



# Alternative Transportation Feasibility Study

## VOLUME I FEASIBILITY STUDY AND RECOMMENDATIONS





**LITTLE BIGHORN BATTLEFIELD NATIONAL MONUMENT**

Alternative Transportation Feasibility Study

PMIS 163914

**Feasibility Study and Recommendations Report**

January 31, 2013



## EXECUTIVE SUMMARY

This alternative transportation feasibility study (ATFS) explores transportation options for the Little Bighorn Battlefield National Monument (park) that are designed to address increasing transportation congestion and safety concerns, provide visitors with a convenient and safer transportation system, improve visitors' ability to understand the events related to the Battle of the Little Bighorn, and help protect natural and cultural resources. In particular, this study was performed to determine whether alternative transportation at the park is feasible; and if so, what form of alternative transportation would best fit the park.

Options identified in the ATFS take into account previous studies and planning efforts such as the park's 1995 *Final General Management and Development Concept Plan (GMP)* and 2005 *Environmental Assessment* to rehabilitate the tour road. The options draw upon public comments on the January 2012 Newsletter and incorporate park staff input through a refinement and evaluation process including two onsite workshops.

### TRANSPORTATION ISSUES

Welcoming over 300,000 annual visitors, the park faces substantial transportation challenges. Most visitors come to the park during the summer months from June to August. During this peak season, parking lots inside the park are frequently full, forcing motorists to keep circulating for an open spot and aggravating vehicle-to-vehicle and vehicle-to-pedestrian conflicts in the parking area. Visitors often are advised to drive through the tour road first and come back to the visitor center area so that a parking spot may become available.

The road connecting the two park units, the Custer Battlefield and Reno-Benteen Battlefield, is the 5.2-mile tour road, which is narrow (average 18-foot wide) and difficult for two-way traffic that consists of a large number of oversized vehicles. The roadbed and pavement surface were not designed to withstand the current traffic load of oversized vehicles that includes recreational vehicles (RV), tour buses, and large trucks. As a result, the tour road experiences excessive deterioration and requires frequent maintenance. Over the last several decades, layers of pavement have been built above the shoulder, creating steep drop-offs.

### STUDY GOALS

Working closely with the National Park Service (NPS) staff, the study team established the following goals for this study:

1. Reduce operation and management requirements through asset management
2. Exercise management practices to solve short-term transportation problems
3. Develop transportation alternatives that protect resource values and enhance visitor experience
4. Recognize opportunities to improve public and community support

More specific objectives were identified under each goal. The goals and objectives formed the basis for developing and evaluating the range of transportation options.

## STUDY METHODOLOGY

The study team implemented an iterative process of identifying, evaluating, and refining transportation options. This process included the following three phases:

1. Formulating a broad range of initial options
2. Initial screening to yield a smaller pool of viable options for further development and evaluation
3. Detailed screening using a set of weighted criteria to identify and refine feasible, detailed options

As the starting point, the study team developed a “toolbox” of transportation measures, which by mixing-and-matching together have the potential to achieve the goals and objectives of this ATFS. These specific measures were derived from previous study and planning efforts, relevant project experience and knowledge, input from the NPS staff, and feedback from stakeholders. The toolbox was used to help formulate the initial set of options and further refine options during the evaluation process.

## INITIAL OPTIONS AND SCREENING

The study team identified the following initial options as having the potential to address project goals.

**Table ES-1: Initial Transportation Options**

Construction Options	
1. Repair tour road and reconfigure parking	Reconstruct the road to a consistent width and correct structural deficiencies. Reconfigure parking lots without enlarging footprint.
2. Widen road and expand parking	"4R" project – Resurfacing, Restoration, Rehabilitation, and Reconstruction. Tour road widened to 24-feet and parking expansion/reconfiguration at the visitor center and Reno-Benteen Battlefield.
3. One-way loop with access from I-90 frontage road	Park tour road extension from Reno-Benteen Battlefield south and west to I-90 to form a one-way loop with two alternatives for Visitor/Administration Facility.
4. One-way loop with access from US 212	Park Tour Road Extension north from Reno-Benteen Battlefield to U.S. 212 to form a one-way loop.
5. Detached multi-use trail paralleling tour road	Build a detached multi-use trail for pedestrians/bicycles along the entire tour road.
6. Alternative infrastructure improvements	Additional vehicle turnarounds at key locations on the tour road; installation of information kiosks and enhanced wayside pullouts with oversized vehicle parking along the tour road; parking reconfiguration at the visitor center and Reno-Benteen Battlefield; drop-off lot for towed vehicles.
No Build Options	
7. Management Improvements	Implement special event management strategies. Enhance cell phone audio tours. Relocate employee parking to increase visitor parking spaces at the visitor center area. Improve signing, striping, and wayfinding system.
8. Seasonal reservation or permit system	Visitors reserve an entry permit by phone, website, etc. prior to visiting the park during the summer months or predetermined peak periods.
9. Permanently close tour road to motorized vehicles	Close the tour road between the entrance station and Reno-Benteen Battlefield to all visitor motorized vehicles and maintain it as a trail.
Transit Options	
10. Voluntary transit	Seasonally provide guided or unguided shuttle, tour bus, or other transit service for visitors; likely require offsite parking and staging; could include a drop-off lot for towed vehicles and oversized vehicles.

(continued)

**Table ES-1: Initial Transportation Options, continued**

11. Mandatory peak/special events/seasonal transit	During peak hours, peak days, special events, or seasonally, close tour road to all private vehicles after the visitor center; provide a tour shuttle for visitors; likely require offsite parking and staging during peak periods and could include a drop-off lot for towed vehicles and oversized vehicles.
12. Mandatory transit for oversized vehicles	Seasonally close tour road to oversized vehicles after the visitor center and designate a mandatory parking/drop-off lot for oversized vehicles and towed vehicles; provide a tour shuttle; likely require offsite parking for oversized vehicles and parking shuttle at peak periods.
13. Mandatory transit for all	Close tour road to private vehicles after the visitor center; provide a tour shuttle for visitors; require offsite parking and staging.

Source: URS Corporation.

To evaluate the initial options, the study team developed the following screening criteria based on the established study goals and objectives:

1. Enhance visitor experience (convenience, comfort, safety, understanding of the events, etc.)
2. Minimize impacts to natural and cultural resources
3. Reduce traffic congestion and parking shortage in the park
4. Manage transportation assets to maintain acceptable conditions
5. Improve visitor safety

Applying these criteria, the study team analyzed each initial option to identify “fatal flaws” by rating the option with a “pass”, “neutral”, or “fail” score. The identified “fatal flaw(s)” would be reason to eliminate an option from further development and more detailed evaluation. Three options in the construction category – No. 1, 2, and 3; one in the no-build category – No. 7; and one in the transit category – No. 10 passed the initial screening and were carried forward for further development and evaluation.

## REFINEMENT OF OPTIONS

Taking into account input from the NPS staff, stakeholders, and the general public, the study team refined the five options that passed initial screening into the following seven options.

### **Option I – Repair the Tour Road and Reconfigure Parking**

Option I repairs and rehabilitates the tour road from the visitor center to the Reno-Benteen Battlefield. Construction work on the tour road would include minor widening of the tour road, where necessary, to achieve a consistent 20-foot pavement width; enhancing the pavement structure to accommodate oversized vehicles; improving drainage; and building appropriate side slopes where feasible. This option would also reconfigure the parking lots within the existing footprints and install appropriate signage to provide wayfinding guidance and direct traffic to less congested parking areas.

### **Option II – Widen the Tour Road and Expand Existing Parking Lots (4R Project)**

This option consists of a resurfacing, restoration, rehabilitation, and reconstruction (4R) project that would widen the tour road from an average 18-foot width to 24-foot wide, correct structural deficiencies of the pavement, and improve horizontal and vertical alignment. In addition to roadway widening and reconstruction, parking at the visitor center and Reno-Benteen Battlefield would be modified and expanded to include bus pull-outs, motorcycle parking, better accommodations for oversized vehicles, and improved traffic flow. This option was the preferred alternative in the 2005 *Environmental Assessment/Assessment of Effect: Rehabilitate Tour Road*.

### **Option III – One-Way Tour Loop via I-90 Frontage Road**

This option extends the tour road from the Reno-Benteen Battlefield south and west to the I-90 frontage road, forming a counter-clockwise one-way tour loop. The tour would start at a new visitor orientation facility located with convenient access from I-90, proceed on a frontage road to Reno's first skirmish line site at Garryowen, and then cross under I-90 to Reno's Crossing. The tour would then follow a new one-way road from Reno's Crossing, extend southeast along the west side of the Little Bighorn River to Reno Creek, enter the Reno-Benteen Battlefield from the south, connect with the existing tour road, and proceed to Last Stand Hill. This option was presented in the 1995 GMP.

### **Option IV – Management Improvements**

This option includes lower-cost and lower-impact operational changes to enhance the visitor experience. It uses existing facilities and seeks to improve communications with visitors and to smooth parking. Various elements could be implemented at the discretion of park management, including seasonal, peak time, and trial applications. Key measures in this option include installation of variable message signs, improved signage and pavement marking, deployment of visitor use assistant(s), parking time limits, condensed visitor orientation program to encourage turnover, cemetery tours to attract parking to the Stone House lot, and a wayfinding plan.

### **Option V – Seasonal Transit from Offsite Staging/Parking to Visitor Center**

This option provides a seasonal, discrete shuttle service for visitors from an offsite staging and parking area during the summer season. The shuttle service extends only to the visitor center. This option improves signage/wayfinding, installs a series of lower cost and lower impact operational improvements, and includes all components of Option I.

### **Option VI-A – Seasonal Transit from Offsite Staging/Parking to Reno-Benteen Battlefield**

This option provides a seasonal, discrete shuttle service from an offsite staging and parking area to the Reno-Benteen Battlefield via the visitor center; constructs additional shuttle stops along the tour road; improves signage/wayfinding; installs a series of lower cost and lower impact operational improvements; and includes all components of Option I.

### **Option VI-B – Peak Days Transit from Offsite Staging/Parking to Reno-Benteen Battlefield**

This transit option is very similar to Option VI-A; however, it provides shuttle service only during a few peak visitation days in the summer including special events, such as the park's Anniversary on June 25.

## **DETAILED SCREENING**

Following refinement of the options, the study team conducted a comparative analysis of each option. The evaluation scored each option, using a set of weighted criteria, to identify the most promising transportation solutions. Detailed screening criteria were based on the initial screening criteria and incorporated additional parameters for financial feasibility, impacts on park management, general impacts on cultural and natural resources, general impacts on visitor experience, and other considerations.



**Table ES-2: Detailed Screening Criteria**

Category	Criteria	Measure/Unit	Effects/Impacts	Weighting Factor	Sub Total
General Impacts to Park Cultural and Natural Resources, Visitor Experience, and Management	Reduction in vehicle miles traveled (VMT)	VMT	Direct	7%	60%
	Reduction in vehicle emissions	tons, cubic feet	Indirect and Cumulative	10%	
	Footprint for additional transportation infrastructure	square feet	Direct and Cumulative	10%	
	Changes in delay and congestion	0-10 with 10 being best	n/a	7%	
	Parking availability	0-10 with 10 being best		7%	
	Safety improvement	0-10 with 10 being best		7%	
	Convenience and comfort	0-10 with 10 being best		7%	
	General impacts to park staff and management	0-10 with 10 being best		5%	
Financial Feasibility	Total Cost of Ownership	US Dollars		18%	40%
	Revenue	US Dollars		10%	
	Funding Sources and Cost Sharing	0-10 with 10 being best	12%		

Source: URS Corporation.

Notes: Estimated values (measures/units) of each criterion were converted proportionally to a score of 0 to 10 (0 being the worst, 10 being the best) before multiplying by the assigned weighting factor.

The total of weighting factors of all criteria is 100%.

As a critical factor in evaluating options, cost could be the most important aspect in determining which options can be implemented. The table below summarizes the estimated lifecycle cost of ownership for each option.

**Table ES-3: Estimated Lifecycle Cost**

Option <sup>(1)</sup>	I	II	III	IV	V	VI-A	VI-B
<b>Lifecycle Costs<sup>(2)</sup></b>	\$3,940K- \$5,910K	\$7,490K- \$11,230K	\$15,750K- \$23,620K	\$430K - \$640K	\$4,540K - \$6,810K	\$5,910K - \$8,870K	\$620K - \$930K

Source: URS Corporation.

Notes: (1) Options I to VI-B: I - Repair the Tour Road and Reconfigure Parking; II - Widen the Tour Road and Expand Parking (4R Project); III - One-Way Loop Tour via the I-90 Frontage Road, Including a Seasonal Transit Service; IV - Management Improvements; V - Seasonal Transit Service from Offsite Staging/Parking to Visitor Center; VI-A - Seasonal Transit Service from Offsite Staging/Parking to Reno-Benteen; VI-B - Peak Days/Special Events Transit Service from Offsite Staging/Parking to Reno-Benteen

(2) The range of costs were estimated to be between -20% and +20% of calculated costs

Results from detailed screening of the seven refined options, in terms of a weighted score, are displayed in the following table. Option VI-A scores the highest at 6.6, followed by Option II at 6.5. Option III scores the lowest at 4.2.

**Table ES-4: Option Scores**

Option <sup>(1)</sup>	I	II	III	IV	V	VI-A	VI-B
<b>Weighted Score<sup>(2)</sup></b>	4.8	6.5	4.2	6.1	6.1	6.6	6.1

Notes: (1) Options I to VI-B: I - Repair the Tour Road and Reconfigure Parking; II - Widen the Tour Road and Expand Parking (4R Project); III - One-Way Loop Tour via the I-90 Frontage Road, Including a Seasonal Transit Service; IV - Management Improvements; V - Seasonal Transit Service from Offsite Staging/Parking to Visitor Center; VI-A - Seasonal Transit Service from Offsite Staging/Parking to Reno-Benteen; VI-B - Peak Days/Special Events Transit Service from Offsite Staging/Parking to Reno-Benteen

(2) The weighted score ranges from 0 as the worst to 10 as the best possible.

In order to draw further conclusions from the detailed screening, the study team and NPS staff also performed a cost-to-importance analysis which accounted for both the weighted score and the total lifecycle cost of ownership for each option. Options with higher importance, which directly correlates to the weighted score, and a lower cost are considered as potentially having higher priority of implementation. Option IV – Management Improvements and Option VI-B – Peak Days Transit to Reno-Benteen Battlefield both have a relatively high importance and low cost.

## KEY FINDINGS AND RECOMMENDATIONS

A comparative evaluation of each option determined that Options I through VI-B may be feasible for future implementation. The National Park Service will further evaluate funding availability, impacts to the park, and the ability of the options to address existing and future transportation needs. The NPS anticipates implementing selected elements of three options, Option I, Option IV, and Option VI-B, in 2013.

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## 1. INTRODUCTION

This alternative transportation feasibility study (ATFS) explored options that have the potential to solve the transportation issues facing the park, including roadway and parking safety, traffic congestion, and parking shortage during the summer months. In particular, the study team developed and evaluated a variety of alternative transportation (AT) options to determine whether AT would be able to solve the park's transportation issues as well as whether AT is feasible at the park.



Entrance Station. Source: URS Corporation

Located near Crow Agency in Big Horn County, the southeast portion of Montana, Little Bighorn Battlefield National Monument (the park) preserves the historic site of the Battle of the Little Bighorn, which took place on June 25<sup>th</sup> and 26<sup>th</sup>, 1876. The park is approximately 60 miles southeast of Billings, Montana, and 70 miles north of Sheridan, Wyoming. This chapter presents an overview of existing transportation conditions and issues in and around the park, a summary of previous studies and planning efforts to address these issues, and the goals and objectives for this study.

### 1.1 EXISTING CONDITIONS AND TRANSPORTATION ISSUES



Tour Road. Source: URS Corporation

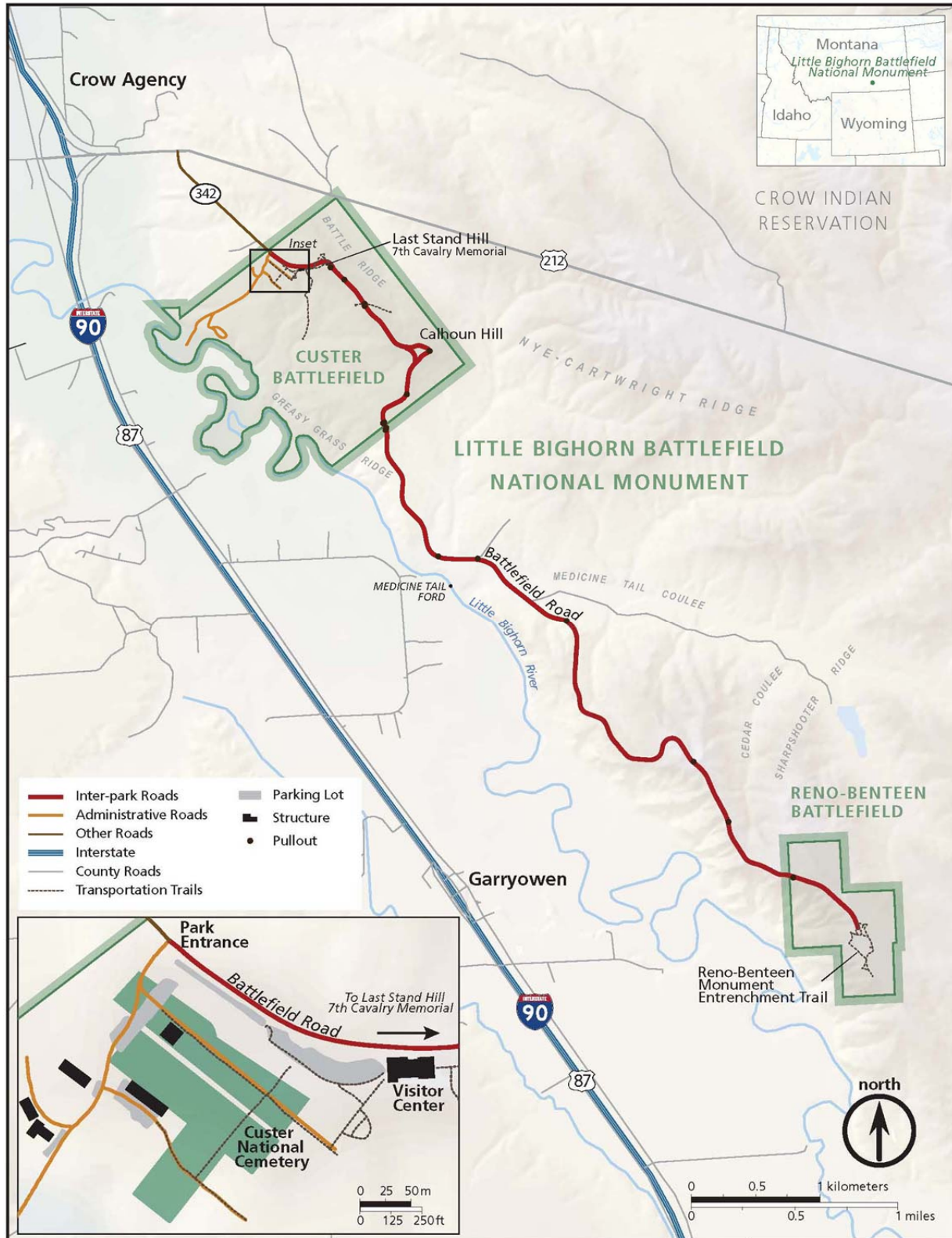
The park encompasses approximately 765 acres of federal land in two separate units (Figure 1-1) – Custer Battlefield on the north and Reno-Benteen Battlefield on the south. The Custer Battlefield unit consists of the park's entrance station, visitor center and museum, Last Stand Hill, and Custer National Cemetery. A 5.2-mile tour road, from the entrance station to the parking lot in the Reno-Benteen Battlefield, is the only road connection between the two units. Both units are surrounded by Crow Indian Reservation land, and the tour road traverses reservation and other private lands on sensitive battlefield landscape. The tour road consists of two lanes, one in each direction, varying in width from 17 to over 20 feet, without shoulders. Outside of the park boundaries, the tour road has a 60-foot right-of-way. Traversing a rolling terrain, the tour road has many horizontal and vertical curves and some steep grades. Approximately 17 wayside pullout areas are located along the tour road.

Visitor parking spaces are provided in both park units, including approximately 144 in the Custer Battlefield, of which four are designated for handicapped parking and 16 for oversized vehicles. There are 15 at the end of road parking and turnaround area in the Reno-Benteen Battlefield, only two of which can accommodate oversized vehicles. Two parking stalls at Reno-Benteen are designated for handicapped parking.

As illustrated in Figure 1-1, Interstate 90 (I-90) runs generally in the north-south direction and provides visitors regional access to the park via an interchange with U.S. Highway 212 (US 212). Two-way frontage roads extend parallel to and on both sides of I-90. Montana State Route 342 (MT 342) connects US 212 on the north and the park's entrance station on the south via an approximately 0.6-mile roadway segment.

**LITTLE BIGHORN BATTLEFIELD NATIONAL MONUMENT**  
*Alternative Transportation Feasibility Study*

**Figure 1-1: Overview Map of the Park**



Source: URS Corporation.



