

APPENDIX H
**ALTERNATIVE DEVELOPMENT EVALUATION
AND EVALUATION FRAMEWORK**

Murphy Road Corridor Study: Evaluation Framework

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DATE: October 27, 2006, revised December 4, 2006

The purpose of this memorandum is to outline the proposed alternative evaluation process and evaluation criteria for the Murphy Road Corridor project. The evaluation criteria will be used by the technical team and the Technical Advisory Committee (TAC) to evaluate the performance of each alternative against a broad range of important project characteristics, representing a full range of city and stakeholder values. The evaluation criteria tie back to the findings from the September 13-14, 2006 stakeholder interviews and the October 2, 2006 TAC meeting. The criteria were revised based on comments from the TAC at its November 7, 2006 meeting. Where possible, evaluation criteria are composed to highlight differences among alternatives.

The evaluation will contain a mixture of quantitative and qualitative measures. Draft performance measures have been developed to rate each evaluation criterion. Performance measures rate the extent to which the alternative achieves the criteria. All criteria will have a constructed scale, generally following the layout described in Table 1 below:

TABLE 1
Overview of Murphy Corridor Study Evaluation Scale

Rating	Description
4	Alternative directly and positively addresses the intent of the criterion.
2	Alternative partially meets the intent of the criterion, addressing some but not all of the objectives.
0	Alternative neither meets nor does not meet intent of criterion. Alternative has no effect, or criterion does not apply.
-2	Alternative does not support the intent of, or negatively impacts, the criterion.

The eight proposed evaluation criteria for the Murphy Road Corridor Study are listed below and described over the next several pages.

- Congestion/Mobility
- Connectivity

- Constructability
- Cost
- Environment – Built (Residential/Business Impacts)
- Environment – Natural
- Multimodal Solutions
- Safety

The evaluation will be conducted at a segment level, with up to ten alternatives being evaluated in total for the Murphy Road Corridor. Organizing alternatives at a segment level allows the team to focus in on those aspects that are most important for each segment. Right of way constraints, for example, may be more critical at one portion of the corridor where environmental impacts may be most critical for another segment. The alternatives may be broken out into segments as follows:

- Segment 1 – SE 3rd Street to Parrell Road: two alternatives assumed, representing two different cross sections
- Segment 2 – Parrell Road to Brosterhous Road: two alternatives assumed, representing two different cross sections
- Segment 3 – Brosterhous Road to SE 15th Street: three alternatives assumed, representing three horizontal alignments for one cross section
- Segment 4 – SE 15th Street to SE 27th Street: zero to three alternatives assumed, planning level for one cross section

No alternatives will be considered west of SE 3rd Street, though the preferred Murphy Corridor alternative will align with the proposed overpass.

Planning level analysis of an alignment east of SE 15th Street will be dependant on the results of initial traffic modeling work, which will identify whether an extension to SE 27th Street should be added to the Bend Transportation System Plan (TSP). If an extension is warranted, the planning level analysis would determine at a cursory level what should be shown in the TSP.

Once the initial evaluation is completed, the preferred options for each segment will be linked and the team will analyze them together at a corridor scale.

Evaluation Criteria

Evaluation criteria are used to differentiate and identify the strengths and weaknesses of each alternative and are most effective when they highlight differences between alternatives. Evaluation criteria must also be measurable and well-defined, allow for a clear comparison among alternatives, and create a mutual understanding of its meaning. The seven draft evaluation criteria for the Murphy Road Corridor project are described over the following pages.

Congestion/Mobility

Objective: To provide a viable transportation solution that accommodates expected future growth along Murphy Road, improves mobility for both local and regional traffic, and retains access to major commercial areas. To meet this objective, the alternative should meet appropriate travel mobility standards (measured as a ratio of volume-to-capacity [v/c]), and provide a not unreasonable delay, both along Murphy Road and at Murphy Road intersections. Relevant mobility standards for all study intersections along Murphy Road are a v/c for individual lane groups less than or equal to 1.0. Unreasonable delay is defined as a delay for any individual lane group of more than 50 seconds for a two-way stop control intersection, or a delay of more than 80 seconds for an all-way stop control or signalized intersection.

Measure: Volume-to-capacity (v/c), Delay

Rating	Description
4	Alternative improves expected future traffic flow along Murphy Road when compared to the future no build alternative. The alternative meets relevant v/c standards and is within acceptable levels of delay at all Murphy Road intersections.
2	Alternative slightly improves expected future traffic flow along Murphy Road when compared to the future no build alternative. The alternative meets relevant v/c standards and is within acceptable levels of delay at some, but not all Murphy Road intersections.
0	Alternative has no effect, or neither meets nor does not meet intent of criterion. Criterion does not apply.
-2	Expected future traffic flow along Murphy Road is the same or worse when compared to the future no build alternative. It does not reduce, and may increase, congestion at intersections in terms of v/c and delay.

