MA Department of Conservation and Recreation
Parking Revenue Generation

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I. Executive Summary

The Massachusetts Department of Conservation and Recreation (DCR) owns parking spaces, which are free to residents, throughout the State of Massachusetts. A Harvard Kennedy School of Government student team analyzed a sub-set of the spaces to determine revenue generation opportunities for DCR. The team concluded that DCR can realize a **total expected net income of approximately $2.6 million annually** by instituting a structured parking program.

The analysis of DCR spaces was the result of a three-stage process:

- Identifying the sub-set of parking spaces and categorizing them for analysis,
- Quantifying potential revenue generation and estimating costs, and
- Analyzing qualitatively the best parking program recommendation.

The team focused on DCR owned parking spaces in Boston, Fenway, and Cambridge as the sub-set of parking spaces within this project's scope. There are 746 spaces – 9 handicap-accessible; 456 free, unrestricted parking available to any driver; 248 Resident Permit Only; and 33 specially permitted spaces. The 9 handicap spaces are not included in any revenue generation calculations.

Based on the quantitative and qualitative review performed, we recommend the following plan for program implementation:

Part 1:	Current Status Quo:	Free, unrestricted parking spaces (450+ spaces)
	Recommendation:	Install parking meters (8AM-8PM) + allow resident permit only parking (8PM-8AM)
	Expected Revenue:	~$2.1 million annually
Part 2:	Current Status Quo:	Special permit parking spaces (30+ spaces)
	Recommendation:	Issue annual DCR permits for a fee
	Expected Revenue:	~$0.1 million annually
Part 3:	Current Status Quo:	Resident permit only parking spaces (200+ spaces)
	Recommendation:	Install parking meters (8AM-8PM) + allow resident permit only parking (8PM-8AM)
	Expected Revenue:	~$1 million annually
Part 4:	Current Status Quo:	Resident permit only parking spaces (40+ spaces)
	Recommendation:	Maintain status quo (24-hour resident permit only parking)
	Expected Revenue:	$0 annually

This report does not include potential revenue from ticketing fees and penalties. Based on benchmarking with the cities of Boston and Somerville, ticketing is expected to raise four times the revenue generated from a parking program. The report concludes with short-term and long-term issues for DCR to consider in order to ease the implementation of a new parking system.

II. Overview of the Project

Background
The Massachusetts Department of Conservation and Recreation (DCR) owns parking spaces as part of its asset portfolio throughout the state. These spaces are generally adjacent to conservation and recreation areas, which comprise the bulk of DCR's scope of responsibility as a state agency. DCR's parking assets are classifiable into two categories based on type: parking lot spaces and street parking spaces. Currently, the parking lot spaces generate revenue through the DCR annual park pass program, which costs $35/year for unlimited annual parking at DCR parking lots throughout the state. Meanwhile, DCR's street parking spaces generate no revenue, aside from parking violation fines and penalties (i.e., law enforcement ticketing revenue).

Revenue Opportunity
DCR has the opportunity to generate revenue from these parking assets to fund department projects and needs. Since the parking lot spaces are currently under a revenue plan, the greatest potential for revenue generation is for the street parking spaces located in the Boston, Fenway, and Cambridge areas. A general overview of the situation revealed that the DCR owned street parking spaces in these areas were not under any single plan or strategy in terms of regulations. In Boston and Fenway, City of Boston signs and regulations were the status quo. The parking regulations posted on these City of Boston signs varied from street to street and were often inconsistent with neighboring streets. In the Cambridge area, DCR's parking spaces were generally unrestricted and free. Each area also had instances of "special permits" being issued for a limited number of spaces; the origin of these special permits remains unclear.

The revenue generation potential from these largely unregulated parking spaces is substantial given the high price for parking in the Boston area. To successfully maximize this opportunity to generate revenue for DCR, this project required a three-stage analysis of the situation that factored in information gathering and a multi-pronged analysis:

Stage 1: **Inventory Process**
Catalogue and categorize the parking spaces owned by DCR.

State 2: **Quantitative Analysis**
Quantify the revenue potential with consideration to costs for implementing a new parking program.

Stage 3: **Qualitative Analysis**
Qualitatively analyze the location context and stakeholders affected by any new program to minimize pushback and maximize program success.

About the Team
This project was completed by a student team for Professor Mark Fagan's MLD-601: Operations Management class at the Harvard Kennedy School as part of a semester-long practical exercise to advise a client on an operations management challenge. The team's three-stage parking revenue analysis builds on the work performed in summer 2014 by two DCR interns.

III. Project Scope

This report is limited in scope to the universe of DCR parking spaces in Boston, Fenway, and Cambridge. Maps of this covered area are provided in Appendix A. Completed by a team at the Harvard Kennedy School (HKS), we focused on background research around resource identification and classification, as well as various revenue simulations, in order to provide DCR with the information to move forward with choosing and implementing a revenue generation plan.

The HKS team completed an inventory of DCR parking spaces in Boston, Fenway, and Cambridge (Stage 1). The inventory included creating maps detailing the number of parking spaces, location of the spaces, and other relevant information. Our team then performed a quantitative analysis that included creating a model for revenue generation under three different types of parking systems: meters, annual permits, and a hybrid meter-permit system (Stage 2). The model allows for user flexibility so that DCR can understand the revenue potential of the three systems analyzed by altering various inputs to the model. The project's qualitative analysis was built on independent research, interviews with Massachusetts State law enforcement and DCR employees, and interim feedback from the DCR Commissioner and his senior staff (Stage 3).

IV. Methodology

A. Stage 1: Inventory Process

1. Gathering Data

Data was gathered in two phases. In the first phase, our team accompanied DCR rangers to each area with DCR parking spaces to count and catalogue the total number spaces. These counts provided the initial information required. In the second phase, we revisited the parking areas to categorize the spaces by location type.

a. Cataloguing

Our team accompanied DCR rangers on two separate trips, on October 10 and 29, 2014, to visit all parking space areas located in Boston, Fenway, and Cambridge. During these initial trips, the team recorded the names of the streets where the parking spaces are located, verified the number of the parking spaces based on previously gathered data by two DCR interns, and counted the number of the parking spaces for streets that lacked data. In addition, we took pictures of the parking signs located next to the parking spaces in order to identify the current categorization of the parking spaces. Information on these parking signs indicates whether the spaces are categorized as free at all times, free for only a period of time during the day, or require a certain type of permit.

The team revisited the parking space areas on October 30 to ensure data accuracy and supplement the information previously gathered. During this trip, we paid special attention to the type of land use (residential, commercial, institutional) adjacent to the parking spaces in order to better understand the context of the locations.

b. Inventory List

Based on the information collected in the field, we created an inventory list to record all data gathered. This inventory list includes information on parking spaces location with specific street names and brief description of the context (i.e., service road spaces, main road spaces, spaces in front of an institution). The streets are divided into segments since many of the streets are long and winding. For each street segment, the inventory list records the number of the parking spaces with the categorization of the parking spaces clearly identified.

c. Categorization

Our team further categorized the information recorded on the inventory list in order to better interpret the data in an Excel spreadsheet (See Appendix B). We listed each street segment on the vertical axis of the spreadsheet. On the horizontal axis, we listed a brief description of the context of each street segment, added land use types for areas adjacent to the street segment, and recorded the number and categorization of the parking spaces. The parking space categories are listed in separate columns on the horizontal axis of the

spreadsheet in an effort to clearly identify how many spaces are there under each category.

2. Creating Maps

We saw the need to visually represent the data on maps to help locate these parking spaces geographically in the Boston, Fenway, and Cambridge areas. These maps had not previously existed with this level of specificity and should provide a more detailed means for DCR to understand its parking spaces. Our team used Google Maps as the base for the maps and created zoomed-in versions of targeted geographic groupings of spots within the larger assigned areas. The sizes and scales of the maps vary as they are designed to best present the information in a legible and clear manner, so scale varies according to need.

In total, we created eight maps presenting the geographic location of the parking spaces as well as other relevant information overlaid on top of the base Google Maps (See Appendix A). Green lines are traces of the street segments where the parking spaces are located. Other information is included in text format as shown on the maps including the number and the categorization of the parking spaces along each street segment as well as the adjacent land use types. The maps aim to help readers get a clear sense of the geographic location, number and categorization of the parking spaces. The maps also helped us to further realize that each location was unique with different types of parking usage and different adjacent land uses.

B. Stage 2: Quantitative Analysis

To understand the potential revenue opportunity, a quantitative analysis was undertaken that included establishing a set of parking program options, building an Excel revenue model, and benchmarking program costs. The Excel revenue model has been provided as an electronic file to DCR. Key screen shots are included in Appendix B.

1. Parking Payment Options

Based on the current available parking payment techniques, cases in other cities in the U.S., and the status quo of DCR's parking lots, our team considered four parking programs: single-space meters, multi-space meters, annual permits, and mobile parking apps.

a. Single-Space Meters

Single-space meters are the most common parking payment method. A meter is installed beside each parking space. Traditional single-space meters only accept coins and are charged by battery, which inconveniences users when they cannot find appropriate coins for payment. Most modern smart meters accept credit cards, smart cards, and mobile payment in addition to coins, and often feature solar power and real-time wireless communication.

b. Multi-Space Meters

Multi-space meters control multiple spaces per block or lot. Multi-space meters incorporate more customer-friendly features such as on-screen instructions and acceptance of credit cards for payment. Most of these meters are wireless and can report problems immediately to maintenance staff.

There are three types of multi-space meters: pay and display, pay by space, and pay by license plate. Pay and display requires the user to purchase a ticket from a pay station to display on the dashboard or window of the vehicle. The printed ticket generally includes information on the location and operator of the machine, expiry time, amount paid, and time entered. With pay by space meters, the driver parks in a space, goes to the meter and enters their space number and payment. The pay station records the time remaining, and enforcement personnel use the machine to check for violations. With the pay by license plate system, the user enters his license plate number into the meter in order to pay. Enforcement personnel track violations via a remote device.

The key differences between these systems are that pay and display is not compatible with add-ons such as mobile payment, pay by space requires extra costs to outline and number parking spaces, and pay by license plate requires purchase of remote devices for enforcement personnel.

c. Annual Permits

This option entails the creation of user-purchased annual parking permits from DCR, which guarantee a certain period and area for parking.

d. Mobile Parking Application

Mobile Parking Application is a recent technology allowing users to pay for parking from their smartphones. Users need to register an account with their license and online payment (credit cards, PayPal, etc.) in the application and insert the session numbers where they park. Users can opt-in to receive a message notification before their parking sessions are set to expire and renew by phone. Enforcement personnel use an administrative account in the app to check for violations.

Due to some users' resistance to a smartphone-only system, we would recommend that DCR consider this option as an add-on to more traditional payment options. For reference, San Francisco, New York City, Seattle, Los Angeles, and Portland, Oregon provide case studies of cities that have adopted newer mobile parking technologies. Further, as of the writing of this report, the City of Boston Transportation Department was finalizing a bidding process to adopt a mobile payment system, which will also include a Pay-By-Voice option for individuals without access to a smartphone.

2. Data Analysis

In order to quantify the monetary value of instituting a parking program for DCR's Boston, Cambridge, and Fenway parking spaces, we built a quantitative model that projects maximum potential revenue for various parking systems, estimates costs for different parking systems, and quantifies the net income for our final recommendation. The model is available separately for review and should be used in conjunction with this report. Blue cells are clearly marked as input cells; they are currently benchmarked to City of Boston standards to provide plausible revenue generation numbers.

a. Revenue

We developed a Microsoft Excel model to quantify the maximum potential revenue that could be generated from the DCR parking spaces in Boston, Fenway, and Cambridge. The following is a screenshot of the maximum potential revenue generation for a sample area; a complete set of screenshots is available in Appendix B.

