

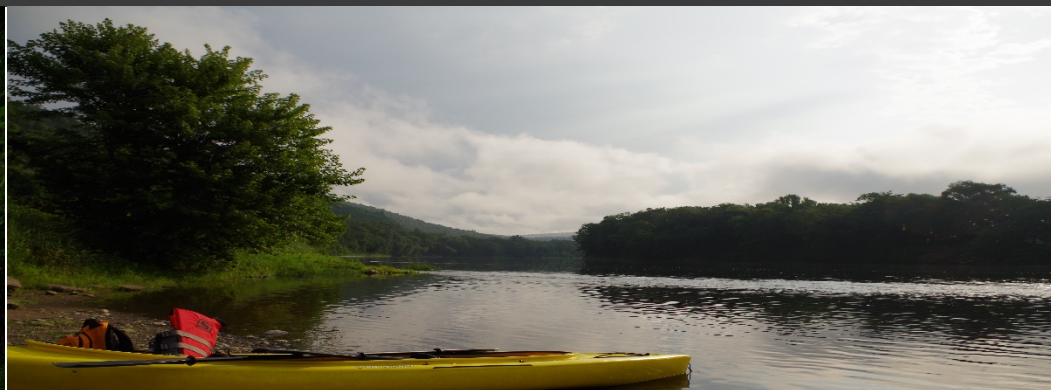


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FINAL REPORT

SYSTEM EVALUATION & OPERATIONAL ANALYSIS FOR PARK SHUTTLE SERVICE

10.27.2017



PREPARED FOR:
DELAWARE WATER GAP NATIONAL RECREATION AREA

SUBMITTED BY:
RSG

IN COOPERATION WITH:
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List of Abbreviations

ABA	Architectural Barriers Act
ADA	Americans with Disabilities Act
ADT	average daily traffic
ATF	alternative transportation feasibility
BAOT	boat at one time
CET	Cascades East Transit
CNG	compressed natural gas
DEWA	Delaware Water Gap National Recreation Area
DWG	Delaware Water Gap
DWGC	Delaware Water Gap Connector
FDR	Franklin Delano Roosevelt
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GHG	greenhouse gas
KPVC	Kittatinny Point Visitor Center
LRIP	Long-Range Interpretative Planning
MCTA	Monroe County Transit Authority
MUTCD	Manual on Uniform Traffic Control Devices
NER	Northeast Region
NPS	National Park Service
PAOT	passenger at one time
PEEC	Pocono Environmental Education Center
PennDOT	Pennsylvania Department of Transportation
QR	Quick Response (“QR”) Code
TDM	transportation demand management
TRIPTAC	Transit in Parks Technical Assistance Center
VMS	variable message signs
VUM	visitor use management

EXECUTIVE SUMMARY

THE PARK

The Delaware Water Gap National Recreation Area (DEWA) is a unit of the National Park Service (NPS). The linear park comprises approximately 105 square miles and 40 miles of the Middle Delaware National Scenic and Recreational River in northeastern Pennsylvania and northwestern New Jersey. It attracts visitors to its hiking and biking trails, boating and swimming opportunities, and picnic areas.

DEWA is one of the largest public use open spaces in one of the most heavily populated regions in the United States. Proximity to such a large population—and being within driving distance of some of the country's largest metropolitan areas—is one of DEWA's greatest strengths and one of its largest challenges. Visitation to the park is high, estimated at somewhere between three and five million visitors each year. Most of the visitors travel to DEWA by car, and many visitors stay for a single day.

High visitation means that DEWA staff practice deliberate park management. Staff members provide programs and resources that balance the need to preserve and protect the natural beauty of the Delaware River and surrounding mountains with the need to provide recreation opportunities for a diverse group of visitors.

THE PILOT PROGRAM AND THE RIVER RUNNER SHUTTLE

To support the accessibility of travel to and from DEWA and between sites within the park, and to address the negative impacts of vehicular travel in and around the park, NPS partnered with the Monroe County Transit Authority (MCTA) to introduce a public transportation pilot program in 2011. With funding assistance from the *Transit in Parks* Program, a weekend shuttle service, branded as the River Runner, has been operating every summer since.

The shuttle evolved from an Alternative Transportation Feasibility (ATF) study, led by DEWA to inventory existing transportation resources. Since 2011, the shuttle system has been adjusted and refined throughout the pilot phase. In 2017, the shuttle was in its final pilot phase and was scheduled for three independent analyses:

1. Shuttle system evaluation and operational analysis (the focus of this report).
2. Financial/business plan.
3. Marketing and communication plan.

The primary reasons for operating the River Runner are to provide alternatives to driving within DEWA, and to provide options for visitors to travel within the park. The shuttle was also intended to support the following stated visitor and resource goals for DEWA in the most cost-effective manner:

- Improve visitor experience.
- Reduce traffic, congestion, and parking demand.
- Reduce pollution.
- Maintain water quality.
- Protect sensitive species.

DEWA, through both the ATF study and other planning and management plans, identifies the shuttle as an important strategy to achieve the goals listed above, but also as a tool to help encourage historically disadvantaged communities to use the park, and increase access to DEWA from nearby population centers.

THIS STUDY

This report describes the shuttle system evaluation and operational analysis study. It is based on field observations, research, and analysis conducted between June 2017 and October 2017 by RSG and Connetics Transportation Group (CTG). The CTG team focused on the operations of the River Runner Shuttle, and the RSG team focused on the supporting transportation infrastructure.

THIS REPORT

This report documents the tasks undertaken in the study and provide short- and long-term recommendations for shuttle enhancement and general transportation improvements in the park.

SUMMARY OF FINDINGS

This report identifies the following issues as existing challenges and areas for improvement that will benefit the park's shuttle, safety, and visitor experiences:

River Runner Shuttle	General Transportation
• Northbound morning trips carry most riders • Southbound trips have low ridership • Capacity constraints in high ridership times • Mostly boats, but also riders • Ridership is concentrated at a handful of stops • Some stops are hardly used at all • Shuttle is frequently late • Capacity issues/loading boats • Congestion at canoe launches • Awareness/understanding is low	• Parking and operations barely accommodated the peak demands • Overflow parking and procedures exist but could be optimized • Road user safety: areas of high risk • Opportunity for greater bicycling uses • Inconsistent wayfinding and directional signage • Opportunity for parking space optimization • Parking management plan should be prepared to organize seasonal peaks, overflow, and demand management strategies



RECOMMENDATIONS

This report identifies the following short-term transportation measures:

Strategy	Guidance	Total Cost
Motor Vehicle Safety		
Yellow Flashing Warning Beacon with Signage	Post-mounted; solar power	\$24,000–\$72,000
Radar Speed Feedback Signs	Solar; to be on same post as static speed-limit sign	\$12,000–\$36,000
Centerline Rumble Strips	See most recent FHWA guidance	\$3,000–\$9,000
Trim Foliage to Improve Sight Distances	May involve tree removal	\$2,000–\$20,000
Transit Rider/Driver Safety	Part of shuttle education videos	\$4,000
Bus Pull-offs for Stops Along Main Roads	May include earthwork, tree removal	\$200,000–\$250,000
Bicycling Safety		
Shared-Lane Markings “Sharrows”	See most recent MUTCD guidance	\$45,000
"Bikes May Use Full Lane" Signage	MUTCD R4-11 sign	\$14,000
Restripe Roadways for 10-foot Travel Lanes	See most recent MUTCD guidance	\$400,000
McDade Recreation Trail Maps	Map of the trail with difficulty levels and access points; insert into existing info signs, if possible	\$300–\$1,600
Signage Warning Bicyclists of US-209 and River Road	On-road signage	\$1,200
Bicycle Network Plan	Conduct a study of existing conditions and create a bicycle master plan	\$50,000

Strategy	Guidance	Total Cost
Wayfinding/Navigation		
Install Large Signs at Driveway Entrances, Visible from Main Road and Access Road, When Applicable	Consistent with existing/desired park signage style (wood posts, brown panels)	\$1,600–\$4,000
Trim Foliage Where It Blocks View of Signage	May involve tree removal	\$800–\$10,000
Install Wayfinding Signage Along Roads Used to Access Sites Off the Main Roads	Consistent with existing/desired park signage style (wood posts, brown panels)	\$3,000–\$6,000
Parking Lot Capacity / Circulation Efficiency		
Monitor Tandem Space Demand and Restripe for Cars If Tandem Spaces Remain Underutilized	Combine with road striping if possible	\$300–\$500 if combined with other striping work
Install Signage at Designated Tandem Spaces to Prohibit Cars Without Trailers	Be consistent with signage text, size, and placement	\$1,000–\$2,500
Overflow Situations		
Provide Notices Online and at Visitor Centers About Lots That Regularly Fill and What the Alternatives Are	Brief message	\$0
Post Real-time Updates on Social Media and the Park's Website	Include within responsibilities of existing park employee, if possible	\$0
Portable VMSs	Be consistent with signage text, size, and placement	\$24,000
"Lot Full" Signs	Be consistent with signage text, size, and placement	\$2,000–\$3,000
A-frame Barricades & Traffic Cones	Be consistent with signage text, size, and placement	\$1,000–\$4,500



Strategy	Guidance	Total Cost
Enforcement of Illegal Parking	New seasonal park employees for weekends and holidays	\$7,000
Develop Overflow Parking Management Policy and Guidelines	In-house or assistance from a consultant	\$25,000
Construct Bathrooms, a Bus Shelter, and Landscaping at the Park and Ride to Make It More Welcoming	Coordinate with PennDOT	\$500,0000

Long-term recommendations call for additional improvements to the transportation network and moving toward stronger multimodal infrastructure to control travel to and through the park. The study identified that much of the parking resources within the park are at or over capacity during peak times. Most of the transportation capacity constraints at DEWA are associated with parking rather than roadway space. US-209 north of River Road and most of River Road has available capacity, but several key points on the network, namely the I-80 connection between the Park and Ride and the Kittatinny Point Visitor Center, are a major constraint. Parking constraints mean people are turned away at the entrances of several of the parking areas and must find another location in DEWA for their recreation activities. As people are turned away, they are arriving at the park earlier or looking for other locations and places for their outdoor activities.

A strategy to help DEWA manage the park would involve transitioning to more multimodal infrastructure that diversifies the transportation network and creates a system of managed access at the most popular and heavily visited sites. Under this more actively managed approach, the River Runner would likely continue to be the primary transit option for transporting people throughout the park, but additional shuttle services would connect intermodal services and remote parking to destinations within the park. Access to Smithfield Beach, Milford Beach, and Dingmans Falls would be allocated based on a mix of reservation systems and shuttle access.

The benefits of a more multimodal approach include the following:

- Additional options for travel to and around DEWA.
- Increased accessibility of park resources, especially for people with limited access to private automobiles.
- More controlled and easily managed access to DEWA's most highly visited sites.
- Increased reliability and predictability for visitors wanting to go to DEWA's most highly visited sites during peak times.
- Reduced vehicular traffic and congestion in DEWA on River Road and US-209.
- Reduced environmental impacts associated with vehicular traffic, including air pollution and greenhouse gas emissions.

Specific long-term recommendations include:

- Manage parking at Kittatinny Point Visitor Center: long term parking fees, manage overnight parking demands, move short-term parking demand to DWG Park and Ride.
- Manage parking at Smithfield and Milford Beaches: reservation system and reduce overall number of parking spaces to encourage use of site by shuttle users.
- Open river beach and canoe launch sites to shuttle riders only: establish specific areas only available to patrons of the shuttle. Creative incentives to encourage greater utilization.
- Develop a second driveway at Smithfield Beach: a northern loop to reduce congestion at the southern entrance.
- Restrict access to River Road: closing parts of the road to specific users, limiting private autos on much of River Road.
- Smithfield Beach shuttle: a dedicated short-run shuttle service between Kittatinny and Smithfield Beach.
- Milford Beach shuttle: a dedicated short-run shuttle service between downtown Milford and Milford Beach.

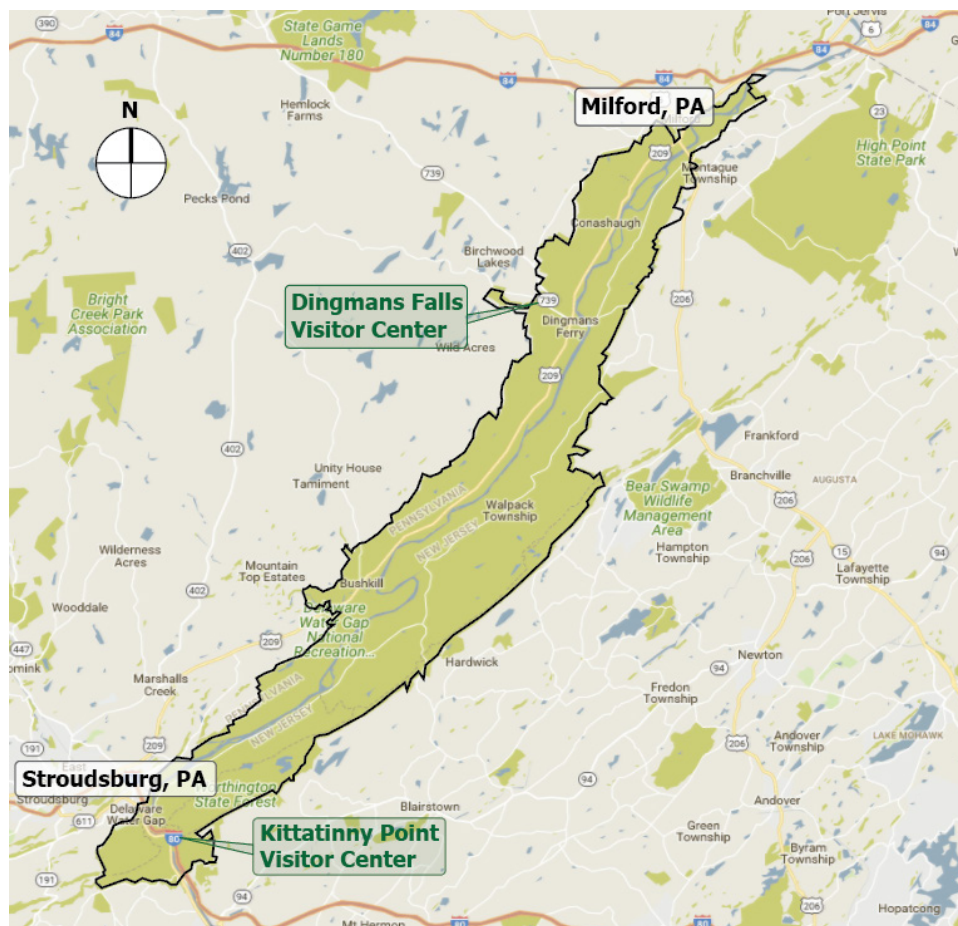


1.0 INTRODUCTION

1.1 | OVERVIEW

The Delaware Water Gap National Recreation Area (DEWA) is a unit of the National Park Service (NPS) and is in northeastern Pennsylvania and northwestern New Jersey. It is a linear park comprising approximately 105 square miles and 40 miles of the Middle Delaware National Scenic and Recreational River. People largely come to DEWA for the river and mountains. The Delaware River is a scenic, slow-moving river that flows from the Catskill Mountains in New York to Delaware Bay and the Atlantic Ocean. The area around the Middle Delaware River in DEWA includes numerous hiking and biking trails that provide access to the mountains and valleys. Hiking trails include the Appalachian Trail, a roughly 2,000-mile hiking trail that runs along the East Coast, connecting Georgia with Maine. Biking trails include the McDade Recreation Trail, which extends most of the length of the park on the Pennsylvania side and provides an opportunity to experience DEWA by bicycle or foot. Other facilities include cultural and historic resources that reflect the use of the area by Native American Indian settlements and early American settlers.

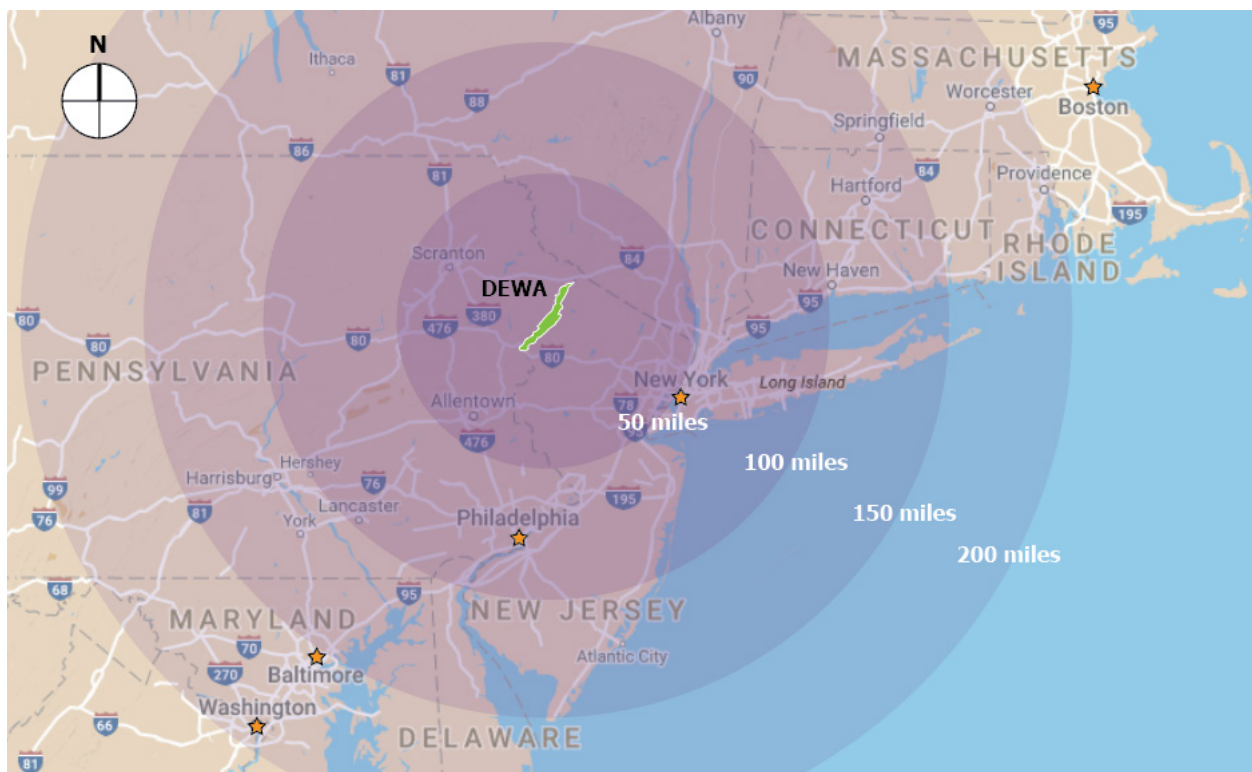
FIGURE 1-1: DEWA



Source: <https://snazzymaps.com/style/102607/basic-regional-and-local>. Markups: RSG.

DEWA was designated as a National Recreation Area by Congress in 1965. Under a separate act, in 1978, Congress also designated the section of the Middle Delaware National Scenic and Recreational River within DEWA as a part of the National Wild and Scenic River System. The purpose of DEWA and the Middle Delaware National Scenic and Recreational River is to preserve the natural, cultural, and scenic resources and values of the Delaware River valley and to provide opportunities for resource-based recreation, education, and enjoyment near the most densely populated region of the nation (Foundation Document 2014). DEWA is within 100 miles of some of the largest metropolitan areas in the United States, including New York City and Philadelphia. As a result, the park is within a two-hour drive of about 20 million people. Extending the radius to 300 miles captures the metropolitan areas of Baltimore, Washington, DC, and Boston. More than 60 million people live within a six-hour drive of the park.

FIGURE 1-2: DEWA PROXIMITY TO MAJOR METROPOLITAN AREAS



Source: Google Maps. Markups: RSG.

NPS and MCTA introduced a public transportation pilot program to DEWA in 2011 to further increase the accessibility of the park and reduce the negative impacts of vehicular travel. The shuttle service, branded as the River Runner, has been operating every summer since. The shuttle service and the supporting transportation infrastructure is the focus of this study.

1.2 | RIVER RUNNER

The River Runner shuttle (“River Runner”) began operations in 2011 as a cooperative effort between the National Park Service and the Monroe County Transit Authority (MCTA), with funding assistance from the *Transit in Parks* Program. It was designed to increase the accessibility of DEWA, both by providing car-free access to the park and by allowing people to travel between sites and locations within the park. The



shuttle evolved from an Alternative Transportation Feasibility (ATF) study, led by DEWA to inventory existing transportation resources. DEWA used the inventory to develop strategies to best manage resources in a way that would increase accessibility to the park and reduce negative impacts from vehicular travel, such as air pollution and congestion. This ATF study evaluated different transportation system options and recommended a bus shuttle option. The ATF recommended testing the shuttle option in the field and adjusting the service based on experience, so that the service would be grounded by ongoing analysis. Since 2011, the shuttle system has been adjusted and refined throughout the pilot phase. In 2017, the shuttle was in its final pilot phase and was scheduled for an evaluation with recommendations to guide the service over the short term (1 to 3 years) and long term (5 to 10 years).

The primary reasons for operating the River Runner are to provide alternatives to driving to DEWA, and to provide options for visitors to travel within the park. The shuttle was also intended to support the stated visitor and resource goals for DEWA in the most cost-effective manner. These goals include the following:

- Improve visitor experience.
- Reduce traffic, congestion, and parking demand.
- Reduce pollution.
- Maintain water quality.
- Protect sensitive species.

DEWA, through both the ATF study and other planning and management plans, identifies the shuttle as an important strategy to achieve the goals listed above, but also as a tool to help encourage historically disadvantaged communities to use the park, and increase access to DEWA from nearby population centers.

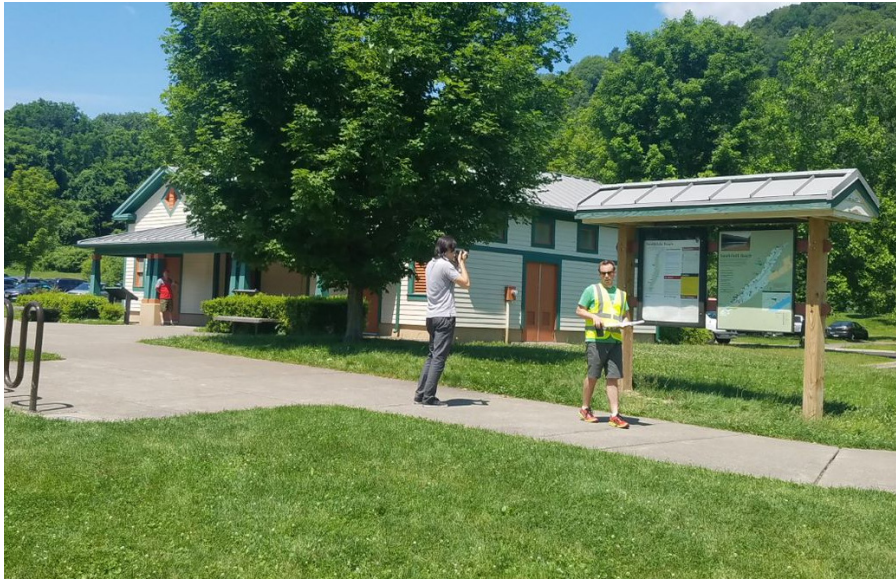
1.3 | STUDY GOALS AND OBJECTIVES

The purpose of the River Runner System Evaluation and Operational Analysis is to evaluate the previous six years of the River Runner System, conduct an analysis of the operations, and provide prioritized recommendations and associated costs and benefits to optimize the existing and future shuttle service. This report focuses on the River Runner service, but the analysis was conducted in conjunction with two other studies: a financial and business plan; and a marketing and communication plan. These additional studies were conducted as independent but coordinated efforts.

The National Park Service retained a study team to evaluate the River Runner. This team prepared the evaluation using a combination of primary and secondary data sources. Primary source data included three days of fieldwork that involved riding shuttle buses and counting vehicular usage of DEWA's primary parking lots. In 2017, the team conducted fieldwork on three weekend days: July 2, July 22, and August 6. These days were designed to be "peak" days when visitation at the park and ridership on the shuttle would be high. As a result, the fieldwork was scheduled but surveyors were dispatched only when the weather forecast suggested warm, sunny days. The purpose of surveying on peak days was so the team could observe the park and the shuttle during its most constrained operations.

The team spent one additional day in the field to observe and inventory traffic flow and safety challenges and inventory the availability of multimodal infrastructure/amenities at each stop. Surveyors also met with MCTA staff and toured the MCTA operations and maintenance facility.

FIGURE 1-3: FIELDWORK IN DEWA



Source: CTG.

SHUTTLE BUS FIELDWORK AND RESEARCH

The River Runner uses four buses, each of which is in service between eight and nine hours per day. The fieldwork team observed each trip once, with two trips sampled twice. As part of observing trips, the team conducted the following activities:

- Recorded passenger boardings and alightings; boat loading and unloading (canoes/kayaks/inflatables), and bicycle unloading and unloading.
- Observed operational characteristics such as shuttle arrival and departure times at each stop, shuttle dwell times, and traffic congestion.
- Observed passenger travel behavior, recording both origins and destinations.

Data collected in the field were combined with existing data points, including transportation and visitation studies conducted previously for and by DEWA staff; historical transit ridership and operations data collected by the MCTA, other relevant data provided by the National Park Service, and information provided by peer shuttle systems. Members of the study team also interviewed drivers for their input and perspective and visited the MCTA facility in Scotrun.

NONSHUTTLE FIELD WORK

A second group visited shuttle stops six times over the course of each observation day to conduct the following field work:

- Recorded the number of vehicles parked in parking lots at shuttle stops, including both legal and illegal/informal parking.
- Observed parking and circulation behaviors and challenges.
- Recorded the license plate state origins of parked vehicles twice during each observation day.



2.0 PARK VISITATION, PLANNING, AND PREVIOUS STUDIES

2.1 | OVERVIEW

DEWA is one of the largest public use open spaces in one of the most heavily populated parts of the United States. Proximity to such a large population—and being within driving distance of some of the country's largest metropolitan areas—is one of DEWA's biggest strengths and one of the largest challenges. Visitation to the park is high, estimated at somewhere between three and five million visitors each year. If the visitation were spread out evenly over 365 days, 5 million visitors equates to 13,700 people traveling to the park each day. In practice, however, visitations are significantly higher on some days and lower on others. Most of the visitors travel to DEWA by car, and many visited for a single day.

High visitation means that DEWA staff practice deliberate park management. Staff members provide programs and resources that balance the need to preserve and protect the natural beauty of the Delaware River and surrounding mountains with the need to provide recreation opportunities for a diverse group of visitors. The National Park Service has tracked visitation for several years and has conducted several studies to guide park program development and management. These data and previous studies were a starting point for the River Runner Shuttle Optimization Report and help inform and shape subsequent study findings and recommendations.

2.2 | VISITATION TRENDS

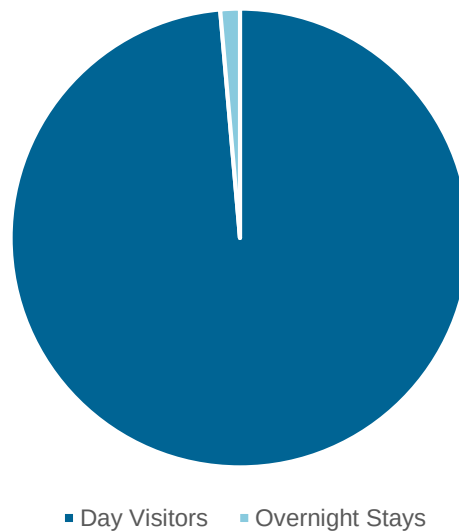
As mentioned, the National Park Service tracks and publishes estimates of annual visitors to DEWA; these data are also tracked by month. The NPS's changed its methods for collecting data on park visitation to create more consistency across NPS properties. However, the new methodology makes an analysis of visitation trends difficult to understand. Between 2011 and 2015, DEWA averaged over 4.5 million visitors each year. The new data collection methods suggest that visitation levels have declined, but anecdotal evidence suggests otherwise. Given the unreliability of visitation counts, for the purposes of this report and analysis, the study team placed annual visitation levels in 2017 at approximately 4.5 million visitors.

Approximately one-third of DEWA visitors, or between 1.4 and 1.8 million people, visit during the summer months of June, July, and August, with the largest number visiting in July. This has been the case historically and continues, even as the number of visitors overall softens. If summer visitors are spread evenly across the 92 days in June, July, and August, then 1.4 million visitors equals approximately 15,200 people per day. If half of the summer visitors travel to the park on weekend days, weekend day visitation could reach 70,000 people. As a comparison, the shuttle transported 168 passengers every summer weekend, on average, or 0.0024% of an "average" day. The shuttle is important in its current configuration, but it does not significantly affect traffic volumes.

Data collected reported in NPS Statistics, concessionaires managing campgrounds, and DEWA staff show that most of the visitors come to DEWA as a day trip, either as part of a longer trip to the region, or as a day trip from the nearby metropolitan areas. Overnight stays¹ constitute less than 2% of all visits (Figure 2-1).

¹ Identified as only those who pay for overnight camping within DEWA. Hotel accommodation in the surrounding communities as well as night stays on the Appalachian Trail are not included.

FIGURE 2-1: 2016 DEWA VISITATION



Source: NPS

2.3 | VISITOR USER GROUPS

DEWA has conducted research to understand why and how visitors come to the park. This is critical to developing effective and appropriate programming and management plans. This information also helps define how people will use the transportation resources in the park and what they need to make their visit successful.

NPS has reviewed and considered how visitors to DEWA are segmented a handful of times, most recently as part of the Social Science Research to support Visitor Use Management Plan (VUM Plan) currently underway at the DEWA. The VUM Plan report initially categorized visitors into four types based on the type of activity planned for the visit (front country visitors; river based user; trail-based users, anglers and hunters, and vehicle-based users). A subsequent analysis further refined the groups into people who visit the front country or developed access areas and those who visit the less-developed or remoter areas of the park. This categorization is consistent with other studies, including DEWA's Long-Range Interpretative Plan, which categorizes visitors into three groups: 1) structured visitors who travel to a specific part of the park for a specific reason, like a picnic at Smithfield Beach, or biking along the McDade Recreation Trail; 2) unstructured visitors who travel to more undeveloped parks of the park; and 3) road travelers who primarily drive through DEWA.

These market segments are important to the shuttle service design because they help define visitor behavior and needs, and the opportunities to meet those needs with public transportation or shuttle services. In its current form, the River Runner benefits river travelers by allowing them to easily access two locations on the river with one vehicle. River visitors tend to be structured visitors; they plan their trip to DEWA to participate in a planned activity. As river travelers, they may or may not have specific origin and destination access areas that they are targeting.

The shuttle could also serve front country users generally. Front country visitors tend to make structured visits and come to the park with a sense of where they intend to go. The shuttle may be able to serve



these visitors by providing connections from intermodal transportation centers or providing access to locations during peak visitation periods. The River Runner could also potentially serve the trail-based users, depending on how trips are planned and their needs to travel at the beginning or end of their hiking or biking trips. Users accessing less-developed areas of the park are a smaller portion of all visitors to DEWA and tend to be less likely to use the shuttle.

2.4 | DEWA PREVIOUS PLANS AND RESEARCH

OVERVIEW

As discussed, the River Runner followed a recommendation identified through an ATF study, conducted in 2009. In addition to this report, the National Park Service and DEWA led or participated in several studies and reports that influenced the development and operations of DEWA's existing transportation network. These reports include the development of a long-range plan and data and findings about visitor use, and the development of a long-range transportation plan, among others. As a starting point to the analysis, the study team reviewed these reports. This next section highlights the key relevant findings from the following reports (in reverse chronological order):

- Social Science Research to Support Visitor Use Management Plan at Delaware Water Gap National Recreation Area (ongoing).
- Survey Findings from the Visitor Use Management at Delaware Water Gap National Recreation Area (March 2017).
- DEWA Long-Range Interpretative Plan (September 2015).
- Northeast Region (NER) Long-Range Transportation Plan (LRTP) (2013).
- Delaware Water Gap Recreation Area Shuttle Project: Assessment and Development Program, Technical Assistance Report (March 2012).
- Delaware Water Gap National Recreation Area Alternative Transportation Feasibility Study, Final Report (June 2009).

SOCIAL SCIENCE RESEARCH TO SUPPORT VISITOR USE MANAGEMENT AT DELAWARE WATER GAP NATIONAL RECREATION AREA (2017)

In March 2017, Clemson University, on behalf of the National Park Service, published a study of visitor perceptions at numerous sites throughout DEWA, based on extensive in-person surveying and tabulation of field camera photographs. The study aided DEWA in developing a VUM Plan, which aims to set an appropriate level of activity, among other goals, throughout DEWA. Over 2,000 surveys were administered as part of this study. Surveys were conducted at several locations (e.g., trail heads, river access points, beaches) and were designed to gauge visitors' experiences, attitudes, and perceptions of overcrowding in the park. The study surveyed many locations served by the River Runner, such as Smithfield and Milford beaches. The findings revealed a general satisfaction with the park and support for actions that promote low-impact recreation, with issues such as litter, antisocial visitor behavior, and crowding viewed only as minor problems. However, one key finding was that approximately 10–20% of surveyed visitors had to change their planned activity due to overcrowding in the park. This means either choosing another location in the park or leaving the park entirely.

Related to this finding was a part of the survey that asked visitors, based on a series of photographs, to gauge a maximum level of crowdedness at a site before they would choose to leave, a value that the study called a "maximum acceptable passenger/boat at one time" (PAOT/BAOT). Clemson staff, via field cameras, monitored and tabulated the number of people, vehicles, and boats accessing the sites over the course of the summer and compared these figures with the PAOT or BAOT for each site. Usage at most of the sites did not approach or exceed the maximum acceptable PAOT/BAOT at any time. This seems to suggest that the 10–20% of individuals who experienced overcrowding, likely did so on the same day or days and in the same limited locations. For example, Smithfield Beach was observed to have exceeded the maximum acceptable threshold for PAOT on six occasions and came close on an additional three occasions. Nevertheless, thresholds were surpassed at only a few sites and on limited occasions, predictably during weekends and holidays.

Parking and traffic access was particularly constrained during the peak dates during the season although most weekends saw parking occupancy nearing capacity. Particularly important is the Kittatinny Point Visitor Center off I-80 in New Jersey; it is often full on weekends without sufficient guidance on where visitors should go and no advanced warning or other signage. Without information the stress of crowding can be a significant deterrent to future visitation.

SOCIAL SCIENCE RESEARCH TO SUPPORT VISITOR USE MANAGEMENT AT DELAWARE WATER GAP NATIONAL RECREATION AREA—SURVEY RESULTS (2016)

As part of the VUM Plan, the study team conducted surveys for 7 different visitor types at Delaware Water Gap National Recreation Area: front country (397 surveys), trails (240 surveys), vehicle (309 surveys), river (200 surveys), hunter (112 surveys), and fishing (91 surveys), combining for a total of 1,349 survey responses. Response rates were excellent for all visitor types (at least 91%) except for vehicle surveys, which had a response rate of 37%, (lower response rates are attributed to challenges associated with getting vehicles to stop). The study grouped key findings into three primary categories based on the questionnaire; 1) front country, trail, and river visitors; 2) hunter and fishing visitors; and 3) vehicle visitors.

Front Country, River, and Trail Visitors

- Visitors in this category were more likely to stay in DEWA for hours rather than days. For these day trips, river visitors' length of stay was about two hours longer on average than front country or trail visitors.
- Approximately 10% of each of these visitors reported not coming to the park at least once because of overcrowded conditions. However, over half of these responses said that it has happened less than three times.
- For front country visitors, Dingmans Falls, Smithfield Beach, and Milford Beach were the three most commonly visited locations. For trail visitors, the three most common were Raymondskill Falls, Dingmans Falls, and Bushkill Meeting Center/McDade Recreation Trailhead. River visitors reported that Dingmans Canoe Launch, Smithfield Beach, and Milford Beach as the three most visited places.

River Visitors Only

- River visitors were most likely to be repeat visitors, as indicated by 67% of respondents. The river visitors were also more likely to visit more often, averaging 35 visits over the last 5 years.



- Almost all the river visitors (88%) had either a kayak, canoe, or both. Most (83%) of river visitors did not have a paid guide. About 41% of river visitors have camped along the river at DEWA.

Hunting and Fishing Visitors

- Over the last 5 years, hunter visitors frequented the park an average of 46 times, while fishing visitors visited an average of 70 times, which were the highest two categories of any visitor type (excluding driving through).
- Among the reasons for choosing to hunt or fish in DEWA, liking the area was the most common response for both types of visitors. Proximity to home and knowing the area were also common for both visitor types.
- The quality of the hunting (fishing) experience being as good as or better than other locations was rated highly, averaging a 3.4 (3.6) on a scale of 1 to 5, with 1 being “Very Poor,” and 5 being “Very Good.” Moreover, all responses were rated 3.2 or higher for questions regarding quality of the visit, the facilities, recreational opportunities, habitat for game (fish), hunting (fishing) experience, space, aesthetics, and game (fish) population.

Vehicle Visitors

- Approximately 43% of the vehicle visitors were driving through because it was on their way to their destination (commuting through the park). Another 33% drove through for recreation, and another 29% said they were visiting. Drivers surveyed drove through an average of five times a week.
- A significant percentage (68%) of vehicle respondents do visit the park for recreational purposes, averaging 35 visits over the past 5 years.
- Of vehicle visitors, 99% live in the United States. The most common origin state was New Jersey (58%), followed by Pennsylvania (19%), and New York (11%).

Implications

- Nearly all respondents were aware that they were in a National Park Service unit.
- Most visitors are “front country, trail, and river” visitors. This contrasts with hunter and fishing visitors, who were part of a smaller sample but visit DEWA often.
- Visitors observed some crowding, but the reported severity indicated it was minimal. Front country and trail visitors reported the swimming area to be most crowded.
- Most visitors live in the United States; among these visitors, nearly all are from neighboring states. This suggests that DEWA is primarily a regional park.
- The most common reason for driving through the park was because it was on the way; however, over two-thirds of these respondents also report coming to the park for recreational purposes.

DELAWARE WATER GAP NATIONAL RECREATION AREA REGION LONG-RANGE INTERPRETATIVE PLAN (SEPTEMBER 2015)

The National Park Service uses the Long-Range Interpretative Planning (LRIP) process to create a vision for the future (5–10 years) for visitor experiences, and then helps match strategies and programs to match this vision. DEWA participated in an LRIP process beginning in 2014 and culminating in a final report published in September 2015. The LRIP planning process uses NPS goals to guide development

of interpretive themes for DEWA and provides insights into visitor expectations for park infrastructure, including transportation systems and shuttle services.

The interdisciplinary planning team that worked on this study articulated three goals for visitors' experiences at DEWA: 1) Access multiple venues for engagement, enjoyment, and finding inspiration; 2) find relevance and personal connection within a context of multiple points of view; and 3) practice stewardship within and beyond park boundaries.

As mentioned in 2.3, the report also categorizes users of the park into three types of groups:

1. **Structured visitors** are people who travel to a specific site for a specific experience. They may have visited the park at a previous time or are traveling with someone who has. This audience may be river users, or extended families, and young adults seeking opportunities for informal, day-long, picnic-style gatherings. The infrastructure of parking lots, picnic areas, and campgrounds is integral to their activities.
2. **Unstructured visitors** are defined as people who choose to avoid developed areas and crowds of people. They are more likely to travel to less-visited areas of the park, during less-visited times of year. Experienced recreationists may have limited interactions with facilities, interpretive exhibits, and park personnel.
3. **Road travelers** are people who travel on scenic routes through the park. They may or may not know they are in a unit of the National Park Service but are aware of the scenery. For these park users, wayfinding and park identification signs can serve as an invitation into off-highway experiences.

By identifying the different types of visitors, the LRIP also helps identify markets and user groups that need to be considered as part of transportation and shuttle service planning. Visitor market segments and their expectations for park infrastructure, programming, and access areas provide direction for transportation investments.

The report also identified areas for "focus of work." The focus areas include several strategies and include recommendations that span visitor experience, interpretation/education, and partnerships/volunteers. The focus of work areas include the following:

- Strengthen partnerships to make them more efficient and effective.
- Strengthen and refocus volunteer programs based on park priorities.
- Increase awareness of the park, its resources, and recreational opportunities to residents in counties that border the park.
- Increase awareness of the park, its resources, and recreational opportunities through electronic platforms.
- Increase visitor safety.
- Increase accessible recreational opportunities for visitors with physical disabilities.



NORTHEAST REGION LONG-RANGE TRANSPORTATION PLAN (2013)

The NER of the National Park Service includes approximately 20% of national park system units in 76 parks among 13 states extending from Maine to Virginia, including DEWA. The NER Long-Range Transportation Plan establishes a structure for transportation planning and decision-making to guide transportation investments.