Connectivity

Objective: Support relevant City goals for improved connectivity in Bend. Address stated stakeholder needs of improving east-west access and connectivity in south Bend. The alternative would address this need by providing direct and efficient access to and between origins and destinations along Murphy Road, southeastern Bend, the Parkway, and downtown. Support improvements that minimize out-of-direction travel and minimize travel times.

Measure: Trip travel distance, travel time.

Rating	Description
4	Alternative provides new connection or improves an existing connection point or facility that substantially minimizes travel time and/or out-of-direction

	travel for regional, local, visitor, and commercial trips, and for non-auto modes.
2	Alternative provides a new connection or improves an existing connection point or facility, leading to a minor reduction in travel time and/or out-of-direction travel for regional, local, visitor, and commercial trips, and for non-auto modes.
0	Alternative has no impact on travel time or directness of travel.
-2	Alternative limits or reduces transportation options or connectivity, increases travel time; and/or requires out-of-direction travel for large portion of users.

Constructability

Objective: Minimize construction impacts and risks. Consider construction staging, specifically regarding minimizing impacts to traffic and the adjacent residents. Optimize use of existing pavement sections in an effort to reduce overall construction costs.

Measure: Assessment of cost efficiencies during construction; comparison of project alternative with other projects around the urban area for funding competitiveness purposes; ability to be built in phases and/or use of existing pavement; and impacts during construction.

Rating	Description
4	Alternative provides a cost effective solution. Construction impacts are minimal and construction staging maintains traffic flow while completing utility relocations, drainage system installations, road grade changes, and other elements of construction. The largest square footage of existing pavement is used in this alternative. Alternative provides opportunities to be built in phases
2	Cost effectiveness of alternative is not clear. The alternative has limited opportunities for building in phases. Construction impacts are moderate and construction staging reduces traffic flow. A moderate amount of existing pavement is used in this alternative.
0	Alternative neither meets nor does not meet intent of criterion. Criterion does not apply.
-2	The alternative is not considered cost effective. There is a limited opportunity for phasing. Construction impacts are substantial and construction staging greatly reduces traffic flow. A small percentage of existing pavement is used in this alternative.

Cost

Objective: To serve as a cost effective investment of public funds.

Measure: Order-of-magnitude cost estimates (to include design, right of way acquisition, and construction).

Rating	Description
4	Alternative provides a cost effective solution and/or alternative cost estimate is within lower third of all alternatives.
2	Cost effectiveness of alternative is not clear, and/or alternative cost estimate is within second lower third of all alternatives.
0	Alternative neither meets nor does not meet intent of criterion. Criterion does not apply.
-2	The alternative is not considered cost effective, and/or alternative cost estimate is within highest third of all alternatives.

Environment – Built (Residential/Business Impacts)

Objective: To avoid, minimize, and/or mitigate impacts to residences and businesses along Murphy Road.

Measure: Number of businesses and residences impacted and severity of impact; number of homes or businesses displaced; qualitative assessment of alternative’s impact on air quality and noise; ability to appropriately mitigate impacts.

Rating	Description
4	Alternative avoids or contains minimal impacts to businesses and residences. No residences or business are displaced. Smallest number of businesses/residences within 30 feet of the existing road (edge of the pavement) that will have a reduced distance to the proposed curb of the alternative. No intersections along Murphy Road have a v/c of higher than 0.90 (proxy for air quality), and total volumes not expected to increase substantially when compared to the no build (proxy for noise).
2	Alternative has minor impacts that may be difficult to mitigate, or major impacts that can be mitigated. One or two residences or business are displaced. Second smallest number of businesses/residences within 30 feet of the existing road (edge of the pavement) that will have a reduced distance to the proposed curb of the alternative. One intersection maintains a v/c of higher than 0.90 (proxy for air quality). Total traffic volumes increase substantially, but not more than 200%, compared to no build (proxy for noise).
0	Alternative neither meets nor does not meet intent of criterion. Criterion does not apply.
-2	Alternative has impacts that are considered substantial and/or may not easily be mitigated. Three or more residences or business are displaced. Third smallest number of businesses/residences within 30 feet of the existing road (edge of the

	pavement) that will have a reduced distance to the proposed curb of the alternative. Two or more intersections along Murphy Road have a v/c of higher than 0.90 (proxy for air quality). Total traffic volumes along Murphy Road are more than 200% of no build (proxy for noise).
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Environment – Natural

Objective: To avoid impacts to the Area of Special Interest (ASI) located immediately east of the BNSF railroad tracks. If impossible to avoid the ASI, minimize impacts and mitigate consistent with the City of Bend Development Code.

