Putting Theory Into Practice

Pilot project summary and lessons learned
Acknowledgements

Thank you

SFMTA

Launching the SFpark pilot project depended on the dedication of a multidisciplinary team within the San Francisco Municipal Transportation Agency (SFMTA).

Project partners

The SFMTA has worked closely with various partners to deliver the SFpark pilot project. Below is a summary of these companies, organizations, and individuals.

Organizational partners

The SFpark projects would not have been possible without the generous financial support of the United States Department of Transportation (USDOT) and Federal Highway Administration as part of the Urban Partnership Program.

SFpark academic advisory team

The following people formed the academic advisory team for the project that offered early guidance and support for the design of this demonstration and how it could offer the most valuable data possible for evaluation.

- Donald Shoup, University of California, Los Angeles
- Robert Hampshire, Carnegie Mellon University
- Adam Millard-Ball, Stanford University
- Rachel Weinberger, University of Pennsylvania

The academic work and writing of Dr. Shoup requires special acknowledgement as it provided the intellectual foundations of the approach to parking management used in the SFpark project.

Program partners

The following companies were major partners with the SFpark project.

- Serco Inc. Serco acted as the prime contractor that led procurements and administered subcontracts.
- Oracle. The SFpark project utilized Oracle data warehouse and business intelligence software and a development team from Oracle Consulting Services.
- Affiliated Computer Solutions (ACS). ACS was a subcontractor to Serco for parking sensors and also worked, under an existing SFMTA contract, on updating the handheld devices used by Parking Control Officers.
- StreetSmart Technology, LLC. StreetSmart provided parking sensors in partnership with ACS.
- IPS Group, Inc. IPS provided single-space parking meters.
- Duncan Solutions. Duncan provided multi-space parking meters.
- Words Pictures Ideas. WPI, with vs.Goliath as a partner, provided communications strategy, marketing, and design.

Program contributors

The following companies made important contributions to the SFpark pilot project.

- DataPark. Parking garage revenue control system programming and price changes
- Ewald & Wasserman Research Consultants. Data collection
- NelsonNygaard Consulting Associates. Data collection, evaluation, and policy analysis
- OpenGeo. Mapping technical support and development
- Phoenix Electric Company. Roadway sensors installation and maintenance
- Pictoform. Parking garage signage
- Sensys Networks. Roadway sensors
- Venus. Service provider for payment by cell phone
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1. INTRODUCTION & OVERVIEW

Many cities have expressed an interest in learning more about SFpark. This book is intended to support other cities as they consider similar initiatives.
Introduction & overview

A short overview of the project

This chapter provides an overview of the context, goals, outcomes, and schedule of the SFpark pilot project as well as its relevance and lessons for other cities.

Goal of the book

As a federally-funded demonstration, the San Francisco Municipal Transportation Agency (SFMTA) purposefully and openly shares information about implementing the SFpark pilot project that other cities might find useful as they consider how to manage parking. This book summarizes the SFpark pilot project and documents lessons learned from project planning, implementation, operation, and evaluation. It was written in late spring 2014 after the pilot and its evaluation report were completed.

This book is an updated version of what the SFMTA wrote in August 2011 soon after the first demand-responsive rate adjustment. It is complemented by a detailed evaluation of the pilot project as well as a technical “how to” manual that summarizes the technical and information management aspects of the project to make it easier for other cities to understand and improve upon what has happened in San Francisco.

Download the PDF of this book at: SFpark.org/docs_pilotsummary
Download a summary of the evaluation findings at: SFpark.org/docs_evalsummary
Download the full evaluation report at: SFpark.org/docs_pilotevaluation
Download the technical “how to” at: SFpark.org/docs_techmanual

Project context

The SFpark pilot project was implemented within San Francisco’s unique context. The SFMTA is the agency in San Francisco that plans, manages, and operates the city’s transportation system, including local public transit (Muni), walking, biking, roads, on-street parking, parking enforcement, and a significant portion of the city’s off-street parking supply (see SFMTA.com to learn more).

In San Francisco, the SFMTA sets parking rates for on-street meters and for the 19 garages and 19 lots managed by the SFMTA. In November 2008, the SFMTA Board of Directors approved the legislation that enabled the SFpark pilot project. It defined the SFpark pilot areas and policies, and empowered the SFMTA Director of Transportation to set rates—within ranges determined by the SFMTA Board—for on-street metered spaces and SFMTA-managed lots and garages in SFpark pilot areas.

For the SFpark pilot project, the SFMTA has also worked closely with the Port of San Francisco, which has jurisdiction—through state legislation—for the over 1,200 metered on-street spaces along the city’s waterfront. The Port has contracted the SFMTA to operate, maintain, and enforce its parking operation and adopted the SFpark enabling legislative language to define its parking management policies.