Boston-Fenway-Cambridge Parking Revenue Generation Model

CONTROL PANEL

			METER	PERMIT	HYBRID
NOTE: Blue cells can be updated.					
INPUT CELL	Hourly rate: identified by current hourly meter rate set by City of Boston	Hourly rate:	$ 1.25		$ 1.25
INFORMATION CELL	Daily rate: calculated for potential comparison purposes	*Daily rate:*	*$ 15.00*		
INFORMATION CELL	Weekly rate: calculated for potential comparison purposes	*Weekly rate:*	*$ 90.00*		
INFORMATION CELL	Monthly rate: calculated for potential comparison purposes	*Monthly rate:*	*$ 390.00*		
INPUT CELL	Annual rate: identified by local area parking garage annual rates	Annual rate:	*$4,680.00*	$ 3,000.00	$ 1,500.00
INPUT CELL	Maximum hours/day: identified by current parking meter hours in the City of Boston	Maximum hours/day:	12	*24*	12
INPUT CELL	Maximum days/week: identified by current parking meter hours in the City of Boston	Maximum days/week:	6	*7*	6
INPUT CELL	Maximum weeks/year: identified by current parking meter hours in the City of Boston	Maximum weeks/year:	52	*52*	52
CALCULATED CELL	Maximum capacity: Maximum hours/day * Maximum days/week * Maximum weeks/year	Maximum capacity/spot (annual hours):	3744		3744
INPUT CELL	Utilization: "reasonably" expected utilization	Utilization:	100%	100%	100%

LOCATION INFORMATION

LOCATION	DESCRIPTION	CLASSIFICATION
Park Drive	Service Area 1R	Residential
Park Drive	Service Area 1L	Residential
Park Drive	Service Area 2R	Residential
Park Drive	Service Area 2L	Residential
Park Drive	Service Area 3R	Residential
Park Drive	Service Area 3L	Residential
Park Drive	Service Area 4R	Residential
Park Drive	Service Area 4L	Residential
Park Drive	Main Road (a)	Residential
Park Drive	Main Road (b)	Residential or Commercial
Park Drive	Past Rotary R	Residential or Commercial
Park Drive	Past Rotary L	Residential or Commercial

PARKING SPOTS - STATUS QUO

FREE			HYBRID		PERMIT		OTHER	TOTAL
FREE	FREE 30MIN LIMIT	FREE EXCEPT 7-10AM	FREE 6AM-10PM	RESIDENT PERMIT 10PM-6AM	RESIDENT PERMIT ONLY	SPECIAL PERMIT	HANDICAP	
					13			13
				13				13
					27			27
				34				34
					23			23
				25				25
					6			6
				6				6
					30			30
					4			4
16								16
14								14
TOTAL 30	0	0	78		103	0	0	211

ANNUAL REVENUE POTENTIAL

METER	PERMIT	HYBRID
12H/6D/52WKS	ANNUAL 24H	12H METER + 12H PERMIT
60,840	39,000	80,340
60,840	39,000	80,340
126,360	81,000	166,860
159,120	102,000	210,120
107,640	69,000	142,140
117,000	75,000	154,500
28,080	18,000	37,080
28,080	18,000	37,080
140,400	90,000	185,400
18,720	12,000	24,720
74,880	48,000	98,880
65,520	42,000	86,520
987,480	633,000	1,303,980

As with the maps we created, the model divides the parking spaces into 5 major areas: Park Drive (sample above), Charlesgate West and Boylston Street, Charlesgate East and Boylston Street, Fenway Road, and Cambridge. Each area is then analyzed at the street level, identifying if the spaces are located on the left or right side of the street. This allows for the identification of parking space regulation variability on the same street. Our analysis identified the area, street (detailing left or right side or using other landmark descriptors), the current parking regulation status quo, and the number of parking spaces.

Classifying the Current Parking Regulations

We found that current parking regulations fell into four categories:

- **Free**: "Unrestricted, 30 minute limit" or "unrestricted, except 7-10AM"
- **Hybrid**: Free 6AM-10AM + Resident Permit 10PM-6AM

- **Permit**: Resident Permit Only or Special Permit
- **Other**: Handicap

It is important to note that any spaces marked Resident Permit for any period of time refer to resident parking permits issued and administered by the City of Boston. Special Permits are issued directly by DCR, although the history and justification of special permit issuance is unclear. Special Permits are indicated with signage at the parking space location, but no special decal has been issued by DCR for affixation in vehicles.

Defining the Revenue-Generating Parking Systems

In Section IV.B.1, we described four major parking payment options: single-space meters, multi-space meters, annual permits, and mobile parking application. To understand the revenue potential for each of these parking system options, the options were collapsed into three main systems:

- **Meter** system, which includes single-space and multi-space meters since revenue generation potential is identical for both,
- **Annual permit** system, and
- **Hybrid** meter-permit system.

The mobile parking application was deemed best included as an add-on feature to any meter system.

Meter System

The meter system maximized the potential revenue for each DCR parking space, while remaining flexible to input changes. The meter system calculates maximum revenue by multiplying the hourly rate charged for a space by the utilization rate of the space. DCR can change the hourly rate (currently benchmarked to the City of Boston's hourly meter rate of $1.25) and the utilization rate to understand the effect on revenue generation.

The utilization rate is applied to the maximum chargeable parking hours for each space. Maximum capacity is currently benchmarked to the City of Boston at 12 hours per day, 6 days per week, and 52 weeks per year. This results in a maximum annual capacity of 3744 revenue-generating hours per space. DCR can change the maximum hours per day, maximum days per week, and maximum weeks per year to understand the effect on revenue generation.

The revenue potential is calculated by each street or section of a street by multiplying the number of parking spaces by the hourly meter rate and the utilization. The meters would be enforced during the day, and the area would revert to free, unrestricted parking overnight.

Annual Permit System

The annual permit system calculates maximum revenue by multiplying the annual permit fee charged for a space by the utilization rate of the space. DCR can change the annual

permit fee (currently benchmarked to the annual private parking garage rate of $3000 in the Boston area) and the utilization rate to understand the effect on revenue generation.

The annual permit system would require DCR to issue permits to individual residents for a set fee. Residents would enter a lottery system since there is a shortage of on-street resident parking spaces available in the City of Boston. As a result, utilization is benchmarked at 100%. Permits would grant exclusive parking rights to the permit holder to 24-hour parking in a marked space owned by DCR.

The revenue potential is calculated by each street or section of a street by multiplying the number of parking spaces by the annual permit fee and the utilization.

Hybrid Meter-Permit System

The hybrid meter-permit system combines elements of the meter system with the annual permit system. The parking meters are enforced for 12 hours per day, after which the area becomes resident permit parking for residents who have purchased an annual permit from DCR. The annual permit rate would be half the fee for a 24-hour permit since permit holders would have restricted access, likely 12-hour overnight access, to the parking spaces.

The revenue potential is calculated by combining the meter and annual permit system revenue for each street or section of a street.

KEY TAKEAWAY
Highest Revenue Generation System: Hybrid Meter-Permit
Combines the revenue potential of the meter system and the annual permit system, and therefore generates the highest revenue for DCR based on quantitative analysis only

c. Costs

The previous section delineated the revenue potential calculations for DCR. In order to provide a comprehensive picture of likely net income realized by DCR, we conducted cost research. This involved determining likely cost for each parking system option: single-space meters, multi-space meters, annual permit, and the add-on mobile parking application. Where specific data was not available, our team made estimates based on stated assumptions. See Appendix B.2 for a screenshot of the cost model.

The cost analysis serves solely as a general estimate, as our research revealed that vendors were willing to negotiate substantially lower prices based on the size and details of the contract (See Appendix D for sample vendor contracts). The two primary sources of information were the City of Boston parking office and the Harvard University Parking Services Office. We received additional information from DCR regarding estimated enforcement costs.

The final system costs were established based on 100% adoption of a single program for all DCR parking spaces. Costs were divided into 3 segments:

- **Capital Expenditure:** Included the purchase of system equipment, specifically meters and enforcement vehicles. All capital expenditure was considered depreciable – over 6 years for the meters and over 7 years for the vehicles. Capital expenditure, therefore, is present in the Total Cost Year 1 and Total Annual Costs (Years 2-6) estimates.

- **Year 1 Costs:** Split into Fixed Costs and Variable Costs. Fixed Costs included the mobile application add-on, which requires a one time set-up fee and subsequently requires a per transaction cost of $0.15 (not included in cost calculations since it minimal and requires transaction volume data not available to us). Variable Costs include the cost to install capital equipment and signage. Year 1 Costs are present in the Total Cost Year 1 and Total Annual Costs (Years 2-6) estimates.

- **Annual Costs**: Split into Fixed Costs and Variable Costs. Fixed Costs include costs that are present regardless of the number of meters purchased and include staff and personnel expenses. Variable Costs are only applicable to the annual permit program for the vehicle decals. Annual Costs are only present in the Total Annual Costs (Years 2-6) estimates.

KEY TAKEAWAY
Lowest Cost System: Annual Permit *Produces the lowest costs due to $0 of capital expenditure required*

C. Stage 3: Qualitative Analysis

In doing our research, it quickly became apparent that a purely numerical, revenue-maximization analysis was only part of the perspective we needed to take in order to make a comprehensive and thoughtful recommendation to DCR. There are a number of considerations that are at least as important as the revenue generation potential of various options open to DCR for its street parking spaces. These qualitative factors relate to DCR's mission of public service, political feasibility, public opinion, type of neighborhood (commercial, institutional, residential), and current parking regulations in place in each neighborhood.

To provide qualitative analysis to DCR, we first performed a stakeholder analysis in which we identified the key stakeholder groups involved and their likely concerns. We then grouped these concerns into the main qualitative factors for DCR to consider in making parking regulation changes. We next performed a close street-by-street analysis, assessing each parking option based on these qualitative factors. We provide additional qualitative information to DCR based on benchmarking interviews we performed with the City of Somerville to assess political and contextual feasibility from a city perspective. We conclude with the initial feedback received in our interim presentation to DCR senior staff.

Ultimately, ***we feel that DCR is better placed to make a final decision regarding the relevance and prioritization of these non-qualitative factors***, since DCR has a greater contextual

understanding than our research team of the political, public, and other non-quantitative factors at play. However, we feel that we provide value in flagging potential issues DCR should consider in making any changes to its current parking system.

1. External Stakeholders

We identified three key stakeholder groups, each with unique concerns they are likely to have about changes to DCR's parking regulations:

- City of Boston, City of Cambridge
- Residents living near parking spaces
- Non-residents using parking spaces

The following is a qualitative stakeholder analysis matrix.

Table: Stakeholder Analysis
Who are the key stakeholder groups? What qualitative issues apply to each stakeholder group?

	Political: City of Boston, City of Cambridge	**Public**: ***Residents*** living near and using parking spaces	**Public**: ***Non-residents*** using parking spaces
Political feasibility: Could changes to current parking regulations generate opposition from municipalities?	✔		
Public opinion: Could changes to current parking regulations generate public pushback?		✔	✔
DCR mission: Would changes to parking regulations promote access between the public and DCR's parks?	✔	✔	✔
Contextual appropriateness: Would changes to parking regulations be appropriate to the type of neighborhood?	✔	✔	✔
Contextual appropriateness: Would parking changes be appropriate given current parking regulations?	✔	✔	✔

Below are some key qualitative factors to consider:

Political feasibility: potential sources of opposition. Any option DCR implements that changes the status quo will evoke a response from other political actors involved. The two most salient political actors we identified are the City of Boston and the City of Cambridge. Currently, each city's residents benefit greatly from the current system in place. In Boston's case, the city has put up signage indicating that certain domains of DCR spaces are available only to Boston residents. This is a benefit to residents, as they're currently able to use spaces that non-residents are not. Should DCR change these spaces to, say, metered regulations, Boston residents will now have to pay for a resource that is currently free. This can be expected to generate pushback from residents and, in turn, from the City of Boston.