Measure: Qualitative assessment of alternative’s impact on ASI according to Exhibit C (“Upland Areas of Special Interest”) of Section 2.7.700 of the Bend Development Code.

Rating	Description
4	Alternative avoids impacts to ASI, and/or protects and enhances the ASI.
2	Alternative has minimal impacts on ASI, which are easy to mitigate in a manner consistent with the Bend Development Code.
0	Alternative has substantial impacts to the ASI, which may be difficult to mitigate in a manner consistent with the Bend Development Code.
NA	Alternative neither meets nor does not meet intent of criterion. Criterion does not apply.

Multimodal Solutions

Objective: To develop a balanced transportation solution that serves multiple modes of transportation, including drivers (passenger and commercial), bicyclists, transit riders, and pedestrians; and meets the needs of all users, including youth, elderly, and those with physical disabilities. To provide an interconnected system of pedestrian and bicycle facilities along Murphy Road for commuting and recreational uses.

Measure: Qualitative assessment of alternative’s provision of services to users of all modes. Qualitative assessment of safety and continuity of bicycle and pedestrian routes to R.E. Jewell elementary school and the future middle school and high school. Qualitative factors include directness and convenience of route, and quality of environment (in terms of grade, lighting, and drainage).

Rating	Description
4	Alternative creates or completes a continuous bicycle and/or pedestrian link to serve commuters and/or recreational users, accommodates future bus transit along Murphy Road, and clearly benefits all users, including youth, elderly, and those with disabilities.

2	Alternative makes minimal improvements to the bike and sidewalk network along Murphy Road. Alternative benefits a subset of the population, and benefits to the youth, elderly, and physically disabled populations are minor and/or indirect. Alternative accommodates future bus transit along Murphy Road
0	Alternative makes no improvements to the bicycle and pedestrian network along Murphy Road, and/or detracts from the existing bicycle and pedestrian network. The alternative does not serve or benefit youth, elderly, and those with physical disabilities. Alternative does not accommodate future bus transit along Murphy Road
NA	Alternative neither meets nor does not meet intent of criterion. Criterion does not apply.

Safety

Objective: To minimize safety conflicts and improve operational safety for all current and future users of the corridor, including autos, freight, transit, bicyclists, and pedestrians. Minimize emergency response times.

Measure: Number of conflict points/movements under each alternative, comparison of alternative against design standards, qualitative assessment of ability to divert traffic away from known safety concerns, and qualitative assessment of travel time change for emergency response times.

Rating	Description
4	Alternative addresses known operational safety issues (if any), provides a lower number of potential conflict points than other alternatives, and is largely consistent with City design standards. Emergency response times are improved under this alternative.
2	Alternative is largely consistent with City design standards, but does not directly address or minimally addresses known safety issues. Number of potential conflict points is not reduced or is the same as or greater than other alternatives. Alternative neither improves nor harms emergency response times.
0	Alternative adds conflict points or otherwise creates an additional safety problem for users, and may increase emergency response times.
NA	Alternative neither meets nor does not meet intent of criterion. Criterion does not apply.

Murphy Road Corridor Study: Alternatives Development and Evaluation Process

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Introduction

This technical memorandum describes the five alternatives developed for the Murphy Road Corridor, between Parrell Road and 15th Street, and the results of an evaluation process performed on these alternatives. Findings from the evaluation process are included. This memo is intended to assist the City of Bend and the project's Technical Advisory Committee (TAC) in weighing the benefits and limitations of each alternative and selecting one preferred alternative for recommendation to City Council at their September 19th meeting. This memo will be revised once a preferred alternative has been selected and endorsed to document that decision process.

Overview

Evaluation criteria were developed for the Murphy Road Corridor Study. These criteria were used by the technical team and the TAC to evaluate the performance of each alternative against a broad range of important project characteristics, representing a full range of city and stakeholder values. Where possible, evaluation criteria were composed to highlight differences among alternatives.

All criteria had a constructed scale, generally following the layout described in Table 1 below (except where noted):

TABLE 1
Overview of Murphy Corridor Study Evaluation Scale

Rating	Description
4	Alternative directly and positively addresses the intent of the criterion.
2	Alternative partially meets the intent of the criterion, addressing some but not all of the objectives.

TABLE 1
Overview of Murphy Corridor Study Evaluation Scale

Rating	Description
0	Alternative neither meets nor does not meet intent of criterion. Alternative has no effect or criterion does not apply.
-2	Alternative does not support the intent of, or negatively impacts, the criterion.
Note: 3 or -1	Some alternatives received a (3) or a (-1) rating, to provide differentiation from other alternatives. In these cases, the alternative was somewhere between a 2 and 4 rating or between 0 or -2 rating. Details are provided in the notes.

