Appendix A

Project Research Summary

Appendix A. City of Seattle – Performance-Based Parking Pricing Study – Project Research Summary (as of 07-17-2011)

	Document Source	Document Name	Document Type	Author	Primary Topic	Notes/Comments
1.	**Albany Parking Authority**	1.a Albany New Meters & Rates	MS Word Doc	Michael Klein	C-Park-L Comments and Media Link	
		1.b Albany NY, New Meters& Rates	MS Word Doc	Eric Wohlleber	APA Press Release	
		1.c New Meter & Rates	MS Excel File	Michael Klein	Initial Results	
2.	**Bay Area Transportation**	2a. Performance Counts: Project Performance Assessment Bay Area Long Range Plan	PowerPoint (PDF)	Doug Kimsey, Planning Director MTC	Project Performance Assessment Bay Area.	
3.	**DC Performance Pricing**	3a. Columbia Heights Performance Based Parking Report	Report (PDF)	District of Columbia DDOT	Performance based parking to solve (Metropolitan DC) mobility Problems.	
		3b. Ballpark Performance Parking Pilot Zones	Report (Word.doc)	District of Columbia DDOT	Ballpark Performance Parking Pilot Zone.	
		3b (1). Multi Space Meters Hours of Operations & Rate Schedule	PDF	District of Columbia DDOT	Hours of operations & rate schedule for commercial corridors.	
		3b (2). Ballpark District Performance Based Parking Report	Report (PDF)	District of Columbia DDOT	Performance based parking for Washington DC area.	
		3b (3). Ballpark District Parking Regulations Map	Map (PDF)	District of Columbia DDOT	Ballpark map that contains variable rate meters, meter parking, residential protections, potential parking, no parking and ball park location.	
		3c. Dc Performance Based Parking Pilots	Report (Word.doc)	West Group Publisher	Implementation of the Performance Based Parking Pilot Zone Act of 2008 in two District neighborhoods.	
		3d. Act - Codification District of Columbia Official Code, 2001 Edition	Report (PDF)	Kittelson & Associates	To establish a performance parking pilot program to protect neighborhood parking.	

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	3e. Guidelines for Effective Parking Management	Report (PDF)	WAMU.org (The Kojo Nnamdi Show)	Parking management with variable pricing.	
	3f. Performance" Prices For D.C.'S Parking Meters	Article (Internet)	The Georgetown Metropolitan	Are performance prices for D.C.'s parking meters a good idea?	
	3g. Why Not: Bring "Performance Parking" to Georgetown	Article (Internet)		How performance parking already works over by Nationals Park and how it could work here in Georgetown.	
	3h. DDOT 2009 Annual Report2-25-10	Annual Report (PDF)	District of Columbia DDOT	DDOT Implementation Progress on "Action Agenda: Sustainability"	Gabe Klein, Director 2010
	3i. DDOT Action Agenda	Program Overview	Gabe Klein	"Action Agenda: Sustainability"	Integrated Transportation, Traffic, Parking and Sustainability Program Overview
	3j. DDOT Green Initiatives	Sustainability Initiatives Overview (PPT)	Faisal Hameed	T ransportation Sustainability Initiatives	
	3.k Performance Parking Pilot Zone Act of 2008	Legislation	Council of District of Columbia	Act authorizing the creation of performance-based parking pilots in Washington, DC	
	3.l Petworth Area Parking Mgmt Plan	Community Parking Mgmt Plan	DDOT	Parking study in the area near Petworth Metro Station	
	3.m Feedback and Progress - Washington, D.C. Pilots	Article – The Parking Professional 2011	Soumya S. Dey, P.E., and Tierney Viteri	New Meter Programs to Improve Its Parking System	

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4.	**Delaware Valley RPC**	4a. Regional Plan for A Sustainable Future	PowerPoint (PDF)	Delaware Valley Regional Planning Commission	Linking projects and plan goals.	
5.	**FDOT - Dynamic Pricing**	5a. Dynamic Parking Pricing Implemental Manual	Report (PDF)	Center for Urban Transportation Research, University of South Florida	Dynamic parking pricing is one proposed strategy to control traffic congestion and the steps to develop this program.	
		5b. Dynamic Travel Information Personalized And Delivered to Your Cell Phone	Report (PDF)	National Center for Transit Research, University of South Florida	Advanced Traveler Information Systems are evolving to keep pace with modern communication networks and mobile devices	
		5c. Dynamic Parking	Report (PDF)	Center for Urban Transportation Research, University of South Florida	Dynamic Parking Pricing is one proposed strategy to control traffic congestion by providing commuters with financial incentives to change their traffic habits.	
		5d. Value of Time and Value of Reliability	Report (PDF)	Center for Urban Transportation Research	The objective of this study is to compile and synthesize current and past research on the value of time to provide practitioners with applicable ranges of estimates.	
6.	**Frontier Center for Public Policy**	6a. Dynamic Parking Pricing Article	Article (PDF)	Stuart Donovan	The benefits of accurate pricing and smart technologies.	
		6b. How Free Is Your Parking	Article (PDF)	Stuart Donovan	This article looks at the origins of these parking regulations and discusses how they impact on our towns and cities.	
7.	**LA Express Park**	7a. LA Express Park Program Overview	Article (Word)	Board of Transportation Commissioners	Program Overview	
		7b. LA Express Park – Intelligent Parking	Promotional	LADOT	Educational Brochure	

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	Document Source	Document Name	Document Type	Author	Primary Topic	Notes/Comments
		Management	Brochure			
		7.c ExpressPark for Downtown L.A.	PowerPoint Presentation	Dan Mitchell, P.E. City of Los Angeles DOT	IPI Presentation – 2010 Pittsburgh	
8.	**MassPort - MAPA - Boston**	8a. Regional Its Architecture for Metropolitan Boston	Report (Internet)	Massachusetts Regional ITS Architectures	Equipment Package: Parking Management.	
		8b. Funding and Implementation	Report (PDF)	Boston Transportation Department	Funding and implementation plan integrates BTD's on-street and off-street parking roles.	
9.	**Parking Taxes**	9a. Parking Taxes, Evaluating Options and Impacts	Report (PDF)	Todd Litman, Victoria Transport Policy Institute	This paper describes and evaluates various types of parking taxes.	
		9b. Evaluating Seattle Parking Tax Options	Report (PDF)	Todd Litman, Victoria Transport Policy Institute	This report describes and evaluates parking tax options for possible implementation by the City of Seattle.	
10.	**Redwood City, CA**	10a. Downtown Redwood City Parking Plan	Educational Report	Dan Zack	Overview of Redwood City's Parking Management Program	
		10b. Parking Guide Map Aug '09	Map (PDF)	Dan Zack	Downtown Parking Map	
11.	**Related Pricing Strategies**					
	Community Engagement	11a (1). Guide to Community Visioning	Manual / Report (PDF)	Gary Green, Anna Haines, Stephen Halebsky	The manual provides community residents with a process for thinking about and planning for their mutual future.	
		11a (2). Facilitator Tool Kit	Report (PDF)	Office of Quality Improvement, University of Wisconsin – Madison	A guide for helping groups get results.	

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Document Source	Document Name	Document Type	Author	Primary Topic	Notes/Comments
Related Pricing Strategies	11b. Complete Streets	Report (PDF)	Stefanie Seskin	Complete Streets Policy Analysis 2010 A Story Of Growing Strength.	
	11c. Changing Places	Article (Internet)	MIT Media Lab	How new strategies for architectural design, mobility systems, and networked intelligence can make possible dynamic, evolving places that respond to the complexities of life.	
	11d. China's Urban Transport Development	Article (Internet)	Google Books	China's urban transport development.	
	11e. Congestion Pricing	Report (PDF)	Shunan Xu	Development and Test of Dynamic Congestion Pricing Modal.	
	11f. Dynamic Pricing In Retail	Article (Internet)	Cynthia Georges	Dynamic pricing in retail can boost the bottom line – the right strategy can improve overall profitability.	
	11g. Georgia Tech Dynamic Pricing	PowerPoint (PDF)	Hani S. Mahmassani, Northwestern University	Dynamic Pricing, Managed Lanes and Integrated Corridor Management: Challenges for Advanced Network Modeling Methodologies.	
	11h. Intermodality and ITS in Frankfurt Rheine-Main	Article (PDF)	Manfred Boltze	This article gives an overview on the development of traffic management and ITS implementations in Frankfurt am Main.	
	11i. Modeling Pricing in the Planning Process	PowerPoint	Ram M. Pendyala Department of Civil and Environmental Engineering University of South Florida	Expert Forum on Road Pricing and Travel Demand Modeling.	
	11j. More Parking – Dynamic Curbside	Article (Internet)	Adam Stein	Chicago discovers their curbsides are lined	

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Document Source	Document Name	Document Type	Author	Primary Topic	Notes/Comments
	Pricing, Parking, Public-Private			with gold.	
	11k. Parking Monitoring System	Article (Internet)		A Parking Monitoring System monitors the storage available in a parking facility and notifies motorists of available parking.	
	11l. RFID Solutions	Report (PDF)	Kevin Fredrick Washbrook	Parking Optimization and Customer Satisfaction.	
	11m. Road and Parking Charges to Reduce SOV	Report (PDF)	Joan Morris Brown University	Assessing the potential for road and parking charges to reduce demand for single occupancy vehicle commuting in the greater Vancouver region.	
	11n. Simulation-Based Approach To Dynamic Pricing	Report (PDF)	Lee Schipper Wei-Shiuen Ng, World Resources Institute	Learning Curve Simulator, a platform for running dynamic pricing algorithms in simulated markets.	
	11o. The Role of Market-Based Instruments	PowerPoint (PDF)		The Role of Market-based Instruments Road Pricing, Parking Fees and Congestion Pricing.	
	11p. TAB 2011 References	Report (PDF)	Richard C. Larson1, Katsunobu Sasanuma	Events Sponsored by the TRB Congestion Pricing Committee at the Transportation Research Board Annual Meeting 2011.	
	11q. Urban Vehicle Congestion Pricing: A Review	Report (PDF)		This report is from the Park Slope section of Brooklyn, New York, a thriving commercial and residential zone. The purpose was “to ascertain the extent of the neighborhood’s ever-worsening traffic and parking problems and to propose solutions to both.”	

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	Document Source	Document Name	Document Type	Author	Primary Topic	Notes/Comments
		11r. Value Pricing	Report (PDF)		Value Pricing Project Quarterly Reports October - December 2007.	
12.	**SFPark**	12a. Could Parking Policy Benefit from More Regional Oversight	Article (Internet)	Eric – Transbay Blog	Through SFpark, both on-street and off-street supply in designated pilot areas, which include many of San Francisco's busiest neighborhoods, will be priced dynamically to match demand.	
		12b. San Francisco UPA Evaluation Plan	Report (PDF)	Battelle Memorial Institute	This report provides an analytical framework for evaluating the San Francisco Urban Partnership Agreement (UPA) under the United States Department of Transportation (U.S. DOT) UPA program.	
		12c. SDOT Research	Article (Internet)	Mike Lindblom	Parking rates that go up at busiest times.	
		12d. SF Article	Article (PDF)	Mark Albertson	Article – Critical vendor replaced before SFpark launch.	
		12e. *SFPark* Survey Plan – Draft	Report (PDF)	SFMTA, Municipal Transportation Agency	SFMTA and the Department of Transportation emphasize careful data collection and evaluation of the *SFPark* pilot projects.	
		12f. SF Parking Space Dashboard	Excel Spreadsheet	SFPark	Parking space dashboard	
		12g. SFpark Pricing Garage Policy110606.	Policy (PDF)	SFPark	Garage Pricing Policy	
		12.h. SFpark Pricing Motorcycle Policy 110608	Policy (PDF)	SFPark	Motorcycle Pricing Policy	

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Document Source		Document Name	Document Type	Author	Primary Topic	Notes/Comments
		12.1.SFpark Pricing On-Street Policy 110608	Policy (PDF)	SFPark	On-Street Parking Pricing Policy	
		12.j. SFpark Pricing Special Event Policy 110608	Policy (PDF)	SFPark	Special Event Parking Pricing Policy	
		12.k. SFpark rate adjustments meter July 2011	Rate Adjustment Summary MS Excel	SFPark	July 2011 Rate Adjustments	
		12.l. SFpark rate adjustments meter July 2011	Rate Adjustment Summary Graphics (PDF)	SFPark	July 2011 Rate Adjustments	
		12.m SFPark Parking Census Summary 1210	Parking inventory summary	SFPark	Parking census by area and by type of parking	
		12.n SFpark Launch Ads	Launch ad graphics (PDF)	SFPark	Program Advertising	
		12.o SFpark Launch Press Kit 1	Launch Press Kit (PDF)	SFPark	Program Press Kit	
		12.p SFpark New Time Limits 1	New Time Limits Listing (PDF)	SFPark	New Time Limits Communication	
		12.q Parking Space Dashboard (1136485_1)	Performance Metrics (MS Excel)	SFPark	Key Pricing Program Success Metrics	
13.	**Donald C. Shoup**	**13a.** Free Parking or Free Markets	Article (Internet)	Donald Shoup	Performance Parking Prices - Cities should set the right price for curb parking, because the wrong prices produce bad results.	
		13b. Great Street	Article (PDF)	Donald Shoup	The price of parking - How can curb parking contribute to making a street great? A city can (1) charge performance	

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					based prices for curb parking and (2) return the revenue to the metered districts to pay for added public services.	
		13c. Response To Anti-planner	Email (PDF)	Donald Shoup	Shoup's - comments on August 16 post on the Cato@Liberty blog about "Free Markets for Free Parking."	
14.	**Singapore**	**14a**. Minimum Parking Requirements	Word Document (audio)		How parking and toilets are (conventionally) planned in very similar ways.	
		14b. Parking Basics	Word Document (audio)	SFPark on Vimeo	Performance-Based Parking Pricing.	
		14c. Singapore Parking Pricing - Part 1and Part 2	Word Document (audio)		Singapore public-sector parking pricing - part 1and Singapore public-sector parking - part 2: HDB's full parking lots.	
		14d. Urban Spatial Structures, Mobility And The Environment	PowerPoint (PDF)	Alain Bertaud	Reducing energy use, pollution and GHG emissions.	
15.	**VPP Pilot Project Funding**	**15a.** Federal Register - Value Pricing Pilot Program	Article (Internet)	The Daily Journal of the US Government	This notice invites States, along with their local government partners and other public authorities, to apply to participate in the Value Pricing Pilot (VPP) program and presents guidelines for program applications for fiscal years (FY) 2010 and 2011.	
		15b. City of Berkeley Value-Priced Parking and Transit Program	Report (PDF)	City of Berkeley, Matt Nichols	Integrating Parking and Transit Pricing with Real-time Parking Information - grant application to the FHWA Value Pricing Pilot Program to support critical elements of a	

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					coordinated program to relieve traffic congestion and increase safety in Berkeley through parking and transportation demand management.	
16.	**VTPI - Litman**	**16a.** Cities Connect - How Urbanity Helps Achieve Social Inclusion Objectives	Report (PDF)	Todd Litman, Victoria Transport Policy Institute	This paper discusses how cities support social inclusion by improving accessibility and opportunity, particularly for people who are physically, economically and socially disadvantaged.	
		16b. The Value of Downtown	Report (PDF)	Todd Litman, Victoria Transport Policy Institute	A city's downtown area has an important and unique role in economic and social Development.	
		16c. Parking Costs, Pricing and Revenue Calculator	Excel Spreadsheet	Todd Litman, Victoria Transport Policy Institute	Spreadsheets calculate parking facility costs, cost recovery pricing, and revenue generation.	
		16d. Parking Taxes, Evaluating Options and Impacts	Report (PDF)	Todd Litman, Victoria Transport Policy Institute	This paper describes and evaluates various types of parking taxes. Commercial parking taxes are a special tax on parking rental transactions.	
		16e. Parking Pricing Implementation Guidelines	Report (PDF)	Todd Litman, Victoria Transport Policy Institute	How More Efficient Parking Pricing Can Help Solve Parking And Traffic Problems, Increase Revenue, and Achieve Other Planning Objectives.	
		16f. Planning Principles and Practices	Report (PDF)	Todd Litman, Victoria Transport Policy Institute	This paper summarizes key principles and practices for effective planning, particularly land use and transportation planning.	
		16g. Parking Pricing Implementation	Report (PDF)	Todd Litman, Victoria	How More Efficient Pricing Can Help Solve	

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	Document Source	Document Name	Document Type	Author	Primary Topic	Notes/Comments
		Guidelines		Transport Policy Institute	Parking Problems, Increase Revenue And Achieve Other Planning Objectives?	
17.	**IPI Presentations – Pittsburgh 2011**	**17a.** An Innovative Solution for On-Street Parking	PowerPoint (PDF)	Tiago Farias, EMEL – Lisbon Mobility/Parking Municipal Company	An Innovative Solution for On-Street Parking Enforcement in Lisbon.	
		17b. Sustainable Transportation Plan	PowerPoint (PDF)	Renée A. Fortier, Director, Transportation, University of California, Los Angeles	How to Create a Sustainable Transportation Plan: The UCLA Experience.	
		17c. Creating Green Parking	PowerPoint (PDF)	Matthew J. Jobin, AIA Rich & Associates, Inc. Parking Consultants Matthew Darst	Green Parking: From Sustainable Design to Green Roofs Creating Truly "Green" Parking	
		17d. Dynamic Pricing and Demand Management	PowerPoint	Onno Zoeter	Approaches to Improve Parking.	
		17e. Express Park	PowerPoint	Dan Mitchell, P.E. City of Los Angeles DOT	Intelligent Parking Management for Downtown Los Angeles.	
		17f. Green Parking to Save Green	PowerPoint	Renée A. Fortier, Director, Transportation, University of California, Los Angeles	Saving Green by Being Green: Strategies for an Affordable, Sustainable Transportation Program.	
		17g. Get Your Stakeholders to Help Sell Your Parking Rate Increase	PowerPoint (PDF)	Kimley-Horn, Carl Walker, CCDC	Parking Rate Assessment Strategies.	
		17h. IPI – Social Media, Using the Power of Social Media to Grow Your Business	Word Document	Ted Janusz Blake Laufer	Using the Power of Social Media to Grow Your Business.	

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			VP Product Development		
	17i. Practical Benefits of a Hosted Parking Management Solution	PowerPoint	Cathy Wolfe, Dir. Of Campus Planning, George Mason University Josh Cantor, Dir. of Parking & Transportation, George Mason University Chris Conklin, Principal, VHB/Vanasse Hangen	New technology is driving many new approaches within the parking industry that would not have been considered a decade ago. This examines one of the ways emerging technologies — the implementation of a hosted parking management system — can help parking managers meet their goals.	
	17j. IPI 2011 Conference & Expo, Real Time Planning and Implementing of transportation Improvements, Pittsburgh, PA	PowerPoint (PDF)	Brustlin, Inc.	Real Time Planning And Implementing Of Transportation Improvements.	
	17k. Strategic Communications – IPI 2011	PowerPoint (PDF)	Josh Kavanagh, UW, Anne Guest, Missoula Parking Commission, Dennis Burns, Kimley-Horn	Complements the skills of the self-taught communicator, back to basics for the marketing professional who may be stuck in the tactical communication realm, and examples of highly effective strategic communications from the parking and transportation world.	
	17l. ParkMobile - Successful Pay by Phone Parking Implementations in United States Made Simple	PowerPoint	Brent Paxton, EVP ParkMobile USA, Inc	Successful Pay by Phone Parking Implementations in United States.	
	17m. Tacoma Downtown Business District Conversion to Paid On-Street Parking	PowerPoint	Dana Brown, Assistant Division Manager Tacoma Public Works, Steph Farber, Owner-LeRoy Jewelers Parking	On-street Parking System Description, Paid Parking Implementation Process, Community Acceptance and On-going Involvement.	

