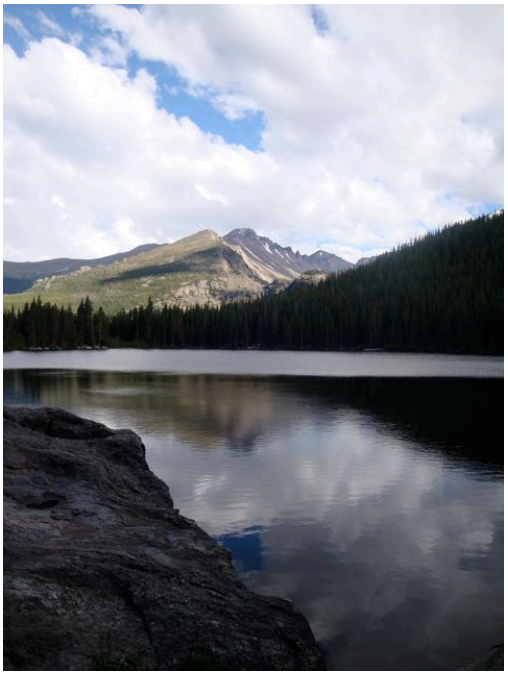
Rocky Mountain National Park
Intelligent Transportation System, Static Signage, and Shuttle Recommendations for the 2012 Bear Lake Road Corridor Construction



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GLOSSARY OF ABBREVIATIONS

CDOT	Colorado Department of Transportation
CFLHD	Central Federal Lands Highway Division
DMS	Dynamic Message Sign
HAR	Highway Advisory Radio
ITS	Intelligent Transportation Systems
MUTCD	Manual on Uniform Traffic Control Devices
ROMO	Rocky Mountain National Park
SR	State Road
TOWN	Town of Estes Park
US	United States Route
WTI	Western Transportation Institute

1. INTRODUCTION

1.1. Background

During 2012 and 2013, Rocky Mountain National Park (ROMO) is continuing the rehabilitation of the Bear Lake Road Corridor. The construction plans call for delays to visitors accessing this corridor. As such, ROMO would like to build upon lessons learned during the 2011 pilot intelligent transportation system (ITS) deployment by implementing ITS in conjunction with pre-trip visitor information to notify visitors of the construction, the need to utilize the shuttle to access the Bear Lake Road Corridor at certain times, and the option to utilize the Fairgrounds Park-and-Ride.

A large proportion of visitors, primarily repeat visitors, come from the "front range" cities of Denver (Denver County), Boulder (Boulder County), Loveland (Larimer County) and Fort Collins (Larimer County). The 2010 Visitor Survey [1] showed that of the 23% of visitors from Colorado, 15% were from Larimer County, 11% from Boulder County, 8% from Denver County, and 6% from Arapahoe County. Similarly, from the Intercept Visitor Survey conducted during the evaluation of the 2011 pilot ITS [2], 32% of the visitors were from Colorado. Of the 32% of Colorado visitors, 4.9% were from Denver, 4.0% from Loveland, 2.4% from Fort Collins, 2.2% from Boulder, 2.2% from Estes Park (Larimer County), and 1.8% from Colorado Springs (El Paso County). Loveland, Fort Collins, and Estes Park are all located in Larimer County for a total of 8.6%.

A primary attraction for visitors arriving on the east side of ROMO is the Glacier Gorge and Bear Lake Trailheads, which are located within ROMO along the Bear Lake Road Corridor. On weekends during the peak summer season, the parking lots at these trailheads were at capacity by 8 and 10 am, respectively, according to a study funded through the 2007 Paul S. Sarbanes Transit in Parks Programs (previously the Alternative Transportation in the Parks and Public Lands program) [3]. Additional parking is found at the Bear Lake Road Park-and-Ride within ROMO; however, it also reaches capacity on summer weekends as early as 11:30 am [3].

A future planning study funded through a 2010 Paul S. Sarbanes Transit in Parks Program grant will pursue a wide array of mechanisms to reduce congestion and thereby increase visitor satisfaction, including spatially and temporally redistributing visitation, modifying the transit routes, and implementing a larger network of ITS [4]. These long-term initiatives are in the planning stages, as ROMO studies factors such as which resources can handle redirected visitation.

As a short-term initiative, a park-and-ride lot was built in the Town of Estes Park (TOWN) during the spring of 2011. The Fairgrounds Park-and-Ride is located within the Fairgrounds at Stanley Park and was constructed with $956,000 received from the Congestion, Mitigation and Air Quality Improvement Program and $250,000 contributed by the TOWN [5]. A pilot ITS study was conducted during the summer of 2011 as an interim solution to the congestion challenges by trying to intercept visitors east of their arrival to Estes Park and shift their mode from private automobile to shuttle bus via the new Fairgrounds Park-and-Ride. Dynamic Message Signs (DMS) and Highway Advisory Radio (HAR) were utilized in 2011 to promote the mode shift. Some of the primary findings and recommendations from the study include:

- Use additional promotion avenues to communicate traveler information to "front range" residents,

- Provide direct links to shuttle information on ROMO and TOWN websites,
- Encourage ROMO and TOWN staff to provide a consistent and positive message that promotes the use of visitor shuttles,
- Identify a name and brand for the Fairgrounds Park-and-Ride that will distinguish it from the Bear Lake Road Park-and-Ride and the Fairgrounds in Lyons, CO,
- Provide improved wayfinding information to the Fairgrounds Park-and-Ride and to the pick-up location at the Fairgrounds Park-and-Ride,
- Capture visitors arriving earlier in the morning by either implementing a shuttle stop for the Hiker Shuttle at the Fairgrounds Park-and-Ride or beginning the service hours of the Silver Route earlier in the day,
- Encourage peak-spreading by providing pre-trip information to visitors through other avenues including COTRIP or the ROMO or TOWN websites,
- Highlight the word "free" in shuttle service information messages to visitors,
- Provide visitor information from a regional perspective, and
- DMS are an effective communication tool whereas the effectiveness of the HAR is marginal.

1.2. Project Overview

For the 2012 Bear Lake Road Corridor construction, a combination of ITS and pre-trip information will be utilized to notify visitors that no private vehicles will be allowed on the Bear Lake Road Corridor between 9 am and 4 pm. Instead, visitors will be encouraged to enter the area either before 9 am or after 4 pm, or to utilize the shuttle from 9 am to 4 pm via the Fairgrounds Park-and-Ride.

The project partners in 2012 include ROMO, Central Federal Lands Highway Division (CFLHD), Colorado Department of Transportation (CDOT), the TOWN, and the Western Transportation Institute (WTI) at Montana State University. For this project, the TOWN partners include both the Director of Public Works and the individual responsible for the planning of events at the Fairgrounds. The roles and responsibilities for each partner are shown in Section 2.

The 2012 project has been designed to build on the lessons learned from the 2011 ITS pilot as shown below:

- Use additional promotion avenues to communicate traveler information to "front range" residents, provide direct links to shuttle information on ROMO and TOWN websites, and encourage peak-spreading by providing pre-trip information to visitors through other avenues including COTRIP or the ROMO or TOWN websites: This is being accomplished as part of the pre-trip planning, and a consistent and positive message that promotes the use of visitor shuttles will be provided by ROMO and TOWN staff. The pre-trip information is being coordinated by ROMO and CFLHD through use of a communications plan. It includes press releases, newspapers at the entrance station, information on ROMO's website, information on 511 and the COTRIP website, rack cards, and training visitor services staff at ROMO and the Estes Park Visitor Center.

Therefore, the intelligent transportation system should serve as a reminder of construction occurring in the Bear Lake Road Corridor rather than the initial source. This contrasts with the 2011 pilot intelligent transportation system, in which the ITS was the first and only source of information about the availability of the Fairgrounds Park-and-Ride.

- Identify a name and brand for the Fairgrounds Park-and-Ride that will distinguish it from the Bear Lake Road Park-and-Ride and the Fairgrounds in Lyons, CO. The park-and-ride in Estes Park lot will consistently be named the Fairgrounds Park-and-Ride lot on literature, the DMS, and the static signs.
- Provide improved wayfinding information to the Fairgrounds Park-and-Ride and to the pick-up location. Recommendations for wayfindings signs to the Fairgrounds Park-and-Ride can be found in Section 3.2 of this report. CFLHD and the TOWN are working together to provide these wayfinding signs at the Fairgrounds Park-and-Ride to direct visitors from the parking lot to the transit pick-up location as well as "no overnight parking" signs within the lot to reduce the number of people parking overnight.
- Capture visitors arriving earlier in the morning by either implementing a shuttle stop for the Hiker Shuttle at the Fairgrounds Park-and-Ride or beginning the service hours of the Silver Route earlier in the day. For 2012, both the Hiker Shuttle and the TOWN shuttles will service the Fairgrounds Park-and-Ride lot. More information about the 2012 shuttles can be found in Section 4.
- DMS are an effective communication tool whereas the effectiveness of the HAR is marginal: Due to this finding, as well as the interference from a local radio station in 2011 and inconsistency in the signal, the ITS to be utilized in 2012 will be solely DMS.
- Highlight the word "free" in shuttle service information messages to visitors: There is a belief that free shuttle service was being confused with free entrance to the park. Therefore, the DMS messages did not include "FREE" as not enough information could be provided to differentiate between the entrance fee and the fare-free shuttles.
- Provide visitor information from a regional perspective: In the 2011 pilot, the DMS were used to provide visitor information from a regional perspective by locating all four DMS on the US 36 corridor (i.e., two DMS close to Estes Park and two DMS on the approach to Lyons). For 2012, the information about the construction needs to be conveyed via three corridors (US 36, US 34, and SR 7). Additionally, the pre-trip information being provided by ROMO and CFLHD should help to heighten visitors' awareness of the DMS. More detailed information about the DMS can be found in Section 3.

1.3. Intelligent Transportation System Concept

The recommended ITS configuration will consist of DMS and static guide signs. Figure 1 shows the locations of the five proposed DMS with yellow pegs. Similar to 2011, CDOT has agreed to loan two DMS for the project on the condition that the agency can remove them if they are needed for another project. The remainder of the DMS will be procured from a vendor.

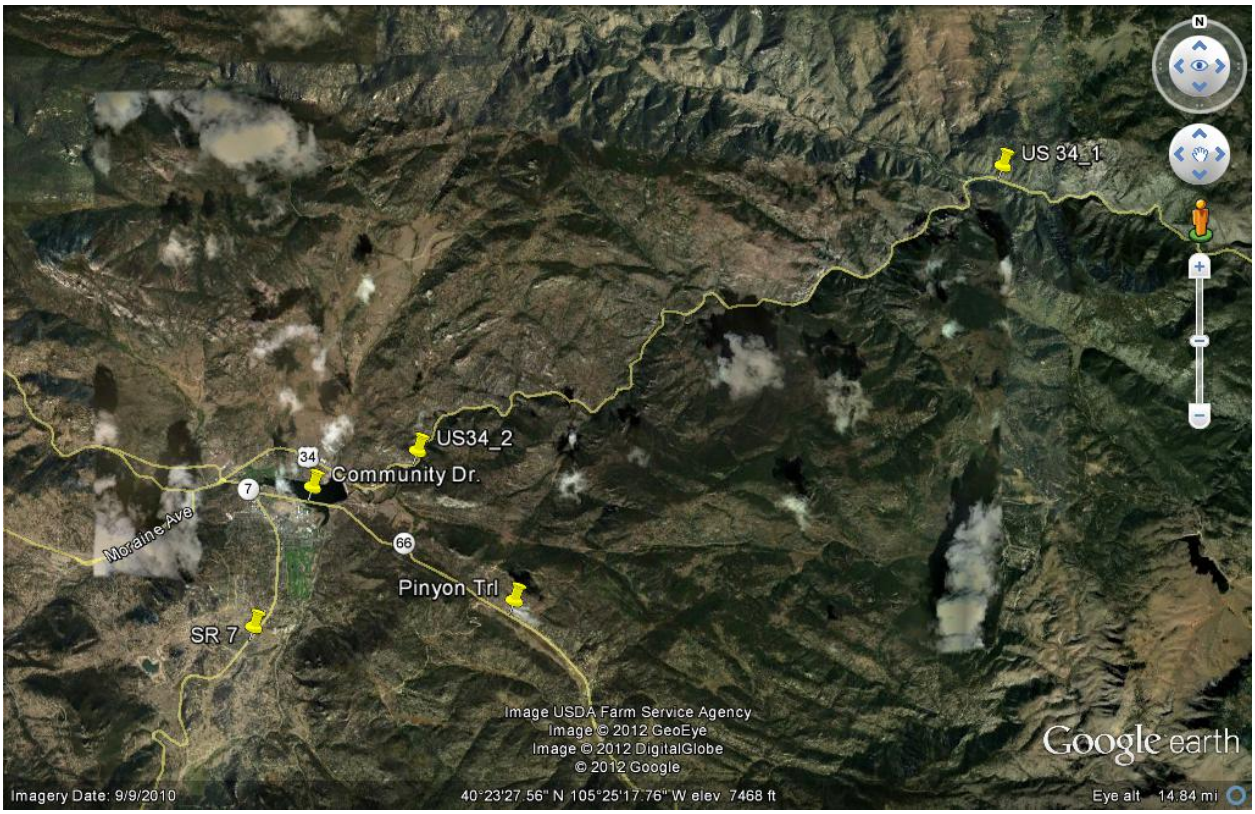

Figure 1: DMS Locations [6]

The five proposed DMS are along the three major routes that lead to the east side of ROMO: US 34, US 36, and SR 7. The photo in Figure 1 shows that two DMS will be placed on US 34. US34_1 is at a distance from Estes Park as a result of the significant curvature on US 34. US34_2 is proposed at a location that has a fairly short sight distance associated with it; however, it is being utilized for construction on Mall Rd prior to the implementation of the 2012 ITS. Two DMS are proposed along US 36: one at Community and one at Pinyon Trail. These are the same locations used during the pilot ITS in 2011. The fifth DMS is proposed on SR 7. Figure 2 shows an example of a dynamic message sign. Additional static park-and-ride signage will be used in conjunction with the DMS to guide visitors to the park-and-ride. Observations during the 2011 pilot ITS showed that visitors needed detailed signage from the DMS to the Fairgrounds Park-and-Ride. The goal is to capture visitors before they reach the park; however, additional static signage will be placed that leads from the park back to the Fairgrounds Park-and-Ride as a back-up.

Figure 2: Portable DMS

The ITS will be in operation from Tuesday, May 29, 2012 through Monday, October 8, 2012. The delivery date for the DMS will be determined once a vendor has been selected. However, the DMS were proposed for installation on Thursday, May 24, 2012.

Figure 3 summarizes the important dates in a timeline.