The eight evaluation criteria for the Murphy Road Corridor Study are listed below and described in more detail in the Evaluation Framework Memo (Technical Memo 7.1).

- Congestion/Mobility
- Connectivity
- Constructability
- Cost
- Environment - Built (Residential/Business Impacts)
- Environment - Natural
- Multimodal Solutions
- Safety

Overview of Alternatives

Five alternatives were developed for the Murphy Road Corridor between Parrell Road and 15th Street. Three (Alternatives A-C) were presented at a TAC meeting on March 6, 2007. The fourth (Alternative D) was presented at a public open house on April 5th (along with the original three) and at a TAC meeting on April 18th. The fifth (Alternative E) was developed upon the request of the City of Bend in July 2007. All alternatives provided improvements to the existing Murphy Road corridor between Parrell Road and Brosterhous Road, as well as including an extension of Murphy Road between Brosterhous Road and 15th Street. All alternatives completed the sidewalk system between Parrell Road and 15th Street, and retained and continued on-street bicycle lanes. A description of the five alternatives is provided below:

- **Alternative A (Continuous Three-Lane Section, Consistent with City Design Standards):** This alternative widens Murphy Road to meet City design standards, as outlined in the City of Bend Development Code. The cross section of Murphy Road for Alternative A includes two 14' travel lanes (one lane in each direction), a 16' center-turn lane, and two 6' on-street bicycle lanes, as well as 6' planter strips and 6' sidewalks on both sides of Murphy Road (see Figure 1). The minimum right-of-way needed for this alternative is 80'. Because existing right-of-way is 60', this alternative requires 10' of right-of-way on both the north and the south of Murphy Road. Signals and left-turn lanes are installed at Parrell Road, Country Club Road, and Brosterhous Road (see Figure 2). The 15th Street intersection would be stop controlled with an extended left turn pocket on Murphy Road.

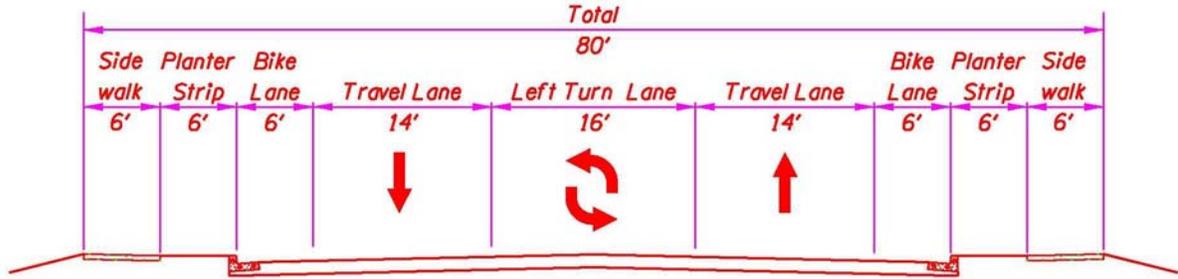


Figure 1: Alternative A Cross Section (Entire Corridor)



Figure 2: Example of a Signalized Interchange (Country Club Drive and Murphy Road)

- Alternative B (Two-Lane Section with Increased Capacity at Key Intersections):** This alternative consists of a two-lane cross section between Parrell and Brosterhous with signals at key intersections. Under Alternative B, the corridor remains similar to what exists today; with two 12' travel lanes (one in each direction), 6' on-street bicycle lanes, and 6' wide sidewalks (see Figure 3). The sidewalk network is extended to create a continuous sidewalk network throughout the corridor. This alternative installs signals at Parrell Road, Country Club Road, and Brosterhous Road. The minimum right-of-way needed for this alternative is 48' (less than the existing right-of-way line). Between Brosterhous Road and 15th Street, Murphy Road would be comprised of two 14' travel lanes and an extended 16' left-turn pocket (approaching 15th Street); additionally two 6' on-street bicycle lanes and 6' sidewalks would be located on both sides of Murphy Road (see Figure 4). The 15th Street intersection would be stop-controlled. This alternative requires an exception from City design standards (for the section between Parrell Road and Brosterhous Road).

