March 19, 2013

TO: Commissioners, Director and Deputy Directors

FROM: Sabrina Anderson, Planning and Programming Manager

SUBJECT: VMP/State/36th Concept Design
March 27, 2013 Request for Adoption

Executive Summary

Alternative 9, a Partial Median U-Turn design is the preferred alternative of the project team and ACHD Staff. Alternative 9 utilizes median U-turns for EB and WB left turns. At grade pedestrian/bicycle crossings are maintained on all four intersection legs and three two-stage pedestrian/bicycle crossings have been added west of the intersection at Arthur Street, on Clover Street east of the intersection, and on VMP at Glendale.

The evaluation matrix for the top five designs, the 20 preliminary alternate evaluation matrix, and basic concept plans for the final five designs were reviewed with the ACHD Commission at a work session on February 13, 2013. Two work sessions were conducted with the Boise City Council- January 15, 2013 and March 12, 2013. The Boise Council did not endorse any alternative, but submitted the attached letter on March 19th, 2013. An interactive website survey was conducted in June and July of 2012, yielding over one hundred comments. Two meetings and numerous one on one interactions occurred with stakeholders. A Public Involvement Meeting was held on November 15, 2012, after intersection options were technically evaluated. 19 written comments were received. Alternative 9 (Partial Median U-Turn) received the highest number one votes from the public.

The State Street Transit and Traffic Operations Plan (TTOP), adopted by ACHD and partner jurisdictions, recognizes rebuilding the State/Veterans Memorial Parkway (VMP) intersection is a critical component for the corridor to operate safely and efficiently. Extremely high volumes on both State Street and VMP necessitated alternative high capacity designs to be considered. Upon adoption of a preferred alternative, the project will be prioritized and recommended for programming as part of the Integrated Five Year Work Plan. Construction could occur as early as 2018. Opportunities to construct the two-stage pedestrian crossings earlier than the intersection improvements will also be presented.

Project Description

State/VMP is one of the busiest intersections in Ada County. This is a key project to maintain and improve traffic flow and safety on both State Street and VMP, as both are mobility arterials connecting the valley. The concept design utilizes the eventual 7-lane section on State Street, including HOV/Transit lanes. It also designed for the best fit cross section on State Street of 120 feet of right of way.

Twenty-two potential solutions were screened for how well they would perform for pedestrian and bicycles, vehicles, land use. The team then analyzed critical traffic movements, physical constraints, and existing roadway
network in the vicinity. Ten alternatives without fatal flaws were selected for a more detailed evaluation. Five alternatives were then chosen for detailed traffic analysis. Different weighting of the design elements was reviewed for the final five alternatives, including a pedestrian/bike emphasis. Under all scenarios, Alternative 9 ranked the highest.

**Criteria:**
- **Pedestrian and Bicycle**- facility connectivity, crossing opportunities and crossing distance. Pedestrian and bicycle exposure, future accommodations, crossing phases, number of mid-block crossings and cycle length were all evaluated.
- **Transit**- stop locations and utilization of HOV lanes
- **Vehicles**- vehicle delay. Existing and 2035 forecasted PM peak hour traffic was evaluated in VISSIM. VISSIM simulation model was needed to quantify traffic operations at multiple intersections. Safety was evaluated for driver expectation related to conventional left turns and out of directional travel. Potential crash severity was evaluated as median u-turns generally are safer than conventional options
- **Land Use**- redevelopment potential, access, and neighborhood compatibility
- **Project Cost**- estimated right of way and construction costs
- **Benefit/Cost**- benefit of fuel savings and reduced user delay over the 20 year design period versus estimated project cost

**Left Turn Lanes**
Left turn movements use much of the green time at intersections. By removing, or re-directing, left turn movements to eliminate traffic signal phases, intersection operations can be improved. Many of the alternatives developed impact the key left turn movements. The two critical vehicle movements are the right turns from State onto VMP during the AM peak and the left turn from VMP onto State during the PM peak.

Alternative 9 includes triple left turns from VMP west bound onto State Street due to the high existing, and projected turning movements. Boise City has expressed concerns about using triple left turns. During final design, the implementation of the third left turn lane will be examined, as State Street is not expected to be a seven lane section for a period of time after the intersection may be constructed. Without a full seven lane section west of VMP, the third left turn lane would have to merge back into the two westbound lanes. A possible solution is to acquire right of way during the intersection project and not construct the third left turn lane until the roadway segment is constructed. Information about how this would affect operations of the intersection will be presented at the meeting.

Mixed input was received regarding a two-stage pedestrian crossing at Glendale (on VMP). Neighborhood level public involvement is recommended early in the design stage to confirm a crossing at that location. In the concept report, a crossing is shown.

Attachment(s):
Draft Concept Report
City of Boise letter
DRAFT Concept Report

State Street-VMP-36th Street Intersection Concept Design

ACHD Project No. 611026

Ada County Highway District
Table of Contents

PROJECT DESCRIPTION ........................................................................................................... 1

PREFERRED ALTERNATIVE – PARTIAL MEDIAN U-TURN ...................................................... 2
  Roadway Cross Sections ........................................................................................................ 2
  Intersection Turn Lanes ......................................................................................................... 3
  Pedestrian and Bicycle Facilities .......................................................................................... 4
  Transit Facilities .................................................................................................................... 4
  Construction Cost and Right-of-Way Impacts ....................................................................... 5

HOW WAS THE PREFERRED ALTERNATIVE DEVELOPED? ............................................ 6
  Project Approach .................................................................................................................. 6
  Key Design Criteria .............................................................................................................. 7
  Project Team and Stakeholder Team .................................................................................... 8
  Previous Plans and Studies .................................................................................................... 8

HOW WAS THE PUBLIC INVOLVED? ................................................................................. 10
  Interactive Website Survey .................................................................................................. 10
  Stakeholder Meetings ........................................................................................................... 11
  Public Involvement Meeting ............................................................................................... 11

WHAT ARE THE INTERSECTION CHALLENGES, CONSTRAINTS AND DESIGN CRITERIA? .... 13
  Vehicles ................................................................................................................................ 13
  Pedestrians .......................................................................................................................... 14
  Bicyclists ............................................................................................................................... 16
  Safety ................................................................................................................................... 17
  Transit .................................................................................................................................. 18
  Land Use .............................................................................................................................. 19
  Drainage ............................................................................................................................... 19
  Utilities ................................................................................................................................. 19
  Environmental ...................................................................................................................... 20
  Right-of-Way ....................................................................................................................... 20
  Taft Elementary School ....................................................................................................... 20
  Veterans Memorial Park ........................................................................................................ 20
  Albertsons .............................................................................................................................. 21
  Access ................................................................................................................................... 21

HOW WERE THE INTERSECTION ALTERNATIVES ANALYZED? ...................................... 22
  22 Initial Alternatives ............................................................................................................ 22
    Alternative Development ...................................................................................................... 22
    Screening-Level Evaluation ............................................................................................... 22
  Ten Preliminary Alternatives ............................................................................................... 24
  Five Final Alternatives ........................................................................................................ 25
Alternative Evaluation ........................................................................................................... 25
Preferred Alternative Evaluation and Ranking ...................................................................... 26

APPENDIX A – FINAL ALTERNATIVE CONCEPT DESIGN LAYOUTS ........................................ A
APPENDIX B – 22 INITIAL ALTERNATIVES ........................................................................... B
APPENDIX C – SCREENING MATRIX FOR DETERMINING PRELIMINARY INTERSECTION
ALTERNATIVES ......................................................................................................................... C

(Remaining Appendices will be included in future submittals)

List of Figures
Figure 1. View of State Street at VMP and 36th Street ................................................................. 1
Figure 2. Multi-modal design for all users ..................................................................................... 2
Figure 3. State Street cross section from TTOP ............................................................................. 2
Figure 4. Alternative 9 – Partial Median U-Turn Intersection ...................................................... 3
Figure 5. Proposed two-stage signalized pedestrian crossing on State Street ............................ 4
Figure 6. Intersection alternatives evaluated ................................................................................ 6
Figure 7. Major project highlights and workflow .......................................................................... 7
Figure 8. Key design criteria ......................................................................................................... 7
Figure 9. Project Team and Stakeholder Team .............................................................................. 8
Figure 10. Previous State Street studies and plans ................................................................. 9
Figure 11. Interactive website survey ............................................................................................ 10
Figure 12. Interactive website survey comment distribution ..................................................... 10
Figure 13. PIM comment form ....................................................................................................... 11
Figure 14. Intersection alternatives – percentage of total points ............................................... 12
Figure 15. Evaluation criteria – percent of total points ............................................................... 12
Figure 16. Vicinity map and existing conditions .......................................................................... 13
Figure 17. Existing peak hour intersection volumes ..................................................................... 14
Figure 18. Two-stage pedestrian crossing operations .................................................................. 16
Figure 19. Bicyclist at intersection ............................................................................................... 16
Figure 20. Percentage of driveway crashes per movement (Figure 1-6 from Access Management
Manual) ........................................................................................................................................ 17
Figure 21. Transit user at intersection .......................................................................................... 18

List of Tables
Table 1. 22 initial alternatives – screening-level analysis fatal flaws ....................................... 23
Table 2. Ten preliminary alternatives – evaluation results ......................................................... 24
Table 3. Five final alternatives – evaluation results ................................................................. 26
Table 4. Five final alternatives – weighting scenarios and ranking ............................................ 27
Project Description

The intersection of State Street, Veterans Memorial Parkway (VMP) and 36th Street is a critical component of the transportation infrastructure in Ada County.

