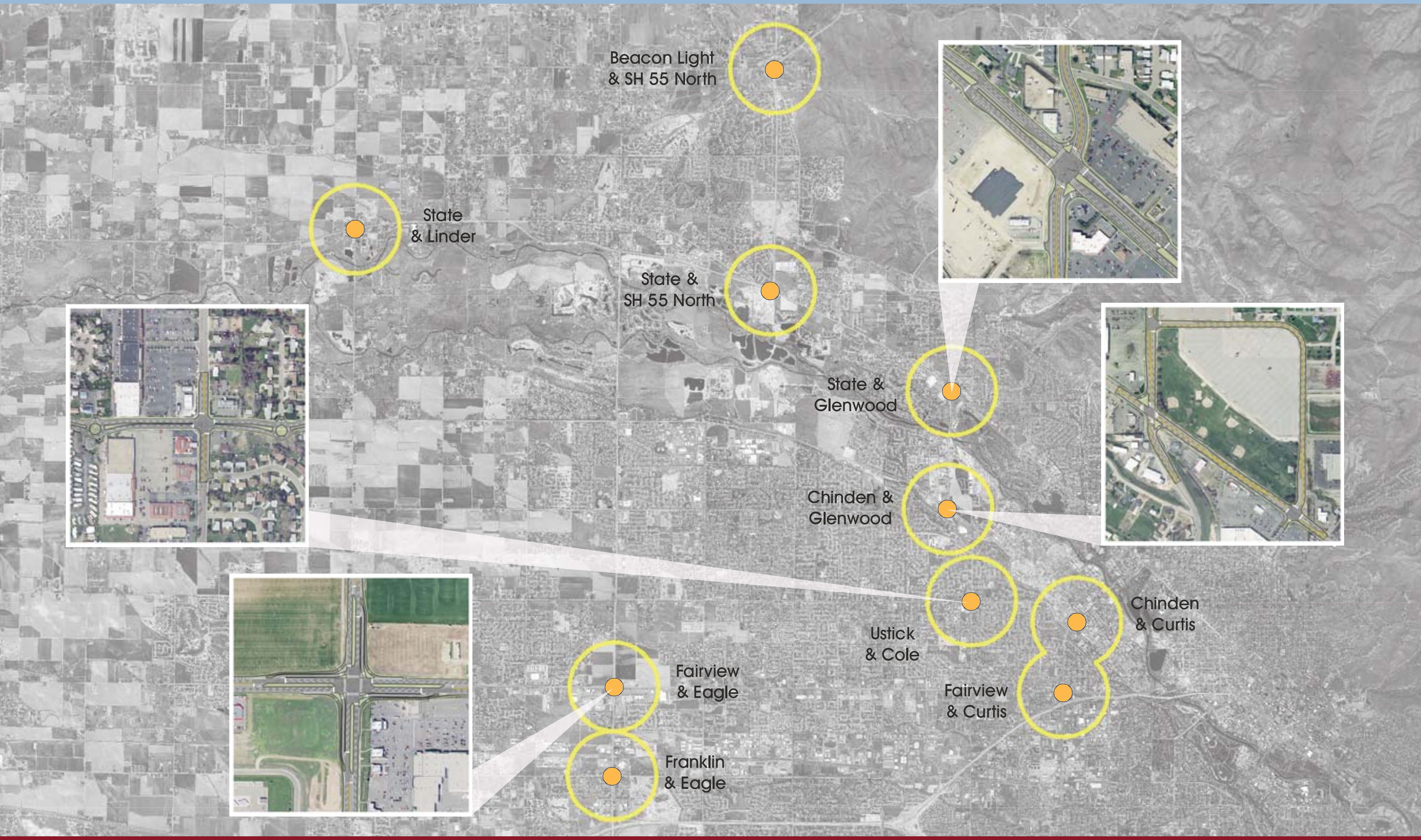
High Volume Intersection Study, Vol. II

Intersection Concept Layout Report

COMPASS
COMMUNITY PLANNING ASSOCIATION
of Southwest Idaho



prepared for
Community Planning Association of Southwest Idaho

submitted by
Wilbur Smith Associates

in association with
HDR
THOMPSON TRANSPORTATION ENGINEERING & PLANNING

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April 21, 2008

The *High Volume Intersection Study* (HVIS) consists of three volumes:

Vol. I Innovative Intersections: Overview and Implementation Guidelines, broadly outlines information about a variety of innovative intersection concepts and provides more specific implementation guidelines for intersection types that appear to be most applicable to southwest Idaho.

Vol. II Intersection Concept Layout Report, features spotlighted high volume intersection concepts at nine different intersections in Ada County.

Vol. III Additional Materials, includes a compatibility matrix between intersection types and urban forms and street functional classifications.

The Community Planning Association of Southwest Idaho (COMPASS) contracted with Wilbur Smith Associates for this study, with additional contributions by Thompson Transportation, HDR, and Joseph E. Hummer, Ph.D., P.E.

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List of Maps

Acronyms and Terms

Acronym or Term	Meaning
ACHD	Ada County Highway District
Additional Materials	A companion to this document and Volume III of the HVIS. The *Additional Materials* document includes a compatibility matrix between intersection types and urban forms and street functional classifications.
ADT	Average daily traffic
Arterial interchange	Characterized by grade separation (overpass or underpass), but designed specifically to fit within the context of a typical intersection. Much smaller footprint than a freeway interchange, simple signal timing, high capacity or even free flow for the major movement, and relatively high flow for the minor movement.
At-grade intersection	An intersection where all vehicles traverse the intersection at ground level, or "at grade." There is no grade separation (overpass or underpass).
Bowtie	A bowtie intersection is fundamentally similar to a Median U-Turn, but roundabouts or tear drops are used at the turn around points.
Capital Improvements Plan (CIP)	ACHD's *Capital Improvements Plan*, adopted July 2006. The projects listed are improvements that will be needed by 2027, and are not scheduled for construction in the Five Year Work Plan (FYWP). They are listed as needs in 6 – 10 years (2013–2017) or 11 – 20 years (2018-2027). The CIP was based on several factors, including deficiencies identified in the COMPASS regional travel demand model.
Communities in Motion (CIM)	*Communities in Motion: Regional Long-Range Transportation Plan 2030*, adopted by COMPASS in August, 2006.
COMPASS	Community Planning Association of Southwest Idaho, the metropolitan planning organization (MPO) for northern Ada County and Canyon County.
COMPASS travel demand forecast model	Two forecasts are relevant: 1) Community Choices 2030 represents current plans for demographics and roadway networks. It is the official model reflected in *CIM*. 2) The Preservation model is unofficial and adds additional population to the north foothills, south Meridian, and other areas. Intersections were designed for Community Choices, but recognizing they may potentially need to serve higher volumes shown in Preservation.
Continuous Flow Intersection (CFI)	An innovative intersection design in which left-turning vehicles cross over the travel lanes of the opposing through movement in advance of the intersection, so left-turns and through movements at the main intersection can proceed simultaneously. Also referred to as a "crossover displaced left-turn" or XDL.
Continuous Green "T"	A design option at T intersections where oncoming traffic from the right need not be stopped to allow left-turns from the T-approach to enter. Instead, left turns have an extended merge lane.

Acronym or Term	Meaning
Conventional intersection	A conventional intersection is any design that is very typical for a given area. For this study, it is generally considered to be the intersection of two major streets, where left-turns are handled by a protected left-turn signal phase from lanes in the median. At high volumes, dual left-turn lanes and right turn bays are common, in addition to through lanes. Also, they usually have four "legs" or approaching streets, and all the lanes proceeding in a common direction are next to each other.
EIS	Environmental Impact Statement
FYWP	ACHD's *Five Year Work Plan 2008-2012*, dated February 28, 2007
HVIS	High Volume Intersection Study
Innovative intersection	An innovative intersection, for the purposes of this project, is any of a series of at-grade or grade-separated intersections that are significantly different from a conventional intersection in some way. Common differences include: a reduction or spreading of conflict points, restriction and/or rerouting of movements, and reduction of the complexity of traffic signal phasing.
Innovative Intersections: Overview and Implementation Guidelines	A companion to this document and Vol. I of the HVIS. The *Overview and Implementation Guidelines* document broadly outlines information about a variety of innovative intersection concepts and provides more specific implementation guidelines for intersection types that appear to be most applicable to southwest Idaho.
ITD	Idaho Transportation Department
LOS	Level of Service of a roadway or intersection. Expressed in ranges from A to F, with A meaning no delay for vehicles, F meaning failure: long waits at intersections and/or stop-and-go traffic conditions.
LRCIP	ITD's *Idaho Horizons - Long Range Capital Improvement and Preservation Program*, dated September 2006.
Median U-Turn (MUT)	An innovative intersection design that provides a turnaround point to which left-turning vehicles are routed. From the street on which the turnaround occurs, left-turns are made by first passing through the main intersection, making a U-turn at the turnaround point, then making a right turn at the main intersection. From the cross street, left-turns are made by first turning right, then making a U-turn at the turnaround point and continuing through the main intersection.
Metropolitan Planning Organization (MPO)	The regional planning entity responsible for transportation planning and approval of federal transportation funding for a given region
Mixed Use Development	A development that contains space for more than one type of use, such as residential or office space over ground-floor retail space, or condos intermixed with office and retail building.
MOE	Measures of Effectiveness
NB, SB, EB, WB	Northbound, Southbound, etc., describing direction of traffic flow
NRCS	Natural Resources Conservation Service, a branch of the U.S. Department of Agriculture whose mission is to "help people help the land". The agency works to enable people to be good stewards of soil, water, and related natural resources on non-Federal lands.

Acronym or Term	Meaning
NW, NE, SW, SE	Northwest, Northeast, etc., describes different intersection quadrants
Parallel Flow Intersection (PFI)	Similar to the CFI although with a smaller footprint. See the PFI section of *Innovative Intersections*: *Overview and Implementation Guidelines*, a companion to this report.
Project Review Committee (PRC)	A committee of representatives from ACHD, Ada County, City of Boise, COMPASS, Garden City, ITD, and Valley Regional Transit which served to provide feedback on the HVIS.
Quadrant Roadway Intersection (QRI)	An innovative intersection design that creates a connection between two legs of the main intersection. Left-turns are routed along the connecting roadway, bypassing the main intersection.
Right-of-way (ROW)	The amount of space required by an intersection or roadway, normally includes travel lanes, gutter, sidewalk, etc.
Roadways to Bikeways Plan - *Draft*	The *Draft Roadways to Bikeways Plan* is ACHD's ongoing bicycle planning project.
SH	Idaho State Highway
Synchro/SimTraffic	Synchro, SimTraffic, and VISSIM are software programs used to analyze traffic performance. Synchro is used to optimize signal settings; SimTraffic has animation capability, and is used to assess MOEs and LOS. SimTraffic is the simulation component of Synchro. VISSIM is a detailed simulator used for presentation graphics, and refined operations analysis.
Town Center Intersection (TCI)	Actually consists of four intersections resulting from the crossing of two one-way couplets. May also include a middle alignment that can be reserved for non-vehicular traffic.
Transit Oriented Development (TOD)	A catch-all phrase for styles and types of buildings that are more likely to improve transit ridership to/from the development. Usually includes higher densities, pedestrian oriented architecture, and may include limitations on parking supply. Street design may have more pedestrian and passenger amenities.
VISSIM	VISSIM, Synchro, and SimTraffic are software programs used to analyze traffic performance. Synchro is used to optimize signal settings; SimTraffic has animation capability, and is used to assess MOEs and LOS. VISSIM is a detailed simulator used for presentation graphics, and refined operations analysis.

Introduction

This report provides details about the application of specific innovative intersection concepts at the ten study intersections, which are all identified on the overview map at the end of this section.

Process

The concepts advanced were identified during earlier alternative screening as meeting several important criteria:

- They provide good traffic performance potential.
- They have a cost that is reasonable, although in many cases higher than that required by standard intersection designs.
- They are compatible with the surrounding area.
- They have relatively low impacts.

Based on the alternative screening and feedback from the Project Review Committee (PRC), one or two concepts were identified at each study intersection to analyze in greater detail and spotlighted in the final report. For each spotlighted concept, a concept layout drawing was prepared, and a detailed operational analysis using Synchro was performed. VISSIM was also used in some cases to provide a more realistic representation of intersection types that are difficult to model properly using Synchro. In addition to the spotlighted concepts, this report addresses other attractive concepts at each study intersection. Any of these options may emerge as preferred upon more in-depth inspection. See also *Vol. III Additional Materials*.

Environmental Scans

A brief scan of documents and imagery was undertaken to identify the presence of land uses, wildlife habitat, and other sensitive sites and features that may need special consideration. This environmental scan included themes that are required for inclusion in common environmental reports and studies. Any issues are identified at each site in the intersection discussions in this Report.

Spotlighted Concepts

Most of the ten study intersections have a single spotlighted concept drawing that shows the lanes, basic geometry, and likely right-of-way (ROW) required to implement the concept. Also shown are basic performance expectations, cost expectations, a cost/benefit ratio, and an overall maximum capacity (the threshold between Level Of Service [LOS] E and F).

The concept drawing also includes a table reporting measures of effectiveness (MOE) that describe the performance of the intersection under various conditions (existing conditions, future no-build and future build). The reported MOEs were based on an average of MOEs from multiple simulation runs of SimTraffic (the simulation component of Synchro).

Average delay per vehicle is used as the basis for assigning (LOS) “grades” to signalized intersections. In addition to average delay and LOS, the MOE table also shows “Percent demand served,” which gives an indication of the level of congestion at the intersection. As an intersection grows more congested, it is less able to serve the traffic demand on a single cycle, so the percent of the demand served falls. Vehicle queues grow longer and “cycle failures” occur, in which a vehicle must wait through more than one signal cycle to traverse the intersection.

Exact placement of roadway features would be determined in a future design project. This study focused more on traffic efficiency and on overall ROW needs. Thus drawings may show impacts that can ultimately be avoided.

Other Concepts

Most intersections also had a number of other noteworthy design concepts that were not spotlighted. For these concepts, key observations and routing plans are discussed.

These other concepts are not necessarily inferior to the spotlighted concepts, but are good designs that are competitive with the others noted. Spotlighted layouts are preferred at the moment, given that no concept has been thoroughly examined to the level that must occur prior to any final decisions.

When there is funding for a more in-depth analysis of each intersection, all of these competitive options should be re-evaluated to determine:

- Which options are still feasible?
- Which can gain public support?
- Have volume expectations changed significantly from what was predicted?
- Would a more thorough review of costs, performance, fatal flaws, etc. allow a concept that wasn't spotlighted to emerge as the locally preferred option?

Cost-Benefit Assumptions

Cost-benefit comparisons are helpful in comprehending the full impact of a proposal. To calculate such a ratio fairly, it is important to compare the incremental cost of constructing the spotlighted concept relative to a conventional or the adopted plan, versus the incremental value of time and fuel savings over the life of the project. Construction costs are discussed below, along with the value of time and fuel that was assumed. There is also a small incremental maintenance cost associated with most spotlighted concepts, assumed to be 10% of the incremental construction cost.

Construction Cost Estimates

Each spotlighted concept includes a concept-level estimate of what it would cost to construct in today's dollars. In many cases, implementing the concept will not stray outside existing of planned ROW except at a few isolated spots. Therefore sidewalks and existing pavement may not need to be altered in those sections. However, this study assumes a maximum cost that reflects a complete reconstruction of all pavement, sidewalks, and utilities to the full extents shown in each featured drawing.

To better understand the incremental cost of each concept, an estimate of the costs required to provide a complete reconstruction of pavement, sidewalks, and utilities given the planned number of lanes organized at a conventional intersection is also provided in many cases. For example a complete rebuild to implement a spotlighted concept might cost $10 million. The same rebuild to implement the adopted plan or a conventional plan might cost $7 million. The incremental cost of $3 million becomes the basis for a cost/benefit estimate. It is also closer to what you might expect to pay to implement the concept if much of the existing infrastructure need not be fully replaced.

Other major assumptions are:

- ROW costs were estimated based on the value of the square footage of land that lies outside existing or planned right of way.
- If an entire parcel may be required, costs reflect the full value of land and improvements.
- Construction and engineering costs were estimated based on unit cost information obtained from Ada County Highway District (ACHD) and Idaho Transportation Department (ITD).
- ROW and construction costs are all expressed in 2007 dollars.

Calculation of Benefit-Cost Ratio

The total amount of user benefit (cost savings) due to reduced delay and fuel consumption over a presumed 20-year intersection lifespan from 2010 to 2030 was estimated as follows:

1. Ten SimTraffic simulations of the future 2030 baseline conditions in the PM peak hour were run, and the results were averaged.
2. Ten SimTraffic simulations of the future 2030 concept conditions in the PM peak hour were run, and the results were averaged.
3. From each set of ten simulation runs, the total vehicle-hours of delay occurring at the main intersection were obtained, and the difference in delay was calculated.
4. The reduction in delay is not as dramatic in the AM period, because volumes are smaller. It was assumed that the AM period would see only 70% of the benefit that occurs in the PM peak.
5. For traffic in the other 22 off-peak hours, it was assumed there would be no congestion in either the base or the build. However, because the build systems all convert 4-phase signals to two-phases, it was assumed that traffic in uncongested periods would always get a 30-second benefit because they eliminate two sets of left-turn phases that might typically be running for 15-seconds each.
6. In some cases, the left-turning traffic (which averages 18% of all traffic in the future 2030 forecast volumes) experiences out-of-direction travel. This was accounted for by assigning a 50 second penalty to left-turning traffic at median U-turn, bowtie and double-quadrant roadway intersections. An 80 second penalty was assigned to left-turning traffic at single quadrant roadway intersections.
7. The sum of the delay savings from the PM peak hour (item #4), the AM peak hour (item #5) and the off-peak hours (item #6) was tallied, and the delay penalty for left-turns (item #7) was subtracted to obtain the total daily delay savings in vehicle hours.
8. The next step was to convert daily delay savings to annual cost savings. To do so, different rules were applied for commercial and non-commercial vehicles. In both cases, however, 300 was used as the basis to represent the number of "days" per year. The loss of 65 days is to account for the conversion of weekday traffic to annual average daily traffic (weekday is higher), and to represent that the peak delay savings do not occur on Sundays, and only to a small extent on Saturdays.
9. For commercial vehicles, the average 2006 Boise area salary of $17.91 per hour was used, plus a typical overhead multiplier of 2.8, equating to $50.15 per hour of delay. Also assumed was that 5% of vehicles being driven for a commercial purpose, a value typical for urban arterials.
10. For non-commercial vehicles, travel surveys typically find that drivers value their time at about ½ of their salary. Half of $17.91 = $8.955 per hour. This applies to the other 95% of vehicles that are non-commercial.
11. Add the results of #10 and #11 to obtain total yearly cost savings due to reductions in delay.
12. In order to calculate cost savings due to reduced fuel consumption, assume 0.2 gallons of gas consumed per vehicle-hour of delay and $3.00 per gallon of gas.
13. Add #12 and #13 to obtain total user cost savings.

Note that there are other benefits that are not quantified here such as air quality improvements, greenhouse gas reductions, a potentially more competitive economy and the associated benefits, etc.

In order to calculate the benefit-cost ratio, the total 20-year value of time and fuel saved was then divided by the total 20-year incremental ROW and construction cost (difference between full rebuild under the baseline and spotlighted concept). A result of 10 would mean "$10 worth of time and fuel savings for every $1 spent on the proposed improvement."

Summary of Benefit-Cost Analysis of Spotlighted Concepts

As noted earlier, the user benefits were computed as the 20-year accumulated value of time and fuel savings. The incremental cost of the project (relative to planned improvements that would be incurred anyway) was also computed as the difference between the cost of the concept and baseline. The total benefit of the concept, or return on investment, is the value of the incremental benefit divided by the incremental cost. This table shows how each concept compares.

Details of each concept are provided in the following chapters.

Key Observations

All concepts show very good returns on investment. The highest rated project is Beacon Light and SH 55, with an estimated return of over $45 on every dollar invested to upgrade from the base to the spotlighted concept. This case is extreme for several reasons. First, it assumes a beyond 2030 volume, because the 2030 COMPASS forecast did not support much more than a conventional design, but the potential beyond 2030 volume as forecast by the Preservation travel demand model certainly does (see COMPASS 2030 model descriptions under Acronyms and Terms, page iii). Also, the baseline assumes only what is currently planned for the intersection (single-left turns on both legs, two through lanes per direction), however, a conventional upgrade to handle the beyond 2030 demand would likely include double-left turns and three through lanes.

State and Linder is similar in that post-2030 volumes were assumed for purposes of corridor preservation. Clearly these top two intersections are excellent projects, but their full-build isn't needed for a long time.

Intersection 2010-2030 Return on Investment*

ID	Intersection	Concept	User benefits	Concept cost	Baseline cost	Incremental cost	User benefits over incremental cost
1	Beacon Light & SH55	CFI	$122.9	$4.3	$1.6	$2.7	**45.6**
2	State & Linder	CFI	$120.0	$11.7	$4.9	$6.7	**17.8**
3	State & SH55	CFI	$93.9	$15.5	$8.1	$7.4	**12.6**
4	State & Glenwood	MUT	$15.5	$8.8	$7.8	$1.0	**14.9**
5	Chinden & Glenwood	QR	$37.3	$6.2	$0.0	$6.2	**6.0**
6	Ustick & Cole	Bowtie	$17.8	$2.2	$0.0	$2.2	**8.0**
8	Fairview & Curtis	QR	$26.5	$9.9	$5.6	$4.3	**6.1**
9a	Fairview & Eagle	QR	$61.5	$12.8	$5.3	$7.5	**8.2**
9b	Fairview & Eagle	CFI	$95.5	$13.6	$5.3	$8.3	**11.5**
10a	Franklin & Eagle	QR	$42.6	$9.8	$5.9	$3.9	**10.9**
10b	Franklin & Eagle	CFI	$93.4	$15.4	$5.9	$9.5	**9.8**

* Benefits and costs shown in millions of dollars

State and Glenwood as a Median U-Turn (MUT) would only cost about $1 million more than the planned improvements, and the user savings results in a return ratio of nearly $15.

Intersections on Eagle give excellent return as either CFIs or Quadrants.

As a single quadrant roadway, Chinden and Glenwood is ranked lower because the out-of-direction time lost to three left-turn movements during the uncongested portion of the day is more significant than the time they gain due to getting through the main intersection in less time. Also because while there is an existing street in the NW quadrant, the volume on that street becomes so high serving four left-turns that the street must be widened, potentially adding substantially to the cost.