This analysis is relevant to the DEWA Shuttle Optimization Report because DEWA is part of the NER, and transportation investment guidelines set the broader context for shuttle planning in DEWA. The NER Long-Range Transportation Plan sets five main goals for transportation assets in parks:

1. **Manage assets wisely**—findings and strategies related to managing assets focus on sustaining high-priority transportation assets.
2. **Ensure access, safety, and mobility**—findings and strategies in this section focus on providing a safe, efficient multimodal transportation system.
3. **Enhance visitor experience**—projects and programs to address the relationship between transportation assets and visitor experience.
4. **Protect resources**—projects that focus on maintaining high-priority transportation resources for the enjoyment of future generations and prioritizes strategies to improve air quality, protect wildlife, promote environmental sustainability, and both mitigate and adapt to climate change.
5. **Ensure sustainable operations**—strategies and programs to achieve sustainable operations goals and ensuring the long-term financial, partnership, and operational sustainability of the transportation system.

The five goals include the following recommendations that relate to the River Runner shuttle service (partial list of relevant recommendations in no particular order):

- Advance strategies to improve access, ensure safety, and mitigate congestion in the parks and gateway communities through local engagement in regional planning activities.
- Incorporate safety and congestion into project planning and prioritization.
- Consider the accessibility needs of all users with every transportation investment.
- Incorporate urban demographics and accessibility goals into project prioritization.
- Continue to take a proactive approach to gauging the need for and implementation of visitor management projects or operational strategies.
- Assess the risk and options to relocate, adapt, or decommission assets that have been identified as being vulnerable to the effects of climate change (severe weather, storm surges, erosion, and sea level change) prior to investing in assets. Consider transportation assets' role in protecting adjacent cultural or historic resources as part of this assessment.
- Promote more parks in the region to become Climate Friendly Parks; complete greenhouse gas (GHG) inventories, host climate workshops, and develop action plans or environmental management systems.
- Maximize energy efficiency and fossil fuel consumption during design and construction of park transportation system.
- Increase the use of high-efficiency and low-GHG emission vehicles and boats.
- Maintain and broaden partnerships and cooperative planning to fully integrate park service access needs at the community and regional levels.

DELAWARE WATER GAP NATIONAL RECREATION AREA ALTERNATIVE TRANSPORTATION FEASIBILITY STUDY, FINAL REPORT (JUNE 2009)

The River Runner was conceptualized in 2009 through an ATF study. The planning work done in this study has shaped the existing River Runner, both in terms of service design and operations. The goals of the service have remained consistent, but the service design has adapted in response to changing circumstances in the park.

The goal of the ATF study was to develop mobility options for visitors while conserving the park's natural, cultural, and scenic resources. Mobility options were evaluated against a set of five goals:

1. Enhance and diversify recreational opportunities for more people by creating a sustainable transportation system.
2. Address parking, safety, and congestion issues.
3. Improve integration of park with surrounding resources and gateway communities.
4. Promote healthy parks and healthy living.
5. Identify opportunities for public-private partnerships.

This process identified and evaluated seven types of transportation strategies. The transportation strategies included a no-action option, plus options that focused on developing new transportation projects (trail development), new transportation services (transit, water taxis, trolleys) and transportation demand management programs. From these high-level options, the ATF study started with 21 independent strategies. The strategies were screened against questions associated with operability, cost-effectiveness, alignment with goals, and minimizing environmental impact. After the screening process, 11 options remained, including a no-action option, 3 options focused on enhancing the trail network, 1 option oriented around transportation demand management strategies, and 6 options associated with a bus transit system.

The recommendations called for the development of bus service in the short term, with two bus routes. One route would be an extension of the existing MCTA Yellow Route to the Pocono Environmental Education Center (PEEC). The other route would be a River Road route. The River Road route was envisioned as a one-way loop traveling counterclockwise from Kittatinny Point Visitor Center to Bushkill Meeting Center via River Road, then traveling south on US-209 back to the Kittatinny Point Visitor Center. Over the longer term, recommendations called for a new route from Port Jervis in New York to the Bushkill Meeting Center to meet the Yellow Route at the PEEC. This three-route network would provide access from the park's southern end (Kittatinny Point Visitor Center) to the northern access point at Port Jervis. In conjunction with bus service designs, the ATF also recommended improvements to the McDade Recreation Trail and upgrading the Bushkill Meeting Center to a full visitor center. These recommendations sought to increase park accessibility, thereby allowing people to travel between destinations within the park and providing connections between nearby multimodal and population centers.



The shuttle alignment recommended by the ATF was operated for one year (2011). The alignment changed in 2012, in part because of a storm that damaged US-209. When US-209 re-opened in 2013, with another new alignment (Section 4.0). However, the initial route concept developed as part of the ATF informed shuttle development and helped shape the existing service by demonstrating parts of the service that was successful and parts that was not.

DELAWARE WATER GAP RECREATION AREA SHUTTLE PROJECT: ASSESSMENT AND DEVELOPMENT PROGRAM, TECHNICAL ASSISTANCE REPORT (MARCH 2012)

In 2011, Tropical Storm Lee caused severe damage to much of the eastern coast of the United States, including northeastern Pennsylvania, New York, and New Jersey. DEWA sustained damage during the storm; the roads to the Dingmans Falls Visitor Center and Highway 209 north of Dingmans Launch were both washed out. As a result, MCTA canceled the DEWA transit service at the end of August through the beginning of September. In the summer of 2012, US-209 was still closed so the shuttle had to travel via SR-739 and SR-2001 to get to the northern ends of the park. The disruption in service led DEWA and its partner in the shuttle service, MCTA, to request transit planning assistance from the Paul S. Sarbanes Transit in Parks Technical Assistance Center (TRIPTAC).

TRIPTAC helped in the form of operational, business strategy, and communication analysis. TRIPTAC also evaluated the demonstration project's first year of operations. The report from this project focuses on the findings and presentations summarized following a workshop charrette held in March 2012. The report included the following recommendations:

- **Changes to the transit service operations.** The TRIPTAC report recommended increasing the shuttle system from a two- to four-bus system. Two of the buses would be assigned to travel the entire DEWA corridor (Stroudsburg to Milford). The second grouping of two buses would operate an overlay service that would travel between Bushkill Access and Milford Beach. The corridor-long service would be operated with standard cutaway vehicles, but vehicles deployed in the overlay service would be equipped with trailers for kayaks, canoes, and other boats.
- **Identification of transit market segments and general ideas for how to best reach these travelers.** The identified transit market segments included locals, tourists, river travelers, hikers, resort guests, and special event attendees (among others). Strategies identified in the report include creating itineraries for hikers, bicyclists, and boaters in addition to traditional route maps and timetables.
- **General suggestions for potential partners who could help support the DEWA shuttles.**

3.0 TRANSPORTATION NETWORK AND RESOURCES—EXISTING CONDITIONS

3.1 | OVERVIEW

DEWA is a linear park that stretches along approximately 40 miles of the Delaware River. The park is roughly split between New Jersey and Pennsylvania. The Pennsylvania side of the river is more developed, with roadways located within one-quarter mile of much of the Delaware River. The New Jersey side of DEWA is more remote and less developed, with limited access, both in terms of road access from the surrounding areas and connections from the Pennsylvania side of the Delaware River.

Transportation is a defining characteristic of DEWA, in part because the park developed around a river and because it is in a developed area that had an existing road network prior to it being designated as a park. Three communities are close to DEWA and serve as gateway communities. At the southern end, gateway communities on the Pennsylvania side include the boroughs of Stroudsburg and Delaware Water Gap; at the northern end of the park, the Borough of Milford plays that role. Between these gateway communities there are at least 50 major and minor entry points and an estimated 86 miles of paved roadway plus roughly another 80 miles of unpaved roadway within DEWA. Most of the roadways and access points are on the northern Pennsylvania side of the river. This is also where the shuttle operates and is the focus of this study.

The River Runner operates within the context of the DEWA transportation network, including the public roadways—but also the park entry points and access areas. Most of the people who visit DEWA drive to the park, and most visitors, even with access to the River Runner, arrive via car. Consequently, roadway design, traffic congestion, and wayfinding signage impact the safety, mobility, and visitor experience of all modes of transportation. It also means that parking is a critical factor to the park's accessibility and the success of the River Runner.

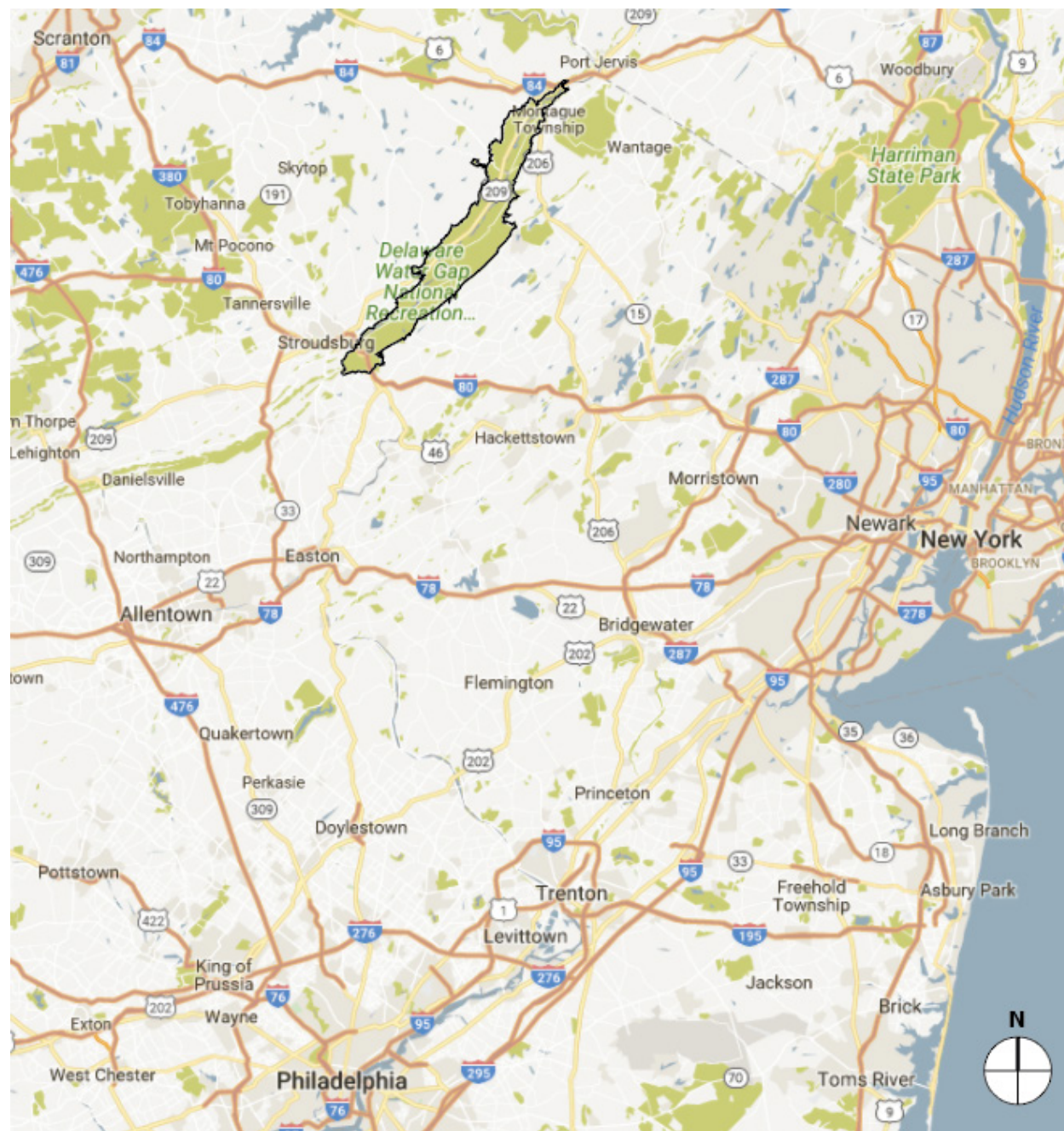
This chapter describes the existing road network and parking resources available within DEWA and in the immediate surrounding area. It also provides an inventory of available public and private transportation services. The analysis focuses on existing conditions and the availability of resources and services. Existing conditions provide the context and framework for potential changes to DEWA's transportation resources and the River Runner operations.



3.2 | ROADWAY CONDITIONS

DEWA is within 100 miles of New York City and Philadelphia. From a transportation perspective, it is on the perimeter of the metropolitan areas of these cities, but it is connected primarily by interstate highways. (Figure 3-1).

FIGURE 3-1: INTERSTATE HIGHWAY ACCESS TO DEWA



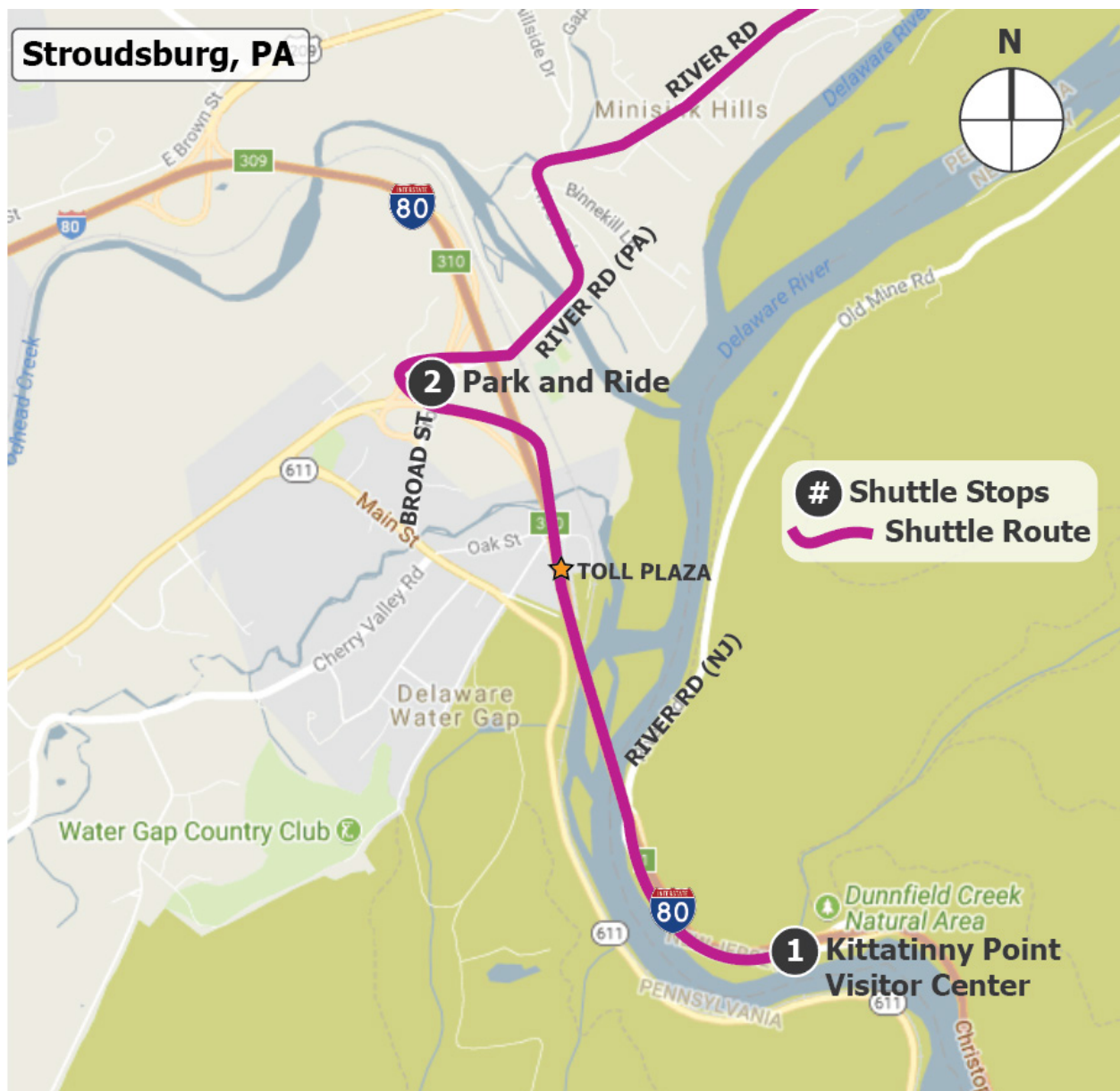
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ROAD NETWORK

Interstate 80

Interstate 80 (I-80) connects the Pennsylvania side of DEWA to the Kittatinny Point Visitor Center (Shuttle Stop #1) in New Jersey, off Exit 1. A \$1.00 toll is required to cross the Delaware Water Gap Toll Bridge when entering Pennsylvania, which is necessary when coming from the Kittatinny Point Visitor Center. This section of the interstate is two lanes in each direction, separated by a concrete barrier. According to the Pennsylvania Department of Transportation (PennDOT) Internet Traffic Monitoring System (iTMS), the average daily traffic (ADT) of I-80 in the Gap is 22,500 vehicles in the eastbound direction and 24,330 vehicles in the westbound direction (2015 data).

FIGURE 3-2: SHUTTLE ROUTE ALONG I-80 AND TRANSITION TO RIVER ROAD



Source: <https://snazzymaps.com/style/102607/basic-regional-and-local>. Markups: RSG.



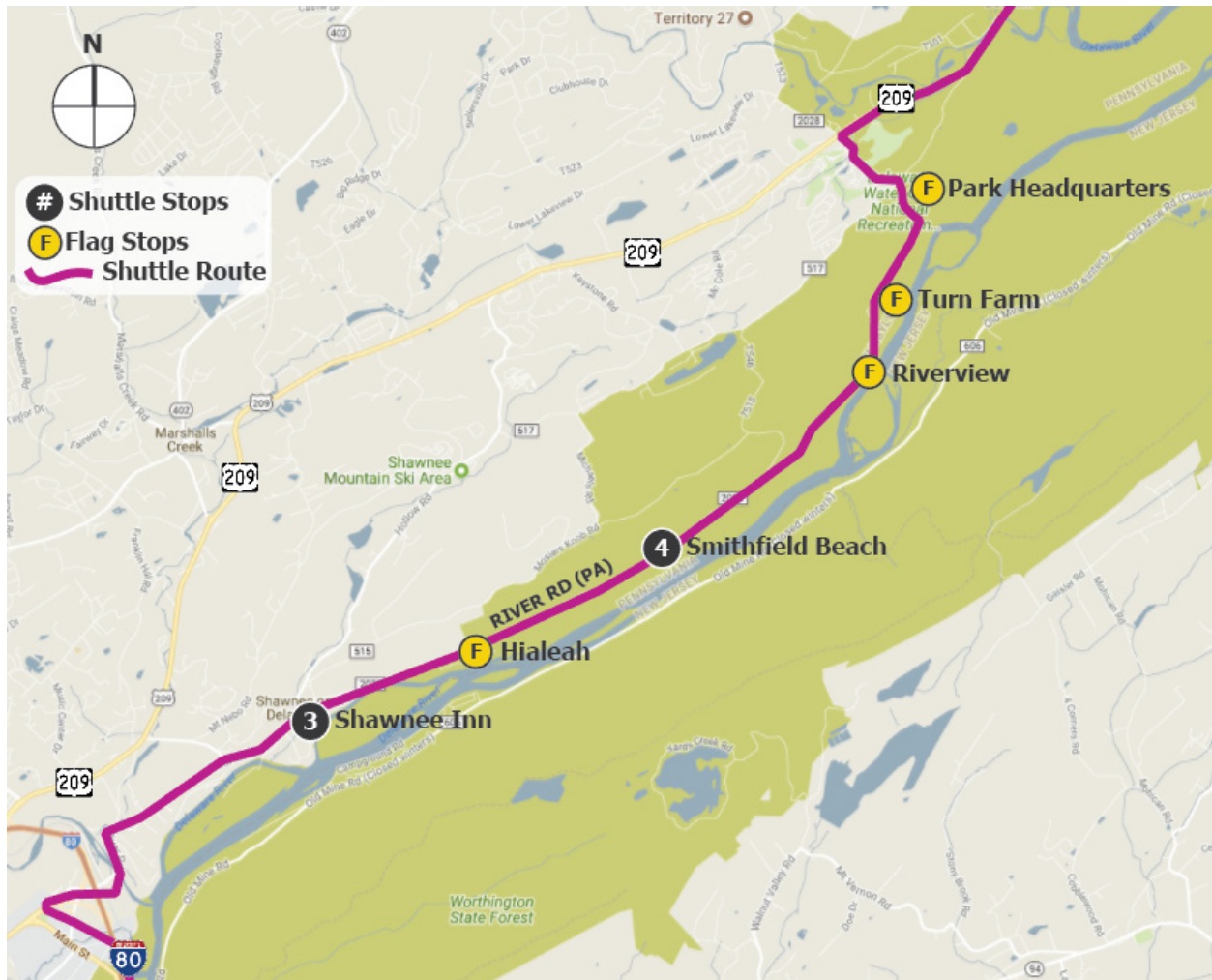
Transition Between I-80 and River Road

From the Kittatinny Point Visitor Center, the shuttle bus and other vehicles must exit I-80 at Exit 310 to access the Delaware Water Gap Park and Ride (Shuttle Stop #2) and shuttle stops to the north within the park. Also in this transition area is the Pennsylvania Welcome Center, across Broad Street from the Park and Ride. The shuttle is required to use I-80 for the segment of travel between the Kittatinny Point Visitor Center and the Park and Ride. As discussed later, severe congestion on the southbound leg between the Park and Ride and the Kittatinny Point Visitor Center along I-80 further disrupted the bus schedule during the Fourth of July holiday weekend. US Route 209 (US-209) can be accessed directly from Exit 309 off I-80.

River Road

Two numbered shuttle stops and four flag stops exist along River Road, a narrow, two-lane road with sharp curves and a rolling topography. River Road is largely surrounded by dense woods, and farmland on the river-side in areas. It passes through the historic Shawnee on Delaware. Sections of River Road may temporarily close during winter storms, but these are eventually reopened. According to PennDOT's iTMS, the ADT of River Road between Shawnee on Delaware and PA-209 is 3,600 vehicles per day (2013 data). South of Shawnee on Delaware the ADT is 4,940 vehicles per day (2014 data). Where River Road crosses Brodhead Creek, just east of the Pennsylvania Welcome Center, the ADT is 5,700 vehicles per day (2013 data). Lane widths are as narrow as eight feet in areas, and the posted speed limit ranges from 30 to 35 mph. Vehicles were observed exceeding this speed limit, especially on downhill sections. Shoulders are nonexistent, and striped roadway edge lines are rare.

FIGURE 3-3: SHUTTLE ROUTE ALONG RIVER ROAD



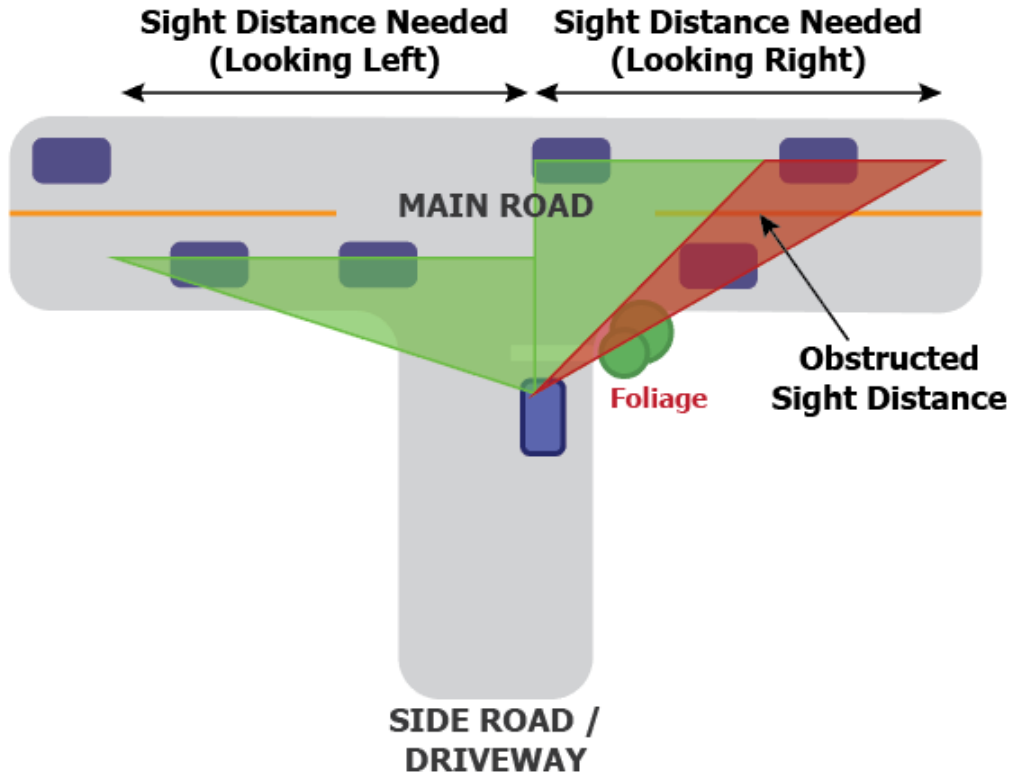
Source: <https://snazzymaps.com/style/102607/basic-regional-and-local/>. Markups: RSG.

Sight Distance

The most significant safety issue on River Road is the minimal and sometimes insufficient sight distances. **Sight distance** is the length of roadway visible to a driver, and a minimum distance is needed for drivers to safely pull out of a driveway or side road into the traffic stream of a main road (**intersection sight distance**, Figure 3-4) and for drivers traveling on a road to safely come to a stop for wildlife, pedestrians, and other slow or stopped objects in the road (**stopping sight distance**, Figure 3-5).

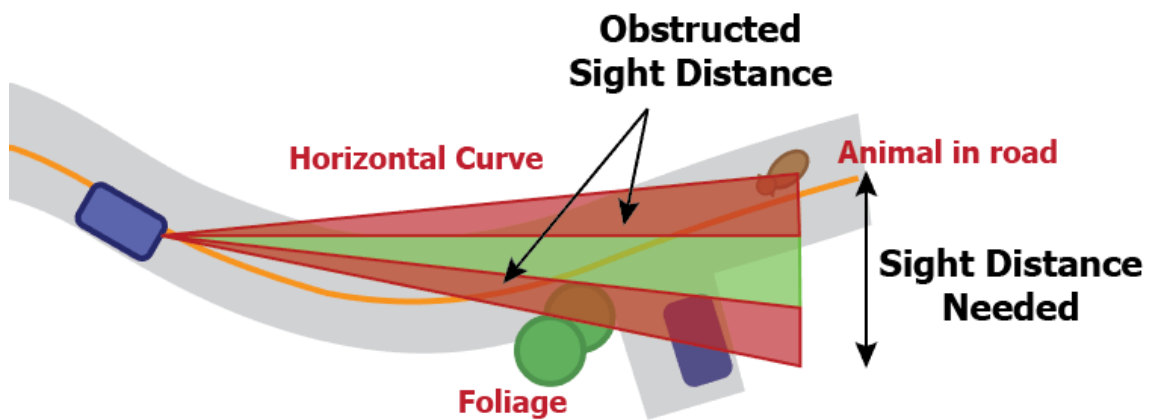


FIGURE 3-4: INTERSECTION SIGHT DISTANCE



Source: RSG.

FIGURE 3-5: STOPPING SIGHT DISTANCE



Source: RSG.

Both intersection and stopping sight distances may be affected by horizontal curves, vertical curves (typically crests in the road), and roadside development such as trees/foliage and buildings. The minimum necessary sight distance is determined based on the prevailing speed of traffic; with high speeds, drivers need more advanced warning than in slower speed areas. Horizontal and vertical sight distances are restricted in many locations along River Road. The observations made during the field visit identified several locations at flag stops and scheduled stops where sight distance was inadequate for the prevailing travel speed.

FIGURE 3-6: INSUFFICIENT INTERSECTION SIGHT DISTANCE LOOKING FROM PARK HEADQUARTERS ONTO RIVER ROAD



Source: RSG.



Source: RSG.



Transit, Bicycles, and Pedestrians

Four of the six shuttle stops along River Road require the bus to enter the lot rather than simply pull off to the side of River Road. At the Riverview and Turn Farm flag stops, which have small lots immediately off the road, the bus pulls over to the side of the road.

Bicyclists were observed using River Road—not in large numbers, but present—especially in mornings when the road is less busy. DEWA's website includes a statement that road biking on River Road in Pennsylvania is “strongly discouraged due to sharp, steep turns, blind curves, and the lack of shoulders.” Several bicyclists were observed using recreational, hybrid bikes rather than faster road bikes; these bicyclists were slower than traffic and possibly more at risk.

No sidewalks or paths exist along River Road; however, the McDade Recreation Trail parallels the road. During the three weekend field observations, there were no pedestrians observed along the road.

US Route 209 (US-209)

While US-209 extends the entire length of the park, the shuttle bus only travels on the 22-mile segment of it between River Road to the south and downtown Milford to the north. Seven numbered shuttle stops and seven flag stops exist along this segment. The road has two lanes with shoulders of varying width and a posted speed limit ranging from 35 to 45 mph until it reaches downtown Milford, where the posted speed limit is 25 mph and there is on-street parking on both sides.

The ADT of US-209 varies by segment. Bushkill Falls Road to US Route 206 experiences the lowest ADT, with less than 4,000 vehicles per day (2016 data). Downtown Milford experiences the highest ADT, with nearly 16,000 vehicles per day (2016 data). Table 3-1 shows the ADT by segment along US-209.

TABLE 3-1: ADT ON US-209 (PA-447 TO DOWNTOWN MILFORD)

Segment	Approximate Length	ADT	Year of Data Collection
PA Route 447 to Seven Bridges Road	2.9 miles	17,530	2015
Seven Bridges Road to Marshalls Creek Bypass	0.8 miles	12,520	2013
Marshalls Creek Bypass to Hollow Road	2 miles	16,200	2015
Hollow Road to River Road	3.1 miles	14,400	2014

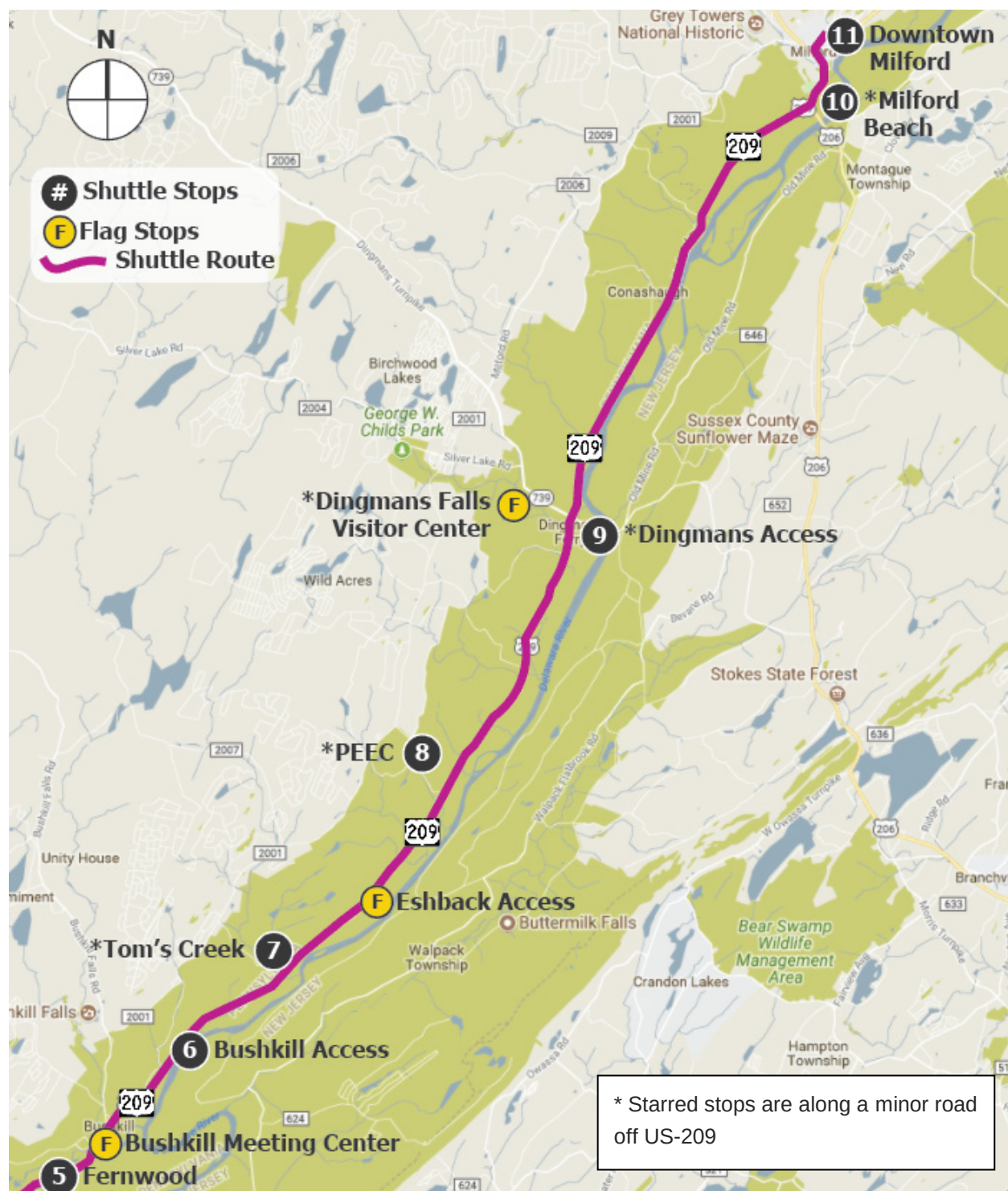
Delaware Water Gap National Recreation Area
System Evaluation & Operational Analysis for Park Shuttle Service

Segment	Approximate Length	ADT	Year of Data Collection
River Road to Bushkill Falls Road	1.7 miles	8,500	2015
Bushkill Falls Road to Veterans' Way (State Route 739)	11.2 miles	3,700	2016
Veterans' Way (SR-739) to US Route 206	6.8 miles	3,100	2016
US Route 206 to Broad Street	0.8 miles	8,690	2017
Hartford Street to Bennett Ave (Broad Street)	0.4 miles	15,900	2016

Shaded cells are outside of the shuttle route and included here only for reference.



FIGURE 3-7: SHUTTLE ROUTE ALONG US-209



Source: <https://snazzymaps.com/style/102607/basic-regional-and-local>. Markups: RSG.

Five of the 14 shuttle stops along US-209 are along a local road off US-209 and as far as a mile away. Of the nine stops with driveways immediately off US-209, two require the bus to enter the lot, while the bus pulls over to the side of the road at the remaining stops.

Bicyclists were observed on this road occasionally throughout the day. Shoulders along this segment of US-209 are at most 3 feet in width. Along narrow stretches of the road, there is just a fog line, the centerline of the roadway has a rumble strip, and the speed limit is 45 mph. DEWA's website includes a statement that road biking is not recommended on US-209 in Pennsylvania due to heavy traffic.

FIGURE 3-8: NARROW LANES AND NO SHOULDER ALONG US-209 NEAR TOM'S CREEK



Source: Google Street View.



CONGESTION AND TRAVEL TIMES

For reference, Table 3-2 includes estimates of travel times and distances between major points, excluding shuttle stops.

TABLE 3-2: UNCONGESTED TRAVEL TIMES AND DISTANCES

Segment	Distance	Driving Time without Traffic or Stops
Kittatinny Point Visitor Center to Park and Ride via I-80	2.5 miles	5 minutes
Park and Ride to Delaware Water Gap Park Headquarters via River Road	10 miles	<20 minutes
Bushkill Meeting Center to downtown Milford via US-209	21 miles	30 minutes
Kittatinny Point Visitor Center to downtown Milford along bus route	35 miles	55 minutes

The route that the shuttle travels on generally does not experience heavy traffic, except the far southern segment between the Park and Ride and Kittatinny Point Visitor Center, which requires crossing the water gap along I-80. Another congested segment is one-half mile within downtown Milford, on E Hartford Street and Broad Street. This segment serves as both the “main street” of town and a direct route to I-84.

US-209 between Stroudsburg and River Road was observed to have heavy traffic congestion in the late afternoons and early evenings of the weekend observation days, adding approximately 15 minutes to the drive. The shuttle does not drive along this segment since it travels south via River Road, but this segment of US-209 may be used by park visitors staying in Stroudsburg or accessing the park from I-80.

WAYFINDING AND COMMUNICATION

Directional Wayfinding

Several types of signs can guide visitors to recreational sites. Three shuttle stops do not have any signage with their stop name. They include downtown Milford, Riverview Trailhead, and Turn Farm Trailhead. Riverview and Turn Farm do have signage identifying their access to the McDade Recreation Trail.

Advanced Warning Signs

The shuttle stops generally have wayfinding signs along the main road to direct visitors to recreation sites in DEWA. These signs include the site name and symbols for the opportunities and amenities at each stop (e.g., picnicking, bathrooms, hiking, and river access) but do not include any indication that the shuttle bus stops there.

The signs are typically placed to give advanced warning of a site—such as a one-half-mile warning (Figure 3-9) or a “next right” warning (Figure 3-10). The use of advanced warning signs is not consistent between sites; certain site types may require different warning signs than others, but in some cases, there was insufficient advanced warning of sites.

FIGURE 3-9: EXAMPLE OF ADVANCED WARNING DIRECTIONAL SIGNAGE IN PARK: ESCHBACK ACCESS (LOOKING NORTH ON US-209)



Source: Google Street View.

FIGURE 3-10: EXAMPLE OF ADVANCED WARNING DIRECTIONAL SIGNAGE IN PARK: BUSHKILL ACCESS (LOOKING NORTH ON US-209)



Source: Google Street View.

Confirmation Signs

Sites sometimes have confirmation signs at their entrances, for both northbound and southbound drivers (Figure 3-11). Confirmation signs are important because there are several minor driveways and pull-offs that visitors could confuse for actual entrances. Not all sites have a sign directly at the entrance, which may create confusion for visitors expecting confirmation of the turn to take.

FIGURE 3-11: EXAMPLE OF CONFIRMATION DIRECTIONAL SIGNAGE IN PARK



Signage for Eshback Access and McDade Trail. Source: CTG, 2017.

Signage for Sites Off the Main Road

For sites on a local road off the main road (including Tom's Creek, PEEC, Dingmans Falls Visitor Center, Dingmans Access, and Milford Beach), the signage on the main road does not consistently specify the street name where the sites are located or give an indication of distance from the main road. In addition, once off the main road, some sites do not have clear directional wayfinding signs to reach the site or to get back to the main road from the site.

Signs Blocked by Foliage

Several wayfinding signs in the park are hidden from the view of upstream drivers, at distances where drivers need to begin decelerating to safely access a site. An example of this is at Bushkill Access; the signs at the entrance of Bushkill Access is obscured by tree branches and foliage both from the north and the south (Figure 3-12 shows the view from north of Bushkill Access).

FIGURE 3-12: SIGN FOR BUSHKILL ACCESS BLOCKED BY FOLIAGE (LOOKING SOUTH ON US-209)



Source: RSG.

Special Circumstance Wayfinding

When parking lots reach capacity, there is no consistent method within the park for notifying visitors in advance and redirecting them to other parking options. Specifically, there are frequent overflow situations at Kittatinny Point Visitor Center, Dingmans Falls Visitor Center, and Smithfield Beach.

An overflow event observed at Smithfield Beach during the July 2 observation was complicated. Because visitors with livery reservations are permitted to park in the grass overflow lot, park staff at the entrance to Smithfield Beach needed to triage visitors, which led to a queue of vehicles on River Road and a rear end crash. Stopped vehicles and queues are especially problematic for this activity given the limited sight distance from the south (northbound) along River Road. Historically, this triage of visitors occurred within the Smithfield parking area at the entrance gate. This setup may add to congestion and travel time, but it would be a safer location to stop and manage the traffic than along River Road given the limited sight distance.



A park ranger directing cars at Dingmans Falls Visitor Center on the August observation weekend said that if the lot is full, the rangers on duty will inform visitors of a lot at the intersection of Dingmans Falls Road and US-209, which is 1.2 miles from the Visitor Center. At Kittatinny Point Visitor Center, a park ranger said that rangers have park radios and are supposed to call into dispatch when a lot is full or when spaces begin to open.

In addition to the two visitor centers, there was a fee collector on duty at Smithfield Beach and at Milford Beach. Dingmans Access has a hut for a fee collector, but it was never occupied during the three observation weekends, and a box was out for parking fees to be paid by honor system. The other shuttle stops / recreation sites did not have park staff on duty, but other than Bushkill Access, none of the other parking lots regularly reached capacity during the three observation weekends.

FIGURE 3-13: OVERFLOW PARKING AT PEEC



Source: RSG.

FIGURE 3-14: VEHICLE QUEUE TO ACCESS SMITHFIELD BEACH



Source: RSG.

FIGURE 3-15: SMITHFIELD BEACH CLOSURE AT RIVER ROAD



Source: RSG.

