FHWA-NJ-2015-012

ADA Paratransit Facility Alternatives

FINAL REPORT
December 2015

Submitted by:

Devajyoti Deka, Ph.D.
Assistant Director for Research
Alan M. Voorhees Transportation Center
and
Center for Advanced Infrastructure and Transportation
Rutgers, The State University of New Jersey

NJDOT Research Project Manager
Paul Thomas

In cooperation with
New Jersey
Department of Transportation
Bureau of Research
and
U. S. Department of Transportation
Federal Highway Administration

DISCLAIMER STATEMENT

“The contents of this report reflect the views of the author who is responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the New Jersey Department of Transportation or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.”

TECHNICAL REPORT
STANDARD TITLE PAGE

1. Report No.	2.Government Accession No.	3. Recipient's Catalog No.
FHWA-NJ-2015-012		

4.Title and Subtitle	5.Report Date
ADA Paratransit Facility Alternatives (2013-01)	December 2015
	6. Performing Organization Code

7.Author(s)	8. Performing Organization Report No.
Deka, Devajyoti	FHWA-NJ-2015-012

9.Performing Organization Name and Address	10. Work Unit No.
Center for Advanced Infrastructure and Transportation Rutgers, The State University of New Jersey 100 Brett Road Piscataway, NJ 08854-8058	11. Contract or Grant No.

12.Sponsoring Agency Name and Address		13.Type of Report and Period Covered
New Jersey Department of Transportation PO 600 Trenton, NJ 08625	Federal Highway Administration US Department of Transportation Washington, D.C.	Final Report
		14.Sponsoring Agency Code

15. Supplementary Notes

16.Abstract

Several transit agencies nationwide have owned ADA-complementary paratransit facilities since the mid-1990s. A few others have taken to facility ownership within the past decade. NJ TRANSIT has always leased its facilities for Access Link, the ADA-complementary paratransit service provided in parts of 18 New Jersey counties. Currently the Access Link service area is divided into five service regions for six "operating regions," with each operating region having a facility of its own. The facilities are leased through private service providers from landlords. This study was conducted primarily to examine the advantages and disadvantages of NJ TRANSIT owning one or more Access Link facilities. The study additionally identified optimum locations for Access Link facilities in the six operating regions.

To fulfill the study's objectives, several tasks were undertaken, including a review of literature and practice, site visits to all six Access Link facilities, interviews with the facility general managers, structured telephone interviews with ADA division officials from 11 transit agencies nationwide, accessibility analysis to identify optimum facility locations within each region, analysis to compare leasing and owning costs for two actual and three potential Access Link facilities, forecasting the growth of each region in terms of riders and size, and the estimation of costs of new facilities in each region.

The results from various types of analysis are summarized in this report. Electronic files containing different types of analysis and results have been separately provided to NJ TRANSIT and NJDOT. Based on the results, eight recommendations were made. Justifications for each recommendation are provided. One of the key recommendations for the NJ TRANSIT ADA Division is to seriously consider ownership of one facility and assess the outcome. It is also recommended that the agency coordinate with other divisions of the agency and conduct appropriate real estate appraisals for the identified properties by using the findings of this study as a guide.

17. Key Words	18. Distribution Statement
ADA; Paratransit; Facilities; Lease; Ownership; Location Analysis	

19. Security Classif (of this report)	20. Security Classif. (of this page)	21. No of Pages	22. Price
Unclassified	Unclassified	78	

Form DOT F 1700.7 (8-69)

ACKNOWLEDGEMENTS

As senior team members, Dr. Peter Jin and Dr. Xiang Liu of Rutgers Department of Civil and Environmental Engineering and Dr. John Betak of Collaborative Solutions significantly contributed to this study. Dr. Betak was practically involved in all tasks, from the site visits to the review of the final report. Dr. Jin led the efforts to compare the costs of leasing and owning facilities, helped with the design of the parking lots in new paratransit facilities, and assisted with the estimation of parking lot costs. Dr. Liu assisted with the estimation of environmental costs associated with paratransit facilities. Rutgers Civil and Environmental Engineering graduate student Seyedamirali Mostafavizadeh Ardestani (Amirali) assisted Dr. Jin with all tasks and also helped to estimate the construction costs of facilities. Without their contributions, this study could not have been completed.

Sherif Stephan, Marta Zurbriggen, Tara Looie, and Jorge Zapata of Rutgers Center for Advanced Infrastructure and Transportation significantly contributed to project administration and quarterly reporting. Samantha Michaele of Alan M. Voorhees Transportation Center was equally helpful with those tasks. The author is grateful for their contributions.

Several graduate students from the Rutgers Edward J. Bloustein School of Planning and Public Policy contributed to the study. Zach Subar and Herbert Wang helped with complex ArcGIS network analysis and various other data processing and analytical tasks. Catrina Meyer reviewed and edited the draft final report. The author sincerely appreciates their contributions.

The author is greatly indebted to the transit agency officials from various parts of the country who volunteered to participate in the telephone interviews. Their insights certainly helped to understand the complex issues associated with the subject matter of this study.

The author is grateful to the general managers of the six Access Link facilities. In addition to spending their valuable time with members of the research team during the site visits, they made an extra effort to provide additional information whenever requested.

The ADA Division of NJ TRANSIT was very helpful in every aspect of the study. In addition to providing data for various purposes, they helped to maintain the study's focus on its primary objectives. Finally, the author is grateful to the New Jersey Department of Transportation's (NJDOT) Bureau of Research for giving the opportunity to conduct this research on an interesting and meaningful subject matter. The NJDOT Project Manager for the study, Paul Thomas, did everything to ensure that the study progressed smoothly. Thanks are also due to NJ TRANSIT's Director of Research, Janice Pepper, for attending all progress meetings and providing valuable insights.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

Background

Although leasing paratransit facilities from private landlords through service providers continues to be popular among some transit agencies, a number of transit agencies nationwide have owned ADA-complementary paratransit facilities since the mid-1990s. A few other agencies took recourse to owning facilities in more recent years. Access Link is the ADA-complementary paratransit service provided by NJ TRANSIT, which serves 18 of New Jersey's 21 counties with approximately 450 revenue vehicles. Since the inception of the service in the mid-1990s, NJ TRANSIT has always leased its Access Link facilities through the private service providers. Currently, all six facilities in the six Access Link operating regions (for five service regions) are leased through the service providers from property owners. Currently, the ADA division of NJ TRANSIT is assessing whether to own one or more of its Access Link facilities.

Research Objectives

One of this study's primary objectives is to assess the advantages and disadvantages of NJ TRANSIT owning one or more of its Access Link facilities. The second major objective of this study is to identify places or locations within each region that would be appropriate for the location of facilities if the agency decided to pursue facility ownership.

Research Tasks

Several key tasks were undertaken to fulfill the research objectives. First, a review of literature and practice was undertaken to examine the methods used for (a) comparing leasing and owning costs of facilities, and (b) identifying optimum locations for facilities in the context of public transportation and beyond. Second, interviews were conducted with the general managers of all six Access Link facilities during site visits. Third, structured telephone interviews were conducted with ADA division officials from 11 transit agencies nationwide. Fourth, by using GIS analysis involving approximately 1.7 million trips, locations were identified within each Access Link region that have a high

level of access to clients and freeways. Fifth, costs of owning and leasing were compared for two actual and three potential Access Link facilities by using data from NJ TRANSIT, the service providers, and a registered professional realtor. Sixth, potential costs were estimated for facilities in each of the six operating regions by taking into account their projected growth up to the year 2040. Finally, the results from the various tasks were synthesized and recommendations were made.

Key Findings

The most important findings of this study were derived from a comparison of owning and leasing costs of five facilities. The comparison of the costs was undertaken for a 25-year period ending in 2040. The results are summarized in Table 1. The break-even years of two of the facilities are also presented in Figures 1 and 2 for illustration purposes. As is often the case with similar analytical models, some assumptions had to be made for the comparison. The results showed that owning costs could break even with leasing costs between 9 and 19 years for the five facilities. Based on several model iterations, the research team concluded that a more realistic timeframe for break-even could be between 12 and 15 years, provided that the leasing costs in the future change in a similar pattern as in the past. The research team also concluded that the savings from ownership would be higher if NJ TRANSIT can continue to own the properties for a period longer than 25 years.

Although the savings in Table 1 were generated from cost models for four properties in Region 5 and one property in Region 6, if reliable data were available for properties in the other regions, the savings in those regions would likely be proportionally similar to those shown in the table since rent and property value are usually directly related.

Table 1 – Summary of findings from comparison of leasing and owning costs of five properties

Property Location	Break-even year	Total savings from owning by 2040 in 2015 dollars
Union, NJ	11	$10,612,935
Clifton, NJ	11	$12,314,159
New Providence, NJ	19	$6,004,405
Newark, NJ	16	$9,013,954
Elmwood Park, NJ	9	$13,667,567

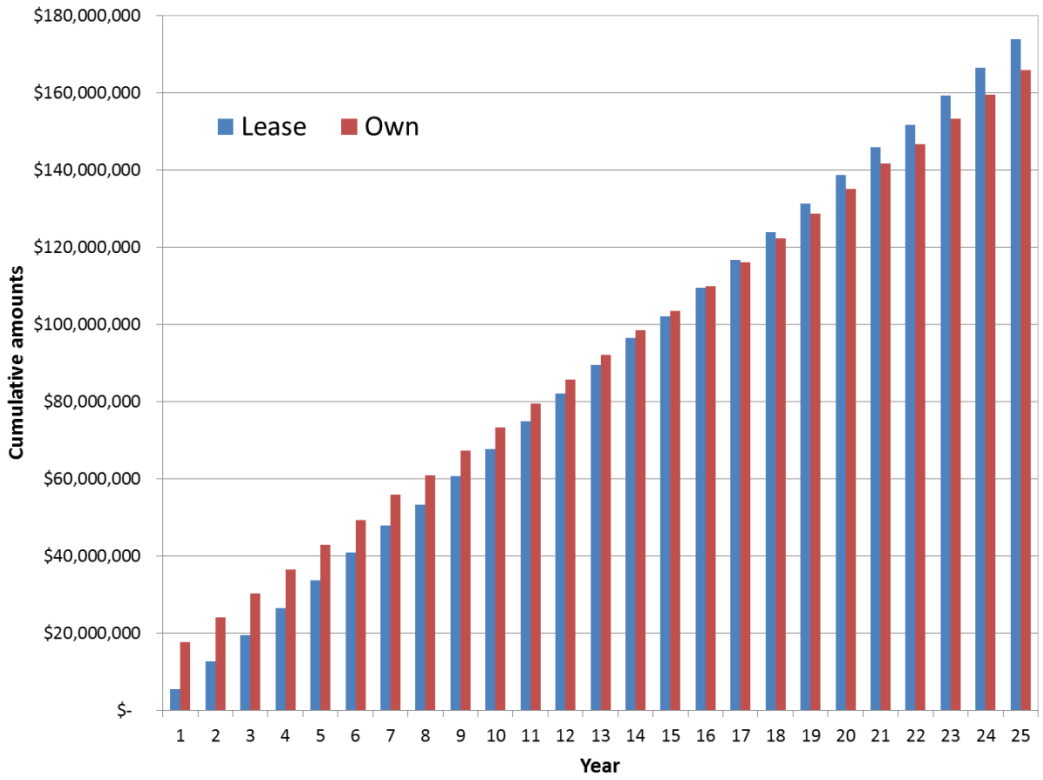

Figure 1. Comparison of owning and leasing costs for a facility in Newark (Region 5)

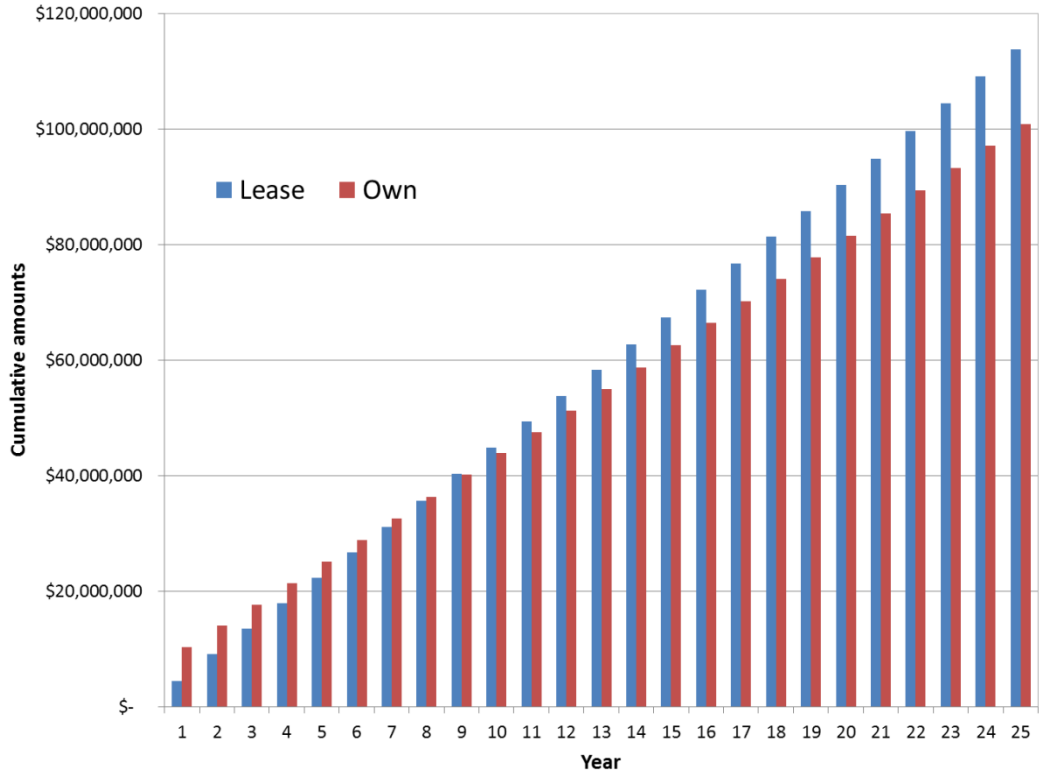

Figure 2. Comparison of owning and leasing costs for a facility in Elmwood Park (Region 6)

The study's overall assessment is that NJ TRANSIT's ownership of an Access Link facility would likely pay for itself in approximately 15 years, provided that (a) major changes do not occur in the overall real estate market, and (b) the property is selected reasonably. This would enable NJ TRANSIT to avoid approximately $6 million to $13 million in facility leasing costs during a 25-year period per region, and more for each year that the facility is utilized after 25 years. With regard to Access Link's other regions, which are expected to need facilities of smaller sizes, avoided costs will be proportionally similar.

The interviews with the general managers of the Access Link facilities provided additional insights about the benefits of facility ownership by NJ TRANSIT. Almost all of the general managers were found to be supportive of NJ TRANSIT owning Access Link facilities. Several of them discussed difficulties with the current leasing practice, including the difficulty of finding properties with appropriate characteristics, time taken to identify and select properties, reluctance of landlords to lease properties for a short period of time, neighborhood objections, and efforts needed to return properties in their original state at the conclusion of leases. Several managers mentioned the high costs of structure modifications, retrofitting, demolition, etc., at the beginning and end of leases. One manager emphasized that by owning facilities, NJ TRANSIT can increase competition among providers by allowing those who cannot currently bid because of the efforts needed and thereby reduce overall cost of service.

The interviews with the ADA division officials from the 11 transit agencies showed that some agencies solely own paratransit facilities and some solely lease facilities through providers, but most own some facilities and lease other facilities. From the agencies that own facilities, no official expressed dissatisfaction with facility ownership. Officials from the two agencies that decided to own facilities within the past ten years appeared to be highly satisfied with facility ownership, one mentioning that he would "give ten out of ten" to their experience. Potential cost savings, better location, and greater control over the facilities were the most commonly cited reasons for the satisfaction.

Several agencies that own facilities took opportunistic approaches to acquire properties. One agency purchased a property that was previously leased as a paratransit facility by

a private service provider. That approach reduced costs of modifications, retrofitting, etc. Another agency purchased a parcel that was particularly inexpensive because of its proximity to an airport runway.

Officials from all agencies that decided to own facilities in recent years emphasized the importance of their ADA division working closely with other divisions of the agencies to acquire facility properties. Some mentioned that the ADA division staff generally does not have the required knowledge about real estate issues and therefore it is important for them to work with the real estate and other divisions of the agency.

None of the agencies that have acquired facility properties in recent years could provide the models they used for comparing owning and leasing costs. However, officials from one agency mentioned that its facility ownership costs are expected to break even with leasing costs in 12 years.

None of the interviewed agencies shared any model for identifying optimal facility locations. However, several officials mentioned the importance of facilities being close to their clients as well as to freeways. Officials from some of the highly urban locations also mentioned the importance of being close to transit stations for easy access of employees to the facilities.

Accessibility analysis with data for approximately 1.7 million Access Link trips helped to identify locations within each region that have a high level of access to Access Link pick-up and drop-off locations as well as a high level of access to freeway ramps. The analysis showed that there is a significant overlap between the areas with high access to clients and high access to freeways in some regions, but not in other regions. Further analysis with Costar data showed that only a very limited number of properties with desirable facility characteristics were sold in the areas with high access to clients and freeways during the past 15 years. The results supported the contention of several facility managers that properties with desirable characteristics, such as large parking lots, are rare.

Finally, tentative costs of new properties, including land value, structure construction cost, and parking lot construction cost, have been provided in this report. The costs

were estimated for facilities with current (2015) size and also with forecast 2040 size. Although the cost estimates provided in this study are tentative, they can be used as guidance by NJ TRANSIT if it intends to purchase land and build parking lots, maintenance structures, and office buildings required by Access Link facilities.

Recommendations

The following are the most important recommendations from the study.

(1) NJ TRANSIT should seriously consider owning one facility and examine the effects in real life before acquiring additional properties.
(2) NJ TRANSIT should consider owning a facility in a region where properties are abundant and land value is not extremely high.
(3) NJ TRANSIT should take a proactive approach and consistently look for appropriate opportunities to own a facility.
(4) NJ TRANSIT should consider properties that can be put to multiple transit uses.

A longer set of recommendations and the justification for each recommendation are presented in the concluding section of this report.

INTRODUCTION

This research was conducted with two broad objectives: (a) to determine the advantages and disadvantages of NJ TRANSIT owning one or more of its Access Link paratransit facilities, and (b) to identify locations that are appropriate for owned facilities. Access Link is the paratransit service provided to persons with disabilities by NJ TRANSIT pursuant to the Americans with Disabilities Act (ADA).

The Access Link facilities are used to park and maintain vehicles by service providers contracted by NJ TRANSIT. The facilities typically have enclosed structures where vehicle maintenance activities take place. In addition, the facility structures contain separate office spaces where training, dispatch, and administrative activities take place. The maintenance area of an Access Link facility is shown for illustration in Figure 3.

Figure 3. The maintenance area of an Access Link facility

Currently, the Access Link service area, covering all counties of New Jersey except Hunterdon, Warren, and Sussex, is divided into five contracting regions and six operating regions. The service is provided to eligible persons traveling to and from locations within ¾ mile of local bus routes. Figure 4 shows the boundaries of the Access Link regions and the current locations of the facilities within each region.