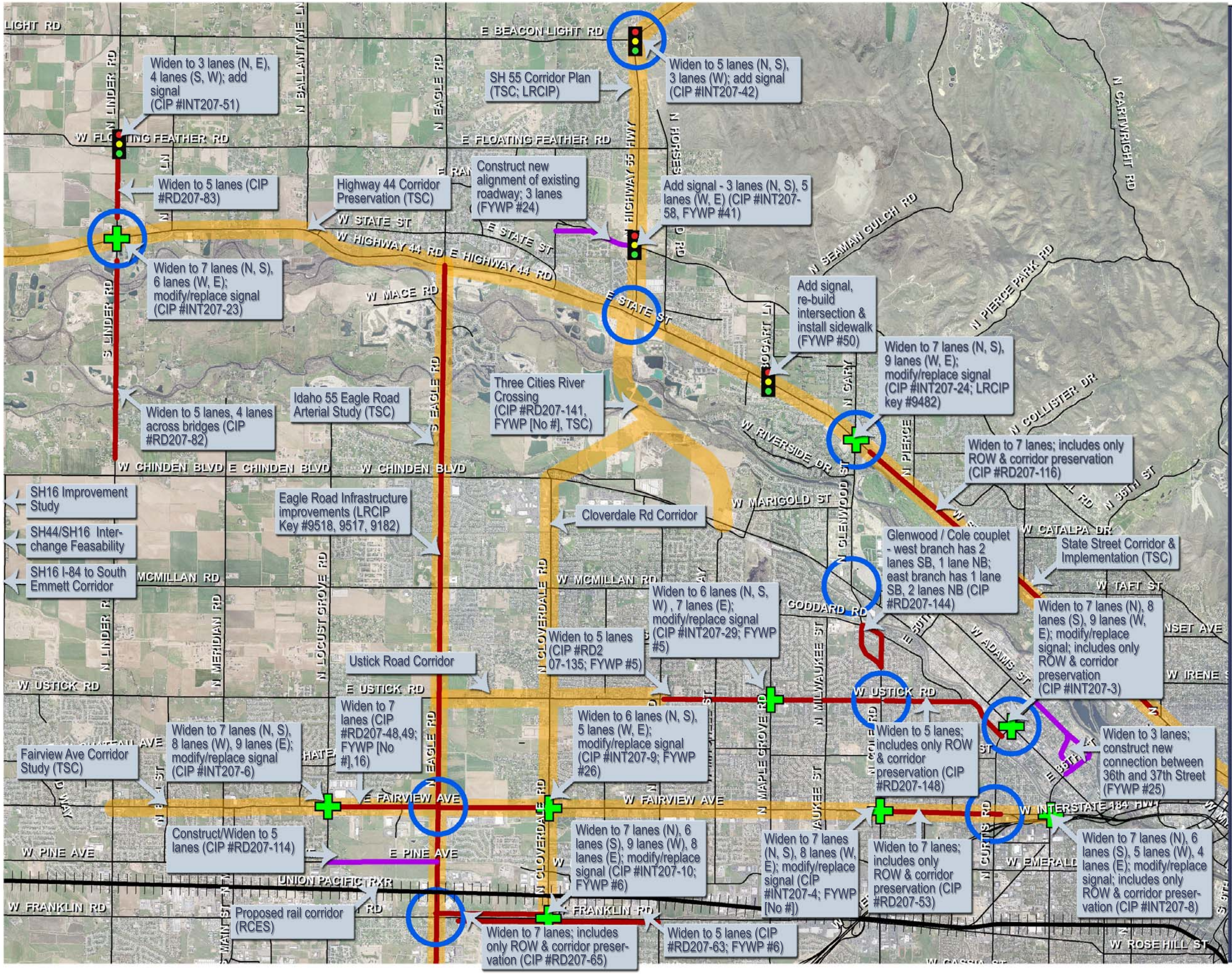
Fairview and Curtis rates very well because even though two of four left-turns require out of direction travel to achieve a two-phase signal, those same movements benefit greatly during congestion, and are outweighed by the benefits to other movements when there is no congestion.

Ustick and Cole is expected to cost just over $2-million to install two roundabouts, making it one of the lowest cost projects. However, because it is serving lower volumes, and because all left turns lose time to out-of-direction travel even in uncongested periods; the accumulated benefits are less significant.

Planned Improvements

The ten study intersections are located in areas that will be strongly impacted over the years ahead by a large number of construction and planning projects. This includes a number of programmed and planned construction projects and studies such as roadway and intersection expansion, traffic signal installation, and corridor feasibility studies. These projects, if completed, will impact the ten study intersections (see **Map #1** on the following page). Improvements are identified on an individual intersection basis and are subject to change.

The planned improvements listed with each intersection in this Report illustrate the potential impacts of the various planning and construction projects on an individual intersection basis.



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High Volume Intersection Study

Planned Improvements Map

Legend

- Corridor/Feasability Study
- Arterial Improvement
- Intersection Improvement
- Study Intersection
- Rail Corridor Study
- Collector Improvement
- Signal Project

N W E S

0 0.5 1 2 Mile

Sources:

ACHD Capital Improvements Plan (CIP) July, 2006

ACHD Five Year Work Plan (FYWP) 2008-2012, February 28, 2007

COMPASS Transportation Coordination (TSC), June 2007

VALLEYRIDE Rail Corridor Evaluation Study (RCES), April 2003

Idaho Horizons - Long Range Capital Improvement and Preservation Program (LRCIP), September 2006

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1. Beacon Light Road and State Highway 55 North

Key Facts

- Three-leg intersection in Eagle City; rural setting; on horizontal curve.
- Beacon Light: ACHD-owned, 50 mph minor arterial, one through lane per direction, 3,000 ADT.
- SH 55 North: ITD-owned, 55 mph principal arterial, two through lanes per direction through the intersection, narrowing to one per direction about 1,500 feet to the north, 9,000 ADT.
- Presently stop controlled, but is planned to be upgraded to signal control. Has potential for very high volumes.
- A significant bluff on the eastern side prevents a fourth leg.
- The intersection of Beacon Light & Horseshoe Bend occurs about 150 feet west of the main intersection. Depending on the future configuration at the main intersection, the proximity of this intersection could be problematic.

Existing Plans

The intersection of North Brookside & SH 55 North occurs about 350 feet north of the main intersection. The 2007 Eagle Comprehensive Plan includes a plan to eliminate this intersection by rerouting Brookside to tie into Beacon Light some 900 feet west of the main intersection **(see Figure 1-1).** Several direct individual property access points onto SH 55 north of the Brookside & SH 55 intersection would also be eliminated by constructing a new frontage/backage road parallel to SH 55 North. The plan also encompasses a new grade-separated interchange at the current intersection of West Brookside & SH 55 North, some 7000 feet to the north.

ACHD's Capital Improvement Plan (CIP) identifies an improvement project at the intersection of Beacon Light & SH 55 North (Project INT207-42). The project includes widening and installation of a new traffic signal, to be performed by 2010 at a cost of $1.623 million.

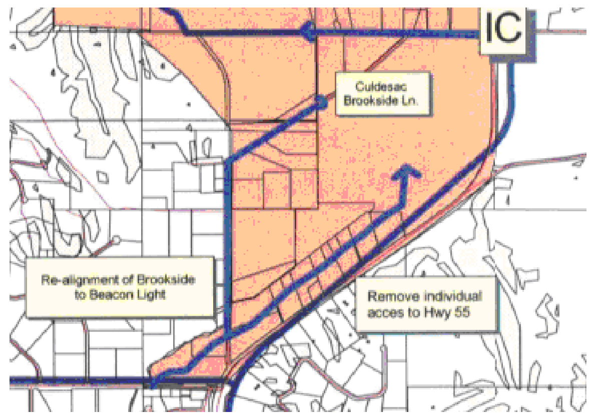


Figure 1-1 Planned Brookside Realignment
(Source: 2007 Eagle Comprehensive Plan)

The intersection also falls within the study area of the SH 55 Corridor Plan, currently in progress.

ACHD's Draft *Roadways to Bikeways Plan* indicates that the south leg of Beacon Light & SH 55 is a marked bike route, and bike lanes are proposed on the west leg.

The 2030 Community Choices travel demand model shows two through lanes per direction on SH 55 North from SH 44 to Brookside Ln. The Preservation model shows three through lanes per direction on SH 55 North between State St. and Beacon Light Rd., and two through lanes per direction north of Beacon Light Rd.

Environmental Scan

- The intersection is about 250 feet from a 500 year floodplain and approximately 550 feet from a 100 year floodplain.

- No wetland areas, cultural sites, or historic properties were identified within a ½ mile radius.
- Dry Creek lies about 900' Northwest of the intersection.

Spotlighted Concept: CFI on one leg

- A CFI on one leg will be an effective means of managing this intersection, if no new alignments are created such as with a quadrant.
- A CFI on the south leg was selected for analysis as it appears it may be lower cost, but a CFI on the west leg is also possible and would likely provide significant benefits as well. Though there are two legs, the full benefits of a CFI at a T-intersection are achieved with a CFI on just one of the two legs.
- ROW should be reserved to allow three through lanes on SH 55 in any design. This six-lane cross-section, which is intended to maximize the new signal's throughput in the event that future volumes warrant it, should extend for a minimum length of ¼ mile north and south of the intersection.

See **Map 2** on page 10.

Other Concepts

Quadrant Roadway

There is an opportunity to create a quadrant roadway as shown in **Figure 1-2** that has many very attractive properties. Because this is a T-intersection, a quadrant in this setting can achieve near-perfect driver expectation. There is no awkward geometry that could potentially confuse drivers. Only a sign is necessary advising that the path to reach NB SH 55 is on the quadrant.

Like a CFI, this system allows the NB to WB left-turn and the EB to NB left-turn to happen at the same time. Therefore it could be made to perform similar to a CFI.

With this system, existing local roads and driveways on Beacon Light between the quadrant and SH 55 may be easier to preserve than under other scenarios, because the traffic volumes and conflict points are greatly reduced.

It would require two coordinated signals to stop SB traffic to allow both the NB and EB left-turns to occur.

This system concept was not developed further largely because it would require creating a new alignment, and as a result may have more impacts and potentially more cost than the spotlighted concept; and there was some desire to contain all improvements to existing alignments. However, this concept seems easily adaptable to the realignment of Brookside that was shown in **Figure 1-1.** If so, this option should be investigated more in the future.

Continuous Green T

A continuous green T intersection treatment could be applied at this location. This would allow the EB left-turns to use a dedicated median lane to accelerate and merge with NB through traffic. The NB through movement would not have to stop at the signal, which would result in a large savings in delay. However, a number of issues make application of the continuous green T at this location challenging:

- The high speed on SH 55 North (55 mph) would require a long median lane for the eastbound (EB) left-turns to accelerate to merging speed.
- The future forecast volumes indicate that the EB left-turn movement (with 650 vehicles) could eventually require a dual left-turn. The dual left-turn would of course require a dual median lane for acceleration and merging, requiring even more space both laterally and longitudinally, and correspondingly higher ROW costs.

- The intersection occurs about halfway along a long horizontal curve. A continuous green T in any case presents a challenging situation for both merging and through movement drivers; the curve adds another undesirable level of complexity.

For these reasons, a continuous green T at this location is not recommended for the final design. However, it may still be worth researching further as an incremental improvement that may function well for a number of years.

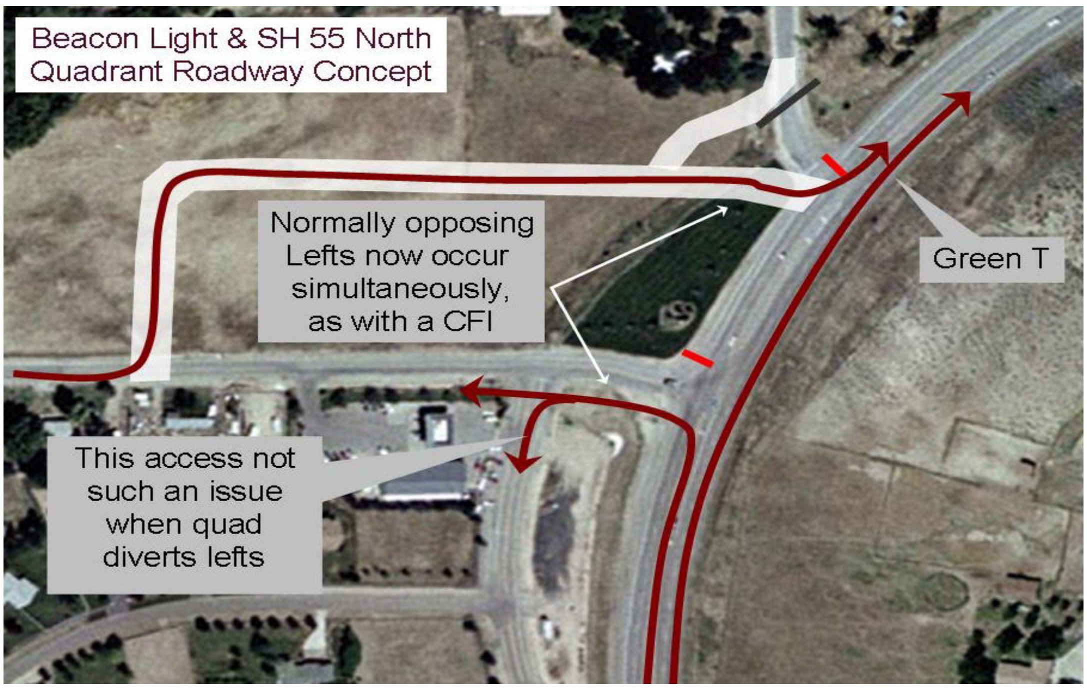


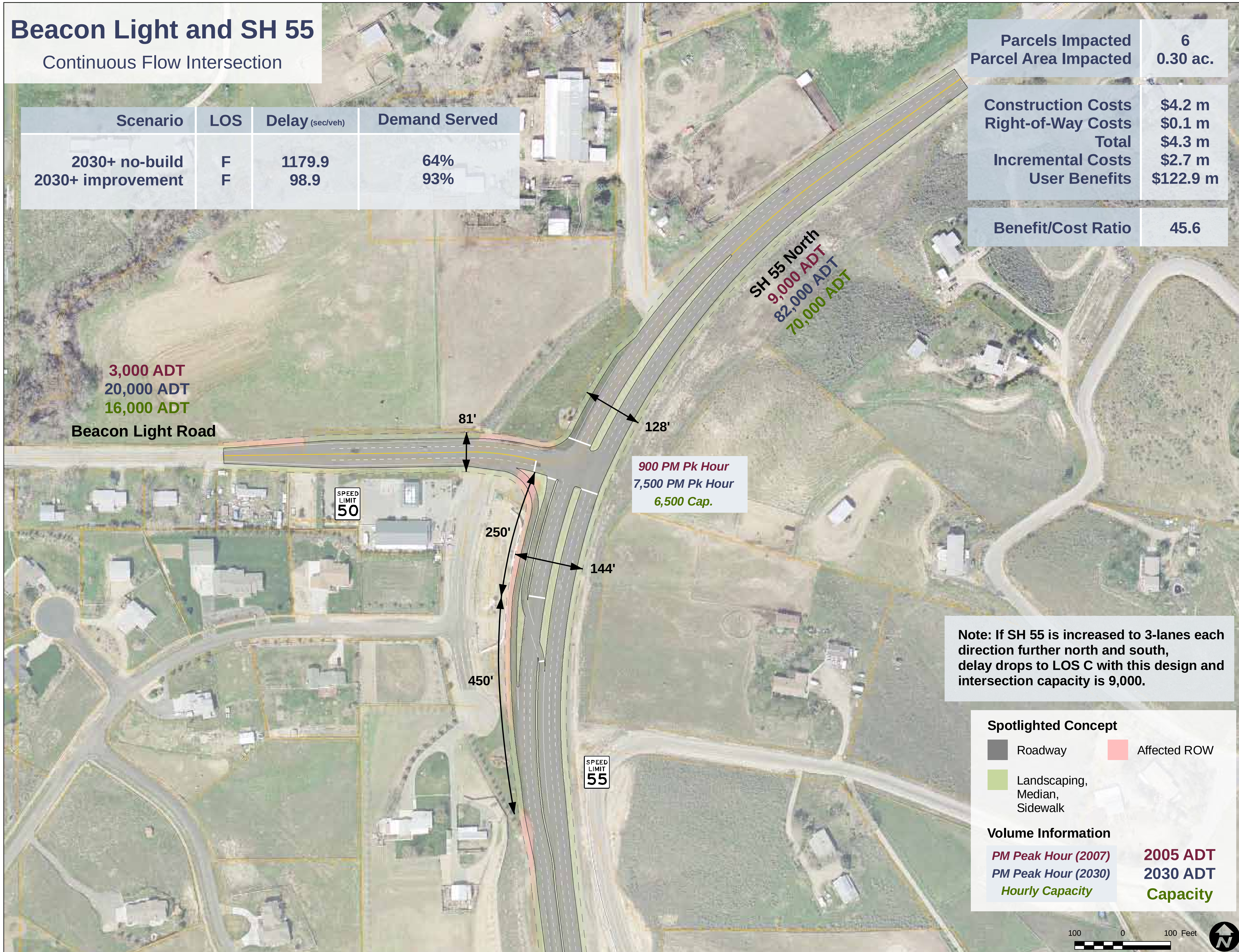
Figure 1-2 Beacon Light and SH 55 Quadrant and Green-T Concept

Beacon Light and SH 55

Continuous Flow Intersection

Scenario	LOS	Delay (sec/veh)	Demand Served
2030+ no-build	F	1179.9	64%
2030+ improvement	F	98.9	93%

Parcels Impacted	6
Parcel Area Impacted	0.30 ac.
Construction Costs	$4.2 m
Right-of-Way Costs	$0.1 m
Total	$4.3 m
Incremental Costs	$2.7 m
User Benefits	$122.9 m
Benefit/Cost Ratio	45.6



Note: If SH 55 is increased to 3-lanes each direction further north and south, delay drops to LOS C with this design and intersection capacity is 9,000.

Spotlighted Concept

- Roadway
- Affected ROW
- Landscaping, Median, Sidewalk

Volume Information

PM Peak Hour (2007)	2005 ADT
PM Peak Hour (2030)	2030 ADT
Hourly Capacity	Capacity

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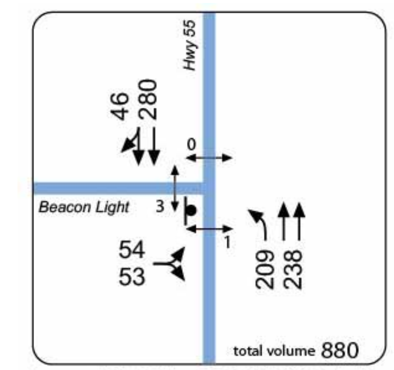
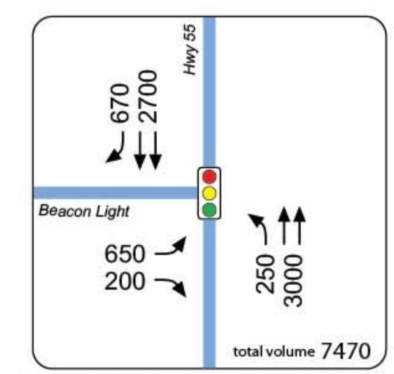
High Volume Intersection Study



Beacon Light & Hwy 55 2007 PM Peak Hour



Beacon Light & Hwy 55 Future PM Peak Hour

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2. State Street and Linder Road

Key Facts

- Four-leg intersection in Eagle City; rural setting; streets meet at an angle slightly off of 90 degrees.
- State: ITD-owned, 55 mph principal arterial, two lanes west of Linder, three lanes east of Linder, 23,000 ADT.
- Linder: ACHD-owned, 50 mph minor arterial, one through lane per direction, 7000 ADT.
- Signal controlled; may experience large traffic volume increase from developments to the north.

Existing Plans

The CIP identifies four construction projects directly or indirectly impacting this intersection:

- RD207-82, with a cost estimated at $22 million and planned for construction in 6-10 years, will expand Linder from Chinden to State to a five lane cross-section (four over bridges).
- RD207-83, with a cost estimate of $3.181 million and planned for construction in 11-20, will expand Linder from State to Floating Feather to a five lane cross-section.
- INT207-23, with a cost estimate of $4.928 million and planned for construction in 11-20 years, will widen the intersection and modify the existing traffic signal.
- INT207-51, with a cost estimate of $1.367 million and planned for construction in 11-20 years, will install a new traffic signal at Floating Feather & Linder, 4400 feet north of State & Linder.

Additionally, at least four corridor studies potentially have significant impacts on State & Linder:

- The Highway 44 Corridor Preservation study is considering the acquisition of up to 200 foot of ROW for State in the area around State & Linder, which would be sufficient to provide at least a six-lane cross-section on State.
- The SH 16 Improvement Study (completed in 2005) and the SH 16 I-84 to South Emmett Corridor (ongoing) may lead to significant improvements on SH 16, located about two miles west of Linder. Improvements such as north-south connectivity across the Boise River and to I-84 would provide additional capacity, potentially reducing traffic demands on Linder.
- The State Street Corridor & Implementation study is currently limited in extent to between Glenwood and 27th Street. However, there is some desire to expand the reach of the project farther west, to Linder and beyond. In any case, the current project envisions creating a transit corridor along at least part of State, which may take the form of two dedicated transit lanes in the center of the street.

The draft *Roadways to Bikeways Plan* shows proposed bike lanes on the north and south legs of State and Linder. Also, based on an interview on January 16, 2008 with ITD, it is likely that bike lanes will be included in future upgrades on State (along the east and west legs of the intersection).

The 2030 Community Choices travel demand model shows two through lanes per direction on State and on Linder in the vicinity of the intersection.

Environmental Scan

- The Middleton Mill Canal crosses east to west approximately 75 feet north of the intersection.
- The 500 year floodplain occurs approximately 300 feet south of the intersection.
- The 100 year floodplain is located approximately 525 feet south of the intersection.
- No wetland areas, cultural sites, or historic properties were identified within a ½ mile radius.
- The Boise River flows approximately 1600' south of the intersection.

Spotlighted Concept: Four-leg CFI

This location is likely to have less volume than other sites through the horizon of this study, but because Linder is one of just a few river crossings, this site may ultimately prove to be one of the busiest of all.

State is the most critical east-west highway in the northern portion of the region. It may ultimately be a good candidate to grade separate at some point beyond the horizon of this study.

For both of these reasons, preserve space for a full four-leg CFI at this site. It can then be constructed incrementally if necessary (first two legs, then four, and ultimately the full CFI footprint will make it easier to grade separate if the need arises.

See **Map 3** on the following page.

Other Concepts

Median U-Turn

A MUT would be easy to develop with the turnaround points on State, but high speeds may make the necessary weaving movements unsafe. The turnarounds could instead be developed on Linder where speeds and volumes are lower.

Bowtie

If turnaround points on Linder are desired, a Bowtie with oval-shaped roundabouts that do not impede through movements, such as in the example below, would be more functionally efficient and aesthetically pleasing than a standard MUT.

Figure 2-1 Example Bowtie with wrap-around lanes

The CFI concepts were preferred over the MUT and Bowtie concepts for several reasons:

- CFI's offer better driver expectancy.
- CFI's are less pedestrian friendly, but the level of pedestrian activity seems likely to be low (could change depending on ultimate land uses).
- CFI's preserve ROW that make grade separation easier – a potentially important feature for State. (However, a roundabout interchange could also be easily developed from the basis of a Bowtie installation.)
- Developing such a Bowtie may conflict with at least one existing home.