The park is facing substantial transportation challenges. In recent years, the park has received over 300,000 visitors a year,<sup>1</sup> most of who came to the park during the summer months from June to August. During the peak visitor season, parking lots adjacent to the visitor center are frequently full, while other parking areas may still be underutilized, such as the Stone House parking lot at the northwest end of the Custer National Cemetery. Parking is a particularly significant problem for oversized vehicles, which include recreational vehicles, trailers, and buses typically over 25-feet in length, because there are too few spots for the number of vehicles. Vehicles frequently keep circulating in the visitor center parking area looking for a parking spot, aggravating vehicle-to-vehicle and vehicle-to-pedestrian conflicts in this area. Turning radii in the parking areas are often too small for large vehicles to maneuver, and there is no safe location for bus loading and unloading.

Built in the mid-1900s, the tour road is narrow and difficult for two-way traffic consisting of many oversized vehicles. Although no collisions have been reported on the tour road, minor accidents have been observed, such as side mirrors being broken by a passing vehicle in the opposite direction and vehicles veering off the pavement while passing<sup>2</sup>. The roadbed and pavement surface were not designed to withstand the current traffic load of oversized vehicles, resulting in excessive deterioration and requiring frequent maintenance. Over the last several decades, layers of pavement have been built up above the shoulder, creating steep drop-offs.



Narrow Tour Road Is Difficult for Two-way Traffic.  
Source: URS Corporation

## 1.2 PREVIOUS STUDY AND PLANNING EFFORTS

Parking and roadway issues, compounded by other challenges such as an outdated and undersized visitor center, have caused negative impacts to visitor experience and present increasing difficulties for the National Park Service (NPS) to protect precious cultural and natural resources in the park. Since the mid-1980s, many efforts have been made to evaluate transportation challenges facing the park and study potential solutions. Some of the major study and planning activities are listed below in chronological order:

1. *1995 Final General Management and Development Concept Plans (GMP)* (An Update to the 1986 GMP), prepared by Little Bighorn Battlefield National Monument
2. *1998 Traffic Safety Study for Little Bighorn Battlefield National Monument*, prepared by Robert Peccia & Associates
3. *2001 Field Report of Little Bighorn Battlefield National Monument*, prepared by Federal Highway Administration (FHWA) and Federal Transit Administration (FTA)
4. *2001 Federal Lands Alternative Transportation Systems Study, Volume III, Summary of National ATS Needs*; prepared by FHWA and FTA

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1. *National Park Service visitor database*, NPS Public Use Statistics Office, <http://www.nature.nps.gov/stats/park.cfm?parkid=310>, website accessed May 2012.

<sup>2</sup> *Existing Traffic and Parking Conditions and Implications for Transportation Alternatives: Little Bighorn Battlefield National Monument*, Jonathan Upchurch, December 16, 2010.

5. 2002 Construction Project to rehabilitate, restore, and resurface (3R) the park's tour road; undertaken by FHWA
6. *2005 Environmental Assessment / Assessment of Effect: Rehabilitate Tour Road*; prepared by Little Bighorn Battlefield National Monument and Denver Service Center (DSC)
7. *2007 Resources Management Plan*, prepared by Little Bighorn Battlefield National Monument
8. *2010 Existing Traffic and Parking Conditions and Implications for Transportation Alternatives: Little Bighorn Battlefield National Monument*, prepared by Jonathan Upchurch
9. *2010 Preliminary Feasibility Study – Alternative Transportation*; prepared by Little Bighorn Battlefield National Monument, DSC, and Intermountain Region (IMR)
10. 2010 Public Engagement on Management Issues and “Next Steps,” undertaken by Little Bighorn Battlefield National Monument

As a result of these study, planning, and project efforts, a number of options have been proposed, including relocating the visitor center and museum collection to a site out of the current park boundary; expanding parking lots, particularly for oversized vehicles; widening and strengthening the tour road; and building a one-way loop tour road for visitors to appreciate the battlefield landscape in a chronological order. Although some of the proposed improvements were completed, such as the 3R construction project, most have not been implemented due to political, economic, and environmental concerns. Today, the park continues to face increasing transportation and related challenges.

At the conclusion of the 2010 public engagement process, the National Park Service recommended several “next steps” to address the identified management issues. One of the next steps to be taken in 2011 was to commence this alternative transportation feasibility study (ATFS) to help the park staff determine mid-term and long-term solutions to transportation challenges.<sup>3</sup>

### 1.3 STUDY GOALS AND OBJECTIVES

Working closely with the NPS staff, the study team established a set of goals for this study, with more specific objectives developed under each goal. The following study goals and objectives were initially discussed in the study kickoff workshop and subsequently reviewed and reorganized.

***Goal #1: Reduce operation and management requirements through asset management***

- Reduce impacts on pavement shoulders, adjacent facilities, and resources
- Contribute to sustainable maintenance practices and funding
- Ensure that new construction projects are sustainable
- Identify both short-term (easier) and long-term projects

***Goal #2: Exercise management practices to solve short-term transportation problems***

- Improve signs and information (“way-finding”)
- “Manage” way out instead of “building” a way out
- Rework patterns within existing paved footprint
- Better manage existing visitor parking inventory
- Rework recreational vehicle (RV) circulation and parking
- Use combination of incentives and enforcement to implement new management practices

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3. *Critical Issues and Opportunities for the 21st Century*. Little Bighorn Battlefield National Monument. October 2010.

***Goal #3: Develop transportation alternatives that protect resource values and enhance visitor experience***

- Reduce noise impacts and air emissions
- Protect resources by limiting expansion of parking and vehicle “footprint”
- Recognize a continuum of resource significance at the park
- Examine appropriate technical alternative transportation system options
- Reduce parking frustration for visitors
- Improve “waysides” experience
- Consider Intelligent Transportation System (ITS) applications
- Use trip planning and the park website as a tool
- Improve visitor safety

***Goal #4: Recognize opportunities to improve public and community support***

- Encourage public and community input and communication
- Engage in identifying and evaluating solutions
- Consider options outside the park boundaries
- Utilize and enhance local concession capability

## **1.4 ORGANIZATION OF STUDY DOCUMENTS**

Major deliverables resulting from this alternative transportation feasibility study for the park are organized into two main documents:

1. *Volume I: Feasibility Study and Recommendations Report* (this document). This report builds upon previous deliverables and serves as a summary document of this alternative transportation feasibility study.
2. *Volume II: Options and Criteria for Evaluation Report* with the following three appendices:
  - A. Existing Conditions – Memorandum
  - B. Synthesis of Project Kickoff Workshop Results – Memorandum
  - C. Synthesized Results of Evaluation of Options Workshop – Memorandum

## 2. OVERVIEW OF STUDY ACTIVITIES

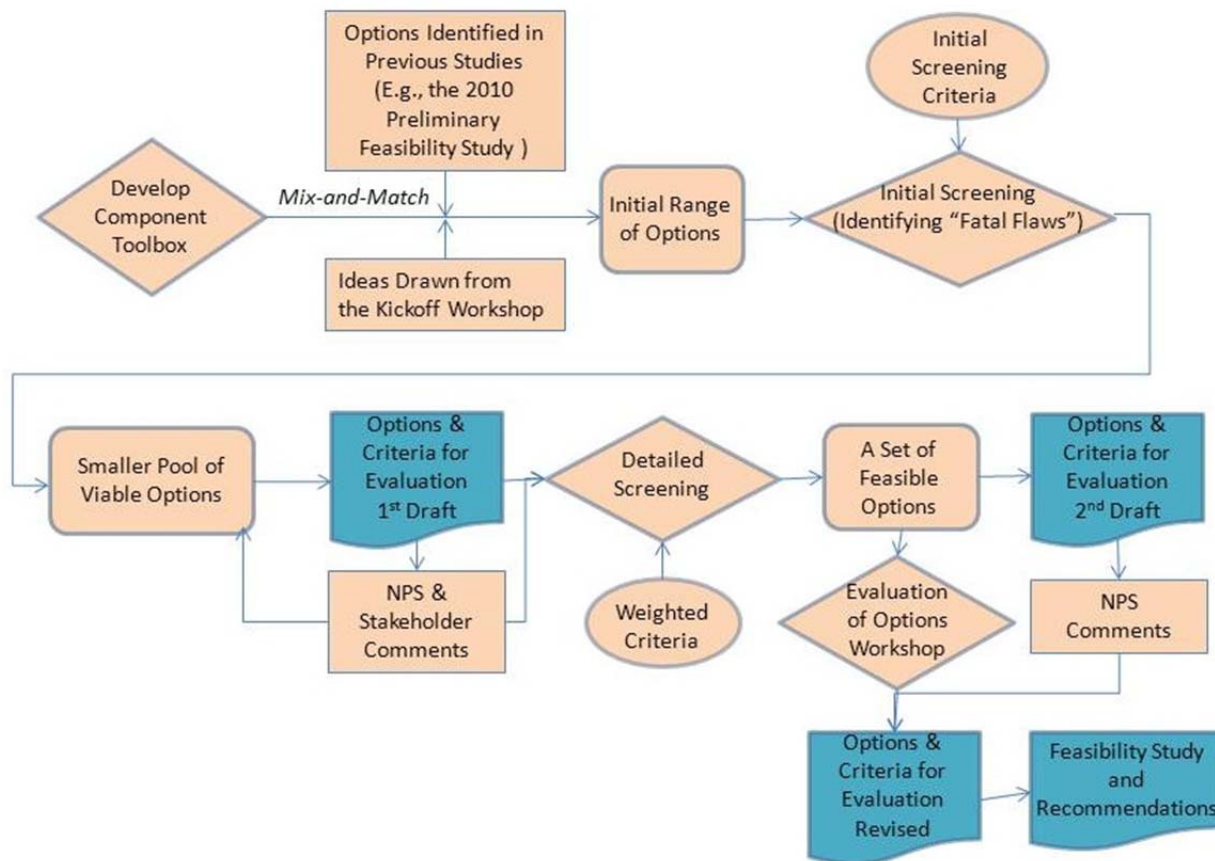
This chapter presents the study methodology and process of options development and evaluation. Major activities during the study process and milestone results from these activities are briefly described in chronological order.

### 2.1 STUDY METHODOLOGY AND PROCESS

This ATFS study explores various transportation options, including all possible travel modes, that have the potential to provide visitors access to the park in a safe and non-stressful way. In particular, the study was set to determine whether alternative transportation is feasible; and if the answer is yes, what form of alternative transportation would fit the park. Park location, characteristics, visitation patterns, cultural and natural resources, financial factors, and partnering opportunities were all taken into consideration.

Working closely with the NPS staff, the study team engaged an iterative process of identifying, evaluating, and refining transportation options, as illustrated by the flow chart in Figure 2-1. This study process includes three phases: (1) formulating a broad range of initial options, (2) initial screening to yield a smaller pool of viable options for further development and evaluation, and (3) detailed screening utilizing a set of weighted criteria to identify and refine a set of feasible, detailed options.

**Figure 2-1: Options Development and Evaluation Flow Chart**



Source: URS Corporation

As the starting point for formulating transportation options, the study team developed a “toolbox” of specific transportation improvement measures (“tools”) which, by mixing-and-matching together, have the potential to achieve the goals and objectives of this ATFS. These improvement measures were derived from previous study and planning efforts for the park, relevant project experience and knowledge of the study team, understanding of the park’s transportation challenges, ideas generated from discussions with the NPS staff, and feedback from stakeholders.

The toolbox was used to help formulate the initial set of options and further refine those feasible options during the detailed screening process. The identified transportation tools are summarized in Table 2-1 and organized in the following categories:

- Management tools such as ITS, Travel Demand Management (TDM), and special event management. These tools typically incur relatively low cost and are particularly useful for short-term or mid-term improvements.
- Infrastructure tools including construction projects of roadway, parking, and related facilities.
- Alternative travel mode tools (excluding transit and private automobiles) in and adjacent to the park, such as facilities to provide access to the park for bicyclists, pedestrians (hikers), and other viable travel modes.
- Transit tools including necessary transit infrastructure, operational components, and ownership, funding and marketing.

Using the component toolbox customized to the park’s transportation challenges, the study team developed a broad range of viable options, each of which has distinctive features but may also include some common components (“tools”) compared with other options. This range of initial options is intended to encompass all viable options that have the potential to improve visitor experience and address transportation issues in the park, but also excludes non-viable options without having to go through a screening process.

This range of options was evaluated against a set of initial screening criteria that were derived from the study goals and objectives. The purpose of the initial screening process is to identify which options have “fatal flaws”, i.e., failing against one or more criteria and therefore would not be able to meet the goals and objectives. The failed options were consequently eliminated from further consideration.

Transportation options that passed the initial screening were carried forward to the next stage of development and evaluation – the detailed screening process. These options continually evolved during this process with refined components and more details. The study team established a set of weighted criteria, which consists of both quantitative and qualitative performance measures, to evaluate and score the options. The weighted criteria take into account various factors that are important to the park, including impacts to park resources, visitor experience, and park management; total cost of ownership; potential revenue; funding sources; and partnership opportunities. As a result, the refined options are ranked from high to low according to their weighted scores. Conclusions and recommendations were then drawn from the evaluation results.

**Table 2-1: Options Development – Toolbox**

Operations and Management		
Intelligent Transportation System (ITS)	Travel Demand Management (TDM)	Special Event Management
<ul style="list-style-type: none"> <li>▪ Dynamic Message Signs (DMS)</li> <li>▪ Pre-Trip Planning: Internet, TV/radio, 511 phone</li> <li>▪ En-route Planning: wireless devices, Highway Advisory Radio (HAR), in-vehicle signing, electronic yellow pages</li> <li>▪ Advanced Parking: availability and directions</li> <li>▪ Electronic Payment &amp; Pricing</li> <li>▪ Transit Management: AVL/CAD, Dynamic Routing/Scheduling, in-vehicle surveillance</li> </ul>	<ul style="list-style-type: none"> <li>▪ Real-Time Traveler Information</li> <li>▪ Parking Pricing (meters, hourly/flat fee)</li> <li>▪ Parking Restrictions: duration, vehicle type</li> <li>▪ Fringe Parking (offsite)</li> <li>▪ Variable admission fee</li> <li>▪ Fee incentives for transit riders</li> <li>▪ Cell phone audio tour</li> <li>▪ Foldable signs (to direct to additional parking, remote lot, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Temporary parking (on and offsite)</li> <li>▪ Transit scheduling: higher frequency of bus departure, longer service period, on-demand, Para-transit, etc. to accommodate high visitation and/or unusual visiting patterns</li> <li>▪ Alternate transit route(s): temporary routes such as transporting visitors between Billings/Hardin and the visitor center</li> <li>▪ Volunteers assisting traffic &amp; parking guidance</li> <li>▪ Mobilizing community/commercial vehicles</li> </ul>
Infrastructure		
Alternate Infrastructure Improvement	Capital Improvement - Roads	Capital Improvement - Parking
<ul style="list-style-type: none"> <li>▪ Expanding OV parking near VC</li> <li>▪ Multiple turn-around locations along Tour Road</li> <li>▪ Reconfiguring Reno-Benteen parking lot</li> <li>▪ Wayside parking spaces for OVs between VC and Reno-Benteen</li> <li>▪ Signing &amp; Striping: regulatory, warning, guidance, wayfinding</li> </ul>	<ul style="list-style-type: none"> <li>▪ One-way loop tour road via I-90 frontage road</li> <li>▪ One-way loop tour road via US 212 north and east of the park</li> <li>▪ Resurfacing, restoring, rehabilitating, reconstructing, and/or widening Tour Road</li> <li>▪ Restrictions to certain vehicle types</li> <li>▪ Seasonal/special events/time of day restrictions</li> <li>▪ Prohibiting all private vehicles on Tour Road</li> </ul>	<ul style="list-style-type: none"> <li>▪ Reconfiguration, signing, striping</li> <li>▪ Expanding existing parking lots</li> <li>▪ Drop lot for towed vehicles</li> <li>▪ New parking lot(s) in the park</li> <li>▪ Offsite parking at the old casino</li> <li>▪ Offsite parking at US 212 &amp; MT 342 junction</li> <li>▪ Offsite parking at Garryowen area</li> <li>▪ Other offsite parking locations</li> <li>▪ Temporary parking for peak days/hours</li> <li>▪ Restrictions to certain vehicle types</li> <li>▪ Seasonal/special events/time of day restrictions</li> <li>▪ Pricing (meters, hourly/flat fees, etc.)</li> </ul>

Table 2-1 Options Development – Toolbox, continued

Alternative Travel Mode	
Alternative Travel Mode - Bicycles	Alternative Travel Mode - Hikers
<ul style="list-style-type: none"> <li>▪ Bike lane on the tour road</li> <li>▪ Multi-use path along tour road</li> <li>▪ Paved shoulder along tour road</li> <li>▪ Shared lane on tour road</li> <li>▪ Bike access to park</li> <li>▪ Allowing bikes on trails</li> </ul>	<ul style="list-style-type: none"> <li>▪ Trail connections</li> <li>▪ Multi-use path along the tour road</li> <li>▪ Sidewalks along the tour road</li> <li>▪ Additional trails (paved, gravel, or dirt)</li> <li>▪ Pedestrian access to park</li> </ul>
Transit	
Infrastructure and Operational Components	Ownership, Funding, and Marketing
<ul style="list-style-type: none"> <li>▪ Vehicle Type: shuttle, van, tour bus, rubber-tired or guided-way tram</li> <li>▪ Fuel Type: diesel, gasoline, compressed natural gas (CNG), propane, liquefied petroleum gas (LPG), hybrid, electric</li> <li>▪ Routes: single vs. multiple, seasonal alternate, offsite to VC to Reno-Benteen</li> <li>▪ Schedule: year-around, seasonal, special events, frequency/headways, weekly/daily variation, dwell times</li> <li>▪ Service Type: guided tour, shuttle, commercial tour buses</li> <li>▪ Facilities: staging, maintenance, fuel storage/supply, washing, ticket/operations office</li> <li>▪ Choice of mode: mandatory vs. voluntary</li> <li>▪ Options for mandatory transit: time of day vs. all day, peak days vs. seasonal vs. year-round, OVs vs. all vehicles, entire park vs. part of the tour road</li> </ul>	<ul style="list-style-type: none"> <li>▪ NPS owns, maintains, and operates transit</li> <li>▪ Owned by NPS, O&amp;M by concessionaire</li> <li>▪ Concessionaire provides all transit vehicles, facilities, and O&amp;M via contract with NPS</li> <li>▪ Park adds a transportation fee onto the entrance fee</li> <li>▪ Partnership for funding and marketing with:                             <ul style="list-style-type: none"> <li>○ Montana DOT</li> <li>○ Billings and/or other municipalities</li> <li>○ Crow Tribe and other stakeholders</li> <li>○ Custer Battlefield Preservation Committee</li> <li>○ Interested local/regional businesses</li> </ul> </li> </ul>

Source: URS Corporation.

Notes: ITS – Intelligent Transportation System. TDM – Travel Demand Management. HAR – Highway Advisory Radio. AVL – Automatic Vehicle Location. CAD – Computer Aided Dispatch. OV – Oversized Vehicles. VC – Visitor Center. PT – Personal Transporter. O&M – Option and Maintenance. MT 342 – Montana State Highway 342 (Park access road). DOT – Department of Transportation

## 2.2 STUDY ACTIVITIES AND MILESTONE RESULTS

Starting in late September of 2011, the study team conducted extensive data collection, literature review, and transportation system analysis to evaluate parking and traffic circulation in the park. An *Existing Conditions Memorandum*<sup>4</sup> was submitted for NPS review.

A multi-day workshop in a charrette setting was held at the park in October 2011. During the workshop, members from the park, NPS Intermountain Region (IMR), NPS Denver Service Center (DSC), and URS study team observed site conditions first-hand, reviewed results from the existing condition analysis, identified detailed transportation issues, established preliminary goals and objectives, and discussed potential transportation solutions. The discussions and preliminary results from this workshop are documented in the *Synthesis of Project Kickoff Workshop Results – Memorandum*.<sup>5</sup>

Following the early study activities, the study team developed a preliminary range of transportation options; established a set of criteria for the purposes of initial and detailed screening, respectively; and conducted technical analysis and evaluation of options using a two-step screening process – initial screening and detailed screening.

In May 2012, a one-day workshop to evaluate transportation options was held at the park. During the workshop the study team presented information on previous study activities and results from the initial screening, described transportation options that were being carried forward through the detailed screening, and discussed analytical steps needed for the detailed screening. Workshop participants, including members from the park, IMR, DSC, and URS went through the detailed screening process and discussed next steps of the study. One major outcome of this workshop was the relative weight, in terms of a percentage, assigned to each criterion for detailed screening. Collectively the weights of all criteria account for a total of 100%. Workshop participants also agreed on the scores of various options against qualitative criteria, such as visitor safety and general impacts to park staff and management. Discussions and results from this workshop are documented in the *Synthesized Results of Evaluation of Options Workshop – Memorandum*.<sup>6</sup>

Stakeholders' involvement is a critical aspect of this study, and the National Park Service has been consistently engaging stakeholders from the beginning. At the early stage of this study, the park published a newsletter announcing commencement of this study, describing transportation issues that the park is facing, laying out study goals and objectives, and soliciting public comments and ideas on the study. A number of comments were received and incorporated into this study. A second newsletter is being prepared to inform the public of the study outcome and introduce the next steps to follow this study.