Similar pushback can be expected from the City of Cambridge if the DCR-owned street spaces within Cambridge are changed over to a metered or annual permit system that requires payment for currently free spaces.

Public opinion: likelihood of public pushback. Similar to the political concerns discussed in the political feasibility section immediately preceding, changes DCR makes to the status quo will have some degree of public pushback whenever currently free parking spaces become monetized, are restricted to residents where they are currently open to all drivers, or conversely are opened up to all drivers where they are currently limited to residents or special permit-holders.

While the existence of public pushback should not immediately preclude a given option or combination of options, we recommend that DCR be aware of the sources of opposition it is likely to face in different scenarios. As indicated in the political feasibility section, it is likely that public pushback will feed into political pushback where residents of Boston or Cambridge are likely to complain to their city.

DCR's mission: connect the public to the environment. DCR's stated mission is "To protect, promote and enhance our common wealth of natural, cultural and recreational resources for the well-being of all" in order to in order to deepen the connection between the people of Massachusetts and the environment. DCR's official website states that it pursues its mission by strengthening the accessibility and quality of the natural resources it oversees. In monetizing its street parking spaces in Boston and Cambridge, we recommend that DCR consider how various monetization possibilities, whether meters, resident permits, free parking, or some combination, impacts its mission to connect the people with nature. This is especially important for DCR-owned parking spaces located near parks and other recreation areas.

Additionally, our team considered whether, as a state entity with a public service mandate, DCR would be in conflict with this mandate should it implement a plan to maximize parking revenue when such a plan might discourage residents from parking in spaces near their homes. We also question whether making available annual permits priced at market value is in opposition to DCR's mandate if it effectively makes parking available to the highest bidder, and precludes residents with less disposable income from utilizing parking spaces that are currently a public good.

Contextual appropriateness. We recommend that DCR consider whether a given monetization option is appropriate given both the type of neighborhood the spaces are in (commercial, institutional, residential), and given the current parking regulations that exist in each neighborhood.

- ***Type of neighborhood*** (commercial, institutional, residential): Certain parking options will be more appropriate given the type of neighborhood. For example, in residential areas where DCR owns spaces, it is less appropriate to install parking meters, even though that might maximize revenue. Rather, in residential areas, we recommend that DCR consider either resident permits or instituting open parking.

- ***Current parking regulations by neighborhood***: Similarly, we recommend that DCR consider current parking regulations in place in each area it owns spaces before deciding on a different option. Any change from the status quo is likely to generate some amount of public and/or political opposition. Our analysis includes an examination of regulations currently in place for each section of spaces, and this consideration informed our ultimate recommendation.

2. Street-by-Street Assessment Summary

Given the distribution of the parking spaces across two cities, there are substantial differences in current parking regulations and neighborhood context. We gathered this information during our visits to the spaces and through interviews with key individuals, such as law enforcement and DCR personnel. Appendix E provides detailed descriptions and notes key challenges for new program implementation for each area reviewed. The following is a summary of the top expected concerns that DCR will need to address.

- Any changes to the status quo parking regulation will result in pushback from stakeholders.
- Areas that currently have free, unrestricted parking spaces available will be the easiest to generate revenue from.
- Any spaces that have special permits will need to be handled individually by DCR. Depending on the organization, special permits may or may not be purchased. It may be difficult for non-profits to pay a market rate for an annual parking space.
- Any changes to 24-hour Resident Permit Only spaces will elicit community pushback. The opposition will likely be due to the fact that residents will lose 12 hours of resident permit only parking during the day to enforce paid meter parking. However, in many areas, switching from 24-hour access to 12-hour meters + 12-hour resident permit only will produce rules and regulations consistency on both sides of one street.

3. Benchmarking: City of Somerville

To understand the best opportunities for successful collaboration with the cities of Boston and Cambridge, our team interviewed the Director of Operations of the Somerville Department of Traffic and Parking. The director provided the following insights:

DCR should work with the cities and communities to solicit feedback and suggestions before the implementation of any program. Cities would be willing to partner with DCR. For example, DCR would undertake the capital costs, while the city would be responsible for maintenance and installation. Negotiated revenue agreements could potentially be split 50-50 between DCR and the city but a higher percentage for DCR is also quite likely as well, depending on the terms of the agreement.

The general thought is that metered parking is the best option for minimal community pushback. Permitted spaces are difficult to enforce and maintain, especially if the permits are not open access resident permits. Therefore, metered parking during the day and unrestricted resident only permit parking during non-meter hours will be best received since cities and residents understand revenue generation needs.

The director confirmed that the ratio of meter parking revenue to ticketing fees and penalties is roughly 1:4. This is consistent with our team's independent research.[1]

4. Interim Feedback from DCR

On November 24, our research group met with DCR Commissioner Jack Murray and senior staff, including our primary client contact Michael Abrahams, Chief Financial Officer. The purpose of the meeting was to provide an interim progress check and discuss our recommendations to date. Feedback from the Commissioner and other DCR staff was incorporated into our final recommendations. The following are notes and comments provided by DCR at that meeting.

a. Notes from the Commissioner: Commissioner Murray affirmed that any change to sections of DCR-owned spaces currently marked as "resident only" parking would likely be met with considerable public and political resistance. He therefore recommended that the status quo be maintained for those areas. We have incorporated Commissioner Murray's feedback into our recommendations.

b. Comments from senior DCR staff: Senior staff raised various concerns that closely relate to the considerations we flagged earlier in our qualitative analysis of the issue. Some specific concerns staff raised:
   - In areas under consideration that are adjacent to DCR parks and public facilities, should the spaces be available for free and unrestricted parking in order to maximize public access?
   - In residential areas, should spaces be made available only to residents?

[1] City of Boston generated ~$16 million in FY2014 parking revenue and ~$60 million in enforcement fees and penalties.

V. Recommendations

Our team's recommendations to DCR come out of a street-by-street assessment that takes into account both quantitative and qualitative factors that will affect revenue generation, public and political support, and implementation. We break out our recommendations below based on a combined analysis of these factors. All handicap-marked spaces have been removed from consideration for a net capacity of 737 parking spaces. The **total expected net income** generated for the following plan is **approximately $2.6 million annually**. Total expected net income is derived from total expected revenue (Part 1: $2,148,120 + Part II: $102,000 + Part III: $940,680 + Part IV: $0), less estimated total costs (~$600,000).

Part 1:	Current Status Quo:	Free, Unrestricted Parking Spaces (459 spaces)
	Recommendation:	Install parking meters (8AM-8PM) + Allow Resident Permit Only parking (8PM-8AM)
	Expected Revenue:	$2,148,120 annually

We recommend that DCR install parking meters, enforced during the day from 8AM to 8PM, and enforce free Resident Permit Only parking from 8PM to 8AM in the following areas unless otherwise noted:

- Park Drive
  - Services Areas 1-4 L
  - Past Rotary R
  - Past Rotary L
- Charlesgate East and Boylston Street
  - Charlesgate East
    - Boylston to Ipswich L
    - Near Newbury
- Fenway Road
  - Simmons College
  - Museum Rd to Forsyth Way
  - NOTE: Since the area is predominantly institutional, the specific institutional sections can be designated free, unrestricted parking during non-meter hours.
- Cambridge
  - Cambridge Parkway
    - NOTE: Since the area is predominantly institutional, the specific institutional sections can be designated free, unrestricted parking during non-meter hours.
  - Memorial Drive – Charles River Side (a)
    - NOTE: Since the area is predominantly institutional, the specific institutional sections can be designated free, unrestricted parking during non-meter hours.
  - Memorial Drive – Wadsworth to Mass Ave
  - Memorial Drive – Bridge to Fowler

Part 2:	Current Status Quo:	Special Permit Parking Spaces (34 spaces)
	Recommendation:	Issue annual DCR permits for a fee
	Expected Revenue:	$102,000 annually

For the three areas which currently have signs requiring a special permit—Our Lady's Guild House, Boston Conservatory, Massachusetts Historical Society, Berklee College of Music, St. Clement's Church, and the boat/yacht club on Memorial Drive—we recommend that DCR contact each institution individually to inform them that they plan to discontinue the special permits. Because some degree of opposition can be expected, we recommend that DCR first conduct a thorough search for any internal documentation of the origin of the special permits. We recommend that DCR offer the institutions the options to purchase a set number of parking spaces if so desired. If an agreement is not reached, the spaces will revert to DCR's parking regulations in the closest area – metered parking and/or Resident Permit Only parking.

Part 3:	Current Status Quo:	Resident Permit Only Parking Spaces (201 spaces)
	Recommendation:	Install parking meters (8AM-8PM) + Allow Resident Permit Only parking (8PM-8AM)
	Expected Revenue:	$940,680 annually

For areas that currently restrict parking to resident permit holders only, we recommend that DCR install parking meters, enforced during the day from 8AM to 8PM, and enforce free Resident Permit Only parking from 8PM to 8AM in the following areas:

- Park Drive
  - Service Areas 1-4 R
  - Main Road
- Charlesgate East and Boylston Street
  - Boylston Street
    - Boston Conservatory R (a)
    - Boston Conservatory L
    - St. Clement's Church (a)
  - Charlesgate East
    - Boylston to Ipswich R
- Fenway Road
  - Forsyth Way to Agassiz Road
    - NOTE: Since the area is predominantly institutional, the specific institutional sections can be designated free, unrestricted parking during non-meter hours.
  - Service Road (Near Forsyth)
    - NOTE: Since the area is predominantly institutional, the specific institutional sections can be designated free, unrestricted parking during non-meter hours.
  - Service Road (Near Agassiz)

Part 4:	Current Status Quo:	Resident Permit Only Parking Spaces (43 spaces)
	Recommendation:	Maintain status quo (24-hour Resident Permit Only parking)
	Expected Revenue:	$0 annually

The Charlesgate West and Boylston Street area requires special attention. The area is currently residential with limited parking options for residents. As such, any spaces that are free (i.e., a single space in front of Our Lady's Guild House not designated by a special permit) or Resident Permit Only should be converted to or remain Resident Permit Only. The single free space in front of the guild house should first be included with the other special permit spaces for the guild house to consider purchasing. The lack of commerce or institutional organizations in the area renders meters unprofitable here.

VI. Implementation Considerations

We recognize that our team's recommendations are a starting point. We have conducted a thorough quantitative analysis of the revenue potential and associated costs of various parking monetization options, and have analyzed the relevant qualitative factors our team has identified. Based on this information, DCR should choose the option or combination of options that best fits the issues at play.

Our team's work concludes prior to implementation. But we wanted to identify what key implementation considerations DCR should keep in mind as it moves to implementing its chosen option. We have divided these into short-term and long-term considerations.