Prior to SFpark, the San Francisco Board of Supervisors managed paid parking much like it is managed in most other North American cities. Parking rates and fines were used to achieve turnover goals through short time limits as well as, often, to increase revenues to balance budgets. Rate setting was not tied to transportation policy goals, and rates at on-street meters were the same all day, every day, regardless of demand. Meter rates were set lower than the rates at municipal garages, giving drivers financial incentive to circle to find on-street parking.

The historical approach to parking management that emphasizes flat meter rates and short time limits to achieve turnover has been reasonably effective but is not convenient for drivers, nor does it explicitly manage towards creating parking availability and thereby achieving broader goals for the city or its transportation system. Low parking availability is inconvenient for drivers but also causes broader problems. For example, when parking is hard to find people either double-park or circle the block looking for parking. Circling drivers are distracted drivers who make lots of right and left turns trying to find a place to park, causing safety issues for other drivers, cyclists, and pedestrians. Circling also wastes time and fuel.

Consequently, everyone experiences the burden of unnecessary greenhouse gas emissions and roads that are less safe and more congested. Store owners often complain that it can be difficult for their driving customers to find a place to park. Public transit sometimes must navigate its way around double-parked cars or drivers waiting to make right or left turns, slowing transit and making it less reliable.

Project goals and outcomes

The primary goal of SFpark was to make it easy to find a parking space. In other words, SFpark aimed to manage demand for existing parking supply towards availability targets so that people, when they choose to drive, can circle to find parking or double-park. To the extent the right level of parking availability is maintained, everyone benefits.
The SFMTA’s evaluation of SFpark, which is detailed in Chapter 4, found that SFpark delivered many of the benefits that were expected. The principle goals and outcomes of SFpark include:

- **Demand-responsive pricing to meet occupancy goals.** SFpark used gradual and periodic (i.e., about every eight weeks) demand-responsive rate adjustments to find the lowest rate possible to achieve availability targets. SFpark increased rates when parking was hard to find and lowered them when demand was low. Even in the context of a growing economy and population, the evaluation shows that parking availability improved dramatically in SFpark pilot areas, significantly outperforming control areas. The amount of time that we achieved the target parking occupancy increased by 31 percent in pilot areas, compared to a 6 percent increase in control areas. Even more significantly, the amount of time that blocks were too full to find parking decreased by 16 percent in pilot areas when it increased by 54 percent in control areas.

- **Meeting occupancy goals to make it easier to find parking.** When there are always a few spaces available, drivers have to spend less time circling for parking. In SFpark pilot areas, the amount of time that it took for most people to find a space decreased by 41 percent, compared to a 13 percent decrease in control areas. SFpark also shortened the distance drivers had to travel before finding a spot.

- **Easier payment methods.** New parking meters accept payment by coin, credit card, the SFMTA parking card, and phone. This likelihood for participants in an intercept survey to report that it was somewhat or very easy to pay for parking increased in pilot areas by 75 percent, or twice as much as in control areas where meters were not upgraded.

- **Lower rates.** In addition to making it easier to pay, SFpark also lowered rates. Over the course of the SFpark pilot project evaluation period, the SFMTA lowered the average hourly rate at meters by 11 cents from $2.69 to $2.58 and average hourly rates at SFpark garages by 42 cents from $3.45 to $3.03.

- **Longer time limits.** Time limits in SFpark pilot areas were extended to four hours and in some areas eliminated altogether. This change emphasized using smart rates rather than inconvenient time limits as the primary tool for creating parking availability, which is the ultimate goal of turnover.

- ** Fewer parking tickets.** By making it easy to pay and extending parking time limits, it is easy for drivers to avoid parking tickets. In SFpark areas, the number of parking-meter related citations issued decreased by 25 percent compared to a 12 percent decrease in control areas.

- **Better parking information.** SFpark helped drivers find spaces with a combination of real-time and static information. Parking wayfinding signage directs drivers to lots and garages; variable message signs and show which garages have availability; mobile web apps and the region’s 511 system showed on- and off-street parking availability; and an open data feed enabled others to display the data as well.

- **Reduced congestion and improve traffic flow.** More parking availability means that drivers spend less time circling to find parking, which implies less congestion and greenhouse gas emissions and better quality of life. In both pilot and control areas, where parking availability improved, traffic volume decreased by approximately 8 percent, compared to a 4.5 percent increase in areas where parking availability worsened. And while overall traffic speed decreased, it decreased only by 3 percent in areas with improved parking availability, compared to a decrease of 6 percent in areas with worsened parking availability.

- **Reduced illegal parking.** More parking availability means that fewer drivers should be tempted to double-park or park illegally in bus zones, on sidewalks, or in front of fire hydrants or driveways. The evaluation showed that where parking availability improved, double parking decreased. Instances of double-parked vehicles increased as parking occupancy rates increased and began to spike around 80 percent occupancy. Double parking decreased in pilot areas by 22 percent, compared to a 5 percent decrease in control areas.

