Dollaride First/Last Mile Connections

Final Report | Report Number 23-18 | September 2022

NEW YORK STATE | NYSERDA

NYSERDA's Promise to New Yorkers:

NYSERDA provides resources, expertise, and objective information so New Yorkers can make confident, informed energy decisions.

Our Vision:

New York is a global climate leader building a healthier future with thriving communities; homes and businesses powered by clean energy; and economic opportunities accessible to all New Yorkers.

Our Mission:

Advance clean energy innovation and investments to combat climate change, improving the health, resiliency, and prosperity of New Yorkers and delivering benefits equitably to all.

Dollaride First/Last Mile Connections

Final Report

Prepared for:

New York State Energy Research and Development Authority

New York, NY

Richard Mai
Senior Project Manager

Prepared by:

Dollaride

New York, NY

Su Sanni
Founder and CEO

Jordan Magid
Head of Operations

and

WXY Architecture + Urban Design

New York, NY

Adam Lubinsky, PhD, AICP
Managing Principal

Raphael Laude
Project Manager

NYSERDA Report 23-18 NYSERDA Contract 152274 September 2022

Notice

This report was prepared by Dollaride and WXY Architecture + Urban Design in the course of performing work contracted for and sponsored by the New York State Energy Research and Development Authority and the GatewayJFK Business Improvement District (hereafter the "Sponsors"). The opinions expressed in this report do not necessarily reflect those of the Sponsors or the State of New York, and reference to any specific product, service, process, or method does not constitute an implied or expressed recommendation or endorsement of it. Further, the Sponsors, the State of New York, and the contractor make no warranties or representations, expressed or implied, as to the fitness for particular purpose or merchantability of any product, apparatus, or service, or the usefulness, completeness, or accuracy of any processes, methods, or other information contained, described, disclosed, or referred to in this report. The Sponsors, the State of New York, and the contractor make no representation that the use of any product, apparatus, process, method, or other information will not infringe privately owned rights and will assume no liability for any loss, injury, or damage resulting from, or occurring in connection with, the use of information contained, described, disclosed, or referred to in this report.

NYSERDA makes every effort to provide accurate information about copyright owners and related matters in the reports we publish. Contractors are responsible for determining and satisfying copyright or other use restrictions regarding the content of the reports that they write, in compliance with NYSERDA's policies and federal law. If you are the copyright owner and believe a NYSERDA report has not properly attributed your work to you or has used it without permission, please email print@nyserda.ny.gov

Information contained in this document, such as web page addresses, are current at the time of publication.

Preferred Citation

New York State Energy Research and Development Authority (NYSERDA). 2022. "Dollaride First/Last Mile Connections," NYSERDA Report Number 23-18. Prepared by Dollaride and WXY Architecture + Urban Design. nyserda.ny.gov/publications

Abstract

Dollaride is a mobility service designed to improve the transit experience for commuters in areas underserved by transit. In this project, Dollaride developed and demonstrated a digital platform for dollar van service and analyzed how optimizing informal transit routes could help reduce vehicle miles traveled and greenhouse gas emissions in transit deserts in New York State.

Keywords

rideshare, dollar van, commuter van, microtransit, shuttle, circulator, transportation, transit, first/last mile, planning, urban planning, transit desert

Acknowledgments

This report was independently produced by Dollaride and WXY Architecture + Urban Design, based on stakeholder interviews, data and geographic analysis, and independent research. The report was produced in partnership with the GatewayJFK Business Improvement District and CityLink NYC Corp, who operated the shuttle vans.

Table of Contents

Notice ..... **ii**
Preferred Citation ..... **ii**
Abstract ..... **iii**
Keywords ..... **iii**
Acknowledgments ..... **iii**
List of Figures ..... **v**
List of Tables ..... **vi**
Acronyms and Abbreviations ..... **vi**
Executive Summary **ES-1**
1 Introduction **1**
1.1 GatewayJFK Transit Desert 1
1.2 Project Opportunity 1
1.3 Project Phasing 2

1.4 Future Phase Development 2
1.5 Route Map 3
1.6 Ridership Trends 3
1.7 Riders 4
1.8 Environmental Assessment 4
1.9 Economic Benefits 5
1.10 Route Formalization and Operational Refinements 5
1.11 Route Enhancement Framework 6
1.12 Key Learnings 6
2 Ridership Trends 8
2.1 Ridership Summary 8
2.2 Ridership Factors 13
2.3 Paid Rider Characteristics 13
2.4 Rides by Time of Day 14
2.5 Passengers Boarding and Alighting 15
2.6 Trip Lengths 17
3 Rider Summary 18
4 Environmental Assessment 21
4.1 Summary 21
4.2 Methods 21
5 Economic Benefits 23
5.1 Summary 23
5.2 Methods 25
6 Route Formalization and Operational Refinements 26
6.1 Data Collection 26
6.2 Route Formalization 27
6.3 Operational Refinements 28
6.4 Urban Design and Route Planning 29
7 Route Enhancement Framework 31
7.1 Before You Start 31
7.1.1 Step 0: Key Questions 31
7.2 Route Planning and Data Prep 32
7.2.1 Step 1. Identify Key Nodes and Destinations 33
7.2.2 Step 2. Analyze Commuter Patterns 33
7.3 Route Drafting and Refining 34

7.3.1 Step 3. Route Drafting 35
7.3.2 Step 4. Estimate Environmental Benefits 37
7.3.3 Step 5. Scoring 37
7.3.4 Step 6. Refining 37
7.4 Bonus. Qualitative + Quantitative Proof-of-Concept 38
7.4.1 Operationalizing the Route Enhancement Framework. Create a Web Tool 38
8 Conclusion 39
8.1 Learnings for Future Route Operation and Design 39
8.2 Business Development Opportunities 40
8.3 Importance to the Dollaride Business Plan 43

List of Figures

Figure 1. GatewayJFK Shuttle Route Map 3
Figure 2. Ridership Trend During the Study Period 9
Figure 3. Ridership by Rider Type 10
Figure 4. New versus Weekly Riders Over Time 11
Figure 5. Total Rides by Price 13
Figure 6. Rides by Time of Day 15
Figure 7. Total Passengers Boarding and Alighting by Stop During the Study Period (Rider Data) 16
Figure 8. Rides by Distance 17
Figure 9. Age of Ridership Survey Respondents 19
Figure 10. Gender of Ridership Survey Respondents 19
Figure 11. Race/Ethnicity of Ridership Survey Respondents 20
Figure 12. Primary Language of Ridership Survey Respondents 20
Figure 13. GatewayJFK Shuttle and MTA Q6 Bus Route 29
Figure 14. Route Enhancement Framework Overview 31
Figure 15. Key Questions Before You Start 32
Figure 16. Route Planning and Data Prep Overview 32
Figure 17. Example: Identification of Key Hospital, Commercial and Manufacturing Nodes in New York City 33
Figure 18. Example: Analyzing Transit Supply 34
Figure 19. Route Drafting and Refining Overview 35
Figure 20. Example: Route Drafting Process for a New Route in Hunts Point, Bronx 36
Figure 21. Example: Scoring for New Routes in New York City 37
Figure 22. Example: Using the Web Tool to Understand Demographic Indicators and Driving 38

List of Tables

Table 1. Rider Type Analysis 10
Table 2. GatewayJFK Connection Operating Hours History 14
Table 3. Environmental Assessment Parameters 22
Table 4. Value of Transportation Time Savings (VTTS) to Riders of the GatewayJFK Shuttle ..24

Acronyms and Abbreviations

ACS	American Community Survey
BID	Business Improvement District (in reference to the GatewayJFK BID)
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide equivalent
ft	Feet
GHG	Greenhouse Gas
IBZ	Industrial Business Zone
ICE	Internal Combustion Engine
kWh	Kilowatt hours
m/s	Meters per second
MPG	Miles per Gallon
MPGe	Miles per Gallon equivalent
MTA	Metropolitan Transportation Authority
MW	megawatts
NYC	New York City
NYCDOT	New York City Department of Transportation
NYS	New York State
NYSERDA	New York State Energy Research and Development Authority
POV	Personal Occupancy Vehicle
tCO_2e	Tons of Carbon Dioxide equivalent
USDOT	United States Department of Transportation
VMT	Vehicle Miles Travelled
VTTS	Value of Transportation Time Savings
W	Watts

Executive Summary

An estimated 2 million New Yorkers live in "transit deserts" where it is time-consuming, expensive, physically challenging, and difficult to access appropriate public transit options. This limits both the physical, social, and economic mobility of these communities. For nearly 40 years, NYC's dollar van system has provided first and last-mile connections for New Yorkers who are underserved by public transportation. However, there are several barriers that limit the scalability of this system, and its potential to connect these users with the city's larger public transit network.The goal of the project is to develop and demonstrate Dollaride's software-as-a-service which is designed to support the micro-transit network and improve the transit experience for commuters in neighborhoods characterized as transit deserts. Dollaride will demonstrate a software tool for digitizing dollar van operations in order to improve first and last-mile connections to public transit hubs. In this project, Dollaride will provide a mobile platform for informal transit networks, and research and demonstrate the impact of optimizing informal transit routes and service networks throughout NYS. Dollaride will track, analyze and show how network expansion can reduce vehicle miles traveled (VMT) and GHG emissions in transit deserts throughout NYS.

The GatewayJFK Shuttle, a first/last-mile transit service that officially launched in April 2021 can be evaluated in two distinct phases, each existing as its own project: (1) the pilot phase and (2) the scalability phase. This project is focused on the scalability phase. The scalability phase of the GatewayJFK Shuttle spanned the 12 months following the pilot phase, from May 2021 to May 2022. Following the route's launch, Dollaride focused on enhancing data collection and analysis to better understand rider behaviors in greater detail, developing app features to improve the rider experience and environmental impact of the service, and producing a data-informed framework for scaling Dollaride's operations across transit deserts in NYS.

Some key highlights of the pilot service include:

- As of June 2022, the service provided a total of 34,810 rides, of which 5,247 are paid rides. Free rides at initial launch spurred an average 1,181 weekly rides, however, a switch to a paid $2.50 fare resulted in an average 125 weekly rides, and a further fare reduction resulted in a slight uptick on average 133 weekly rides.
- As of June 2022, Dollaride served a total of 9,710 unique riders, many of whom use the service to travel to and from Jamaica Station, a transit hub.

- Over a one-year period, the service provided an estimated $108,000 in economic value to riders, mainly from time and productivity savings from a more efficient commute, using a Value of Transportation Time Savings (VTTS) analysis to calculate a dollar measure of the cost of time savings. Unsurprisingly, it was found that a fare-free model provided higher economic value.
- Key lessons learned from the pilot service include the need for price consistency and service reliability, service visibility, strategically deployed field ambassadors, and the marginal nature of environmental benefits. Through extensive outreach to riders and the local community, Dollaride was able to identify ways to further improve and expand the service. From a business model standpoint, a private partner is key in helping subsidize the fares and sustaining operations, and only if the above lessons learned are implemented. From an environmental standpoint, the micromobility service does help shift some riders from private automobiles, encourages shared rides, and can further decrease GHG by potentially switching to EVs.

1 Introduction

Dollaride is a mobility company designed to support the "dollar van" microtransit network by improving the transit experience, growing ridership, and expanding the service territory in neighborhoods with limited public transit service. Dollaride launched the GatewayJFK Shuttle transit service on April 5, 2021, in conjunction with the GatewayJFK Business Improvement District (BID) to eliminate the area's existing transit desert and to create opportunities for the BID.

1.1 GatewayJFK Transit Desert

The GatewayJFK BID is a district located in the neighborhood surrounding Jamaica, Queens. It's a collective of property owners, small businesses, agencies, and shops that work to provide professional services and workforce opportunities to the community. Known as an "Off-Airport" community, it also provides valuable support for the air cargo industry located at JFK Airport.

One of the BID's main challenges is that it's nestled in an area with poor access to public transportation. Workers and residents have a hard time navigating the surrounding area, and an infrequent and crowded bus line makes daily commuting a logistical challenge. As such, the GatewayJFK BID can be described as a transit desert, areas characterized by limited transportation, including poor public transportation options and a lack of infrastructure. The term "transit desert" originates from a study (Jiao et.al 2012) that determined a correlation between transit dependency and transit deserts. Those who are transit dependent rely solely on public transportation when commuting.

1.2 Project Opportunity

GatewayJFK partnered with Dollaride to create an affordable and reliable shuttle service for workers to travel to and from the district. The GatewayJFK Shuttle, powered by Dollaride, was established to bring new opportunities to the neighborhood.

The GatewayJFK Shuttle service aims to bolster informal transit service networks in the GatewayJFK BID service area and to reduce vehicle miles traveled (VMT) and greenhouse gas (GHG) emissions. The project addresses, through an equity lens, the "first/last-mile" issue associated with neighborhoods underserved by transit by offering a flexible, streamlined service for GatewayJFK commuters.

1.3 Project Phasing

The GatewayJFK Shuttle, a first/last-mile transit service that officially launched in April of 2021 can be evaluated in two distinct phases, each existing as its own project: (1) the pilot phase and (2) the scalability phase. This report summarizes the findings of the latter, the scalability phase.