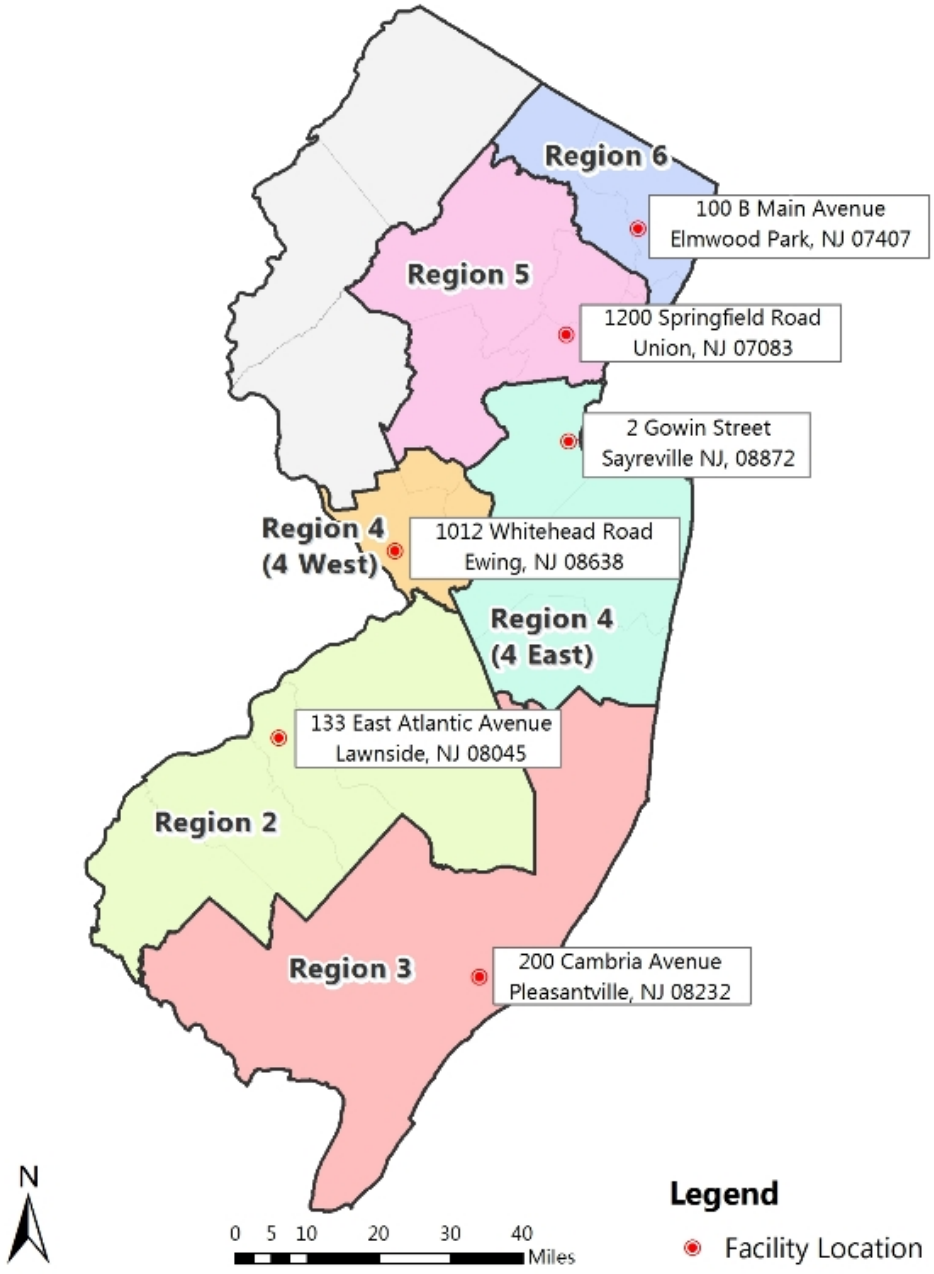

Figure 4. The six Access Link operating regions and the current facility locations

As shown in Figure 4, each region currently has one main facility. In addition to the facilities shown in the figure, a small satellite facility consisting of only a parking lot is located in Neptune, Monmouth County, which serves a part of Region 4 East. In four of the six facilities, the Access Link vehicles, or revenue vehicles, are parked in outdoor parking lots, but in the Region 4 West and Region 6 facilities, they are parked in indoor parking lots. In all facilities, employee parking is located outdoors. An outdoor parking lot for revenue vehicles is presented for illustration in Figure 5.

Figure 5. An outdoor parking lot for Access Link vehicles in a facility (employee parking lot in the background)

Access Link service is provided by private service providers in all six operating regions, structured through five service regions. NJ TRANSIT offers contracts to service providers through a competitive bidding process. The current contract length is three years, followed by optional annual contracts for the subsequent four years. In recent years, contracts have continued for seven years in most cases. The service providers come into agreement with potential property owners at the time of preparing bids, and when the bids are successful, they sign leases with the property owners for the duration of the contract.

At the beginning of a new lease agreement for a facility, significant modifications have to be made within the structures, including installation of lifts, wash bays, and other equipment in the maintenance area. The office areas also typically require retrofitting and installation of computing and other electronic equipment. Similarly, at the conclusion of a lease, when the operation moves to another location, expenditures have to be made for restoring the facility because landlords typically want the properties to be returned in their original state. Furthermore, because of the scarcity of properties with desired characteristics, service providers currently have to spend a significant amount of time and resources in their search for properties. While service providers typically have 6 to 9 months from NJ TRANSIT's notice to proceed to prepare a facility in advance of beginning their contract, recently the preparation time has been double or triple this time due to the permit approval processes of municipalities. Since NJ TRANSIT eventually bears these costs in one way or another, it could potentially save resources if it owned the facilities instead of having to pay landlords through the service providers' leases.

Historically, Access Link service operations have often been moved from one facility to another when transitioning from one contract to the next even when the service provider remained the same. The most common reason for frequent movement of operations from one facility to another has been a high ridership growth, which increases the required number of revenue vehicles, which in turn increases the demand for revenue vehicle parking spaces. Increase in the number of revenue vehicles also increases the number of vehicle operators and other employees, which increases the demand for non-revenue vehicle parking spaces and office space. Currently, operations are in the process of moving from existing facilities to new facilities in two regions. In both cases, increase in service demand (and resultant scarcity of parking spaces) is the primary reason for the movement. Although providers could avoid the problem by leasing larger facilities at the outset, due to the short contract length, they would have to pay for unused capacity by doing so.

By owning Access Link facilities, NJ TRANSIT can potentially save substantial amounts of resources because of the high costs involved in frequent movement from one leased

facility to another. Risks and associated costs of prolonged transitions between leased facilities can also be avoided. In addition to the savings, it can potentially find better facility locations and have greater control over the facilities. Furthermore, by owning facilities, NJ TRANSIT can potentially increase competition among the service providers since smaller providers that cannot currently afford to secure facilities for bids will also be able to compete.

However, since NJ TRANSIT has always been leasing Access Link facilities through service providers, facility ownership will require a deviation from past thinking and practice. Although several transit agencies nationwide have owned ADA paratransit facilities since the mid-1990s, and other agencies have started owning facilities in more recent times, NJ TRANSIT will have to carefully evaluate the benefits and risks associated with the ownership of specific facilities with detailed studies. This research is intended to help the agency with some basic understanding about the advantages of owning and leasing Access Link facilities. It provides a summary of literature review and practice scan, a summary of findings from interviews with the current general managers of the Access Link facilities, a summary of interviews with ADA division officials from a number of transit agencies nationwide, a comparison of the costs of owning and leasing for selected facilities, and a summary of costs that may be expected if NJ TRANSIT wanted to purchase properties in the six operating regions for Access Link facilities.

The remainder of this report is divided into the following broad sections in sequential order.

Literature review: It provides a detailed description of the related literature.

Site visits and interviews with regional facility managers: It summarizes the knowledge gained from visits by the research team to the six operating regional facilities and on-site interviews with the general managers of each facility.

Interviews with nationwide transit agencies: It summarizes the knowledge gained from structured telephone interviews with ADA division officials from 11 transit agencies nationwide.

Appropriate locations for access link facilities: It presents results from analyses pertaining to the accessibility of various locations within the Access Link service area to the pick-up and drop-off locations in order to identify optimal facility locations for each region.

Comparison of facility owning and leasing costs: It provides results from the comparison of owning and leasing costs of five current and potential Access Link facilities for a 25-year period.

Potential cost of new facilities: It presents results from analyses that included forecasting of Access Link demand as well as the estimation of land cost and construction cost of facilities in all six operating regions.

Summary of findings and recommendations: It summarizes the key research findings from various sections and makes several recommendations for the NJ TRANSIT ADA Division based on the findings.

It ought to be noted that a large number of Excel spreadsheet files and GIS shapefiles were generated through this research. Those files have been provided separately to NJ TRANSIT and the New Jersey Department of Transportation's Bureau of Research. This report only describes the methodologies, presents the results, and discusses the implications of the results.

LITERATURE REVIEW

Introduction

This literature review was prepared in view of the overall objectives of the research. The review included studies that are relevant to the current study because of subject matter, data, or methods. The extensive literature search showed that studies that directly address ownership/leasing and location of ADA-complementary paratransit service are extremely rare. However, relevant studies exist in the general context of public transportation, especially regarding the location of bus facilities. Literature also exists in the general context of location of private facilities such as warehouses and public facilities like schools and fire stations. The review of studies in these fields provided insights about the issues that are pertinent to facility location in general. Some of the methods and general considerations in these studies are also relevant to the current study.

The remainder of this chapter is divided into seven sections. The first section includes a review of studies on public transit facility location. The second section includes a review of mathematical modeling techniques to determine optimal location of facilities. The third section summarizes literature on facility location decisions to minimize risks and maximize benefits and efficiency. The fourth section discusses the differences between public and private sectors in their approaches to making facility location decisions. The fifth section includes a review of literature on important financial considerations of agencies in real estate transactions. The sixth section presents a review of literature on operations and management strategy considerations for demand-response transit services. The concluding section summarizes the key elements of the reviewed literature in the context of ADA paratransit facilities.

Transit Facility Location and Other Location Optimization Strategies

Studies that have directly addressed the location decisions for garages and maintenance facilities of paratransit services are almost non-existent. A rare study, by Boyacı and Geroliminis (1), addressed facility location for demand-responsive transit service and emergency response service in Athens, Greece. The study used a

probabilistic model due to the uncertainties related to the demand for service and travel time. Another study that combined paratransit service and facility location was conducted by Jones (2). However, the study primarily focused on the location of social service facilities in relation to the availability and cost of paratransit service instead of examining the location of paratransit facilities such as garages. In other words, this study was primarily about the destinations of paratransit users rather than the locations from which paratransit vehicle runs begin.

Uyeno and Willoughby (3) examined transit facility location in British Columbia, Canada, by focusing on buses. The study noted that bus deadhead (the time to and from garages) is an important consideration for bus garage location because deadhead time can be costly. The study uses a methodology with the acronym BUBLS to determine the location of bus garages in the study area. Although conventional transit buses operate under circumstances that are different from paratransit vehicles, the principle of reducing deadhead time applies to paratransit service as well. Only two other studies were found that directly addressed the location of transit maintenance facilities (4, 5). These three studies together indicate that an important consideration in making decisions about transit facility location ought to be operating costs of delivering service.

While studies that specifically sought to identify optimum locations for transit or paratransit facilities are rare, a large volume of literature has been published on the general concept of optimizing location of establishments of various types (e.g., production plants, distribution centers, hospitals, fire stations). Researchers from geography, urban and regional economics, operations research, and production and distribution science have contributed significantly to this body of literature. Some of these studies emphasize that location decisions can have both positive and negative effects on the surroundings (6). While hospital trauma units and fire stations are classic cases of establishments that affect the surrounding areas both positively and negatively, even transit facilities/garages may have such effects in certain circumstances. When neighbors perceive potential negative impacts, it may not be possible to locate a facility in the most economically desirable location because of public opposition. Thus

understanding the politics of location could be as important as understanding the economics of location.

A highly practical study was conducted by Beruvides et al. (4) using a concept known as Regional Maintenance Center (RMC). The premise of RMC, which aims to minimize maintenance costs and enhance rural transit service, is that the quality and costs of repairs could be easily monitored when vehicle maintenance is undertaken at a single regional facility instead of at many regional facilities. The study established minimum criteria and basic requirements of an RMC facility. A site assessment instrument was developed to help with RMC facility site selection and operations.

Modeling Location Decisions using Mathematical Methods

A number of studies on location of facilities provided detailed discussions on the theoretical or mathematical underpinnings of location analysis, while other studies provided useful information on empirical estimation. These studies have generally considered different aspects of analysis. For example, Owen and Daskin (7) considered mathematical formulations for location under uncertainty, O'Kelly (8) considered the mathematical formulation for an interactive hub pattern of locations, Teixeira and Antunes (9) considered a hierarchical pattern of facility location, and Johansson and Leonardi (10) considered multi-level and multi-agency location decisions. Although none of these studies focused on transit facilities, the methodologies used in these studies can be useful for transit and paratransit studies also.

There are many other studies that provided mathematical approaches to determining facility location for the efficient delivery of goods and services to customers. In a study by Nozick and Turnquist (11), a modeling approach was developed which encompasses inventory costs, transportation costs, facility costs, and customer responsiveness to maximize efficiency of service delivery. The study integrated discrete choice location analysis, inventory analysis, and multi-objective techniques to develop a comprehensive model to identify location of distribution centers. The model was applied to a car manufacturing company in the US to illustrate its validity.

In another study, Gill and Bhatti (12) demonstrated a significant impact of warehouse location and retailer allocation in the structure of the entire supply chain network for the purpose of gaining efficiency. A hypothetical model was proposed to address this problem by accounting for distribution costs and warehouse capital costs. The study considered distribution cost as a function of distance travelled. Several cost components were considered. For example, the overall warehouse costs included loading and unloading costs, storage and retrieval costs, real estate costs, energy costs, compensations of warehouse managers and secretaries, and the cost of telephone service. The objective of the model was to minimize the total costs by trading off between the warehouse capital costs and distribution costs. Due to the similarity between an ADA facility and a warehouse in a supply chain network, these methods can be relevant for a paratransit facility location study also.

Melkote and Daskin (13) developed a mathematical model that simultaneously optimized facility location and the corresponding transportation costs. This study was based on a model introduced by Daskin et al. (14). The objective of the model was to find an optimum network design and facility locations that would minimize the total system costs including facility costs as well as link construction costs and transportation costs. The authors claim that the model could be used in regional planning, distribution, energy management, and other disciplines.

Taniguchi et al. (15) conducted a study on terminal location by considering network traffic congestion. The study considered energy consumption for transportation as a measure of cost. A mathematical model was developed to determine the optimal size and location of public terminals. A trade-off between transportation costs and terminal facility costs led to the minimization of total costs in the model. The model was successfully applied to the Kyoto-Osaka region of Japan.

Tuzkaya et al. (16) undertook a comprehensive study on facility siting to maximize benefits and opportunities while minimizing costs and risks. A multi-criteria decision-making technique known as Analytical Network Process (ANP) was used. ANP is one the most comprehensive approaches for the analysis of decisions on a large scale. A

case study of solid waste storage in Istanbul, Turkey, was presented to illustrate the validity of the technique.

Maximizing Benefits and Minimizing Costs and Risks

A number of studies considered accessibility, service equity, and risks, which are all closely related to this study's objectives. A mathematical facility location study by Teixeira and Antunes (9) developed a discrete hierarchical model to maximize accessibility. Varying levels of demand, different types of facilities, and different types of users were considered in the model. The model objective was to maximize the accessibility of users to the facility. The model was applied to a school location problem in a Portuguese region.

Another study that considered accessibility from a different perspective was by Orloff (6). It considered both positive and negative effects of access to facilities. While high level of access to a facility is usually desirable, some facilities may also have negative effects on those living nearby. For example, while a fire station in close proximity is likely to reduce the time taken for a fire engine to arrive at a particular location, people living in close proximity of fire stations also have to live with noise pollution.

Doerner et al. (17) considered risk mitigation in facility location decisions. According to the study, consideration of natural disasters is important to reduce risks when making decisions about facility location. The study presented a multi-decision model for siting schools in the coastal areas of Sri Lanka by considering the risk of tsunami inundation. A statistical model was used to identify the impacts of tsunami on schools. The goals of the model were to maximize the service area, minimize the potential costs due to tsunami, and minimize the costs of construction to withstand potential impacts of tsunami.

Differences between Public and Private Facility Location Considerations

A large number of studies have noted that the considerations for locating public facilities are vastly different from private facilities (18, 19, 20, 21, 22,). While the location of private facilities (e.g., private warehouse) is almost entirely dependent on efficiency, for

determining the location of public facilities (e.g., playground, fire station, or transit facility), it is important to consider both efficiency and equity. Taken together they indicate the importance of maximizing total social welfare, instead of profit, for public entities. The concept of total social welfare necessitates consideration of a large number of variables, including number of users (or beneficiaries) of the facility, land use impacts, environmental impacts, etc. Thus, while the location of a private facility may be dependent only on private costs and benefits, the location of a public facility such as a transit facility will have to be dependent on both private and social costs and benefits.

A study by Revelle and Liebman (23) compared facility location models for both the public and private sectors. Batta et al. (24) proposed a model that incorporates efficiency and equity objectives into a location model. Although this study is based on a hypothetical mathematical model, it provides insights about some of the variables that are important for location decisions.

Despite certain differences between the two, the location decisions for both private and public facilities are dependent on the principle of minimizing costs. For example, all else being equal, a facility in an area with low land value would be more desirable than an area with high land value irrespective of whether the facility is private or public. Some studies have therefore explicitly examined the relationship between land value and facility location (22, 25).

DeVerteuil (26) argues that to maximize efficiency and equity from the location of public facilities, some of the primary considerations are distance, pattern, accessibility, impact, and externalities. In the context of the location of paratransit facilities, distance may imply distance to clients, pattern could include trip patterns and land use patterns, accessibility could imply access to trip origins and destinations, impact could be land use impact or environmental impact, while externalities (both positive and negative) could be experienced in terms of land value and the environment.

Financial Considerations in Real Estate Transactions

Real estate transactions are frequently accompanied by a number of financial risks. A few studies investigated the factors associated with real estate in facility location decisions. These studies indicate that the financial risks associated with real estate transactions can be grave. According to Simons (27), the public sector is traditionally not as well-equipped to handle real estate transactions as the corporate sector. The study included a review of real estate decision-making and management practices in the public sector. A survey of municipal property managers in the Cleveland area of Ohio was conducted to examine the real estate management practices in the public sector. The goal of the study was to determine if any corporate real estate management tactics were applied in a public sector setting. Based upon the study's results, the author concluded that public sector real estate practices were not as robust in evaluating financial consequences as private sector entities. The study suggested that the adoption of corporate strategies and approaches to real estate could help public sector entities in making better real estate decisions.

Wheaton et al. (28) conducted another study on real estate that is relevant to the current study. Although past experiences of the real estate market are often used to predict future performances, the researchers argue in this study that real estate markets should be evaluated through a forward-looking methodology instead of historical analysis. Much uncertainty in the real estate markets is due to outside factors that had little influence on historical experiences. The study concluded that the highest risks in real estate involve uncertainties about the future. A major takeaway from this study for the current study is that past trends alone cannot provide a real assessment of the future real estate markets. While the assessment of risks from historical experiences is important, it is equally important to be cognizant about new developments and trends in the future.

Another study, by Ebert (29), evaluated the advantages and disadvantages of leasing versus owning of real estate assets in the corporate sector. According to the study, a common belief is that leasing real estate is better than owning for corporations because they do not have to take out large loans against their assets when they lease. However,

this is not a sound long-range financial strategy as leasing is more costly than borrowing in the long run. Furthermore, leasing provides neither resale benefits nor an opportunity for redevelopment at the conclusion of operations. The study concludes that leasing of facilities is a suitable strategy only in certain circumstances. Some of these circumstances are:

- When short-term flexibility is needed
- If the size of space needed is not large enough to warrant a single-use space
- If the lease is a reaction to a competitive threat
- If the corporation does not have capital to acquire the property

Joseph et al. (30) presented a decision-making framework and identified the major factors that ought to be taken into account when selecting locations of real estate properties. This study proposed a corporate approach to site selection that can be applied in the absence of enhanced support systems without compromising the fundamental considerations in such a decision. The study emphasizes that firms ought to have foresights about optimal real estate mixes.

