Arches Alternative Transportation System and Congestion Management Study

FINAL FEASIBILITY STUDY

Volume I

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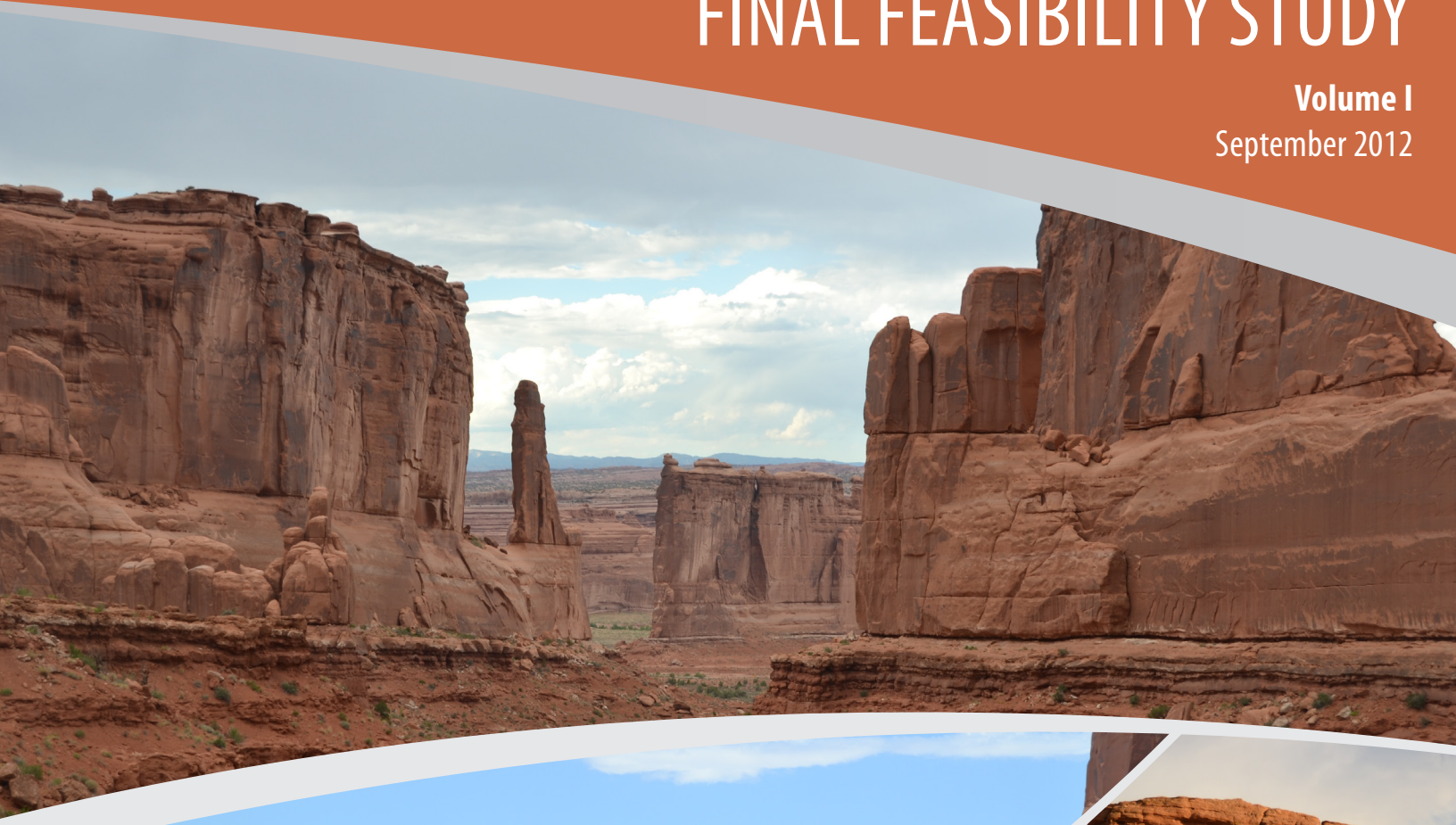

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INTRODUCTION

Arches National Park preserves over 2,000 natural sandstone arches, including the internationally renowned Delicate Arch, in a setting unlike any other in the world. At Arches, a visitor can get an up-close, personal experience of these extraordinary rock formations set against dramatic colorful vistas. This accessibility has attracted thousands of visitors from around the world; annual visitation was over one million in 2011. In recent years, this high visitation rate during the peak season has far exceeded the park‟s automobile capacity which has caused severe parking and traffic congestion, degrading visitor experience and impacting this fragile desert ecosystem.

As part of its long-term transportation planning efforts, Arches National Park initiated the Alternative Transportation System and Congestion Management Study in 2011 to reduce traffic congestion, air and noise pollution, greenhouse gas emissions, and the impacts of transportation on Arches‟ valuable resources. The study aims to achieve this reduction by decreasing the number of automobiles within the park while maintaining and improving public access and visitor experience. The study includes both a shuttle alternative and non-shuttle alternatives to meet these goals.

SUMMARY OF PROJECT HISTORY

The study began with a kick-off meeting and site visit with NPS staff and the consultant team. As the project moved forward, the team developed the *Preliminary Transportation Analysis,* which analyzed existing transportation and visitation patterns and congestion conditions. The report identified initial parameters of a potential shuttle service for consideration including seasonal operations, variations by day of week and time of day, candidate shuttle stop locations in the park, visitor capacity constraints, potential route structures, and incentives for shuttle use. Based on these parameters, the analysis identified initial upper and lower bounds for fleet size, ridership, and parking needs, as well as operational, staging, and maintenance needs for the shuttle to inform selection of sites.

Next, the team developed the *Draft Concepts Plan*, which considered a range of congestion management and shuttle options for Arches National Park. The report included two Moab shuttle route options:

- Alternative 1: Moab Center Street
- Alternative 2: Moab Main Street

And four Arches shuttle route options:

- Alternative 3: Arches Two-Route with In-Park Loop
- Alternative 4: Arches Two Route
- Alternative 5: Arches One Route
- Alternative 6: Arches Three Route

These routing options were developed to cater to the needs of different visitor groups, identified as visitor “market segments” in the report. The route alternatives were combined with complementary congestion management strategies to create four scenarios that represented a range of costs and benefits:

- Scenario 1: Congestion Management only; No Shuttle
- Scenario 2: Basic Shuttle
- Scenario 3: Enhanced Shuttle
- Scenario 4: Maximum Shuttle Access

These four scenarios were presented for National Park Service (NPS) staff and local stakeholder consideration at a project workshop on November 15, 2011. Participants suggested changes to the targeted visitor market segments, refinements to the alternatives as well as new routes and scenarios.

Options for a preferred scenario were discussed at the workshop and the field was narrowed to candidate route variations based mainly on Alternatives 3 and 5.

The consultant team refined the scenarios developed at the workshop and prepared a draft preferred scenario for the Arches National Park shuttle pilot. The preferred alternative was finalized in consultation with NPS staff in December 2012.

The preferred shuttle alternative presented in the *Draft Feasibility Study* was based on this preferred shuttle route. Upon additional analysis, some additional refinements were made to the preferred scenario during the development of the *Draft Feasibility Study* to optimize shuttle operational efficiency and ease of visitor use. The primary change was to change to a single route rather than a north and south loop to improve visitor understanding and operational efficiency.

This *Final Feasibility Study* reflects final adjustments that were made to the shuttle system based on NPS feedback, including removal of the Hiker and Sunset shuttles from the initial pilot project, adjustments to the season and hours of operation of the main shuttle, and a decision not to include the Moab shuttle in the initial pilot in order to align shuttle costs with available funding. The Hiker, Sunset and Moab routes are still included as "Shuttle System Adjustments" in the event that additional funding is identified by the park or through public-private partnerships with the City of Moab and/or local businesses and non-profit organizations.

CONTENTS OF THIS REPORT

This *Final Feasibility Study* provides a detailed description of the final preferred Arches pilot shuttle system with accompanying congestion management strategies (section 1) as well as two non-shuttle alternatives (section 2) that would rely entirely on other congestion management strategies to achieve the park‟s goals. The report compares the benefits and costs of the shuttle system against those of the congestion-management-only scenario (section 3) and describes the impacts (section 4).

SECTION 1: SHUTTLE SYSTEM ALTERNATIVE

A shuttle system in Arches National Park will enhance the park‟s accessibility by providing visitors with an alternative mode by which to experience the park: a shuttle bus. The shuttle system was designed to provide visitors with an attractive shuttle-based park experience that will be competitive with driving through the park.

CREATING THE VISITOR SHUTTLE EXPERIENCE

Arches National Park had over one million visitors in 2011. These visitors were diverse in their reasons for visiting Arches National Park and the way they experienced the park. Some came for just a few hours to see just two or three sites while others came for multiple days and saw most of the sites. Some traveled mostly on the main roads and saw the sights primarily from the seats of their cars while others explored the less-visited dirt roads and spent time hiking, rock climbing, or backpacking in the backcountry.

A shuttle in Arches National Park aims to attract some portion of these visitors in order to alleviate the acute parking and traffic congestion that the park has experienced in recent years. To do this, a shuttle cannot simply stop where congestion is the worst, but must provide an attractive visitor experience that people will choose over driving. Given the diversity of visitor experiences in Arches, it would be impossible to design a single shuttle to appeal to all visitors. For example, a fast shuttle with limited stops will appeal to certain groups, while other visitors will desire a shuttle with more stops and may not mind a longer ride.

To design a comprehensive system with multiple routes to meet all visitor needs is not possible within realistic budget constraints. Arches National Park has some unique challenges in comparison to other national park shuttle systems. First, the road through Arches is 18 miles long with two spur roads which provide access to the most popular visitor sites within the park. Long drive times contribute to high operating costs. For instance, to provide service comparable to the frequent, comprehensive service offered on the popular Zion National Park shuttle, which has a 3 mile route, would cost many times more at Arches. In addition, the length of the Arches‟ road combined with the park‟s extreme summer heat requires a service that will move visitors around quickly and efficiently and allow visitors a fast exit out of the park at the end of their stay.

Fortunately, the shuttle does not need to appeal to every visitor who enters Arches to have an effect on the current congestion problem. The shuttle must attract enough riders to reduce the impact of private vehicles on the park and relieve severe congestion. To do this, the consulting team, in collaboration with NPS staff, identified a range of common visitor experiences at Arches National Park and grouped these into potential “market segments” for shuttle design. These market segments are described in terms of their desired park experience as well as their size, impact on congestion, and willingness to use a shuttle.

The preferred shuttle scenario is designed to attract the largest market segments with the highest potential to use the shuttle. The shuttle seeks to offer a competitive alternative to driving for these segments by providing an equivalent or enhanced experience for travel within the park. By attracting a significant portion of these market segments, the shuttle can significantly relieve park congestion. The targeted market segments are shown in table 1.

The preferred shuttle scenario was developed based on the best information available today, which does not include any direct information on visitor preferences regarding shuttle design. The shuttle is designed as a three-year pilot program and can be modified after implementation as actual usage patterns become known and in response to feedback from visitors. Over the course of the first season, the park will collect visitor surveys, which will greatly enhance the information available about visitor preferences to inform shuttle design. The park will also be able to gauge shuttle success through actual ridership counts and measurement of private vehicle use and congestion impacts. In response to this data, the park may adjust

location of stops, the number or structure of shuttle routes, the operating season, hours or frequency, and/or the accompanying congestion management strategies. By the end of the pilot period, the park should have sufficient information so that the long-term shuttle, if they choose to continue with a shuttle system, is designed to best meet park and visitor needs.

To accommodate this uncertainty, this study includes potential adjustments that could be tested in addition to the preferred shuttle scenario, described in "Shuttle Adjustments" section.

Table 1 Targeted Market Segments

Market Segment	Description	Market Size	Effect on congestion	How this segment was considered in design of preferred shuttle
"Big Two" Visitors	This type of visitor has only 2-3 hours to spend in Arches and is likely to only visit two major destinations: Balanced Rock and the Windows section. These visitors might stop at Park Avenue, Courthouse Towers, or La Sal Viewpoint, but are unlikely to travel beyond the Windows Road.	**Large** – park staff receives large number of requests for a 2-3 hour itinerary.	**High** – As these visitors are mainly visiting two of the most congested sites, they have a relatively large impact on congestion.	▪ A clear, direct, and easy shuttle itinerary that hits major sites and can be completed in two hours. ▪ Direct service to Balanced Rock and Windows ▪ Efficient, reliable shuttle operations ▪ Reliable ▪ Kid-friendly
"Guide-me" Tourists	This segment corresponds with the mainstream park user. These visitors typically have just one day in which to visit Arches National Park and are likely to spend 4-6 hours in the park. They are most focused on seeing the famous sites: Balanced Rock, Windows, Delicate Arch, and Devil's Garden, but may also want to do a short hike, stop at viewpoints, and see other sites if time permits. This market segment looks for guidance from the park on what they should see.	**Large**	**High** - The sheer volume of visitors in this segment has a large impact on congestion. This is illustrated in the overlap between trailhead popularity and parking lot congestion.	▪ Direct service to major sites ▪ Some additional sites available ▪ Interpretative elements ▪ Efficient, easy-to-understand routing structure ▪ One-way hikes ▪ Kid-friendly
Endurance - All Day Visitors	Individuals in this segment typically have just one day in which to visit Arches National Park and want to see it all. Members of this segment aspire to visit every destination in the park and spend as many as eight hours during their visit.	**Large**	**High** - This segment has a large impact on parking congestion because of its large size and extended use of the park.	▪ Comprehensive service to most sites ▪ On-board interpretative elements ▪ One-way hikes ▪ Kid-friendly

Market Segment	Description	Market Size	Effect on congestion	How this segment was considered in design of preferred shuttle
Day Hikers	This segment includes visitors who do multi-hour hikes, mainly at Devil‟s Garden. Individuals in this segment park for long periods of time and need to bring larger amounts of water and gear than other groups.	**Small**	**High** – Although small in size, this group has a disproportionate impact on parking congestion because they leave their vehicles for long periods of time.	▪ One-way hikes ▪ Direct service to Devil‟s Garden early in the morning ▪ Ample on-board cargo space
Sun-setters	Individuals in this segment visit Delicate Arch to observe the sunset. These individuals are likely members of other market segments, but return to the park in the evening (or stay later than their counterparts) to see the sunset. These visitors visit in the evening to experience solitude, quiet, and night-scenery.	**Small**	**High** - Concentrated use at specific times and locations results in localized congestion.	▪ Direct evening service ▪ On-board interpretative elements-opportunity for experience-driven “sunset” or “night sky” shuttle

ARCHES PREFERRED SHUTTLE ROUTE & STOPS

The Arches pilot shuttle system will include one main route that represents a refinement of the scenarios developed at the November 15, 2011 workshop in Moab. The preferred shuttle route was designed to meet the following primary objectives. These include experiential goals to cater to the targeted market segments as well as NPS goals for cost-effectiveness:

- Provide a direct route to Windows without a transfer and convenient 2-3 hour visitation options to cater to the "Big Two" visitor.
- Include the high visitation sites to cater to the "All-day visitor" and "Guide-me tourist" to ensure visitors don"t feel they would be "missing" something by taking the shuttle.
- Provide a direct way home at the end of the day for hot and tired visitors and hikers returning from Devil"s Garden.
- Design simple, intuitive routes.
- Maximize access, while also taking efficiency and length of trip into consideration.
- Design for efficient and cost-effective routing and shuttle operations.