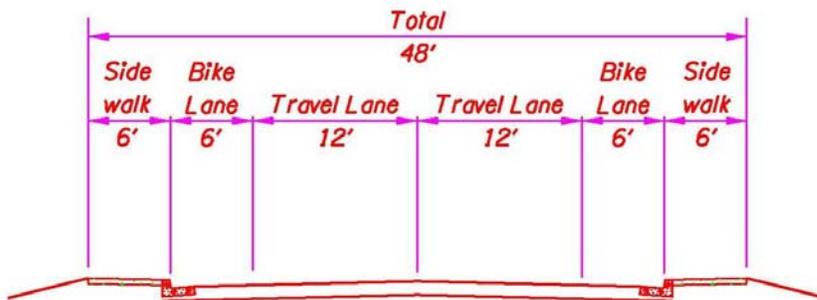


Figure 3: Alternative B and C Cross Section (from Parrell Road to the Railroad over crossing)

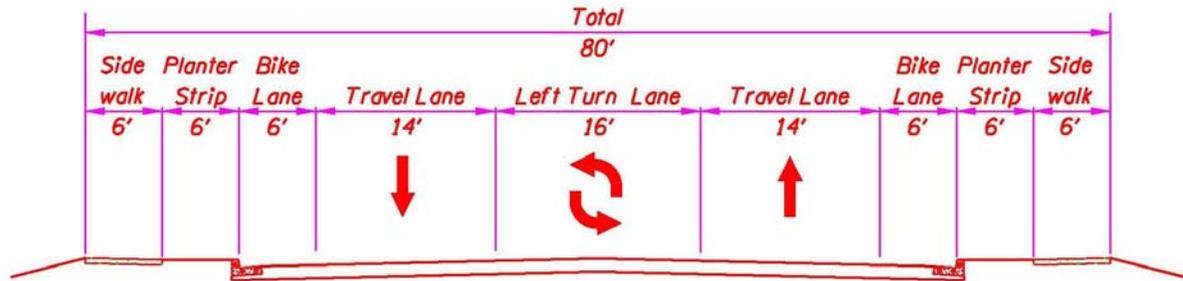


Figure 4: Cross Section between Brosterhous Road and 15th Street (for Alternatives B, C, D, and E)

- Alternative C (Two-Lane Section with Roundabouts at Key Intersections):** This alternative is similar to Alternative B, but installs roundabouts in lieu of signals at Parrell Road, Country Club Road, and Brosterhous Road (see Figure 3). The radius of the roundabouts is estimated to be 55' and with entry widths of 16' (see Figure 5). Between Brosterhous Road and 15th Street, Murphy Road would be comprised of two 14' travel lanes and an extended 16' left-turn pocket (approaching 15th Street); additionally two 6' on-street bicycle lanes and 6' sidewalks would be located on both sides of Murphy Road (see Figure 4). The 15th Street intersection would be stop-controlled. This alternative requires an exception from City design standards (for the section between Parrell and Brosterhous).

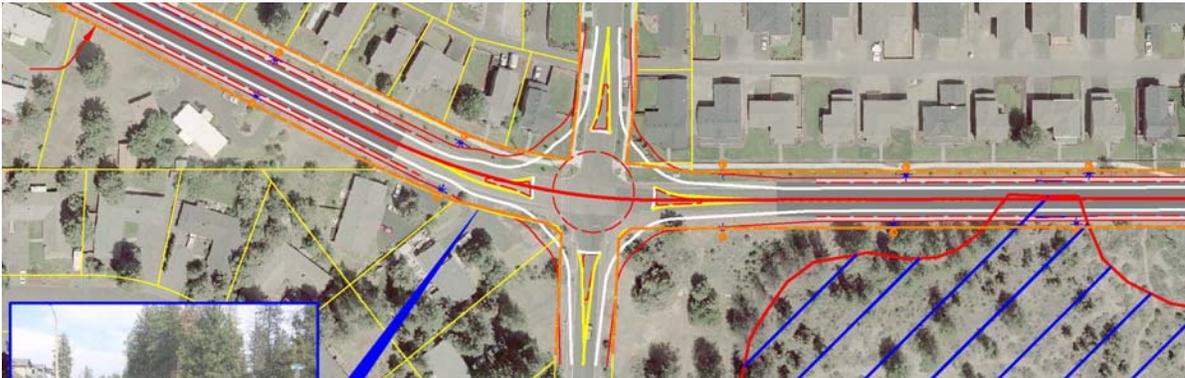


Figure 5: Example of a Roundabout Interchange (Country Club Drive and Murphy Road)

In March 2007, the TAC requested that the technical team produce a hybrid alternative that would provide the benefits of a three lane cross section (similar to Alternative A) but narrower than what is required by City of Bend design standards. This alternative was developed with roundabouts at key intersections (similar to Alternative C). This hybrid alternative, Alternative D, is described below:

- Alternative D (Reduced Width Three-Lane Section with Roundabouts at Key Intersections):** This alternative includes roundabouts at key intersections, while reducing the cross section of the roadway, to minimize right-of-way acquisition between intersections. The radius of the roundabouts is estimated to be 55' and with entry widths of 16' (see Figure 5). From Parrell Road to Brosterhous Road, the corridor has three 12' travel lanes (one in each direction and a center turn lane) as well as a 6' on-street bicycle

lane and a 6' sidewalk on both sides of Murphy Road (see Figure 6). Between Brosterhous Road and 15th Street, Murphy Road would be comprised of two 14' travel lanes and an extended 16' left-turn pocket (approaching 15th Street); additionally two 6' on-street bicycle lanes and 6' sidewalks would be located on both sides of Murphy Road (see Figure 4). The 15th Street intersection would be stop-controlled. This alternative requires an exception from City design standards (for the section between Parrell and Brosterhous).