State and Linder

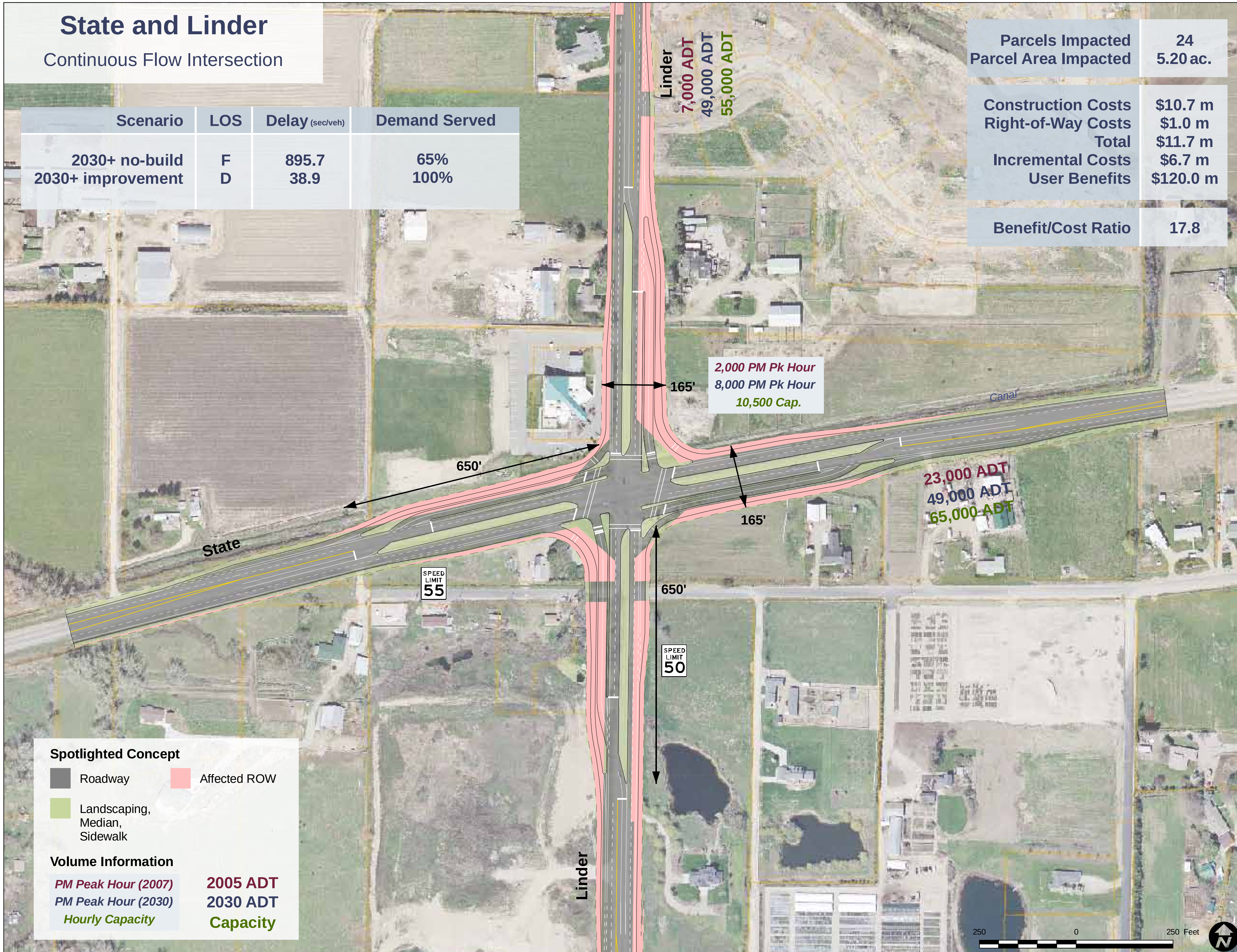
Continuous Flow Intersection

Scenario	LOS	Delay (sec/veh)	Demand Served
2030+ no-build	F	895.7	65%
2030+ improvement	D	38.9	100%

Parcels Impacted	24
Parcel Area Impacted	5.20 ac.

Construction Costs	$10.7 m
Right-of-Way Costs	$1.0 m
Total	$11.7 m
Incremental Costs	$6.7 m
User Benefits	$120.0 m

Benefit/Cost Ratio	17.8



Spotlighted Concept

- Roadway
- Affected ROW
- Landscaping, Median, Sidewalk

Volume Information

PM Peak Hour (2007)	2005 ADT
PM Peak Hour (2030)	2030 ADT
Hourly Capacity	Capacity

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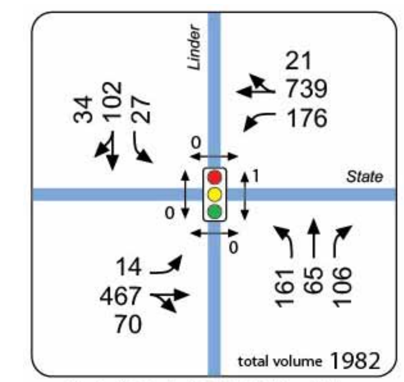
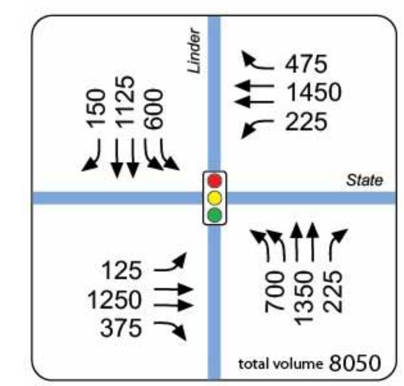


State & Linder 2007 PM Peak Hour



State & Linder Future PM Peak Hour

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3. State Street and State Highway 55 North

Key Facts

- Three-leg intersection in Eagle City; urban setting; streets meet at a 90 degree angle.
- Fourth leg may be developed as a result of the Three Cities River Crossing study.
- State: ITD-owned (SH 44), 55 mph principal arterial, five lanes, 36,000 ADT.
- SH 55 North: ITD-owned, 50 mph principal arterial, four lanes, 14,000 ADT.
- Signal controlled.

Existing Plans

The CIP and ACHD's Five Year Work Plan (FYWP) identify two construction projects indirectly impacting this intersection:

- INT207-58 (CIP)/#41 (FYWP): This signal project, with a cost estimate of $97,000 and planned for construction in 6-10 years, will install a new traffic signal at Hill & SH 55 North. The new signal, 3300 feet north of State & SH 55 North, will be close enough to have an impact on operations.
- #24 (FYWP); This collector improvement project, with a cost estimate of $5.775 million and planned for construction in 2010, will widen Hill west of SH 55 North to a three lane cross-section and realign the road.

Additionally, at least two corridor studies potentially have significant impacts on State & SH 55 North:

- The State Street Corridor Strategic Plan study is currently limited in extent to between SH 55 and 23rd Street. However, there is some desire to expand the reach of the project farther west, to beyond Eagle Rd. In any case, the current project envisions creating a transit corridor along at least part of State St., which may take the form of two dedicated transit lanes in the center or outside lanes of the street.
- The draft EIS for the Three Cities River Crossing study has been completed and is currently in a comment period (until March 3, 2008). If approved, this project, providing a north-south connection between State and Chinden (crossing the Boise River), will provide a fourth leg at this intersection.

The draft *Roadways to Bikeways Plan* shows that the north and west legs of State & SH 55 North are currently marked bike routes. Also, based on an interview on January 16, 2008 with ITD, it is likely that bike lanes will be included in future upgrades on State (along the east and west legs of the intersection).

The 2030 Community Choices travel demand model shows two through lanes per direction on State and on SH 55 North in the vicinity of the intersection.

Environmental Scan

- The area directly north of the intersection is identified as prime agricultural land, but has been developed. In general, prime agricultural land may require coordination with the Natural Resources Conservation Service (NRCS), but previously developed land is unlikely to raise major concerns.
- The area directly south of the intersection is located within the 100 year floodplain.
- The Dry Creek Canal crosses State Street directly east of the intersection then crosses west across SH 55 directly north of the intersection with State Street.
- No wetland areas, cultural sites, or historic properties were identified within a ½ mile radius.

- The Boise River flows 2000' to the south of the intersection.

Spotlighted Concept: Four-leg CFI

This situation is very similar to State and Linder, and as might be expected the best performing concepts are also very similar. If SH 55 is extended south, it will be one of just a few river crossings which will tend to draw more volume than may otherwise be expected, but because it is closer to the heart of the city, high volumes will be reached much sooner than on Linder.

A four-leg CFI is an ideal solution at this site for several reasons:

- Because State needs to maintain a high design speed, it may someday be a candidate for grade separation. A CFI best protects that option. Significant ROW already exists, along with ideal setbacks and access control for a CFI.
- A CFI offers better driver expectancy than the next best options.

See **Map 4** on the following page.

Other Concepts

Median U-Turn

A MUT would be easy to implement at this intersection, but high speeds on both State and SH 55 would make the necessary weaving movements unsafe.

Bowtie

A Bowtie similar to that described earlier for Linder is possible on SH 55. While it has inferior driver expectation, it is more pedestrian friendly. The value of pedestrian friendliness versus driver expectancy at this site could be debated in greater detail at a later date.

A few other concepts are possible, but do not offer anything more attractive than these.

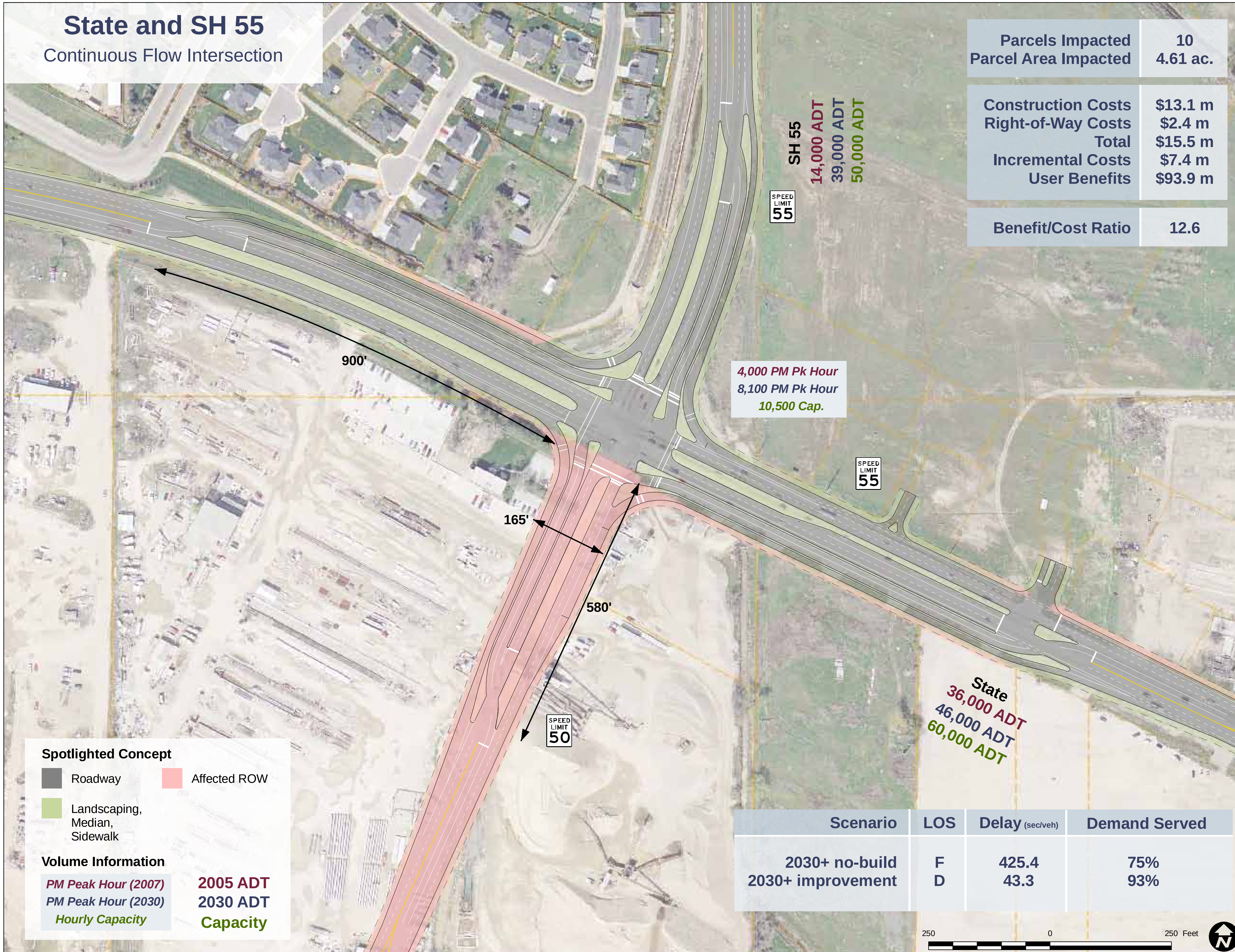
State and SH 55

Continuous Flow Intersection

Parcels Impacted	10
Parcel Area Impacted	4.61 ac.

Construction Costs	$13.1 m
Right-of-Way Costs	$2.4 m
Total	$15.5 m
Incremental Costs	$7.4 m
User Benefits	$93.9 m

Benefit/Cost Ratio	12.6



Spotlighted Concept

- Roadway
- Affected ROW
- Landscaping, Median, Sidewalk

Volume Information

PM Peak Hour (2007)	2005 ADT
PM Peak Hour (2030)	2030 ADT
Hourly Capacity	Capacity

Scenario	LOS	Delay (sec/veh)	Demand Served
2030+ no-build	F	425.4	75%
2030+ improvement	D	43.3	93%

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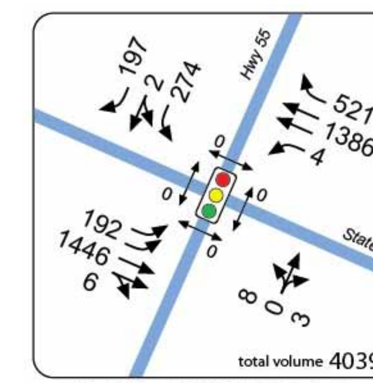
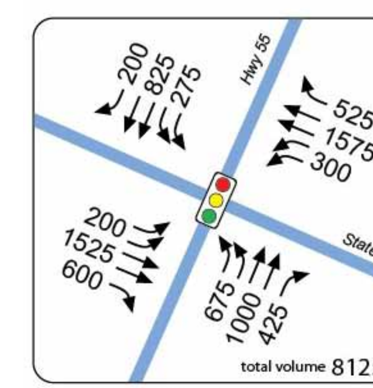


State & Hwy 55 2007 PM Peak Hour



State & Hwy 55 Future PM Peak Hour

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4. State Street and Glenwood Street

Key Facts

- Four-leg intersection at the border of Boise and Garden City; urban setting; streets meet at an angle slightly off of 90 degrees.
- State Street: 45 mph principal arterial, five lanes, 36,000 ADT. ITD-owned west of Glenwood (SH 44); ACHD-owned east of Glenwood.
- Glenwood (south of State): ITD-owned (SH 44), 35 mph principal arterial, five lanes, 36,000 ADT.
- Gary (north of State): ACHD-owned, 35 mph minor arterial, three lanes, 14,000 ADT.
- Signal controlled.

Existing Plans

The CIP and FYWP identify two construction projects directly or indirectly impacting this intersection:

- INT207-24 (CIP): This intersection improvement project, with a cost estimate of $7.776 million and planned for construction by 2020, will widen State & Glenwood and modify the traffic signal.
- #50 (FYWP); This signal project, with a cost estimate of $675,000 and planned for construction by 2012, will install a new traffic signal at State & Bogart. The new signal, 4800 feet west of State & Glenwood, will be close enough to have an impact on operations.
- The State Street Corridor Strategic Plan study is currently considering the creation of a transit corridor along this part of State St., which may take the form of two dedicated transit lanes in the center or outside lanes of the street. The CIP identifies the need for an arterial improvement project (RD207-116) for ROW and corridor preservation for a seven-lane cross-section along State east of Glenwood, at a cost of $2.448 million, to be completed by 2020.

The draft *Roadways to Bikeways Plan* shows that there are currently bike lanes on the north leg of State & Glenwood. The Plan also shows a proposed bike lane on the south leg. Based on aerial photographs, a bike lane exists on the east leg, at least in the westbound (WB) direction. Also, based on an interview on January 16, 2008 with ITD, it is likely that bike lanes will be included in future upgrades on State (along the east and west legs of the intersection).

The 2030 Community Choices travel demand model shows two through lanes per direction on State St. west of Glenwood St. and three through lanes per direction east of Glenwood St. Also, Gary (north of State) has one lane per direction in the model, while Glenwood St. (south of State St.) has two travel lanes per direction. The additional travel lanes on State St. east of Glenwood St. may be transit only, but are dependent upon the transit oriented land uses implemented along the corridor.

Environmental Scan

- The intersection is located within an area identified as prime agricultural land. In general, prime agricultural land may require coordination with the NRCS, but previously developed land is unlikely to raise major concerns.
- Approximately 250 feet south of the intersection is the 500 year floodplain, associated with the Boise River.
- A section of the Boise Valley canal is located approximately 400-450 north of the intersection.

- A portion of the 100 year floodplain is located approximately 1150 feet southeast of the intersection.
- No wetland areas, cultural sites, or historic properties were identified within a ½ mile radius.
- The Boise River flows approximately 2300' south of the intersection.

Spotlighted Concept: MUT

This intersection is challenging due to the number of driveways near the intersection, relatively tight ROW, skewed crossing, and a higher than average number of pedestrians.

In this environment, Quadrant Roadways and MUTs appear to be the most realistic options, and the latter was selected for a more detailed analysis largely because it appears to be the easiest to implement.

Because there are existing parking lots on State, it is easier to find an acceptable spot to create the turning basin necessary for larger trucks to complete the turn. Speeds on State in this area are lower so any weaving that occurs can be done safely.

This is a more pedestrian friendly option than a CFI, but comes with unusual driver expectation.

See **Map 5** on page 20.

Other Concepts

Bowtie

An oval-shaped Bowtie is an attractive modification of the spotlighted MUT. Where the U-turn would require stopping oncoming traffic with a signal to allow vehicles to turn, **Figure 4-1** shows how an oval creates a wrap-around lane so that neither the U-turns nor the oncoming traffic will need to stop. The oval itself can then be landscaped to help revitalize the area.

There are locations along State with large parking lots on both sides that may allow such ovals to be developed. They may not need to be as wide or long as this, but only conform to minimum standards of design in order to minimize ROW. This option was not spotlighted because of the larger ROW required, but it may be an enhancement worth the extra cost.

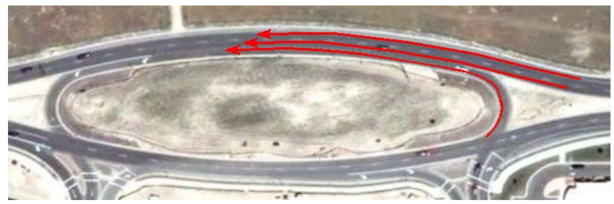


Figure 4-1 Bowtie that avoids impeding oncoming traffic

Quadrant Roadways

Innovative Intersections: Overview and Implementation Guidelines articulates how a single quadrant, two opposing quadrants, or even four quadrants can all be used to greatly improve the efficiency of a system. **Figure 4-2** shows that there are potentially four realistic alignments that could be used at this intersection to obtain all the benefits of a full four-quadrant system (or any subset).

A full four-quadrants is the most pedestrian-friendly of all options, as it removes the most conflicts with pedestrians and may allow some existing pavement to be reclaimed for landscaping. It is also transit friendly because it is easier for buses to reach stops on the quadrants than to try and maneuver to stops on the mainlines. This system shares much in common with Town Center Intersections (TCI) – driveways on the quadrants are no problem, and the enhanced auto access makes the system very business friendly.

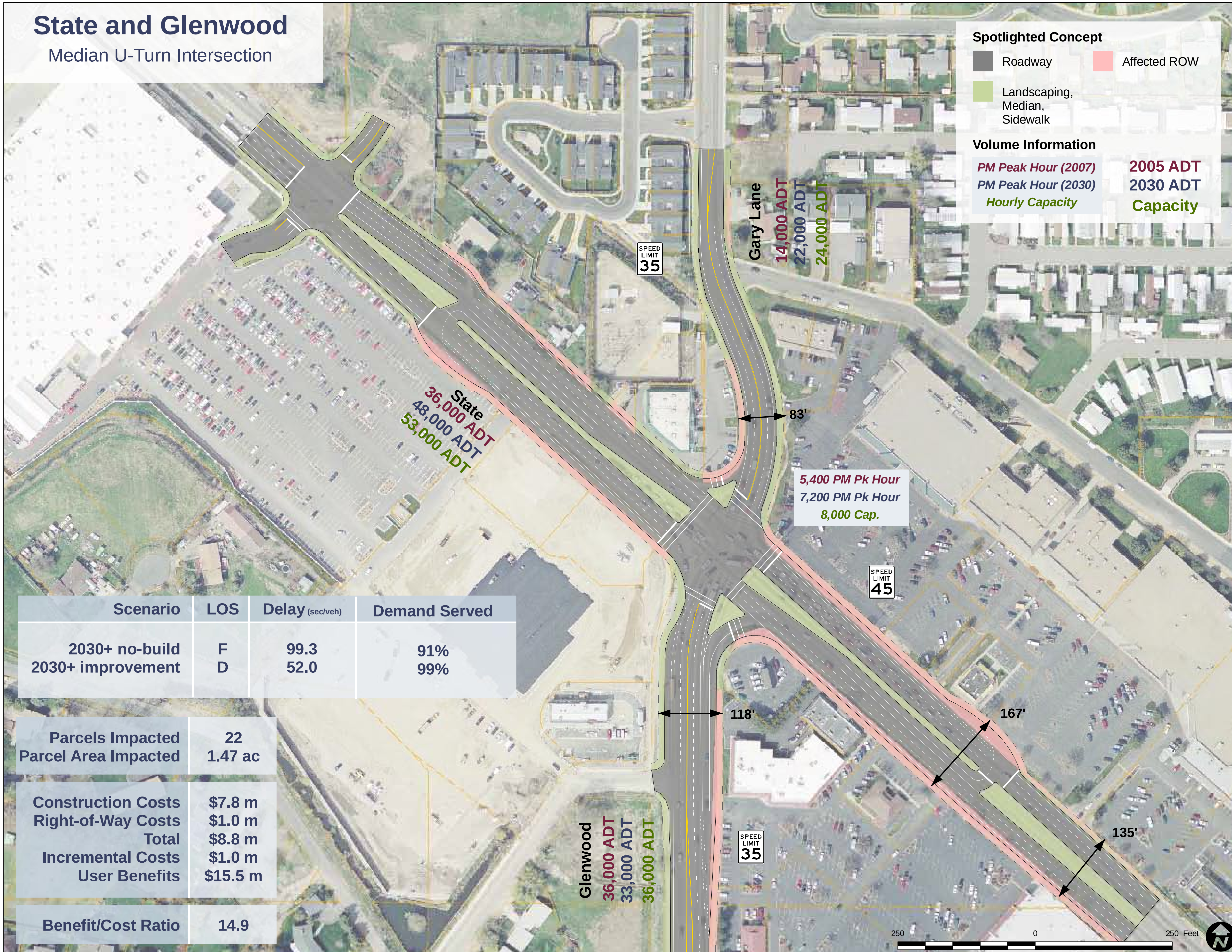
Many driveways near the intersection may be relocated to the quadrants, further enhancing the safety and efficiency of the mainline. This is a very good option, but it was not spotlighted for detailed analysis largely because it would be more expensive to implement than the MUT. Although Saxton

Drive exists and could serve as a roadway for the northwest quadrant, potential roadways in the other quadrants would all be on private property. This single quadrant was also not analyzed, partly because of the relatively high turning volume from northbound (NB) Glenwood St. to westbound State St. and the narrow ROW of Gary Ln.