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<sup>4</sup> *Alternative Transportation Feasibility Study for Little Bighorn Battlefield National Monument, Volume II: Options and Criteria for Evaluation, Appendix A.* URS Corporation, November 2011.

<sup>5</sup> *Alternative Transportation Feasibility Study for Little Bighorn Battlefield National Monument, Volume II: Options and Criteria for Evaluation, Appendix B.* URS Corporation, December 2011.

<sup>6</sup> *Alternative Transportation Feasibility Study for Little Bighorn Battlefield National Monument, Volume II: Options and Criteria for Evaluation, Appendix C.* URS Corporation, August 2012.



### 3. TRANSPORTATION OPTIONS AND EVALUATION

This chapter describes the development and evaluation of transportation options, including the two-stage screening process. This process has been detailed in *Volume II: Options and Criteria for Evaluation Report*<sup>7</sup>. Therefore, this chapter does not contain the same level of detail, and instead focuses on defining the transportation options, presenting screening criteria, and summarizing evaluation results.

#### 3.1 INITIAL OPTIONS AND SCREENING

The initial set of transportation options developed in this study was synthesized from the following aspects:

1. A wide range of transportation options formulated from previous studies and planning
2. Early activities of this ATFS including the Kickoff Workshop
3. Stakeholders feedback via a newsletter
4. A transportation toolbox developed for this ATFS

These initial options were then evaluated against general screening criteria derived from the study goals and objectives, as previously described in Chapter 1, in order to narrow the scope of options to a relatively short list of viable options.

#### Initial Range of Options

The initial options are grouped into three categories: construction, no-build, and transit.

Each of the construction options includes distinctive capital projects, in the nature of construction or reconstruction, to improve the park's transportation infrastructure. These options lean heavily on roadway and parking expansion to solve the park's transportation issues.

The no-build options are intended to utilize the current park staff, infrastructure, and management tools to mitigate traffic congestion, roadway safety, and parking shortage. It should be noted that the term "no-build" does not mean that the park should not take any action; instead, it seeks to meet transportation challenges without having to build new or reconstruct current infrastructure, which typically incur high capital costs.

The transit options propose transit to provide park access for visitors, park staff, and volunteers. Each transit option has distinctive features with regard to transit operating time period(s), varying requirements for different visitor groups, geographic extent of the transit services, etc. For example, one option may prohibit all private automobiles from traveling on the tour road, while another may impose such restrictions only on oversized vehicles. The following subsections define and illustrate each initial option under the above three categories.

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<sup>7</sup> *Alternative Transportation Feasibility Study for Little Bighorn Battlefield National Monument, Volume II: Options and Criteria for Evaluation*. URS Corporation, November 2012.

### Construction Options

#### 1) Repair the Tour Road and Reconfigure Parking

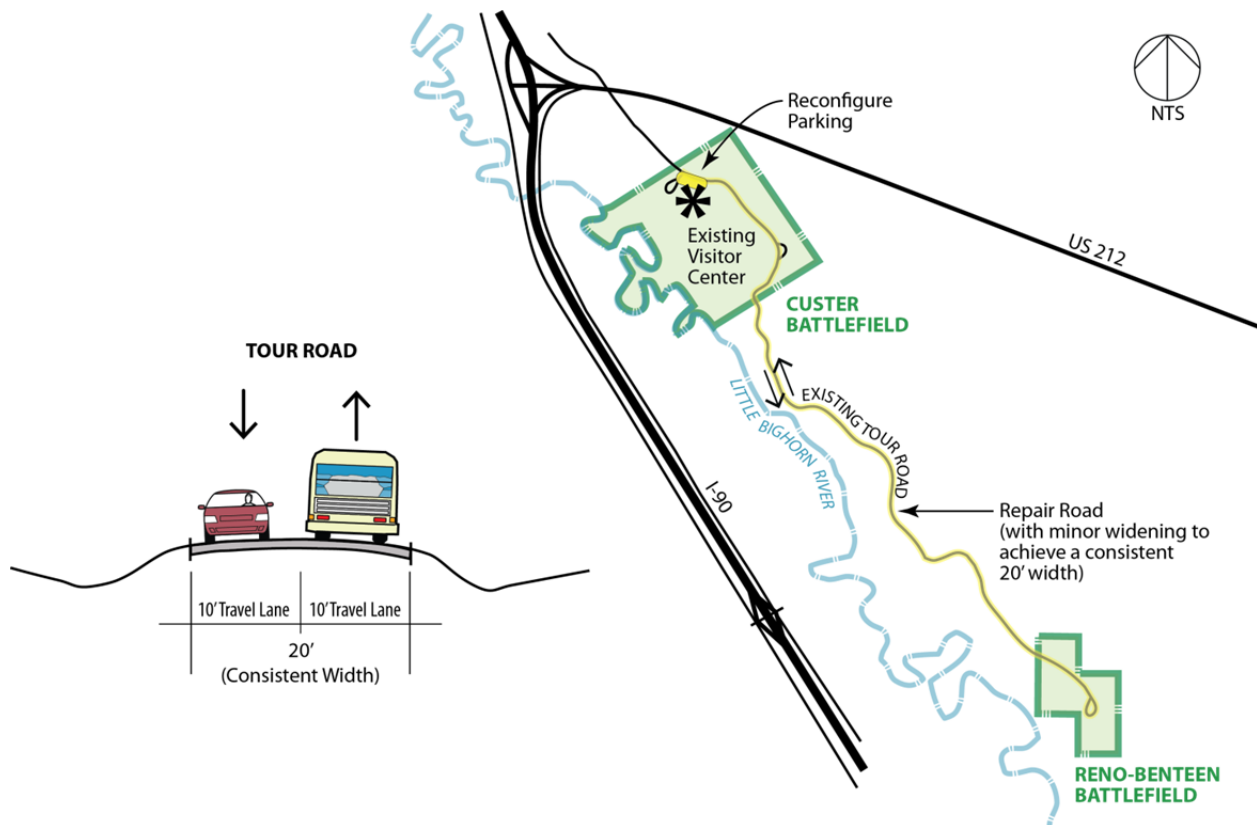
This option (Figure 3-1) would repair the existing tour road and reconfigure the existing parking lots in the visitor center area without increasing the paved footprint of the parking lots.

Construction work on the tour road includes minor widening of the tour road, where necessary, to a consistent 20-foot pavement width; restoring the pavement structure and correcting structural deficiencies; applying new or recycled layer(s) of pavement material to restore or enhance the ride quality; and improving drainage where necessary.

Parking reconfiguration would be accomplished within the existing parking area footprint through signing, striping/restriping, and possibly modifying landscape and driveways for more efficient parking patterns. Specific measures may include restriping the Stone House parking lot for oversized vehicles, modifying the driveway to this parking area to accommodate oversized vehicles, and converting all parallel parking spaces along the north side of the tour road for passenger cars only (via signing and restriping). Figure 3-2 illustrates the parking reconfiguration at the visitor center area and Stone House parking lot. It should be noted that the parking layout shown in Figure 3-2 is only for illustration purposes, not actual design.

Appropriate signage, such as signs directing oversized vehicles to the Stone House parking lot, must be installed in association with the above changes.

**Figure 3-1: Repair the Tour Road and Reconfigure Parking**



Source: URS Corporation.

Figure 3-2: Proposed Visitor Center Parking Reconfiguration



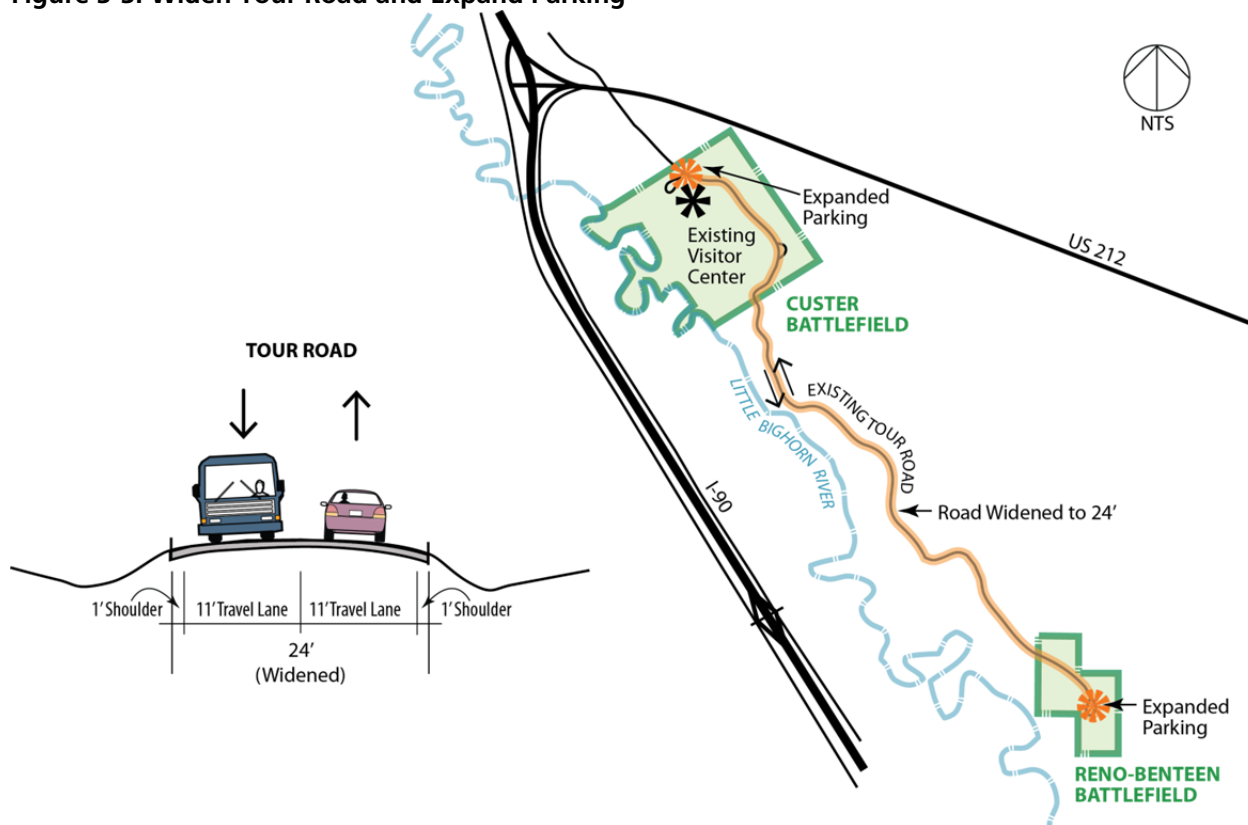
## 2) Widen Road and Expand Existing Parking Lots

This is a construction project to resurface, restore, rehabilitate, and reconstruct (4R project) the tour road, as well as expand the parking lots at the visitor center area and Reno-Benteen Battlefield.

This option (Figure 3-3) is described as Option A in the 2010 *Preliminary Feasibility Study*<sup>8</sup> and was the preferred alternative in the 2005 *Environmental Assessment / Assessment of Effect: Rehabilitate Tour Road*<sup>9</sup> for Little Bighorn Battlefield National Monument. This option would widen the tour road to 24-feet to accommodate safe passing for oversized vehicles and to correct structural deficiencies in the road. The tour road cross-section would consist of two 11-foot travel lanes with one-foot shoulders. Parking at the visitor center and Reno-Benteen Battlefield would be modified and expanded to include bus pull-outs, motorcycle parking, better accommodations for oversized vehicles, and improved traffic flow (Figure 3-4).

This option would not preclude transit; the widened road could support future shuttle service with larger transit vehicles and the improved visitor center parking lot could serve as a staging area for transit.

Figure 3-3: Widen Tour Road and Expand Parking



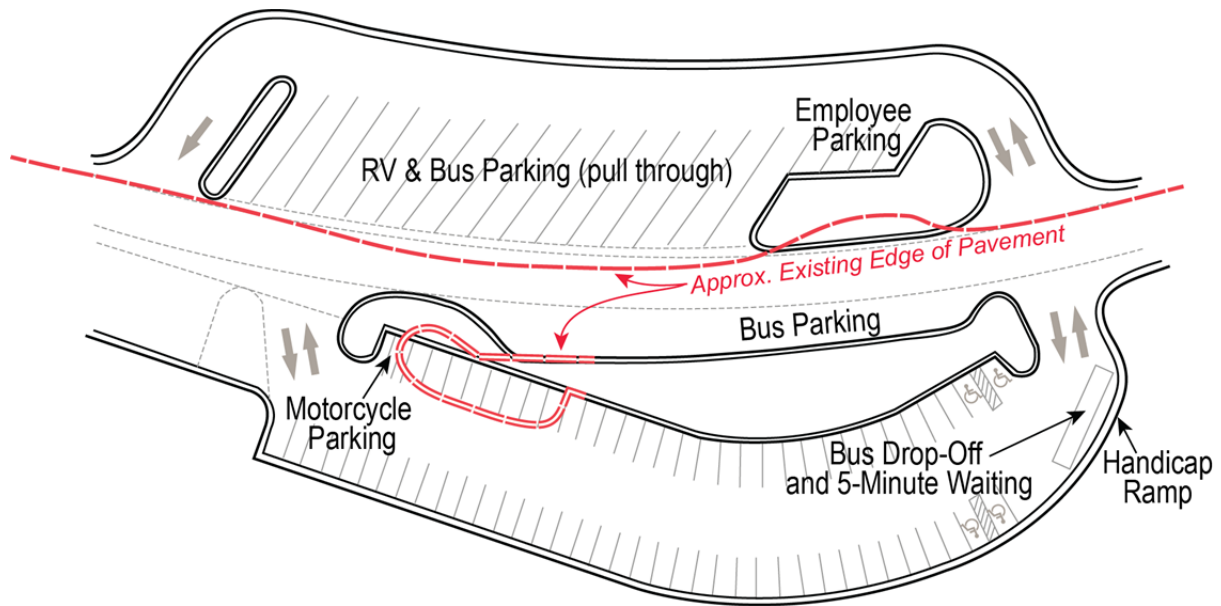
Source: URS Corporation.

<sup>8</sup> *Preliminary Feasibility Study – Alternative Transportation, Draft*, Little Bighorn Battlefield National Monument, February 2010.

<sup>9</sup> *Environmental Assessment / Assessment of Effect: Rehabilitate Tour Road*, Little Bighorn Battlefield National Monument, June 2005.

**Figure 3-4: Proposed Visitor Center Parking Improvements**

Reproduced from 2005 *Environmental Assessment/Assessment of Effect: Rehabilitate Tour Road*.



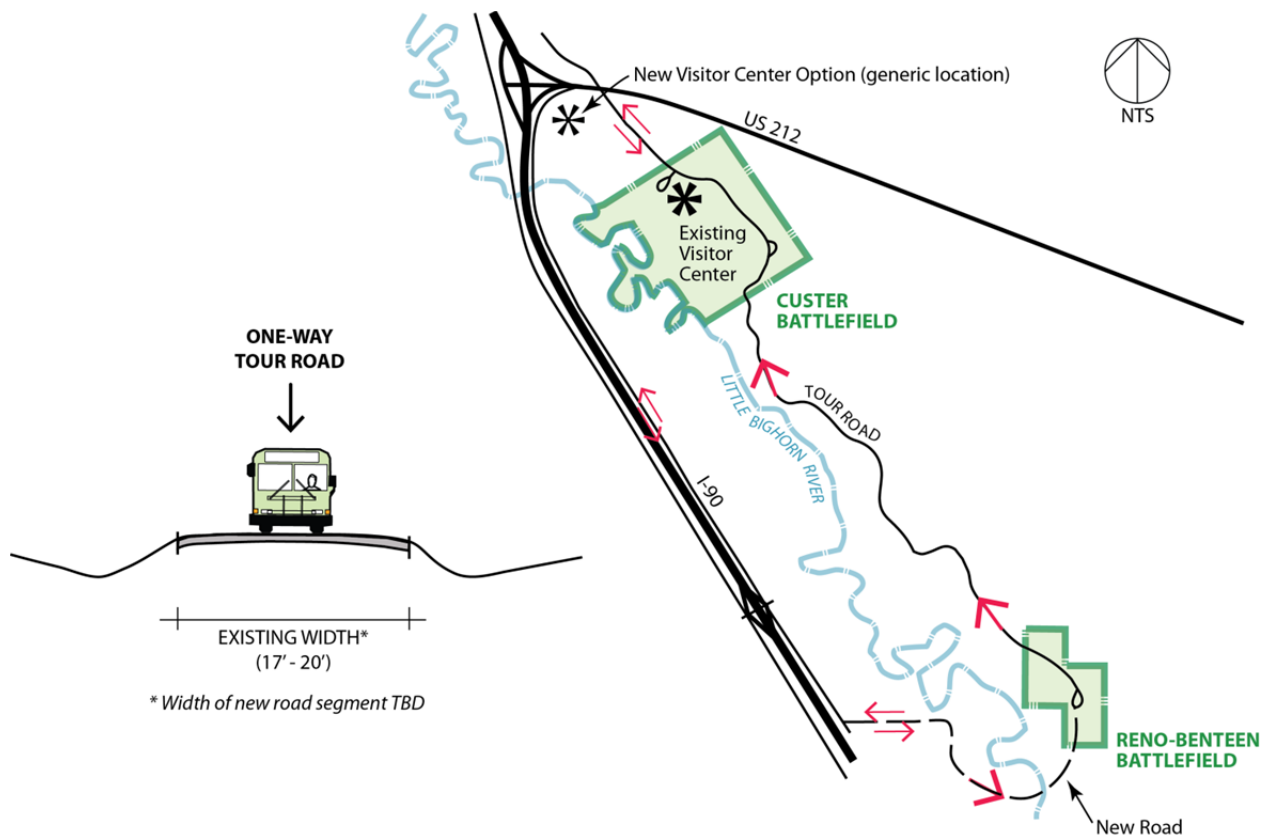
Source: Little Bighorn Battlefield National Monument.

### 3) One-Way Tour Loop with Access from I-90 Frontage Road

This option (Figure 3-5) includes converting the existing tour road to one-way only and a proposed tour road extension from Reno-Benteen Battlefield south and west to the I-90 frontage road, forming a counter-clockwise one-way tour loop. This one-way loop would allow visitors to experience the historic sites in the chronological sequence of the battle. The tour road extension would require a bridge over Little Bighorn River and was originally envisioned in conjunction with a new visitor orientation/ administration facility and parking area. Additional parking has also been proposed west of the Little Bighorn River, at the beginning of the one-way tour road segment.

This option was first presented in the 1995 *General Management Plan Update*<sup>10</sup> and again in the 2010 *Preliminary Feasibility Study*<sup>8</sup> as Option E. It was also revisited during the ATFS Project Kick-off Workshop in October 2011<sup>5</sup>. This option would include transit service on the tour road and the new one-way traffic circulation would improve traffic safety. Additionally, the one-way conversion would free up right-of-way for other multi-modal improvements in the future.

Figure 3-5: One-Way Loop Tour Road via I-90 Frontage Road (from GMP)



Source: URS Corporation.

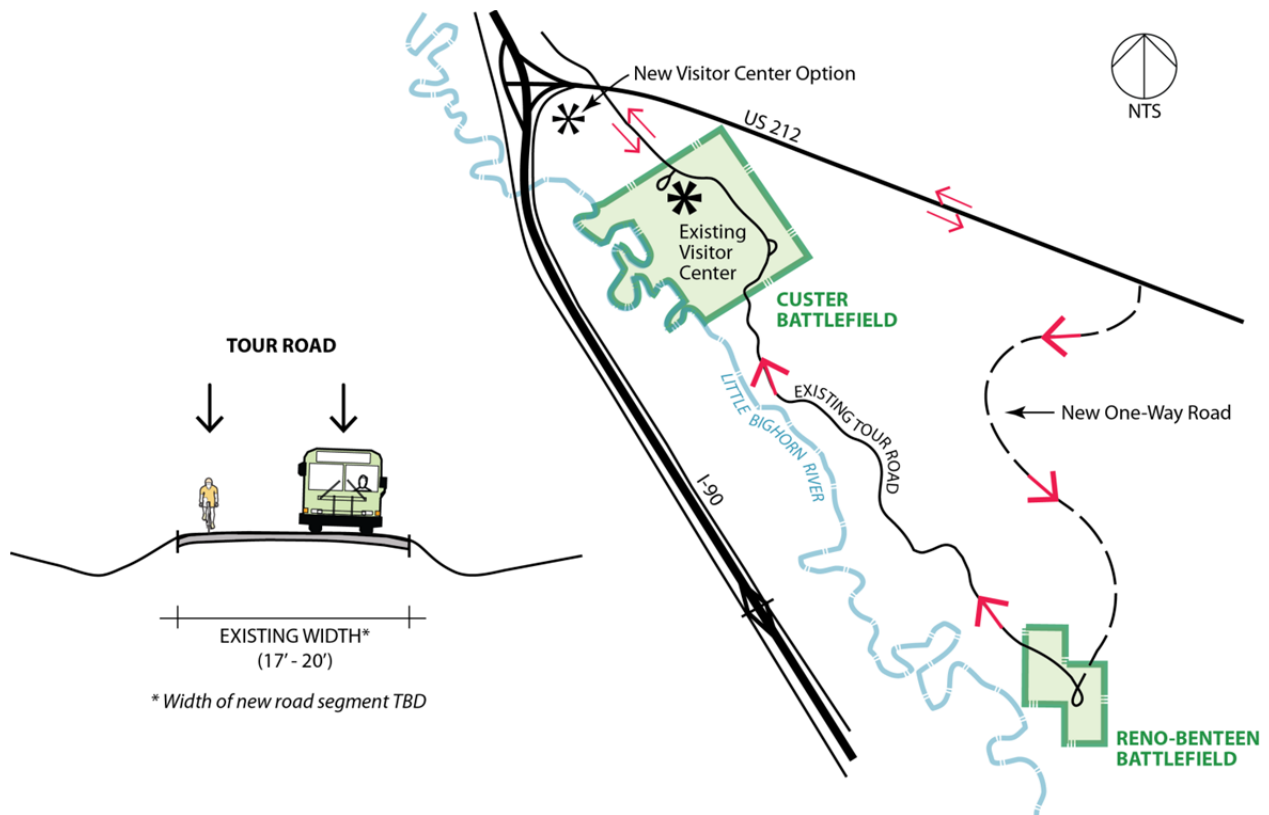
<sup>10</sup> *Final General Management and Development Concept Plans (GMP) (An Update to the 1986 GMP)*, Little Bighorn Battlefield National Monument, 1995.