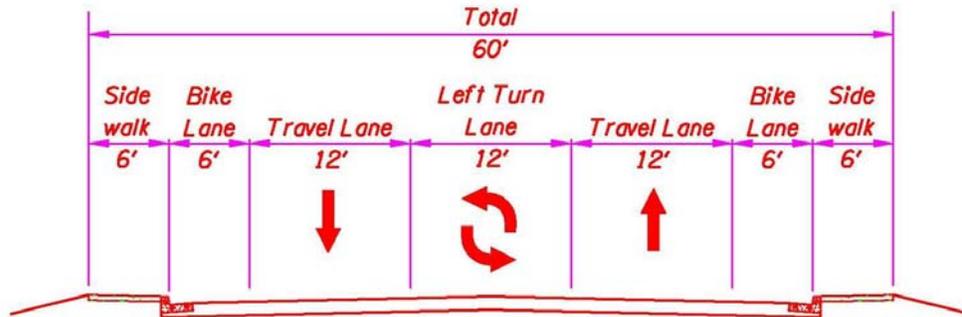


Figure 6: Alternative D and E Cross Section (from Parrell to Brosterhous)

Between April and July 2007, new aerial photographs were taken and additional survey data were collected to assist in the refinement of the above alternatives. The technical team created a variation of Alternative D after this new data was available, to compare the impacts of signalized versus roundabout intersections along Murphy Road. This new alternative, Alternative E, is described below.

- Alternative E (Reduced Width Three-Lane Section with Signals at Key Intersections):**
 The cross section of this alternative is identical to Alternative D (see Figure 6), but includes signals at key intersections (Parrell Road, Country Club Road, and Brosterhous Road). Between Parrell Road and Brosterhous Road, the corridor has three 12' travel lanes (one in each direction and a center turn lane). There is also a 6' on-street bicycle lane and 6' sidewalk on both sides of Murphy Road through this section. Between Brosterhous and 15th Street, Murphy Road would be comprised of two 14' travel lanes and an extended 16' left-turn pocket (approaching 15th Street); additionally two 6' on-street bicycle lanes and 6' sidewalks would be located on both sides of Murphy Road (see Figure 4). The 15th Street intersection would be stop-controlled. This alternative requires an exception from City design standards (for the section between Parrell and Brosterhous).

Evaluation of Alternatives

Table 2 summarizes the results of the alternatives evaluation process. This matrix documents the measurement methods, performance of each alternative, and any assumptions made by the technical team and the TAC when evaluating the five Murphy Road Corridor alternatives.

TABLE 2
Evaluation of Alternatives Matrix

Objectives & Criteria	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
CONGESTION/MOBILITY MEASURE: V/C, DELAY					
RATING	4	2 (3)	2 (3)	4	4
NOTES	- All alternatives will improve congestion over the no build. - Alternative A performs better than Alternatives B and C by removing left-turn vehicles from the main through movement traffic streams along EB/WB Murphy Road.	- Alternative will improve congestion when compared to no build. - A slight increase in delay may occur over Alternative A due to mid-block left turn vehicles blocking through trips along EB/WB Murphy.	- Alternative will improve congestion when compared to no build. - A slight increase in delay may occur over Alternative A due to mid-block left turn vehicles blocking through trips along EB/WB Murphy.	- Alternative will improve congestion when compared to no build. - Alternative D performs better than Alternatives B and C by removing left-turn vehicles from the main through movement traffic streams along EB/WB Murphy Road.	- Alternative will improve congestion when compared to no build. - Alternative E performs better than Alternatives B and C by removing left-turn vehicles from the main through movement traffic streams along EB/WB Murphy Road.
CONNECTIVITY MEASURE: TRIP TRAVEL DISTANCE, TRAVEL TIME					
RATING	4	4	4	4	4
NOTES	- All alternatives will improve connectivity when compared to no build.	- All alternatives will improve connectivity when compared to no build.	- All alternatives will improve connectivity when compared to no build.	- All alternatives will improve connectivity when compared to no build.	- All alternatives will improve connectivity when compared to no build.