3.3 | PARKING RESOURCES

At each shuttle stop, passenger cars circulate within parking lots and must maneuver into and out of parking spaces, around cars with trailers, and around pedestrians. All scheduled shuttle stops have a dedicated off-street parking supply, ranging from a small gravel lot with a capacity of about 10 cars to multiple lots, which are paved lots with space for up to 370 vehicles. Whether using the shuttle bus or not, most park visitors park a vehicle at parking lots that coincide with a shuttle stop. Along the River Runner route, there are 11 numbered shuttle stops and 13 flag stops. One of the numbered stops, Fernwood Resort (#5), was not observed during this study; the private resort and tourist business at the stop has been shuttered since 2013. The parking lots at each stop range in size, circulation patterns, and separation of uses. Several stops regularly reach parking capacity early in the day; for the most part, these are stops that provide river access, attract large groups of picnickers (such as Milford and Smithfield beaches), or have a unique recreational or otherwise appealing site at them (such as Dingmans Falls Visitor Center and PEEC).

STOP LAYOUT AND CIRCULATION

Several of the shuttle stops' parking lots are separated by use. At these stops, such as Smithfield Beach, there is typically a main parking lot, a motorboat water access area with 15-minute or day-long parking, and a nonmotorized boat water access area.

**TABLE 3-3: MULTILOT SHUTTLE STOPS**

Shuttle Stop	Parking Areas
1—Kittatinny Point Visitor Center	Main lot: mostly car spaces (only four tandem spaces) Picnic lot: car spaces only Boat access lot: gravel
4—Smithfield Beach	Main lot: car spaces only Motorboat access lot: tandem spaces only, with day-long parking Canoe/Kayak access lot: short-term parking only Overflow lot: grass
6—Bushkill Access	South lot: tandem spaces only North lot: car and tandem spaces Canoe/kayak access: short-term parking only Motorboat access: short-term parking only
9—Dingmans Access	Main lot: car and tandem spaces) Secondary lot: car and tandem spaces Boat launch area: access for both motor boats and canoes/kayaks; short-term parking only
10—Milford Beach	Main lot: car spaces only Motorboat access lot: day-long tandem parking Canoe/kayak access lot: four day-long parking spaces

Several shuttle stops have designated circulation routes; they may include one-way loops or have separate entrance and exit driveways connecting to the main road. Many stops have no designated path to follow, often because they are too small for this type of setup to be helpful.

TABLE 3-4: PARKING LOT ACCESS AND CIRCULATION

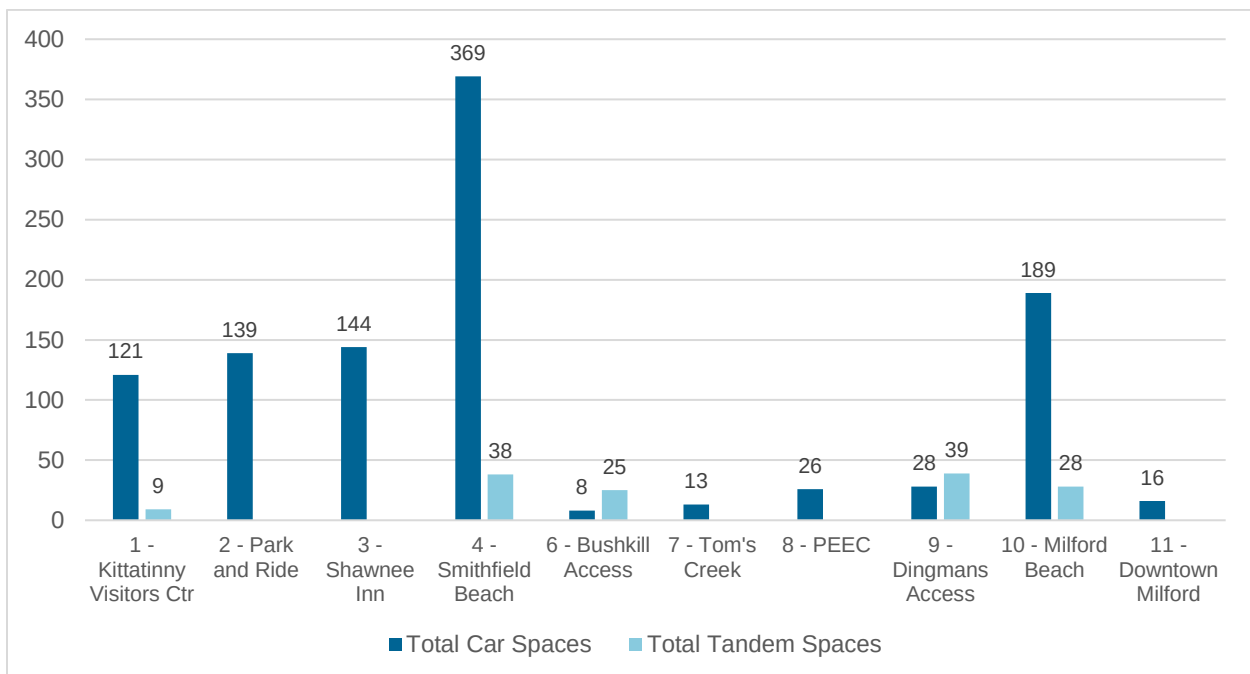
Lot	Access	Circulation with Lot
1—Kittatinny Point Visitor Center	Two access points for main lot; both allow enters and exits	No designated circulation. Two-way flow throughout
2—Park and Ride	One access point	One-way counterclockwise circulation around outer ring
3—Shawnee Inn	One access point	One-way flow informally designated by angled parking
Hialeah (F)	Two access points; one entrance (south), one exit (north)	One-way northbound circulation from entrance driveway to exit driveway
4—Smithfield Beach	One access point	Two-way circulation. An outer road for vehicles to bypass the main lot to access the motorboat lot and grass overflow lot
Riverview (F)	One access point	No designated circulation
Turn Farm (F)	One access point	No designated circulation

Lot	Access	Circulation with Lot
Park Headquarters (F)	One access point	No designated circulation, but circular road would allow for a one-way loop
Bushkill Meeting Center (F)	One access point per lot	No designated circulation
6—Bushkill Access	One access point	Two one-way counterclockwise loops (one northern loop and one southern loop)
7—Tom's Creek	Two access points; both allow enters and exits	No designated circulation
Eshback Access (F)	One access point	No designated circulation
8—PEEC	Two access points; one entrance (south), one exit (north)	One-way northbound circulation from entrance driveway to exit driveway
Dingmans Falls (F)	One access point	One-way counterclockwise circulation
9—Dingmans Access	One access point	No designated circulation
10—Milford Beach	One access point	No designated circulation
11—Downtown Milford	One access point	No designated circulation

PARKING CAPACITY

Of the paved and striped parking lots, five have a mix of single-vehicle spaces and double-length vehicle spaces, which can fit cars with trailers (car-trailer combinations are also called “tandems” in this report). The remaining four striped lots have only regular-size vehicle spaces.

FIGURE 3-16: VEHICLE CAPACITY AT NUMBERED SHUTTLE STOPS



Source: RSG.

Use of Single- and Double-Length Parking Spaces

Cars without trailers are not prohibited from parking in tandem spaces, and in many cases, cars without trailers were observed parking in tandem spaces, especially in lots where there are many more tandem spaces than necessary. Most tandem spaces in the park can be accessed from both ends, and when cars without trailers park in them, they typically park at one end so that the space can fit two cars.

FIGURE 3-17: CARS PARKED IN A ROW OF TANDEM SPACES AT DINGMANS ACCESS



Source: RSG.

In general, the use of tandem spaces by cars was not observed as problematic; this system better utilized the limited capacity in some of the lots which otherwise would not have been used. Overall, during the three observations, there was excess capacity of tandem spaces.

However, when a lot nears capacity and both cars and tandems are looking to park, this shared use of space raises a question of which type of vehicle should have priority in double-length spaces. To answer this question, considerations should first include which vehicle type deserves priority in overcrowded lots. Second, considerations should include examination of the ease and safety of parking a tandem versus two vehicles in informal/illegal spaces if overflow parking is not prohibited.

The Bushkill Access parking lot may be the only example of this issue, as it only has eight car spaces and 25 tandem spaces. This lot can become overcrowded, as was seen on the Fourth of July observation

weekend when both cars and tandems parked on the grass. It was observed that cars first used the tandem spaces, forcing both tandems and additional cars to park on the grass.

FIGURE 3-18: OVERFLOW PARKING AT BUSHKILL ACCESS—SOUTHERN LOT



Source: RSG.

PARKING UTILIZATION

The following is a list of parking lots that regularly near or exceed capacity. Details of each stop can be found in Appendix A: River Runner Stop Inventory.

- **Kittatinny Point Visitor Center.** Boaters, hikers, and general park visitors visit this site for visitor information, the views of the Water Gap, access to the river, and access to several trails, including the Appalachian Trail. The DEWA website includes a note that parking is in high demand on weekends throughout the summer and fills to capacity by 10:00 a.m.
- **Shawnee Inn.** This lot provides water access but is only open for people staying at the Shawnee Inn.
- **Smithfield Beach.** This is a popular site for boat and canoe access, swimming, and picnicking. It has a capacity of 370 cars, not including its grass overflow lot.
- **Dingmans Falls Visitor Center.** In addition to offering visitor information, this site provides access to Dingmans Falls. It is marked prominently on the park map.



The following parking lots typically are underutilized on weekends. Small lots that do not have much available capacity are not included here.

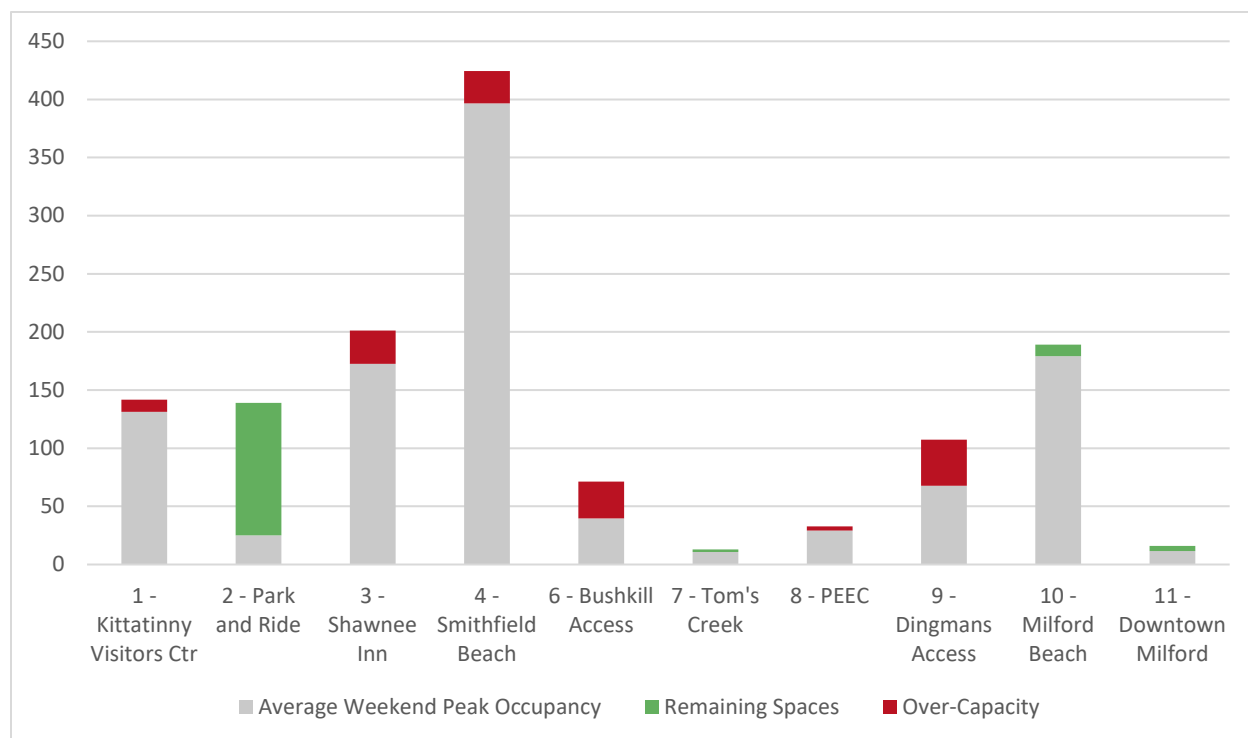
- **Park and Ride.** Although likely utilized during the work week, weekend observations showed this lot typically being significantly under capacity.
- **The motorboat lot at Smithfield Beach.** Smithfield Beach's separated motorboat lot had no more than a handful of vehicles at any time during the observation weekends, even when the other lots at Smithfield Beach had reached capacity and the park ranger was turning vehicles away.

Figure 3-19 below summarizes the average peak occupancy of the three observation days. Peak occupancy refers to the highest number of vehicles observed in each lot during each of the three trips. The average peak occupancy for each shuttle stop was found using the following equation:

$$\text{Average Peak Occupancy} = \frac{\text{Sum of Each Trip's Peak Occupancy}}{3 \text{ trip days}}$$

The parking occupancy shows that during the observation period, many stops have parking demands that currently exceed the capacity of the lots. Given that Kittatinny Point Visitor Center, Smithfield Beach, and Dingmans Access all were turning away vehicles, the demand is higher than the observed data indicates. Generally, all the formal stops and parking areas were shown to operate near or over capacity at one point during the weekend, except for the Park and Ride lot, which was the only one with significant remaining capacity.

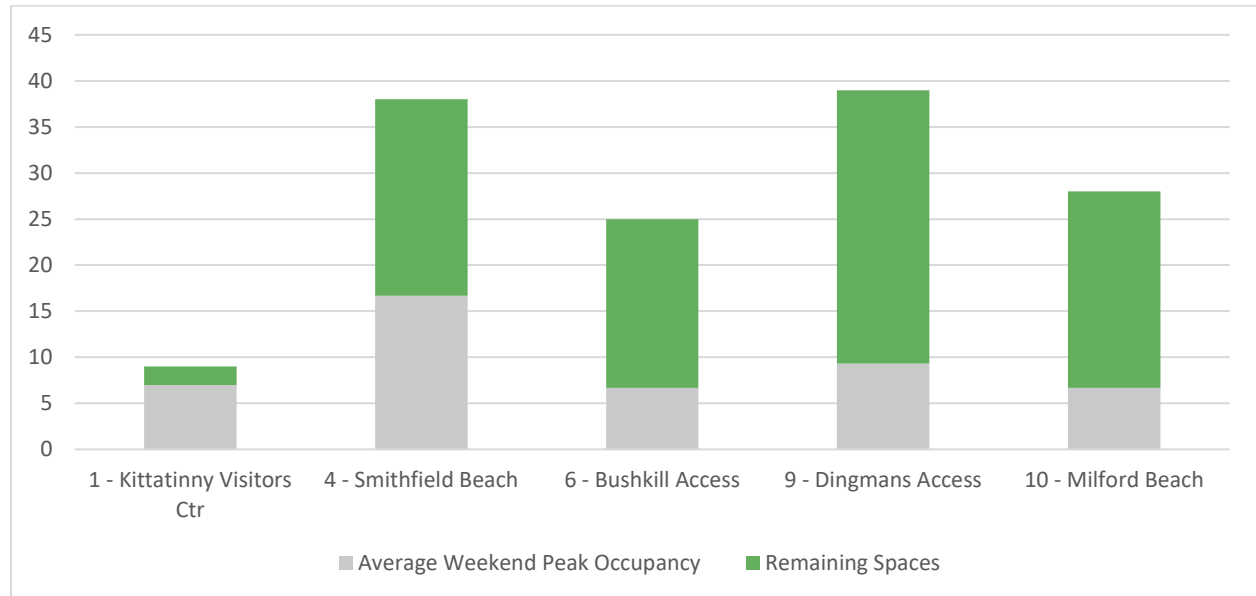
FIGURE 3-19: AVERAGE PEAK CAR OCCUPANCY AT NUMBERED SHUTTLE STOPS



Source: RSG.

Figure 3-20 uses the same average peak occupancy method to understand the degree to which the tandem spaces were in demand during the busiest times of the day. The data show that across the board, tandem spaces were underutilized during the field observation.

FIGURE 3-20: AVERAGE PEAK TANDEM OCCUPANCY AT NUMBERED SHUTTLE STOPS WITH RIVER ACCESS



Source: RSG.

The shuttle presents an opportunity to reduce the parking demands at specific locations or during specific times of day within the park. The 18-person shuttle would displace on average 7 private cars (using an average occupancy of 2.5 persons per car).

3.4 | TRANSPORTATION SERVICES

Some private and public transportation services are available to people traveling to DEWA. The most significant of these services is the River Runner, which operates within the park and provides connections to and from the gateway communities on the Pennsylvania side of the park. The River Runner is operated by the MCTA as part of the Transit in the Parks program. An overview of the River Runner is provided here, and more detail is in Section 4.0. In addition to the River Runner, there are a handful of public and private transportation services that operate within DEWA and in the area immediately surrounding the park.

RIVER RUNNER

The River Runner provides free public transportation services to people visiting within DEWA, operating on weekend days and holidays between Memorial Day and Labor Day. The shuttle is equipped with trailers that have racks to carry kayaks, canoes, tubes, and rafts as well as bicycles. Indeed, most shuttle riders travel up river (northbound) to launch their watercraft and then travel down river (southbound) on the river. Another handful of riders use the shuttle to get dropped off or picked up along the McDade Recreation Trail. The shuttle has been in operation since 2011, and in 2017, not including riders boarding

or alighting on the DWGC, the River Runner carried just under 3,000 riders, or approximately 87 riders during each day of operations.

Vehicle Fleet

Vehicles assigned to the River Runner are gasoline fueled Ford Champion Challenger C-241 medium-duty vehicles (Figure 3-21). The bus accommodates 18 passengers and has one wheelchair lift. These vehicles are part of MCTA's shared ride fleet; during the summer the vehicles are also used by the River Runner on weekends.

FIGURE 3-21: RIVER RUNNER



River Runner operator loading kayaks. Photo source: CTG, 2017.

MCTA owns six Sea Lion trailers that were paid for by DEWA. The first trailer was purchased in 2011; three more were purchased between 2011 and 2012. The trailers (Figure 3-21) are equipped with racks for boats and bikes; there are three racks on one side of the trailer, this provides space for roughly six kayaks or canoes, depending on the size of individual boats and the capabilities of the individuals loading the boats. The other side of the trailer has a rack for two or more kayaks, plus two bike racks that can hold up to eight bikes. The buses do not have bike racks on the front of the vehicle.

Management, Funding, and Service Costs

The River Runner operates as a cooperative agreement between the National Park Service and MCTA. As part of this cooperative, MCTA manages and operates the shuttle. They also coordinate funding for the service. As the entity responsible for managing and operating the River Runner, MCTA hires, trains,

and dispatches drivers. MCTA also maintains and deploys vehicles; staffs the customer service line; and records data and reports shuttle productivity. MCTA also prints the River Runner schedule, posts shuttle information on its website and manages shuttle signage along the route. As a partner in the service, the National Park Service helps fund the shuttle and helps with service design, communications, and outreach. The National Park Service also sets aside shuttle loading and unloading sites at the access areas within the Park.

In its role of coordinating and leveraging funding, MCTA draws on its position as the public transportation provider in Monroe County. As the local public transportation provider, MCTA is funded through a combination of Federal Transit Administration (FTA) and PennDOT programs. FTA and PennDOT funding programs are nearly always designated for capital or operating purposes. Federal (FTA) capital programs typically pay up to 80% of the cost of infrastructure and equipment, such as buses; and depending on the service type will pay up to 50% of the cost of service operations. PennDOT helps local agencies match this funding, typically by paying the remaining 20% of the cost of capital equipment. PennDOT also typically pays about 30% of the cost of operations. MCTA raises the remaining 20% of the operating costs through passenger fares and contributions from the Monroe County government.

The River Runner costs an estimated \$81,000 per year to operate. The shuttle is free to passengers, so the operating costs are funded through a block grant of \$50,000 provided by the National Park Service, plus \$31,000 allocated leveraged MCTA's federal and state grant funding.

The purchase and maintenance of the capital equipment is shared between MCTA and DEWA. The vehicles used on the service are from MCTA's existing fleet. Most of MCTA's shared ride services are operated on weekdays only, leaving a portion of the fleet available to operate on weekend days and holidays. MCTA purchased both the vehicles with federal and state resources. The Sea Lion trailers were purchased through the cooperative agreement with DEWA, using NPS grant funds.

Other Public Transportation Services

The other public transportation services in Monroe County are also provided by MCTA. Not including the River Runner, MCTA operates eight scheduled fixed-route services. These services are designed to provide mobility throughout Monroe County. As a result, the system is largely built around the following:

- Four longer-distance fixed routes that provide connections between communities; these routes include the Blue, Orange, Red, and Yellow routes.
- Two circulator-type services that are designed as one-way loops. These routes provide mobility and connections within communities (Stroudsburg Circulator and the Silver Loop).
- Two express routes, including the Eastburg Express, which offers limited but direct service between Tobyhanna and East Stroudsburg. and the Toby Express, which offers limited by direct service between East Stroudsburg and the Tobyhanna Army Depot.

Most of MCTA's routes operate on weekdays only. Exceptions include the Blue Route, which runs on Saturdays and Sundays and the Red Route, which operates on Saturdays. One of MCTA's regular bus routes, the weekday Yellow Route, partially overlaps with the weekend River Runner. The Yellow Route begins/ends service in Delaware Water Gap (DWG) at the Pennsylvania Welcome Center and the DWG Park and Ride lot. Connections are not possible as the Yellow Route operates on weekdays and the River Runner operates on weekends. MCTA also operates several shared services for Monroe County



residents. Dial-a-Ride service is available to members of the public. In addition, MCTA operates special shared ride services to certain populations, such as older adults, people with disabilities, and veterans. Fares for the public are based on zones, which reflect distance groupings. People traveling as part of other programs may pay reduced fares. The adult one-way fare on MCTA fixed-route services is \$1.50, but discounts are available to people who purchase multiday passes or are in other designated fare categories. Fares on the shared ride services vary by program and ride purpose.

MCTA's operations and maintenance facility, located in Scotrun, contains the full range of transit support functions, including bus maintenance bays, spare part rooms, fueling stations and storage and a bus wash facility. The maintenance facility is open for approximately 20 hours per day and 7 days each week. Mechanics and technicians work on the buses nearly every day. MCTA employs bus cleaners who clean and fuel the bus.

PRIVATE TRANSPORTATION SERVICES

Several private transportation services (liveries) transport people in and around DEWA. Most of these private transportation operators are associated with canoe/kayak rental companies and river trips that operate within the park under a Commercial Use Authorization, which allows commercial operations within a park. People sign up for guided or self-guided tours of the Delaware River and the private companies transport their clients, together with boats, and drop them off at one of the access points along the river and pick them up down river. The livery services are organized in response to client needs and are priced accordingly. Many of the livery services use the same canoe launch facilities as the River Runner.

Regional Transportation Services

Regional transportation services provide connections between Stroudsburg and DWG and the New York and Philadelphia metropolitan areas. Services are also available between Port Jervis, New York, which is just east of Milford and New York City. Regional transportation services at the southern end of DEWA are provided by bus, while the connections available at Port Jervis are provided via rail.

Martz Bus Service

The Martz Stroudsburg DWG bus terminal provides daily connections to/from New York City's Port Authority and weekday-only service between DWG and Wall Street/Downtown, and Midtown/Uptown. Approximately 15 scheduled round trips occur between DWG and the Port Authority on weekends/holidays. The one-way travel time is scheduled as between one hour and 90 minutes, depending on the time of day. A one-way full-fare adult bus ticket costs about \$20, depending on type of ticket purchased. The Martz DWG terminal is 3.8 miles from the Kittatinny Point Visitor Center and is served by the Delaware Water Gap Connector service on weekend days and holidays.

Coach USA

From the Frisky Goat Café in Milford, Coach USA runs commuter service to multiple locations in New York City. Six inbound and seven outbound weekday trips occur, with three roundtrips on the weekends and limited holiday service. The travel time from Milford to the first New York City stop (Port Authority) is approximately 120 to 140 minutes, with one-way fares set at \$24.50. The Frisky Goat Café is also the northern terminus of the River Runner, with transfers for all but one of the weekend trips.

Metro-North Railroad Port Jervis Station

The Metropolitan Transportation Authority Metro-North Railroad Port Jervis Station is the end of the line for service that operates between Port Jervis, Penn Station in New York City, and Hoboken, New Jersey. Approximately 15 trips occur on weekdays and 7 trips occur on weekends and holidays. The travel time between Penn Station and Port Jervis is about two hours and a one-way adult fare is between \$20 and \$25, depending on time of day and purchase method. The Port Jervis Station is seven miles from Milford, Pennsylvania, or approximately eight miles to DEWA's Milford Beach Fee Access Area.



4.0 RIVER RUNNER—ROUTE PROFILE/SERVICE ANALYSIS

DEWA and MCTA are investing significant resources in the success, development, and operations of the River Runner. When it was initially developed, the River Runner was designed to meet the combined goals of increasing accessibility to DEWA and reducing the negative impacts associated with vehicular travel in the park. As part of evaluating both the opportunities to strengthen the River Runner and to identify strategies to strengthen access to and mobility within the park, the study team conducted a detailed analysis of the shuttle's service design, operations, and performance. This analysis considers the performance of the shuttle both within the context of these clear and unique goals, but also from a more traditional transit operating perspective. The analysis largely focuses on the experience observed in 2017, but also uses historical data to understand service strengths, weaknesses, and opportunities.

4.1 | SERVICE ALIGNMENT AND DEVELOPMENT

SERVICE ALIGNMENT

The River Runner operates between the Kittatinny Point Visitor Center and downtown Milford. It begins service at the Kittatinny Point Visitor Center and crosses the Delaware River via I-80, into Pennsylvania, stopping at the Delaware Water Gap Park and Ride lot (DWG Park and Ride) before re-entering DEWA and traveling along River Road. The shuttle stays on River Road until the intersection with US-209 and then primarily stays on US-209 into Milford, Pennsylvania, traveling off route to enter DEWA access points (Figure 4-1). The total corridor is about 37.5 miles long (not including travel to PEEC); without stops to pick up passengers or load/unload boats, the corridor takes approximately 55 minutes to travel.

Eleven scheduled stops exist along the River Runner (Appendix A includes a detailed inventory of each scheduled River Runner stop). These stops are primarily located on major facilities and resources in the park, including fee access areas, canoe launches, and picnic areas. As part of serving these stops, the River Runner travels off the main roadways, entering fee access areas and bringing riders to canoe launch areas. Another 13 designated “flag” stops allow riders to wave down the bus. However, riders can flag down the bus at any safe location along the route.

FIGURE 4-1: RIVER RUNNER ALIGNMENT

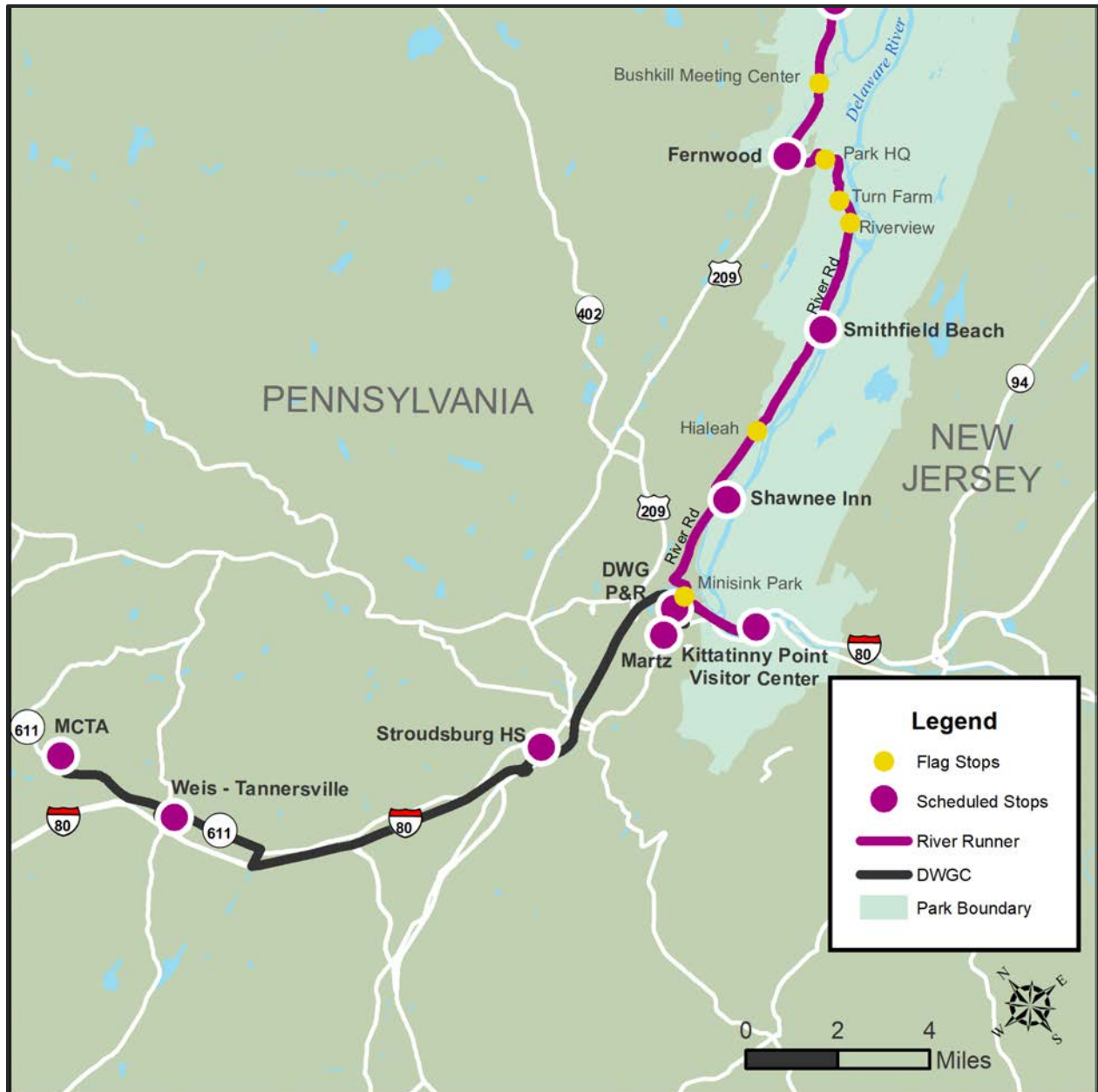


Source: MCTA, NPS



The River Runner begins and ends as a connecting service, the Delaware Water Gap Connector (DWGC) that travels between the MCTA headquarters in Scotrun to the Kittatinny Point Visitor Center. The DWGC route is approximately 25 miles long and takes 30 minutes to travel. The DWGC provides access to DEWA from a handful of locations in Monroe County, including the Martz DWG terminal (Figure 4-2).

FIGURE 4-2: DWG CONNECT ALIGNMENT



Source: MCTA, NPS

SERVICE DEVELOPMENT

The River Runner began operations in 2011 following a recommendation developed as part of a larger evaluation of alternative transportation options for DEWA. Since then, the service has grown to include the entire corridor and to provide service for people, boats, and bikes traveling to and within the park. This growth is increasingly apparent in the development of the service over time; however, changes in service design reflect not only this focus but also available funding, experience with operations, and responses to external events, such as flooding and road closures.

2011 (Year 1)

In 2011, the shuttles operated for 45 days (weekend days only), beginning the first weekend in June until the last weekend in October. The service used two buses. Seasonal ridership was 1,177, or approximately 26 riders per day. During the first year of operations, the shuttle included two routes:

- The Riverview North shuttle connected East Stroudsburg, Eastern Stroudsburg University, and the Martz terminal with stops in the southern end of the park, including Shawnee, Smithfield Beach, Fernwood, and Bushkill Village. Each one-way trip required approximately 45 minutes. It operated with hourly service and provided 11 round trips.
- The McDade Mover served the northern end of the park, with stops on both sides of US-209, including the PEEC, Dingmans Falls Visitor Center, and river access points at Bushkill, Dingmans, and Milford Beach. One-way trips on the McDade Mover took approximately one hour; service was hourly with eight daily round trips.

2012 (Year 2)

Following the technical assistance provided by TRIPTAC, the DEWA shuttle was rebranded as the River Runner. US-209 was closed in 2012, so the shuttle was rerouted through State Route 739 and US 2001. As a result, the service design retained the two-route system, but in different configurations:

- The River Runner traveled between the Martz DWG bus terminal and downtown Milford Beach. The bus traveled on River Road and then via US 2001 to downtown Milford, ending at Milford Beach. Each trip took approximately 80 minutes. The service operated with six daily round trips.
- The Upper River Runner traveled from Bushkill Village to Milford Beach, also traveling via US 2001. One-way trips were scheduled for 50 minutes; service frequency was every half-hour for most of the day with 11 daily trips.

Service levels were also increased significantly from two buses per day to seven for a total of six round trips. The service schedule was shortened to 32 days, operating on weekend and holiday days between Memorial Day and Labor Day. Ridership responded positively to the new service design, increasing to 2,177 riders or about 68 riders per day.

2013 (Year 3)

In 2013, the route was both shortened and operated with a reduced schedule. The shortened route traveled between the Martz DWG terminal and Dingmans Fee Access Area, eliminating service to Milford Beach and downtown Milford. This shortened the one-way travel time to 55 minutes. The number of buses used to operate the route decreased from seven to two vehicles, allowing for eight daily round trips. Ridership dropped to 1,180 or approximately 36 riders per day.



2014 (Year 4)

Service was expanded in 2014, with an additional vehicle added, for a total of three buses assigned to the route each day. The route was also extended from the Martz DWG terminal to downtown Milford, increasing the one-way travel time to 1 hour and 40 minutes. The number of daily round trips decreased to six and the route also added back service to PEEC, Milford Beach, and downtown Milford. Ridership grew to 1,571 over the 33 days of operation for an average daily ridership of approximately 48 riders.

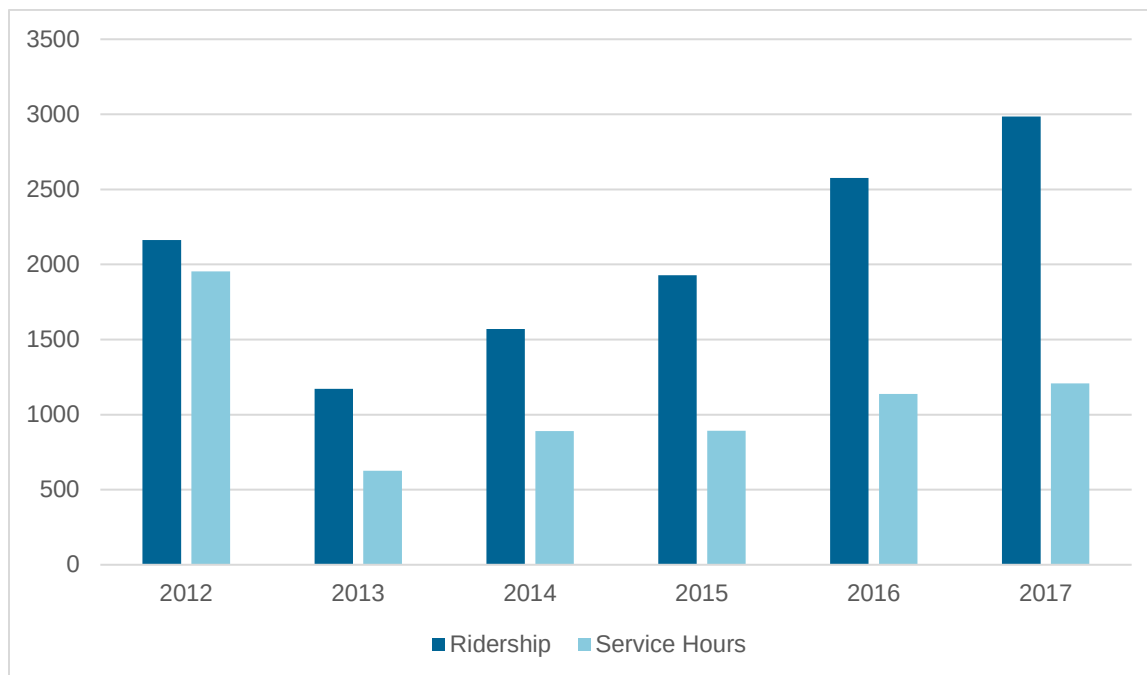
2015 (Year 5)

There were no major changes in 2015. The shuttle retained the same alignment (Martz DWG to downtown Milford) and remained at six daily round trips. Ridership increased to 1,918. Over 34 days of service, the River Runner carried approximately 56 riders per day.

2016 (Year 6)

The service alignment in 2016 changed slightly so that the Martz DWG terminal was served by the DWGC and the River Runner began at the Kittatinny Point Visitor Center. The addition of another vehicle (four total) allowed the shuttle to make eight daily round trips. The shuttle also added a stop at the Kittatinny Point Visitor Center. Over 32 days of operation, ridership increased to 2,513 or 79 riders per day.

FIGURE 4-3: RIVER RUNNER ANNUAL RIDERSHIP AND SERVICE HOURS



Source: CTG based on MCTA data

SERVICE DESIGN AND SCHEDULE

In 2017, the River Runner operated nearly identically as it did in 2016 with a primary service alignment from the Kittatinny Point Visitor Center to downtown Milford. By 2017, most of the shuttle riders were also river travelers. These travelers park their cars at one end of the park, usually at a canoe launch, board the

shuttle with their boat, and ride it north to another canoe launch site. The riders will travel down river by boat and get off the river where their car is parked. A handful of shuttle riders used the shuttle in an analogous way but parked their car and launch their boat at the northern end of the park, paddled down river, pulled their boats out down river, and then rode the shuttle bus back to where they left their car. These riders also used the shuttle to travel north.

During the observation period, nine riders boarded the River Runner with bikes and an even smaller number of people used the shuttle as transportation within the park. During the fieldwork, bicyclists boarded the shuttle at the start of their trip, putting bikes on the bus at the southern end and riding north to another stop, where they got off the shuttle and rode back to their starting point. Drivers reported that they had also picked up cyclists who got tired on route and used the shuttle to travel back to the place where they started their ride. No hikers boarded the shuttle during the observation period, but drivers reported that they had picked up a handful of hikers in the past.

Service Schedule

Each River Runner trip begins with the DWGC service, stopping at the MCTA headquarters, the Weis Markets in Tannersville, Stroudsburg High School, and the Martz DWG bus terminal before beginning River Runner service at Kittatinny Point Visitor Center. Shuttles returning to MCTA at the end of their day make this same trip only in reverse. The DWGC offers four morning northbound trips (to DEWA) and four afternoon southbound trips (to MCTA).

Each one-way trip takes approximately two hours (including recovery time on the River Runner only), allowing two round trips per bus, or eight daily trips overall (four vehicles, each of which makes two trips). The shuttle frequency is scheduled with departures every hour, except for the first and last trip of the day, where there is a 120-minute gap between shuttles (Table 4-1).

Northbound trips are scheduled to departure from the Kittatinny Point Visitor Center at 5 minutes before the hour, arriving in downtown Milford 100 minutes later. The shuttle has 25 minutes of layover/recovery time, creating a 120-minute cycle time. This allows the southbound trip to depart on the hour. The southbound trip is scheduled to take 94 minutes and is allocated 20 minutes of layover/recovery time before beginning the second northbound trip.

TABLE 4-1: DWGC AND RIVER RUNNER TRIP SCHEDULE

Depart MCTA (Northbound)	Depart Kittatinny Point Visitor Center VC (Northbound)	Depart Downtown Milford (Southbound)	Depart Martz DWG (Southbound)
6:20 a.m.	6:55 a.m.	9:00 a.m.	"N/A"
8:20 a.m.	8:55 a.m.	11:00 a.m.	"N/A"
9:20 a.m.	9:55 a.m.	12:00 p.m.	"N/A"
"N/A"	10:55 a.m.	1:00 p.m.	2:40 p.m.
11:20 a.m.	11:55 a.m.	2:00 p.m.	"N/A"
N/A	12:55 p.m.	3:00 p.m.	4:40 p.m.
N/A	1:55 p.m.	4:00 p.m.	6:00 p.m.
N/A	3:55 p.m.	6:00 p.m.	7:40 p.m.

Source: CTG based on MCTA data.



4.2 | SERVICE PRODUCTIVITY AND PERFORMANCE

OVERALL RIDERSHIP AND USAGE

Service productivity and performance has varied as the number of buses and routing of the shuttle has changed. In terms of overall ridership, the number of riders has generally increased over time. An exception occurred in 2012 when there was a significant increase in the amount of service provided; more service resulted in more riders. The pattern of steady increase is also apparent with the number of boats carried; boat portage has increased steadily since 2013, increasing by nearly 250% between 2013 and 2016. The number of bikes loaded and unloaded from the shuttle varied from year to year, with no clear trends.