Operations and Management Strategies for Demand-Response Transit

While studies on facility location for paratransit have been rare, a few studies have addressed contracting issues faced by public transit generally. Over the years several studies investigated the advantages and disadvantages associated with contracting transit services and the manner in which service is provided. A fairly dated TCRP Synthesis Report presented an overview of the service contracting practice across the United States (31). Talley (32) investigated the benefits and drawbacks of contracting various parts of paratransit service. More recent studies (33, 34, 35) have addressed experiences in contracting conventional transit operations to private companies in the United States and abroad, seeking to identify the circumstances under which efficiency can be improved through privatization. Other recent studies look even more broadly at the possible forms of public versus private ownership and the operation of transit systems and facilities (36, 37, 38).

Two studies focused specifically on the effect of operation and management strategies on the productivity and performance of demand responsive transit systems (39, 40). The studies concluded that the way services and contracts are structured and managed can affect productivity and costs.

One important issue that is not discussed in much of the existing literature but is important for the current study is the determination of facility size to accommodate expected growth. Fu (41) and Diana, et al. (42) provided some insights about the association between service demand, fleet size, and the need for shifting geographic alignments of service regions.

Conclusion

This literature review was conducted to identify studies that could assist in identifying the major issues, data sources, methods, and decision-making frameworks that are pertinent to location and owning/leasing decisions of ADA paratransit facilities. It revealed that virtually no existing study specifically addresses the owning/leasing issues of ADA paratransit facilities or identifies methods to determine the location of such facilities. However, a few studies in the context of conventional fixed-route transit addressed issues related to the location of transit facilities. These studies indicated that overall operating costs and deadhead trips/time should be two important considerations for decisions pertaining to the location of facilities. It can be concluded from these studies that travel time between facilities and pick-up/drop-off locations and its influence on operating costs because of energy consumption and labor costs should be important considerations for evaluating the advantages of alternative paratransit facility locations. Other studies provided insights about the importance of considering land costs, construction costs, maintenance costs, labor costs, and the costs of utilities.

The reviewed literature in other fields of study provides additional insights for this study. For example, the literature indicated that considerations and priorities in making location and owning/leasing decisions for government or public entities are different from private entities. While decisions for private facilities are motivated solely or primarily by profit, for decisions regarding public facilities such as schools and fire stations, other

considerations, such as access and service equitability are equally important. Yet, the literature review showed that public agencies in general are less well-equipped to make real estate decisions.

The literature review provided insights from several studies on relevant models to determine optimal facility location. While some of the models are simple and easily implementable, others are more comprehensive but also more difficult to implement empirically because of data limitations. It can be concluded from the review that the selection of methods for the determination of location of Access Link facilities will involve a compromise between rigor and real-life applicability.

Another insight from the literature review is that the location of certain facilities can have both positive and negative impacts. In can be inferred from the review of studies that ADA paratransit facilities can be one of those types of facilities that will have an overall positive effect on clients in the surrounding areas, but can also be perceived by others as having negative impacts on the surroundings. In the specific context of any transit facility, the actual or perceived environmental impacts would be important to consider.

The review also showed the importance of assessing risks associated with facility location. Risks involving natural disasters appear to be a particularly important consideration in making facility location decisions. The review showed that risks from natural disasters can be addressed by selecting suitable locations and selecting appropriate methods and material for construction. In the context of ADA paratransit facilities in New Jersey, obviously one has to be cognizant of the risks associated with hurricanes, storms, and flooding. While it may seem more appealing to locate a facility in a low-lying area because of low land value, the consideration of risks associated with flooding and damage to structures, equipment, and vehicles may make other locations more favorable because of lower damage risks.

A valuable insight from the literature review is that the choice between leasing and owning real estate assets is complex. A reviewed study in the corporate sector indicated that leasing is often considered more favorably than owning because it does not involve the borrowing of large amounts of money. However, leasing should be considered less

favorably because it costs more in the long run. This brings to the forefront issues related to leasing duration and discounting. It can be inferred from the review that the answer to the owning/leasing question of ADA paratransit facilities will be dependent on the duration of leases NJ TRANSIT will consider.

The literature review showed that even if the risks of locating and owning/leasing paratransit facilities are properly measured and addressed based on existing data, there will always be uncertainties in the future. As one of the reviewed studies indicated, the benefits and burdens of real estate decisions are often determined by uncertainties rather than risks. Therefore, it will be as important for this study to gain foresights about the future possibilities and changes as it will be to assess the risks on the basis of existing information.

SITE VISITS AND INTERVIEWS WITH REGIONAL FACILITY MANAGERS

Introduction

Site visits were made by the research team to all six facilities in the six Access Link operating regions between September 15 and October 10 of 2014. The site visits had three broad objectives: (a) to visually inspect the facilities; (b) to collect data about the facilities, including number of revenue and non-revenue parking spaces, number of employees of different types, dimensions of properties, floor space of structures, division of structures into different components, and environmental issues such as flooding; and (c) to conduct interviews with the facility general managers about issues that are important for the study, including advantages and disadvantages of NJ TRANSIT owning Access Link facilities and the status quo practice of leasing facilities from private landlords through providers. The data collected from the site visits on various physical characteristics of the facilities were used for the prediction of size and costs of future facilities. The interviews with the general managers of the facilities informed the research team about the past and present leasing arrangements, the processes involved in searching for and leasing properties, leasing costs, the advantages and disadvantages of the status quo practice of providers leasing properties from private landlords, and the potential effects of NJ TRANSIT owning some or all of the facilities and then leasing them out to service providers. During each of the site visits, a staff member from NJ TRANSIT ADA Division was also present. The key information collected through the interviews with the general managers of the facilities is summarized below.

Current Leasing Practices

Currently the service providers receive contracts from NJ TRANSIT for a maximum of seven years, of which the first three are confirmed and the remaining four are optional annual contracts. Private contractors first identify properties and subsequently bid for contracts with the intent of using that property as a facility. The selected properties usually have the required parking spaces and a structure that can be used for vehicle maintenance, administrative activities, training, etc. However, modifications within the

structures and installation of necessary computing and vehicle maintenance equipment are often necessary.

Several interviewed managers maintained that finding properties with desirable characteristics is an extremely difficult and time-consuming task. One manager mentioned that finding desirable properties is particularly difficult because the available properties often do not have large parking lots required by Access Link operations. He mentioned that most available properties have large structures and small parking lots, but Access Link facilities require large parking lots and small structures. Another manager mentioned that the company identified between 60 and 70 properties and made site visits to approximately 20 with other staff members as a part of a bid for a seven-year contract. The process of identifying properties to the providers' satisfaction and preparing bids takes several months. Some of the managers also mentioned hardships associated with demolition and/or reconstruction of facility structures at the end of contracts as landlords often demand properties to be returned in their original state. Finally, the research team learned that some landlords are reluctant to lease properties to service providers because the lease period is considered too short.

Factors Affecting Facility Location

All facility managers were asked about the factors they considered important when they look for potential properties to use as Access Link facilities. The factors most often mentioned were size of property, including revenue and non-revenue parking spaces; leasing cost; access to clients; sufficient access/egress space for revenue vehicles; zoning; and easy access to highways.

Growth of ridership is one of the most common reasons for facility relocation. Although in many instances, the same contractor has won back-to-back bids for the same region, facilities typically have to be relocated to a different part of the region because of growth and the need to expand. Growth of ridership increases the demand for revenue and non-revenue parking spaces over seven-year contract periods, forcing providers to find larger properties after every seven years. Several managers acknowledged that

relocating facilities after every seven years is burdensome to them as well as to NJ TRANSIT because of the additional efforts and resources.

Access to labor was not considered a serious issue by most facility managers. Only one manager mentioned having to pay higher wages because of the scarcity of skilled and reliable vehicle operators in the immediate vicinity. Parking requirement for vehicle operators and other workers at facilities is a serious concern for almost all facility managers.

Environmental Issues

The general managers of the facilities were also asked about environmental issues they might have encountered. Providers typically identify properties in areas that are zoned industrial. Only in rare instances rezoning had to be sought. The managers of only one facility mentioned facing a certain level of neighborhood opposition when the decision was made to establish the facility in a particular location. Although certain concessions had to be made to appease the residents of the neighborhood, it was possible to establish the facility in the selected location.

Flooding affected two facilities in the past. Both of these instances were during hurricanes. Considering the large size of the facilities, damage to property was minimal in both instances. Although the facility structures suffered some damage, only two revenue vehicles suffered serious damage during the two hurricanes. The damage to vehicles was modest, because during one hurricane, all vehicles were moved to another location far from the facility, and during the other hurricane, the vehicles were moved from one side of the facility to another.

Advantages of NJ TRANSIT Ownership of Properties

With the exception of one, all facility managers were highly supportive of NJ TRANSIT ownership of facilities. They recognized that large sums of funds are required each time a facility is moved from one location to another at the conclusion of a seven-year contract period. More importantly, they expressed concerns about the efforts needed on their part to identify properties, come into agreement with landlords, retrofit structures,

and install equipment in the beginning of a contract, and also the efforts needed to modify the facilities to their original state at the end of a contract. Finding properties is particularly difficult since properties with desired dimensions and parking space-structure size combinations are very rare. It is particularly difficult to find properties that can accommodate a large fleet of revenue vehicles and also accommodate a large number of employee vehicles. One manager mentioned, and some others agreed that NJ TRANSIT's ownership of facilities may increase the number of bids received (because of less effort on bidders' part), which in turn could potentially lower overall costs for NJ TRANSIT.

Conclusion

The site visits and interviews with the general managers of the facilities were highly insightful. In addition to allowing the research team to have a good understanding about the physical characteristics of the facilities and their surroundings, they provided valuable information about the bidding process, the contractual agreements, and the issues encountered by the providers. The most notable takeaway from the interviews with the managers was that identifying appropriate properties is difficult and the bidding process is arduous. For these reasons, the managers themselves are generally favorable to NJ TRANSIT owning the facilities and leasing them out to service providers through a bidding process. They are cognizant that resources are spent in the beginning and end of each seven-year contract period that could have been avoided if NJ TRANSIT owned the facilities. It was also mentioned that NJ TRANSIT's ownership may reduce overall costs for NJ TRANSIT as a larger number of service providers might bid for contracts due to reduced hardship on their part.

INTERVIEWS WITH NATIONWIDE TRANSIT AGENCIES

Introduction

Telephone interviews were completed with the ADA division officials from 11 transit agencies nationwide using a structured questionnaire approved by the Institutional Review Board (IRB) of Rutgers University. The objectives of the interviews were the following:

(a) to comprehend the propensity of owning and leasing ADA paratransit facilities by transit agencies
(b) to comprehend the major challenges encountered by transit agencies in making facility owning and leasing decisions
(c) to determine the processes followed and methods used by transit agencies in making decisions about owning and leasing facilities
(d) to determine the methods used by transit agencies to evaluate potential facility locations
(e) to comprehend the perceptions of transit agency officials regarding the advantages and disadvantages of owning and leasing facilities.

Table 2 shows the names of the transit agencies from which officials participated in the interviews. Three other agencies were contacted, but officials from those agencies either did not show interest or could not afford time for the interviews. All 14 agencies were selected after examining their characteristics in the National Transit Database (NTD) to ensure that they serve mostly urban and suburban regions like NJ TRANSIT and had significantly large fleets of ADA paratransit vehicles. A list of specific officials from the agencies was initially obtained from NJ TRANSIT, although the actual officials participating in the interviews were different in some cases from the original list because of staffing changes within the agencies. The officials from the selected agencies were first informed by email that they would be contacted by telephone by the research team. In subsequent phone calls, the officials were provided detailed information about the study and also requested to participate in interviews.

The interview script and the assent form were sent to all agencies that showed interest in participating in interview. Subsequently, the time and date for the interviews were set up and the interviews conducted. As shown in Table 2, all interviews were conducted between December 2014 and January 2015. For some of the agencies, several officials participated in the interview, whereas for other agencies, only one official participated. All interviewed officials held high-ranking positions within the ADA division of the agencies, mostly serving as administrator, manager, or director. All interviewed officials were fully knowledgeable of the agencies' ADA services and were able to provide detailed information about the paratransit facilities they owned and/or leased. Many also had insights about ADA paratransit beyond their own agencies.

Table 2 – List of agencies interviewed and dates of interview

Agency	Location	Interview Date
Access Services	Los Angeles, CA	12-12-2014
Dallas Area Rapid Transit	Dallas, TX	11-25-2014
Denver Regional Transportation District	Denver, CO	12-15-2015
King County Dept. of Transportation - Metro Transit	Seattle, WA	12-04-2014
Maryland Transit Administration	Baltimore, MD	12-19-2014
Massachusetts Bay Transportation Authority	Boston, MA	01-19-2015
Pace Suburban Bus Service	Chicago, IL	12-18-2014
Regional Transportation Commission of Southern Nevada	Las Vegas, NV	01-13-2015
San Diego Metropolitan Transit System	San Diego, CA	12-19-2014
Washington Metropolitan Area Transit Authority (WMATA)	Washington, DC	12-15-2014
Tri-County Metropolitan Transportation District (TriMet LIFT)	Portland, OR	01-19-2015

Leasing and Owning Practices of the Agencies

The number of facilities owned and leased by the interviewed agencies at the time of the interview is shown in Table 3. One can compare the distribution of owned and leased facilities by the other agencies with NJ TRANSIT's from the table (shown at the bottom of the table). The information in the table was collected through the interviews. A comparison of the collected information with NTD data showed some differences, potentially due to the NTD information being outdated. One can observe from Table 3 that six of the 11 agencies interviewed own at least one facility, whereas NJ TRANSIT currently leases all of its six facilities through service providers. The table also shows that most of the agencies that own their facilities also lease some other facilities through their service providers.

Table 3 – Number of facilities owned and leased by the interviewed agencies

Agency Name	By Agency		By Provider		Total Facilities
	Own	Lease	Own	Lease	
Access Services	0	0	0	6	6
Dallas Area Rapid Transit (DART)	1	0	0	0	1
Denver Regional Transportation District (DRTD)	0	0	0	5	5
King County Dept. of Transportation - Metro Transit	0	0	0	5	5
Maryland Transit Administration	0	0	1	2	3
Massachusetts Bay Transportation Authority (MBTA)	0	0	2	1	3
Pace Suburban Bus Service	2	0	2	9	13
Regional Transportation Commission of Southern Nevada (RTCSN)	2	0	0	0	2
San Diego Metropolitan Transit System (SDMTS)	1	0	0	0	1
Washington Metropolitan Area Transit Authority (WMATA)	1	0	0	4	5
Tri-County Metropolitan Transportation District (TriMet LIFT)	3	0	0	0	3
NJ TRANSIT	0	0	0	*6*	*6*
Total	10	0	5	38	53
Percent	19%	0%	9%	72%	100%

Table 4 shows additional information about the interviewed agencies, including geographic area served, number of revenue vehicles, current length of contracts with service providers, and whether taxi service is provided in addition to paratransit service. The information, collected through the interviews, is useful to compare the agencies' characteristics with NJ TRANSIT's. In terms of vehicle fleet size, NJ TRANSIT is not one of the largest, but it covers a larger geographic area than the other agencies. It is also evident that, unlike NJ TRANSIT, several agencies provide taxi service through service providers in addition to paratransit service.

It is evident from the Table 3 that leasing facilities through providers is the most common practice among the agencies. While some already own facilities, others are considering the alternative. Four agencies that own their facilities provided valuable information about facility ownership. Among these agencies, two purchased properties from private property owners for the purpose of establishing paratransit facilities, but two others established their facilities on land that was already owned by the transit agency. The facility owned by one of these two agencies is only a satellite facility where maintenance work is not performed. However, the interview revealed that the agency is

also actively pursuing the option of owning fully-equipped facilities. The facilities owned by the other agencies are fully equipped where vehicles are stored and maintained.

Table 4 – Some characteristics of the interviewed agencies

Agency Name	Area (sq. mi.)	No. of Paratransit Vehicles	Provider Contract Length	Provides Taxi Service
Access Services	1,500	680	5+1+1+1+1+1	Yes
Dallas Area Rapid Transit	700	108	2 pilot + 5	No
Denver Regional Transportation District	2,400	324	3+1+1	Yes
King County Dept. of Transportation - Metro Transit	2,000	2,000	5+1+1+1+1+1	No
Maryland Transit Administration	1,795	483	3+1+1	Yes
Massachusetts Bay Transportation Authority	700	972	5+1+1	Yes
Pace Suburban Bus Service	3,446	1,100	5+0 & 8+0	Yes
Regional Transportation Commission of Southern Nevada	Not Available	305	5+1+1+1+1+1	No
San Diego Metropolitan Transit System	716	173	5+2+2	No
Washington Metropolitan Area Transit Authority (WMATA)	1,500	600	5+1+1+1+1+1	Yes
Tri-County Metropolitan Transportation District (TriMet Lift)	575	268	2+1+1+1+1	Yes
NJ TRANSIT	*5,325*	*400*	*3+1+1+1+1*	*No*

The interviews with agencies owning facilities revealed several key pieces of information about the owned facilities. One agency has owned its property since 2006, while another purchased its property in December 2010 and built the facility on it within six months. Yet another agency has owned one facility since 1989, built another facility in 2007, and built yet another facility in 2010.

One of the agencies currently owning a facility mentioned purchasing the property from the landlord when the lease with the previous contractor expired. A reason for the purchase was that the property already had all the needed infrastructure and it was large enough to accommodate growth for another 15 to 20 years. The facility was serving at only half its capacity at the time of the interview.

Another agency currently owning a facility mentioned purchasing the property because of low land value due to its location. Apparently, the facility is located under the flight path to an airport, because of which the value of the property was lower than similar

properties in the area. The agency also leased an adjoining area that is environmentally sensitive. The agency did not purchase that land due to concerns about liability.

Some of the agencies that own their own facilities expressed dissatisfaction with their past leasing experiences. Some of them perceived leasing costs to be too high. One agency was also dissatisfied with the location of their previously leased facility. Some of the agencies also mentioned dissatisfaction with the way service providers maintained the facilities.

Although most agencies did not or could not provide information about the actual costs of facility ownership, one agency mentioned that it invested in the range of $8 to $10 million and expected to recover the full cost of the facility in approximately 12 years. The agency also mentioned that it would reduce 100,000 miles of deadhead trips annually and save approximately $125,000 per year by reducing non-revenue trip miles since the previous facility (before owning) was very far from where the clients are located.

A significant concern for agencies in making decisions about owning facilities is the accommodation of growth in the future. While one of the agencies owning its facility is currently operating at about 50% of its full capacity, another one is operating at about 80%. Two facilities owned by another agency are serving at full capacity, whereas another one is serving at less than full capacity. The official mentioned that the agency considers a horizon year for 15 to 20 years into the future when it comes to the capacity of owned facilities. It is reluctant to purchase properties larger than the size required in 15 to 20 years because of its concern about paying for unused capacity in the beginning.

While an agency official mentioned that its only owned facility is not shared with any other transit uses, it was learned from three other agencies that their facilities are shared with other transit uses. In one case, a part of the property is used as storage facility for the agency's rail system, in another case a part of the property is used by the agency's rural transit service, and yet another case, the agency's owned facilities are shared with fixed-route buses. Sharing owned facilities with other transit modes did not appear to be a major issue for most agencies. However, one official mentioned that their

paratransit operators became organized after they moved the facility to a property shared with fixed-route buses.