TABLE 2
Evaluation of Alternatives Matrix

Objectives & Criteria	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
CONSTRUCTABILITY					
MEASURE: COST EFFICIENCIES, FUNDING COMPETITIVENESS, PHASING POTENTIAL, IMPACTS DURING CONSTRUCTION					
RATING	2	4	2	2	4
NOTES - Utility relocations will be about the same for alternatives.	- This alternative impacts driveway connections to Murphy Road. A moderate amount of existing pavement is used, though it is not clear whether the condition of the pavement substructure will allow reuse.	- The largest amount of existing pavement is used under this alternative, though it is not clear whether the condition of the pavement substructure will allow reuse.	- This alternative has the highest initial construction cost, and the largest impact to construction phasing. Require detours during construction of roundabouts	- A moderate amount of existing pavement is used under this alternative, though it is not clear whether the condition of the pavement substructure will allow reuse. - Require detours during construction of roundabouts.	- A moderate amount of existing pavement is used under this alternative, though it is not clear whether the condition of the pavement substructure will allow reuse. - No detours needed.
COST					
MEASURE: ORDER-OF-MAGNITUDE COST ESTIMATES					
RATING	2	4	- 2	- 2	4
NOTES	- Third highest ROW acquisition and initial construction cost.	- The lowest cost, due to low ROW acquisition, storm sewer & utility relocations.	- Second highest ROW acquisition. Most storm sewer modifications.	- Highest acquisition cost and increased cost to widen and reconstruct storm sewer system and incorporate roundabouts.	- Second lowest cost; due to low ROW acquisition cost, with a smaller cost to widen road and reconstruct storm sewer system.

TABLE 2
Evaluation of Alternatives Matrix

Objectives & Criteria	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
ENVIRONMENT – BUILT (RESIDENTIAL/BUSINESS IMPACTS)					
MEASURE: BUSINESS AND RESIDENCES IMPACTED, BUSINESSES AND RESIDENCES DISPLACED, AIR QUALITY, NOISE, ABILITY TO MITIGATE					
RATING	-2	2	-2 (- 1)	- 2	2
NOTES - Air quality and noise were not determining factors for any of these alternatives.	- An estimated one house would be displaced (ODOT design/connection). - An estimated 30 houses or businesses are within 30' of the existing right of way.	- One residence would be displaced and a minimal amount of property will be acquired at intersections (ODOT design/connection). - No houses or businesses are within 30' of the existing right of way and could be negatively impacted.	- Impacts are at the roundabouts, including impacts to built environment and access to road. - Four houses are expected to be displaced (ODOT design/connection will determine one of these homes) - Three houses or businesses are within 30' of the existing right of way and would be negatively impacted.	- Impacts are primarily at the roundabouts, including impacts to the built environment and access to the road. - Up to seven houses or businesses would be displaced (ODOT design/connection will determine one of these homes). - Six houses or businesses are within 30' of the existing right of way and could be negatively impacted. - Three substantial access issues to resolve.	- One residence would be displaced and a minimal amount of property will be acquired at intersections (ODOT design/connection). - No houses or businesses are within 30' of the existing right of way and could be negatively impacted.
ENVIRONMENT – NATURAL					
MEASURE: IMPACT ON ASI					
RATING	2	4	4	4	4
NOTES - There are no impacts to the ASI immediately east of the railroad tracks.	- Approximately 10' to 15' of the ASI immediately east of Country Club Road would be impacted. Since the ASI boundary was already entered, and this alternative would expand on the existing roadway, the impacts are minimal.	- There are no additional impacts to the ASI immediately east of Country Club Road.	- There are no additional impacts to the ASI immediately east of Country Club Road.	- There are no additional impacts to the ASI (immediately east of Country Club Road) outside of the existing right of way line, however, some of the ASI within that area may be affected.	- There are no additional impacts to the ASI (immediately east of Country Club Road) outside of the existing right of way line, however, some of the ASI within that area may be affected.