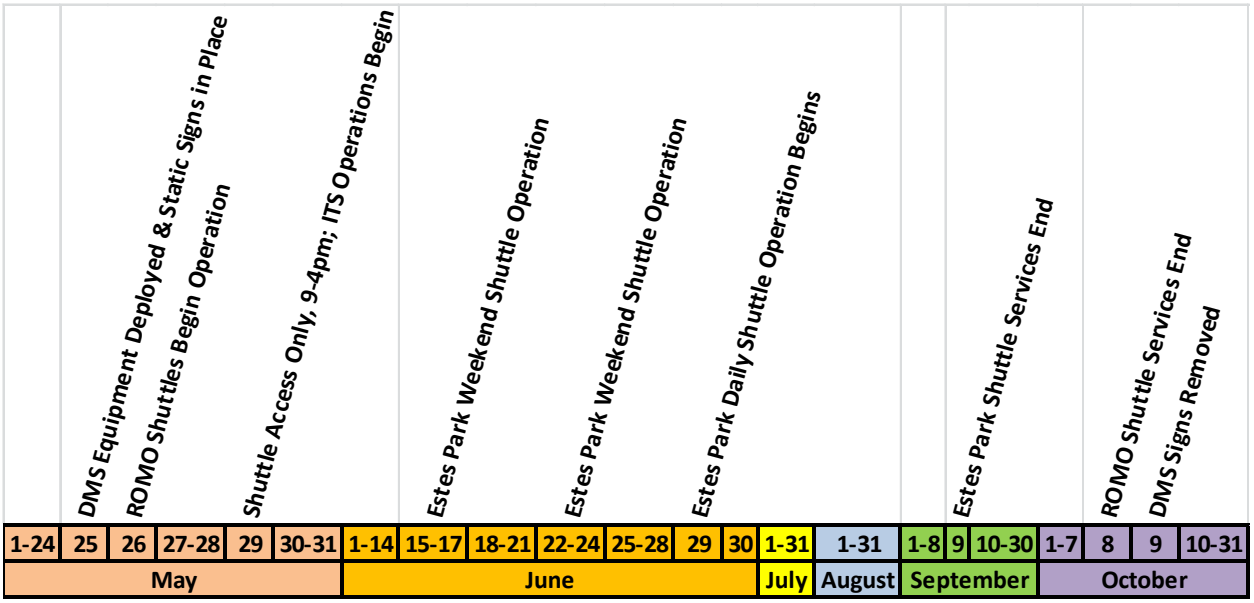

Figure 3: ITS Implementation Timeline

The research team recommends that the DMS be turned on at 8:45 am on days of operation and turned off at 4 pm. This schedule coordinates with the time frame during which private vehicle use will be restricted on the Bear Lake Road Corridor.

2. PARTNER ROLES AND RESPONSIBILITIES

This section lists the agencies and departments that will be taking part in the operations and execution of the operations plan, and their respective responsibilities. A list of personnel and contact information is located in Appendix A.

2.1. Rocky Mountain National Park

Responsibilities of ROMO include:

- Work with CFLHD to request encroachment permit through CDOT for DMS
- Work with CFLHD to request permit through CDOT for static signage
- Coordinate with CFLHD to contract with a DMS vendor
- Operate DMS (e.g., turn on/off, change messages)
- Keep a DMS message log including date, time turned on, location, message utilized, time message changed/DMS turned off (Appendix B)
- Contact CFLHD if DMS system is not functioning, and maintain a log of this information including date, time, location, how long system is inoperable, and when/how restored (Appendix B)
- Drive by the DMS systems once a week (or more frequently as needed) to ensure that they are working properly. Keep a log of this test including date, time, device, operation, action (e.g., if contractor needed to be contacted through CFLHD), and when/how device was fixed (Appendix B)
- Arrange with CFLHD for contractor to relocate DMS systems if needed within the rental period
- Arrange with CFLHD for contractor to pick-up DMS systems at the end of the rental period
- Work with the TOWN and ROMO on an update to the shuttle maps displayed at the shuttle shelter at the Fairgrounds Park-and-Ride lot

2.2. Colorado Department of Transportation

The CDOT shall be responsible for the following tasks:

- Set up and remove two CDOT DMS
- Train ROMO staff on the operation of the two CDOT DMS
- Perform maintenance to CDOT DMS system if needed (as requested by ROMO)
- Upload and change CDOT DMS messages
- Relocate the CDOT DMS system if needed within the study period
- Install concrete barriers to shield CDOT DMS [Region 4]

2.3. Central Federal Lands Highway Division

Responsibilities of CFLHD include:

- Work with ROMO to request encroachment permit through CDOT for DMS
- Work with ROMO to request permit through CDOT for static signage
- Work with ROMO to develop a communications plan that provides pre-trip information to visitors
- Identify DMS vendors
- Coordinate with ROMO to contract a DMS vendor
- Contact vendor per ROMO request if DMS system is not functioning or if it needs to be relocated
- Fabricate and install (or identify an entity to fabricate and install) static signs
- Confirm that proposed static sign locations do not conflict with existing signage. If any do, CFLHD will present this information to WTI for additional consideration
- Work with the TOWN to install a sign identifying the Fairgrounds Park-and-Ride
- Work with the TOWN to provide wayfinding to the shuttle stop from the Fairgrounds Park-and-Ride lot
- Work with TOWN to install "No overnight parking" signage at the Fairgrounds Park-and-Ride lot
- Work with the TOWN and ROMO on an update to the shuttle maps displayed at the shuttle shelter at the Fairgrounds Park-and-Ride lot

2.4. Town of Estes Park

The TOWN shall be responsible for the following tasks:

- Fabricate and install static signage, as coordinated with CFLHD, from the DMS to the Fairgrounds Park-and-Ride
- Install "No overnight parking" signage at the Fairgrounds Park-and-Ride
- Provide wayfinding to the shuttle stop from the Fairgrounds Park-and-Ride lot
- Install a sign to identify the Fairgrounds Park-and-Ride
- Work with CFLHD and ROMO on an update to the shuttle maps displayed at the shuttle shelter at the Fairgrounds Park-and-Ride lot

2.5. Western Transportation Institute

WTI shall be responsible for the following tasks:

- Provide recommendations on the DMS locations
- Develop pre-approved DMS messages with project partners

- Propose static signage to supplement DMS
- Provide ongoing recommendations and guidance for ROMO shuttle service, as issues arise

2.6. DMS Contractor

The contractor shall be responsible for the following tasks:

- Place and test their DMS in conjunction with ROMO
- Train ROMO staff on the operation of their DMS
- Relocate their DMS if needed within the rental period
- Perform maintenance to their DMS if needed (as requested by ROMO) within rental period
- Pick up their DMS at the end of the rental period

3. INTELLIGENT TRANSPORTATION SYSTEM & STATIC SIGNAGE

This section discusses the intelligent transportation system (ITS) and static signage. The ITS discussion includes conditions for use, coordination and deployment, site locations, messaging, and deactivating and relocating the DMS. The static signage section covers coordination and deployment, existing signage, and site locations.

3.1. Intelligent Transportation System

As a result of the lessons learned from the 2011 pilot ITS, the 2012 ITS designed for the construction along the Bear Lake Road Corridor will only utilize DMS equipment.

3.1.1. Conditions for Use

A DMS is designed to display a summary of the specific condition (e.g., parking availability, traffic congestion), and an action to be taken by the motorists (e.g., use park-and-ride). Maintenance Guidelines for DMS can be found in Appendix C.

3.1.1. Coordination and Deployment

Placement of the DMS and static signage within the right-of-way along SR 7, US 34 and US 36 requires permit/authorization from the Colorado Department of Transportation (CDOT). The deployment, operations, and maintenance of the DMS system require interagency cooperation.

3.1.2. Site Locations

WTI staff conducted a field visit to identify site locations for the deployment of the ITS. Based on the field visit, WTI is proposing a combination of DMS and static signs that will complement ROMO and CFLHD's marketing campaign. A total of five dynamic message signs are proposed. The static signs are intended to lead a visitor from a DMS or from the road closure kiosk within ROMO to the Fairgrounds Park-and-Ride lot. The static signs from the kiosk to the Fairgrounds Park-and-Ride will help to guide visitors from ROMO back to the lot in a clear manner. There are three corridors along which the dynamic message signs and static signs will be orientated: SR 7, US 34, and US 36.

Figure 4 shows the selected locations for the DMS. These locations are described in detail in the sections that follow. Refer to Appendix D for more information about all of the candidate locations that were considered for the DMS. Appendix E contains guidelines for the placement of DMS.

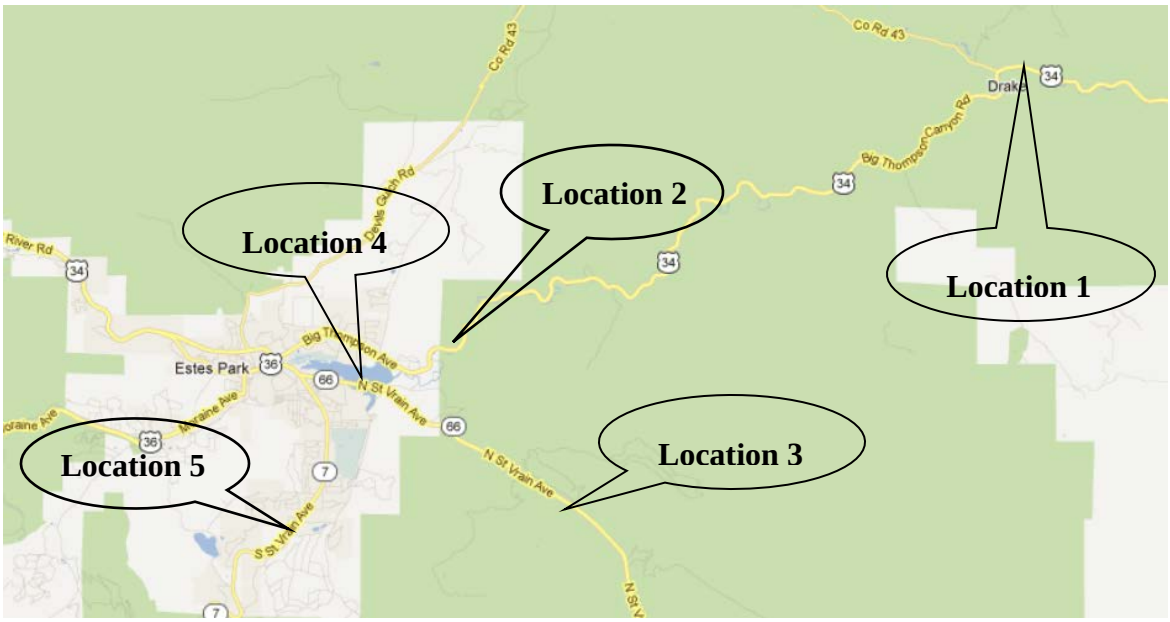

Figure 4: Proposed DMS Locations [6]

3.1.2.1. Location 1 – US 34 near CR 43

Location 1, near the junction of CR 43 and US 34, is proposed to have one DMS facing WB traffic, as shown in Figure 5. The DMS should be placed west of #1561 Big Thompson Highway, approximately 50 feet west of the "Right Lane Ends" static sign. This location was chosen due to the length of site distance available. Due to the mountainous curves on this roadway, this was one of the only locations with significant site distance available.

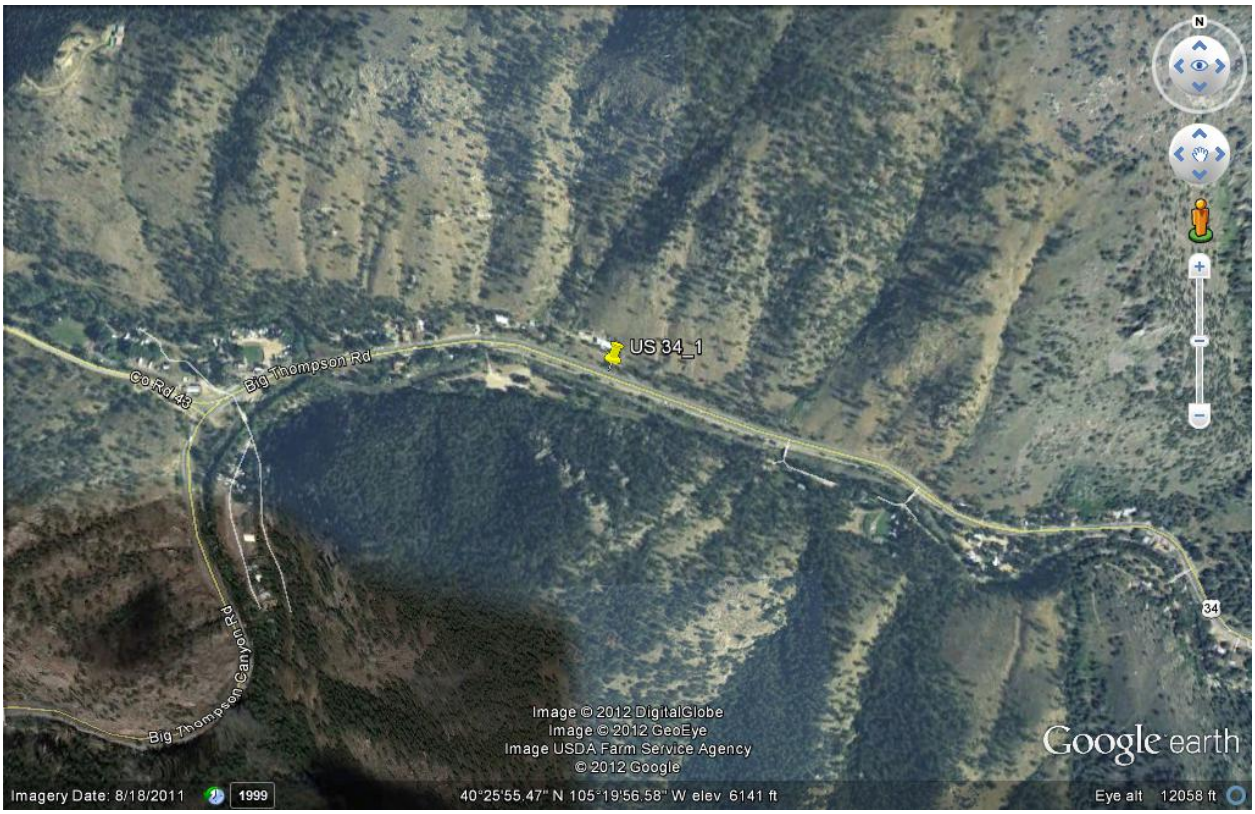

Figure 5: US 34_1 Proposed DMS Location, Overview [6]

Figure 6 shows the elevation view of the first proposed DMS location on US 34. As shown in the figure, there is a 4 foot shoulder followed by a 12 foot flat area between the shoulder and hill. The DMS should be placed within the 12 foot flat area.

Figure 6: US 34_1 Proposed DMS Location, Elevation View

3.1.2.2. Location 2 – US 34 near Estes Park

The DMS at Location 2 will be on the north side of US 34, east of Mall Road, as shown in Figure 7. The proposed location is currently being used by CDOT to notify travelers of the roadwork on Mall Rd.

Figure 7: US 34_2 Proposed DMS Location, Overview [6]

Figure 8 shows the elevation view of the second proposed DMS on US 34. The photo shows the DMS currently being used by CDOT to notify travelers of the roadwork on Mall Rd.

Figure 8: US 34_2 Proposed DMS Location, Elevation View (photo courtesy CFLHD)

3.1.2.3. Location 3 – US 36 east of Pinyon Trail Rd

The DMS at Location 3 will be on the north side of US 36, just east of Pinyon Trail, as shown in Figure 9. The proposed location was utilized in 2011.

Figure 9: US36_1 Proposed DMS Location, Overview [6]

Figure 10 shows an elevation view of the placement for the DMS near Pinyon Trail. As shown in the figure, a sufficient offset is provided.