Figure 4-2 Four-quadrant system at State and Glenwood

State and Glenwood

Median U-Turn Intersection



Scenario	LOS	Delay (sec/veh)	Demand Served
2030+ no-build	F	99.3	91%
2030+ improvement	D	52.0	99%

Parcels Impacted	22
Parcel Area Impacted	1.47 ac

Construction Costs	$7.8 m
Right-of-Way Costs	$1.0 m
Total	$8.8 m
Incremental Costs	$1.0 m
User Benefits	$15.5 m

Benefit/Cost Ratio	14.9

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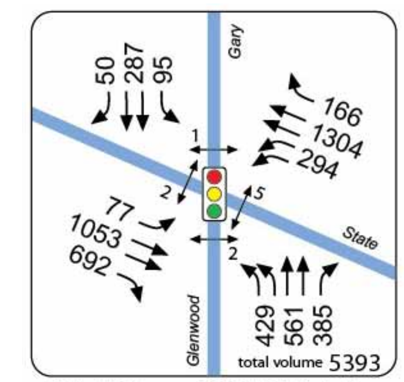
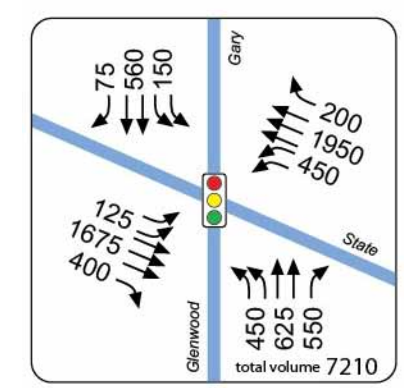


State & Glenwood 2007 PM Peak Hour



State & Glenwood Future PM Peak Hour

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5. Chinden Boulevard and Glenwood Street

Key Facts

- Four-leg intersection in Garden City; urban setting; streets meet at an angle well off of 90 degrees.
- Chinden: ITD-owned (US 20/26), 35 mph principal arterial, five lanes, 32,000 ADT.
- Glenwood north of Chinden: ITD-owned (SH 44), 35 mph principal arterial, five lanes, 34,000 ADT.
- Glenwood south of Chinden: ACHD-owned, 35 mph principal arterial, four lanes, 34,000 ADT.
- Signal controlled.
- Kent Ln.: ACHD-owned south of Alworth St; north of Alworth St., county-owned as part of the park/fairgrounds complex.
- Lorimer Ln.: county-owned as part of park/fairgrounds complex.

Existing Plans

The CIP identifies one construction project indirectly impacting this intersection:

- RD207-144: This arterial improvement project, with a cost estimate of $1.493 million and planned for construction in 6-10 years, will create a two-way couplet along Cole and a new alignment to the east. The northern terminus of the project is about 2000 feet south of Chinden & Glenwood. The project will improve north-south capacity with a better connection between Cole and Glenwood, possibly increasing traffic demand at Chinden & Glenwood.

Additionally, at least one corridor study potentially has significant impact on Chinden & Glenwood:

- The draft EIS for the Three Cities River Crossing study has been completed and the comment period ended March 3, 2008. If approved, this project, providing a north-south connection between State and Chinden (crossing the Boise River), will provide additional north-south capacity, potentially increasing traffic demands on Chinden.

The draft *Roadways to Bikeways Plan* shows that there is currently a multi-use path running parallel to Glenwood north of Chinden. Measurements from aerial photographs locate this path at about 40 feet east of the edge of pavement on Glenwood. The Plan also shows proposed bike lanes on the east leg of Chinden & Glenwood.

Discussions with Ada County Development Services indicate that land in the northeast quadrant of Chinden & Glenwood is currently being considered for annexation to the City of Garden City.

The 2030 Community Choices travel demand model shows two through lanes per direction on all four intersection legs.

Environmental Scan

- The intersection is located within an identified extent of prime agricultural land. In general, prime agricultural land may require coordination with the NRCS, but previously developed land is unlikely to raise major concerns.
- The Thurman Drain crosses east to west approximately 350 feet south of the intersection on the Boise bench.
- The Thurman Mill Canal is located approximately 575 feet north of the intersection.
- The intersection is located approximately 525 feet from the 500 year floodplain.
- Ada County parkland and property is located at the northeast corner of the

intersection, which could pose special environmental concerns.

- The Expo Center is under lease by the County until 2010 and may be considered for annexation to the City beyond this date. The Garden City Comprehensive Plan identifies the abutting land for future Mixed-Use or Transit-Oriented Development.
- No wetland areas, cultural sites, or historic properties were identified within a ½ mile radius.

Spotlighted Concept: Single Quadrant Roadway

Like the previous intersection further north on Glenwood, this one is also challenging due to the number of driveways near the intersection, relatively tight ROW, skewed crossing, and a higher than average number of pedestrians.

Again, Quadrant Roadways and MUTs are good options. This time the former was selected for more detailed analysis because there is an excellent existing candidate in the northeast quadrant that could be implemented almost immediately at a very low cost.

The analysis suggests that the existing quadrant could easily handle today's volume with only minor construction to install signals and enhance turn pockets at the intersections. However, if all four left turns continued to be routed on just this one quadrant, then by 2030 the quadrant itself would need to be widened to five lanes, perhaps making some of the other options that were not examined in detail more attractive.

See **Map 6** on page 24.

Other Concepts

Multiple Quadrants

While the spotlighted option would be extremely low cost, its big drawback is unusual and circuitous paths to complete the four left turns, and the single quadrant itself may become congested by 2030.

There are various obstacles, but possibilities exist for roadways in the other three quadrants. With multiple quadrant roadways, driver expectancy improves greatly and circuitous paths are reduced by each quadrant that is added.

Figure 5-1 Four-quadrant possibility at Chinden and Glenwood

There appears to be enough room to improve the north side of the southwest roadway to handle a bit more volume without touching the property of existing homes. However residents would not welcome the prospect of a busier street, even if it is handling just the NB to WB movement.

MUT/ Bowtie

Preliminary screening suggested this concept would have high operational performance at this site. It would be relatively low cost (higher cost as a Bowtie, lower as a MUT). It may prove more acceptable to the public than the circuitous paths of a single quadrant, or the cost and perceived impacts of multiple quadrants.

Show in **Figure 5-2** is a concept for a Bowtie on Chinden, where it appears it would impact only parking. If such were pursued, it would be necessary to avoid connecting to major driveways or side streets that may require designing them as roundabouts. This would impede traffic flow on Chinden. The point is merely to create a wrap-around lane for left turns that were prohibited at the main intersection. If the Bowtie is used to serve many more movements, it will itself become a problem.

Note that a traditional MUT could also be located at the same spots shown. It would impact less parking, but would also require a signal to stop oncoming traffic for the U-turning vehicles.

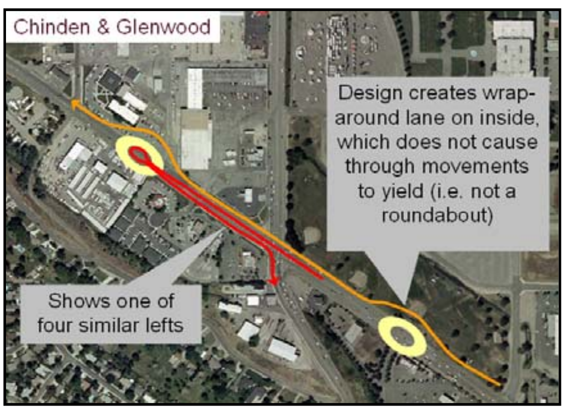


Figure 5-2 Bowtie option and routing on Chinden and Glenwood

Chinden and Glenwood

Quadrant Roadway Intersection

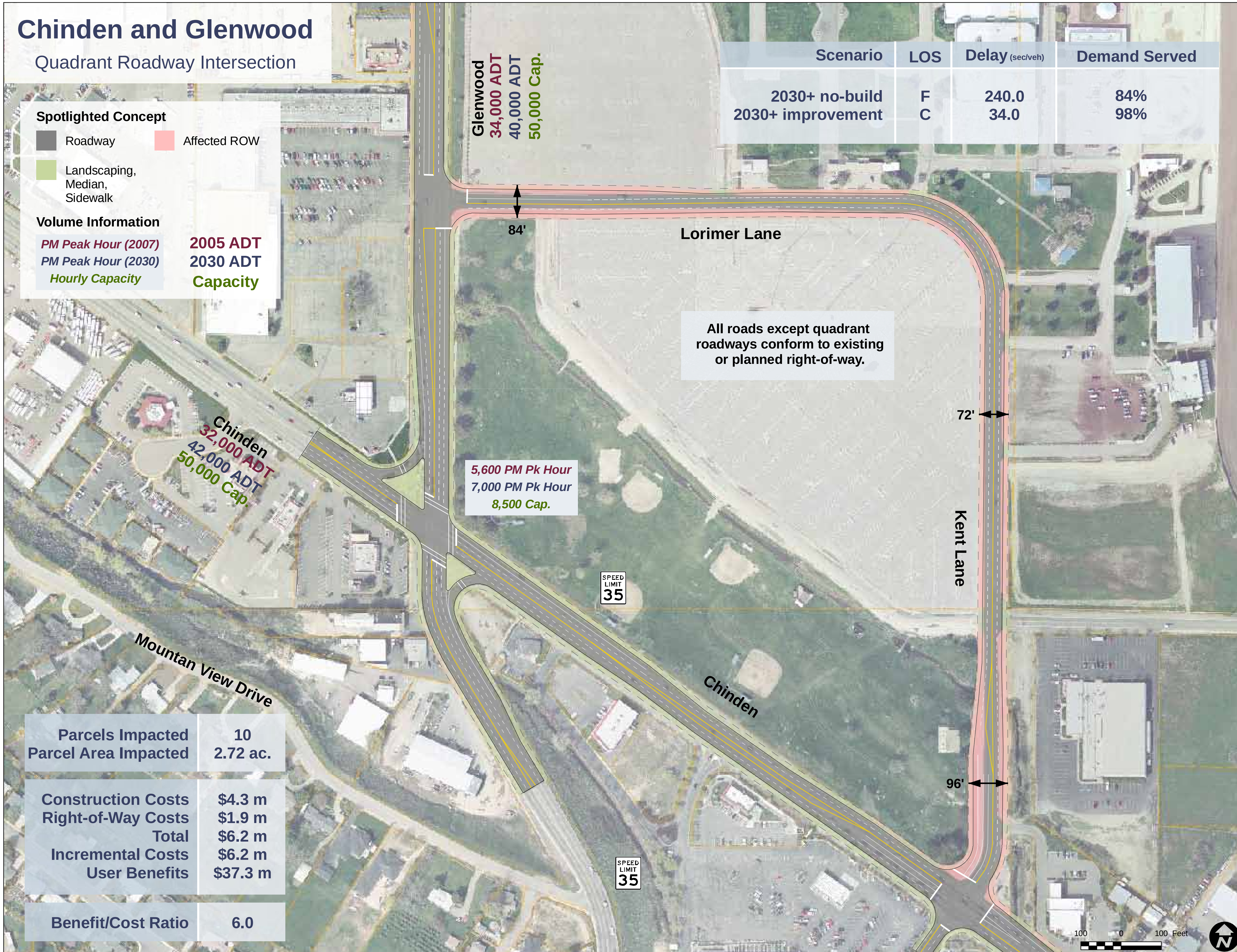
Spotlighted Concept

- Roadway
- Affected ROW
- Landscaping, Median, Sidewalk

Volume Information

PM Peak Hour (2007)	2005 ADT
PM Peak Hour (2030)	2030 ADT
Hourly Capacity	Capacity

Scenario	LOS	Delay (sec/veh)	Demand Served
2030+ no-build	F	240.0	84%
2030+ improvement	C	34.0	98%



Parcels Impacted	10
Parcel Area Impacted	2.72 ac.

Construction Costs	$4.3 m
Right-of-Way Costs	$1.9 m
Total	$6.2 m
Incremental Costs	$6.2 m
User Benefits	$37.3 m

Benefit/Cost Ratio	6.0

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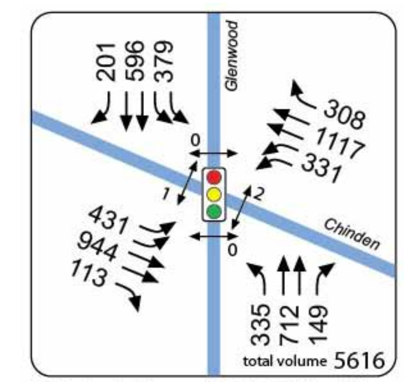
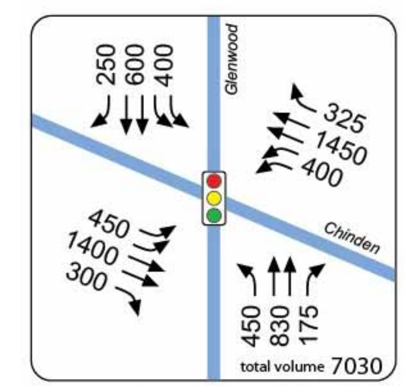


Chinden & Glenwood 2007 PM Peak Hour



Chinden & Glenwood Future PM Peak Hour

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6. Ustick Road and Cole Road

Key Facts

- Four-leg intersection in Boise; urban setting; streets meet at a 90 degree angle.
- Ustick: ACHD-owned, 35 mph minor arterial, three lanes, 17,000 ADT.
- Cole: ACHD-owned, 35 mph minor arterial, four lanes, 19,000 ADT.
- Signal controlled.

Existing Plans

The CIP and FYWP identify several construction or ROW preservation projects directly or indirectly impacting this intersection:

- RD207-144 (CIP): This arterial improvement project, with a cost estimate of $1.493 million and planned for construction in 6-10 years, will create a two-way couplet along Cole and a new alignment to the east. The southern terminus of the project is about 1700 feet north of Ustick & Cole. The project will improve north-south capacity with a much better connection between Cole and Glenwood, possibly increasing traffic demand at Ustick & Cole.
- RD207-135 (CIP)/INT207-29/#5 (FYWP)/: This arterial and intersection improvement project, with a cost estimate of $15.795 million (per the FYWP) and under construction, will widen Ustick west of Cole to five lanes and widen Ustick & Maple Grove and modify the traffic signal there. The now completed signal, 5300 feet west of Ustick & Cole, is close enough to have an impact on operations.
- RD207-148 (CIP): This arterial improvement project, with a cost estimate of $5 million and planned for construction in 6-10 years, will preserve ROW for a five lane cross-section on Ustick east of Cole.
- INT207-4 (CIP): This intersection improvement project, with a cost estimate of $8.016 million and planned for construction in 11-20 years, will widen Fairview & Cole and modify the traffic signal. The signal, 5300 feet south of Ustick & Cole, is close enough to have an impact on operations.

The draft *Roadways to Bikeways Plan* shows that there are currently bike lanes on the east and west legs of Ustick & Cole.

The 2030 Community Choices travel demand model shows two through lanes per direction on all four intersection legs.

There are plans to build a new branch library (the Boise West Branch Library) in the southwest quadrant of this intersection.

Environmental Scan

There are no identified environmental constraints within a ½ mile radius of the intersection.

Spotlighted Concept: Bowtie

The tight ROW and the pedestrian/ neighborhood atmosphere make this intersection very challenging. Many choices simply won't work well. However, a tight Bowtie will be functionally efficient and will also fit in with the context of the area better than any other choice.

In this case using the smallest possible roundabouts is preferred over the oval designs discussed earlier. The oval designs are more important on larger streets where much higher volumes are expected and where higher speeds need to be maintained.

In this environment, a single roundabout in the main intersection would fail, but two roundabouts on either side of the main intersection to handle mostly left-turn movements are appropriate to the entering volumes. Roundabouts will have smaller impacts than ovals, and provide access to attached driveways or local streets. It appears possible to install roundabouts using vacant lots and some parking to minimize the impacts to just one or two homes.

To be conservative in the necessary footprint, the roundabouts shown here are large enough to allow a semi with a single trailer to make the turn. If the concept is carried further, consider tighter roundabouts if necessary to lower costs and avoid impacts. Trucks would then be prohibited from making left turns or U-turns, and would need to utilize parking lots or approach from different directions as necessary to maneuver. In an area with relatively few trucks, this may be a reasonable restriction.

See **Map 7** on the following page.

Other Concepts

Jughandles (Mini-Cloverleaf)

Jughandles share much in common with quadrant roadways, but are typically much tighter and are often one-way streets. **Figure 6-1** shows how the concept would look in this case. To make a left turn, all vehicles would instead make three rights on a "loop ramp" as with a cloverleaf freeway interchange. Unlike a loop ramp on a freeway, this would be very low speed (15-20 mph).

It would also allow driveways on the loop as necessary to improve property access. **Figure 6-1** also shows an orange arrow noting how loops can be two-way streets to allow right-turns to use it (making it more like a quadrant roadway). If there is sufficient space to make it two-way, this creates better property access and removes the risk of someone entering the wrong way. This would cost more to develop than roundabouts, but would likely be less impacting than a traditional intersection widening and in the end would be much more efficient.

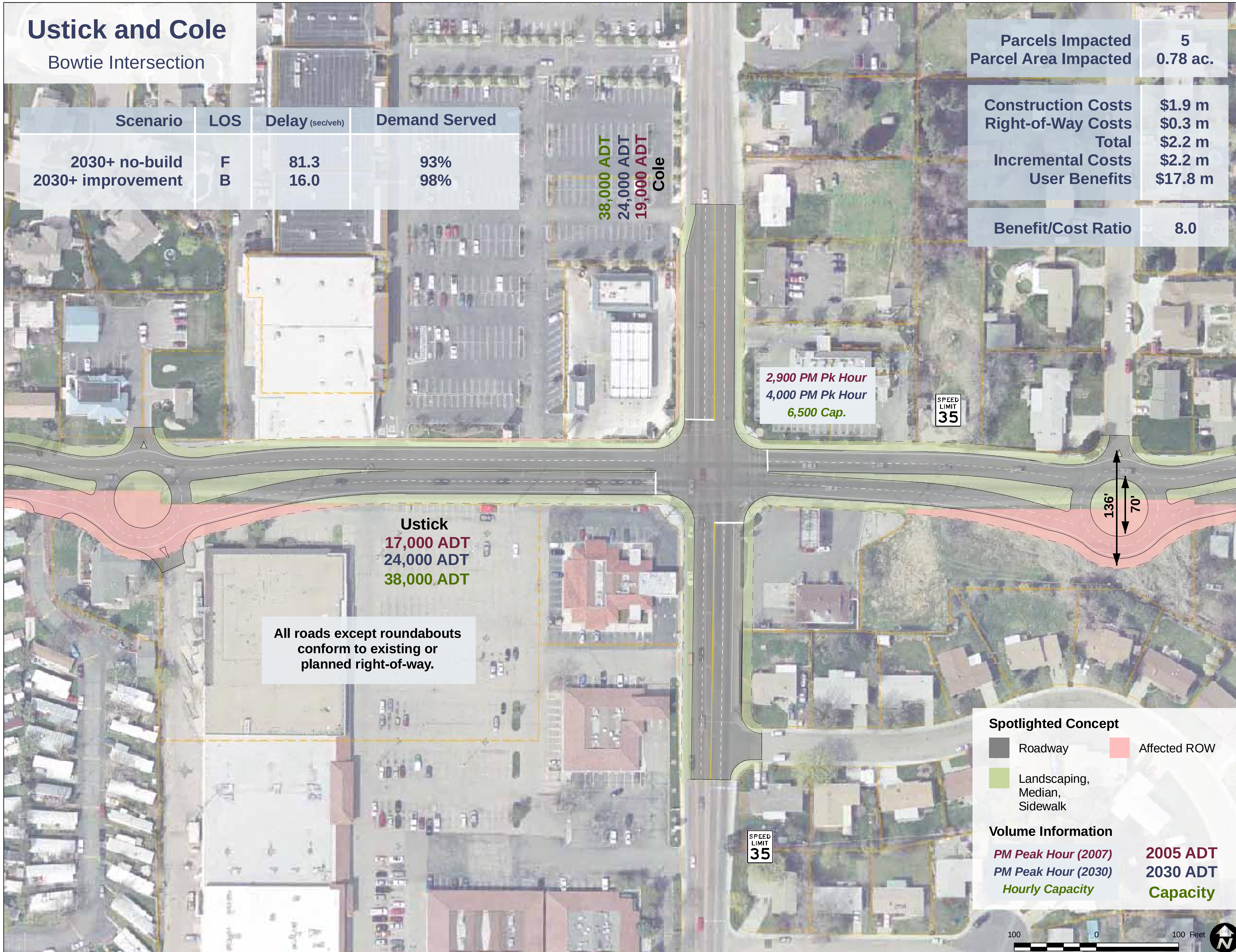
Figure 6-1 Routing left turns on four jughandles at Ustick and Cole

Ustick and Cole

Bowtie Intersection

Scenario	LOS	Delay (sec/veh)	Demand Served
2030+ no-build	F	81.3	93%
2030+ improvement	B	16.0	98%

Parcels Impacted	5
Parcel Area Impacted	0.78 ac.
Construction Costs	$1.9 m
Right-of-Way Costs	$0.3 m
Total	$2.2 m
Incremental Costs	$2.2 m
User Benefits	$17.8 m
Benefit/Cost Ratio	8.0



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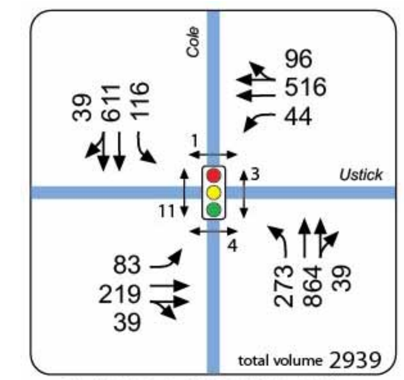
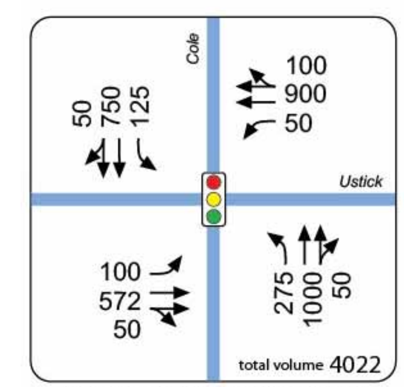


Ustick & Cole 2007 PM Peak Hour



Ustick & Cole Future PM Peak Hour

WilburSmith ASSOCIATES

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7. Chinden Boulevard and Curtis Road

Key Facts

- Four-leg intersection in Garden City; urban setting; streets meet at a 90 degree angle.
- Chinden: ITD-owned (US 20/26), 35 mph principal arterial, five lanes, 34,000 ADT.
- Curtis (south of Chinden): ACHD-owned, 35 mph minor arterial, four lanes, 32,000 ADT.
- Veterans Memorial (north of Chinden): ACHD-owned, 35 mph minor arterial, four lanes, 26,000 ADT.
- Signal controlled.

Existing Plans

The CIP and FYWP identify several construction or ROW preservation projects directly or indirectly impacting this intersection:

- RD207-148 (CIP): This arterial improvement project, with a cost estimate of $5 million and planned for construction in 6-10 years, will preserve ROW for a five lane cross-section on Ustick east of Cole. The improved east-west capacity eventually provided on Ustick could lead to increased traffic at Ustick & Curtis; a signalized T-intersection located 600 feet south of Chinden & Curtis.
- #25 (FYWP): This collector improvement project, with a cost estimate of $3.990 million and planned for completion by 2012, will widen Adams to three lanes and create a new connection between 36th and 37th. This route runs parallel to Chinden, thus increasing east-west capacity, and possibly reducing traffic demand at Chinden & Curtis.
- INT207-3 (CIP): This intersection improvement project, with a cost estimate of $900,000 and planned for construction in 11-20 years, will preserve ROW for widening Chinden & Curtis.

The draft *Roadways to Bikeways Plan* shows that there are currently bike lanes on the south leg of Chinden & Curtis (along Curtis). The north leg (along Veterans Memorial) features a multi-use path.