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				Advisory Task Force Co-chair, and Bill Timmer Principal, Bluewater Project Management Services, LLC		
18.	Disabled Parking Placards	18.a Payment Exemption as a Barrier to Regulating Parking	MS PowerPoint	Jonathan A. Williams	Meter Payment Exemption for Disabled Placard Holders as a Barrier to Managing Curb Parking	2010 Thesis document, Presented at California Public Parking Assn.
19.	New York City – Park Smart	19.a PARK Smart Greenwich Village Pilot Program – Results	Program Results Letter (PDF)	NYCDOT	Greenwich village performance pricing pilot program – results	
		19.b PARK Smart Parkslope Pilot Program Preliminary Results.pdf	Program Results Summary (PPT)	NYCDOT	Parkslope performance pricing pilot program – results	
20.	General Parking Pricing Literature Review	20.a Access 23 - 02 - Small Change into Big Change.pdf	Article (PDF)	Douglas Kolozsvari / Donald Shoup	Market rate pricing	
		20.b Rational Parking	Article (PDF)	Great Communities Collaborative	Advanced Parking Management and Planning Strategies	
		20.c Parking Video Links	MS Word Doc	D. Burns	Compilation of links to parking strategy and customer education videos	
		20.d Austin Leads the Way	Article – The Parking Professional 2011	Robert Spillar and Steve Grassfield	New Parking Technology Introduction	
21.	Federal Highway Administration (FHWA)	21.a Value Pricing Pilot Program	MS Word (from	FHWA	Description of Value Pricing and Pricing	

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Document Source	Document Name	Document Type	Author	Primary Topic	Notes/Comments
	Notice of Grant Opportunities	FHWA website)		Pilot Funding Opportunities	

Appendix B

Review of Other Performance-Based Parking Pricing Pilot Programs

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Review of Other Performance-Based Parking Pricing Pilot Programs

a. Primary Programs Reviewed

i. SFPark
ii. LA Express Park
iii. Washington DC Pilot Programs
iv. NYC ParkSmart

b. Secondary Programs Reviewed

i. Albany, NY
ii. City of Manchester, NH
iii. Winnipeg, Manitoba, Canada
iv. City of Berkeley Value-Priced Parking and Transit Program
v. Redwood City, CA

San Francisco, CA - SF*Park*[1]

Program Overview:

SFMTA established SF*park* to use new technologies and policies to improve parking in San Francisco. Reducing traffic by helping drivers find parking benefits everyone. More parking availability makes streets less congested and safer. Meters that accept credit and debit cards reduce frustration and parking citations. With SF*park*, we can all circle less and live more. SF*park* works by collecting and distributing real-time information about where parking is available so drivers can quickly find open spaces.

To help achieve the right level of parking availability, SF*park* periodically adjusts meter and garage pricing up and down to match demand. Demand-responsive pricing encourages drivers to park in underused areas and garages, reducing demand in overused areas.

Through SF*park*, real-time data and demand-responsive pricing work together to readjust parking patterns in the City so that parking is easier to find.

Program Goals and Objectives:

- Reduced circling of blocks looking for parking
- Consistent availability of parking – 1 to 2 stall per block face
- Parking management to block face level

Benefits of SFPark

By reducing congestion, better parking management will benefit everyone – drivers, business owners, transit riders, bicyclists and pedestrians. This program will help make San Francisco an even better place to work and live. To summarize the benefits:

- Make it easier to park and pay. SFpark pilot areas will have new parking meters that accept coins, credit cards, the SFMTA parking smart card, and cell phones to make it easy to pay.
- Longer time limits. Time limits in SFpark areas will be extended to four hours, and in some areas we will test eliminating time limits altogether. This is much more convenient for drivers and shoppers.
- Fewer parking tickets. By making it easy to pay and extending parking time limits, it will be easy for drivers to avoid parking tickets.
- Reduce congestion and improve traffic flow. More parking availability means that drivers will spend less time circling to find parking. Less circling will reduce congestion and greenhouse gas emissions, and improve the quality of life in San Francisco's neighborhoods.
- Improved Muni speed and reliability. Less circling and double parking will help Muni become faster and more reliable, especially on busy commercial corridors.

[1]Information on SFPark derived from review of its web information site at http://sfpark.org/about-the-project/

- Increase San Francisco's economic vitality and competitiveness. Improving access to commercial areas, whether by foot, bicycle, transit, or car (by making it easier to park), will foster economic activity in San Francisco's downtown and neighborhood commercial districts.
- Reduce illegal parking. More parking availability means that fewer drivers will be tempted to double-park or park illegally in bus zones, on sidewalks, or in front of fire hydrants and driveways.
- Improve safety for all road users. The right level of parking availability reduces double-parking and circling, both of which present hazards for pedestrians, bicyclists, and other drivers.
- Better air quality. 51 percent of San Francisco's greenhouse gas emissions are transportation-related. Less congestion and circling, as well as helping Muni to become a more reliable, will help to reduce greenhouse gas emissions and other pollutants.

Program Elements:

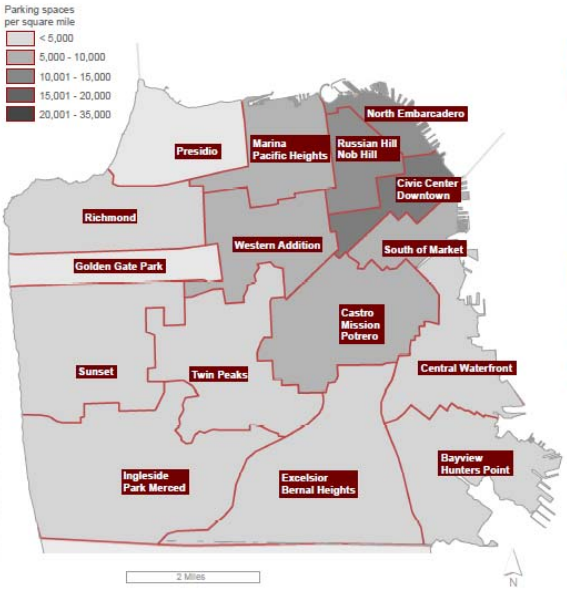
SF*Park* sensors, installed in on-street parking spaces and in City-owned garages, track when and where parking is available. Sensor data is uploaded wirelessly to the SF*park* data feed, making this information available to the public via this website, smart phone applications and eventually text message and 511.

SFPark Parking Census Database

The SFPark "Parking Census" is organized by neighborhood/district and identifies publicly available parking in the following categories:

- On-Street
  - Metered
  - Unmetered
- Off-Street
  - Paid
  - Free
  - Customer
  - Permit

The census also quantifies the total spaces per neighborhood/district as well as the number of spaces/square mile. See sample census map below.



SFpark

Parking Census

Publicly Available Parking in San Francisco

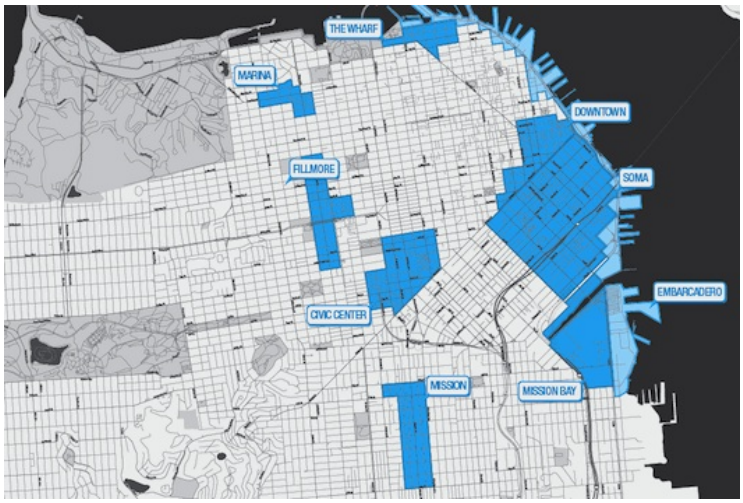
	On-street		Off-street				Spaces/	Total
	Metered	Unmetered	Paid	Free	Customer	Permit	sq. mile	spaces
Bayview - Hunters Point	118	15,800	12,354	239	1,706	738	8,329	30,955
Castro - Mission - Potrero	2,764	27,800	7,520	82	4,070	1,878	11,727	44,114
Central Waterfront	40	10,400	4,873	101	2,030	3,138	6,999	20,582
Civic Center - Downtown	5,286	1,900	31,668	0	1,963	2,283	33,995	43,100
Excelsior - Bernal Heights	1,049	41,000	230	428	1,557	746	7,332	45,010
Golden Gate Park	0	3,800	1,124	912	0	234	3,717	6,070
Ingleside - Park Merced	558	30,500	2,468	651	6,149	4,199	6,593	44,525
Marina Pacific Heights	1,566	14,300	4,895	1,032	1,685	839	10,556	24,317
North Embarcadero	2,470	3,500	11,660	30	951	706	16,223	19,317
Presidio	220	2,500	1,080	3,121	1,099	300	2,821	8,320
Richmond	1,473	18,200	758	879	1,718	88	7,009	23,116
Russian Hill - Nob Hill	3,796	6,700	12,497	0	1,432	132	19,190	24,557
South of Market	2,081	4,200	7,642	0	1,398	1,863	14,138	17,190
Sunset	1,135	31,600	131	37	585	311	7,508	33,799
Twin Peaks	283	25,700	1,571	179	356	1,064	7,397	29,153
Western Addition	1,625	19,000	5,168	0	2,723	2,072	12,051	30,588
San Francisco	24,464	256,900	105,639	7,691	29,422	20,597	9,172	445,000

Notes

1. Neighborhood boundaries drawn to reflect similar land-use patterns. The Civic Center - Downtown roughly corresponds to the C-3 planning district.
2. Metered parking is managed by the SFMTA, the Port of San Francisco, and the Presidio Trust.
3. Unmetered parking figures are extrapolations based on a randomly selected sample of a minimum of 20% of City street segments per neighborhood. The SFMTA has surveyed 32% of all street segments.
4. The survey of off-street parking was conducted by the SFMTA from Oct 2008 to Oct 2009. 'Paid' is parking available on an hourly or daily basis for a price. 'Permit' is parking requiring some form of permission (e.g., employee only or company vehicles only).'Free' is parking available without daytime restriction. 'Customer' is parking available to customers only.
5. Metered on-street parking does not include 1,812 metered motorcycle spaces.
6. Confidence levels: metered on-street +/- 1%; unmetered on-street +/- 5%; off-street +/- 5%.. Total is rounded to nearest 1,000.

SFPark Rate Adjustment Processes

In SFpark pilot areas, meter rates will vary based on time of day and day of week, and rates will be adjusted over time in response to demand.



Rates will be adjusted on a block-by-block basis, using the occupancy data provided by the parking sensors that have been installed in all on-street parking spaces in the SFpark pilot areas.

Adjusting Rates

1. Meter operational hours will be split into distinct rate periods
In order to help ensure that parking is available in metered parking spaces, SFpark meters may charge different rates based on the time of day in which a car is parked. To facilitate this demand responsive time-of-day pricing, the meter operational hours will be split into distinct rate periods throughout the day.

Most meters in the City operate on a 9am to 6pm schedule. Those meters will be split into the following rate periods:

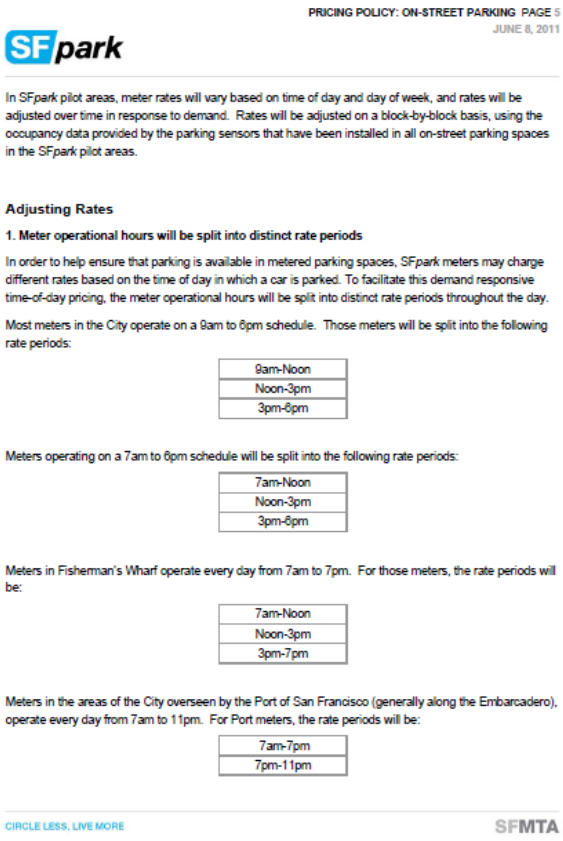
- 9am-Noon
- Noon-3pm
- 3pm-6pm

Meters operating on a 7am to 6pm schedule will be split into the following rate periods:

- 9am-Noon
- Noon-3pm
- 3pm-6pm

Meters in the areas of the City overseen by the Port of San Francisco (generally along the Embarcadero), operate every day from 7am to 11pm. For Port meters, the rate periods will be:

- 7am-7pm
- 7pm-11pm



PRICING POLICY: ON-STREET PARKING PAGE 5
JUNE 8, 2011

SFpark

In SFpark pilot areas, meter rates will vary based on time of day and day of week, and rates will be adjusted over time in response to demand. Rates will be adjusted on a block-by-block basis, using the occupancy data provided by the parking sensors that have been installed in all on-street parking spaces in the SFpark pilot areas.

Adjusting Rates

1. Meter operational hours will be split into distinct rate periods

In order to help ensure that parking is available in metered parking spaces, SFpark meters may charge different rates based on the time of day in which a car is parked. To facilitate this demand responsive time-of-day pricing, the meter operational hours will be split into distinct rate periods throughout the day.

Most meters in the City operate on a 9am to 6pm schedule. Those meters will be split into the following rate periods:

9am-Noon
Noon-3pm
3pm-6pm

Meters operating on a 7am to 6pm schedule will be split into the following rate periods:

7am-Noon
Noon-3pm
3pm-6pm

Meters in Fisherman's Wharf operate every day from 7am to 7pm. For those meters, the rate periods will be:

7am-Noon
Noon-3pm
3pm-7pm

Meters in the areas of the City overseen by the Port of San Francisco (generally along the Embarcadero), operate every day from 7am to 11pm. For Port meters, the rate periods will be:

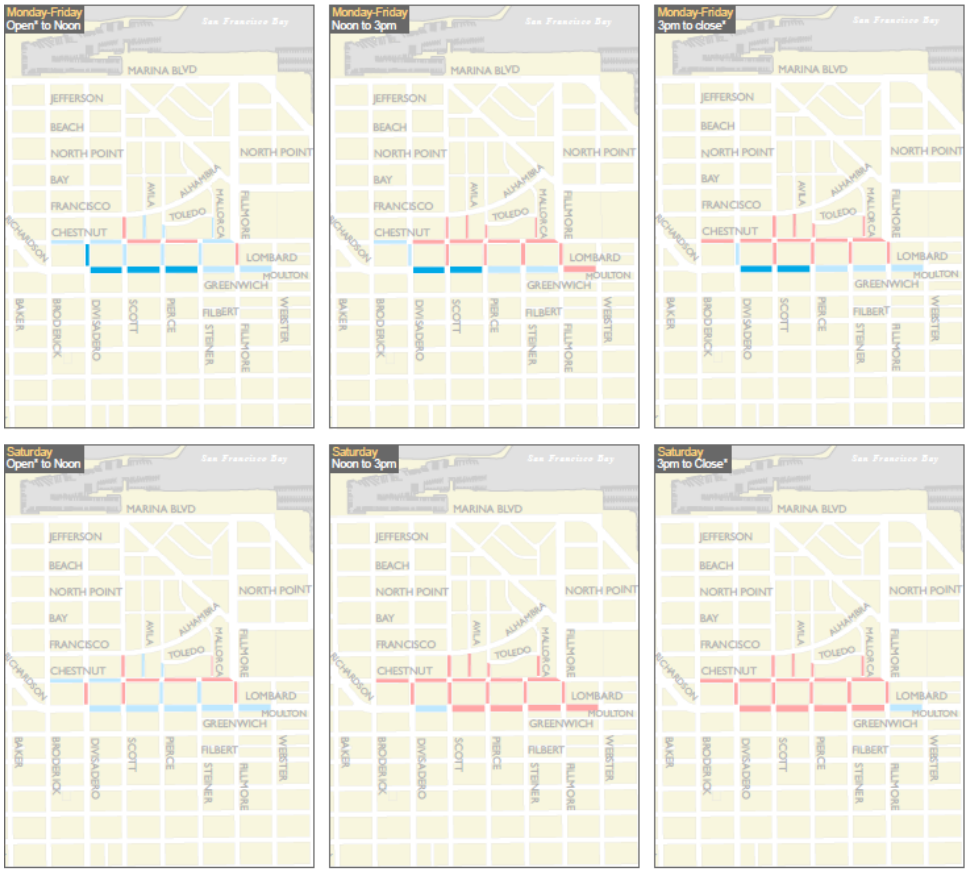
7am-7pm
7pm-11pm

CIRCLE LESS, LIVE MORE SFMTA

Rate Adjustment Announcements

All SFpark rate adjustments are listed in the following documents at least seven days before they go into effect. You will need the free Microsoft Excel Reader, Adobe Acrobat Reader or compatible programs to view these documents.

Adjustment	Date	Rate Adjustment Overview	Data	Maps
Meters	07/11/2011	▲ 32% ● 37% ▼ 31%	XLS	PDF



Marina
Pilot Area

Meter Rate Changes
July 2011

+ $0.25
no change
- $0.25
- $0.50**

0.25 Mile

* In this pilot area, on-street, non-commercial meters operate from 9 am to 6 pm; meters at Pierce Street Garage close at 10 pm.

** No rates were lowered $0.50 in this pilot area.

SFpark

Meter Operational Hours will be Split into Distinct Rate Periods

These rate periods are as consistent as possible across meters, which increases ease of use for drivers when using meters in different parts of the City. Because SFpark meters will charge different hourly rates at different times of day, if a driver arrives at a meter during one time frame but leaves during another, he must pay the correct hourly rates for each time frame in which he parks. Thus, a driver who arrives at a meter at 11am and wishes to park until 1pm must pay for one hour at the 9am-Noon rate, and one hour at Noon-3pm rate.

Weekend Rates Will Differ

Because weekend parking trends differ significantly from weekday parking trends, demand-responsive rate adjustments will separate weekdays from weekends. This will help ensure that parking is available in metered parking spaces.

Rates Will Respond to Demand Over Time

Rates for parking meters will change gradually and periodically based on demand.
Changes to the rates will be made no more often than once per month.
When prices are updated, the update will be made on or near the first day of the month.
At the outset of the SFpark program, rates at meters will respond to demand as shown by occupancy in the previous month.