State Street is the only east-west principal arterial in the county located north of the Boise River. It connects Boise and Garden City to the communities of Eagle, Star and Middleton. VMP is a minor arterial that is one of only five roadways in Ada County that provides interstate access and crosses the Boise River. 36th Street is a minor arterial that connects State Street with Hill Road.

Intersection improvements are being planned to:

- Improve vehicle operations
  - The current traffic demand exceeds the intersection’s capacity during the morning and evening commutes
  - Some motorists spend three minutes or more waiting to travel through the intersection during the evening commute
  - Traffic volumes in year 2035 are expected to increase more than 30 percent on State Street to 47,000 vehicles per day (vpd) and more than 20 percent on VMP to 39,000 vpd

- Expand pedestrian and bicycle facilities
  - Pedestrians and bicyclists are currently crossing State Street at unmarked and uncontrolled locations – east and west of the signalized intersection – that expose the users to significant safety risk that will continue to increase as vehicle traffic grows
  - The majority of respondents to an online survey conducted for this project requested improvements for pedestrians and bicyclists
  - Respondents to the public involvement meeting for this project ranked pedestrians and bicyclists as the second most important evaluation criteria, behind vehicles, in selecting the preferred intersection improvements

- Enhance transit facilities
  - State Street was designated as a transit corridor in the Transit and Traffic Operations Plan (TTOP), adopted by ACHD and partner jurisdictions
  - TTOP recommended widening State Street to six lanes to provide curbside, high occupancy vehicle (HOV) lanes dedicated to transit, carpools, vanpools, emergency vehicles and business access
  - TTOP also recommended consolidating existing bus stops to create bus pull-outs, reducing impedance to traffic in the HOV travel lanes, adding bus stations, and providing more services to transit riders
The goal of the project is to address the needs of all users – pedestrians, bicyclists, transit riders and motorists – while integrating with the adjacent land uses: Veterans Memorial Park, Taft Elementary School, neighborhoods and businesses. The intent of the concept design is to identify the intersection improvements as a basis for project funding and programming. Final design, right-of-way and construction are currently unfunded.

Preferred Alternative – Partial Median U-Turn

To meet the project goal, 22 intersection improvement alternatives were initially developed and presented to the Project Team for consideration. As described in the section titled, How Was the Preferred Alternative Developed?, the 22 alternatives were reduced down to the following five alternatives for detailed analysis:

- Alternative 1 – No-Build
- Alternative 3 – Conventional Intersection
- Alternative 9 – Partial Median U-Turn Intersection
- Alternative 14 – Partial Couplet Intersection
- Alternative 20 – Partial Median U-Turn plus Partial CFI Intersection

The evaluation matrix developed for selecting the preferred alternative consisted of traditional design elements, estimated costs and input from stakeholders and the public. Alternative 9, Partial Median U-Turn Intersection, was selected as the preferred alternative by the Project Team.

Roadway Cross Sections

The recommended roadway cross section on State Street is from TTOP, providing six lanes with the curbside lane designated HOV for transit, car pools, van pools, emergency vehicles and business access. As shown in Figure 3, the anticipated right-of-way width for the six-lane roadway with a raised median island varies from 113 to 120 feet.
Intersection Turn Lanes

The Partial Median U-Turn Intersection replaces the conventional, direct left turns on State Street with median U-turns. The median U-turns, also called indirect left turns, Michigan left turns and through-turns, prohibit drivers from making traditional left turns at the intersection and routes them instead through the intersection and downstream approximately 600 to 1,000 feet where motorists make a U-turn. The U-turn movements will be signalized to facilitate the turns and will be coordinated with the traffic signals at the main intersection.

On VMP and 36th Street, direct left-turns are utilized; however, due to the extremely high volume of northbound left-turns on VMP, triple left-turn lanes are utilized by this alternative. As a reference, the traffic engineering rule of thumb is that dual left-turn lanes should be considered when the left-turn volume exceeds 300 vehicles per hour (vph). In 2011, there were 837 vehicles on VMP making the northbound left-turn in the PM peak hour, which significantly exceeds the capacity of the two left-turn lanes currently available. There is not a traffic threshold volume rule of thumb for triple left-turn lanes. It is an improvement that is recommended after detailed intersection capacity analysis.

Right-turn lanes are provided on all four approaches, with storage length provided to accommodate the forecasted year 2035 traffic.

Figure 4. Alternative 9 – Partial Median U-Turn Intersection
Pedestrian and Bicycle Facilities

Sidewalk improvements on State Street consist of 6-foot wide sidewalks that are detached with a 5-foot separation from the back of curb, with the exception of the Smokey Davis frontage. The sidewalk is attached at this location to avoid building impacts and will be further evaluated during final design. Two two-stage, signalized pedestrian crossings are proposed at the median U-turn intersection locations. Pedestrians would cross during the U-turn signal phase.

Along VMP, a 6-foot wide detached sidewalk is proposed for the west side of the street from Glendale Street north to State Street. The sidewalk does not extend south of Glendale Street because sidewalk is not available on the west side of the Boise River Bridge. A two-stage, signalized pedestrian crossing is proposed at Glendale Street to provide access to the east side of VMP connecting users to a multi-use path located on the Boise River Bridge. Because comments were received following the public involvement meeting against the proposed two-stage pedestrian crossing on VMP, additional public input on the proposed crossing should be solicited during final design.

On the east side of VMP, a 6-foot wide detached sidewalk is proposed, where possible within the existing right-of-way. However, based on discussions with the ACHD Bicycle Advisory Committee, a wider sidewalk/pathway will be evaluated along the entire park frontage to accommodate the anticipated higher volume of pedestrians. This proposal will be further evaluated during final design.

The proposed sidewalk on 36th Street is 6-foot wide detached 5-foot from the back of curb.

Bike lanes are proposed on all four approaches of the intersection. The southbound bike lane on VMP extends to the project limits; however, facilities south of the project limits need to be verified. During concept design, an option was presented to ACHD staff to shift the roadway striping to the east to provide room for a southbound bike lane on the Boise River Bridge. This would require eliminating the bike lane on the east side of the bridge and routing bicyclists to the nearby multi-use path that many bicyclists currently use. This option needs further exploration during final design. Another proposal that needs to be vetted is the possible realignment of paths in Veterans Memorial Park to encourage north-south travel through the park to Clover Drive as an alternate to traveling on VMP bike lanes.

Transit Facilities

In addition to the HOV lanes on State Street for transit use, the project proposes replacing six existing bus stops with two bus pull-outs and two bus stations.

The bus pull-outs would provide areas for the buses to pull out of curbside lane traffic for loading and unloading, reducing impedance to HOV traffic. The proposed locations are west of Arthur Street on the north and south sides of State Street.
Bus stations are similar to pull-outs, but provide additional services such as ticketing. They are larger than pull-outs, requiring room for ticket kiosks, benches and other amenities. There were two optional locations for the bus stations discussed with VRT, with both east of VMP. One option is locating them immediately east of Dewey Street, and the second option is locating east of VMP. This would require impacting the Veterans Memorial Park, which may require environmental mitigation. The locations need to be evaluated further during final design.

**Construction Cost and Right-of-Way Impacts**

The estimated project cost for the Partial Median U-Turn Intersection is approximately $7.7 million, with $1.6 million estimated for right-of-way, and $6.1 million estimated for construction. The cost is $100,000 higher than the project cost estimate for Alternative 3, Conventional Intersection, making it the second least expensive build option.
How Was the Preferred Alternative Developed?

Project Approach

The preferred intersection alternative was developed utilizing a multi-step process with the Project Team assessing multiple alternatives to determine the best intersection design to balance the needs of all users. Throughout the process, the public and stakeholders were involved to determine specific needs and concerns and integrate solutions into the design.

As shown in Figure 6, 22 unique conventional and innovative intersection alternatives were initially identified. These intersection alternatives were subjected to a qualitative screening-level and fatal flaw analysis where they were reduced to ten preliminary intersection alternatives by the Project Team. The ten preliminary alternatives were then reduced to the five final intersection alternatives by the Project Team based on the traffic operations, estimated costs and refined qualitative evaluations. Horizontal layouts and a rating and ranking methodology were developed for the five final intersection alternatives. With input from the public and stakeholders, the Project Team selected Alternative 9, Partial Median U-Turn, as the preferred intersection alternative.

Figure 6. Intersection alternatives evaluated
The major project highlights and workflow are shown in Figure 7.

**Key Design Criteria**

Prior to developing intersection alternatives, the Project Team identified five key design criteria that complement the purpose and need of the project (Figure 8). The design criteria were used to screen the intersection alternatives from 22 to five and were the key components to the rating and ranking methodology used to select the preferred alternative. The five key design criteria and subcomponents are listed below.

- **Vehicles**
  - Average vehicle delay

- **Pedestrians and Bicyclists**
  - Pedestrian and bicycle crossing distance
  - Pedestrian crossing stages and cycle length (wait time)
  - Midblock pedestrian crossing opportunities
  - Pedestrian and bicyclist exposure (safety)
• Transit
  o Stop location (near-side or far-side)
  o Access to pedestrian facilities
  o Traffic/transit performance

• Land Use
  o Redevelopment potential
  o Access and connectivity
  o Property impacts

• Capital Cost
  o Right-of-way cost
  o Construction cost

Project Team and Stakeholder Team

The team was composed of two groups:

• Core Project Team (referred to as Project Team) – ACHD staff from select departments, the City of Boise and Federal Highway Administration (FHWA)

• Stakeholder Team – a multi-disciplinary group utilized at select Project Team meetings to provide critical input during the alternative development process and help select the preferred alternative

The lists of Core Project Team and Stakeholder Team members are shown in Figure 9.