Officials from all four agencies who discussed in detail their facility ownership experience seemed highly satisfied. One interviewed official said he would “give ten out of ten” to their facility ownership experience. The others also expressed similar satisfaction. One added that the agency is considering owning additional facilities due to satisfaction with its past owning experience. Having greater control was often cited as a reason for satisfaction.

Some of the officials from agencies that do not currently own facilities also thought that ownership of facilities by transit agencies is a good idea. Many mentioned that they do not own facilities because they are simply following conventions set forth right after the ADA came into existence. By pointing out that almost all fixed-route bus facilities are owned by transit agencies, some mentioned that agencies have not gotten into the business of owning paratransit facilities because ADA paratransit is relatively new. However, since the ADA requirements for transit agencies are not likely to go away or change, they feel more and more agencies will gradually begin to own their paratransit facilities. One agency felt that it will not be able to purchase suitable properties if it does not act soon because of a high demand for land in urban areas, where most its clients are located. One agency official pointed out that transit has not wholeheartedly gotten into the practice of owning paratransit facilities because of the perception among officials that the funds are being provided by government.

Regarding the appropriateness of transit agencies owning paratransit facilities, one interviewee provided support by saying that “ADA is not going to go away,” and since most fixed-route bus facilities are already owned by transit agencies, there is no reason for them not to own paratransit facilities. Regarding facility ownership, one agency official mentioned that agencies should buy inexpensive land in $7-8 million range and build structures with desired specifications. The same official also mentioned that there was no need for agencies to build a “Taj Mahal” worth $40 million. Instead agencies should focus on functionality of owned facilities. When asked whether agencies should

own large or small facilities, most said it all depends on specific circumstances, but one said it may be more appropriate to start with a small facility on an experimental basis.

From the interviews, it was clear that different divisions of transit agencies have to act together if agencies are to be able to obtain properties for paratransit facilities. All agencies that currently own facilities mentioned that ownership of facilities was possible only because of collaboration between divisions, including the real estate division and the capital programming division. One interviewee mentioned that the ADA divisions of transit agencies are too small and too inexperienced to acquire facility properties on their own.

Despite the general support for paratransit facility ownership by transit agencies, not all interviewees expressed urgency about owning their paratransit facilities. One agency mentioned that there is no need to consider facility ownership because its historical leasing experience has been good. Another agency official mentioned that the agency has not seriously considered facility ownership because there is no external pressure to do so.

In sum, the interviews revealed that the agencies that own some of their facilities are highly in favor of owning facilities and they are highly satisfied with facility ownership. Some of the agencies that currently do not own any facility are also in favor of owning facilities. However, two agencies that currently do not own facilities seem to be satisfied with not owning facilities. One of those agencies seemed concerned that facility ownership may increase total costs because of additional costs on maintenance and labor. That agency also mentioned the potential for abuse of properties if agencies owned the facilities.

Location of Facilities

All interviewees were asked several questions about the location of paratransit facilities. These questions were about the methods they used for determining facility location, the factors they considered to be important for facility location, and their satisfaction with the location of their current facilities.

The interviews indicated that all agencies are concerned about having good locations, but only a few mentioned using rigorous methodologies to identify optimal locations. One agency mentioned that its Information and Technology division used location models to assess the appropriateness of locations for potential facilities. Another agency also mentioned conducting location analysis, but the analysis for the agency was conducted by its capital programming division for fixed-route bus facilities. Some other agencies mentioned using Trapeze to determine appropriateness of locations in terms of proximity to clients or reducing deadhead trip mileage. However, none of the agencies provided access to the models they used.

Most agencies mentioned identifying facilities instead of first identifying locations and then looking for facilities in an ideal location. The practice appeared to be commonplace because of the scarcity of properties with the desired characteristics. One agency exemplified the property scarcity problem by mentioning an instance when four different companies submitted contract bids by proposing the same property for facility establishment. Another reason for the agencies not undertaking serious location analyses is that since the ADA, they have always gone by available properties in the market instead of identifying locations. Despite not undertaking any rigorous methodological analysis for facility location, most agencies indicated that they are satisfied with the current location of their facilities. Only one agency mentioned that one of its facilities could be a little closer to its clients than its current location. It appeared overall that the agencies have an intuitive feeling about good locations.

Among the agencies that own facilities, one mentioned conducting an analysis to examine how much deadhead mileage could be reduced by moving the facility to another location. One agency that purchased the property formerly leased by its own service provider felt that the property was optimally located vis-à-vis its clients. Another agency that mentioned that one of its owned facilities could perhaps be located somewhat closer to clients compared to its current location felt that being a little far from clients is not a significant issue because of the other benefits from owning facilities. It appeared from the interviews that the agencies have a good sense about a location’s appropriateness because of past experience running operations.

From the interviews, the following location characteristics appeared to be important for the agencies:

a) Low deadhead trips and mileage
b) Being in the middle of clients
c) Close proximity to freeways
d) Multiple routes to freeways
e) Ease of entering and exiting the facility by paratransit vehicles
f) Sufficient employee parking
g) Good access by public transit to employees

Among the above characteristics, the first two are interrelated. They also appeared to be the most important considerations for the agencies. Although several interviewees mentioned the importance of reducing non-revenue miles and hours, one interviewee mentioned that it is more important to be generally closer to clients rather than trying to reduce non-revenue miles and hours because dispatching programs reduce the first and the last trips' duration.

Freeway access was also considered to be very important by all agencies. The importance of employee parking was emphasized more by agencies in places that are generally considered automobile oriented, whereas transit access to employees was emphasized by agencies located in places with a high level of transit availability. One agency official mentioned that instead of looking at location characteristics alone, agencies have to look at all characteristics of the facilities, including cost, capacity for vehicle storage, et cetera.

In sum, the interviews revealed that most agencies are aware of the good location characteristics for facilities, but using methodological tools for identifying locations is not very common. Even among the agencies that use methodological tools, using Trapeze to reduce deadhead trips appeared to be the most common.

Environmental and Zoning Issues

All interviewees were asked about their experiences dealing with environmental and zoning issues related to paratransit facility location. It appeared from the interviews that most agencies leave it to the providers to deal with those issues. That is not surprising because most facilities are leased by the providers. Most mentioned that they require the providers to demonstrate that the properties are not hazardous.

Although environmental issues did not appear to be a great concern for most agencies, it seems to be a greater concern for the agencies that decided to own facilities. The interviews indicated that transit agencies consider liability issues when they decide to own a property. For example, one agency mentioned that instead of purchasing an environmentally sensitive land adjacent to its paratransit facility, it decided to obtain a long-term lease on the property from the landlord.

Encountering zoning issues did not appear to be common for most agencies. However, some agencies mentioned having to forgo desired properties because of zoning incompatibility. Yet it appeared that zoning issues have not greatly affected the agencies. The same can be said about neighborhood complaints, but that may be because most agencies have left those issues to be dealt with by the service providers.

Conclusion

The interviews with the transit agency officials showed considerable support for paratransit facility ownership by transit agencies even though the most common practice continues to be leasing facilities through providers. The agencies that decided to own facilities are clearly in favor of the idea of agencies owning facilities instead of leasing. They are highly satisfied with their facility-owning experience. In addition to potential future savings from facility ownership, they are pleased with the control they have over owned facilities. Some of the other agencies that currently do not own facilities also endorse the idea of agencies owning at least some of the facilities. The agencies that currently do not own facilities but endorse the notion of ownership are located in large and growing metropolitan areas. Some of these agencies are concerned that if they do not purchase properties soon, they may not be able to find

desirable properties in the future because of population growth in the areas where facilities should be ideally located.

The agencies that own paratransit facilities indicated that ownership was possible only because of collaboration between different divisions within the transit agencies, including the real estate and capital programming divisions. The interviews also indicated that other divisions within the agencies often assist the ADA division with identifying desirable locations for facilities.

It was evident from the interviews that conducting rigorous methodological analysis to identify suitable facility locations is not a common practice. Most agencies first identify what is available in the market and then assess the facilities in terms of access to clients, deadhead trips, proximity to freeways, et cetera. Some interviewees indicated that they have no choice but acquire what is available in the market because of the scarcity of suitable properties. Yet the agencies seem to have an abstract idea about the appropriateness of locations and the factors that are important for facility location.

APPROPRIATE LOCATIONS FOR ACCESS LINK FACILITIES

Introduction

One of the primary objectives of this study is to identify locations within each of the six Access Link operating regions that are desirable for facility location. The objective of this effort was to provide NJ TRANSIT information about the desirable locations so that the agency's future owning and leasing efforts can include an assessment of identified properties in relation to the identified locations. Although the service providers are cognizant of some of the factors that are important for facility location, like many other parts of the country, they have not historically made any effort to identify appropriate locations through a quantitative method.

The interviews with agencies from different parts of the country revealed that the factors that are the most important for facility location are non-revenue hours, proximity to clients, and proximity to major highways. The general managers of the six Access Link facilities also maintained that these are the most important factors for paratransit location. The research team made an effort to determine if desirable locations could be identified on the basis of non-revenue hours, defined in this study as the time traveled by an Access Link vehicle from a facility to the first pick-up of the vehicle run and the time traveled by a vehicle from the last drop-off to the facility. Trip data for a 20-month period were analyzed to examine if geographic size and other characteristics of the six operating regions could be empirically associated with non-revenue hours, but the effort indicated that variations of average non-revenue hours per vehicle run among the regions are very small. Upon further inquiry, the research team learned from NJ TRANSIT that the dispatching software optimizes vehicle runs in such a way that the first pick-up and the last drop-off are often closest to the facility so that non-revenue hours and miles are minimized for every vehicle run. It was therefore concluded by the research team that because of the specific dispatching algorithm, the non-revenue segment of the vehicle runs would always be very short irrespective of where the facility is located. With that determination, it was decided that the effort should focus on identifying desirable locations for the regions in terms of proximity to pick-up and drop-off locations and proximity to freeway ramps.

Access to Pick-ups, Drop-offs, and Freeway Ramps

This analysis was conducted by using data for approximately 1.7 million trips made by Access Link vehicles in the six operating regions within a 20-month period beginning in October 2012. The dataset, obtained from NJ TRANSIT, contains the exact location coordinates of the pick-ups and drop-offs recorded by Global Positioning System (GPS) installed in Access Link vehicles. Analysis began with visual inspection of maps showing the pick-up and drop-off locations. Figure 6 schematically shows the pick-up locations for the entire service area covering all six Access Link operating regions. Similar maps were prepared for each region for both pick-ups and drop-offs. Although the maps are informative about the general location of pick-ups and drop-offs, they do not quantitatively demonstrate the desirability of various locations within the service regions. Visual inspection is also inadequate because a large number of pick-ups and drop-offs occur at the same address. Yet another problem with visual inspection is that it does not take into account the travel time from different locations to the pick-up and drop-off points.

To quantitatively estimate the attractiveness of locations based on pick-ups and drop-offs, each census block group within a region was considered a location. A block group is a census geography that is smaller than a census tract but larger than a census block. The number of block groups in each Access Link region is shown in Table 5.

Table 5 – Number of census block groups in the six Access Link operating regions and beyond

Access Link Region	Block Groups	Percent
Region 2	902	14.3
Region 3	528	8.4
Region 4 (4 East)	1193	18.9
Region 4 (4 West)	278	4.4
Region 5	1640	25.9
Region 6	1517	24.0
Not in service area	262	4.1
Total	6320	100

The analysis estimated the attractiveness of each block group within a region for facility location. The total number of block groups in the entire state of New Jersey is 6,320, out of which all but 262 are located within the six Access Link operating regions.

It is evident from the table the total number of block groups is the largest in Region 5, closely followed by Region 6. In contrast, Region 4 West has the fewest block groups. The number of block groups in Regions 5 and 6 is large because of the relatively large geographic area of the two regions and also the relatively small size of block groups in highly urbanized areas.

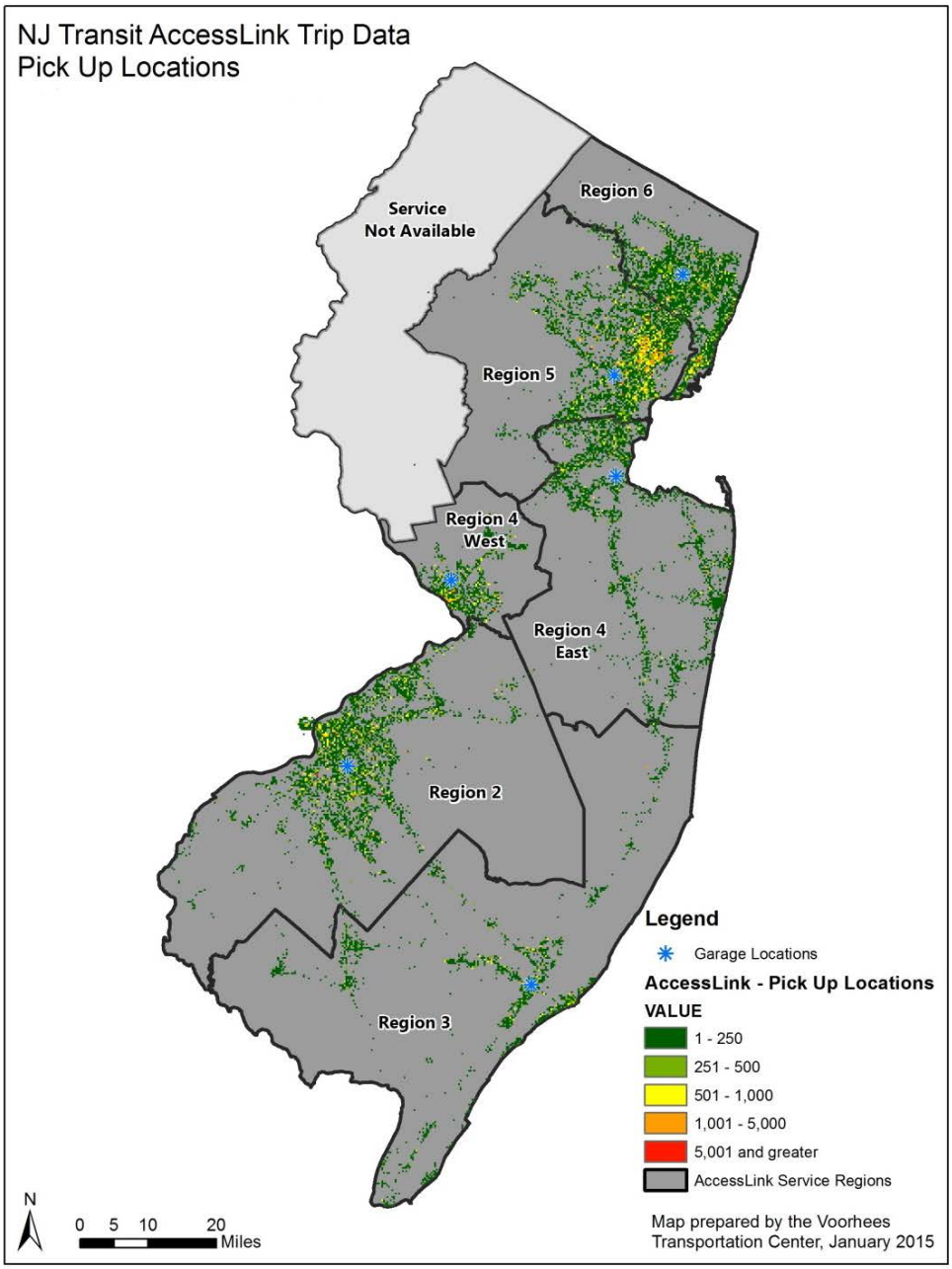

Figure 6. Pick-ups in the Access Link regions

The quantitative measure used to estimate the relative attractiveness of the block groups within each Access Link Region is called accessibility. Although accessibility of places or locations can be estimated by using several methods, for the sake of simplicity, only the three following measures were tested:

$$A_i = \sum \frac{P_j}{T_{ij}} \quad (1)$$

$$A_i = \sum \frac{P_j}{T_{ij}^2} \quad (2)$$

$$A_i = \sum \frac{\sqrt{P_j}}{T_{ij}} \quad (3)$$

In the above measures, A_i refers to accessibility of block group *i*, P_j refers to number of pick-ups at location *j*, T_{ij} refers to the travel time between block group *i* and Pick-up location *j*. Since block groups are areas whereas pick-up locations are addressed or a specific points on a map, the travel times between the two were estimated from the centroid of the block groups and the pick-up locations. The ArcGIS Network Analyst was used to estimate the travel times with the 2012 road network for New Jersey.

In all three equations above, the larger the value of accessibility of a block group relative to the other block groups in the region, the more attractive the block group is for facility location. That is because in all three equations, number of pick-ups is the numerator and travel time between block groups and pick-up locations is the denominator. According to all three equations, when pick-ups are high, and/or travel time is low, accessibility is high. However, compared to Equation 1, travel time is weighted more heavily in Equation 2, and pick-ups are weighted less heavily in Equation 3.

It should be noted that additional analysis was undertaken by replicating the models above, where the pick-ups were replaced by drop-offs. However, since pick-ups and drop-offs typically happen at the same locations, the results were almost identical. For that reason, only the results from the analysis of pick-ups are presented in this report. It should also be noted that a comparison of the results by the three models above showed that the relative attractiveness of the block groups remains similar when accessibility is measured by the three models (although Model 2 places greater emphasis on travel time and Model 3 places lower emphasis on number of pick-ups).

Therefore the results and maps provided to the project sponsors pertain to the analysis by Model 1. The measured accessibility of block groups in Region 5 is shown for illustration in Figure 7. Similar maps were prepared for all six operating regions.