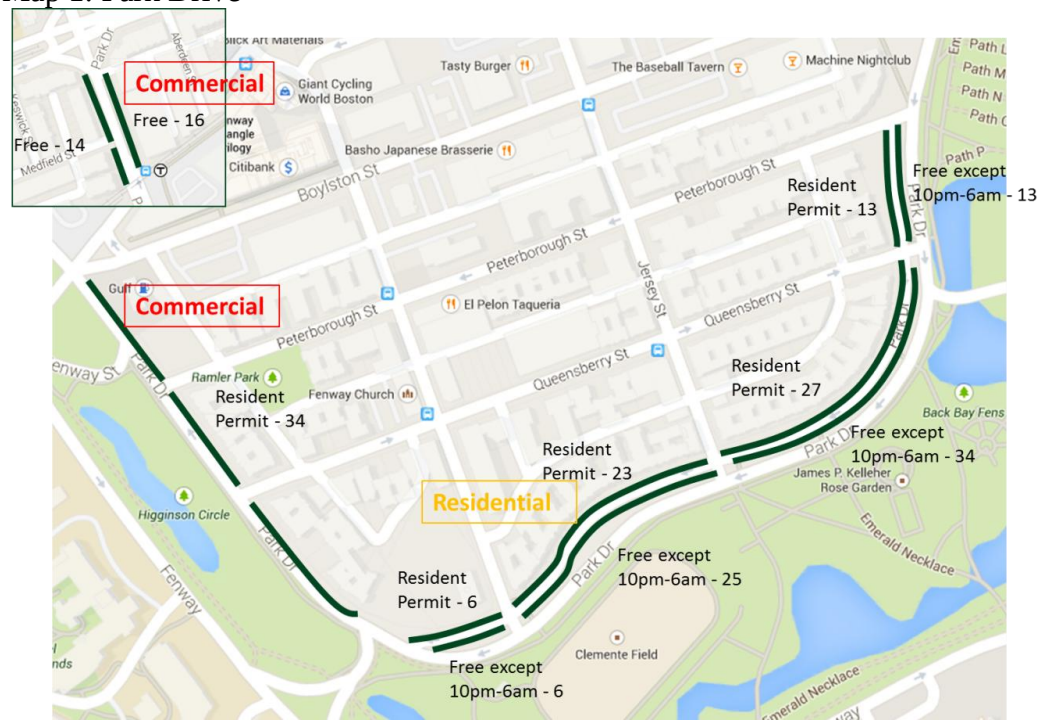
A. **Short-term implementation considerations/recommendations:** For any areas in which DCR has chosen a parking option that is different from the status quo, we recommend that DCR outreach to both the Cities of Boston and Cambridge, and to affected residents or non-resident space-users.
    a. **Discussions and collaboration with Boston and Cambridge:** We recommend that DCR work to "bring along" the Cities of Boston and Cambridge on the decision-making and implementation process. Based on our discussion with the City of Somerville, we believe that Boston and Cambridge can be allies in this process if DCR works to understand, acknowledge, and accommodate the cities' interests and concerns. Specifically, DCR could reach out to each city's parking officials, explain DCR's position, and seek their input. Our contact at the City of Somerville indicated that the cities might be willing to enter into a revenue sharing agreement in exchange for taking charge of enforcement of newly installed parking meters.
    b. **Public outreach**: DCR could conduct listening sessions and focus groups and administer resident surveys in order to get an accurate sense of public opinion regarding making changes to these parking spaces, and provide information in advance of changes. We believe that public opposition can be lessened if residents and non-resident space users are informed of changes, and allowed to provide input into the decision-making and implementation process. Surveys, focus groups, listening sessions, and community meetings provide means for providing information and seeking input.
    c. **New technologies**: We recommend that DCR parking officials remain up-to-date on emerging parking monetization technologies. Current new technologies to implement are smart meters that accept credit and debit cards as well as cash, and pay-by-mobile options.

B. **Long-term implementation considerations/recommendations**: Of the four recommendations detailed in section V of the report, the most potentially contentious is the third, resident only permits. This portion of the recommendations poses the greatest challenge for DCR

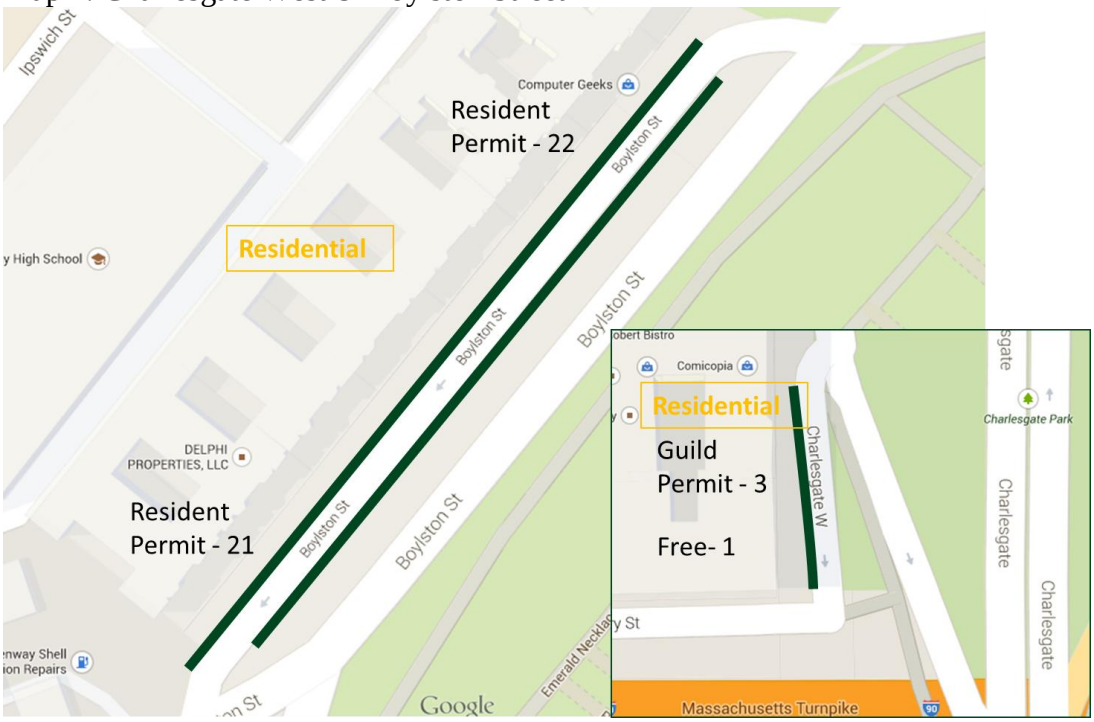
VIII. Appendices

Appendix A: Maps

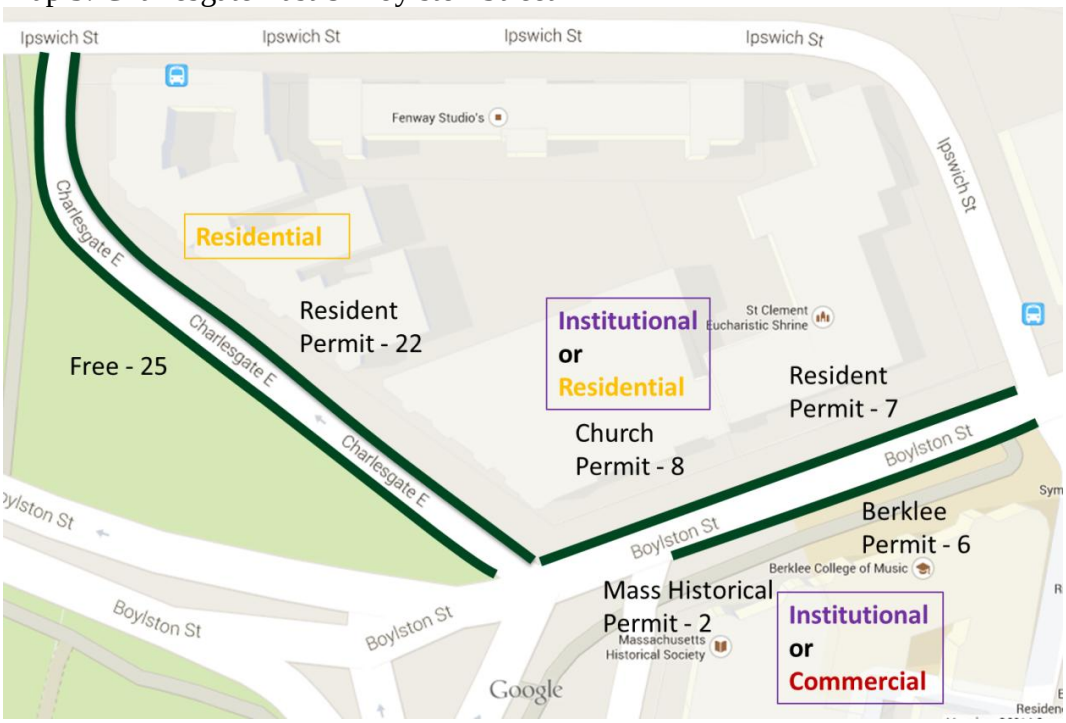
Map 1: Park Drive



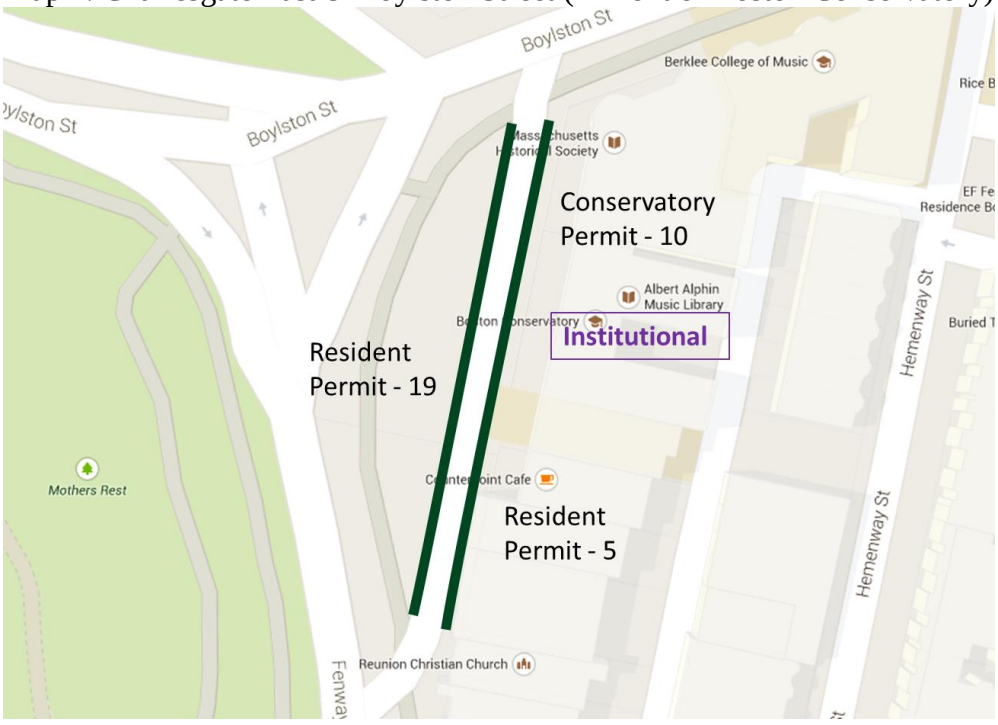
Map 2: Charlesgate West & Boylston Street