The Arches shuttle will allow visitors to see the four most popular attractions in the park: Balanced Rock, Windows, Delicate Arch and Devil"s Garden and visit a number of secondary sites as well. Passengers will access the shuttle exclusively from a park-and-ride location just outside of the park. It will then operate in a one-way loop stopping at all stops on the northbound journey and only prime stops on the southbound journey. This allows for a direct "one-seat" ride to Balanced Rock and Windows and a fast route out of the park from Windows to cater to the 2-3 hour visitor. It also allows for visitors with more time to see many of the prime sites in the northern end of the park, while still maintaining a faster limited-stop route back to the park-and-ride lot at the end of a visit. The single route structure is simple and cost-effective and provides a good balance between access and efficiency.

Stop Locations

There will be eleven stops in Arches on the preferred shuttle system:

1. Visitor Center
2. Park Avenue
3. La Sal Mountains Viewpoint
4. Courthouse Towers
5. Balanced Rock
6. Upper Windows
7. Wolfe Ranch/Delicate Arch Trailhead
8. Delicate Arch Viewpoint
9. Fiery Furnace
10. Sand Dune Arch
11. Devil"s Garden Trailhead

The shuttle system was designed to provide service to all of the stops identified as prime candidates as well as a number of secondary sites in the park. One of the outcomes of the November planning workshop was the importance of giving visitors ample opportunities to stop throughout the park. Based on the proliferation of social pull-off locations throughout the park (spots where visitors stop that are not designated for stopping and parking), it is clear that visitors want to stop frequently to enjoy the views.

The Visitor Center, Balanced Rock, Windows, Wolfe Ranch, Delicate Arch Viewpoint, Fiery Furnace, and Devil‟s Garden Trailhead were included because they were high or prime shuttle stop candidates in the *Preliminary Transportation Analysis Conclusions*. Park Avenue and Courthouse Towers were identified as moderate shuttle stop candidates, but they were included in the preferred shuttle scenario to allow visitors to easily complete the one-way hike between these two locations, which is an incentive to ride the shuttle. The La Sal Viewpoint was a low candidate for a shuttle stop in the *Preliminary Transportation Analysis Conclusions*, but has been included as a stop because it allows for excellent panoramic views of the park and surrounding area as an introduction to the park. Locating a stop here introduces the potential for enhanced interpretation at this site to emphasize its "introductory" role.

This set of preferred stops will be tested in the initial pilot and stops can be adjusted over time in response to rider feedback and other evaluation tools (see "Shuttle Adjustments" section for more information).

One-way Loop Structure

Shuttle materials and park staff will educate visitors about the one-way nature of this route, emphasizing that sites should be visited while traveling northbound and that the only direct ways out of the park are from Windows and Devil‟s Garden.

The only itinerary that is impossible on this shuttle is the "quick trip" including only Windows and Delicate Arch because the southbound shuttle will not stop at Delicate Arch. All passengers who board northbound shuttle at Windows will have to travel to Devil‟s Garden before returning to the park entrance. Based on results from the 2003 visitor survey, more than two-thirds of visitors spend more than 4 hours in the park (65%) and over 20% spend more than 7 hours. Further, over 60% of visitors hike the Delicate Arch trail and over 50% hike to Landscape Arch. Given this overlap and the amount of time people spend at the park, it is reasonable that most visitors who choose to ride the shuttle beyond Windows will want to see both Delicate Arch and Devils Garden. This issue is also addressed in the "Shuttle Adjustments" section below.

Shuttle parking areas, shuttle stop designs, and other infrastructure requirements are discussed in the final part of section 1.

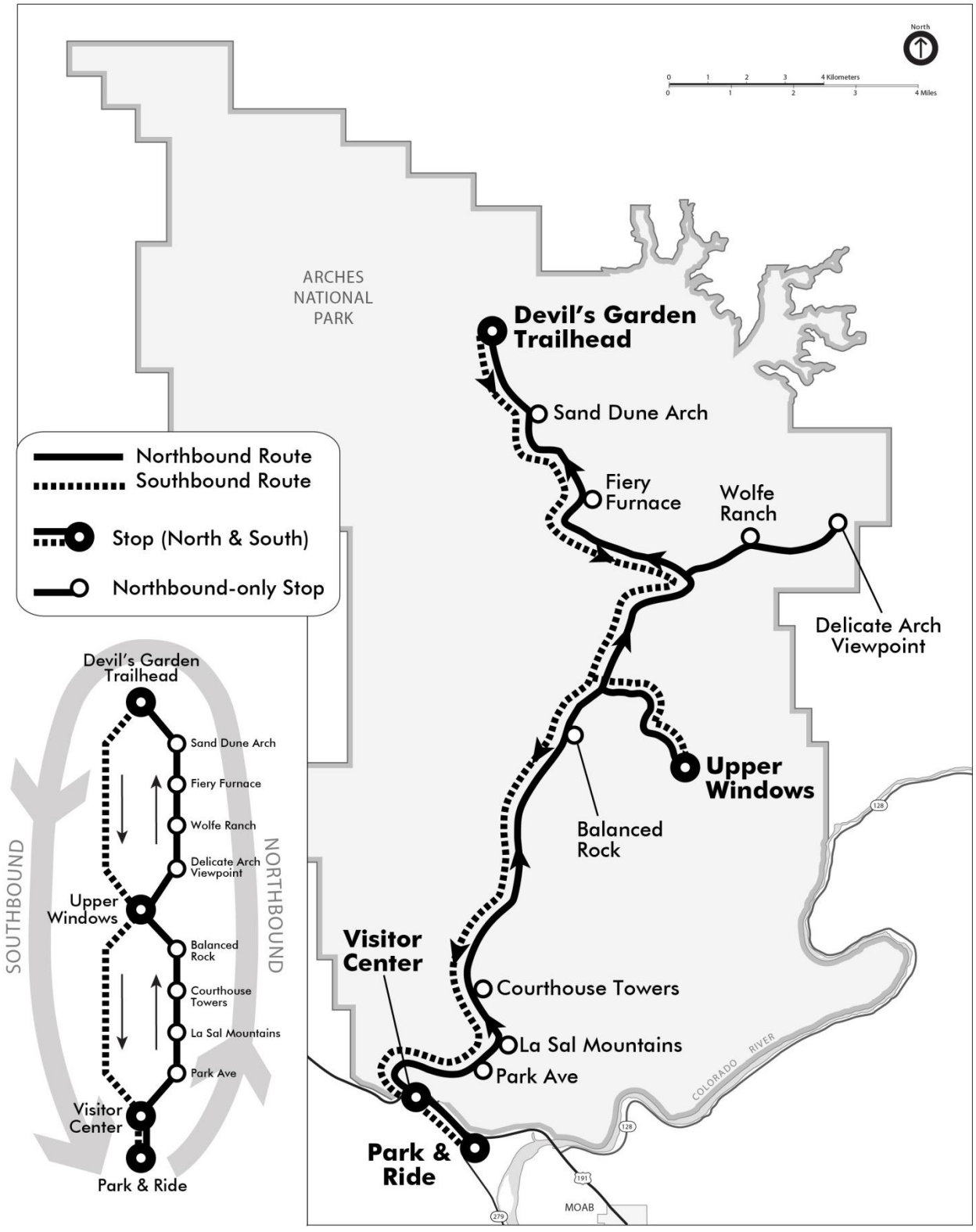

Figure 1 Arches Shuttle Route

SHUTTLE SCHEDULE

The shuttle will commence operation the second Saturday in May and the season will end the last Sunday in September. Each day, the shuttle will run from 8 AM to 5 PM every 15 minutes: the first shuttle will leave the park-and-ride lot at 8 AM and the final shuttle of the day will depart from Devil‟s Garden at 4:30 PM. (See "Schedule, Frequency and Vehicles" below for additional information on shuttle frequency.)

Table 2 summarizes the Arches shuttle operating season and schedule.

Table 2 Shuttle Season and Schedule

Shuttle Season	Second Saturday in May – Last Sunday in September (~20 weeks)
Hours of Operation	8 AM – 5 PM
Frequency	Every 15 minutes

SHUTTLE SYSTEM ADJUSTMENTS

The preferred shuttle was designed as a one-way loop in order to balance comprehensiveness with efficiency and cost-effectiveness. During the first season of operation, the success of this preferred pilot shuttle route can be measured through ridership counts, measurement of private vehicle use and congestion impacts, visitor surveys and rider feedback. Based on this data, the park can make adjustments to any of the parameters of the shuttle‟s design, such as:

- **Adjustments to stop locations**: Many of the stop locations that are included in the preferred shuttle were prime candidates based on popularity and parking congestion; however a number of the secondary sites, such as La Sal Viewpoint, Sand Dune Arch, and Fiery Furnace were included to enhance the visitor experience. The pilot will afford the opportunity to test these types of stop locations to see if they are worth the extra time. Stop locations such as Lower Windows and Skyline Arch were considered as candidate shuttle stops but not included out of concern for the length of the shuttle route. These stops could be added to the route if necessary to respond to visitor feedback.
- **Operating Season, Hours or Frequency**: The season and hours could be expanded or contracted according to shuttle performance data. Final adjustments were made to the pilot shuttle route and operations schedule to ensure the pilot shuttle can operate within realistic funding constraints. The original proposed operating season and schedule was from mid-March through mid-October and from 8 AM to 6 PM daily.
- **Route structure**: Adjustments could be made to the shuttle system route structure. Some potential route variations that were considered in the final design of the preferred shuttle route are described below. These would enhance the shuttle system, but would also add to the operating budget and vehicle requirements. These or any other adjustments to the shuttle will have to be evaluated once the service is in operation.

Funding to implement adjustments over time has been built into the operating cost estimates. Assuming no major operating flaw is revealed, the initial pilot shuttle system should operate for at least a few months before any significant alterations are made and it is recommended that any major restructuring of the service should wait until the second season to allow for collection of robust visitor feedback and performance data. All changes should be grounded in data and made only on a periodic basis in order to isolate the causes of changes in performance and ultimately determine the best routing structure for the long-term shuttle system, if the park decides to continue the service.

Shuttle Variant 1 – Add a stop at Delicate Arch on the Southbound Route

Shuttle Variant 1 is a variation on the preferred shuttle route that would add a stop at Wolfe Ranch and Delicate Arch in the southbound direction as the shuttle is heading out of the park. This variation should be implemented if visitors indicate strong desire for visiting Windows and Delicate Arch without traveling to Devil‟s Garden or if the lack of a fast and direct route out of the park for hikers from Delicate Arch is causing major frustration. Adding this stop will increase the travel time for riders leaving Devil‟s Garden and, therefore, will not benefit all riders. Implementing this variation would allow park staff to test the trade-offs between meeting the needs of visitors to Delicate Arch against potential frustrations caused by a less direct route for hikers from Devil‟s Garden.

This would be a relatively minor adjustment to the preferred route, shown in figure 2. This variant would add approximately 12 minutes of travel time to the preferred route, which would require one additional vehicle. The difference in operating cost that this entails is addressed in the discussion of shuttle cost at the end of this section.

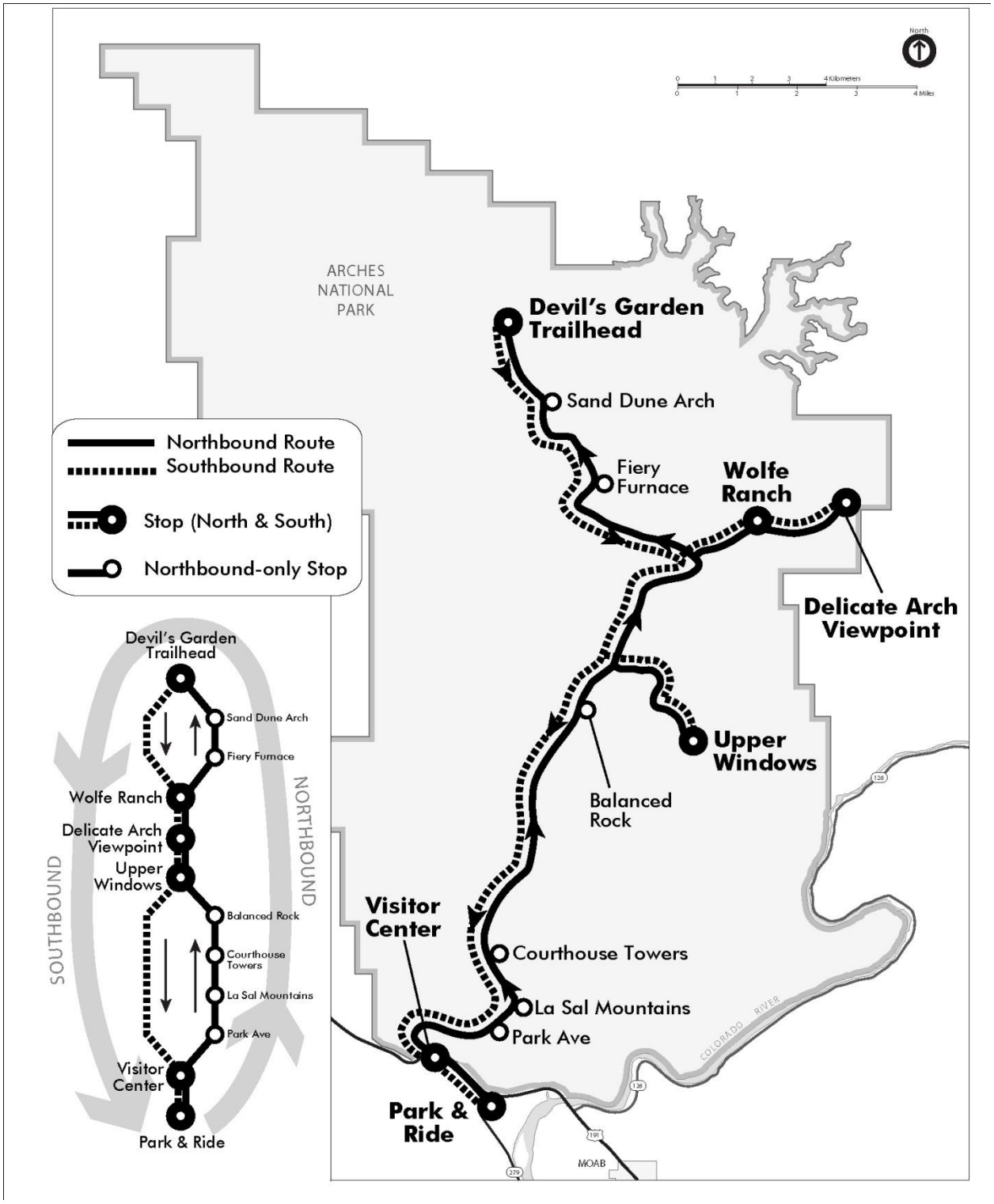

Figure 2 Shuttle Variant 1: Preferred Route with Southbound Stop at Delicate Arch

Shuttle Variant 2 – Two Loop Routes

Shuttle Variant 2 is a more significant variation on the preferred shuttle which would split the single park loop into a two-route loop system: a south loop similar to the south end of the preferred shuttle and an express north route that travels direct from the park entrance to Windows and then through the northern end of the park. The north loop would follow the preferred route through the north end of the park and make only two stops on the southbound trip: Wolfe Ranch/Delicate Arch Trailhead and Delicate Arch Viewpoint. Similar to Shuttle Variant 1, this adjustment would accommodate two visitor experiences that are not well served on the preferred shuttle: visitors wishing to see Windows and Delicate Arch without traveling to Devil‟s Garden and hikers who want a direct route out of the park from Delicate Arch. It would also add a third option which is an express non-stop route from the park entrance to Windows. This route is not as efficient as the other routes and therefore would be significantly more costly to operate. It is also potentially more confusing for shuttle riders, but it would provide a wide range of visitor experiences while still preserving direct exit routes from the park for visitors.