TABLE 4-2: RIVER RUNNER HISTORICAL RIDERSHIP AND BOATS AND BIKES CARRIED

	Passengers	Boats	Bikes
2011	1,183	203	69
2012	2,106	1,072	139
2013	1,150	678	115
2014	1,563	1,005	73
2015	1,919	1,209	120
2016	2,513	1,660	96
2017	2,944	1,895	107

Source: MCTA data.

SERVICE PRODUCTIVITY

For the analysis of service productivity, the team distinguished the DWGC and the River Runner. This helps highlight changes to the River Runner, which have largely improved service productivity in comparison to the DWGC, which changed less and has not experienced improved productivity (Table 4-3). Average daily ridership on the River Runner increased from 2011 through 2017; some years were down, but the overall trendline is positive. Ridership per day in 2016 and 2017 eclipsed 2012, even though the shuttle operated significantly more service hours in 2012. In terms of ridership per hour, the service was at its most productive in 2017, when it averaged 2.7 riders per hour, marginally more than the 2.3 figure in 2016.

TABLE 4-3: RIVER RUNNER SERVICE PRODUCTIVITY

Year	Passengers per Day	Passengers per Hour	Passengers per Mile
2011	25.7	NA	NA
2012	65.8	1.2	0.06
2013	35.5	2.0	0.09
2014	47.6	2.0	0.10
2015	56.4	2.5	0.11
2016	78.5	2.3	0.12
2017	86.6	2.7	0.13

Source: MCTA data.

Ridership growth on the River Runner compares with service productivity on the DWGC, which is significantly lower (Table 4-4). Lower ridership on the DWGC is expected for a few reasons, such as a more limited schedule and that the DWGC provides connecting service only and no direct access to the Delaware River. Ridership peaked in 2016 when the DWGC carried nearly two riders a day. Since that time, there has been less than one rider per day. Passengers per service hour has generally remained consistent at a little under half a passenger. Passengers per service mile is generally one-tenth of the River Runner at 0.01, which is due to the combination of low ridership and length of the route.

TABLE 4-4: DWGC SERVICE PRODUCTIVITY

Year	Passengers per Day	Passengers per Hour	Passengers per Mile
2011	N/A	N/A	N/A
2012	1.8	0.3	0.01
2013	0.6	0.3	0.01
2014	N/A	N/A	N/A
2015	0.3	0.1	0.01
2016	2.0	0.5	0.01
2017	1.2	0.3	0.01

Source: CTG based on MCTA data.

Once the service was rebranded as the River Runner, and all vehicles were equipped with trailers, the shuttle has steadily increased the number of watercraft users carried (Table 4-5). The number of watercraft carried per day has increased from 2012 to 2017, and at the same time the number of passengers per boat decreased but has stabilized around 1.6 passengers per boat since 2013.

Increases in the portage of boats contrasts with bikes. The average number of bikes the shuttle carried per day hit a high point in 2012 at 4.3 bikes and has fluctuated since that time. The shuttle carried just 3.1 bikes per day (on average) in 2017, which is significantly lower than the average number of boats portaged each day, despite the shuttle having equal capacity for boats and bikes.

TABLE 4-5: RIVER RUNNER BOAT AND BIKE SERVICE PRODUCTIVITY

	Passengers per Day	Boats per Day	Passengers per Boat	Bikes per Day
2011	25.7	4.4	5.8	1.5
2012	65.8	33.5	2.0	4.3
2013	35.5	20.5	1.7	3.5
2014	47.6	30.5	1.6	2.3
2015	56.4	35.6	1.6	3.5
2016	78.5	51.9	1.5	3.0
2017	78.0	55.7	1.6	3.1

Source: CTG based on MCTA data (includes data from River Runner only).



RIDERSHIP AND BOAT/BIKE LOADINGS ANALYSIS

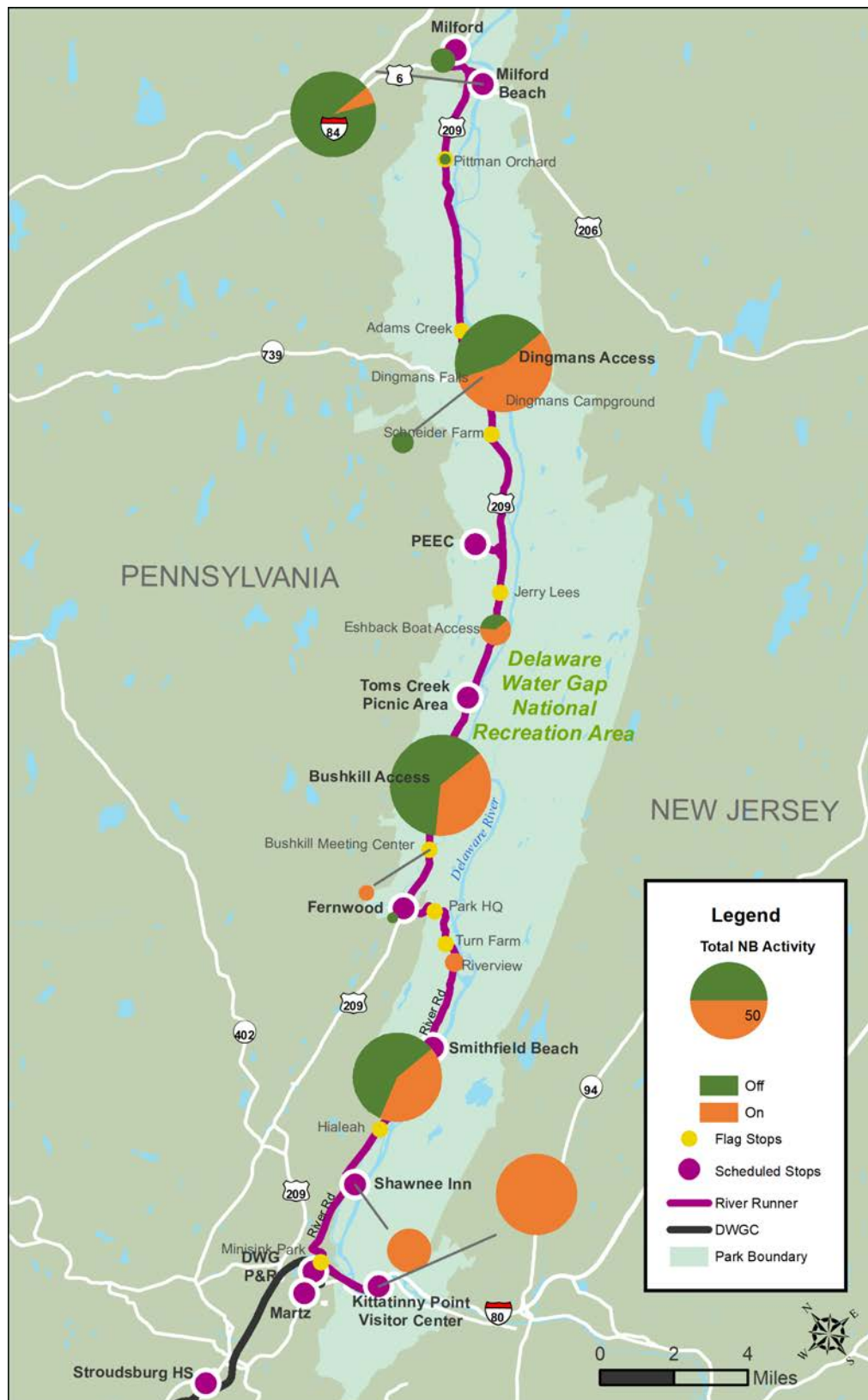
As part of understanding the River Runner, the study team examined ridership, boat, and bike loadings on a more detailed level, including by direction of travel, by individual trip (by time of day), and by stop. Data used for the ridership by direction of travel draws on data from 2011 to 2017, while data on ridership by trip and by stop reflects data collected during 2017; each shuttle trip was sampled at least once, and the two highest ridership trips were sampled twice.

Ridership, by Direction of Travel

The analysis of ridership by direction shows that ridership is heavily concentrated directionally and clusters around a handful of stops. Northbound trips carry nearly all the riders; in 2017, on an average day, northbound trips were responsible for 90% of all riders. Ridership also clusters around five stops (Kittatinny Point, Smithfield, Bushkill, Dingmans, and Milford Beach), all of which have water access and canoe launch areas. Figures 4-4 and 4-5 represents this relationship, showing all northbound and southbound boardings and alightings observed over the three days of observation by the study team.

In 2017, the shuttle also transported 1,895 boats, or approximately 56 boats a day and 107 bikes or approximately 3 bikes per day (not counted were 17 boats that were loaded on the DWGC). The patterns of boat and bike loading and unloading are consistent with the ridership data. Passengers and boats largely board the shuttle at one of the six primary stops and unload upstream at one of the four primary upriver canoe launch sites.

FIGURE 4-4: RIVER RUNNER RIDERSHIP, BY STOP: NORTHBOUND FIELD OBSERVATIONS, 2017



Source: MCTA. Data overlay: CTG.



FIGURE 4-5: RIVER RUNNER RIDERSHIP, BY STOP: SOUTHBOUND FIELD OBSERVATIONS, 2017



Source: MCTA. Data overlay: CTG.

Ridership, by Trip

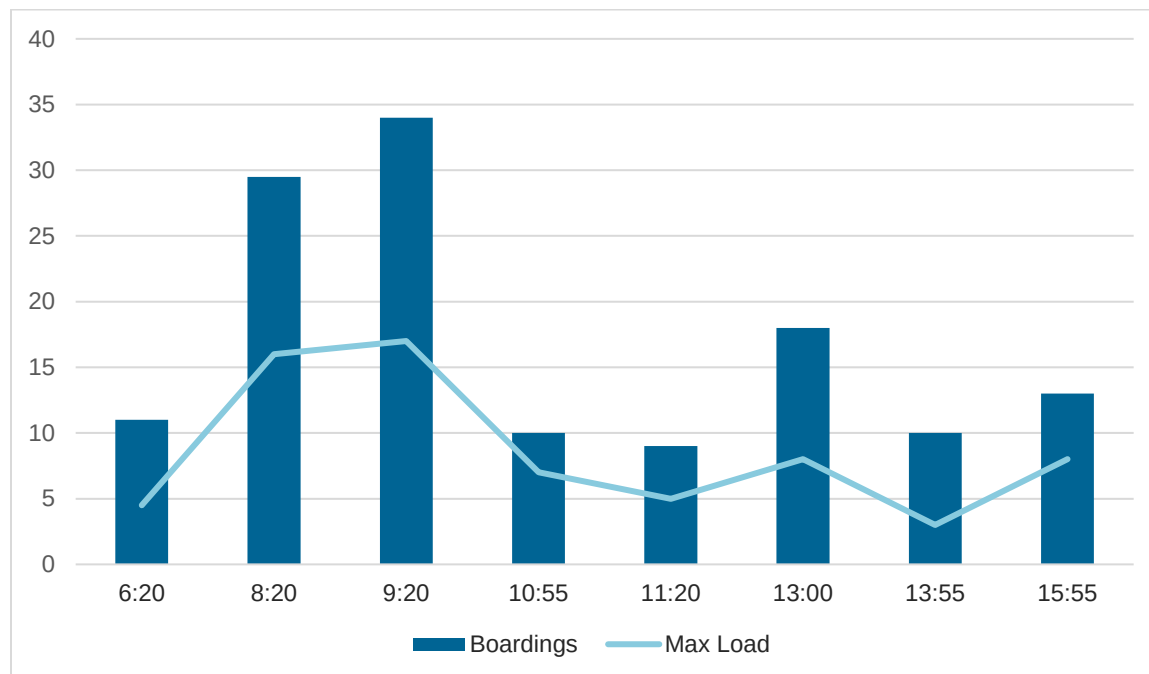
The River Runner provides eight northbound and eight southbound trips. The distribution of riders across the individual trips varies by time of day and by direction. Overall, the morning trips carry more riders than the afternoon trips; and consistent with the historical findings, northbound trips carry more riders than southbound trips (Figure 4-8 and Source: CTG).

Figure 4-9). The “max load” line on the graph shows the maximum number of riders (or boats or bikes) on the shuttle at one time.

Capacity constraints were also observed on several of the morning northbound trips, especially the 8:20 a.m. and 9:20 a.m. trips. These two trips have an average of 16 riders on the bus at the same time, which approaches the 18-passenger seating capacity of the bus. In addition, space for boats exceeded capacity on several trips (Figure 4-12). Indeed, the primary constraint on the shuttle is space for boats, rather than seats on the bus. Observations recorded by the field researchers confirmed that riders and their boats were unable to board the bus on several trips. Capacity constraints occurred on multiple trips on July 2, which was part of the Fourth of July holiday weekend, as well as the first weekend in August. After the morning trips, however, capacity was no longer a problem and riders and boats were easily accommodated.

The southbound trips, as noted, had lower ridership overall and a handful of trips had no riders at all. The midmorning (10:55 a.m.) and midafternoon (1:55 p.m.) trips carried the most riders with approximately 10 riders recorded on each trip. Consistent with this observation, there were only a handful of boats or bikes on these trips; the trips with boats and bikes are the same as the ones with more riders (10:55 a.m. and 1:55 p.m.).

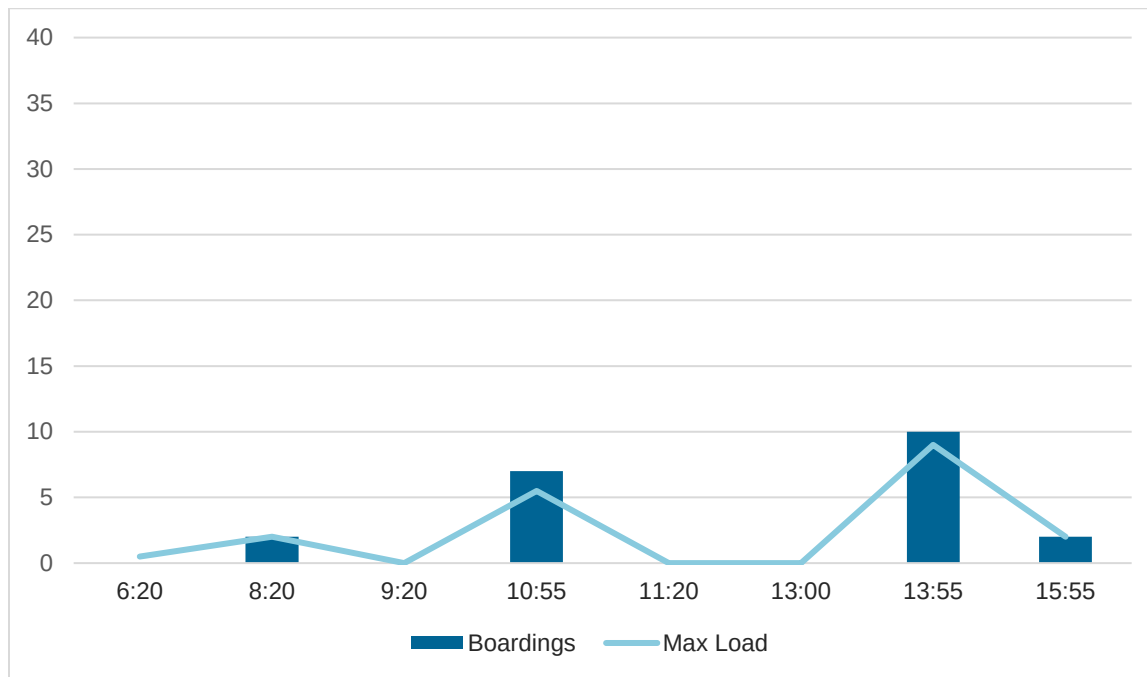
FIGURE 4-6: RIVER RUNNER NORTHBOUND PASSENGER BOARDINGS WITH MAXIMUM LOAD, BY TRIP



Source: CTG.



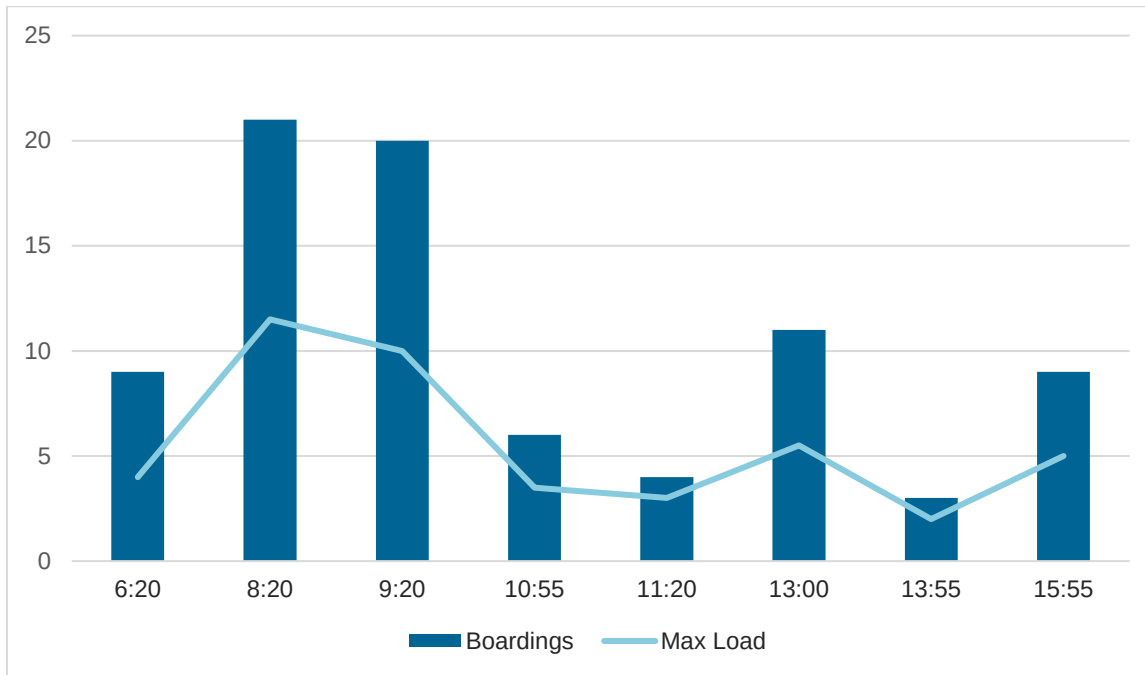
FIGURE 4-7: RIVER RUNNER SOUTHBOUND PASSENGER BOARDINGS WITH MAXIMUM LOAD, BY TRIP



Source: CTG.

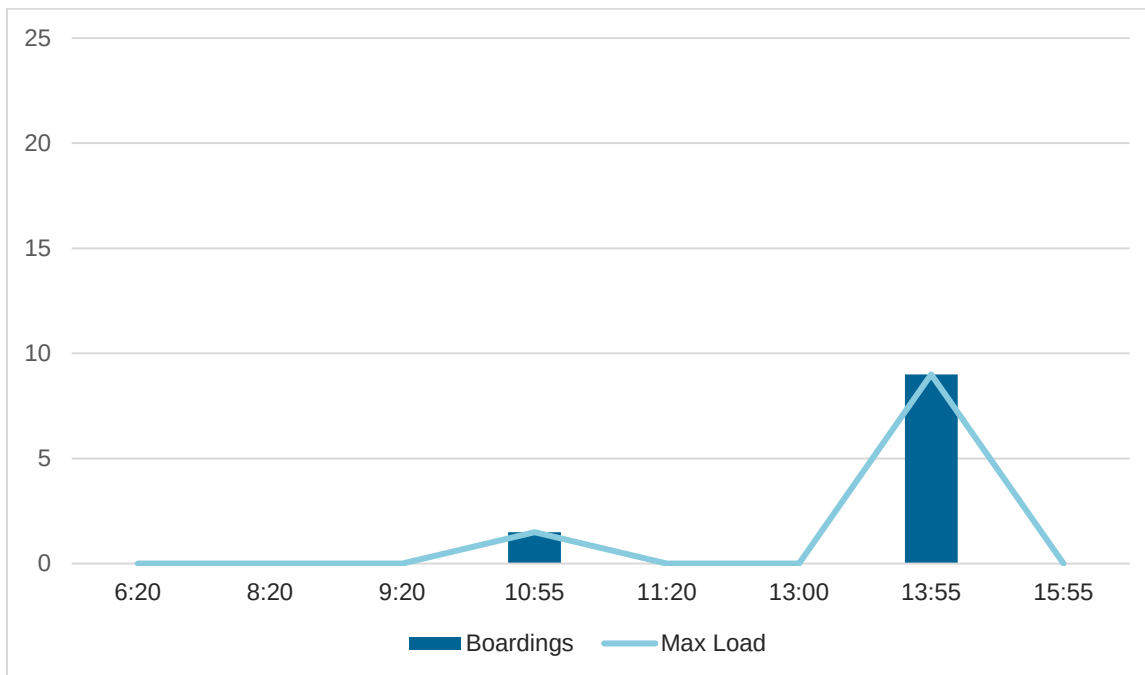
Boat loading and unloading follow a similar pattern as passenger boardings, with the two midmorning trips showing the highest ridership. The shuttle has capacity for eight boats, but the actual number of boats that can be accommodated varies based on the type and size of boat and the ability of the driver or passenger to stack the boats. In some cases, small boats (paddle boards and small kayaks) were put into the shuttle to avoid leaving riders and boats behind. In every case, the driver requested permission from passengers before loading their boats inside the vehicle.

FIGURE 4-8: RIVER RUNNER NORTHBOUND BOAT LOADING BY TRIP WITH MAXIMUM LOAD



Source: CTG.

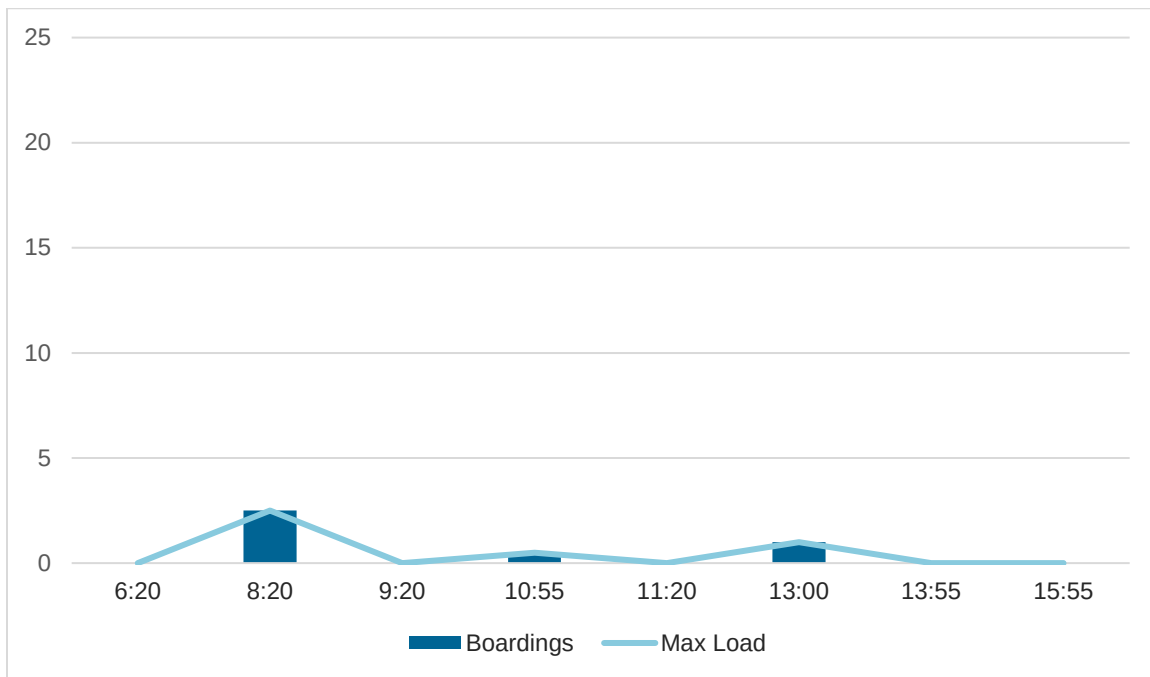
FIGURE 4-9: RIVER RUNNER SOUTHBOUND BOAT LOADING BY TRIP WITH MAXIMUM LOAD



Source: CTG.

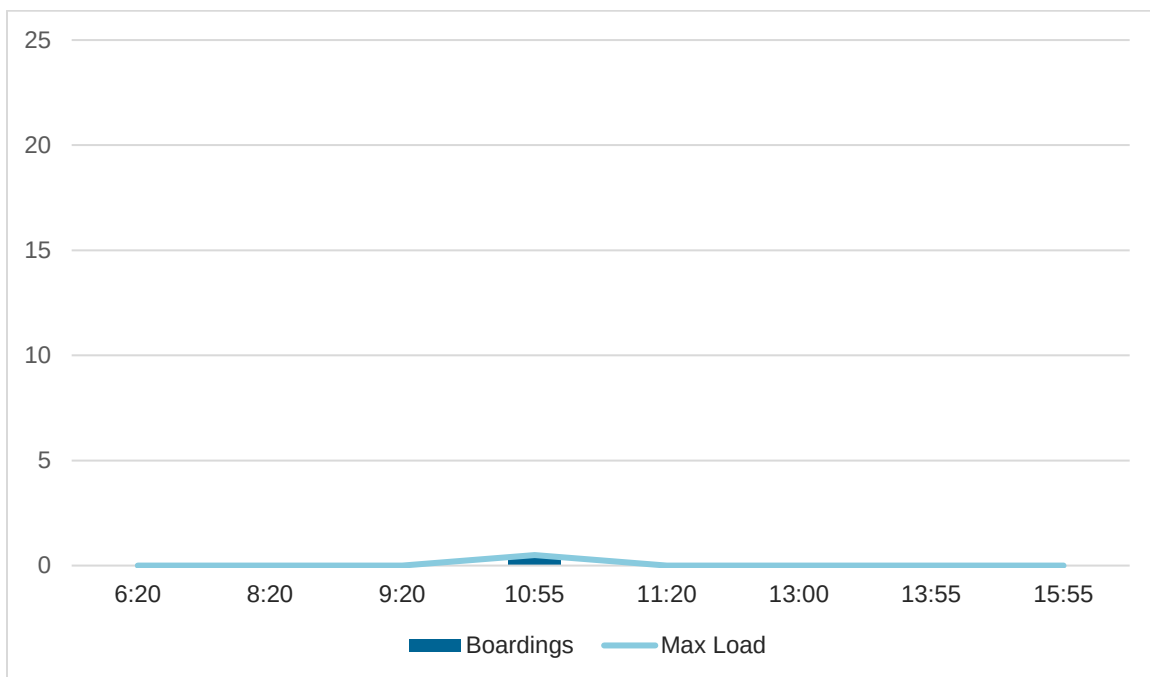


FIGURE 4-10: RIVER RUNNER NORTHBOUND BIKE LOADING BY TRIP WITH MAXIMUM LOAD



Source: CTG.

FIGURE 4-11: RIVER RUNNER SOUTHBOUND BIKE LOADING BY TRIP WITH MAXIMUM LOAD



Source: CTG.

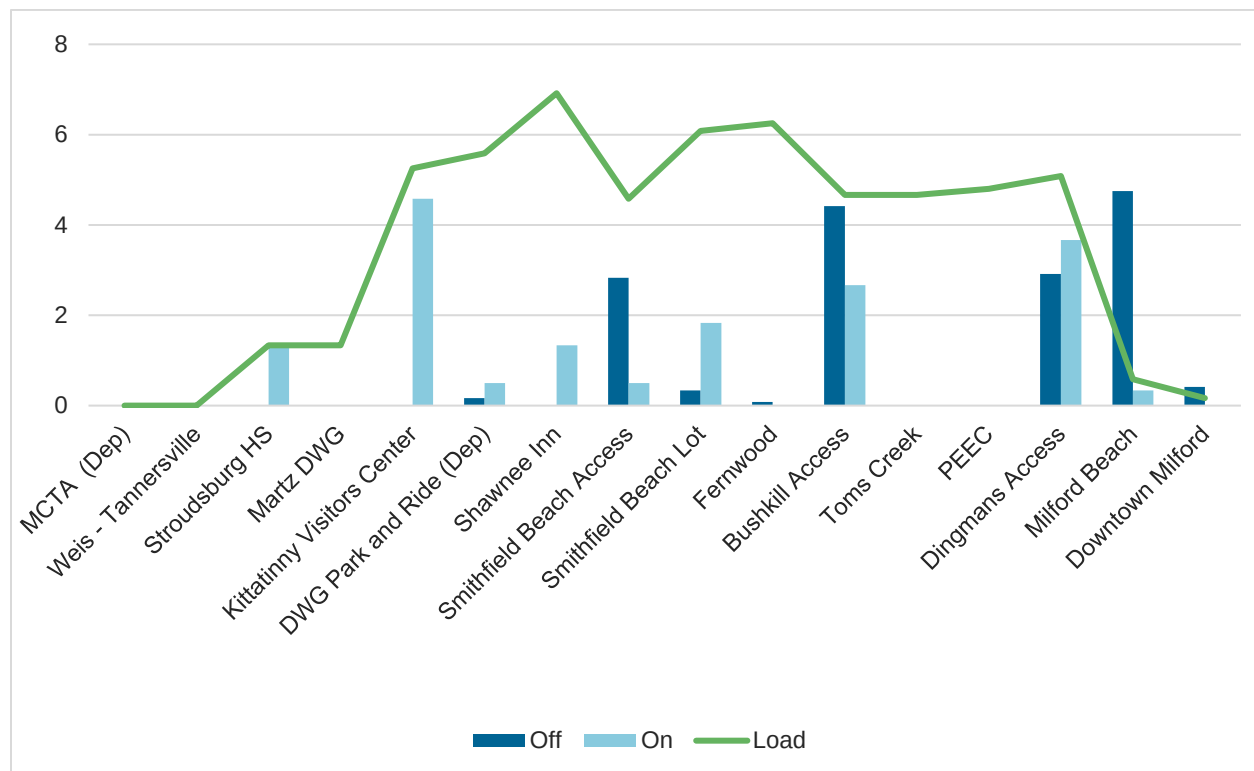
Ridership, by Stop

Ridership by stop shows rider boarding and alightings at individual stops along the route. These data show how frequently individual stops are used. In addition, by mapping where riders (and boats) get on and off the shuttle, it is possible to see capacity constraints (and availability) by location (Figure 4-11 and Figure 4-12). The consulting team also recorded individual rider and rider group origins and destinations (where individual riders boarded and alighted), to more clearly understand how riders use the route (Figure 4-13).

The analysis of ridership by stop reinforces other data and the overall design of the River Runner; passengers largely board the shuttle at southbound stops and travel north to canoe launches. Clusters of riders board at the Kittatinny Point Visitor Center, Smithfield Beach, and Bushkill and travel to Smithfield Beach, Bushkill, Dingmans, and Milford Beach. Another cluster of riders board at Dingmans and get off at Milford. Comparing the northbound and southbound trips underscores the dominance of the northbound trip in terms of ridership. The maximum average number of riders on the shuttle during southbound trips never exceeds two passengers at any stop.

With two notable exceptions, nearly all riders board and alight the shuttle from canoe launch locations. The two exceptions, Stroudsburg High School and the DWG Park and Ride lot, have large parking lots. These two stops are also at the most southern end of the route, which improves the likelihood that passengers will be able to load their boats on the shuttle.

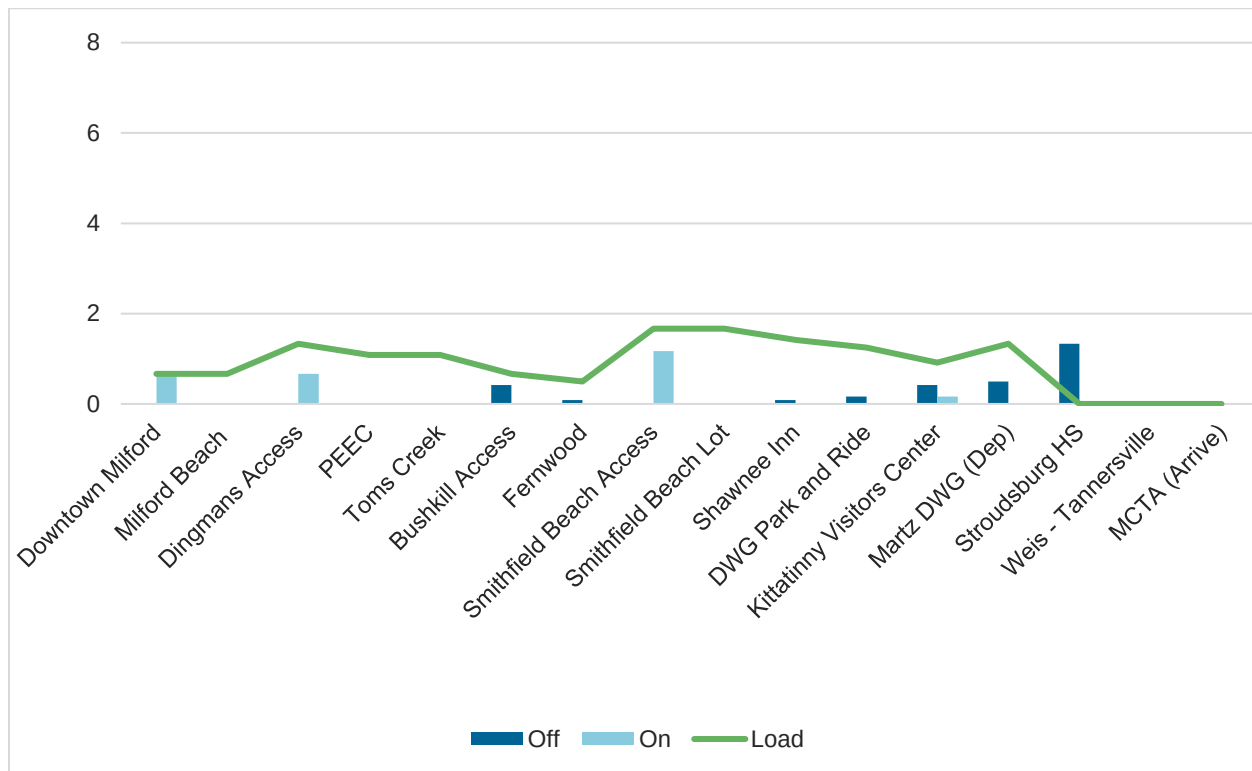
FIGURE 4-12: RIVER RUNNER RIDERSHIP BY STOP: NORTHBOUND AVERAGE DAY 2016



Source: CTG based on MCTA data.

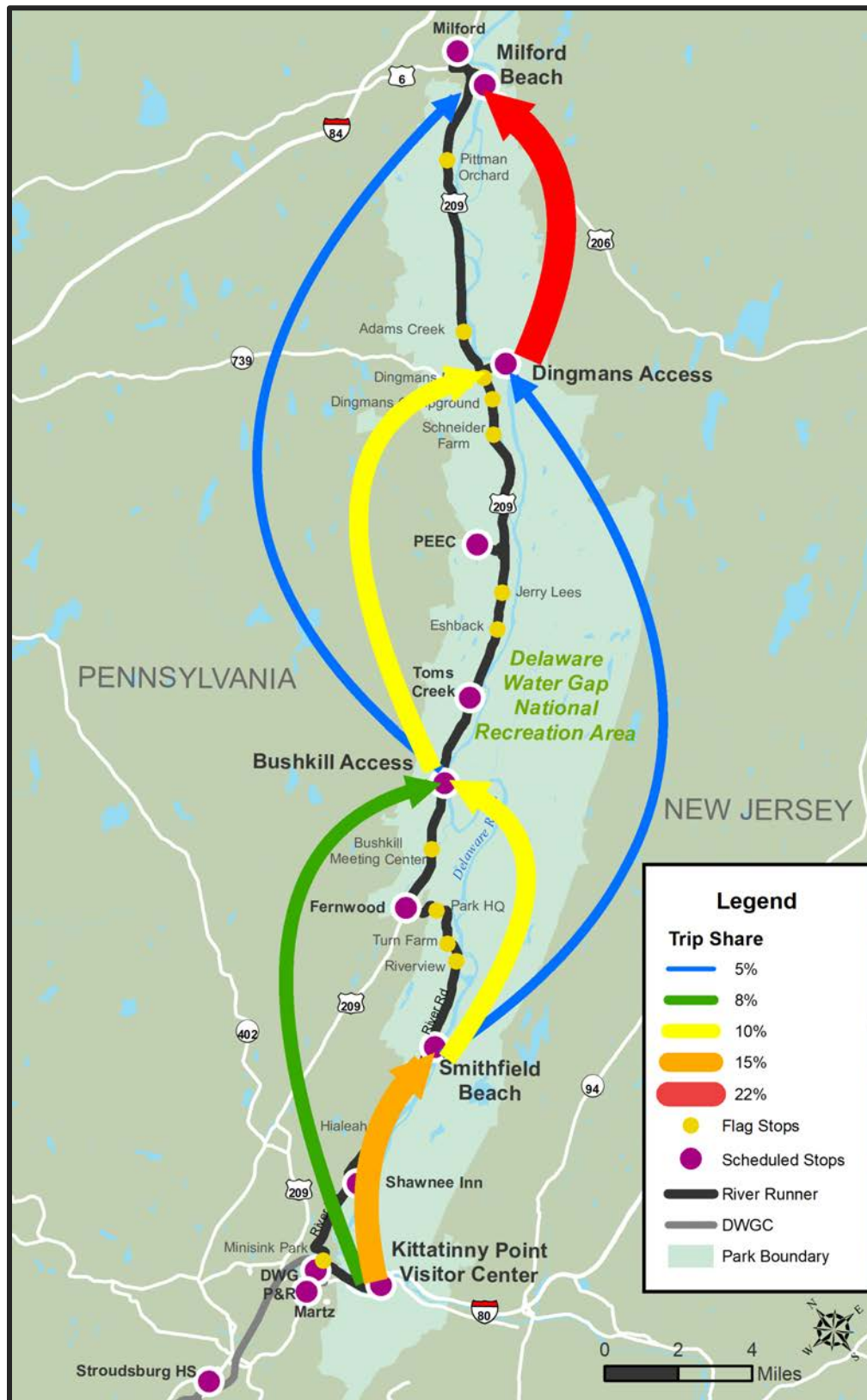


FIGURE 4-13: RIVER RUNNER RIDERSHIP BY STOP: SOUTHBOUND AVERAGE DAY 2016



Source: CTG based on MCTA data.

FIGURE 4-14: PRIMARY ORIGIN AND DESTINATION PAIRS, NORTHBOUND ONLY



Source: CTG based on MCTA data.



ON-TIME PERFORMANCE

Observations collected in the field revealed that the River Runner does not adhere to the published (scheduled) arrival and departure times. This is especially true for the early trips of the day and in the northbound direction when demand for the shuttle outstrips capacity. Indeed, during the observations, the shuttle fell behind schedule during the first trip of the day. During the Fourth of July holiday weekend, the shuttle never got back on schedule. During the other peak (but not holiday) days, the shuttle was generally able to get back on schedule during the southbound trips.

Scheduling the River Runner is challenging because the number of boats loaded on the shuttle varies, both by trip and by stop. In addition, the amount of time required to secure the boats varies because the type of boats and the sequence of boat loading adds complexity to securing the trailer. In addition, differences between the drivers and passengers can also affect dwell time. Some drivers can load boats more quickly than others; some passengers are more or less willing to help load boats; and some drivers are reluctant to leave people behind and try to find space for as many boats as possible. As the number of boats loaded onto the trailer increases, so does the loading time for each boat.

One of the fundamental attributes of fixed-route transit service is that the bus stops at identified locations along the route at the scheduled times. Meeting this schedule is important for riders who need to know when buses arrive and depart. Transit drivers are almost always instructed to not get ahead of schedule (because they would leave behind passengers who arrive at the stop on time). For purposes of this analysis, a shuttle is considered “on time” if it leaves no earlier than one minute ahead of schedule and departs from the stop no later than 10 minutes after the scheduled time. Because the River Runner loads boats and both the number of boats loaded on the trailer and the complexity of securing the boats varies, it is difficult to create an accurate time table. As a result, the River Runner is currently scheduled with a long layover time (35 to 25 minutes, depending if the shuttle serves PEEC) at the end of the northbound trip. This layover time is included in the schedule to allow drivers to make up time lost during the scheduled trips.

The variation in the bus dwell times recorded show the tremendous variation by stop. The same stop, for example, may have no boats loading and a short dwell time to up to 20 or 30 minutes of dwell time (Table 4-6). The stops with the most riders are also the stops with the greatest range of dwell times. Bushkill, for example, averaged eight minutes for each outbound trip, due to the loading and unloading of several boats per stop. This ranged from 1 minute to as much as 22 minutes. The two Smithfield Beach access and parking lot stops could also experience lengthy dwell times, ranging from 13 to 25 minutes. In total, five stops exceed the average five-minute dwell times in the outbound direction.^[2] Conversely, stops in the inbound direction experienced low dwell times, which reflects the low ridership in that direction.