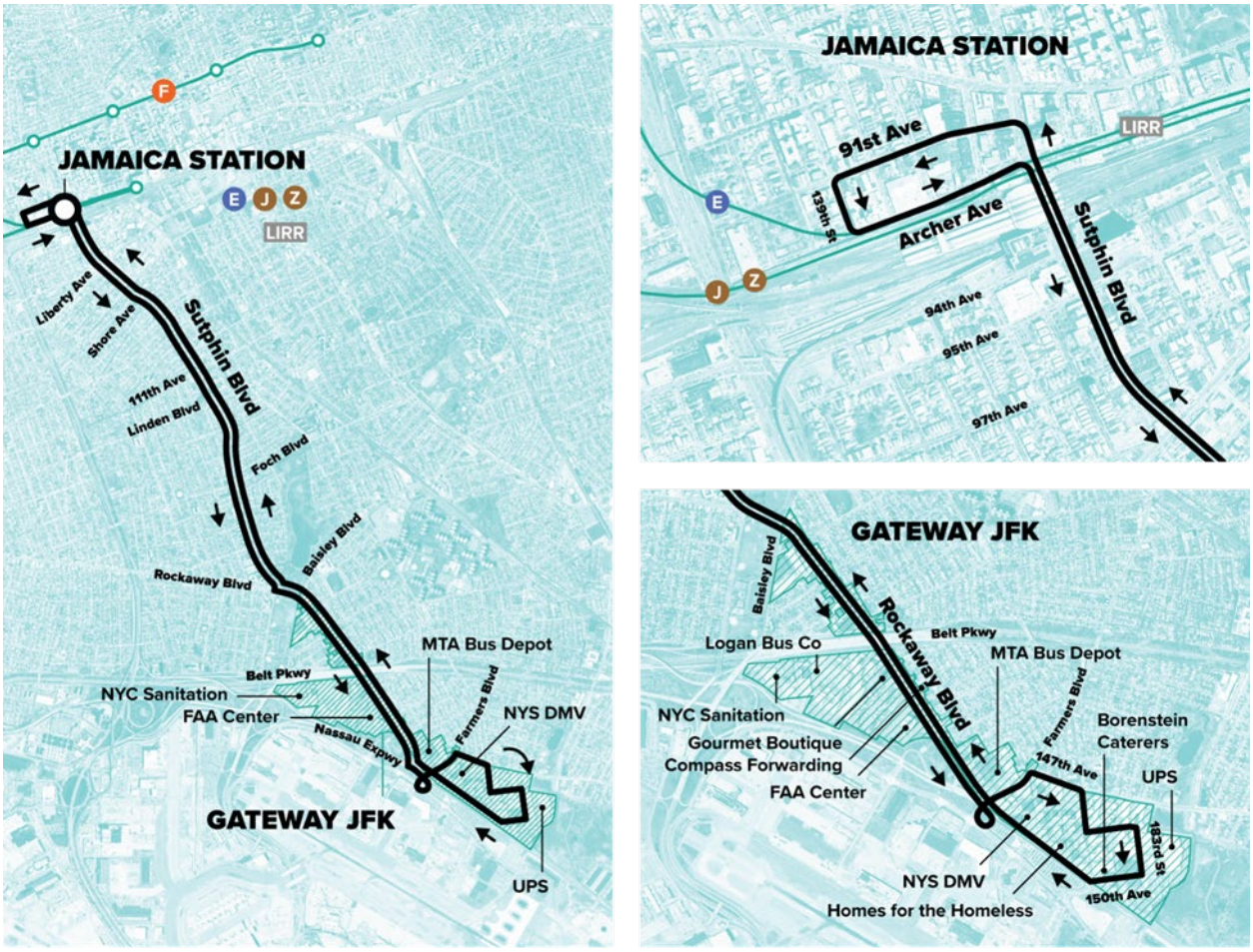
> The **pilot phase** of the GatewayJFK Shuttle route extended from the initial research before launching the service on April 5, 2021, to the completion of the two-month launch period on May 28, 2021. This initial project centered around the operational components of launching the new route in partnership with a private funder, and the logistics of getting vehicles on the road. The pilot phase also assessed actual versus expected ridership characteristics in an attempt to understand the key motivations of riders using the service. This project was funded under NYSERDA PON 3871, and findings from this project are captured in the GatewayJFK Shuttle Pilot Final Report (June 2021).
>
> The **scalability phase** of the GatewayJFK Shuttle spanned twelve months following the pilot phase, from May 29, 2021 to May 29th, 2022. Following the route's launch, Dollaride focused on enhancing data collection in an effort to understand rider behaviors in fine detail, building app features to improve rider experience and the environmental impact of the service, as well as produce a data-informed framework for scaling Dollaride's operations across transit deserts in New York State. This report outlines the implications of the data collected in this phase and how Dollaride can best transfer learnings from the operation of the GatewayJFK route as it looks to scale service provisions in a way that reduces GHG emissions and fills in transit gaps. This project was funded under NYSERDA PON 3914.

1.4 Future Phase Development

To further improve the GatewayJFK Shuttle service, the **environmental refinement phase** is a potential future project that would optimize first/last-mile transportation, as well as other informal transit services, for environmental benefits. Such a project would maximize Dollaride's environmental commitment by transitioning the core infrastructure of its shuttle services—the internal combustion engines that carry riders—to a fleet of electric vehicles, turning all trips into carbon offsets. While a project aimed at environmental refinement does not exist at the time of writing, it would be a key next step to the long-term sustainable impact of Dollaride's first/last-mile transit solutions.

1.5 Route Map

Figure 1. GatewayJFK Shuttle Route Map



The shuttle's route is presented in Figure 1. In practice, the shuttle deviated from the route shown above to operate more flexibly, changing routes based on observed ridership trends during the project period. The GatewayJFK BID is highlighted in the teal hatched area in the maps above with key anchor employers referenced throughout the report.

1.6 Ridership Trends

As of June 1, 2022, the shuttle has served a total of 34,810 rides, of which 5,247 have been paid rides. Between the weeks of June 13, 2021, and September 26, 2021—a period of 16 weeks of rapid growth where the shuttle was provided as a free service before the shuttle transitioned to a paid model—weekly ridership averaged 1,181 rides and hit a record 1,692 rides the week of July 18, 2021.

However, weekly ridership declined significantly following the implementation of a $2.50 fare starting on September 27, 2021. The $2.50 fare was introduced to subsidize the service and minimize the funds that would be needed from private funders, such as the GatewayJFK BID. By using this funding model, Dollaride's goal was to provide a public service partially funded by private investment. Dollaride hypothesized that if the service was to be entirely funded by private funders (i.e., if the service was 100% free to riders), the service would need to prioritize private interests. The implementation of a fare, and efforts to optimize the fare amount, during the course of the demonstration period, enabled Dollaride to test its hypothesis.

Since the week of October 3, 2021, weekly ridership has only averaged 125 rides, or 25 rides per day of service. On November 1, 2021, the fare was reduced to $2.00 resulting in a slightly higher average of 133 rides per week, or 27 rides per day of service. These trends can be displayed in Figures 2, 3 and 4.

Of note, only approximately 70% of rides can be officially accounted for due to fare evasion. Unofficially, higher ridership counts can be achieved through daily reports from shuttle drivers, pointing both to a strong demand for the service.

1.7 Riders

As of June 1, 2022, the shuttle has served a total of 9,710 unique riders. Riders primarily use the shuttle to travel to and from Jamaica Station, with the majority of those boarding and alighting occurring at the Archer Avenue And Sutphin Boulevard Stop (see Figure 7).

1.8 Environmental Assessment

Over a one-year period between June 2021 and June 2022, the shuttle emitted a net estimated 65 tons of carbon, approximately 1.55 tons per 1,000 miles. In total, the shuttle emitted about 69 tons of carbon but offset another 4 tons by shifting riders away from low-occupancy modes. As such, we estimate that approximately 6% of shuttle emissions are offset because of mode shifts. These findings demonstrate that more investments in the clean vehicle infrastructure underlying a first/last mile shuttle service are necessary in order to reduce GHG emissions. For example, replacing internal combustion engine vehicles (note: an average paratransit shuttle's fuel economy is 7.10 miles per gallon of gas, per the U.S. Department of Energy's Energy Efficiency and Renewable Energy) used during this project with electric vehicles would remove carbon emissions from the tailpipe all together and result in a 90% more energy efficient fleet.

As of 2021, the White House Council of Economic Advisors set the price of one tCO_2 at 51 U.S. dollars. Using this figure, we estimate the net environmental cost of the shuttle during the pilot period to be $3,338 overall and $79 per 1,000 miles.

1.9 Economic Benefits

The project team estimates that during the study period, the shuttle provided about $108,000 in economic value to riders, principally in the time saved from a more efficient commute. The team estimated the dollar savings by performing a Value of Transportation Time Savings (VTTS) analysis, a dollar measure of the cost of time saved that refers to the benefits of faster travel time (see Economic Benefits section for methods).

For riders who transferred to the subway or a Metropolitan Transportation Authority (MTA) bus before or after riding the free shuttle (and thus saved only time and not fare), each ride provided between $2.00 and $5.00 in VTTS. For riders that did not need to transfer, VTTS per free ride was between $5.00 and $8.00.

For riders who transferred to the subway or an MTA bus before or after riding the $2.00 paid shuttle (and thus saved only time and not fare), each ride provided between $0.25 and $3.50 in VTTS. For riders that did not need to transfer, VTTS per paid ride was between $3.00 and $6.00.

A regular service like the shuttle, especially if it continues to be free, can provide substantial economic benefits to its riders. We find that for regular riders of the shuttle, the total annual VTTS per rider can amount to between 2% and 30% of their household income, depending on their income level, whether they transfer to an MTA service, and how frequently they ride the shuttle.

1.10 Route Formalization and Operational Refinements

Improving the GatewayJFK Shuttle route will require updates to Customer Experience, Marketing and Outreach, and Vehicle Operations, as referenced in the Operational Refinement addendum. The shuttle service must be at least as good as the next best transit option. In the case of the GatewayJFK route, shuttles must operate as well, if not better, than the MTA bus and dollar cabs that operate in parallel with the shuttle service. In order to formalize the shuttle, the project team focused on developing a financially and environmentally sustainable service.

Additionally, at the start of the project, the project team intended to propose urban design interventions that enhance connections to public transportation. These urban design interventions were to include recommendations for new dedicated curb space for commuter vans, signage, street furniture, lighting, and other elements that help establish formal commuter van pick-up locations, enhance safety, or improve traffic and circulation. The project team consulted with the New York City Department of Transportation (DOT) to install signage at popular stops along the route. Upon learning that the application for signage must be submitted and led by the shuttle vendor, CityLink—not by Dollaride or GatewayJFK—the project team decided not to pursue signage any further. This decision enables Dollaride and GatewayJFK to maintain full flexibility to select a different vendor, if desired in the future.

Future operational refinements will rely on a renewed partnership with both the GatewayJFK BID and DOT to optimize pickup conditions and minimize effects of dangerous corridors along the route. Urban design efforts along the route include the revitalization of stop conditions with gray/green infrastructure and wayfinding features, traffic flow improvements, and the removal of street parking at each stop.

1.11 Route Enhancement Framework

The project team produced a route enhancement framework, a methodology that could be followed to identify new shuttle routes as Dollaride scales to other areas of New York State. The framework focuses on key demographic profiles, popular transit and commuter patterns, priority nodes, route performance, rider metrics and environmental benefit to help Dollaride maximize route efficiency, rider retention, and carbon offsets.

1.12 Key Learnings

Price consistency service reliability. Consistency in price and reliability of service is a key factor in acquiring a regular, devoted customer base. This trend can be observed via the October 2021 change in pricing model from free to paid. The increase in cost caused a dramatic decrease in ridership that has yet to fully recover as of June 2022. In addition, sticking to a regular route schedule is of the utmost importance for obtaining regular users. As a next step, the project team believes this issue can be resolved if Dollaride increases private funding for the route, reduces fares, strictly monitors the vehicle reliability, and attracts those riders who were disaffected by price and reliability concerns.

Service visibility. The consistent use of wrapped vehicles with branding that is cohesive with the Dollaride brand advertises the service and improves recognition for those who are tangentially aware of the service. The GatewayJFK partnership allowed Dollaride to develop a cohesive co-branded graphic language for the route, which helped to promote the route through the BID's trusted name and iconography. Future routes should also capitalize on partnerships with enterprise clients to promote and attract riders through co-branded marketing schemes.

Field ambassador cost-benefits. Field marketing plays a crucial role in rider acquisition for short bursts of time. Field Marketers, known within Dollaride as "field ambassadors," are hired by Dollaride on a part-time basis to recruit riders directly off the street and train them to use Dollaride's mobile application. Although field ambassadors are costly, they provide a necessary benefit of rider acquisition and brand familiarity during periods of service stagnation.

Marginal nature of environmental benefits. Due to lower ridership trends following the phasing-in of paid service, the route's environmental benefits are marginal per the nature of capacity. Environmental benefit is largely dependent on high levels of ridership, at which point the cumulative offset is large enough to outweigh cumulative route emissions. Beyond increasing ridership, Dollaride can replace internal combustion engine vehicles with electric vehicles, thereby drastically increasing carbon offsets and enhancing the shuttle's environmental benefit.

2 Ridership Trends

2.1 Ridership Summary

As of June 1, 2022, the shuttle has served a total of 34,810 rides, of which 5,247 have been paid rides. As noted in the executive summary, the shuttle served an average 1,181 rides per week between the weeks of June 13, 2021, and September 26, 2021—a period of 16 weeks before the shuttle transitioned to a paid model and after rapid growth in the early months of the pilot. A period of rapid initial growth in ridership can be seen in Figure 2, which is followed by the period of strong performance outlined above.

However, weekly ridership declined significantly following the implementation of a fare starting in October 2021. This can be seen as the significant drop in Figure 2. Since the week of October 3, 2021, weekly ridership has averaged 125 rides, or 25 rides per day of service.

Figure 2 also highlights how changes in data collection format can impact high-level route reporting. In July 2021, Dollaride's data collection service transitioned from using a tool called Glide to one called Google BigQuery. When Glide was used prior to July 2021, riders were able to use a non-verifiable phone number when submitting a ride request in the Dollaride app. This would often result in fake or incorrect phone numbers being registered as unique riders, and presumably inflated the number of unique riders recorded by Dollaride's database. When Google BigQuery was implemented, however, Dollaride was able to verify accounts. Therefore, the data collected between July and October 2021 is the most accurate and representative data showing rider patterns during the shuttle's pre-fare period.