This adjustment could be implemented if the visitor experiences available on the current shuttle are not attracting enough riders to alleviate congestion. The two-loop adjustment is shown in figure 3. This route would add significant operating time to the shuttle system and therefore require more vehicles and entail significantly higher operating costs, which is discussed at the end of this section.

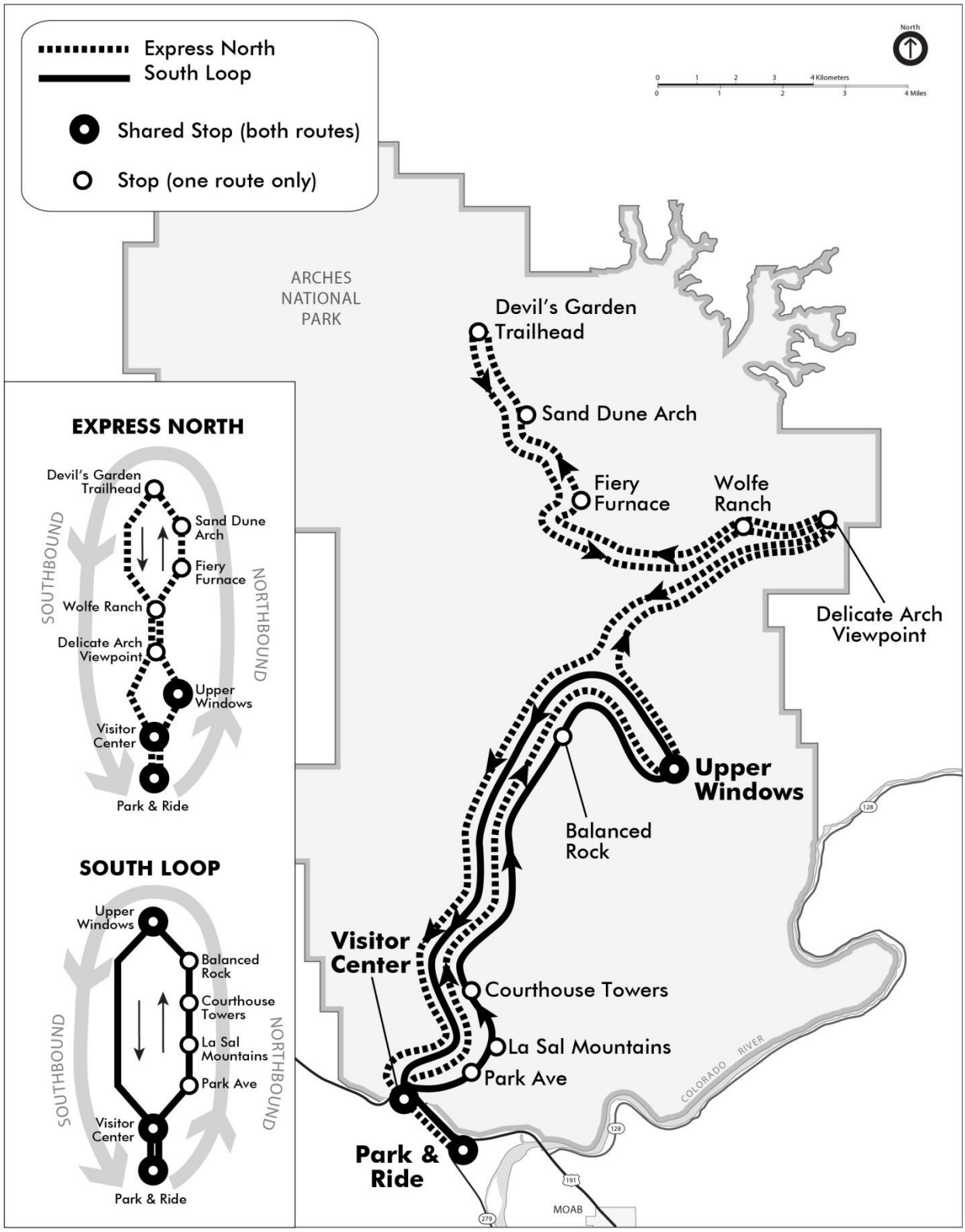

Figure 3 Shuttle Variant 2: Two-Loop Structure

Addition of "Specialty" Shuttle Routes

Two "specialty" shuttle routes were initially considered for the pilot shuttle system in the *Draft Feasibility Study*, but were not included due to funding constraints. These routes could be considered in the future if additional funding is identified. These routes could also potentially be provided through public-private partnerships with local businesses and/or non-profit organizations in Moab.

Hiker Express Shuttle

During the workshop, park staff expressed a concern that visitors hiking from the Devil‟s Garden trailhead have a disproportionate impact on congestion because they arrive early and occupy between 25% and 30% of prime parking spaces at Devil‟s Garden for long periods of time. The *Draft Feasibility Study* included a Hiker Express shuttle that would travel non-stop to Devil‟s Garden in the early morning to cater to all-day hikers. This would free up parking spaces at the trailhead that would otherwise be occupied for hours while these visitors hike.

The Hiker Shuttle would begin operation earlier than the other routes to allow hikers to reach the trailhead before the heat of the day and would operate through midmorning. The proposed Hiker Shuttle hours of operation were 7 AM until 10 AM. As initially designed, the shuttle would not take visitors back to the entrance to the park. Hikers would board the main Arches Shuttle to return southbound when they are done hiking. To incentivize use of this shuttle, the park could restrict parking at Devil‟s Garden to a 3 or 4 hour maximum.

Sunset Shuttle

The second specialty shuttle that was included in the *Draft Feasibility Study* was a Sunset Shuttle that would make a non-stop trip to Delicate Arch in the evening for sunset. Like the Hiker Express, this shuttle route was designed to cater to a market segment that is relatively small, but has a disproportionate impact on congestion at the Wolfe Ranch parking lot during the sunset hours. The exact schedule of this route could vary by season according to the time of sunset. The shuttle would have to be timed to arrive at the Wolfe Ranch trailhead at least 70-90 minutes before sunset to allow variable hiking times to Delicate Arch. Daily departure time for the shuttle could be posted at the Visitor Center. To avoid overcrowding at Delicate Arch, it is recommended that only one trip be scheduled per day.

The Hiker Express and Sunset Shuttle routes are illustrated in figure 4 below.

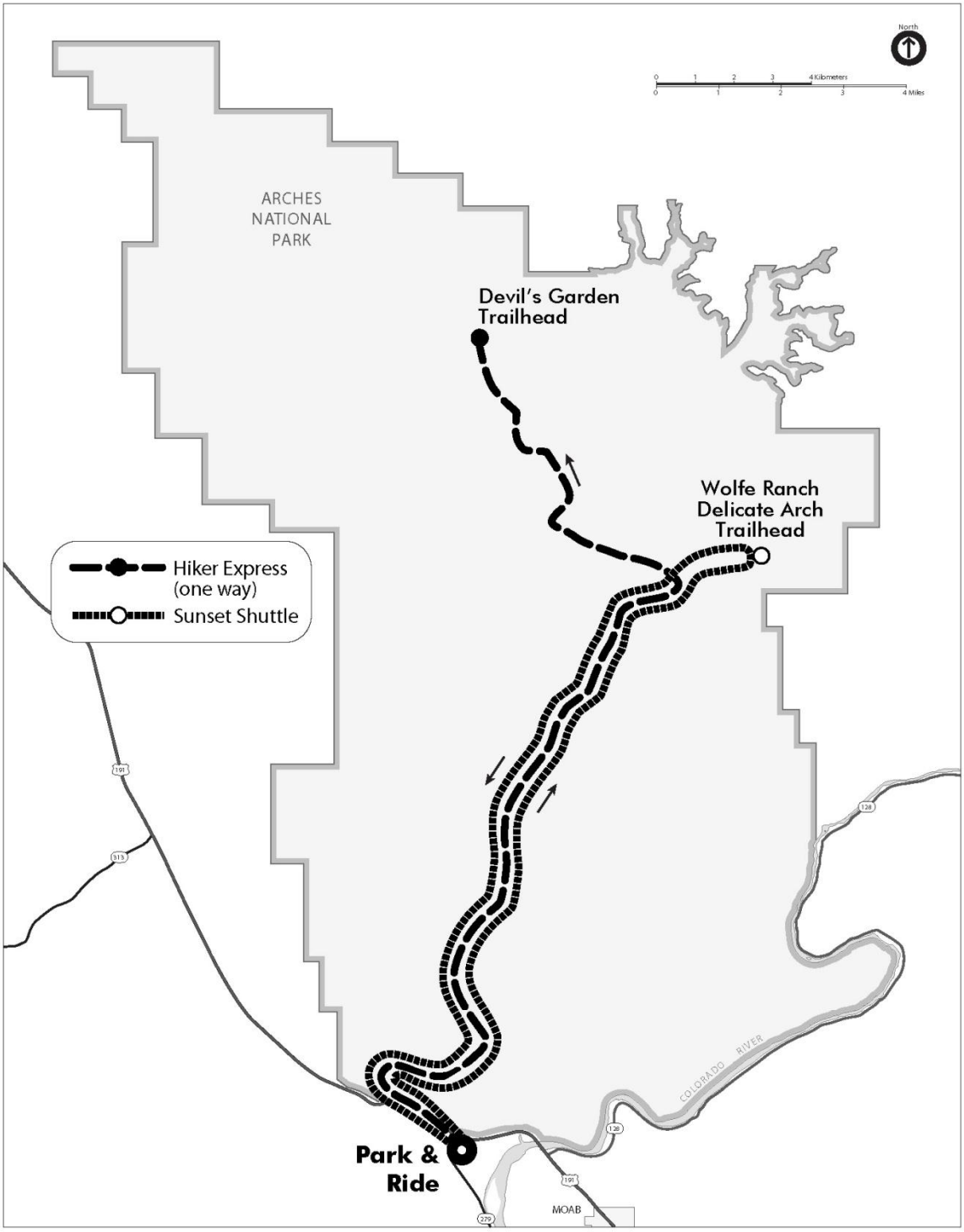

Figure 4 Hiker Express and Sunset Shuttle Routes

Addition of Moab Shuttle "Feeder" Route

The initial pilot shuttle system will operate from a large park-and-ride lot outside the park entrance. However, access to the shuttle could also be provided through a Moab "feeder" shuttle that would bring visitors from their hotels in the city to the park entrance. These types of town-park feeder shuttles exist in many National Park communities across the country. Inclusion of a Moab route in the system is desired by the park and the City of Moab, but was not possible due to funding availability. The Moab route is an optional addition to the Arches shuttle if funding becomes available in the future. The addition of a Moab shuttle would change the visitor access experience to the Arches shuttle system and could possibly offer an added incentive to ride the shuttle.

Initial design of a Moab shuttle route was completed as part of this feasibility study. A Moab shuttle would require further design refinement and collaboration with the Utah Department of Transportation regarding transit operations on U.S. highway 191 (e.g. information on actual locations, signing, striping, bus size(s), stop frequency, etc.) before commencing operations, but the following provides a basis for future work.

The preferred Moab shuttle route would travel down Main Street through the city to park entrance. The Main Street route was selected because it provides the shuttle with high visibility; the fastest, most direct route to the park; and access to key destinations such as the Moab Information Center (MIC) and Main Street businesses. Compared to other non-Main Street alternatives considered, a route down Main Street with minimal turns would also seem shorter and more efficient to most riders.

This convenient central routing could serve local residents and employees along the way, providing an additional amenity to the City of Moab. Similar "city/park" shuttles in other locations have provided either free or low-cost trips for local residents and employees making local trips outside of the park. The Moab shuttle can also potentially provide service to employees who live in Moab, who would be able to commute into the park without driving.

Main Street is also U.S. highway 191 and therefore a shuttle along Main Street will require coordination with the Utah Department of Transportation (UDOT). Permission from UDOT would be necessary to develop any on-highway shuttle stops. NPS and Moab city staff have discussed the feasibility of the Moab shuttle with UDOT and UDOT staff indicated openness to considering stops on U.S. highway 191. If UDOT did not approve shuttle stops on Main Street, this route could still be viable, but shuttle stops would have to be developed off-street in private lots. The off-street option was not initially favored by park staff or Moab stakeholders. The preferred route through Moab and potential stop locations are shown in figure 5.

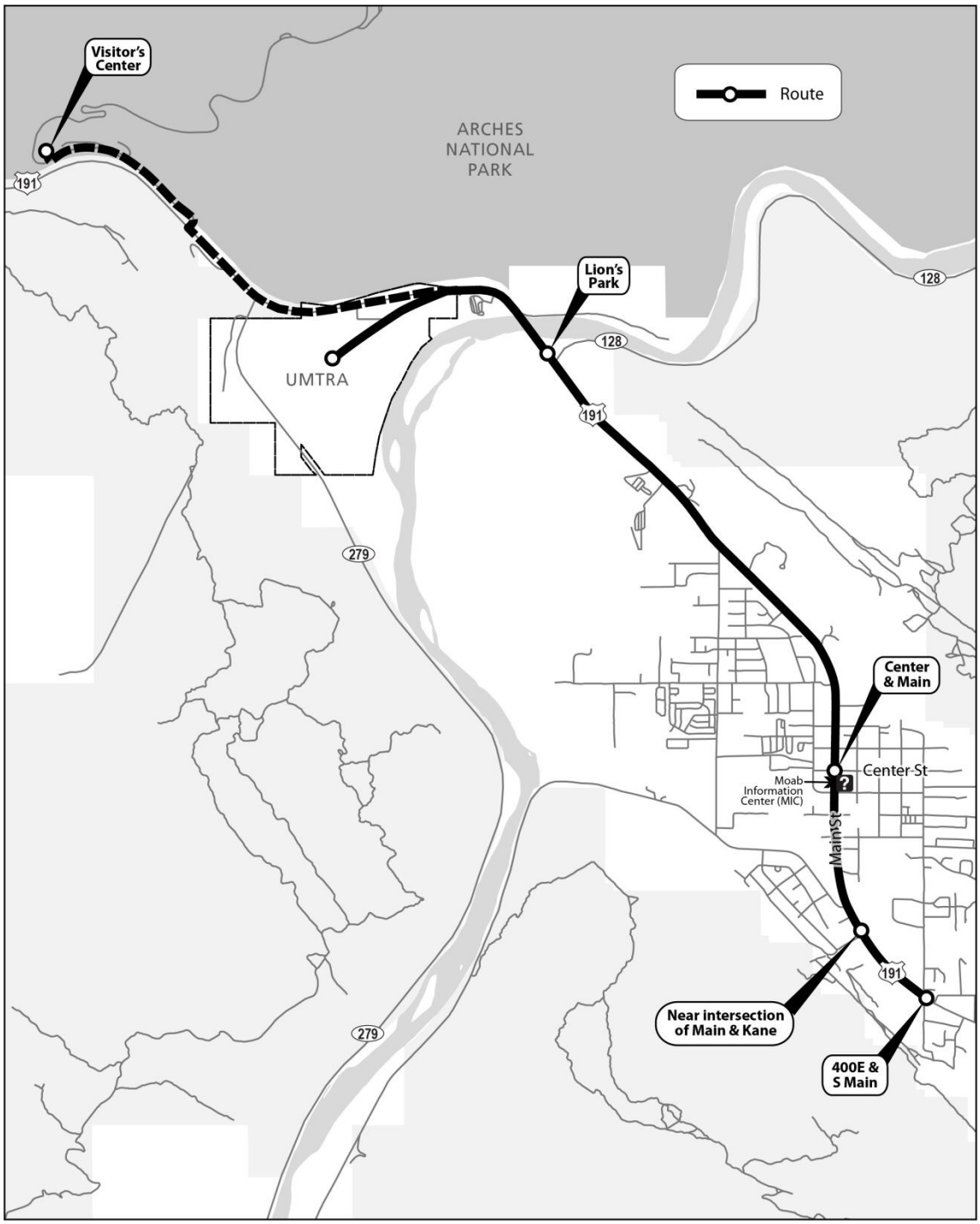

Figure 5 Moab Main Street Route & Potential Stops

Moab Shuttle Stop Locations

Stop locations were not finalized for the Moab shuttle route. The following are potential stops, refined from original proposals based on discussions at the November workshop.