TABLE 4-6: RIVER RUNNER DWELL TIME—NORTHBOUND TRIPS (NUMBERS SHOWN IN MINUTES)

River Runner Shuttle Stop	Minimum Dwell Time	Maximum Dwell Time	Range	Average
Kittatinny Point Visitor Center	0:00	0:29	0:29	0:10
DWG Park and Ride (Dep)	0:00	0:05	0:05	0:01
Shawnee Inn	0:00	0:14	0:14	0:03
Smithfield Beach Access	0:00	0:25	0:25	0:04
Smithfield Beach Lot	0:00	0:13	0:13	0:04
Fernwood	0:00	0:02	0:02	0:00
Bushkill Access	0:01	0:22	0:21	0:08
Toms Creek	0:00	0:01	0:01	0:00
PEEC	0:00	0:00	0:00	0:00
Dingmans Access	0:03	0:13	0:10	0:07
Milford Beach	0:01	0:19	0:18	0:06
Downtown Milford	0:00	0:00	0:00	0:00

Source: CTG.

TABLE 4-7: RIVER RUNNER DWELL TIME – SOUTHBOUND TRIPS (NUMBERS SHOWN IN MINUTES)

River Runner Shuttle Stop	Minimum Dwell Time	Maximum Dwell Time	Range	Average
Downtown Milford	0:00	0:00	0:00	0:00
Milford Beach	0:00	0:06	0:06	0:01
Dingmans Access	0:00	0:10	0:10	0:01
PEEC	0:00	0:01	0:01	0:00
Toms Creek	0:00	0:02	0:02	0:00
Bushkill Access	0:00	0:08	0:08	0:01
Fernwood	0:00	0:01	0:01	0:00
Smithfield Beach Access	0:00	0:20	0:20	0:03
Smithfield Beach Lot	0:00	0:03	0:03	0:00
Shawnee Inn	0:00	0:03	0:03	0:00
DWG Park and Ride	0:00	0:11	0:11	0:01
Kittatinny Point Visitor Center	0:00	0:04	0:04	0:01

Source: CTG.

Long dwell times are not necessarily problematic, so long as the dwells can be anticipated and incorporated into shuttle schedules; that way, riders can reasonably predict when this shuttle bus will arrive and depart. Because the River Runner cannot reasonably predict dwell times, the service struggles with on-time performance.



The shuttle struggles to stay on time because the morning trips are the most crowded and carry the most boats. As a result, the shuttle falls behind schedule on the first trip and as soon as the first or second stop and can stay off-schedule for the rest of the trip. Observed data shows that every northbound scheduled stop was late for at least half the trips (Table 4-8). Southbound trips are also unable to stay on time, even though passenger and boat activity is significantly lower. This suggests that the recovery time built into the schedule is not sufficient to keep the shuttle on schedule.

TABLE 4-8: RIVER RUNNER ON-TIME PERFORMANCE—NORTHBOUND TRIPS

River Runner Shuttle Stop	Early (1 minute before scheduled time)	On Time	Late (arrive > 10 minutes from scheduled time)
Kittatinny Point Visitor Center	0%	50%	50%
DWG Park and Ride	0%	50%	50%
Shawnee Inn	0%	36%	64%
Smithfield Beach Access	0%	25%	75%
Fernwood	17%	17%	67%
Bushkill Access	0%	25%	75%
Toms Creek	0%	18%	82%
PEEC	0%	33%	67%
Dingmans Access	0%	17%	83%
Milford Beach	0%	17%	83%
Downtown Milford	0%	25%	75%

Source: CTG based on data collected in summer 2017.

Highlighted areas denote stops with when the shuttle is late 5% of the time.

TABLE 4-9: RIVER RUNNER DWELL TIME—SOUTHBOUND TRIPS (NUMBERS SHOWN IN MINUTES)

River Runner Shuttle Stop	Early (1 minute before scheduled time)	On Time	Late (arrive 10 minutes or more from scheduled time)
Downtown Milford	0%	33%	67%
Milford Beach	0%	44%	56%
Dingmans Access	0%	42%	58%
PEEC	0%	33%	67%
Toms Creek	8%	42%	50%
Bushkill Access	0%	42%	58%
Fernwood	0%	50%	50%
Smithfield Beach Access	17%	33%	50%
Shawnee Inn	27%	27%	45%
DWG Park and Ride	25%	25%	50%

Source: CTG based on data collected in summer 2017

Highlighted areas denote stops with when the shuttle is late 50% of the time.

5.0 PEER REVIEW

5.1 | OVERVIEW

In addition to collecting data on the River Runner, the study team also examined other similarly sized and positioned shuttle services operating in park environments nationwide. DEWA's River Runner is unique among other NPS services in terms of operating environment and because it transports riders and their boats upriver; however, there are opportunities to learn from other services. The objective of this peer review is to understand the strengths and weaknesses of comparable NPS shuttle systems and identify best practices and lessons learned that may offer creative ideas and solutions for the River Runner.

PEER SELECTION PROCESS

The consulting team worked with MCTA and the National Park Service to identify analogous peers. The process started with the full list of NPS public transportation services. The study team then screened the list to identify services that were 1) operated with a bus; 2) seasonal; 3) designed to provide mobility within the park; 4) managed through a cooperative agreement with another entity; and 5) connected with other transportation services.

The screening process identified a handful of shuttles that met most of the criteria. However, because none of the shuttles were oriented around river travel, the study team conducted an internet search to look for other river portage type services. This process identified an additional peer in Bend Oregon that transports river travelers. The selection process yielded five peers for comparison:

1. Bandelier Shuttle in Bandelier National Monument, Los Alamos, New Mexico.
2. Muir Woods Shuttle in Muir Woods National Monument, Mill Valley, California.
3. Summit Shuttle in Scotts Bluff National Monument, Gering, Nebraska.
4. Roosevelt Ride at Home of Franklin D. Roosevelt National Historic Site, Hyde Park, New York.
5. Ride the River Shu in Bend, Oregon (non-National Park Service).

5.2 | BANDELIER NATIONAL MONUMENT SHUTTLE

OVERVIEW

Bandelier National Monument is in Los Alamos, New Mexico, about 100 miles north of Albuquerque, New Mexico. The Bandelier National Monument preserves an area occupied by Ancestral Pueblo People, with a major reoccupation from 1150 to 1550 AD. In 2016, approximately 200,000 people visited the park. The major attraction in the park is Frijoles canyon and cultural resources like cliff dwellings. Bandelier has a single access road. During peak times, the number of visitors exceeds roadway capacity and creates congestion. Parking is also limited.



The Bandelier shuttle travels from the White Rock Visitor's Center to the main visitation area of Bandelier National Monument. The shuttle is designed to manage access to the park, and during peak periods (from mid-May until mid-October between the hours of 9:00 a.m. and 3:00 p.m.), the shuttle is mandatory. The mandatory shuttle includes a handful of exceptions, including by time of day (before 9:00 a.m. and after 3:00 p.m.); vehicles with disability tags or plates; vehicles with pets on board; overnight backpackers; bicycles; official park business; and tour groups.

SERVICE HISTORY AND EVOLUTION

In 2011, the Las Conchas fire burned much of the land in and around Bandelier National Monument, ultimately damaging or destroying some 150,000 acres. Heavy rains after the fire led to major flooding events, which damaged several trails within the park and damaged a bridge that connected the park entrance with a picnic area and the park's primary parking lot. The parking area was inadequate before the flood, and without access to the primary parking area, the National Park Service and the Bandelier National Monument partnered with Atomic City Transit, the local transit agency, to operate the shuttle. In the first season, the shuttle was mandatory and offered free of charge. After operating for three years as a temporary "Emergency Shuttle," the shuttle was converted to a permanent service with approval of dedicated funding in the form of a transportation fee, which is part of the park entrance fee.

SERVICE AND OPERATING CHARACTERISTICS

The Bandelier shuttle is shown in Figure 5-1 and operates daily from 9:00 a.m. to 5:00 p.m. between mid-May and mid-October (with mandatory ridership until 3:00 p.m.). One-way trips are 21 miles and take approximately 30 minutes to complete. Headways are 30 minutes Mondays through Fridays (32 daily one-way trips) and 20 minutes on Saturdays and Sundays (48 daily one-way trips), making about 2,610 vehicle trips a year. The shuttle is operated with medium-duty 22-passenger cutaway vehicles. The shuttle continues operation under a cooperate agreement with Atomic City Transit, which provides three diesel buses, fuel, and other resources required to run the shuttle. The shuttle is free to ride; however, the entrance fee to the park is \$20 per vehicle. Of the \$20, approximately \$7 goes to a transportation fee, which contributes to covering the cost of the transit service.

FIGURE 5-1: BANDELIER SHUTTLE VEHICLE



Vehicle in service at Bandelier National Monument. Source: <https://www.nps.gov/band/planyourvisit/shuttle.htm>.

TABLE 5-1: BANDELIER SHUTTLE OPERATING STATISTICS, 2016

Operating Statistics	
Span of Service	9:00 a.m.–5:10 p.m.
Vehicles	3 22-passenger Medium-Duty Transit Vehicles
Vehicle Seats	19
Annual Trips	2,610
Service Miles	23,490
Service Hours	2,841
Annual Operating Costs	\$166,220

Source: CTG based on NPS data



Performance Statistics

The Bandelier shuttle has high ridership compared to its peers, which is largely due to restricted vehicular access through most of the day during peak season. In addition, many visitors do not have options other than the shuttle to visit some parts of the park. The high ridership and relatively low costs make this shuttle the most efficient service of the peers in terms of cost per rider.

TABLE 5-2: BANDELIER SHUTTLE SERVICE PRODUCTIVITY, 2016

Service Productivity & Financial Performance	
Ridership	47,661
Riders per Trip	18.3
Riders per Mile	2.0
Riders per Hour	16.8
Cost per Rider	\$3.49

Source: CTG based on NPS data

Lessons Learned

- The Bandelier shuttle benefits from a cooperative agreement with Atomic City Transit, which operates and manages the service. This partnership is like the one DEWA has with MCTA.
- The Bandelier shuttle is mandatory for most visitors traveling to Bandelier National Monument, which strengthens shuttle ridership.
- Los Alamos is positioning itself as a tourist destination with multiple destinations, many of which are accessible by public transportation. The shuttle to Bandelier National Monument fits within the community's broader tourism and economic development vision.
- The Bandelier shuttle requires travelers to stop in White Rock (New Mexico), which historically has attracted fewer visitors than nearby Los Alamos. Los Alamos County also developed a visitor center in White Rock. The decision to put the shuttle stop in White Rock reinforces local economic development efforts.

5.3 | MUIR WOODS SHUTTLE, MUIR WOODS NATIONAL MONUMENT

Muir Woods National Monument is in Mill Valley, California, roughly 16 miles north of San Francisco. Muir Woods is well known for its hiking trails among old-growth coastal redwood trees. The park is part of the Golden Gate National Recreation Area and is open all year; it attracted roughly 1.2 million visitors in 2016.

Given its proximity to San Francisco and the metropolitan Bay Area, the transportation road network to Muir Woods is heavily traveled and often congested. In addition, parking at the park is limited and visitors often have trouble finding parking. Rather than clear land and construct additional parking spaces that would detract from the aesthetics of the park, park leadership implemented the Muir Woods shuttle.

SERVICE HISTORY AND EVOLUTION

The Muir Woods shuttle, shown in Figure 5-2, is operated as a cooperative agreement between the National Park Service and Marin Transit. The shuttle costs \$425,000 to operate, with approximately 48% of the cost covered by passenger fares. The transit district pays \$122,000 for the shuttle and the National Park Service contributes \$97,000. Marin Transit provides the vehicles. Passenger fares are set at \$5 per one-way ride. The fare is charged to adults only; children 15 years old or younger, older adults aged 65 or more, and people with disabilities ride for free.

The Muir Woods shuttle service carries approximately 100,000 riders each year, which is approximately 20% of all visitors using the shuttle to get to the park. During peak periods, the shuttle carries up to 25% of all visitors to Muir Woods².

In a response to public safety risks from illegal parking and foot traffic along narrow roads, Muir Woods will soon require reservations for both parking in the park and a seat on the shuttle. The reservation system will launch in early 2018 and will accommodate day-of and advance-notice reservations. Parking reservation fees will be \$8 per vehicle in 2018 and will increase by \$0.50 every two years. Shuttle reservation fees will be \$3 per person age 16 or older and will increase \$0.25 every two years. Reservation fees will be separate from the park admission entrance fee.

FIGURE 5-2: MUIR WOODS SHUTTLE VEHICLE



Vehicle in service at Muir Woods National Monument. Photo Source: www.marintransit.org.

² Marin Officials Call for a Fee Hike on Muir Woods Shuttle, Marin Independent Journal, December 2014



SERVICE OPERATING CHARACTERISTICS

The Muir Woods shuttle is operated with heavy-duty 35-foot and 40-foot transit vehicles and consists of two routes:

- Route 66 operates to/from the Pohono State Park and Ride and the Muir Woods Visitor Center. Route 66 operates on weekend days only between mid-May and late October with roughly 20-minute frequencies from 9:00 a.m. to 5:00 p.m. Although Route 66 does not operate on weekdays, it does increase the level of service to 10-minute frequencies during its peak season (late May to early September).
- Route 66F operates between the Sausalito Ferry and Marin City Hub to Muir Woods Visitor Center. Route 66F operates on weekend days between mid-May and late October and operates weekday service between mid-June and mid-August. Service frequencies on Route 66F are roughly every 30 minutes from approximately 10:00 a.m. to 7:00 p.m.

The shuttles also connect with other transit services, so riders can take transit from several locations across the Bay Area. The Pohono Park and Ride lot is also served by Marin Transit. At the Sausalito Ferry Terminal, there is connecting service to Golden Gate Ferry and Golden Gate Transit. The Marin City Hub offers connecting service to Marin Transit and Golden Gate Transit.

The Muir Woods shuttle service operates the greatest number of trips, service hours, and service miles compared to peer services. The extensive service is reflected in the annual operating costs, which are nearly \$440,000 more than the next most expensive shuttle, Bandelier.

TABLE 5-3: MUIR WOODS OPERATING STATISTICS, 2016

Operating Statistics	
Span of Service	9:05 a.m.–7:55 p.m.
Vehicles	10 Heavy-Duty Buses
Seats per Vehicle	40
Annual Trips	5,807
Service Miles	37,814
Service Hours	4,413
Annual Operating Costs	\$604,476

Source: CTG based on NPS data

Muir Woods Performance, 2016 Statistics

The Muir Woods shuttle has excellent service productivity carrying 28 riders per hour of service. The shuttle benefits from a high level of service (frequency) and offering a travel option in a congested region. The operating cost per rider is reasonably low as well; at \$4.87 it is close to the average of peer costs. The success of the shuttle can be seen in the ridership level, which has increased over 60% from 2013 to 2016.

TABLE 5-4: MUIR WOODS SERVICE PRODUCTIVITY, 2016

Service Productivity & Financial Performance	
Ridership	124,043
Riders per Trip	21.4
Riders per Mile	3.3
Riders per Hour	28.1
Cost per Rider	\$4.87

Source: CTG based on NPS data

TABLE 5-5: MUIR WOODS HISTORICAL RIDERSHIP

Year	Ridership
2013	77,486
2014	102,950
2015	110,643
2016	124,043

Source: CTG based on NPS data

LESSONS LEARNED

- The Muir Woods shuttle was an alternative to building additional parking. The number of visitors allowed into the park has grown, with growth accommodated by shuttle rather than parking.
- Limited parking, in turn, has strengthened the shuttle because there is not enough parking for all visitors to drive directly to the site.
- Fares paid by visitors who ride the shuttle are an important revenue source for the service. Historically, fares have covered approximately 50% of the operating costs; more recently, officials say fares will cover up to 75% of the costs of the service.
- In 2018, Muir Woods will implement a reservation system for both vehicle parking and seats on the shuttle. These increased restrictions reflect a need to manage growth in demand for visits to the park.
- Reservations were instituted because there is still significant congestion and related safety challenges despite having a shuttle place.

5.4 | SUMMIT SHUTTLE, SCOTTS BLUFF NATIONAL MONUMENT

Scotts Bluff National Monument stretches over an area of 3,000 acres in western Nebraska. The park is over 800 feet above the North Platte River, and has significant geological, paleontological, and human history. Summit Road, which travels to the summit of Scotts Bluff, opened in 1937 and is still used today. The roadway has been designated as a protected mountain road and has extremely sharp turns and low-hanging ceilings in its three tunnels. This forces length and height restrictions on vehicles traveling to the summit.



In 2016, a total of 130,085 visitors came to the park, many of which could not safely traverse Summit Road in their vehicles. Summit Shuttle offers an alternative to reach the summit to those with vehicles that do not meet the restrictions. While the shuttle is not mandatory for vehicles within size restrictions, some drivers prefer the shuttle. Most passengers take the shuttle in both directions, however trails in the park enable visitors to take the shuttle one way and hike another way. Park rangers also travel with the shuttle and share information about the natural, cultural, and historical aspects of the park along the way.

SERVICE HISTORY AND EVOLUTION

The ATS has been operating since 1997, serving thousands of visitors a year. A \$5 entrance fee applies to each vehicle, and there is a \$3 entrance fee per pedestrian, bicyclist, and motorcyclist; no transportation fee applies. The park has always owned and operated the shuttle, managing the operations with seasonal and year-round staff. Recently, the park has considered restricting private vehicle access in the park from 8:00 a.m. until 1:00 p.m. to reduce wear on the historic Summit Road. This would invariably increase the demand for the shuttle dramatically and increase service costs.

SERVICE OPERATING CHARACTERISTICS

Summit Shuttle, shown in Figure 5-3, used 16-passenger medium-duty cutaway vehicles to bring visitors to the summit and trails. The trip takes from 7 to 10 minutes one way and is free of charge. The shuttle does not operate on a regular schedule, instead operating as an on-demand service, relying on visitor requests to prompt trips. Visitors can call ahead or request the shuttle at the visitor's center. The shuttle is directly owned and operated by the National Park Service, which requires little capital costs and operating costs due to the small operation.

FIGURE 5-3: SCOTTS BLUFF SHUTTLE VEHICLE



Vehicle in service at Scotts Bluff National Monument. Photo Source: <https://www.nps.gov/scbl/planyourvisit/shuttle.htm>.

TABLE 5-6: SCOTTS BLUFF OPERATING STATISTICS, 2016

Operating Statistics	
Span of Service	8:00 a.m.–7:30 p.m.
Vehicles	1 Medium-Duty 16-Passenger Vehicle
Seats per Vehicle	12
Annual Trips	3,048
Service Miles	156
Service Hours	667
Annual Operating Costs*	\$15,357

*Annual operating costs are from FY 2010 (latest available year).
Source: CTG based on NPS data

Performance Statistics

Although ridership on Summit Shuttle is the lowest among the peers, there has been an increase of 65% from 2013 to 2016. Other metrics, such as riders per trip and riders per hour, are comparatively low; however, the cost per rider shows that the service is relatively cost effective.

TABLE 5-7: SCOTTS BLUFF SERVICE PRODUCTIVITY, 2016

Service Productivity & Financial Performance	
2016 Ridership	2,732
Riders per Trip	0.9
Riders per Mile	17.5
Riders per Hour	4.1
Cost per Rider*	\$4.39

*Cost per rider is from FY2010 when ridership was approximately 3,500
Source: CTG based on NPS data

TABLE 5-8: SCOTTS BLUFF HISTORICAL RIDERSHIP

Year	Ridership
2013	1,659
2014	1,636
2015	2,525
2016	2,732

Source: CTG based on NPS data



LESSONS LEARNED

- Summit Shuttle is required because not all vehicles are able to safely traverse the road to the summit of the bluff. The road is also challenging for some drivers. Some visitors would not be able to access this location without the shuttle.
- Summit Shuttle has relatively low ridership compared to its peers. Ridership partially reflects relatively low visitation to the park overall. However, the size of the operation meets the demand, creating a relatively cost-effective transit service.
- The shuttle has been successfully owned and operated by the National Park Service for over 30 years and has maintained a small but significant role in the park transportation system. Shuttle operations have been examined by the National Park Service in the Scotts Bluff NM Alternative Transportation System Operational and Contractual Characteristics Report, but the shuttle has continued to operate much in the same way it has for decades.

5.5 | ROOSEVELT RIDE, HOME OF FRANKLIN D ROOSEVELT

The Home of Franklin D. Roosevelt (FDR) is a National Historic Site located in Hyde Park, New York, about 90 miles north of New York City. The National Historic Site consists of Springwood, FDR's family home, the FDR Presidential Library and Museum, and Top Cottage, FDR's retreat house. Two other National Historic Sites are also near the FDR site: the Vanderbilt Mansion National Historic Site and the Eleanor Roosevelt National Historic Site.

The Roosevelt Ride is a shuttle service designed to meet two needs: 1) picking up and dropping off visitors at the Metro-North Station in Poughkeepsie, New York; and 2) transporting people between the FDR, Eleanor Roosevelt, and Vanderbilt Mansion National Historic Sites. People who want to take the shuttle from the train station must make reservations. They are greeted at the Poughkeepsie Metro-North Station at 10:36 a.m. by a park ranger and then transported via a guided tour to the FDR Homestead. After returning to the FDR Homestead, the shuttle operates hourly service between the FDR Homestead (Hyde Park Wallace Center) and the Eleanor Roosevelt site (Val-Kill), Top Cottage, and the Vanderbilt Mansion. At 5:00 p.m., the shuttle brings visitors back to the same train station, where they can connect to MTA service and travel back to New York City.

SERVICE OPERATING CHARACTERISTICS

The National Park Service owns and operates the FDR Homestead shuttle, also called the Roosevelt Ride. The Roosevelt Ride is the most expensive shuttle that is owned and operated by the National Park Service among its peers, costing nearly \$140,000 per year. The shuttle operates daily from May 1 to October 31. The shuttle is free, but admission to the National Historic Sites is \$28.00 (adults), although higher fees are under discussion this year (2017). The National Park Service owns two vehicles (Figure 5-4) for this service, operating one at a time.

FIGURE 5-4: THE ROOSEVELT RIDE SHUTTLE VEHICLE



Vehicle in service at Home of Franklin D Roosevelt. Photo Source: <https://dutchesstourism.com>.

TABLE 5-9: FDR HOMESTEAD OPERATING STATISTICS, 2016

Operating Statistics	
Span of Service	11:10 a.m.–4:50 p.m.
Vehicles	1 Medium-Duty 22-Passenger Transit Vehicle
Seats per Vehicle	30
Annual Trips	2,760
Service Miles	828
Service Hours	1,288
Annual Operating Costs	\$138,632

Source: CTG based on NPS data



PERFORMANCE STATISTICS

Ridership of the Roosevelt Ride increased 45% from 2013 to 2016. Although the cost per rider was the highest among peers with cost information, it was still within a reasonable range of other shuttles. The “riders per mile” category, conversely, was the highest among peer shuttles.

TABLE 5-10: FDR HOMESTEAD SERVICE PRODUCTIVITY, 2016

Service Productivity & Financial Performance	
2016 Ridership	24,438
Riders per Trip	8.9
Riders per Mile	29.5
Riders per Hour	19.0
Cost per Rider	\$5.67

Source: CTG based on NPS data

TABLE 5-11: FDR HOMESTEAD HISTORICAL RIDERSHIP

Year	Ridership
2013	16,909
2014	20,129
2015	20,089
2016	24,438

Source: CTG based on NPS data

LESSONS LEARNED

- Riders on the Roosevelt Ride must reserve a seat on the shuttle. This guarantees that there will be riders before a bus is dispatched.
- Shuttles schedules are based on the Metro-North rail schedule. This scheduling facilitates both pick-up and drop-off services for passengers arriving at the Metro-North Train Station in Poughkeepsie, which is approximately five miles from the FDR National Historic Site. This service ensures that the shuttle is convenient.
- A park ranger accompanies the shuttle so that the tour effectively begins once visitors board the shuttle. Access to the ranger also adds value to the shuttle service.

5.6 | RIDE THE RIVER (OREGON, NON-NATIONAL PARK SERVICE)

The Deschutes River between Riverbend Park and Drake Park in Bend, Oregon, has become a popular location for summertime tubing. However, this activity increased traffic, illegal parking, and people driving under the influence. In 2006, the Bend Police Department provided funding (\$10,000) to start a shuttle service, the Ride the River, to help manage the traffic, parking and driving impacts associated with river travelers. The Ride the River gives people floating down the river a safe and convenient way to tube on the river without using their own vehicles.

SERVICE HISTORY AND EVOLUTION

The Ride the River shuttle service started in 2006, with service offered seven days a week. The first year the transit service shuttled 4,241 passengers. The second year the shuttle operated, service was cut to four days a week (Friday through Monday). Then, in 2015, Cascades East Transit (CET) increased service back to seven days a week, and ridership increased. Ridership has increased consistently since then, with preliminary 2017 figures surpassing previous ridership amounts by mid-August.

SERVICE OPERATING CHARACTERISTICS

Seasonal service operating from mid-June through Labor Day, seven days a week. The Ride the River shuttle, shown in Figure 5-5, operates with a trailer equipped with a large cage system that encloses the floats. The shuttle operates with CET's regular 40-foot heavy-duty transit vehicles. Passengers are allowed to carry inner tubes only, which must also be within size limitations.

FIGURE 5-5: RIDE THE RIVER SHUTTLE VEHICLE



Vehicle in Service at Deschutes River. Photo Source: <http://cascadeseasttransit.com/ride/ride-the-river/>.

Fares are purchased for \$3 and provide all-day access to the shuttle with a wristband. Most riders enter the Deschutes River at Riverbend Park and exit at Drake Park, where the Ride the River shuttle picks them up for the return trip to Riverbend Park. The service is used heavily in one direction—northbound to Riverbend Park. The shuttle operates relatively limited hours, reflected in the lowest number of service hours compared to its peer systems.



TABLE 5-12: RIDE THE RIVER OPERATING STATISTICS, 2016

Operating Statistics	
Span of Service	11:30 a.m.–6:30 p.m.
Seats per Vehicle	30
Annual Trips	1,110
Service Miles	4,490
Service Hours	624

Source: CTG based on Cascade East Transit data

Performance Statistics

The Ride the River was the most efficient peer service studied in terms of riders per trip and riders per hour. Ridership has been increasing year over year, with a dramatic increase in ridership seen following the increase in service back to seven days a week.

TABLE 5-13: RIDE THE RIVER SERVICE PRODUCTIVITY, 2016

Service Productivity	
2016 Ridership	30,031
Riders per Trip	27.1
Riders per Mile	5.3
Riders per Hour	48.1

Source: CTG based on Cascade East Transit data

TABLE 5-14: RIDE THE RIVER HISTORICAL RIDERSHIP

Year	Ridership
2015	24,800
2016	30,031
2017*	34,298

*2017 ridership figure is to August 14th only.

Source: CTG based on Cascade East Transit data

LESSONS LEARNED

- Ride the River operates an efficient service carrying nearly 48 riders per hour.
- Cascade East Transit uses a wristband system so people can take unlimited rides on the shuttle.
- The shuttle frequency increases from service every 30 minutes to service every 15 minutes on days with high demand or high temperature. Conversely, the shuttle reduces or eliminates service on days with poor weather conditions.
- Restricting the type of watercraft to inner tubes and limiting the size of the inner tubes increases the number of passengers that the shuttle can serve. It also makes it easier to load and unload the inner tubes.

5.7 | LESSONS FROM PEERS

The peer transit systems address the unique needs of the parks that they serve. Despite the differences in service design and operation, the services face common challenges. Challenges include balancing the need to make a park or recreational resource accessible with the desire to minimize the impact of visitors on the surrounding environment. The following findings offer learning opportunities for other parks, including DEWA, which has already taken actions that align with its peers and that are supported by their success elsewhere:

- Partnering with local transit operators helps reduce capital costs, largely by sharing vehicles among services. Partnerships also help the National Park Service leverage the knowledge and expertise of the transit agency.
- Parks can implement (or increase) shuttle service as an alternative to adding parking capacity. In the peer cases (Bandelier and Muir Woods), the shuttle helped mitigate the impact of reduced parking. Trading off the inconvenience of riding a shuttle for reduced development within a park is valued by many visitors.
- Transit has been successful where the park's landscape makes it challenging or unsafe to drive, such as in Bandelier and Scotts Bluff, but also Ride the River Transit.
- Some parks raise funds for shuttle services by implementing a transportation fee; however, the effort associated with securing this fee can be significant.
- Advertisements and information systems help increase awareness.
- Continual monitoring of the shuttles helps keep shuttle operating costs to a minimum while meeting the transportation needs of the visitors.
- Other services that are primarily used for portage to river access have difficulty in maintaining equal distribution of ridership on outbound and inbound trips.
- Restricting the type of boat that visitors use can be an effective way of increasing capacity with increasing costs.



6.0 STRENGTHS, OPPORTUNITIES, AND CHALLENGES (KEY FINDINGS)

6.1 | TRANSPORTATION NETWORK

This section discusses the strengths and opportunities of the roadways used by the shuttle.

STRENGTHS

Vehicle Capacity

Most of the shuttle route roadway experiences little to no traffic congestion. Traffic congestion within the park appears to only regularly be an issue in downtown Milford and westbound along I-80 leading to the toll plaza. The majority of congestion issues and delays that the shuttle experiences is attributed to the travel within the stops and not along the corridor, save for the Milford and I-80 stretches. For example, significant delays to the shuttle can be attributed to the loading and unloading activities, livery congestion at the water drop locations, the Smithfield beach entrance.

Traffic Calming Measures

The roadway includes several traffic calming measures, including centerline rumble strips and narrow lanes. The effectiveness of these measures has not been quantified, but they are appropriate designs to have in place.

Minimal Impact to Park Environment

The roadways through the park provide vehicular access to numerous recreational opportunities while creating minimal impact on the natural environment of the park. This is partly accomplished by appropriately having two lanes (no more than is necessary).

OPPORTUNITIES AND CHALLENGES

Motor Vehicle Safety

Safety along the roadways is compromised by minimal and sometimes insufficient stopping sight distance and intersection sight distance. This is especially true along River Road, which has several significant horizontal and vertical curves, and trees are closer to the road due to the absence of shoulders. River Road also appears to have a higher likelihood of wildlife along the road, potentially affecting moving vehicles.

Bicycling Safety

These roads have narrow to nonexistent shoulders and posted vehicle speeds of up to 45 mph, making them high-stress roads for bicyclists. According to DEWA's website, bicycling is not recommended on River Road or US-209. However, confident cyclists will assume the lane and be more tolerant of the higher speed vehicles and the narrow shoulders. Bicyclists were observed on both River Road and US-209, showing that there is a demand for bicycling on these roads in addition to the McDade Recreation Trail.

Pedestrian Safety

No sidewalks or shared use paths facilities exist along River Road or along US-209 north of River Road. Pedestrians were not observed walking along the shoulders of either road except along US-209 nearing the village center of Milford. From an access standpoint, the distance between points of interest is far enough that many people may not be interested in walking. For recreational users, the McDade Recreational Trail provides a safe and more enjoyable walking and jogging environment. Some locations include crosswalks to improve safety and notification of pedestrian activity to the motorist.

Transit Safety

Shuttle flag stops require the bus to pull to the side of the main road rather than into a driveway or access road. This can be dangerous in areas with minimal sight distances, as well as areas with higher speeds, such as along US-209 at the Eshback Access entrance, where people may be loading and unloading boats.

Wayfinding/Navigation Signage

Types of signage used to direct travelers to recreational sites included one-half mile warnings, next-right/next-left warnings, identification signs directly at the site entrance (visible from the main road), and identification signs along access roads (only visible after turning onto the access road). The project team observed inconsistencies in which types were used, and insufficient signage for some sites. It is arguably important to at minimum have signs directly at the site entrance, visible from the main road, to direct and confirm travelers to turn at that point; there are numerous minor streets and driveways that visitors may confuse for actual entrances. In addition, several signs were obscured from view by overgrown foliage at points at which drivers should begin decelerating to safely access a site.

Parking Efficiency

Several of the shuttle stops that have both single-length (car) and double-length (vehicle with trailer, or tandem) spaces have many more double-length spaces than necessary. Cars generally will use these tandem spaces efficiently (i.e., with two cars per space), but some drivers may be confused. In addition, in near-full lots where single- and double-length spaces are within the same lot (rather than a separate tandem lot), there is a question of whether cars or tandems should have priority when both are vying for space.

Parking Lot Occupancy: Lots Over Capacity

At least five lots regularly exceeded capacity, and other lots exceeded capacity over the Fourth of July holiday weekend. Lots reaching capacity can result in the following:

- Drivers must find an alternative parking location and possibly change activity plans.
- Illegal parking within lots, typically on grass areas.
- Congestion at lot entrances, where cars may be turned around by a park ranger on duty.
- Congestion within the parking lot as drivers search for an available parking spot, if there is no park ranger on duty or signage to give notice at the main road.
- Frustration for park visitors and rangers, especially for visitors who do not have a way of knowing what the best alternative lot or site is.



Congestion creates a higher safety risk, and it slows down the shuttle bus and other vehicles. Parking on grass areas also poses a safety risk and affects the natural environment of the park.

Parking Lot Occupancy: Lots Under Capacity

The DWG Park and Ride lot is regularly under capacity on summer weekends, with over 80% of the 140-space lot empty. This alone is not a problem, but because there are several nearby lots that regularly fill, this lot is not drawing the utilization that it can easily accommodate. At Milford and Smithfield beaches, where there are separated lots just for motorboat parking, cars do not park in the motorboat lot (per signage prohibiting it), but these lots were often nearly empty during the observation weekends. Meanwhile, there may be congestion at canoe launch areas.

6.2 | RIVER RUNNER

The River Runner is a successful and important service that fulfills several roles in DEWA's transportation network, including providing circulation within the park and shuttling river travelers along the river. Riders voiced their appreciation of the service with comments made during the fieldwork; this appreciation is also demonstrated via increasing ridership. The data analysis and service observations point out several River Runner strengths and some of the challenges and weakness.

STRENGTHS

Nonmotorized Boat Transportation

The River Runner facilitates one-way, nonmotorized (kayak, canoe, paddleboard, and floats) travel on the river. Without the River Runner, river users would need to have access to two cars or work with a private rental company. In this way, the River Runner makes it easier, more convenient, and less expensive for people to recreate on the river. It also reduces traffic congestion in the park, energy consumption, and vehicular emissions. The success of the River Runner in providing this service is evidenced in rider comments and the data, which show that the number of riders and boats carried by the shuttle has increased each year since 2013.

Partnership with MCTA

DEWA's partnership with MCTA is a strength of the service. Without MCTA, it is unlikely that DEWA would be able to have the shuttle. MCTA's ability and willingness to provide vehicles and leverage other federal funding programs and state programs makes the service possible. MCTA also contributes transit planning, management, and operational expertise.

Drivers

Another strength of the River Runner is the drivers. The drivers are friendly, patient, and helpful under a variety of challenging circumstances, including loading and unloading large numbers of boats, figuring out ways to accommodate as many boats as possible, and serving frustrated riders. As part of observing the shuttle, all the fieldwork staff remarked on the drivers and their professionalism, courtesy, and creativity under conditions that were frequently challenging.

Flag Stops

The flag stops are both a strength and a weakness of the River Runner. Thirteen flag stops are designated on the route. Most of these flag stops are located at the entrance to a campground, river access point, or picnic area. Riders must walk to the main road (River Road or US-209) and flag down the shuttle. The bus does not stop at these locations unless flagged by a passenger and the shuttle is directed to stop if the location is safe.

Designating flag stops is a strategy to increase the accessibility of the shuttle (and DEWA) without requiring the bus to stop unnecessarily. Several of the flag stops were used during the observation days, including Eshback Access, near the Tree Tops resort, Bushkill Meeting Center, Hialeah, Riverview Trailhead, Dingmans Falls Visitor Center, and at the bottom of the PEEC access road. In this way, the flag stops work. The challenge with the flag stops, however, occurs along River Road, where stopping is dangerous for both the shuttle and the passengers. Although drivers do not have to stop for riders waiting in unsafe locations, most drivers pick up riders when they are looking for a ride.

OPPORTUNITIES AND CHALLENGES

The River Runner faces several opportunities and challenges in its current configuration.

Capacity Constraints

The River Runner experiences capacity constraints, especially during morning northbound trips. Capacity constraints are more likely to occur on holidays and good weather days. They are also largely related to space available to load boats on the trailer, rather than seats on the bus. On at least a handful of occasions, there was no space for any more boats and every seat on the bus was occupied. The capacity constraints cause three types of reactions and challenges:

1. **Anxiety over waiting for shuttles.** The most common outcome is that riders cannot get on the shuttle and must wait for the next bus, which would be scheduled to arrive an hour later. Waiting an hour is frustrating to many riders, most of whom are eager to get on the river. Frustration led some riders to get anxious about their place in line. Anxiety over who was first in line was strongest at Smithfield Beach because that location has an official stop at the canoe launch and an official stop for picking up the boats. During the Fourth of July weekend, a handful of riders waiting at the second stop expressed concern to the driver that their “place in line” would not be recognized.
2. **Changes in behavior due to oversubscribed shuttles.** A second outcome of the shuttle being oversubscribed is that some riders changed their behavior. Most of the riders changed their behavior by boarding (or trying to board) at an earlier stop farther south on the route. In some cases, this meant people tried to board the River Runner at the Shawnee Inn or at the DWG Park and Ride (instead of Smithfield or Kittatinny Point, respectively). One party boarded at the Stroudsburg High School to ensure their large party of seven individuals and eight boats were all able to get on the same bus, even though this required a shuttle trip in both directions. Another way that passengers changed their behavior was by parking their car at the canoe launch and riding the shuttle after they completed their water trip, traveling back up river (north) to where their car was parked. In these cases, most parties left a portion of their party with the boats at the pull-



out, while another portion of the party rode the shuttle to pick up the car. Although northbound ridership, as discussed earlier, is high, it drops slightly in the afternoon, enabling these types of trips.

3. **Abandonment of the shuttle.** At least some potential riders are also discouraged from using the shuttle bus altogether. These riders bring two cars into the park as a way to avoid having to use the shuttle.

On-Time Performance

Another persistent challenge with the River Runner is on-time performance. The existing service schedule does not adequately account for the time required to load and unload boats, so the bus falls behind schedule early in the route and struggles to get back on time, even when low ridership on the southbound trip means the bus can travel faster than the schedule. MCTA and the drivers recognize that the shuttle is unable to stay on schedule; to account for this, a relatively large layover, 21–25 minutes are built into the schedule at the end of the trip so the driver has a chance to both take a break and get back on schedule, unless one of the trips is scheduled to serve PEEC, where layovers are reduced to 5-8 minutes. In practice, even with the break, it can be difficult for the shuttle to get back on schedule. Experience during the fieldwork days is that most trips fell behind schedule early in the shift and stayed behind schedule for both trips.

Not staying on time makes the service unpredictable and unreliable; this also makes the service less convenient and more confusing for riders. Delays also increase anxiety for passengers who must wait for the next shuttle; other activities are largely precluded since riders do not know when the delayed shuttle will arrive. The unreliability of the service schedule is also at least partially responsible for the dearth of nonboating riders using the service.

Underutilized Stops

In addition to carrying few riders on the southbound trips, there are also a handful of scheduled stops on the River Runner that are rarely used. These stops include the DWG Park and Ride lot, the Shawnee Inn, Fernwood Resort, Tom's Creek, PEEC, and downtown Milford. Three of these stops—Fernwood Resort, Tom's Creek and PEEC—did not pick up or drop off riders on any of the observation dates in 2017. The fieldworkers visited each of the regular stops 24 times during the peak visitation days; PEEC was sampled five times during the three days. Historical ridership data confirms these findings; ridership has been low at these locations for most of the shuttle's history. The other three stops—DWG Park and Ride, the Shawnee Inn, and downtown Milford—were observed to have some riders, although in almost every case the numbers were low. In addition, like the stops with no riders, historical ridership information confirms that ridership at these locations is low.

In addition, there are stops on the DWGC which do not serve many riders. No riders were observed at MCTA or Weis Markets. A handful of riders were observed at Stroudsburg High School and the Martz DWG bus terminal. Historical data shows that ridership at these stops has been low over the lifetime of the service.

Most of deviations to bus stops are relatively short and quick. Two exceptions are the PEEC and Weis Market. PEEC is located one mile from US-209 and takes about 10 minutes for the shuttle to travel there and back. The stop is served four times a day (once from each shift) using about 40 minutes of shuttle

operating resources per day. Serving Weis Market means the River Runner must travel about two miles out of its way, requiring about 10 minutes of travel time. The market is served eight times (twice per shift), consuming about 80 minutes of travel time daily.

Site Capacity Issues/Congestion at Canoe Launch Areas

During the field observations, staff reported waiting to get into Smithfield Beach on Sunday, July 3. Congestion delays the shuttle, exacerbating challenges with on-time performance. On peak days, DEWA's access areas, particularly Smithfield and Milford beaches had capacity issues; more people wanted to use Smithfield and Milford beaches than could be accommodated by available parking at the site. The capacity constraint was largely reported in terms of lack of parking space. Indeed, the parking areas are sized to match site capacity—both in terms of the impact larger volumes of visitors will have on the natural environment, and on the facility capabilities including lifeguards, toilets/septic systems, and trash removal. As a result, a full parking lot indicates that the site has reached its visitor capacity.