Figure 2. Ridership Trend During the Study Period

In July of 2021, Dollaride transitioned its data collection platform from a survey-based tool called Glide, to the Dollaride app coupled with Google BigQuery. This point is noted in Figures 2, 3, and 4. Following this change, Dollaride has been able to verify new user accounts and store ride data and rider accounts in a singular Google BigQuery data warehouse.

Prior to July of 2021, Dollaride was only able to accurately analyze ride requests as if *each ride request represents a unique rider.* This is because Glide relied entirely on phone numbers entered manually by riders each time a ride request was made. Therefore, the data included invalid phone numbers and those with typos. As a result, analysis of repeat ridership (riders who make a ride request more than once) and weekly riders (riders who make at least one ride request per week) is less reliable prior to July 2021.

When transitioning to Google BigQuery, Dollaride implemented features that made it possible to attribute each ride request to a specific user, thereby making it possible to analyze the repeat ridership patterns of individual riders with extremely high confidence.

Table 1. Rider Type Analysis

	Glide App		BigQuery		Total	
Rider Type	*Rides*	*Share*	*Rides*	*Share*	*Rides*	*Share*
New Rider	6,001	55%	1,827	12%	7,828	29%
Repeat Rider	4,902	45%	13,860	88%	18,762	71%
Weekly Rider	3,231	30%	8,530	54%	11,761	44%
Total	**10,903**	**100%**	**15,687**	**100%**	26,590	**100%**

Table 1 indicates that during the first period of data collection, using the Glide App, nearly 55% of riders were riding for the first time. However, following the implementation of the BigQuery database, only 12% of riders were new riders. The number of weekly riders rose from 30% to 54% following this change. While this difference could be the result of improved account verification methods, it also suggests that the service may have already achieved a high rate of market penetration during the summer of 2021.

Figure 3. Ridership by Rider Type

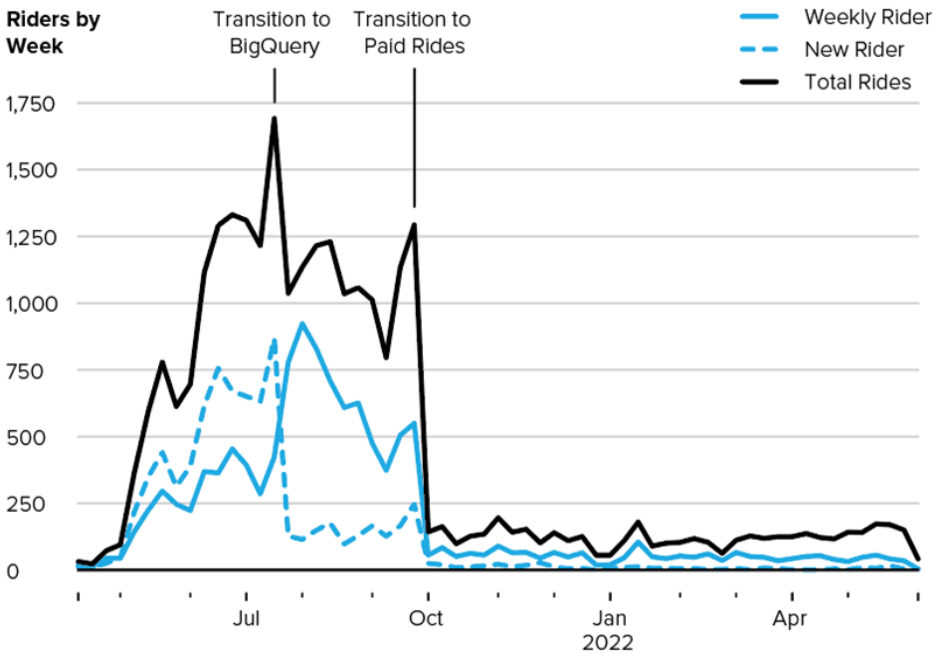
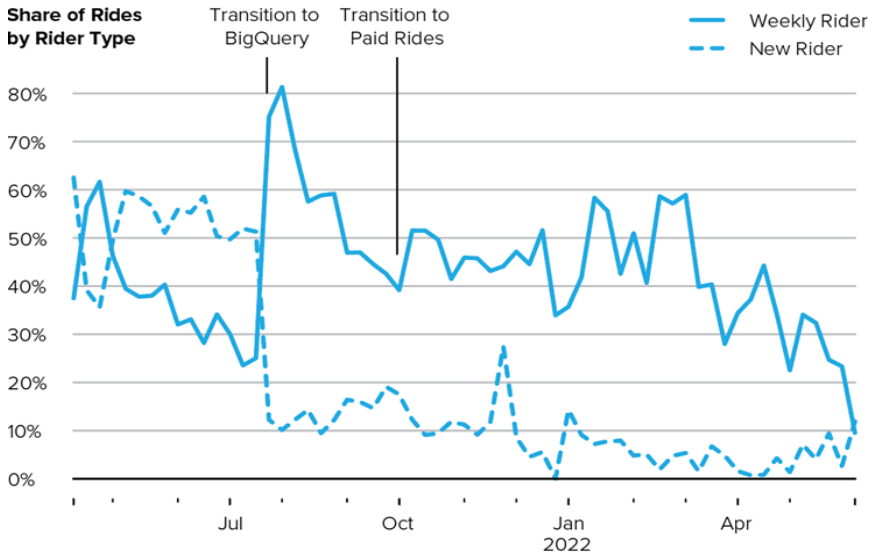


Figure 3 indicates the total number of rides served, the total number of rides served to new riders, and total number of rides served to weekly riders by week for the entirety of the shuttle's service.

Figure 4 indicates that the share of rides taken by weekly riders was between 40% and 60% most weeks following the implementation of the Dollaride app and BigQuery database. Surprisingly, this figure does not appear to have been impacted significantly by the implementation of a fare in October 2021 despite ridership dropping by nearly 90% after the change.

Figure 4. New versus Weekly Riders Over Time



After switching Dollaride's data collection system, we also see a dramatic decrease in the number of new riders, declining from a weekly average of about 53% to a weekly average of about 9%. This suggests that Dollaride had achieved market saturation earlier than previously understood and that attracting new riders to the system would be difficult. This decrease may also be attributed to the way in which Dollaride collected phone numbers. Glide permitted users to input their phone numbers without needing to verify for accuracy. It is possible that some users wrote an incorrect phone number when using Glide, inflating the overall number of new riders. The Dollaride app authenticates the user phone numbers by sending an SMS with a code to each user's phone number in lieu of a password. This change enabled Dollaride to receive more accurate data. Nonetheless, the additional layer of verification likely only accounts for a portion of the 43% decrease in new riders during the transition.

Of note, most users do not consider Dollaride their primary means of transit during the week, suggesting that Dollaride's service complements existing transportation infrastructure, namely the convergence of the Long Island Railroad (LIRR), the E/J/Z subway and the Q6 bus at Jamaica Station. According to route data from October 2021, about 93% of riders used the service between 0-1 times per week, followed by 6% two to four times per week and less than 1% five to seven times per week. Since the transition to

paid rides, riders have used the shuttle at a higher frequency per week, pointing to the service's value to the local transit market. These results improved by May 2022, when about 83% of riders used the service between zero to one time per week, followed by 12% two to four times per week, 5% five to seven times per week and less than 1% eight plus times per week. Given that Dollaride also averages less than five first-time riders per week, it can be assumed that most riders who use the shuttle zero to one time per week are not new riders. They are likely people who are eligible for free transfers on public transit, but use the service if they are running late, highlighting an interesting pattern of user behavior.

Upon further analysis of repeat ridership patterns, 58% of repeat riders use the shuttle one to two times per quarter, followed by 14% three to four times per quarter, 11% five to nine times per quarter, 6% 10-14 times per quarter and 12% 15+ times per quarter. Because most riders only use the service one to two times per quarter, customer retention can be considered a challenge for future operation. Only 12% of riders consider the shuttle a regular form of transit (15+ rides per quarter), a metric that will need to be bolstered in future quarters to achieve a sustainable level of rider retention and service.

In order to facilitate retention growth, the project team believes that Dollaride should develop a loyalty program for regular riders, offering discounts for individuals who frequent the service at least two to three times per week, or implementing either a subscription model such as a weekly or monthly pass or the ability to achieve a discount through bulk purchase such as a 10-ride pass.

At the time of writing this report, Dollaride began developing a loyalty program for riders. The main objectives of the program are twofold: (1) increase the number of times a rider uses the service per week and (2) increase the number of new riders using the service per week. Both of these objectives are achieved by using either discount codes or distributing other incentives, such as gift cards. Every three weeks Dollaride sends 50% off discount codes to super riders, riders identified as riding at least three times per week. These codes are valid for a limited period of time and Dollaride experiments with variables that may influence the impact of this effort on increasing ridership. Some variables include the format (SMS versus email versus flyers), copywriting, day of week, time of day, and the duration that a code is active.

In addition to this effort, Dollaride contacts super riders directly to conduct user research, gather qualitative input and request referrals to increase ridership. In exchange for participating, users receive gift cards. The results of this work are observed in Dollaride's data. In Q4 of 2021, 2.9% of all riders used the service more than 15 times. In Q3 of 2022, 12.4% of all riders used the service more than 15 times.

2.2 Ridership Factors

Ridership is correlated with outbound subway ridership, with many riders coming from the Jamaica Long Island Railroad (LIRR) station in the morning and the opposite in the afternoon. The absence of a fare also notably drives ridership, as evidenced by the dramatic decline in ridership after a fare was imposed in October 2021.

2.3 Paid Rider Characteristics

Are paid riders riding differently than they did before the price drop? What characteristics are shared? Which are different? These questions are key to understanding how riders respond to fare fluctuations.

The implementation of a fare decreased the share of both new riders and weekly riders, suggesting that would-be riders are discouraged to both try the shuttle for the first time and use the service regularly.

Figure 5. Total Rides by Price

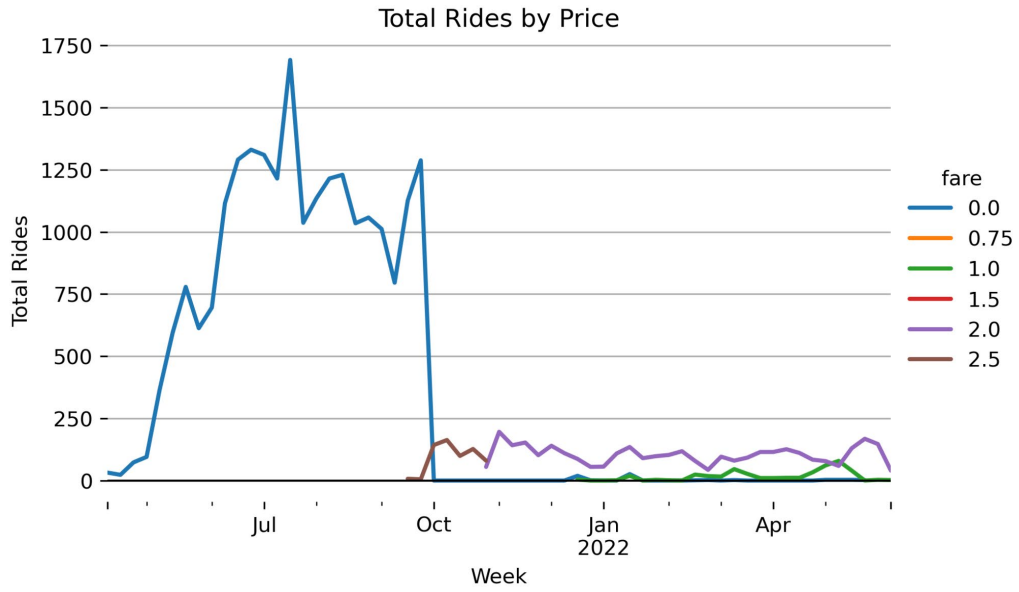


Figure 5 illustrates ride count over time, broken down by fare price. High week-over-week (WoW) ride growth was witnessed between April and July 2021, with a steep decline in WoW ridership due to the implementation of a paid fare in October 2021. A fare of $2.50 was put into place in October 2021, before it was lowered to $2 the next month in November 2021. WoW ridership has remained steady at around 125 rides per week since October 2021. To note, a discounted fare of $1 has also been in effect since December 2021 as a promotional offer via experimental discount codes and has resulted in moderate growth since inception; this explains why both $1 and $2 fares have been in effect since December 2021.

2.4 Rides by Time of Day

Ridership on the shuttle is concentrated during the early morning shift, from 5:00 a.m. to 8:00 a.m., when 28% of rides were served, and during the late afternoon/evening shift between 2:00 p.m. and 9:00 p.m., when 60% of rides were served. Peak ridership occurs between 5:00–6:00 p.m.

Through rider interviews, it is understood that the existing Q6 bus line is often overcrowded during peak hours, thus the shuttle captures excess demand that is not able to be serviced by the Q6. During less popular commuting times, such as late nights and weekends, the Q6 is not as overburdened, thus it is inefficient for Dollaride to operate at off-peak hours.