South End of Moab: A shuttle stop located at the south end of Moab could serve shuttle passengers staying at the cluster of hotels and campgrounds located on South Main Street between 400E Street and Uranium Avenue. There are seven hotels and campgrounds clustered within half a mile of each other at this location. A shuttle stop located near Kane Creek Boulevard would allow all the visitors at these hotels and campgrounds to walk to the shuttle stop within 5-10 minutes.[1] Kane Creek Boulevard also has a crosswalk and signal which would allow for access to the shuttle stop from both sides of the street.

Those visitors staying at hotels and campgrounds located south of the City of Moab could use a park-and-ride lot at the south end of Main Street to access the shuttle. One potential location for a shuttle park-and-ride and/or operations and maintenance facility is in the vicinity of the intersection of 400E and Main Street. There was strong interest in capturing recreational vehicle (RV) drivers as riders of the shuttle route. One possibility that was discussed includes working with campground operators to shuttle their clients to the start of the south end of the Moab route.

The location of a shuttle stop at the south end of Moab would require further study as well as coordination with UDOT, the City of Moab, and private property owners before finalizing a location.

Downtown Moab: There was strong support for a stop located at the MIC, at Center and Main Streets, right in the heart of downtown Moab. The MIC is an excellent source for visitor information and a shuttle stop here would be a great opportunity to extend the park experience into the City of Moab. It also offers a place to sell park entrance passes for shuttle riders. Passengers could walk directly to a stop at the MIC from the many hotels located downtown and this stop allows easy access to downtown restaurants and shops.[2] Pedestrian conditions are excellent in this section of Moab; Center Street has enhanced urban design, colored crosswalks, and pedestrian crossing signals that are highly conducive to easy and safe passenger access and boarding to the shuttle.

Ideally, a stop for the Arches-bound shuttle would be located at the curb on the eastern side of Main Street in front of the MIC, not requiring the shuttle to make any turns off of Main Street and allowing seamless access for visitors to/from the MIC entrance pavilion/plaza. The curb parking lane here is sufficiently wide enough to accommodate a shuttle stop, but would require removal of a few parking spaces. The return shuttle from Arches would ideally stop on the southwest corner of Main and Center Streets, potentially taking advantage of the large curb bulb-out at this location.

In addition, locating a shuttle stop at the MIC would provide an amenity to the City of Moab as there are a number of civic buildings on Center Street within a quarter mile walking distance from this stop including the Grand County Library, a Moab city playground, city offices, and the Center Street ballpark.

[1] Lodging sites in this cluster include: Silver Sage Inn, La Quinta Inn, Comfort Suites, Moab Valley Inn, Canyonlands Campground, Red Stone Inn, and Big Horn Lodge. These hotels have over 420 units (according to data from Moab"s official tourism website: http://www.discovermoab.com/hotels.htm which does not include the campground).

[2] Eleven hotels, inns and lodges are located within a ¼ mile radius of this stop, including over 530 units (according to data from Moab"s official tourism website: http://www.discovermoab.com/hotels.htm). Hotels and inns include River Canyon Lodge, Bowen Motel, Roadway Landmark Inn, Red Rock Lodge, Best Western Canyonlands, Kokopelli Lodge, Rustic Inn, Best Western Greenwell, Ramada, Virginian Inn, and Gonzo Inn.

It may be possible to provide limited parking for shuttle passengers directly at the MIC, however the benefits of these few spaces is unlikely to outweigh other beneficial uses of the MIC parking lot. Locating a shuttle stop at this location would require coordination with UDOT, the City of Moab, and the MIC.

North Moab: There are a number of hotels along Main Street/U.S. highway 191 north of Moab, suggesting potential demand for a shuttle stop. However, the street environment is dominated by car, truck, and freight traffic and is not conducive to pedestrian circulation. Hotels are also spaced far apart making it difficult to efficiently locate a shuttle stop. On-street shuttle stops are not recommended in this area. Visitors staying at lodging in this stretch would have to be served through a park-and-ride lot closer to the park entrance.[3]

Lions Park: A final potential shuttle stop would be at Lions Park where the City of Moab is constructing a multi-modal transit hub. The Lions Park site could serve as an excellent multi-modal transfer point for a park shuttle service. Its function as a park-and-ride lot may be limited by several factors including competing demand for parking space from other uses and parking management policies enacted by the City of Moab. Traffic operations associated with the site"s proximity to two major highways would have to be studied to locate a shuttle stop here.

Park-and-ride lot or Visitor Center: The Moab route would connect to the main Arches shuttle either at a park-and-ride lot located outside the park, or at the Visitor Center, as discussed below.

Additional Considerations for Moab Shuttle Route

Locating stops near hotels and other attractions would allow people to access the shuttle on foot and reduces the need for park-and-ride facilities. Some smaller park-and-ride facilities would still be needed to allow access to visitors staying at hotels and motels that are not near a shuttle stop. In addition, locating shuttle stops downtown could induce demand for on-street parking, which is already perceived to be a major issue on Main Street. Providing some park-and-ride facilities and encouraging walk-only access to the downtown stop would avoid exacerbating these perceived parking issues.[4] The location of these park-and-ride lots to serve the Moab route must be carefully considered. If a large park-and-ride lot is also being offered right outside the park entrance, it may decrease use of the Moab route.

Shuttle marketing efforts must include promotion of walking routes to shuttle stops and limited park-and-ride options. Shared parking opportunities should be explored with the City of Moab, especially at locations such as schools, churches, and the new Lions Park transit center (where there are lots that are potentially unused for parts of the week and/or year).

To provide the best possible experience for the riders who board a shuttle in Moab, passengers could continue into the park on the same shuttle without having to transfer at the park-and-ride lot. However, a Moab route that travels into Arches without passing through the park-and-ride lot introduces the issue of when and how visitors would pay their entrance fee. If the park opts to include a Moab route, this issue

[3] These hotels have over 600 units combined according to data from Moab"s official tourism website: http://www.discovermoab.com/hotels.htm which includes Adventure Inn, Days Inn, Hampton Inn, Inca Inn, Super 8, Riverside Inn, Motel 6, Holiday Inn, Aarchway Inn.

[4] This is a common perception in small downtown environments like Moab, but sometimes does not reflect a true parking shortage, but merely a mismatch of supply and demand. Often all drivers are trying to access the most convenient on-street parking which is unregulated while off-street lots with ample spaces remain unoccupied within a block of the main street. Traffic surveys have not been done to verify parking supply and occupancy in Moab.

will have to be addressed, as well as how the Moab route would interline with the Arches shuttle. This is addressed below in the discussion of entrance fee payment.

ACCOMPANYING CONGESTION MANAGEMENT STRATEGIES

Congestion management strategies can enhance the benefits of the shuttle, making it a more attractive alternative to driving. This section describes the preferred congestion management strategies that were selected for implementation in conjunction with a shuttle in Arches. The congestion-management only alternative is described in Section 3 of this report.

Visitor Information

Marketing will be critical in the success of the Arches shuttle. Developing clear, compelling informational materials and then widely disseminating this information and actively educating park visitors is going to be the single best tool to increase use of the shuttle.

The first step is designing the materials and messaging. The shuttle will not necessarily "speak for itself" as an attractive way to visit the park. The language that is used and type of information that is offered will impact people‟s likelihood to ride. The shuttle must be promoted as the best way to see the park for the targeted visitor segments. The "two-hour visitor" and the "guide-me" tourist were targeted for this pilot in part because these visitors actively seek advice on the best ways to see Arches.

In addition, visitors will have to be educated about the one-way nature of this route, emphasizing that sites should be visited while traveling northbound and that the only two direct ways out of the park are from Windows and Devil‟s Garden.

Visitor itineraries should be developed to recommend the best ways to use the shuttle to see the park; a sample is shown in table 3. Simple shuttle brochures could be developed that include both the shuttle route map and suggested use of the shuttle.

Table 3 Potential Visitor Itineraries on Shuttle

Time Available	Itinerary Description	Visitor Group Targeted
2 hours	Use the northbound shuttle to see panoramic vistas at La Sal Viewpoint, visit Balanced Rock and explore the Windows. Return home from Windows on the southbound shuttle.	▪ Big "2" (Two-hour visitor) ▪ "Guide-Me" Tourist
3-4 hours	Use the northbound shuttle to hike Park Avenue to Courthouse Towers, the shuttle will pick you up and take you to visit Balanced Rock and the Windows. Return home from Windows.	▪ Big "2" (Two-hour visitor) ▪ "Guide-Me" Tourist
4-7 hours	Take the northbound shuttle to visit Windows, Delicate Arch, Devil‟s Garden and more! You will have time to visit many of the parks great sites and take a hike or two. Remember to visit the sites you want to see on your way north, as you will get a direct trip home from Devil‟s Garden at the end of your visit on the southbound shuttle.	▪ Endurance All-Day Visitor ▪ "Guide-me" Tourist

Once the shuttle materials are developed, this shuttle information should be prominently featured in all the NPS trip planning resources that are already offered: the front page of the local newspaper, the front page of the Arches website, a shuttle page on the Arches website, in the Arches Facebook profile and through the Twitter feed. Posters could also be developed that could be prominently displayed in the MIC, in hotel lobbies, on campground bulletin boards, and in store windows in downtown Moab. The goal should be for shuttle information to be nearly ubiquitous; no one should leave Moab or the NPS website unaware that there is an Arches shuttle available.

Training park staff that interacts with visitors on how to talk about the shuttle and how to encourage its use will also be important.

Partnerships

Strengthening the partnerships through which shuttle information is disseminated will also be critical. More formal partnerships could be established with local hotels, docents at the MIC, and tourism bureaus such as Discover Moab and the Travel Council of Grand County. Training could be offered for concierges and MIC docents similar to the training that is provided to park staff, so that everyone who frequently works with park visitors is aware of the shuttle and understands how it can best be used.

There are some good examples of marketing partnerships in other national parks, including the Yosemite Area Regional Transit System (YARTS) shuttle in Yosemite which is promoted through the hotel desks along the route and in the Golden Gate National Recreation Area where anyone staying at the Fort Baker lodge gets information about alternatives to private vehicles and the cost of parking.

These marketing and information efforts would be relatively low-cost, but could require the investment of a significant amount of park staff time to implement, especially the initial development of materials and the establishment and maintenance of partnerships, including ongoing training.

Changeable Message Signs

Changeable message signs indicating congestion conditions and encouraging shuttle use would be an excellent congestion management tool to implement in conjunction with the shuttle. They could be located on U.S. 191 in Moab and north of Arches for traffic headed southbound. Muir Woods National Monument in California is a good example of the impact of changeable message signs, which play a pivotal role in getting drivers to switch modes to a shuttle. The highway message sign reads: “Muir Woods Parking Full - Use Shuttle.” According to a survey conducted in 2007, over half of those taking the Muir Woods shuttle did so because of a physical sign they saw en route to the park, including the changeable highway sign and other static signs. Alternatively, the park could use flip-signs to promote shuttle usage that are activated by park staff. These would be lower cost, but are not likely to be as visible to visitors as they enter the area from the north or from the City of Moab. Portable electronic signs are recommended.

Shuttle Priority at Entrance Gate

Based on the recommendation to initiate shuttle service at a large park-and-ride lot, the visitor experience on the shuttle is going to begin outside the park entrance. Shuttles must be given priority in entering the park over private vehicles to ensure that the first visitor experience on the shuttle is not waiting in line at the entrance gate. Park staff has reported that queues at the entrance gate sometimes stretch all the way to U.S. highway 191.

In the long term, especially if the park opts to continue with a permanent shuttle operation, the park should widen the entrance road to allow for a shuttle-only lane that bypasses the entrance station. A preliminary analysis of conditions at the entrance gate indicate that a shuttle-only entrance lane around

the entrance gate could be created on the northern side of the current entrance station through a relatively small widening of the road. To ensure shuttles are not stuck behind vehicles queuing on the entrance road the entrance road could be widened back towards the highway to allow the shuttle to bypass a longer queue of vehicles. The length of road widening that would be required for shuttles traveling in the shuttle-only lane to reliably bypass the queue would be based on how long the vehicle queue reaches during peak season. One constraint is the existence of a culvert under the entrance road. This may pose environmental and/or financial barriers to road widening beyond this point. Both of these widening concepts are illustrated in figure 6.

Given the high cost of this solution, for the purposes of the pilot, park staff has indicated that shuttles can use the maintenance road which turns off of the entrance road before the entrance station to bypass the queues. This is not an optimal situation for shuttles as it requires that they take a more circuitous route, but is a relatively low-cost solution for the purposes of the pilot project.

Entrance Station -Road Widening Opportunities

A Widen pavement at entrance station to create a shuttle-only lane

B Potential additional roadway widening (north side) to extend the shuttle-only lane if queues are regularly longer than approximately 6 cars. Significance of regrading effort are yet to be confirmed.

C Existing drainage corridor and culvert may limit road widening opportunities

Figure 6 Potential Long-Term Entrance Station Reconfiguration for Shuttle-Priority Lane

Parking Management

Parking management is a tool that can be used to encourage use of the shuttle. One strategy to encourage use of the shuttle is to discourage long-stay parking at sites such as Windows and Devil"s Garden. This could be done through establishing parking limits at parking areas. If implemented, these limitations should be advertised to park visitors before they enter the park, in shuttle promotional materials and on park literature and the website.

Parking issues could arise at the Visitor Center parking lot if shuttle riders use it as another park-and-ride. This can be discouraged through information in the shuttle materials about parking opportunities. However, if it proves to be a problem, a time limit and enforcement may also be necessary at the Visitor Center lot.

Implementation of parking time limits would require enforcement. Strategies to address these enforcement requirements will need to be developed by the park. Existing staff may be able to cover these responsibilities as they will be spending less time managing traffic congestion after shuttle operations begin. Arches could opt to monitor lots with seasonal staff during the peak weekends and communicate to visitors that parking time limits will be actively enforced during these times. This has not been included in the cost estimates for the pilot.

Finally, discouraging use of oversized vehicles such as RVs in the park has been discussed due to the fact that there is very limited oversize vehicle parking in the park and that these vehicles cause a disproportionate amount of congestion and collisions. This issue is important in the shuttle pilot because some oversized vehicle spaces may be removed to accommodate shuttle stops. Ample provision of over-sized vehicle parking at the park-and-ride lot and active promotion of the shuttle for RV drivers will be critical. Materials should be distributed at RV campgrounds discussing the challenges of driving RVs in Arches (e.g. the narrow and curvy road). Special marketing at RV campgrounds may be warranted as well as working with campground owners to possibly shuttle visitors to the park-and-ride lot.