As SFpark continues to collect occupancy data from the parking sensors, however, SFpark staff will consider including occupancy data from earlier months and years to assist in making pricing determinations and, if necessary, possible adjustments to analysis of occupancy to correct for concentrated use of disabled parking placards on particular blocks.
In order to achieve the goal of at least one available parking space per block, meter rates will be adjusted with the goal of maintaining no more than 80% occupancy on any given block. Rates will be adjusted using the following formula:

- When occupancy is 80-100 percent, the hourly rate will be raised by $0.25.
- When occupancy is 60-80 percent, the hourly rate will not be changed.
- When occupancy is 30-60 percent, the hourly rate will be lowered by $0.25.
- When occupancy is less than 30 percent, the hourly rate will be lowered by $0.50.

In accordance with the SFpark enabling legislation approved by the SFMTA Board of Directors in November 2008, the SFMTA will notify the public of price changes no less than seven calendar days before the change in prices via the SFMTA and SFpark websites.

Rates Will Be Adjusted on a Block-by-Block Basis

Price changes made to meters will be made on a per-block basis. Larger areas were considered but blocks were chosen to allow parking rates to respond to rapidly changing parking demand patterns that sometimes shift block to block in San Francisco. Pricing changes on a block-by-

block basis is also expected to more effectively help to redistribute parking demand within a neighborhood to better achieve availability targets and therefore the larger parking management goals of SFpark.

Special Event Pricing

The SFMTA Board resolution that enabled the SFpark program designated three "special event areas," or areas that tend to host large, well-publicized events that generate a significant, short-term demand for parking. Special events include baseball games, concerts, conventions, major parades and street festivals, entertainment/cultural shows, exhibitions, and other similar events.

The SFpark special event areas for on-street parking are:

- South Embarcadero
- Civic Center
- Fillmore

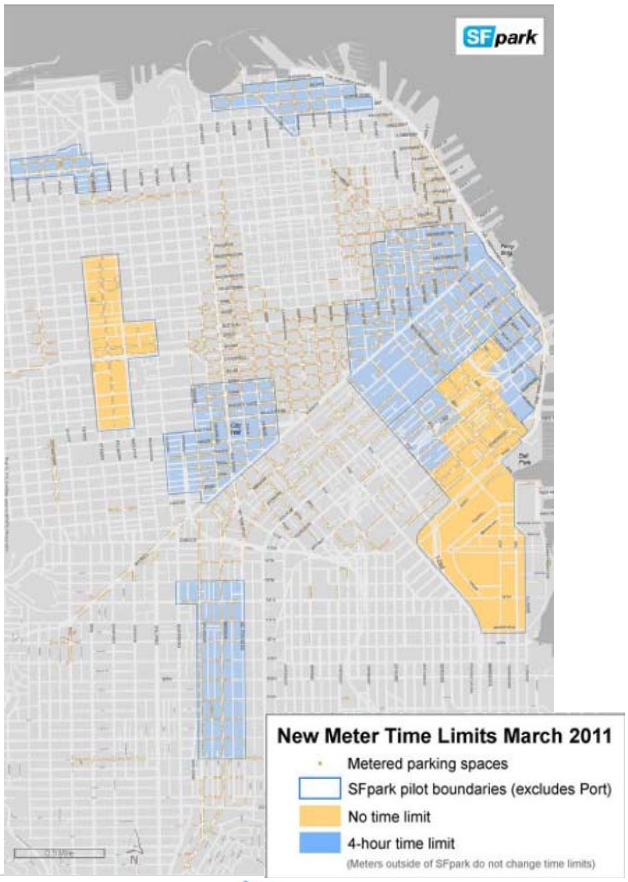
In these special event areas, meter rates could range from $0.25 to $18.00 per hour. SFpark staff will determine rates for particular events based on the parking demand the event is expected to generate, including surveys of rates a nearby private off-street parking facilities.

Changes to Meter Time Limits

Currently, meters in SFpark pilot areas limit parking to durations between 30 minutes and two hours. The allowed length of stay at meters is unpredictable; the short time limits are difficult and expensive to enforce, and often force people to cut their trips short or risk receiving a parking ticket.

To address these problems, the SFpark program will lengthen time limits in the pilot areas to four hours in most places, and eliminate time limits altogether in the Fillmore and parts of the South Embarcadero.

The map to the right shows where the new SF*park* time limits apply.



The table to the right shows the adjustments to time limits (both lengthening and elimination) on a street block basis.

SFpark SFpark Extended Meter Time Limits p. 1

Street Block	SFpark, non-SFpark	New Time Limit	Meter Status	Area	Operational & new limits effective starting:
300 ASH ST	SFpark	4 hrs	operational	Civic Center	1/11/11
900 EDDY ST	SFpark	4 hrs	operational	Civic Center	1/11/11
300 FELL ST	SFpark	4 hrs	operational	Civic Center	1/11/11
100 CAPP ST	SFpark	4 hrs	operational	Mission	1/11/11
0 HOFF ST	SFpark	4 hrs	operational	Mission	1/11/11
1500 SOUTH VAN NE	non-SFpark	no limit	operational	Outer Mission	1/11/11
1400 VALENCIA ST	non-SFpark	no limit	operational	Outer Mission	1/11/11
1500 VALENCIA ST	non-SFpark	no limit	operational	Outer Mission	1/11/11
1100 FRANKLIN ST	non-SFpark	no limit	operational	Polk	1/11/11
400 HYDE ST	non-SFpark	4 hrs	operational	Polk	1/11/11
500 HYDE ST	non-SFpark	4 hrs	operational	Polk	1/11/11
600 HYDE ST	non-SFpark	4 hrs	operational	Polk	1/11/11
500 HYDE ST	non-SFpark	4 hrs	operational	Polk	1/11/11
600 HYDE ST	non-SFpark	4 hrs	operational	Polk	1/11/11
1700 MISSION ST	non-SFpark	4 hrs	operational	Western SoMa	1/11/11
800 TURK ST	SFpark	4 hrs	operational	Civic Center	2/11/11
500 BRANNAN ST	SFpark	no limit	operational	South Embarcadero	2/11/11
800 HARRISON ST	SFpark	4 hrs	operational	South Embarcadero	2/11/11
300 RITCH ST	SFpark	no limit	operational	South Embarcadero	2/11/11
500 05TH ST	SFpark	4 hrs	operational	South Embarcadero	2/11/11
600 05TH ST	SFpark	no limit	operational	South Embarcadero	2/11/11
400 05TH ST	SFpark	4 hrs	operational	South Embarcadero	2/11/11
500 BRANNAN ST	SFpark	no limit	operational	South Embarcadero	2/11/11
0 LAPU-LAPU ST	SFpark	4 hrs	operational	South Embarcadero	2/11/11
400 ELLIS ST	non-SFpark	4 hrs	operational	Tenderloin	2/11/11
500 ELLIS ST	non-SFpark	4 hrs	operational	Tenderloin	2/11/11
400 LEAVENWORTH S	non-SFpark	4 hrs	operational	Tenderloin	2/11/11
500 LEAVENWORTH S	non-SFpark	4 hrs	operational	Tenderloin	2/11/11
400 LEAVENWORTH S	non-SFpark	4 hrs	temporarily removed	Tenderloin	2/11/11
800 SUTTER ST	non-SFpark	4 hrs	operational	Tenderloin	2/11/11

SFMTA | Municipal Transportation Agency

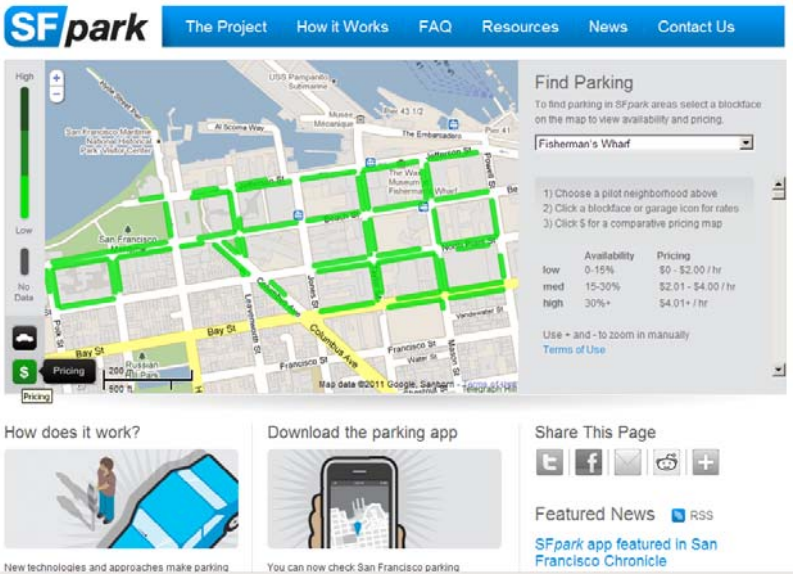
Motorcycle Meter Rate Adjustments

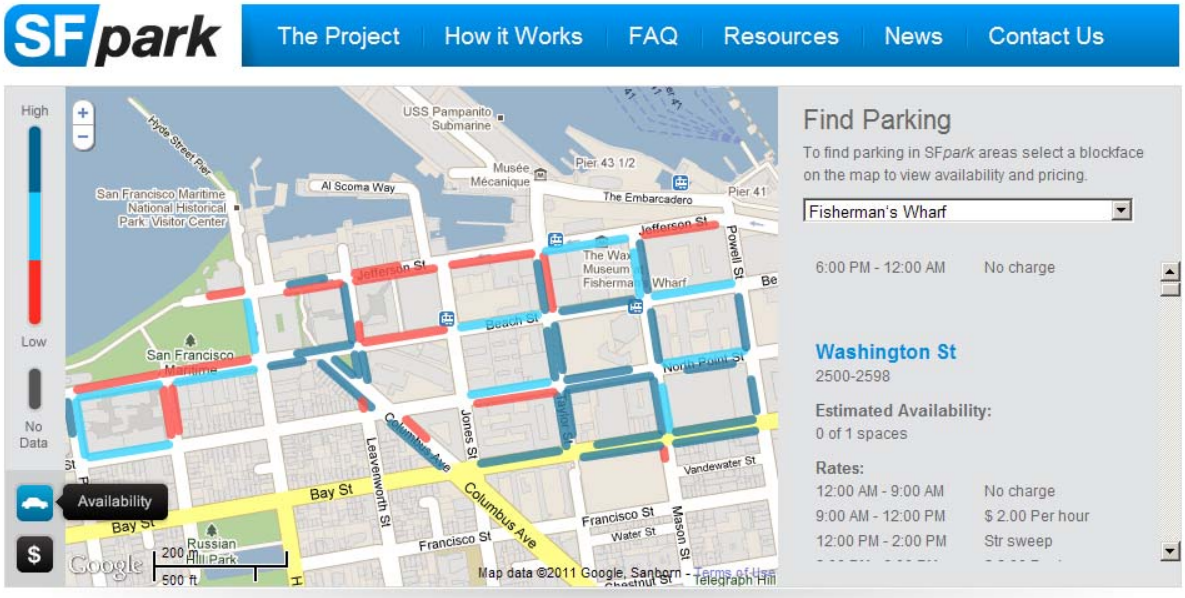
The SFMTA will also implement demand-responsive pricing for metered motorcycle parking in order to achieve occupancy targets. Motorcycle rate adjustments involve manual surveys rather than in-ground sensor data and thus will occur less frequently (approximately four times per year). The same occupancy thresholds used for regular metered spaces apply to motorcycle spaces.

Parking Web-site and Mobile App

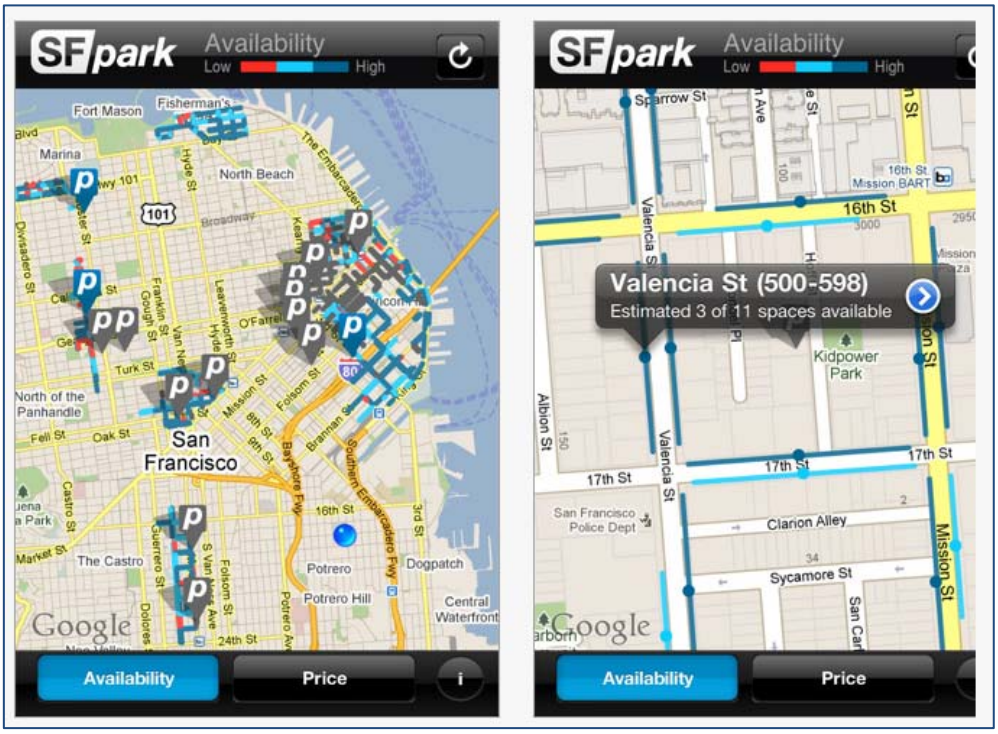
SFPark has a very well developed parking web-site to assist parkers in finding available parking, understanding pricing by location and time of day. It is a dynamic and well designed program providing excellent maps and graphics. Below are several screen shots provided for illustrative purposes.

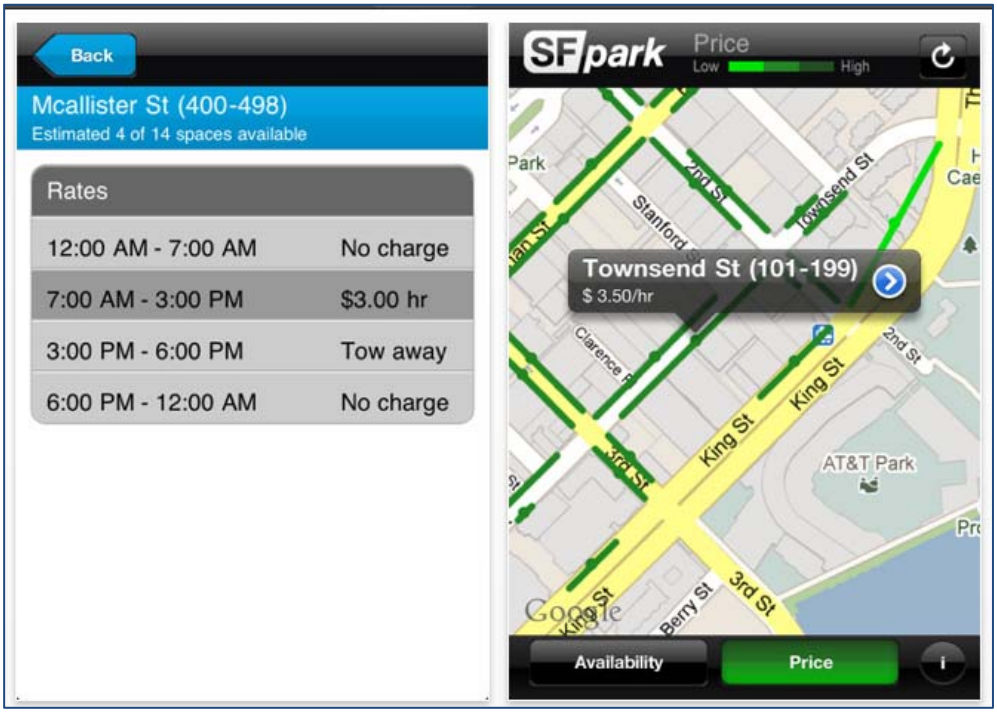
Web-site Screen Shots





I-Phone Screen Shots





Program Funding:

$19.8 million grant from the U.S. Department of Transportation's Urban Partnership Program

Applicable Lessons for Seattle:

Extremely sophisticated system made possible with significant grant funding (federal). The SFPark program should serve as an on-going model to evaluate feasibility, cost, administration and management, not only for Seattle but rest of nation.

Los Angeles, CA - LA Express Park

Program Overview:

ExpressPark™, the Downtown Intelligent Parking Management (IPM) Project is proposed as a comprehensive strategy to relieve traffic congestion, reduce air pollution, and improve transit efficiency in Downtown Los Angeles through the implementation of demand-based parking pricing and operational policies. ExpressPark™ will utilize vehicle sensors and a real-time parking guidance system to optimize the utilization of public on- and off-street parking in the Downtown Los Angeles Area, thus reducing the significant traffic congestion and pollution associated with drivers searching for parking. Similar to congestion pricing, demand-based parking pricing will also encourage a modal shift to carpooling, bicycling, and public transportation. To support the new parking pricing and policies, new meter technology will be deployed to provide motorists with alternative payment options and improved convenience. A complementary parking guidance system will also be implemented to support efficient travel to the most appropriate available parking.

Program Goals and Objectives:

- Reduce traffic congestion and its resulting air pollution
- Improve travel efficiency through a real-time parking guidance system
- Improve travel times for transit and through traffic
- Encourage a modal shift from single-occupancy vehicles to more efficient forms of transportation
- Optimize parking revenues to fund system expansion to other high-demand areas

Program Elements:

ExpressPark™ includes the following components:

1. New Parking Meter Technology - New parking meter technology will be deployed for approximately 6,000 on-street metered parking spaces in the project area. These new parking meters will be capable of charging motorists demand-based parking rates depending on the time of day and length of stay. They will also provide alternative payment options, allowing motorists to pay for parking using their credit card, smart card, or cell phone, and even receive a text message when their paid parking time is about to expire.

2. Vehicle Sensors and Central Management System - Wireless vehicle sensors will be placed in each of the project's on-street metered parking spaces to provide real-time occupancy and parking duration information. This information will be wirelessly transmitted to a central management system for data processing. The management system will then analyze the data to recommend revised rates, time limits, and hours of operation with a goal of achieving approximately 70-90% of the spaces on each block occupied during metered hours. After each adjustment is made, the system will analyze the parking sensor data to evaluate the resulting

effects on parking behavior and recommend further refinements until optimal pricing and policies are achieved.

In addition to the on-street sensors, occupancy reporting systems will be implemented for City-owned off-street parking facilities in the project area, serving approximately 7,500 spaces. These systems may utilize individual vehicles sensors, cordon counting systems, or advanced revenue control systems to collect parking data. The central management system will similarly analyze off-street data to recommend optimal coordinated pricing structures and operational policies, as well as to evaluate the impact of on-street operational changes on off-street demand.

The project area includes approximately 15% of all the on-street metered parking in the City of Los Angeles and represents a very high demand parking area of the City. The parking meter rates in the area currently range from $1.00 to $4.00 per hour with typical hours of operation from 8:00 AM to 8:00 PM Monday through Saturday. Demand for parking in many areas extends well into the evening hours and on Sunday, including shopping, special event, and entertainment areas.