The 2030 Community Choices travel demand model shows two through lanes per direction on all four intersection legs.

This intersection is included in current planning efforts by Garden City and ACHD.

Environmental Scan

- The intersection is located within the 500 year floodplain.
- The Settlers Canal is located approximately 1110 feet south of the intersection.
- No wetland areas, cultural sites, or historic properties were identified within a ½ mile radius.

Potential Concepts

Due to Garden City's ongoing planning efforts directed at Chinden & Curtis and the wide range of options, no specific "spotlighted" concept was advanced at this location. However, this site has a number of possible arrangements that should all be researched in more depth. The following pages show a wide variety of potential applications and some of the more interesting concepts to be evaluated in greater depth at a later date.

Town Center Intersections (TCI)

This intersection style has a strong ability to encourage urban renewal. The need for renewal in this area makes this an exciting site at which to apply this concept, and there are numerous alignment options to choose from. Access control can be less stringent with a TCI than is necessary with a CFI or MUT, which is important in dealing with existing properties in the area. High-level operational analysis suggests it may be at least as efficient as other reasonable choices.

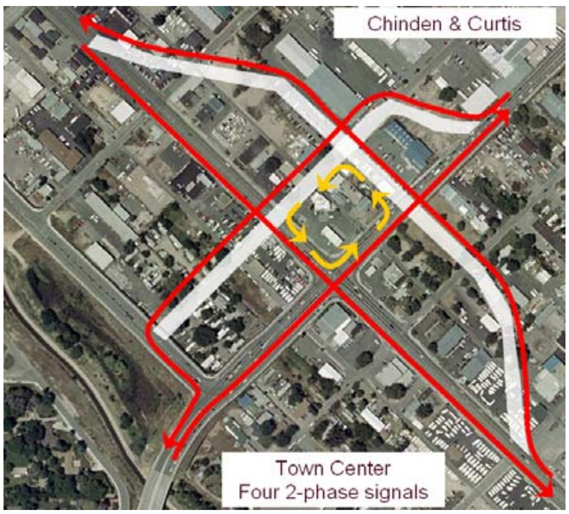

Figure 7-1 TCI, Option A

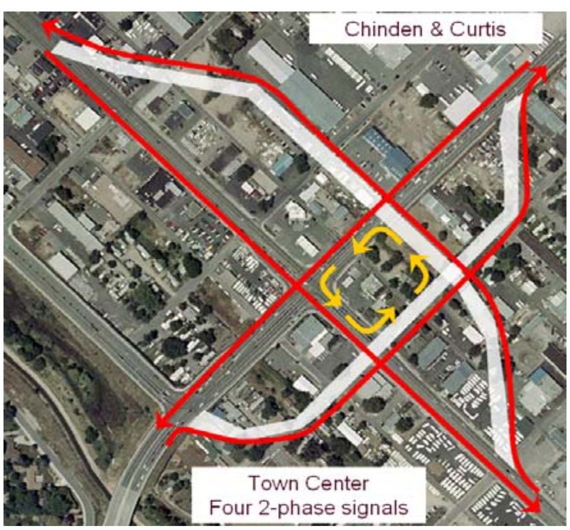

Figure 7-2 TCI, Option B

Figure 7-1 and **Figure 7-2** are essentially the same, with the major difference being whether a new alignment would parallel Curtis on the north or south side. The red shows thru movements, and the orange shows where left turns would occur. This is a typical TCI with four intersections replacing today's single intersection, but each intersection would have efficient two-phase signals and the system could handle much higher volumes than exist today.

Developing either of these choices will impact property and may need a sponsor willing to utilize tax-increment financing, perhaps followed up by a public-private partnership.

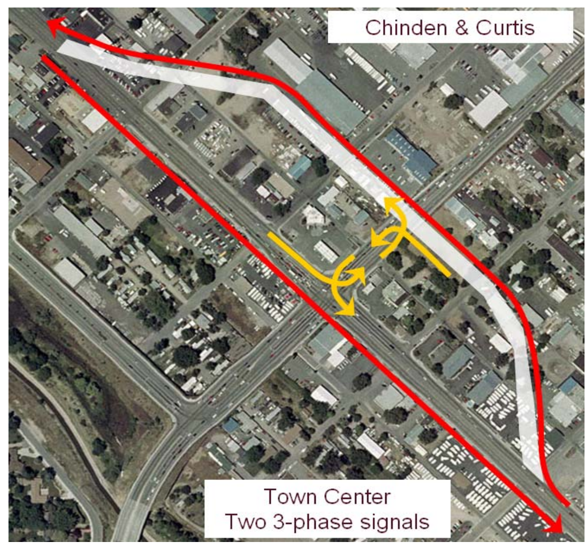

Figure 7-3 Half TCI, Two three-phase signals

Figure 7-3 shows a half TCI. In orange are the conflicting left turns that create two three-phase signals. This is a more efficient system than exists today, and could be a first step towards a full TCI.

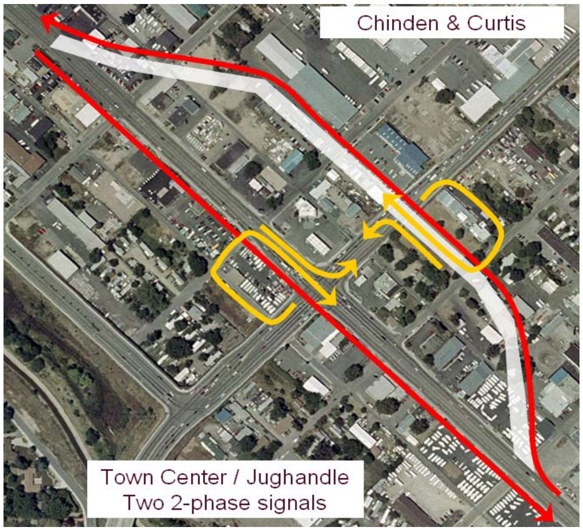

Figure 7-4 Half TCI with Jughandles, Two 2-phase signals

Figure 7-4 shows how the half TCI can be combined with jughandles to achieve two two-phase signals. This is a very efficient system that will achieve most of the benefits of the full TCI, but with significantly less cost.

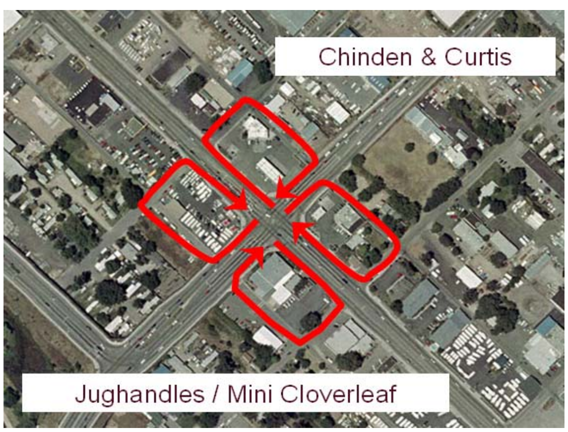

Figure 7-5 Chinden and Curtis Full Jughandles

There are two low-cost solutions that may be possible to implement in the near term. Both could improve the situation for ten years or so while a more ideal solution is identified and funded.

The first is the jughandle/mini-cloverleaf shown in **Figure 7-5**. There are existing alleyways and local streets that could serve this purpose. If they are restricted to one-way movements, they may not need much new ROW.

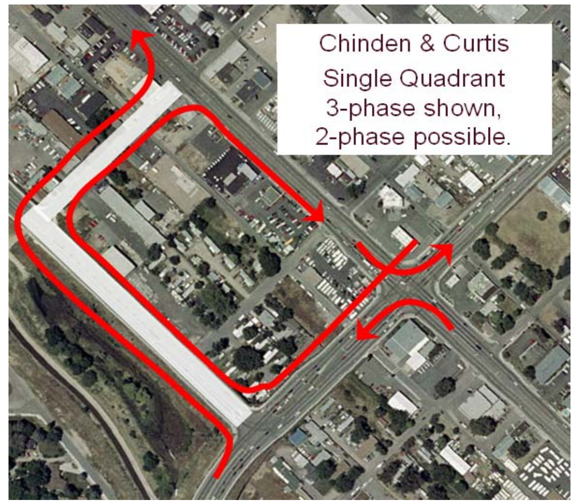

Figure 7-6 Low cost, short term benefits using existing quadrant and three-phase operation

The second is to operate a single quadrant along the white path in **Figure 7-6.** Both roads already exist, and would require only signal installation, signing/striping, and minor construction. A single quadrant can serve all four left turns, but this creates unusual driver expectancy and may overly congest the quadrant. The figure shows how two left turns could use the quadrant, and the remaining two would operate as standard left turns achieving a three-phase signal. Note that transportation departments around the country are beginning to spend millions to reduce from 4-phase to three-phase signals. This one could be done on less than half a million dollars.

MUTs on Chinden are also a reasonable, fairly low cost option here as well.

For illustration, the CFI and Parallel Flow Intersection (PFI) options are shown in **Figure 7-7** and **Figure 7-8**. The CFI is more restrictive on access for a longer distance and requires a right-turn ramp (orange) so that drivers don't mistakenly turn into the left storage bay. The PFI would have fewer access impacts, and would not need the right-turn ramp (reducing the footprint) because there is much less risk drivers would mistakenly turn into the left bay. However, the entry point of the southern-most left storage bay is likely too close to the T-intersection to make it work.

Neither of these options offers significant advantages over the others discussed, and should probably not be pursued further at this site.

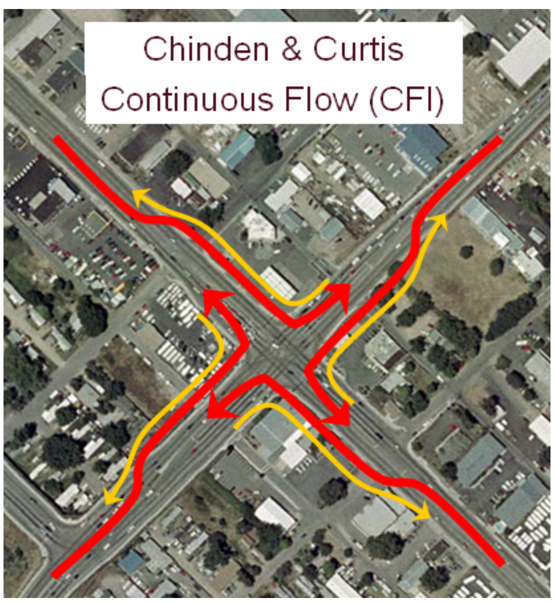

Figure 7-7 CFI routing and likely impacts

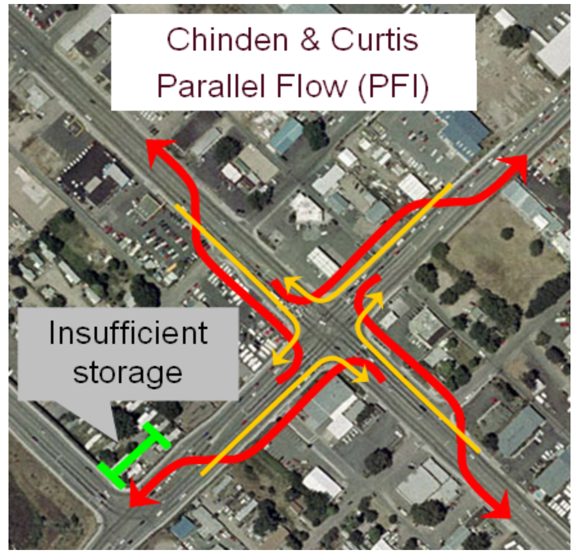

Figure 7-8 PFI routing and likely impacts

8. Fairview Avenue and Curtis Road

Key Facts

- Four-leg intersection in Boise; urban setting; streets meet at a 90 degree angle.
- Fairview: ACHD-owned, 35 mph principal arterial, five lanes, 27,000 ADT.
- Curtis: ACHD-owned, 35 mph minor arterial, four lanes, 33,000 ADT.
- Signal controlled.

Existing Plans

The CIP identifies three construction or ROW preservation projects directly or indirectly impacting this intersection:

- RD207-53: This arterial improvement project, with a cost estimate of $3.316 million and planned for construction in 11-20 years, will preserve ROW for a 7 lane cross-section on Fairview both west and east of Curtis.
- INT207-4: This intersection improvement project, with a cost estimate of $8.016 million and planned for construction in 11-20 years, will widen Fairview & Cole and modify the traffic signal. The signal, 5300 feet west of Fairview & Curtis, is close enough to have an impact on operations.
- INT207-8: This intersection improvement project, with a cost estimate of $800,000 and planned for construction in 11-20 years, will preserve ROW for widening Fairview & Orchard. The signal, 2650 feet east of Fairview & Curtis, is close enough to have an impact on operations.

Additionally, at least one corridor study potentially has significant impact on Fairview & Curtis, the Fairview Avenue Corridor Study, with completion expected in 2009.

The draft *Roadways to Bikeways Plan* shows that there are currently bike lanes on the north and south legs of Fairview & Curtis. The Plan also shows proposed bike lanes extending farther south on the south leg (across the I-184 overpass) and on the west leg.

The 2030 Community Choices travel demand model shows two through lanes per direction on Curtis and three lanes per direction on Fairview.

Environmental Scan

- There are no identified environmental constraints within the direct vicinity of the intersection.
- The North Slough passes approximately 750 feet south of the intersection.

Spotlighted Concept: Single Quadrant Roadway Plus Roadway Realignment

This intersection appeared the most challenging intersection because of its proximity to the freeway. There was reluctance to adopt it as one of the ten study intersections out of concern it may take much more resources than available to identify a reasonable solution. However, a very attractive solution emerged nonetheless.

Figure 8-1 describes the major problem of this intersection. Two major streams of left-turns bound for WB Fairview merge and there are just 400 feet (about 15 car lengths), to serve 500 vehicles per hour today and over 800 per hour in the future. The inefficiency of a 4-phase signal, the need to dedicate major portions of the cycle to this left-turn, combined with the lack of space to store vehicles, present a major challenge.

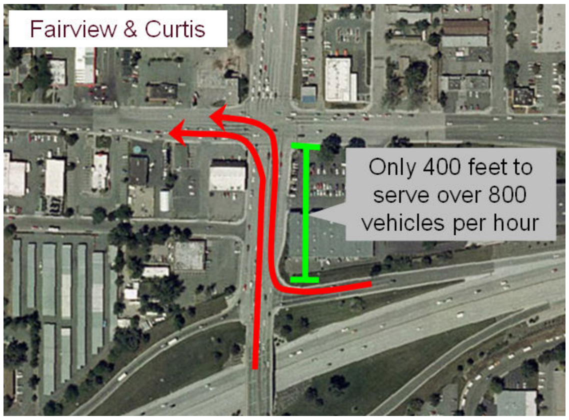

Figure 8-1 Fairview and Curtis: huge demand, no storage space

Some of the solutions for improving signal efficiency such as a CFI simply won't work here because there is not enough length for the run-out. A PFI treatment on the north and south legs can create the required storage, but would likely impact three significant businesses in the SW quadrant and two in the NE quadrant. A MUT on Fairview is challenging because of a nearby intersection, and because converting left-turns to a right-U-through pattern would overwhelm the capacity to turn right. A quadrant roadway in the northeast is possible and would be better than the status quo, but may not fully address the problem.

Figure 8-2 shows what emerged as the most practical solution to advance in the near term. It requires re-routing the northbound left-turns behind existing businesses to a T-intersection using Opohonga Street. To accomplish this, Opohonga must be realigned to the intersection of the freeway ramps so that it can receive those movements.

Figure 8-2 Routing plan with three-phase operation on two quadrants

The intersection of Curtis with the ramps would then appear at first glance to be a five-leg intersection, creating some worry that it may become problematic. However, Opohonga would be just one-way at this point as is the on-ramp, so in reality it is just a three-phase signal, and good channelization and signage can easily direct drivers where to be to enter either the freeway or Opohonga.

On the spotlighted concept drawing, Opohonga is shown as just one-way clear to the T, but it could be two-way from the T eastward to close to Curtis, to provide better property access if necessary. Do not allow two-way travel on Opohonga all the way to Curtis, as the eastbound movements would complicate operations at the critical intersection of I-184 and Curtis.

This is a satisfactory solution to one of three left-turns. **Figure 8-2** shows how a quadrant roadway in the NE would handle the opposing left, resulting in a three-phase signal where all movements maintain perfect or near-perfect driver expectation. In this case, the NE quadrant can be easily implemented with no widening to either Bond or Amber street if those segments are converted to one-way. There are enough other streets in the area that converting small portions of these two to one-way would not significantly hinder local access.

Figure 8-3 shows how the same quadrant could also take on the two additional left-turns to obtain a two-phase signal. Two directions plus additional volume would certainly require widening the quadrant and impacting a number of properties.

Figure 8-3 Routing plan with two-phase operation on two quadrants

Figure 8-3 is the routing that would create the most capacity, and hence, it is the concept that was analyzed in detail for purposes of estimating the costs and benefits of the full design. However, the routing of **Figure 8-2** is a very attractive interim solution that has much lower overall costs, and would clear up intersection congestion for a number of years.

The concept drawing shows dual left-turns on the northbound approach of I-184 and Curtis. It appears possible to use the existing bridge deck to accommodate the resulting six lanes of traffic (two through lanes per direction and two left-turn lanes), although at the sacrifice of any accommodation for pedestrian or bicycle traffic over the bridge. If it is necessary to continue to provide a means for north-south pedestrian and bicycle access in this area, it may be required to build a separate structure parallel to the existing bridge.

See **Map 8** on the following page.

Other Attractive Concepts

No other concepts appeared to offer anything as attractive as this, so they were not studied in any detail.

Fairview and Curtis

Quadrant Roadway Intersection

Scenario	LOS	Delay (sec/veh)	Demand Served
2030+ no-build	F	109.5	89%
2030+ improvement	C	26.0	94%

All roads except quadrant roadways conform to existing or planned right-of-way.

Parcels Impacted	21
Parcel Area Impacted	1.31 ac.

Construction Costs	$9.0 m
Right-of-Way Costs	$0.9 m
Total	$9.9 m
Incremental Costs	$4.3 m
User Benefits	$26.5 m

Benefit/Cost Ratio	6.1

Spotlighted Concept

- Roadway
- Affected ROW
- Landscaping, Median, Sidewalk

Volume Information

PM Peak Hour (2007)	2005 ADT
PM Peak Hour (2030)	2030 ADT
Hourly Capacity	Capacity

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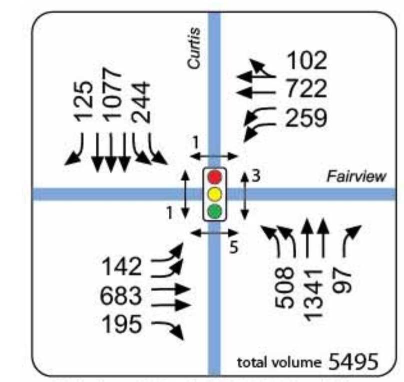
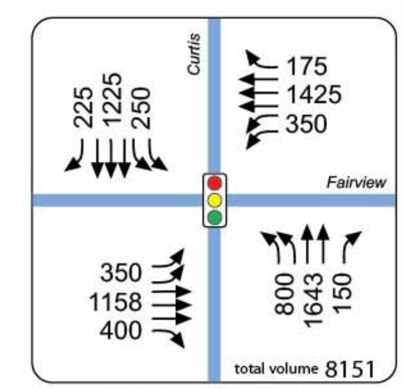
High Volume Intersection Study



Fairview & Curtis 2007 PM Peak Hour



Fairview & Curtis Future PM Peak Hour

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9. Fairview Avenue and Eagle Road

Key Facts

- Four-leg intersection in Meridian; urban setting; streets meet at a 90 degree angle.
- Fairview: ACHD-owned, 40 mph principal arterial, five lanes, 41,000 ADT.
- Eagle: ITD-owned (SH 55), 50 mph principal arterial, five lanes, 46,000 ADT.
- Signal controlled.

Existing Plans

The CIP, FYWP and LRCIP identify several construction projects directly or indirectly impacting this intersection:

- Key #9518/9517/9182 (LRCIP): These three adjacent projects, each at a cost from $20 million to $40 million and planned for construction in ITD's "Far Horizon" (2023 or beyond), are to provide infrastructure improvements on Eagle both south and north of Fairview.
- RD207-48 (CIP)/Unnumbered FYWP project: This arterial improvement project, with a cost estimate of $7.054 million (per the FYWP) and planned for construction in 6-10 years, will widen Fairview to 7 lanes west of Eagle.
- RD207-49 (CIP)/#16 (FYWP): This arterial improvement project, with a cost estimate of $6.632 million and planned for construction in 6-10 years, will widen Fairview to 7 lanes east of Eagle.
- RD207-114 (CIP): This collector improvement project, with a cost estimate of $5.328 million and planned for construction in 6-10 years, will widen Pine to five lanes west of Eagle. The improved east-west capacity provided on Pine could lead to increased traffic at Pine & Eagle, a signalized intersection located 2650 feet south of Fairview & Eagle, close enough to impact operations.
- INT207-6 (CIP): This intersection improvement project, with a cost estimate of $5.453 million and planned for construction in 11-20 years, will widen Fairview & Locust Grove and modify the traffic signal. The signal, 5300 feet west of Fairview & Eagle, is close enough to have an impact on operations.
- INT207-9 (CIP): This intersection improvement project, with a cost estimate of $4.395 million and under construction, is to widen Fairview & Cloverdale and modify the traffic signal. The signal, 5300 feet east of Fairview & Eagle, is close enough to have an impact on operations.

Additionally, several completed or ongoing corridor studies potentially have or will have significant impacts on Fairview & Eagle:

- The Fairview Avenue Corridor study, with completion expected in 2009, will likely result in recommendations for improvements on Fairview both west and east of Eagle.
- The Cloverdale Road Corridor study (currently on hold) will lead to recommendations for improvements along Cloverdale, which runs parallel to Eagle one mile to the east. At Chinden, Cloverdale would tie in to the southern terminus of the Three Cities River Crossing project (if it is approved). Cloverdale could thus become a very important "relief valve" for north-south traffic, possibly reducing traffic demand on Eagle.
- The Idaho 55 Eagle Road Arterial Study (completed in 2004) and the SH 55 Corridor Plan (with expected completion in 2009) both deal with issues on Eagle north and south of Fairview.

The draft *Roadways to Bikeways Plan* shows that there are proposed bike lanes on the west and east legs of Fairview & Eagle.

The 2030 Community Choices travel demand model shows three lanes per direction on all four legs of Fairview and Eagle. However, Eagle is shown narrowing to two through lanes per direction to the north of Fairview and south of Ustick.

Environmental Scan

- The intersection is located within a large area identified as prime agricultural land. In general, prime agricultural land may require coordination with the NRCS, but previously developed land is unlikely to raise major concerns.
- No wetland areas, cultural sites, or historic properties were identified within a ½ mile radius.

Spotlighted Concepts: CFI and Two Quadrant Roadways

This is a high-profile intersection with dramatic development occurring nearby, and decisions need to be made rather soon. Two concepts showed enough merit to warrant deeper analysis.

The first concept is to preserve a footprint for a four-leg CFI. The access control and property setbacks are already well situated to allow a CFI to fit easily. A CFI will fit well with driver expectation, but it can be intimidating for pedestrians, which may be a significant issue as there is a major proposal for a mixed-use residential development in the northeast quadrant.

See **Map 9** on page 39.

The second concept is for two quadrants – one in the northeast and one in the southwest. This performs very well also. It is much more pedestrian friendly. Two left turns are standard, and two are a bit more circuitous as shown in **Figure 9-1.**

See **Map 10** on page 40.