Optional Future Strategy: Mandatory Shuttle

At this time, directly controlling access to the park by closing to private vehicles and making the shuttle mandatory is not desired by park staff. However, the existence of a shuttle does provide the opportunity to restrict access for private vehicles in the future if warranted by congestion conditions.

A mandatory shuttle could be implemented on a set schedule, such as peak weekends or on an as-needed basis triggered by a certain visitation level. The latter would require establishment of a “peak” visitation limit, above which access would be restricted to shuttle only. Another option is making access to Windows and/or Wolfe Ranch/Delicate Arch by shuttle only during times of peak congestion to relieve congestion at these heavily visited sites. A drawback to this strategy includes the potential for creating even more congestion at sites on the main road.

Mariposa Grove in Yosemite National Park is an example of a mandatory shuttle during the peak visitation period. When the parking lot at the Grove fills, the road is closed to private vehicles and tour buses, which are routed to a parking lot where park shuttles are available to take them to the Grove. Road closure is actively managed over the course of the day to respond to parking occupancy levels. If this strategy were implemented, changeable message signs would be a useful tool to improve information dissemination of the closure.

The shuttle system capacity would have to be ramped up considerably to accommodate the higher level of shuttle use. In addition, the route structure might need to be reconsidered to accommodate a wider range of visitor needs, as discussed in the “Shuttle Adjustments” section.

Staffing

Oversight and administration of the shuttle will require at least one full-time manager on park staff, described in detail in the cost section, below. It is also recommended that Arches hire a part-time transportation demand management coordinator during the shuttle season to manage development of informational materials, information dissemination, and partnerships. The transportation manager, who would run the system, would also complete the initial development of marketing materials and relationship building for partnerships in advance of the first season of operation.

SHUTTLE FARES AND ENTRANCE FEE

It is well documented in transportation research that people pay a lot of attention to out-of-pocket costs and that price levels can have a large impact on people‟s decision-making. If it is more expensive to enter the park on the shuttle than it is to enter by private vehicle, cost will be a disincentive to use the shuttle. There are two components of cost for the Arches shuttle: shuttle fares and entrance fees for the park.

Arches National Park is in a different position than other park shuttles that operate only within the park. Shuttle passengers at Arches will board outside the entrance gate because space for shuttle rider parking is not available inside the park. Therefore, the payment of entrance fees by shuttle riders must be addressed, both in terms of how much they pay and how to collect entrance fees since these visitors will pass through the entrance station on board the shuttle.

Another factor that should be taken into consideration is the potential for implementation of a transportation fee at Arches in conjunction with a park shuttle. In other parks, transportation fees have not brought in as much revenue as anticipated because the fees are only charged on entrance fees paid at the gate; pass holders do not pay. Arches may need to revisit this issue once decisions are made about the transportation fee.

Fare

It is recommended that the Arches shuttle be free to maximize ridership (i.e. shuttle riders should pay no more than the per-person equivalent paid by visitors in private automobiles). In other park environments, fares have been found to significantly decrease visitors‟ likelihood to ride (even a modest fare of just a few dollars) (Dunning 2005). For this reason, the shuttles in both Zion and Bryce Canyon National Parks have been fare-free from conception. The Acadia National Park shuttle showed a 600% increase in shuttle ridership when fares were eliminated in 1997 and the community has been committed to providing fare-free service ever since. Some shuttles, like Acadia, have provided riders opportunities to donate, which brings in significant supplemental income. In Acadia‟s case, rider donations contributed $30,000 to annual operating costs in 2006 (Dunning 2005).

Entrance Fee

Currently park staff does not favor differential pricing for shuttle passengers. As the park works through the potential initiation of a transportation fee this issue may also be revisited.

Most importantly, the payment of entry fees by shuttle passengers should be structured so that entering the park on the shuttle does not cost *more* than entering the park by private vehicle, as this would disincentivize shuttle use. This is most relevant for families and groups who pay $10 if they enter together in one vehicle, but would be boarding the shuttle individually. Currently the entrance fees for Arches are as follows:

- Individuals: $5 (Good for 7 Days)
- Vehicle including all occupants: $10 (Good for 7 days)

- Federal lands passes and the "Local Passport" ($25 one-year pass to the four National Parks in the area) are also accepted

To parallel this fee structure for private vehicles, a group pass should also be made available for shuttle riders. Some options for group passes are:

- Establishing a maximum number of individuals per group that can enter on a single pass
  - Using average vehicle occupancy (NPS standard is 2.7 people in the peak season)
  - Using the maximum occupancy of a standard sedan: 4-5 people
- Establishing a family pass for two adults and unlimited children under the age of 18
- Charging individual shuttle riders a lower fee than $5, so that the group fare, combined does not far exceed the cost of a $10 vehicle entrance

Structuring a fare system this way may somewhat impact revenue if passengers purchase group passes who would have otherwise entered the park in multiple vehicles. The park will have to balance whether these potential revenue impacts are worth the congestion management benefits that will come from ensuring there is no financial disincentive to ride the shuttle.

Fare Collection and Proof of Payment

Entrance fees should be collected at a fare payment station in the park-and-ride lot outside the park. For the pilot, it is recommended that a temporary staffed fee-payment booth or kiosk be installed next to the shuttle stop in the park-and-ride lot to collect entrance fees and distribute shuttle tickets before passengers board the shuttle.

In the long-term, more permanent fare collection systems could include:

- **Entrance Station**: Arches could have an entrance station similar to the existing station that would charge vehicles as they entered the parking lot. This would have to be evaluated from a circulation standpoint so as to not create queuing onto the highway. In addition, there may be issues with having an entrance station at this lot because it is anticipated to be a multiagency public lot.
- **Automated Ticket Machine(s)**: Arches could provide 2-3 automated ticket machines where passengers would purchase tickets before boarding the shuttle. This would likely replace a staffed kiosk.

It is recommended that shuttle passengers receive a shuttle pass with their entrance fee that must be shown to re-board the shuttle inside the park. Requiring a shuttle pass would prevent people from driving to one of the lots in the park, for example Windows, parking their vehicle and taking the shuttle to see sites farther north. Doing this would undermine the parking and congestion benefits that the shuttle is designed to solve.

Appendix G includes a discussion of fare collection if a Moab "feeder" shuttle is offered.

DEMAND AND RIDERSHIP

Ridership on a shuttle depends on many factors such as stop locations, routing, fares, ease of use, clarity of the system, incentives, and overall competitiveness with private vehicle travel. Therefore, projecting ridership is an exercise in estimating with the best data available today how likely Arches visitors are to ride the shuttle. There is a base number of people who are likely to ride a shuttle regardless of its design, simply because they would prefer a shuttle experience over driving their personal vehicle. By targeting large visitor segments that are most likely to ride in the design of the shuttle and offering a package of congestion management strategies to incentivize shuttle use, ridership is likely to be higher.

Demand estimates can indicate what type of congestion impacts a shuttle is likely to have by predicting how many private vehicles will be taken off the road. Demand estimates are also necessary in order to determine how many riders the shuttle system must be designed to carry.

There is a degree of uncertainty in estimating the demand for a service that does not yet exist. Ridership may be higher or lower than the projections and the park will have to adjust to respond to conditions once the shuttle system is implemented either by adjusting vehicle frequency or size.

Ridership is also likely to fluctuate significantly over the course of the year and over the course of the day, for example visitation rises from March through May and begins to taper again in the fall. The park must select a "design day" on which to base the size of the system. The shuttle cannot be designed for the peak day or it would run largely empty for much of the season. Similarly, it cannot be designed for the average day or it would be overflowing half of the time. Therefore, ridership estimates made here are based on a "design day" representing the 85th percentile of visitation over the course of the peak season. This means the shuttle should not be over capacity more than 15% of the time.

The following ridership estimates assume a voluntary shuttle. If Arches makes the shuttle mandatory for all or part of the park, ridership will be higher and the system will have to adjust accordingly.

Estimating Demand

Two methods are used to estimate demand for a shuttle in Arches. The visitor survey conducted in 2003 included a question about willingness to use a shuttle service if offered, which was used to establish the general range of potential demand for a shuttle service, described below. The shuttle system has been designed to hit a targeted trip diversion of 25%, the upper end of the visitor survey results. These numbers were verified through peer research of a number of other national park and resort shuttle systems that have similarities with the Arches shuttle. Although none of these examples are perfect peers, examining ridership on these systems provides a reasonableness test for the Arches demand projections.

Based on the design of the system and evidence from the visitor survey and peers, it is estimated the shuttle at Arches will be capable of attracting 23-28% of the visitors to Arches.

Visitor Survey

The visitor survey is a strong data set since it uses actual data from visitors to the park. The question from the survey stated: "Would you use a shuttle to see sites in the Park?" Responses indicated that 50-54% of visitors stated they would use a shuttle service if offered (NPS 2003). However, individuals tend to overstate their willingness to ride a shuttle in surveys asking for stated intent; this is called "non-commitment bias." It is common practice in transit ridership estimation exercises to reduce stated intent by a factor of two or three to estimate actual ridership. Therefore, based on this survey, and adjusting for non-commitment bias, a shuttle in Arches should be able to attract 17-24% of the shuttle season visitors into Arches National Park.[5]

Ridership Projection

The Arches shuttle is estimated to attract 1,160-1,430 riders per day and 170-210 riders during the peak hour from 9:30 AM – 10:30 AM. It should be noted that demand fluctuations over the course of the

[5] One-third of 50% = 16.7% to one-half of 54% = 27%.

season may yield daily ridership as low as 500 per day in late September to as high as 2,000 on Memorial Day weekend.

Shuttle ridership estimates are based on the following methodology:

- **Step 1:** A "design day" of 85th percentile visitation was used for this demand estimate. For the peak season, the 85th percentile was 1,800 vehicles in one day in 2010.
- **Step 2**: The number of vehicles per day was projected out to the year 2013 when the shuttle is likely to begin operation, using a growth factor of 3% per year. This growth yields a 2013 "design day" of 1,910 vehicles entering the park.
- **Step 3:** This figure was multiplied by the average vehicle occupancy rate of 2.7 passengers to produce an estimate of daily visitors: 5,160.
- **Step 4:** The daily visitor estimate was multiplied by the demand estimate of 23-28%. This calculation yields a range of daily ridership of 1,160 to 1,430 for our shuttle "design day."
- **Step 5:** Daily visitation patterns were then applied to the daily ridership figure to get hourly ridership which can inform shuttle capacity and frequency calculations. The peak hour ridership on the shuttle, 9:30 – 10:30 AM, would be 170-210 riders.

Demand on Comparable Peer Shuttles

Peer data is used as point of reference for shuttle ridership projections. Table 4 provides data on several comparable peer systems. These are included as peers because they are voluntary shuttles that have some similarity with Arches.

Table 4 Ridership on Comparable Visitor Transportation Systems

Park	Gateway Community	Gateway Community Population	Shuttle Season Park Visitation	Total Shuttle Riders for Season	Trip Diversion Rate	Peak Frequency	Date of Data
Acadia	Bar Harbor, ME	5,129	1,559,358	405,000	26%	15 Min	2001
Rocky Mountain	Estes Park, CO	6,432	2,219,015	395,257	18%	10 Min	2007
Glacier	Multiple	N/A	1,103,894	105,640	10%	15 Min	2008
Bryce Canyon	Rubys Inn	N/A	728,026	400,000	55%	6 Min	2001
Bryce Canyon	Rubys Inn	N/A	825,701	300,000	36%	13 Min	2008

Taking into account similarities and differences among the systems, the following insights are offered to help frame the prospective ridership for a shuttle at Arches National Park:

- Prior to major service reductions in 2002, Bryce Canyon operated on a 6-minute headway and achieved a 55% trip diversion rate. After implementing significant service changes in 2002, frequency was set at 13 minutes. By 2008, after several years of fluctuating visitation, ridership was approximately 36% of transit season visitation. One of the factors attributed to Bryce‟s high ridership is its simple route configuration; all of the major destinations are aligned along the route making it easy for visitors to experience the park on the shuttle. Aspects of the Bryce Canyon experience that carry over to Arches include a single entrance point and a number of stops that

can be served on a single run. Arches is more dispersed than Bryce, so ridership may be lower due to diversity of visitor itineraries.

- Acadia has operated on a 15 minute frequency for many years and is currently achieving a trip diversion rate of approximately 26%. Acadia is more dispersed than Arches with multiple entrances, but also has extensive deployment of Intelligent Transportation System (ITS) infrastructure. The same strategies may not be applicable in an Arches context; however a similarly extensive congestion management program is recommended in support of the Arches shuttle which should help to ensure maximum ridership.

Together, these cases confirm a range of potential trip diversion rates for the Arches shuttle within range of the 25% target established for the Arches shuttle system.

If a Moab shuttle route is offered in the future, it will attract some portion of the Arches shuttle riders and may also attract Moab residents to use the shuttle. Ridership considerations for a Moab route are included in appendix G.

SCHEDULE, FREQUENCY AND VEHICLES

Frequency

Service frequency is determined by several factors:

- **System capacity**: The capacity of a shuttle system is determined by two things: frequency and size of vehicle. Smaller vehicles traveling more frequently can accommodate as many total passengers as larger vehicles traveling less frequently. Therefore frequency and vehicle size must be set to respond to anticipated hourly vehicle loads. In general, service frequency levels should be set so that passengers are able to find a seat and do not have to spend too much time waiting for the bus. Especially at Arches where it is very hot in the summer, the goal must be short passenger wait times and mostly seated passengers.
- **Visitor experience**: Higher frequency will also affect ridership because a more frequent shuttle will be more convenient to use and therefore attract more riders. Operators wishing to achieve higher ridership as a strategy for minimizing congestion set frequency levels relatively high to attract a larger number of riders.
- **Fiscal constraints**: Funding constraints are another major factor in determining frequency. Although it would be desirable to provide service every three minutes, this level of service is not financially feasible in most operating environments.
- **Resource constraints**: Resource constraints become a factor in a park setting because vehicle capacity and frequency can be used together to set passenger delivery rates based on resource standards. For example the NPS Visitor Experience Resource Protection (VERP) project in Arches developed social standards for visitor capacity at Delicate Arch. Shuttle size and frequency could be adjusted to ensure that these standards are met.

These factors must all be balanced against one another to determine the shuttle frequency for the Arches shuttle.

Regarding system capacity, based on the visitor survey, the shuttle is expected to attract at least 17% of park visitors. Therefore, at a minimum the shuttle should operate at a frequency to guarantee short waits and seated passengers for 17% of visitors to ride the shuttle. Demand estimates predict ridership in the 23-28% range, as described above; therefore, the shuttle should aim to guarantee short waits and seated passengers for that level of ridership. A second tool that can be used to adjust system capacity is vehicle size. This tool is discussed in the Preferred Vehicle section, below.

Regarding visitor experience, a 15-20 minute wait between vehicles is considered the longest span that passengers are willing to wait without consulting a schedule. Due to this constraint and the summer heat experienced at Arches, the park should aim to have no longer than 15-minute waits between vehicles.

To assess fiscal constraint, a number of scenarios were developed based on these inputs to determine the costs for different frequencies. These are shown in table 5.