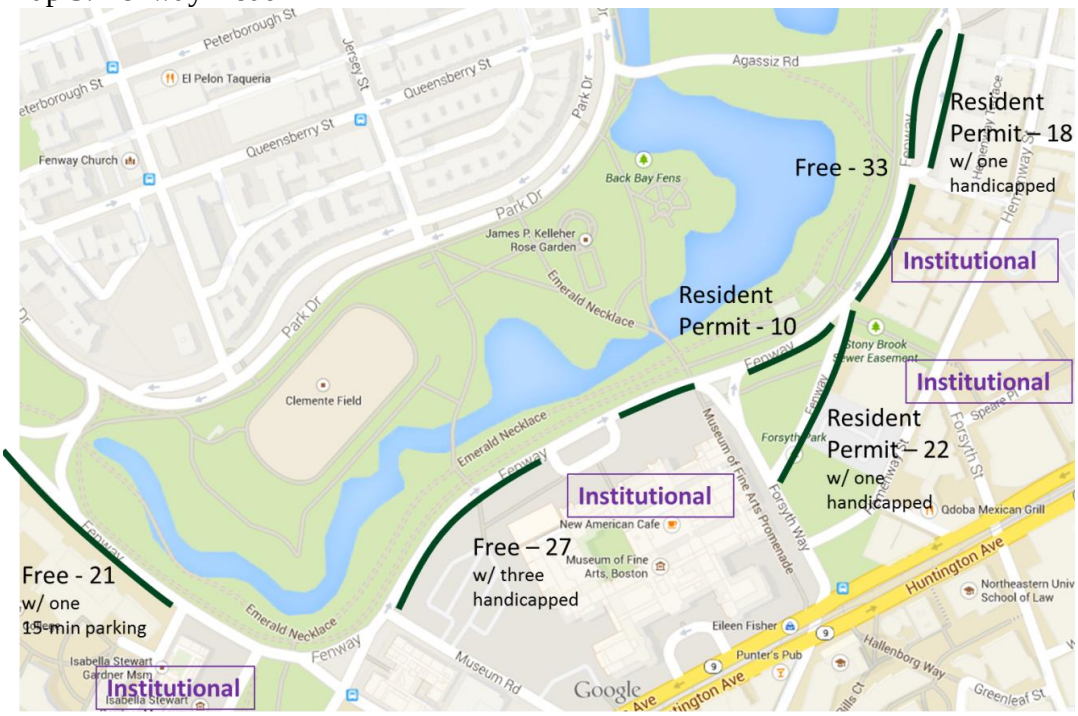
Map 3: Charlesgate East & Boylston Street



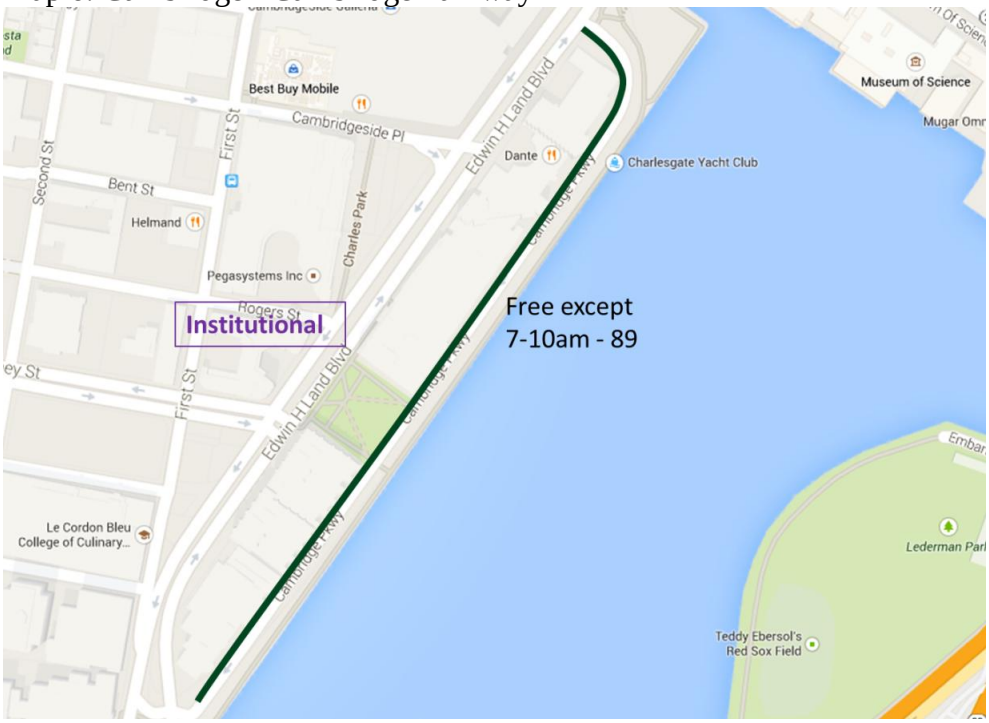
Map 4: Charlesgate East & Boylston Street (In front of Boston Conservatory)



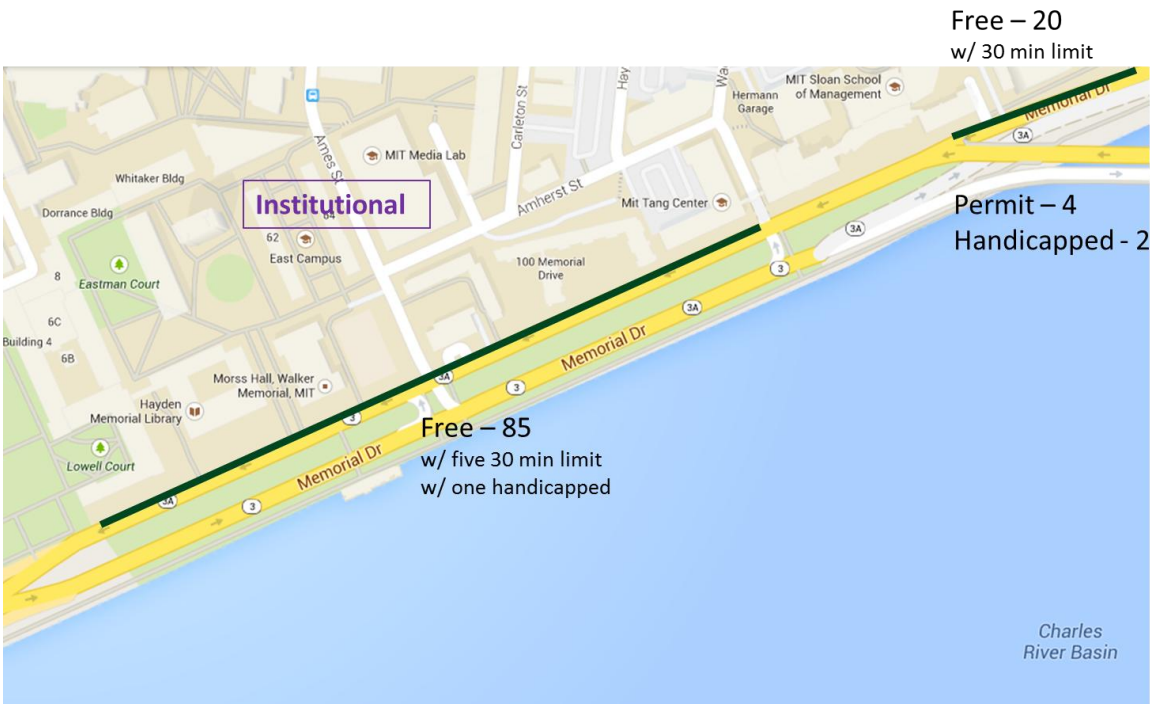
Map 5: Fenway Road



Map 6: Cambridge - Cambridge Parkway



Map 7: Cambridge - Memorial Drive (Wadsworth to Mass Ave)



Map 8: Cambridge - Memorial Drive (Mass Ave to Fowler Street)

Appendix B: Revenue Model

B.1 Maximizing Potential Revenue Generation – Area Breakdowns

Boston-Fenway-Cambridge Parking Revenue Generation Model

CONTROL PANEL

NOTE: Blue cells can be updated.			METER	PERMIT	HYBRID
INPUT CELL	Hourly rate: identified by current hourly meter rate set by City of Boston	Hourly rate:	$ 1.25		$ 1.25
INFORMATION CELL	Daily rate: calculated for potential comparison purposes	*Daily rate:*	*$ 15.00*		
INFORMATION CELL	Weekly rate: calculated for potential comparison purposes	*Weekly rate:*	*$ 90.00*		
INFORMATION CELL	Monthly rate: calculated for potential comparison purposes	*Monthly rate:*	*$ 390.00*		
INPUT CELL	Annual rate: identified by local area parking garage annual rates	Annual rate:	*$4,680.00*	$ 3,000.00	$ 1,500.00
INPUT CELL	Maximum hours/day: identified by current parking meter hours in the City of Boston	Maximum hours/day:	12	*24*	12
INPUT CELL	Maximum days/week: identified by current parking meter hours in the City of Boston	Maximum days/week:	6	*7*	6
INPUT CELL	Maximum weeks/year: identified by current parking meter hours in the City of Boston	Maximum weeks/year:	52	*52*	52
CALCULATED CELL	Maximum capacity: Maximum hours/day * Maximum days/week * Maximum weeks/year	Maximum capacity/spot (annual hours):	3744		3744
INPUT CELL	Utilization: "reasonably" expected utilization	Utilization:	100%	100%	100%

LOCATION INFORMATION			PARKING SPOTS - STATUS QUO							ANNUAL REVENUE POTENTIAL		
			FREE			HYBRID		PERMIT		OTHER	TOTAL	METER	PERMIT	HYBRID
LOCATION	DESCRIPTION	CLASSIFICATION	FREE	FREE 30MIN LIMIT	FREE EXCEPT 7-10AM	FREE 6AM-10PM	RESIDENT PERMIT 10PM-6AM	RESIDENT PERMIT ONLY	SPECIAL PERMIT	HANDICAP		12H/6D/52WKS	ANNUAL 24H	12H METER + 12H PERMIT
Park Drive	Service Area 1R	Residential						13			13	60,840	39,000	80,340
Park Drive	Service Area 1L	Residential					13				13	60,840	39,000	80,340
Park Drive	Service Area 2R	Residential						27			27	126,360	81,000	166,860
Park Drive	Service Area 2L	Residential					34				34	159,120	102,000	210,120
Park Drive	Service Area 3R	Residential						23			23	107,640	69,000	142,140
Park Drive	Service Area 3L	Residential					25				25	117,000	75,000	154,500
Park Drive	Service Area 4R	Residential						6			6	28,080	18,000	37,080
Park Drive	Service Area 4L	Residential					6				6	28,080	18,000	37,080
Park Drive	Main Road (a)	Residential						30			30	140,400	90,000	185,400
Park Drive	Main Road (b)	Residential or Commercial						4			4	18,720	12,000	24,720
Park Drive	Past Rotary R	Residential or Commercial	16								16	74,880	48,000	98,880
Park Drive	Past Rotary L	Residential or Commercial	14								14	65,520	42,000	86,520
		TOTAL	30	0	0		78	103	0	0	211	987,480	633,000	1,303,980

Boston-Fenway-Cambridge Parking Revenue Generation Model

CONTROL PANEL

NOTE: Blue cells can be updated.