In addition to on-street parking, LADOT and other departments of the City of Los Angeles operate an additional 7,500 public parking spaces in the Downtown project area, including the Civic Center, El Pueblo, Pershing Square, and South Park. The Los Angeles Convention Center operates 5,100 of these spaces, which primarily serve event traffic - traffic that regularly and significantly impacts commuter congestion and travel times.

PRIMARY PROJECT COMPONENTS:

- Prepare system architecture and design documents
- Prepare performance specifications for field equipment
- Prepare functional requirements for the central management system
- Prepare the Request for Proposals
- Evaluate proposals and award contracts
- Public outreach
- Install and test new equipment
- Perform system integration
- System operation and monitoring of project elements
- Evaluate performance measures

PUBLIC OUTREACH AND MARKETING

The implementation of demand-based pricing and the other parking meter management policy changes will be coordinated closely with our public outreach program. Public acceptance of this new approach to parking management is critical to its success. LADOT has been actively engaged in public outreach since the inception of the program. We have made presentations to the Chamber of Commerce, the Central City Association, the Central City East Association, the affected City Council offices, Metro's Corridor Advisory Groups, and other stakeholder groups. The Los Angeles Chamber of Commerce has provided a letter of support for the project.

Recognizing that a significant public outreach and marketing effort to educate the public about the functionality and the benefits of demand-based parking pricing and the Parking Guidance System is a critical component of the ExpressPark™ project, we have currently budgeted $500,000 for this effort. This public outreach and marketing program will include the following components at a minimum:

- Logo/brand development and copyright
- Sign and labeling design
- Brochures
- A public website
- web-based instructional videos
- A Public Service Announcement
- Attend public meetings
- Assist in preparing press releases and media packages
- Development and placement of advertising
- Customer service assistance phone service

The public outreach and marketing campaign will focus on educating the consumer and the local businesses regarding the value of demand-based parking pricing, but it will also include an outreach effort to private parking operators for inclusion in the Parking Guidance System, including pursuing mutual advertising opportunities.

Program Funding:

$15 million grant from US Department of Transportation

Applicable Lessons for Seattle:

In contrast to the “piece meal” RFP approach that San Francisco took, LA took a different approach and developed a comprehensive RFP approach packaging all equipment, signage, software and project management into a single package.

Washington, DC Pilot Programs[2]

Program Goals and Objectives:

Beyond the two specific performance-based parking pricing pilot programs underway in Washington, DC, there is a larger strategic framework that should be reviewed. The following is an overview of that larger community access and congestion mitigation strategy.

Mission Statement:
The mission of the District of Columbia Department of Transportation is to:
Develop and maintain a cohesive, sustainable transportation system that delivers safe, affordable, and convenient ways to move people and goods — while protecting and enhancing the natural, environmental, and cultural resources of the District.

Vision Statement:

DDOT is committed to achieving an exceptional quality of life in the nation's capital through more sustainable travel practices, safer streets, and outstanding access to goods and services.
Central to this vision is improving energy efficiency and modern mobility by providing next generation alternatives to single occupancy driving in the city.

Action Agenda: Sustainability

DDOT's work plan for the year was summarized in their publication entitled: "Action Agenda: Sustainability". The key elements are summarized below:

1. Make walking and biking the mode of choice for trips less than 1 and 3 miles respectively
    - Expand bike share program to at least 100 stations/1000 bikes
    - Set aside 5% of capital budget annually for bikes and peds
2. Prioritize expansion and enhancement of transit services
    - Construct initial two line segments of 37-mile streetcar system
    - Consolidate a minimum of 100 bus stops
3. Minimize traffic congestion and promote vehicle operations
    - Increase enforcement of double-parking & rush-hour violations
    - Improve on-street commercial loading operations and on-street parking management through pricing strategies
4. Encourage development projects that promote and support non-auto mobility
    - Review & guide transportation demand management (TDM)
    - Support OP/OZ efforts to modernize zoning requirements
5. Minimize the environmental impacts of transportation infrastructure
    - Develop standards for low-impact design (LID) treatments and management in the public space

[2] Information on Washington DC's program was derived from review of its web information site http://ddot.dc.gov/DC/DDOT/About+DDOT/News+Room/New+Parking+Pilot+Program+Primer

- Pursue "de-concretization" by expanding tree boxes, planting medians, and reducing impervious surfaces
- Establish electric vehicle charging stations
- Pilot the use of LED fixtures for roadway and pedestrian lighting

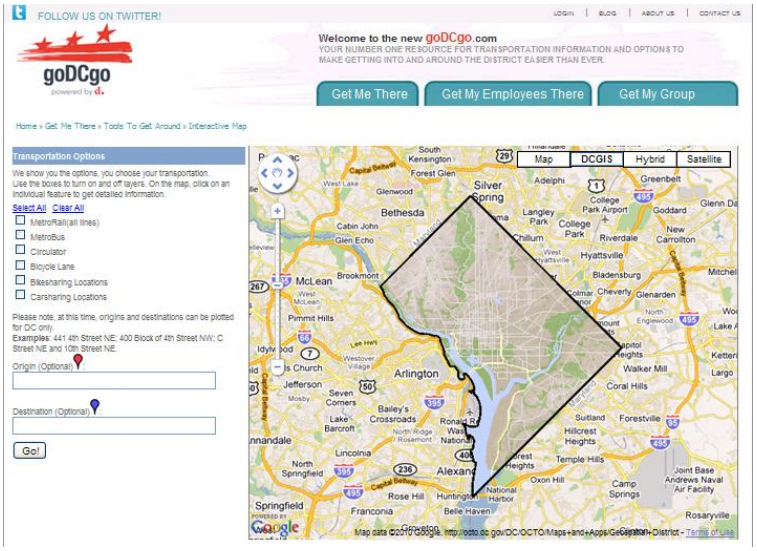
6. Use technology to improve traveler information, choice and convenience
    - Implement real time bus displays and information in bus shelters and on PDAs and via cell phone
    - Implement pay-by-phone for parking and other viable applications
    - Use www.godcgo.com to promote alternative travel in the District

The following graphic places the goDCgo.com website, DDOT's primary communications vehicle, into the context of major transportation demand management (TDM) initiatives.

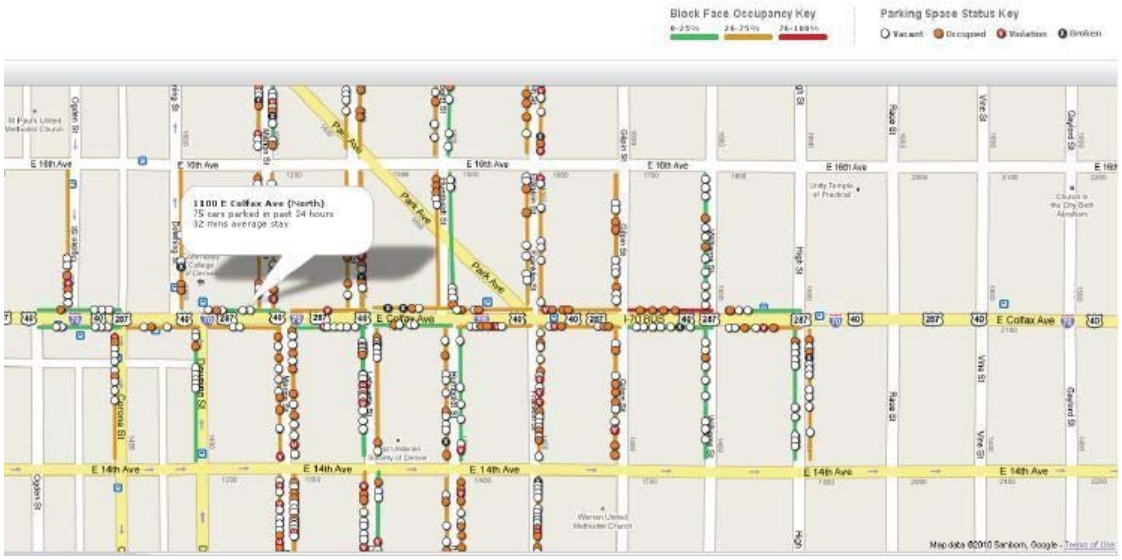
While parking is an important component, it needs to be appreciated within the larger context of the traffic and transportation equation. The following diagram shows the overall program context as it relates to the DDOT program.

Parking availability information and communications are key issues shared by the DDOT and SDOT programs. The following are some of the strategies being employed by DDOT.

Using their goDCgo website as the base for information, the following graphics illustrate how DDOT makes curb lane parking congestion information available to the public.



By entering a specific address into the parking district map above, detailed on-street occupancy data is provided (see example below). In this case, the data is provided via the "Streetline" system.

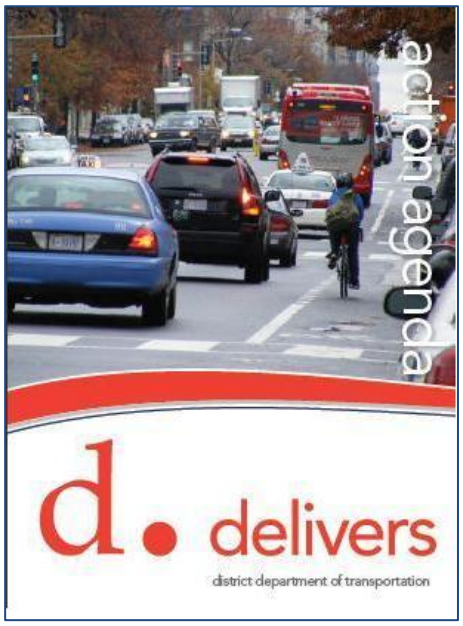


Similar data is also made available via mobile devices as pictured below.

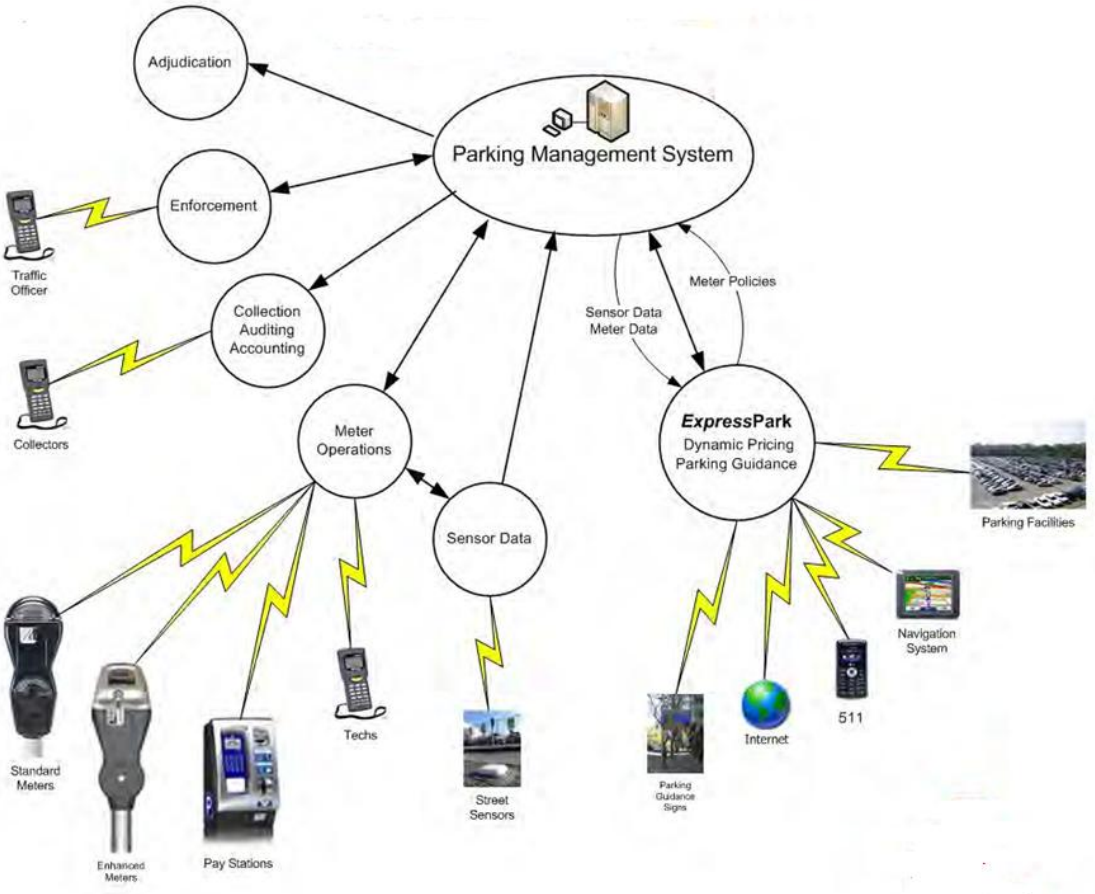
Information distribution is not limitied simply to parking information. Information is also assembled for a variety of multi-modal options including:

Overall Program Goals

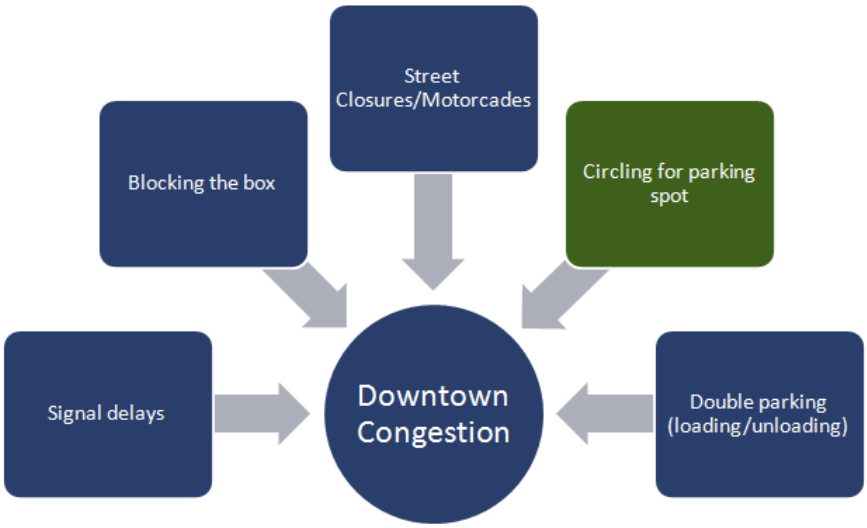
- Improved customer service
  - Multiple payment options
  - Maximize convenience
  - Real-time parking availability
  - Reduce frustration with broken meters
- Enhanced operational efficiency
  - Dynamic pricing
  - Real-time operational status
  - Exception based enforcement
  - Enhance meter uptime
  - Lower cost
- Better revenue management
  - Minimize coin transaction
  - Real-time auditing



The parking meter management system ties into a larger ITS system.



According to a report from the Downtown Congestion Task Force (December 2004), the following are the primary sources of traffic congestion. Approximately 15% - 20% of downtown congestion is caused by circling for a parking spot.[3]



Performance Based Parking Pricing and Parking Meter Pilots

DDOT will test out multiple systems from a variety of vendors, including pay-by-space, pay-by-license plate and pay-by-phone parking. The goal is to identify the best technology and solutions to improve the parking experience for motorists in the District. The pilot project is targeted to last two years.

Parking Meter/Sensor Pilots:

The following table provides an overview:

Program Elements:

Pay-by-phone, pay-by-space, pay-by-plates and occupancy sensors are some of the methods that will be tested in select areas. Areas include Independence Avenue, Friendship Heights, Foggy Bottom, Georgetown and areas around Nationals Park.

Technology	Functionality	Location
Pay-by-space multi-space meter with occupancy sensors	Patrons enter space # and pay for parking. Information uploaded to enforcement handheld Targeted enforcement	900 to 1200 block of Independence Avenue SW, Friendship Heights
Pay-by-license plate multi-space meter with occupancy sensors	Patrons pay at meter using license plate. Enforcement using drive-by license plate recognition	1300 block of U Street NW
Credit card accepting, networked single space meter	Pay using coins and credit cards Real time transaction and operations monitoring	50 metered spaces throughout the District
Pay-by-cell	Patrons pay using cellular phone call	700 spaces in Dupont Circle, K Street, Union Station
Pay-by-cell and mobile application	Pay using cellular phone call or mobile applications on Smart phones	1000 spaces in Foggy Bottom, GU Hospital, Baseball Stadium Area (SE)
Occupancy Sensors	Real-time occupancy and payment status	Common to all MSM pilots

[3] Source: DDOT Presentation at first "Green Gov" conference 2010. "Beyond the Commute" – Gabriel Klein

Pay-By-Cell Pilot Programs

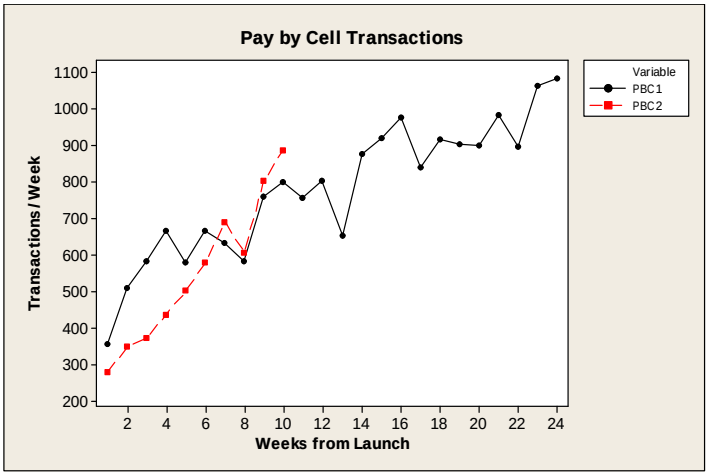
Here are the preliminary results of the first two pay-by cell pilots re: payment option adoption rates:

Pay-by-Cell Pilot 1:

- Initiated April 2010
- 750 spaces
- 7475 users
- 18,000 transactions

Pay-by-Cell Pilot 2:

- Initiated July 2010
- 1000 spaces
- 3245 users
- 7300 transactions



Based on continued success Washington DC has now chosen Park Mobile for city-wide pay-by-cell phone implementation.

DDOT has defined the following "migration path" as it relates to the adoption of new programs and technologies:

- Asset intensive program to "asset lite" solutions
- Non-communicating assets to networked "smart" assets
- Coin transactions to virtual transactions
- Reactive maintenance to proactive
- Fixed rate structure to dynamic pricing
- Limited occupancy/demand information to real-time
- Enforcement – "walk the beat" to targeted

Performance Based Parking Pricing Pilots

Columbia Heights Pilot Zone -

Below is a summary of the Columbia Heights pilot zone findings:

- There are 44 blocks within the Columbia Heights pilot zone
- 32 or 73% of the blocks have an occupancy rate below 85%
- 12 or 27% of the blocks have an occupancy rate at or above 85%
- 6 blocks have multi space meters (MSMs) with variable hours of operation
- 3 MSM blocks or 50% have an occupancy rate at or above 85%
- Columbia Heights Pilot Zone Turnover Rate
    - The average turnover in the Columbia Heights pilot zone is two hours and forty seven minutes.

- The average turnover on multi space meter (MSM) blocks is one hour and fifty eight minutes.
- The average turnover on non metered streets in pilot zone is two hours and fifty two minutes.