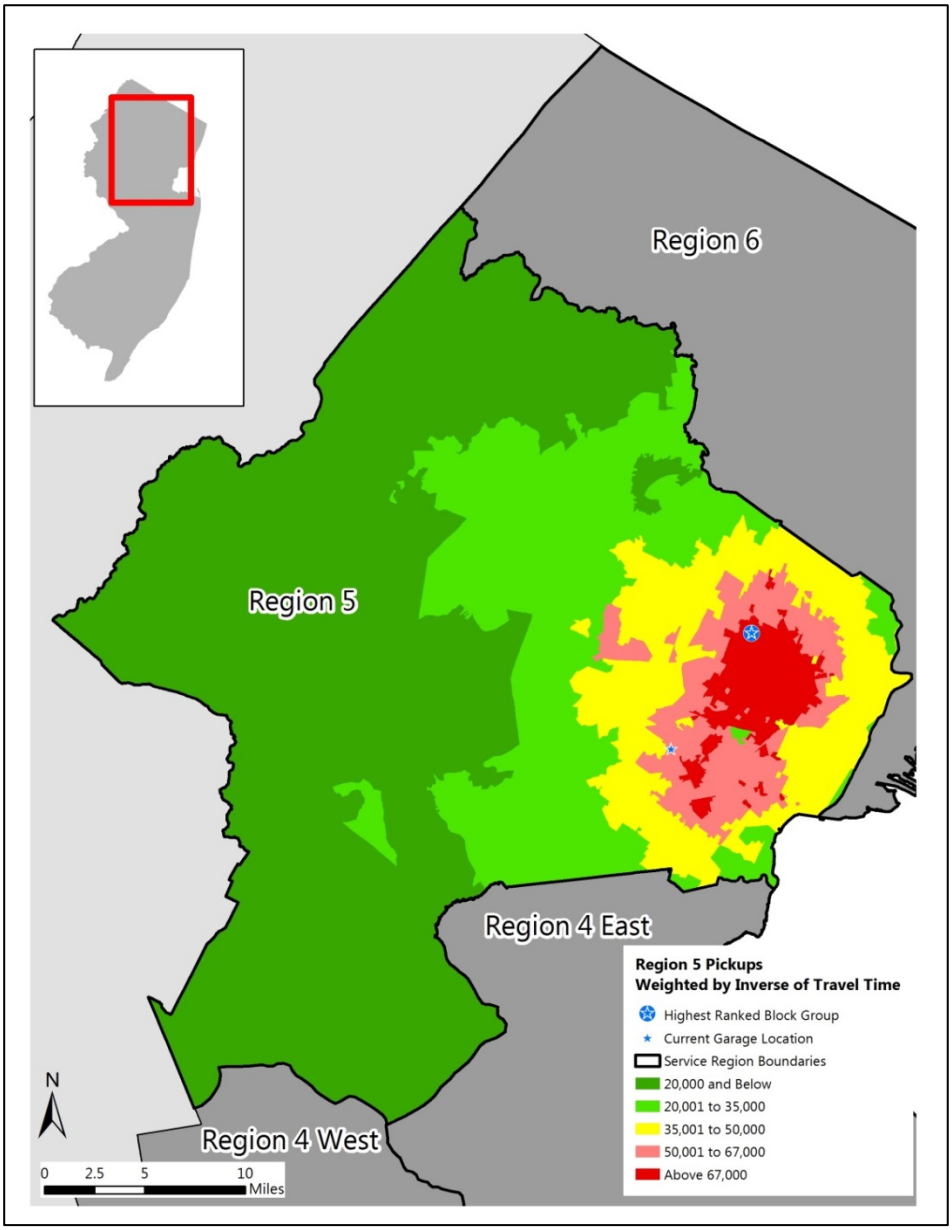

Figure 7. Accessibility to pick-ups for block groups in Region 5

It is evident from Figure 7 that the eastern part of Region 5 is far more desirable than the western part for facility location because of the former's close proximity to Access Link pick-ups and drop-offs. The map also shows that the current leased facility for the

region is located in an area with high accessibility but it is around six miles south of the concentration of block groups with the highest accessibility in terms of pick-ups and drop-offs.

For the identification of appropriate locations, access to client pick-ups and drop-offs was one of two criteria considered. The other criterion was access to freeways. Based on the interviews with the Access Link facility managers and transit agencies nationwide, as well as further discussions with NJ TRANSIT ADA Division, the research team decided that block groups located within five minutes of freeway ramps should be considered as areas with high a high level of access to freeways. For reference, five of the six Access Link facilities are currently located within five minutes of freeway ramps. The travel times between the freeway ramps and the block group centroids were estimated by the ArcGIS Network Analyst.

In the next step of the identification process, the block group maps showing access to clients and access to freeway ramps were combined so that the block groups with a high level of access to clients and also a high level of access to freeway ramps could be identified. Although access to clients was estimated for all block groups in the Access Link service area, for the sake of simplicity, only those block groups were considered to have high client accessibility if their estimated accessibility was within the top 20% of the block groups within the region.

In the final step of the effort, land use maps from the New Jersey Department of Environmental Protection were overlaid on the combined maps of access to clients and access to freeways to identify the areas with industrial uses that overlapped with a high level of access to clients and freeway ramps. It was important to identify the areas with industrial land uses because all current Access Link facilities are located in industrial areas and it will be difficult to locate Access Link facilities in areas with other types of land uses. The maps showing access to clients, access to freeways, and land uses for the six operating regions are presented in Figures 8 through 13.

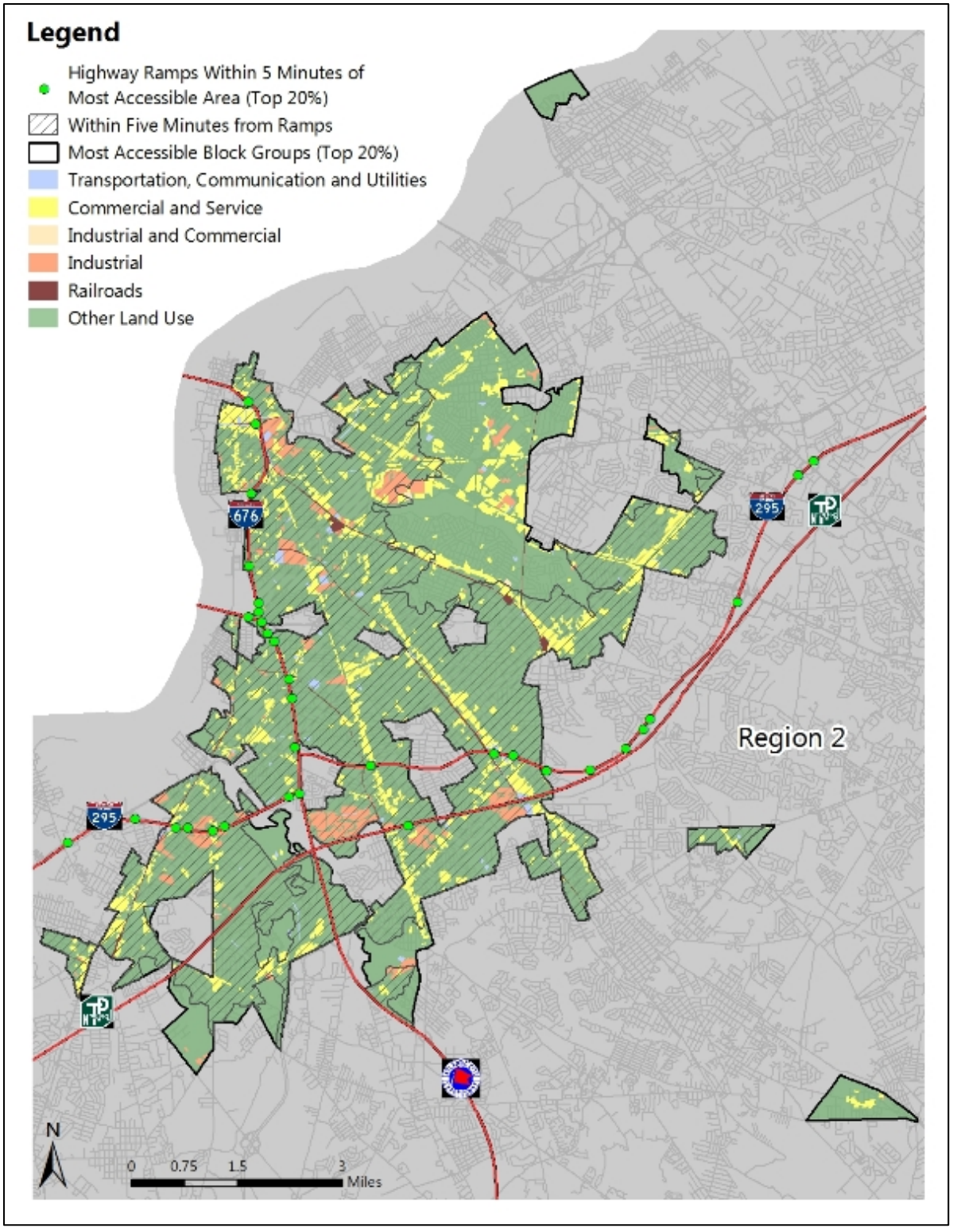

Figure 8. Land uses in block groups with high access to clients and freeways, Region 2

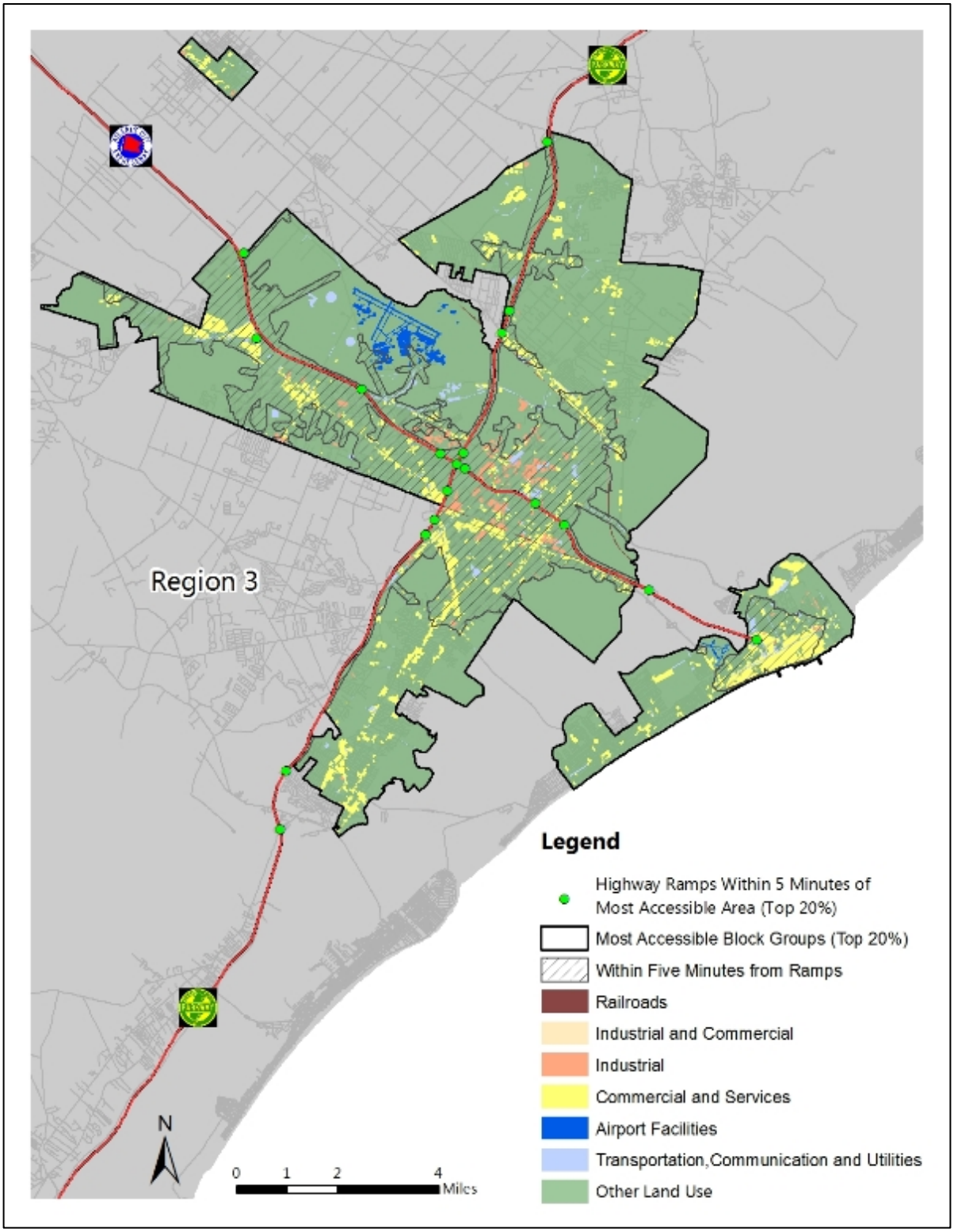

Figure 9. Land uses in block groups with high access to clients and freeways, Region 3

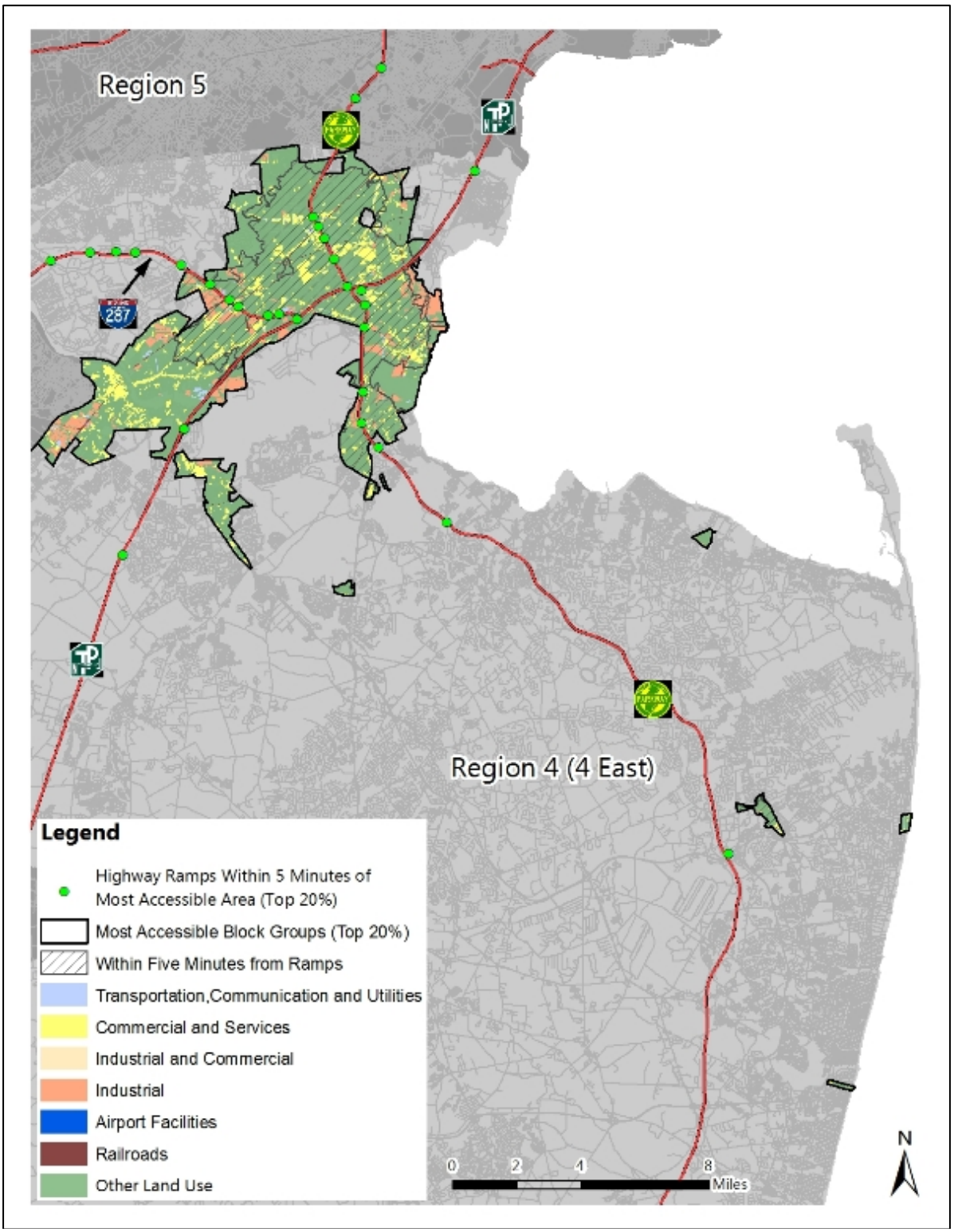

Figure 10. Land uses in block groups with high access to clients and freeways, Region 4 East

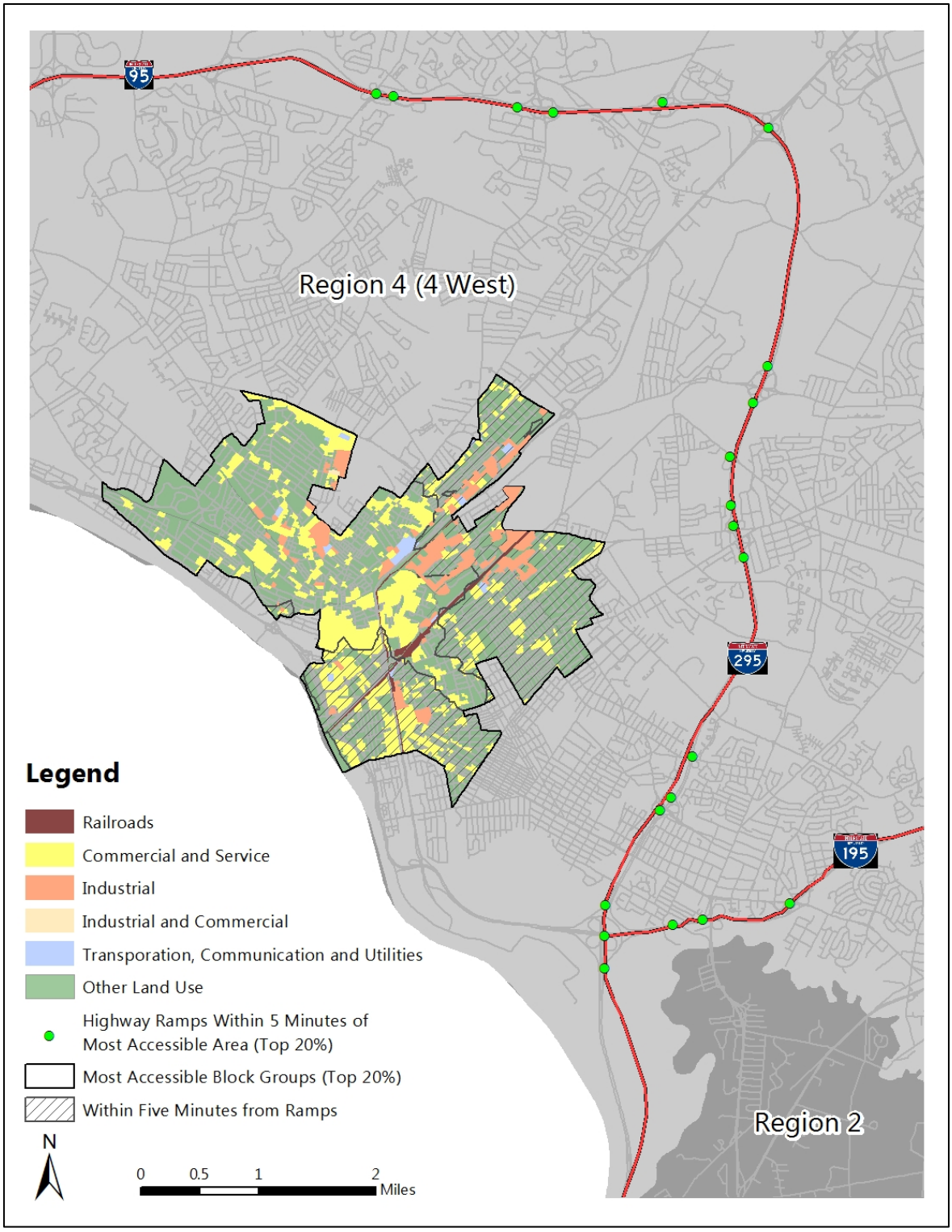

Figure 11. Land uses in block groups with high access to clients and freeways, Region 4 West