- **Improved 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. The SFMTA assumes that reducing circling by distracted drivers looking for parking helps to reduce collisions with pedestrians, cyclists, and other cars.

- **Better air quality.** Approximately half of San Francisco’s greenhouse gas emissions are transportation-related. Less congestion and circling, as well as helping Muni to become more viable for more trips, reduces greenhouse gas emissions and other pollutants. The evaluation showed that greenhouse gas emissions decreased. Drivers generated 7 metric tons of greenhouse gasses per day in pilot areas and 8 metric tons in control areas. This dropped by 30 percent by 2013, compared to a decrease of 6 percent in control areas.

- **Increased San Francisco’s economic vitality and competitiveness.** SFpark significantly improved parking availability in pilot areas, which improved customer access to commercial districts. SFpark also significantly improved the utilization of our garages, helping to return them to their original purpose—to make it easy to find parking for short-term trips and support economic vitality rather than as places for commuters to park. While available data does not allow us to confirm a causal relationship, the SFMTA assumes that improving parking availability improves customer access to commercial districts and therefore supports economic vitality.

- **Increasing funding for transit.** Though raising revenue was not a goal of the project, between meter, garage, citation, and parking tax revenue, SFpark appears to have caused a net increase of $1.9M in annual parking-related revenue. By City Charter, this additional revenue returns to the SFMTA to help pay to operate public transit.
Scope

- 7 pilot areas with new policies, technology, and significant data collection
- 2 control areas with no new policies or technology but significant data collection
- 6,000 metered spaces, or 25 percent of the city's total
- 12,250 off-street spaces, or 75 percent of off-street spaces managed by the SFMTA

Relevance for other cities

Cities around the world are interested in the common and urgent goals of reducing traffic congestion and transportation-related greenhouse gas emissions.

SFpark is a demonstration of a parking-based approach to congestion management. Parking availability and price are two of the most important factors when people choose whether or not to make a trip by car. The combination of time-of-day, demand-responsive pricing and off-peak discounts at garages was intended to reduce circling and double-parking, and to influence when and how people choose to travel.

SFpark is relevant for other cities because the SFpark approach is replicable. Every major city already has parking management infrastructure (e.g., parking meters and garages), and people are accustomed to paying for parking. Parking-based strategies complement other congestion management strategies, and they are relatively low cost, do not present privacy issues, and require only local approvals in most cases (rather than state approvals, which can be the case for approaches such as congestion pricing).

Lessons learned

The following observations and overall lessons learned were gathered during pilot project planning, implementation, and evaluation.

Project planning

- Scope of work. It is easy to underestimate the scope, magnitude, and technological sophistication necessary to offer real-time parking data and provide demand-responsive pricing.
- Executive leadership. Many challenges accompanied planning and implementing a ground-breaking project with complex technology, significant policy changes, and a large amount of discovery and uncertainty. The support of a dedicated executive at the agency was critical, as was having appropriate financial resources.
- Understanding the parking supply. For reasons explained in Chapter 4, understanding the existing parking supply was a critical first step in the planning, implementation, and evaluation of SFpark.
- Strong and coherent intellectual foundations. This parking management approach was based on the pioneering academic work of Professor Donald Shoup from UCLA. The clarity and strength of those foundations made it easier to develop policies, goals, and tools that were easily communicated and understood.
- Striking the right balance between complexity and simplicity. We have had to balance the potential complexity of managing parking effectively with the need to have something simple enough to be communicated clearly and quickly to customers. We had to strike a similar technological balance between what is desirable and what is feasible.
- Emphasizing data collection and project evaluation. The SMFTA committed to stakeholders that we would gather the data that would allow a rigorous evaluation of the project. That improved the project's credibility.
Institucional
• SFMTA’s role. The fact that the SFMTA manages on-street parking, municipal parking garages and lots, and parking enforcement allowed the SFMTA to focus more on project delivery instead of interagency coordination and communication. In some cities, various parking functions are managed by separate agencies, which may pose significant challenges.
• Internal consensus and cultural change. Even with the SFMTA’s advantageous organizational structure, building internal consensus and cooperation for SFpark’s significant policy, organizational, and technological changes required significant time and effort.

The SFMTA Meter Shop was critical. SFpark was only possible because of the Meter Shop’s strong support of the program and previous accomplishments. One foundation for the SFpark pilot project was the Meter Shop’s existing meter data and configuration management system. Without it, the SFpark project team likely would have had to undertake that separate (and sizeable) development effort. The existing system also meant that the Meter Shop was already accustomed to using information systems to manage meters and could advise the SFpark development team.