Previous Plans and Studies

Several plans and studies preceded the State Street-VMP-36th Street intersection concept design which developed the basic framework for this project. Figure 10 on the following page shows the progression of previous efforts on State Street.
State Street Corridor Strategic Plan Study (2004)
• Established 6-lane cross section (120-foot right-of-way) with two dedicated vehicle travel lanes and one HOV/transit lane in each direction
• Identified need for high-volume intersection at State-VMP-36th (Full Couplet)

State Street Transit and Traffic Operation Plan (2011)
• Established curbside HOV and transit lane
• Established median type, and sidewalk and bike lane placement/width

State Street Alignment and Right-of-Way Study (2013)
• Established centerline alignment and right-of-way corridor on State Street for future 6-lane roadway (120-foot right-of-way)

State Street-VMP-36th Intersection Concept Design (2013)
• Develops an innovative intersection alternative to accommodate pedestrians, bicycles, transit and motorists

Figure 10. Previous State Street studies and plans
How was the Public Involved?

Involvement with the public and stakeholders was a key component of the concept design process. Multiple tools and venues were employed to engage the public and stakeholders, including an interactive website survey to solicit public comment on their specific issues and concerns, exclusive stakeholder meetings and an open-house public involvement meeting (PIM), which presented the five final alternatives for comment and ranking.

To ensure the public and stakeholders had adequate opportunities to review and comment on the project, information was available on ACHD’s website throughout the course of the concept design.

Interactive Website Survey

During the initial stages of this project, an interactive website survey was hosted by ACHD to provide a venue for the public to share their experiences and concerns with the intersection area. ACHD distributed a mailer notifying the public of the project and interactive survey.

Feedback was solicited for the following:

- What issues do you experience when traveling (driving, walking, or biking) through the State Street/VMP/36th Street intersection?
- What are typical routes that you use today to avoid traveling through the intersection?
- What are typical routes that you use today for walking or biking in the project area?
- Where would you like to walk or bike, but currently do not and why (e.g., gaps in sidewalk or bike lanes, busy roads without shoulders or sidewalks, busy intersections to cross, etc...)?
- What is your experience with transit at the State Street/VMP/36th Street intersection?

The survey ran for 31 days, during which 114 individual comments were received. The comments were distributed between seven main categories as shown in Figure 12.
**Stakeholder Meetings**

Stakeholders were a key component during the intersection concept development process. Their input was used to help develop and refine the intersection alternatives. The following three stakeholder meetings were held at ACHD with members of the Project Team:

- September 6, 2012 – Stakeholders reviewed the project background and provided general input regarding concerns in project area
- October 16, 2012 – Stakeholders reviewed details of the five final intersection alternatives and provided input for alternative refinement
- November 15, 2012 – Stakeholders met with the Project Team (agency and consultant members) during the public involvement meeting and provided comments on the five final intersection alternatives

In addition, follow-up meetings with the Project Team and two key stakeholders – Boise School District and VRT – were held following the public involvement meeting to address their concerns and solicit feedback. Phone and email coordination with the third key stakeholder, Albertsons/Supervalu, was conducted following the PIM to address their concerns.

**Public Involvement Meeting**

The project’s PIM was held on November 15, 2012, at the ACHD Commission Room. The open-house format meeting provided an opportunity for the public to review exhibits detailing the project, view visualizations of the intersection traffic operations for each alternative, speak with Project Team members and give feedback via a project-specific Comment Form (Figure Figure 13). The comment period extended through November 29, 2012.

At the PIM, 34 attendees signed in and 16 comments were received. An additional ten comments were received following the PIM for a total of 26 comments.

Feedback was solicited for the following:

- Do you have difficulty using this intersection?
- Rank the three evaluation criteria that you think are the most important.
- Taking into consideration the evaluation criteria, choose your top two alternatives, ranking them accordingly.

The key findings from the PIM responses were:

- The majority of users have difficulty using the intersection. The most likely users to experience difficulty are motorists, followed by pedestrians and bicyclists, with transit users having the least difficulty.
As shown on Figure 15, the public feels the most important evaluation criterion is vehicles, followed by pedestrians and bicyclists, and the benefit/cost ratio. Transit, stakeholder input and land use all had similar scores, below the benefit/cost ratio. Project cost was the least important.

Alternative 9, Partial Median U-Turn, received the most number-one votes and was the highest ranked alternative, as shown on Figure 14 on the following page. Alternative 14, Partial Couplet, was the public’s number two ranked alternative.

![Vehicles: 29%]

![Pedestrians and Bicyclists: 23%]

![Benefit/Cost Ratio: 12%]

![Public and Stakeholder Input: 11%]

![Land Use: 9%]

![Transit: 10%]

![Project Cost: 6%]

**Figure 15. Evaluation criteria – percent of total points**

![Alt 9. Partial Median U-Turn: 37%]

![Alt 14. Partial Couplet: 26%]

![Alt 3. Conventional: 17%]

![Alt 1. No-Build (Existing Conditions): 11%]

![Alt 20. Partial Median U-Turn and Partial CFI: 9%]

**Figure 14. Intersection alternatives – percentage of total points**
What are the Intersection Challenges, Constraints and Design Criteria?

The State Street-VMP-36th Street intersection poses unique design challenges and constraints due to its prominence in Ada County’s transportation system, its surrounding land uses and varied users.

For reference, Figure 16 shows the existing conditions in the vicinity of the intersection including bus stops and pedestrian and bicycle facilities.

**Figure 16. Vicinity map and existing conditions**

**Vehicles**

The average traffic volumes are currently 35,000 to 36,000 vehicles per day (vpd) on State Street, 32,000 vpd on VMP and 11,000 vpd on 36th Street. By 2035, the intersection is anticipated to experience a 31 percent increase in traffic with 45,000 to 47,000 vph on State Street, 39,000 vpd on VMP and 14,000 vpd on 36th Street. With the projected growth, State Street will exceed the maximum planning-level traffic volume for the existing five-lanes (approximately 40,000 vpd) and will require six/seven lanes in the near-term.
During the PM peak hour, the intersection is currently over capacity, with observed queues extending over ¼-mile. The northbound left-turn and westbound through movements are the highest volume movements at the intersection. As a result, they generate the largest queues, require a large percentage of signal green time, and cause large delays for all motorists traveling through the intersection. Additionally, the northbound left-turn volume during the PM peak hour is one of the highest left-turn volumes in Ada County. During the AM peak hour, the intersection is also over capacity, and large eastbound through and right-turn movements generate long queues that extend to Collister Drive.

Because of the heavy directional movements during the AM and PM peak periods, the key to improving traffic operations is to accommodate the two key vehicle movements during the AM and PM peak periods (four key movements total). The key movements are shown in Figure 17 in bold.

**Pedestrians**

Due to the commercial, residential, park and elementary school land uses and the proximity to transit stops, the State Street-VMP-36th Street intersection has continuous pedestrian activity throughout the day. During the highest peak period in the midday, approximately 38 pedestrians per hour were observed crossing at the intersection. Sidewalks currently exist in the vicinity of the intersection; however, there are several discontinuous segments of sidewalk along State Street.

The following pedestrian facilities currently exist within the intersection area:

- **State Street**
  - Continuous 5-foot sidewalk to the east of VMP
  - Discontinuous 5-foot sidewalk to the west of VMP
- **36th Street**
  - Continuous 5-foot sidewalk on both sides of roadway
• VMP
  o Multi-use path on east side of roadway from greenbelt to State Street
  o No pedestrian facilities on west side of roadway, with no connection to greenbelt and no sidewalk on Boise River Bridge
  o No direct pedestrian access to VMP from Quail Glen neighborhood in southwest corner of State Street-36th-VMP intersection

Six-foot wide detached sidewalks with 5-foot wide separation from the back of curb are proposed on all four approaches, with the exception of the VMP approach. On the west side of VMP, sidewalk is proposed from State Street to a proposed mid-block pedestrian crossing near Glendale Street, which is discussed below.

In addition to the signalized pedestrian crossings at the State Street-VMP-36th Street intersection, mid-block crossings are proposed on State Street and VMP to improve pedestrian accessibility and safety. Pedestrians are frequently observed crossing at midblock locations to avoid out-of-direction travel to the main intersection, particularly on the east leg of State Street.

To make the crossings more user-friendly for pedestrians and bicyclists while minimizing vehicle delay, two-stage signalized pedestrian crossings are proposed at the mid-block crossings. With a two-stage pedestrian crossing, the median serves as a refuge to split the crossing into two steps. The advantages of a two-stage crossing include the following:
  • Easier for pedestrians and bicyclist to negotiate due to a smaller crossing distances
  • Reduces vehicle delays because only one direction of traffic is required to stop at a time
  • Signalized crossing is safer for pedestrians and bicyclists

Figure 18 on the following page illustrates the operations of a two-stage pedestrian crossing. Pedestrians cross to the median in one stage. Once in the median, pedestrians walk against oncoming traffic to provide a better view of potential conflicts. Pedestrians then cross the second half of the roadway in one stage. Where applicable, the pedestrian crossings on State Street are paired with the median U-turn movements. The median U-turn signal phase will run concurrently with one of the two pedestrian phases.