TABLE 2
Evaluation of Alternatives Matrix

Objectives & Criteria	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
MULTIMODAL SOLUTIONS					
MEASURE: PROVISION OF SERVICES TO USERS OF ALL MODES, SAFETY AND CONTINUITY OF BICYCLE AND PEDESTRIAN ROUTES TO SCHOOLS					
RATING	4	4	4	4	4
NOTES - All users benefit from this alternative, since the pedestrian and bicycle facilities are connected and form a continuous link. - Suggested pedestrian crossing slightly west of the old school drive to Jewell Elementary to provide a safe, mid-block connection.	- Good visibility throughout corridor. - A median refuge may be needed, and/or longer signal time to allow safe crossings for elderly, physically disabled, and/or youths.	- Future improvements for buses can be built incrementally; bus pullout may be beneficial for traffic flow. Since the alternative is within the existing right of way, pullouts could be added later with minimal impacts to some areas of the road. - Good visibility throughout corridor.	- Future improvements for buses can be built incrementally; bus pullout may be beneficial for traffic flow. Since the alternative is within the existing right of way, pullouts could be added later with minimal impacts to some areas of the road. - Visibility is good between roundabouts. - Elderly, disabled, and/or young users of the road may have difficulty crossing the road at the roundabout. It may require longer waits or more education (to users of the road and signage). However, the comfort level of pedestrians and bicyclists with roundabouts is high in Bend, and this was not felt to be of great concern.	- Visibility is good between roundabouts. - Elderly, disabled, and/or young users of the road may have difficulty crossing the road at the roundabout. It may require longer waits or more information (to users of the road and signage). However, the comfort level of pedestrians and bicyclists with roundabouts is high in Bend, and this was not felt to be of great concern.	- Good visibility throughout corridor. - A median refuge may be needed, and/or longer signal time to allow safe crossings for elderly, physically disabled, and/or youths.

TABLE 2
Evaluation of Alternatives Matrix

Objectives & Criteria	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
SAFETY					
MEASURE: NUMBER OF CONFLICT POINTS/MOVEMENTS, COMPARISON AGAINST DESIGN STANDARDS, ABILITY TO DIVERT TRAFFIC AWAY FROM KNOWN CONCERNS, TRAVEL TIMES FOR EMERGENCY RESPONSE					
RATING	2	0	2	4	2
NOTES	- Separates mid-block turning vehicles from through lanes. Concern about higher vehicle speeds due to wider roadway, leading to a greater number of and more severe crashes. - Emergency response time is improved when compared to no build and to Alternatives B and C.	- Number of conflict points is not reduced, and the alternative does not improve or harm response time. - The Alternative neither meets nor does not meet the intent of this criterion.	- Alternative reduces number of turning vehicle conflicting points and decreases severity of crashes in intersection vicinity. - The alternative may increase response time for emergency vehicles, though all agreed that design of roundabout should include adequate approach widths and internal radius to best accommodate and serve emergency vehicles.	- This alternative provides the least number of conflicting points at intersections and segments within the intersections. - The flush medians and wider radius, inscribed circle diameter and lane width within roundabout provides easier maneuvering of emergency vehicles. - Emergency response time between roundabouts is improved when compared to no build and to Alternatives B and C.	- Separates mid-block turning vehicles from through lanes. Concern about higher vehicle speeds due to wider roadway, leading to a greater number of and more severe crashes. - Emergency response time is improved when compared to no build and to Alternatives B and C.
TOTAL SCORE	18	24 (25)	14 (16)	18	28

Findings

The five alternatives ranged from a high total score of 28 points (for Alternative E) to a low of 14 points (for Alternatives C). The general findings are as listed below; alternatives are listed in order from the highest score to the lowest:

- **Alternative E (Reduced Width Three-Lane Section with Signals at Key Intersections):** This alternative scored the highest of the five. The reduced cross section helped to reduce the impact to the built and natural environment, while keeping costs low. Keeping the center turn lane also increased the mobility and safety of the alternative.
- **Alternative B (Two-Lane Section with Increased Capacity at Key Intersections):** This alternative received the second highest score. Since it was a smaller cross section it cost the least, had minor impacts to the built environment and no additional impacts to the

natural environment. However, this alternative had no safety improvements when compared to the current Murphy Road.

- **Alternative A (Continuous Three-Lane Section):** While this cross section met City design standards, it required right-of-way acquisition from over 30 properties and impacted one of the areas of special interest (ASI). The full width, three-lanes also carried a high cost estimate.
- **Alternative D (Reduced Width Three-Lane Section with Roundabouts at Key Intersections):** This alternative scored low for the same reasons as Alternative C, with larger costs and impacts to the built environment. However, this alternative did provide a center turn lane which increased the mobility and safety of the alternative. Roundabouts would also require a detour of traffic from Murphy Road during construction.
- **Alternative C (Two-Lane Section with Roundabouts at Key Intersections):** This alternative received the lowest total score. While congestion and safety improvements were made due to the roundabouts, it carried an increased cost and impacts to the built environment. The highest number of houses would be displaced with this alternative because of the right-of-way needed at each intersection. Access would also be of concern for residences that were not displaced, but would be located too near the roundabout to safely access the street. Roundabouts would also require a detour of traffic from Murphy Road during construction.

Next Steps

The results of this evaluation process were discussed with the City of Bend and the TAC in September 2007. Comments from these groups were incorporated into the evaluation framework and into this memorandum. The TAC recommended selecting alternatives D and E as preferred alternatives at the Bend City Council during their September 19, 2007 meeting. On November 7, 2007 the City Council agreed with the recommendations and deferred a decision as to specific intersection design and consistency of the center lane to the design phase.