#### 4) One-Way Tour Loop with Access from US 212

This option (Figure 3-6) includes a proposed tour road extension from Reno-Benteen Battlefield north to US 212, forming a clockwise one-way tour loop. Like the previous option, the one-way tour road would allow visitors to experience the historic sites in the chronological sequence of the battle; however, this extension would avoid the costs and impacts associated with a new bridge over the Little Bighorn River. An optional new visitor contact station, located adjacent to the junction of US 212 and MT 342, would provide guidance to visitors particularly in relation to the one-way tour road and parking locations. New parking would be installed in this area should the optional visitor contact station be constructed.

This option was discussed at the ATFS Project Kick-off Workshop in October 2011<sup>5</sup>. Like the previous option, the road extension and traffic modifications to one-way circulation could include transit service and would improve traffic safety. Additionally, the one-way conversion would free up right-of-way along the current tour road for other multi-modal improvements, particularly to accommodate non-motorized travel modes, in the future.

Figure 3-6: One-Way Loop Tour Road via US 212

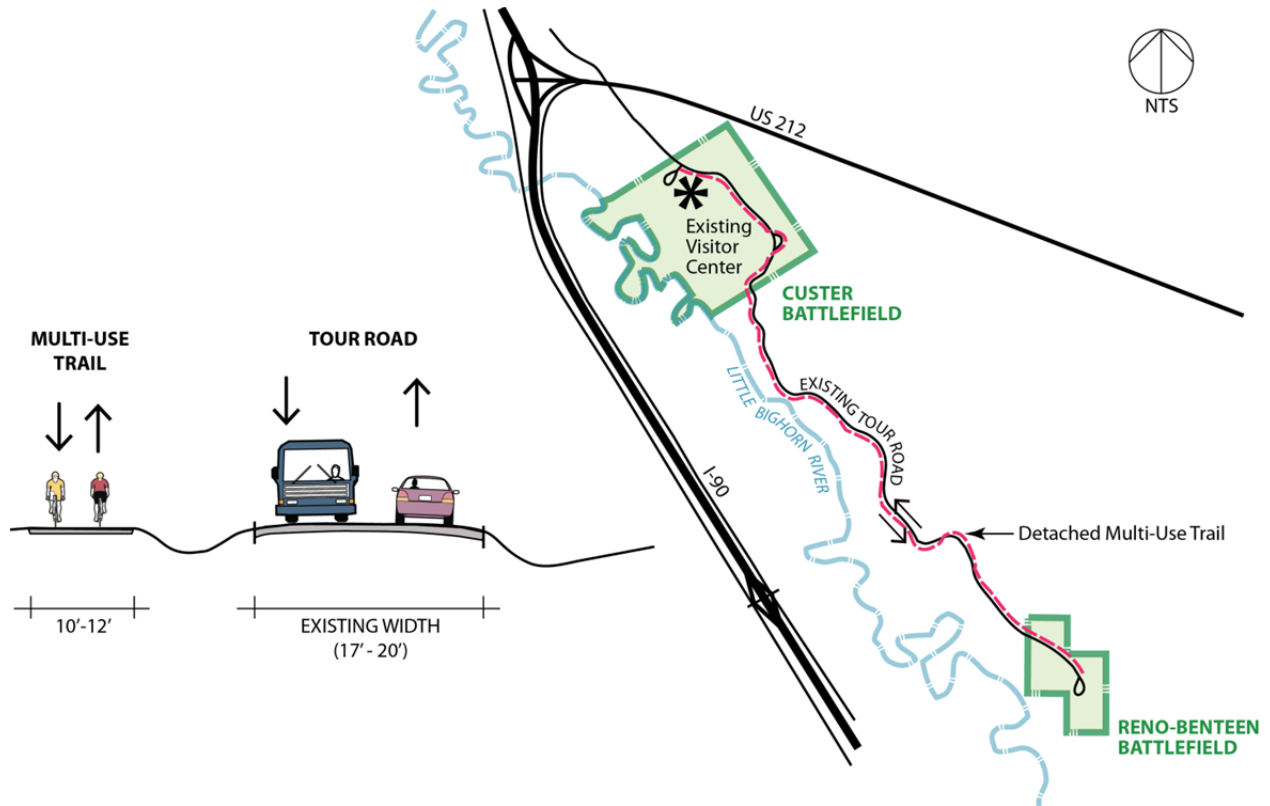


Source: URS Corporation.

### 5) Detached Multi-use Trail Paralleling Tour Road

This option (Figure 3-7) proposes a detached multi-use trail for non-motorized travel modes along the entire tour road. This trail would be 10- to 12-foot wide and could be paved, gravel, or unpaved. Discussed at the ATFS Project Kick-off Workshop in October 2011, this option would significantly improve access and safety for non-motorized travel modes.

**Figure 3-7: Detached Multi-use Trail**



Source: URS Corporation.

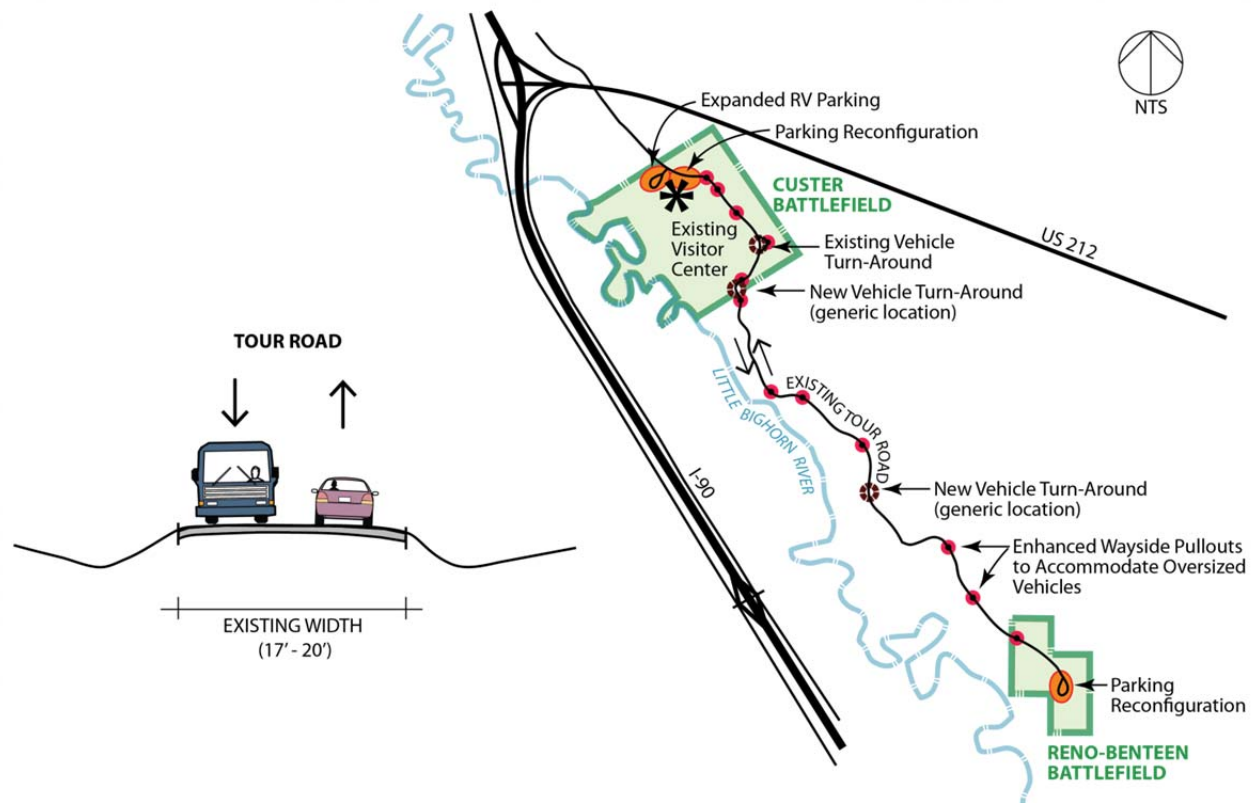


## 6) Alternate Infrastructure Improvements

This option (Figure 3-8) is a collection of various lower-impact/lower-cost infrastructure improvements meant to enhance visitor experience and protect cultural and natural resources in and adjacent to the park.

Improvements under this option, many of which were discussed at the ATFS Project Kick-off Workshop in October 2011, include vehicle turnarounds at key locations on the tour road, enhanced or additional wayside pullouts with oversized vehicle parking, and expansion/ reconfiguration of oversized vehicle parking in a less sensitive area west of the visitor center (Figure 3-9). These improvements could be made in conjunction with expansion of the trail network for pedestrians and other non-motorized travel modes. It should be noted that the parking layout shown in Figure 3-9 is only for illustration purposes, not actual design.

**Figure 3-8: Alternate Infrastructure Improvements**



Source: URS Corporation.

Figure 3-9: New Oversized Vehicle Parking (October 2011 Project Kickoff Workshop)



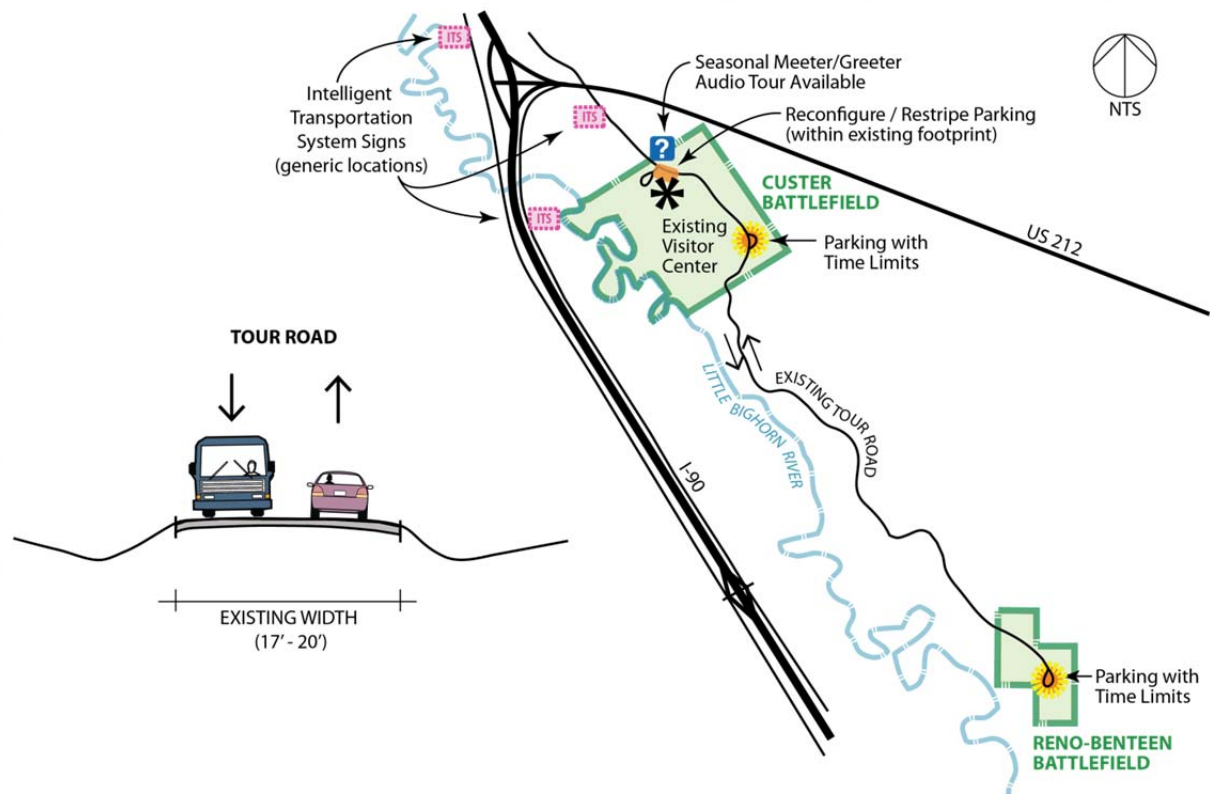
## No-Build Options

### 7) Management Improvements

This option (Figure 3-10) is a collection of lower-cost and lower-impact operational changes to enhance visitor experience. Many of these changes were suggested in the *2010 Preliminary Feasibility Study – Alternative Transportation*<sup>8</sup> as Option C.

This option utilizes existing facilities but seeks to improve communications with visitors and to smooth parking. ITS signs would be added along I-90, at the entrance to the park, and inside the park. A seasonal “meeter/greeter” would assist visitors with parking logistics and promote use of the park’s tour road audio tour at peak times when parking is unavailable at the visitor center. Additionally, the visitor center parking area could be signed with time limits to encourage turnover. It should be noted that enforcement of time restrictions in the parking area could be difficult and require extra efforts of park staff, but these restrictions have the potential to substantially mitigate congestion and conflicts in the parking area.

Figure 3-10: Management Improvements



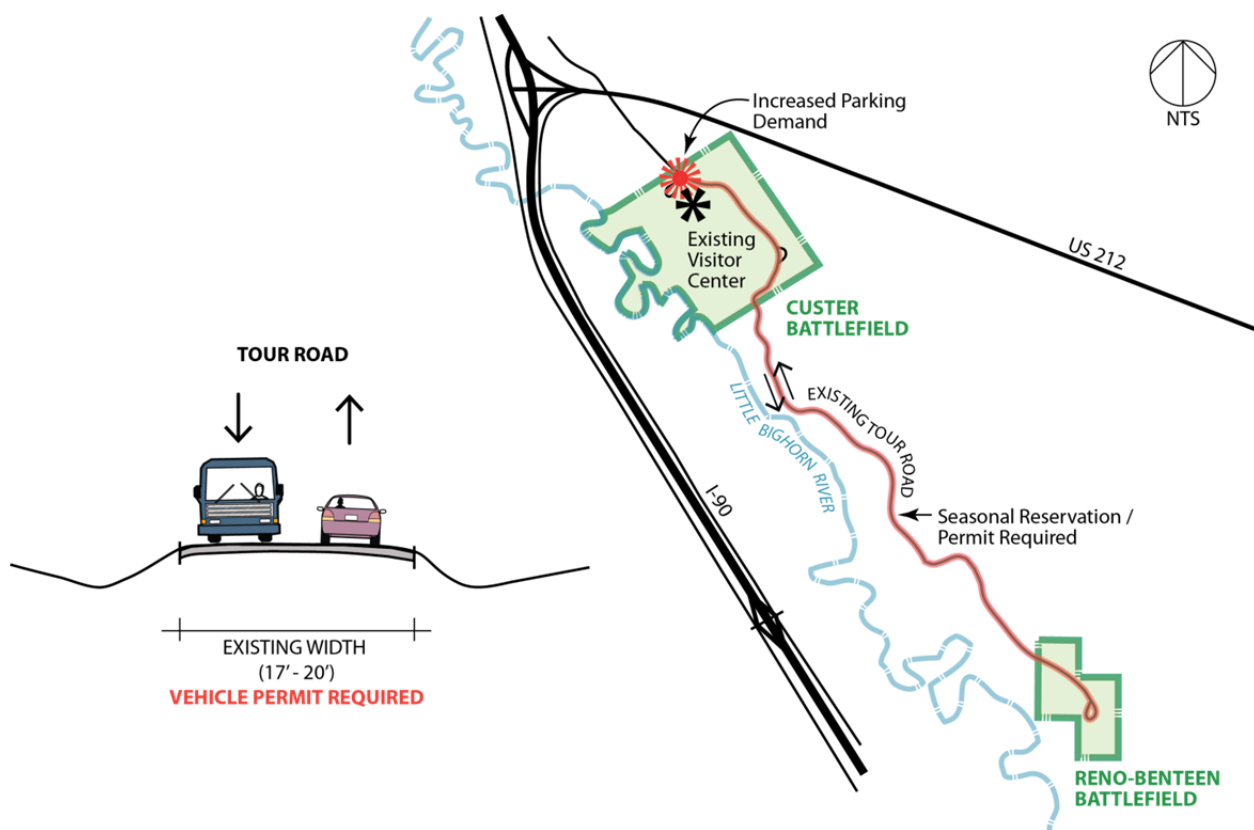
Source: URS Corporation.

### 8) Seasonal Reservation / Permit System

This option (Figure 3-11) would seasonally restrict access to the park and require that visitors reserve an entry permit ahead of time. This option was first identified in the *1998 Traffic Safety Study*<sup>11</sup> and was mentioned in the *2010 Preliminary Feasibility Study – Alternative Transportation*<sup>8</sup> as a less feasible option (Option D).

This option would not preclude transit service. Alternative modes such as transit, bicycles, and hiking could be incentivized by not requiring an access permit or reservation.

**Figure 3-11: Seasonal Reservation and Permit**



Source: URS Corporation.

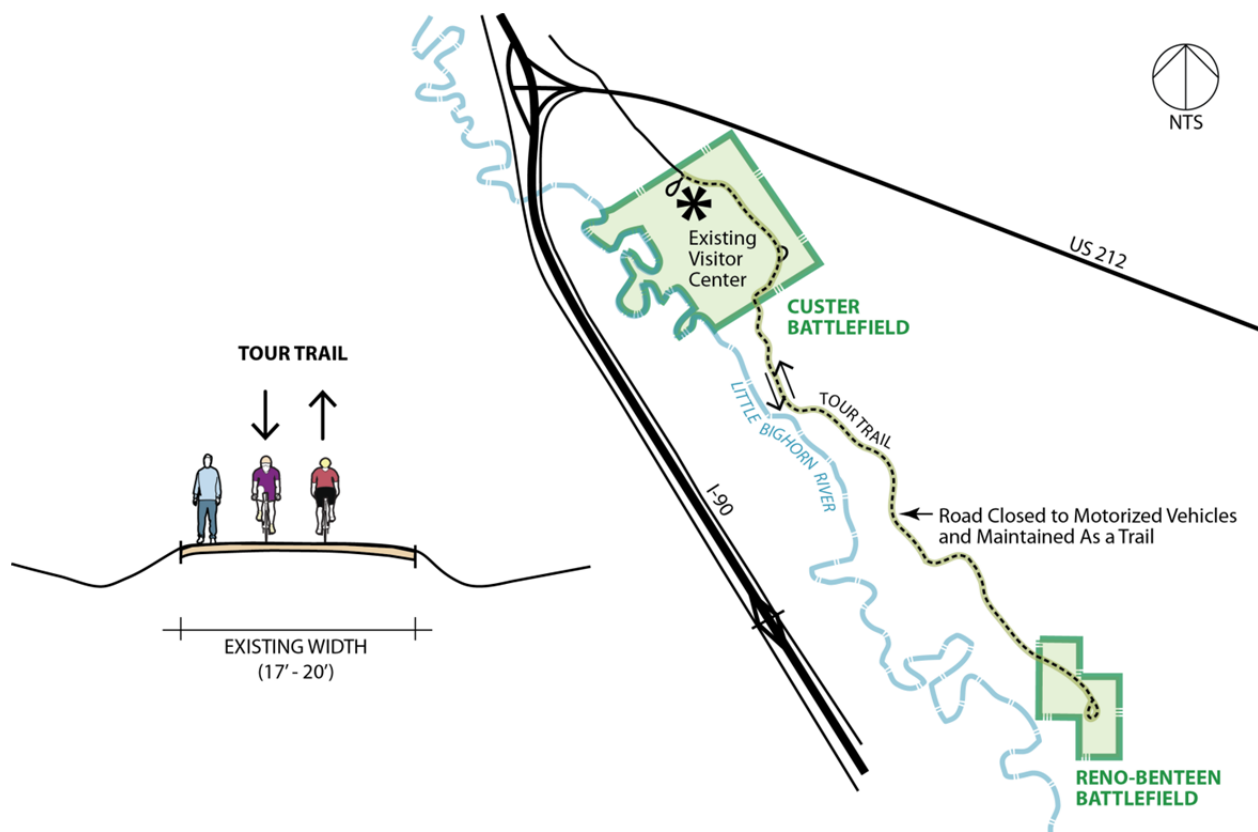
<sup>11</sup> *Traffic Safety Study for Little Bighorn Battlefield National Monument*, Robert Peccia & Associates, 1998.