- Vehicle Data within Columbia Heights Pilot Zone
  - 8,722 vehicles were observed in the pilot zone during data collection
  - 42% of these vehicles were registered in the District of Columbia
  - 34% were registered in 'other jurisdictions.'
  - 16% were registered in the State of Maryland
  - 8% were registered in the Commonwealth of Virginia
- Columbia Heights Pilot Zone Revenue Collections
  - DDOT began meter collections in Columbia Heights in March 2009.
  - From March 2009 through August 2009 the department has collected a total of $83,173.51 in revenues.
  - $16,634.70 of revenues collected is dedicated to immediate non automotive transportation improvements within the Columbia Heights pilot zone.
- District Department of Public Works (DPW) Parking Ticket Violation Information
  - DPW has issued a total of 1,945 tickets in the Columbia Heights pilot zone from March 2009 through August 2009.
  - 1,242 of these tickets were issued in the 2900 through 3300 blocks of 14th Street, NW. This segment of the 14th Street, NW corridor is the central retail corridor of the zone. Each of these blocks is a MSM street with occupancy rates above 85%.
  - 703 tickets were issued on the remaining residential streets and mixed used blocks.
- Recommended Modifications to Columbia Heights Pilot Zone
  - Increase size of DC USA parking signage on corridors throughout pilot zone
  - Provide a parking validation program at DC USA
  - Increase meter fees within pilot zone

The graphic to the right is an example of the data presentation from the study.

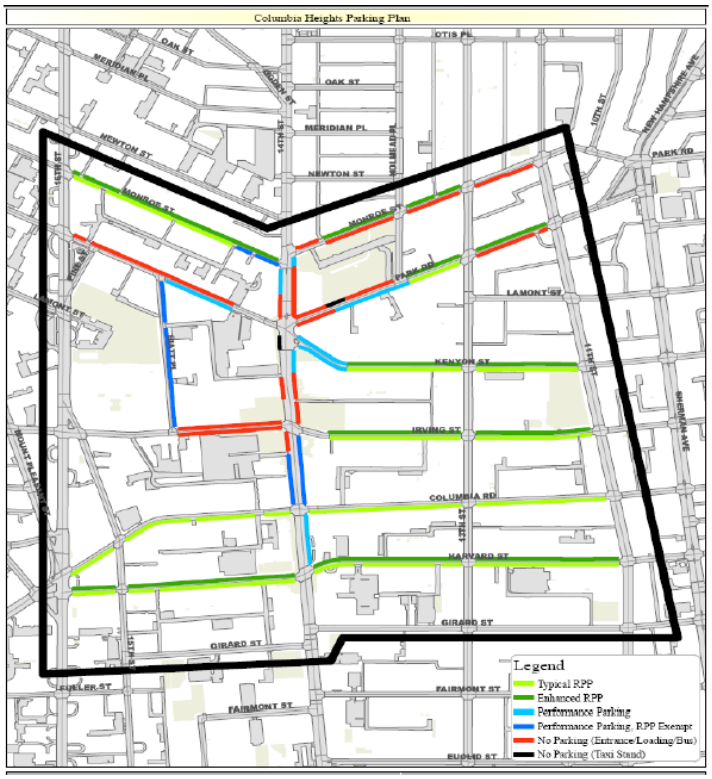
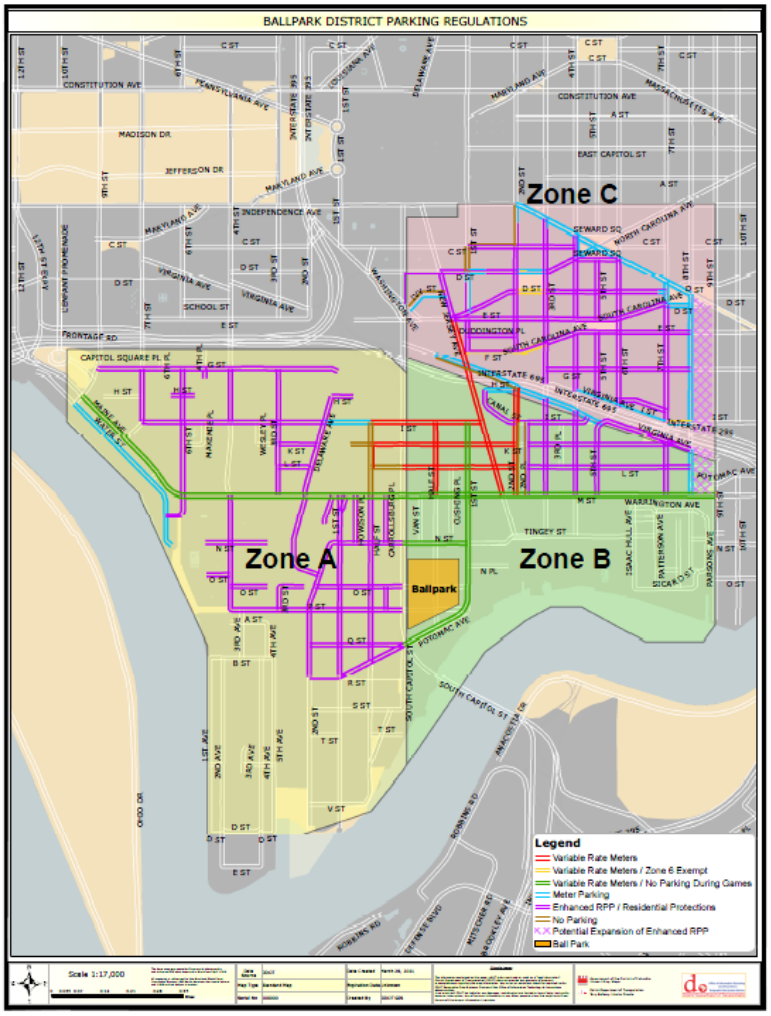


Figure 1: Columbia Height Performance Based Parking Pilot Zone

Columbia Heights Performance Based Parking Report 4
September 2009

Ward 6 (Ball Park) Pilot Zone

Below is a summary of the Ward 6 (Ball Park) pilot zone findings:



Ballpark District Pilot Zone Curbside Occupancy Rate

- 18 of the blocks have an occupancy rate below 85% on game days
- 10 of the blocks have an occupancy rate at or above 85% on game days
- 20 of the blocks have an occupancy rate below 85% on non game days
- 8 of the blocks have an occupancy rate at or above 85% on non game days

Ballpark District Pilot Zone Turnover Rate

- The average game day turnover in the Ballpark District pilot zone on all blocks is two hours and eighteen minutes
- The average game day turnover on multi space meter (MStvl) blocks is one hour and fifty four minutes
- The average game day turnover on residential blocks is two hours and fifty two minutes
- The average non game day turnover in the Ballpark District pilot zone on all blocks is one hour and fifty four minutes
- The average non game day turnover on MSM blocks is one hour and forty three minutes
- The average non game day turnover on residential blocks is one hour and fifty nine minutes

Vehicle Data within Ballpark District Pilot Zone

- Over 30,000 vehicles were observed in the pilot zone during data collection
- 44% of these vehicles were registered in the District of Columbia on game days
- 32% were registered in 'other jurisdictions' on game days
- 14% were registered in the State of Maryland on game days
- 11% were registered in the Commonwealth of Virginia
- 48% of these vehicles were registered in the District of Columbia on non game days
- 29% were registered in 'other jurisdictions' on non game days
- 13% were registered in the State of Maryland on non game days
- 10% were registered in the Commonwealth of Virginia on non game days

Ballpark District Pilot Zone Revenue Collections

- DDOT began meter collections in the Ballpark District in March 2008.
- From March 2008 through October 2009 the department has collected a total of $1,444,046.71 in revenues.
- $288,809.34 of revenues collected is dedicated to non automotive transportation improvements within the Ballpark District pilot zone.
- At the request of Council member Wells DDOT established an Advisory Committee and this body is assisting the department in determining how these revenues are spent.

Program Funding:

Not available at the time of this review.

Applicable Lessons for Seattle:

As Washington DC is testing a range of options and equipment vendors, Seattle can learn from this pilot issues related to feasibility, customer experience and performance of equipment and vendors.

New York City – Park Smart Program[4]

Program Overview:

PARK Smart is a program to make parking easier while reducing congestion and improving safety. DOT is conducting six-month pilots in neighborhoods across the City to evaluate how the program works in different settings. The agency works closely with community boards, merchants, BIDs and other local stakeholders when developing the pilots. Based on the success of the pilots, PARK Smart areas have been made permanent in several neighborhoods. The key element of the pilots is a "time band" type of pricing that increases the hourly rate during a peak time band (noon to 4 p.m.) then decreases the rate all other hours. PARK Smart aims to increase the number of available metered parking spaces by encouraging motorists to park no longer than necessary.

Program Goals and Objectives:

- Increase the availability of parking spaces
- Increase safety
- Reduce double-parking
- Reduce pollution
- Reduce congestion from circling vehicles

Program Elements:

A six-month trial of PARK Smart began in October 2008 in Greenwich Village. Due to the success of the pilot program, 71 muni-meters in the West Village were permanently programmed to the PARK Smart rate structure. The PARK Smart rates are as follows: $3.75 per hour from noon through 4:00 pm, $2.50 per hour for all other hours.

In May 2009 a second six-month pilot began in Park Slope, Brooklyn. Meter rates are $1.50 per hour from noon to 4:00 pm and $0.75 per hour at all other times that meters are in effect. All other regulations remain the same. Due to the success of this pilot, the Park Slope PARK Smart pilot is being made permanent.

In June 2010 a third pilot began on the Upper East Side. Meter rates are $3.75 per hour from noon to 4:00 pm and

[4]See, http://www.nyc.gov/html/dot/html/motorist/parksmart.shtml. See also, http://www.nyc.gov/html/dot/downloads/pdf/parksmart_gv_results_july09.pdf

$2.50 per hour at all other times that meters are in effect. All other regulations remain the same.

Program Funding:

Results indicate that additional funding was not necessary as dual rates were compatible with existing meter system.

Applicable Lessons for Seattle:

A fairly simple system to execute using data collection tools to establish a peak and non-peak time band. Works with existing equipment and is low cost to implement and administer. This program does not attempt to establish individual hourly peaks or to price parking at a level more granular than a defined district. Research indicates that increased rates in the peak were not necessarily associated with 85% Occupancy Standard.

Program Results:

PARK Smart Greenwich Village Pilot Program – Results

Greenwich Village Pilot Area, Manhattan
Parking Occupancy and Turnover Results: Summary

- PARK Smart meters show an increase in the number of available parking spaces in March as compared with pre-implementation levels.
    - Parking space occupancy declined from 77% to 71% on Tuesdays and from 75% to 69% on Fridays during the noon to 4 p.m. period (while the peak rate is in effect).
    - Occupancies were only slightly changed on Saturdays, with occupancies at PARK Smart meters increasing from 67% to 71%, reaching an occupancy rate comparable to the weekday level.
    - Motorists were parking for a somewhat shorter amount of time; the frequency of those who parked for less than one hour increased by 12% (from 48% to 60%) of parkers in the pilot area, while the frequency of those who parked for more than one hour decreased by the same percentage.
    - Approximately 5% of meters were expired during pre-implementation, versus 4% after the six months.
- Merchant and User Survey Results: Summary
    - Somewhat less than one-half of drivers and merchants were aware of the new parking meter rates in effect from noon to 4 pm:
    - 46% of drivers said they were aware of the new rates
    - 34% of merchants said they were aware of the new rates
- Up to one in five drivers said the rate change affected their driving and parking habits:
    - 18% of drivers said the new rates affected how long they parked
    - 13% of drivers said the new rates affected how often they drove to the area
    - 19% of drivers said the new rates affected where they parked

- Most merchants and drivers indicated that finding metered parking became easier or remained about the same during the pilot.
    - 57% of merchants and 61% of drivers reported that parking became easier or remained about the same as compared with pre-pilot conditions.

Recommendations for PARK Smart

Results from the six-months of data collection show that the PARK Smart pilot accomplished the goal of increasing parking availability on weekdays. Therefore, it would be beneficial to continue the program in Greenwich Village in order to maintain an optimal level of parking availability throughout the day. To be consistent with the surrounding area's new meter rates, the PARK Smart program should be made permanent with a new rate of $2.00/hour off-peak and $3.00/hour during the noon to 4 pm peak-period.

PARK Smart Pilot Timeline

PARK Smart Pilot Timeline

September 2008: Pre-Implementation Data Collection	Data was collected to assess parking occupancy, vacancy, turnover, illegal parking and traffic volumes. Parking data were collected for a typical weekday (Tuesday), a busy weekday (Friday) and a weekend day (Saturday).
October 6th, 2008: PARK Smart Pilot Begins	Field visits were performed immediately after "Turn-On" date to assess conditions.
November 2008: One-Month Snapshot	Data on parking occupancy, vacancy, turnover and illegal parking were collected on Tuesdays and Fridays to assess initial impacts.
March 2009: Post-Implementation Conditions, including Merchant and Parker Surveys	Pre-implementation data collection was replicated to compare "before" and "after" conditions after six months. In addition, merchants and parkers were interviewed to assess awareness and satisfaction with the program.

Park Slope Pilot Area, Brooklyn

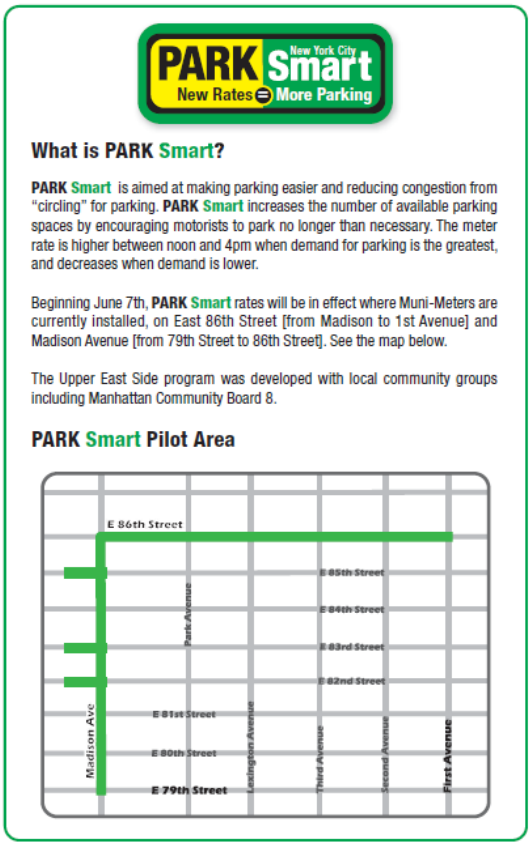
Recommendations Summary:

- Make the pilot permanent
- Expand the PARK Smart area
    - South to 15th Street on both avenues
    - Include 9th Street and spurs
    - North on Fifth Avenue to Dean Street
- Implement with installation of new Muni-meters in Spring 2011
- To address the needs of restaurants in the northern portion of Fifth Avenue:
    - Extend meter hours to 9 p.m. north of 6th Street (now 7 p.m.)
    - Extend the duration to 2 hours (now 1 hr)
    - Extend the peak rate through the afternoon and evening to discourage residents from using meters from 7 p.m. to 9 p.m.

- Based on the high occupancy levels in the late afternoon, extend the peak rate to 7 p.m. in the remaining PARK Smart Areas
    - Consider adjusting $1.50 peak rate
- Make pilot permanent
- Expand PARK Smart area
- Fifth Avenue Restaurant Area: 2 hr duration, meters operate to 9 p.m., peak rate
- Extend peak rate to remaining PARK Smart areas
    - Consider adjusting peak rate

86th Street and Madison Avenue Pilot, Manhattan

In June 2010 a third pilot began on the Upper East Side. Meter rates are $3.75 per hour from noon to 4:00 pm and $2.50 per hour at all other times that meters are in effect. All other regulations remain the same.



Below is a flyer used as a communications tools for this initiative. Above is a decal that was also used.

Secondary Programs Review

A few smaller cities have also begun more limited experiments in the area of on-street parking pricing alternative strategies. These include:

- Albany, NY
- City of Manchester, NH
- Winnipeg, Manitoba, Canada
- City of Berkeley Value-Priced Parking and Transit Program
- Redwood City, CA

Some of these smaller programs are not fully developed performance-based parking pricing programs, but they are implementing a variety of related strategies that are of interest to the study. Examples include:

Albany, NY

Albany, NY recently implemented a new on-street progressive pricing approach in conjunction with the elimination of time limits.

Albany's new on-street progressive rate structure:

- Eliminated the 2 hour limit and are using economic/market forces to create turnover by charging an extra $.25 per hour for the 3rd through 10th hour – total cost to park for 10 hours is now $21.50
- There have been a few of those all day customers, but turnover is good and average length of stay is about an hour.

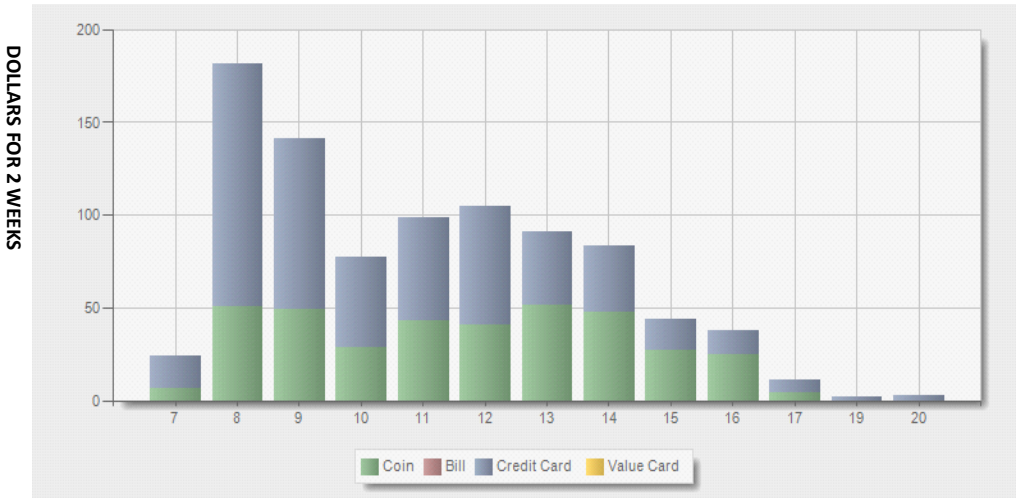
Initial Results:

Below is a summary of early program result data:

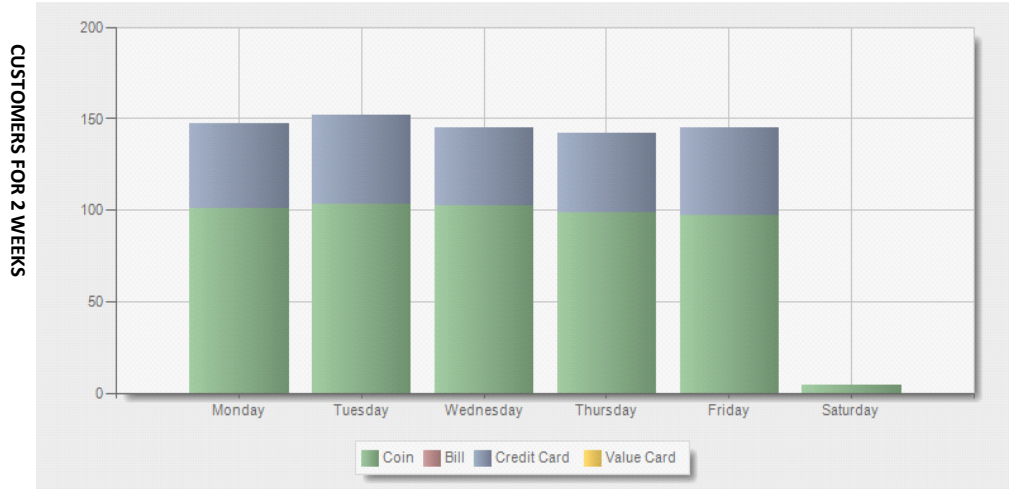
Albany Parking Authority - Initial Program Results

Number of Customer:	709		
Days of Data:	10		
		Minutes	Hours
Data Totals:	$890.40	40,885	681
Average Purchase:	$1.26	58	0.96
Minimum Purchase:	$0.25	12	0.2
Maximum Purchase:	$15.25	480	8
Median:	$0.50	24	0.4
Average Hourly Rate:	$1.31		
Long Stay (Over 2 hrs.)	93		
% of "Long Stay" Customers	13.10%		

MSM PURCHASE AMOUNT PER HOUR OF DAY 6/15-28/11 (FIRST 2 WEEKS OF DATA)



MSM NUMBER OF CUSTOMERS 6/15-28/11 (FIRST 2 WEEKS OF DATA)



Media - Notes from newspaper Article on Recent Program Rollout:

- The new, solar-powered meters also will extend the time people can spend in a space from two to 10 hours, but it will get more expensive for a longer stay.