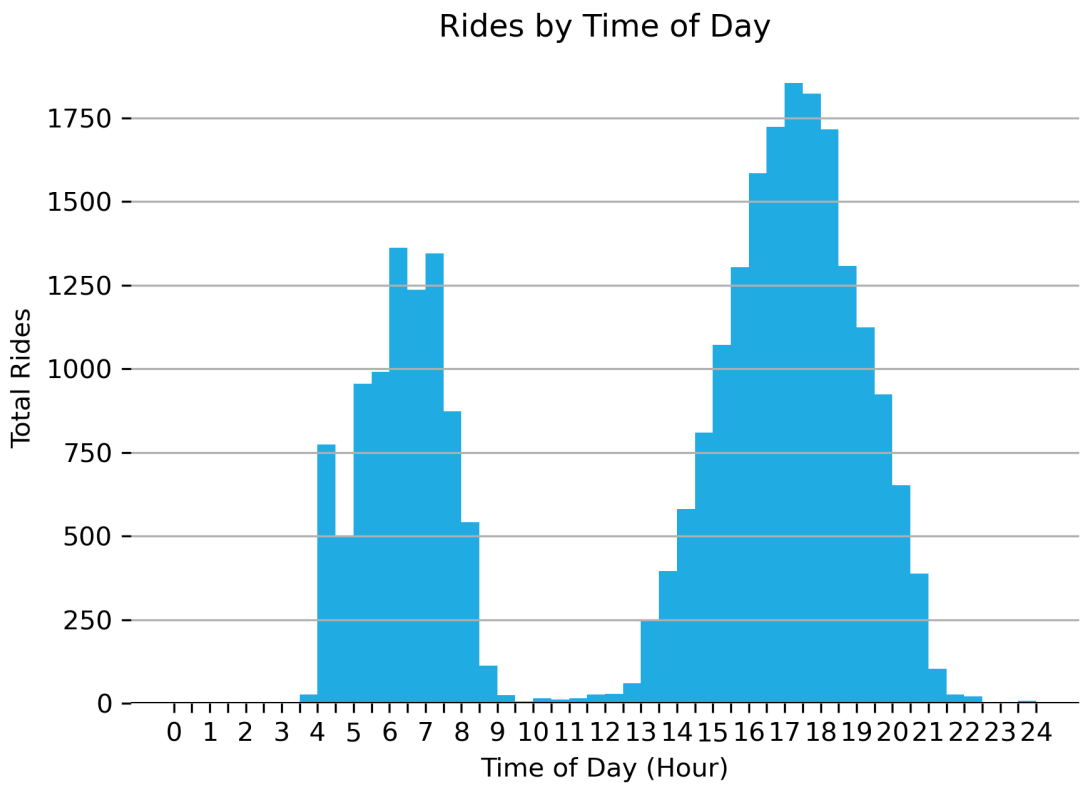
Over the past year, the shuttle has operated according to the following schedule, tweaking timing to maximize ridership by capitalizing on surplus demand during busy commuting hours:

Table 2. GatewayJFK Connection Operating Hours History

Period	Weekday Morning Service	Weekday Evening Service
April 5, 2021 to August 27, 2021	5:00 a.m. to 9:00 a.m.	5:00 p.m. to 9:00 p.m.
August 30, 2021 to January 21, 2022	5:00 a.m. to 9:00 a.m.	2:00 p.m. to 9:00 p.m.
January 24, 2022 to May 6, 2022	5:00 a.m. to 9:00 a.m.	3:00 p.m. to 7:00 p.m.
May 9, 2022 to today	5:00 a.m. to 9:00 a.m.	3:00 p.m. to 7:00 p.m.

Note: due to data collection inconsistencies, the data in Figure 6 differs slightly from operational hours; however, the daily ridership peaks are important for the continued refinement of operations.

Figure 6. Rides by Time of Day



2.5 Passengers Boarding and Alighting

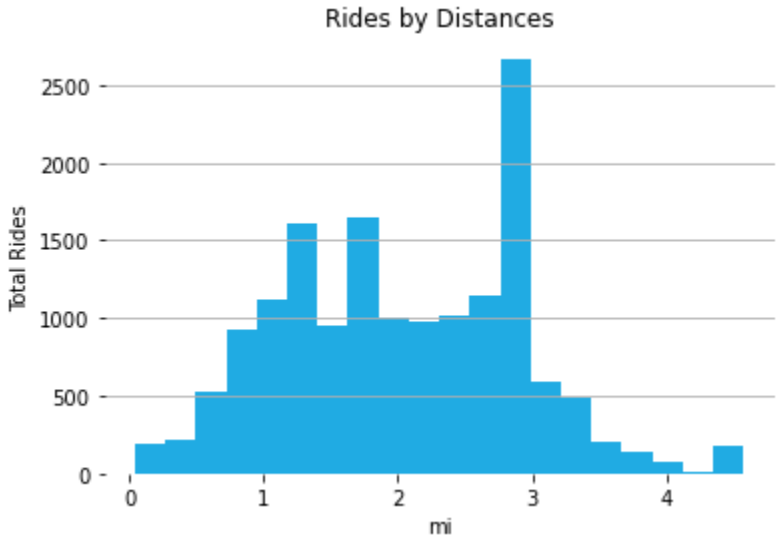
The GatewayJFK Shuttle operates principally as a shuttle to and from Jamaica Station. The route is approximately 4.3 miles long one-way, from Jamaica Station to JFK Airport at Rockaway Blvd. and 150th Rd. According to rider data, approximately 43% of all boardings (50%) and alightings (36%) occur at the Archer Avenue And Sutphin Boulevard stop near Jamaica Station. Of the total boardings and alightings, 43% took place at the Archer Avenue and Sutphin Boulevard stop, 30% took place along Sutphin Blvd. before the GatewayJFK BID, and 27% took place within the BID. Of the total boardings and alightings within the BID, 52% of them took place along Rockaway Blvd. between Belt Parkway and Nassau Expressway, signaling the route's use as commuter thoroughfare between Jamaica Station and the GatewayJFK BID. The shuttle can continue to be optimized to account for this primary use by removing stops outside of the BID and targeting promotional fares to employees within the BID boundaries.

Figure 7. Total Passengers Boarding and Alighting by Stop During the Study Period (Rider Data)

2.6 Trip Lengths

Half of the trips on the shuttle were between 1.3 and 2.8 miles in length, with a median trip length of 2 miles (see Figure 8). The distance from Jamaica Station to Baisley Boulevard and Rockaway Boulevard, the edge of the BID, is about 2.3 miles.

Figure 8. Rides by Distance



The most popular stretch of stops in the BID, according Dollaride data, are the stops at Rockaway Boulevard at the Belt Parkway (North and South Conduit Avenues) and Rockaway Boulevard at Baisley Boulevard. These two stops are all between 2.3 and 2.5 miles from Jamaica Station. The most frequent trip length, not surprisingly, is around 2 miles. About 25% of trips are longer than 2.75 miles. This metric again highlights that riders are using the shuttle as a commuter link between Jamaica LIRR and the GatewayJFK BID, rarely frequenting stops that are longer than the distance to the BID. Given that the median trip length is only 2 miles, it can be understood that Dollaride riders care more about relative speeds of the vehicle than they do distance traveled.

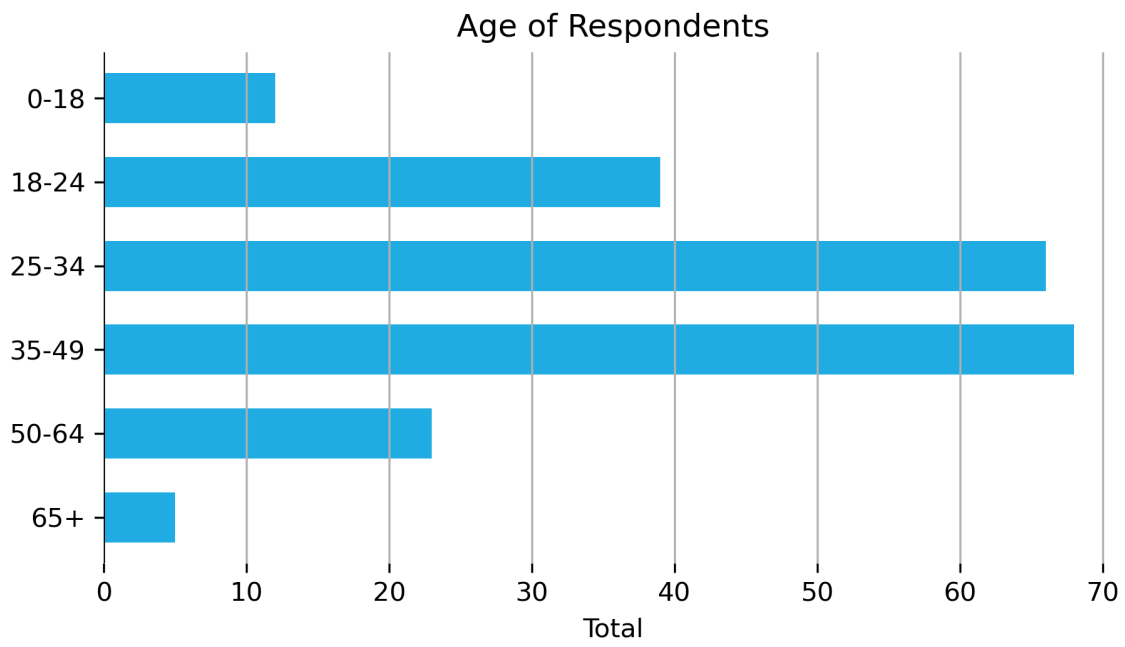
3 Rider Summary

Intercept survey results provide a valuable insight on key demographics of shuttle riders. Surveys were conducted on the vehicle during service via Google Forms, and respondents were granted Dollaride vouchers in exchange for their participation. Of 213 survey respondents, the most common demographic profile for riders who were surveyed is an English-speaking Black or African American woman between the ages of 25–49. While this demographic summary contrasts with the most common GatewayJFK worker, 65% of whom are men and 45% of whom are white, the shuttle rider persona aligns with the 60% of GatewayJFK workers who fall within the 30–54 age bracket. As a note, even though GatewayJFK is an industrial/cargo hub, the Federal Aviation Administration (FAA) is one of the BID's major employers and heavily influences its demographic profile. From the team's conversations with FAA employees, it is understood that many commute from Long Island and New Jersey using privately operated vehicles and are provided free gated parking by their employer. As a result, this population of employees is especially difficult to convert into shuttle riders and may represent a demographic profile that skews that of the GatewayJFK BID.

From the survey data, Dollaride can glean that GatewayJFK's "white collar" workers (e.g., FAA employees in the GatewayJFK BID) are not using the shuttle. The following survey data can help serve Dollaride's future outreach, marketing strategies and route planning. As a disclaimer, the following survey data is self-selected and thus may not represent a comprehensive picture of the route's ridership.

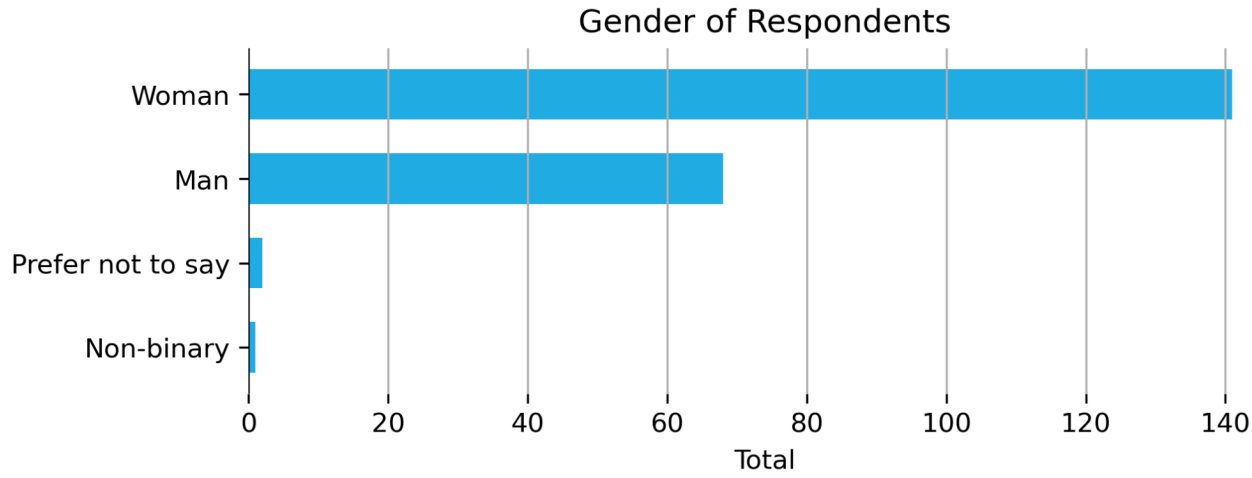
Age. Of 213 survey respondents, the greatest share of respondents are between 25–49 at a combined 63% of respondents; the smallest share of respondents are 65 and above, at only 2% of respondents.

Figure 9. Age of Ridership Survey Respondents



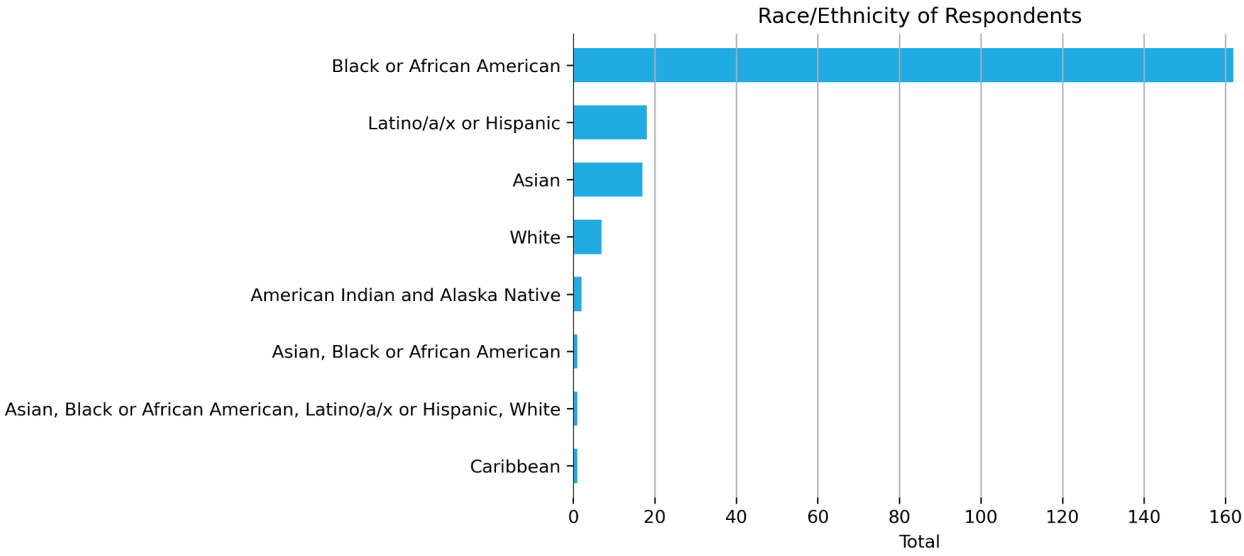
Gender. Two-thirds of respondents are women (67%) and one-third are men (32%).