Capacity issues have negative impacts on the River Runner largely because the bus sits in congestion when private vehicles are waiting to get through the fee gate or when vehicles queue on the road, waiting to turn into the access area. For the most part, congestion at the access locations was highly localized and brief, lasting no more than 10 minutes. However, access area waits exacerbated shuttle delays.

Congestion at Canoe Launches

Another challenge related to site capacity is congestion at the canoe launch areas. Access to the canoe launch is shared with other users, including members of the public who are launching their own boats but also private livery companies who bring large numbers of boats and individuals to the river. Vehicles slow down, double park, and wait in the road. Consequently, access to the canoe launch sites can be congested, especially at Kittatinny Point, Smithfield Beach, Bushkill, Dingmans Launch, and Milford Beach. The congestion slows down the shuttle, adding to reliability issues. Congestion occurs when livery services, private vehicles, and the shuttle all compete for space as close to the launch area as possible. The River Runner also brings riders as close to the canoe launch site as possible. This increases the convenience of the service because it reduces the distance riders must carry their boats and gear. In most cases, the shuttle stop is located on the far side of the canoe launch site, so the driver should drive just past the launch site, stop, and let passengers get off and unload their boats. Nearly all the canoe launch sites are signed with a 15-minute parking time. The parking time limit was not well enforced during the six observation days; no enforcement of the time limit was recorded.

Information Systems

Riders can obtain information about the River Runner from online and printed materials. The service is advertised on the MCTA website, together with the shuttle schedule. The DEWA website also provides a link to the MCTA website. The route schedule and map are also printed and available at several locations in and around DEWA. Other information about the service is on the shuttle stop signs; the shuttle signs are located at each scheduled stop and all the designated stops. Each sign includes both a telephone number and quick response (QR) code so that riders can get more information. Park rangers are also aware of the service and provide information to interested visitors. This network of information and signage provides several portals and methods for people to learn about the shuttle. The approach is also consistent with other NPS shuttles. Despite this relatively extensive network of information portals, many



park visitors did not understand how the River Runner operated. The fieldwork team observed riders confused about which direction the shuttle was traveling, where to wait for the shuttle, and when the next shuttle would arrive at the stop. Most of the canoe launch sites do not have cell service, so the QR codes are not accessible to visitors. The consulting team also observed slightly inconsistent information between the PDF brochure and the table on the MCTA webpage. The brochure lists Kittatinny Point Visitor Center service at five minutes before the hour, whereas the MCTA webpage lists the stop on the hour. Neither schedule is clear as to whether these are departure or arrival times.

Low Southbound Ridership

The River Runner has not successfully attracted large numbers of nonboating riders. A handful of riders use the shuttle as part of a one-way bike trip and a handful of other riders travel between destinations in the park, but both the data and observed patterns suggest that most riders are either beginning or ending a river trip. In practical terms, this means that the shuttle bus is traveling empty for the entire southbound direction. The lack of southbound riders undermines the shuttle performance.

7.0 SHORT-TERM SERVICE IMPROVEMENT OPTIONS

DEWA's transportation network includes a public road network, anchored by River Road and US-209, and several access roads. It also includes parking lots; access roads to campgrounds, river beaches, and boat launches; the McDade Recreation Trail; many hiking trails; and the River Runner. Together these resources facilitate movement through DEWA and create opportunities for visitors to experience the resources of the park.

In addition to facilitating access, the transportation network also helps manage park resources and visitors' experiences. Infrastructure investments and controls on how they are used and operated encourage or discourage use of these resources. Smithfield Beach, one of the largest access fee areas in the park, has an extensive and well-maintained transportation facility with parking for private vehicles and vehicles with boat trailers; it also includes a motorized boat launch and a canoe launch. Visitors must pay to enter Smithfield Beach (unless they enter on the River Runner). Development at Smithfield facilitates and encourages use of the site. In other cases, the lack of a paved roadway or parking spaces, or the lack of shuttle service, makes DEWA areas less accessible and attractive to visitors.

The objective of the transportation system analysis is to prioritize short-term recommendations and develop longer-term strategies to improve DEWA's transportation network, including the River Runner. Combined, the recommendations strengthen transportation by making it safer, easier to use, and more accessible. These recommendations also reduce the impacts from vehicular travel. In the short-term, the consulting team's recommendations focus on the optimization of the existing resources and facilitating access to and within the park. Over the long-term, recommendations consider strategies to use the transportation network to help manage and guide development of the park.

7.1 | TRANSPORTATION NETWORK IMPROVEMENTS

MOTOR VEHICLE SAFETY

To address insufficient sight distances, options include both increasing sight distance where possible, slowing down traffic, and increasing driver awareness of unsafe conditions. To increase sight distance, a simple first step would be to trim foliage along the sides of the road on curves and at intersections and then remove trees, if necessary.

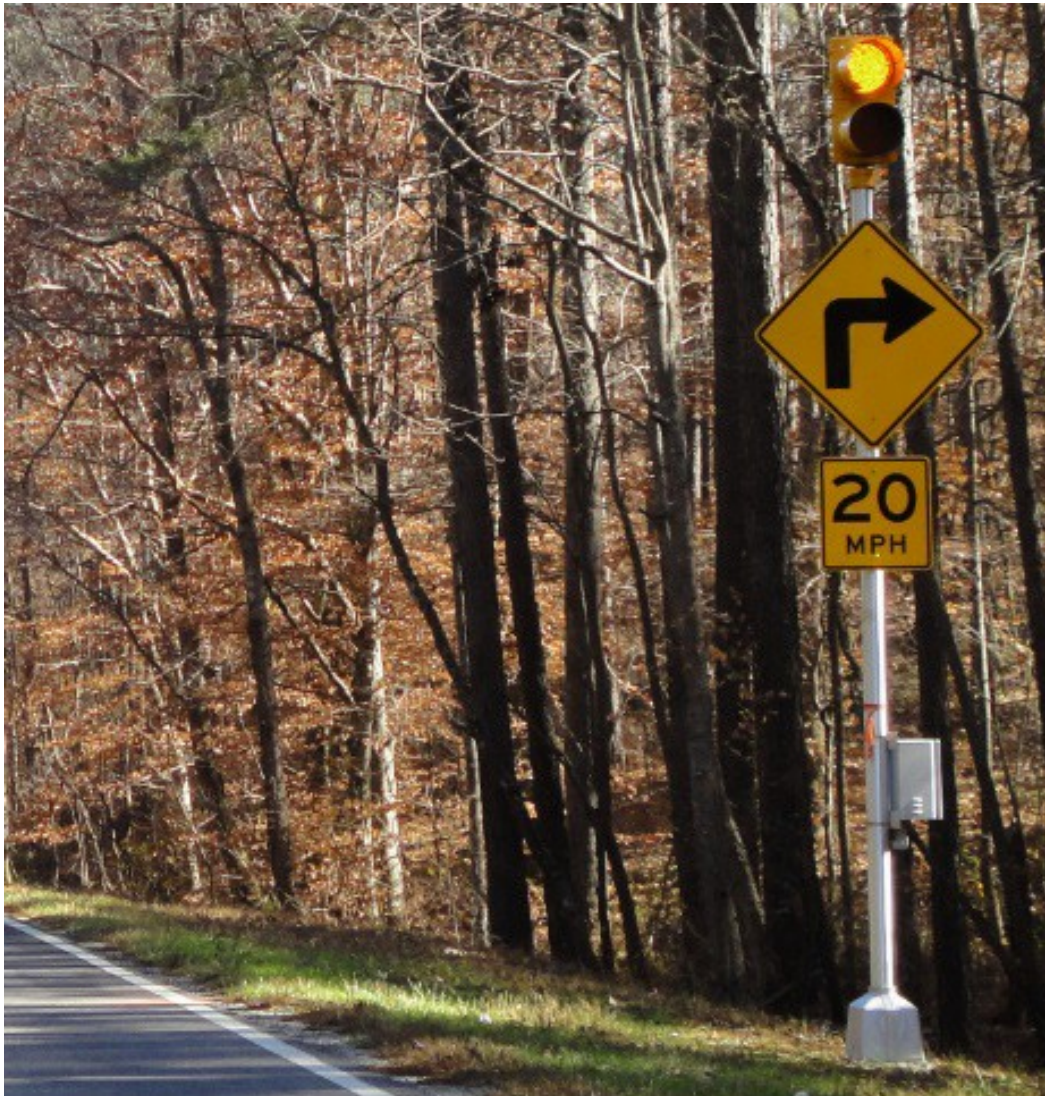
To ensure vehicles drive at appropriate speeds in general, and to warn drivers of upcoming curves or blind drives, the following measures may be used:

- Yellow flashing warning beacon in conjunction with signage (Figure 7-1), such as those currently used to warn drivers of deer.
 - For sensitivity to wildlife within the park, yellow flashing lights could be shut off at night.
 - Flashers could also be linked to in-pavement sensors (or similar) that would only be triggered if a certain speed is met or if queues are present.
- Radar speed feedback signs, to be used in conjunction with speed-limit signs (Figure 7-2).



- Install centerline rumble strips in segments with significant horizontal curves, steep grades, or narrow lanes. Two areas would benefit from these installations:
 - Brisco Mountain Road on the way to PEEC.
 - River Road (where there are no existing rumble strips), especially the northern segment between Rte. 209 and the Riverview stop.

FIGURE 7-1: YELLOW FLASHING WARNING BEACON



Source: <https://www.fhwa.dot.gov/publications/research/safety/15030/009.cfm>.

FIGURE 7-2: RADAR SPEED FEEDBACK SIGN



PHoto: Richard Drdul via Flickr

Source: <https://www.aclu.org/blog/privacy-technology/radar-speed-signs-machine-monitoring-and-chilling-effects>.

BICYCLING SAFETY

While DEWA does not recommend bicycling on River Road or US-209, bicycling is not prohibited along these roads and bicyclists were observed during the observation weekends. Three short-term improvement concepts exist to address these current conditions, which could be implemented together.

Provide Bicycle Facility Information

Given the variety of users in the area, it is appropriate to discourage entry- and mid-level riders from cycling on US-209 and River Road. Signage could be installed at entrance points to these roads to let bicyclists know the road conditions and to advise that only experienced and confident bicyclists ride along the road. Signage at access points to the McDade Recreation Trail should clearly mark the presence and quality of the off-road facility. Signage could include a map of the trail and access points, with identification of difficulty levels. Figure 7-3 shows the standard McDade Trail information at locations. This can be enhanced to provide additional insights, trail wayfinding, points of interest, and shuttle information.



FIGURE 7-3: MCDADE RECREATION TRAIL INFO



Make Roadways Safer for Bicyclists

Confident cyclists do and will continue to use these roads, and the roads should be improved as much as possible to accommodate them. Potential short-term measures include:

1. **Install shared-lane markings (“sharrows”) (Figure 7-4).**
 - A sharrow in each direction may be placed every half mile along River Road and US-209. (On more typical applications of these features, where bicycling is encouraged for all ages and abilities, sharrows are recommended every 250 feet or more frequently, depending on the volume of bicycle traffic and the reason for the placement of the sharrows.)
 - The Manual on Uniform Traffic Control Devices (MUTCD), which guides the design of public transportation facilities, suggests sharrows only on roadways with speed limits below 35 mph. An exception may be appropriate here since the roadway is not wide enough to accommodate sufficient bicycle lanes, and because it is not recommended for entry- and mid-level riders.
2. **Install “Bicycles May Use Full Lane” signs (Figure 7-5).**
 - “Bicycles May Use Full Lane” signs have been shown to be more effective at increasing awareness of driver and bicyclist roadway rights and responsibilities than “Share the Road” signs.
 - Remove existing outdated “Share the Road” signs.
 - One sign in each direction may be placed once per mile to avoid signage clutter. Place adjacent to sharrows if sharrows are used.
3. **Restripe US-209 to have 10-foot travel lanes.**
 - Restriping would maximize shoulder widths while providing a visual narrowing of the traveled way to encourage slower travel speeds.

FIGURE 7-4: SHARED-LANE MARKINGS ("SHARROWS")



Source: <http://www.bikede.org/2012/05/10/a-missed-1st-for-the-1st-state-fairfax-county-va-gets-sharrows/>.

FIGURE 7-5: BICYCLES MAY USE FULL LANE SIGN (MUTCD R4-11)



Source: MUTCD https://mutcd.fhwa.dot.gov/htm/2009/part9/fig9b_02_longdesc.htm.

Comprehensive Study of Bicycle Accommodations in the Park

A separate dedicated review of the cycle wayfinding, safety, and infrastructure would facilitate the park's desire to encourage greater numbers of cyclists. This would result in a bicycle master plan for the park, including the following recommendations:

- Consistent bike parking options.
- A bike map, available online and at visitors' centers.
- A maintenance plan to keep facilities in good condition.
- Resources like bike pumps around the park.
- Promotion of the bicycle facilities.

TRANSIT SAFETY

The roadside should be reviewed for grading dedicated pull-offs to safely accommodate buses at shuttle stops where the bus pulls to the side of the main road rather than into a driveway or access road. Crosswalks or pedestrian warning signs could be used for stops on the opposite side of the road. Along River Road, the stops of Hialeah, Riverview, Turn Farm, and the headquarters all have restricted sight distances and narrow roadway conditions. Where possible, pull-offs should be enhanced to improve the safety and efficiency of these flag stops. For some locations, such as Riverview and Turn Farm, these flag stops should be removed given the very limited width and restricted sight distances. In particular, Eshback Access would benefit from a pull-off due to the high speeds along that stretch of US-209 and the loading/unloading of watercraft in the area. The gradient of the drive off of US-209 could be improved by paving further down the driveway. The gradient of the transition between gravel and pavement in that area has been identified as an issue, aggravating the safety issues.

WAYFINDING/NAVIGATION

Wayfinding improves how visitors access recreational sites within the park and their overall experience of the park. Wayfinding signage could be improved in the following ways.

- Install identification signs (equivalent to exit signs at freeway off-ramps, after earlier signage describing what is at the exit and where the exit is) for stops without signage at the driveway entrance or main road entrance that drivers can see before turning into the driveway.
- Trim foliage where it blocks the view of wayfinding signage.
- Include wayfinding signage to help drivers easily reach stops that are not immediately off the main road and to navigate back to the main road. Stops currently in need of these changes include the following:
 - Dingmans Access stop.
 - Milford Beach stop.

PARKING LOT CAPACITY/CIRCULATION EFFICIENCY

The following measures could be implemented to improve safety and reduce congestion and confusion within parking lots:

- **Restripe underutilized double-length spaces within certain lots to be single-length spaces.** This could be as simple as striping longitudinal lines along a row of double-length spaces. Several double-length spaces could remain, using signage to prohibit cars from parking in those spaces. During Shad fishing season in May, when there are a significantly higher number of tandems and fewer cars, an exception could be made where tandems can use two single-length spaces. The following sites both have more double-length spaces than necessary located in a lot primarily used by cars.
 - Dingmans Access—Based on the three weekend observations, the southern lot does not appear to require any tandem spaces, and the northern lot could remove approximately half of its tandem spaces while still leaving room for an increase in tandem use.



- Bushkill Access—The southern lot currently only has double-length spaces, yet few tandems parked there. This could be designated a car lot for most of the year, perhaps leaving two designated tandem spaces.
- **Ensure signage that limits parking to 15 minutes is consistent.**
- **Ensure signage that restricts parking for certain types of vehicles is consistent.** With the existing parking supply and the oversupply of double-length spaces, this may not be appropriate since these spaces work well when shared with cars. However, if the supply of tandem and car spaces more adequately matches the demand, as recommended here, signage at the remaining tandem spaces would be crucial.

OVERFLOW SITUATIONS

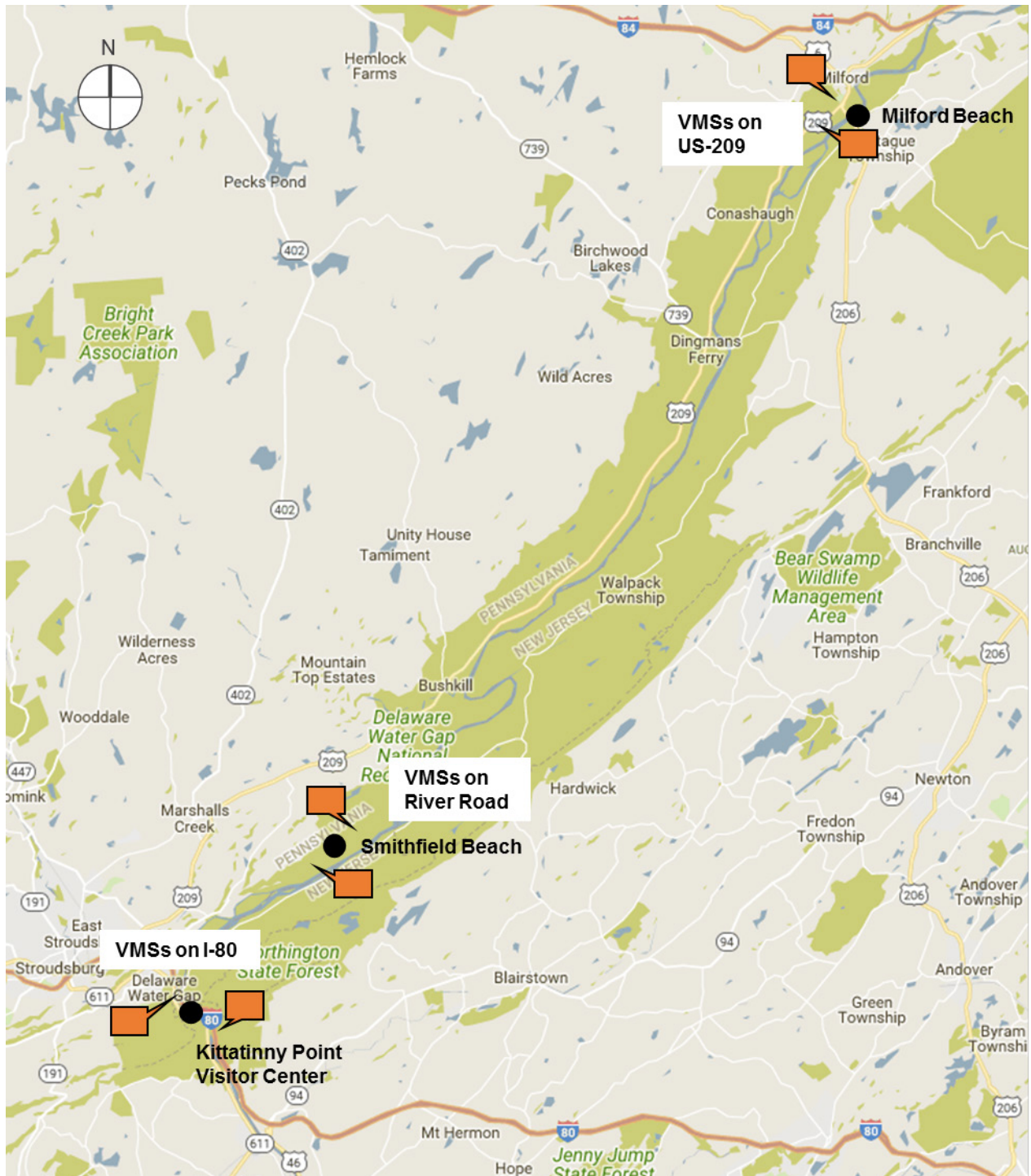
An opportunity exists to create a more formalized and consistent approach to the management of parking lots and park access during busy weekends and events.

- For lots that regularly reach capacity, include a **notice at the two visitor centers and online** to let potential visitors know that they regularly fill and present alternatives.
 - Smithfield Beach: Redirect to Milford Beach for a beach experience, or to the Park and Ride for shuttle access.
 - Kittatinny Point Visitor Center: Redirect to the Park and Ride for shuttle access and other locations for river access.
- Post **real-time updates on social media and the park’s website** to inform visitors about full lots so that they can make decisions before entering the park or once in it.
- Warn visitors of full lots using **variable message signs (VMSs)** on the roadways ahead of the stops, with one in each direction of travel, so that vehicles do not try to enter the lot. These would be placed prior to Kittatinny Visitor Center, Smithfield Beach, and Milford Beach on I-80, River Road, and US-209, respectively. Park Dispatch would control the messages. Figure 7-6 has a map of potential VMS locations. Aesthetics are important, and it would only be suggested that on peak weekends that these may be used on River Road within the park. VMSs could be used more often on other roadways entering the park.
- **Provide park staff with a “tool chest” of appropriate traffic management barriers and signage** that can be easily installed during busy weekends at key locations. These items should be visible and should clearly convey the message to drivers before they enter site driveways. For sites where the River Runner or river trip vehicles must enter the parking lot, barriers must still allow these vehicles into the site, which precludes the option of placing a barrier across the entire entrance lane. Possible tools include the following:
 - “Lot Full” signs placed on River Road or US-209 at driveway entrance, possibly attached to site identification signs. For sites where VMSs are used, these static signs would not be necessary.
 - Traffic cones and other delineators. High-visibility reflective cones could be placed along the center line and edges of River Road in advance of congested entrances to some of the beach locations.

- A-frame barricades to partially block site entrance lanes. This barricade would emphasize the lot is closed but would still allow room for the shuttle and river trip vehicles to drive around. The shuttle may need to cross partially into the exit lane. (Figure 7-7 has an example of this strategy at Smithfield Beach.)
- **Control illegal parking with signage and enforcement** to avoid the environmental and safety impacts. These impacts include vehicles parking on grass areas and the capacity impacts of vehicles parking longer than 15-minutes in short-term parking areas and cars using designated tandem spaces. Additional jurisdiction powers or enforcement measures may need to be approved by the local magistrate.
- Create an **overflow policy and guidelines** to address overflow situations in a holistic, consistent, and efficient way, and educate all park staff on the guidelines. The park should identify where people should park and decide whether certain users should be prioritized over others. These decisions should then guide where and how visitors are instructed to park their vehicles.

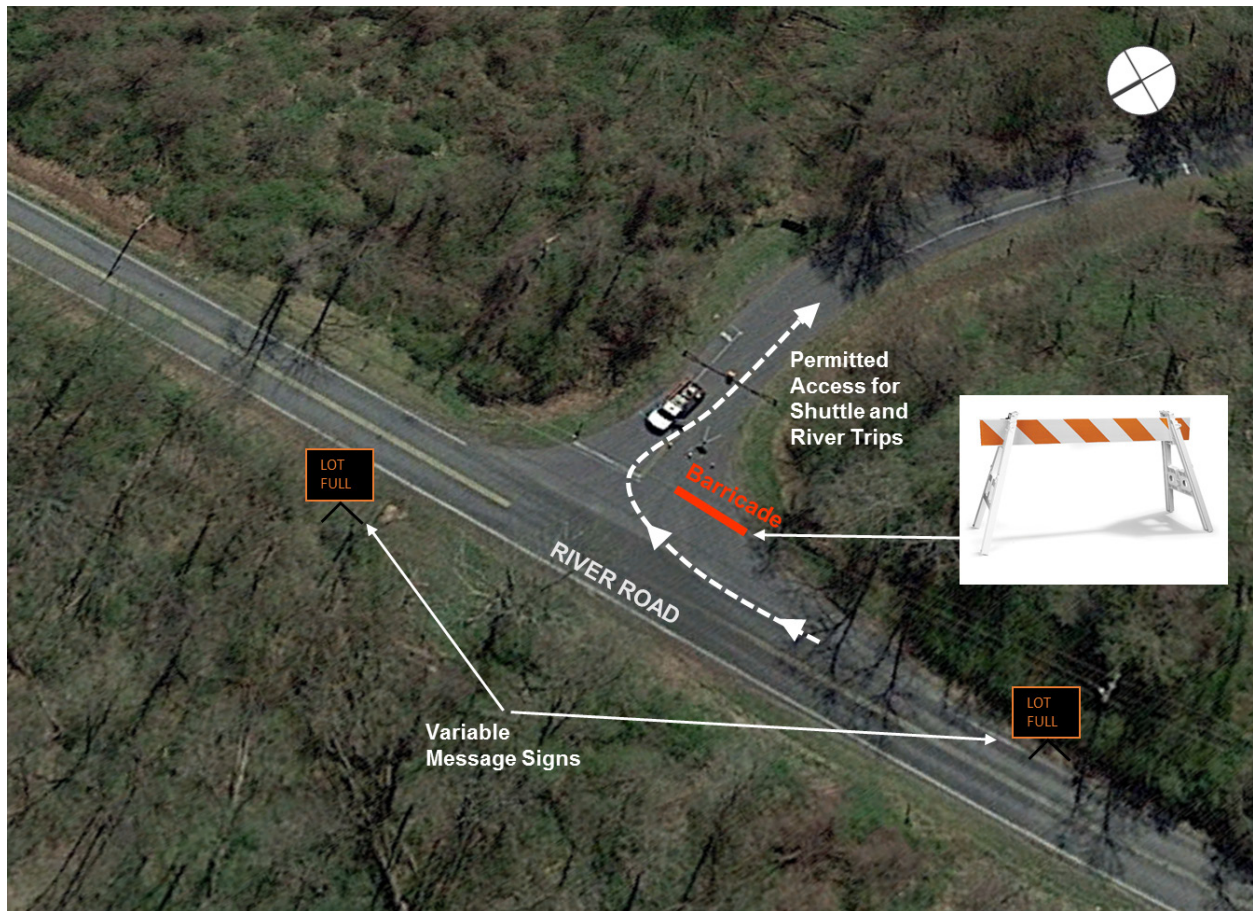


FIGURE 7-6: POTENTIAL VARIABLE MESSAGE SIGN LOCATIONS



Source: <https://snazzymaps.com/style/102607/basic-regional-and-local>. Diagram features: RSG.

FIGURE 7-7: DIAGRAM OF PROPOSED SIGNS AND BARRIERS AT SMITHFIELD BEACH WHEN FULL



Source: Google Earth. Diagram features: RSG.

ENCOURAGE USE OF THE PARK AND RIDE

Make the Park and Ride a more welcoming shuttle stop with bathrooms, a bus shelter, and possibly lot landscaping. The DEWA audience has a different set of expectations and user demands from the Park and Ride than the commuter audience. Limitations on National Park funding restricts the use of Park funds only on National Park land. DEWA has significant limits and restrictions on how it may participate in off-park property which limits what might otherwise be achieved on this parcel. Although very restricted funding may be available for the Park and Ride, DEWA could continue to supply visitors with information encouraging the use of the Park and Ride to access the River Runner.



7.2 | SHORT-TERM TRANSPORTATION MEASURE COST ESTIMATES

Strategy	Guidance	Locations	Unit Cost	Approximate Quantity	Total Cost
Motor Vehicle Safety					
Yellow Flashing Warning Beacon with Signage	Post-mounted. Solar power	River Road, ahead of low sight distance segments	\$12,000 per beacon	2–6 beacons	\$24,000–\$72,000
Radar Speed Feedback Signs	Solar. To be on same post as static speed-limit sign	River Road and US-209	\$6,000 per sign	2–6 signs	\$12,000–\$36,000
Centerline Rumble Strips	See most recent FHWA guidance	River Road where missing, Brisco Mountain Road	\$1,500 per mile	0.9 miles on Brisco Mountain Road; 1-5 miles on River Road	\$3,000–\$9,000
Trim Foliage to Improve Sight Distances	May involve tree removal	Any roadway or intersection within the park where necessary	\$200–\$1,000 per area	10–20 areas	\$2,000–\$20,000
Transit Rider/Driver Safety	Part of Shuttle education videos	Throughout park and online (websites, social media)	\$4,000	1 study	\$4,000
Bus Pull-offs for Stops Along Main Roads	May include earthwork, tree removal	Eshback Access, Riverview, Turn Farm, Headquarters, Hialeah	\$50,000 per pull-off	4–5 pull-offs	\$200,000–\$250,000
Bicycling Safety					
Shared-Lane Markings “Sharrows”	See most recent MUTCD guidance	US-209 and River Road	\$320 per marking	1 sharrow in each direction every half mile	\$45,000

Strategy	Guidance	Locations	Unit Cost	Approximate Quantity	Total Cost
"Bikes May Use Full Lane" Signage	MUTCD R4-11 sign	US-209 and River Road	\$250 per sign	1 sign in each direction every mile	\$14,000
Restripe Roadways for 10-foot Travel Lanes	See most recent MUTCD guidance	US-209 where possible	\$18,000 per mile	21 miles	\$400,000
McDade Recreation Trail Maps	Map of the trail with difficulty levels and access points. Insert into existing info plaques, if possible	Available online and posted at access points	\$20 per insert; \$100 if new plaque is necessary	16 trailheads	\$300–\$1,600
Signage Warning Bicyclists of US-209 and River Road	On-road signage	On US-209 at River Road, Veterans' Way (SR-739), and downtown Milford; on River Road at US-209 and Buttermilk Falls Road	\$250 per sign	5 signs	\$1,200
Bicycle Network Plan	Conduct a study of existing conditions and create a bicycle master plan	Throughout park	\$50,000	1 study	\$50,000
Wayfinding/Navigation					
Install Large Signs at Driveway Entrances, Visible from Main Road and Access Road, When Applicable	Consistent with existing/desired park signage style (wood posts, brown panels)	Conduct an inventory of wayfinding signage to ensure consistency and comprehensiveness	\$400 per sign	4–10 signs	\$1,600–\$4,000



Strategy	Guidance	Locations	Unit Cost	Approximate Quantity	Total Cost
Trim Foliage Where It Blocks View of Signage	May involve tree removal	Conduct an inventory of wayfinding signage to ensure consistency and comprehensiveness	\$200–\$1,000 per area	4–10 areas	\$800–\$10,000
Install Wayfinding Signage Along Roads Used to Access Sites Off the Main Roads	Consistent with existing/desired park signage style (wood posts, brown panels)	Egypt Mills Road (Tom's Creek), Brisco Mountain Road (PEEC), Dingmans Falls Road (Dingmans Falls), Veterans' Way (SR-739) (Dingmans Access), Milford Beach Road / Metz Road (Milford Beach)	\$300 per sign	10–20 signs (2-4 signs for each of the five routes)	\$3,000–\$6,000
Parking Lot Capacity / Circulation Efficiency					
Monitor Tandem Space Demand and Restripe for Cars If Tandem Spaces Remain Underutilized	Combine with road striping if possible	Bushkill Access, Dingmans Access	\$2 per linear feet of striping	150–250 linear feet	\$300–\$500 if combined with other striping work
Install Signage at Designated Tandem Spaces to Prohibit Cars Without Trailers	Be consistent with signage text, size, and placement	Conduct an inventory of where signage does and does not currently exist	\$250 per sign	4–10 signs	\$1,000–\$2,500
Overflow Situations					

Strategy	Guidance	Locations	Unit Cost	Approximate Quantity	Total Cost
Provide Notices Online and at Visitor Centers About Lots That Regularly Fill and What the Alternatives Are	Brief message	Kittatinny Point Visitor Center, Dingmans Falls Visitor Center, online	Virtually no cost	One-time update	\$0
Post Real-time Updates on Social Media and the Park's Website	Include within responsibilities of existing park employee, if possible	Online	Virtually no cost	Regular updates throughout summer	\$0
Portable VMSs	Be consistent with signage text, size, and placement	Ahead of Kittatinny Point Visitor Center, Smithfield Beach, and Milford Beach on I-80, River Road, and US-209, respectively	\$4,000 per sign	6 signs (2 for each site)	\$24,000
"Lot Full" Signs	Be consistent with signage text, size, and placement	A stash to be used where necessary	\$250 per sign	8–12 signs	\$2,000–\$3,000
A-frame Barricades & Traffic Cones	Be consistent with signage text, size, and placement	A stash to be used where necessary	\$150 per barricade \$25 per cone	8–12 barricades 100 cones	\$1,000–\$4,500
Enforcement of Illegal Parking	New seasonal park employees for weekends and holidays	Throughout shuttle route	\$15/hour	Two new seasonal employees for weekends and holidays in the summer	\$7,000



Strategy	Guidance	Locations	Unit Cost	Approximate Quantity	Total Cost
Develop Overflow Parking Management Policy and Guidelines	In-house or assistance from a consultant	Throughout shuttle route	\$25,000	1 study	\$25,000
Construct Bathrooms, a Bus Shelter, and Landscaping at the Park and Ride to Make It More Welcoming	Coordinate with PennDOT	DWG Park and Ride	\$500,0000	1 set	\$500,0000

7.3 | RIVER RUNNER

OVERVIEW

The River Runner has been operating for six years and has changed and evolved; however, over the last three years, shuttle service and operations have stabilized, leading to an increase in ridership and—by nearly all accounts—an increase in importance to visitors. At the same time, however, the shuttle faces several challenges, which primarily reflect periodic overuse, underuse, and tardiness. These challenges are interrelated because overcrowding on the morning northbound trips causes the shuttle to fall behind schedule; this makes it an unreliable service for people traveling southbound.

The consulting team's recommendations attempt to address these fundamental challenges by laying out a strategy to increase capacity when it is needed, thereby improving the shuttle's on-time performance and encouraging riders to use the shuttle in new ways. These three primary recommendations—increase shuttle capacity, improve on-time performance, and improve information systems—support the short-term recommendations. Each of the three recommendations support strategies and investments to address the described challenges. The strategies are mutually supportive. The shuttle will become easier to use and more attractive to riders as operations are optimized, thereby making the shuttle more efficient and effective.

The recommendations minimize cost and present streamline improvements that could realistically be implemented within one to three years. The estimated cost of the recommendations involves a one-time capital investment of approximately \$9,000, plus approximately \$32,500 in ongoing costs. These investments are expected to increase average daily ridership from about 90 to 125 riders, representing a 35% increase in ridership over the first few years.

INCREASE SHUTTLE CAPACITY

The River Runner carries about 90 riders per day, or an average of 12 riders per trip. These ridership estimates obscure the fact that the shuttle is constrained in the morning when it is heading northbound. On high-ridership days, these first three northbound trips (departing from Kittatinny Point at 6:55 a.m., 8:55 a.m., and 9:55 a.m.) can carry as many as 75 riders, with some trips turning away riders. Constraints occur because there is not enough space for boats, but also because of the volume of passengers. Constraints primarily occur on northbound morning trips, between the Kittatinny Point Visitor Center and the Bushkill Access Fee Area.

The study team recommends two strategies for alleviating capacity constraints:

- Change the trailer configuration to increase capacity for boats/watercraft.
- Add an additional shuttle trip during the morning.

In addition, subsequent recommendations designed to make the shuttle easier to understand and use will also help address capacity issues.

Change Trailer Configuration to Maximize Space for Boats

The River Runner vehicles are equipped with trailers that have four racks for boats: three racks on one side and one rack on the other side. The side of the trailer with one rack can accommodate two or three boats and up to eight bikes. Data and experience shows that while the space for boats is oversubscribed,

there is seldom demand for more than two bikes on any single trip. In addition, bikes have more flexibility about the direction of travel so that one-way trips could easily be taken northbound or southbound. Nonmotorized river travel, on the other hand, needs to be southbound.

FIGURE 7-8: BOATS LOADED ON RIVER RUNNER



Source: CTG. River Runner operator loading kayaks, water tube.

FIGURE 7-9: SOME TRIPS ON THE RIVER RUNNER ARE AT CAPACITY



Source: CTG. River Runner vehicle at passenger capacity at Delaware Water Gap Park and Ride.

FIGURE 7-10: SPACE FOR BOATS ON RIVER RUNNER TRAILER



Source: CTG, 2017. River Runner vehicle at boat capacity.

A relatively simple solution would be to put bike racks on the front of the buses and repurpose the space used for bike racks to carry more boats. Bike racks could be added to the front of the bus and provide space for two to three bikes, depending on the rack configuration. Front-loading racks are also safer, as the driver will have a clearer view of the passenger. MCTA could also consider a policy to allow bikes on board in cases when demand exceeds the external bike slots. Each additional space for a kayak or canoe on the morning trip can help the shuttle attract an estimated 0.6 riders; therefore, space for six boats could increase daily ridership by about four riders per day (126 riders per year).

FIGURE 7-11: CUTAWAY BUS WITH FRONT BIKE RACKS



Source: <https://www.sportworks.com/about-sportworks/blog/what-information-is-needed-to-figure-out-what-rack-will-fit-my-bus-or-shuttle>.

Increase Morning Northbound Service

The River Runner schedule has eight daily trips, which are hourly for much of the day, except for a two-hour gap between the first and second morning trip and between 1:55 p.m. and 3:55 p.m. The morning gap is a problem because it occurs when demand is high. Passengers who miss the 6:55 a.m. bus must wait two hours for the next bus, significantly delaying their plans. Consequently, the 8:55 a.m. bus is oversubscribed, creating additional capacity and operational problems. The current schedule is designed to avoid having a bus departing at 7:55 a.m. overlapping with the bus that departs at 11:55 a.m. The current schedule also ensures the shuttle spans a longer period of time and provides a late-afternoon trip, a feature that is important to many riders.

The study team recommends adding a single round trip that leaves the Kittatinny Point Visitor Center at 7:55 a.m. and reaches downtown Milford at 9:35 a.m. The shuttle would complete the southbound trip and then go out of service (Table 7-1). This schedule provides service when it is needed the most but does not add service during times of low demand. It also creates a midday trip on the DWGC, which may be attractive to some travelers, particularly those that may use Stroudsburg High School as a Park and Ride. The additional midday trip will add approximately 27 riders per day, or nearly 880 riders per year.

The study team also considered reconfiguring the existing schedule. This reconfiguration would add additional resources in the morning and shorten the River Runner's overall span of service. Ultimately, the study team does not recommend this approach because the last trip of the day offers reassurance for travelers who may be concerned about being stranded in the park. As a result, the study team recommends adding service rather than moving existing service earlier in the day.

TABLE 7-1: RIVER RUNNER—POTENTIAL SERVICE SCHEDULE WITH ADDITIONAL HALF-DAY TRIP

Shuttle Trip/Driver Assignment	Depart KVC	Arrive Milford	Depart Milford	Arrive KVC
A	6:55	8:35	9:00	10:34
Short A	7:55	9:35	10:00	11:34
B	8:55	10:35	11:00	12:34
C	9:55	11:35	12:00	13:34
D	11:55	12:35	13:00	15:34
A	10:55	13:35	14:00	14:34
Short A	No Trip	No Trip	No Trip	No Trip
B	12:55	14:35	15:00	16:34
C	13:55	15:35	16:00	17:34
D	15:55	17:35	18:00	19:34

Source: CTG.

Cost to Increase Shuttle Capacity

Increasing capacity of the River Runner would cost approximately \$23,000, including \$10,000 to update the trailers and \$13,000 to add additional transit service. Updating the trailers will cost approximately \$1,500 per bus to purchase a front-loading bike rack (estimated cost about \$750 each) plus another \$1,000 to update the boat trailer with racks for kayaks and canoes. Assuming all six of MCTA's trailers are updated, the estimated cost of this strategy is \$9,000. The cost estimates include \$1,000 based on the assumption that MCTA will need to increase the number of shuttles with trailer hitches from five to six to ensure one vehicle is available as a spare. The additional cost of a half-day trip is roughly \$13,000 per year (about 200 additional service hours at a cost of \$64 per hour). MCTA pays its drivers hourly, so on



days when drivers work longer days, due in part to capacity issues, they are paid. Eliminating overtime pay represents a potential way to add service without significantly increasing costs.

ON-TIME PERFORMANCE

One of the biggest challenges of the River Runner is that the shuttle rarely operates on time, especially when traveling northbound. On-time performance issues have several causes, including the shuttle schedules, which do not allow enough time for boat loading and unloading, but also operational issues experienced in the field. The operational issues include travel time to stops that are not productive and congestion in the boat launch areas. Our recommendations, therefore, include three strategies: 1) increasing the wait or dwell time at shuttle stops to better reflect experience in the field; 2) eliminating unproductive stops; and 3) reducing congestion at canoe launch sites.

Increase Dwell Times at Canoe Launch Stops

The River Runner's current schedule does not adequately account for the time required to load and unload boats. Capturing this time is challenging because the amount of time the bus spends at each stop fluctuates by day and by time of day. The study team recommends adjusting schedules by increasing the amount of time the bus dwells at each of the major canoe launch sites (Kittatinny Point, Smithfield, Bushkill, Dingmans, and Milford Beach) to improve on-time performance. The study team developed a draft schedule using the average dwell time recorded at each stop. This schedule underestimates and overestimates actual dwell times in many cases; drivers should remain cognizant of passenger activity to keep the bus on schedule. Increasing the dwell time at several stops, will also increase travel times and the cost to operate each trip. Accordingly, the study team recommends balancing increases in travel times by implementing operational improvements that will reduce travel times, such as eliminating unproductive stops and reducing congestion at canoe launches.