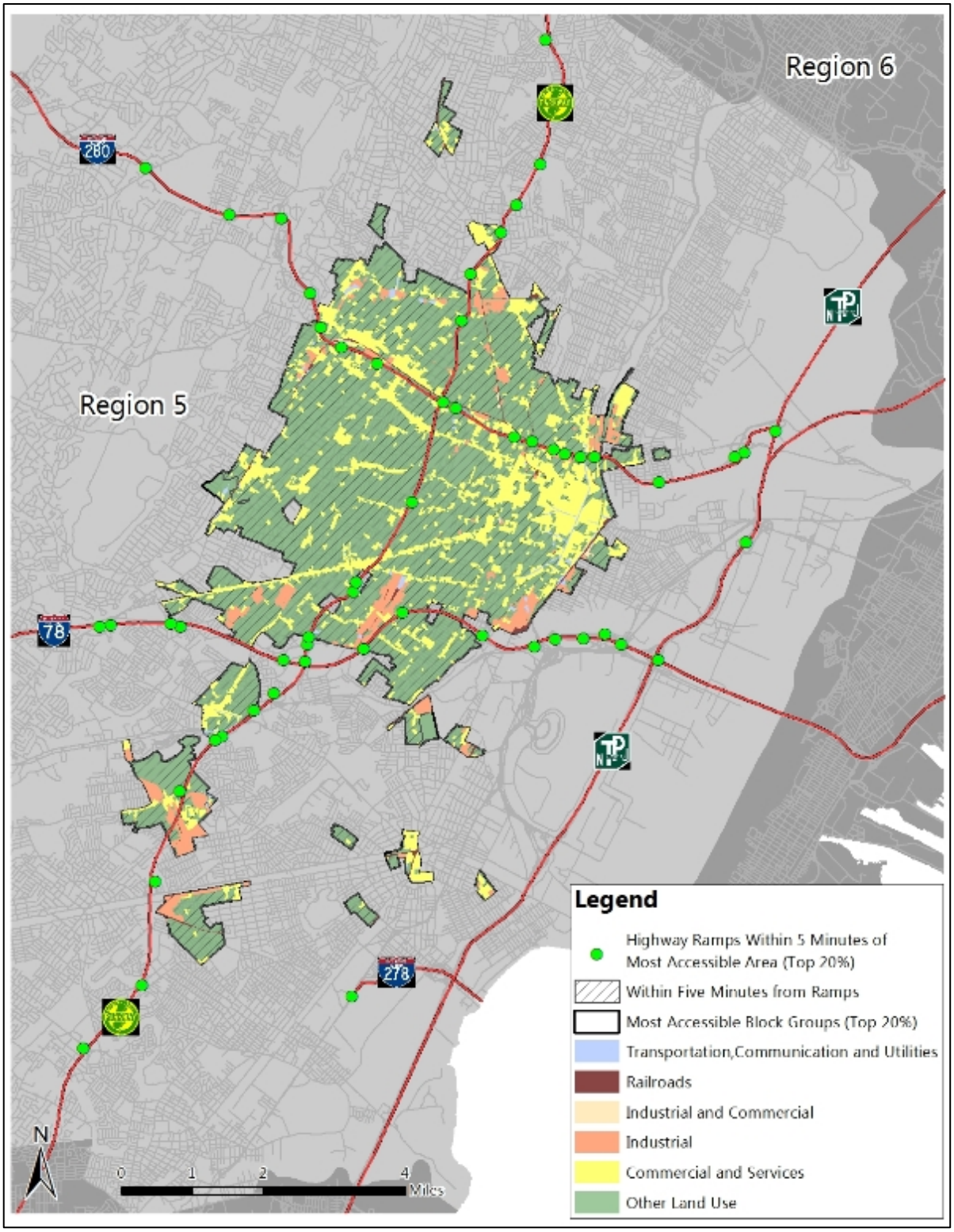

Figure 12. Land uses in block groups with high access to clients and freeways, Region 5

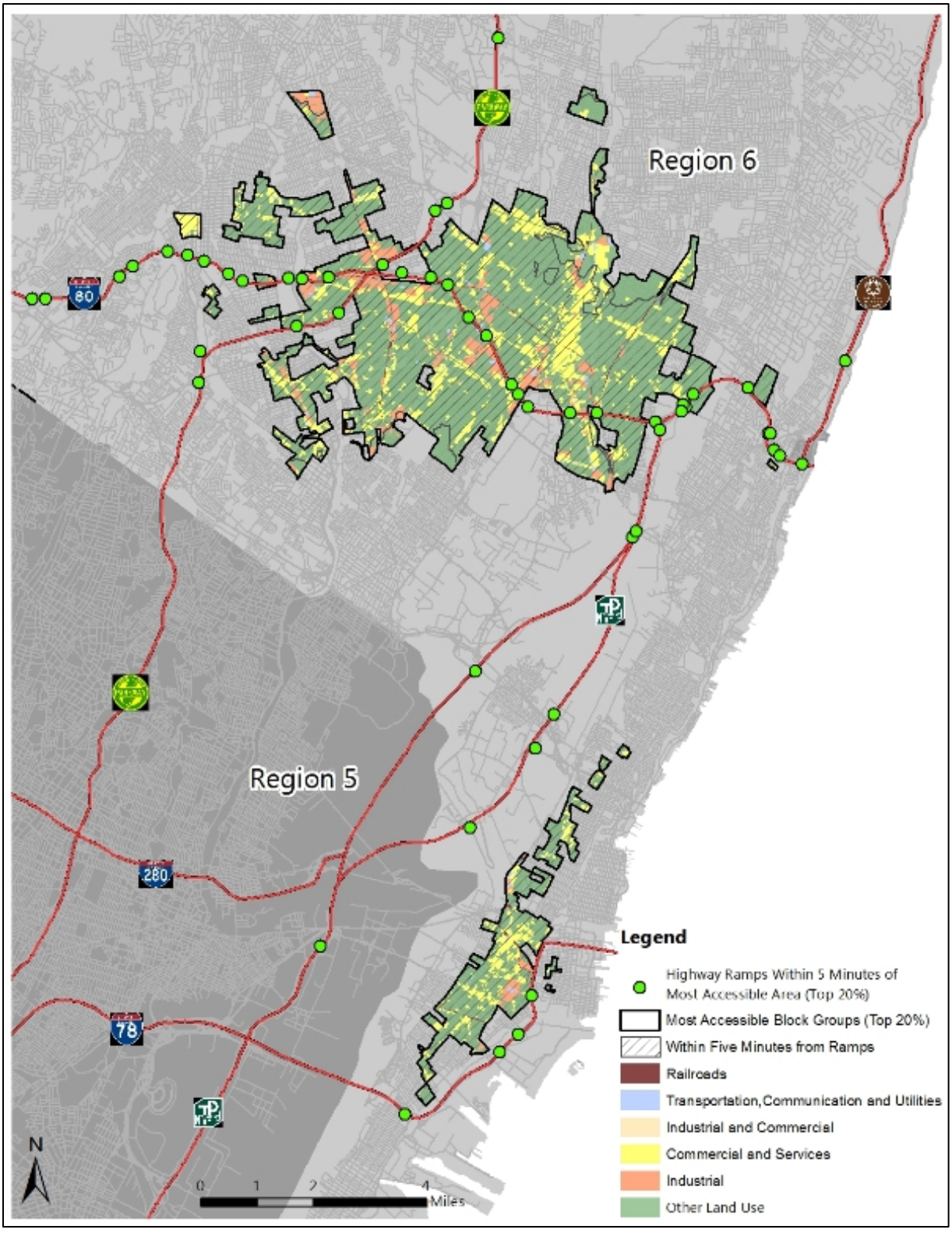

Figure 13. Land uses in block groups with high access to clients and freeways, Region 6

Conclusion

As the interviews with regional facility managers and transit agency officials indicated that it is rare for transit agencies and service providers to conduct location analyses to identify areas that are attractive for paratransit facility location, an effort was made by the research team to test three versions of a model to identify attractive locations within each of the six Access Link operating regions by taking account proximity to pick-ups and drop-offs as well as access to freeway ramps. The ArcGIS Network Analyst was used to estimate travel time between block group centroids and pick-up locations and freeway ramps. The GIS shapefiles containing the results of the analysis were provided to the project sponsor.

Several important observations can be made from the analysis. First, block groups within each region have varying degrees of accessibility to pick-up and drop-off locations. In all six operating regions, there are concentrations of block groups with very high levels of accessibility to pick-ups and drop-offs. That is because pick-ups and drop-offs are concentrated in the areas where the clients live and the places they commonly visit. Second, there is a significant overlap between the block groups that have the highest level of accessibility to pick-ups and drop-offs and the block groups that have a very high level of access to freeway ramps in some regions, whereas the overlap is noticeably lower in other regions. For example, almost all block groups in Regions 5 and 6 that fall within the top 20% in terms of access to pick-ups and drop-offs are within five minutes of freeway ramps. In contrast, almost half of the block groups in Region 4 West and Region 3 that fall within the top 20% in terms of access to pick-ups and drop-offs are not within five minutes of freeway ramps. The reason for some regions having greater overlap than others is that freeways are more ubiquitous in some regions than others.

Perhaps the most important observation from the analysis is that despite each region having reasonably large areas with overlaps between a high level of accessibility to pick-ups and drop-offs and a high level of access to freeways, industrial land is limited in those high-access areas in all six operating regions. Figures 8 through 13 bear testimony to this fact. Due to the limited availability of industrially zoned properties,

identifying properties in the highly accessible areas may be challenging. For that reason, it would be appropriate for NJ TRANSIT to scan the availability of properties on a regular basis if it intends to acquire one or more properties for Access Link facilities.

Finally, it is worth noting that only a part of the research products from accessibility analysis are presented in this report. The GIS shapefiles and accompanying technical documentation should assist NJ TRANSIT in assessing locational advantages and disadvantages of any property that is considered for owning or leasing.

COMPARISON OF FACILITY OWNING AND LEASING COSTS

Introduction

Considering that one of the most important objectives of this research is to examine the costs of owning and leasing paratransit facilities for NJ TRANSIT, analytical efforts were undertaken in this section to compare the owning and leasing costs of five properties that already contain the required structures and parking spaces. Two of these properties are currently leased by service providers in two separate Access Link regions, whereas the other three properties are being considered by a service provider as potential for a facility for the next seven years. Thus the comparison of owning and leasing costs is fairly realistic for all five properties. Detailed information on costs of owning and leasing was collected from NJ TRANSIT, the service providers for the regions, and an experienced registered professional realtor who deals with industrial and commercial properties in the study area.

Estimation of Costs

At the outset, past and present leasing costs of the facilities currently leased by the service providers in the six operating regions were obtained from the ADA Division of NJ TRANSIT. The datasets included detailed breakdown of the costs, including annual rent, utilities, labor, operations, and taxes, for each contract period. Since NJ TRANSIT will have to continue to incur certain types of costs (e.g., operations and labor) even if it decides to own its facilities in the future, only those items were included as leasing costs that could be avoided if NJ TRANSIT owned the facilities. For the three properties that are not currently being leased by the provider but a provider is considering them for leasing in the immediate future, the potential leasing costs for those properties were obtained from the provider.

Since the six properties that are currently being leased and the properties that are being considered for lease are not in the market for sale, the potential sale price of the properties was obtained from a registered realtor, who used land value and the value of the structures within the properties to estimate the total price of the properties with the assumption that the selected properties are similar to properties sold in the neighboring

area. The total sale price of the properties was used as the cost of owning the properties.

A spreadsheet-based cost model was developed to compare the leasing and owning costs over a 25-year period, from 2016 to 2040. It was assumed for the comparison that the annual discount rate would be 3%. Another assumption was that the lease cost for the properties would go up by a certain amount every eighth year because of the current practice of seven-year contracts. The specific amount of increase in the eighth year was determined by the historical increase in lease costs.

Although detailed cost information on leasing and owning was obtained for the current facility properties in all six operating regions, it was decided that the comparisons would be made only for two existing facilities and the three facilities currently being considered for leasing. Cost comparisons were not made for the existing facilities in the other regions because it was felt that the leasing costs and/or sale prices were not reflective of reality for various reasons (e.g., a facility being split between two properties, a service provider acquiring larger than required property and giving NJ TRANSIT discount for allowing to store school buses in a part of the facility, employees having to park outside a facility because of capacity issues, etc.).

Table 6 – Summary of findings from comparison of leasing and owning costs of five properties

Property Location	Break-even year	Total savings from owning by 2040 (in 2015 dollars)
Union, NJ	11	$10,613,000
Clifton, NJ	11	$12,314,000
New Providence, NJ	19	$6,004,000
Newark, NJ	16	$9,014,000
Elmwood Park, NJ	9	$13,668,000

The spreadsheet models comparing the costs of owning and leasing the five properties was presented to NJ TRANSIT in electronic format so that the model could be tested by changing the assumptions and the input values. The basic model results are summarized in Table 6. The break-even years for two facilities are shown in Figures 14

and 15 for illustration purposes. It should be noted that the five facilities are described only by the name of the municipality where they are located instead of the actual address because of the confidential nature of the information obtained from a service provider's proposals.

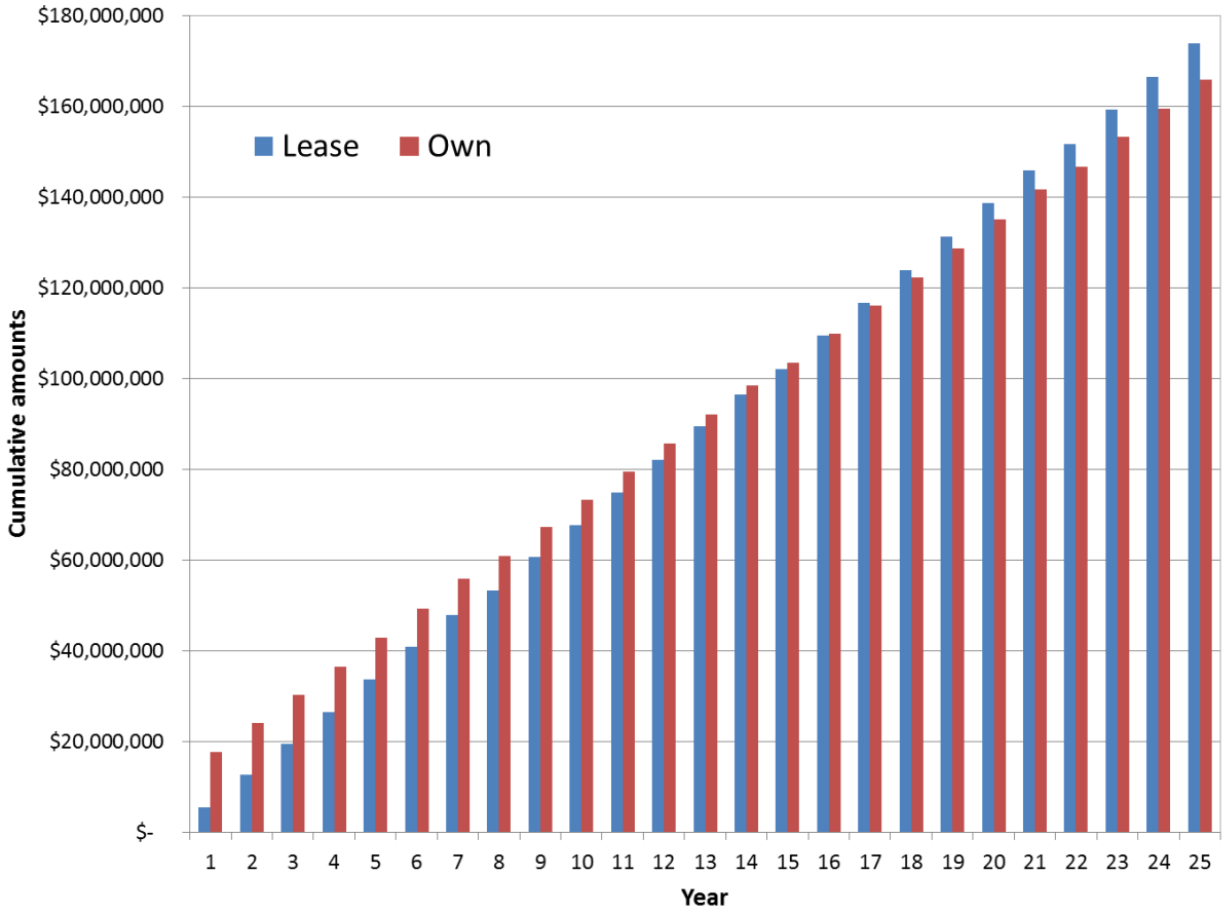

Figure 14. Comparison of owning and leasing costs for a facility in Newark (Region 5)

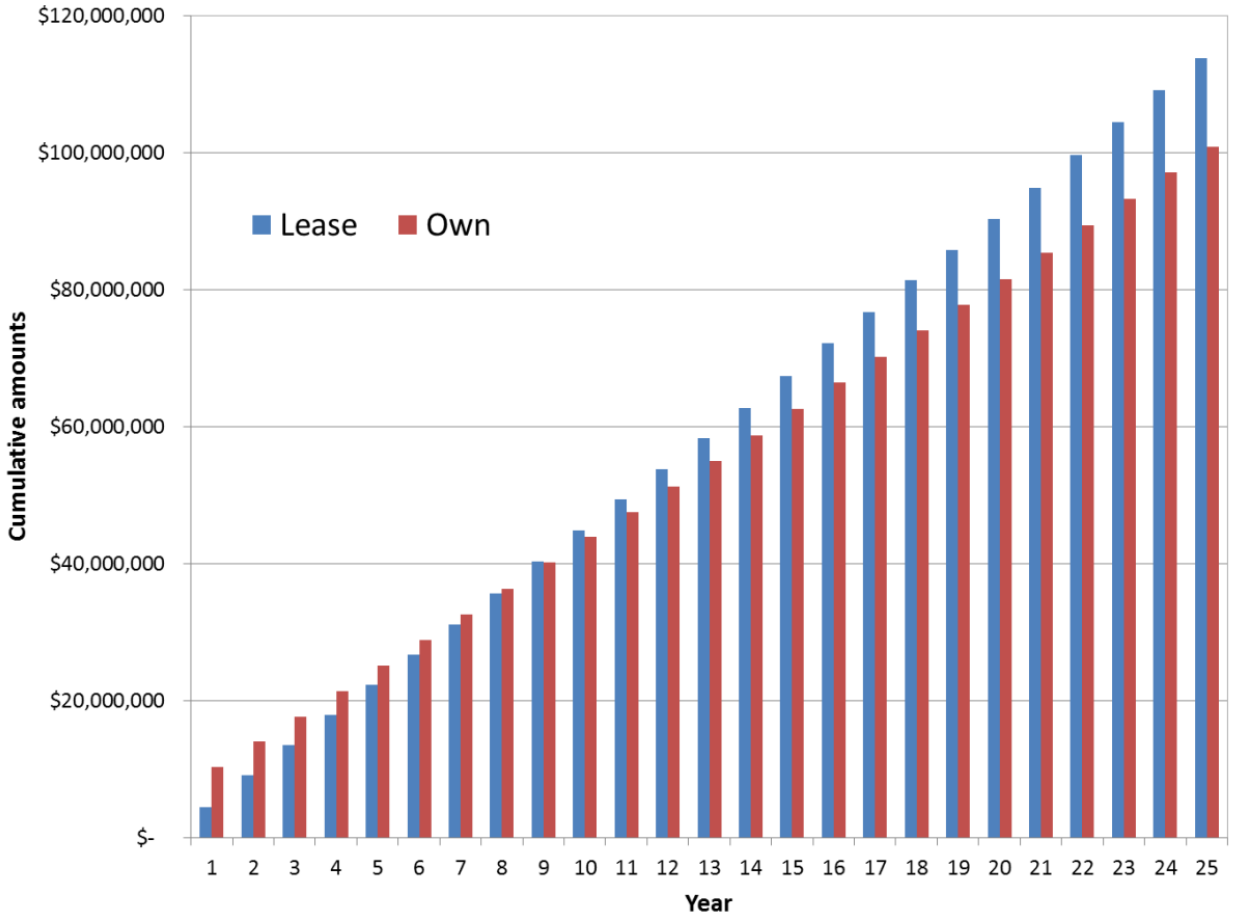

Figure 15. Comparison of owning and leasing costs for a facility in Elmwood Park (Region 6)

Conclusion

The results presented in Table 6 show that owning will break-even over leasing costs for all five facilities in less than 20 years, although the break-even years vary significantly between the five properties. The savings from owning also vary significantly between the properties because they are directly related to the break-even years. When the break-even year is small, the savings are large because savings occur only after the break-even year. A few other observations from the analysis are important. First, if NJ TRANSIT owned and held the properties beyond the horizon year of 2040, the savings could be larger than shown in Table 6. Second, the analysis revealed that the elimination of taxes in the owning scenario contributes significantly to savings from owning. Third, the break-even years found through the modeling effort for the five

properties are in a similar range as that mentioned by another agency during the nationwide interviews (12 years). Finally, based on various iterations of the model, the research team concluded that achieving break-even in less than ten years could be unrealistic. Although the break-even year for one property was found to be nine years, it may be because of distorted lease costs or sale price due to special circumstances involving the property.