Several public comments, including a comment from Albertsons, were submitted in favor of a grade-separated pedestrian crossing at the State Street-VMP-36th Street intersection. The Project Team recognized that an in-depth evaluation of a grade-separated crossing is needed. An ACHD standard policy regarding implementation of grade-separated pedestrian and bicycle crossings is expected to be developed prior to final design of this project. The final design portion of the project will evaluate the crossing if the policy has not been established at that time.
Bicyclists

36th Street and VMP serve as important connections for bicyclists traveling between commercial and residential locations and the Boise River Greenbelt. Figure 19 shows a photo of a bicyclist at the State Street-VMP-36th Street intersection. During the highest peak period in the PM, approximately 40 bicyclists per hour were observed crossing at the intersection. Bike lanes and multi-use pathways exist within the vicinity of the intersection but only for north-south travel on 36th Street and VMP. However, some of bike lanes that exist do not meet ACHD’s current minimum width standards.

The following bicycle facilities currently exist within the intersection area:

- State Street
  - None
- 36th Street
  - Variable width (1-foot to 4-foot measured from lip of gutter) bike lanes on both sides of roadway
- VMP
  - Multi-use path on east side of roadway from greenbelt to State Street
  - Variable width (3-foot to 3.5-foot) striped shoulder on east side of roadway from 475 feet north of Adams Street to Stilson Road
  - Variable width (2.5-foot to 3-foot) striped shoulder on west side of roadway from 475 feet north of Adams Street to State Street

Five-foot bike lanes are proposed for both sides of the roadway on all four intersection approaches.
The Project Team recommended the following evaluations prior to or during future design phases:

- Re-alignment of the multi-use pathways through Veterans Memorial Park to provide a more direct connection to the proposed pedestrian crossing near State Street and Clover Street
- Assess the feasibility of providing a 5-foot bike lane for southbound bicyclists across the Boise River Bridge

**Safety**

Between 2007 and 2011, there were 56 reported crashes at the State Street-VMP-36th Street intersection with 25 injury crashes and no fatalities. An ITD-2658 Safety Evaluation form was utilized to calculate an existing crash rate of 0.57 crashes per million vehicles, compared to a base crash rate of 0.54 crashes per million vehicles, which indicates the intersection exceeds the average crash rate for similar intersections with similar volumes in Idaho.

No reported vehicle-pedestrian or vehicle-bicycle crashes occurred at the intersection in the five year evaluation period. In addition, many pedestrians and bicyclists were observed crossing State Street at uncontrolled and unmarked mid-block crossings, particularly to the east of the intersection.

With the unique intersection concepts evaluated for this study, it was not possible to quantify the safety potential of each intersection alternative. Because the intersection has a higher-than-average crash rate, all ‘build’ alternatives are expected to improve pedestrian, bicyclist and vehicle safety compared to the No-Build alternative (existing conditions) due to the addition of bike lanes, sidewalks, two-stage pedestrian crossings, medians, right-turn lanes and other improvements.

The preferred alternative incorporates median U-turns in combination with non-traversable medians. Managing left-turn movements is important for the safety and operation of a corridor because more than two-thirds of all access-related collisions involve left-turning vehicles, as shown in Figure 20 from the Access Management Manual published by the Transportation Research Board. Several national publications provide statistics and guidance regarding the safety of left turns and medians.

- NCHRP 420, *Impacts of Access Management Techniques*, notes:
  - Non-traversable medians reduce accident rates compared with undivided or two-way left-turn lanes (TWLTs) in both urban and rural locations.
  - Eliminating direct left turns from driveways and replacing them with indirect U-turn maneuvers results in a **20 percent reduction** in the accident rate.

![Figure 20. Percentage of driveway crashes per movement (Figure 1-6 from Access Management Manual)](image-url)
U-turn crossovers were found to have roughly 50 percent of the accident rates of roads with TWLTLs.
Case studies on several arterials throughout the U.S. show replacing TWLTLs with raised medians can reduce accidents from 15 percent to 57 percent.

- NCHRP 524, Safety of U-turns at Unsignalized Median Openings, notes:
  - For urban arterial corridors, average median opening accident rates for directional three-leg median openings (with U-turns and/or directional left turns) are about 48 percent lower than accident rates for conventional three-leg openings.

**Transit**

In addition to being a heavy commuter route, State Street has the highest levels of ridership in the Treasure Valley. Figure 21 shows a photo of a transit user at the State Street-VMP-36th Street intersection. In the future, State Street is envisioned as a transit corridor with increased regional, express and local bus service and HOV lanes. The TTOP identified the curbside lane on State Street as the HOV lane dedicated to transit, carpools, vanpools, emergency vehicles and business access.

During separate stakeholder meetings, the Project Team worked with VRT to identify the preferred transit stop locations that complimented the intersection alternatives. The existing six stops on State Street within the half-mile intersection area were consolidated to four: two bus pull-outs and two bus stations. In general, the proposed bus stops are located near proposed controlled pedestrian crossings.

VRT prefers all stop locations to be far-side to maximize the use of transit signal priority; however, in some cases near-side stops have less property impacts and fewer conflicts with U-turn and right-turn traffic. West of VMP, their preferred bus pull-out locations are far-side of the pedestrian crossings, but they approved a near-side pull-out for eastbound traffic due to conflicts with U-turn and right-turn traffic. East of VMP, their preferred bus station locations are at between Dewey and 36th Street and at Veterans Memorial Park. Impacts to the park may not be allowed due to environmental concerns so the bus station is located between Clover Drive and Clithero Drive for this intersection concept design.

VRT did not select a preferred intersection alternative.

The transit elements were initially evaluated for accessibility and accommodations of existing and future transit at this intersection. This evaluation was further expanded to include provision of the high-occupancy vehicle (HOV)/transit lane, stop and station locations, consideration for bus pull-outs, and access to these areas for the preliminary and final alternative stages of the study.
Land Use

Initially, the land use elements were evaluated for redevelopment potential, access and connectivity, and property impacts. Two key elements with redevelopment potential are parcel size and access to the property. In the case of this intersection, the area is mostly built out, but has a low improvement-to-land ratio, which can be one measure for looking at redevelopment potential. For the preliminary ten and final five alternatives, the land use evaluation was expanded to include a closer look at compatibility with adjacent land uses.

Drainage

A review of as-constructed plans provided by ACHD for the State Street-VMP-36th Street intersection shows that storm water from the intersection collects in a 36-inch pipe that is routed under Stilson Road. From there ACHD indicated that the existing storm water routes under Veterans Memorial Park before discharging into the Boise River.

A detention pond was assumed for the drainage disposal for the future intersection reconstruction. The vacant parcel located on Glendale Street adjacent to Veterans Memorial Parkway was identified as a potential location for the detention pond and included in the project cost estimate. However, alternative treatment and disposal methods will be evaluated during final design.

Utilities

Utility facility maps were provided by ACHD to supplement the field surveys and identify potential conflicts. The following utilities were identified in the vicinity of the State Street-VMP-36th Street intersection:

- Idaho Power (overhead transmission)
- Intermountain Gas
- United Water
- City of Boise Sewer
- Telephone
- Storm Drain
- Irrigation

A high-level review of the utility data was conducted. The intersection improvements are anticipated to impact all of the underground utilities listed above, requiring relocations or adjustments. Idaho Power’s overhead power line on the south side of State Street that routes to the east will not be impacted; however, their facilities on State Street to the west and on VMP will be impacted and relocation will be required. The cost to relocate the power poles is not included in the project cost estimates.
Environmental

An environmental scan (see Appendix C) was conducted to identify and minimize the potential impacts of the intersection improvements. The scan identified environmental resources within the intersection area and permits that may be required during future design and construction phases. The following properties that are potentially impacted by the intersection improvements were identified by the scan:

- Veterans Memorial Park is listed as a property where Section 6(f) funds were used. Further discussion of the history and challenges of the park is included below in the Veterans Memorial Park section of the report.
- No historic sites are listed within the intersection area; however, the Farmers Union Canal crossing VMP north of the Boise River is eligible for recording and two potentially eligible sites exist at Viking Drive Inn and the residence on the northwest corner of State Street and Arthur Drive.

Right-of-Way

ACHD Right-of-Way staff was consulted to determine the property impacts and identify parcels that may require total acquisition for the intersection alternatives. In locations where property access is removed with certain intersection alternatives, such as the residences on Stilson Street, ACHD identified parcels for total acquisition in order to provide future access to the adjacent properties.

Taft Elementary School

During separate stakeholder meetings with the Boise School District, they indicated that a major concern with any intersection alternative is school bus access and circulation at Taft Elementary School. Currently, busses are routed on 36th Street to Anderson Street in order to drop students off on the curb closest to the school. The Boise School District noted that the current bus drop-off access circulation is not ideal due to the proximity to the State Street-VMP-36th Street intersection. In the near-term, the Boise School District would prefer to extend (connect) 38th Street and provide a school bus drop-off on Sunset Avenue prior to the reconstruction of the State Street-VMP-36th Street intersection. The current parent drop-off location off of Anderson Street would remain.

The Boise School District did not select a preferred alternative but did indicate during meetings that they were not in favor of alternatives that required right-of-way from Taft Elementary School, such as Alternative 14, Partial Couplet.