### 9) Permanently Close Tour Road to All Motorized Vehicles

This option (Figure 3-12) would close the road to motorized vehicles after the visitor center and maintain it as a trail instead. This option was mentioned in the *2010 Preliminary Feasibility Study – Alternative Transportation*<sup>8</sup> as a more restrictive version of then Option D – a seasonal reservation/permit system.

This option would open the tour road right-of-way to non-motorized travel modes and would encourage cycling and hiking. Depending on demand, this option may require additional visitor center and/or offsite parking.

**Figure 3-12: Permanently Close Tour Road to Motorized Vehicles**



Source: URS Corporation.

### ***Transit Options***

Four transit options, numbered 10 to 13, were proposed for initial screening and described below. Options 10, 11, and 12 are illustrated in Figure 3-13. Option 13 is illustrated in Figure 3-14.

The service time period of each of the three transit options 10, 11, and 12 can be varied to operate during the peak season, typically from Memorial Day to Labor Day; a few weeks during the summer months when the park encounters parking and traffic congestion; or only during some special events such as the Memorial Day weekend, the park's anniversary (June 25), the Sturgis Motorcycle Rally, and Labor Day.

#### **10) Peak Period/Special Events/Seasonal Voluntary Transit**

This option (Figure 3-13) would provide a voluntary seasonal shuttle/tour bus service for visitors to see the sights along the tour road. This option would require offsite parking and a parking shuttle to transport visitors into the park. It could also include a drop-off lot for towed vehicles and oversized vehicles. This option could improve safety for bicyclists riding in mixed traffic by reducing the number of private vehicles on the tour road. Like the other transit options, this option could encourage walking and bicycle trips by providing return transportation on shuttle buses equipped with bicycle racks.

#### **11) Peak Period/Special Events/Seasonal Mandatory Transit for All Visitors**

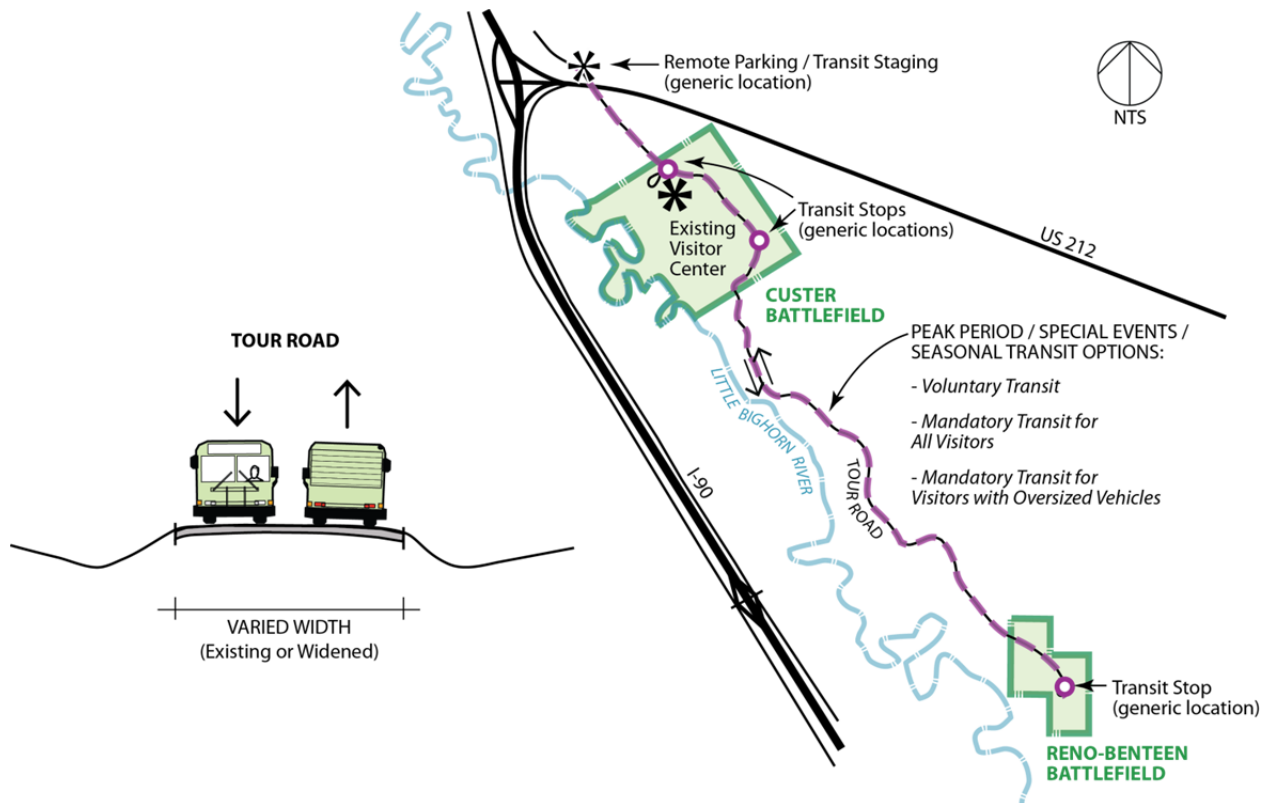
This option (Figure 3-13) would close the tour road to all private vehicles after the visitor center during peak hours, peak days, or certain seasons. Parking and tour shuttles would provide access to the tour road and offsite parking location(s). This option would effectively reduce or eliminate traffic and parking congestion in the park, improve safety for bicyclists and pedestrians utilizing the tour road, and reduce impacts to resources. Like the other transit options, the shuttle could encourage walking and bicycle trips by providing return transportation on shuttle buses equipped with bicycle racks. This option could also include a drop-off lot for towed vehicles.

#### **12) Peak Period/Special Events/Seasonal Mandatory Transit for Visitors with Oversized Vehicles**

This option would (Figure 3-13) seasonally close the tour road to all oversized vehicles after the visitor center and a tour shuttle would provide access to the tour road. This option would require a mandatory drop-off lot for towed vehicles, an offsite oversized vehicle parking lot, and a parking shuttle. By prohibiting oversized vehicles on the tour road, this option would improve traffic safety for all visitors utilizing the roadway. Like the other transit options, the shuttle could encourage walking and bicycle trips by providing return transportation on transit vehicles equipped with bicycle racks.

The original ideas of this transit option were first explored in the *1998 Traffic Safety Study*<sup>11</sup> and revisited in subsequent studies. The *2010 Preliminary Feasibility Study - Alternative Transportation*<sup>8</sup> explored transit in conjunction with offsite oversized vehicle parking and possibly seasonal oversized vehicle restrictions on the tour road (from Entrance Station to Reno-Benteen) as Option B. The October 2011 Project Kickoff Workshop<sup>5</sup> explored similar concepts but considered road access restrictions for all private vehicles during peak times/days.

Figure 3-13: Peak Period/Special Events/Seasonal Transit Options



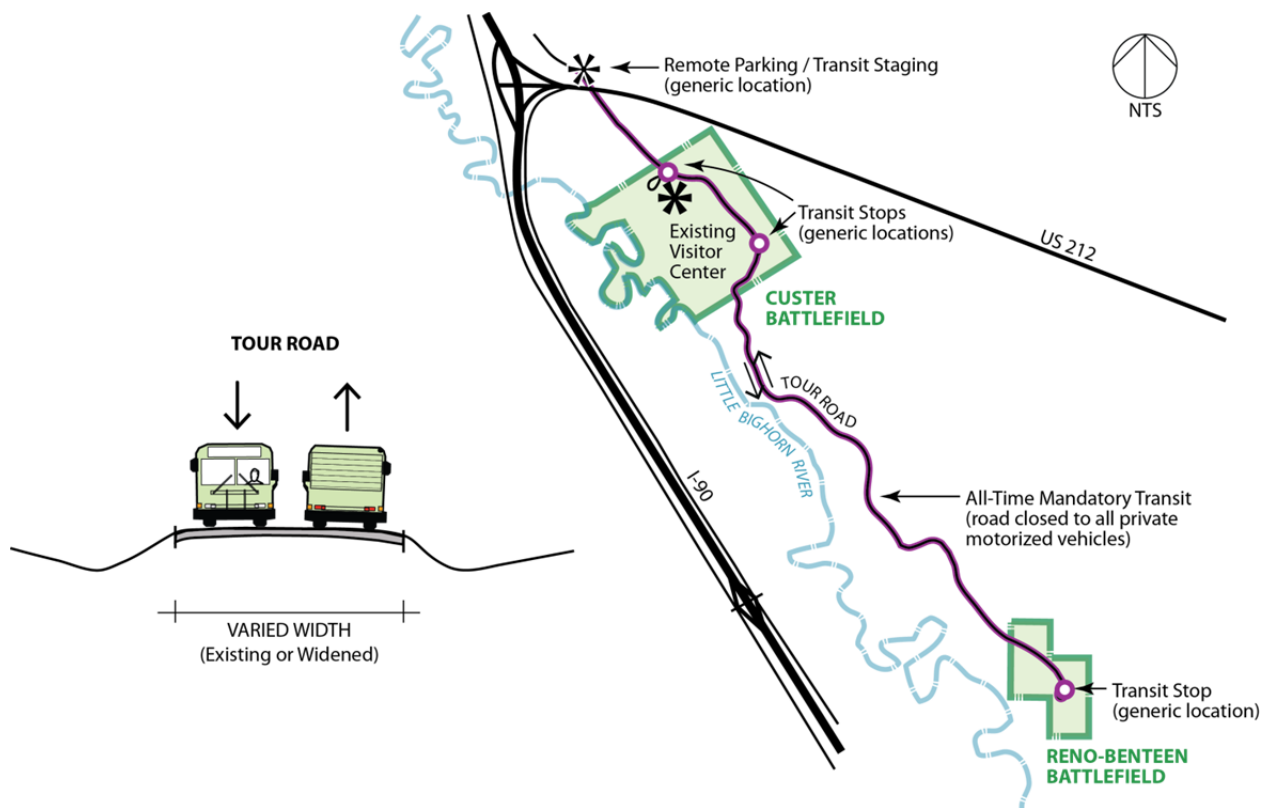
Source: URS Corporation.

### 13) Year-round Mandatory Transit for All Visitors with Motorized Vehicles

This transit option (Figure 3-14) would close the tour road to all motorized vehicles after the visitor center throughout the year. A tour shuttle would provide access to the tour road between the visitor center area and Reno-Benteen Battlefield unit. This option would require offsite vehicle parking and a parking shuttle as well. This option would significantly improve access and safety for alternative travel modes utilizing the roadway including bicyclists, pedestrians, etc. due to motorized vehicles being prohibited on the tour road. Like the other transit options, the shuttle could encourage walking and cycling trips by providing return transportation on vehicles equipped with bicycle racks.

Similar mandatory transit options were explored in the 1998 *Traffic Safety Study*<sup>11</sup> and revisited in subsequent studies. The 2010 *Preliminary Feasibility Study – Alternative Transportation*<sup>8</sup> suggested that restricting all private vehicles on the tour road would be a less feasible option. The October 2011 Project Kickoff Workshop<sup>5</sup> did not distinguish between oversized and regular-size private vehicles and considered various transit and multi-modal scenarios which would restrict motorized vehicle access.

Figure 3-14: Year-round Mandatory Transit for All Visitors with Motorized Vehicles



Source: URS Corporation.

## Initial Screening

The objective of initial screening is to determine if an option has “fatal flaws” by rating each initial option using a “pass,” “neutral,” or “fail” score, based on a set of criteria. The identified “fatal flaw(s)” would be reason to not carry an option forward for further development and more detailed evaluation.

The study team derived initial screening criteria from the project goals and objectives that were developed during the Kickoff Workshop<sup>5</sup>, with the following considerations:

- Criteria collectively should assess whether an option would be able to help fulfill the park mission as stated below:  
*“Little Bighorn Battlefield National Monument preserves, protects, and interprets the historic, cultural, and natural resources, including lands, pertaining to the Battle of the Little Bighorn, leaving them unimpaired, and provide visitors with an understanding of the historic events leading up to the battle, the encounter itself, and the consequences by both the military and American Indian contingents, for the enjoyment of future generations.”<sup>8</sup>*
- Criteria need to be consistent with established goals and objectives resulting from the Kickoff Workshop, while avoiding looking into detailed performance measures, which will be the focus of detailed screening.
- Criteria should balance short-term and long-term transportation needs. Although some goals and objectives target short-term improvements more than others, each criterion needs to avoid focusing only on short-term or long-term improvements and impacts.



- Criteria should be applied to evaluate each option’s effectiveness in solving the critical transportation issues summarized in the *Existing Conditions Memorandum*<sup>4</sup> and identified through previous planning and study efforts for the park.

Based on the goals and objectives articulated at the Kickoff Workshop<sup>5</sup>, the study team set forth the following criteria for screening the initial set of transportation options:

- A. Enhance visitor experience
- B. Minimize impacts to historical, cultural, and natural resources
- C. Reduce traffic congestion and parking shortage in the park
- D. Manage transportation assets to maintain acceptable conditions
- E. Improve visitor safety

Results of applying these criteria to screen the initial transportation options are presented in Table 3-1. As the table shows, three of the construction options, including Option 1 - Repairing Tour Road and Reconfiguring Parking Lots; Option 2 - Widening Tour Road and Expanding Parking Lots (4R Project), and Option 3 - One-way Loop via I-90 Frontage Road (the GMP Option), passed the initial screening. Each of these three options is rated as “pass” or “neutral” against all initial screening criteria. In addition, previously approved plans were included.

In the no-build category, one of the three options, Option 7 - Management Improvements and Parking Reconfiguration, is rated as “pass” or “neutral” against all initial screening criteria, and therefore is considered as passing the initial screening. The other two no-build options are each rated “fail” against at least one criterion.

In the transit category, one of the four options, Option 10 - Voluntary Transit for All Visitors, is rated as “pass” or “neutral” against all initial screening criteria, and therefore is considered as passing the initial screening. The other three transit options are each rated “fail” against at least one criterion.

General discussions of evaluating the 13 options against each criterion (the initial screening process), including the rationale of assigning a score of “pass,” “neutral,” or “fail” to each option against a certain criterion, are presented in *Volume II: Options and Criteria for Evaluation Report*<sup>7</sup>.

As a result of the initial screening process, the following five initial options have been carried forward for further development and evaluation while the others were eliminated from further consideration:

- Option 1: Repair Tour Road and Reconfigure Parking
- Option 2: Widen Tour Road and Expand Parking Lots (4R Project)
- Option 3: One-Way Loop Tour Road via I-90 Frontage Road (GMP Option)
- Option 7: Management Improvements
- Option 10: Voluntary Transit for All Visitors

Table 3-1: Initial Screening Matrix

Initial Set of Options	Initial Screening Criteria				
	A	B	C	D	E
	Enhance visitor experience	Minimize impacts to historical, cultural, and natural resources	Reduce traffic congestion and parking shortage in the park	Manage transportation assets to maintain acceptable conditions	Improve visitor safety

**CONSTRUCTION OPTIONS**

★ 1) Repair Tour Road and Reconfigure Parking	Pass	Neutral	Neutral	Pass	Neutral
★ 2) Widen Road and Expand Existing Parking Lots (4R Project)	Pass	Neutral	Pass	Neutral	Pass
★ 3) One-Way Loop via I-90 Frontage Road (GMP Option)	Pass	Neutral	Pass	Neutral	Pass
4) One-Way Loop via US 212	Pass	Fail	Pass	Neutral	Pass
5) Detached Multiuse Trail Paralleling the Tour Road	Pass	Fail	Fail	Fail	Neutral
6) Alternate Infrastructure Improvements	Pass	Fail	Neutral	Pass	Neutral

**NO-BUILD OPTIONS**

★ 7) Management Improvements and Parking Reconfiguration	Pass	Neutral	Pass	Neutral	Neutral
8) Seasonal Reservation/ Permit System	Fail	Neutral	Pass	Neutral	Neutral
9) Permanently Close Road to Motorized Vehicles and Maintain it as a Trail	Fail	Pass	Fail	Neutral	Neutral

**TRANSIT OPTIONS**

★ 10) Voluntary Transit for All Visitors	Pass	Pass	Neutral	Neutral	Pass
11) Mandatory Peak/Seasonal/Special Events Transit for All Visitors with Motorized Vehicles	Fail	Pass	Neutral	Neutral	Pass
12) Mandatory Transit for Visitors with Oversized Vehicles	Fail	Pass	Neutral	Neutral	Pass
13) Mandatory Year-round Transit for All Visitors with Motorized Vehicles	Fail	Pass	Pass	Fail	Pass

Source: URS Corporation.

Note: ★ = option passes initial screening

## 3.2 REFINED TRANSPORTATION OPTIONS

The detailed screening of transportation options in this study included refinement of the options which passed the initial screening to a greater detail, as well as application of a set of detailed screening criteria to evaluate the transportation options. This section defines the refined transportation options, following the initial screening and further development and analysis.

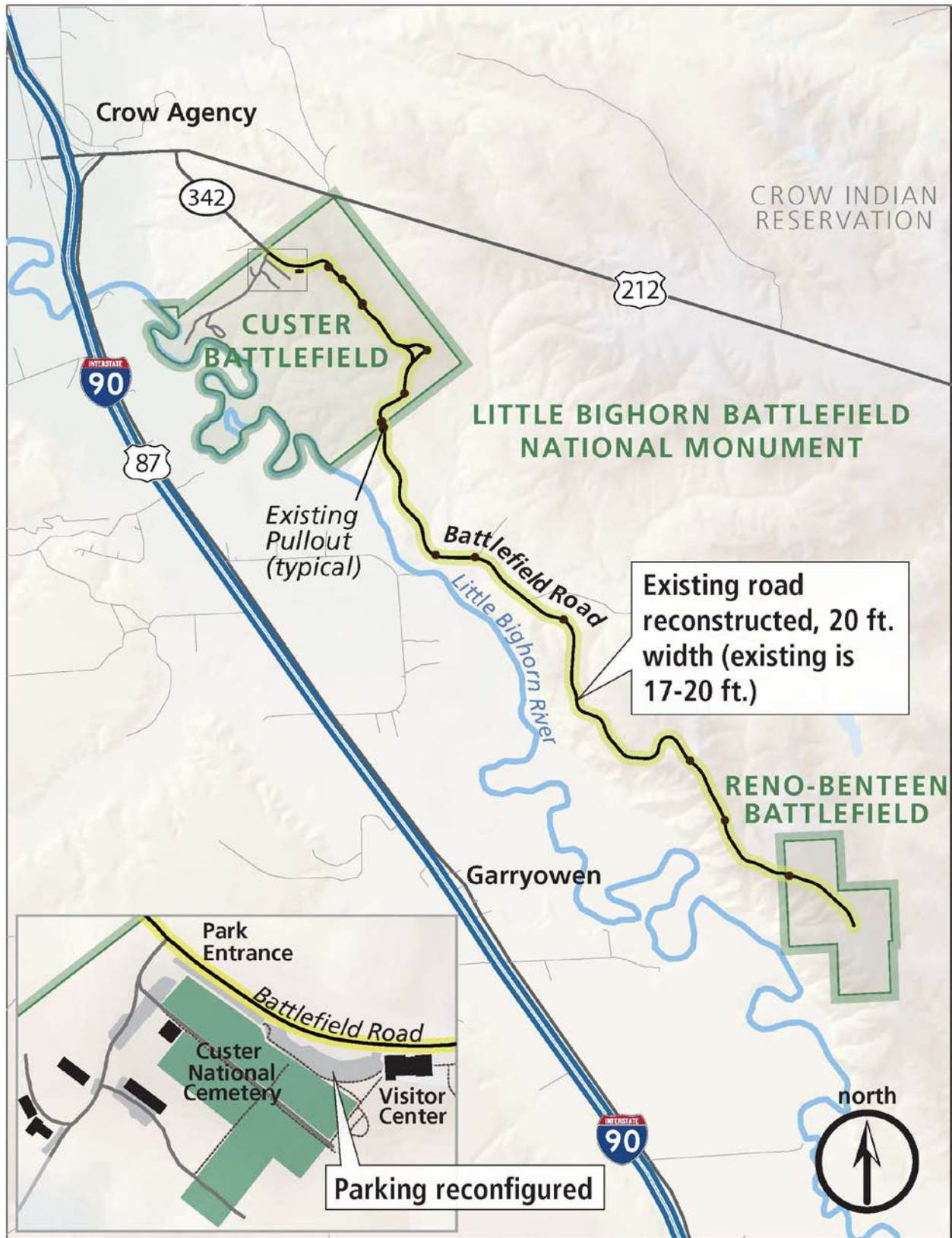
Input from the Evaluation of Options Workshop<sup>6</sup>, conducted at the park on May 7, 2012, was taken into consideration while the study team refined the options. For the purpose of detailed screening, options that passed initial screening have been assigned new numbers. Specifically, initial options 1, 2, 3, and 7 were renumbered as Options I, II, III, and IV. Option 10 evolved into three transit options V, VI-A, and VI-B.