Resource constraints have not played a large role in shuttle planning because the park has indicated that VERP standards should not be used to drive shuttle design, indicating that congestion conditions so far exceed the VERP standards that they have ceased being useful as a management tool. In addition, to truly abide by VERP standards, private vehicles would also have to be controlled and at this time, the park does not intend to control private vehicle access.

Table 5 shows the preferred shuttle system with 10, 15, and 20 minute frequencies and the peak vehicle loads that would result if the shuttle attracts 23-28% of park visitors. It also shows the difference in operating cost between the three scenarios. Operations and maintenance costs are based on a fully allocated hourly rate of $94.88 which reflects an average industry rate of $75 plus a 10 percent premium for remoteness and a 15 percent premium for including vehicle depreciation as part of the service contract during the pilot project. Estimates in prior deliverables were based on the base-rate of $75 per hour.

Table 5 Vehicle Loads and Cost for Different Frequencies on Main Arches Shuttle ($2011)

Option	Preferred with 10-Minute Service	Preferred with 15-Minute Service	Preferred with 20-Minute Service
Percent vehicle trips diverted/day	23% – 28%	23% – 28%	23% – 28%
Peak Vehicle Load (Passengers) 9:30 – 10:30 AM	28 – 35	42 – 52	56 – 69
Total Annual Operating Cost for Shuttle	$1.8 M	$1.2 M	$960,000

Based on the analysis presented here, as well as an evaluation of peer cases and best practices presented above, 15-minute service is recommended for the Arches shuttle service at this time. A 20-minute service would yield peak vehicle loads that far exceed the size of the vehicles that are feasible to operate in Arches and shuttles arriving at least every 15 minutes or less would provide a better visitor experience and therefore be more likely to attract visitors to the shuttle. A 15-minute frequency also exceeds the seated capacity of the recommended vehicle (40 seated passengers); however, due to financial resource constraints, 15-minute service is financially feasible at this time. If demand warrants more frequent service and additional funds become available, Arches can consider increasing the shuttle frequency. Service every 15 minutes is used as the base assumption for the main Arches shuttle throughout the remainder of this report.

As previously discussed, the peak vehicle load estimate is based on 85th percentile estimates of future visitation, which means there will be times when demand to ride the shuttle exceeds the shuttle system capacity. When this occurs, passengers will either have to stand on the shuttle or wait another 15 minutes for another bus to arrive. Given the long travel distances in Arches, it will be important for as many people as possible to have a seat. Arches may want to implement a “no standees” policy to remove the option of standing. However, given the heat in the summer months, it is also undesirable for passengers to be waiting for long periods of time. Therefore, at times of the highest demand, shuttle frequencies may have to increase or a “trailer bus” may have to be available to serve the stops where long lines are occurring.

Preferred Vehicle

The vehicle recommended for the shuttle service is a low-floor heavy duty 40-foot standard transit vehicle. This vehicle type maximizes ease of access and operation efficiency offered by a low-floor vehicle and meets passenger capacity needs described above – to accommodate a peak vehicle load of 42-52 passengers at a 15-minute frequency.

An estimate was completed to assess the feasibility of providing the same level of service with a 30-foot vehicle. To accommodate 23-28% of visitors on the shuttle with no long waits and no standees with a 30-foot vehicle would require 9-10 minute frequency. As shown in table 5, operating shuttles more frequently would increase the annual operating cost to $1.8 M per year. In addition, operating smaller vehicles would increase the number of times a queue of waiting passengers could not be fully served by the next available bus.

Vehicle Procurement Options

There are two general options available to Arches for acquiring vehicles for the shuttle service:

- **Lease**: The first option is to purchase vehicles as part of a turnkey service contract that includes labor and vehicles. Under this option Arches would reimburse the service vendor for vehicle depreciation or lease costs as part of the negotiated service rate. While FTA‟s capital cost of contracting rules will also allow for reimbursement of up to 80% of the cost of depreciation charged through a service contract, it is not clear if these rules would also be allowed under the Paul S. Sarbanes program.
- **Purchase**: The second option is to purchase vehicles directly. Direct purchases can be facilitated with federal grants through a variety of sources. Most sources will cover 80% of the capital cost.

Given the uncertainty in the ridership estimates and because vehicle life is more than 10 years for heavy duty vehicles, it is recommended NPS lease vehicles for the first three years of the pilot program. This will allow NPS to measure ridership, peak vehicle loads, and wait times so that procurement decisions can respond to observed travel patterns. Arches can specify a permanent vehicle after the third year of operations.

Fuel and Propulsion

The principle consideration in determining fuel type is to balance the costs and benefits of the various fuel options. The recommended criteria for selection of a fuel type for Arches National Park are:

- Noise emission levels
- Air pollutant emission levels
- Life-cycle operations costs

These criteria correspond with the project goals of improving visitor experience, reducing air quality impacts of park transportation, and establishment of a financially viable congestion management strategy.

Given the rapid pace of change in vehicle technologies and performance standards, evaluation of fuel types is a challenging process. Many of the available studies provide conflicting information about vehicle performance. This is often a result of comparisons being made without controlling for differences in vehicle specifications, size, year, and practices unique to individual manufacturers. These issues are compounded when conclusions from national studies are applied to the operating environment in Arches National Park. Nevertheless, evaluation of life-cycle costs and benefits can guide the decision making process.

Six fuel types were evaluated:

- Propane
- Compressed Natural Gas (CNG)
- Hybrid
- Clean Diesel
- Biodiesel
- Electric

Table 6 outlines a comparison of noise levels, tailpipe GHG emissions and life-cycle operating cost per mile for each of the fuel types. Reliable information for propane vehicles was not available in a comparable format, but anecdotal evidence from Zion National Park suggests propane would perform equally well with the other fuel types presented. The primary disadvantage of propane is the limited supply of vehicles. Electric vehicles were ruled out based on the infrastructure requirements and impacts of today‟s electric vehicles. A more in-depth discussion of each fuel type is included in appendix F.

Based on the available performance and cost data, it is recommended NPS investigate hybrid, CNG and both clean diesel and biodiesel options. Prior to procurement of a service providers, NPS should work toward securing favorable partnership agreements with CNG suppliers to provide discounted or donated vehicles and capital support for a CNG fueling station. Given the strength of the local natural gas industry, there is potential to leverage a partnership as part of a broader public awareness campaign to promote local fuels and CNG.

If a compelling partnership has not emerged around CNG, Arches should leave this option open to the vendor. This can be accomplished by specify performance goals relating to air quality, operations and maintenance (O&M) costs, vehicle noise levels, and allowing the vendor to select a fleet capable of meeting the performance targets.

Table 6 Summary of Fuel Type Performance

Fuel Type	External Noise during Acceleration[6]	Tailpipe GHG Emissions[7]	Life Cycle Operating Cost per Mile[7]
Propane	78 dBA	N/A	N/A
Diesel Hybrid	70 dBA	Best	2.05
Compressed Natural Gas (CNG)	72 dBA	Roughly Equal	1.63
Clean Diesel	70 dBA		1.53
Biodiesel	70 dBA		1.55

[6] Noise data is based on samples from individual vehicles identified in FTA‟s Altoona bus testing facility database.

[7] Transit Bus Life Cycle Cost and Year 2007 Emission s Estimation. (2007) Accessed January 17, 2012. http://fta.dot.gov/documents/WVU_FTA_LCC_Final_Report_07-23-2007.pdf

SHUTTLE INFRASTRUCTURE AND DESIGNS

Shuttle Operations and Facilities

Park-and-Ride Lot

A park-and-ride lot will be necessary to accommodate the private vehicles of visitors riding the shuttle. If the shuttle service operates between destinations within the park only, this will need to be a large facility and should be located outside the park but in close proximity. The most likely site for this function is the uranium mining tailings remedial action (UMTRA) site along U.S. 191 just east of the park‟s southern entrance, although final approval for use of this site is still pending. For the purposes of this study, all analysis assumes a shuttle starting location of the UMTRA site. If the park-and-ride lot is farther away, shuttle operating time and costs may be slightly higher. If the park is unable to use the UMTRA sites, shuttle operational assumptions may have to be adjusted.

Given that a park-and-ride lot will be the first part of the Arches experience for many people, it is important that the lot be designed in the spirit of the National Park aesthetic and ethos even in the pilot project.

Size of Park-and-Ride Lot

It is estimated that peak parking demand at the park-and-ride lot will range between 200 and 250 vehicles at one time. Sampled entrance station vehicle entry and exit data from one week in September 2011 was used to estimate parking lot turnover at the park-and-ride lot. After approximately four hours of steadily increasing arrivals, park occupancy hits its peak around the middle of the day (11:45 AM – 2 PM) and then begins to decline. The park-and-ride lot must accommodate 23-28% of this peak park vehicle occupancy. The peak park occupancy figures from September were scaled up to match the shuttle design day of 1,910 vehicles to arrive at the park-and-ride lot size estimates.

To determine the portion of spaces that should be oversize vehicle spaces, the 2010 parking occupancy surveys were used to estimate the average percent of parked vehicles that were oversize. It was determined that 8-12% of spaces should be oversize spaces; this was scaled up because the park wants to encourage use of the shuttle by RVs. Therefore the park-and-ride lot should accommodate approximately 30 oversize vehicle spaces. Three to four shuttle spaces will also be needed to accommodate shuttle boarding, alighting and layover: one northbound boarding, one for southbound alighting, and at least one, ideally two layover spaces.

To accommodate these parking and shuttle space needs, the park-and-ride lot would need to be approximately 4-5 acres. The park should track parking occupancy in this parking lot to determine if the lot should be smaller or larger for long term implementation, if the park chooses to pursue a permanent shuttle.

The total spaces for each type of vehicle are summarized in table 7.

Table 7 Park-and-Ride Lot

Type of Vehicle Spaces	Number of Spaces
Standard Size Vehicles	230
Oversized Vehicles	30
Shuttle	3-4
Acreage	
Total Acreage Needed	4-5 acres

The lot would also need to be equipped with painted pedestrian crossings and curb ramps to ensure rider safety as well as signage (e.g. posted speed limits, pedestrian awareness) to orient visitors on where to pick up the shuttle. Additional lot requirements could include buffer planting and bio-retention areas to mitigate impacts from stormwater runoff. Basic passenger amenities must include a shelter for protection from sun and rain, seating, trash receptacles, restrooms, and drinking water.

In summary, beyond the spaces themselves, parking lot requirements include:

a. Painted pedestrian crossings and curb ramps
b. Signage (speed limits, pedestrian awareness)
c. Concrete wheel stops
d. Speed humps
e. Buffer planting and bio-retention areas (long-term)
f. Shelter for protection from sun and rain with seating and trash receptacles
g. Fee payment facility (kiosk/booth)
h. Restrooms
i. Drinking water
j. Wayfinding signage
k. Informational and educational signage

20-30 foot wide planting and biorention areas between the parking aisles are important but may not be feasible in the pilot project. It is recommended that the space be set aside in anticipation of a permanent facility and as a way to manage storm water through the pilot. This area may also be used to expand RV parking if additional RV parking is needed.

Should the pilot project be a success and a permanent parking lot constructed, additional components such as raised pedestrian crossings or other special landscape paving and planting treatments should be considered.

Park-and-Ride Layout

Given these requirements, there are two possible parking lot layout possibilities. Both are shown in appendix C. In model 1, the shuttle stops and passenger loading area are on the outside loop of the parking lot. The outside loop road serves as primary circulation for both shuttles and private vehicles. Model 2 separates private vehicles and shuttles by incorporating two loops. The passenger loading area is located between the two. Roads may be one-way or two-way depending on NPS preferences. Both models will accommodate shuttle system and passenger needs and final site planning should help determine which one is most appropriate.

In both models the shuttle parking bays utilize a sawtooth curb, as opposed to a linear curb, which can save a significant amount of space and allows for a more compact passenger boarding area. In both models a separate pedestrian network and clearly marked crossings are essential to creating an environment in which visitors can safely transfer from one mode of transportation to another.

Maintenance Facility

It is recommended to package maintenance, operations, and capital depreciation of rolling stock into a single service contract. As such, site selection, acquisition of land, and construction and/or lease of a maintenance facility would be the responsibility of the contractor and not the NPS. The following information will enable NPS to accurately articulate approximate facility needs to prospective contractors as part of the initial procurement process.

Approximate maintenance facility size is estimated using annual system miles and total fleet size. A spreadsheet model developed by the Minnesota Department of Transportation is used to estimate square footage requirements for maintenance bays, maintenance storage, tire storage, wash bays, and administrative services including employee parking. The results are summarized in table 8.

Implementation Options

Shuttle service can be operated in-house, through a concession, or through a third-party contract. Early feedback provided by NPS staff from Arches National Park indicated a strong preference for contracting transit service to a third-party provider. This guidance is reflected in the operating, maintenance, and capital cost assumptions. Operating costs reflect an adjusted average industry rate for third-party contracts of $75 per service hour. Adjustments include a 10% remoteness increase plus a 15% increase during the pilot project to cover vehicle depreciation costs included in the service contract.

Service contracts allow for a great deal of flexibility in determining how vehicle maintenance is performed. For simplicity during the pilot project, we recommend packaging maintenance, operations, and capital depreciation of rolling stock into a single service contract.

Shuttle Stop Designs

Every stop will be located within an existing parking lot in the park. Shuttle stop amenities will exist at each stop identified in the preferred route, although not all amenities are proposed for all stops. Every shuttle stop must be designed to allow the shuttle vehicle to pull out of the path of travel into a 40-foot-long by 10-foot-wide curbside space for passengers to enter or exit the shuttle. A 20-foot clear approach zone behind the stop is necessary as is a 10-15 foot clear egress zone in front of the stop.

There are two basic types of shuttle stops that will be required for the Arches shuttle: stops that accommodate only northbound shuttles will only require one shuttle space whereas shuttle stops that will accommodate north and southbound shuttles require space for two shuttles to stop. At the two-shuttle stops, an additional 40-foot shuttle space and a 10-foot buffer will be required to allow both shuttles to safely pull into and out of the curb.

At all shuttle stops, drivers should abide by a “stop-drop-and-go” policy, limiting dwell time to only what is required for passenger loading and unloading. This will minimize the chances for shuttle bunching, which would cause two shuttles traveling the same direction to arrive at once. If this occurs at the northbound only stops, the parked shuttle should offload passengers and move as quickly as possible, letting the second vehicle pick up the passengers at that stop to prevent the waiting shuttle from blocking traffic.

In the preferred route, the following stops will be required to be two-shuttle stops:

- Visitor Center
- Upper Windows
- Devil‟s Garden Trailhead

Table 8 Approximate Maintenance Facility Requirements

INPUT:	
Total Annual System Miles (from Transit Report or Projected)	298,000
Total Bus Fleet, all classes of buses	14
OUTPUT:	
MAINTENANCE BAYS	
Number of bays based on vehicle miles per year	2
Number of bays based on number of buses	1
Recommended Number of Maintenance Bays (average of above two rows)	**2**
WASH BAYS	
Recommended Number of Wash Bays	**1**
NECESSARY AREA FOR BAYS AND TRANSIT GARAGE	
Overall Maintenance Bay Area	1,685
Parts Room	685
Maintenance Storage	149
Tire Storage	250
Wash Bays	1,800
Administrative Office Space	1,058
Subtotal	**5,628**
Check: Total Maintenance Service Area based on fleet miles	4,717
Recommended Approximate Area of Transit Garage (average of above two rows rounded to nearest 500)	**4,900**
FUELING STATIONS	
Recommended Number of Fueling Stations	**1**
SITE AREA	
Automobile Parking Area	5,743
Total Area of Building	4,900
Total Site Circulation Area	4,900
Recommended Minimum Site Area (Acres)	**0.4**

Sources: Worksheet: Minnesota Department of Transportation; Inputs: Nelson\Nygaard, Inc. 2011

Shuttle Variants 1 and 2 would require Wolfe Ranch/Delicate Arch Trailhead and Delicate Arch Viewpoint stops to be two-shuttle stops. In lots where space is available, two-shuttle stops should be provided to better accommodate shuttle bunching if and when it occurs.