			METER	PERMIT	HYBRID
INPUT CELL	Hourly rate: identified by current hourly meter rate set by City of Boston	Hourly rate:	$ 1.25		$ 1.25
INFORMATION CELL	Daily rate: calculated for potential comparison purposes	*Daily rate:*	*$ 15.00*		
INFORMATION CELL	Weekly rate: calculated for potential comparison purposes	*Weekly rate:*	*$ 90.00*		
INFORMATION CELL	Monthly rate: calculated for potential comparison purposes	*Monthly rate:*	*$ 390.00*		
INPUT CELL	Annual rate: identified by local area parking garage annual rates	Annual rate:	*$4,680.00*	$ 3,000.00	$ 1,500.00
INPUT CELL	Maximum hours/day: identified by current parking meter hours in the City of Boston	Maximum hours/day:	12	*24*	12
INPUT CELL	Maximum days/week: identified by current parking meter hours in the City of Boston	Maximum days/week:	6	*7*	6
INPUT CELL	Maximum weeks/year: identified by current parking meter hours in the City of Boston	Maximum weeks/year:	52	*52*	52
CALCULATED CELL	Maximum capacity: Maximum hours/day * Maximum days/week * Maximum weeks/year	Maximum capacity/spot (annual hours):	3744		3744
INPUT CELL	Utilization: "reasonably" expected utilization	Utilization:	100%	100%	100%

LOCATION INFORMATION			PARKING SPOTS - STATUS QUO							ANNUAL REVENUE POTENTIAL		
			FREE			HYBRID		PERMIT		OTHER	TOTAL	METER	PERMIT	HYBRID
LOCATION	DESCRIPTION	CLASSIFICATION	FREE	FREE 30MIN LIMIT	FREE EXCEPT 7-10AM	FREE 6AM-10PM	RESIDENT PERMIT 10PM-6AM	RESIDENT PERMIT ONLY	SPECIAL PERMIT	HANDICAP		12H/6D/52WKS	ANNUAL 24H	12H METER + 12H PERMIT
Charlesgate West	In front of Our Lady's G	Residential	1						3		4	18,720	12,000	24,720
Boylston Street	Service Road R	Residential						21			21	98,280	63,000	129,780
Boylston Street	Service Road L	Residential						22			22	102,960	66,000	135,960
											0	-	-	-
		TOTAL	1	0	0		0	43	3	0	47	219,960	141,000	290,460

Boston-Fenway-Cambridge Parking Revenue Generation Model

CONTROL PANEL

NOTE: Blue cells can be updated.

			METER	PERMIT	HYBRID
INPUT CELL	Hourly rate: identified by current hourly meter rate set by City of Boston	Hourly rate:	$ 1.25		$ 1.25
INFORMATION CELL	Daily rate: calculated for potential comparison purposes	*Daily rate:*	*$ 15.00*		
INFORMATION CELL	Weekly rate: calculated for potential comparison purposes	*Weekly rate:*	*$ 90.00*		
INFORMATION CELL	Monthly rate: calculated for potential comparison purposes	*Monthly rate:*	*$ 390.00*		
INPUT CELL	Annual rate: identified by local area parking garage annual rates	Annual rate:	*$4,680.00*	$3,000.00	$ 1,500.00
INPUT CELL	Maximum hours/day: identified by current parking meter hours in the City of Boston	Maximum hours/day:	12	*24*	12
INPUT CELL	Maximum days/week: identified by current parking meter hours in the City of Boston	Maximum days/week:	6	*7*	6
INPUT CELL	Maximum weeks/year: identified by current parking meter hours in the City of Boston	Maximum weeks/year:	52	*52*	52
CALCULATED CELL	Maximum capacity: Maximum hours/day * Maximum days/week * Maximum weeks/year	Maximum capacity/spot (annual hours):	3744		3744
INPUT CELL	Utilization: "reasonably" expected utilization	Utilization:	100%	100%	100%

LOCATION INFORMATION			PARKING SPOTS - STATUS QUO								ANNUAL REVENUE POTENTIAL		
			FREE			HYBRID		PERMIT		OTHER	TOTAL	METER	PERMIT	HYBRID
LOCATION	DESCRIPTION	CLASSIFICATION	FREE	FREE 30MIN LIMIT	FREE EXCEPT 7-10AM	FREE 6AM-10PM	RESIDENT PERMIT 10PM-6AM	RESIDENT PERMIT ONLY	SPECIAL PERMIT	HANDICAP		12H/6D/52WKS	ANNUAL 24H	12H METER + 12H PERMIT
Boylston Street	Boston Conservatory R	Institutional						5			5	23,400	15,000	30,900
Boylston Street	Boston Conservatory R	Institutional							10		10	46,800	30,000	61,800
Boylston Street	Boston Conservatory L	Institutional						18		1	19	84,240	54,000	111,240
Boylston Street	Mass Historical Society	Institutional or Commercial							2		2	9,360	6,000	12,360
Boylston Street	Berklee College of Mus	Institutional or Commercial							6		6	28,080	18,000	37,080
Boylston Street	St. Clement's Church (a	Residential or Institutional						7			7	32,760	21,000	43,260
Boylston Street	St. Clement's Church (b	Residential or Institutional							8		8	37,440	24,000	49,440
Charlesgate East	Boylston to Ipswich R	Residential						22			22	102,960	66,000	135,960
Charlesgate East	Boylston to Ipswich L	Residential	25								25	117,000	75,000	154,500
Charlesgate East	Near Newbury	Residential	8								8	37,440	24,000	49,440
											0	-	-	-
		TOTAL	33	0	0	0		52	26	1	112	519,480	333,000	685,980

Boston-Fenway-Cambridge Parking Revenue Generation Model

CONTROL PANEL

NOTE: Blue cells can be updated.

			METER	PERMIT	HYBRID
INPUT CELL	Hourly rate: identified by current hourly meter rate set by City of Boston	Hourly rate:	$ 1.25		$ 1.25
INFORMATION CELL	Daily rate: calculated for potential comparison purposes	*Daily rate:*	*$ 15.00*		
INFORMATION CELL	Weekly rate: calculated for potential comparison purposes	*Weekly rate:*	*$ 90.00*		
INFORMATION CELL	Monthly rate: calculated for potential comparison purposes	*Monthly rate:*	*$ 390.00*		
INPUT CELL	Annual rate: identified by local area parking garage annual rates	Annual rate:	*$4,680.00*	$3,000.00	$ 1,500.00
INPUT CELL	Maximum hours/day: identified by current parking meter hours in the City of Boston	Maximum hours/day:	12	*24*	12
INPUT CELL	Maximum days/week: identified by current parking meter hours in the City of Boston	Maximum days/week:	6	*7*	6
INPUT CELL	Maximum weeks/year: identified by current parking meter hours in the City of Boston	Maximum weeks/year:	52	*52*	52
CALCULATED CELL	Maximum capacity: Maximum hours/day * Maximum days/week * Maximum weeks/year	Maximum capacity/spot (annual hours):	3744		3744
INPUT CELL	Utilization: "reasonably" expected utilization	Utilization:	100%	100%	100%

LOCATION INFORMATION			PARKING SPOTS - STATUS QUO								ANNUAL REVENUE POTENTIAL		
			FREE			HYBRID		PERMIT		OTHER	TOTAL	METER	PERMIT	HYBRID
LOCATION	DESCRIPTION	CLASSIFICATION	FREE	FREE 30MIN LIMIT	FREE EXCEPT 7-10AM	FREE 6AM-10PM	RESIDENT PERMIT 10PM-6AM	RESIDENT PERMIT ONLY	SPECIAL PERMIT	HANDICAP		12H/6D/52WKS	ANNUAL 24H	12H METER + 12H PERMIT
Fenway Road	Simmons College	Institutional	21								21	98,280	63,000	129,780
Fenway Road	Museum Rd to Forsyth	Institutional	27							3	30	126,360	81,000	166,860
Fenway Road	Forsyth Way to Agassiz	Institutional	33					10			43	201,240	129,000	265,740
Fenway Road	Service Road (Near For	Institutional						22		1	23	102,960	66,000	135,960
Fenway Road	Service Road (Near Aga	Residential						18		1	19	84,240	54,000	111,240
											0	-	-	-
		TOTAL	81	0	0	0		50	0	5	136	613,080	393,000	809,580

Boston-Fenway-Cambridge Parking Revenue Generation Model

CONTROL PANEL

NOTE: Blue cells can be updated.

			METER	PERMIT	HYBRID
INPUT CELL	Hourly rate: identified by current hourly meter rate set by City of Boston	Hourly rate:	$ 1.25		$ 1.25
INFORMATION CELL	Daily rate: calculated for potential comparison purposes	*Daily rate:*	*$ 15.00*		
INFORMATION CELL	Weekly rate: calculated for potential comparison purposes	*Weekly rate:*	*$ 90.00*		
INFORMATION CELL	Monthly rate: calculated for potential comparison purposes	*Monthly rate:*	*$ 390.00*		
INPUT CELL	Annual rate: identified by local area parking garage annual rates	Annual rate:	*$4,680.00*	$3,000.00	$ 1,500.00
INPUT CELL	Maximum hours/day: identified by current parking meter hours in the City of Boston	Maximum hours/day:	12	*24*	12
INPUT CELL	Maximum days/week: identified by current parking meter hours in the City of Boston	Maximum days/week:	6	*7*	6
INPUT CELL	Maximum weeks/year: identified by current parking meter hours in the City of Boston	Maximum weeks/year:	52	*52*	52
CALCULATED CELL	Maximum capacity: Maximum hours/day * Maximum days/week * Maximum weeks/year	Maximum capacity/spot (annual hours):	3744		3744
INPUT CELL	Utilization: "reasonably" expected utilization	Utilization:	100%	100%	100%

LOCATION INFORMATION

LOCATION	DESCRIPTION	CLASSIFICATION
Cambridge	Cambridge Parkway	Institutional
Cambridge	Memorial Drive (Charle	Institutional
Cambridge	Memorial Drive (Charle	Institutional
Cambridge	Memorial Drive (Wadsv	Institutional or Residential
Cambridge	Memorial Drive (Bridge	Institutional or Residential
		TOTAL

PARKING SPOTS - STATUS QUO

FREE			HYBRID		PERMIT		OTHER	TOTAL
FREE	FREE 30MIN LIMIT	FREE EXCEPT 7-10AM	FREE 6AM-10PM	RESIDENT PERMIT 10PM-6AM	RESIDENT PERMIT ONLY	SPECIAL PERMIT	HANDICAP	
		89						**89**
	20						2	**22**
						4		**4**
79	5						1	**85**
40								**40**
								0
119	25	89	0		0	4	3	**240**

ANNUAL REVENUE POTENTIAL

METER	PERMIT	HYBRID
12H/6D/52WKS	ANNUAL 24H	12H METER + 12H PERMIT
416,520	267,000	550,020
93,600	60,000	123,600
18,720	12,000	24,720
393,120	252,000	519,120
187,200	120,000	247,200
-	-	-
1,109,160	711,000	1,464,660

B.2 Cost Estimates

Boston-Fenway-Cambridge Parking System Cost Estimates

	Type:	SINGLE SPACE METER		MULTI-SPACE METER		ANNUAL PERMIT	
	# of Units Required (estimate):	800		80		800	
CAPEX	**Capital Expenditure**		**$330,000**		**$1,130,000**		**$50,000**
	Meter, Per Unit	$350	$280,000	$13,500	$1,080,000		
	Enforcement Vehicle, Per Unit	$25,000	$50,000	$25,000	$50,000	$25,000	$50,000
YEAR 1	**Fixed Cost**		**$1,500**		**$1,500**		**$0**
	Mobile Application Add-on		$1,500		$1,500		
	Variable Cost		**$80,000**		**$200,000**		**$8,000**
	Installation + Signage, Per Unit	$100	$80,000	$2,500	$200,000	$10	$8,000
ANNUAL	**Fixed Cost**		**$568,606**		**$329,746**		**$568,606**
	Administration and Management		$250,000				$250,000
	Repairs and Preventative Maintenance				$5,200		
	Subscription Fee				$5,940		
	Enforcement - DCR Rangers		$318,606		$318,606		$318,606
	Variable Cost		**$0**		**$0**		**$4,000**
	DCR Parking Decal, Per Unit					$5	$4,000
	TOTAL COST YEAR 1		**$703,915**		**$718,388**		**$587,748**
	TOTAL ANNUAL COST (YRS 2-6)		**$622,415**		**$516,888**		**$579,748**
	Transaction-based Variable Costs						
	Transaction fee: mobile application	$0.15		$0.15		$0	