Figure 10. Gender of Ridership Survey Respondents



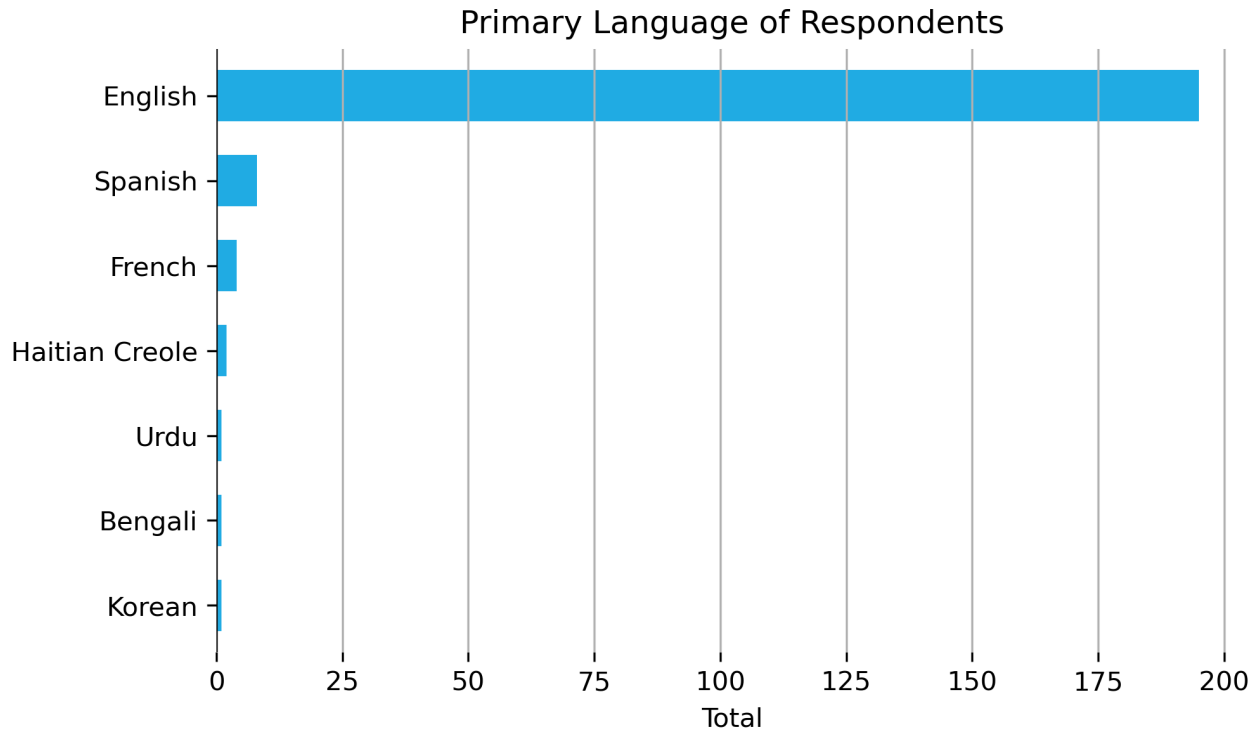
Race/Ethnicity. The vast majority of respondents are Black or African American (78%), followed by Latino/a or Hispanic (8%), Asian (8%), White (3%) and American Indian or Pacific Islander (1%).

Figure 11. Race/Ethnicity of Ridership Survey Respondents



Primary Language. The vast majority of respondents speak English as their primary language (94%), followed by Spanish (4%), French (2%) and Haitian Creole (1%).

Figure 12. Primary Language of Ridership Survey Respondents



4 Environmental Assessment

4.1 Summary

Over a one-year period between June 2021 to June 2022, the GatewayJFK Shuttle drove 42,116 miles including deadhead miles (miles which had no passengers), with a net estimated 65.46 tons of carbon emissions or 1.55 tons per 1,000 miles. Dollaride shuttles receive approximately seven miles per gallon and emit 3.27 pounds of carbon dioxide (CO_2) per mile (per the U.S. Department of Energy's Alternative Fuels Data Center; see Paratransit Shuttle MPG, "Average Fuel Economy per Major Vehicle Category").

In total, the shuttle emitted about 69.30 tons of carbon but offset another 3.84 tons by shifting riders away from low-occupancy modes such as private vehicles or rideshare. As such, the project team estimates that approximately 6% of the shuttle's emissions are offset because of mode shifts. These findings demonstrate that more investments in the infrastructure underlying a first/last mile shuttle service are necessary in order to reduce GHG emissions. For example, replacing the internal combustion engine vehicles used during this pilot with electric vehicles would remove carbon emissions from the tailpipe all together and result in significant carbon offsets.

As of 2021, the White House Council of Economic Advisors set the price of one tCO_2e at 51 U.S. dollars. Using this figure, the project team estimates the net environmental cost of the shuttle during the period to be $3,338 overall and $79 per 1,000 miles.

4.2 Methods

The shuttle's emissions were estimated based on Dollaride's route and survey data. Available data includes both Dollaride's monthly emissions (in pounds CO_2) and monthly environmental impact (in pounds CO_2). It is assumed that the gap between Dollaride's monthly emissions and environmental impact represents an emission-offset figure. To convert emissions data from pounds CO_2 to tons CO_2, we use a conversion rate of 2000 pounds:1 ton. Additionally, the constants listed in Table 3 are employed to estimate environmental cost. The $51 price of one tCO_2e set by the White House Council of Economic Advisors is used to determine environmental cost of the GatewayJFK Shuttle.

Table 3. Environmental Assessment Parameters

Indicator	#	Source
Internal Combustion Engine (ICE) POV Emissions		
Lbs CO2 per gallon of gasoline (lbsCO2/gal)	19.50	NYCDOT
Average MPG	24.20	Union of Concerned Scientists. "How Clean is Your Electric Vehicle?"
ICE energy conversion rate (to mechanical, %)		US Office of Energy Efficiency and Renewable Energy. "All-Electric Vehicles."
ICE emissions (gCO2/mile)	365.5	calculated based on above figures
ICE emissions (lbsCO2/mile)	**0.81**	calculated based on above figure
Assumed deadhead miles for taxis, ubers, lyfts, doll	0.41	
Assumed people in carpool	2.00	
Carpool constant	**0.40**	
Lyft constant	**1.37**	
Internal Combustion Engine (ICE) Dollar Van Emissions		
Lbs CO2 per gallon of gasoline (lbsCO2/gal)	19.50	https://www.eia.gov/environment/emissions/co2_vol_mass.php
Average MPG (Paratransit Shuttle)	7.10	https://afdc.energy.gov/data/10310
ICE energy conversion rate (to mechanical, %)	0%	https://www.fueleconomy.gov/feg/atv.shtml
ICE emissions (gCO2/mile)	1245.78	
ICE emissions (lbsCO2/mile)	**2.75**	
EV EFFICIENCY		
EV emissions (gCO2e/mile)	120.00	Union of Concerned Scientists. "How Clean is Your Electric Vehicle?"
EV emissions (lbsCO2e/mile)	0.26	calculated based on above figure
EV efficiency compared to standard POV in NYC	33%	calculated based on above figures
Travel Behavior		
Average Daily VMT per POV in NYC	9.00	Cortright, Joe, NYC's Green Dividend
Yearly VMT per POV	3287	calculated based on above figures
EMISSIONS SUMMARY		
Yearly POV Emissions (tCO2e)	1.32	calculated based on above figures
Yearly Emissions Offset per EV (tCO2e)	0.89	calculated based on above figures
COST		
Cost per tCO2e	$ 51	https://www.scientificamerican.com/article/cost-of-carbon-pollution-pegged-at-51-a-ton/

5 Economic Benefits

5.1 Summary

The GatewayJFK Shuttle offers time savings to employees and residents of the BID coming from or going to Jamaica Station. We estimate the Value of Transportation Time Savings (VTTS) to these riders to be between $2 and $5 per ride with no fare charged and between $0.25 and $3.50 per ride with a $2 fare charged. In total, we estimate the total economic benefit to riders in VTTS of the connection during the study period to be about $128,000, highlighting the service's economic importance to its customers. We also acknowledge that the value of time saved can also be measured through personal wellbeing, given the potential for individuals to engage in personally fulfilling activities during the time saved from commuting.

According to the U.S. Department of Transportation (USDOT) guidelines for developing VTTS estimates,[1] VTTS is a valuable measure that captures the social benefits of reducing time spent traveling. These benefits are threefold: Time spent traveling is time not spent (1) producing goods/services or (2) engaging in enjoyable leisure activities. And (3) "conditions of travel during part or all of a trip may be unpleasant and involve tension, fatigue, or discomfort."

The VTTS to riders depends principally on three factors:

1. The household income of the rider.
2. Whether or not the rider is transferring to the subway or another MTA bus at Jamaica Station.
3. Whether or not the shuttle charges a fare (it did not during a portion of the pilot).

To derive VTTS, we need to estimate the household income of the rider and whether or not they are transferring to an MTA service. Since the shuttle changed its fare structure during the study period, VTTS is calculated both for free and paid fare models.

[1] United States Department of Transportation (USDOT). September 2021. "The Value of Travel Time Savings: Departmental Guidance for Conducting Economic Evaluations." https://www.transportation.gov/sites/dot.gov/files/docs/2016%20Revised%20Value%20of%20Travel%20Time%20Guidance.pdf

First, we assume that the income distribution of GatewayJFK BID workers approximately matches that of workers living in New York City's outer boroughs, excluding Staten Island. While detailed geographic data on jobs in the BID is available from the U.S. Census' Longitudinal Employer-Household Dynamics (LODES) data set, income data for these jobs is provided only in three ranges, which do not accurately capture the range of incomes in the BID. Estimates derived from LODES are used elsewhere but are less appropriate for the economic analysis presented here.

Next, we assume 54% of riders transfer to the subway or an MTA bus. This figure is based on a sample of 212 rides taken in March 2022. The question, "Are you transferring to or from an MTA service?" was added to the survey to better understand rider behavior. This closely mirrors the share of rides that begin at the terminus (Archer Avenue at Sutphin Boulevard), which is 50%.

The estimated VTTS to riders depending on these conditions is summarized in Table 4.

Table 4. Value of Transportation Time Savings (VTTS) to Riders of the GatewayJFK Shuttle

	VTTS per ride			
Household	Connection Fare and MTA Transfer			
Income	No / No	No / Yes	Yes / No	Yes / Yes
$ 15,000	$ 4.99	$ 2.24	$ 2.99	$ 0.24
$ 25,000	$ 5.64	$ 2.89	$ 3.64	$ 0.89
$ 42,500	$ 6.51	$ 3.76	$ 4.51	$ 1.76
$ 62,500	$ 7.31	$ 4.56	$ 5.31	$ 2.56
$ 90,000	$ 8.23	$ 5.48	$ 6.23	$ 3.48

The VTTS to riders is highest when the shuttle does not charge a fare and the rider does not transfer to an MTA subway or bus. For workers with annual household incomes between $15,000 and $42,500, the VTTS of the shuttle is between about $5 and $6.50 per ride. If these riders are transferring to an MTA subway or bus, the VTTS of the shuttle is considerably less, between about $2 and $4 per ride.

A regular service like the GatewayJFK Shuttle can provide substantial economic benefits to its riders. We find that for regular riders of the shuttle, the total annual VTTS per rider can amount to between 2% and 33% of their household income, depending on their income level, whether they transfer to an MTA service, and how frequently they ride.

5.2 Methods

The estimates of VTTS presented above draw on the USDOT guidelines for developing VTTS estimates published in the 2016 edition of the "Departmental Guidance for the Valuation of Travel Time in Economic Analysis."

Specifically, the USDOT guidelines recommend valuing the time savings provided by waiting, transferring, and walking at 100% of hourly mean household income and 50% for all surface transportation. This discrepancy was developed based on the perceived inconvenience of waiting, transferring, and walking.

The USDOT guidelines recommend analyzing VTTS rates relative to mean household incomes for the local metropolitan regional area, in this case New York City. We use the formula developed by Waters (1993) to do so, recommended by Reck and Axhausen (2020)[2] [1] in their paper: "Subsidized Ridesourcing 25or the First/Last Mile: How Valuable and 25or Whom." We draw heavily from the methods used in the Reck and Axhausen paper for the economic analysis presented here.

Finally, calculating VTTS for the shuttle requires comparing trip length, wait time, walking distance, and fare for the Q6 bus versus the shuttle. To do so, we assume that all shuttle rides are "rides of opportunity" in which the rider was planning to use another mode before seeing the shuttle, either in person or using the Dollaride app's real-time location tracking feature. Under this assumption, there is no wait time or transfer time for the shuttle. The Q6, by contrast, does not serve the same function as the shuttle. Based on the frequency of the Q6, which runs on a 10-minute headway, we assume an average wait time of 5 minutes. (Based on interviews conducted within the study area, wait times for the Q6 could be much longer than 5 minutes, however.) Next, based on the size of the BID and distribution of Q6 stops in the study area, we assume an average walk time to the Q6 of 7 minutes. Finally, the shuttle route runs about 25-minute headways on average, compared to an estimated 35-minute headway for the Q6 from the same stop.