Diagrams of existing parking lots and suggested stop locations in those lots are included in appendix B.

The pilot project will require minimal additional pavement anywhere in the park, however, some existing private vehicle parking spaces will be eliminated to accommodate these shuttle parking spaces. The

shuttle stop shelter and seating area should always be on the same side as the shuttle doors to avoid passengers exiting into oncoming traffic.

Visitor Amenities

Four visitor amenities are recommended at each shuttle stop.

1. **Shelter** – This 8 foot wide x 12 foot long steel and wood four post structure will provide shade from the sun and optional protection from the rain. The recommended concrete footings are above ground which will allow them to be relocated should the need arise. The roof structure is shown as a latilla pitched roof which is a detail that is seen elsewhere in the Arches region. A vertical shade cloth stretched between two posts may give further protection to visitors (appendix A, figure 3).
2. **Bench** – A Benson Thermoplastic Expanded Steel Park Bench or Victor Stanley Model PRSNA-10 Production Series with recycled plastic slats is recommended (appendix A, figure 4).
3. **Wayfinding signage** – Small metal signs attached to existing park fences or a new post or the shelter itself are recommended to provide visitors with shuttle route information. Stenciled markings in the roadway may provide an additional low-cost wayfinding approach (appendix A, figure 4).
4. **Trash receptacle** – A park-approved wildlife-safe trash can is recommended (appendix A figure 4).

These components are depicted graphically in appendix A, figure 2.

Currently no additional drinking water facilities are proposed at Windows. To compensate there will need to be proactive and consistent messaging about the lack of water in the park.

These amenities should be installed on a concrete pad or stabilized decomposed granite (for pilot project purposes) located behind the existing sidewalk. To minimize clearing of vegetation, the exact location of each pad should be determined in the field. Cost estimates assume an area of approximately 200 square feet (approximately 10 feet by 20 feet).

SHUTTLE COST

Shuttle costs are broken down by administrative costs, O&M costs, and capital costs. Of these, O&M costs are the largest portion of the total life cycle costs for transit service. A summary of shuttle costs is shown in table 11, a detailed breakdown of costs is provided in appendix F.

Administrative Costs

Oversight and administration of the shuttle will require at least one full time seasonal senior-level manager on park staff. This transportation manager position is assumed to be a GS 11 working a nine-month season. The congestion management strategies call for responsibilities that will require a seasonal part-time mid-level professional trained in transportation planning and/or communication. The transportation demand management (TDM) coordinator is assumed as a GS 7 position working a seven-month season. Loaded NPS labor rates for these positions are provided in appendix F.

The transportation manager position should begin one year prior to implementation of the pilot project. This staff person will be responsible for negotiating the shuttle service contract, hiring the TDM coordinator, and coordinating with designers and contractors for final design and construction of the temporary shuttle facilities.

Capital Costs

Vehicle capital costs are not included for the 3-year pilot reflecting our recommendation to procure vehicles through the service contract. Additional capital costs associated with accompanying congestion management strategies include purchase of three portable variable message signs and upgrades to wayfinding signs throughout the park.

Capital costs for passenger facilities and other elements supporting the shuttle are divided into two phases. Phase 1 costs include elements required for the pilot project. The majority of these items are temporary or easily removable. These costs are programmed in year one of the pilot project, with an allowance for additional improvements in Year 2 to accommodate the operational requirements of shuttle variant 1.

Phase 2 costs reflect permanent installations required to support a long-term shuttle operation in Arches National Park these costs appear in Year 4 of the cost estimate.

Operations and Maintenance Costs

For the first three years of the pilot, it is assumed vehicles will be leased as part of the service contract. For full implementation the feasibility study includes cost estimates that assume purchase of vehicles utilizing available federal capital matching funds, which could cover up to 80 percent of the vehicle cost. Therefore, operations and maintenance costs during Years 1 - 3 include a vehicle depreciation premium which would be removed in Years 4 – 16. The base-year fully allocated hourly service cost is $94.88. However, given the uncertainty of the capital matching funding source, an additional long-term financial feasibility scenario was analyzed, discussed in the next section "Long Term Financial Feasibility".

For the pilot, the cost to operate the preferred shuttle system is approximately $1.2 M per year in 2011 dollars. Appendix F includes an escalation calculation to project actual operating costs for the anticipated opening year (2015). Table 9 shows the key cost drivers: frequency, span of service, miles, and travel time and the resultant seasonal operating cost for the Arches shuttle.

Table 9 Annual Operating Costs and Cost Drivers for Preferred Shuttle ($2011)

Route	Frequency and Span of Service	One-Way Miles	Approximate One-Way Travel Time	Total Vehicles Needed	Total Seasonal (Annual) Operating Cost
Main Shuttle	15 minutes 8 AM – 5 PM	NB: 30 miles SB: 25 miles	NB: 1 hr 20 min SB: 60 min	10	$1.2M

**Includes 20% spare ratio (10 vehicles + 20% spare ratio = 12 vehicles)*

For comparison, table 10 shows the key drivers and resultant seasonal operating cost for the potential adjustments to the main shuttle route described at the start of Section 1.

It should be noted that the full Class C cost estimates included in appendix F assume the operating cost of Variant 1 starting in Year 2 of the pilot project to accommodate this adjustment or a comparable relatively small adjustment to the shuttle system. If the park opts to implement Variant 2 or another adjustment to the system of comparable scope, this will increase operating costs beyond what is assumed in the cost estimates.

Table 10 Operating Cost Comparison for Variants on the Main Shuttle Route ($2011)

Route	Operating Season and	One-Way Miles and	Total	Total

	Schedule	Approximate Travel Time	Vehicles Needed	Seasonal (Annual) Operating Cost
Preferred Shuttle Route	Mid-May - Late September 8 AM – 5 PM Every 15 minutes	NB: 30 miles; 1 hr 20 min SB: 25 miles; 60 min	10*	$1.2 M
Increased Operating Hours	*Expanded Operating Hours*: 8 AM – 6 PM	Same as Preferred	Same as Preferred	$1.3 M
Increased Operating Season	*Expanded Season*: Mid-March - Mid-Oct. 8 AM – 5 PM	Same as Preferred	Same as Preferred	$1.8 M
Variant 1: Add Southbound Delicate Arch Stop	Same as Preferred	NB: 30 miles; 1 hr 20 min SB: 30 miles; 1 hr 12 min	11*	$1.3 M
Variant 2: Two Loop Route	Same as Preferred	NB: 30 miles; 1 hr 20 min SB: 14 miles; 36 min	15*	$1.9 M
Hiker Shuttle	Same Season as Preferred 7 AM – 10 AM Every 60 minutes	18-miles; 40 minutes	2**	$80,300
Sunset Shuttle	Same Season as Preferred (~ 6 PM – 9 PM) One Shuttle Run	14 miles; 33 minutes	1**	$40,100
Moab "Feeder" Route	Mid-May - end of September 8 AM – 5 PM Every 15 minutes	6.3 miles; 17 min	4	$0.5 M

**This does not include the 20% spare ratio that would be built into the system as a whole*

*** Vehicles for sunset and hiker shuttles could be sourced from the fleet serving the main route by coordinating schedules or by interlining the routes*

O&M costs for the shuttle system also include maintenance of the temporary park-and-ride lot, rental of temporary bathrooms at the park-and-ride lot, and congestion management-related efforts including labor for maintenance of variable message signs. The cost estimates in table 11 include all O&M costs for the shuttle system.

Table 11 Summary of Costs for Preferred Pilot Shuttle System

Cost	Start Up - 2014	2015	2016	2017
Administrative	$78,676	$150,302	$154,811	$159,456
Operations & Maintenance	-	$1,341,647	$1,562,926	$1,754,706
Capital	$202,827	$1,550,726	$68,223	$202,017
Total	**$281,503**	**$3,042,676**	**$1,785,960**	**$2,116,179**

SHUTTLE SYSTEM PERFORMANCE

The Arches shuttle system was designed to address the severe peak season congestion issues the park has experienced in recent years. The shuttle"s performance can be measured in terms of the reduction in the number of private vehicles that enter the park, or vehicle diversions. A summary of the congestion impacts of the shuttle is shown in table 12.

Table 12 Congestion Impacts and Cost of Preferred Shuttle System

Metric	Performance	
Vehicle Trip Diversion Rate	23%	28%
Daily Vehicle Trips Diverted	430	530
Peak Hour Vehicles Diverted	63	77

LONG-TERM FINANCIAL FEASIBILITY

During the pilot period, all vehicles would be leased through the contracted operator. To understand the long-term operational costs of implementing a shuttle system at Arches National Park, the feasibility study analyzes and compares the lifecycle costs of two scenarios for the subsequent 10-year period (2018 through 2027). The first scenario assumes the park continues leasing vehicles through the contractor, the second assumes the NPS purchases vehicles. Both of these scenarios assume that no grant money will be available to subsidize any of the capital costs for the shuttle system. Lifecycle costs for the ten year period for both purchased and leased vehicles are provided in table 13. A comparison of the total ten-year lifecycle costs are provided in table 14.

Table 13 Summary of Costs for Long-Term Operation

Cost	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Purchased Vehicles										
Administrative	$164,239	$169,167	$174,242	$179,469	$184,853	$190,398	$196,110	$201,994	$208,054	$214,295
Operations & Maintenance	$1,560,507	$1,607,322	$1,655,542	$1,705,208	$1,756,364	$1,809,055	$1,863,327	$1,919,227	$1,976,804	$2,036,108
Capital	$ 8,368,751									
Total	$10,093,498	$1,776,489	$1,829,783	$1,884,677	$1,941,217	$1,999,454	$2,059,437	$2,121,221	$2,184,857	$2,250,403
Total Discounted to $2012	***$8,407,601***	***$1,435,372***	***$1,434,081***	***$1,432,790***	***$1,431,500***	***$1,430,212***	***$1,428,925***	***$1,427,639***	***$1,426,354***	***$1,425,070***
Leased Vehicles										
Administrative	$164,239	$169,167	$174,242	$179,469	$184,853	$190,398	$196,110	$201,994	$208,054	$214,295
Operations & Maintenance	$1,792,425	$1,846,197	$1,901,583	$1,958,631	$2,017,390	$2,077,911	$2,140,249	$2,204,456	$2,270,590	$2,338,708
Capital	$1,481,457									
Total	$3,438,122	$2,015,364	$2,075,825	$2,138,100	$2,202,243	$2,268,310	$2,336,359	$2,406,450	$2,478,643	$2,553,003
Total Discounted to $2012	***$2,863,859***	***$1,628,380***	***$1,626,914***	***$1,625,450***	***$1,623,987***	***$1,622,525***	***$1,621,065***	***$1,619,606***	***$1,618,148***	***$1,616,692***

Table 14 Comparison of Total Ten-Year Costs (2018-2027)

Cost	Purchased Vehicles	Leased Vehicles
Administrative	$1,882,821	$1,882,821
Operations & Maintenance	$17,889,464	$20,548,140
Capital	$8,368,751	$1,481,457
Total	$28,141,036	$23,912,418
Total Discounted to $2012	***$21,279,545***	***$17,466,626***

Overall, with no capital grant matching funds available, it would cost the NPS approximately $4.2 million ($3.8 million in 2012 dollars[8]) more if the park purchases vehicles after the pilot period than if they continue to lease vehicles from the contractor. Additionally, in 2029, the NPS would need to make an additional capital expenditure to acquire a new fleet of buses as standard heavy duty transit vehicles have approximately a 12-year lifecycle. The actual capital amount required in 2029 would vary depending on how many vehicles the shuttle service requires at that time, as well as the availability of new technology. Assuming the same number of vehicles and similar costs per vehicle, the park would need to spend $9.5 million ($6.9 million in 2012 dollars) to purchase 14 vehicles. All financial spreadsheets, including all assumptions, are provided in Appendix F.

[8] Note on 2012$: These figures are shown in 2012 dollars because the ongoing operating savings are spread over the life of the pilot whereas the one-time capital expenses are concentrated at the beginning of the 10 year period. Looking at all the expenditures in 2012 dollars is important to make an apples-to-apples comparison between the two scenarios today.

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SECTION 2: NON-SHUTTLE CONGESTION MANAGEMENT ALTERNATIVES

A range of non-shuttle congestion management strategies was also considered as a means to address the severe parking and congestion issues that Arches faces. In recent years, park visitation that exceeds park capacity occurs all day long on most days throughout the entire summer season. During the peak season the volume of visitors is so great and so consistent that it is impractical to incentivize visitors to arrive during off peak times of day or days of the week. The only way to make any significant impact on congestion is by directly controlling the number of visitors in the park at one time.

At this time, however, closing the park to vehicles after a certain capacity is reached is not desired by park staff. While the shuttle offers the best opportunity to accommodate current visitation levels without needing to accommodate their cars, two alternative non-shuttle options are considered here: The first is a reservation system capable of achieving the park‟s targeted trip reduction rate of 25%. The second is a low-cost, non-shuttle, non-reservation system designed to spread demand in time and space to treat the symptoms of chronic congestion.

RESERVATION SYSTEM

In response to the need to provide innovative and effective solutions for traffic congestion, a reservation system for Arches National Park could be considered as an alternative to the shuttle system. This could also be implemented as a complement to the shuttle, but is considered here as a stand-alone congestion management strategy. A reservation system would provide a systematic method to control the number of visitors entering the park in order to spread visitation more evenly throughout the day and throughout the season. Directly regulating the number of visitors allowed to enter the park at a given time would have a directly proportional effect on traffic and parking conditions in the park.

The system would not necessarily result in turning any visitors away from the park, but would mean that some visitors could not come at their desired time and day. This strategy would severely impact visitor experience for visitors who are unable to visit the park due to available reservations not aligning with their available time. A reservation system may also raise concerns about equity, as individuals who are uncomfortable with or have difficulties accessing the web-based or telephone system may feel disadvantaged. On the other hand, a reservation system would enhance the visitor experience in the park by reducing the potential for overcrowding at the sites and reduce visitor frustration arising from searching for parking. It would also create more certainty for visitors when making plans to visit Arches National Park.

A reservation system would allow the park to control overall traffic volumes on an hourly basis. For example, a number of vehicle slots could be allocated per half hour and these could be reserved in advance. For “drive-up” visitors, if all the slots for that time period have been reserved, the park gates will be closed and they will not be permitted to enter. If there are slots still available, they will be able to enter. One potential option to mitigate the equity issue mentioned above would be to save a certain number of entries for “drive ups” and have those available on a first come first serve basis at the park entrance gate.

In this way, overflow parking and roadway congestion can be more readily controlled, especially if the number of slots is set based on the total number of parking spaces available. As the number of visitors in the park at one time decreases, overall traffic safety will improve due to lower traffic volumes and parking demand. Adjustments could be made as necessary for seasonal fluctuations.