- Meters will provide directions in English, Spanish, French and German. A previous version of the story erroneously reported that Dutch was among the languages included.

- It does have one downside for commuters: no more piggybacking on time left on the meter by someone else.

- The old meters allowed people to park for up to two hours at a total cost of $1.25. The new system will enable people to park for 10 hours. While the rate for the first two hours will remain the same, the rate will increase 25 cents an hour for any additional time.

- Unlike the mechanical meters, the new ones will also track what time the person pays.

- Drivers aren't required to pay for parking until 8 a.m., Klein said. Under the old system, someone arriving for a 7:30 a.m. meeting that lasts two hours would drop coins in the meter. They would then be charged for the first half hour, when they aren't required to pay, and have their meter run out before their meeting ended. Under the new system, a person who pays at 7:30 a.m. won't start being billed until 8 a.m. The new machines will also print a receipt, which drivers are to display on the passenger side of their front window with the time stamp facing up.

- "I think it's a great idea. I often come down here and don't have quarters," he said. "I'm constantly going into the bank to get a roll of quarters." Kylie Nunziato of Albany said allowing people to park for more than two hours is a needed change.

- "People who have jobs coming out every two hours is ridiculous," she said. Her boyfriend, Josh Crowfut, of Albany said he's glad the machine will still take coins because the credit card fees would wipe out earnings from people who pay for a few quarters' worth of parking.

- We are using a progressive rate structure to generate turnover by using price to clear the market rather than rationing length of stay to force turnover. Our old rates were $1.25 per hour with a 2 hour limit, we did not change those rates, and so there was no push back associated with a rate increase. Thereafter, rates climb by .25 per hour, resulting in a 10 hour stay costing $21.50.

- All the TV stations covered this in a very positive way, so the media was our friend, and nicely supported our efforts which made our Parking Ambassador's job that much easier.

- The data from the first few days of operation indicates that the rate structure we chose is working well, with about 10% of users staying for more than 2 hours, and with average length of stay at about 1 hour. To date the longest stay was 4.25 hours and the

payment was $6.25. We'll follow up with more information after more time has elapsed.

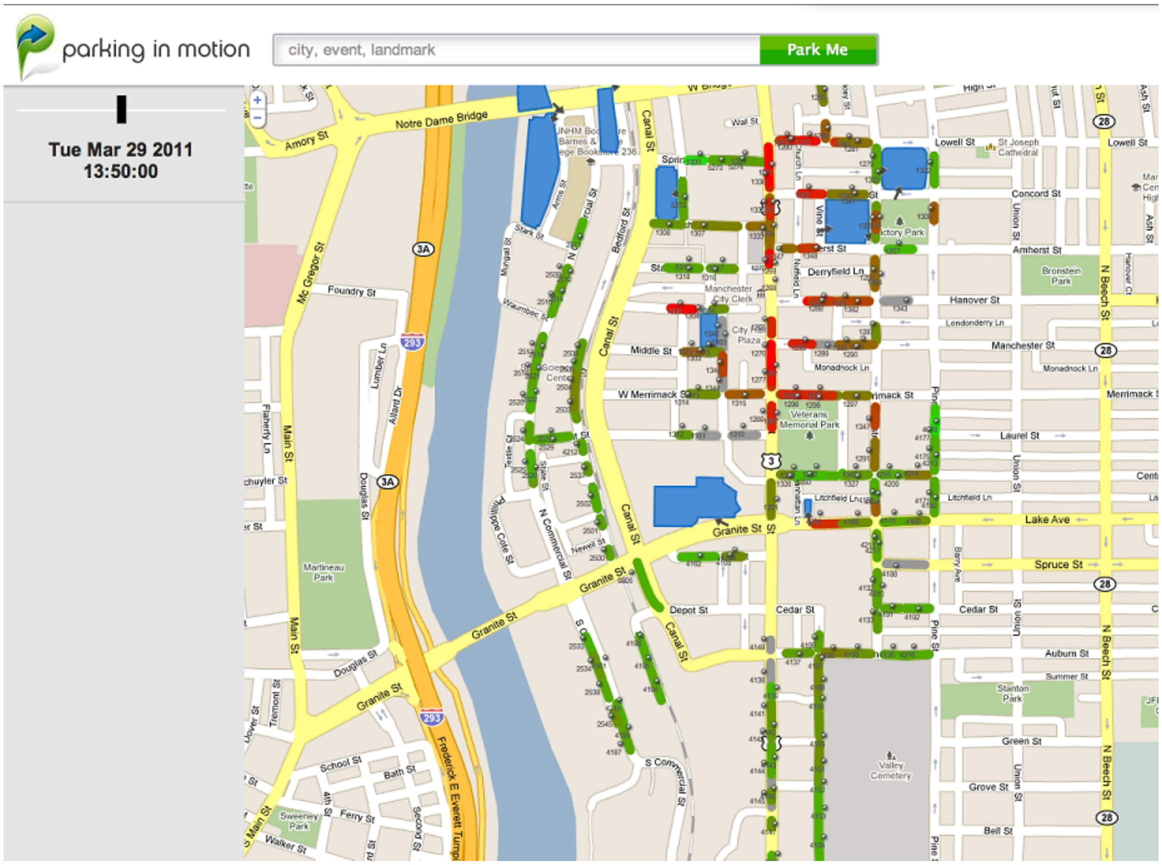
Communications:
Sticker for top of new Cale meters.

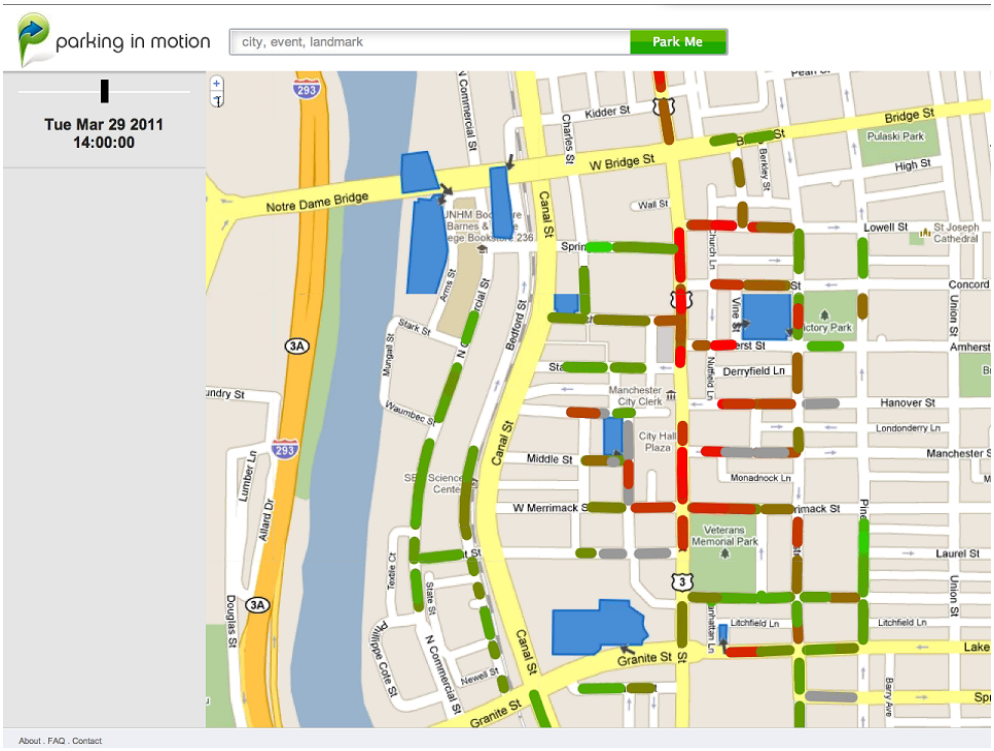
Manchester, NH

In Manchester, NH the city parking program was an early pilot for a "Parking Heat Map" concept that used a combination of pay-station data and traditional parking survey data combined with a "predictive algorithm" to provide web-based parking data.

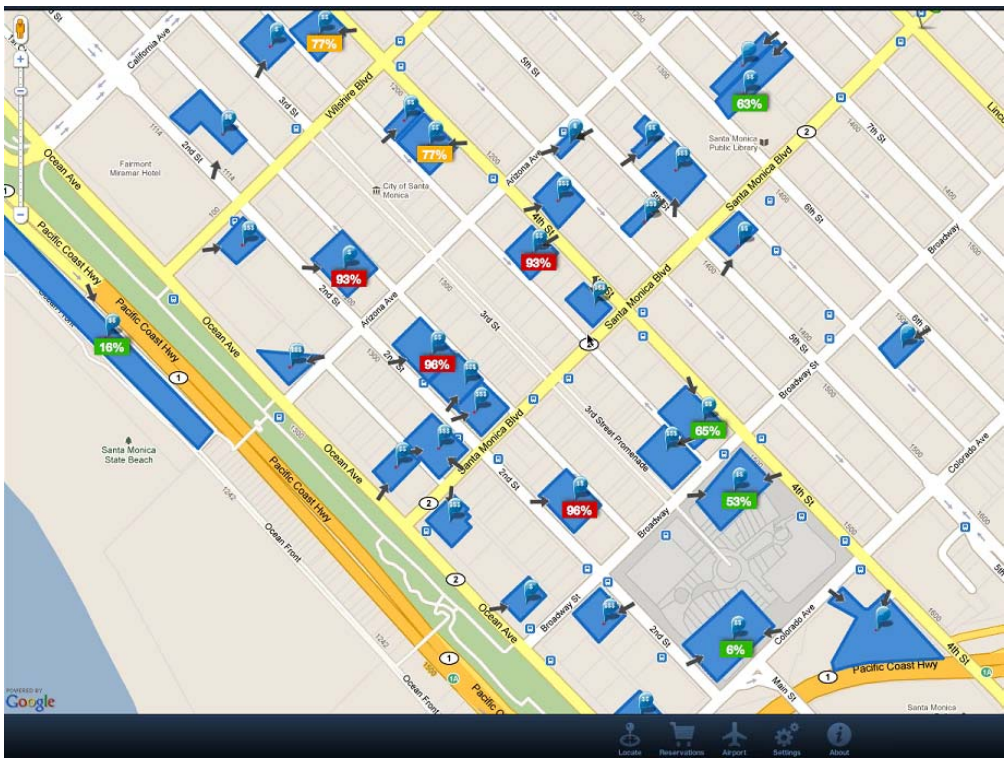
This approach did not claim to be providing actual data on real-time parking availability, but rather the "parking heat map" shows a color-coded representation of the likelihood of finding available parking based on historical data trends and the application of the predictive algorithm. One of the questions that this raises for the Seattle project is whether this approach, while not providing real-time data such as the more expensive sensor-based approaches being piloted in the SF*Park* and LA Express Park projects, could provide an adequate level of data on which to based parking pricing adjustments going forward.

The following are some screen shot examples to illustrate the concept and the graphics:


parking in motion
city, event, landmark
Park Me
Tue Mar 29 2011
13:50:00
Notre Dame Bridge
Amory St
Canal St
Foundry St
Mc Gregor St
Main St
Lowell St
Concord St
Amherst St
Hanover St
Manchester St
Middle St
W Merrimack St
Laurel St
Lake Ave
Spruce St
Cedar St
Depot St
Granite St
Auburn St
Green St
Grove St
Bell St
N Beech St
Veterans Memorial Park
Valley Cemetery
Martineau Park
Bronstein Park
Stanton Park
Sweeney Park
School St
Bath St
Ferry St
Walker St
Douglas St
Frederick E Everett Turnpike



The example below is from Santa Monica, CA:



Winnipeg, Canada

The Winnipeg Parking Authority (WPA) has effectively utilized mobile license plate recognition (LPR) technology to document on-street parking utilization in support of a variable parking pricing strategy based on a time-of-day approach.

David Hill, former WPA Chief Operating Officer and a member of the project's parking expert advisory panel, suggested that a $60,000 upgrade to the latest version of the Genetec LPR software may correct the problems that Seattle has been experiencing in their trails of using mobile LPR as a data collection methodology. This is being investigated.

The WPA also uses online instructional videos as an effective tool for communicating and educating the public. Examples can be seen at: http://www.theparkingstore.winnipeg.ca/theparkingstore/payparkingpermits.stm.

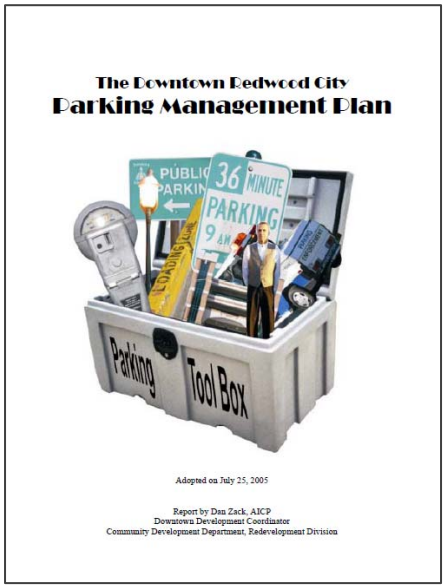
Redwood City, California

Redwood City was an early adopter of many of Professor Donald Shoup's ideas, including market rate pricing of on-street parking, elimination of time limits and demand-based pricing. Redwood City eliminated time stay limits in most on-street areas of the downtown. Signs have been removed and meters have been reprogrammed to allow parkers to purchase any length of time by the hour during enforcement hours. This eliminated enforcement expenses for chalking tires.

Prices are structured so that the most popular spaces are most expensive and the less popular spaces are cheaper (however hourly prices only range from $0.25 to $0.50 per hour and free parking areas are provided in some areas). For the most part, the main change in Redwood City was elimination of time stays and deployment of pay by space meters. The pricing differential between $0.25 and $0.50 per hour does not seem significant enough to affect occupancy behavior. Nonetheless, Redwood City does market their program as "performance-based pricing."

In an interesting document entitled: "The Downtown Redwood City Parking Management Plan" the following topics are addressed:

- The Unique Nature of Parking in Downtowns
- Downtown: A Park Once Environment
- The "Shared Parking" Efficiencies of Downtowns
- Shared Use Agreements
- Valet Parking
- Parking Management Discussion
- Prices
- Time Limits
- Why charge for parking?
- Market-Rate Pricing



- What motivates parkers?
- The Four Parker Groups
    - The "Unpleasables"
    - The Dream Parkers
    - The Convenience Hunters
    - The Bargain Hunters
- Setting Prices to Meet People's Needs
- Will Charging for Parking Drive Away Business?
- Permits as a Pricing Tool
- Time Limits
- What is the appropriate time limit?
- Parking Assessment Districts

A quick review of this list reveals many issues being discussed in Seattle. The document can be downloaded from: http://www.redwoodcity.org/bit/transportation/parking/pdf/DowntownRedwoodCityParkingPlan.pdf.

Appendix C

Parking Technology Review

Parking Technology Review

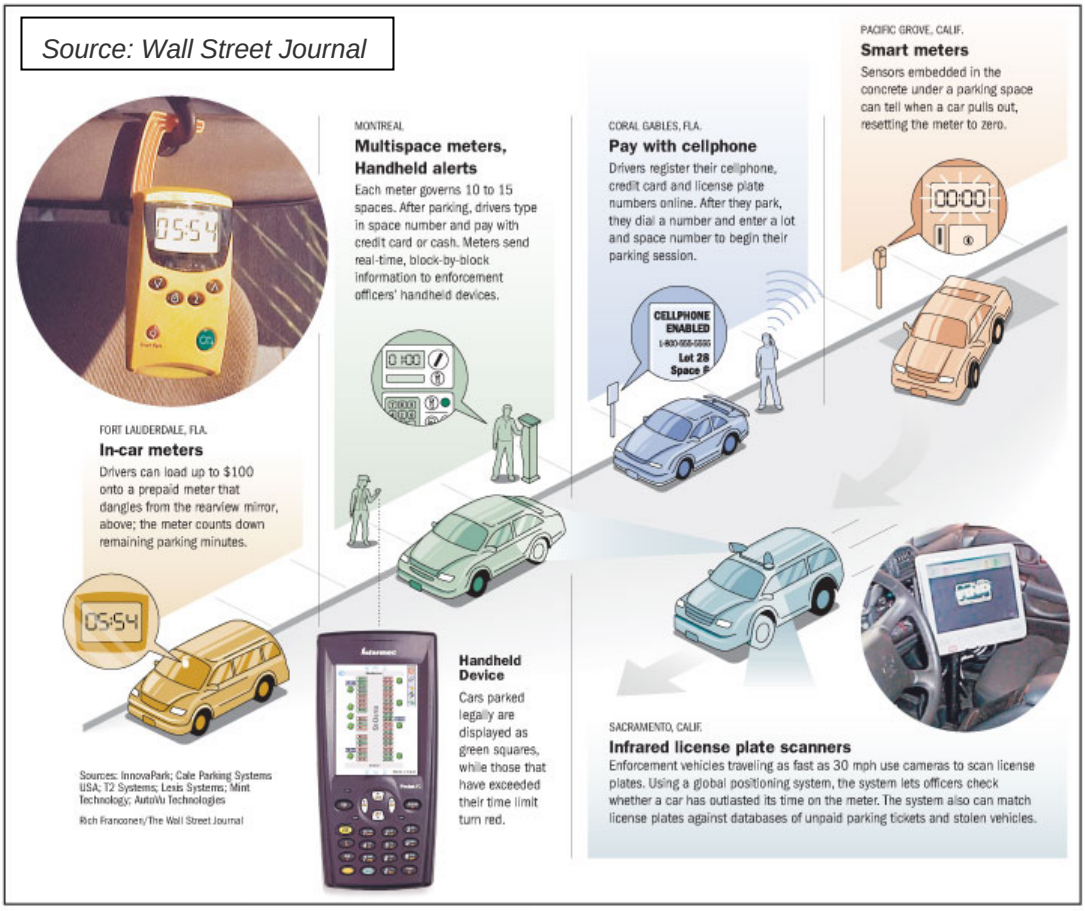
New Technologies

Technological Review of Revenue Control and Parking Enforcement Equipment

Over the past decade, parking meters have evolved significantly from the traditional coin-activated digital meter to a variety of technologies that include multi-space pay stations and numerous payment methods including payment by credit card, cell phone, smartphone applications, and human to machine interface.