Figure 10: US36_1 Proposed DMS Location, Elevation View

3.1.2.4. Location 4 – US 36 in Estes Park

Location 4 on US 36, just east of Community Drive, will have one DMS as shown in Figure 11. The DMS should be placed north of the guardrail. The proposed location was used in 2011. This device will direct visitors from US 36 and US 34 via Mall Rd onto Community Drive. Therefore, it is a significant junction point.

Figure 11: US36_2 Proposed DMS Location, Overview [6]

3.1.2.5. Location 5 – SR 7

Location 5, just south of Scott Road on SR 7, is proposed to have one DMS, as shown in Figure 12.

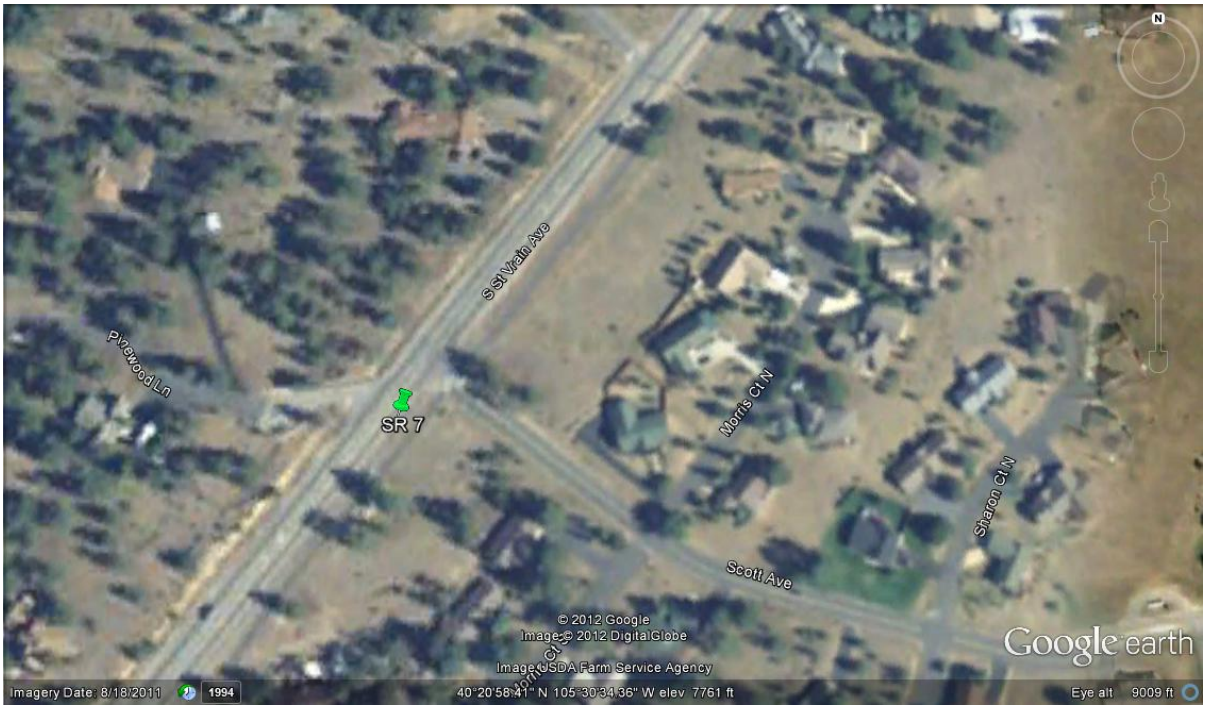

Figure 12: SR7 Proposed DMS Location, Overview [6]

Figure 13 shows an elevation view of the placement for the DMS on SR 7. There should be sufficient offset from the roadway and the neighboring multi-use pathway for the DMS. The DMS should be placed so that it does not impede the sight triangle of motorists entering SR 7 from Scott Street.

Figure 13: SR 7 Proposed DMS Location, Elevation View

3.1.3. Messages

All messages must be approved and prioritized according to need, and chosen appropriately when an event occurs.

3.1.3.1. Prioritized Messages

For this ITS installation, only park-and-ride and shuttle bus messages will be used. If there is a need for use of the DMS due to a higher priority event (e.g. extreme weather conditions, fire, accidents, etc.) then CDOT and ROMO would work together to determine if the signs need to be reallocated.

3.1.3.2. Displaying Messages

Messages displayed should convey real-time information and be simple and short in order to accommodate the vast majority of the motorists reading the sign, and help accommodate motorists with low reading skills. Each displayed message should convey a complete thought.

3.1.3.3. Approved Messages

WTI has developed DMS messages for the construction project, with the approval of ROMO, based on the following goals and parameters.

During the summer of 2011 ITS pilot study, the main goal for the DMS was to promote a mode shift from private automobile to shuttle bus to reduce congestion in ROMO. To accomplish this, the DMS were used to notify travelers of the Fairgrounds Park-and-Ride lot and to direct them to tune into the highway advisory radio (HAR) for more information about the shuttles.

For the 2012 Bear Lake Road construction project, the main goal for the DMS is to direct visitors to the Fairgrounds Park-and-Ride lot prior to entering ROMO because the Bear Lake Road Corridor will be closed to private automobiles from 9 am to 4 pm due to the construction. By notifying visitors before park entry, the system should ease traffic by decreasing the number of vehicles that would need to turn around once they reach the Bear Lake Road Corridor construction. Otherwise, these vehicles would have to return to the Moraine Park or Beaver Meadows Visitor Centers or drive more than 6.5 miles back into Estes Park to the Fairgrounds Park-and-Ride to take the shuttle.

Due to the change in goals for this project (i.e., roadwork/construction this year), the change in ITS equipment proposed (i.e., no HAR this year), and the addition of DMS locations on new routes, new messages are being proposed for the summer of 2012.

During the summer of 2011, the DMS messages were updated midway through the pilot study due to lessons learned during the evaluation. These changes included:

- "SHUTTLE TO RKY MTN" replaced with "FREE VISITORS SHUTTLE" to promote the free aspect of the shuttle and also to indicate that the shuttles would have stops in the TOWN as well as ROMO (i.e., last year the ROMO Hiker Shuttle did not have a stop at the Fairgrounds Park-and-Ride)
- "PARK AND RIDE IN ESTES" replaced with "PARK AND RIDE AT FAIRGRND" due to the concern that people were confusing the Fairgrounds Park-and-Ride for the Bear Lake Park-and-Ride within ROMO.

The DMS messages for 2012 were created to incorporate the 2011 recommendations, as well as to meet the following new objectives:

- Avoid asking travelers to call 511 or the ROMO line because the messages might appear to promote cell phone use while driving. Also avoid these messages in areas with spotty cell phone coverage (i.e., do not tell them to call in an area where cell coverage does not exist).
- Avoid phrases such as "major delay" or "road closures" due to ROMO's concern that viewers would choose not to visit ROMO/TOWN at all, rather than ride the shuttle.
- Describe specific location of roadwork, i.e. use "roadwork Bear Lake Road" instead of "roadwork in Rky Mtn." Avoid creating the impression that the entire park is under construction or the construction is wider than just the Bear Lake Road Corridor. This could cause travelers to choose not to visit ROMO/TOWN at all if they perceive the construction to be extensive.

The DMS messages were also created so that the DMS at locations close to the Fairgrounds Park-and-Ride (i.e., Locations 2, 4, and 5 (Figure 4)) contained directions to it (i.e., next left/right). The DMS on US 34 and US 36 are intended to be used in conjunction with the DMS located further away on these same routes. Therefore, the DMS located further out of town will provide general details about the roadwork and the shuttles, whereas the DMS in town will be used to remind travelers that the Fairgrounds Park-and-Ride is available and to direct them how to get there.

The messages proposed for the DMS shown below are those which were recommended based on the feedback from the project partners. The messages are proposed to be displayed from 8-3:30 pm, daily, beginning Tuesday, May 29, 2012. Although the Hiker Shuttle has longer operation hours that could allow for additional messaging outside of this time period, ROMO expressed during the 5/21/2012 conference call that their goal is to get users onto the shuttles during the 9-4 pm restricted period. Visitors coming to ROMO outside of this period are allowed to access the Bear Lake Road Corridor with their private vehicles.

Additional messages considered, and the reasons that they were not used, can be found in Appendix F.

US 34 NEAR COUNTY ROAD 43

Four messages were proposed because the closer DMS may not be operable for a period of time and because it is unclear if a two or three phrase message can be used. The 2009 Manual on Uniform Traffic Control Devices identifies as a Standard, the use of messages with only two phases. However, the Federal Highway Administration publication FHWA-RD-03-066, Portable Changeable Message Sign Handbook (http://www.fhwa.dot.gov/publications/research/infrastructure/pavements/ltpp/reports/03066/#message), whose webpage was updated on 4/23/2012, identifies under “Message Display” a “Three-Phase PCMS” and under “Maximum Number of Phases” it indicates that “Three phases should be used only when necessary and should contain a simple message.” Therefore, an in-field investigation will be made to determine whether two or three phase messages are appropriate for this location.

The following message should be used if only two phases are allowed and the closer DMS is in operation.

(Message 2012-1)

RMNP	PARK AND
BEAR LK	RIDE AT
ROADWORK	FAIRGRND

During a 5/14/2012 conference call, CDOT recommended, and ROMO agreed, that "RMNP" will be interpreted correctly by travelers as Rocky Mountain National Park. This abbreviation was chosen over the "RKY MTN" abbreviation that was used in 2011.

The following message should be used if three phases are allowed and the closer DMS is in operation.

(Message 2012-2)

RMNP	SHUTTLE	PARK AND
BEAR LK	ACCESS	RIDE AT
ROADWORK	ONLY	FAIRGRND

During the 5/21/2012 conference call, ROMO expressed an interest in providing a more assertive message regarding visitor use of the shuttles. Therefore, instead of "USE RMNP SHUTTLES," "SHUTTLE ACCESS ONLY" was proposed and included prior to "PARK AND RIDE AT FAIRGRND" instead of after it. Participants discussed whether this message should remain after the TOWN shuttles began their operation on June 29th. It was decided that the message would be reconsidered once TOWN input was available.

The following message should be used if only two phases are allowed and the closer DMS is not in operation.

(Message 2012-3)

PARK AND	LEFT
RIDE AT	AT
FAIRGRND	MALL RD

The following message should be used if three phases are allowed and the closer DMS is not in operation.

(Message 2012-4)

RMNP	PARK AND	LEFT
BEAR LK	RIDE AT	AT
ROADWORK	FAIRGRND	MALL RD

US 34 NEAR MALL ROAD

A two phase message was utilized as a result of the expectation that sight distance for the DMS would be limited. A message used on a DMS at the same location for another project only contained two frames.

(Message 2012-5)

PARK AND	LEFT
RIDE AT	AT
FAIRGRND	MALL RD

US 36 NEAR PINYON TRAIL

During the 2011 pilot intelligent transportation system installation, three phases were utilized. Three phase messages are again proposed for 2012 on US 36 because the DMS are conveying informational rather than safety messages, the sight distance is known to be good from the 2011 deployment (the DMS will be deployed at the same locations), there were no problems reported in 2011 (confirmed by CDOT on 5/14/2012 conference call), three phases have been known to be used in other locations, and the aforementioned FHWA report identifies three phases as an option.

(Message 2012-6)

RMNP	SHUTTLE	PARK AND
BEAR LK	ACCESS	RIDE AT
ROADWORK	ONLY	FAIRGRND

US 36 NEAR COMMUNITY

This message was indicated as the preferred message (see 5/21/2012 conference call notes) when compared with an alternative (see Appendix F) because it contains a reference to the static park-and-ride signs that the TOWN is installing.

(Message 2012-7)

PARK AND	NEXT	THEN
RIDE AT	LEFT	FOLLOW
FAIRGRND		SIGNS

SR 7

Two options are presented for the DMS on SR 7: one with two phases and one with three phases. If this DMS is utilized, the use of two versus three phases will be evaluated in the field.

(Message 2012-8)

RMNP	PARK AND	RIGHT
BEAR LK	RIDE AT	AT
ROADWORK	FAIRGRND	MANFORD

(Message 2012-9)

RMNP	PARK AND
BEAR LK	RIDE AT
ROADWORK	FAIRGRND

3.1.4. Deactivating Systems and Relocation

If DMS are placed in locations with restricted sight distance or other limitations, the systems may need to be relocated for better performance. The contractors will be responsible for deactivating and relocating the systems. The contractors should log pertinent information, such as the reason for relocation, time deactivated, time re-activated and other details.

3.2. Static Signage

3.2.1. Coordination and Deployment

Placement of the DMS and static signage within the right-of-way along SR 7, US 34 and US 36 requires permit/authorization from the Colorado Department of Transportation (CDOT). The deployment, operations, and maintenance of the DMS system require interagency cooperation.

3.2.1. Existing Signage

There are five existing Fairgrounds signs. Figure 14 shows a wide view of all five signs. Figure 15 shows a close-up of four signs that are in close proximity to one another.

Figure 14: Existing Fairgrounds Signs [6]

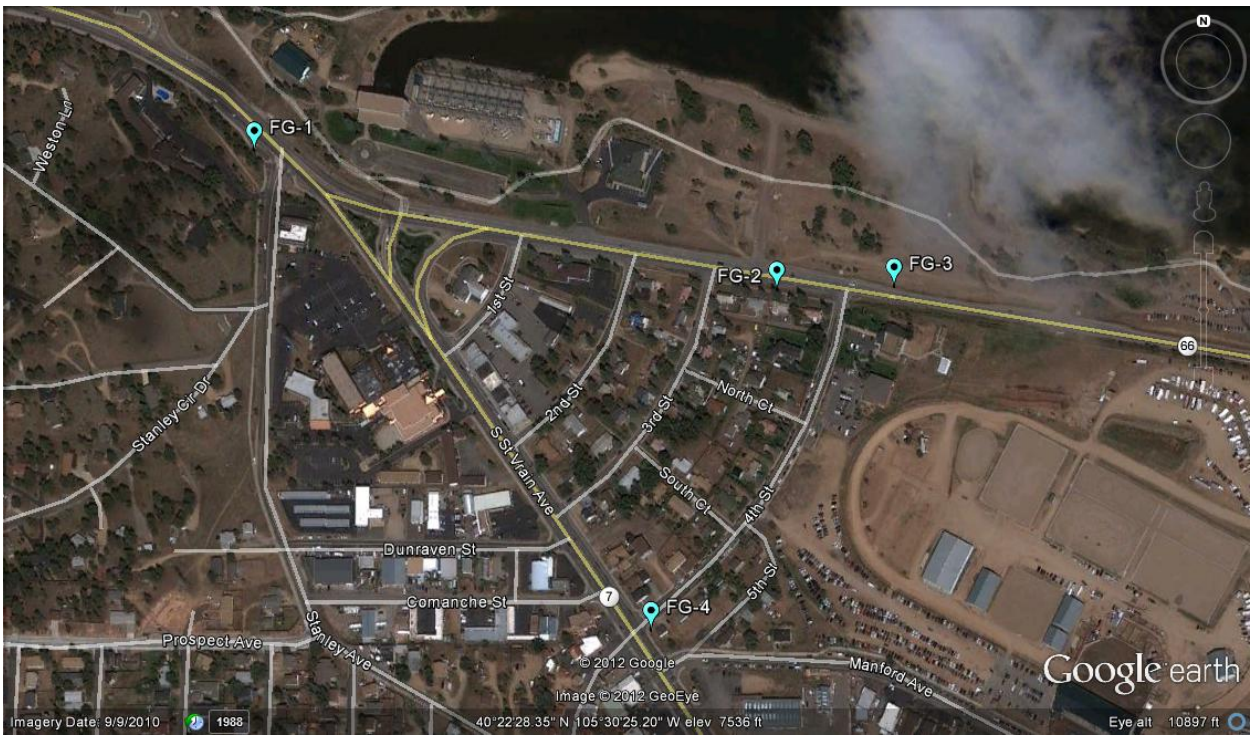

Figure 15: Existing Fairgrounds Signs, Close-Up [6]

FG-1, FG-2, FG-3, and FG-5 have white lettering on a green background. FG-4 uses white lettering on a brown background. FG-1 (Figure 16) and FG-4 (Figure 17) are on a sign combined with other information. FG-2, FG-3, and FG-5 only have "Fairgrounds" and directional information on them (Figure 18).