Communications
• Parking management as powerful tool. With the SFpark pilot project, the SFMTA has shifted towards recognizing parking management as a powerful tool for achieving transportation goals. Being able to communicate that promise with our customers and stakeholders, and then following through by lowering parking rates where merited, was important. These actions help to establish more trust and credibility in SFMTA parking management. Many people were skeptical of the SFMTA’s goals for parking management and feared that SFpark was simply a way to raise parking rates.
• Destination of revenue. In San Francisco, revenue from parking meters, citations, and garages is returned to the SFMTA to support transit services. It was important to have a clear explanation of how parking revenue from SFpark (or SFMTA parking management) is used, and relating parking management revenues to funding transit and the overall transportation system was typically well-received.
• Effective communications. Having a skilled communications and design team that was passionate about the project was part of the success in the project.
• Conducting extensive outreach. Outreach, including hundreds of one-on-one meetings with community leaders from the start of the project, was essential to the project’s reception. Through this outreach, key leaders in the community came to understand the project and were then able to effectively advocate for SFpark to their constituencies. Project outreach to customers, stakeholders, and within the SFMTA required a large amount of time and effort.
• Transparency. It was helpful to be open and clear about SFpark’s goals, policies, and methods. For instance, when prices are adjusted, both the rules and the data used to make decisions to raise rates, lower them, or keep them the same were all shared online.

Contracting and administration
• Procurement approach. It was important to choose a flexible contracting and procurement approach so that we could more quickly in an unpredictable environment.
• Uncertainty and discovery. Because of that high degree of uncertainty and immaturity in the field, a significant amount of discovery was required for the development of the back-end SFpark system. With the continuous adjustments necessary for the project, the collaborative and interactive Agile methodology was more appropriate than the traditional process-based approach to project management.
• Permitting and regulations. Permitting and regulations (e.g., poles, street installation, power, signs), as well as contract negotiations for new technologies, took much more time than expected.
• Procurement logistics. The logistics of procuring so much new equipment presented significant challenges. The technology used in SFpark is not plug and play. Implementing SFpark required a lot of hand coding for different technologies to work together. As this field and market matures, this problem will likely diminish, but for now it remains an issue for any city, as well as an opportunity to significantly upgrade a city’s ability to manage data and make more informed decisions.

Implementation and operation
• Enforcement. Parking policies require effective enforcement. Without it, the benefit of any policy changes is likely to be compromised.
• Urgency. Federal project deadlines created an urgency that is uncommon in public projects and gave us aggressive goals to work towards.
• Custom technology. The technology used in SFpark is not plug and play. Implementing SFpark required a lot of hand coding for different technologies to work together. As this field and market matures, this problem will likely diminish, but for now it remains an issue for any city, as well as an opportunity to significantly upgrade a city’s ability to manage data and make more informed decisions.
• Organizational changes and challenges. Creating the SFpark data management system and then preparing to run a real-time information service required several significant changes within the SFMTA. From a technical perspective, it has challenged the SFMTA to determine the best ways to use, support, and maintain that system with the rigor that is required for providing a high-availability data service.
• Most technology used did not meet our initial expectations. In particular, the accuracy and reliability of parking sensors is not perfect, which limits the possibilities of what can be done with that data. However, the technology continues to evolve and improve. In the meantime, the SFMTA has developed a method for approximating parking availability from meter payment data.
• Parking sensor data is new, subtle, and complex. There was a learning process for SFMTA to discover how to better understand and use that data for operations, contract management, and evaluation. As parking sensors become more commonplace, it is likely that de facto standards will develop in this area.
• Pursuing SFpark on a pilot basis was a sound approach. To have attempted this change all at once citywide would have had an unacceptably high risk of failure.
2. PARKING MANAGEMENT POLICY

The SFpark project sought to manage parking via clear and transparent policies. This chapter summarizes the policy that enabled SFpark, the detailed policies for setting rates, and other related policies.
Enabling policy
The policies that enabled and defined the SFpark pilot project

In November 2008, the SFMTA Board of Directors approved legislation that enabled the SFpark pilot project. It defined the SFpark pilot project areas and specified the ranges and limits for rates, time limits, and parking availability targets. Subsequent policy documents elaborated and refined this legislation.

Enabling legislation
The SFpark pilot project required several legislative changes, and the November 18, 2008, enabling legislation was the most important. That legislation was intended to be detailed enough to define how the pilot project would operate while being flexible enough to refine and adjust policies during detailed planning and implementation. Changing prices slowly and incrementally turned out to be a successful approach, allowing the city to gradually adjust rates just enough—and not more—to achieve the desired outcomes. While this approach lengthened the time needed to achieve an optimal price, it also gave customers time to react to changes and may have prevented opposition when and where rates were increased.

The enabling legislation is annotated with comments and planned refinements, followed by excerpts from subsequent policy documents that provide more detail.