On the whole, the model results showed that owning a facility could be beneficial in the long run, even though a substantial amount of funds would be required upfront to purchase properties. The following section of the report provides useful insights about the potential price of properties in the six operating regions.

POTENTIAL COST OF NEW FACILITIES

Introduction

This section describes an effort to assess the costs of properties that could be used as Access Link facilities in the six operating regions. This assessment would be particularly useful if NJ TRANSIT wanted to purchase compatible properties and build the required parking lots and structures. The effort began with an assessment of industrial properties in the Costar database that were sold during the period 2000-2015. Data on only industrial properties were assessed since all Access Link facilities are currently located on industrial land. Costar is a private data vendor and NJ TRANSIT currently maintains a license to use the data it provides. The downloaded dataset contained detailed information on 6,084 properties throughout New Jersey.

A simultaneous effort was undertaken to forecast the future size of facilities in the six operating regions. For the purpose of forecasting, past data on ridership and revenue vehicle growth was used. Per recommendation of the NJ TRANSIT ADA Division, forecasts were made up to the horizon year of 2040.

The first section below describes why purchasing land and building structures can be attractive for NJ TRANSIT. The subsequent sections summarize the methods used and the results from the analysis of future facility construction costs. The spreadsheet models used to estimate the costs have been provided to the project sponsors.

Attractiveness of Purchasing Land and Building Structures and Parking Lots

An advantage of purchasing land and constructing structures and parking lots is that the facility can be designed specifically to meet the functional and other needs of the agency. On the other hand, purchasing a property that already has the required structure and parking lot could reduce costs. However, finding properties that already have parking lots that can accommodate a large fleet of revenue and non-revenue vehicles could be difficult.

The review of sold properties in the Costar database showed that industrial properties generally have much smaller number of parking spaces than what is required for

Access Link facilities. For illustration, Table 7 shows the mean and median number of parking spaces in the sold industrial properties in the Costar database. The table also shows the number of parking spaces required for the facilities in 2015. By comparing what is required with the mean and median number of parking spaces in the Costar database, one can comprehend the potential difficulties in finding properties with parking lots with appropriate size.

Table 7 – Mean and median parking spaces in the Costar industrial properties sold in 2000-2015 compared with parking spaces required at the Access Link facilities

	Number of parking spaces in the Costar database on sold industrial properties		Number of revenue and non-revenue parking spaces required at facilities in 2015
	Mean	Median	
Region 2	101	78	207
Region 3	19	15	69
Region 4 East	61	50	140
Region 4 West	33	20	85
Region 5	110	60	315
Region 6	104	90	171

It is evident from Table 7 that the mean number of parking spaces in the sold properties is less than half of what is currently required for the facilities in all regions except Region 6. This comparison illustrates the contention of facility managers that finding properties that can accommodate large Access Link vehicle fleets is extremely difficult. It will be even more difficult to find properties that can accommodate the forecast number of vehicles. Because of this difficulty, purchasing large vacant properties and constructing structures and parking lots may be a more pragmatic option than looking for properties that already have appropriately large parking lots.

Forecasting Facility Size

For the forecasting of facility size in the year 2040, it was necessary to use past data of the growth of Access Link ridership and vehicles. The monthly ridership data for each of the six operating regions was available from NJ TRANSIT for the period 1998-2015, whereas vehicle growth data was available for the period 2000-2015. However,

because of the re-configuration of Region 4 in 2004, separate vehicle growth data were not available for Region 4 East and Region 4 West for the entire duration.

Three sets of growth rates were obtained by using simple regression. For the first set, the growth rates were obtained by using monthly ridership data, converted to 12-month moving averages. For the second set, the number of vehicles in each year was used. For the third set, ridership data were used only for the past seven years, also by converting the monthly data to 12-month moving averages. The forecasts on the basis of the past seven years were made due to relatively higher growth during this period in certain regions, especially Region 4 East. Annual growth rates were obtained from the growth forecasts up to the year 2040 that were through the regression models. Those rates are presented in Table 8. It ought to be noted that the rates presented in the table refer to the *r* in the following equation:

$$P_t = P_0(1 + rt)$$

Where, *r* is the annual growth rate, *t* is the forecast year, P_t is the forecast volume in year *t* and P_0 is the current year volume.

Table 8 – Annual growth rates for forecasting future size of facilities

Region	Rates based on all years (Vehicles)	Rates based on all years (Ridership)	Rates based on past seven years (Ridership)
Region 2	0.0419	0.0401	0.0477
Region 3	0.0206	0.0252	0.0149
Region 4 East	NA	0.0506	0.0821
Region 4 West	NA	0.0236	0.0191
Region 5	0.0536	0.0497	0.0627
Region 6	0.0652	0.0537	0.0614

NA: Not available because rates could not be estimated due to data unavailability.

The spreadsheets with the estimation of growth rates were provided to the project sponsor. Those spreadsheets also contain the forecast number of riders, revenue vehicles, and revenue and non-revenue parking spaces for each year up to the year 2040. The forecasts were obtained by applying the growth rates in Table 8 to the

current number riders, vehicles, and the number of revenue and non-revenue parking spaces.

The forecasts of revenue and non-revenue parking spaces were used to forecast the total size of the properties and the size of the structures by taking the existing Region 5 facility as the model. This specific facility was used as model because its various components, including the parking area, the structure, and the maintenance and office areas within the structure are better defined than the other facilities. The floor plan of the facility structure was used to separate the office area and the maintenance area.

For the estimation of parking lot size, assumptions were made about the size of parking spaces, configuration of parking spaces, vehicle turning spaces, and vehicle movement within the facility. For Access Link vehicles, mostly consisting of cutaway minibuses, parking spaces were assumed to be 12 feet by 24 feet. For non-revenue vehicles, consisting of automobiles belonging to employees and visitors, parking spaces were assumed to be 10 feet by 20 feet. The configuration of parking spaces is shown in Figure 16. As shown in the bottom portion of the figure, employees and visitors would be able to move an automobile without having to move other vehicles, but as shown in the top portion, the revenue vehicles would be parked back-to-back in two rows. The configuration for revenue vehicles is more liberal than the current parking configuration in the Region 5 facility, where revenue vehicles are parked back-to-back in three rows.

In order to estimate the total property size and the size of the structure containing the maintenance and the office areas for each regional facility, the current proportions in the Region 5 facility were used. The current Region 5 facility contains one structure, divided equally between the maintenance area and the office area. The separate parking lots for revenue and non-revenue vehicles are located outdoors. To obtain the 2040 property size, the ratio of total property size T to parking lot size P in the current Region 5 facility, T/P, was applied to the estimated 2040 parking lot size determined on the basis of forecasts of parking space requirement obtained from the three growth rates. Similarly, structure size S was estimated on the basis of the current ratio of S/P, the maintenance area M was estimated on the basis of the current ratio of M/P, and the office area F was estimated on the basis of the current ratio of F/P. Simply put, the

assumption was that the various components of the facilities in all regions will have the same proportions as the current Region 5 facility, but their sizes will vary across the regions because of different current sizes and growth rates for the different regions.

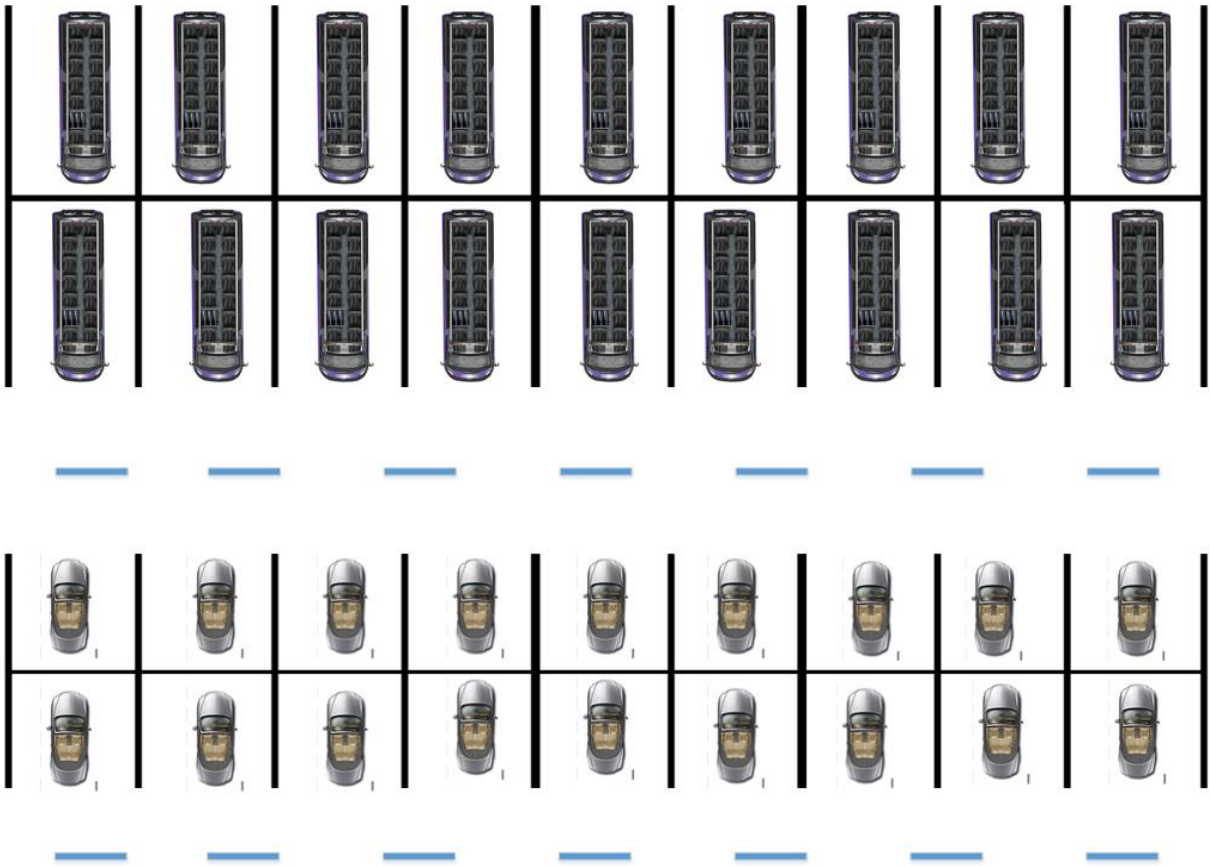

Figure 16. Revenue and non-revenue parking space configuration

The current and forecast (2040) size of facility properties and structures for the six operating regions are provided in Table 9. The current size of facilities is presented at the top of the table, followed by the 2040 forecasts. Since three sets of growth rates were used to forecast the size of facilities and their components, three sets of forecasts are presented. The largest among the facilities today, the Union facility for Region 5, is located in a property that is 4.71 acres. The size of the Region 5 facility, assuming it will continue to be in a single property, may become as large as 12.09 acres by the year 2040 if the past growth pattern continues. Although the Region 5 facility will perhaps

continue to be the largest of all facilities, because of faster growth in recent years, the Region 4 East facility may require a significantly larger facility than the current facility.

One may note from Table 9 that the structures within the facilities containing the maintenance area and the office area take up only a small proportion of the total property. The reason for that is that the revenue and non-revenue parking lots take up almost all of the rest of the property.

Table 9 – Area for total property, total facility structure, maintenance area, and office area for the six operating regions, 2015 and 2040

Size/Area	Region 2	Region 3	Region 4 East	Region 4 West	Region 5	Region 6
Current size (2015)						
2015 Total Property Area (Acre)	3.09	1.03	2.09	1.27	4.71	2.56
2015 Maintenance Area (SF)	6,010	2,003	4,065	2,467	9,148	4,970
2015 Office Area (SF)	6,010	2,003	4,065	2,467	9,148	4,970
2040 Forecasts based on vehicle growth, all years						
2040 Total Property Area (Acre)	6.34	1.56	4.74*	2.02*	11.02	6.73
2040 Maintenance Area (SF)	12,306	3,032	9,207*	3,923*	21,399	13,069
2040 Office Area (SF)	12,306	3,032	9,207*	3,923*	21,399	13,069
2040 Forecasts based on ridership growth, all years						
2040 Total Property Area (Acre)	6.20	1.68	4.74	2.02	10.56	5.99
2040 Maintenance Area (SF)	12,035	3,265	9,207	3,923	20,513	11,643
2040 Office Area (SF)	12,035	3,265	9,207	3,923	20,513	11,643
2040 Forecasts based on ridership growth, past seven years						
2040 Total Property Area (Acre)	6.78	1.42	6.39	1.88	12.09	6.49
2040 Maintenance Area (SF)	13,176	2,749	12,409	3,645	23,486	12,599
2040 Office Area (SF)	13,176	2,749	12,409	3,645	23,486	12,599

* Since growth rates using vehicle growth could not be estimated for Regions 4 East and 4 West, these forecasts are based on ridership growth over all years.

Estimation of Parking Lot and Structure Costs

For the estimation of construction cost of parking lots, various sources were reviewed. Because of a high discrepancy of rates in the reviewed sources, rates were used from an actual parking lot construction project undertaken by the Center for Advanced

Infrastructure and Transportation of Rutgers University. The parking lot cost estimates included the cost of pavement, sidewalk, curb and gutter, and lighting and signage.

Two construction cost estimates – one high and the other low – were obtained for parking lots of the facilities. At the current Region 5 facility, which was used as the model for cost estimates of all facilities, a small portion of the land within the property is not used for any functional purpose. The low cost estimate was obtained for each facility by assuming that a similar proportion of land will remain unpaved and unutilized, whereas the high cost estimate was obtained by assuming that the whole area within the property will be fully developed and paved like a parking lot.

The construction cost of the structures containing the maintenance area and the office area within the facilities was estimated by using the 2015 National Building Cost Manual by Craftsman (43). The forecast size of the structures was used as input for all regions. A few assumptions had to be made for the construction cost estimation, including the dimension of the facility (width and length), ceiling height, and number of rolling doors and lifts. Following the current configuration of the Region 5 facility, it was assumed that the area under the structures would be divided into two halves, one containing the office area and the other containing the maintenance area. Similarly, based on the current configuration of the Region 5 facility, it was assumed that the length to width ratio of the structure would be 2:1. The ceiling height for the office area was assumed to be 10 feet and the height for the maintenance area was assumed to be 20 feet. The current number of doors and lifts relative to the current size of the Region 5 facility was used to forecast the number of doors and lifts needed forfeit the forecast size of the facilities. The National Building Cost Manual provides high, average, and low cost estimates of construction costs on the basis of quality of construction and material. The high and low cost estimates were recorded for the facilities in all six operating regions.

Estimation of Land Cost

Land value for the properties appropriate for the current and future size of the facilities in the six operating regions was estimated from Costar data on industrial property sales between 2000 and 2015. In addition to providing the total sale price, it provides

information on land and improvements separately for the sold properties. Since these values pertain to the year of sale, they were converted to 2015 dollars by using the inflation calculator developed by the US Bureau of Labor Statistics (44).

Two estimates of mean and median land value of properties were obtained for each region. One set was obtained by using all properties in the dataset, while the other set was obtained by using data for only large properties, defined as properties that are between 100% and 150% of the predicted size of the properties in 2040. The estimated value per acre for properties obtained from the Costar database is shown in Table 10.

Table 10 – Mean and median land value per acre for industrial properties

	Estimated from all properties			Estimated from large properties only		
Region name	Mean	Median	N	Mean	Median	N
Region 2	$535,977	$474,529	592	$446,842	$413,022	55
Region 3	$377,532	$215,131	72	$320,065	$304,810	5
Region 4 East	$1,021,769	$784,671	897	$608,017	$588,392	108
Region 4 West	$685,159	$488,798	137	$467,434	$316,238	14
Region 5	$1,518,930	$1,192,316	1279	$916,135	$567,234	41
Region 6	$2,567,778	$1,781,343	1510	$1,461,842	$1,350,855	68

It is evident from Table 10 that when properties in the dataset are restricted to only large properties, the mean and median values have to be calculated from a very small number of properties. For that reason, the values obtained for Region 3 and Region 4 West may not be very reliable. On the other hand, when all properties are included for estimation, the values may not be reflective of the actual cost that would be involved because smaller properties may not have the attributes needed for Access Link facilities. Yet it appears from the comparison of the two sets of values that the value per acre is substantially smaller when the data are restricted to large properties. The only exception is Region 3, but the value per acre for large properties for that region was calculated from only five properties.

The estimated costs of structures (office and maintenance area combined), parking lots, and land for the current period (2015) are shown in Table 11. For land value estimation, median value per acre was used. Between the two rates shown in Table 10 – the rate

obtained from all properties and the rate obtained from large properties – the higher was used as the high rate and the lower was used as the low rate so that a range of land values could be obtained for each region similar to the structure and parking costs.

The costs shown in Table 11 reflect costs for facilities that could accommodate the current needs and therefore should not be confused as the value of the properties where the current facilities are located. It should also be noted that the construction cost of structures shown in the table does not include costs of infrastructure elements such as plumbing, heating, and cooling.

Table 11 – Structure, parking, land, and total costs for 2015 facility size

	Structure cost (000)*		Parking cost (000)		Land cost (000)		Total cost (000)	
	Low	High	Low	High	Low	High	Low	High
Region 2	$987	$1,628	$746	$881	$1,278	$1,468	$3,010	$3,978
Region 3	$385	$625	$249	$294	$222	$314	$856	$1,234
Region 4 East	$718	$1,173	$504	$596	$1,232	$1,642	$2,454	$3,412
Region 4 West	$400	$747	$306	$362	$402	$621	$1,108	$1,730
Region 5	$1,375	$2,287	$1,135	$1,342	$2,672	$5,616	$5,182	$9,245
Region 6	$821	$1,367	$617	$729	$3,457	$4,559	$4,895	$6,655

* Structure cost only includes the cost of the buildings, rolling doors, and lifts, but does not include costs of heating, cooling, plumbing, and other infrastructure.

Table 12 shows the forecast total costs as well as the costs of structure, parking, and land for 2040. The amounts shown are in 2015 dollars. Three sets of forecasts are presented in the table, each estimated by using one of the three growth rates mentioned in Table 10. Similar to Table 11, both high and low costs are presented in order to show a range of costs. It is evident from the table that total cost is likely to be the highest for Region 5, irrespective of which growth rate is used. One reason for the potentially high cost for the Region 5 facility is that it is already the largest and its high growth is expected to continue in the future. Although land value varies widely in the region, it could be fairly high. The cost for the Region 6 facility can also be expected to be high relative to the other regions. The high land value in the region, perhaps because of its proximity to New York City, would be the primary reason to the high cost. In terms of growth, Region 4 East will experience the most if the growth in the past seven years

continues. This growth can be expected to contribute significantly to the cost of a facility in the region.