Figure 16: FG-1 Existing Sign (photo courtesy of CFLHD)

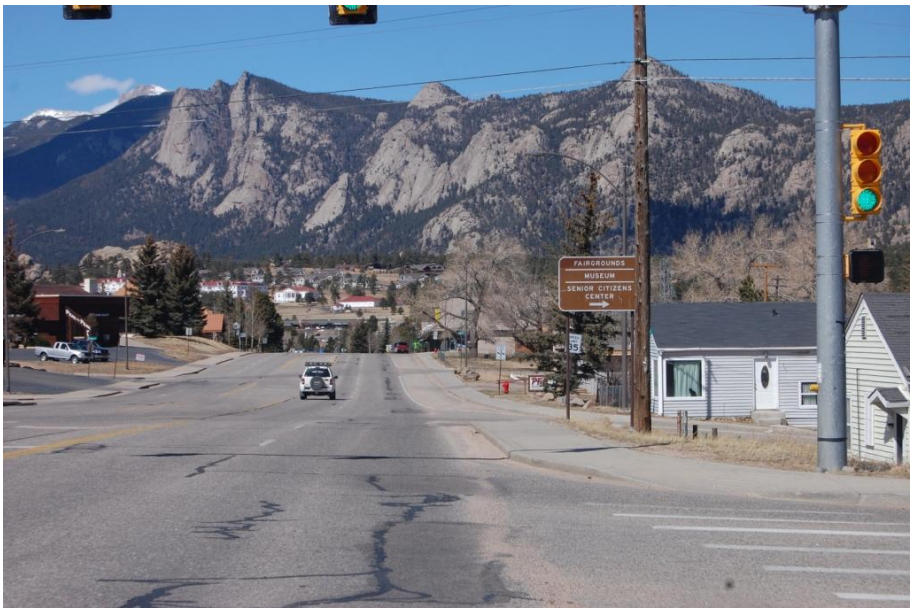

Figure 17: FG-4 Existing Sign (photo courtesy of CFLHD)

Figure 18: Example of FG-2, FG-3, and FG-5 Existing Signs

The TOWN has requested that signs avoid directing visitors to the Fairgrounds Park-and-Ride via 4th Street. Therefore, this plan recommends relocating FG-2 and FG-3 to the approaches on either side of Community Drive.

3.2.1. Site Locations

Twenty-eight static park-and-ride signs are proposed in Table 1. However, only fifteen are highly recommended. The signs identified as "recommended" are those which are minimally necessary for wayfinding from points of information (DMS or road closure kiosk) to the Fairgrounds Park-and-Ride. Those identified as "optional" are signs that may help reassure visitors that they are on the right path. These signs are proposed as a result of lessons learned during the 2011 pilot ITS. Potential users were observed turning as the DMS had instructed, but if they did not get subsequent confirmation that the Fairgrounds Park-and-Ride was near, they turned around and continued into the park with their private vehicle.

Table 1: Proposed Park-and-Ride Static Signs

	Sign Name	Direction Facing	Arrow Direction	Attached or Independent	Recommended or Optional	Related Figure(s)
1	US34-1	WB	Left	Attached (FG5)	Recommended	Figure 22
2	US34-2	WB	Straight	Independent	Optional	Figure 22, Figure 23
3	US34-3	WB	Straight	Independent	Optional	Figure 22, Figure 23
4	US34-4	WB	Left	Independent	Recommended	Figure 23, Figure 26
5	US36-1	EB	Straight	Independent	Optional	Figure 23, Figure 24, Figure 26
6	US36-2	EB	Right	Attached (relocated FG2)	Recommended	Figure 22, Figure 23, Figure 24
7	US36-3	WB	Left	Attached (relocated FG3)	Recommended	Figure 22, Figure 23, Figure 24
8	SR7-1	EB	Straight	Independent	Optional	Figure 23, Figure 26
9	SR7-2	EB	Left, angle	Attached (FG1)	Recommended	Figure 23, Figure 24, Figure 26
10	SR7-3	EB/SB	Straight	Independent	Optional	Figure 23, Figure 24, Figure 26
11	SR7-4	EB/SB	Left	Independent	Recommended	Figure 23, Figure 24, Figure 25,
12	SR7-5	WB/NB	Right	Independent	Recommended	Figure 22, Figure 23, Figure 24, Figure 25, Figure 26
13	SR7-6	WB/NB	Straight	Independent	Optional	Figure 25
14	SR7-7	NB	Straight	Independent	Optional	Figure 25
15	Community-1	SB	Straight	Independent	Recommended	Figure 22, Figure 23, Figure 24
16	Community-2	SB	Right	Independent	Recommended	Figure 22, Figure 23, Figure 24, Figure 25

17	Manford-1	EB	Straight	Independent	Optional	Figure 23, Figure 24, Figure 25, Figure 26
18	Manford-2	EB	Left	Independent	Recommended	Figure 22, Figure 23, Figure 24, Figure 25
19	Manford-3	WB	Right	Independent	Recommended	Figure 22, Figure 23, Figure 24, Figure 25
20	Manford-4	WB	Straight	Independent	Recommended	Figure 22, Figure 23, Figure 24, Figure 25
21	Mall Rd-1	SB	Right/Straig	Independent	Optional	Figure 22
22	Mall Rd-2	SB	Right	Independent	Recommended	Figure 22, Figure 23
23	From ROMO-1	EB	Straight	Independent	Optional	Figure 27
24	From ROMO-2	EB	Left	Independent	Recommended	Figure 27
25	From ROMO-3	EB	Straight	Independent	Optional	Figure 27
26	From ROMO-4	EB	Straight	Independent	Optional	Figure 26, Figure 27
27	From ROMO-5	EB	Straight	Independent	Optional	Figure 26, Figure 27
28	From ROMO-6	EB	Right	Independent	Recommended	Figure 23, Figure 26, Figure 27

*The decision to use a right or straight arrow will be decided based on a field check of the curvature of the road where the sign is installed.

Taking into consideration how the optional signs interact with the roadway network is necessary because they may conflict with existing signs. Section 2D.50 of the Manual on Uniform Traffic Control Devices (MUTCD) [7] indicates that "regulatory, warning and other guide signs have a higher priority" than community wayfinding signs, and consequently community wayfinding signs should only be installed where there is adequate spacing between them and higher priority signs. The purpose of the proposed park-and-ride signs can be construed as community wayfinding signs. Therefore, the implementation of these signs should be considered on a case-by-case basis to ensure that they do not conflict with higher priority signs. Signs identified as "Attached" are those which are recommended to be mounted on existing signage. For example, US34_1 would be mounted beneath the "Fairgrounds" sign (FG5) that exists. The table also identifies the direction that the sign should face and the type of arrow that should be used beneath the sign.

Figure 19 shows the design of the park-and-ride signs utilized to guide visitors from the DMS to the Fairgrounds Park-and-Ride during the 2011 pilot intelligent transportation system. Notice that the sign utilizes only the generic "Park & Ride." Figure 20 shows a sign for the Federal Center Station Park-and-Ride for RTD in Denver, Colorado. Notice that this sign indicates that there are three modes for which the park-and-ride can be used: carpooling, light rail, or bus. Also, notice that the name of the park-and-ride is identified on the sign. Taking the designs of these two signs into consideration, WTI developed a concept for the signs to be used in 2012, which will guide people from the DMS to the Fairgrounds Park-and-Ride (Figure 21). The colors and size associated with the concept shown in Figure 21 should be determined according to MUTCD. Take note of the inclusion of the Fairgrounds Park-and-Ride name on the sign. Using the name of the park-and-ride lot in the communications plan by ROMO/CFLHD, within the DMS messaging and on the static signage, will help brand the park-and-ride lot. Branding the Fairgrounds Park-and-Ride should help to differentiate between it and ROMO's Bear Lake Road Park-and-Ride.

Figure 19: 2011 Park-and-Ride Guide Signs

Figure 20: Park-and-Ride (photo courtesy of CFLHD)

Figure 21: Proposed Park-and-Ride Sign

Figure 22 through Figure 27 show the geographic locations of the proposed static signs along the corridors. The identified locations are not exact. They need to be sited more carefully in the field. Note that there will be duplication of signs within the next five figures. (e.g., one sign may show up in multiple figures)

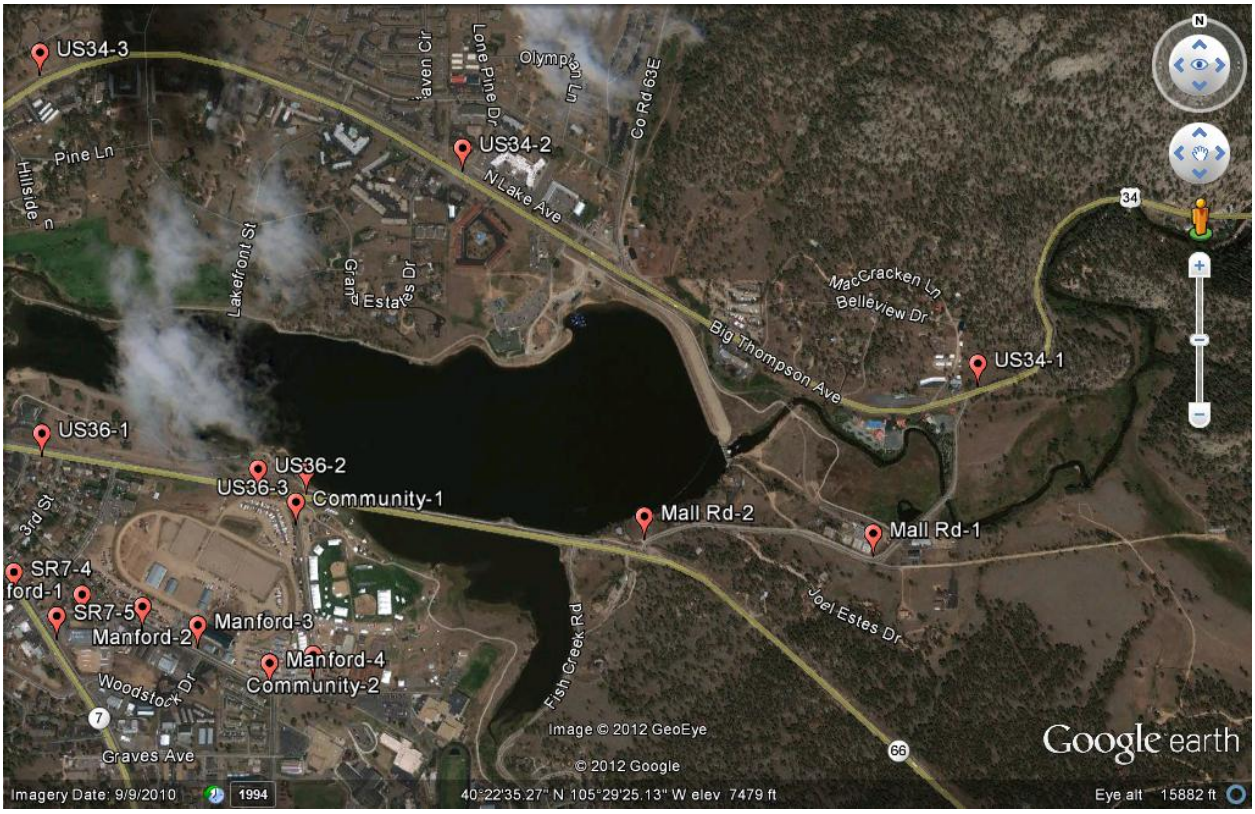

Figure 22: Static Signs, Easternmost View [6]

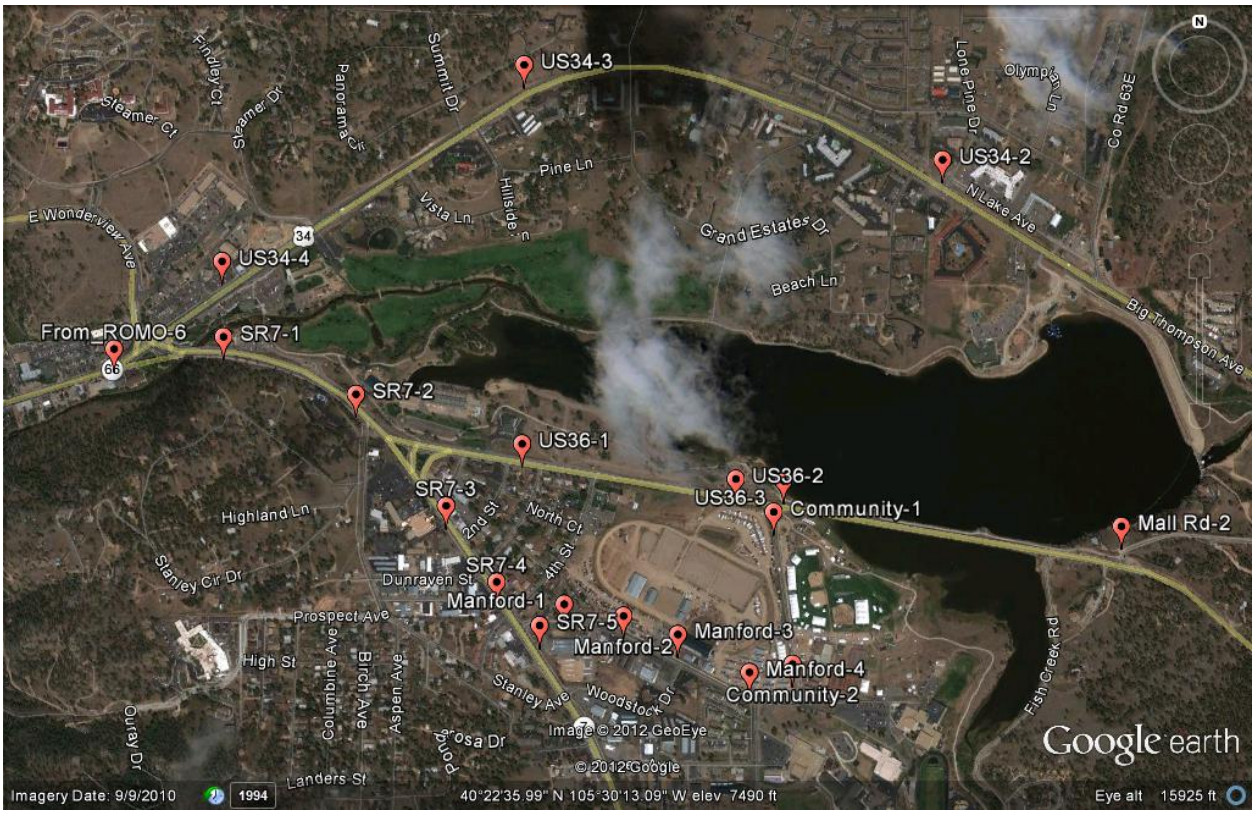

Figure 23: Static Signs, US 34, US 36, SR 7 [6]