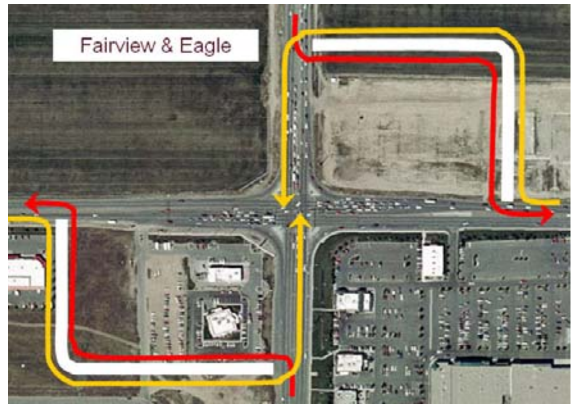


Figure 9-1 Fairview and Eagle routing plan with two opposing quadrants

The path in the northwest quadrant would pass through a proposed mixed-use development. This may at first be perceived negatively by a land owner or developer, but much like the TCI concept, it could also be a very good opportunity.

The featured concept design drawing shows the basic path and number of lanes necessary to serve the movements. It is not shown connecting to other internal streets, but it easily could. **Figure 9-2** shows that it is less important how the path between Fairview and Eagle is defined.

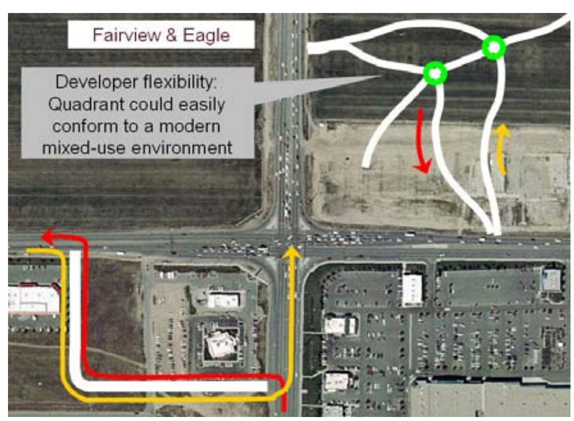


Figure 9-2 Mixed-use friendly quadrant design

A new development might want to take advantage of the traffic routed through the development. This could create two pedestrian-friendly one-way streets lined with retail and short-term parking that would all get good visibility. It might even have interior roundabout intersections, for example. It would be necessary to adopt a design appropriate to a mixed-use environment, but with an eye to avoid impeding these left-turn movements more than is reasonable.

Two quadrants also create two ways for any driver to complete a left-turn. This feature also enhances the ability of the intersection to adapt to unusual circumstances like construction or accident detours. **Figure 9-3** shows how the left turns that might normally occur using the NE quadrant can be shifted temporarily to the SW. The light blue line shows how even through movements can be rerouted if there were an accident.

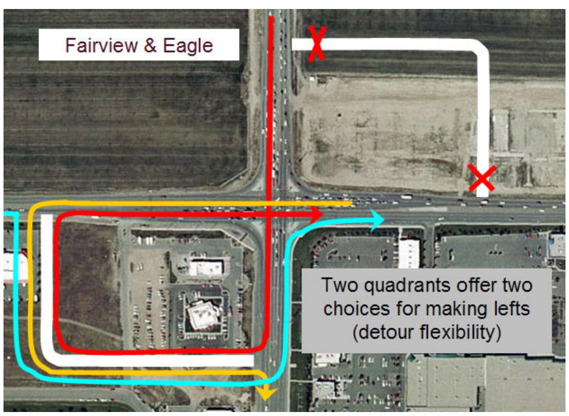


Figure 9-3 Detour flexibility inherent in quadrant designs

Fairview and Eagle

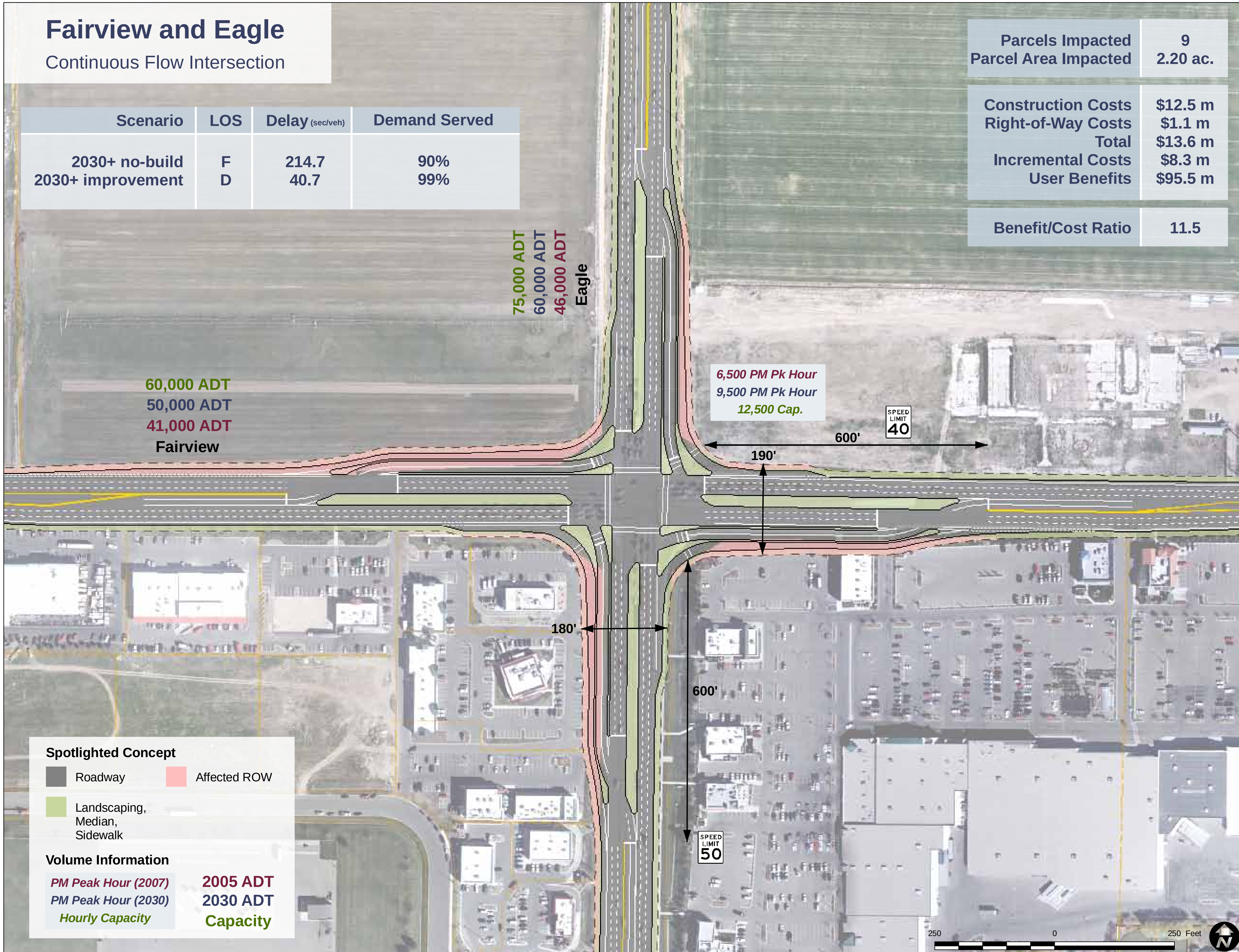
Continuous Flow Intersection

Scenario	LOS	Delay (sec/veh)	Demand Served
2030+ no-build	F	214.7	90%
2030+ improvement	D	40.7	99%

Parcels Impacted	9
Parcel Area Impacted	2.20 ac.

Construction Costs	$12.5 m
Right-of-Way Costs	$1.1 m
Total	$13.6 m
Incremental Costs	$8.3 m
User Benefits	$95.5 m

Benefit/Cost Ratio	11.5



Spotlighted Concept

- Roadway
- Affected ROW
- Landscaping, Median, Sidewalk

Volume Information

PM Peak Hour (2007)	2005 ADT
PM Peak Hour (2030)	2030 ADT
Hourly Capacity	Capacity

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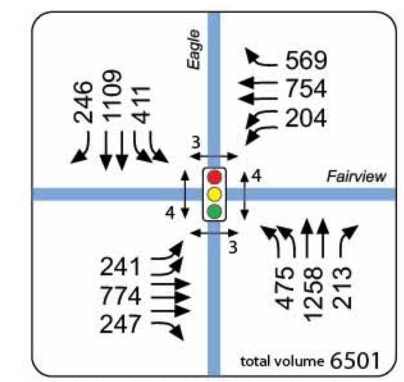
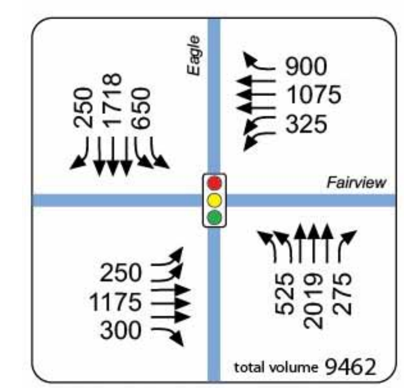
High Volume Intersection Study



Fairview & Eagle 2007 PM Peak Hour



Fairview & Eagle Future PM Peak Hour

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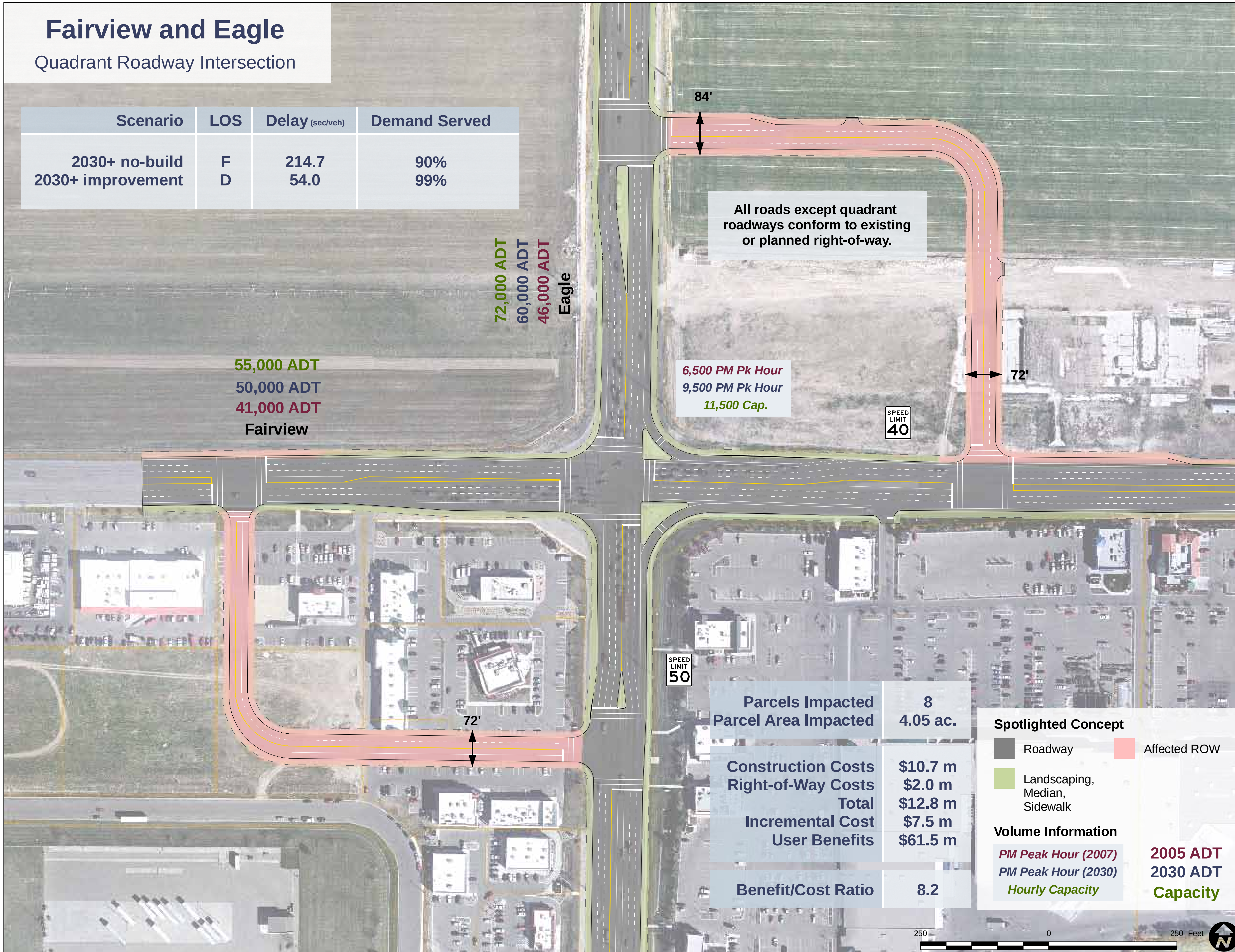
HDR

Fairview and Eagle

Quadrant Roadway Intersection

Scenario	LOS	Delay (sec/veh)	Demand Served
2030+ no-build	F	214.7	90%
2030+ improvement	D	54.0	99%



Parcels Impacted	8
Parcel Area Impacted	4.05 ac.
Construction Costs	$10.7 m
Right-of-Way Costs	$2.0 m
Total	$12.8 m
Incremental Cost	$7.5 m
User Benefits	$61.5 m
Benefit/Cost Ratio	8.2

Spotlighted Concept

- Roadway
- Affected ROW
- Landscaping, Median, Sidewalk

Volume Information

PM Peak Hour (2007)	2005 ADT
PM Peak Hour (2030)	2030 ADT
Hourly Capacity	Capacity

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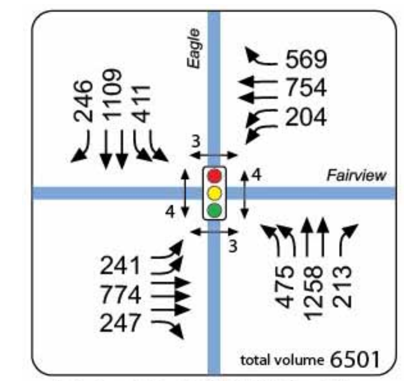
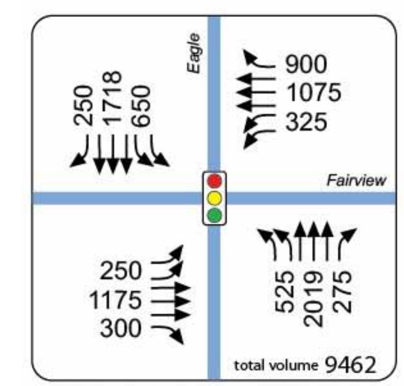
of Southwest Idaho

High Volume Intersection Study



Fairview & Eagle 2007 PM Peak Hour



Fairview & Eagle Future PM Peak Hour

WilburSmith
ASSOCIATES

THOMPSON TRANSPORTATION ENGINEERING & PLANNING

HDR

10. Franklin Road and Eagle Road

Key Facts

- Four-leg intersection in Meridian; urban setting; streets meet at a 90 degree angle.
- Franklin: ACHD-owned, 40 mph principal arterial, five lanes, 17,000 ADT.
- Eagle: ITD-owned (SH 55), 50 mph principal arterial, five lanes north of Franklin, six lanes south of Franklin, 53,000 ADT.
- Signal controlled.

Existing Plans

The CIP, FYWP and LRCIP identify several construction projects directly or indirectly impacting this intersection:

- Key #9518/9517/9182 (LRCIP): These three adjacent projects, each at a cost from $20 million to $40 million and planned for construction in ITD's "Far Horizon" (2023 or beyond), are to provide infrastructure improvements on Eagle both south and north of Franklin.
- RD207-63 (CIP) / #6 (FYWP) / INT207-10 (CIP): This arterial improvement project, with a cost estimate of $12.319 million (per the FYWP) and planned for construction by 2009, will widen Franklin to five lanes east of Eagle. Also included in the project is intersection work at Franklin & Cloverdale, which at 5300 feet east of Franklin & Eagle is close enough to impact operations.
- RD207-65 (CIP): This arterial improvement project, with a cost estimate of $1.027 million and planned for construction in 11-20 years, will preserve ROW for widening Franklin to a 7-lane cross-section east of Eagle.
- RD207-114 (CIP): This collector improvement project, with a cost estimate of $5.328 million and planned for construction in 6-10 years, will widen Pine to five lanes west of Eagle. The improved east-west capacity provided on Pine could lead to increased traffic at Pine & Eagle, a signalized intersection located 2650 feet north of Franklin & Eagle, close enough to impact operations.

Additionally, several completed or ongoing corridor studies potentially have or will have significant impacts on Fairview & Eagle:

- The Fairview Avenue Corridor study, with completion expected in 2009, will likely result in recommendations for improvements on Fairview both west and east of Eagle. Improvements on Fairview (which runs parallel to Franklin one mile to the north) may reduce traffic demand on Franklin.
- The Cloverdale Road Corridor study (currently on hold) will lead to recommendations for improvements along Cloverdale, which runs parallel to Eagle one mile to the east. At Chinden, Cloverdale would tie in to the southern terminus of the Three Cities River Crossing project (if it is approved). Cloverdale could thus become a very important "relief valve" for north-south traffic, possibly reducing traffic demand on Eagle.
- The Idaho 55 Eagle Road Arterial Study (completed in 2004) and the SH 55 Corridor Plan (with expected completion in 2009) both deal with issues on Eagle north and south of Fairview.

The draft *Roadways to Bikeways Plan* shows that there are proposed bike lanes on the west and east legs of Franklin & Eagle. Based on aerial photographs of the intersection, there is an existing bike lane running northbound only on the south leg of Franklin & Eagle.

The 2030 Community Choices travel demand model shows three lanes per direction on the south, north and east legs of Franklin and Eagle, and two through lanes per direction on the west leg.

Environmental Scan

- Prime agricultural land is located approximately 400 feet north of the intersection. In general, prime agricultural land may require coordination with the NRCS, but previously developed land is unlikely to raise major concerns.
- The Snyder Lateral is located approximately 450 feet south of the intersection.
- The Gruber Lateral is located approximately 1 080 feet north of the intersection.
- The Union Pacific Railroad is located approximately 1200 feet north of the intersection.

Spotlighted Concepts: CFI and Single Quadrant Roadway

The choices that appear the most promising here are the same as those at Fairview and Eagle. There are more single-family homes at this intersection, but many of them will likely be redeveloped into other uses as this intersection becomes more popular. Assuming that will be the case, then the footprint and access control necessary for a CFI should be relatively easy to obtain through the normal requirements imposed on developers.

See **Map 11** on page 44.

Figure 10-1 shows an existing roadway in the NE quadrant. Creating an opposing quadrant in the SW would result in the same configuration as the option further north at Fairview and Eagle – very attractive in terms of consistency and enhancing driver expectancy.

See **Map 12** on page 45.

However there is a neighborhood of homes in the SW that may be far enough from the main intersection as to avoid redevelopment. Residents would not welcome higher volumes on the street, and to complete the quadrant would require at least one home. An alternative diagonal path appears to be available behind an existing business that may not require any homes. However the connections to the main roadways may be too close to the main intersection.

Figure 10-1 NE and SW quadrant options

Figure 10-2 shows the possibility of NW and SE quadrants. The NW is easily developed. The SE quadrant is being redeveloped at this moment, and it may or may not be feasible to develop a quadrant roadway there after the development is complete.

Figure 10-2 NW and SE quadrant options

Consistency

There is something to be said for making the same decision for Eagle at both Fairview and Franklin, to provide better uniformity and enhance driver expectancy. The quadrant at Fairview could be attractive to the pedestrian nature of a forthcoming mixed-used development there, but it is more difficult to create at Franklin. The CFI concept is relatively straight forward to develop at both sites. CFIs can also create more steady flow on Eagle because they do not introduce additional stops as would the T-intersections of the quadrant concepts.

A Note About Pine Street and Eagle Road

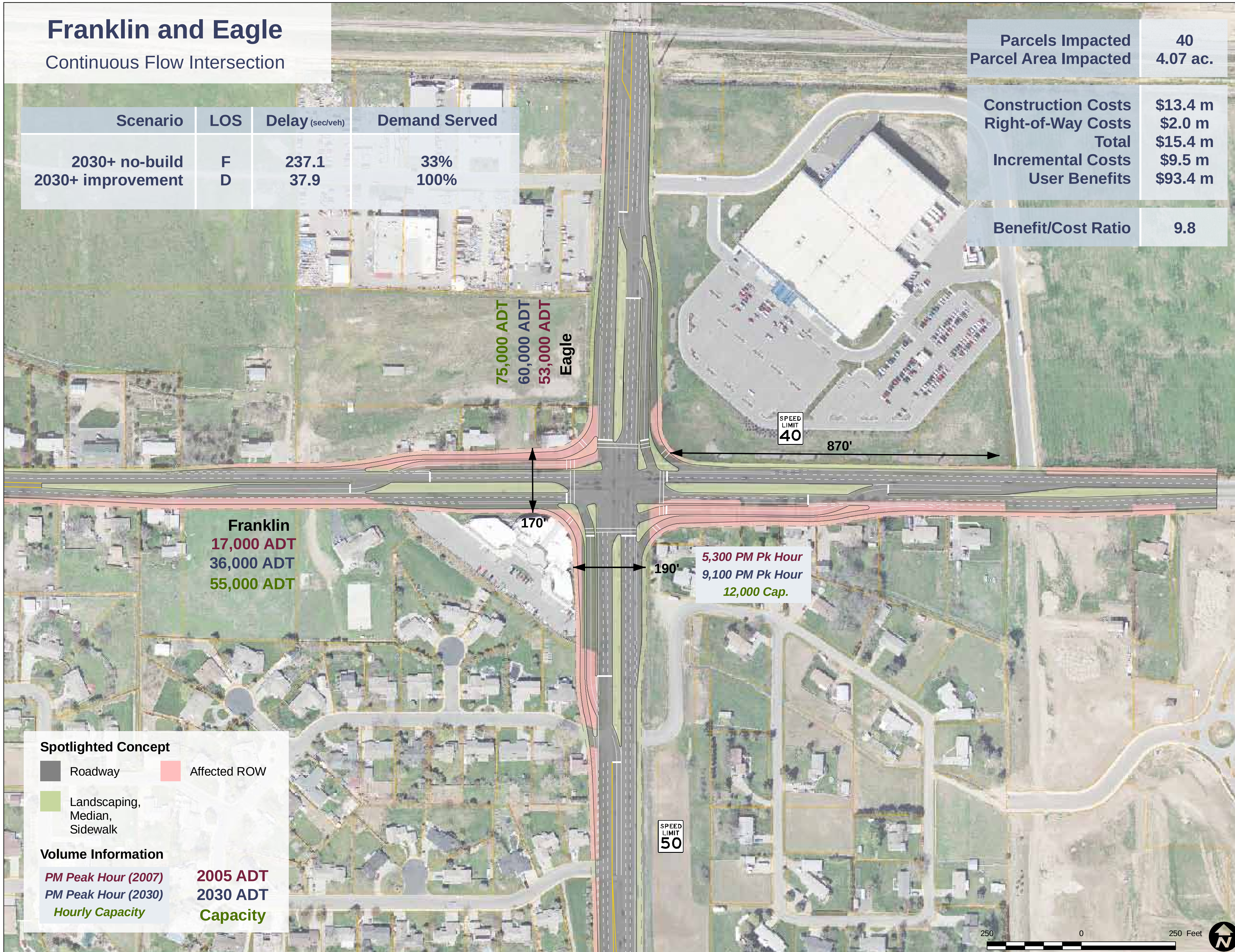
The benefits of improved flow created by improvements on Eagle at Fairview and Franklin can be partially lost if there are other inefficient intersections, as may be the case at Pine Street. However Pine is a lower volume intersection and may not need as much time to serve. This may allow it to be well synchronized to the other intersections so as not to impede overall flow on Eagle. This issue should be studied further in a more detailed analysis of the corridor.