MUNICIPAL TRANSPORTATION AGENCY BOARD OF DIRECTORS RESOLUTION No. 08-192

WHEREAS, On November 6, 2006, the San Francisco Municipal Transportation Agency (SFMTA) Board of Directors approved Resolution 07-169, which authorized the acceptance and expenditure of various funds associated with the Urban Partnership Program (UPP) in anticipation of establishing the SFpark program and approved variable pricing required for the acceptance of those funds; and,

WHEREAS, On April 15, 2008, the SFMTA Board received a report on SFpark, a program to evaluate new parking management approaches and technology in order to manage San Francisco’s parking supply and demand to support the SFMTA’s overall transportation goals; and,

WHEREAS, The SFMTA Board approved Resolution 08-026 on April 15, 2008, approving two contracts required to implement SFpark and the associated pilot projects; and,

WHEREAS, The Executive Director of the Muni Parkways Program was a state-funded project, the SFMTA also received federal environmental (NEPA) clearance.

WHEREAS, A public hearing on these pilot program parking pricing modifications was noticed in compliance with requirements of Chapter 4.104 and 16.112.

WHEREAS, The Fort of San Francisco approved on October 26, 2008 Resolution 08-68, approving parking pricing and management changes consistent with those contained in this Resolution, and thereby adopting a consistent approach to parking management for the metered on-street parking in its jurisdiction, including areas along the Embarcadero that are adjacent to the SFpark Pilot Project Areas; and,

WHEREAS, The SFpark Parking Project received environmental clearance under the California Environmental Quality Act as a Class 6 Categorical Exemption from the San Francisco Planning Department on May 19, 2008, now, therefore, be it,

RESOLVED, That the San Francisco Municipal Transportation Agency Board of Directors authorizes the Executive Director/CEO to set parking rates within SFpark Parking Project Areas and Parking Project Special Event Areas for the approximate 18 month duration of the SFpark parking pilot projects; and, be it further,

RESOLVED, That parking within the areas specified in Attachment A, incorporated by reference into this resolution, are designated as SFpark Parking Project Areas; and, be it further,

RESOLVED, That parking within the areas specified in Attachment B, incorporated by reference into this resolution, are designated as SFpark Parking Project Special Event Areas; and, be it further,

RESOLVED, That the San Francisco Municipal Transportation Agency Board of Directors authorizes the Executive Director/CEO to adjust parking rates within SFpark Parking Project Areas as often as every 20 calendar days; and, be it further,

RESOLVED, That the San Francisco Municipal Transportation Agency Board of Directors authorizes the Executive Director/CEO to adjust metered parking rates within SFpark Parking Project Areas in increments of no more than $0.50 per hour and in increments of more than $0.50 per hour for parking garages and lots; and, be it further,

RESOLVED, That the San Francisco Municipal Transportation Agency Board of Directors authorizes the Executive Director/CEO to adjust metered parking rates within SFpark Parking Project Areas in small increments as the block level (i.e., two opposing block-faces or both sides of one street between two cross streets); and, be it further,

RESOLVED, That the rates for parking meters, parking garages, and parking lots in SFpark Parking Project Areas may be either flat rates (same price per hour at all times), or may be based on time of day (variable price by time of day), length of stay (variable price by how long a vehicle has been parked), or a combination of those pricing structures; and, be it further,

RESOLVED, That the rates for parking meters and metered lots in the SFpark Parking Project Areas, including all types and kinds of parking, including but not limited to automobile, commercial loading, and motorcycle, parking meters, shall be between $0.25 per hour and $6.00 per hour; and, be it further,

RESOLVED, That the hourly rates for parking garages in the SFpark Parking Project Areas shall be between $1.00 per hour and $10.00 per hour; and, be it further,

RESOLVED, That for on-street parking rates in the SFpark Parking Project Special Event Area shall be between $0.25 per hour and $18.00 per hour during or up to four hours for special events; and, be it further,

RESOLVED, That any parking price or rate changes for monthly parking in parking garages that are within the ranges specified in this resolution must be posted on the SFMTA website no less than seven calendar days in advance of the price change; and, be it further,

RESOLVED, That any parking price or rate changes for monthly parking in parking garages that are within the ranges specified in this resolution must be posted on the SFMTA website no less than seven calendar days in advance of the price change; and, be it further,

RESOLVED, That parking within the areas specified in Attachment B, incorporated by reference into this resolution, are designated as SFpark Parking Project Areas; and, be it further,

RESOLVED, That parking within the areas specified in Attachment A, incorporated by reference into this resolution, are designated as SFpark Parking Project Areas; and, be it further,

RESOLVED, That for on-street parking rates in the SFpark Parking Project Special Event Area shall be between $0.25 per hour and $18.00 per hour during or up to four hours for special events; and, be it further,

RESOLVED, That the Executive Director/CEO is authorized to provide for those drivers who pay an hourly rate for at least three hours of parking in parking garages in SFpark Parking Project Areas a discount of between $1.50 and $2.50 for entering garages during off-peak times (based on availability and congestion targets) and a discount of between $0.50 and $2.00 for exiting garages during off-peak times, without being required to provide this discount for those drivers who pay a ‘‘early bird’’ monthly, or other fixed time period or special rate structures; and, be it further,