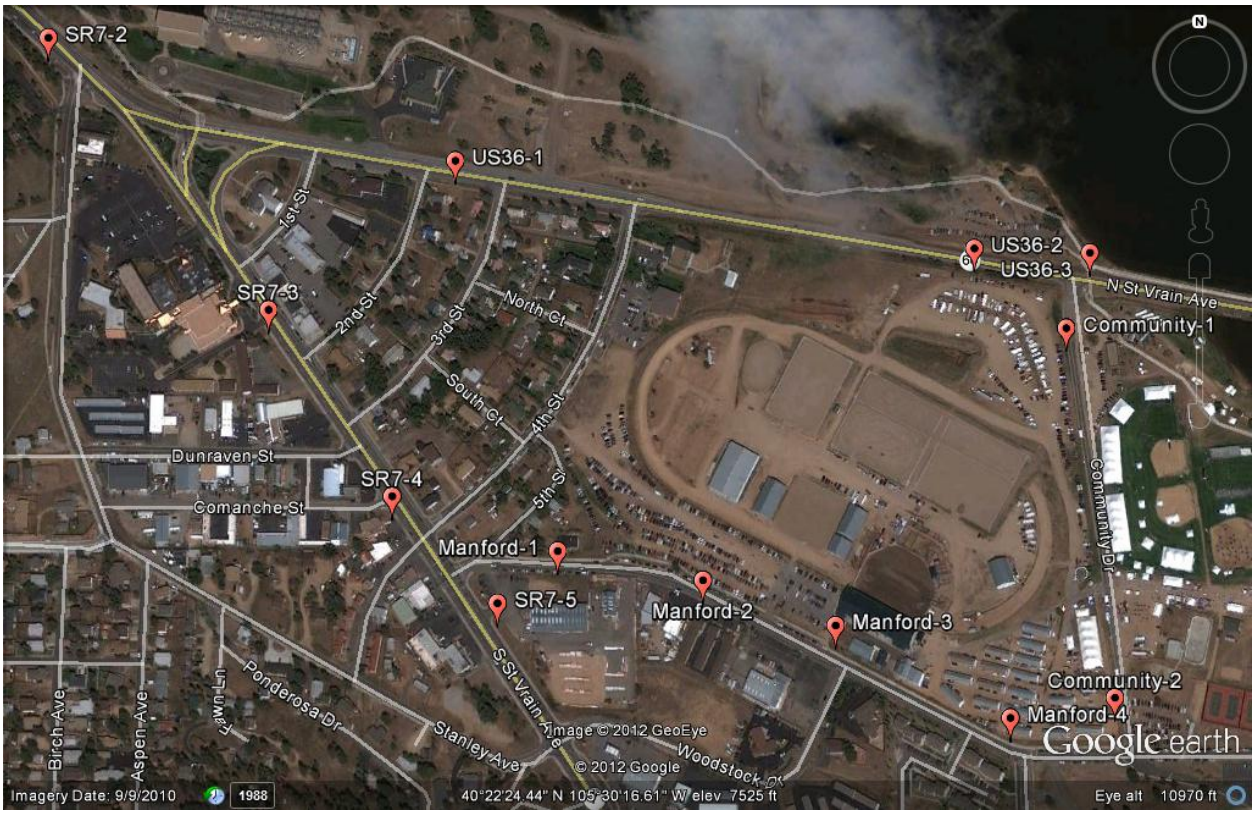

Figure 24: Static Signs, Fairgrounds Area, Close-Up [6]

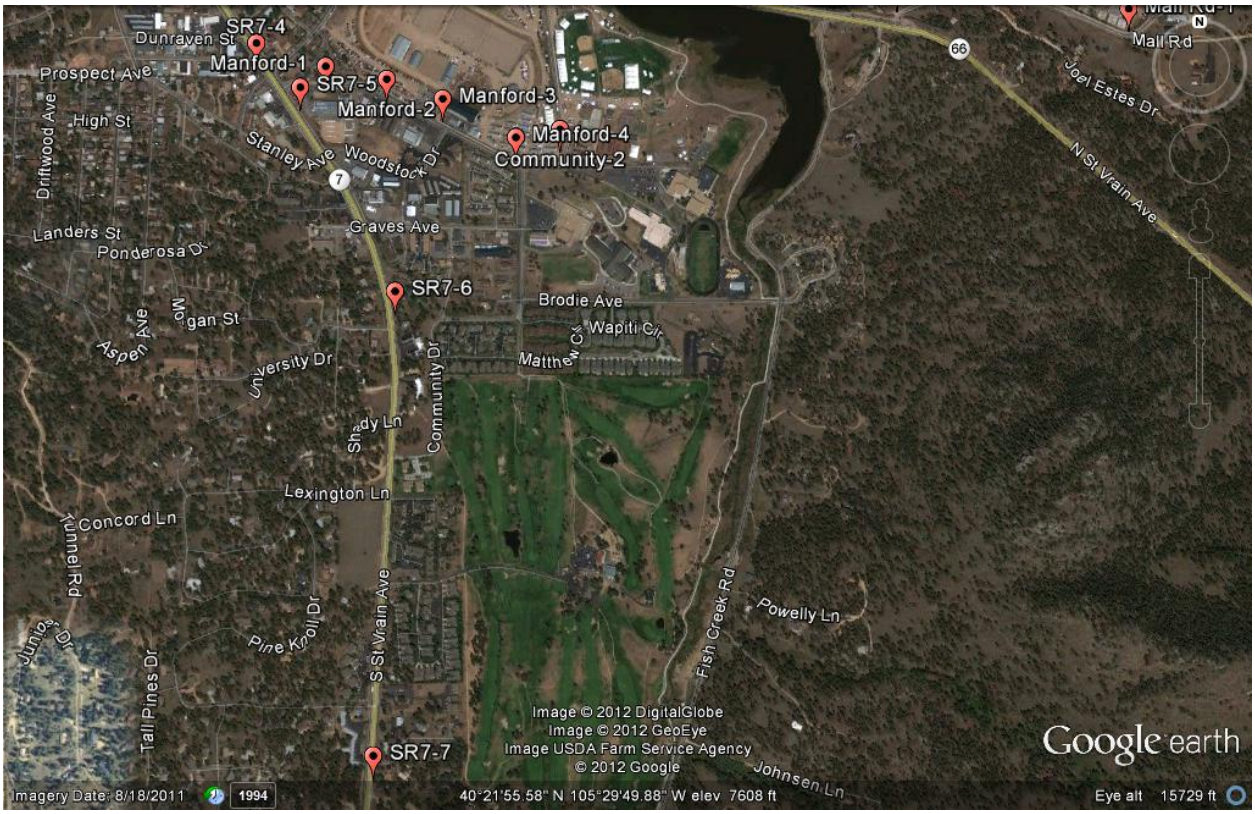

Figure 25: Static Signs, SR 7 [6]

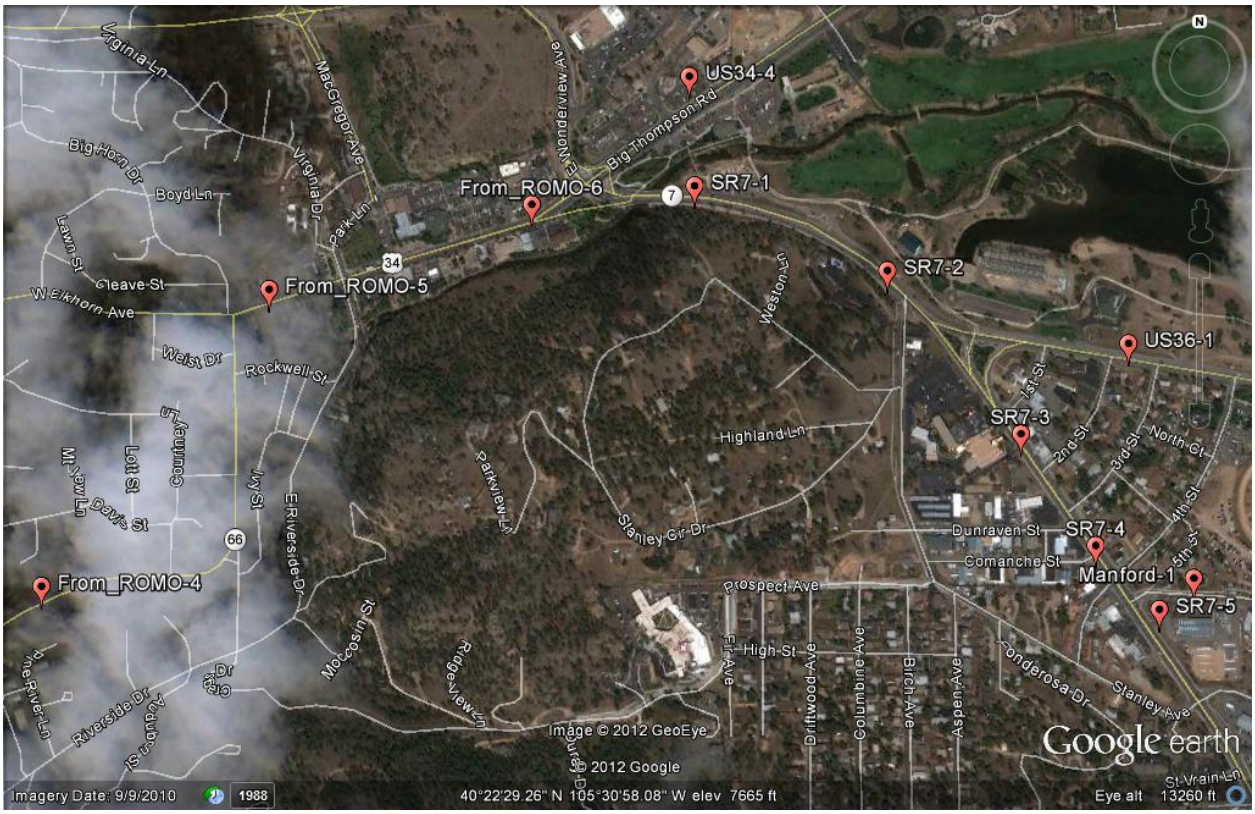

Figure 26: Static Signs, Downtown Estes Park [6]

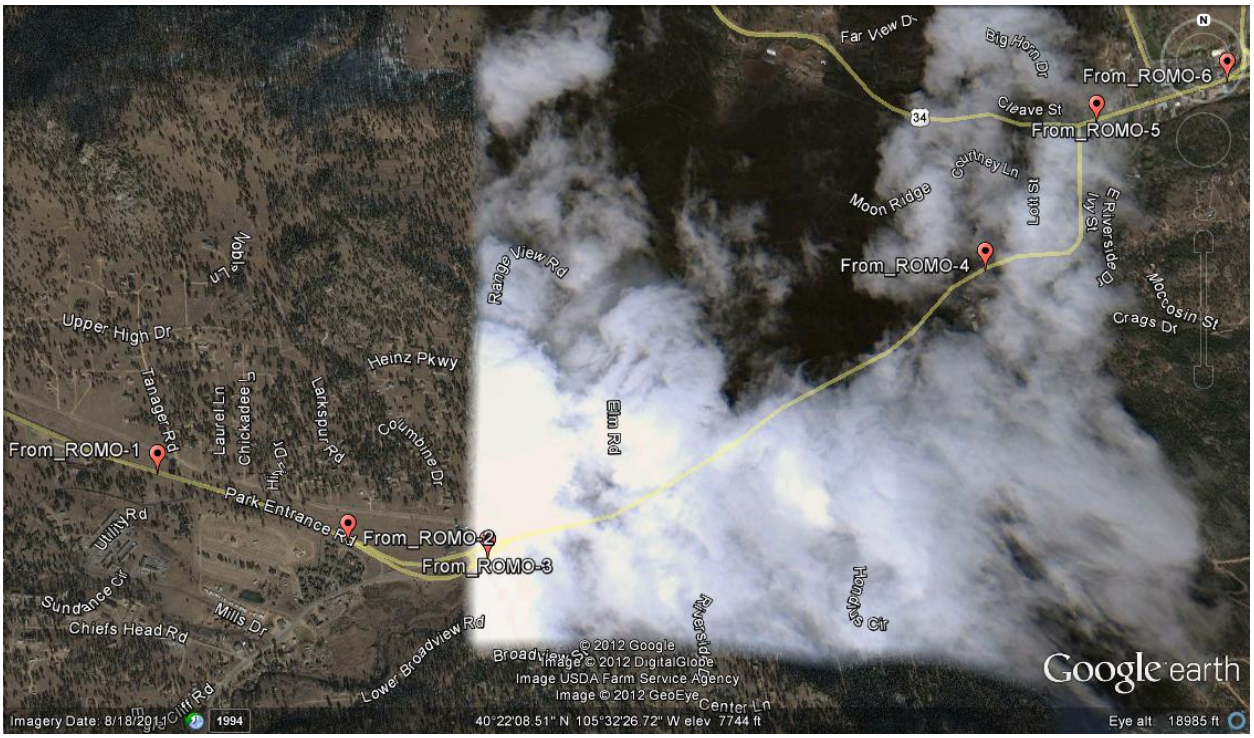

Figure 27: Static Signs, ROMO Approach [6]

The following four descriptions lay out how the proposed static signage will be encountered by visitors as they are directed to the Fairgrounds Park-and-Ride from US 34, US 36, SR 7 or re-rerouted from ROMO.

3.2.1.1. US 34 Park-and-Ride Static Signs

When visitors see the two US 34 DMS, there are three potential routes that they might follow. For route 1, a visitor would follow US 34 (US 34_1) to Mall Rd (Mall Rd_1, Mall Rd_2) to US 36 (US36_2) to Community (Community 1, Community 2) to Manford (Manford 4, Manford 3) to the Fairgrounds Park-and-Ride. For route 2, visitors traveling along US 34 who miss the static sign US34_1 would follow US 34 (US34_2, US34_3, US34_4) to SR 7 (SR7_1, SR7_2) to US 36 (US36_1, US36_2) to Community (Community 1, Community 2) to Manford (Manford 4, Manford 3) to the Fairgrounds Park-and-Ride. For route 2, visitors who miss the SR7_2 sign would follow SR 7 (SR7_3, SR7_4) to Manford (Manford 1, Manford 2) to the Fairgrounds Park-and-Ride.

3.2.1.2. US 36 Park-and-Ride Static Signs

A visitor approaching on US 36 would follow US 36 (US36_3) to Community (Community 1, Community 2) to Manford (Manford 4, Manford 3) to the Fairgrounds Park-and-Ride.

3.2.1.3. SR 7 Park-and-Ride Static Signs

A visitor approaching on SR 7 would follow SR 7 (SR7_7, SR7_6, SR7_5) to Manford (Manford 1, Manford 2) to the Fairgrounds Park-and-Ride.