### **Option I – Repair the Tour Road and Reconfigure Parking**

Option I is a reconstruction project that would repair the existing tour road. This option is illustrated in Figure 3-15 and Figure 3-16. The following proposed features define the key components of this transportation option:

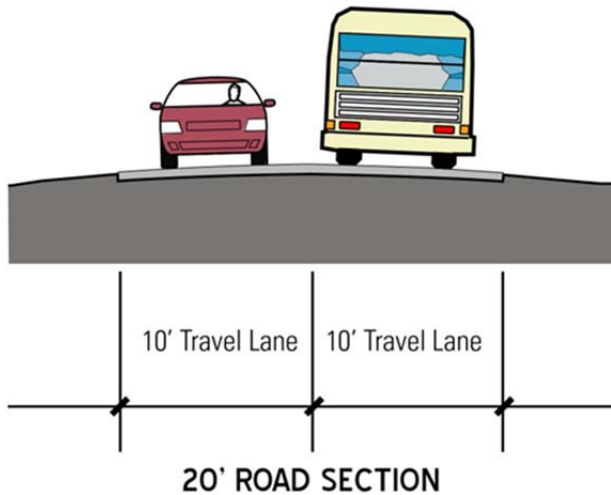
1. The tour road from the visitor center to Reno-Benteen Battlefield, approximately 5.2 miles in length, would be rehabilitated to correct structural deficiencies. The repaired road would have an enhanced pavement structure that is sufficient to withstand repeated loads of oversized vehicles.
2. Construction work on the tour road also includes minor widening of the tour road, where necessary, to a consistent 20-foot pavement width (Figure 4-2); applying new or recycled layer(s) of pavement material to restore or enhance the ride quality; and improving drainage where necessary.
3. Horizontal and vertical realignment and reconstruction are NOT included in this option.
4. Repairs to the tour road would be properly engineered and may widen the road slightly for standardization and proper construction.
5. The tour road improvements would work with existing cattle guards and box culverts.
6. Shoulders would not be provided; however, proper roadside treatment, such as side slopes, would be created to improve safety.
7. Parking lots would be reconfigured or restriped without enlarging the footprint. Appropriate signs that provide wayfinding guidance and redistribute parking to less congested areas should also be installed.
8. This option does not include new or expanded transit service for visitors, but would accommodate the existing interpretive Apsaalooke tours.

Figure 3-15: Option I – Repair Existing Road and Reconfigure Parking



Source: URS Corporation.

**Figure 3-16: Proposed Cross-section for Option I**



Source: URS Corporation.

### **Option II – Widen the Tour Road and Expand Existing Parking Lots (4R Project)**

This option consists of a resurfacing, restoration, rehabilitation, and reconstruction (4R) project that would widen the tour road from an average 18-foot width to 24-feet wide, correct structural deficiencies of the pavement, and improve horizontal and vertical alignment. The widened tour road would have two 11-foot travel lanes with one-foot shoulders on both sides.

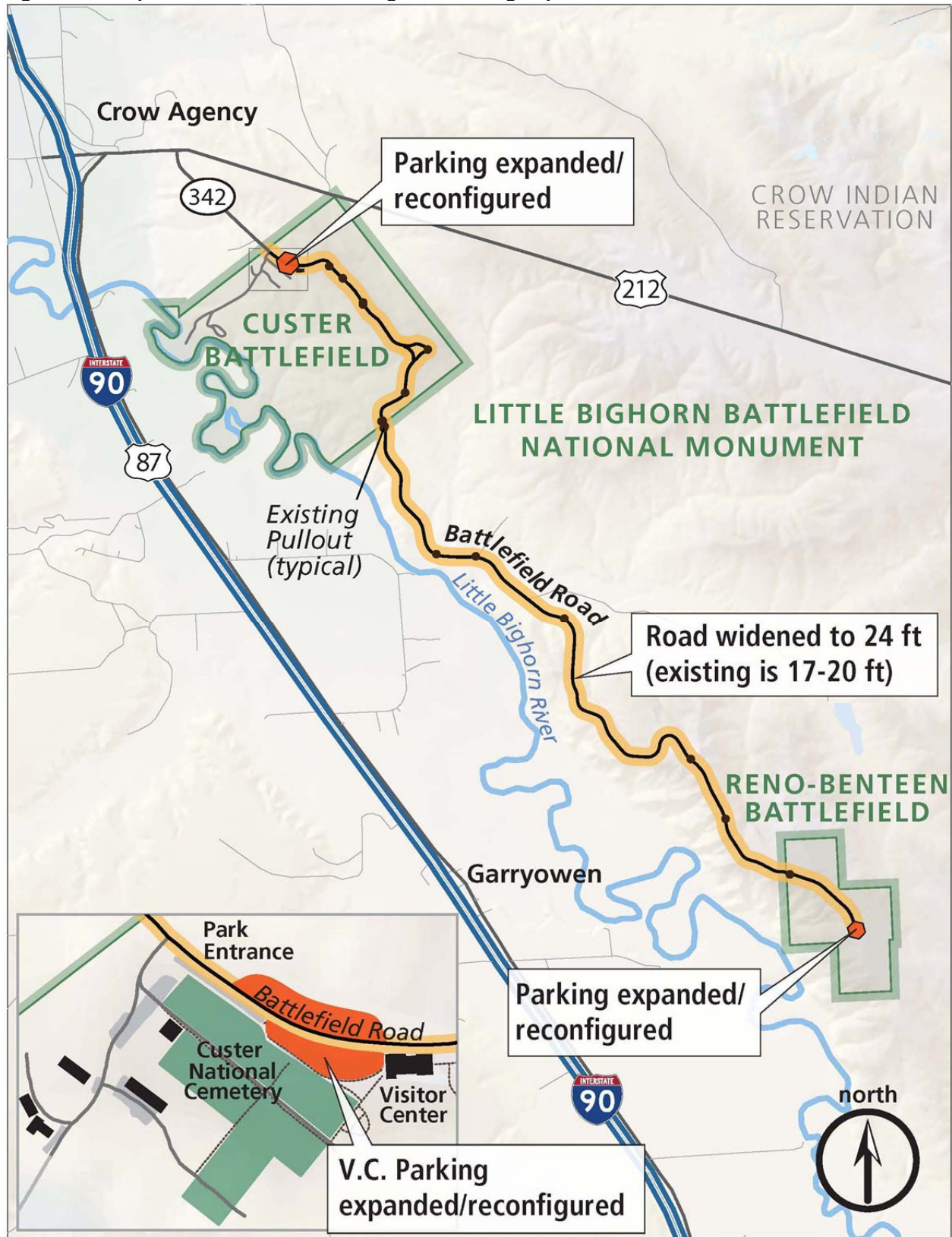
In addition to roadway widening and reconstruction, parking at the Custer Battlefield and Reno-Benteen Battlefield units would be modified and expanded to include bus pull-outs, motorcycle parking, better accommodations for oversized vehicles, and improved traffic flow. In total, 34 new parking spaces would be added in the park.

This option was the preferred alternative in the *2005 Environmental Assessment/Assessment of Effect: Rehabilitate Tour Road*<sup>9</sup>. Although this option does not include new or expanded transit service, it would not preclude transit; the widened tour road could support future shuttle service with larger transit vehicles and the improved visitor center parking lot could serve as a staging area for transit.

This construction project would not require changes to the existing park boundaries, but would increase footprints of the tour road as well as parking lots in the park.

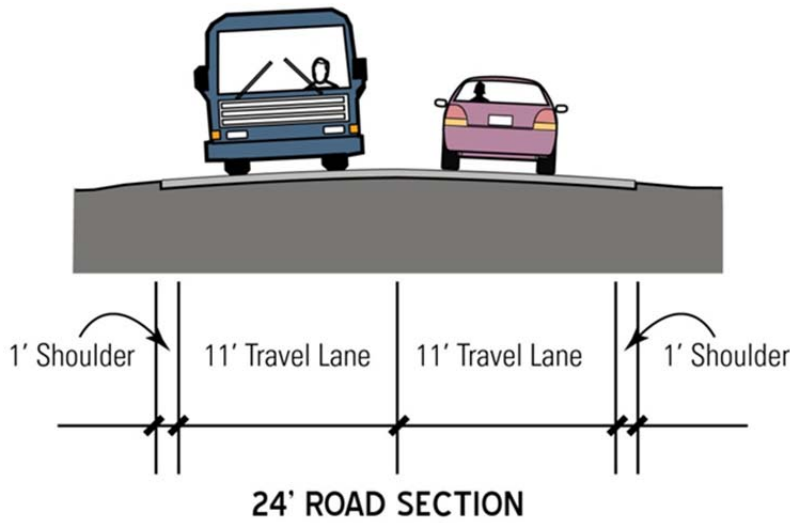
This option is illustrated in Figure 3-17 and Figure 3-18.

Figure 3-17: Option II - 4R Road Widening and Parking Expansion



Source: URS Corporation.

Figure 3-18: Proposed Cross-section for Option II



Source: URS Corporation.

### Option III – GMP One-Way Tour Loop via I-90 Frontage Road

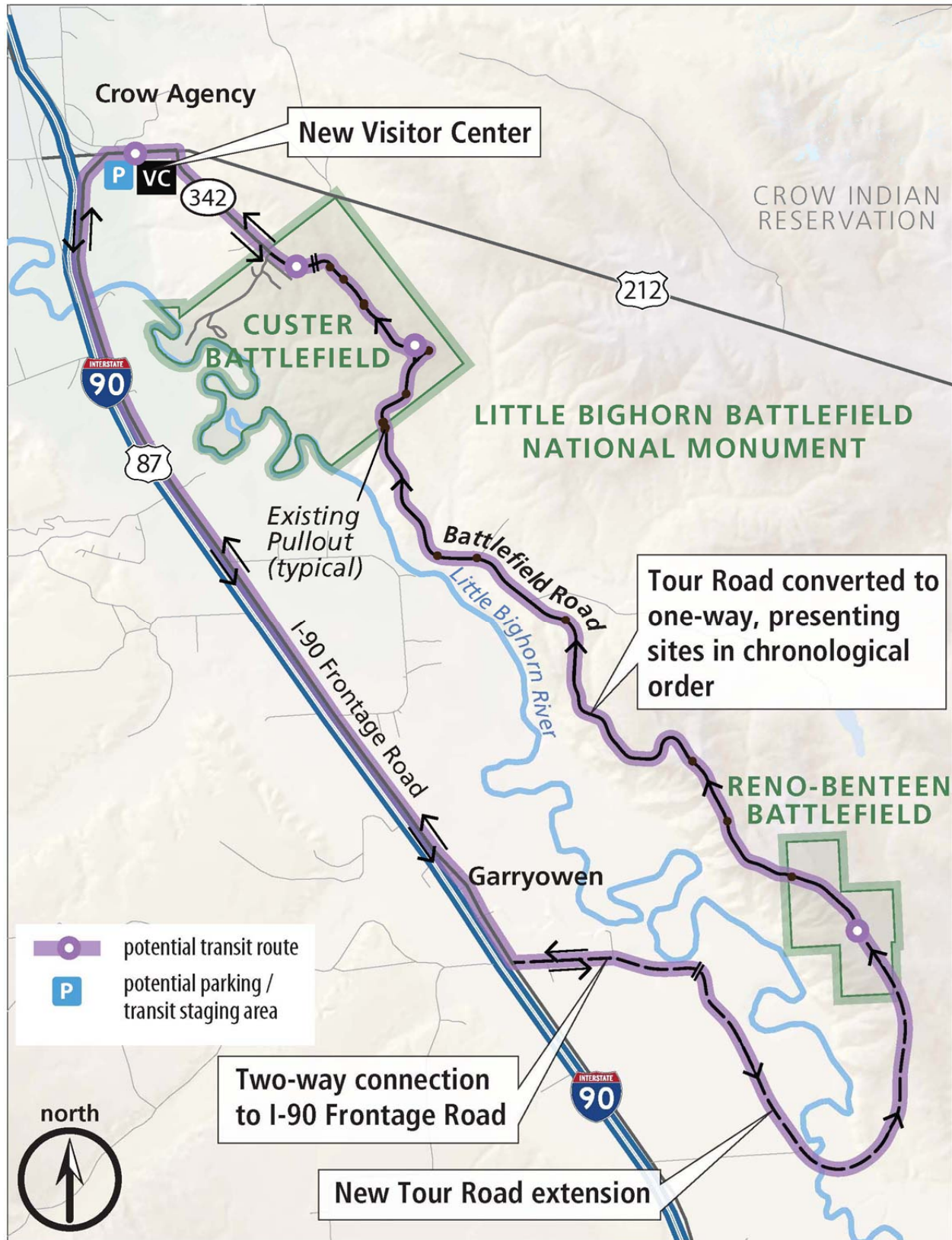
This option would extend the tour road from Reno-Benteen Battlefield south and west to the I-90 frontage road, forming a counter-clockwise one-way tour loop. The park's *General Management Plan*<sup>12</sup> (originally published in 1986 and updated in 1995) calls for a new visitor orientation/administration facility, located with convenient access from I-90. The tour would start at the new visitor orientation facility, proceed on the I-90 frontage road to Reno's first skirmish line site at Garryowen, and then cross under I-90 to arrive at Reno's Crossing. The tour would then follow a new one-way road from Reno's crossing, extend southeast along the west side of the Little Bighorn River to Reno Creek, enter the existing Reno-Benteen Battlefield from the south, connect with the existing tour road, and proceed over the tour road to Last Stand Hill. This option is illustrated in Figure 3-19 and Figure 3-20.

Key features of this transportation option include:

- A proposed tour road extension from Reno-Benteen Battlefield south and west to the I-90 frontage road would form a counter-clockwise one-way tour loop. This one-way loop would provide visitors the opportunity to tour the battlefield in a chronological order.
- The existing tour road from the visitor center to Reno-Benteen Battlefield, approximately 5.2 miles in length, would be rehabilitated to correct structural deficiencies. The repaired road would have an enhanced pavement structure that is sufficient to withstand repeated loads of oversized vehicles.
- Construction work on the tour road also includes minor widening of the tour road, where necessary, to a consistent 20-foot pavement (Figure 3-20); applying new or recycled layer(s) of pavement material to restore or enhance the ride quality; and improving drainage where necessary.

<sup>12</sup> *Final General Management and Development Concept Plans (GMP) (An Update to the 1986 GMP)*, Little Bighorn Battlefield National Monument, 1995

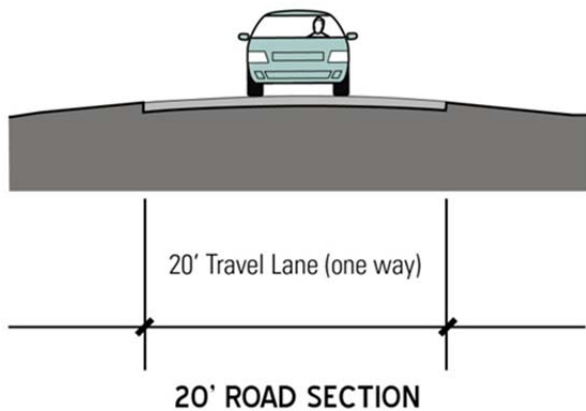
Figure 3-19: Option III - GMP One-way Tour Loop via I-90 Frontage Road



Source: URS Corporation.



**Figure 3-20: Proposed Cross-section for Option III on Existing Tour Road**



Source: URS Corporation.

- The repaired tour road would be converted from two-way to one-way from Reno-Benteen Battlefield to Last Stand Hill. The 20-foot wide pavement would be striped and signed to clearly designate the one-lane, one-way operation.
- This option includes a seasonal transit service that would provide shuttle tours from Memorial Day through Labor Day. The shuttle tours provide a large percentage of the annual visitation the opportunity of a guided tour of the battlefield and its environment.
- New visitor parking lots would be constructed at the new visitor orientation facility and at the Reno-Crossing site west of the Little Bighorn River, where the new one-way road begins.
- For visitors who would like to tour the battlefield, they can choose to take the shuttle tour or use their own vehicles to proceed through the one-way loop; for visitors who only intend to visit the Last Stand Hill or the national cemetery, they may drive along the current access road, MT 342, from the north to enter the park at the existing entrance station.

### **Option IV – Management Improvements**

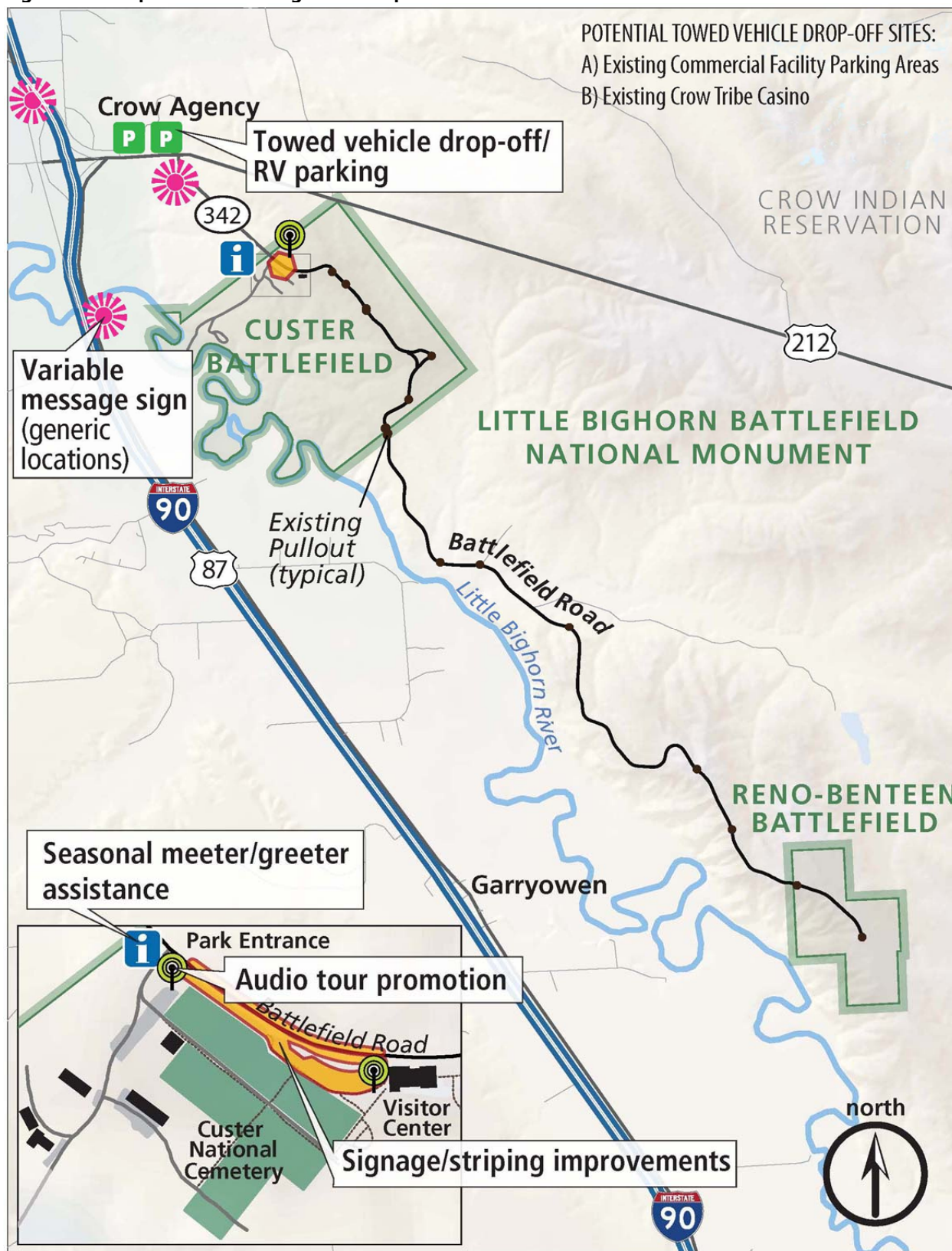
This option is a collection of lower-cost and lower-impact operational changes to enhance the visitor experience. It utilizes existing facilities but seeks to improve parking and communications with visitors. Option IV includes various elements that could be implemented at the discretion of park management, including seasonal, peak time, and trial applications. Key features include:

- Install variable message signs (VMS) on I-90 and park access road (MT 342) before the entrance station. These signs could alert visitors to parking options and restrictions and provide information about special events such as times or special limitations.
- The park's internal signage/stripping could be improved. The following recommendations from the 2010 Upchurch report have been retained:
  - New signage would direct visitors to additional parking areas located by the Stone House and the visitor center.
  - Change "Towed Vehicle Parking Only" to "Oversized Vehicle Parking Only." Supplement with pavement markings adjacent to the edge line that read "Oversized Vehicles Only."