B.3 Summary of Proposed Revenue Generation Model

Boston-Fenway-Cambridge Parking Revenue Generation Model

LOCATION INFORMATION			PARKING SPOTS - STATUS QUO								RECOMMENDATION		
			FREE			HYBRID		PERMIT		OTHER	TOTAL	METER	PERMIT	HYBRID
LOCATION	DESCRIPTION	CLASSIFICATION	FREE	FREE 30MIN LIMIT 8AM-6PM	FREE EXCEPT 7-10AM	FREE 6AM-10PM	RESIDENT PERMIT 10PM-6AM	RESIDENT PERMIT ONLY	SPECIAL PERMIT	HANDICAP		12H/6D/52WKS + FREE RES. PERMIT	ANNUAL 24H	12H METER + 12H PERMIT
Park Drive	Service Area 1R	Residential	0	0	0	0		13	0	0	**13**	60,840		
Park Drive	Service Area 1L	Residential	0	0	0	13		0	0	0	**13**	60,840		
Park Drive	Service Area 2R	Residential	0	0	0	0		27	0	0	**27**	126,360		
Park Drive	Service Area 2L	Residential	0	0	0	34		0	0	0	**34**	159,120		
Park Drive	Service Area 3R	Residential	0	0	0	0		23	0	0	**23**	107,640		
Park Drive	Service Area 3L	Residential	0	0	0	25		0	0	0	**25**	117,000		
Park Drive	Service Area 4R	Residential	0	0	0	0		6	0	0	**6**	28,080		
Park Drive	Service Area 4L	Residential	0	0	0	6		0	0	0	**6**	28,080		
Park Drive	Main Road (a)	Residential	0	0	0	0		30	0	0	**30**	140,400		
Park Drive	Main Road (b)	Residential or Commercial	0	0	0	0		4	0	0	**4**	18,720		
Park Drive	Past Rotary R	Residential or Commercial	16	0	0	0		0	0	0	**16**	74,880		
Park Drive	Past Rotary L	Residential or Commercial	14	0	0	0		0	0	0	**14**	65,520		
Charlesgate West	In front of Our Lady's Gui	Residential	1	0	0	0		0	3	0	**4**		12,000	
Boylston Street	Service Road R	Residential	0	0	0	0		21	0	0	**21**			
Boylston Street	Service Road L	Residential	0	0	0	0		22	0	0	**22**			
Boylston Street	Boston Conservatory R (a	Institutional	0	0	0	0		5	0	0	**5**	23,400		
Boylston Street	Boston Conservatory R (b	Institutional	0	0	0	0		0	10	0	**10**		30,000	
Boylston Street	Boston Conservatory L	Institutional	0	0	0	0		18	0	1	**19**	84,240		
Boylston Street	Mass Historical Society	Institutional or Commercial	0	0	0	0		0	2	0	**2**		6,000	
Boylston Street	Berklee College of Music	Institutional or Commercial	0	0	0	0		0	6	0	**6**		18,000	
Boylston Street	St. Clement's Church (a)	Residential or Institutional	0	0	0	0		7	0	0	**7**	32,760		
Boylston Street	St. Clement's Church (b)	Residential or Institutional	0	0	0	0		0	8	0	**8**		24,000	
Charlesgate East	Boylston to Ipswich R	Residential	0	0	0	0		22	0	0	**22**	102,960		
Charlesgate East	Boylston to Ipswich L	Residential	25	0	0	0		0	0	0	**25**	117,000		
Charlesgate East	Near Newbury	Residential	8	0	0	0		0	0	0	**8**	37,440		
Fenway Road	Simmons College	Institutional	21	0	0	0		0	0	0	**21**	98,280		
Fenway Road	Museum Rd to Forsyth W	Institutional	27	0	0	0		0	0	3	**30**	126,360		
Fenway Road	Forsyth Way to Agassiz R	Institutional	33	0	0	0		10	0	0	**43**	201,240		
Fenway Road	Service Road (Near Forsyt	Institutional	0	0	0	0		22	0	1	**23**	102,960		
Fenway Road	Service Road (Near Agass	Residential	0	0	0	0		18	0	1	**19**	84,240		
Cambridge	Cambridge Parkway	Institutional	0	0	89	0		0	0	0	**89**	416,520		
Cambridge	Memorial Drive (Charles I	Institutional	0	20	0	0		0	0	2	**22**	93,600		
Cambridge	Memorial Drive (Charles I	Institutional	0	0	0	0		0	4	0	**4**		12,000	
Cambridge	Memorial Drive (Wadswo	Institutional or Residential	79	5	0	0		0	0	1	**85**	393,120		
Cambridge	Memorial Drive (Bridge to	Institutional or Residential	40	0	0	0		0	0	0	**40**	187,200		
		TOTAL	264	25	89	78		248	33	9	**746**	$3,190,800		

PARKING SYSTEM OPTIONS		
TYPE	DESCRIPTION	EST. UNITS REQUIRED
OPTION 1:	Single Space Meter	660
	DCR Permit	34
OPTION 2:	Multi-space Meter	78
	DCR Permit	34

COST ELEMENTS					TOTAL COST		NET INCOME		
CapEx	Yr 1 Fixed	Yr 1 Variable	Annual Fixed	Annual Variable	Year 1	Annual	Year 1	Annual	
281,000	1,500	66,000	568,606	-	682,258	614,418	$2,508,542	$2,576,382	Option 1
	-	340		170					
1,103,000	1,500	195,000	329,746	-	709,398	512,558	$2,481,402	$2,678,242	Option 2
	-	340		170					

Appendix C: Annual Permit Benchmarking - Annual Rates of Parking Garages

Cost Per Spot in Park Drive Area				
Address of Garage	**Name of Parking Garage**	**Monthly**	**Annual**	**Notes**
401 Park Dr. (bet. Brookline Ave-Beacon St.)	LAZ Landmark Center (capacity: 208)	325	3900	This is website stated figure.
44 Fullerton St. (bet. Brookline Ave-Miner St.)	LAZ Parking - Landmark Center (capacity: 300)	325	3900	This is website stated figure.
101 Kilmarnock St, (bet. Park Dr-Queensberry St.)	StanHope Garage Inc	300	3600	Contact: (617 262 0691) asked on 14 Nov 2014, It only operates on hourly or daily basis. The figure is only estimated based on the fee charged by other operators proximity to DCR parking spaces. , i.e., This is not official figure.
Cost Per Spot in Fenway Road area				
69 Museum Rd., Boston, MA 02115.	Museum of Fine Arts (capacity: 473)	350	4200	Contact: 617 369-3657 (asked on 14 Nov. 2014 learned that annual fee is calculated on based monthly rate.)
76 Gainsborough Street, Boston, MA 02115	ParkMe (76 Gainsborough Street)	250	3000	Contact: 617 347-7278 (asked 14 Nov 2014, if one agrees to whole year, monthly rate can be discounted to $240.)
5-11 Haviland Street	5-11 Haviland Street Garage	400	4800	Contact: (781) 718-6575 (asked on 14 Nov 2014)
35 Westland Ave. Boston, MA 02115	Westland Avenue Garage (capacity: 305)	310	3720	Contact: (617) 437-1577 (asked on 14 Nov 2014 and learned that $310/month is 24 hours availability; $215/month is day parking from 5:00AM and 7:30PM; $225/month is for night parking from 4:00PM to 9:30AM.
Cost Per Spot in Charlesgate West & Boylston Street Service Areas				
1085 Boylston St Boston, MA 02215,	1085 Boylston St. (capacity: 35)	350	4200	Contact: (617) 542-1549 (called on 14 Nov. 2014)
1081 Boylston St Boston, MA 02215	1081 Boyslon Street (capacity: 28)	350	4200	Contact: (617) 542-1549 (called on 14 Nov. 2014)
55 Yawkey Way Boston, MA 02215,	55 Yawkey Way Lot (capacity: 175)			Contact: (617) 236-5525 (called on 14 Nov. 2014, and learned that currently operates only hourly/ daily basis.)
77 Jersey St Boston, MA 02215	1330 Boylston Garage	350	4200	Contact: (617) 236-5558 (called on 14 Nov. 2014)
49-67 Lansdowne St. Boston, MA 02215	Lansdowne Garage			Contact: 617 421 0125 (operate by Standard Parking)

Cost per Spot in front of Boston Conservatory areas				
The nearby garages are mentioned as above: 5-11 Haviland Street Garage; The 1085 Boylston St.; and 1081 Boyslon Street.				
Cost per spot in Charlesgate East & Boylston Street Service Area				
These areas are institutional areas. The nearby garages are mentioned as above: 5-11 Haviland Street Garage; 1085 Boylston St.; and 1081 Boyslon Street. In addition these, the followings are also in proximity.				
50 Dalton St Boston, MA 02115	Hynes Auditorium Garage	345	4140	Contact: (617) 247-8006 (asked on 14 Nov 2014)
341 Newbury St Boston, MA 02115,	341 Newbury St.,			Contact: (617) 536-3380
79 Exeter St Boston, MA 02116,	Prudential Center Parking Garage	460	5520	Contact: (617) 236-3060 (asked on 14 Nov. 2014 learned that annual fee is calculated on based monthly rate.)
425 Newbury St. Boston, MA 02115	Somerset Visitor Parking			Contact: (617) 723-1488 (asked on 14 Nov 2014 learned that they currently take only on hourly/ daily basis.

Appendix D: Additional Cost Analysis Research

Single-space Meters

Company	Duncan Solutions, Inc.[2]
Model	Liberty Single-Space Meters (Smart Meters)
Features	• Accepts coins, credit cards, debit cards and pay-by-cell payment • Secure PCI-Compliant credit card processing • Supports complex rate structures and audit programs • Communicates wirelessly for real-time data management • Datakey provides simple, straight-forward inventory management • Solar powered with rechargeable battery for extended life
Cost Information	
Liberty Meter	$495/meter
Monthly Cellular[3]	$5.50/month/meter
Credit/debit Transaction Fee	$0.06/transaction
Model76 Housing[4]	$215/housing
Other Information	
Maintenance	• The meters come with a one year warranty • Preventative maintenance is generally handled by the client's staff and that consists of wiping the lens 1-2 times per year, changing batteries as needed and clearing any coin jams. Duncan provides all of the training to do this during installation and have a 24/7 customer support to assist
Supplies	Batteries are the major supply for any type of meter like this. Duncan provides the battery as part of the purchase and they are 100% rechargeable, either at the meter through solar contribution, or via a charger
Life Expectancy	10 years

[2] Duncan is a member of the National Cooperative Purchasing Alliance (NCPA), which means that members can purchase from that association and avoid a procurement process. The state of Massachusetts is a member and Duncan has provided several departments technology off of this purchasing vehicle.

[3] All "smart" meters have a monthly fee to cover the costs of the modem and the software that allows for the management of the technology.

[4] The housings are what the meters are "housed" in for protection.