[2] Reck, D. J., & Axhausen, K. W. 2020. "Subsidized ridesourcing for the first/last mile: how valuable for whom?" European Journal of Transport and Infrastructure Research, 20(4), 59-77. https://doi.org/10.18757/ejtir.2020.20.4.5314

6 Route Formalization and Operational Refinements

6.1 Data Collection

The duration of the demonstration period for this project was 12 months from June 1, 2021 to June 1, 2022, exceeding the initial data collection period by four months. This enabled the project team to collect more representative data, fine-tune the key data points, adjust the data visualizations to be more usable, and improve the accuracy of data by cleaning up Dollaride's data warehouse.

The key performance indicators (KPIs) that were identified by the project team to be important for operating a first/last mile shuttle service were divided into four categories:

1. **Growth**—How is the service expanding and sustaining itself over time?
2. **Funnel**—How is Dollaride doing at turning users into loyal riders over time?
3. **Mobility**—How are Dollaride's vehicles performing in the field?
4. **Campaigns**—How are specific marketing initiatives performing?

The following KPIs were collected during the 12-month demonstration and data collection period (divided by category):

1. **Growth:**
    - Daily ride requests (number of rides per day).
    - Ride requests per hour (service hour performance).
    - Repeated ridership per day (number of riders using the shuttle > 1 time per day).
    - Bid ridership (number of riders associated with the client funding the route).
    - Revenue per month (dollars earned from fares).
    - Farebox recovery (percentage of operating costs offset by fares).
    - Refunds (number of riders refunded due to an issue).
    - User acquisition (cost per unique rider and rider retention rate).
2. **Funnel:**
    - First time riders per week (percentage of new users converting to paid riders).
    - New user accounts (number of new users per week).
    - Repeat ridership per quarter (rider loyalty to the service per quarter).
    - Rider frequency breakdown (rider loyalty to the service per week).
    - Super riders (contact information for our most loyal customers).

3. **Mobility:**
    - Top pick-up and drop-off stops (map and list of popular pickup and drop-off stops).
    - Number of runs per day (number of times each vehicle completes a loop).
    - On-time performance (percentage of times per week that drivers start their shifts on time).
    - Stop dwell (instances per week when a vehicle idles for more than 7 minutes).
    - Environmental impact (shuttle emissions, carbon offsets and vehicle miles traveled per month).
4. **Campaigns:**
    - Field ambassador performance (performance of field ambassadors).
    - Promo code usage (number of people using a discount code per week).
    - Overall promo code usage (performance of all discount codes used to-date).
    - Specific promo code usage (detailed performance of all discount codes used to-date).

6.2 Route Formalization

Formalizing the GatewayJFK Shuttle route—making it a financially and environmentally sustainable service—will require updates to Customer Experience, Marketing and Outreach, and Vehicle Operations. The shuttle service must be at least as good as the next best transit option. In the case of the GatewayJFK route, shuttles must operate as well, if not better, than the MTA bus and informal "dollar cabs" that operate in parallel with the shuttle service. These learnings can be applied by Dollaride as it creates new first/last mile routes in other parts of New York State, optimizing for sustainability from the start of the service.

In order to formalize the shuttle, the project team stresses the importance of:

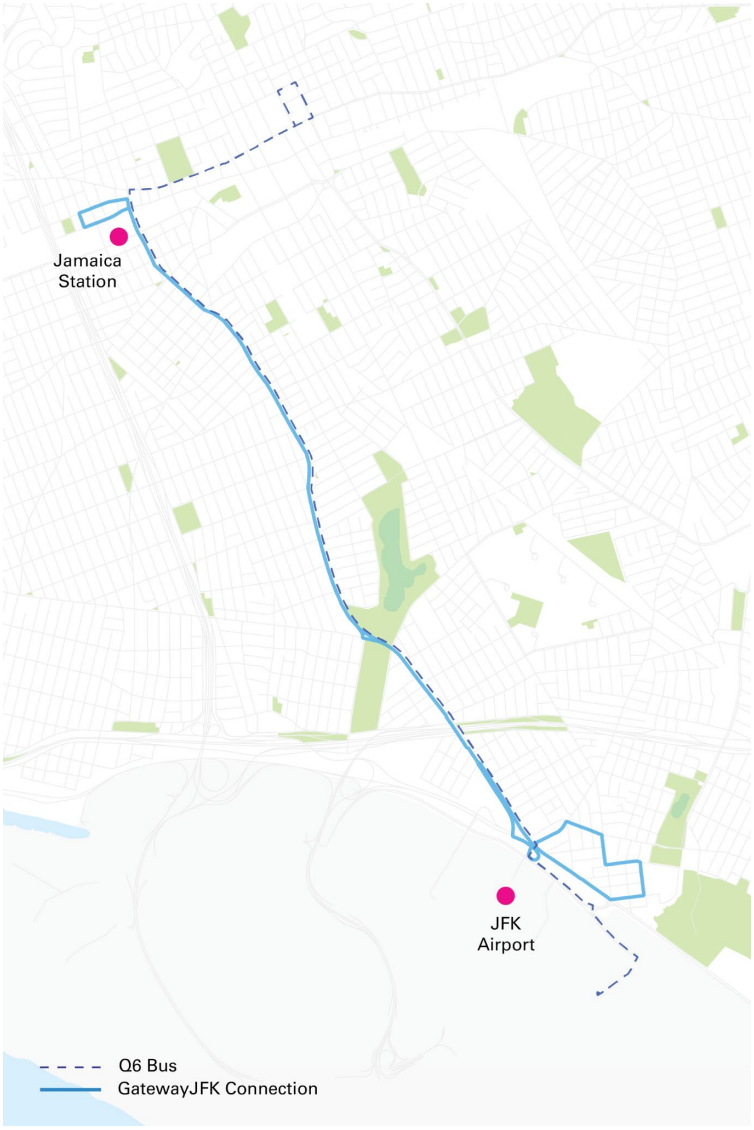
1. **Providing Consistent Service**—Of the many elements that were tracked and monitored closely by the Dollaride operations team, service consistency was highly correlated with ridership. When normal vehicle schedules adherence varied, loyal riders deferred to other options.
2. **Ensuring the Shortest Dwell Times**—While first/last mile shuttle service is preferred by many due to its speed over fixed-route transit, dwell times are found to reduce those savings. At certain points of the GatewayJFK service, dwell times at Jamaica LIRR exceeded 10 minutes, which deterred customers from the shuttle to the bus. Drivers dwelled for long periods of time in order to wait for the most riders they can get for any single run, but it is necessary to keep the vehicle dwell time less than 5 minutes so that the time savings of using the shuttle are greater than that of alternative modes.
3. **Conducting Service Audits**—It is important that the performance of the drivers, Field Ambassadors, and overall product are being monitored in real life via auditing. This ensures consistent rider experience and holds the service accountable. Creating a singular interface that auditors can use to report their observations allows for multiple people to audit at any one time.

6.3 Operational Refinements

As the shuttle services a first/last mile utility in the GatewayJFK transportation landscape, it is imperative that transit and multi-modal connections are considered for any existing or new shuttle service.

1. **Limit Redundancy of Transit Service**—The MTA's Q6—Sutphin Boulevard Bus has been the most popular alternative for riders; see Figure 13 below. Creating a new route in an area where there is no continuous fixed-route transit service may be required in order to solve a true transit desert. Additionally, Dollaride should sync route schedules with public transit timetables to fill in service gaps more deliberately and reduce wait times.
2. **Connect to Major Transit Hubs**—The GatewayJFK Shuttle service connects to the Jamaica LIRR station, which accounts for about 50% of the shuttle's ridership, by far the largest generator of riders. Connecting a first/last mile shuttle service to a major transit hub provides the most mobility for the user and attracts the most riders.

Figure 13. GatewayJFK Shuttle and MTA Q6 Bus Route



6.4 Urban Design and Route Planning

Further formalization of the shuttle will require both urban design and route planning improvements. Urban design initiatives will include a partnership with GatewayJFK and New York City Department of Transportation (NYCDOT) to update user-friendliness of the built environment around key pickup and drop-off zones.

Urban design initiatives include, but are not limited to:

1. **Traffic flow.** Implement traffic flow updates to minimize the impact of dangerous corridors and remove street parking at stop locations to improve efficiency and safety of boarding and alighting. For example, the creation of bus lanes along the existing route would both improve the service time and provide additional safety for riders boarding or alighting at the curb.
2. **Wayfinding.** Create permanent wayfinding and signage at key stops to improve service-to-rider communication.
3. **Beautification and accessibility at shuttle stops.** Landscape major stops with native trees and shrubs, while adding protective covers to improve rider experience while waiting for the shuttle. Additionally, eliminate street parking within greater distances of stops to prevent congestion during pickups and drop-offs.

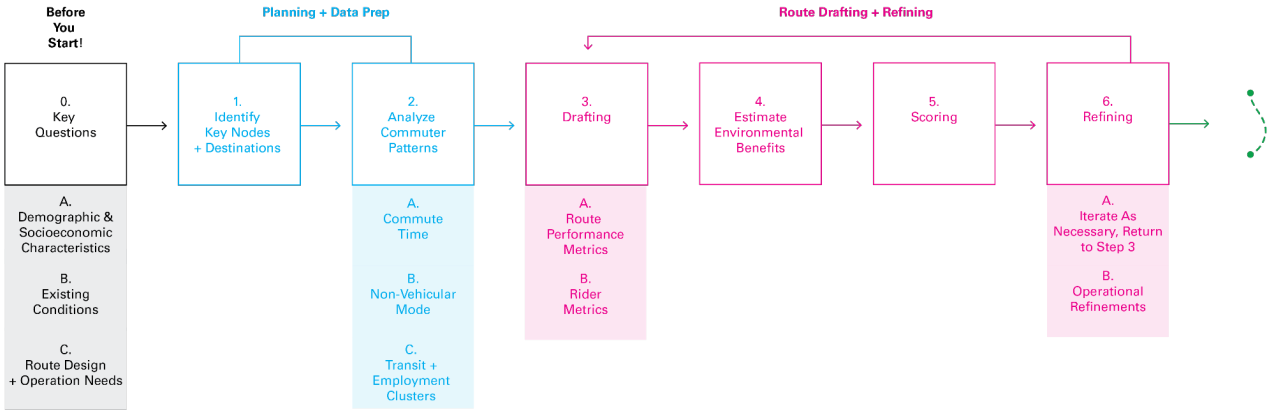
Route planning updates include, but are not limited to:

1. **Turns.** Minimize turns along the route to optimize vehicle efficiency.
2. **Stops.** Improve the vehicle's trip time along the route by removing stops that are lightly trafficked.

7 Route Enhancement Framework

The project team has drafted the following framework to serve as a tool to streamline Dollaride's efforts to scale and eliminate transit deserts across New York City. The framework focuses on key demographic profiles, popular transit and commuter patterns, priority activity nodes, route performance, rider metrics, and environmental benefits to help Dollaride maximize route efficiency and rider retention.

Figure 14. Route Enhancement Framework Overview

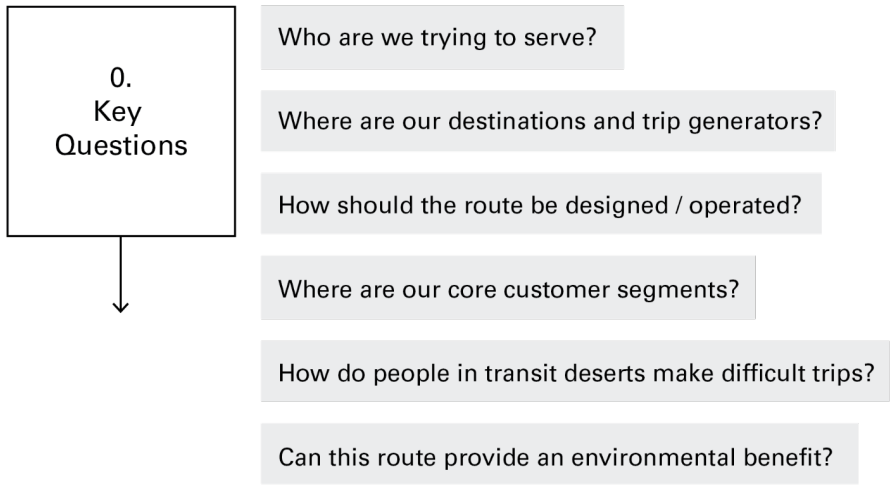


7.1 Before You Start

7.1.1 Step 0: Key Questions

Before beginning planning a route, it's essential to frame route creation by answering a few key questions about the core consumer, key destinations, existing transit deserts, and environmental opportunities.