RESOLVED, That for parking garages in SFpark Parking Project Areas, during the SFpark parking pilot period the Executive Director/CEO is authorized to forgo the prices when ‘‘early bird’’ parking rates may apply, so long as those times are restricted to those drivers who enter a garage between 5:00 AM and 10:00 AM and exit the garage between 3:00 PM and 8:00 PM; and, be it further,

RESOLVED, That for parking garages in SFpark Parking Project Areas, during the SFpark parking pilot period the Executive Director/CEO is authorized to adjust the cost of all types of daily, monthly, ‘‘early bird’’, and other non-hourly parking rates in garages in SFpark parking pilot areas by up to 50 percent compared to those rates as of November 30, 2008; and, be it further,

RESOLVED, That any parking price or rate changes for monthly parking in parking garages that are within the ranges specified in this resolution must be posted on the SFMTA website no less than seven calendar days in advance of the price change; and, be it further,

RESOLVED, That any parking price or rate changes for monthly parking in parking garages that are within the ranges specified in this resolution must be posted on the SFMTA website no less than seven calendar days in advance of the price change; and, be it further,

RESOLVED, That the Executive Director/CEO is authorized to adjust availability standards and targets during the pilot project period to better achieve the goals of SFpark.

1. Wherever mentioned ‘‘second half’’ will be to this reduced to at least every 28 days to enable monthly changes.
2. The Executive Director/CEO is able to assign this ability to a staff-level designee. The intent is to make the setting of parking rates into a more technical data-driven process guided by rules and policies set by the SFMTA Board.
3. As seen in the more detailed pricing policy documents, the pilot project is using time of day pricing. The rationale is that time of day pricing more effectively influences when people drive, and therefore congestion. More complex pricing structures were considered, but were not adopted because of the necessity to readily communicate (and understand) them at the meter or garage.
4. City law requires that upper and lower bounds be set. For on-street parking, $10.00/ hr was set $3.00 higher than the highest hourly rate at that time.
5. Subsequent policy documents defines the off-peak and early (and 1/2 hour time period as being before 7:00 AM and after 6:00 PM). This rate range was too narrow and, for several garages, likely need to be adjusted during the course of the project.
6. Setting availability standards for each type of parking was deferred until more detailed analysis could be completed. These standards are refined in the more detailed pricing policy documents.
7. This concept is to achieve of the availability standard 80 percent of the time. However, the availability standard is a measure of the development of the detailed rate adjustment policies because availability is being calculated or averaged over a significant period of time (e.g., three hours, which already allow for the possibility of exceeding the standard part of the time). The intent of accepting some amount of the availability standard at any time is to not encourage the adjustment of future hourly rates by the Executive Director/CEO to correct for lower or higher than expected availability. That for on-street parking rates in the SFpark parking pilot period the Executive Director/CEO is authorized to make these adjustments for the following parking projects; and, be it further.
8. Setting availability standards for each type of parking was deferred until more detailed analysis could be completed. These standards are refined in the more detailed pricing policy documents.
9. As seen in the more detailed pricing policy documents, the pilot project is using time of day pricing. The rationale is that time of day pricing more effectively influences when people drive, and therefore congestion. More complex pricing structures were considered, but were not adopted because of the necessity to readily communicate (and understand) them at the meter or garage.
10. City law requires that upper and lower bounds be set. For on-street parking, $10.00/hr was set $3.00 higher than the highest hourly rate at that time.
On-street pricing

Demand-responsive pricing to achieve parking availability goals

This section excerpts large sections of the policies used to set rates in the SFpark pilot project (with some minor updates for this book). These documents are available in their entirety online as part of a transparent, rules-based approach to setting rates.

On-street pricing

This section excerpts the SFpark on-street rate adjustment policy that outlines how the SFMTA uses occupancy data to make demand-responsive rate adjustments at on-street parking meters.

As part of the SFpark pilot project, the San Francisco Municipal Transportation Agency (SFMTA) uses a demand-based approach to adjusting parking rates at metered parking spaces in the SFpark pilot areas. The goals include:

- Having a consistent, simple, and transparent approach for setting meter rates.
- Using those rates, including demand-responsive pricing and off-peak discounts, to help manage congestion, improve Muni speed and reliability, and achieve other transportation-related benefits.
- Achieving parking availability targets to reduce the number of drivers who double-park or circle while looking for parking.