3.2.1.4. From ROMO Park-and-Ride Static Signs

If visitors arrive at the road closure kiosk on Bear Lake Road between 9 and 4 pm, they will be asked to turn around and park their vehicle at the Fairgrounds Park-and-Ride and return via the shuttle bus. It is assumed that the parking lots at the Moraine and Beaver Meadows Visitor Centers will fill first, and people will need to return to the Fairgrounds Park-and-Ride. Visitors rerouted to the Fairgrounds Park-and-Ride would take the Park Entrance Rd (From_ROMO-1, From_ROMO-2) to Moraine Avenue (From_ROMO-3, From_ROMO-4) to East Elkhorn Avenue (From_ROMO-5, From_ROMO-6) to SR 7 (SR7_1, SR7_2) to US 36 (US36_1, US36_2) to Community (Community 1, Community 2) to Manford (Manford 4, Manford 3) to the Fairgrounds Park-and-Ride. If they miss the SR7_2 sign, they would end up continuing on SR 7 (SR7_3, SR7_4) to Manford (Manford 1, Manford 3) to the Fairgrounds Park-and-Ride.

3.2.2. 511

WTI has recommended to ROMO that information about the construction in the Bear Lake Road Corridor be provided on CDOT's 511 line. For users familiar with the 511 line in Colorado, this information could prove valuable. Additionally, the pre-trip information being coordinated by ROMO and CFLHD could specifically direct users to 511. However, as mentioned previously, it is preferred not to coordinate the DMS with 511 (to prevent drivers from calling while driving). CDOT's 511 (accessed anywhere via 303-639-1111) currently provides callers with eight options:

1) Closures, Chain Laws, or Restrictions;

2) Road Conditions;

3) Trip Travel Times;

4) Trucker Information;

5) Construction Information;

6) Special Events;

7) To Be Transferred to States Surrounding Colorado, and

8) Other Transportation Providers Such As Bus Companies or Carpools.

The initial proposal was to provide the information related to ROMO's Bear Lake Road Corridor construction under option 8 (Other Transportation Providers Such as Bus Companies or Carpools). However, one could easily expect that the information would instead be under option 5 (Construction Information). Furthermore, the recording presents these eight options rather quickly. In contrast, the 511 lines for Montana (1-800-226-ROAD) or Wyoming (1-888-996-7623) offer only three primary options:

1) Highway Conditions,

2) Tourism, and

3) Other States.

When thinking about ROMO, a user would logically choose 2) Tourism, and they would subsequently be presented with a sub-menu that includes the national parks within the state. It would be worthwhile for CDOT to consider a simpler configuration for their 511 line. Regardless, providing the information about the Bear Lake Road Corridor construction on the 511 CDOT line would be desirable. It is recommended, however, that the pre-trip information provided by ROMO/CFLHD specify the option under 511 where the Bear Lake Road Corridor construction information can be found (i.e. call 511, choose option 8). The installation of signage for 511 along US 34, US 36 and SR 7 would be at the discretion of CDOT.

4. SHUTTLES

4.1. Overview

Many Federal Lands, specifically National Parks, use shuttles (public transportation) to reduce congestion on roadways, and reduce pressure to create more parking within the Parks. Some Federal Lands have also used shuttles to mitigate the effects of construction projects.

Acadia, Yosemite and Zion National Parks; Cape Cod National Seashore; and Maroon Bells/Snowmass Wilderness Area (Forest Service) have all used shuttles to provide visitor access to lands without using a personal vehicle. Glacier National Park instituted its shuttle service to mitigate the effects of the reconstruction of the Going to the Sun Road.

The shuttle services noted herein also interface, in many instances, with transportation services offered by the gateway community or regional services. The Roaring Fork Transportation Authority (RFTA) provides service to Maroon Bells, to the broader Aspen community, and even to Glenwood Springs, some 40 miles away. The Island Explorer helps link Bar Harbor, Maine with Acadia National Park.

The shuttles offered by Rocky Mountain National Park (ROMO) and Estes Park, Colorado are similar to the shuttle services noted above, in that they are used to manage traffic and parking issues, allow visitor access without the use of cars, and mitigate the effects of road construction.

The Hiker, Bear Lake and Moraine Park Shuttles are focused on linking people from Estes Park, Colorado (the gateway community) into some of the most popular locations in ROMO. Specifically, the Hiker Shuttle brings people from Estes Park into ROMO, where they may transfer to the Bear Lake and Moraine Park Routes that distribute riders to many popular trailheads. The routes and schedules of these services have been modified in 2012, due to construction along Bear Lake Road.

The Town of Estes Park, Colorado has implemented shuttle service in the community to provide for the movement of visitors within the community, as well as provide a linkage to the ROMO shuttle service.

ROMO runs three shuttle routes: the Hiker Shuttle Express Route, the Bear Lake Route, and the Moraine Park Route. They are shown in Figure 28. For 2012, as a result of the construction, the route stops and times have been modified from previous years.

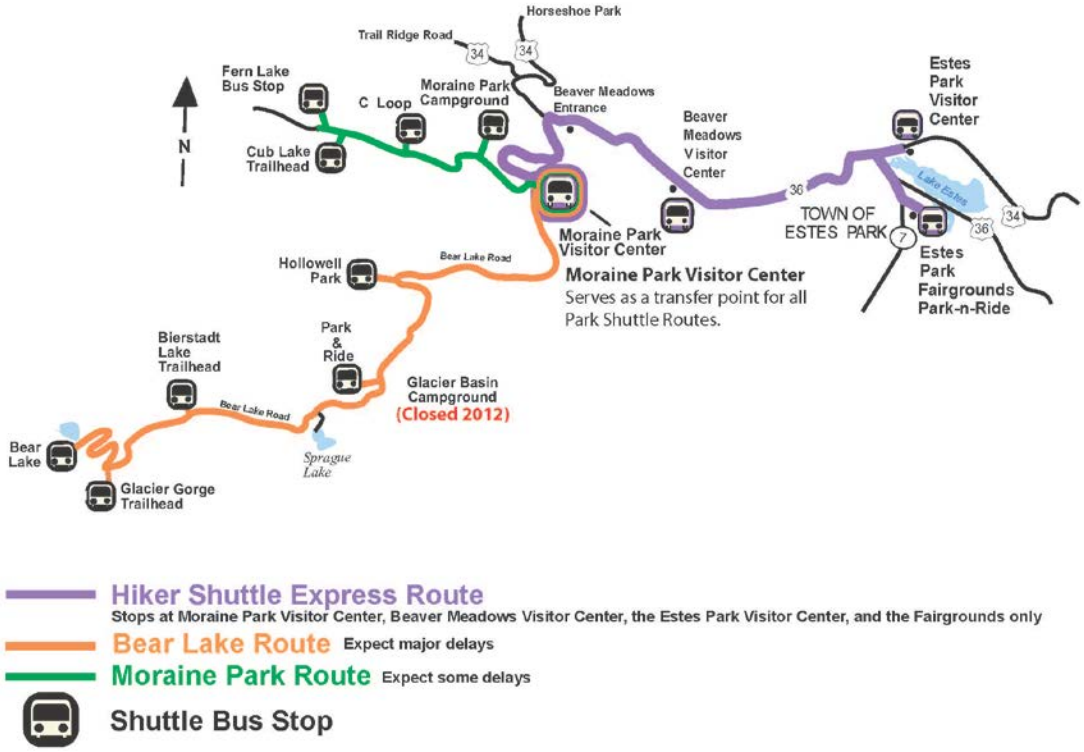

Figure 28: ROMO Shuttle Routes [8]

The Hiker Shuttle Express Route will stop at the Fairgrounds Park-and-Ride, Estes Park Visitor Center, Beaver Meadows Visitor Center, and Moraine Park Visitor Center. The Hiker Shuttle Express Route begins running at 6:30 am leaving from the Estes Park Park-and-Ride, with its last run leaving from the Moraine Park Visitor Center at 8 pm. The Hiker Shuttle runs hourly early and late in the day, and runs every 30 minutes from 9 am to 6 pm.

The Bear Lake Route will stop at the Moraine Park Visitor Center, Hollowell Park, the Bear Lake Park & Ride, the Bierstadt Lake Trailhead, the Glacier Gorge Trailhead, and the Bear Lake Trailhead. The Bear Lake Route begins running at 7 am leaving from the Moraine Park Visitor Center, with its last run leaving the Bear Lake Trailhead at 7:30 pm. The Bear Lake Route will run on 15 minute headways; however, the shuttles will pass through the construction. Therefore, they may be delayed.

The Moraine Park Route will stop at the Moraine Park Visitor Center, Moraine Park Campground, C Loop, Cub Lake Trailhead, and Fern Lake Bus Stop. The Moraine Park Route begins running at 7 am leaving from the Moraine Park Visitor Center, with its last run leaving Fern Lake Bus Stop at 7:30 pm.

The Town of Estes Park has four shuttles: the Red, Blue, Brown, and Silver routes (the Town may incorporate numbers and/or symbols to further identify the routes in 2012). The Red, Blue and Silver routes are planned to operate from 9 am to 10 pm when daily operations begin [9]. During the weekends of June 15-17 and June 22-24, they will operate from 12-10 pm. The Brown route is planned to operate from 8 am to 9 pm when daily operations begin. This route

will not operate during the weekends of June 15-17 and June 22-24. A map of the routes for the summer of 2012 was not finalized at the time of this publication.

4.2. Potential Issues

The following section highlights information about specific items/issues that may occur during this year's season. This section also presents information that may be used to make changes to the shuttle systems that could help provide both short- and long-term solutions to transportation issues in the ROMO/Estes Park area.

4.2.1. Signage/Messages

To make the ROMO and Estes Park shuttles successful in 2012 and beyond, it is important to install proper signage and disseminate effective messages about routes, schedules and stops in order to notify visitors about construction and guide them to the Fairgrounds Park & Ride. Part of the messaging may be about "tracking" systems that allow individuals to see the current location of buses, and estimate their arrival at various stops.

An overall theme/message such as "Park It in Estes Park" or "Park-Estes" can have multiple subtexts, such as, "Park your car and use the shuttles in Estes Park and ROMO", or "Enjoy Rocky Mountain National Park." It will be important that ROMO and Estes Park agree on the messaging and signing so that individuals are not confused about how/where to access the shuttle services, and the routes and schedules of the shuttles.

4.2.2. Shuttle Capacity

The buses likely to be used for the ROMO and Estes Park shuttles will have a capacity of approximately 28 individuals (seated), with a total capacity of 45 (including 17 standees). If daily visitors are encouraged to use the Fairgrounds Park-and-Ride, it is possible that during the month of June 2012 (when only the ROMO shuttle is operating), the ROMO Hiker Shuttle could fill up at the Fairgrounds Park-and-Ride during periods of heavy visitation and use. The Hiker Shuttle will have a half hour headway (the bus will come to the Fairgrounds every half-hour), which will allow a total of 90 people per hour to be transported to the Estes Park Visitor Center and beyond. With the addition of Estes Park's Silver Route (June 29 through September 9), there will be one bus every 15 minutes, with two buses every half-hour (a total of six buses per hour). This will increase the carrying capacity of the shuttles to 270 people per hour, which should be adequate capacity between the Fairgrounds Park-and-Ride and the Estes Park Visitor Center. However, this does not address capacity from the Estes Park Visitor Center to the Beaver Meadows Visitor Center, or the Moraine Park Visitor Center.

While Estes Park's Brown Route will still provide service to the Beaver Meadows Visitor Center, it operates only once per hour (a 60 minute headway) and is not a very direct route, taking nearly 45 minutes from the Estes Park Visitor Center to the Beaver Meadows Visitor Center. The concern, therefore, is that there may not be sufficient capacity during the month of June from the Fairgrounds Park-and-Ride to the Estes Park Visitor Center, and there may not be adequate capacity during the entire summer from the Estes Park Visitor Center to the Beaver Meadows Visitor Center and the Moraine Park Visitor Center, where people would transfer to the Bear Lake and/or Moraine Park routes. This is due to the fact that only the Hiker Shuttle (30 minute headways) and the Brown route (60 minute headways) provide service to the Beaver

Meadows Visitor Center, and only the Hiker Shuttle provides service to the Moraine Park Visitor Center.

When discussing capacity of the shuttles, it is important to keep in mind the carrying capacity of the trails in the Bear Lake and Moraine Park area. The goal of the shuttles is not necessarily to increase the number of people who can access the trails along Bear Lake Road, but rather to mitigate the effects of Bear Lake Road being closed to private vehicle access between 9 am and 4 pm.

For evaluation purposes, it will be important to collect boarding and alighting data on the various routes and stops, and whether or not visitors have to wait a significant amount of time for the buses. The data can be used for both short- and longer-term modifications to service. It is possible that additional service (additional buses or runs on routes) can be added, depending on available budget resources. However, it is anticipated that additional services will only be added if the waiting time to board a bus becomes significant. "Visitor services" personnel will be instructed to talk to visitors waiting for the bus and offer them other alternatives (such as walking to other locations) instead of simply waiting for the bus.

4.2.3. Unprotected Left Turns

Shuttles leaving the Estes Park Visitor Center must make a left-hand turn out of the parking/loading area on to US 34 without the aid of any type of traffic control devices (stop light, stop sign, etc.). During the peak visitation periods of the summer, shuttles can be delayed 5 to 10 minutes while waiting to make a left-hand turn due to the traffic on US 34. This delay can have a significant impact on the schedule of the shuttles. While it is unlikely that anything can be done this summer to address this issue, traffic control devices should be considered as part of future projects, for instance if a parking garage/structure is built at the Estes Park Visitor Center.

4.2.4. Difference in Schedules/Days of Service

If an overall effort is to be maintained to have visitors utilize the shuttle service in Estes Park, it is important that the shuttle services of Estes Park and ROMO have services and messages that are as consistent as possible. For the summer of 2012, it is currently planned that the ROMO service will begin May 29 and operate until October 9, while the Estes Park service will begin June 29 and operate until September 9. The Red, Blue and Silver Routes will operate during the weekends (Friday-Sunday) of June 15-17 and June 22-24. Their hours are limited from 12 - 10 pm. The Brown Route will not operate during these weekends.

The ability to operate a shuttle service is a direct function of the budget available for the service. While the shuttle service of Estes Park is relatively new, the Town of Estes Park should explore the possibility of leveraging existing local funds with Federal Transit Administration (FTA) funds. It is possible that funding from the National Park Service for its shuttle service may also be eligible for leveraging FTA funds. Research, planning and discussion beyond the scope of this project would be necessary to determine the types and amount of additional funding that may be available. Additional funding could be used to make sure that the ROMO and Estes Park shuttles have a similar schedule (days of service). It is noted that the shuttles also have different hours of service (span of service), as the ROMO shuttles are scheduled to operate from 6:30 am to 8 pm (Hiker Shuttle) and 7 am to 7 pm (Bear Lake and Moraine Park routes), while the Estes Park

shuttles will operate from 9 am to 10 pm (Red, Blue and Silver routes) and 8 am to 9 pm (Brown route).