Multi-space Meters

Company	VenTek International [5]
Model	venSTATION Multi-Space Meters (Pay by Space/Pay& display/ Pay by License Plate)
Features	• Solar Power • Credit Card & Coins • Cellular Connectivity
Cost Information	
Automated Revenue Collection Equipment	
Meters	$7,995/meter
Bill Acceptance*	+$1,232/meter
AC Power* [6]	- $895/meter
Pay-by-License Alpha Numeric Key Pad*	$495/unit
Parking Signs	$75/unit
Installation, Training and Shipping	
Installation& Training	$300.00 /meter
Shipping	$20.00/meter
Annual Recurring Software Fees	
System Management Software (Primary User)	$495.00/year
System Management Software (Secondary User)	$295.00/year
Data Hosting Service	$45.00/month/meter
GSM/GPRS Cellular Connectivity Service	$45.00/month/meter
Payment Gateway(Transaction Processing) Service	$0.05/credit card transaction
Consumables	
Standard Ticket Paper Rolls	$1.40/card
Cleaner-Thermal Printer, box of 25	$1.00/unit
Cleaner-Credit Card Reader, box of 50	$1.00/unit
Bill Acceptor, box of 15	$2.50/unit
Spares	
Spare Coin Locking Revenue Collection Unit	$113.00/unit
Spare Bill Locking Revenue Collection Unit	$211.00/unit
Services	
Standard Warranty[7]	0
Extended 1 Year Factory Warranty[8]	$626.50/year/meter
Extended Factory Warranty After Year 5[9]	$3,425.96/5 year/meter
Preventative Maintenance	$13,500/meter
Essential Support Plan[10]	$521.25/unit
Onsite Hourly Labor Rate	$125.00/hr.
Pay Station Optional Features*	

[5] DCR has purchased multi-space meters from VenTeck for its other parking lots.
[6] Use AC Power instead of Solar Power
[7] Free unlimited tech support for 3 months/warranty issues for 12 months
[8] Years 2 through 5 total for 4 years
[9] Year 5 through 10 - total for 5 years
[10] 12 hours of technical support (phone/email)

Custom Color*	$450.00/unit
Custom Wrap*	$795.00/unit
Braille Graphics*	$995.00/unit
Bar Code Reader*	$1,175.00/unit
QR Code Reader*	$1,175.00/unit
Remote Validation - Pay By Space*	$10.00/pay station
venMOBILE Subscription Fee - Mobile Permitting[11]*	$995.00/unit
Other Information	
Life Expectancy	10 years

* add-on or optional

[11] Remote enforcement & violation issuance with immediate payment by customer at pay station

Mobile Parking Application

Mobile Parking Application vendor shares revenue with DCR in two ways: 1) users are charged extra transaction fee which is added to the original parking fee; 2) transaction fee is included in the parking fee and DCR need to share certain percent of revenue with the company.

	Cost	Service	Biggest Implementation	In Boston[12]?	Customer Service[13]	# of users	# of transactions	others
Pay by phone	$0.13[14]+ $1,500 installation fee	All[15] except signs	MBTA Seattle Dallas Galveston	MBTA	3	8M in worldwide	20.4M in US	PCI Compliant; Pay by Point in 7 countries
Parkmobile	$0.25	All	Washington DC; Miami	Motor Garage	1	2.5M in US	15.6M/year in US	PCI Compliant; only in US
Pango	$0.1+ $1.99 Premium	All	Philadelphia	No	2	1M worldwide	24M/year worldwide	59 cities worldwide; 5 countries
Mobile Now	$0.45	All	New Jersey, Florida/ Maryland	No	2			Only in US

[12] All four companies are the candidates of mobile parking payment supplier of Boston City
[13] Measured by the responsiveness from customer service in scale of 1-3. 3 is the highest and 1 is the lowest.
[14] Transaction fee is based on 1-time payment
[15] Smart Phone In App; Training Days; Launch Event& PR; Custom Service; Maintenance; 3rd party integrations; Signs and decals; Marketing (more details in the following proposal from Pango.)

Proposal from Pango for Mobile Parking Application Service
We (Pango) propose the following terms with the Department of Conservation and Recreation (DCR):

- Agreement Period and Renewal Period: 2 years with one-year renewal option. Agreement period will commence with the signing of this letter.

- Scope of Service: DCR may choose to implement Pango in the whole City's whole parking system or in selected parts of the City through different phases. We recommend that you roll Pango out to all of your metered parking spaces. We will support whatever implementation you may find most amendable for the trial period.

- Fees and Costs

Item	Cost	Description
Basic Service		
Transaction Fee	$0.10	The Parker will pay a $0.10 transaction fee for each parking session.
Optional Monthly Premium Services	$1.99	Pango will charge $1.99 monthly to those customers who OPTIONALLY sign up for our premium services.
Other Services		
Smart Phone In App Alerts	FREE	Customer automatically gets an in-app alert for parking expiration.
Garage Locations, Pricing, & Coupons	FREE	Pango will survey the City's garage locations monthly to update pricing and location information.
Training Days	FREE	Pango will provide 5 – 10 days of training to City employees and traffic enforcement.
Launch Event & PR	FREE	Pango will provide a world class launches event and PR to build awareness for the City.
Custom Report Creation	FREE	The City may have additional requirements for the customization of reports. Pango will customize our system for free at any time with reasonable notice of the requirements.
3rd Party Integrations	FREE	The City may have requirements for Pango to integrate with 3rd party systems for reporting and data sharing. Pango will do this task for free for the City with reasonable notice of the requirements.
24X7 Customer Support	FREE	Pango has 24X7 customer support through our call center. We have a dedicated team who are trained on the City's regulations and parking system.
Signs and Decals	FREE	Pango will have a preference for a locally owned sign company to produce the signage for the City, where possible
Marketing and Launch Event	FREE	Pango will hire a feet on the street marketing team for the launch of the service, and to market the service during the part of the trial period. Pango will hire local

		residents of the City, where possible.
City Paid Costs		
Credit Card Processing Fees	FREE	The City will not pay credit card processing fees for the parking transactions. Pango can use the City's merchant account processor or we can use Pango's merchant account processor (Wells Fargo). We will use whatever merchant account the City selects for Pango. Pango makes no money on these processing costs.

Appendix E: Street-by-Street Description

Description	Description	Challenges
Park Drive		
Service Area 1R; Service Area 1L; Service Area 2R; Service Area 2L; Service Area 3R; Service Area 3L; Service Area 4R; Service Area 4L; Main Road (a); Main Road (b)	Park Drive service areas and the main road are in a residential area. The left side of the road, where applicable, is free unrestricted parking for anyone during the day and Resident Permit Only from 10PM-6AM. The right side of the road is 24-hour Resident Permit Only parking. MA State Police Patrolman Bob Whittier noted that many of the parking spaces on the left side of the street (free, unrestricted) are utilized by out of town commuters who work in institutions in the general area (schools, hospital, Fenway ball park, etc.). Trooper Whittier pointed out that this is generally unsafe in residential areas since anyone can park in the spaces. Red Sox fans also utilize the spaces on game nights, frustrating residents who have to wait late into the night, ~10PM per the current restrictions, to find parking.	• Resident pushback for any limitations on current 24-hour Resident Permit Only parking (Benefit: additional Resident Permit Only parking spaces become available from 8PM-8AM, which better aligns with resident parking needs, and creates consistency with city parking regulations on neighboring streets) • Non-resident pushback for any payment requirements
Past Rotary R; Past Rotary L	Park Drive area past the rotary (near Beacon St intersection) is a residential area that is adjacent to a commercial area. The spaces are currently free, unrestricted parking for anyone.	• Resident pushback for any limitations on current 24-hour parking (Benefit: only residents allowed to park from 8PM-8AM, which reserves spaces for residents only, and creates consistency with city parking regulations on neighboring streets) • Non-resident pushback for any payment requirements
Charlesgate West and Boylston Street		
Charlesgate West - In front of Our Lady's Guild House	The street in front of Our Lady's Guild House has special permit parking for the guild house. However, it is unclear the history or terms of the special permits. The guild house serves the community as a shelter.	• Guild house unable to or unwilling to purchase a permit from DCR • Perceived inequality for special permitting opportunities for select organizations
Boylston Street - Service Road R; Service Road L	Boylston Street service road area is in a residential zone with limited parking options for residents.	• Resident pushback for any limitations on current 24-hour Resident Permit Only parking

Description	Description	Challenges
Charlesgate East and Boylston Street		
Boylston Street – Boston Conservatory R(a); Conservatory R(b); Conservatory L	The service street in front of the Boston Conservatory has both Resident Permit Only parking and special permit parking for the Boston Conservatory. The history and details of the special permits is unclear. The street is institutional.	• Resident pushback (from residents who live a few blocks away) for any limitations on current 24-hour Resident Permit Only parking • Boston Conservatory pushback on purchasing a permit from DCR • Perceived inequality for special permitting opportunities for select organizations
Boylston Street – Mass Historical Society; Berklee College; St. Clement's Church (b)	Boylston Street in front the Mass Historical Society, Berklee College of Music, and St. Clement's Church has special permit parking for all three institutions. The history and details of the special permits is unclear. The street is institutional.	• Mass Historical Society, Berklee College, and St. Clement's church pushback on purchasing a permit from DCR • Perceived inequality for special permitting opportunities for select organizations
Boylston Street – St. Clement's Church (a); Charlesgate East – Boylston to Ipswich L; Boylston to Ipswich R Near Newbury	Boylston Street in front of St. Clement's Church (left of the special permit spaces) and Charlesgate East from Boylston to Ipswich (right side only) and near Newbury are Resident Permit Only parking. On Charlesgate East from Boylston to Ipswich, the left side is free, unrestricted parking. Boylston Street is institutional, while Charlesgate East is residential.	• Resident pushback for any limitations on current 24-hour Resident Permit Only parking (Benefit: additional Resident Permit Only parking spaces become available from 8PM-8AM, which better aligns with resident parking needs, and creates consistency with city parking regulations on neighboring streets)
Fenway Road		
Simmons College; Museum Rd to Forsyth; Forsyth to Agassiz	This portion of Fenway Road is free, unrestricted parking for anyone. The area is institutional – universities, museums, etc. The City of Boston streets that intersect Fenway Road here are metered.	• Non-resident pushback for any payment requirements (Benefit: creates consistency with city parking regulations on neighboring streets)
Service Road (Near Forsyth)	This service road off Fenway Road is designated as Resident Permit Only. However, the surrounding area is predominantly institutional.	• Non-resident pushback for any payment requirements (Benefit: creates consistency with city parking regulations on neighboring streets) •
Service Road (Near Agassiz)	This service road off Fenway Road is designated as Resident Permit Only.	• Non-resident pushback for any payment requirements

Description	Description	Challenges
Cambridge		
Cambridge Parkway; Memorial Drive – Charles River Side(a)	Cambridge Parkway and portions of Memorial Drive on the Charles River side have free parking. Cambridge Parkway spaces are free, except from 7-10am. The Memorial Drive spaces have 30-minute limits. The areas appear to be predominantly institutional.	• Non-resident pushback for any payment requirements (Benefit: creates consistency with city parking regulations on neighboring streets)
Memorial Drive – Charles River Side(b)	Memorial Drive on the Charles River side near the boat/yacht club has special permit parking for the club. The history and details of the special permits is unclear. The street is institutional.	• Boat/Yacht club pushback on purchasing a permit from DCR • Perceived inequality for special permitting opportunities for select organizations
Memorial Drive – Wadsworth to Mass Ave; Bridge to Fowler	The portion of Memorial Drive opposite the Charles River from Wadsworth to Mass Ave and then from the Bridge to Fowler has free, unrestricted parking for anyone. The area is a mix of both institutional and residential.	• Resident pushback for any limitations on current 24-hour Resident Permit Only parking (Benefit: additional Resident Permit Only parking spaces become available from 8PM-8AM, which better aligns with resident parking needs) • Non-resident pushback for any payment requirements