Pre-SFpark parking meter policies

Rates

Prior to SFpark, parking meters in San Francisco charged a single hourly rate regardless of the time of day or year. Meter rates varied by zone, with the most expensive rates downtown and the cheapest in the neighborhood commercial districts:

<table>
<thead>
<tr>
<th>Zone</th>
<th>Price per hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downtown</td>
<td>$3.50</td>
</tr>
<tr>
<td>Downtown periphery</td>
<td>$3.00</td>
</tr>
<tr>
<td>Fisherman's Wharf</td>
<td>$3.00</td>
</tr>
<tr>
<td>Neighborhood commercial districts</td>
<td>$2.00</td>
</tr>
</tbody>
</table>
Method of setting rates
Prior to SFpark, the San Francisco Board of Supervisors
set meter rates via periodic price changes based on
recommendations made by the SFMTA, mainly during
the budget-planning process. There was no set formula or
approach for setting meter rates, and changing meter rates
was often a contentious process.

Hours and days of operation
Most parking meters in the city are operational Monday
to Friday from 7am to 6pm, depending on location. In a portion of the Soma pilot area,
meters within SFMTA jurisdiction operate until 10pm
to facilitate special event pricing, particularly during
baseball games at AT&T stadium. Meters in Fisherman’s
Wharf are operational every day from 7am to 7pm, and
meters in areas administered by the Port of San Francisco
(mostly along the Embarcadero) are operational every day
from 7am to 11pm.

SFpark on-street pricing
In SFpark pilot areas, meter rates vary based on time of day
and day of week, and rates are adjusted over time in
response to demand. Rates are adjusted on a block-by-
block basis, using occupancy data from parking sensors
installed in most on-street parking spaces in the SFpark
pilot areas.

Adjusting rates
1. Meter operational hours are split into distinct rate periods
To help ensure that parking is available in metered
parking spaces, SFpark meters charge different rates
based on the time of day. To facilitate this demand-
responsive, time-of-day pricing, the meter operational
hours are split into distinct rate periods throughout the day.

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

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Rate 1</th>
<th>Rate 2</th>
<th>Rate 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>7am–Noon</td>
<td>9am–Noon</td>
<td>Noon–3pm</td>
<td>3pm–6pm</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Rate 1</th>
<th>Rate 2</th>
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</tr>
</thead>
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<td>7am–Noon</td>
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<td>3pm–6pm</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Rate 1</th>
<th>Rate 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>7am–Noon</td>
<td>7am–Noon</td>
<td>Noon–3pm</td>
</tr>
</tbody>
</table>

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 are:

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Rate 1</th>
<th>Rate 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>7am–Noon</td>
<td>7am–Noon</td>
<td>Noon–3pm</td>
</tr>
</tbody>
</table>

These rate periods are as consistent as possible across
meters to make it easier for drivers to use meters in
different parts of the city. Because SFpark meters charge
different hourly rates at different times of day, if a driver
arrives at a meter during one rate period but leaves during
another, he must pay the correct hourly rates for each rate
period in which he parks. Thus, a driver who arrives at a
meter at 11am and parks until 1pm must pay for one hour
at the 9am–Noon rate, and one hour at the Noon–3pm rate.

2. Weekend rates differ
Because weekend parking trends differ significantly
from weekday parking trends, demand-responsive rate
adjustments separate weekdays from weekends. This helps
ensure that parking is available in metered parking spaces
every day of the week.

3. Rates respond to demand over time
Rates for parking meters change gradually and
periodically based on demand. Changes to the rates are
made no more often than once per month. At the outset of the
SFpark program, rates at meters respond to demand
as shown by occupancy in the previous month. As SFpark
continues to collect occupancy data from the parking
sensors, however, occupancy data from earlier months and
years will be considered 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.

To achieve the goal of at least one available parking
space per block, meter rates are adjusted with the goal of
maintaining no more than 80 percent occupancy on
any given block. Rates are adjusted using the following formula:

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

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

For parking occupancy, some cities use a target of no more than 85 percent. This threshold refers to parking occupancy as measured at a single point in time, typically via manual observation which is the only method available to most cities. The SFMTA target of 60 to 80 percent occupancy refers to the average parking occupancy as measured continuously over a period of time (typically three hours of continuous data rather than a one or two snapshots in time as in most manual surveys of parking occupancy). Via the SFpark pilot project, the SFMTA pioneered this approach to measuring parking occupancy, adapting parking occupancy measurement and targets to newly available technology and the radically increased amount of occupancy data that parking sensors provide.

The 60–80 percent target range for average parking occupancy is intended to ensure that the commonly cited 85 percent threshold is rarely exceeded during the three hour period so that most drivers can typically find a parking space quickly.

4. Rates are adjusted on a block-by-block basis

Price changes made to meters on a per-block basis. The SFMTA considered larger areas but chose blocks 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 was also expected to more effectively redistribute parking demand within a neighborhood to better achieve availability targets and therefore the larger parking management goals of SFpark.

Thirteen rate adjustments

Between July 2011 and January 2014, the SFMTA executed thirteen demand-responsive rate adjustments at SFpark meters. As a result, the average cost to park at metered spaces decreased from $2.73 per hour to $2.46 per hour.