4.2.5. Shuttles Caught in Construction/Traffic

Unfortunately, shuttles are not immune to construction and other traffic delays. While Bear Lake Road will be closed to all vehicles but ROMO shuttles from 9 am to 4 pm, the ROMO shuttles may be stuck in traffic due to the construction or as a result of other issues. The Estes Park shuttles could be stuck in traffic due to reoccurring congestion in the Estes Park area from the increase in traffic during the summer months. As noted earlier, one traffic issue is that the shuttles can be delayed exiting the Estes Park Visitor Center due to the unprotected left-hand turn onto US 34. These traffic delays may lead to shuttles not being at stops at the right (scheduled) time. There is a plan in place to use alternative routes between some stops, specifically, so that shuttles are not traveling through the downtown area between the Estes Park Visitor Center and Beaver Meadows Visitor Center stops.

4.2.6. Parking Capacity & Traffic Issues Caused by People Traveling to/from Parking Lots

If the park-and-ride messages are effective, it is possible that visitors (especially visitors coming for just one day), may exceed the capacity of the Fairgrounds Park-and-Ride, Estes Park Visitor Center, Beaver Meadows Visitor Center, and Moraine Park Visitor Center parking lots. This is especially true at the Beaver Meadows and Moraine Park Visitor Centers, where some parking will be restricted to one hour limits. Parking concerns should be less of an issue when the Estes Park shuttles are operating, as people will be able to park in multiple locations and use the Estes Park shuttles to access the ROMO shuttles.

4.2.7. Park Passes

One issue that needs to be clearly communicated to visitors relates to Park entrance passes. Riders of the ROMO shuttle service (which is fare-free) need to have a pass to enter the Park (as is the case with people entering by any other mode). While there is the ability to purchase passes at the Estes Park Visitor Center and Beaver Meadows Visitor Center, shuttle riders who get on the Hiker Shuttle at the Fairgrounds Park-and-Ride may be reluctant to get off the bus to purchase a pass. There are two main options available: 1) install a pass kiosk at the Fairgrounds Park-and-Ride location, or 2) ensure that all visitors transferring to the Bear Lake and/or Moraine Park routes at the Moraine Park Visitor Center have passes.

ROMO has tried to avoid having the drivers actively enforce the pass policy. It is hoped that with the proper messaging, most people will purchase a pass.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

5.1.1. Intelligent Transportation System & Static Signage

The design of the intelligent transportation system for 2012, during the Bear Lake Road Corridor construction, draws on the lessons learned from the 2011 pilot intelligent transportation system. Therefore, only dynamic message signs will be deployed. These signs, in conjunction with the information provided to potential visitors by Rocky Mountain National Park and Central Federal Lands Highway Division through their communication plan, are expected to guide visitors to the Fairgrounds Park-and-Ride. The dynamic message signs are expected to essentially serve as reminders.

5.1.2. Shuttles

As is the case with numerous Federal lands and their gateway communities, ROMO and Estes Park, Colorado are using public transportation (shuttles) to reduce traffic and parking issues in the area, while trying to ensure access to popular locations in Estes Park, and trailheads and recreational sites in ROMO. Both shuttle systems will be implementing and managing changes to their schedules and routes this year due to construction on the Bear Lake Road.

Much of this report focuses on signage and messaging, making sure that visitors to Estes Park and ROMO understand the construction related issues, and encouraging them to utilize the shuttle services to the maximum extent possible. It is important, therefore, that ROMO and Estes Park work together to ensure a consistent message is presented to visitors on both the construction project and the available shuttle services.

While the ROMO and Estes Park shuttle services complement one another, one concern is the fact that the Estes Park shuttles will not be operating in full until June 29 (although select routes will operate during the weekends of June 15-17 and June 22-24). This will make messaging about the shuttle service more complex, and may lead to a lack of capacity at the Fairgrounds Park-and-Ride and the Estes Park Visitor Center. It is noted, however, that Estes Park has continued to expand its shuttle service, and this year (Summer 2012) Estes Park will have the most service (hours of service) to date.

While capacity may be an issue, there is some flexibility with the contractor, and ROMO will have some flexibility to make changes to the service, if significant issues arise during the summer. It is anticipated, however, that additional service will only be added as a last resort if the delay to board a bus becomes a significant issue.

5.2. Recommendations

5.2.1. Intelligent Transportation System & Static Signage

The following is recommended:

1) Deploy five dynamic message system signs (2 on US 36, 2 on US 34, and 1 on SR 7) and twenty-eight subsequent static signs to guide visitors to the Fairgrounds Park-and-Ride. If the available resources cannot fund all five dynamic message signs and twenty-eight

static signs, then four dynamic message signs (2 on US 36 and 2 on US 34) and the fifteen highly recommended static signs are recommended. This would provide the bare minimum amount of information, and the behavior of visitors should be observed and additions made if necessary.

2) Collect data to evaluate the effectiveness of providing pre-trip information to visitors in coordination with the dynamic message signs. Comparing ridership of the shuttle systems in 2011 and 2012, recording observations about the utilization of the Fairgrounds Park-and-Ride lot (can be done by volunteers providing information), collecting data on occupancy of the Bear Lake Road Park-and-Ride, and recording feedback from the public with regards to the system all require relatively minimal time commitments. Desirably, a survey would be conducted to learn the most effective means by which information was conveyed and to obtain additional information to improve upon the design for the 2013 system; however, it is understood that resources may limit this option.

3) Provide Bear Lake Road Corridor construction information on 511. When directing users to 511 to obtain this information, it is imperative that the directions be detailed to guide callers through subsequent options (i.e. call 511, choose option 8).

4) Coordinate with CDOT to add a link to the COTRIP webpage (Figure 29) under "Traffic Partners" specifically for ROMO. This link should direct visitors to the construction/shuttle information on ROMO's webpage to make it easier to get the information for the construction on Bear Lake Road. If information about the Bear Lake Road construction is removed from ROMO's website, this link should be removed.

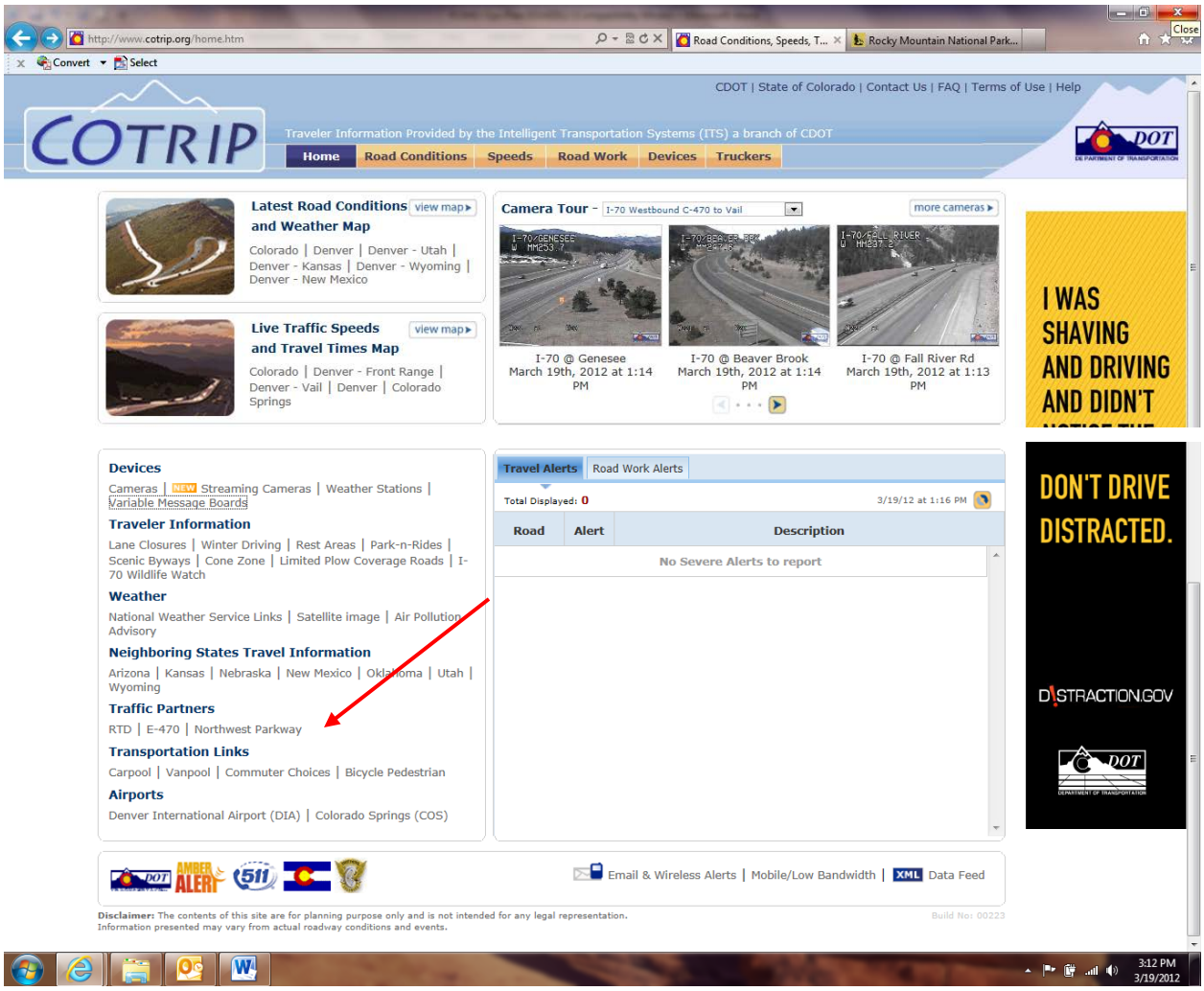

Figure 29: COTRIP Webpage

5.2.2. Shuttles

Yogi Berra, a former catcher of the New York Yankees once said, "It is hard to make predictions, especially about the future." While there has been considerable discussion and planning to mitigate effects of the construction on Bear Lake Road, the reality is that no one can predict exactly how visitors will process the signage and messaging, and how they will utilize the shuttle system.

It is recommended, however that:

1) Rocky Mountain National Park and Estes Park provide visitors a consistent message about utilizing the shuttle systems for movement within Estes Park and to the trailheads and sites on Bear Lake Road. This includes making sure visitors know the differences in starting dates of the ROMO and Estes Park shuttles, and the specific routes and schedules of the shuttle services.

2) ROMO staff should communicate with the construction staff to limit the delays endured by the shuttles (e.g., allow the shuttles to go through, and then the road is closed for the possible 20-minute delays).
3) Given carrying-capacity and budget constraints, ROMO management maintains communication with the shuttle contractor and adds shuttles to the routes as may be necessary to limit delays (people waiting for buses).
4) ROMO and Estes Park explore the possibility of leveraging their funds with funds from the Federal Transit Administration to provide more service during the peak summer season (e.g., the Estes Park shuttle service runs from Memorial Day to Labor Day).
5) Data is collected and analyzed so that at the end of the season ROMO and Estes Park have a better understanding of what additional shuttle services may be necessary (routes and/or frequency) and where parking capacity exists, or may be exceeded. This information will be particularly valuable as construction continues into 2013.
6) Traffic control devices (a stop light) should be included as part of the parking garage/structure at the Estes Park Visitor Center so shuttles can make a left-hand turn on to US 34 without having to wait a significant amount of time.

5.2.3. Additional Recommendations

The following are additional recommendations from WTI, which are not necessarily specific to the intelligent transportation system, static signs, or shuttles:

1) As a result of brainstorming ideas with CFLHD, WTI recommends conducting a train-the-trainer event for Visitor Center staff, hotel staff, campground staff, and YMCA staff so they can provide accurate information to visitors.
2) At present, ROMO has information about the shuttles on the "Getting Around" webpage (http://www.nps.gov/romo/planyourvisit/gettingaround.htm). However, it would be useful to include a discussion of connecting to the shuttle system on the "Directions" webpage (http://www.nps.gov/romo/planyourvisit/directions.htm) under "By Car." Unless users are actively looking for the shuttle connection, they may miss this information, even with the link on the right-hand side of the webpage.
3) It is recommended that signs be posted in the Fairgrounds Park-and-Ride for "no overnight parking."
4) It is recommended that a sign which clearly identifies the Fairgrounds Park-and-Ride be constructed and installed.

Rocky Mountain National Park and Estes Park, with input from the Central Federal Lands Highway Division and Western Transportation Institute have developed a plan for mitigating the effects of construction on Bear Lake Road. Moving forward, it will be important that the plan is implemented, with enough flexibility to modify the plan, based on outcomes.

It is also important that data is collected on the use of the various shuttle services and parking lots, so that the plan can be improved upon for 2013 and beyond.

APPENDIX A: OVERALL CONTACT INFORMATION

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APPENDIX B: LOG FORMS

DMS Message Log

Date	Organization Changing Message	Location (Community, Pinyon Trl, Mall Rd, CR 43, SR 7)	Time Message On (i.e. 10am)	Time Message Off (i.e. 10am)	Accessed Remotely (yes or no)	Message Number (if not pre-approved message, type out entire message)

System Test Log

Date	Organization Testing Device (i.e. ROMO, CFLHD, etc.)	Location (i.e. Community, Pinyon Trl, Mall Rd, CR 43, SR 7)	Time of Test	Operation (i.e. working properly or needs fixing)	Need to Contact contractor? (i.e. yes/no answer)	When Device Fixed (i.e. date and time)	How Device Fixed

APPENDIX C: MAINTENANCE GUIDELINES

C.1 Roles and Responsibilities

As mentioned earlier, the contractors will be responsible for the maintenance of DMS systems. This section provides general guidelines for the maintenance of DMS systems. Maintenance of systems should strictly follow the specific device instructions provided by vendors.

C.2 Maintenance of DMS

Refer to the DMS Manufacturer's maintenance manuals for in-depth maintenance instructions. The following is a brief summary of preventative maintenance requirements to keep the DMS, hydraulic lift, batteries and trailer in good working condition.

C.2.1. Hydraulic lift

With the sign lowered, periodically check the hydraulic fluid reservoir and add the appropriate fluid as necessary. Reference the manufacturer guidelines as needed.

C.2.2. Batteries

Periodically inspect the battery terminals; clean and tighten as necessary. Check the battery fluid level monthly and fill with distilled water when needed.

C.2.3. Trailer

Check brake fluid (if applicable), tires and lug nuts, and lubricate the jack. Maintain tire pressure according to the manufacturer's recommendations. Periodically inspect for loose connections and hardware, and tighten as required.

C.2.4. Communications and Controller

Ensure all connections for Central Processing Unit cabinet are seated. It is convenient and generally helpful to place labels on switches and positions. Placing warning labels such as "SWITCH TO OFF POSITION TO AVOID BATTERY DRAIN" may avoid some unnecessary maintenance.

C.2.5. System Inspection

Regularly inspect the transmitter, power supply (e.g., solar panel), batteries, and recording device to observe any physical damage to the system or lightening damage to the antenna and other external components. Look for cables and wires that may have been damaged.

C.2.6. System Cleaning

After shutting down the system, clean dust and dirt from the surfaces of panes and components with a damp cloth or spray cleaner. If insects or other pests are in the cabinet, check for holes/entryways and seal them with silicone, or duct seal.

APPENDIX D: CANDIDATE DMS LOCATION ANALYSIS

In addition to the DMS locations identified in Section 3.1.2, other locations were identified as potential candidates. If necessary, these locations could be used as "back-ups." However, these locations were not chosen initially, because they were not considered optimal.