The graphic below, which appeared in the *Wall Street Journal*, depicts several types and varieties of both revenue control devices and enforcement technology, and could have included other technologies such as single-space credit card meters. As one of the first major U.S. cities to make a substantial commitment to multi-space meters, the City of Seattle is well aware of this evolution in the technology.

The remainder of this sub-section focuses on currently available technologies, payment methods, and their implications for both the customer and program staff.



The following technologies are directly related to specific recommendations in the main report.

Pay-by-Cell Phone

Pay-by-cell phone as a parking payment option is just as it sounds – once motorists park their vehicles, they call a phone number usually located on a sign or the parking meter, enter their space or license plate number, and then hang up. Smartphones have an app that doesn't require a phone call. An initial, one-time setup to link a credit card number with a phone number is required. The system then uses caller ID to match the user with the account. This technology has great potential for making parking easier and providing a significant number of customer benefits.

Pay-by-cell is flexible for a variety of paid parking system integrations. For example, in a pay-by-space area, the parker would enter a parking space number when paying. In a pay & display or pay-by-license plate system, the parker would enter a license plate number. Some systems create a "parking zones" with specific parking rates by zone. In this scenario, the parker would enter the zone number as displayed on the pay-by-cell signage. Some cities, such as Calgary, there is a combined "pay-by-license plate and zone" approach.

Pay-by cell phone provides a new payment option that brings tangible customer benefits related to the ease of parking and improved customer convenience. Examples include:

- Pay for parking in your car when it is raining
- Receive text message notifications that your meter is about to expire
- See enhanced parking information and messages

Implementation costs are relatively low. In fact, some companies claim they will install their systems at no charge to the City. Typical fees are based on a per transaction cost that is either passed along to the user or paid by the City, much like a credit card processing fee. Advisory panel members report that other cities have negotiated rates to be between $0.10 and $0.35 per transaction. Most cities pass the transaction costs on to the end user.

Pay-by-cell is gaining in popularity and acceptance. Based on a recent study, conducted for the City of Phoenix, some peer cities reported pay-by cell usage in the 15% – 20% range. Pay-by cell acceptance is growing as per-use fees decline and especially as more smartphone apps combine finding a space with space payment.

The big advantage is the ability to add time remotely from your cell phone. If motorists, who planned to stay half an hour, decide to extend their trip for additional shopping or dining, they can call the number provided and add time to their parking to avoid a violation. If used in a pay-by-space environment, the system has the ability to block the addition of time extended beyond the limit; however, as more cities move toward performance-based pricing without time limits, pay-by-cell could gain traction. Simply having another payment option is a positive program element in terms of customer service.

A number of cities are deciding to offer the pay-by-cell option. Washington, D.C. will complete a citywide implementation this summer; Portland, OR has just started a limited pilot in conjunction with its pay-and-display meters; and both SF*Park* and LA Express Park will include cell and smartphone payment options.

Benefits of Pay-by-Cell Phone:

1. Eliminates the need to carry cash or coins when parking on-street.
2. Warning text messages notify the motorist that their meter time is close to expiring and allows them to extend time remotely from anywhere.
3. Eliminates the need to stop at a meter to pay—simply identify your parking space number, dial the appropriate number, and proceed to your destination at the same time.
4. Receipts can be viewed and printed online from your established Pay-by-Cell Phone account.
5. Handheld devices notify enforcement officers exactly where and when a time will expire and allows them to proactively move in that direction.
6. Can potentially provide another means of customer communication

Disadvantages of Pay-by-Cell Phone:

1. Not everyone has a cell phone.
2. Has same space-numbering issue as a pay-by-space meters (maintenance, space requirements).
3. In a pay-and-display system such as Seattle's, the customer would enter their license plate number, which may be an irritation for users who do not remember their license plate number.
4. Costs associated with the need for an interface between Parking Enforcement citation device and pay-by-cell system since no receipt will be displayed. This will require live internet access. (There are also associated advantages for officers to have internet access and live data for other enforcement activities.)
5. Each motorist is required to set up an account with a credit card number linked to that account.
6. Fees (per transaction or monthly) may discourage some patrons. Up-front communication of these fees is important.
7. There is a need for fair amount of additional signage on each block. This is generally supplied by the vendor.

Wireless Sensors

When discussing on-street parking technology, the emergence of wireless sensor technology must be considered. As mentioned previously, some vendors now offer sensors integrated into single-space-credit card-capable meters; but most current applications are stand-alone sensors embedded in the street (or less frequently, the curbside) and linked to either multi-space pay-by-space meters or single-space credit card-capable meters.

The two leading firms offering in-ground sensors both provide robust back-end software that can take information from pay-by-space meters (and also pay-by-phone applications) to provide parking metrics data and analysis and also have significant "directed enforcement" applications with interfaces to most major handheld vendors using open systems.

It must be recognized, however, that this technology is still evolving and has not been fully proven in large-scale urban environments. Issues that are still being addressed include sensor accuracy, detection and transmission latency (i.e., delays in transmission), interference from other electrical sources, and the ability to handle all types of spaces (parallel, diagonal, and perpendicular) and all types of vehicles (motorcycles, oversized trucks, etc.).

At present, the greatest obstacle to wide adoption of sensors is cost. Sensors have both substantial up-front and ongoing per-space costs. And the cost/benefit has not been conclusively demonstrated in a large-scale application, although that dynamic may become clearer over the next few years.

Sensors currently cost between $125 and $225 per sensor depending on the features. Los Angeles is reportedly paying approximately $180 per sensor and a lease fee of $5 per sensor per month with a 3 year term. At least 1.5 sensors are assumed per space in a pay and display environment because spaces are not marked,

LA is also paying a $4.50 per month premium (over the wireless meter data fees) for data transmission. This cost depends on how much and how often you are transmitting data and what type of data you are gathering. It is also important to note that these costs do not include the cost of the "rate engine" to do the analysis.

As discussed above, the two largest tests of performance-based parking management currently underway (and largely funded by the Federal government) each feature multi-space meters using the pay-by-space methodology or a combination of pay-by-space and single-space credit card-capable meters in conjunction with in-ground sensors.

Parking Applications

Another major innovation is the increase in public and private sector applications intended to make more parking data available to the parking public and offer new services to parkers. SDOT has ventured into this work with the release of the Seattle Parking Map, and associated data on the City's data.seattle.gov. The Seattle Parking Map provides daily updated location and description of all parking signs, on-street parking rates, temporary no parking locations, as well as off-street parking facility locations, rates and hours of operation. The Map also displays real-time parking availability from the e-Park system.

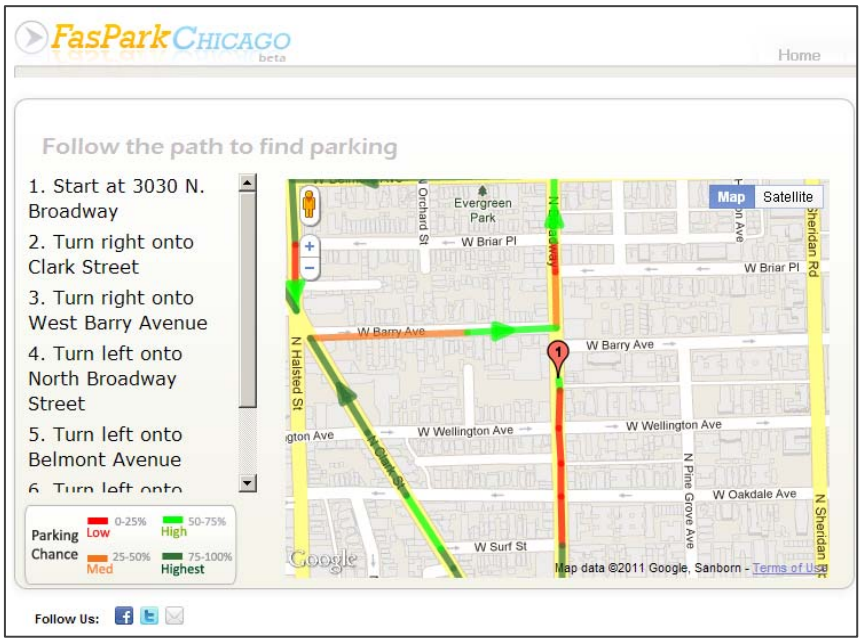
Made possible by the tremendous increase in smartphone usage (originally the iPhone and now Android-based phones) and more recently the iPad and similar devices, all of which incorporate GPS capability, these applications can gather information about a parker's whereabouts while also offering differing levels of information about the environment in which the vehicle is located or to which it is heading.

The earliest (and simplest) of these apps were intended to remind vehicle owners where they had parked and when their meter time or time limit would expire. The applications' basic functions were to help motorists avoid parking citations for unpaid meter violations or other regulations, such as street cleaning or rush-hour prohibitions. At least a dozen such applications are available for the iPhone and Android smart phones, including The Parking Meter, Parkbud, Parking Mate, G-Park, CarPark, Honk, and Parking Assistant.

Perhaps the most advanced of these applications is cgCraft's "Parking," which allows users to not only record information on when their meter will expire, but also map regulations and times in effect in set areas. After parking in a mapped street, a user receives warnings when a regulation is about to take effect. The graphic to the left presents a cgCraft Parking screen for entering regulation information.

Several vendors have built upon these tracking applications by adding an interactive component in which those who are parking in an area can notify other users of when they intend to leave. In theory, this allows users intending to visit an area to identify spaces that may be opening as they arrive. Google pioneered this type of application with Open Spot, which was quite limited. Perhaps the most sophisticated example of this application is ParkShark, a free iPhone and iPad application intended to support major cities (currently New York) by providing maps displaying off-street locations, the location of red-light cameras, and potentially available on-street parking based on user input. A typical ParkShark screen is presented to the right.

An application that tries to use trend data to provide predictive guidance on parking availablilty is FasPark, which is tailored to Chicago. FasPark is a recently developed web- and smartphone-based predictive application that offers information on on-street parking availability in Chicago. A user enters his current location and the system returns a screen with both a map and text instructions directing him or her to the nearest available blocks that should have available parking. The map is color coded and predicts the chance of finding parking in the area on a four-level scale from low to very high. A FasPark screen is presented below.



Of course, the most ideal parking application provides real-time data on parking availability to motorists and ultimately allows them to pay for parking using a smartphone. Several vendors are beginning to make more advanced applications available. These advanced applications provide more dynamic information on parking availability linked to online services.

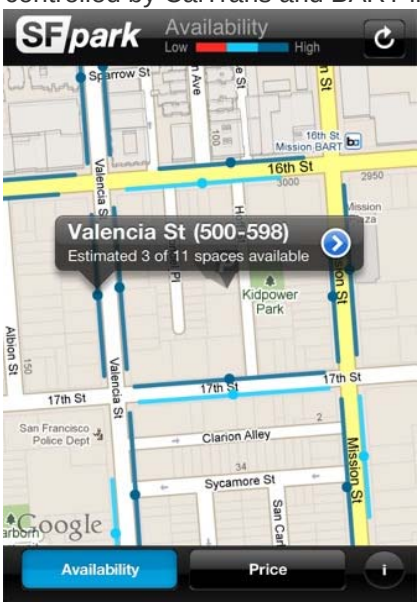
Parking In Motion (PIM) now has web and iPhone/Android applications and and claims to cover 300 American cities and 78 airports in the U.S. and Canada (covering 20,000 locations). They proactively work with off-street facility owners to gather information on capacities, rates, and historic occupancies. The PIM application tries to incorporate as much real-time information from garage owners as possible. They also offer the opportunity for patrons to use online coupons and make reservations online or via phone before arriving at participating garages. Presented above are two PIM screens.

Another example is ParkingCarma, which works by matching parking users needs with available spaces. Parking lots and other parking asset owners can sign up with ParkingCarma and share their parking space availability. ParkingCarma will then manage this information in a real-time database, constantly monitoring which spaces are in use and which ones are open.

Consumers can register with ParkingCarma by going online and entering their name and address and some information about their car. Once registered, users can then begin making reservations online. By

using their assigned PIN number, users will be able to reserve a parking space hourly, daily, or monthly via the internet or by using a phone or wireless device. ParkingCarma will reserve the closest available spot for them and provide detailed directions on how to find it. Users have the ability to modify or cancel their reservations, check their account balances online, and be billed through their method of choice including credit card or wireless phone bill.

At the heart of ParkingCarma is a sophisticated central database and intelligent matching logic. Using advanced algorithms and applied hardware advances, ParkingCarma optimizes parking solutions based on various parameters specified by parking asset managers. ParkingCarma continuously analyses usage data and can make market-pricing adjustments in real time. Transactions are compiled for billing purposes and statistical analysis, with the data output configurable for any specific need. The core dataset and engine interface with the web, telephony, and accounting functions through standard application programming interfaces. ParkingCarma is currently being implemented at lots/structures controlled by CalTrans and BART in the San Francisco area.



The current focus for such parking applications is the ability to harness real-time information about on-street parking availability and rates. These new applications are still in the early stages of development. Los Angeles, in conjunction with Streetline, its sensor vendor and IPS, its single-space credit card-capable meter vendor, has initiated a parking application called Parker, which combines payment and occupancy data to provide real-time availability information to web and smartphone users.

The latest version (Parker 2.0) is available for both Android and Apple smartphones. Coverage is still somewhat limited, covering on-street spaces and some off-street locations in the Hollywood and Studio City areas of LA. A Parker screen is shown to the right.

SF*park* offers a similar application for the eight areas of its pilot in which it has deployed sensors. These currently cover 7,000 metered spaces (25% of the city's inventory) as well as 12,500 spaces in 15 of 20 SFMTA garages. The graphic below shows an iPhone screen (an Android version is promised shortly).

One of the key questions for the industry going forward is the extent to which on-street data provided by intelligent meters and sensors will be made available to parking application vendors. Vendors currently earn fees by selling their applications at nominal rates and/or from advertising on their sites. Some, such as Parking In Motion, are perhaps being paid fees when users reserve parking at off-street lots. It is in the interests of cities and the vendors to have as much information publicly available as possible, but it is unclear to what extent cities (especially those implementing enhanced technology without major Federal support) will seek to recoup their capital cost by selling such information, and whether the customer base will pay enhanced fees for applications offering real-time data.

The following technologies are not directly applicable to the recommendations in the main report, but are rapidly progressing and may be beneficial to the City of Seattle in future endeavors.

Multi-Space Meters (MSM)

When upgrading meter inventories over the past decade, the majority of cities have adopted multi-space meter technology, whether they employ pay-and-display (P&D) or pay-by-space (PBS) methodologies. Most major meter manufacturers now support both approaches.

Multi-space meters offer a number of advantages:

1. Multi-space meters can accept a variety of payment forms in addition to coins including bills, credit cards, debit cards, dedicated stored value cards and pay-by-phone (although this last is more complicated and limited with pay-and-display).
2. Multi-space meters systems have been shown to increase parking revenue up 40% against single space/coin only meters, largely because when paying by credit card, parking patrons tend to buy the maximum time allowed.
3. Multi-space systems provide a less cluttered streetscape, with one or two meters per block being the norm.
4. Multi-space operations experience reduced meter maintenance and collections costs. With wireless communications, the meter can indicate when collection or maintenance is necessary, and allow remote access to control rates and days/hours in effect. Fewer collectors per thousand metered spaces are required because there are fewer coins to collect and multiple spaces are collected in one consolidated vault.
5. Revenue reconciliation is greatly improved. The meters can document all access to revenue vaults and the amount in the vault when removed, and the vaults remain secure while being removed and delivered to the counting facility.
6. If an individual meter is not operational, patrons can pay for parking at another multi-space meter on the same block face or across the street. The city does not lose revenue and turnover continues to be encouraged.

Although the general benefits of multi-space meters are rather compelling, each type has its advantages, disadvantages, and fervent adherents.

<u>Pay and Display (P&D)</u>

The Pay-and-Display system is currently deployed in Seattle and has the greatest portion of market share in the US, partly because it was the first model introduced. The motorist parks, then walks to a multi-space meter operating in Pay-and-Display mode. The motorist then pays for the desired duration of parking using coin, cash, credit or debit card, or smart card and receives a receipt for payment. The parking patron then returns to his/her vehicle and displays the receipt in the vehicle as instructed with the expiration time visible. The displayed receipt proves to the enforcement staff that the space has indeed been paid for through the printed expiration time.

Benefits of Pay-and-Display:

1. Pay-and-display is a relatively simple operation, from both the motorist and the maintenance point of view. There are no space numbers to assign and maintain. Patrons do not have to remember a space number when paying at the meter.

2. Since one is buying "time" not a "space", cities can offer what is referred to as "portability of time". For example, if you pay for 2 hours and come back to your car after 45 minutes, you can drive to another location and park, and the receipt would still be valid for the additional 75 minutes. Of course, "portability of time" can raise difficult operational issues as metered pricing becomes more complex with varying rates in different areas and/or at different times.
3. More cars can park in the same amount of on street parking area if specific space delineation is not required. This typically will increase revenue for the parking system. This will become more of a reality if the trend towards smaller vehicles continues.

Disadvantages of Pay-and-Display:

1. Motorists must return to the vehicle to display the printed receipt as proof of payment. This requirement is more problematic in certain environments with extremes in temperature, heat, snow and ice conditions, or extremes in topography.
2. While the use of electronic devices to issue citations is compatible in Pay-and-Display operations, visual inspection of each parked vehicle is required to determine if the vehicle is in violation(with the officer walking the beat). Thus it can be more labor intensive to patrol blocks with P&D MSM's than older electronic single space meters. In addition, newer approaches to enforcement such as "directed enforcement" (see below) are not practical with this technology.

3. Pay-by-Phone is only compatible with Pay-and-Display operations if the meter software/hardware can support communication between the pay-by-phone vendor and the meter so that a receipt can be printed once the phone payment has been made, or if data on paid plates is provided to officers separately.
4. With Pay-and-Display the motorist cannot add to the amount of time paid for parking without having to return to their vehicle after purchasing additional time at a nearby meter.
5. Vehicle sensors and related technologies do not interface well with Pay-and-Display meters. Since there are no assigned space numbers (or even defined spaces in most P&D environments) it is difficult to integrate occupancy and duration of stay data with meter payment data.

Pay-By-Space (PBS)

Pay-By-Space is a multi-space meter operational methodology that has grown in popularity over the past few years, especially where snow and ice are not a concern. The user interface is initially more complicated, but has definite advantages that cities often find worthwhile.

Some have referred to PBS meters as electronic honor boxes. The basic premise of the methodology is that the motorist parks in a marked space, notes the space number, and proceeds to the closest meter to purchase time at that space. In an on-street application, there are usually one or two machines per block face.

The motorist then operates the multi-space meter as directed by the manufactures instructions. Some of the newer meters have instructions right on their programmable digital displays, giving the motorists step-by-step instructions on how to pay for their parking. They may also

offer various options at the time of purchase such as the ability use coupons or special payment cards or codes. The motorist then takes his receipt and continues to his destination (without having to return to his vehicle to display the receipt).

Given that most Pay-By-Space machines are networked, the motorist can actually add more time for their space number at any meter (not just the one on the block face where they parked) so long as he knows his space number.

One significant drawback to a Pay-By-Space system is the need to number each space. Some argue that this requirement defeats the use of multi-space meters to "declutter" the streetscape. In some environments with warmer climates space numbering can be accomplished by painting space numbers on the pavement or curbs. However, in northern cities with significant snow accumulation, pole mounted signs are a requirement.