- New signage on the west side of the oversized vehicle parking area (the curb north and south of the restrooms) to indicate oversized vehicles only.
- “Additional Car Parking” directional signing at both the beginning and end of the island (north and south of the restrooms) to direct regular sized vehicles to main road parking area.
- Visitor Use Assistant(s) (VUA) could be employed on a seasonal basis to assist with managing visitors and congestion. The VUAs would proactively direct visitors to available parking and provide other critical information to entering visitors to help mitigate congestion, especially during peak events. The seasonal VUA(s) or interpretive staff could:
  - Be stationed or float around inside the entrance station and parking areas to assist visitors with wayfinding and parking.
  - Help reduce regular vehicle parking in the oversized vehicle parking area.
  - Discourage parking in non-designated locations.
  - Provide tour route information to visitors in line at the entrance station or in parking areas during peak times when parking is unavailable.
  - Alternatively, existing park staff could continue to carry out these duties as part of their “collateral duties.” The use of existing staff would be more flexible, only requiring deployment at peak times. However, this variation takes staff time away from other important duties.
- The visitor center parking area could be signed with time limits to encourage turnover, such as a one-hour time limit from 9 a.m. to 3 p.m. Although enforcement of time restrictions in the parking area could be difficult and require extra efforts of park staff, these restrictions have the potential to substantially mitigate congestions and conflicts in the parking area.
- Additional turnover at the visitor center parking lots could be encouraged by shortening the length of the visitor orientation movie and program.
- The park could provide cemetery tours to attract parking into the Stone House lot. While this element requires additional programming, this management strategy does not require significant construction and redistributes parking activities away from the visitor center parking lots.
- A wayfinding plan should be developed and implemented to provide clear guidance for visitors to access the park and tour the battlefield. Although the various VMS and traditional signing and striping, as described in this subsection, would collectively serve the wayfinding purpose, a comprehensive wayfinding plan should also consider other media such as the Internet, highway advisory radio (HAR), 511 phone, etc.
- No significant changes are proposed for the tour road. This option does not increase the paved footprint, nor require construction.
- An offsite parking lot should be provided, via partnership with existing land owners, for towed vehicle drop-off and recreational vehicles (RVs) towing a smaller automobile. Potential locations include the old casino parking lot and other underutilized parking areas adjacent to the junction of US 212 and MT 342.

Some of the key features in this option are illustrated in Figure 3-21.

Figure 3-21: Option IV – Management Improvements



Source: URS Corporation.

The only transit option that passed the initial screening – Peak Period/Special Events/Seasonal Voluntary Transit – was further developed into three transit options as described below.

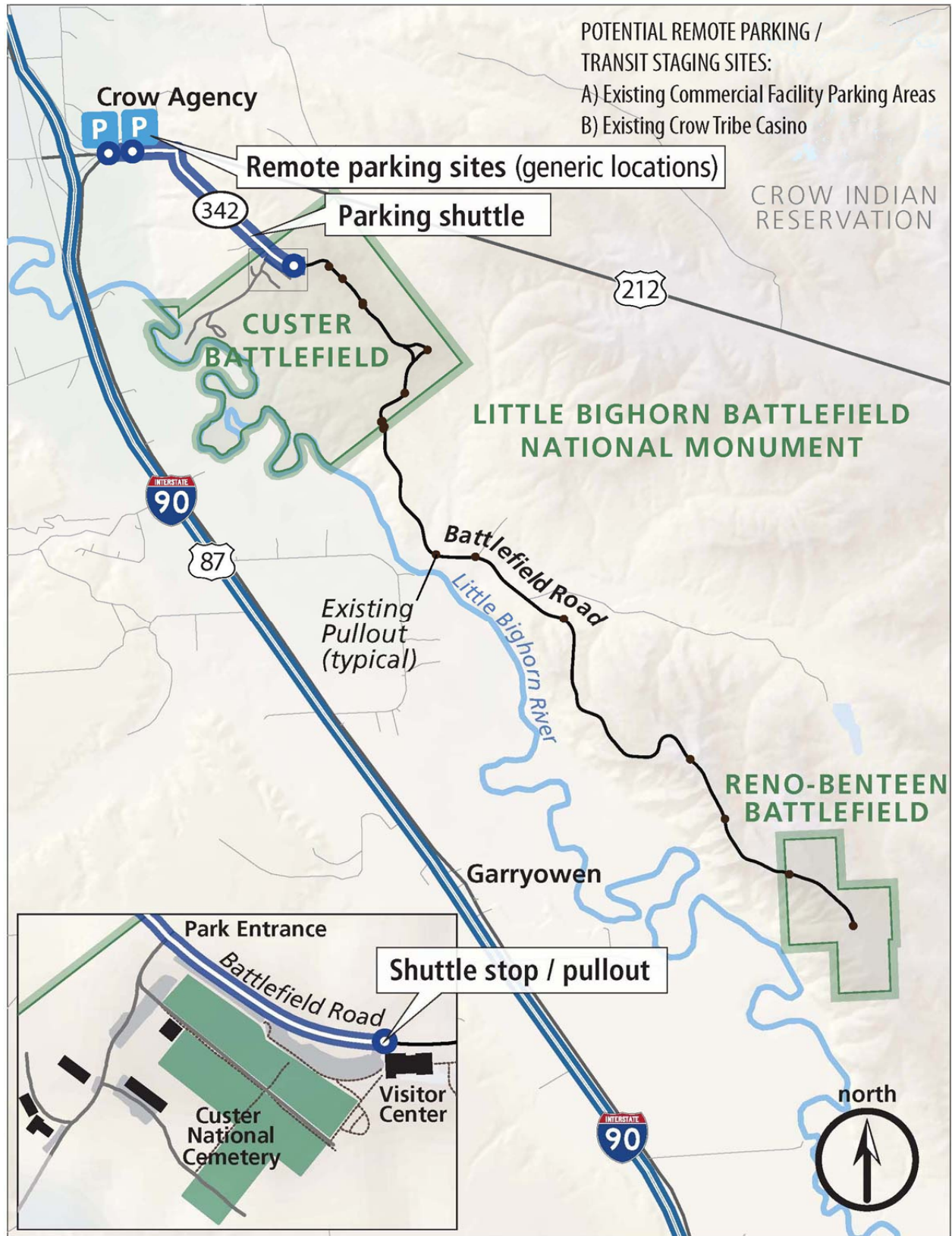
### **Option V – Seasonal Transit from Offsite Staging/Parking to Visitor Center**

This option would provide a seasonal shuttle service for visitors to access the park. Key features of this option are described below:

- A shuttle service would be provided between an offsite staging/parking area and the visitor center during the summer season. No intermediate shuttle stops would be provided.
- The operating season/time would be Memorial Day to Labor Day (approximately 14 weeks), 9 a.m. to 5 p.m.
- The shuttle service is not offered on the tour road east and south of the visitor center.
- Visitors can choose to take the shuttle or use their own vehicles, and they are allowed to use designated visitor parking inside the park, such as at the visitor center area, and at Reno-Benteen Battlefield.
- Although this seasonal transit system would not provide shuttle service between the Custer Battle Field and Reno-Benteen Battlefield units, it is expected to be attractive to those visitors who only intend to stop at the visitor center as well as the rest of the Custer Battlefield unit. Visitor data of the last several years show that approximately 50% of the visitors did not take the tour road beyond (east and south of) Last Stand Hill.
- Variable messaging signs, as well as traditional signs and pavement markings, would be installed to notify visitors of the available shuttle, parking locations and limitations, and options to access the park.
- Under this option, Option I – Repairing Tour Road and Reconfiguring Parking would be included as one element. Although the shuttle service would not extend to the tour road, the road improvements would improve traffic safety, in part by allowing oversized vehicles, including RVs and tour buses, to operate on the tour road in a safer manner.
- A clear message needs to be delivered to visitors that if they plan to tour the battlefield via the tour road, there is no transit service on the tour road and they would have to use their own vehicles. This could be delivered prior to and at the staging area, on the access road, and at the entrance station using VMS, traditional information signs, transit contractor's staff, and fee collection staff.

This option is illustrated in Figure 3-22.

Figure 3-22: Option V – Seasonal Transit from Offsite Staging/Parking to Visitor Center



Source: URS Corporation.

### **Option VI-A – Seasonal Transit from Offsite Staging/Parking to Reno-Benteen Battlefield**

This option would provide a seasonal shuttle service for visitors to access the park and see sights along the tour road. Key features of this option are described below:

- A shuttle service would be provided between an offsite staging/parking area, the visitor center, and Reno-Benteen Battlefield.
- The operating season/time would be Memorial Day to Labor Day (approximately 14 weeks), 9 a.m. to 5 p.m.
- Three shuttle stops are recommended: visitor center, Last Stand Hill, and the Reno-Benteen parking lot. Each stop would have a bus pull-out, a bench, and a bus sign with a supplemental plaque of appropriate schedule information. Rest facilities, such as a shelter and a restroom, would not be included at the remote sites due to significant visual impacts on the sensitive battlefield landscape.
- Shuttle stops outside of the park boundaries along the tour road are not recommended. Although the park has a 60-foot right-of-way along the tour road, parking or walking outside of the park boundaries is discouraged since it is mostly private property.
- Visitors can choose to take the shuttle or use their own vehicles to access the park and tour the battlefield, and they are allowed to use designated visitor parking spaces inside the park, such as at the visitor center area, and at Reno-Benteen Battlefield.
- VMS, as well as traditional signs and pavement markings, would be installed to notify visitors of the available shuttle, parking locations and limitations, and options to access the park.
- Under this option, Option I – Repairing Tour Road and Reconfiguring Parking would be included as one element. The road improvements are necessary for the seasonal shuttle service to operate in a safe and effective way.

### **Option VI-B – Peak Days Transit from Offsite Staging/Parking to Reno-Benteen Battlefield**

This transit option is very similar to Option VI-A. The difference is that Option VI-B only provides a shuttle service during a few peak visitation days in the summer (approximately 10-15 days), including some special events (such as the park’s anniversary on June 25), while Option VI-A provides a seasonal shuttle service from Memorial Day to Labor Day. Due to their similarities, these two transit options are numbered with the same Roman number “VI”, but with a different letter designation A and B.

The rationale for Option VI-B, as a variation of Option VI-A, is to create a transit option that is focused only on the days when traffic, parking, and circulation are most adverse and would most benefit from transit. This approach could potentially reduce total life cycle costs for the transit operation while achieving the most important benefits for the park and visitors. This variation concept emerged from discussions after the Evaluation of Options Workshop<sup>6</sup> held in May 2012.

The characteristics of this transit variation would be essentially identical to those of Option VI-A in terms of time span of daily service, staging, route, etc. Bus frequency/headway would be dependent on the demand level during those peak days as well as vehicle type from the contractor.

Collection procedures of a transportation fee, which if approved would be imposed on top of the regular entrance fee for all visitors, could remain the same as for the seasonal transit but may be

lower due to the expected lower total life cycle cost of this concept compared to the full seasonal transit option.

The peak days only transit option introduces several potential issues and risks compared to the full seasonal transit service. There may be confusion for both park staff and visitors about which days have transit. Signing, web sites, and other information would need to be very clear regarding the occasional availability of the transit service. There may not be consistent staffing / drivers over the summer due to the sporadic nature of the service. Buses for this type of transit service are most likely to come from an existing fleet (as opposed to a park-dedicated fleet for the full seasonal transit) that is available during the summer such as school buses, or other fleets with peaks in the winter recreation season. The buses would likely not have a park themed “livery” (paint scheme) to fit the park setting and make them easily identifiable and attractive. Finally, there is some risk that a willing entity may not be found to contract for so few days spread out over the summer months.

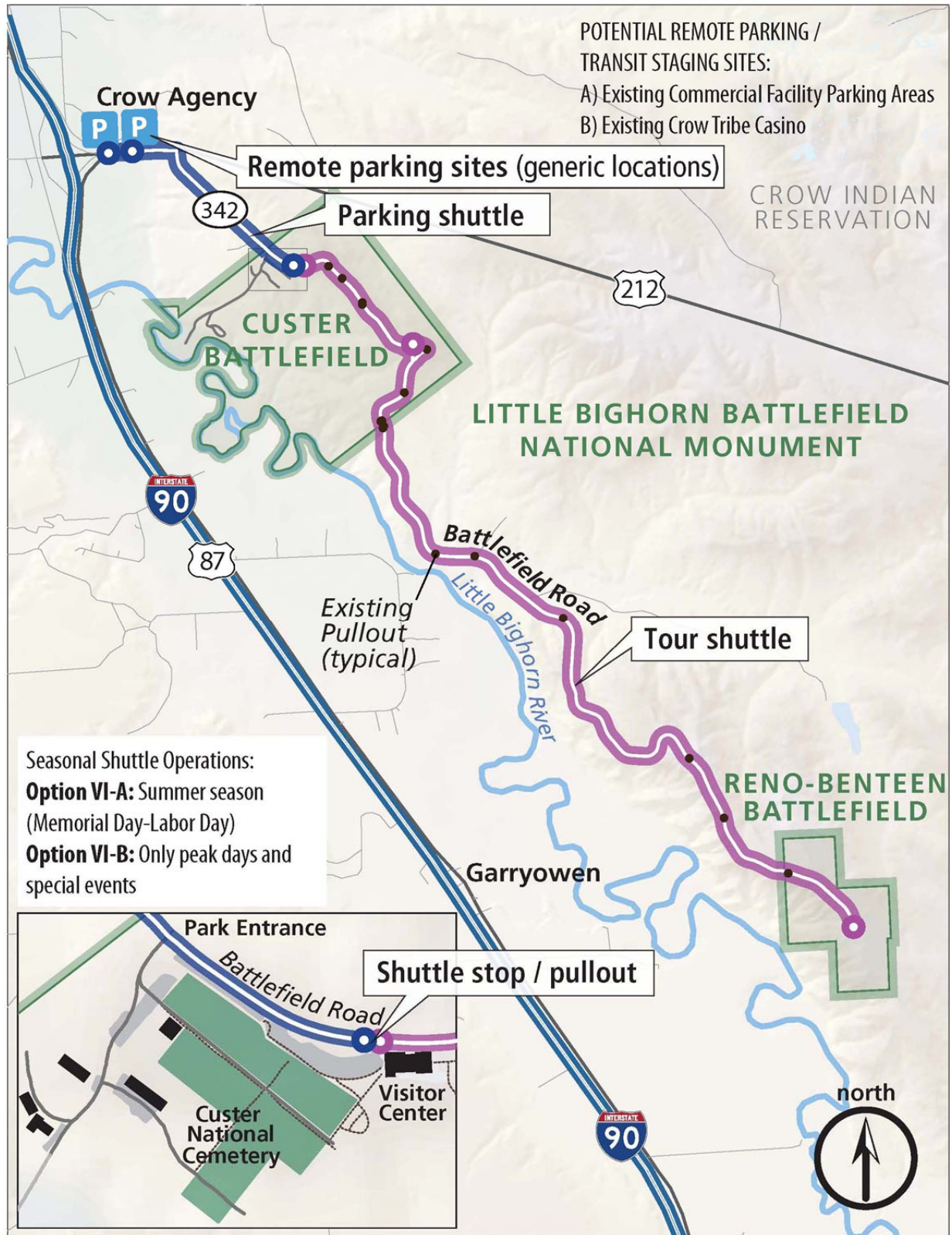
Despite the above potential issues and risks, it is possible that a partnership can be developed with another entity that has underutilized vehicles available during the summer months. These potential partners include a nearby school district or its transportation provider, and recreation facilities that have transit resources but whose peak season is in the winter months.

Due to its relatively low total lifecycle costs and effectiveness in mitigating the most severe traffic congestion, safety, and parking shortage by focusing on the relatively few peak days, Option VI-B could be implemented as a special events management strategy for other non-transit options, including Options I to IV. It could also be considered as the first phase, or a pilot transit program, for the full-seasonal transit options including Options V and VI-A.

It should be noted that this option would utilize existing transportation facilities in the park, including roads and parking lots, and would not require the tour road to be repaired or parking lots to be reconfigured. It is expected that the existing maintenance practice would be continued, and that the existing facilities would be able to adequately accommodate shuttle services during a relatively short operating period.

Transit options VI-A and VI-B are illustrated in Figure 3-23.

Figure 3-23: Options VI-A and VI-B – Transit from Offsite Staging to Reno-Benteen Battlefield



Source: URS Corporation.



### 3.3 ESTIMATED COSTS

As a critical factor in evaluating transportation options, cost could be the most important aspect in determining which options can be implemented, particularly if other factors are similar among the options in consideration.

The study team estimated lifecycle cost of ownership, including capital, operation, and maintenance over a 12-year span. The 12-year span is applied to all options to be consistent with the *Bus Lifecycle Cost Model for Federal Land Management Agencies*<sup>13</sup>, which is adopted for this ATFS for transit cost estimates.

Costs of ownership for each option would continue to accrue beyond the first 12-year lifecycle, including recapitalization of transit fleets, continued operating and maintenance costs, depreciation of transportation infrastructure, etc. However, these continued costs are expected to be proportional to the first 12-year lifecycle. Therefore, for options evaluation purpose, it is sufficient to account for the costs over the 12-year lifecycle.

*Volume II – Options and Criteria for Evaluation*<sup>7</sup> describes assumptions of transportation infrastructure, including transit vehicles, facilities, and operations for each option. These assumptions are based on a comprehensive analysis of each option with regard to meeting the park’s transportation challenges and provide the base information for cost estimates.

For transit options, it was assumed that a transit system for the park would seasonally rent or otherwise share an existing local maintenance facility to avoid the capital costs of building a separate maintenance facility. Therefore, a total leasing fee of \$75,000 over the 12-year lifecycle (approximately 10 percent of the construction costs) is assumed for the transit system to use an existing maintenance facility. An exception is Option VI-B – Peak Days Transit, for which a maintenance facility was not accounted for in the cost estimate since the system would only operate during 10-15 days a year and local maintenance may not be needed.

An engineer cost estimate, using the *Montana Department of Transportation Average Prices Catalog*<sup>14</sup>, was performed for Option I – Repairing the Tour Road and Reconfigure Parking, Option II – Widening the Tour Road and Expanding Parking (the 4R Project), Option III – One-way Tour Loop via I-90 Frontage Road (the GMP Option), and the construction components (repairing the tour road and new parking) for Options V and VI-A, respectively. These cost estimates follow the guidelines of the *NPS Cost Estimating Requirements Handbook*, specifically *Class C Construction Cost Estimates for Feasibility Studies (Least Detailed)*. Itemized cost elements that need conceptual design components were generalized to a higher level so that reasonable assumptions could be made.

Cost estimates of transit options and concepts were performed using the *2011 Bus Lifecycle Cost Model for Federal Land Management Agencies*<sup>13</sup>.

These cost estimates are considered as “order of magnitude” and rely heavily on engineering judgment. Cost estimating with a higher level of accuracy cannot be achieved until conceptual design and engineering drawings are developed. Table 3-2 describes some of the mark-up and add-on factors that are required for Class C Cost Estimates.

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13. *Bus Lifecycle Cost Model for Federal Land Management Agencies*, prepared for US Department of Transportation, prepared by John A. Volpe National Transportation Systems Center, 2011.

14. *Average Prices Catalog: Metric and English*, Montana Department of Transportation, Contract Plans Bureau, January 2011 to June 2011 Edition.

**Table 3-2: Mark-up and Add-ons for Class C Cost Estimate**

Mark-up/Add-on	Value	Description
<b>Location Factor:</b>	0.00%	Montana DOT average price catalog accounts for the location of the project in Montana.
<b>Remoteness Factor:</b>	7.00%	Site is approximately 70 miles from closest commercial center (Billings). State highway and Freeway access to site.
<b>Wage Rate Factor:</b>	0.00%	Montana DOT average price catalog accounts for wage rates based on Davis Bacon Act
<b>State &amp; Local Taxes:</b>	0.00%	Crow Agency, MT has 0.0% sales tax. There is no sales tax in the State of Montana, and no documented localized sales taxes in Crow Agency.
<b>Design Contingency:</b>	30.00% or 10.00%	Maximum suggested percentage for conceptual plans. Current conceptual plans are very general in detail requiring an increased contingency percentage. Includes drainage, traffic control and signing/stripping.  Since Option II – the 4R project – has been designed, it should no longer be considered as a conceptual plan. Accordingly, a design contingency of 10% was applied for Option II in this study.
<b>Standard General Conditions:</b>	10.00%	A mid-range percentage was selected from the suggested 4-20% range to account for multiple remote worksites to be coordinated.
<b>Government General Conditions:</b>	5.00%	Half of the standard general conditions to account for the increased administrative and quality requirement of the NPS.
<b>Historic Preservation Factor:</b>	2.00%	Construction would take place in a historic district - no impact to historic structures is anticipated at this time.
<b>Contractor Overhead:</b>	0.00%	Contractor overhead is included in the average unit costs calculated by the Montana DOT.
<b>Contractor Profit:</b>	0.00%	Contractor profit is included in the average unit costs calculated by the Montana DOT.
<b>Bonds and Permits:</b>	2.50%	2 percent bonds and 0.5 percent permit costs anticipated.
<b>Contracting Method Adjustment:</b>	10.00%	Competitive Negotiation of Construction is anticipated; however, other methods may be used.
<b>Construction Management Adjustment:</b>	8.00%	Estimate for construction management activities of the project. Has been requested on other feasibility level estimates.
<b>Washington contingency:</b>	10.00%	Estimate for possible Washington office involvement. Has been requested on other feasibility level estimates.
<b>Annual Inflation Escalation Factor:</b>	5.00%	Estimated annual inflation rate for construction activities in Montana.
<b>Time Until Project Midpoint (Months)</b>	39	December 2014 is estimated as the midpoint of the construction efforts. Added additional 12 months for unit prices from 2011.
<b>12-year Maintenance Estimate</b>	N/A	To provide consistent estimates with ATS options: a 12 year maintenance estimate was established. Average annual cost was assumed to be \$10,000/mile, increasing 5% annually thru year 12.

Source: National Park Service and Montana Department of Transportation. Data compiled by URS Corporation.

Table 3-3 summarizes cost estimate results, in terms of a range of dollar amounts, for each of the seven transportation options evaluated during the detailed screening process. The range of +/- 20% reflects the level of uncertainty of concept details at this stage.