Veterans Memorial Park

Veterans Memorial Park was one of the major design constraints for the project. Land and Water Conservation Funds were used for improvements to the park in 2008. Section 6(f) of the act prohibits the conversion of property acquired or developed with these grants to a non-recreational purpose without the approval of the US Department of the Interior’s National Park Service.
Due to its 6(f) status, right-of-way impacts to the park were avoided. The intersection was widened to the west and north, retaining park right-of-way, for each of the final five alternatives. There is a possibility that the park’s 6(f) boundary may extend beyond the right-of-way limits, resulting in environmental impacts to the park not anticipated during concept design. As directed by ACHD, further environmental study will be conducted in future design phases.

**Albertsons**

Albertsons (Supervalu) is the largest commercial property in the intersection area. Stakeholder outreach and coordination was conducted with Albertsons to address their concerns and incorporate their comments into the design, as necessary.

Albertsons indicated that much of their business comes from the north on 36th Street. As a result, their primary concern with all intersection alternatives is access for southbound travelers on 36th Street. ACHD Traffic approved left-in access for Alternative 3, Conventional, Alternative 9, Partial Median U-Turn and Alternative 20, Partial MUT plus Partial CFI. Left-turns out of the Albertson’s approach would be prohibited by the proposed raised median. They provided a formal letter indicating Alternative 3, Conventional, as their preferred alternative with Alternative 9, Median U-turn intersection, as their second ranked preferred alternative. They also were in favor of a grade-separate pedestrian crossing which was previously discussed in the *Pedestrians* section of the report.

**Access**

The upcoming State Street Access Management Plan (currently programmed for fiscal year 2014) will determine access for the approved intersection option. For this concept design, business and private accesses shown on the intersection exhibits are conceptual only. Dustpan approaches are shown for most business accesses, recognizing curb return approaches will likely be required for design.

Within the intersection improvement limits, several public roadways will have restricted access due to the proposed median, particularly on the east leg of State Street. Potential breaks in the median for left-in or U-turn access will also be addressed with the future access management plan.
How Were the Intersection Alternatives Analyzed?

The intersection alternatives were analyzed in three stages. For the first stage, the 22 initial intersection alternatives were evaluated with a high-level screening analysis to identify ten preliminary intersection alternatives for further analysis. The second stage refined and evaluated the ten preliminary intersection alternatives to identify the five final alternatives. The third and final stage further refined the five intersection alternatives and then scored and ranked their relative performance to assist the Project Team in selecting a preferred alternative.

22 Initial Alternatives

Alternative Development

Various types of at-grade and grade-separated intersection concepts were considered for the State Street-VMP-36th Street intersection. Because of the high existing and future traffic volumes at the intersection, an innovative solution was anticipated to reduce vehicle delays and improve transit, pedestrian and bicyclist mobility.

One of the main elements of many innovative intersection concepts is to better manage left-turn movements because they use much of the traffic signal green time at intersections. By removing or re-directing left-turn movements, traffic signal phases are eliminated and user delays can be reduced. Therefore, many of the initial intersection alternatives developed for the Street-VMP-36th Street intersection attempt to improve operations by either:

- Removing the northbound left-turn movement from the primary intersection (VMP)
- Removing or reducing the southbound opposing left-turn and through phases (36th Street)
- Removing or reducing the eastbound and westbound left-turn phases (State Street)

Screening-Level Evaluation

A qualitative screening-level evaluation of the initial 22 alternatives was conducted with the five key evaluation criteria – vehicles, pedestrians and bicyclists, transit, land use and capital cost. Intersection elements that did not align with the project goals were identified as fatal flaws. The fatal flaws range from poor vehicle operations to severe pedestrian and bicycle conflicts to negative business access impacts.

The list of 22 preliminary alternatives and fatal flaws identified during the screening-level analysis are summarized in Table 1. Alternatives highlighted in gray were selected by the Project Team as the ten preliminary alternatives to be refined and evaluated in the next stage. Intersection alternatives with fatal flaws were eliminated with the exception of three alternatives. Alternative 1, No-Build, was retained to satisfy federal-aid funding requirements. Alternative 13, Full Couplet, was retained by the Project Team to further evaluate an alternative with high redevelopment potential. Alternative 22, Single-Point Urban Intersection, was retained by the Project Team to include the highest capacity and highest cost alternative for comparison purposes. See Appendix B – 22 Initial Alternatives for illustrations and descriptions of the intersection alternatives.
### Table 1. 22 initial alternatives – screening-level analysis fatal flaws

<table>
<thead>
<tr>
<th>No.</th>
<th>Alternative</th>
<th>Pedestrian and Bicyclist Conflicts</th>
<th>Transit/HOV Lane Conflicts</th>
<th>Property Impacts</th>
<th>Business Access Impacts</th>
<th>Vehicle Operations</th>
<th>Low Benefit versus Cost</th>
<th>Capital Cost</th>
<th>Similar to Other Alternatives</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No-Build Intersection&lt;sup&gt;1&lt;/sup&gt;</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>No-Build Intersection Plus Pedestrian Enhancements</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Conventional Intersection</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Three-Lane Roundabout</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Forward Jughandle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Reverse Jughandle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Continuous Flow Intersection (CFI), Parallel Flow Intersection (PFI)</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Full Median U-Turn Intersection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Partial Median U-Turn Intersection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Split T-Intersection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Partial Superstreet Intersection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Through-About</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Full Couplet&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Partial Couplet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Quadrant 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Quadrant 2: Quadrant and Forward Jughandle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Quadrant 3: Quadrant and Forward Jughandle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Quadrant 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Quadrant 5: Quadrant and Partial Median U-Turn</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Partial Median U-Turn and Partial CFI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Fly-over/Fly-under</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Single-Point Urban Intersection&lt;sup&gt;3&lt;/sup&gt;</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td></td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Alternatives highlighted in gray were selected by the Project Team as the ten preliminary alternatives to be further evaluated.

<sup>1</sup> No-Build carried forward for federal-aid process despite fatal flaws

<sup>2</sup> Full Couplet carried forward by Project Team as a high-cost/high-redevelopment potential comparison despite fatal flaws

<sup>3</sup> Single-Point Urban Intersection carried forward by Project Team as a high-cost/high-vehicle-capacity comparison despite fatal flaws
Ten Preliminary Alternatives

For the evaluation of the ten preliminary alternatives, planning-level horizontal layouts were developed to refine the pedestrian, bicycle, transit and land use evaluations, to determine preliminary property impacts, and to estimate capital costs. A preliminary traffic analysis was conducted to determine the relative operations of the intersection or system of intersections.

Table 2 summarizes the results of the preliminary alternatives evaluation. The pedestrian and bicyclist, transit and land use criteria are rated on a relative qualitative scale with five grades (listed from worst to best) – bad, poor, fair, good and excellent. Average vehicle delay and capital cost (construction plus right-of-way) are ranked on a relative scale from 1 to 10, where 1 has the lowest vehicle delay and cost and 10 has the highest. Alternatives highlighted in gray were selected by the Project Team as the five final alternatives to be refined and evaluated in the next stage.

Table 2. Ten preliminary alternatives – evaluation results

<table>
<thead>
<tr>
<th>No.</th>
<th>Alternative</th>
<th>Pedestrians and Bicyclists</th>
<th>Transit</th>
<th>Land Use</th>
<th>Vehicle Delay, Rank (1=lowest, 10=highest)</th>
<th>Capital Cost, Rank (1=lowest, 10=highest)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No-Build</td>
<td>Bad</td>
<td>Bad</td>
<td>Fair</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Conventional</td>
<td>Bad</td>
<td>Good</td>
<td>Fair</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>Partial Median U-Turn</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>13</td>
<td>Full Couplet</td>
<td>Good&lt;sup&gt;1&lt;/sup&gt;, Excellent&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Good</td>
<td></td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>14</td>
<td>Partial Couplet</td>
<td>Fair</td>
<td>Excellent</td>
<td>Good</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>15</td>
<td>Quadrant 1</td>
<td>Good&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Good&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Fair</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>18</td>
<td>Quadrant 4</td>
<td>Good&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Good&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Fair</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>19</td>
<td>Quadrant 5</td>
<td>Good&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Good&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Fair</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>20</td>
<td>Partial Median U-Turn and Partial CFI</td>
<td>Fair</td>
<td>Fair</td>
<td>Fair</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>22</td>
<td>Single-Point Urban Intersection</td>
<td>Bad&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Poor&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Poor</td>
<td>1</td>
<td>10</td>
</tr>
</tbody>
</table>

Alternatives highlighted in gray were selected by Project Team as the five final alternatives to be further evaluated

1 Ratings assigned prior to the addition of mid-block crossings on State Street and VMP

2 Ratings assigned prior to coordination with VRT
Five Final Alternatives

Alternative Evaluation

For the five final alternatives, the concept-level intersection alignment and geometry were established and horizontal layouts showing the locations of pedestrian, bicycle and transit facilities were developed. The analysis was updated to include vehicle delay and cost, plus a benefit/cost ratio and rankings of the publics’ preferred intersection alternative.