Benefits of Pay-By-Space

1. The motorist does not need to return to his vehicle to display a receipt as proof of payment.
2. Unlike Pay and Display, there is no "portability of time" and when a vehicle leaves a space, the new occupant does not know whether any time remains and will usually buy what is, in effect, the same block of time. This can enhance revenues but can also be viewed as anti-customer.
3. In the optimum configuration, enforcement can utilize handheld devices that display the payment status of each legal space on the block face. Officers can then visit only the occupied/unpaid spaces rather than inspect every vehicle on the block.
4. Used in conjunction with in-street space sensors, Pay-by-Space meters can support enforcement of meter time limits by blocking purchase of additional time when the occupying vehicle has exceeded the time limit. As an alternative, based on program policy, some vendors' meters can also charge a higher fee for time extensions when the sensor indicates that the original time limit has been /would be exceeded.
5. Used in conjunction with in-street space sensors, occupancy data can be generated for statistical analysis projects for a given area. This data can be useful in accurately determining turnover, duration of stay and the number of vehicles exceeding the time limit. The data can also aid in determining with greater accuracy the amount of revenue collected for the space, and projecting potential revenue from changes in rates or hours.
6. Pay-By-Space systems are more amenable to "pay-by-cell phone" as an option. This option works by the motorist calling a designated phone number or using a smart phone application, which requires a first time account setup. Once the account is activated and tied to a credit card, the motorist pays for their space via his phone. Use of this option is especially attractive to corporate vehicle fleets given the availability of consolidated, monthly statements. Pay-by-cell also allows patrons to receive warnings when their time is about to expire, and if permitted, to add more time to their parking session. Cities are increasingly moving toward this payment option.

Disadvantages of Pay-By-Space

1. Motorists must remember their space number and enter it correctly at the meter; sometimes they must return to their vehicle to remind themselves of the space number. IF entered incorrectly, the patron may be ticketed even though he has paid.
2. As discussed above, Pay-by Space does not provide "portability of time;" many customers and elected officials consider this a negative.

3. Space marking requirements vary based on a City's weather, and in all cases must be well thought out, carefully installed and properly maintained. The major difficulty involves those systems in cold weather where the pavement markings or numbered sign posts will be covered by snow and ice. Confusing space signage, as in the photo on the right, can also created significant problems.

Recent Trends in MSM's

Multi-space meter technology is extremely dynamic at present, with new capabilities and functions being added to major vendors' product lines on a steady basis. Some of the major trends include:

1. Greater Flexibility: Meter manufacturers are responding to the desire for more sophisticated management of on-street spaces by delivering meters which support multiple rate and time-in-effect structures, special event parking, etc.
2. Support for Additional Purposes: The most recent meters demonstrated for municipal parking managers support non-parking functions such as the sale of transit fare tickets. Some manufacturers are also modifying their MSM's to link to curbside charging stations so owners of electric vehicles could pay for a charge at the meter.
3. Greater integration: This is perhaps the most important change. Meter manufacturers have been moving toward open systems using non-proprietary operating systems and publishing application programming interfaces (API's) which allow other vendors and types of equipment to communicate with their meters, while also allowing their meters to work in conjunction with other meters, and to communicate with a variety of handhelds, payment services, etc. One of the major pay-by-phone vendors recently indicated that his firm could build an interface to a new meter make/model in approximately two weeks. Manufacturers are also building more robust back-end software that can integrate and manage information from other equipment/service providers. Austin, TX for example, recently implemented a mix of MSM and SS-CCC meters, with all being monitored and controlled by the MSM vendors back-end software. Such integration becomes more critical given the recent emphasis on the "management" of parking management.

Credit Card Capable Single Space Meters

In the last several years, SSCCC meters have become a viable operational and financial alternative to multi-space meters that provides many of the primary benefits of MSMs (improved customer payment options, reduced coin collections, tighter revenue tracking and reconciliation, self-reporting of outages, and back-end software support for functions such as rate/time changes.) Currently, only a few vendors provide the option to retrofit current single space meter housing with an electronic mechanism that can perform on-line credit card transactions as well as continued acceptance of coin and cell phone payments. SSCCC meters need to meet the Payment Card Industry (PCI) security standards. Credit card transactions are encrypted and authorized, and only the last four digits of each credit card number are stored within the meters for security purposes.

As with multi-space meters, installations have demonstrated significant potential to increase the average revenue per meter by allowing for payment by credit card.

Also noteworthy is the fact that at least two major SSCCC meter vendors are now demonstrating such meters with incorporated space sensors (in either the meter itself or added to the meter pole), which could make sensor technology much more cost effective going forward.

Benefits of Credit Card Capable Single Space Meters:

1. Because these new meters look like the conventional single space meters that everyone knows, there is little to no learning curve required and public acceptance is high.
2. From a convenience perspective, the meter is located immediately at the head of each stall with no need to walk to a multi-space meter (and potentially back to the car to display a receipt).
3. The meters provide multiple customer payment options including both coins and electronic payment methods (i.e., credit cards, smart cards, etc.).
4. Meter rates and schedules can be automatically and electronically updated to new meter heads using GIS and RFID technologies. Similarly, centralized meter databases can be automatically updated as new mechanisms are deployed.
5. SSCCC meters are increasingly compatible via back-end software in integrated environments with multi-space meters, so therefore potentially attractive for limited, specialized locations where multi-space meters are not cost effective.

Disadvantages of Credit Card Capable Single Space Meters:

1. Potentially higher up-front cost for credit card capable meters than for conventional meters, but in some cases competitive with per-space costs of multi-space meters.
2. Ongoing costs for wireless services and management system access can be higher since each space requires a communications device.
3. May be more vulnerable to skimming if physical access is obtained to the credit card reader's circuitry and the reader is tapped.

Pay-by-License Plate

Pay-by-license plate is an operating methodology that has been brought from Europe to the U.S. and Canada. Rather than using space numbers, this operating method requires motorists to pay for parking by entering their license plate number (as well as parking zone, if applicable) into a multi-space meter or cell phone payment system.

While this works well in Europe, this methodology has been slower to take hold in the U.S., due to U.S. license plate numbers. Europe uses a standard license plate with straight-line numbers assigned by country. Europe does not allow vanity plates or special characters. In the U.S. the numbering systems varies by state with special plates, vanity plates, special characters and other items that complicate the entering of the "number." The success of the system will be contingent upon motorists remembering their own specific license numbers, and the ability of the system to accept specialized information.

Below are the fundamental steps in the pay-by-license plate/zone process:

1. Vehicle parks in a zoned area
    - Each metered space is located within a zone, with signage indicating zone numbering
    - Motorist uses multi-space meter or Pay-by-Phone option for payment
    - Motorist enters zone and license plate information
    - Motorist pays applicable parking rate
2. License plate and payment information stored in a real-time database
    - License Plate Recognition (LPR) equipped vehicle patrols zones
    - LPR Patrol takes digitized picture of parked vehicle's license plate
3. License Plate Recognition Patrol Communicates with system database
    - Database informs LPR Patrol of vehicle's payment status
    - If expired, a violation with photo, is processed and mailed to the vehicle owner
    - LPR Patrol continues route enforcement

Calgary is a great example of a successful implementation of this operating method in North America. In Calgary, the pay-by-license plate process utilizes both multi-space meters and pay-by-cell phone technology. For parking enforcement, the system incorporates a mobile License Plate Recognition (LPR) system. The LPR system allows the City to gather parking utilization data by date, time and zone. This data allows the City to better analyze parking usage, needs and enforcement patterns. Additionally, the City is able to effectively adjust parking rates to encourage short-term on-street parking while encouraging long-term parkers to utilize less expensive off-street parking facilities.

Portland, OR has recently announced plans to pilot pay-by-plate in conjunction with its existing base of P&D multi-space meters. Patrons in the pilot area will be able to set up an account with the pay-by-cell vendor and then as they park, buy parking time for a service charge of $.35 per transaction. The service fee and the price of parking will be billed to their credit card accounts. Parking enforcement staff will get a listing of paid plates sent to their handhelds, which they can use as a supplement to checking for paid receipts in vehicles which purchase time at the MSM.

<u>Benefits of Pay-by-License Plate:</u>

1. Pay-by-License Plate eliminates the need for numbering spaces
2. Pay-by-License Plate provides the flexibility of taking your time with you to another parking space, similar to that of Pay-and-Display.
3. Reduces human error in enforcement and allows enforcement officers to patrol larger areas in less time (but not if used in a mixed environment such as that being piloted in Portland).
4. Applicable with Pay-by-Phone integration for additional time and warnings for time expiration.
5. Meter-based variants allow versatility in payment options and locations. Pay-by-License Plate allows the motorist to pay at any location.

<u>Disadvantages of Pay-by-License Plate:</u>

1. Many motorists don't have their license plate memorized.

2. Enforcement can be complicated, requiring either LPR equipment and software or wireless communication of paid plate information to handhelds with all plates screened.
3. Possible public perception of the license plate recording as a violation of privacy.

Meter-less Pay-by-License Plate

This methodology is both a variant on the Pay-by-License Plate approach and builds on Pay-by-Cell Phone. It has not been fully proven in a major municipal application but may become feasible and popular in the future. In this approach, no meters or space markings are needed. Those wishing to park must establish an account, and then when they want to park they use a smart-phone application or call a service center number and buy time. Officers use handhelds or LPR vehicles which have real-time links to database of paid plates. Several impediments must be overcome to this technology to take hold: 1) for performance-based parking, the program would need to establish and sign zones with the varying rate structures or payment would have to be made via smart phones with GPS capabilities; 2) effective enforcement will depend on either LPR-equipped handhelds or vehicles. The former have not proven dependable and the latter are not without some operational problems; 3) other means of payment would have to be available to those without accounts. Washington D.C. is including a limited test of this approach in its current performance-based pilot.

In-Car Meters

The in-car meter allows the parking operator to sell a small metering device, which remains in the car, to a motorist. The motorist pre-pays for parking by adding time to this device, usually by taking it into a location that will “add time” to the system. In another version of in-car meters, time is added to the meter account via cell phone.

When the motorist parks, the motorist activates the in-car meter device, which usually has a digital readout indicating that the motorist has “paid” for the parking they’re using and decrements time as it elapses.

These devices have not caught on in large numbers throughout the U.S., but still remain a potential alternative for those parking systems with a large regular or repeating customer base that would benefit from this type of device.

Benefits of In-Car Metering:

1. In-car meters can be programmed for multiple zones with different rates for each zone.
2. They can be used with other systems or as a new “stand alone” system.
3. Controlled parking areas can be increased by adding in-car meters only in fringe areas with minimal capital investment.
4. They are very convenient for users - no need to carry coins or tokens, or to interface with parking revenue control equipment.
5. The system is fair - charging only for the actual time parked.
6. The parking system receives payment “up front”.

7. Motorists receive a receipt whenever parking time is purchased.

Disadvantages of In-Car Metering:

1. If value is stored in the device and the device is lost or stolen, the value is lost.
2. Customers must purchase meters (and sometimes time) in advance.
3. Limited locations where value can be added if cannot add time via cell phone.

Appendix D

Parking Pricing Strategies and Technology Feasibility
Current Parking System Capabilities Matrix

Appendix D – Parking Pricing Strategies and Technology Feasibility
Current Parking System Capabilities Matrix

Parking Pricing Strategies and the Feasibility of Existing Parkeon Technology

Seattle has an existing installed base of multi-space Parkeon pay stations. There are approximately 1,500 Stelio Pay and Display, 700 Strada Pay and Display, 17 Strada Pay by Space and 10 CityPal machines (installation in progress). As Seattle considers a variety of performance-based parking pricing strategies, it would be helpful to know what Seattle's existing installed base can handle in terms of more dynamic parking pricing and conditions. The pricing strategies described below are examples of performance-based pricing that are being considered. Some of the strategies could theoretically be combined. For each, it would be helpful to know if the associated pay station type can handle each scenario, whether changes to the conditions described can be easily altered (i.e., wirelessly "pushed" with a degree of confidence in stability or whether hard-coded programming is necessary or recommended). For each strategy and technology, the issue of system complexity and maintenance should also be considered and discussed if relevant. The information about the basic feasibility of each technology for each strategy is important, but it would be helpful to expand on the potential benefits and risks of each where possible.

<table>
<tr><th>Strategy and Description</th><th>Stelio Pay and Display</th><th>Strada Pay and Display</th><th>Strada Pay by Space</th><th>CityPal</th></tr>
<tr><td rowspan="3">Rate-Setting by Time of Day – Multiple tariffs throughout the day: e.g., a morning rate, a mid-day rate, and afternoon rate, and an evening rate. Speak to ability to pro-rate purchases accordingly across time zones. Ability to have durations of time zones within the day vary.</td><td colspan="4">The standard Parkeon tariff engine allows different rate periods ("slots") to be programmed and linked to the time of purchase. Slot durations are variable.
Parking fee calculations can either be made through different tariff periods or blocked and pro-rated to the end of a period.</td></tr>
<tr><td>Parking limits are managed by maximum payment amount. Thus a constant maximum time limit cannot be maintained across two slots where rate varies.</td><td colspan="3">Parking limits can be managed by maximum payment amount OR maximum stay time.</td></tr>
<tr><td>Credit card increments (blue button) are by amount only.</td><td colspan="3">Credit card increments may be by amount only (e.g. 25 cent increments) or by time (e.g. 15 minute increments).</td></tr>
</table>

Strategy and Description	Stelio Pay and Display	Strada Pay and Display	Strada Pay by Space	CityPal
	For changes, hard-coded programming is recommended and requires EPROM change. Each meter must be visited individually to initiate the change. Wireless updates can be performed but there is risk of reversion to the hard-coded rates on major machine intervention or reset.	For changes, hard-coded programming is recommended using the standard loader. Each meter must be visited individually to initiate the change. Wireless updates can be performed but there is risk of reversion to the hard-coded rates on major machine intervention or reset.	Pushing the tariff wirelessly is normal practice (and coordinated with server side updates to ensure corresponding updates to integrated mobile phone payment rates….below). No need to visit each meter individually.	Pushing the tariff wirelessly is normal practice. No need to visit each meter individually.
	New rate downloads can generally only be made at night because the machines are reporting their daily transactions at night. The rate downloads are handled at the same time. This should be followed up with hard-coded programming as described above to avoid a reversion during a major intervention or reset.		New rate downloads can be initiated on demand.	
	Two-line display only. Tariff information is by rate card.	5” Monochrome graphical display. Limited ability to show on-screen tariffs. Tariff information by rate card in most cases.		7” color touch screen graphical display. No need to have tariff cards to explain rates. **This eliminates the need to change rate cards when a parking rate is adjusted.**
<u>Evening Flat Rate</u> – Ability to have an hourly rate or rates until 6 p.m., combined with a single flat-rate after 6 p.m.	Supported by the standard tariff engine. Programming is accomplished on each platform as described above.			
<u>Day of Week Rates</u> – Vary pricing by day of week to reflect demand: e.g., one hourly rate for Monday – Thursday, a different hourly rate for Fridays and Saturdays, and different hourly rate for Sundays.				

Strategy and Description	Stelio Pay and Display	Strada Pay and Display	Strada Pay by Space	CityPal
First Hour Free – Ability to "credit" the first hour of purchase: e.g., with a three-hour time-limit, ability to purchase three hours of time to display while only paying for two, or to purchase two hours of time displayed while only paying for one.	Supported but generally only used to provide a 2 to 5 minute "grace period". Not recommended for long free periods because tickets need to be issued without taking payment which leads to misuse.		Supported, but not practical if sensors are not used. Without sensors, meter has no way of knowing if a customer is the same one who got the first hour free or a new customer. Maximum enforcement required (e.g. chalking tires or LPR).	Supported for pay by space but not practical if sensors are not used. Without sensors, meter has no way of knowing if a customer is the same one who got the first hour free or a new customer. Enforcement required (e.g. chalking tires or LPR). Not recommended for pay and display because receipts are issued without taking payment which can lead to misuse.
Progressive Rates – Charging an increasingly higher rate for longer-duration stays: e.g., first two hours are $2/hour, but each successive hour is incrementally $.50/hour more.	Supported by the standard tariff engine. Programming is accomplished on each platform as described above.			
Event-Based Rates – On select days (and potentially only for select hours of those days), charge a higher hourly or flat rate to reflect event-based demand: e.g., on event day, before 4 p.m., $2/hour; after 4 p.m., $5/hour with longer time limits or a $15 flat rate.	Support by download of a different rate for action specifically on that day. Only one event tariff can be downloaded in advance. Limitation of the Stelio tariff engine (can only store one tariff in advance).	Supported by download of a different rate for action specifically on that day. Many event tariffs can be downloaded in advance.		
Seasonal Rates – For areas with seasonal demand swings, higher rates during high-demand months; e.g., $3/hour April – September, $1/hour October – March.	Supported by reprogramming or download pursuant to programming methods described above.	Seasonal tariffs supported.		

Strategy and Description	Stelio Pay and Display	Strada Pay and Display	Strada Pay by Space	CityPal
Vary Time Limits by Day of Week – Longer time limits for the weekend: e.g., 2-hour time limits Monday through Friday during paid parking hours; 4-hour time limits on Saturdays.	Supported by the standard tariff engine. Programming is accomplished on each platform as described above.			
Frequent Rate Changes – Change parking rates or other conditions on a quarterly basis based on demand.	Supported by reprogramming or download. Only one tariff change can be downloaded in advance.	Supported. Many tariffs changes can be downloaded in advance.		
Pay by Cell – Ability of existing system to integrate with payment by cell phone. This would include integrated reporting at the block face level on transactions and paid occupancy, as well as integration for the customer experience.	Integration supported but no block face reporting available.		Integration supported. Data reported by space or group of spaces.	Integration supported but no block face reporting available in pay and display mode.
Rate-Setting By Smaller Geographies – Seattle currently has 23 separate paid parking areas with their own rates. This example presumes different rates at a more granular level; multiple areas within each neighborhood, or even rate-setting down to the blockface level.	There is no technical issue with this but there are obviously some logistical and public education issues to manage the more separate tariffs are deployed on street. In pay-and-display mode, receipt formats must also be encoded to clearly indicate the tariff zone in which they are valid.			
Integration with In-Street Sensors – Ability of the technology to integrate with an in-street sensor information system to measure demand and influence rate/pricing decisions.	Integration is supported in back-office management system but primarily in pay-by-space mode. Sensor data integration is problematic when spaces are not marked with space-specific numbering.			

Strategy and Description	Stelio Pay and Display	Strada Pay and Display	Strada Pay by Space	CityPal
Multiple Simultaneous Rates – Ability of technology to charge one class of users one rate (e.g., general parking public) and another class of users a separate rate (e.g., commercial vehicles or motorcycles.)	Supported via "user" button (for motorist to select appropriate tariff).		Not supported unless different classes of users have their own unique allocated spaces.	Supported.
License Plate Recognition – Ability of technology to integrate with license plate technology to promote more seamless, efficient enforcement.	No license plate entry	License plate entry possible with machine upgrade, allowing either "pay-by-plate" or "pay-and-display" with plate printed on ticket.	No license plate entry (Space number entry required)	License plate entry possible without hardware upgrade, allowing either "pay-by-plate" or "pay-and-display" with plate printed on ticket.
Real-Time Data – Ability of technology to provide real-time data relative to occupancy or paid transaction to enable potential integration with mobile apps.	Real time transaction data not available.	Real time transaction data available with software and data plan upgrade.		Real time transaction data standard.