects to optimize infrastructure life cycles and minimize project costs and traffic impacts experienced during construction.

Congestion Reduction – To achieve a significant reduction in congestion on the National Highway System.

Traffic operations analysis was conducted under existing, 2025 and 2040 traffic conditions to make sure that traffic bottlenecks were mitigated at appropriate times to ensure an efficient transportation system through the study year of 2040.

System Reliability – To improve the efficiency of the surface transportation system.

Studies have found traffic incidents are responsible for as much as 25 percent of delays experienced on major arterials in the United States. By dually reducing crashes and improving overall intersection operations, system reliability, freight movement and economic vitality will all benefit.

Freight Movement and Economic Vitality – To improve the national freight network, strengthen the ability of rural communities to access national and international trade markets and support regional economic development.

Both 15th and 21st Street carry minimal freight traffic. These corridors are classified as collectors and are located within residential neighborhoods. The intent of these corridors is not to carry freight traffic.

Environmental Sustainability – To enhance the performance of the transportation system while protecting and enhancing the natural environment.

Although the natural environment is not a major project component, providing safety and operational improvements while preserving existing homes and the overall character of the study corridors was a driving force when making improvement decisions.

Reduced Project Delivery Delays – To reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in the project development and delivery process, including reducing regulatory burdens and improving agencies' work practices.

This study included multiple levels of involvement with both the public and key decision makers and stakeholders. This reduced the likelihood for future opposition to proposed recommendations that may cause project delays.

NATIONAL PERSPECTIVE.

KLJ has the size and scope of engineering-based services you need, with the local expertise to drive your project forward to a successful result.

TRUSTED ADVISOR.

KLJ delivers quality and accuracy you expect from a trusted advisor and dedicated partner.

REGIONAL EXPERTISE.

KLJ is dedicated to improving the health, safety and welfare of our communities.

KLJ