From the concept design, construction and right-of-way costs were refined from the previous estimates. The total capital costs were estimated using the following cost basis:

- **Construction Cost:**
  - Roadway – A cost of $11 per square foot was applied to the total area of pavement. The estimated cost was based on recent bids for intersection projects in Ada County (non-federal-aid). Drainage, traffic signals equipment, and illumination are included in the cost.
  - Contingency – A 15 percent contingency was included to account for level of design

- **Right-of-Way:**
  - Land – Where only land acquisition was identified, a cost of $10 per square foot was applied to all residential and commercial areas.
  - Residential and Commercial Buildings – Where total property acquisition was identified, the 2012 value from the Ada County Assessor was applied (includes land).
  - Contingency – A 15 percent contingency was included to account for level of design
  - Taft Elementary School – An additional $200,000 was assumed for access, routing and parking impacts with the alternatives where the school parking was impacted.

- **Additional mitigation costs**, such as the potential relocation of parking, access or building modifications to the Taft Elementary School entrance were not included in the total cost.

The benefit/cost ratio compares the vehicle operations benefits to the capital costs. The benefit is the cost savings due to reduced delay and fuel consumption over a 20-year design life compared to Alternative 1, No-Build, which is assumed to have a benefit of zero.

Table 3 summarizes the results of the final alternatives evaluation.
Table 3. Five final alternatives – evaluation results

<table>
<thead>
<tr>
<th>Criteria Type</th>
<th>Evaluation Criteria</th>
<th>Alternative</th>
<th>1</th>
<th>3</th>
<th>9</th>
<th>14</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No-Build (Existing Conditions)</td>
<td>Conventional</td>
<td>Partial Median U-Turn</td>
<td>Partial Couplet</td>
<td>Partial Median U-Turn and Partial CFI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Qualitative</td>
<td>Pedestrians and Bicyclists</td>
<td>Bad</td>
<td>Bad</td>
<td>Good</td>
<td>Fair</td>
<td>Fair</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Transit</td>
<td>Bad</td>
<td>Good</td>
<td>Good</td>
<td>Excellent</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Land Use</td>
<td>Fair</td>
<td>Fair</td>
<td>Good</td>
<td>Fair</td>
<td>Fair</td>
<td></td>
</tr>
<tr>
<td>Quantitative</td>
<td>Vehicle Delay, seconds</td>
<td>146</td>
<td>76</td>
<td>54</td>
<td>52</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Capital Cost, millions [construction / R/W]</td>
<td>0</td>
<td>7.6</td>
<td>7.7</td>
<td>11.6</td>
<td>9.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Benefit/Cost Ratio (rank)</td>
<td>0</td>
<td>5.6</td>
<td>7.3</td>
<td>5.1</td>
<td>7.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Public Input of Preferred Alternative (rank)</td>
<td>6</td>
<td>9</td>
<td>20</td>
<td>14</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

Preferred Alternative Evaluation and Ranking

A methodology was developed to score and rank the five final alternatives to help the Project Team select a preferred intersection alternative. The methodology converts the evaluation criteria results to raw scores and then applies weighting factors to each criterion to calculate a total score and ranking.

The evaluation criteria consist of qualitative and quantitative values that were converted to raw qualitative scores. A relative scale of 1 to 5 points was established, with 1 point assigned to the worst performance and 5 the best. For the qualitative criteria (pedestrians and bicyclists, transit and land use) 1 point corresponds to a ‘bad’ rating and 5 points corresponds to an ‘excellent’ rating. For the qualitative criteria (vehicle delay, benefit/cost ratio and public input), the points (1 to 5 scale) are distributed proportionally across each evaluation criteria so two alternatives with similar costs, for example, with have similar raw scores.

With the calculated raw scores for each intersection alternative, several different weighting scenarios were evaluated which applied a different emphasis to each evaluation criteria. Table 4 summarizes the results of the weighting scenarios and rankings. Alternative 9, Median U-Turn, is consistently first ranked among all of the scenarios. Alternative 14, Partial Couplet, is second ranked in all scenarios except the benefit/cost oriented scenario where Alternative 20, Partial Median U-Turn and Partial CFI, is second ranked. The No-Build alternative is ranked last for all weighting scenarios.
Table 4. Five final alternatives – weighting scenarios and ranking

<table>
<thead>
<tr>
<th>Weighting Scenario</th>
<th>Alternative</th>
<th>No-Build (Existing Conditions)</th>
<th>Conventional</th>
<th>Partial Median U-Turn</th>
<th>Partial Couplet</th>
<th>Partial Median U-Turn and Partial CFI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equal</td>
<td></td>
<td>5</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Public Response Preference</td>
<td></td>
<td>5</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Vehicle, Pedestrian, Bicycle and Transit Oriented</td>
<td></td>
<td>5</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Pedestrian, Bicycle and Transit Oriented</td>
<td></td>
<td>5</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Benefit/Cost Oriented</td>
<td></td>
<td>5</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>
Appendix A – Final Alternative Concept Design Layouts
ALTERNATIVE 1 – NO-BUILD (EXISTING CONDITIONS)
Appendix B – 22 Initial Alternatives
## Table B-1. 22 initial alternatives and illustrations

<table>
<thead>
<tr>
<th>No.</th>
<th>Alternative</th>
<th>Illustration</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No-Build Intersection</td>
<td></td>
<td>Existing intersection</td>
</tr>
<tr>
<td>2</td>
<td>No-Build Intersection plus Pedestrian Enhancements</td>
<td></td>
<td>Existing intersection plus pedestrian enhancements (potential sidewalk extensions, mid-block crossings or a grade-separated crossing).</td>
</tr>
<tr>
<td>3</td>
<td>Conventional Intersection</td>
<td></td>
<td>Conventional signalized intersection with three through lanes on State (2 vehicle, 1 HOV/Transit) plus bike lanes. No additional through lanes on VMP or 36th. The NB left-turn movement is a triple left.</td>
</tr>
<tr>
<td>4</td>
<td>Three-Lane Roundabout</td>
<td></td>
<td>Modern roundabout with three circulating lanes (2 vehicle, 1 HOV/Transit).</td>
</tr>
</tbody>
</table>
## Initial Alternatives

<table>
<thead>
<tr>
<th>No.</th>
<th>Alternative</th>
<th>Illustration</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Forward Jughandle Intersection</td>
<td><img src="image1" alt="Illustration" /></td>
<td>Forward jughandle routes left-turn vehicles to the right to a secondary intersection. The secondary intersection would require signalization. Concept is used in Alternatives 16, 17 and 18.</td>
</tr>
<tr>
<td>6</td>
<td>Reverse Jughandle Intersection</td>
<td><img src="image2" alt="Illustration" /></td>
<td>Reverse jughandle routes NB left-turn vehicles through the primary intersection to a loop lane and then back through the primary intersection. A bypass lane or quadrant roadway would be required around the loop lane for SB right-turn vehicles.</td>
</tr>
<tr>
<td>7</td>
<td>Continuous Flow Intersection (CFI), Parallel Flow Intersection (PFI)</td>
<td><img src="image3" alt="Illustration" /></td>
<td>In a CFI, left-turn vehicles cross over opposing through traffic prior to entering the intersection. This allows the left-turn vehicles to proceed through the intersection with the corresponding through vehicles, requiring only a two-phase signal at the primary intersection. A system of five coordinated traffic signals is required. The PFI is a patented design that is similar to the CFI.</td>
</tr>
<tr>
<td>8</td>
<td>Full Median U-Turn Intersection</td>
<td><img src="image4" alt="Illustration" /></td>
<td>All left-turn vehicles are re-routed to signalized median U-turn intersections located 600' to 1,000' downstream on State Street. The primary intersection operates with two phases.</td>
</tr>
<tr>
<td>No.</td>
<td>Alternative</td>
<td>Illustration</td>
<td>Description</td>
</tr>
<tr>
<td>-----</td>
<td>------------------------------------</td>
<td>--------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>9</td>
<td>Partial Median U-Turn Intersection</td>
<td><img src="image1" alt="Illustration" /></td>
<td>EB and WB left-turn vehicles are re-routed to signalized median U-turn intersections located 600' to 1,000' downstream on State Street. Direct NB and SB left-turn movements are allowed. The NB left-turn movement is a triple left. The primary intersection operates with three phases.</td>
</tr>
<tr>
<td>10</td>
<td>Split T-Intersection</td>
<td><img src="image2" alt="Illustration" /></td>
<td>The NB and SB movements would be separated into two signalized T-intersections. The existing north leg (36th Street) would be closed to vehicle traffic and relocated to N. Anderson.</td>
</tr>
<tr>
<td>11</td>
<td>Partial Superstreet Intersection</td>
<td><img src="image3" alt="Illustration" /></td>
<td>All vehicles from VMP and 36th Street are re-routed to the major street via a right-turn movement to a median U-turn intersection, with the exception of the NBLT vehicles. Direct EB and WB left turns from State Street are allowed. For this alternative, the NB left turn is direct and has three lanes.</td>
</tr>
<tr>
<td>12</td>
<td>Through-About</td>
<td><img src="image4" alt="Illustration" /></td>
<td>State Street through movements are unchanged, all other movements are re-routed to a counterclockwise circulating roundabout. Signalized control is needed to stop State Street through movements.</td>
</tr>
</tbody>
</table>
### APPENDIX B – 22 INITIAL ALTERNATIVES