Eliminate Unproductive Stops and Route Deviations

Some of the longer scheduled times can be captured by making the schedules more efficient by eliminating unproductive stops and route deviations. Eliminating these stops and investing the saved travel time to make the service more reliable will help attract riders. The primary unproductive stops that require time-consuming deviations from the main route include the following:

- **Weis Markets Tannersville**—Only two riders boarded or disembarked from the River Runner stop at the Weis Markets stop in Tannersville in 2017, and no riders were observed or recorded during field observations. In addition, the stop at Weis Markets was intended as an opportunity for riders to transfer to the River Runner from other MCTA routes. Because few riders are using the stop, it should be eliminated. In addition, serving the Weis Markets is time consuming because it requires the shuttle to backtrack on SR-611, which has traffic lights and congested intersections.
- **Pocono Environmental and Education Center**—PEEC is served four times per day. No riders were recorded using the stop during field observations, while only 13 passengers boarded in all of 2017, or less than one passenger for every 10 trips. Traveling to/from PEEC adds an additional 10 minutes to the trip. Eliminating the stop will not inconvenience any riders and will save approximately 40 minutes during each day of operations.

The River Runner serves other stops that have low productivity, including Tom's Creek, Fernwood, the Martz Bus Terminal, and downtown Milford. These stops were considered for elimination but were ultimately kept on the schedule because serving the stop did not incur a significant time penalty (Tom's Creek and Fernwood), or because the stop adds value to the overall transit system by providing intermodal or economic development connections (Martz Bus Terminal and downtown Milford). These stops should be reevaluated in the next few years; if ridership remains low, it may make sense to eliminate them.

Address Congestion at Canoe Launch Sites

The River Runner drops off and picks up riders at the canoe launch sites, requiring the shuttle to drive further into the fee access areas and, in some cases, navigate driveways that are narrow and have tight turns. Dropping off riders close to the boat launch makes the shuttle more convenient for riders, so it is an important service.

However, as other individuals and groups use the canoe launch sites, the areas are frequently congested. Congestion is also caused by vehicles parking illegally, not pulling all the way off the road and vehicles spending too long loading or unloading or waiting for friends. Congestion at the canoe launch sites is a persistent problem for the shuttles; it slows down the shuttle and is a significant contributor to challenges associated with keeping the shuttle on schedule. During the field observations, congestion was observed nearly every day (Figure 7-12).

FIGURE 7-12: RIVER RUNNER WAITS BEHIND A CANOE LIVERY BUS



River Runner operator's view of private livery. Photo source: CTG, 2017.

Potential strategies for reducing congestion at the boat launch would be to designate and enforce priority parking for the shuttle, enforce existing posted parking limits, and designate a parking spot for private river operators.

[Designate and Enforce Priority Parking for River Runner](#)

The River Runner is signed at all the major canoe launch locations. Signs tell riders where to wait for the shuttle. In practice, the shuttle does not consistently park at the signed parking spot, largely because the spot is taken or because it is inaccessible for another reason (blocked by other vehicles). One strategy that would improve the shuttle's access to the boat launch would be to clearly mark the parking spot for the River Runner (during set times and days of the week) and protect the parking spot through enforcement.

[Enforce Canoe Launch Wait Times](#)

Posted parking time limits and reminders for people to pull all the way off the road when they park their vehicles could also reduce congestion at canoe launch sites. Nearly every boat launch site is posted with signs limiting parking time, but these limitations are rarely enforced. Providing enforcement would help the shuttle stay on time; it would also reduce congestion generally and increase the accessibility of the canoe launch sites.

[Designate Parking Location for Private River Operators](#)

Another strategy to reduce congestion at the canoe launch sites is to designate a parking area for the private livery services that operate guided and unguided river tours on the Delaware. Private operators

were observed parking their vehicles and trailers close to the boat launch and staying there for most of the day. While these vehicles and trailers were almost always pulled off the main road, they tended to wait for extended periods. Given the duration of time spent at the boat launch site, they may be requested to park slightly further from the boat launch area. This change would mean the private livery services would need to carry their boats further to get them to the river, but it would improve circulation at the launch and help streamline shuttle operations.

Revised Schedule

The study team developed a revised schedule reflecting adjusted dwell times, removing the most underutilized stops, and assuming improved enforcement at the canoe launch (Table 7-2). This schedule allows 1 hour 55 minutes for the shuttle to travel from Kittatinny Point to downtown Milford and 1 hour 28 minutes to make the southbound trip back to Kittatinny Point. It also allows a 27-minute layover in Milford to maintain the existing four-hour roundtrip schedule. More detail on the schedule is available in Appendix B.

TABLE 7-2: RIVER RUNNER—POTENTIAL MODIFIED SERVICE SCHEDULE

Shuttle Trip/Driver Assignment	Depart KPVC	Arrive Milford	Layover	Depart Milford	Arrive KPVC
A	7:00	8:57	0:25	9:22	10:50
B	9:00	10:57	0:25	11:22	12:50
C	10:00	11:57	0:25	12:22	13:50
A	11:00	12:58	0:25	13:23	14:50
D	12:00	13:57	0:25	14:22	15:50
B	13:00	14:58	0:25	15:23	16:50
C	14:00	15:58	0:25	16:23	17:50
D	16:00	17:58	0:25	18:23	19:50

Source: CTG.

Travel times include dwell times to account for loading and unloading of passengers and boats (Table 7-3). The average dwell time observed during the three days of observation varied significantly, especially for northbound trips. Total dwell times were more than three times greater in the northbound direction than in the southbound direction. The schedule maintained the 25-minute layovers to account for the unpredictable but likely additional delay in the northbound direction. The schedule may be more predictable by eliminating two stops. Travel times in the southbound direction were reduced by 5 minutes and the layover/dwell at Kittatinny Point Visitor Center decreased from 19 minutes to 10 minutes. These times leave a smaller margin for delays and a shorter break for the driver since the 10 minutes available will likely be used for loading boats. The study team believes that fewer boardings, and the resulting smaller variations in southbound travel times, will make the reduced southbound layover manageable. Of course, as the team observed during field work, large parties board, albeit rarely, in the southbound direction, resulting in significant delays to the southbound run-time. This unpredictability cannot be built into the schedule and will have to be managed by the driver.



TABLE 7-3: RIVER RUNNER—AVERAGE DWELL TIMES

Stop	Northbound Average	Southbound Average
Kittatinny VC	10:00	01:30
DWG Park and Ride	01:30	01:10
Shawnee Inn	3:00	0:49
Smithfield Beach Access	5:00	3:55
Smithfield Beach Pick-up	4:00	0:52
Bushkill Access	8:45	1:15
Dingmans Access	7:30	1:45
Milford Beach	7:00	1:07
Total Dwell	47:45	11:34

Source: CTG.

Cost to Improve On-time Performance

The study team assumed only minor costs associated with these strategies, including approximately \$500 for signage and \$2,000 to cover potential increases in driver overtime pay.

IMPROVE INFORMATION SYSTEMS

Seasonal, tourist-oriented transit routes are inherently difficult to communicate to potential riders. These services typically operate intermittently (weekend days only) or on a limited basis (seasonal), giving passengers less time to learn and understand them. In addition, tourist services serve occasional visitors, which means potential riders may be more sensitive to perceived challenges with transit service such as not understanding how it works or when it arrives/departs; not knowing where to get on or off the bus; and fear about getting on the bus in the wrong direction. As a result, even more than traditional transit routes, tourist-oriented services must be simple, easy to understand, and easy to communicate with riders.

The River Runner adheres to the following standard transit service design principles that make a route easy to understand and communicate:

- Follow the same alignment for nearly every trip (limit service variances).
- Use the same alignment on the inbound and outbound trips (travel the same path in both directions).
- Place bus stops directly across from each other.
- Schedule the bus on a clock-face schedule (depart from major destinations on the hour, etc.)
- Operate on consistent and logical service frequencies (i.e., every 20 minutes).

Marketing and information systems have a significant impact on transit service ridership and are critical to successful tourist or seasonal transit services. The River Runner was described by several riders as “the best kept secret.” This perception makes the shuttle attractive to some riders, but also implies the service is missing other markets. The study team identified two major strategies for improving information systems to attract riders: making the existing service easier to use and teaching riders to use the shuttle in new ways.

Make the Shuttle Easier to Understand and Use

Despite doing many things to make the service easy to understand and use, there are a handful of strategies that could make the shuttle more logical and intuitive for riders. Some of these ideas and recommendations were developed as a result of coordination between the shuttle team and the consultant team working on marketing and information systems (Booz Allen Hamilton).

Add Signage on Bus Identifying Direction of Travel

One of the most frequent questions asked of drivers is which direction the bus is traveling. Knowing in which direction the shuttle is traveling (i.e., northbound or southbound) is difficult because the shuttle rarely stays on schedule and many people get on or off the bus away from the road, so they are not able to visually see the direction of travel. Adding signage is an easy strategy to help riders understand how the shuttle works. This idea was developed and recommended by Booz Allen Hamilton.

Operate on Clock-Face Schedule from Kittatinny Point Visitor Center

Operate on a clock-face schedule from the Kittatinny Point Visitor Center. Kittatinny Point is both the first stop in the northbound schedule and one of the highest ridership stops. Scheduling the shuttle to leave on the hour from Kittatinny Point makes the shuttle easy to remember and a bit easier to gauge the time the shuttle should be at subsequent stops. The River Runner currently uses a clock-face departure from downtown Milford, but not Kittatinny Point. If only one stop can be set to a clock-face schedule it should be Kittatinny Point, because ridership at this stop is significantly higher.

Add a Second Stop at Smithfield Beach

Create two stops at Smithfield Beach: one at the boat launch for passengers unloading boats and another in front of the Smithfield Beach restroom for passengers loading boats. This arrangement is already used informally (Figure 7-13), but it creates some confusion for passengers who are unsure of where to wait for the shuttle. Allowing passengers to board the shuttle at the Smithfield Beach restroom is also more convenient for passengers because it is closer to the parking lot.

FIGURE 7-13: PADDLERS LOADING AT SMITHFIELD “SECOND STOP”



River Runner passengers waiting at Smithfield Beach. Source: CTG, 2017.

[Use Northbound and Southbound](#)

Change web and printed materials to talk about travel in terms of direction (e.g., northbound and southbound, instead of in and outbound). This terminology is more in line with both the actual direction of travel and riders' perception of the direction they are traveling.

[Provide Shuttle Schedules at Major Bus Stop Locations](#)

The existing shuttle stops are signed. They also include a QC code so that riders can use their phones to get more information about the bus. This is a valuable solution but is rendered ineffective because of a lack of cell service in many locations. Given this fact, MCTA and DEWA could post the shuttle schedule at the key stops: Kittatinny Point Visitor Center, Smithfield Beach, Bushkill Access Area, Dingmans, and Milford Beach.

[Ensure Consistent Information](#)

Make sure information is consistent across all media. In some cases, the printed materials differed from the web-based information. Discrepancies can be frustrating to users, even if the differences are minor.

[Create Guidelines for How to Load and Unload Boats](#)

Create clear guidelines for riders regarding how to work with the shuttle driver to load and unload personal boats. Rider guidelines should also provide instructions for shuttle queuing.

Teach Riders to Use Shuttle in New Ways

The River Runner is full on some trips and some segments, but at other times the shuttle is nearly empty. One of the reasons why there are capacity challenges on the River Runner is because nearly all the riders use the service in the same way (i.e., boarding with their boats at Kittatinny Point or Smithfield and traveling to Smithfield or Bushkill). Some riders try to avoid capacity issues by boarding at more southern or lower ridership stops, such as Stroudsburg High School, the DWG Park and Ride, or the Shawnee Inn. While this strategy may increase the chances an individual rider has of getting on the River Runner, this practice only changes where and when the capacity constraint occurs.

At the same time, the River Runner from Bushkill to Dingmans and from Dingmans to Milford Beach has capacity. Likewise, there is capacity on the afternoon shuttles. One way to increase capacity of the route is to encourage river travelers to use the shuttle in the following different ways:

- **Launch boats from locations farther north along the river.** This may be challenging for people accessing DEWA from the south end because of the increased travel time associated with getting to Dingmans Boat Launch as compared with Kittatinny Point or Smithfield, but there is a lower chance of having to wait for the shuttle.
- **Launch boats from where they park their car and use the shuttle to travel back to their car at the end of the trips.** Some of the more experienced river runners have already learned that this is a safer way to ensure access to the shuttle when space for boats may be unavailable but seats on the shuttle are available. This strategy requires at least two people in the party (one to retrieve the car and one to attend the boats). It could also mean that parties must pay two entrance fees (one to park cars and one to pick up boats), although this could be rectified via policy change.
- **Make river trips in the afternoon.** One of the easiest ways for riders to ensure they can get a seat on the bus would be to travel in the afternoon. In most cases, afternoon river travel does not need to be coordinated with late-afternoon shuttle trips because most river travelers end their trips at their cars. Afternoon travel could be promoted as part of communicating the service.

Create Videos to Teach People How to Use Shuttle

Produce a video that shows and tells passengers how to use the shuttle. This instructional video could discuss the shuttle schedule and provide guidelines for how to load boats.

Cost to Improve Information Systems

The cost to improve information systems is approximately \$4,000, including the cost to update marketing materials, add signage, and produce rider information materials like videos and online resources. The cost of information systems is assumed to be an annual cost given the need to continually update and improve materials.

COSTS, BENEFITS, AND IMPACTS

The short-term recommendations consist of a handful of strategies and actions that can realistically be implemented in the short term, within one to three years. By implementing these recommendations, ridership on the River Runner is expected to increase by about 33% in the short term, adding approximately 1,000 riders over the existing case in the early years and growing to about 1,800 riders

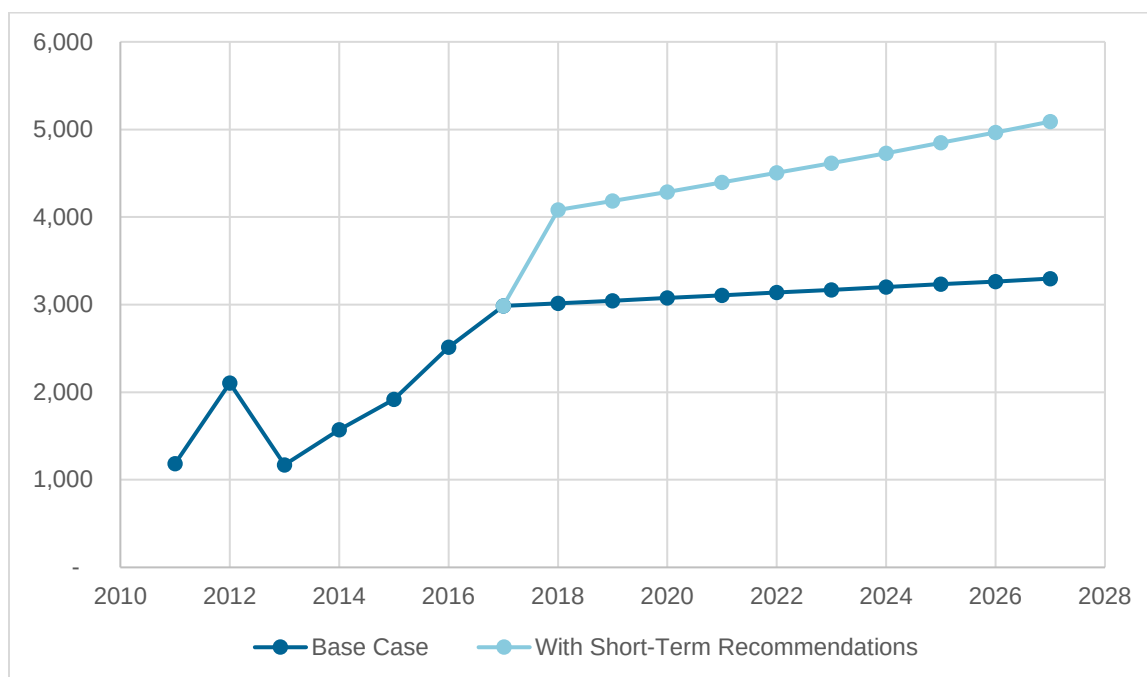


over the base case by 2027. The cost of the strategies is estimated at approximately \$15,000 in one-time capital investments plus additional operating costs of about \$30,000 to the shuttle's annual operating costs.

Ridership

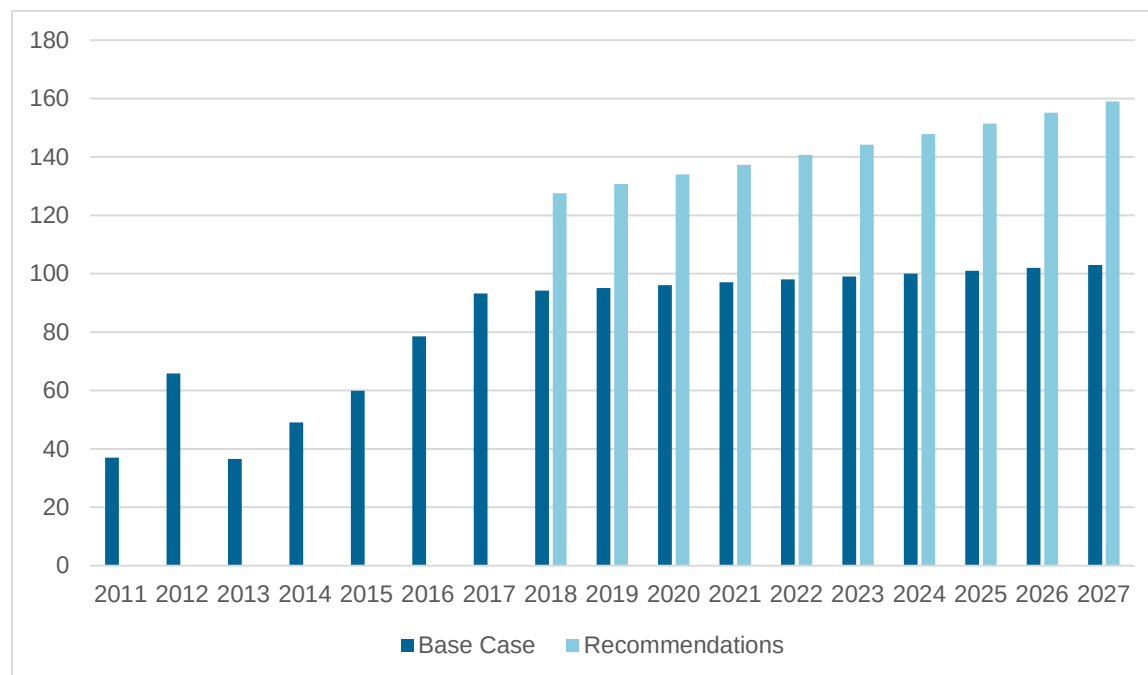
Ridership on the River Runner has increased since the service began in 2011. Growth has been steady, but not even, in part because the service and service hours have varied. Since 2015, the shuttle operations have been more consistent, and ridership has grown steadily. Ridership over the last few years suggests that ridership on the River Runner will continue to grow, albeit slowly. Riders will develop “work arounds” to avoid capacity constraints, increasing the number of riders carried. The study team expects that this rate of growth will be slow, but steady, increasing at a conservative rate of approximately 1% per year. At this rate, the River Runner will add one rider per day, on average. With the recommendations suggested, overall growth will be stronger, but conservatively increasing by 5% each year (Figure 7-14), adding three to four riders per day. The growth largely results from the increased capacity associated with the additional trip, but also the combined impact of strategies to improve on-time performance and passenger information systems.

FIGURE 7-14: ANNUAL RIDERSHIP ON THE RIVER RUNNER: HISTORICAL AND FORECAST GROWTH (2011–2027)



Source: CTG.

FIGURE 7-15: DAILY RIDERSHIP ON THE RIVER RUNNER: HISTORICAL AND FORECAST GROWTH (2011–2027)



Source: CTG.

Costs

The cost of the short-term recommendations is estimated at about \$15,000 in one-time investments, plus about \$30,000 annually if they are implemented. Capital improvements include reconfiguring the boat trailers, putting bike racks on the front of the shuttle buses, repairing MCTA's sixth trailer, and adding a hitch to a sixth MCTA vehicle. Operational expenses are largely attributed to the costs of adding a half-day trip and the staffing costs associated with enforcing the canoe launch areas. Additional operating expenses are added to cover the cost of annual marketing efforts. Over the 10-year period, this increases the cost of the service by \$315,000. The cost per rider associated with the improvements is nearly equal to the 2017 cost immediately after the recommendations are implemented (Figure 7-16). Over time, however, the River Runner is expected to realize a lower cost per rider from an estimated \$28.50 cost per rider in the base case to \$25.30 cost per rider with the recommendations.

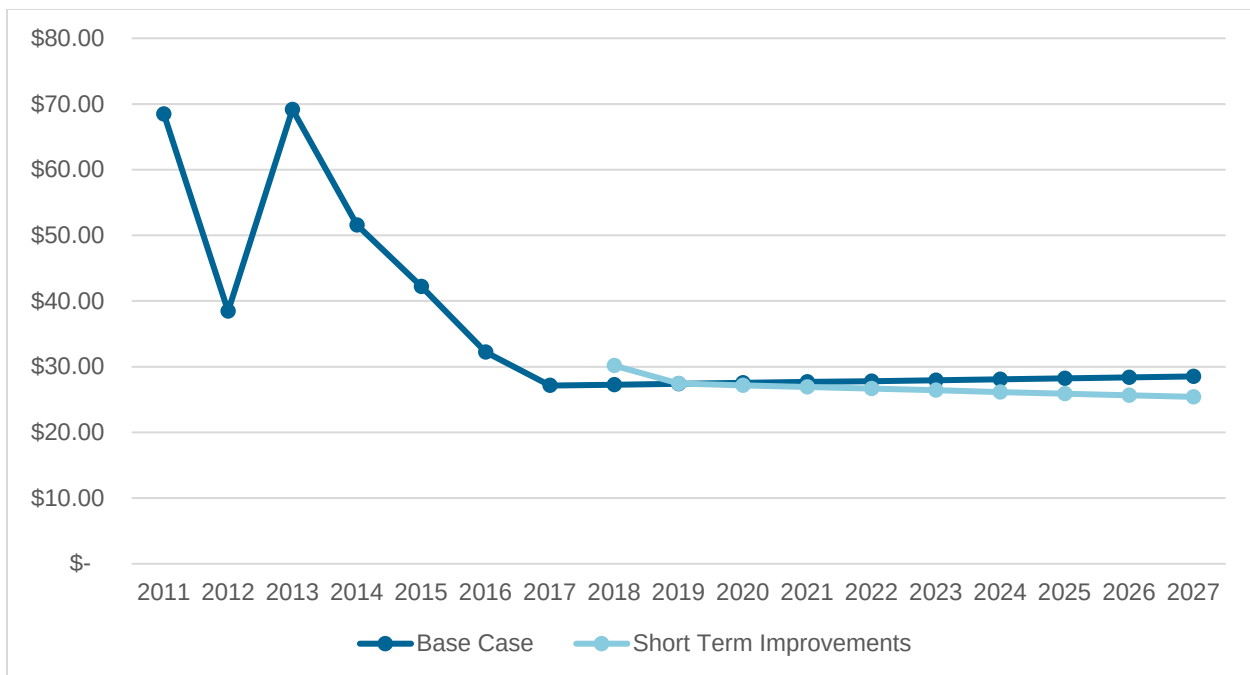


TABLE 7-4: ANNUAL ESTIMATED COSTS OF SHORT-TERM RIVER RUNNER RECOMMENDATIONS (2018–2027)

Year	Capital Investments	Operational Expenses
2018	\$15,000	\$30,000
2019	"N/A"	\$30,000
2020	"N/A"	\$30,000
2021	"N/A"	\$30,000
2022	"N/A"	\$30,000
2023	"N/A"	\$30,000
2024	"N/A"	\$30,000
2025	"N/A"	\$30,000
2026	"N/A"	\$30,000
2027	"N/A"	\$30,000
Total	\$15,000	\$300,000

Source: CTG.

FIGURE 7-16: COST PER RIDER: BASE CASE AND WITH SHORT-TERM RECOMMENDATIONS



Source: CTG.

Other Impacts

Recommendations have additional impacts, over and above the described changes in ridership and financial costs, including administrative costs associated with implementation and environmental impacts associated with reduced energy consumption and reduced emissions. The administrative costs of the short-term recommendations are not expected to be significant. Except for enforcement of the parking rules at the canoe launch areas, most of the recommendations are not expected to be complex or challenging to implement. Enforcing parking rules at the canoe launch may meet resistance from some of the livery services and individuals loading and unloading boats, but most of this resistance can be addressed by education, incremental implementation, and issuing warnings before tickets. In addition, in most cases, the recommendations only call for enforcement of the rules, not adding new ones. Adding a half-day trip also means MCTA will need to assign one more vehicle to the River Runner fleet, so the fleet includes the five vehicles used in operation, plus one spare vehicle. In terms of environmental impacts, the short-term recommendations will increase transit ridership by 14,200 (cumulative over the ten-year period, 2018-2027) and eliminate roughly 5,400 vehicle trips. Using an average trip mileage of 11.2, this equates to a reduction of 65,000 vehicle miles over the 10-year period or about 2,750 gallons of gasoline and 24.4 metric tons of greenhouse gases. No impacts are expected on MCTA's emergency preparedness systems or plans.

7.4 | CAPITAL EQUIPMENT NEEDS AND OPTIONS

Capital equipment, especially vehicles, influences the accessibility of the service. The vehicles and their fuel efficiency also affect the environmental impact of shuttle operations.

SHUTTLE VEHICLES

The short-term recommendations call for adding an additional trip to the existing service. Adding this trip means MCTA will need to have another vehicle available for the River Runner. This is not expected to add capital costs because the additional vehicle will be drawn from MCTA's existing fleet. The cost to add a trailer and a hitch have been added to the investment costs.

AMERICANS WITH DISABILITIES ACT (ADA) OPTIONS

The River Runner is currently operated with Ford Champion Challenger C-241 medium-duty vehicles, commonly referred to as "cutaway vehicles." All the vehicles are equipped with wheelchair lifts and have seating capacity for up to 18 passengers, plus space for one or two wheelchairs. The vehicles are fully compliant with ADA requirements. As discussed, vehicles on the River Runner are also used by MCTA to operate shared ride services, which largely cater to older adults and individuals with disabilities. The only difference between the vehicles used on the River Runner and the other shared ride vehicles is the trailer hitch at the back of the bus.

ALTERNATIVE FUEL VEHICLES

MCTA's bus fleet consists of a variety of vehicle types (full-sized heavy-duty buses, medium-duty buses and smaller vans and sedans). MCTA manages its fleet according to the guidelines and requirements specified by the FTA by replacing vehicles when they reach the end of their useful life. As of 2017, all MCTA vehicles operate with diesel or gasoline and the River Runner vehicles run on gasoline.



MCTA plans to transition its vehicles to compressed natural gas (CNG). The fleet transition will occur as part of a public-private partnership (P3) managed by Pennsylvania. Under this agreement, the private sector will develop CNG fueling stations at public transportation agencies around the state. By working with the private sector to design, build, finance, operate, and maintain CNG filling stations, the state has effectively removed the largest barrier to adopting CNG vehicles.

CNG is cleaner, quieter, produces fewer emissions, and has lower and more stable fuel costs compared to diesel fuel. CNG buses can also operate at levels consistent with diesel vehicles in terms of the travel range from a full tank of fuel. As a result, CNG vehicles (not including the CNG filling stations) are easily integrated into most transit fleets and offer environmental and cost benefits with minimal disruptions.

In 2016, approximately 17% of transit agencies in the United States operated CNG vehicles. CNG vehicles normally come with several barriers to entry, the most significant of which is the cost of building and maintaining filling stations. By removing this barrier, Pennsylvania has made CNG much more attractive to transit agencies in the state. Other barriers include safety upgrades required to maintain facilities to accommodate working with flammable gases instead of liquids.

MCTA is scheduled to get a fill station built in 2019 and will start replacing diesel vehicles with CNG as buses reach their useful life. MCTA's plans to transition its fleet to CNG vehicles is focused on full-sized, heavy-duty buses, but there are fewer medium-duty cutaway CNG vehicles available in the marketplace and existing models have a limited range (about 250 miles as compared with 350 miles). As a result, MCTA is not planning to transition its shared ride vehicles, which are used on the River Runner to CNG.

As of 2017, there are no alternative fuel vehicle options for shared ride vehicles that will give MCTA the desired range and fall within the same cost structure as gasoline vehicles. Propane offers some advantages but given MCTA has plans to transition to CNG for a portion of its fleet and retain gasoline for at least another portion of its fleet, adding a third fuel would be burdensome and expensive. However, as CNG vehicle technology improves and offers longer range vehicles, it may be a feasible option for MCTA's shared ride fleet in the short or medium term.

The market for alternative fuel vehicles is developing quickly. Over the longer term, these vehicles are likely to meet MCTA's operational requirements at or below the cost of owning and operating a diesel or gasoline vehicle. As the market develops, MCTA should continue to explore its options for alternative fuel vehicles, including CNG for shared ride vehicles and battery electric vehicles. Battery electric vehicles are the only zero emission vehicle options available and offer other environmental benefits associated with reduced operational noise.

8.0 LONGER-TERM RECOMMENDATIONS

8.1 | OVERVIEW

Short-term recommendations reflect opportunities to improve DEWA's transportation network by making the network safer and easier for visitors to understand and use. In the case of the River Runner, these recommendations would improve service operations and increase service productivity. The short-term recommendations reflect incremental changes that will correct deficiencies in the network, and they retain the existing transportation network in its current form and structure. Most of these opportunities are relatively low cost and can be implemented easily pending available funding.

One of the challenges facing DEWA involves planning for continued increases in the number of visitors, especially during the peak periods. Experience in 2017 suggests that, even at current levels of visitation, DEWA is over capacity during holiday weekends and at capacity during good weather weekends. Capacity issues almost exclusively affect people traveling to the park for day trips, most of whom want to spend the day at Smithfield or Milford Beach. As visitation increases, so will traffic and parking congestion and demand for the River Runner. A critical challenge for DEWA is two-fold. They need to offer visitors some way to reliably know if they can gain access to their desired location; without some sense of certainty, people will start arriving earlier and earlier for their spot in the park. The second challenge is that in cases where DEWA needs to turn people away from Smithfield and Milford, they need to encourage visitors to visit another part of the park that is equipped to host day trippers and picnickers.

Consequently, management of the transportation network, including parking areas, is a critical step to helping DEWA prepare for increased visitation. The study team's recommendations call for additional improvements to the transportation network and moving toward stronger multimodal infrastructure to control travel to and through the park.

8.2 | CONSIDERATIONS FOR LONG-TERM STRATEGY

DEWA has a variety of characteristics that make it unique. It is located near one of the most heavily populated regions in the United States and was established as a National Recreation Area after the area had been populated for centuries. DEWA is also situated around the Delaware River, which makes the park long and relatively narrow. The combined effect of these characteristics is that the park has multiple access points and includes public roadways.

Managing the transportation resources within DEWA requires balancing NPS goals with the fact that park facilities are public rights-of-way. As observed in 2017, much of the parking resources within the park are at or over capacity during peak times. Most of the transportation capacity constraints at DEWA are associated with parking rather than roadway space. US-209 north of River Road and most of River Road has available capacity, but key points on the network, namely the I-80 connection between the Park and Ride and the Kittatinny Point Visitor Center, is a major constraint.

Parking constraints mean people are turned away at the entrances of several of the parking areas and must find another location in DEWA for their recreation activities. As people are turned away, they are arriving at the park earlier or looking for other locations and places for their outdoor activities.



Localized capacity constraints exist on the River Runner. Riders are responding to the capacity issues by arriving earlier, using different stops, or changing the way they ride the bus. Over time, if the shuttle continues to be oversubscribed, some riders will seek other solutions.

Recognizing these challenges and constraints, the study team recommends that DEWA start to work toward a strategy of more actively managing the park's transportation resources both for DEWA and for visitors seeking predictable and reliable information about their visit. Expanding existing transportation assets, such as parking lots or roadways (River Road and US-209), is not feasible or desirable given difficulty and expense; it would also have environmental impacts and create subsequent impacts on the already constrained transportation network.

A strategy to help DEWA manage the park would involve transitioning to more multimodal infrastructure that diversifies the transportation network and creates a system of managed access at the most popular and heavily visited sites. Under this more actively managed approach, the River Runner would likely continue to be the primary transit option for transporting people throughout the park, but additional shuttle services will be added to connect intermodal services and remote parking to destinations within the park. Access to Smithfield Beach, Milford Beach and Dingmans Falls would be allocated based on a combination of reservation systems and shuttle access.

The benefits of a more multimodal approach include the following:

- Additional options for travel to and around DEWA.
- Increased accessibility of park resources, especially for people with limited access to private automobiles.
- More controlled and easily managed access to DEWA's most highly visited sites.
- Increased reliability and predictability for visitors wanting to go to DEWA's most highly visited sites during peak times.
- Reduced vehicular traffic and congestion in DEWA on River Road and US-209.
- Reduced environmental impacts associated with vehicular traffic, including air pollution and greenhouse gas emissions.

Despite creating tangible benefits, the success of a multimodal approach requires strengthening some transportation options (such as shuttle services) *and* discouraging use of private vehicles. Private automobile use continues to be the dominant mode of travel in the United States despite continued investment in public transit, bicycle, and pedestrian networks. Investments in multimodal infrastructure have proven to be most successful when paired with disincentives to driving alone, such as constraints on parking supply and higher charges for parking. Some NPS properties, such as Bandelier National Monument, have also had success restricting vehicular access to the park (Section 5.0). These strategies can be difficult and controversial to implement, but greatly increase the likelihood of success.

Transportation Network Innovations

A multimodal approach will also increase the park's flexibility in responding to technical innovations. Changes to the transportation network, especially changes that may be among us in the next 10 years, are harder to predict. After many decades of minimal innovation, the transportation sector is at the cusp of transformation. Some of the more recent innovations that changed travel patterns were associated with ride sharing technologies and transportation network companies, like Uber and Lyft. These services, and

the introduction of on-demand transit services, are starting to impact public transportation services. Other innovations, like connected vehicles and fully or partially autonomous vehicles, may have an even larger impact on how people travel by reducing or eliminating the need for human participation in vehicle operations. New vehicle technologies also have potential to reduce the cost of public transportation, which could lead to higher service frequencies, making transit more competitive with private automobile travel.

While it is unlikely that River Road or US-209 will be among the first parts of the transportation network to develop a connected network, or be viable routes for autonomous vehicles, the access roads, like I-80, will likely become part of the connected network or be navigable by autonomous vehicles. As the primary transportation network becomes more connected and autonomous there are opportunities for new modes, especially fixed-guideway systems that may be more oriented around moving people than moving vehicles. Under such a paradigm, the opportunity for faster, lower-cost fixed-guideway transportation focused on moving people rather than vehicles could directly connect DEWA and the gateway communities with New York City and Philadelphia. Investing less in roadway infrastructure and more in shared ride services, like shuttles, means DEWA can respond and adapt to innovation faster. If people start using private vehicles less, either because cars transition to a shared or autonomous (or both) system, shuttles will more easily integrate with these networks.

8.3 | TRANSPORTATION NETWORK INVESTMENTS

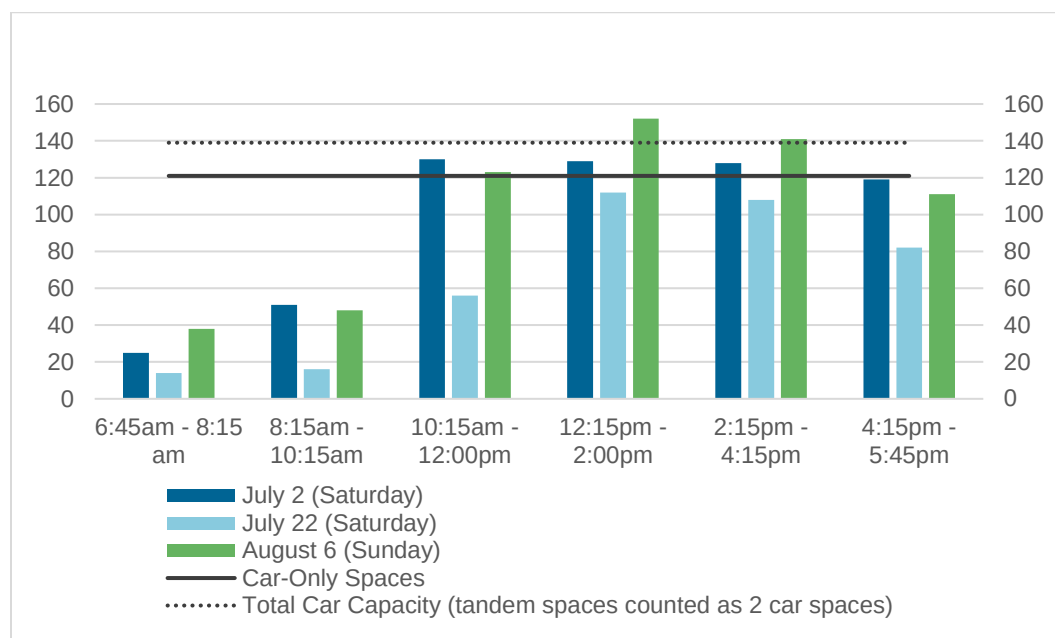
A handful of discreet, unrelated transportation improvements can be implemented over the long term that support the goals of increasing park management and accessibility.

MANAGE PARKING AT KITTATINNY POINT VISITOR CENTER

The Kittatinny Point Visitor Center is located on the east side of the Delaware River in New Jersey. The site is popular due to views of the iconic DWG geological features, river access, proximity to the Appalachian Trail, and multiple free parking lots. Kittatinny Point Visitor Center is the first and last stop for River Runner in DEWA. Parking count data collected as part of this study, shown in Figure 8-1 below, confirmed that parking at the site was nearly at or over capacity during the field observations between 12:00 p.m. and 4:00 p.m., and on two days, parking was at or over capacity as early as 10:00 a.m. Parking is currently (2017) available free of charge and there are no time limits on people's stays. People are also allowed to park their vehicles overnight, including for multiple nights.



FIGURE 8-1: VISITORS CENTER PARKING OCCUPANCY



Source: RSG.

Kittatinny Point is a popular starting and ending point for river travel, both for people traveling with private liveries and people using the River Runner. People also use the location as a hiking trail head. Parking conflicts occur when visitors who briefly stop at the visitor center conflict with people who park their cars for long periods of time. The goal of managing the parking resources is to better balance these competing needs by charging a fee for parking a vehicle longer than 30 minutes and designating a limited number of spaces for longer-term parking:

- Institute a fee for vehicles parked more than 30 minutes. Establishing a parking fee will help reduce the demand for parking overall and ensure spaces are available for people using the Kittatinny Point Visitor Center. Instituting this policy will require parking management infrastructure (self-park systems with minimal infrastructure) and enforcement. Rates should be consistent with other parking fees in the park.
- Create limits and develop special rates for overnight parking. Overnight parking at Kittatinny Point is likely attractive to people making multiple night hiking or river trips because the activity levels at the site help keep vehicles safe. The amenities at the site also make it an attractive place to come back to after multiple days in the field. At the same time, overnight parking consumes scarce parking spaces for long periods of time and given capacity issues needs to be managed.

Strategies to manage overnight parking include:

- Designate a handful of spaces (5 to 10) for longer-term or overnight parking. Parking in these spaces should have a higher rate based on the time spent at the site.
- Offer similar alternatives at other DEWA sites, such as Smithfield Beach to give visitors options if the overnight spaces fill up.
- People could also be instructed to park vehicles at the PA Welcome Center or DWG Park and Ride lot. Although these parking lots will not be as attractive to visitors making hiking or

river trips, parking is available and can be accessed free of charge. DEWA staff should request permission from PennDOT before encouraging people to use these parking lots for overnight parking.

- Parking at Kittatinny Point will likely exceed capacity over the long term, even with fees. Parking can be limited to 30-minute parking for all vehicles once the Smithfield Beach shuttle discussed in Section 8.4 is implemented. The Smithfield Beach shuttle will provide connections between Kittatinny Point and the DWG Park and Ride lot, so people can use the shuttle to access the hiking trails or move boats between the two sites.

OPEN RIVER BEACH AND CANOE LAUNCH SITES TO SHUTTLE RIDERS ONLY

As visitation to DEWA increases, and the swimming beaches (Smithfield and Milford) reach capacity more often, DEWA can develop an additional river beach and canoe launch area and make them accessible only via the shuttle. These sites would be developed with space for the shuttle to turn around in but would have no parking for private vehicles.