Franklin and Eagle

Continuous Flow Intersection

Scenario	LOS	Delay (sec/veh)	Demand Served
2030+ no-build	F	237.1	33%
2030+ improvement	D	37.9	100%

Parcels Impacted	40
Parcel Area Impacted	4.07 ac.
Construction Costs	$13.4 m
Right-of-Way Costs	$2.0 m
Total	$15.4 m
Incremental Costs	$9.5 m
User Benefits	$93.4 m
Benefit/Cost Ratio	9.8



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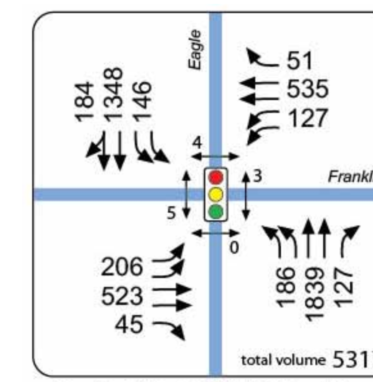
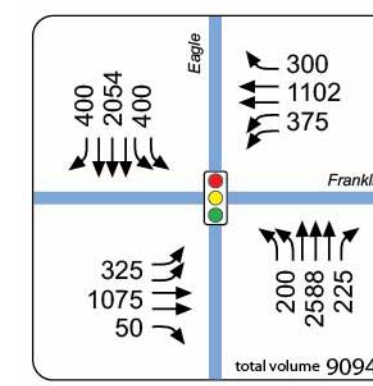


Franklin & Eagle 2007 PM Peak Hour



Franklin & Eagle Future PM Peak Hour

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Franklin and Eagle

Quadrant Roadway Intersection

Parcels Impacted	28
Parcel Area Impacted	2.29 ac.

Construction Costs	$8.8 m
Right-of-Way Costs	$1.0 m
Total	$9.8 m
Incremental Costs	$3.9 m
User Benefits	$42.6 m

Benefit/Cost Ratio	10.9

Scenario	LOS	Delay (sec/veh)	Demand Served
2030+ no-build	F	237.1	83%
2030+ improvement	E	55.2	99%

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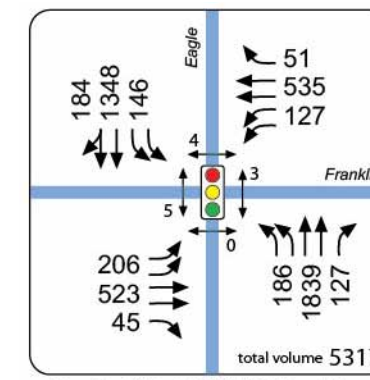
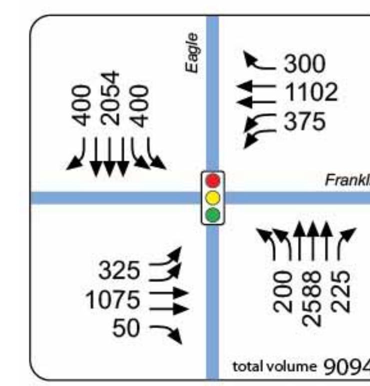


Franklin & Eagle 2007 PM Peak Hour



Franklin & Eagle Future PM Peak Hour

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Appendix: Cost Estimates

Detailed concept level cost estimates were computed for each spotlighted intersection concept. Most assume a full reconstruction of all pavement, utilities, sidewalks, etc. within several hundred feet of the intersection (i.e. the full drawings). A similar estimate is typically provided to replace all of the above given the baseline planned assumptions. In some cases the cost of planned improvements was estimated by ACHD.

In two cases, Chinden and Glenwood and Ustick and Cole, there are no plans to widen or replace existing pavement, utilities, and sidewalks. Hence, the baseline cost is zero. In these cases, it was assumed that for the corresponding intersection concept, nothing would be reconstructed except those elements that are a direct function of implementing the roundabouts in the case of Ustick and Cole, and widening the quadrant roadway in the case of State and Glenwood.

SHORT RANGE PROJECT COST SUMMARY SHEET

Project:	Beacon Light Rd. and State Hwy 55
Date:	3/8/2006
Functional Classification:	Intersection Only
Federal Aid or non-Federal Aid:	non-Federal Aid
Segment Description: (project limits)	Widen, add signal
Rural or Urban Bridge:	Urban/Bridge Project
Intersection Surfacing Material	Asphalt
CIP Number:	INT207-42
Total # of Existing Lanes:	
Existing RW Width (ft):	
Total # of Proposed Lanes:	5
Proposed RW Width (ft):	
Project Length (miles):	0.0
Existing Roadway Width (ft):	

Leg of Intersection	North	East	South	West
Existing PavementWidth:	68	0	68	26
Existing RW Width:	0	0	64	92
Proposed # Lanes:	6	0	5	3
Proposed RW Width:	108	0	96	70
Proposed Length:	800	0	800	300

	non-Fed Aid Unit Costs	Unit	Quantity	Total Item Cost	% TIF Eligible	Total TIF Cost
1. Preliminary Engineering (10% line 25 for Rural -- 15% for Urban/Bridge)				$202,844	30.70%	$62,277
2. Right-of-Way Costs (costs determined by RW contractor or ACHD RW Dept)				$0	30.00%	$0
3. Utility Adjustments (cost per project)				$19,408	33.00%	$6,405
4. Removal of Obstructions (trees, irrigation boxes, bridges, etc.)						
Trees (assumed all are 6"+ all)	$350.00	EA	0.0	$0	0.00%	$0
Irrigation Boxes	0	MI	0.0			
Bridges:						
Small (10' - 20' span)	$5,000.00	EA	0.0			
Medium (20' - 50' span)	$180.00	SF	0.0			
Large (50'+ span)	$15,000.00	EA	0.0			
Bituminous Surface	0.00	SY	12,956.0			
Other						
6. Storm Sewer (urban and semi-urban only)	$342,140.00	MI	0.4	$136,856	33.00%	$45,162
7. Earthwork	$14.00	CY	15,101.9	$211,426	33.00%	$69,771
8. Intersection and Roadway Surfacing				$168,925	33.00%	$55,745
Asphalt Surfacing	$50.00	TN	3,378.5			
Concrete Surfacing	$4.00	SF	139,800.0			
9. Aggregate Base Course	$25.00	CY	1,726.0	$45,306	33.00%	$14,951
10. 6" Minus Uncrushed Aggregate Subbase Course	$12.50	CY	11,650.0	$152,906	33.00%	$50,459
11. Structures				$0	33.00%	$0
Box Culverts	$180.00	SF	0			
Minor Bridge	$180.00	SF	0			
Major Bridge	$100.00	SF	0			
Grade Separation	$100.00	SF	0			
12. Traffic Signals	$50,000.00	EA	1	$50,000	33.00%	$16,500
13. Illumination	$5,000.00	EA	$5,000.0	$0	30.70%	$0
14. Curb / Gutter / Approaches				$72,653	33.00%	$23,975
Rural Approaches (assumes 20'x30'x3" approaches)	$0.00	mile/side	$0.0			
Curb/Gutter/Approaches (cost/mile/side)	$90,816.00	mile/side	$1,720.0			
15. Sidewalk				$65,707	0.00%	$0
Sidewalk (assumes 7' side sidewalk at back of curb)	$82,133.80	mile/side				
16. Roadside Development				$20,424	33.00%	$6,740
Fencing	$20.00	LF	0			
Seeding	$20,037.60	AC	$14,520.0			
17. Delineators / Signing / Channelization (0% of items 4 thru 16)	0.00	%	$924,203	$0	30.70%	$0
18. Const Stormwater Pollution Prevention Plan (0% of items 4 thru 17)	0.00	%	$924,203	$0	30.70%	$0
19. Construction Traffic Control (5% of items 4 thru 18)	5.00	%	$924,203	$46,210	30.70%	$14,187
20. Special Project Features (see field data summary sheet)				$0	30.70%	$0
21. Cost of Construction (items 3 thru 20)				$989,821	30.70%	$303,895
22. Other Miscellaneous Construction Items (15% of item 21)				$148,473	30.70%	$148,473
23. Mobilization (8% of items 21 + 22)				$91,064	30.70%	$27,958
24. Construction Engineering and Inspection (10% of Items 21+22+23)				$122,936	30.70%	$37,744
25. Total Construction Costs (21+22+23+24)				$1,352,293	30.70%	$415,181
26. Construction Contingency (5% of item 25)				$67,615	30.70%	$20,759
27. Total Project Cost (1+2+25+26)				**$1,622,752**	**30.70%**	**$498,217**
28. Project Cost Per Mile (27 / project length in miles)				**#Div/0!**		
29. Project Cost Per Lane Mile (28 / # of proposed lanes)				**#Error**		

1/9/2008 *CIP Number:* INT207-42 Page 10

SOURCE: ACHD estimate, 2006

Beacon Light & SH 55 - CFI

Item Description	Quantity	Units	Average Cost	TOTAL
Removals	40,423	SY	$8	$ 323,387
Excavation	27,084	CY	$6	$ 162,502
Granular subbase	15,669	CY	$18	$ 282,037
3/4" Aggr Ty A/B for base	6,894	CY	$32	$ 220,615
PL Mix Pav CL I	13,444	Ton	$65	$ 873,844
Conc sidewalk - 4" depth	0	SF	$6	$ -
Comb curb & gutter ty A 2	0	Ft	$20	$ -
Median Island	2,309	SY	$90	$ 207,850
Signal	1	Each	$250,000	$ 250,000
Sub Total				$ 2,320,235
Drainage	1	LS	10% of construction	$ 232,023
Utilities	1	LS	8% of construction	$ 185,619
Landscaping	1	LS	2% of construction	$ 46,405
Signing & Striping	1	LS	3% of construction	$ 69,607
Mobilization	1	LS	10% of construction	$ 232,023
Traffic control	1	LS	5% of construction	$ 116,012
PE & CEI	1	LS	15% of construction	$ 348,035
Contingencies	1	LS	30% of construction	$ 696,070
Construction Total				**$ 4,246,029**
Right-of-Way (Residential)	0.20	Acre	$175,000	$ 35,000
Right-of-Way (Commercial)	0.10	Acre	$350,000	$ 35,000
Right-of-Way Total				**$ 70,000**
Total Project				**$ 4,316,029**

SOURCE: Wilbur Smith Assoc. est., 2008

LONG RANGE PROJECT COST SUMMARY SHEET

Project:	**State Hwy 44 and Linder Rd.**		
Date:	3/8/2006	*Functional Classification:*	Intersection Only
Federal Aid or non-Federal Aid:	non-Federal Aid	*Segment Description: (project limits)*	Widen, modify/replace signal
Rural or Urban Bridge:	Urban/Bridge Project		
Intersection Surfacing Material	Concrete		
CIP Number:	INT207-23		
Total # of Existing Lanes:		*Existing RW Width (ft):*	
Total # of Proposed Lanes:	6.50	*Proposed RW Width (ft):*	
Project Length (miles):	1.0		
Existing Roadway Width (ft):			

Leg of Intersection	North	East	South	West
Existing PavementWidth:	40	40	40	40
Existing RW Width:	0	0	0	0
Proposed # Lanes:	7	6	7	6
Proposed RW Width:	120	108	120	108
Proposed Length:	800	800	800	800

	non-Fed Aid Unit Costs	Unit	Quantity	Total Item Cost	% TIF Eligible	Total TIF Cost
1. Preliminary Engineering (10% line 25 for Rural -- 15% for Urban/Bridge)				$586,482	50.63%	$296,926
2. Right-of-Way Costs (costs determined by RW contractor or ACHD RW Dept)				$236,000	50.00%	$118,000
3. Utility Adjustments (cost per project)				$56,115	50.00%	$28,057
4. Removal of Obstructions (trees, irrigation boxes, bridges, etc.)						
Trees (assumed all are 6"+ all)	$350.00	EA	0.0	$135,820	#######	$135,820
Irrigation Boxes	0	MI	0.0			
Bridges:						
Small (10' - 20' span)	$5,000.00	EA	0.0			
Medium (20' - 50' span)	$180.00	SF	0.0			
Large (50'+ span)	$15,000.00	EA	0.0			
Bituminous Surface	0.00	SY	14,222.0			
Other						
6. Storm Sewer (urban and semi-urban only)	$342,140.00	MI	0.6	$205,284	50.00%	$102,642
7. Earthwork	$14.00	CY	31,111.1	$435,556	50.00%	$217,778
8. Intersection and Roadway Surfacing				$1,152,000	50.00%	$576,000
Asphalt Surfacing	$50.00	TN	6,960.0			
Concrete Surfacing	$4.00	SF	288,000.0			
9. Aggregate Base Course	$25.00	CY	3,556.0	$93,333	50.00%	$46,667
10. 6" Minus Uncrushed Aggregate Subbase Course	$12.50	CY	24,000.0	$315,000	50.00%	$157,500
11. Structures				$17,280	50.00%	$8,640
Box Culverts	$180.00	SF	96			
Minor Bridge	$180.00	SF	0			
Major Bridge	$100.00	SF	0			
Grade Separation	$100.00	SF	0			
12. Traffic Signals	$50,000.00	EA	1.5	$75,000	50.00%	$37,500
13. Illumination	$5,000.00	EA	$5,000.0	$0	50.63%	$0
14. Curb / Gutter / Approaches				$108,979	50.00%	$54,490
Rural Approaches (assumes 20'x30'x3" approaches)	$0.00	mile/side	$0.0			
Curb/Gutter/Approaches (cost/mile/side)	$90,816.00	mile/side	$1,720.0			
15. Sidewalk				$98,561	0.00%	$0
Sidewalk (assumes 7' side sidewalk at back of curb)	$82,133.80	mile/side				
16. Roadside Development				$35,328	50.00%	$17,664
Fencing	$20.00	LF	0			
Seeding	$20,037.60	AC	$14,520.0			
17. Delineators / Signing / Channelization (0% of items 4 thru 16)	0.00	%	$2,672,141	$0	50.63%	$0
18. Const Stormwater Pollution Prevention Plan (0% of items 4 thru 17)	0.00	%	$2,672,141	$0	50.63%	$0
19. Construction Traffic Control (5% of items 4 thru 18)	5.00	%	$2,672,141	$133,607	50.63%	$67,643
20. Special Project Features (see field data summary sheet)				$0	50.63%	$0
21. Cost of Construction (items 3 thru 20)				$2,861,863	50.63%	$1,448,915
22. Other Miscellaneous Construction Items (15% of item 21)				$429,279	50.63%	$429,279
23. Mobilization (8% of items 21 + 22)				$263,291	50.63%	$133,300
24. Construction Engineering and Inspection (10% of Items 21+22+23)				$355,443	50.63%	$179,955
25. Total Construction Costs (21+22+23+24)				$3,909,877	50.63%	$1,979,508
26. Construction Contingency (5% of item 25)				$195,494	50.63%	$98,975
27. Total Project Cost (1+2+25+26)				**$4,927,852**	**50.63%**	**$2,494,893**
28. Project Cost Per Mile (27 / project length in miles)				**$4,927,852**		
29. Project Cost Per Lane Mile (28 / # of proposed lanes)				**$758,131**		

1/9/2008 *CIP Number:* INT207-23 Page 6

SOURCE: ACHD estimate, 2006

State & Linder - CFI

Item Description	Quantity	Units	Average Cost	TOTAL
Removals	91,369	SY	$8	$ 730,951
Excavation	61,217	CY	$6	$ 367,303
Granular subbase	37,676	CY	$18	$ 678,159
3/4" Aggr Ty A/B for base	16,577	CY	$32	$ 530,471
PL Mix Pav CL I	32,326	Ton	$65	$ 2,101,163
Conc sidewalk - 4" depth	0	SF	$6	$ -
Comb curb & gutter ty A 2	0	Ft	$20	$ -
Median Island	10,189	SY	$90	$ 917,036
Signal	2	Each	$250,000	$ 500,000
Sub Total				$ 5,825,083
Drainage	1	LS	10% of construction	$ 582,508
Utilities	1	LS	8% of construction	$ 466,007
Landscaping	1	LS	2% of construction	$ 116,502
Signing & Striping	1	LS	3% of construction	$ 174,752
Mobilization	1	LS	10% of construction	$ 582,508
Traffic control	1	LS	5% of construction	$ 291,254
PE & CEI	1	LS	15% of construction	$ 873,762
Contingencies	1	LS	30% of construction	$ 1,747,525
Construction Total				**$ 10,659,901**
Right-of-Way (Residential)	4.68	Acre	$175,000	$ 819,000
Right-of-Way (Commercial)	0.52	Acre	$350,000	$ 182,000
Right-of-Way Total				**$ 1,001,000**
Total Project				**$ 11,660,901**

SOURCE: Wilbur Smith Assoc. est., 2008

State & SH 55 - Baseline

Item Description	Quantity	Units	Average Cost	TOTAL
Removals	60,271	SY	$8	$ 482,168
Excavation	40,382	CY	$6	$ 242,290
Granular subbase	23,700	CY	$18	$ 426,600
3/4" Aggr Ty A/B for base	10,428	CY	$32	$ 333,696
PL Mix Pav CL I	20,335	Ton	$65	$ 1,321,775
Conc sidewalk - 4" depth	49,925	SF	$6	$ 299,550
Comb curb & gutter ty A 2	11,031	Ft	$20	$ 220,620
Median Island	2,137	SY	$90	$ 192,330
Signal	1	Each	$250,000	$ 250,000
Sub Total				$ 3,769,029
Drainage	1	LS	10% of construction	$ 376,903
Utilities	1	LS	8% of construction	$ 301,522
Landscaping	1	LS	2% of construction	$ 75,381
Signing & Striping	1	LS	3% of construction	$ 113,071
Mobilization	1	LS	10% of construction	$ 376,903
Traffic control	1	LS	5% of construction	$ 188,451
PE & CEI	1	LS	15% of construction	$ 565,354
Contingencies	1	LS	30% of construction	$ 1,130,709
Construction Total				**$ 6,897,323**
Right-of-Way (Residential)	0.00	Acre	$262,500	$ -
Right-of-Way (Commercial)	2.24	Acre	$525,000	$ 1,176,000
Right-of-Way Total				**$ 1,176,000**
Total Project				**$ 8,073,323**

SOURCE: Wilbur Smith Assoc. est., 2008

State & SH 55 - CFI

Item Description	Quantity	Units	Average Cost	TOTAL
Removals	96,371	SY	$8	$ 770,967
Excavation	64,569	CY	$6	$ 387,411
Granular subbase	39,852	CY	$18	$ 717,335
3/4" Aggr Ty A/B for base	17,535	CY	$32	$ 561,115
PL Mix Pav CL I	34,193	Ton	$65	$ 2,222,542
Conc sidewalk - 4" depth	64,840	SF	$6	$ 389,040
Comb curb & gutter ty A 2	31,285	Ft	$20	$ 625,700
Median Island	11,107	SY	$90	$ 999,649
Signal	2	Each	$250,000	$ 500,000
Sub Total				$ 7,173,759
Drainage	1	LS	10% of construction	$ 717,376
Utilities	1	LS	8% of construction	$ 573,901
Landscaping	1	LS	2% of construction	$ 143,475
Signing & Striping	1	LS	3% of construction	$ 215,213
Mobilization	1	LS	10% of construction	$ 717,376
Traffic control	1	LS	5% of construction	$ 358,688
PE & CEI	1	LS	15% of construction	$ 1,076,064
Contingencies	1	LS	30% of construction	$ 2,152,128
Construction Total				**$ 13,127,979**
Right-of-Way (Residential)	0.10	Acre	$262,500	$ 26,250
Right-of-Way (Commercial)	4.51	Acre	$525,000	$ 2,367,750
Right-of-Way Total				**$ 2,394,000**
Total Project				**$ 15,521,979**

SOURCE: Wilbur Smith Assoc. est., 2008

LONG RANGE PROJECT COST SUMMARY SHEET

Project:	State St. and Glenwood St.
Date:	3/8/2006
Federal Aid or non-Federal Aid:	non-Federal Aid
Rural or Urban Bridge:	Urban/Bridge Project
Intersection Surfacing Material	Concrete
CIP Number:	INT207-24
Total # of Existing Lanes:	
Total # of Proposed Lanes:	8.11
Project Length (miles):	1.0
Existing Roadway Width (ft):	
Functional Classification:	Intersection Only
Segment Description: (project limits)	Widen, modify/replace signal
Existing RW Width (ft):	
Proposed RW Width (ft):	

Leg of Intersection	North	East	South	West
Existing PavementWidth:	68	90	90	80
Existing RW Width:	0	0	0	0
Proposed # Lanes:	7	9	7	9
Proposed RW Width:	120	144	120	144
Proposed Length:	800	1000	800	1000

	non-Fed Aid Unit Costs	Unit	Quantity	Total Item Cost	% TIF Eligible	Total TIF Cost
1. Preliminary Engineering (10% line 25 for Rural -- 15% for Urban/Bridge)				$792,577	50.67%	$401,592
2. Right-of-Way Costs (costs determined by RW contractor or ACHD RW Dept)				$1,435,000	50.00%	$717,500
3. Utility Adjustments (cost per project)				$75,834	50.00%	$37,917
4. Removal of Obstructions (trees, irrigation boxes, bridges, etc.)						
Trees (assumed all are 6"+ all)	$350.00	EA	0.0	$183,548	#######	$183,548
Irrigation Boxes	0	MI	0.0			
Bridges:						
Small (10' - 20' span)	$5,000.00	EA	0.0			
Medium (20' - 50' span)	$180.00	SF	0.0			
Large (50'+ span)	$15,000.00	EA	0.0			
Bituminous Surface	0.00	SY	32,933.0			
Other						
6. Storm Sewer (urban and semi-urban only)	$342,140.00	MI	0.7	$239,498	50.00%	$119,749
7. Earthwork	$14.00	CY	44,246.9	$619,457	50.00%	$309,728
8. Intersection and Roadway Surfacing				$1,638,400	50.00%	$819,200
Asphalt Surfacing	$50.00	TN	9,898.7			
Concrete Surfacing	$4.00	SF	409,600.0			
9. Aggregate Base Course	$25.00	CY	5,057.0	$132,741	50.00%	$66,370
10. 6" Minus Uncrushed Aggregate Subbase Course	$12.50	CY	34,133.0	$448,000	50.00%	$224,000
11. Structures				$0	50.00%	$0
Box Culverts	$180.00	SF	0			
Minor Bridge	$180.00	SF	0			
Major Bridge	$100.00	SF	0			
Grade Separation	$100.00	SF	0			
12. Traffic Signals	$50,000.00	EA	1.5	$75,000	50.00%	$37,500
13. Illumination	$5,000.00	EA	$5,000.0	$0	50.67%	$0
14. Curb / Gutter / Approaches				$127,142	50.00%	$63,571
Rural Approaches (assumes 20'x30'x3" approaches)	$0.00	mile/side	$0.0			
Curb/Gutter/Approaches (cost/mile/side)	$90,816.00	mile/side	$1,720.0			
15. Sidewalk				$114,987	0.00%	$0
Sidewalk (assumes 7' side sidewalk at back of curb)	$82,133.80	mile/side				
16. Roadside Development				$32,384	50.00%	$16,192
Fencing	$20.00	LF	0			
Seeding	$20,037.60	AC	$14,520.0			
17. Delineators / Signing / Channelization (0% of items 4 thru 16)	0.00	%	$3,611,158	$0	50.67%	$0
18. Const Stormwater Pollution Prevention Plan (0% of items 4 thru 17)	0.00	%	$3,611,158	$0	50.67%	$0
19. Construction Traffic Control (5% of items 4 thru 18)	5.00	%	$3,611,158	$180,558	50.67%	$91,487
20. Special Project Features (see field data summary sheet)				$0	50.67%	$0
21. Cost of Construction (items 3 thru 20)				$3,867,550	50.67%	$1,959,657
22. Other Miscellaneous Construction Items (15% of item 21)				$580,132	50.67%	$580,132
23. Mobilization (8% of items 21 + 22)				$355,815	50.67%	$180,288
24. Construction Engineering and Inspection (10% of Items 21+22+23)				$480,350	50.67%	$243,389
25. Total Construction Costs (21+22+23+24)				$5,283,847	50.67%	$2,677,283
26. Construction Contingency (5% of item 25)				$264,192	50.67%	$133,864
27. Total Project Cost (1+2+25+26)				**$7,775,616**	**50.67%**	**$3,939,842**
28. Project Cost Per Mile (27 / project length in miles)				**$7,775,616**		
29. Project Cost Per Lane Mile (28 / # of proposed lanes)				**$958,639**		