Figure 15. Key Questions Before You Start



7.2 Route Planning and Data Prep

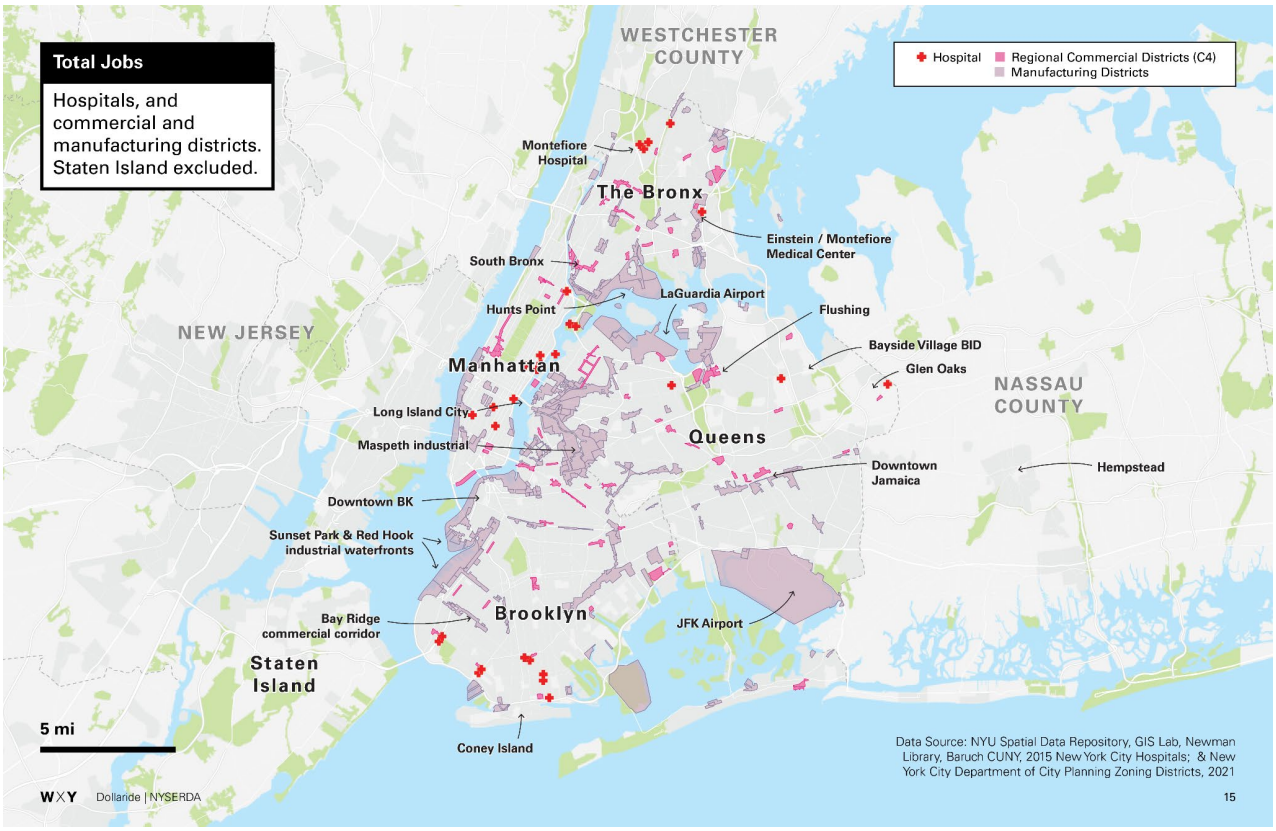
This overarching step focuses on planning and data prep to understand both where underserved key nodes of activity are located and commuter patterns across the location of interest.

Figure 16. Route Planning and Data Prep Overview

7.2.1 Step 1. Identify Key Nodes and Destinations

After grounding the route planning process in Step 0, the next step is to identify key nodes and destinations for route service enhancement such as hospitals, educational institutions, commercial centers, transit stations and other employment clusters. Intersecting BIDs, Industrial Business Zones (IBZs), commercial/manufacturing districts with a hospital, college, or transit hub illustrates potentially high-trafficked nodes worth analyzing.

Figure 17. Example: Identification of Key Hospital, Commercial and Manufacturing Nodes in New York City

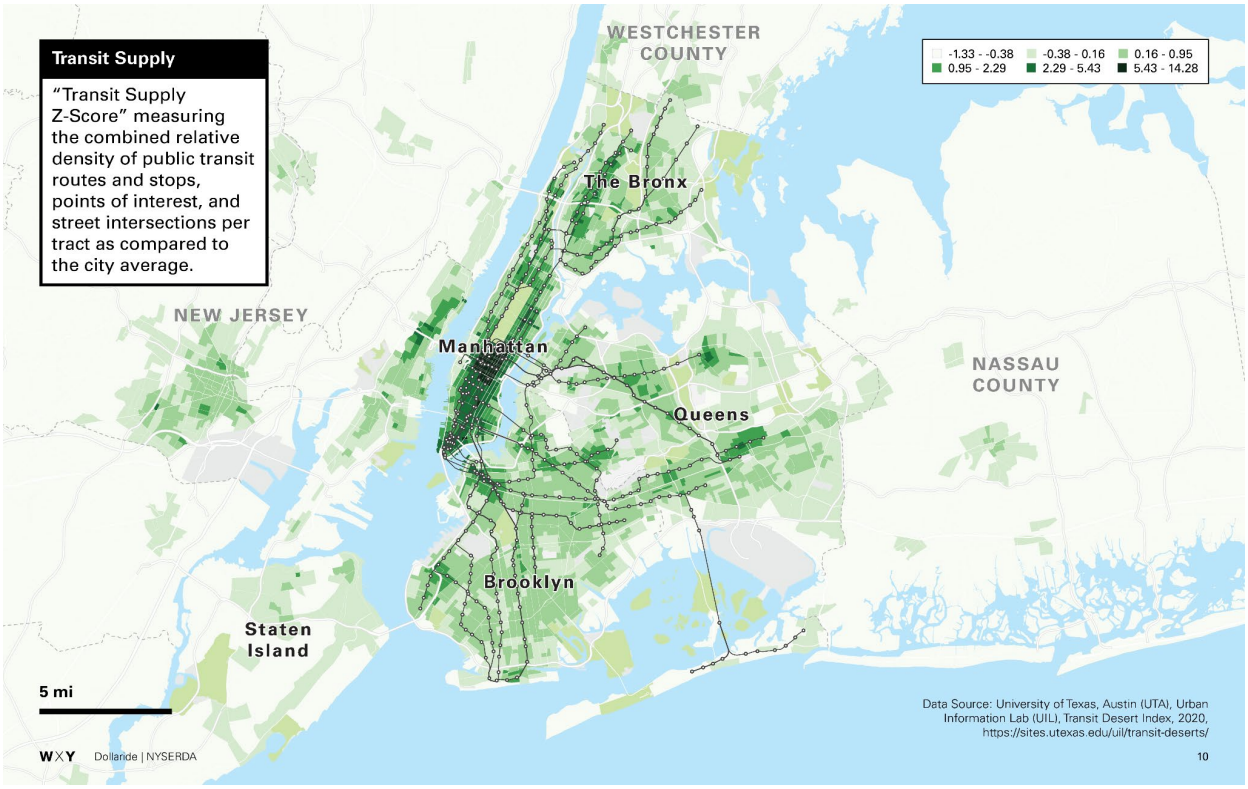


7.2.2 Step 2. Analyze Commuter Patterns

Additionally, it is important to understand commuter patterns such as non-vehicular mode split, commute times, commute peaks, and share of commuters living in transit deserts. Based on existing transit and LODES data, this analysis can help to pinpoint the areas most in need of additional public transit options.

Figure 18. Example: Analyzing Transit Supply

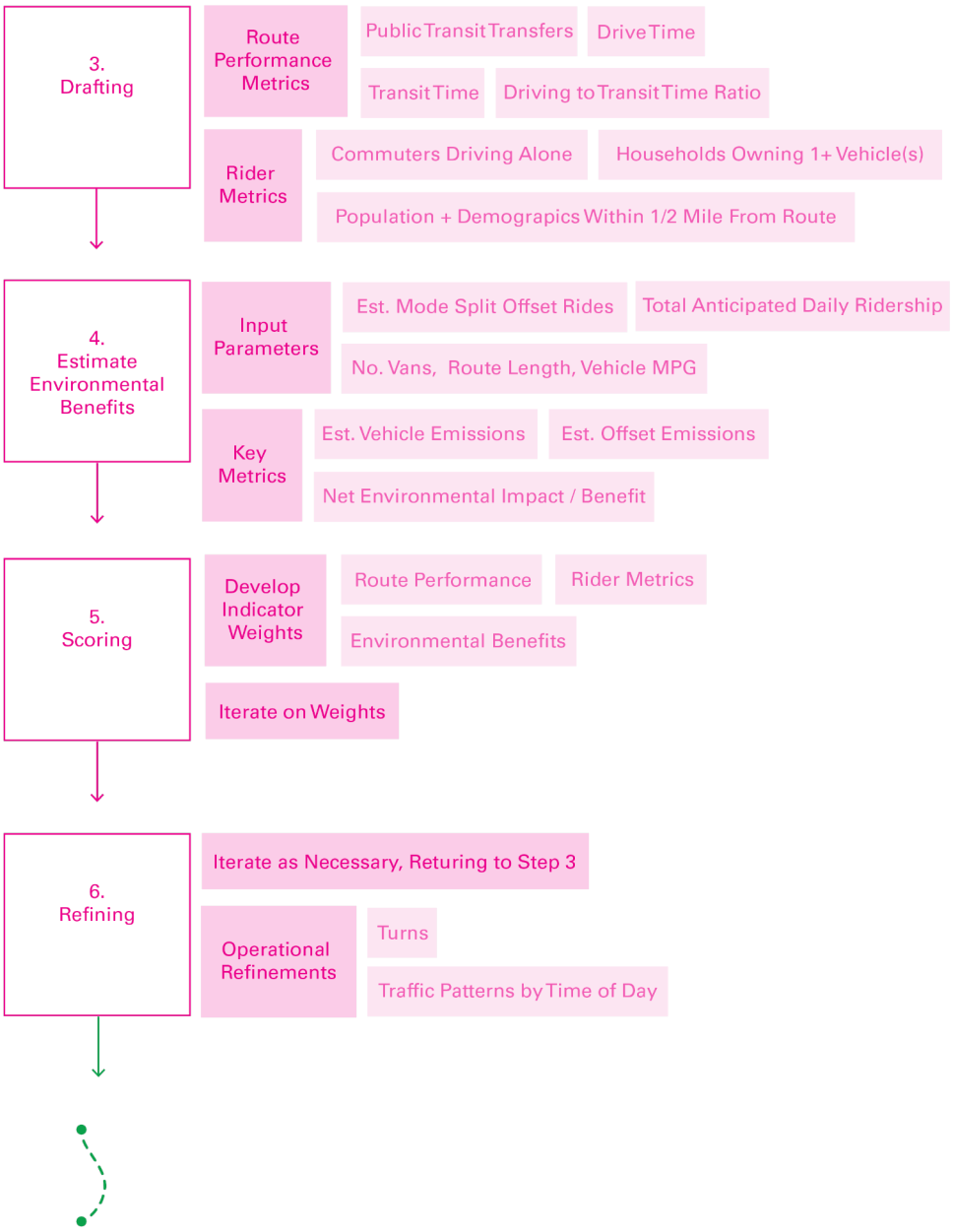
This is based on z-score of relative density of public transit routes and stops, points of interest, and street intersections per tract as compared to the New York City average.



7.3 Route Drafting and Refining

This phase focuses on the route design process, including drafting and refining routes to adhere to operational goals.

Figure 19. Route Drafting and Refining Overview



7.3.1 Step 3. Route Drafting

Draft possible routes connecting key destinations and linking to major commuter residential origins. Keep in mind route performance metrics such as number of transfers on public transit, drive time, transit time, and driving; transit time ratio, and rider metrics, such as the share of commuters driving alone/riding transit, the share of households owning 1+ vehicle(s), the total population living within a half-mile of the route, and the demographic composition of people living within a half-mile of the route. Both American

Community Survey (ACS) and LODES data sets are preferable for narrowing down route options in the drafting phase. This is a proprietary process that Dollaride would use internally when designing a route on behalf of a BID, municipality, or another private funder. With additional proof-of-concept, Dollaride would look to expand the drafting process and make it more readily valuable for external use.

Figure 20. Example: Route Drafting Process for a New Route in Hunts Point, Bronx

7.3.2 Step 4. Estimate Environmental Benefits

Estimate environmental benefits using input parameters of estimated mode split of offset rides, total anticipated daily ridership, number of vans in service, route length and vehicle miles per gallon. Evaluate environmental impact using key metrics of total estimated vehicle emissions, total estimated offset emissions, and net environmental impact/benefit.

7.3.3 Step 5. Scoring

Score drafted routes by developing indicator weights, determined by route performance, rider metrics and environmental benefits, and then iterating on those weights 1-3 times. The scoring process is especially useful in weighing the pros and cons of a large number of routes.

Figure 21. Example: Scoring for New Routes in New York City

This is based on transit time improvement, potential users in service area, employees in cluster and more.

Route	Terminals	Transit Time Improvement	Potential Users in Service Area	Empoloyees in Cluster	Proximate to Shopping Center?	Proximate to Existing EV Charger?	Connects to Existing Transit Access?
Bronx Connector	Hunts Point to Morris Park	100%	196,000	45,000	Yes	Yes	Yes
Cross-Borough Link	Broadway Junction to Elmhurst	85%	316,000	37,000	Yes	Yes	Yes

7.3.4 Step 6. Refining

Continue to refine drafted and scored routes, iterating on each draft, and returning to Step 3 as necessary. Finalize the route by making operational refinements such as turns and traffic patterns by time of day.