**Table 3-3: Summary of Cost Estimates**

Option <sup>(1)</sup>	I	II	III	IV	V	VI-A	VI-B
Lifecycle Costs <sup>(2)</sup>	\$3,940K - \$5,910K	\$7,490K - \$11,230K	\$15,750K - \$23,620K	\$430K - \$640K	\$4,540K - \$6,810K	\$5,910K - \$8,870K	\$620K - \$930K

Source: URS Corporation.

Notes: (1) Options I to VI-B: I - Repair the Tour Road and Reconfigure Parking; II - Widen the Tour Road and Expand Parking (4R Project); III - One-Way Loop Tour via the I-90 Frontage Road, Including a Seasonal Transit Service; IV - Management Improvements; V - Seasonal Transit Service from Offsite Staging/Parking to Visitor Center; VI-A - Seasonal Transit Service from Offsite Staging/Parking to Reno-Benteen; VI-B - Peak Days/Special Events Transit Service from Offsite Staging/Parking to Reno-Benteen

(2) The range of costs were estimated to be between -20% and +20% of calculated costs

### 3.4 DETAILED SCREENING CRITERIA

The seven transportation options, which had been further developed after the initial screening, were evaluated and ranked using a set of more refined screening criteria, with the goal of identifying a list of the most feasible options. These options are expected to be carried forward by the National Park Service for a potential environmental compliance and planning process at a later time. The criteria used for detailed screening is presented in Table 3-4.

The following discussions are intended to assist readers in understanding how criteria were applied:

1. **Performance Measures** – Each of the 11 criteria listed in Table 3-4 can be considered as a “performance measure” for the corresponding impact category. For instance, reduction in Vehicle Miles Traveled (VMT) is a performance measure for general impacts to natural and cultural resources, while total cost of ownership is a performance measure for financial feasibility.
2. **Resource Protection** – Three criteria, including reduction in VMT, reduction in emissions, and footprint increase, collectively measure the extent of general impacts to natural and cultural resources. All these criteria are quantitative measures that can be calculated for each transportation option.
3. **Visitor Experience** – Four criteria, including change in delay and congestion, parking availability, safety improvement, and convenience and comfort, collectively measure the general impacts to visitor experience. These are used as qualitative measures and were estimated, using a scale 0-10 (a higher score represents less impact), for each transportation option.
4. **Management** – The criterion “General impacts to park staff and management” considers how each transportation option would affect park management in terms of staffing, budget, maintenance, operation, enforcement, etc. on a scale 0-10.
5. **Financial Feasibility** - Three criteria, including total cost of ownership, revenue, and funding sources and cost sharing, collectively measure the financial feasibility of each transportation option. Costs and revenue are both quantitative measures and were calculated for each transportation option. The third criterion, funding sources/availability and cost sharing opportunities, is a qualitative measure and was estimated for each option.

**Table 3-4: Detailed Screening Criteria**

Category	Criteria	Measure/Unit	Effects/Impacts	Weighting Factor	Sub Total
General Impacts to Park Resources, Visitor Experience, and Management	Reduction in vehicle miles traveled (VMT)	VMT	Direct	7%	60%
	Reduction in vehicle emissions	tons, cubic feet	Indirect and Cumulative	10%	
	Footprint for additional transportation infrastructure	square feet	Direct and Cumulative	10%	
	Changes in delay and congestion	0-10 with 10 being best	n/a	7%	
	Parking availability	0-10 with 10 being best		7%	
	Safety improvement	0-10 with 10 being best		7%	
	Convenience and comfort	0-10 with 10 being best		7%	
General impacts to park staff and management	0-10 with 10 being best	5%			
Financial Feasibility	Total Cost of Ownership	US Dollars	n/a	18%	40%
	Revenue	US Dollars		10%	
	Funding Sources and Cost Sharing	0-10 with 10 being best		12%	

Source: URS Corporation.

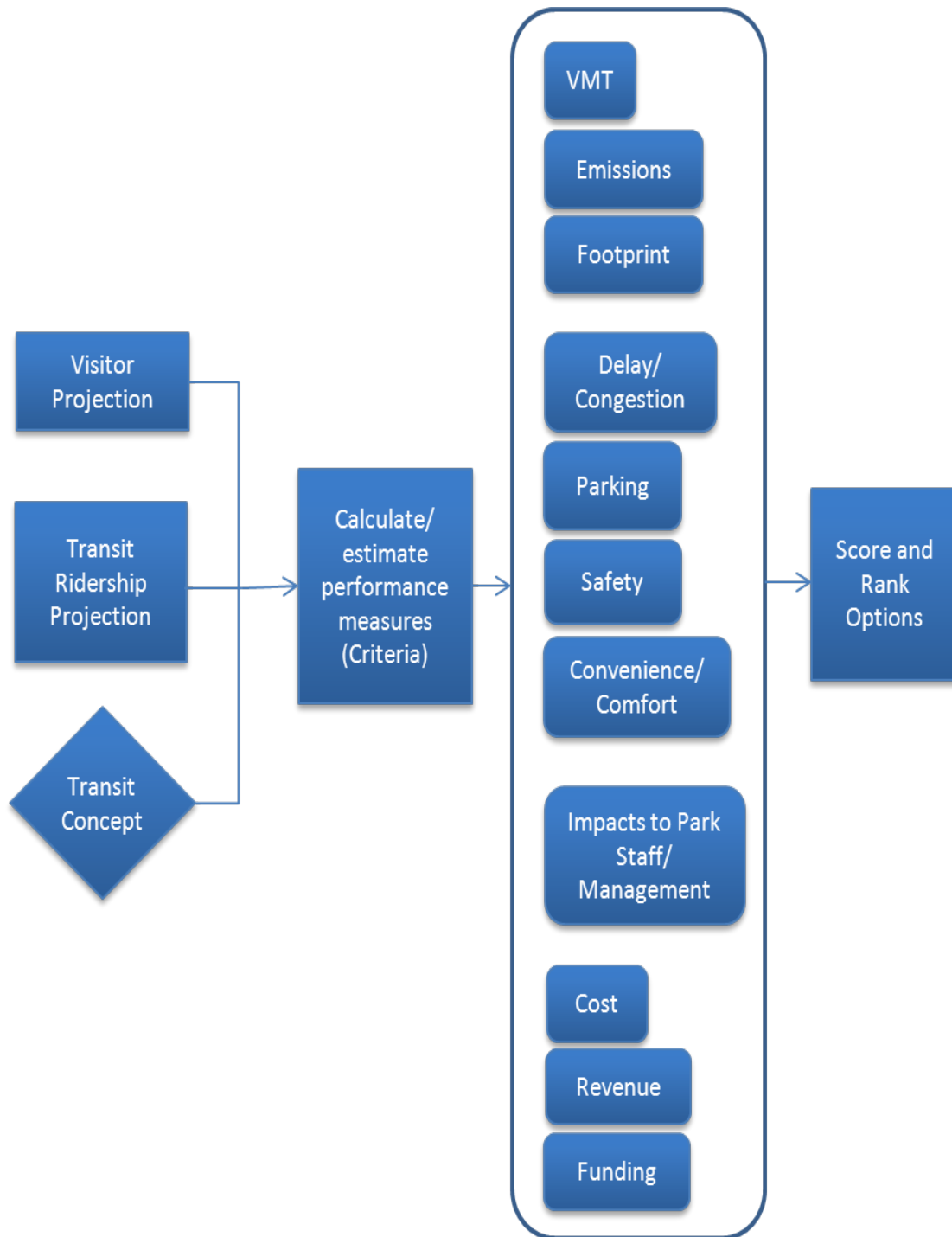
Notes: Estimated values (measures/units) of each criterion will be converted proportionally to a rating score of 0-10 (0 being the worst, 10 being the best) before multiplying an assigned weighting factor.

The total of weighting factors of all criteria is 100%.

6. **Scores vs. Criteria** – For quantitative criteria, such as reduction in VMT, each option scored at a scale 0-10 with 10 being best (i.e., least impact). For qualitative criteria, such as safety improvement, the numerical assessment (0-10) of each option automatically transferred to a score of 0-10.
7. **Range of Scores** – For each criterion, one of the seven transportation options (Option I to VI-B) scored zero while another option scored 10. In other words, both ends of the score spectrum (0-10) were assigned to a transportation option, respectively.
8. **Weighted Scores** – After each transportation option scored (0-10) on all 11 criteria, the 11 scores of the option were weighted using their corresponding weighting factors (in percentage), resulting in a single weighted score for each option.
9. **Weighting Factors** – Each criterion has a weighting factor, expressed as percentage, which represents the relative importance of the criterion – compared with other criteria – in scoring the transportation options. These weighting factors were discussed during the Evaluation of Options Workshop<sup>6</sup>, held at the park on May 7, 2012, and agreed upon by workshop participants.

The flow chart in Figure 3-24 illustrates major steps of the detailed screening process.

Figure 3-24: Detailed Screening Process



Source: URS Corporation.

### 3.5 DETAILED SCREENING RESULTS

Table 3-5 summarizes the score results from analyzing the transportation options against all detailed screening criteria and presents the overall weighted score of each option. Transit Option VI-A – Seasonal Transit from Offsite Staging/Parking to Reno-Benteen scores the highest at 6.6, followed by Option II – Widen the Tour Road and Expand Parking (4R Project) at 6.5. Option III – One-way Tour Loop via I-90 Frontage Road scores the lowest at 4.2.

**Table 3-5: Detailed Screening Results – Scoring Matrix**

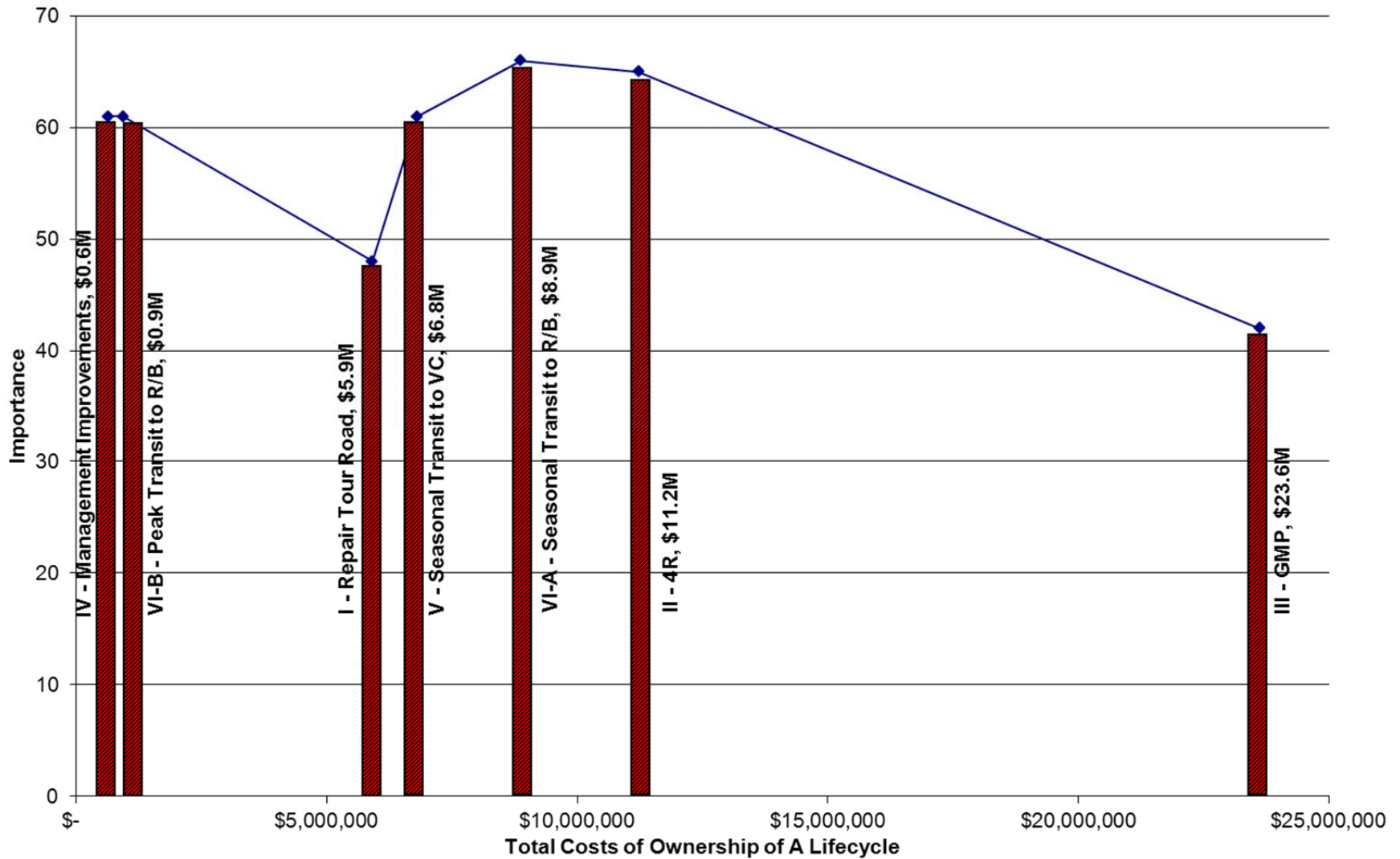
Criteria	Option							Weighting Factor
	I	II	III	IV	V	VI-A	VI-B	
Vehicle miles traveled (VMT)	5	5	0	5	10	9	6	7%
Vehicle emissions	5	5	0	5	9	10	6	10%
Footprint	8	5	0	10	7	7	8	10%
Delay and congestion	0	7	10	3	5	8	6	7%
Parking availability	0	7	10	4	6	8	5	7%
Safety improvement	0	8	10	5	4	7	6	7%
Convenience and comfort	4	8	10	2	5	6	0	7%
General impacts to park staff/management	2	10	8	6	4	3	0	5%
Total cost of ownership	8	5	0	10	7	6	9	18%
Revenue	3	7	10	0	6	5	8	10%
Funding sources and cost sharing	9	8	0	10	3	4	5	12%
<b>Weighted Score</b>	<b>4.8</b>	<b>6.5</b>	<b>4.2</b>	<b>6.1</b>	<b>6.1</b>	<b>6.6</b>	<b>6.1</b>	<b>100%</b>

Source: URS Corporation.

Notes: (1) Options I to VI-B: I - Repair the Tour Road and Reconfigure Parking; II - Widen the Tour Road and Expand Parking (4R Project); III - One-Way Loop Tour via the I-90 Frontage Road, Including a Seasonal Transit Service; IV - Management Improvements; V - Seasonal Transit Service from Offsite Staging/Parking to Visitor Center; VI-A - Seasonal Transit Service from Offsite Staging/Parking to Reno-Benteen; VI-B - Peak Days/Special Events Transit Service from Offsite Staging/Parking to Reno-Benteen

Using the estimated costs, as summarized in Section 3.3, and the weighted scores of options as shown in Table 3-5, a cost-to-importance analysis was performed to draw further conclusions from the detailed screening from a different perspective. This analysis is illustrated in Figure 3-25.

Figure 3-25: Costs to Importance of Transportation Options



Source: National Park Service and URS Corporation.

In Figure 3-25, the importance value of an option was directly converted from the weighted score (summarized in Table 3-5) by a multiplier of 10. Therefore, this importance reflects the weighted value of an option accounting for all detailed screening criteria.

As illustrated by the cost-to-importance chart, Option IV – Management Improvements and Option VI-B – Peak Days Transit to Reno-Benteen Battlefield both have relatively high importance but the lowest costs of ownership. Accordingly, each of these two options can be implemented to achieve similar values as some other options, such as Option V – Seasonal Transit to Visitor Center, but at much lower cost. On the other end, Option III – One-way Loop via I-90 Frontage Road (GMP) would cost much more than all other options but scores lowest in importance.



## 4. CONCLUSIONS AND RECOMMENDATIONS

This chapter draws conclusions from this ATFS, presents recommendations with regard to the transportation options, and lays out the next steps for the National Park Service to consider following this study.

The seven transportation options, which were evaluated using a set of detailed screening criteria, resulted in a range of weighted scores between 4.2 and 6.6. On a scale of 0 to 10, the gaps of score among these options are relatively small. In particular, five of the seven options have a weighted score between 6.1 and 6.6, indicating that the scores by themselves may not be sufficient to remove some of the options from further development and evaluation. However, the scores should be used to prioritize the seven options with regard to programming and potential implementation timeline. The cost-to-importance chart provides another perspective to compare the options, in terms of values in return of added costs.

The study team recommends that the seven options undergo further analysis in a separate study. This future study should use comparative analysis techniques such as Choosing by Advantage (CBA) and Value Engineering (VE) to further develop the concepts, perform preliminary design, and conduct appropriate environmental process. The following are recommendations if an improvement program needs to be developed in the short or mid-term.

Option I – Repairing Tour Road and Reconfigure Parking would strengthen the road to accommodate heavy vehicles and provide some level of relief to parking shortage. This option is relatively low cost (approximately \$5.9 million) but also scores low (4.8, second to the lowest), indicating that by itself this option would not be cost effective in solving the park’s transportation issues. Therefore, it is not recommended as a standalone option; instead, it would be much more effective to implement this option along with a transit program, including Option III, V, and VI-A.

Option II – Widening Tour Road and Expanding Parking scores the second highest (6.5), closely behind Option VI-A (6.6), but also would incur the second highest total costs (approximately 11.2 million dollars). This option should be considered as an effective but more costly alternative to a transit program.

Due to its relatively high costs and substantial impacts, Option II should have a lower priority for implementation unless other options with similar or higher scores but lower costs, such as Option VI-A, are found less feasible in further analysis following this study.

Option III (GMP option) – One-way Loop via I-90 Frontage Road scores the lowest (4.2) and would incur the highest costs (approximately \$23.6 million) among the seven transportation options. As the GMP preferred alternative, this option should remain as the long-term plan, and the National Park Service will look toward implementation of the GMP as visitation, funding, and tribal consultation warrant.

However, the GMP option costs much higher than all other options while providing similar or less values, in terms of score, to other options. Therefore, the study team recommends that a value engineering analysis of the GMP option should be conducted prior to its implementation to explore feasible ways to reduce costs while retaining or enhancing the values.

Option IV – Management Improvements consists of a series of lower-cost and lower-impact non-capital, operational measures to enhance the visitor experience. It scores relatively high (6.1) and would incur the lowest cost (approximately \$600,000) among the seven options. This option should

be implemented as soon as feasible to provide immediate relief of parking shortage, path-finding assistance, and visitor safety issues.

Instead of implementing this option in its entirety, elements of this option may be installed at the discretion of park management pending funding availability, including seasonal, peak time, and trial applications.

Option V – Seasonal Transit from Offsite Staging/Parking to Visitor Center would be attractive to visitors who intend to visit the Custer Battlefield Unit but not the entire tour road or the Reno-Benteen Battlefield. It scores the third highest (6.1) and would incur the fourth highest cost (approximately \$6.8 million). It should be noted that much of the cost (\$5.9 million) comes from repairing the tour road and reconfiguring parking to improve road and parking safety and reduce congestion and parking shortage. The transit system itself would cost less than \$1 million.

This option is expected to effectively mitigate parking shortage in the visitor center area, which could be the most needed relief during special events and other high visitation days.

Option VI-A – Seasonal Transit from Offsite Staging/Parking to Reno-Benteen scores the highest (6.6) and would incur the third highest cost (\$8.9 million) of the seven options, behind Options II and III. Similar to Option V, much of the cost (\$5.9 million) for Option VI-A comes from repairing the tour road and reconfiguring parking. The transit system of Option VI-A would cost approximately \$3 million.

This option should be implemented after a pilot program of Option VI-B has been operated successfully and with sufficient evidence that there would be relatively high demand for transit services during other days.

Option VI-B – Peak Days Transit from Offsite Staging/Parking to Reno-Benteen Battlefield provides temporary shuttle services during peak days when parking shortage, traffic congestion, and traffic safety issues are most critical. Its cost ranks among the lowest (less than \$1 million) yet offers much needed relief and improvement to visitor experience during the days of transit operation. It should be noted that Option VI-B does not include repairing the tour road and reconfiguring parking lots, which is the main reason why it costs much less than Option V.

It is recommended that Option VI-B be implemented as a three-year pilot program or as the first phase of a more comprehensive transit program, such as Option VI-A.

The study team recommends that the National Park Service consider taking the following steps after this study:

1. Secure funding for Option IV – Management Improvements and start implementing this option in its entirety, or some elements, pending funding availability.
2. Develop an improvement program to implement Option VI-B – Peak Days Transit from Offsite Staging/Parking to Reno-Benteen Battlefield. This option should be installed as a three-year pilot program. During its operation, the park should continuously monitor the transit system, with regard to ridership, visitor experience, resource impacts, and impacts to park staff and management. Information collected should be used to analyze if a long-term transit system would be cost effective.
3. Consider Option I – Repair Tour Road and Reconfigure Parking only as a component of a more comprehensive option with a transit system, including Options III, V, and VI-A.
4. Conduct a planning level or concept development study to further develop and evaluate the other four options (II, III, V, and VI-A), using comparative analysis techniques such as

Choosing by Advantage (CBA), Value Engineering (VE), and appropriate environmental process. This study should identify a recommended alternative. Recommendations require appropriate public compliance planning prior to agency decisions and implementation.

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Notes: DSC – Denver Service Center. LIBI – Little Bighorn Battlefield National Monument.

## Agency Statement

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As the nation’s principal conservation agency, the Department of the Interior has the responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environment and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.