Recreation.gov

Recreation.gov is part of the Recreation One-Stop E-Gov initiative that provides a single point of access to information about Federal recreational activities and reservations. Management Policies 2006, Section 8.2.6.2 establish Recreation.gov as the preferred provider of reservation services for all federally managed parks and public lands. Recreation.gov provides a comprehensive source of information about thousands of Federal recreation opportunities. The website is provided under the National Recreation Reservation Service (NRRS), a Federal interagency program which delivers recreation reservation services for participating partner agencies under a contract administered by the U.S. Forest Service.

NRRS is a web based inventory management system that allows end users, government recreation employees and call center agents to search for, reserve and enter payment information through a web browser. It is implemented as an interagency recreation portal providing campground/tour reservation services and trip planning information for Federal recreation sites. The NRRS consolidates recreation-related reservation and trip planning services for the Army Corps of Engineers, Forest Service, NPS, Bureau of Land Management, and Bureau of Reclamation at the Recreation.gov web portal. Recreation.gov is designed to handle all aspects of a reservation for reservable Federal sites and activities. NRRS is developed and operated by Reserve America.

Sales Channels

Recreation.gov offers three main sales channels for customers to make reservations: Internet, call center, and in person at field locations.

- **Internet Sales -** Recreation.gov serves as the Federal recreation and activity website portal. It also provides customers with the ability to directly access reservation services for facilities and activities.
- **Call Center Sales -** Customers may call 1-877-444-6777 toll free to connect to one of a team of sales agents who process the reservation request.
- **Field Sales Channel** – The Field Sales Channel allows a walk-up customer to come to a participating recreation site that is equipped with the required computer and communications capability and book either an immediate reservation or an advance reservation. Field personnel utilize different applications dependent upon their specific need (camping, tours, wilderness permits, etc.) to provide field sales for customers.

Implementation Procedure and Costs

In order to add a new facility to Recreation.gov for reservation services, a representative from Arches National Park must contact an Agency Technical Representative (ATR) at Recreation.gov to discuss the facility, inventory process, and expectations. It is necessary to understand the demand and use patterns in order to achieve desired congestion management results. Once it is determined that the facility has potential to be successful to serve customers recreational needs, a new inventory request must be completed so it can be added to the system. The Help Desk and Inventory (HDI) service personnel will work with park staff to define a plan and timeline to identify all required steps for incorporating the new facility into the reservation system.

All contractor costs are paid by the customer when they make a reservation depending on how the reservation is made. For example, a ticketing reservation made through the Reservation.gov call center costs $3.18, an internet reservation, $2.80, or reservation made at the park using the contractor"s separate field sales application, $0.45 (see table 15).These costs can be added to the cost of the permit or reservation.

While there are no start-up costs to join Recreation.gov, park fees must be raised to cover the transaction costs charged by the Recreation.gov contractor. According to material provided by the NPS Recreation.gov liaison, all proposals to raise fees to offset Recreation.gov contractor costs must be approved by the Associate Director, Business Services according to procedures in RM-22A, Chapter 3 and the annual memorandum from the Director.

Table 15 Current Contract Line Item Numbers for Recreation.gov - 2011

Ticketing - Cost per Reservation	
Toll Free Call Center	$3.18
On the web at www.Recreation.gov	$2.80
On site at the park	$0.45

Cost

A reservation system can be very low-cost to a park because ticketing fees are passed to visitors. A summary of costs for the reservation system is shown in table 16, a detailed breakdown of costs is provided in appendix F.

Administrative Costs

Implementation of a reservation system would require a portion of park staff time to coordinate with the Recreation.gov ATR personnel. However, reduced visitation would likely reduce demand for park staff in other capacities. Administrative costs, therefore, assume no net increase in staffing for a reservation system. It is assumed any additional staff time needed to coordinate with the Recreation.gov ATR personnel will be facilitated through reassignment of existing staff.

Capital Costs

Capital costs include computers and ticketing machines. Ticketing machines are estimated to cost approximately $1,600 each. Computers are estimated at approximately $2,500 each. We assume a total of five ticketing stations: one at each entrance station window plus two at the MIC in downtown Moab plus one extra to be placed at a location at the discretion of local park staff. Useful life of ticketing machines and computers is estimated at five years.

Operations and Maintenance Costs

The majority of on-going operations and maintenance costs associated with a reservation system would be passed on to visitors through the ticketing fees identified above. Costs that would be incurred locally include annual fees for high-speed internet. Contractor prices include custom ticket stock.

Table 16 Summary of Costs for Reservation System

Cost	2013	2014	2015
Administrative	-	-	-
Capital	$22,000	-	-
Operations & Maintenance	$4,000	$4,000	$4,000
Total	**$26,000**	**$4,000**	**$4,000**

Revenue

Limitations on visitation will reduce annual revenue received by the park. A 25% reduction in visitation would likely result in a proportionate 25% reduction in annual revenue. Anecdotal evidence from implementation of reservation systems in other parks suggests the incremental fee charged to make the reservation does not have a significant effect on demand.

Performance

The primary performance measure used to estimate benefits of the shuttle system is number of trips diverted during the shuttle season. With a reservation system, it is in the park‟s control to determine how many visitors enter the park and how many cars are diverted; therefore the "trip diversion rate" is an input rather than an output in this system.

Ideally, the park would set the number of available permits to reflect park capacity so that severe congestion issues are avoided. The number of vehicles in the park is affected by entrance patterns and length of stay so the number of permits available per hour would have to be determined based on average entrance and exit patterns to arrive at hourly vehicle entrance maximums. The number of permits should be made available hourly. In the initial year of implementation, the park would likely have to make adjustments during the season to release fewer or more permits in order to determine the optimal level.

Translating a reservation system into trip diversion rates is difficult because the rate of vehicles turned away will vary dramatically by hour, day and month. The park has set a goal of 25% of peak season trips diverted as a goal for the shuttle system. Therefore, to allow for comparability, a 25% trip diversion rate is also used for the reservation system. This may mean a lower trip diversion rate during the shoulder season and days of the week with lower visitation, and a higher rate during the peak of the peak. Overall, the park is aiming for a 25% diversion, so that is the metric used in the cost-benefit analysis.

It should be noted that this does not necessarily mean 25% of would-be visitors would not be permitted to visit the park, but some portion of visitors would not be able to visit at their desired time or at all.

NON-RESERVATION, NON-SHUTTLE CONGESTION MANAGEMENT STRATEGY

A congestion management only strategy is intended to reduce the traffic congestion in the park by diverting the number of cars in one location at one time. In contrast to a shuttle or reservation strategy that diverts the actual number of cars that enter the park, a congestion management strategy works to spread peak demand at certain locations in the park on certain days by communicating with park visitors and local partners. The congestion management only strategy outlined in this section is a relatively low cost strategy if implemented alone.

Administrative Cost– Transportation Demand Management Coordinator

A congestion management strategy would require a TDM coordinator to proactively manage traffic and parking in Arches. The TDM Coordinator would have five primary responsibilities:

1. Provide up-to-date peak congestion information on the park‟s website
2. Foster partnerships with area hotel, campground, and tourism bureaus to communicate specific messages about park congestion and preferred visitation times
3. Develop and market new tours at the park to disperse demand, such as dawn tours, sunset/night sky tours, and off-season activities
4. Update the information on the variable message signs and radio dispatch

5. Manage temporary staff stationed throughout the park to disperse congestion at peak times

This position would require one full-time mid-level professional staff, and some administrative support. The administrative costs include one full-time staff plus approximately one tenth FTE administrative support. Based on discussions with park staff, this small amount of administrative support does not need to be itemized as a project cost. Loaded NPS labor rates for the TDM coordinator position are provided in appendix F.

New marketing materials will need to be produced to communicate with community partners and park visitors. Based on correspondence with park staff, additional marketing budget will not be needed to accommodate these materials.

Capital Costs – Signs and Radio System

This non-shuttle congestion management strategy requires variable message signs and a highway advisory radio system to communicate with park visitors in real time. Three variable message signs would be required to communicate traffic and parking information to park visitors. These signs could be located on U.S. 191 north of the Arches entrance for southbound traffic and in Moab for southbound and northbound traffic. However, we recommend that these signs be portable to accommodate future needs. Although the signs might only be needed during the high season, a lifecycle cost analysis determined that purchasing the signs instead of renting them on a daily basis would be more cost effective.

The highway advisory radio system will be needed to communicate with park visitors. Variable message signs can be used to trigger visitors to tune into the radio station and receive parking and congestion updates. The TDM coordinator can also use its existing online social media resources, such as Facebook and Twitter, to communicate with park visitors at no cost.

The TDM coordinator will control the variable message signs and advisory radio broadcasting. Additional new static signs may also be needed. The TDM coordinator would need to do an inventory of existing signs in the park to determine where improved signage and wayfinding are needed. Based on a preliminary assessment of the park, eight new signs are included in this cost estimate.

Operations and Maintenance Costs – Parking Coordinators

Temporary parking coordinators would be needed during the high season at three parking lots for an estimated four hours per day. These coordinators will monitor parking congestion levels and communicate parking congestion information in real time to the TDM coordinator. Five radios will be needed for parking coordinator communications.

The variable message signs will also require annual operations and maintenance, estimated at $1,400 per year per sign.

Total Cost

Costs for this congestion management strategy are broken down by administrative costs, O&M costs, and capital costs. A summary of costs for the non-shuttle, non-reservation system is shown in table 17, a detailed breakdown of costs is provided in appendix F.

Table 17 Summary of Costs for Non-Shuttle Non-Reservation Congestion Management Strategy

Cost	2013	2014	2015
Administrative	$40,000	$41,000	$42,000
Operations & Maintenance	$12,000	$13,000	$13,000
Capital	$120,000	-	-
Total	**$172,000**	**$54,000**	**$55,000**

Performance

The goal of this transportation planning effort is to improve visitor experience and reduce the number of private vehicles entering the park. The non-shuttle, non-reservation congestion management approach described in this section relies on partnerships, visitor information, and access management to distribute visitor demand, either within the park or over the course of the year. In this scenario, the benefit is not measured by the number of cars diverted. Therefore, this strategy does not offer an apples-to-apples comparison to the reservation system or shuttle strategy. Instead, this strategy aims to spread peak demand throughout the park in order to limit congestion in certain areas.

To assess the benefit of this congestion management strategy, a new metric other than „cars diverted" will need to be established. For example, a before and after study could be done that analyzes the number of cars parked at popular viewpoints on high demand days, such as Delicate Arch. The benefit of the strategies outlined in this section would be determined based on the number of parked cars reduced, assuming that the total number of visitors to the park that day did not change substantially.

For comparability, a trip reduction rate of 1 – 2% is assumed in the cost benefit analysis tables in appendix F.

SECTION 3: COST-BENEFIT ANALYSIS

A cost benefit analysis was conducted for the shuttle system, reservation system, and non-shuttle, non-reservation congestion management strategy using the cost and performance information provided in earlier sections of this report. Table 18 summarizes the first-year cost benefit analysis for each of the strategies.

Cost estimates are based on base year 2011 estimates, escalated to the year shown in the annualized cost estimate tables provided in appendix F. Assumptions for quantities and unit prices are also shown in the detailed tables provided in appendix F.

Table 18 Summary of First-Year Cost Benefit Analysis

	Shuttle System	Reservation System	Non-Shuttle, Non-Reservation Congestion Management Strategy
Total Annual Cost ($M)	$3.042 M	$0.026 M	$0.172 M
Net Operating Subsidy ($M)	$0.59 M	$0.004 M	$0.052 M
Total Annual Trips Diverted	175,900	197,000	9,900
Total Cost per Visitor Trip Diverted	$17.29	$0.13	$17.38
Net Operating Subsidy/Trip Diverted	$3.40	$0.02	$5.26

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SECTION 4: IMPACTS ANALYSIS

Overall, most park resources would experience long-term beneficial impacts from the reduction in the number of private vehicles traveling in Arches. However, the implementation of the pilot shuttle system has the potential to both beneficially and adversely impact individual park resources. To provide an initial assessment of potential impacts to all park resources, a draft Environmental Screening Form has been completed and is available in appendix E.

SOILS

A large percentage of park land surface is exposed bedrock or shallow soil over bedrock with sparse land cover (NPS 2006). The soils in the park are generally very susceptible to damage by trampling, unplanned foot traffic, and social pull-offs outside of designated parking areas. The shuttle aims to reduce congestion throughout the park and eliminate the need for visitors to park on the shoulder of the road when parking spaces are at capacity. As a result, soils disturbance would be reduced and there would be beneficial impacts to this valuable park resource.

If paving or the redesign of the layout of certain parking areas is needed to accommodate a park shuttle, there may be short-term disturbance of soils immediately adjacent to existing parking areas. Soils in these areas are likely to have been previously disturbed by social trailing and/or vehicle parking. However, any soil disturbance in an arid environment can have a negative impact; therefore impacts could vary from negligible to moderate. Additional short-term soil disturbance may occur from the installation of temporary shade structures at the shuttle stop locations within the park, but this impact is expected to be minor.

AIR QUALITY

Grand County, which includes Arches National Park, is in attainment for all criteria pollutants regulated under the Clean Air Act‟s National Ambient Air Quality Standards. In 1977, Arches National Park was designated as a Class I air quality area, which requires the highest protection under the Clean Air Act (NPS 2006b). While major sources located in both Colorado and Utah, such as power plants, mineral extraction, and off highway vehicle use, impact the park‟s air quality, vehicle emissions are the biggest source of emissions within the park. The park contains air quality related values (AQRVs), including vegetation, wildlife, visibility, and night skies. Currently, visibility is the most sensitive AQRV within the park (NPS 2006b). The implementation of a shuttle system within Arches would result in long-term beneficial impacts to air quality from the reduction of private vehicle emissions within the park. A greenhouse gas (GHG) emissions analysis was completed for this feasibility study and projected that there would be a reduction of between 528 – 796 tons of carbon dioxide emissions within the park. The full GHG analysis is provided in appendix D.

SOUNDSCAPES

The impact to soundscapes from the implementation of a park shuttle will require additional information, including the type of fuel used for the park shuttle. Private vehicles in the park can range from quiet hybrid passenger cars to large diesel trucks or RVs, so the impact of the park shuttle on the overall soundscapes of Arches would not be expected to be significant.

VISITOR EXPERIENCE

Overall, the shuttle would be expected to have a long-term beneficial impact on park visitors. It will expand the range of modes available to visitors for experiencing the park. For those visitors in oversized vehicles, which can be difficult to navigate on narrow park roads, the shuttle will provide an alternative means of accessing the park. This beneficial impact would not be limited to those visitors riding the

shuttle, but also to the other visitors who will benefit from fewer cars on the roads and more available parking spaces.

PARK OPERATIONS AND MANAGEMENT

The shuttle system would impact on park operations due to the increased cost of operating the shuttle. This impact could be mitigated through grant money and the implementation of a transportation fee included in the park entrance fee. Impacts to park management would also include the additional duty of managing the contractor of the pilot shuttle as well as implementing the congestion management strategies. However, park staff, including Law Enforcement Rangers, are currently spending a great deal of time managing parking lots and congestion within the park during peak times, so the implementation of the park shuttle would reduce the need to have full time staff monitoring parking lots and allow these staff members to dedicate their time to other park priorities.

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As the nation‟s principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering wise use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historic 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. The department also promotes the goals of the Take Pride in America campaign by encouraging stewardship and citizen responsibility for the public lands and promoting citizen participation in their care. The department also has major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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