7.4 Bonus. Qualitative + Quantitative Proof-of-Concept

Ongoing Conversations. Stakeholder Outreach + Interviews

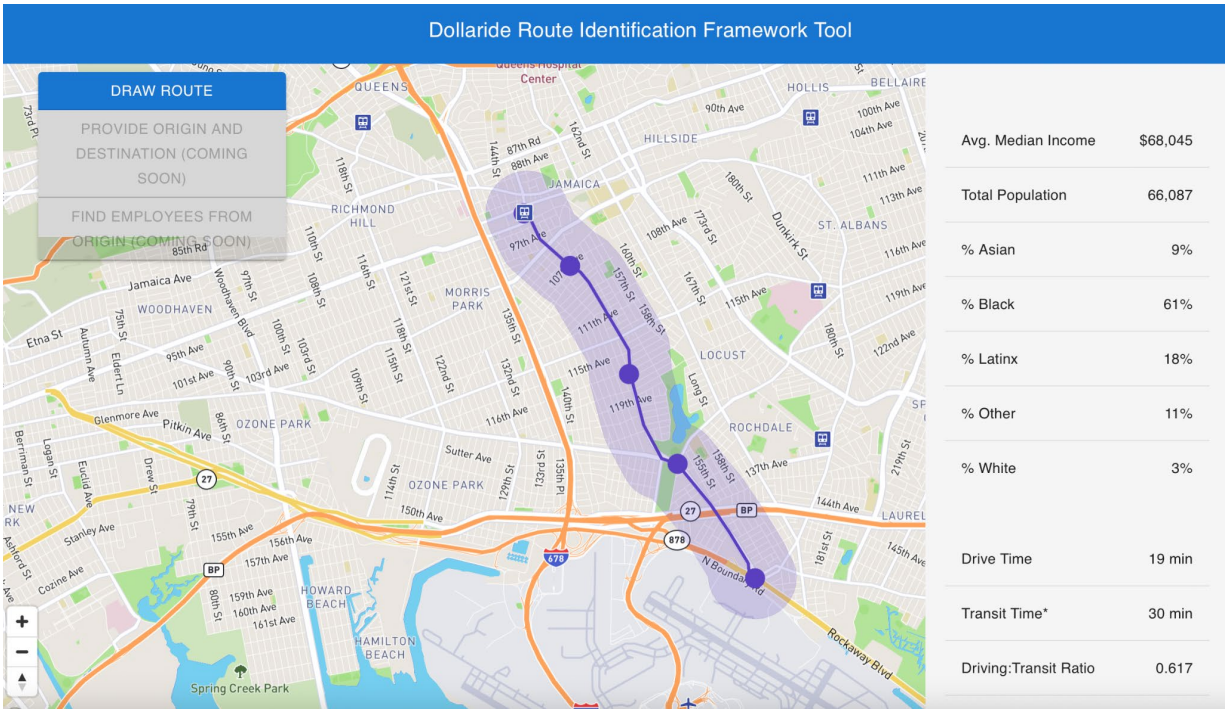
Continue to assess local demand and potential financial partners for current or future first/last mile shuttle routes through interviews with anchor employees or institutions.

7.4.1 Operationalizing the Route Enhancement Framework. Create a Web Tool

Continue the build out of the Dollaride Route Identification Framework Web Tool as a mechanism to operationalize and evaluate current and future routes. The tool design affords the potential to be a major touchpoint of the ongoing Dollaride product offering in the future. The project team developed this tool to help Dollaride reduce the amount of time and technical staff required to test and implement new shuttle routes. Though not thoroughly tested and lacking key features to allow the tool to design routes from start to finish, the project team heavily utilized the tool to help design two routes for the Clean Transit Access Program (CTAP) submission process. The team found that the tool helped reduce the route design process considerably. See the accompanying screen recording to experience the tool in action: https://youtu.be/mV3lvY2dA9M

Figure 22. Example: Using the Web Tool to Understand Demographic Indicators and Driving

Transit ratio for the GatewayJFK Shuttle route.



8 Conclusion

The project team considers the shuttle's continued first/last mile operation to have been an important learning opportunity which provided findings that, if implemented, would make Dollaride's route operations and business development scalable across New York State.

8.1 Learnings for Future Route Operation and Design

The route's pilot phase highlighted opportunities to improve data collection and possible future analyses.

Shuttle visibility is essential. On-the-ground marketing efforts through field ambassadors were highly effective in growing ridership. Organic growth in ridership is possible only when riders know about the service and feel comfortable boarding the shuttle. A learning due to the hyperlocal community focus of this project is that service visibility compounds through word-of-mouth marketing that is enabled by tapping into local community networks via on-the-ground efforts. Moreover, on days when substitute shuttles that were not wrapped with the GatewayJFK Shuttle branding had to run, ridership would be significantly lower. Urban design improvements, such as signage, at key nodes and stops would also aid rider comfort and increase likelihood of repeat and weekly ridership.

Short headways and vehicle speed is of the essence. Our analysis of VTTS highlights the importance of providing time savings to riders relative to other modes. The VTTS benefits described in the data analysis section are only possible because riders are using the shuttle in moments of opportunity but have a back-up in the Q6. If the shuttle required an additional 5 to 10 minutes of time, providing either more coverage to the BID or waiting longer at stops, the incentive to ride the shuttle and the VTTS benefits the shuttle provides would be greatly diminished. This suggests that Dollaride should target areas where large time improvements are possible over existing modes, rather than being the only available mode in an area.

The flexible routing and scheduling is a benefit to shuttle services like the GatewayJFK Shuttle. The project team found that waiting for shifts to end at specific locations and times with an empty bus could provide a reliable batch of riders. This kind of service is only possible with flexible routing and scheduling.

The shuttle service is complementary to existing public transit modes, providing added capacity at peak times that can provide a reliable fallback. Our engagement efforts and data analysis suggest that the shuttle is providing a complementary service to the Q6, which is often overburdened at rush hours. This metric was captured through surveys and anecdotal customer engagement but is essential for understanding why users gravitate toward Dollaride's more user-friendly service (e.g., WiFi, power outlets, additional legroom, etc.) over existing bus service. However, it is likely that a similar shuttle service to this one would be in competition with existing public transit where the existing transit is not over capacity. Dollaride should continue to prioritize routes which do not compete directly with existing public transit, or routes where parallel transit options are overburdened by demand.

Following the shuttle's pilot phase (April 5th–May 28th, 2021), its year-long operational phase (May 29, 2021–May 29, 2022) emphasizes the need for sustainable long-term growth through additional rider loyalty, operational enhancements, and brand awareness.

Pricing model fluctuation deters loyal ridership and reduces competitiveness. The steep decline in ridership in parallel with the October 2021 implementation of a paid fare model disrupted the route's month-over-month (MoM) growth due to rider willingness-to-pay. This learning illustrates that a drastic change in pricing model from free to paid rides upended a rider base that predominantly transfers to or from an MTA service—and therefore, is eligible for a free transfer. A subset of weekly riders who rely on the route remained consistent throughout the pricing fluctuation, but this was not the norm. To optimize future service, the shuttle team needs to determine a sustainable long-term fare that maximizes both rider willingness-to-pay and at minimum offsets the cost of operation for Dollaride.

8.2 Business Development Opportunities

The project team's partnership reveals the benefits, challenges, and opportunities of operating a first/last mile service funded by local stakeholders. The GatewayJFK BID, the primary "enterprise-sponsor" under the project, remains an instrumental partner, not only providing cost-sharing but offering valuable insights and connections within the community. Through working with the GatewayJFK BID, Dollaride gained access to prospective partners in government, real estate development and other areas of the private sector with high job densities. Dollaride used these relationships to conduct user interviews, develop community stakeholder maps, identify new funding streams, and solicit private entities to contribute funds to the service. This is important because as the route continued operations, the project data revealed that riders in transit deserts are especially price sensitive. To make a first/last mile service effective and sustainable, the service would need to rely on private funding to subsidize as much as 100% of the fares.

There is likely a significant opportunity for Dollaride to secure this necessary funding by working with the existing 73 Business Improvement Districts across New York City. While the GatewayJFK BID is unusual in that it is one of the few BIDs in NYC designated as an Industrial Business Improvement District, transit needs are prevalent across nearly all BIDs. For instance, interviews with the Long Island City Partnership—a governing body akin to a Business Improvement District—revealed that even areas that superficially appear rich in public transit options suffer from transit gaps (e.g., late night hours when low-income hourly workers rely on public transit) or have anchor employers located in corners of the neighborhood with greater than a 20-minute walk to the nearest public transit option. Such a service would need to be designed deliberately to fill in transit gaps and minimize redundancy with existing transit options. This would mitigate the risk that a BID is using funds to subsidize corporate shuttles in areas that appear to be high-income and already abundant with transit options.

The project team learned that in order to secure funding from these partners, it is critical to position the first/last mile service as one that does not just serve "transit deserts," but one that can be custom designed to operate during underserved hours and in micro-areas of a larger district that lack equitable access to public transit. The Route Enhancement Framework, developed in Task 6.1, is a useful tool for doing this planning, which would be a necessary part of the partnership development phase. The Framework incorporates data sets that identify transit gaps and inaccessible micro-areas and helps Dollaride design a route that both attracts sufficient funding to support the service *and* addresses a true transit need.

Large institutions represent an ideal partner in launching first/last mile shuttle services. These institutions represent a critical mass of workers commuting from a diversity of areas within the surrounding region. For example, universities and hospitals that exist in high-density neighborhoods tend to oversee a large workforce—in some cases greater than 10,000 individuals. While some employees commute using a combination of public transit options, most employees rely on single occupancy vehicles (SOVs) to commute. Employers often absorb responsibility for providing parking infrastructure for these employees. In some cases, this involves employers offering subsidized parking fares in third-party lots. In other cases, large employers convert their own land into private parking lots.

There is a clear value proposition to institutions and large anchor employers: save these employers from needing to provide parking options *and* reduce the institution's net carbon emissions by replacing SOVs with shared shuttles. These institutions typically have small departments dedicated to "Transit Demand Management." The teams can include as many as five full-time employees overseeing parking lots and operating their own in-house transit solutions. By providing a turn-key transit solution that relies on technology for automated reporting and has expertise in launching and operating a first/last mile shuttle service, Dollaride can reduce the burden placed on Transit Demand Management personnel.

Lastly, institutions offer a large, ready, and willing target audience of users that would eliminate the need for Dollaride to market the service and attract riders. This attribute of institutional partnerships would resolve many of the challenges that arose during the data collection period. Ridership was an uncontrollable variable because the GatewayJFK BID's audience is associated with many hard-to-reach small and mid-sized businesses. This made marketing expensive, limited the growth of ridership and consequently stunted the environmental benefit of the service. By serving a more targeted audience, Dollaride can better predict ridership patterns and environmental benefits *before* launching a new service; enabling Dollaride to build routes that maximize environmental benefits.

In addition to forming partnerships with large employers, Dollaride can further subsidize fares and increase ridership by placing advertisements on the exterior of its vehicles. During the demonstration period, Dollaride successfully installed advertisements paid for by The David Prize, a New York based grant-giving organization, on the exterior of several vans. Dollaride is continuing to pursue funding from advertisers, corporate sponsors, and real estate developers to support shuttles. Additional development of this revenue stream will further subsidize fares and amplify Dollaride's growth trajectory.

While it is true that partnerships with community organizations, like Business Improvement Districts, offer Dollaride access to a wide variety of employers and result in a unique privately funded public service, the project highlighted the complexities involved in such a partnership. Business Improvement Districts serve a wide array of interests, including those of residential, commercial, and industrial tenants, as well as those of real estate developers and government officials. These interests do not always align, making it difficult for a single transit service to optimize its operations.

Additionally, the data collected during the demonstration period highlighted the necessity of marketing and continuous growth in ridership in order to maximize environmental benefit. These objectives were limited, however, by the implementation of a fare to fund ongoing operation of the route. The outcome

of this inherent conflict was limited ridership, which ultimately negatively impacts carbon offsets. A successful first/last mile service would benefit from a more defined and predictable target audience of riders—in other words, an audience to "optimize for," and sufficient funding to support a minimal fare if it aims to increase carbon emission offsets.

8.3 Importance to the Dollaride Business Plan

The data collection period demonstrated the necessity of enterprise funding to ensure that a first/last mile shuttle service both reduces VMT and fills in a transit gap. This matches with the structure of the project, in which the GatewayJFK BID supported the project with sufficient funding to make the service responsive to user needs. One key takeaway is that a successful first/last mile service must integrate itself into the wider public transit infrastructure, especially with regard to pricing.

A significant barrier to growth for this type of service stems from the unique audience being served. The audience of this first/last mile service includes individuals who are both transferring from an existing mode of transit with its own fare (e.g., the MTA), and individuals who are predominantly low-to-middle income. As a result, this population is particularly price sensitive. While the data collected indicates that the first/last mile shuttle is valuable for commuters, the data also shows that this group of riders is not prepared to spend additional money on their commute. This dynamic resulted in stunted growth in ridership when fares were implemented. Alternatively, the data collected during the free-ride period demonstrates that ridership would drastically increase if fares were eliminated, subsequently increasing the environmental benefit of the service. The dynamics of pricing relative to time saved are captured in the VTTS analysis (see sections 1.9 and 5).

Dollaride's business model is aligned with the results of this project. However, during the course of the data collection period, Dollaride needed to renegotiate the amount of funding provided by GatewayJFK. In order to develop a sustainable business model based on the project results, the project team believes enterprise funders must expect to pay the full cost of service operations. The original relationship between the GatewayJFK BID and Dollaride was one in which both partners expected fares to offset at least some of the operating expenses with fares. The data, however, demonstrates the risk inherent in such a strategy, particularly when the audience of riders is using the service as part of a multi-modal or first/last mile commute. Going forward, Dollaride's business model must seek sufficient enterprise funding to fully subsidize fares for its first/last mile service, and therefore maximize ridership and environmental benefits.

NYSERDA, a public benefit corporation, offers objective information and analysis, innovative programs, technical expertise, and support to help New Yorkers increase energy efficiency, save money, use renewable energy, and reduce reliance on fossil fuels. NYSERDA professionals work to protect the environment and create clean-energy jobs. NYSERDA has been developing partnerships to advance innovative energy solutions in New York State since 1975.

To learn more about NYSERDA's programs and funding opportunities, visit nyserda.ny.gov or follow us on Twitter, Facebook, YouTube, or Instagram.

New York State Energy Research and Development Authority

17 Columbia Circle
Albany, NY 12203-6399

toll free: 866-NYSERDA
local: 518-862-1090
fax: 518-862-1091

info@nyserda.ny.gov
nyserda.ny.gov

State of New York
Kathy Hochul, Governor

New York State Energy Research and Development Authority
Richard L. Kauffman, Chair | Doreen M. Harris, President and CEO