1/9/2008 *CIP Number:* INT207-24 Page 7

SOURCE: ACHD estimate, 2006

State & Glenwood - Median U-Turn

Item Description	Quantity	Units	Average Cost	TOTAL
Removals	58,177	SY	$8	$ 465,416
Excavation	38,979	CY	$6	$ 233,874
Granular subbase	23,835	CY	$18	$ 429,030
3/4" Aggr Ty A/B for base	10,487	CY	$32	$ 335,584
PL Mix Pav CL I	20,450	Ton	$65	$ 1,329,250
Conc sidewalk - 4" depth	42,598	SF	$6	$ 255,588
Comb curb & gutter ty A 2	13,120	Ft	$20	$ 262,400
Median Island	4,907	SY	$90	$ 441,630
Signal	2	Each	$250,000	$ 500,000
Sub Total				$ 4,252,772
Drainage	1	LS	10% of construction	$ 425,277
Utilities	1	LS	8% of construction	$ 340,222
Landscaping	1	LS	2% of construction	$ 85,055
Signing & Striping	1	LS	3% of construction	$ 127,583
Mobilization	1	LS	10% of construction	$ 425,277
Traffic control	1	LS	5% of construction	$ 212,639
PE & CEI	1	LS	15% of construction	$ 637,916
Contingencies	1	LS	30% of construction	$ 1,275,832
Construction Total				**$ 7,782,573**
Right-of-Way (Residential)	0.00	Acre	$350,000	$ -
Right-of-Way (Commercial)	1.47	Acre	$700,000	$ 1,029,000
Right-of-Way Total				**$ 1,029,000**
Total Project				**$ 8,811,573**

SOURCE: Wilbur Smith Assoc. est., 2008

Chinden & Glenwood - Quadrant Roadway

Item Description	Quantity	Units	Average Cost	TOTAL
Removals	30,383	SY	$8	$ 243,063
Excavation	20,357	CY	$6	$ 122,139
Granular subbase	11,325	CY	$18	$ 203,852
3/4" Aggr Ty A/B for base	4,983	CY	$32	$ 159,457
PL Mix Pav CL I	9,717	Ton	$65	$ 631,601
Conc sidewalk - 4" depth	30,018	SF	$6	$ 180,108
Comb curb & gutter ty A 2	6,278	Ft	$20	$ 125,568
Median Island	0	SY	$90	$ -
Signal	2.75	Each	$250,000	$ 687,500
Sub Total				$ 2,353,288
Drainage	1	LS	10% of construction	$ 235,329
Utilities	1	LS	8% of construction	$ 188,263
Landscaping	1	LS	2% of construction	$ 47,066
Signing & Striping	1	LS	3% of construction	$ 70,599
Mobilization	1	LS	10% of construction	$ 235,329
Traffic control	1	LS	5% of construction	$ 117,664
PE & CEI	1	LS	15% of construction	$ 352,993
Contingencies	1	LS	30% of construction	$ 705,986
Construction Total				**$ 4,306,517**
Right-of-Way (Residential)	0.00	Acre	$350,000	$ -
Right-of-Way (Commercial)	2.72	Acre	$700,000	$ 1,904,000
Right-of-Way Total				**$ 1,904,000**
Total Project				**$ 6,210,517**

SOURCE: Wilbur Smith Assoc. est., 2008

Ustick & Cole - Bowtie

Item Description	Quantity	Units	Average Cost	TOTAL
Removals	11,266	SY	$8	$ 90,130
Excavation	7,548	CY	$6	$ 45,290
Granular subbase	4,272	CY	$18	$ 76,894
3/4" Aggr Ty A/B for base	1,880	CY	$32	$ 60,148
PL Mix Pav CL I	3,665	Ton	$65	$ 238,244
Conc sidewalk - 4" depth	11,545	SF	$6	$ 69,270
Comb curb & gutter ty A 2	3,830	Ft	$20	$ 76,600
Median Island	1,742	SY	$90	$ 156,814
Signal	1	Each	$250,000	$ 250,000
Sub Total				$ 1,063,391
Drainage	1	LS	10% of construction	$ 106,339
Utilities	1	LS	8% of construction	$ 85,071
Landscaping	1	LS	2% of construction	$ 21,268
Signing & Striping	1	LS	3% of construction	$ 31,902
Mobilization	1	LS	10% of construction	$ 106,339
Traffic control	1	LS	5% of construction	$ 53,170
PE & CEI	1	LS	15% of construction	$ 159,509
Contingencies	1	LS	30% of construction	$ 319,017
Construction Total				**$ 1,946,006**
Right-of-Way (Residential)	0.50	Acre	$262,500	$ 131,250
Right-of-Way (Commercial)	0.28	Acre	$525,000	$ 147,000
Right-of-Way Total				**$ 278,250**
Total Project				**$ 2,224,256**

SOURCE: Wilbur Smith Assoc. est., 2008

LONG RANGE PROJECT COST SUMMARY SHEET

Project:	Chinden Blvd. and Veterans Memorial Parkway		
Date:	3/8/2006	*Functional Classification:*	Intersection Only
Federal Aid or non-Federal Aid:	non-Federal Aid	*Segment Description: (project limits)*	Widen, modify/replace signal
Rural or Urban Bridge:	Urban/Bridge Project		
Intersection Surfacing Material	Asphalt		
CIP Number:	INT207-3		
Total # of Existing Lanes:		*Existing RW Width (ft):*	
Total # of Proposed Lanes:	8.25	*Proposed RW Width (ft):*	
Project Length (miles):	1.0		
Existing Roadway Width (ft):			

Leg of Intersection	North	East	South	West
Existing PavementWidth:	80	90	90	90
Existing RW Width:	0	0	0	0
Proposed # Lanes:	7	9	8	9
Proposed RW Width:	120	144	132	144
Proposed Length:	1000	1000	1000	1000

	non-Fed Aid Unit Costs	Unit	Quantity	Total Item Cost	% TIF Eligible	Total TIF Cost
1. Preliminary Engineering (10% line 25 for Rural -- 15% for Urban/Bridge)				$600,136	50.08%	$300,562
2. Right-of-Way Costs (costs determined by RW contractor or ACHD RW Dept)				$1,800,000	50.00%	$900,000
3. Utility Adjustments (cost per project)				$57,421	50.00%	$28,711
4. Removal of Obstructions (trees, irrigation boxes, bridges, etc.)						
Trees (assumed all are 6"+ all)	$350.00	EA	0.0	$138,982	#######	$138,982
Irrigation Boxes	0	MI	0.0			
Bridges:						
Small (10' - 20' span)	$5,000.00	EA	0.0			
Medium (20' - 50' span)	$180.00	SF	0.0			
Large (50'+ span)	$15,000.00	EA	0.0			
Bituminous Surface	0.00	SY	38,889.0			
Other						
6. Storm Sewer (urban and semi-urban only)	$342,140.00	MI	0.8	$273,712	50.00%	$136,856
7. Earthwork	$14.00	CY	50,555.6	$707,778	50.00%	$353,889
8. Intersection and Roadway Surfacing				$565,500	50.00%	$282,750
Asphalt Surfacing	$50.00	TN	11,310.0			
Concrete Surfacing	$4.00	SF	468,000.0			
9. Aggregate Base Course	$25.00	CY	5,778.0	$151,667	50.00%	$75,833
10. 6" Minus Uncrushed Aggregate Subbase Course	$12.50	CY	39,000.0	$511,875	50.00%	$255,938
11. Structures				$0	50.00%	$0
Box Culverts	$180.00	SF	0			
Minor Bridge	$180.00	SF	0			
Major Bridge	$100.00	SF	0			
Grade Separation	$100.00	SF	0			
12. Traffic Signals	$50,000.00	EA	1.5	$75,000	50.00%	$37,500
13. Illumination	$5,000.00	EA	$5,000.0	$0	50.08%	$0
14. Curb / Gutter / Approaches				$145,306	50.00%	$72,653
Rural Approaches (assumes 20'x30'x3" approaches)	$0.00	mile/side	$0.0			
Curb/Gutter/Approaches (cost/mile/side)	$90,816.00	mile/side	$1,720.0			
15. Sidewalk				$131,414	0.00%	$0
Sidewalk (assumes 7' side sidewalk at back of curb)	$82,133.80	mile/side				
16. Roadside Development				$33,120	50.00%	$16,560
Fencing	$20.00	LF	0			
Seeding	$20,037.60	AC	$14,520.0			
17. Delineators / Signing / Channelization (0% of items 4 thru 16)	0.00	%	$2,734,353	$0	50.08%	$0
18. Const Stormwater Pollution Prevention Plan (0% of items 4 thru 17)	0.00	%	$2,734,353	$0	50.08%	$0
19. Construction Traffic Control (5% of items 4 thru 18)	5.00	%	$2,734,353	$136,718	50.08%	$68,471
20. Special Project Features (see field data summary sheet)				$0	50.08%	$0
21. Cost of Construction (items 3 thru 20)				$2,928,492	50.08%	$1,466,659
22. Other Miscellaneous Construction Items (15% of item 21)				$439,274	50.08%	$439,274
23. Mobilization (8% of items 21 + 22)				$269,421	50.08%	$134,933
24. Construction Engineering and Inspection (10% of Items 21+22+23)				$363,719	50.08%	$182,159
25. Total Construction Costs (21+22+23+24)				$4,000,906	50.08%	$2,003,750
26. Construction Contingency (5% of item 25)				$200,045	50.08%	$100,187
27. Total Project Cost (1+2+25+26)				**$6,601,087**	**50.08%**	**$3,305,983**
28. Project Cost Per Mile (27 / project length in miles)				**$6,601,087**		
29. Project Cost Per Lane Mile (28 / # of proposed lanes)				**$800,132**		

1/9/2008 *CIP Number:* INT207-3 Page 9

SOURCE: ACHD estimate, 2006

Fairview & Curtis - Baseline

Item Description	Quantity	Units	Average Cost	TOTAL
Removals	43,186	SY	$8	$ 345,488
Excavation	28,935	CY	$6	$ 173,610
Granular subbase	17,534	CY	$18	$ 315,612
3/4" Aggr Ty A/B for base	7,715	CY	$32	$ 246,880
PL Mix Pav CL I	15,044	Ton	$65	$ 977,860
Conc sidewalk - 4" depth	29,965	SF	$6	$ 179,790
Comb curb & gutter ty A 2	6,568	Ft	$20	$ 131,360
Median Island	196	SY	$90	$ 17,640
Signal	1	Each	$250,000	$ 250,000
Sub Total				$ 2,638,240
Drainage	1	LS	10% of construction	$ 263,824
Utilities	1	LS	8% of construction	$ 211,059
Landscaping	1	LS	2% of construction	$ 52,765
Signing & Striping	1	LS	3% of construction	$ 79,147
Mobilization	1	LS	10% of construction	$ 263,824
Traffic control	1	LS	5% of construction	$ 131,912
PE & CEI	1	LS	15% of construction	$ 395,736
Contingencies	1	LS	30% of construction	$ 791,472
Construction Total				**$ 4,827,979**
Right-of-Way (Residential)	0.00	Acre	$350,000	$ -
Right-of-Way (Commercial)	1.14	Acre	$700,000	$ 798,000
Right-of-Way Total				**$ 798,000**
Total Project				**$ 5,625,979**

SOURCE: Wilbur Smith Assoc. est., 2008

Fairview & Curtis - Quadrant Roadway

Item Description	Quantity	Units	Average Cost	TOTAL
Removals	68,539	SY	$8	$ 548,310
Excavation	45,921	CY	$6	$ 275,526
Granular subbase	25,832	CY	$18	$ 464,984
3/4" Aggr Ty A/B for base	11,366	CY	$32	$ 363,721
PL Mix Pav CL I	22,164	Ton	$65	$ 1,440,675
Conc sidewalk - 4" depth	66,735	SF	$6	$ 400,410
Comb curb & gutter ty A 2	15,789	Ft	$20	$ 315,780
Median Island	1,448	SY	$90	$ 130,280
Signal	4	Each	$250,000	$ 1,000,000
Sub Total				$ 4,939,685
Drainage	1	LS	10% of construction	$ 493,969
Utilities	1	LS	8% of construction	$ 395,175
Landscaping	1	LS	2% of construction	$ 98,794
Signing & Striping	1	LS	3% of construction	$ 148,191
Mobilization	1	LS	10% of construction	$ 493,969
Traffic control	1	LS	5% of construction	$ 246,984
PE & CEI	1	LS	15% of construction	$ 740,953
Contingencies	1	LS	30% of construction	$ 1,481,906
Construction Total				**$ 9,039,624**
Right-of-Way (Residential)	0.04	Acre	$350,000	$ 14,000
Right-of-Way (Commercial)	1.27	Acre	$700,000	$ 889,000
Right-of-Way Total				**$ 903,000**
Total Project				**$ 9,942,624**

SOURCE: Wilbur Smith Assoc. est., 2008

Fairview & Eagle - Baseline

Item Description	Quantity	Units	Average Cost	TOTAL
Removals	45,989	SY	$8	$ 367,912
Excavation	30,813	CY	$6	$ 184,878
Granular subbase	18,976	CY	$18	$ 341,568
3/4" Aggr Ty A/B for base	8,350	CY	$32	$ 267,200
PL Mix Pav CL I	16,282	Ton	$65	$ 1,058,330
Conc sidewalk - 4" depth	32,205	SF	$6	$ 193,230
Comb curb & gutter ty A 2	7,022	Ft	$20	$ 140,440
Median Island	536	SY	$90	$ 48,240
Signal	1	Each	$250,000	$ 250,000
Sub Total				$ 2,851,798
Drainage	1	LS	10% of construction	$ 285,180
Utilities	1	LS	8% of construction	$ 228,144
Landscaping	1	LS	2% of construction	$ 57,036
Signing & Striping	1	LS	3% of construction	$ 85,554
Mobilization	1	LS	10% of construction	$ 285,180
Traffic control	1	LS	5% of construction	$ 142,590
PE & CEI	1	LS	15% of construction	$ 427,770
Contingencies	1	LS	30% of construction	$ 855,539
Construction Total				**$ 5,218,790**
Right-of-Way (Residential)	0.13	Acre	$350,000	$ 45,500
Right-of-Way (Commercial)	0.00	Acre	$700,000	$ -
Right-of-Way Total				**$ 45,500**
Total Project				**$ 5,264,290**

SOURCE: Wilbur Smith Assoc. est., 2008

Fairview & Eagle - CFI

Item Description	Quantity	Units	Average Cost	TOTAL
Removals	95,325	SY	$8	$ 762,597
Excavation	63,867	CY	$6	$ 383,205
Granular subbase	40,393	CY	$18	$ 727,073
3/4" Aggr Ty A/B for base	17,773	CY	$32	$ 568,732
PL Mix Pav CL I	34,657	Ton	$65	$ 2,252,714
Conc sidewalk - 4" depth	56,605	SF	$6	$ 339,630
Comb curb & gutter ty A 2	24,386	Ft	$20	$ 487,720
Median Island	8,743	SY	$90	$ 786,892
Signal	2	Each	$250,000	$ 500,000
Sub Total				$ 6,808,563
Drainage	1	LS	10% of construction	$ 680,856
Utilities	1	LS	8% of construction	$ 544,685
Landscaping	1	LS	2% of construction	$ 136,171
Signing & Striping	1	LS	3% of construction	$ 204,257
Mobilization	1	LS	10% of construction	$ 680,856
Traffic control	1	LS	5% of construction	$ 340,428
PE & CEI	1	LS	15% of construction	$ 1,021,284
Contingencies	1	LS	30% of construction	$ 2,042,569
Construction Total				**$ 12,459,671**
Right-of-Way (Residential)	1.20	Acre	$350,000	$ 420,000
Right-of-Way (Commercial)	1.00	Acre	$700,000	$ 700,000
Right-of-Way Total				**$ 1,120,000**
Total Project				**$ 13,579,671**

SOURCE: Wilbur Smith Assoc. est., 2008

Fairview & Eagle - Quadrant Roadway

Item Description	Quantity	Units	Average Cost	TOTAL
Removals	83,813	SY	$8	$ 670,507
Excavation	56,155	CY	$6	$ 336,930
Granular subbase	33,062	CY	$18	$ 595,114
3/4" Aggr Ty A/B for base	14,547	CY	$32	$ 465,512
PL Mix Pav CL I	28,367	Ton	$65	$ 1,843,862
Conc sidewalk - 4" depth	71,270	SF	$6	$ 427,620
Comb curb & gutter ty A 2	14,543	Ft	$20	$ 290,860
Median Island	1,186	SY	$90	$ 106,784
Signal	4.5	Each	$250,000	$ 1,125,000
Sub Total				$ 5,862,190
Drainage	1	LS	10% of construction	$ 586,219
Utilities	1	LS	8% of construction	$ 468,975
Landscaping	1	LS	2% of construction	$ 117,244
Signing & Striping	1	LS	3% of construction	$ 175,866
Mobilization	1	LS	10% of construction	$ 586,219
Traffic control	1	LS	5% of construction	$ 293,109
PE & CEI	1	LS	15% of construction	$ 879,328
Contingencies	1	LS	30% of construction	$ 1,758,657
Construction Total				**$ 10,727,808**
Right-of-Way (Residential)	2.26	Acre	$350,000	$ 791,000
Right-of-Way (Commercial)	1.79	Acre	$700,000	$ 1,253,000
Right-of-Way Total				**$ 2,044,000**
Total Project				**$ 12,771,808**

SOURCE: Wilbur Smith Assoc. est., 2008

Franklin & Eagle - Baseline

Item Description	Quantity	Units	Average Cost	TOTAL
Removals	51,458	SY	$8	$ 411,664
Excavation	34,477	CY	$6	$ 206,862
Granular subbase	20,968	CY	$18	$ 377,424
3/4" Aggr Ty A/B for base	9,226	CY	$32	$ 295,232
PL Mix Pav CL I	17,990	Ton	$65	$ 1,169,350
Conc sidewalk - 4" depth	37,490	SF	$6	$ 224,940
Comb curb & gutter ty A 2	7,474	Ft	$20	$ 149,480
Median Island	0	SY	$90	$ -
Signal	1	Each	$250,000	$ 250,000
Sub Total				$ 3,084,952
Drainage	1	LS	10% of construction	$ 308,495
Utilities	1	LS	8% of construction	$ 246,796
Landscaping	1	LS	2% of construction	$ 61,699
Signing & Striping	1	LS	3% of construction	$ 92,549
Mobilization	1	LS	10% of construction	$ 308,495
Traffic control	1	LS	5% of construction	$ 154,248
PE & CEI	1	LS	15% of construction	$ 462,743
Contingencies	1	LS	30% of construction	$ 925,486
Construction Total				**$ 5,645,462**
Right-of-Way (Residential)	0.49	Acre	$350,000	$ 171,500
Right-of-Way (Commercial)	0.13	Acre	$700,000	$ 91,000
Right-of-Way Total				**$ 262,500**
Total Project				**$ 5,907,962**

SOURCE: Wilbur Smith Assoc. est., 2008

Franklin & Eagle - CFI

Item Description	Quantity	Units	Average Cost	TOTAL
Removals	100,321	SY	$8	$802,565
Excavation	67,215	CY	$6	$403,289
Granular subbase	42,303	CY	$18	$761,445
3/4" Aggr Ty A/B for base	18,613	CY	$32	$595,620
PL Mix Pav CL I	36,296	Ton	$65	$2,359,212
Conc sidewalk - 4" depth	56,605	SF	$6	$339,630
Comb curb & gutter ty A 2	24,386	Ft	$20	$487,720
Median Island	12,020	SY	$90	$1,081,791
Signal	2	Each	$250,000	$500,000
Sub Total				$7,331,272
Drainage	1	LS	10% of construction	$ 733,127
Utilities	1	LS	8% of construction	$ 586,502
Landscaping	1	LS	2% of construction	$ 146,625
Signing & Striping	1	LS	3% of construction	$ 219,938
Mobilization	1	LS	10% of construction	$ 733,127
Traffic control	1	LS	5% of construction	$ 366,564
PE & CEI	1	LS	15% of construction	$ 1,099,691
Contingencies	1	LS	30% of construction	$ 2,199,382
Construction Total				**$13,416,228**
Right-of-Way (Residential)	2.38	Acre	$350,000	$833,000
Right-of-Way (Commercial)	1.69	Acre	$700,000	$ 1,183,000
Right-of-Way Total				**$2,016,000**
Total Project				**$15,432,228**

SOURCE: Wilbur Smith Assoc. est., 2008

Franklin & Eagle - Quadrant Roadway

Item Description	Quantity	Units	Average Cost	TOTAL
Removals	73,077	SY	$8	$ 584,616
Excavation	48,962	CY	$6	$ 293,769
Granular subbase	28,277	CY	$18	$ 508,985
3/4" Aggr Ty A/B for base	12,442	CY	$32	$ 398,140
PL Mix Pav CL I	24,262	Ton	$65	$ 1,577,006
Conc sidewalk - 4" depth	65,035	SF	$6	$ 390,210
Comb curb & gutter ty A 2	13,982	Ft	$20	$ 279,640
Median Island	894	SY	$90	$ 80,476
Signal	2.75	Each	$250,000	$ 687,500
Sub Total				$ 4,800,342
Drainage	1	LS	10% of construction	$ 480,034
Utilities	1	LS	8% of construction	$ 384,027
Landscaping	1	LS	2% of construction	$ 96,007
Signing & Striping	1	LS	3% of construction	$ 144,010
Mobilization	1	LS	10% of construction	$ 480,034
Traffic control	1	LS	5% of construction	$ 240,017
PE & CEI	1	LS	15% of construction	$ 720,051
Contingencies	1	LS	30% of construction	$ 1,440,103
Construction Total				**$ 8,784,626**
Right-of-Way (Residential)	1.67	Acre	$350,000	$ 584,500
Right-of-Way (Commercial)	0.62	Acre	$700,000	$ 434,000
Right-of-Way Total				**$ 1,018,500**
Total Project				**$ 9,803,126**

SOURCE: Wilbur Smith Assoc. est., 2008