<table>
<thead>
<tr>
<th>No.</th>
<th>Alternative</th>
<th>Illustration</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>Full Couplet</td>
<td><img src="image1.png" alt="Full Couplet Illustration" /></td>
<td>Both State Street and VMP/36th are converted to two one-way roadways forming a system of four two-phase signalized intersections. The NB left-turn movement is a triple left.</td>
</tr>
<tr>
<td>14</td>
<td>Partial Couplet</td>
<td><img src="image2.png" alt="Partial Couplet Illustration" /></td>
<td>VMP and 36th are converted to two one-way roadways forming a system of two three-phase signalized intersections. The NB left-turn movement is a triple left.</td>
</tr>
<tr>
<td>15</td>
<td>Quadrant Intersection 1</td>
<td><img src="image3.png" alt="Quadrant Intersection 1 Illustration" /></td>
<td>Left-turn vehicles are removed from the primary intersection by using an additional roadway in one or more quadrants. The Mercer quadrant re-routes NBLT and EBRT movements. The N. Anderson quadrant re-routes SBLT and WBRT movements.</td>
</tr>
<tr>
<td>16</td>
<td>Quadrant Intersection 2: Quadrant and Forward Jughandle</td>
<td><img src="image4.png" alt="Quadrant Intersection 2 Illustration" /></td>
<td>Left-turn vehicles are removed from the primary intersection by using an additional roadway in one or more quadrants. The S. Anderson quadrant/jughandle re-routes all SB movements and the EBLT movement. The Veterans Park quadrant re-routes WBLT and NBRT movements.</td>
</tr>
<tr>
<td>No.</td>
<td>Alternative</td>
<td>Illustration</td>
<td>Description</td>
</tr>
<tr>
<td>-----</td>
<td>--------------------------------------------------------</td>
<td>--------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>17</td>
<td>Quadrant Intersection 3: Quadrant and Forward Jughandle</td>
<td></td>
<td>Left-turn vehicles are removed from the primary intersection by using an additional roadway in one or more quadrants. The S. Anderson quadrant/jughandle re-routes all SB movements.</td>
</tr>
<tr>
<td>18</td>
<td>Quadrant Intersection 4: Quadrant and Forward Jughandle</td>
<td></td>
<td>Left-turn vehicles are removed from the primary intersection by using an additional roadway in one or more quadrants. The N. Anderson quadrant/jughandle re-routes all SB movements.</td>
</tr>
<tr>
<td>19</td>
<td>Quadrant Intersection 5: Quadrant and Partial MUT</td>
<td></td>
<td>Left-turn vehicles are removed from the primary intersection by using an additional roadway in one or more quadrants. The N. Anderson quadrant re-routes all SBLT and WBRT movements. The Mercer quadrant re-routes NBLT and EBRT movements. EBLT and WBLT movements are re-routed using median U-turn intersections on State Street. The primary intersection operates with two phases.</td>
</tr>
<tr>
<td>20</td>
<td>Partial Median U-Turn and Partial CFI Intersection</td>
<td></td>
<td>NB left-turn movement is re-routed before the primary intersection using CFI concepts. The remaining left-turn movements are re-routed using median U-turn intersections on State Street. The primary intersection operates with three phases.</td>
</tr>
<tr>
<td>No.</td>
<td>Alternative</td>
<td>Illustration</td>
<td>Description</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------------</td>
<td>--------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>21</td>
<td>Fly-over/Fly-under</td>
<td></td>
<td>NB left-turn movement is grade separated.</td>
</tr>
<tr>
<td>22</td>
<td>Single-Point Urban Intersection</td>
<td></td>
<td>State Street through movements are uninterrupted via grade separation. A traffic signal controls VMP and 36th through traffic and all left-turn traffic.</td>
</tr>
</tbody>
</table>
Appendix C – Screening Matrix for Determining Preliminary Intersection Alternatives
### 22 Initial Alternatives

(last updated 7/30/12 prior to the addition of mid-block crossings and coordination with VRT and Stakeholders)

<table>
<thead>
<tr>
<th>No.</th>
<th>Alternative</th>
<th>Type</th>
<th>Illustration</th>
<th>Description</th>
<th>Pedestrians, Bicycles and Transit</th>
<th>Local Use</th>
<th>Safety</th>
<th>Capital Cost</th>
<th>Identified by Project Team for Further Analysis (Y=Yes, N=No)</th>
<th>Comments</th>
<th>Symbol</th>
<th>General</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No-Build Intersection</td>
<td>At-Grade</td>
<td><img src="image1.png" alt="Illustration" /></td>
<td>Crossing intersection</td>
<td><img src="image2.png" alt="Symbol" /> <img src="image3.png" alt="Symbol" /> <img src="image4.png" alt="Symbol" /></td>
<td><img src="image5.png" alt="Symbol" /></td>
<td><img src="image6.png" alt="Symbol" /></td>
<td><img src="image7.png" alt="Symbol" /></td>
<td><img src="image8.png" alt="Symbol" /></td>
<td>Required for Federal Aid</td>
<td></td>
<td>Excellent</td>
<td>None</td>
</tr>
<tr>
<td>2</td>
<td>No-Build Intersection plus Pedestrian Enhancements</td>
<td>At-Grade</td>
<td><img src="image9.png" alt="Illustration" /></td>
<td>Crossing intersection plus pedestrian enhancements (potential sidewalk extensions, mid-block crossings or a grade-separated crossing)</td>
<td><img src="image10.png" alt="Symbol" /> <img src="image11.png" alt="Symbol" /> <img src="image12.png" alt="Symbol" /> <img src="image13.png" alt="Symbol" /></td>
<td><img src="image14.png" alt="Symbol" /></td>
<td><img src="image15.png" alt="Symbol" /></td>
<td><img src="image16.png" alt="Symbol" /></td>
<td><img src="image17.png" alt="Symbol" /></td>
<td>Although identified as a separate alternative in the scope, the Project Team agreed to treat pedestrian enhancements as an interim measure that will be identified later in the concept design.</td>
<td></td>
<td>Good</td>
<td>Low</td>
</tr>
<tr>
<td>3</td>
<td>Conventional Intersection</td>
<td>At-Grade</td>
<td><img src="image18.png" alt="Illustration" /></td>
<td>Conventional signalized intersection with three through lanes (3 vehicle, 1 HOV/Transit) plus bike lanes. No additional through lanes on VMP or SB. The NB left turn movement is a trip left.</td>
<td><img src="image19.png" alt="Symbol" /> <img src="image20.png" alt="Symbol" /> <img src="image21.png" alt="Symbol" /> <img src="image22.png" alt="Symbol" /></td>
<td><img src="image23.png" alt="Symbol" /></td>
<td><img src="image24.png" alt="Symbol" /></td>
<td><img src="image25.png" alt="Symbol" /></td>
<td><img src="image26.png" alt="Symbol" /></td>
<td>Required per Scope</td>
<td></td>
<td>Fair</td>
<td>Moderate</td>
</tr>
<tr>
<td>4</td>
<td>Three-Lane Roundabout</td>
<td>At-Grade</td>
<td><img src="image27.png" alt="Illustration" /></td>
<td>Roundabout with three circulating lanes (3 vehicle, 1 bike/transit)</td>
<td><img src="image28.png" alt="Symbol" /> <img src="image29.png" alt="Symbol" /> <img src="image30.png" alt="Symbol" /></td>
<td><img src="image31.png" alt="Symbol" /></td>
<td><img src="image32.png" alt="Symbol" /></td>
<td><img src="image33.png" alt="Symbol" /></td>
<td><img src="image34.png" alt="Symbol" /></td>
<td>Total Flow - Synchro analysis of 2012 PM peak hour traffic results in LOS F, volume to capacity ratio greater than 1.8 and queues exceeding 2,700 feet.</td>
<td></td>
<td>Poor</td>
<td>High</td>
</tr>
<tr>
<td>5</td>
<td>Forward Jughandle Intersection</td>
<td>At-Grade</td>
<td><img src="image35.png" alt="Illustration" /></td>
<td>Roundabout routes left turn vehicles to the right to a secondary intersection. The secondary intersection would require signalization. Concept is used in Alternatives 14, 17 and 18.</td>
<td><img src="image36.png" alt="Symbol" /> <img src="image37.png" alt="Symbol" /> <img src="image38.png" alt="Symbol" /> <img src="image39.png" alt="Symbol" /></td>
<td><img src="image40.png" alt="Symbol" /></td>
<td><img src="image41.png" alt="Symbol" /></td>
<td><img src="image42.png" alt="Symbol" /></td>
<td><img src="image43.png" alt="Symbol" /></td>
<td>Total Flow - Similar to quadrant concept, used in alternatives 14, 15 and 17.</td>
<td></td>
<td>Good</td>
<td>None</td>
</tr>
<tr>
<td>6</td>
<td>Reverse Jughandle Intersection</td>
<td>At-Grade</td>
<td><img src="image44.png" alt="Illustration" /></td>
<td>Roundabout routes NB left turn vehicles through the primary intersection to a loop lane and then back through the primary intersection. A bypass lane or quadrant roadway would be required around the loop lane for SB right turn vehicles.</td>
<td><img src="image45.png" alt="Symbol" /> <img src="image46.png" alt="Symbol" /> <img src="image47.png" alt="Symbol" /> <img src="image48.png" alt="Symbol" /></td>
<td><img src="image49.png" alt="Symbol" /></td>
<td><img src="image50.png" alt="Symbol" /></td>
<td><img src="image51.png" alt="Symbol" /></td>
<td><img src="image52.png" alt="Symbol" /></td>
<td>Total Flow - Reverse Jughandle for NB left turn would negatively impact pedestrians, bicyclists and transit/HOV lane.</td>
<td></td>
<td>Poor</td>
<td>None</td>
</tr>
<tr>
<td>7</td>
<td>Continuous Flow Intersection (CFI), Parallel Flow Intersection plus</td>
<td>At-Grade</td>
<td><img src="image53.png" alt="Illustration" /></td>
<td>At a CFI left turn vehicle crosses over opposing through traffic prior to entering the intersection. (This allows the left turn vehicle to proceed through the intersection with the opposing through traffic, requiring only a two-phase signal at the primary intersection. A system of two coordinated traffic signals is required. The PFI is a patented design that is similar to the CFI.).</td>
<td><img src="image54.png" alt="Symbol" /> <img src="image55.png" alt="Symbol" /> <img src="image56.png" alt="Symbol" /> <img src="image57.png" alt="Symbol" /></td>
<td><img src="image58.png" alt="Symbol" /></td>
<td><img src="image59.png" alt="Symbol" /></td>
<td><img src="image60.png" alt="Symbol" /></td>
<td><img src="image61.png" alt="Symbol" /></td>
<td>Total Flow - Good for accommodating traffic demand but impacting pedestrian accommodations. Also bad for business access and transit accommodations.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Full Median U-Turn Intersection</td>
<td>At-Grade</td>
<td><img src="image62.png" alt="Illustration" /></td>
<td>Left turn vehicles are re-routed to signalized median U-turn intersections located 666' to 1,000' downstream on State Street. The primary intersection operates with two phases.</td>
<td><img src="image63.png" alt="Symbol" /> <img src="image64.png" alt="Symbol" /> <img src="image65.png" alt="Symbol" /> <img src="image66.png" alt="Symbol" /></td>
<td><img src="image67.png" alt="Symbol" /></td>
<td><img src="image68.png" alt="Symbol" /></td>
<td><img src="image69.png" alt="Symbol" /></td>
<td><img src="image70.png" alt="Symbol" /></td>
<td>Total Flow - NB left turn volume is too large to route through the intersection twice. Synchro analysis of 2012 PM peak hour traffic results in LOS F, volume to capacity ratio greater than 1.8 and unstable queues that exceed capacity.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### APPENDIX C - SCREENING MATRIX FOR DETERMINING PRELIMINARY INTERSECTION ALTERNATIVES