Table 12 – Structure, parking, land, and total costs for 2040 facility size

Based on ridership growth, all years:

	Structure cost (000)**		Parking cost (000)		Land cost (000)		Total cost (000)	
	Low	High	Low	High	Low	High	Low	High
Region 2	$1,789	$2,956	$1,493	$1,765	$2,559	$2,940	$5,842	$7,661
Region 3	$487	$841	$405	$479	$362	$512	$1,254	$1,833
Region 4E	$1,208	$2,126	$1,143	$1,351	$2,790	$3,720	$5,140	$7,196
Region 4W	$599	$1,031	$487	$575	$639	$987	$1,725	$2,594
Region 5	$2,794	$4,699	$2,546	$3,009	$5,991	$12,593	$11,331	$20,301
Region 6	$1,527	$2,688	$1,445	$1,708	$7,147	$8,098	$10,120	$12,494

Based on vehicle growth, all years:

	Structure cost (000)**		Parking cost (000)		Land cost (000)		Total cost (000)	
	Low	High	Low	High	Low	High	Low	High
Region 2	$1,823	$3,016	$1,527	$1,805	$2,617	$3,007	$5,967	$7,828
Region 3	$539	$889	$376	$445	$336	$476	$1,252	$1,810
Region 4E*	$1,208	$2,126	$1,143	$1,351	$2,790	$3,720	$5,140	$7,196
Region 4W*	$599	$1,031	$487	$575	$639	$987	$1,725	$2,594
Region 5	$2,901	$4,889	$2,655	$3,139	$6,250	$13,137	$11,806	$21,164
Region 6	$1,846	$3,104	$1,622	$1,917	$9,090	$11,987	$12,558	$17,008

Based on ridership growth, past seven years:

	Structure cost (000)**		Parking cost (000)		Land cost (000)		Total cost (000)	
	Low	High	Low	High	Low	High	Low	High
Region 2	$1,882	$3,117	$1,635	$1,933	$2,802	$3,219	$6,319	$8,269
Region 3	$493	$810	$341	$403	$305	$431	$1,139	$1,645
Region 4E	$1,849	$3,086	$1,540	$1,820	$3,759	$5,013	$7,149	$9,920
Region 4W	$638	$1,039	$452	$535	$594	$917	$1,684	$2,491
Region 5	$3,188	$5,369	$2,915	$3,445	$6,860	$14,419	$12,962	$23,232
Region 6	$1,784	$2,179	$1,563	$1,848	$8,763	$11,556	$12,111	$15,583

* Since growth rates using vehicle growth could not be estimated for Regions 4 East and 4 West, these forecasts are based on ridership growth over all years.

** Structure cost only includes the cost of the buildings, rolling doors, and lifts, but does not include costs of heating, cooling, plumbing, and other infrastructure.

Conclusion

This section showed how much it might cost to purchase land and construct parking lots and structures for facilities in the six Access Link operating regions. Although purchasing facilities that already have the required parking lots and structures could be less expensive than purchasing land and building the required structures and parking

lots, finding such properties with parking lots that could accommodate the forecast number of vehicles might be difficult.

The cost estimates provided above are tentative for two reasons. First, the forecasts were made on the basis of data that were already available. Although the forecasts were made with care, the assumption in making the forecasts was that the future will continue to be like the past. As discussed in the literature review, other researchers have contended that the future is not always like the past. A number of external factors, including demographic shifts due to migration, and changes in awareness and availability of paratransit services provided by local governments, can affect the future demand for Access Link service. However, it is difficult to predict how these changes will affect the demand for Access Link.

Second, value of land and costs of construction can also change over time. The greater those changes, the farther will be the forecasts presented here from reality. For that reason, the cost estimates presented here are more likely to reflect reality in the near term than far into the future.

Finally, it ought to be noted that the total facility ownership costs could be higher than what are presented here, especially when the costs of heating, cooling, plumbing, fire and security equipment, et cetera, are added. The research team noted that the costs of security equipment and personnel can vary significantly from location to location within the same region. Because of these reasons, the results presented in this report should be used only as a guide to making decisions. If NJ TRANSIT wants to purchase properties for any of its Access Link facilities, it must conduct detailed real estate evaluation of the property by licensed professionals. The information provided here should assist NJ TRANSIT to identify properties that have the appropriate characteristics and inform the agency how the value of the identified properties compares to similar properties within the specific regions.

SUMMARY OF FINDINGS AND RECOMMENDATIONS

Summary of Findings

This research investigated whether NJ TRANSIT should consider owning one or more of its ADA paratransit facilities, and if it wanted to do so, where would be the appropriate locations. To answer these questions, several tasks were undertaken, including a review of literature and practice scan, site visits and interviews with the general managers of the six existing facilities, interviews with ADA division officials from transit agencies nationwide, comparison of owning and leasing costs for five properties, and estimation of costs of facilities including land value and the costs of constructing parking lots and structures.

The review of literature, although useful for a general understanding of the related issues and methods, showed that little has been done by researchers and transit agencies to examine the advantages and disadvantages of transit agencies owning ADA paratransit facilities. Although efforts have been made in other fields to develop and use advanced methodologies to identify optimum locations for facilities, for transit agencies, such efforts have been limited to conventional bus facilities.

The site visits provided useful information to the research team about the physical characteristics of the existing facilities, the surroundings of the facilities, and the ease of access from the facilities to freeways and clients. The interviews with the general managers of the facilities were particularly insightful. Almost all facility managers would prefer NJ TRANSIT to own the facilities. In view of the difficulties encountered by the service providers, it is not surprising that they would rather have NJ TRANSIT own properties and lease them out to private providers. The managers mentioned difficulties with identifying appropriate properties, a long bidding process, difficulties from landlords regarding short lease period and return of properties in original state, and occasional disapproval from neighbors. They felt, if NJ TRANSIT owned the properties, the burden on private bidders would be substantially reduced. It was also mentioned during the interviews that the reduced burden may increase interest among a greater number of service providers and thus increase competition and reduce costs.

The interviews with the ADA division officials from transit agencies from other parts of the country were equally insightful. The interviews revealed that some agencies are more proactive about owning ADA facilities than others. Although some agencies began to own ADA paratransit facilities in the mid-1990s, others decided to own in recent years. Officials from none of the agencies that own facilities expressed dissatisfaction with facility ownership. Many in fact expressed a high level of satisfaction. Some felt they have greater control, whereas others felt they are saving resources through ownership and improved location. It was also mentioned during the interviews that cost savings and functionality are two important considerations for facility ownership.

The interviews also revealed that agencies that decided to own facilities in recent years were opportunistic in their search for properties to own. One agency, for example, purchased a property that was formerly leased from the landlord by the service providers. Another agency mentioned finding a low-cost land parcel near an airport runway. All agencies that own facilities insisted that collaboration among divisions within the agency is important for paratransit facility ownership since the ADA divisions usually do not have the required resources and connections. Finally, the interviews revealed that many owned ADA paratransit facilities are shared with other transit components, including fixed-route bus, rail, and rural transit.

The comparison of five facilities, of which two are real and three are potential but all have the characteristics of Access Link facilities, provided insights about the savings that would result and the time it may take to recover the costs if NJ TRANSIT decided to own one or more facilities. The cost models showed that savings in the range of $9.0 to $13.7 million would occur in a 25-year period for four out of five properties analyzed. The models showed that the break-even could occur between nine and 19 years. Although the cost models showed that break-even could occur as early as nine years for one facility, from various runs the research team concluded that a more realistic break-even year could be in the 12 to 15 year range. Although the comparisons are tentative since it cannot be known exactly how much the properties would cost if they were in the market, the results can be construed to suggest that NJ TRANSIT will not lose by owning properties if it can afford to hold them for many years. The interviews

with transit officials indicated that the probability of a loss decreases substantially when properties can be put to alternative uses.

Finally, the research team examined how much it might cost if NJ TRANSIT wanted to purchase land and build the required parking lots and structures. Tentative cost estimates were made for 2015 and 2040 with certain simplifying assumptions. Because of the large size of the region and high growth of service demand, the facility in Region 5 is likely to remain the largest in 2040. Finding properties that can accommodate the forecast growth is likely to be a challenge for the region. Since value of land varies widely within the region, the cost range for facilities in the region is also high. Land value is likely to be the highest in Region 6. Region 4 East, the region that has experienced the high growth rate in recent years, may be a good candidate for facility ownership. Although land value in the region is higher than some of the other regions, the Costar data showed that industrial property transactions are higher in this region than the other regions.

Similar to the model results comparing the owning and leasing costs of facilities, the estimates of land value, building construction cost, and parking lot construction cost should be considered tentative because of the assumptions made. These estimates should be used only as a guide in making decisions.

Recommendations

The following recommendations have been made on the basis of the research findings. Each recommendation is followed by a set of justifications.

(1) NJ TRANSIT should seriously consider owning one facility and examine the effects in real life before acquiring additional properties.
   (a) The interviews with agencies nationwide showed strong support for ownership
   (b) Most current Access Link service providers are in favor of NJ TRANSIT ownership of facilities
   (c) NJ TRANSIT ownership may increase competition among providers and thus reduce service costs

(d) The estimated costs of ownership are not exorbitant and are in the same range for most regions as stated by other agencies
(e) The cost models comparing leasing versus owning for all five facilities showed that a break-even would occur in less than 20 years.

(2) Consider owning a facility in a region where properties are abundant and land value is not extremely high.
(a) Higher supply is typically associated with lower price
(b) Paying excess value due to proximity to Manhattan or Philadelphia should be avoided because access to those places is not important for Access Link.

(3) Consider owning a facility near clients and multiple freeways, but remain open to alternative locations if other property characteristics are more favorable.
(a) Proximity to clients and proximity to freeways are the two most common considerations for all interviewed agencies and the facility managers
(b) Very few properties were sold in such areas during the past 15 years
(c) Vehicle runs can be arranged to reduce non-revenue miles if facilities are not located in the middle of clients
(d) Land value savings could be higher than savings in non-revenue miles/hours when a facility is not located in the middle of clients.

(4) Take a proactive approach and consistently look for appropriate opportunities to own a facility.
(a) The two agencies that decided to own facilities waited until desired properties were available
(b) One agency acquired land near a runway because it was inexpensive
(c) One agency acquired a property that was leased by the provider before to reduce costs.

(5) Pay attention to potential growth of ridership when deciding on property size and use projections only as a guide.

(a) Historical growth of ridership varied substantially between the regions
(b) Growth rates vary modestly depending on data
(c) Projections were made from available data only
(d) Unforeseen changes can make actual growth deviate from forecasts.

(6) Coordinate with other divisions of the agency (e.g., real estate) for serious consideration of ownership.
(a) Every agency that owns facility mentioned this as a necessity
(b) The perpetual long searches by service providers, a discussion with an NJ TRANSIT Bus official, and the limited number of sold properties in the Costar database indicate that properties with desired characteristics are rare
(c) Due to the scarcity, continued search for properties seems unavoidable.

(7) Consider properties that can be put to multiple transit uses.
(a) Many transit agencies owning facilities indicated sharing them with other uses (e.g., rail storage, rural transit, local bus, etc.) without any problem
(b) Even if a paratransit operation is not completely satisfactory from a specific location, sharing can reduce the burden on Access Link.

(8) Once a desired type of property is identified, conduct detailed real estate evaluation by licensed professionals by using the findings in this study as a guide.
(a) The study's findings are not exact
(b) The literature review showed that unforeseen future events and patterns can make actual growth deviate from forecasts based on past trends.

REFERENCES

1. Boyacı, B., and Geroliminis, N. (2012). *Facility Location Problem for Emergency and On-Demand Transportation Systems*. Swiss Transport Research Conference (STRC 2012) Proceedings, Ascona, Switzerland.

2. Jones, F.R. (1995). *Paratransit and Land Use: Facility Siting Considerations*. Report No. NUTI93USF2.1, Center for Urban Transportation Research, University of South Florida, Tampa.

3. Uyeno, D. H., and Willoughby, K. A. (1995). Transit Centre Location-Allocation Decisions. *Transportation Research Part A: Policy and Practice*, 29(4), pp. 263-272.

4. Beruvides, M. G., Simonton, J., Ng, E. and others. (2010). Site Assessment Instrument for Regional Maintenance Center. *Journal of Public Transportation*, 13(1), pp. 39-54.

5. Spielberg, F., and Aderle, S. (1987). *Transit Garage Planning Guidelines: A Review*. Office of Planning, Urban Mass Transportation Administration, U.S. Department of Transportation, 400 Seventh Street SW, Washington, D.C.

6. Orloff, C. (1977). A Theoretical Model of Net Accessibility in Public Facility Location. *Geographical Analysis*, 9, pp. 244-256.

7. Owen, S. H., and Daskin, M. S. (1998). Strategic Facility Location: A Review. *European Journal of Operational Research*, 111(3), pp. 423-447.

8. O'Kelly, M. E. (1986). The Location of Interacting Hub Facilities. *Transportation Science*, 20(2), pp. 92-106.

9. Teixeira, J. C., and Antunes, A. P. (2008). A Hierarchical Location Model for Public Facility Planning. *European Journal of Operational Research*, 185(1) pp. 92-104.

10. Johansson, B., and Leonardi, G. (1987). Public Facility Location: A Multiregional and Multi-authority Decision Context. *Handbook of Regional and Urban Economics*, 1, pp. 133-170.

11. Nozick, L. K., and Turnquist, M. A. (2001). Inventory, transportation, service quality and the location of distribution centers. *European Journal of Operational Research*, *129*(2), pp. 362-371.

12. Gill, A., and Bhatti, M. I. (2007). Optimal Model for Warehouse Location and Retailer Allocation. *Applied Stochastic Models in Business and Industry*, *23*(3), pp. 213-221.

13. Melkote, S., and Daskin, M. S. (2001). An Integrated Model of Facility Location and Transportation Network Design. *Transportation Research Part A: Policy and Practice*, *35*(6), 515-538.

14. Daskin, M. S., Hurter, A. P., and Van Buer, M. G. (1993). *Toward an integrated model of facility location and transportation network design*. Working Paper. The Transportation Center, Northwestern University, Evanston, IL, USA.

15. Taniguchi, E., Noritake, M., Yamada, T., and Izumitani, T. (1999). Optimal size and location planning of public logistics terminals. *Transportation Research Part E: Logistics and Transportation Review*, *35*(3), 207-222.

16. Tuzkaya, G., Önüt, S., Tuzkaya, U. R., and Gülsün, B. (2008). An analytic network process approach for locating undesirable facilities: An example from Istanbul, Turkey. *Journal of Environmental Management*, *88*(4), 970-983.

17. Doerner, K. F., Gutjahr, W. J., and Nolz, P. C. (2009). Multi-criteria location planning for public facilities in tsunami-prone coastal areas. *Or Spectrum*, *31*(3), 651-678.

18. Teitz, M. B. (1968). Toward a Theory of Urban Public Facility Location. Papers in Regional Science, 21(1), 35-51.

19. Morrill, R. L., and Symons, J. (1977). Efficiency and Equity Aspects of Optimum Location. Geographical Analysis, 9(3), pp. 215-225.

20. Lea, A. C. (1979). Welfare Theory, Public Goods, and Public Facility Location. Geographical Analysis, 11(3), pp. 217-239.

21. Talen, E., and Anselin, L. (1998). Assessing spatial equity: an evaluation of measures of accessibility to public playgrounds. Environment and Planning a, 30, 595-614.

22. McAllister, D. M. (1976). Equity and Efficiency in Public Facility Location. Geographical Analysis, 8(1), 47-63.

23. Revelle, C., Marks, D., Liebman, J.C. (1970). An Analysis of Private and Public Sector Location Models. Management Science. 16(11). pp. 692-707

24. Batta, R., Lejeune, M., and Prasad, S. (2014). Public facility location using dispersion, population, and equity criteria. *European Journal of Operational Research*, *234*(3), 819-829.

25. Sakashita, N. (1987). Optimum Location of Public Facilities under the Influence of the Land Market. Journal of Regional Science, 27(1), pp. 1-12.

26. DeVerteuil, G. (2000). Reconsidering the Legacy of Urban Public Facility Location Theory in Human Geography. Progress in Human Geography, 24(1), pp. 47-69.

27. Simons, R. A. (1993). Public Real Estate Management - Adapting Corporate Practice to the Public Sector: The Experience in Cleveland, Ohio. The Journal of Real Estate Research, 8(4), pp. 639-654

28. Wheaton, W.C., Torto, R.G., Sivitanides, P.S., Southard, J.A., Hopkins, R. E., Costello, J. M. (2001). Real Estate Risk: A Forward Looking Approach. Torto Wheaton Research.

29. Ebert, L. P. (1987). Lease vs. Buy: The Corporate Perspective. Real Estate Issues. Spring/Summer 1987. pp. 15-20

30. Joseph, R. S., James, D. R., and Neil, C. G. (2001). Corporate real estate site selection: a community-specific information framework. *Journal of Real Estate Research*, *22*(1), 165-198.

31. Simon, R. M. (1998). Transit Cooperative Research Program (TCRP) Synthesis Report 31: Paratransit contracting and service delivery methods. Transportation Research Board.

32. Talley, W. K. (1990). Paratransit Services, Contracting Out and Cost Savings for Public Transit Firms: A Firm Specific Analysis. *Transportation Planning and Technology*, 15(1), pp. 13-25.

33. Frick, K. T. , Taylor, B., and Wachs, M. (2008)*. Contracting of Public Transit Services: Evaluating Tradeoffs*. University of California Transportation Center Research Report. University of California.

34. Karlaftis, M., and McCarthy, Patrick (1999). The Effect of Privatization on Public Transit Costs. *Journal of Regulatory Economics*, 16, pp. 27-43.

35. Karlaftis, M. (2010). Ownership and Competition In European Transit: Assessing Efficiency. *Transportmetrica*, 6(2), pp. 143-160.

36. Jensen, P. H., and Stonecash, R. E. (2004). *The Efficiency of Public Sector Outsourcing Contracts: A Literature Review*. Melbourne Institute of Applied Economic and Social Research, Melbourne, Australia.

37. Jensen, P. H., and Stonecash, R. E. (2005). Incentives and the Efficiency of Public-Sector Outsourcing of Contracts*. Journal of Economic Surveys*, 19(5), pp. 767-786.

38. Hefetz, A., and Warner, M.E. (2012). Contracting or Public Delivery? The Importance of Service, Market, and Management Characteristics. *Journal of Public Administration Research and Theory*, 22, pp. 289-317.

39. Palmer, K, Dessouky, M., and Abdelmaguid, T. (2004). Impacts of Management Practices and Advanced Technologies on Demand Responsive Transit Systems. *Transportation Research Part A*, 38, pp. 495-509.

40. Palmer, K., Dessouky, M., and Zhou, Zhiqiang (2008). Factors Influencing Productivity and Operating Cost of Demand Responsive Transit. *Transportation Research Part A*, 42, pp. 503-523.

41. Fu, L. (2003). Analytical Model for Paratransit Capacity and Quality of Service. *Transportation Research Record: Journal of the Transportation Research Board*, 1841, pp. 81-89.

42. Diana, M., Dessouky, M.M., and Xia, N. (2006). A Model for the Fleet Sizing of Demand Responsive Transportation Services with Time Windows*. Transportation Research Part B*, 40, pp. 651-666.

43. Moselle, B. (2015). 2015 National Building Cost Manual. (39th Edition), Craftsman Book Company, Carlsbad, CA.

44. Bureau of Labor Statistics (2015). CPI Inflation Calculator. Bureau of Labor Statistics, Washington, DC. Available at: http://www.bls.gov/data/inflation_calculator.htm. Accessed on June 6, 2015.