One potential location for a shuttle-only canoe launch site is Eshback Access. The Eshback Access area provides access to the river with a canoe launch area, small gravel driveway, access to the McDade Recreation Trail, bike racks, and restrooms. It is located roughly 0.2 miles from US-209. Anecdotal data suggests that Eshback Access is one of the most frequently used flag stops on the shuttle system. The shuttle currently does not travel in and out of the site. While the roadway to the canoe launch is likely sufficient for the bus, there is limited space for the bus to turn around, especially if vehicles are parked at the site. Eshback is located roughly halfway between Bushkill and Dingmans, making it an attractive paddle for canoers and kayakers. It would also attract riders to the northern end of the River Runner, when the vehicle tends to have capacity. The site is also already developed and would only require minor changes to make it serviceable by the shuttle. However, making the site shuttle access only, potentially only on holidays and weekend days, would require enforcement. The site could be open to vehicular traffic on days when the shuttle is not operating.

Developing Eshback Access as a shuttle-only canoe launch would require minor roadwork at the site to create an area sufficient for the vehicle to turn around. This could be accomplished with a gravel surface and does not require paving. Serving Eshback Access would add roughly 10 minutes to the shuttle schedule; this also has an ongoing cost. Private vehicles do use the sites on weekend days and holidays, so one of the most significant costs would likely be complaints from current users and the costs associated with enforcing access to the site. Advertising through brochures in park marketing materials would also be required to make this site successful.

DEVELOP SECOND DRIVEWAY AT SMITHFIELD BEACH

Smithfield Beach is the most developed site in DEWA. The site includes a canoe launch, motorized boat launch and a swimming beach and has access to River Road by one driveway at the southern end. The vehicle parking lot contains 370 parking spaces and 37 tandem spaces for boat trailers in the boat launch. In total, the Smithfield Beach area includes over five acres of paved area. As a result, it is one of the most heavily trafficked locations in the park; it is also one of the most congested. The current layout of the parking area is not designed for vehicles to easily enter and exit and circulate within the lot; this is



especially true for the shuttle. Confusion and congestion at the driveway entrance to Smithfield Beach exacerbates traffic flow and safety concerns.

One strategy to address issues with traffic flow and congestion would be to develop a second driveway between Smithfield Beach and River Road at the northern end of the parking lot. An approximate location for this driveway is shown in Figure 8-2. It would begin where the main lot meets the perimeter road (the access road running along the northwest edge of the paved lots), just southwest of the motor boat lot. It would curve as needed and end along a straight section of River Road to minimize sight distance issues and to overcome the steep grade. This second driveway would be most practical as an egress-only drive, with the existing driveway limited to entering vehicles only. With the extra space at the entrance drive, there could be two vehicle entrance lanes, or one lane could be a priority lane for the River Runner to enter the site. The ring road would be appropriate as a one-way road south of the new driveway.

FIGURE 8-2: SCHEMATIC OF NORTHERN EGRESS AT SMITHFIELD BEACH



Source: Google Earth. Diagram features: RSG.

Creating a second driveway and making the site access **one-way in and one-way out** (as described above and shown in Figure 8-2) would separate traffic and help manage traffic flow. Improved access and circulation would also create operational advantages for the River Runner; the shuttle would benefit from easier and less congested circulation. The benefit of the entrance-only design at the southern end would

improve or eliminate the limited sight distance issues for exiting Smithfield Beach. Alternatively, creating a second driveway and using **both driveways as access/egress** facilities would create logical traffic flows for travelers arriving from and departing to the north and the south. However, this configuration may create challenges for internal circulation flow, especially during times when the parking lot is full, and it would require a second fee collection site or use of a controlled automatic gate. Developing the second driveway would require developing about 300 linear feet of park land to connect the northern end of the parking lot with River Road. The exact location of the egress drive would need to be designed to ensure safe lines of site for vehicles making left turns and to overcome the grade change between the parking area and River Road. The cost of this strategy is expected to be high because the area would likely require an environmental review process; developing new roadway facilities in the park is expensive.

RESTRICT ACCESS TO RIVER ROAD

River Road is a scenic and historic road. It provides access to several DEWA resources, public and private facilities like the Shawnee Inn, and several residences, shops, and restaurants. River Road, however, has narrow lanes without shoulders or space for pedestrians or bicyclists. Many drivers were also observed driving over the posted speed limit, exacerbating safety issues. The idea of restricting access to River Road is an idea that has been considered in the past. This strategy offers DEWA benefits in terms of managing traffic, improving safety, increasing options for nonmotorized travel, and enhancing the natural and environmental appeal of the park. The study team considered recommending restrictions to the roadway because of these benefits and developed a handful of hybrid options to minimize the impact on vehicles, including the shuttle, but ultimately the team does not recommend changes to River Road at this time.

One of the concerns about restricting access to River Road is that it will have significant operational impacts on the River Runner because the bus travels on the roadway. Changes in River Road could align with the shuttle operations. Potential strategies include the following:

- Closing River Road to general vehicular travel on weekends or key times, with exceptions for park vehicles, including the shuttle and people staying at the Shawnee Inn. Under this scenario, the shuttle would transport people between Smithfield Beach and the DWG Park and Ride lot or other remote parking site.
- Designating River Road as a one-way facility allowing travel northbound and using the freed-up road space for sidewalks or bike paths. This change would impact the shuttle alignment, requiring it to travel southbound via US-209. It would also likely change the local circulation between the DWG Park and Ride lot, and the Kittatinny Point Visitor Center. US-209, south of River Road, experiences high levels of congestion that would affect shuttle operations in this scenario.
- A hybrid option could include one-way traffic northbound for general traffic but also allow the shuttle to travel southbound. With education, this may be a strategy implemented on holiday and weekend days only. This option would create a less congested southbound route for cyclists and pedestrians, with the occasional conflict with the shuttle (1 or 2 per hour). Private shuttles would be excluded from this exception, requiring a longer diversion onto US-209.

Ultimately, as discussed, no changes to River Road are recommended at this time until the transportation demand management (TDM) strategies discussed below are attempted. If, even with the TDM measures,



congestion on River Road grows, changing the management and operation of River Road may be revisited.

8.4 | TRANSPORTATION DEMAND MANAGEMENT STRATEGY, SOUTH END (KITTATINNY POINT AND SMITHFIELD BEACH)

Some of DEWA's most popular, heavily visited, and congested areas are in the south end of the park. These facilities include the Kittatinny Point Visitor Center, including the surrounding hiking trails and canoe access locations; and Smithfield Beach, which is heavily used by day picnickers and both boaters and canoers/kayakers. The two sites are located approximately eight miles apart.

As congestion at these sites increases, DEWA should develop a South End TDM plan to direct and control vehicular access at these facilities. This strategy would consist of four primary means designed to facilitate a "park once" concept for visitors and reduce vehicular travel within the park. The TDM strategy would consist of incentives and disincentives, including the following:

- **Limit parking** at the Kittatinny Point Visitor Center to short-term uses only (roughly 30 minutes).
- **Direct longer-term parking to the DWG Park and Ride lot.** The Park and Ride lot would need to be developed with additional facilities to make it a more comfortable location for travelers. A second option for longer-term parking is the Pennsylvania Welcome Center. The park should initiate conversations with the Welcome Center as it is renovated over the coming year to determine whether parking, shuttle stops, or other coordinated activities could occur at the site.
- **Manage access to Smithfield Beach using a combination of a reservation system and shuttle-only access.** This system would require visitors to make a reservation for holiday and weekend day use of Smithfield Beach. People would be allowed to visit Smithfield Beach without a reservation but would be required to travel to the site by shuttle. A separate reservation system could be created for people with boat trailers; people with private livery reservations; or people with disabilities. This strategy helps the park manage access to the site and helps visitors to reliably predict their ability to gain access to Smithfield Beach. Pricing strategies can be eventually incorporated to further change the demand structure and possibly raise revenues that can cover some of the amenities or expanded shuttle operations.
- **Implement new, additional shuttle service** that circulates between the Kittatinny Point Visitor Center, the DWG Park and Ride lot (or PA Welcome Center), and Smithfield Beach. The shuttle would be in addition to the River Runner service and would be equipped with trailers, bike racks, and luggage racks for picnic and beach gear. The shuttle would also be implemented as a frequent service. Two shuttles dedicated to the circulator—plus the River Runner—would allow for a departure every 20 minutes.
- **Signage, information, and public outreach.** Teaching the public to adapt to new ways of accessing Smithfield Beach and parking at Kittatinny Point will require signage, outreach, and information. This strategy and approach is consistent with how other national park properties are managed in other parts of the country, so will be familiar to many visitors. Nonetheless, the operating system is a departure from current practices and may inconvenience some visitors, especially in the beginning. Signage and information systems will be especially important for visitors traveling from the north to Smithfield. Without proper planning (and getting a reservation) travelers may be required to travel past Smithfield Beach to board a shuttle.

- **Retain River Runner to provide corridor-long service** from the DWG Park and Ride lot (or PA Welcome Center) to downtown Milford. Assuming the River Runner grows as expected, it will continue to offer hourly service from approximately 7:00 a.m. to 5:00 p.m. on holidays and weekend days. The River Runner would continue to serve the Stroudsburg High School and the Martz Bus Terminal as vehicles go and in out of service. It may also serve the Kittatinny Point Visitor Center, but this site will no longer be used to pick up river travelers and load boats.

The TDM strategy would be a departure from DEWA's existing management practices of the transportation network. The new strategy would move toward managed and controlled access to the Kittatinny Point Visitor Center and Smithfield Beach. The proposed TDM approach is designed to enhance access to the facilities by providing more ways to get to and from the sites, decreasing the need for a private automobile to get to and from key sites and reducing vehicle impacts.

SMITHFIELD BEACH SHUTTLE

Despite its success, the River Runner has not had much luck encouraging park visitors to leave their cars at remote parking lots and use the shuttle to access Smithfield Beach. This is primarily because the benefit to the traveler for taking the shuttle (i.e., saving the fee to enter the access area) does not offset the inconvenience associated with riding the shuttle, especially with current service frequency. In addition, because the Smithfield Beach parking lot is roughly sized to accommodate the maximum number of visitors allowed at the site, DEWA staff largely use the parking lot to estimate site capacity. Shuttling additional day trippers to Smithfield Beach is not a goal. Under the TDM plan, access to Smithfield Beach would be managed by a combination of access restrictions implemented through a parking reservation system and shuttle service. This approach and service design has been adopted at some other NPS sites and will soon be adopted by Muir Woods, one of the sites evaluated in this study's peer review.

Actively Manage Parking at Smithfield Beach

The primary challenge at Smithfield Beach is overuse of the site. Site limitations at Smithfield Beach include staffing (park rangers and lifeguards), facilities (trash removal, restrooms, and septic systems) and the ability of the site to maintain facilities in an environmentally sustainable way. The demand on these systems has consistently exceeded their capabilities. The traditional way to manage access is to adopt a "first come, first serve" approach, letting the site fill up and turning away visitors who arrive later. This could also be done in conjunction with using entrance fees to manage costs.

An alternative approach would be to develop a reservation system for access to Smithfield Beach. The reservation system would be used to manage roughly half of the capacity of Smithfield Beach, or about 500 individuals/parking spots. The cost to book a spot would be consistent with other access fees and would allow families and parties planning a large outing to book their visit in advance and guarantee access. Reservations could be booked based on party size and number of vehicles and be priced accordingly.

Other people interested in visiting Smithfield Beach could still travel to the site, but these visitors would be required to park at a remote lot (DWG Park and Ride lot) and ride the shuttle to the beach. The shuttle would control visitor access based on the number of vehicles and seats on the buses. The shuttle could provide access to Smithfield Beach for up to 360 individuals. This assumes medium-duty "cutaway" 18-passenger transit vehicles are used for the shuttle service and operate at maximum capacity with a

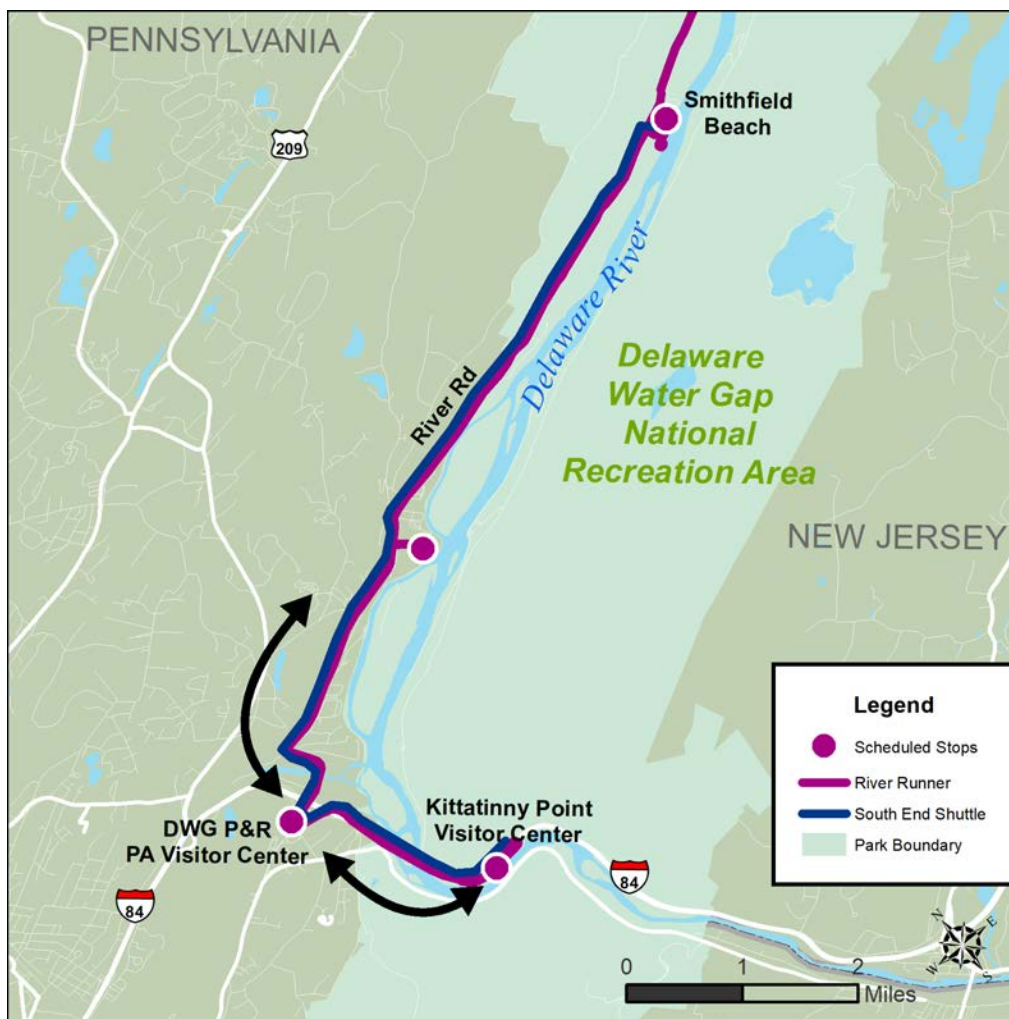


service span from 6:00 a.m. to 8:00 p.m. (consistent with Smithfield Beach's opening hours, which are signed as roughly sunrise to sunset). Requiring access via the shuttle is likely to discourage some visitors from traveling to Smithfield Beach. Some of these visitors will go to different parks and others will look for additional ways to visit DEWA.

Shuttle Service to Smithfield Beach

The Smithfield Beach shuttle would operate between the Kittatinny Point Visitor Center, the DWG Park and Ride lot (or PA Welcome Center), and Smithfield Beach (Figure 8-3). The shuttle will focus on providing direct, fast, and frequent service and would not serve the Shawnee Inn or make flag stops. The shuttle would operate at 30-minute frequencies, meaning a bus would depart from Kittatinny Point every half-hour. Riders would also have access to the River Runner and schedules would be coordinated so that a shuttle would depart from Kittatinny Point/DWG Park and Ride and Smithfield Beach every 20 minutes. An indicative schedule is included in Figure 8-3; this schedule includes sufficiently long dwell times at each site to allow time for passengers to load gear and picnic supplies and unload at Smithfield Beach.

FIGURE 8-3: SOUTH END POTENTIAL SHUTTLE ALIGNMENT: KITTATINNY POINT VISITOR CENTER—DWG PARK AND RIDE—SMITHFIELD BEACH



Source: CTG.

TABLE 8-1: SOUTH SHUTTLE SAMPLE SCHEDULE

Shuttle Trip / Driver Assignment	Depart Kittatinny Point Visitor Center	Arrive Smithfield Beach	Depart Smithfield Beach	Arrive Kittatinny Point Visitor Center
A	8:45	9:03	9:15	9:32
B	9:15	9:33	9:45	10:02
A	9:45	10:03	10:15	10:32
B	10:15	10:33	10:45	11:02
A	10:45	11:03	11:15	11:32
B	11:15	11:33	11:45	12:02
A	11:45	12:03	12:15	12:32
B	12:15	12:33	12:45	13:02
A	12:45	13:03	13:15	13:32
B	13:15	13:33	13:45	14:02
A	13:45	14:03	14:15	14:32
B	14:15	14:33	14:45	15:02
A	14:45	15:03	15:15	15:32
B	15:15	15:33	15:45	16:02
A	15:45	16:03	16:15	16:32
B	16:15	16:33	16:45	17:02
A	16:45	17:03	17:15	17:32
B	17:15	17:33	17:45	18:02
A	17:45	18:03	18:15	18:32
B	18:15	18:33	18:45	19:02

Source: CTG.

Ridership

A range of ridership for the Smithfield Beach shuttle has been estimated pivoting off the capacity of the shuttle vehicles and assuming varying percentages of seats are filled. As discussed earlier, the maximum ridership per day possible, assuming no standees, would be 360 passengers (i.e., a 10-hour service span operating two trips per hour with all 18 seats filled). Using existing average occupancy data, this would be approximately 150 vehicles removed from the road per day.

The study team prepared high, medium, and low daily and annual ridership estimates (assuming an average of 34 days per year) (Table 8-2). The high estimations are designed to reflect holiday weekends and good weather days when attendance at the park is at its peak whereas low ridership estimates are more likely to occur on early season days when the weather is not as warm. On most days, ridership is expected to align more closely with the medium ridership estimates, or about 230 riders per day. Annual ridership is estimated to range from a low of 3,876 to a high of 11,016 passengers carried.

TABLE 8-2: SOUTH SHUTTLE RIDERSHIP ESTIMATES

Ridership Level	Percent of Seats Filled	Daily Ridership Estimate	Annual Ridership Estimate
High	90%	324	11,016
Medium	65%	234	7,956
Low	40%	114	3,876

Source: CTG.



Costs

Capital costs associated with implementing the Smithfield Beach shuttle would be limited to the costs of adding front loading bike racks and trailer hitches to two of MCTA's shared ride vehicles in their existing fleet. The cost of purchasing and installing a hitch is estimated at \$2,500 per vehicle, plus the costs of two additional reconfigured trailers at \$3,000 each, for a total one-time investment of approximately \$11,000. MCTA's existing facilities can accommodate the addition of this service, so no facility improvements would be required. Estimated operating costs for the shuttle would be approximately \$43,500 per year (about 680 additional service hours at a cost of \$64 per hour). The cost per rider is estimated at about \$5.60, based on the medium forecasts. Total costs over a 10-year period would be approximately \$446,000.

South End TDM Strategy Investment Needs and Benefits

Implementing the South End TDM strategy will help DEWA realize several benefits; it will also require capital and operating investments.

Benefits include the following:

- Increased access to Kittatinny Point Visitor Center and Smithfield Beach, especially for people with limited access to private vehicles.
- Reduced vehicular traffic and associated impacts on River Road and through DEWA.
- Enhanced operating environment within DEWA, both on River Road, but also at the Kittatinny Point Visitor Center and Smithfield Beach.
- Managed parking at Kittatinny Point Visitor Center and Smithfield Beach.
- A reliable and predictable way for visitors to access Smithfield Beach.
- Depending on fees, increased revenue for DEWA.

Investment costs associated with the strategy include the following:

- Information systems to communicate revised procedures to visitors.
- "Street team" staff support during implementation to explain the process to visitors. Staff will need to be located at Smithfield Beach, Kittatinny Point, and the DWG Park and Ride lot on holiday weekends and good weather days during the first year (at least).
- Development of an online reservation system with call center support so that visitors can book their trips.
- Two medium-duty "cutaway" transit vehicles equipped with front-loading bike racks, trailer hitches, and rear boat trailers. These vehicles would be drawn from MCTA's existing fleet, so the costs would be associated with the additional equipment, as detailed above.
- Operating costs for the new shuttle route.
- Improvements to the DWG Park and Ride lot. The DWG Park and Ride lot has space for about 150 vehicles. Assuming an average party size of 2.5 per vehicle, the parking lot could provide access to Smithfield Beach for nearly 400 individuals. This includes both day trippers traveling to Smithfield Beach and river travelers and other visitors using the River Runner to access other sites in the park. To accommodate volumes of this size, the DWG Park and Ride lot would need to be equipped with signage and waiting facilities for passengers, such as shelters, benches, trash

cans, and restrooms. Using the Park and Ride lot and developing amenities requires coordination and collaboration with PennDOT.

- Another option for a remote parking facility is the PA Welcome Center located across from the DWG Park and Ride lot on Broad Street. If DEWA plans to encourage visitors to park vehicles at either of these locations, staff should work with PennDOT to confirm approval. This is especially important in the immediate term because the PA Welcome Center is scheduled for site improvements and renovations.

8.5 | TRANSPORTATION DEMAND MANAGEMENT STRATEGY, NORTH END (MILFORD BEACH AND DOWNTOWN MILFORD)

DEWA's other popular, heavily visited, and congested area is at the north end of the park at Milford Beach. Like Smithfield Beach, the number of visitors interested in spending a day at Milford Beach exceeds site capacity. High volumes and overcrowding can also erode the park atmosphere of Milford Beach. As congestion at Milford Beach increases, DEWA should move toward a TDM strategy to manage access to Milford Beach. This strategy uses parking restrictions and enhanced shuttle services to help DEWA manage visitation volumes and traffic impacts. At the same time, the strategy creates options for people to access Milford Beach. Capacity issues at Milford Beach are not as acute as Smithfield Beach; the study team recommends implementing the TDM strategy at Smithfield Beach first and using the experience at that facility to inform final design of the Milford Beach strategy.

Dingmans Falls Visitor Center is also located at the north end of DEWA and is a frequently congested site. Data collected as part of this study shows that, on holiday and good weather weekends, the parking lot (50 spaces) is near capacity at 10:00 am and at or over capacity for most of the afternoon from 12:00 p.m. to 4:00 p.m. At this time, the study team is not recommending including Dingmans Falls in the TDM strategy because it is located about 10 miles from Milford Beach and 11 miles from downtown Milford. As the TDM strategy is successful, however, this decision can be reconsidered and shuttle service to Dingmans Falls could be added to the TDM strategy. The Milford Beach TDM strategy includes three primary means designed to manage access to the beach and facilitate a "park once" concept for people visiting Milford and Milford Beach. The strategy is based on a series of incentives and disincentives:

- **Manage access to Milford Beach using a combination of a reservation system and shuttle-only access.** Consistent with the recommendations for Smithfield Beach, Milford Beach would be accessible via a reservation system and a shuttle. Reservations would be available for roughly 100 parking spaces (half of the 190 spaces in the lot) and roughly 250 people. A separate reservation system could be created for people with boat trailers, with private livery reservations or for people with disabilities. Another 250 people would be allowed to visit Milford Beach without a reservation but would be required to travel to the site by shuttle. Visitation could be managed by the shuttle service.
- **Development of a remote access parking facility.** DEWA would need to develop a remote parking lot for people to use. The lot should be sized for between 50 to 100 spaces, based on the assumption that some people will ride the shuttle in from downtown Milford. One potential location for the remote parking is the US-209 north contact station parking area (Figure 8-4). Developing this site would require signage, passenger waiting facilities (shelters and benches), trash collection, restrooms, and park information kiosks.



- Implement a **new, additional shuttle service** that circulates between downtown Milford, Milford Beach, and a new remote parking lot. The shuttle would be in addition to the River Runner service and would be equipped with bike racks on the front of the bus and luggage racks inside the vehicle, but not trailers. The shuttle would also be implemented as a frequent service. Two shuttles dedicated to the circulator would allow for departures every 15-20 minutes.
- **Retain River Runner to provide corridor-long service** from the DWG Park and Ride lot (or PA Welcome Center) to Milford. As soon as the Milford Beach shuttle is available, the River Runner would not need to continue to offer service into downtown Milford; instead, service could end at Milford Beach. Assuming the River Runner grows as expected, it will continue to offer hourly service from approximately 7:00 a.m. to 7:00 p.m. on holidays and weekend days. The River Runner would continue to serve the Stroudsburg High School and the Martz Bus Terminal as vehicles go and in out of service.

As discussed, the TDM approach would be a departure from the DEWA's existing management practices and instead would use several interrelated strategies to manage vehicle access to Milford Beach. The shuttle would also create fast and frequent connections between downtown Milford and Milford Beach, strengthening the ties between this gateway community and the park. The shuttle would also increase options for accessing Milford Beach, reduce the need for a private automobile to get to and from key sites, and minimize impacts associated with private vehicle travel.

FIGURE 8-4: POTENTIAL REMOTE PARKING LOCATION AT NORTH CONTACT STATION

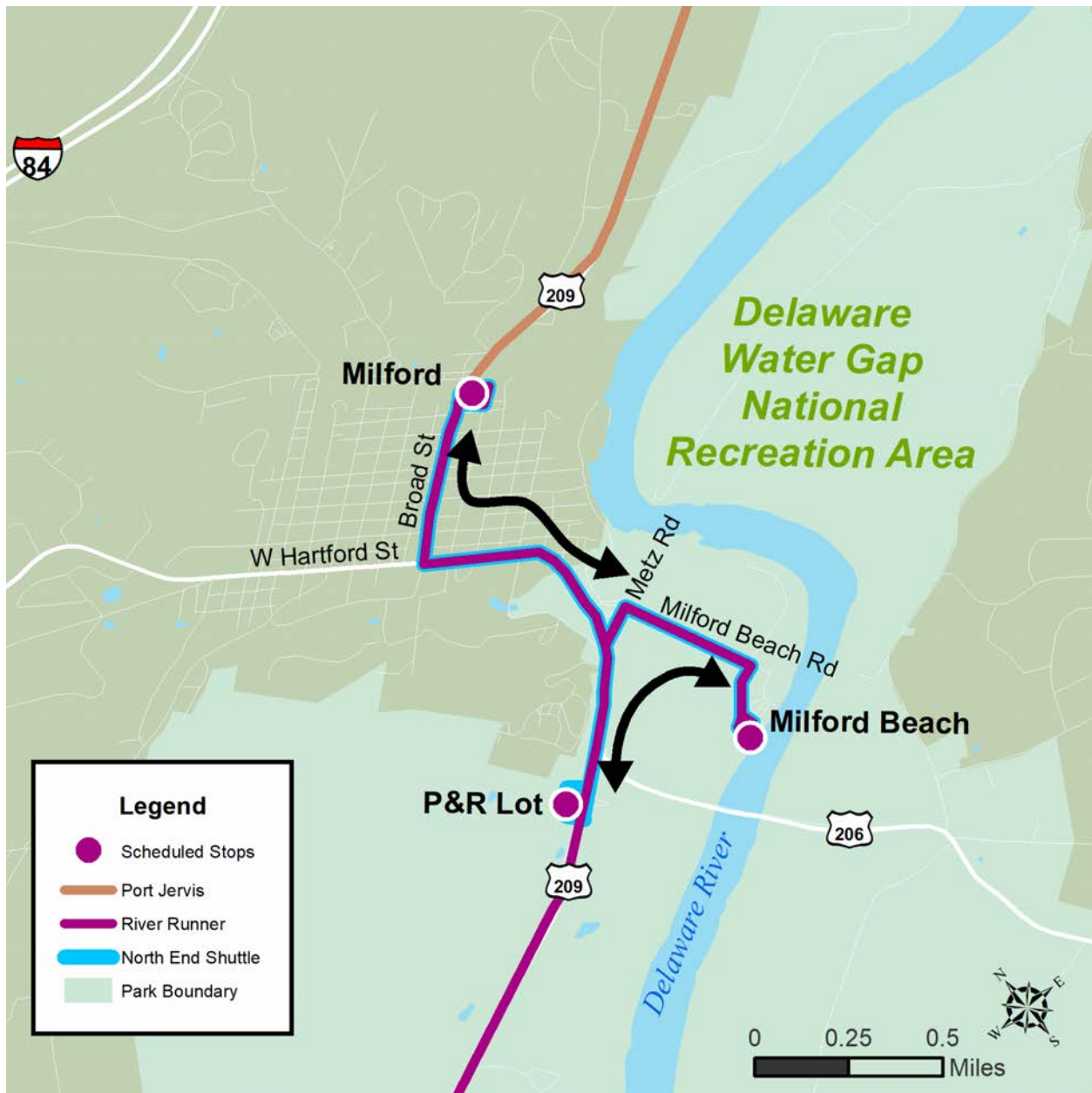


Source: Google Earth.

MILFORD BEACH SHUTTLE

The Milford Beach shuttle would connect remote parking (potentially at an existing lot near the intersection of US Routes 209 and 206), Milford Beach, and downtown Milford. Trips would begin at the north contact station, travel to Milford Beach, and end at the Frisky Goat Café in downtown Milford and then return to the north contact station via Milford Beach. This alignment allows for direct connections from the remote lot to Milford Beach and from downtown Milford to Milford Beach.

FIGURE 8-5: NORTH END POTENTIAL SHUTTLE ALIGNMENT: PORT JERVIS—DOWNTOWN MILFORD—MILFORD BEACH—DINGMANS FALLS



Source: CTG.



A one-way trip from the remote parking lot to downtown Milford via Milford Beach is about 2.8 miles long and takes about 11 minutes to travel. The consulting team estimates that a round trip, including dwell times and layovers, could be completed in 30 minutes. If two shuttles were assigned to the route, departures could be scheduled every 15 to 20 minutes. The Milford Beach shuttle would not operate with a trailer and would not need to account for the long dwell times associated with loading and unloading boats. The sample schedule in Table 8-3 assumes a 15-minute headway and a service span from 9:00 a.m. to 7:00 p.m., which is roughly equal to the Milford Beach opening hours. The schedule assumes the vehicle will wait 2 minutes at Milford Beach, and 3 minutes in downtown Milford. If the 2 to 3 minutes of wait times and breaks proves insufficient to maintain on-time performance, headways could be modified to every 20 minutes.

TABLE 8-3: NORTH SHUTTLE SAMPLE SCHEDULE

Shuttle Trip	Depart P&R Lot	Arrive Milford Beach	Depart Milford Beach	Arrive Milford	Depart Milford	Arrive Milford Beach	Depart Milford Beach	Arrive P&R Lot
A	9:00	9:04	9:06	9:12	9:15	9:21	9:23	9:28
B	9:15	9:19	9:21	9:27	9:30	9:36	9:38	9:43
A	9:30	9:34	9:36	9:42	9:45	9:51	9:53	9:58
B	9:45	9:49	9:51	9:57	10:00	10:06	10:08	10:13
A	10:00	10:04	10:06	10:12	10:15	10:21	10:23	10:28
B	10:15	10:19	10:21	10:27	10:30	10:36	10:38	10:43
A	10:30	10:34	10:36	10:42	10:45	10:51	10:53	10:58
B	10:45	10:49	10:51	10:57	11:00	11:06	11:08	11:13
A	11:00	11:04	11:06	11:12	11:15	11:21	11:23	11:28
B	11:15	11:19	11:21	11:27	11:30	11:36	11:38	11:43
A	11:30	11:34	11:36	11:42	11:45	11:51	11:53	11:58
B	11:45	11:49	11:51	11:57	12:00	12:06	12:08	12:13
A	12:00	12:04	12:06	12:12	12:15	12:21	12:23	12:28
B	12:15	12:19	12:21	12:27	12:30	12:36	12:38	12:43
A	12:30	12:34	12:36	12:42	12:45	12:51	12:53	12:58
B	12:45	12:49	12:51	12:57	13:00	13:06	13:08	13:13
A	13:00	13:04	13:06	13:12	13:15	13:21	13:23	13:28
B	13:15	13:19	13:21	13:27	13:30	13:36	13:38	13:43
A	13:30	13:34	13:36	13:42	13:45	13:51	13:53	13:58

Shuttle Trip	Depart P&R Lot	Arrive Milford Beach	Depart Milford Beach	Arrive Milford	Depart Milford	Arrive Milford Beach	Depart Milford Beach	Arrive P&R Lot
B	13:45	13:49	13:51	13:57	14:00	14:06	14:08	14:13
A	14:00	14:04	14:06	14:12	14:15	14:21	14:23	14:28
B	14:15	14:19	14:21	14:27	14:30	14:36	14:38	14:43
A	14:30	14:34	14:36	14:42	14:45	14:51	14:53	14:58
B	14:45	14:49	14:51	14:57	15:00	15:06	15:08	15:13
A	15:00	15:04	15:06	15:12	15:15	15:21	15:23	15:28
B	15:15	15:19	15:21	15:27	15:30	15:36	15:38	15:43
A	15:30	15:34	15:36	15:42	15:45	15:51	15:53	15:58
B	15:45	15:49	15:51	15:57	16:00	16:06	16:08	16:13
A	16:00	16:04	16:06	16:12	16:15	16:21	16:23	16:28
B	16:15	16:19	16:21	16:27	16:30	16:36	16:38	16:43
A	16:30	16:34	16:36	16:42	16:45	16:51	16:53	16:58
B	16:45	16:49	16:51	16:57	17:00	17:06	17:08	17:13

Ridership

A range of ridership for the Milford Beach shuttle has been estimated pivoting off the capacity of the shuttle vehicles and assuming varying percentages of seats are filled. As discussed earlier, the maximum ridership per day possible, assuming no standees, would be 360 passengers (i.e., a 10-hour service span operating two trips per hour with all 18 seats filled). The study team prepared high, medium, and low daily and annual ridership estimates (assuming an average of 34 days per year) (Table 8-4). The high estimations are designed to reflect holiday weekends and good weather days when attendance at the park is at its peak. Low ridership estimates, on the other hand, reflect early season days when the weather is not as warm. On most days, ridership is expected to align more closely with the medium ridership estimates, or about 200 riders per day. Annual ridership is estimated to range from a low of 3,672 to a high of 9,792 passengers carried.



TABLE 8-4: NORTH SHUTTLE RIDERSHIP ESTIMATES

Ridership Level	Percent of Seats Filled	Daily Ridership Estimate	Annual Ridership Estimate
High	80%	288	9,792
Medium	55%	198	6,732
Low	30%	108	3,672

Costs

Capital costs associated with implementing the Milford Beach shuttle would be limited to the costs of adding front loading bike racks to two additional vehicles drawn from MCTA's existing shared ride fleet. The cost of the bike racks is estimated at \$1,000 per vehicle for a total one-time investment of approximately \$2,000. MCTA's existing facilities can accommodate the addition of this service, so no facility improvements would be required. Estimated operating costs for the shuttle would be approximately \$87,000 per year (about 1,360 additional service hours at a cost of \$64 per hour). Total costs over a 10-year period would be approximately \$872,000. The estimated cost per rider, based on medium ridership forecasts, is about \$12.90.

North End TDM Strategy Investment Needs and Benefits

Implementing the North End TDM strategy will help DEWA realize a series of benefits; it will also require capital and operating investments.

Benefits include the following:

- Increased access to Milford Beach, especially for people with limited access to private vehicles.
- Reduced vehicular traffic and associated environmental impacts on US-209.
- Reduced congestion at the intersection of US-209 and US-206.
- Reduced crowding and overuse of Milford Beach facilities.
- A reliable and predictable way for visitors to access Milford Beach.
- Enhanced connections between Milford and DEWA.
- Depending on fees, increased revenue for DEWA.

Investment costs associated with the strategy include the following:

- Information systems to communicate revised visitation procedures.
- "Street team" staff support during the initial implementation period to explain the process to visitors. Staff will need to be located at Milford Beach on holiday weekends and good weather days during the first year to direct travelers.
- Development of an online reservation system with call center support so that visitors can book their trips.
- Two medium-duty "cutaway" transit vehicles drawn from MCTA's existing fleet, equipped with front-loading bike racks.
- Operating costs for the new shuttle route.
- Development of the north contact station with between 50 and 100 parking spaces. The lot would need clear and safe vehicular access and egress and passenger facilities such as signage and waiting facilities for passengers (such as shelters, benches, trash cans, and restrooms).

EXCURSIONS TO METRO-NORTH STATION AT PORT JERVIS

A final opportunity for shuttle service would be to connect a shuttle to the Metro-North Station in Port Jervis. Port Jervis is located seven miles from downtown Milford, requiring roughly 20 minutes of travel time. Given demand from the train station is likely to be limited, the study team recommends offering transit service on a reservation-based system that would meet specific trains and bring people to downtown Milford and Milford Beach. The excursion could be modeled after the service set up for the FDR Homestead and could include visits to Grey Towers Historic Site in Milford. MCTA could operate this service as part of its other DEWA-related transportation services, but because Port Jervis is in New York State, operating agreements between MCTA and Orange County, New York would likely be required.

8.6 | INDICATORS OF TRANSIT SERVICE QUALITY AND PERFORMANCE

Indicators of transit service quality and performance should be used to measure the costs and benefits associated with the long-term recommendations identified above. Transit agencies monitor service quality and performance for a number of reasons, including meeting reporting and regulatory requirements, identifying how well service is meeting customer needs, understanding the effects of actions previously taken to improve performance, and supporting decisions on service changes.

In the case of the DEWA shuttle services, including the River Runner, the Delaware Water Gap Connector (DWGC) and the proposed Smithfield Beach and Milford Beach shuttles, performance measures can help both NPS and MCTA evaluate the effectiveness of the shuttle services. MCTA already collects detailed data on ridership on both the River Runner and DWGC services; this data can be used to compile a handful of performance measures to track the effectiveness and efficiency of the shuttle services. In all cases, the recommended performance measures reflect quantitative data that MCTA already collects and information that could be reported to NPS annually as part of a service report that could be submitted by MCTA to NPS at the conclusion of every season. These metrics can include:

- **Passengers (ridership) per hour** – ridership per hour allows NPS and MCTA to understand the cost-effectiveness of the shuttle by reporting the number of riders carried for each hour of service invested in the shuttle. NPS and MCTA should expect to see an increase in the annual ridership per hour as awareness and understanding about the River Runner service increase and as a result of implementing the short-term recommendations. Over the longer term, as the long-term recommendations are implemented, the number of riders per hour should continue to increase.
- **Passengers per Boat / watercraft** – the number of passengers per boat carried by the River Runner helps NPS and MCTA evaluate if the service is primarily catering to river runners, or if other riders are using the service. It will also help show if reconfiguring the trailers allow the River Runner to carry more boats and watercraft. MCTA already collects this data, so examining trends should be relatively easy to compute.
- **On-time performance** – given the current challenges associated with on-time performance, the study team recommends that MCTA collect and report data on on-time performance. Given the challenges associated with boat loading and unloading, MCTA may pick a handful of locations to measure and report on-time performance (i.e. Kittatinny Point, Smithfield Beach and Dingmans) as a proxy for overall on-time performance. Ideally, the percentage of trips that meet the agreed upon on-time performance standard will increase over time.



The Smithfield Beach and Milford Beach shuttles should also be measured and evaluated regularly as part of understanding the effectiveness of the service. In particular, the study team recommends that NPS and MCTA implement the Smithfield Beach service first, and upon successful implementation of that shuttle expand to Milford Beach. The south end of the park, including Smithfield Beach but also Kittatinny Point Visitors Center are higher demand facilities and have more acute parking challenges. Thus, although different, if the shuttle / reservation system is more likely to be successful at Smithfield Beach. Lessons learned from implementation of the system can be applied to Milford Beach. Performance metrics for the South End and North End TDM strategies may include:

- **Smithfield Beach shuttle riders per hour** – riders per hour on the Smithfield Beach shuttle will give an indication of how effective the shuttle is in transporting passengers around the south end of the park.
- **Passengers per boats / watercraft** – passengers per boat or watercraft will help NPS and MCTA understand the type of rider using the shuttle (river runner as compared with day picnickers). This measure will also help NPS and MCTA evaluate the value of providing a boat trailer.
- **River Runner shuttle riders per hour** – measuring riders per hour on the River Runner in conjunction with the Smithfield Beach shuttle will help NPS and MCTA understand the impact of the Smithfield Beach service on the River Runner.
- **Weekend visitation rates at Smithfield Beach** – tracking the number of visitors traveling to Smithfield Beach on weekends before and after the shuttle is implemented will allow the NPS to evaluate the effectiveness of the shuttle on visitation to the park.
- **Days when Smithfield / Milford Beach is closed due to overcrowding** – tracking the number of days when the swimming beaches are closed due to a lack of parking will help NPS staff understand if the shuttle / reservation system makes the site more or less accessible to members of the public.



9.0 ENDNOTES

[1] The Smithfield Beach stop was delineated into two separate columns due to the shuttle stopping at two different locations at the site. Flag stops are not included in the analysis.

[2] Smithfield Beach Access and Lot are treated as one stop here.