#### STATE STREET-VMP- 36TH STREET INTERSECTION

**CONCEPT DESIGN**  
ACHD Project No. 611026

#### 22 Initial Alternatives  
(last updated 7/30/12 prior to the addition of mid-block crossings and coordination with VRT and Stakeholders)

<table>
<thead>
<tr>
<th>No.</th>
<th>Alternative</th>
<th>Type</th>
<th>Illustration</th>
<th>Description</th>
<th>Vehicles</th>
<th>Pedestrians, Bicyclists and Transit</th>
<th>Local Use</th>
<th>Safety</th>
<th>Capital Cost</th>
<th>Identified by Project Team for Further Analysis (Note: green mark indicates)</th>
<th>Comments</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Pedestrian and Bicycle Impact</td>
<td>Overall Local Use Impact</td>
<td>Safety Improvement</td>
<td>Project Cost</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Rating</td>
<td>Rating</td>
<td>Rating</td>
<td>Rating</td>
<td>Rating</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Galleries for pedestrian and bicycle crossings at NFT intersections.</td>
<td></td>
</tr>
</tbody>
</table>
## 22 Initial Alternatives

(last updated 7/30/12 prior to the addition of mid-block crossings and coordination with VRT and Stakeholders)

<table>
<thead>
<tr>
<th>No.</th>
<th>Alternative</th>
<th>Type</th>
<th>Illustration</th>
<th>Description</th>
<th>Vehicles</th>
<th>Pedestrians, Bicyclists and Transit</th>
<th>Local Use</th>
<th>Safety</th>
<th>Capital Cost</th>
<th>Identified by Project Team for Further Analysis</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Expected</td>
<td>Expected Overall Impact</td>
<td>Expected Overall Safety Improvement</td>
<td>Expected Project Cost</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Demand</td>
<td>Land Use</td>
<td>Impact</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Quadrant Intersection 3: Quartet and Forward U-Guide

- **At-Grade**
- Illustration: [Image]

This alternative is a quadrant intersection with a U-gate guide. Vehicles are removed from the primary intersections using an additional roadway in one or more quadrants. The Anderson quadrant U-gate guide involves all left movements.

- Expected Demand: Moderate
- Expected Overall Impact: Poor
- Expected Overall Safety Improvement: Poor
- Expected Project Cost: Moderate

**Comments:** The vehicle operations are expected to be poor due to the close distance of the Anderson quadrant intersection to the primary intersection. Particularly in the AM peak, left turns are expected to be unavoidably long.

### Quadrant Intersection 4: Quartet and Forward U-Guide

- **At-Grade**
- Illustration: [Image]

This alternative is a quadrant intersection with a U-gate guide. Vehicles are removed from the primary intersections using an additional roadway in one or more quadrants. The Anderson quadrant U-gate guide involves all left movements.

- Expected Demand: Moderate
- Expected Overall Impact: Good
- Expected Overall Safety Improvement: Good
- Expected Project Cost: Moderate

**Comments:** Expected to accommodate vehicles, pedestrians, bicyclists, and transit relatively well. However, large right-of-way and construction costs are expected. Mid-block pedestrian crossings can be installed at the quadrant intersections.

### Quadrant Intersection 5: Quartet and Partial U-Guide

- **At-Grade**
- Illustration: [Image]

This alternative is a quadrant intersection with a U-gate guide. Vehicles are removed from the primary intersections using an additional roadway in one or more quadrants. The Anderson quadrant U-gate guide involves all left movements.

- Expected Demand: Moderate
- Expected Overall Impact: Good
- Expected Overall Safety Improvement: Good
- Expected Project Cost: Moderate

**Comments:** Expected to accommodate vehicles, pedestrians, bicyclists, and transit relatively well. However, large right-of-way and construction costs are expected. Mid-block pedestrian crossings can be installed at the quadrant and U-Guide intersections.

### Partial Median-L-Shape and Partial U-Guide

- **At-Grade**
- Illustration: [Image]

This alternative is a partial median L-shape and partial U-gate guide. Vehicles are removed from the primary intersections using U-Guide concepts. The remaining left turn movements are re-routed using median to turn intersections on State Street. The primary intersection operates with three phases.

- Expected Demand: Moderate
- Expected Overall Impact: Good
- Expected Overall Safety Improvement: Good
- Expected Project Cost: Moderate

**Comments:** Expected to accommodate vehicles, pedestrians, bicyclists, and transit relatively well, and have less right-of-way and construction costs compared to the quadrant alternatives. Mid-block pedestrian crossings can be installed at the U-Guide and U-Guide intersections.

### Hybrid Flyover

- **Grade Separated**
- Illustration: [Image]

This alternative is a hybrid flyover. The left turn movement is grade separated.

- Expected Demand: High
- Expected Overall Impact: Poor
- Expected Overall Safety Improvement: Poor
- Expected Project Cost: High

**Comments:** The construction cost versus the operational benefit is less preferable than the U-Guide alternative.

### Single-Point Urban Intersection

- **Grade Separated**
- Illustration: [Image]

This alternative is a single-point urban intersection. State Street through movements are uninterrupted via grade separation. A traffic signal controls VMP and 36th through traffic and all left turn traffic.

- Expected Demand: High
- Expected Overall Impact: Good
- Expected Overall Safety Improvement: Good
- Expected Project Cost: High

**Comments:** Previous analysis has shown that this alternative operates relatively well for vehicle traffic, however, it requires large construction costs and accommodates pedestrians, bicyclists, and transit addition.
TO: Sabrina Anderson, Manager, Planning and Programs, ACHD
FROM: Kathleen Lacey, Comprehensive Planner
DATE: March 19, 2013
RE: Boise City Council Comments, VMP/State/36th Street Intersection Concept Design

Background: On January 15th and March 12, 2013, Ada County Highway District (ACHD) staff gave presentations to the Boise City Council on the concept study and project team recommendations for the VMP/State/36th St. intersection design. The ACHD Commission requested comments and approval of the concept design from the Council.

Council Action: On March 12, 2013 the Boise City Council declined to make a recommendation on the proposed concept design, Alternative 9 – Partial Median U-Turn.

Council Concerns with Alternative 9: The City Council expressed the following concerns:

- 2035 projections for vehicle delay may not occur if driving habits change and daily VMT continues to drop or increase minimally
- Improving vehicle flow may create a negative impact on adjacent land uses
- Widening the intersection could encourage additional single occupancy vehicle travel and delay implementation of increased transit service
- Council opposed three left turning lanes on any segment of the intersection
- Council expressed concern for pedestrian and bicyclist safety even with the two-phased bike/ped signals off-set from the intersections
- Council stated concerns with unbroken medians extending more than 300-500 ft. from the intersection
- Council requested review of the proposed storm water retention pond to implement a more urban, low impact design
- Council requested that if changes are made to the intersection, they be phased, with pedestrian and bicycle improvements constructed as the first activity to enable drivers to acclimate to the pedestrian and bicycle movements.
- Council supported constructing the intersection in accord with the planned commercial arterial standards in the Livable Streets Design Guide and with designs appropriate for an urban commercial corridor
- All physical improvements constructed need to be designed and of high quality materials in the context of an urban activity center where pedestrian activity is desired and welcomed rather than giving a perception that pedestrian activity is unsafe.