4TH STREET

The park-and-ride lot in Estes Park is designed with accesses from both 4th Street and Manford Avenue. The original proposed DMS location in Estes Park would have been just east of 4th Street, as shown in Figure 30. Figure 31 shows the topography along the side of the road at this location. Although not ideal, the topography could have provided a flat enough surface on which to position the DMS trailer.

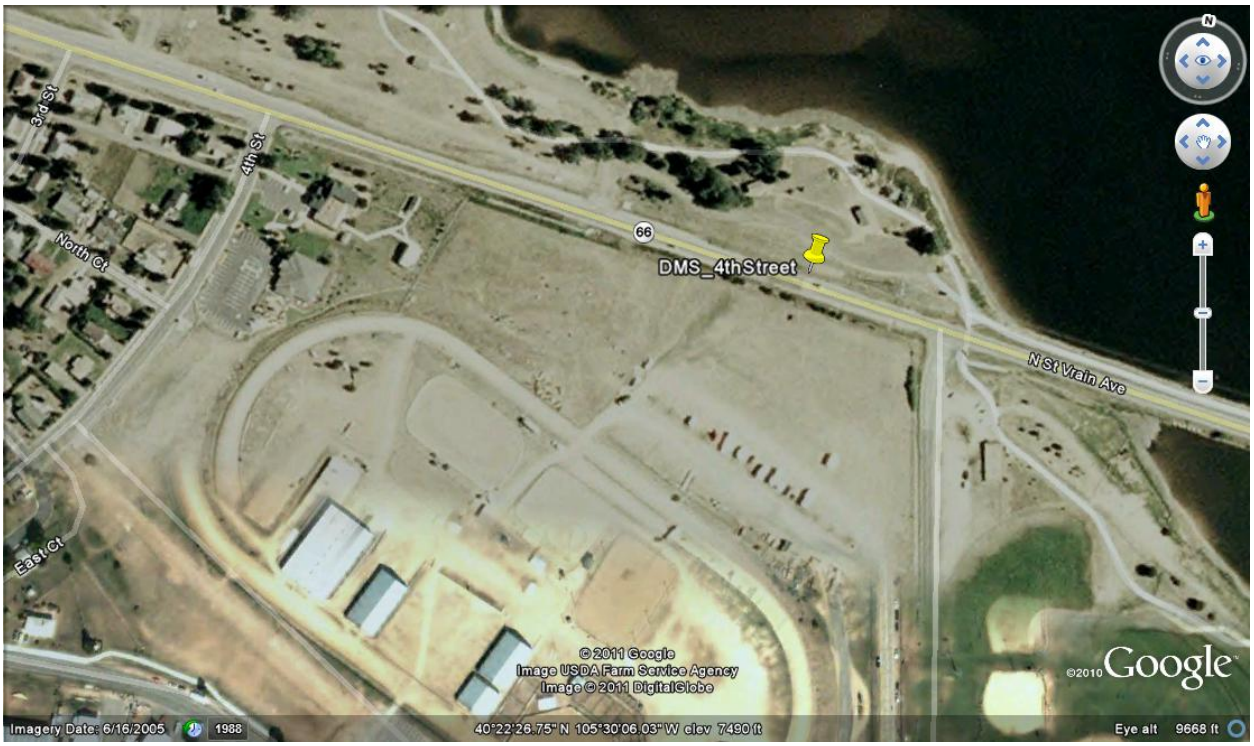

Figure 30: Estes Park, Park and Ride Access Via 4th Street (6)

Figure 31: Proposed 4th Street DMS Location Topography

However, Scott Zurn of Estes Park indicated that public input had resulted in a request by local residents to route users from US 36 onto Community Drive, where they would turn right onto Manford Avenue followed by a right into the park-and-ride lot. To accommodate this request, the 4th Street entrance is periodically closed off by the TOWN. Therefore, the proposed DMS location, as identified in Section 3.1.2.4 is prior to Community Drive.

APPENDIX E: GUIDELINES ON DMS PLACEMENT

E.1. Guidelines on DMS Placement

This section describes guidelines for the placement of DMS.

E.1.1. DMS

Placement of DMS should follow general regulations to guarantee optimal viewing of the sign to motorists, including sight distance, horizontal and vertical alignment, delineation and positive protection, and physical security.

E.1.1.1. Sight Distance

The signs should be visible from ½ mile under ideal day and night conditions. Each sign message should be legible from all lanes at the specified distance and in accordance with the current revision of Part 6 of the Manual on Uniform Traffic Control Devices (MUTCD) [7]. In the field, the portable DMS should be sited and aligned to optimize visibility.

Chapter 6F of the 2009 MUTCD specifies standards and guidance on the placement and use of Portable DMS, which are described as follows.

Standards:

- Portable DMS shall automatically adjust their brightness under varying light conditions to maintain legibility
- The control system shall include a display screen upon which messages can be reviewed before being displayed on the message sign. The control system shall be capable of maintaining memory when power is unavailable
- Portable DMS shall be equipped with a power source and a battery back-up to provide continuous operation when failure of the primary power source occurs
- When a portable DMS is mounted on a trailer, a large truck, or a service patrol truck, the bottom of the message sign panel shall be a minimum of 7 ft above the roadway in urban areas and 5 ft above the roadway in rural areas when it is in the operating mode
- Techniques of message display such as animation, rapid flashing, dissolving, exploding, scrolling, travelling horizontally or vertically across the face of the sign or other dynamic elements shall not be used

Guidance:

- For a trailer or large truck mounted sign, the letter height should be a minimum of 18 in. For DMS mounted on service patrol trucks or other incident response vehicles, the letter height should be a minimum of 10 in
- Retroreflective material, also known as conspicuity material, should be affixed in a continuous line on the face of the portable DMS trailer to permanently delineate the devices to oncoming traffic
- Portable DMS should be placed off the shoulder of the roadway and behind a traffic barrier when possible. If a traffic barrier is not available, the DMS should be placed off

the shoulder outside of the clear zone. If the DMS is placed on the shoulder or within the clear zone, it should be delineated with temporary traffic control devices

- Portable message signs should be utilized to supplement and not replace conventional signs and pavement markings.
- When messages are divided into two phases, each phase should be displayed for a minimum of 2 seconds, and the combined display time for each phase should be less than 8 seconds.
- Messages should be brief with a maximum of three thoughts, each on its own line
- Additional portable DMS should be utilized if more than two phases are needed to convey a message.

Support:

- Per Table 2A-5 of the MUTCD, for changeable message signs used for temporary traffic control, the legend may be yellow or orange with a black background.

E.1.1.2. Horizontal and Vertical Alignment

DMS should not be placed in sags or just beyond crests of roadways. DMS should be level and angled approximately three degrees away from perpendicular to the roadway to minimize glare. DMS, if facing either east or west, should be checked at sunrise and sunset to ensure that their reflection of the sun does not blind motorists.

E.1.1.3. Delineation and Positive Protection

Two DMS will be provided by CDOT. CDOT requires that the DMS are protected by a concrete barrier.

The remaining two DMS will be rented from a vendor. The contracted DMS, where possible, should be placed behind existing rigid or semi-rigid protection (barrier or guardrail). This will help to avoid potential injury to errant motorists, while simultaneously aiding in the protection of this valuable equipment. When DMS systems are required for long terms in locations where no protection exists, a temporary guardrail or barrier should be considered. Where positive protection is not feasible DMS should be delineated with drums. If a DMS is placed on a 10 ft shoulder, a shoulder closure should be installed. If a DMS is placed adjacent to a 4 ft shoulder, it should be delineated with a minimum of three drums. If possible, DMS should not be placed closer than 6 ft or farther than 20 ft from the edge of the roadway. A sign placed closer than 6 ft from the edge of the roadway becomes an obstruction that causes a reduction in traffic flow. A sign placed farther than 20 ft from the edge of the roadway becomes unreadable for many motorists.

E.1.1.4. Physical Security

When the DMS controller door is open, the operator should stand in front to block the box so that passing motorists cannot see the internal components of the compartment. Blocking this door may decrease glare on the screen. When checking the message on the sign face, the operator should close the door to ensure passing motorists are not aware of cabinet's contents.

The DMS system's keyboard box should be secured with a sturdy lock. The operator should check all locks and never leave any door open even for a moment. The operator should also chain and lock the trailer to a fixed object if possible. If the DMS is to be left in one place for a long period of time, then its trailer wheels should be removed.

APPENDIX F: ALTERNATIVE DMS MESSAGES

The following messages were considered. However, due to the reasons explained below, they were not chosen for implementation.

CDOT recommended during the 5/14/2012 conference call using "N" instead of "AND" in "PARK AND RIDE AT FAIRGRND. However, in a subsequent call (5/21/2012), project partners decided that the "N" might be confused unless used with "-." One of the premises for using "N" was to save space. However, not utilizing the full "AND" does not allow for any additional information. Therefore, the recommended messages retained the original "AND."

During the 5/14/2012 conference call, CDOT recommended, and ROMO agreed, that "RMNP" will be interpreted correctly by travelers as Rocky Mountain National Park. This abbreviation was chosen over the "RKY MTN" abbreviation that was used in 2011. Therefore, the recommended messages contain "RMNP."

Several of the messages identified below contain "FREE." However, after much discussion during 5/7/2012 and 5/14/2012 conference calls, "FREE" was identified as a concern by ROMO. They felt that although the survey responses indicated in the 2011 "Evaluation of an Intelligent Transportation System for Rocky Mountain National Park and Estes Park" report [2] that free was a significant motivator for the use of the shuttle system, users may have been confusing the free shuttle with free access to the park. Users of the shuttles are still required to pay the park entrance fee.

US 36 (NEAR COMMUNITY)

(Message 2012-A)

PARK AND	FREE	NEXT
RIDE AT	RKY MTN	LEFT
FAIRGRND	SHUTTLE	

(Message 2012-B)

PARK AND	FREE	NEXT
RIDE AT	VISITORS	LEFT
FAIRGRND	SHUTTLE	

The messages shown above were crafted so that Message 2012-A would be used prior to when the TOWN shuttles were operating (May 29 through June 29) and Message 2012-B would be

used after (after June 29, except on June 15-17 and June 22-24). However, after much discussion during 5/7/2012 and 5/14/2012 conference calls, "FREE" was identified as a concern by ROMO. They felt that although the survey responses indicated in the 2011 "Evaluation of an Intelligent Transportation System for Rocky Mountain National Park and Estes Park" report [2] that free was a significant motivator for the use of the shuttle system, users may have been confusing the free shuttle with free access to the park. Users of the shuttles are still required to pay the park entrance fee.

(Message 2012-C)

PARK AND	VISITOR	NEXT
RIDE AT	SHUTTLES	LEFT
FAIRGRND		

Message 2012-C was not recommended because it was felt that identifying to travelers that they would need to follow additional signs after turning took priority over identifying the presence of the "VISITOR SHUTTLES." The recommended message identifies to users that they need to follow additional signs. An observed challenge during the 2011 pilot intelligent transportation system deployment was getting travelers from the turn at Community Drive to the Fairgrounds Park-and-Ride. Several travelers that had turned at the DMS directing them to Community Drive turned around shortly then after when they did not immediately see the park-and-ride.

US 34 (NEAR MALL RD)

(Message 2012-D)

PARK AND	LEFT	THEN
RIDE AT	AT	FOLLOW
FAIRGRND	MALL RD	SIGNS

While this message was originally proposed, after further consideration, a three phrase message is not recommended at this location.

US 34 and US 36 FURTHER OUT

(Message 2012-E)

ROADWORK	AVOID	PARK AND
BEAR LK	DELAY	RIDE AT
RKY MTN*		FAIRGRND

This message was removed because travelers are not going to avoid delay by taking the shuttles at the Fairgrounds Park-and-Ride. The shuttles can still experience delay.

(Message 2012-F)

ROADWORK	PARK AND	FREE
BEAR LK	RIDE AT	RKY MTN
RKY MTN*	FAIRGRND	SHUTTLE

As discussed previously, ROMO has concerns with “FREE.”

(Message 2012-G)

ROADWORK	PARK AND	FREE
BEAR LK	RIDE AT	VISITOR
RKY MTN*	FAIRGRND	SHUTTLE

As discussed previously, ROMO has concerns with “FREE”

(Message 2012-H)

BEAR LK	DUE TO	PARK AND
PARKING	BEAR LK	RIDE AT
LIMITED	ROADWORK	FAIRGRND

This message was removed from consideration because parking is more than just limited; there may not be any available.

(Message 2012-I)

ROADWORK	USE	FAIRGRND
BEAR LK	SHUTTLES	PARK AND
RKY MTN*	9AM-4PM	RIDE

This message was removed from consideration because project partners expressed concerns that 9AM-4PM might be confused as the duration over which the shuttles run rather than as the time there will only be shuttle access and Bear Lake Road will be closed to private automobiles.

(Message 2012-J)

ROADWORK	USE FREE	FAIRGRND
BEAR LK	SHUTTLES	PARK AND
RKY MTN*	9AM-4PM	RIDE

This message was removed from consideration because project partners expressed concerns that 9AM-4PM might be confused as the only duration over which the shuttles run. Additionally, as discussed previously, ROMO has concerns with "FREE."

(Message 2012-K)

ROADWORK	PARK AND	RKY MTN
BEAR LK	RIDE AT	ESTES
RKY MTN*	FAIRGRND	SHUTTLE

Partner discussion recommended exchanging RKY MTN for RMNP.

(Message 2012-L)

RMNP	PARK AND	USE
BEAR LK	RIDE AT	RMNP
ROADWORK	FAIRGRND	SHUTTLES

(Message 2012-M)

RMNP	PARK AND	USE
BEAR LK	RIDE AT	VISITOR
ROADWORK	FAIRGRND	SHUTTLES

Message 2012-L and Message 2012-M were not utilized because ROMO preferred a more assertive message directed at shuttle use (per 5/21/2012 conference call).

For US 34 only:

(Message 2012-N)

RMNP	PARK AND	LEFT
BEAR LK	RIDE AT	AT
ROADWORK	FAIRGRND	ROUTE 36

Message 2012-N was only recommended for use if Mall Road cannot be utilized for the project, the DMS in close vicinity to Mall Road cannot be used, and three phases can be used.

(Message 2012-O)

PARK AND	LEFT
RIDE AT	AT
FAIRGRND	ROUTE 36

Message 2012-O was only recommended for use if Mall Road cannot be utilized for the project, the DMS in close vicinity to Mall Road cannot be used, and only two phases can be used. This message assumes that visitors were provided with enough pre-trip information that they understand that the presence of roadwork in the Bear Lake Road Corridor is related to the use of the Fairgrounds Park-and-Ride. The full term "ROUTE" is used because otherwise MUTCD (Table 1A-2) recommends using "BEST" prior to RT or RTE.

SR 7

(Message 2012-P)

ROADWORK	PARK AND	RIGHT
BEAR LK	RIDE AT	AT
ROAD	FAIRGRND	MANFORD

The first phase for Message 2012-P was replaced with “RMNP BEAR LK ROADWORK.”

(Message 2012-Q)

ROADWORK	PARK AND	RIGHT
BEAR LK	RIDE AT	AT
RKY MTN	FAIRGRND	MANFORD

The first phase for Message 2012-P was replaced with “RMNP BEAR LK ROADWORK” because it was felt that RMNP better communicated Rocky Mountain National Park than RKY MTN.

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