Download rate adjustment data and maps at: SFpark.org/rates

July 2011 rate changes: Mission

<table>
<thead>
<tr>
<th>Monday–Friday</th>
<th>9am to noon</th>
<th>Monday–Friday</th>
<th>Noon to 3pm</th>
<th>Monday–Friday</th>
<th>3pm to 6pm</th>
</tr>
</thead>
<tbody>
<tr>
<td>SFpark</td>
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</tbody>
</table>

** No rates were lowered $0.50 in this pilot area.
Estimating parking occupancy using meter payment data

This section outlines the SFMTA’s plan to continue demand-responsive rate adjustments by using meter payment data, rather than sensor data to estimate occupancy.

Overview

During the SFpark pilot, the SFMTA used in-ground parking sensors to estimate parking occupancy in SFpark pilot and control areas. At the end of 2013, the SFMTA made 13 demand-responsive rate adjustments from occupancy data from parking sensors. As part of evaluating the SFpark pilot projects, the SFMTA will evaluate whether or not to use parking sensors in the future.

The SFMTA has also collected meter payment data from smart parking meters that can wirelessly communicate payment status. Using data from parking sensors and parking meters collected throughout the SFpark pilot, the SFMTA developed a model to estimate parking occupancy using meter payment data. The SFMTA intends to use the Sensor Independent Rate Adjustment (SIRA) model to continue demand-responsive rate adjustments.

Developing the Sensor Independent Rate Adjustment model

The SFMTA developed the SIRA model by analyzing the relationship between parking occupancy rate (how many spaces are occupied) and meter payment rate (how many spaces are paid). If everyone paid the meter for exactly all of the time that they park, the SFMTA could simply use payment rate as the occupancy rate.

However, data from the SFpark pilot confirmed that payment rates are lower than occupancy rates, meaning that for all of the time that meters are occupied, they are only paid some of that time. This is a result of people using parking permits (such as disabled placards and City official business permits) to legally occupy a space without paying the meter, non-functioning meters, people running over the time that they paid, or people simply not paying the meter.

Using SIRA for demand-responsive rate adjustments

The SFMTA developed the SIRA model using linear regression to estimate occupancy rates using payment rates. After examining millions of records and adjusting for the factors explained below, the SFMTA found that there is a stable and consistent relationship between occupancy and payment rates.

The SIRA model includes adjustment factors to account for three types of variation. First, because not everyone pays the meter, the model adjusts for the difference between occupancy rates and payment rates. Second, the SIRA model accounts for variation in behavior between weekdays and weekends. Third, the model accounts for differences in payment rates in different parts of the city.

The SFMTA developed the SIRA model by analyzing the statistical relationship between occupancy and payment rates from the SFpark pilot to develop the SIRA model. The SIRA model uses linear regression to estimate occupancy rates using payment rates. After examining millions of records and adjusting for the factors explained below, the SFMTA found that there is a stable and consistent relationship between occupancy and payment rates.

Using SIRA for demand-responsive rate adjustments

The SFMTA plans to start adjusting on-street rates using the SIRA model in SFpark areas in June 2014, and to continue those rate adjustments about every two months. Guided by the SFpark pilot evaluation and after the installation of smart meters citywide, the SFMTA will develop a proposal for expanding demand-responsive pricing beyond current SFpark areas and to all meters citywide.

Expanding use of the SIRA model

The SIRA model was developed using data from the SFpark pilot, representing a quarter of San Francisco’s metered spaces over a distinct period in time. When considering if and how the model needs to be recalibrated to use in more areas in the future, thought should be given to its underlying assumptions about how non-payment varies (or not). A variety of factors may explain non-payment, but the important ones are parking policies and practices, particularly those involving:

- Parking enforcement strategies (because the perceived level of enforcement drives how many people choose not to pay)
- Parking citation or fine amounts
- Time limits
- Payment methods (because payment rates increase when it is easy to pay)

The SFMTA will continue to refine and update the SIRA model as necessary.
Special event

This section describes how the SFMTA adjusts parking meter rates in special event pricing areas.

As part of SFpark, the SFMTA tested using demand-responsive pricing to better achieve parking space availability targets during special events such as baseball games. Beginning in 2013, the SFMTA implemented special event pricing around San Francisco's baseball stadium in the South Embarcadero pilot area.

In this special event area, meter rates during special events are either $3, $5, or $7 per hour depending on how close a parking space is to the stadium. These rates can be adjusted to achieve parking availability targets of 20 to 40 percent during special events. The following guidelines determine special events price changes:

- When availability is less than 20 percent, the hourly rate rises to the next special event price level.
- When availability is 20–40 percent, the hourly rate does not change.
- When availability is greater than 60 percent, the hourly rate decreases to the lower price level or is considered for removal from special event pricing.

The above guidelines are utilized to the extent that price adjustments would help to preserve and/or enhance the clearly defined and easily communicated boundaries for the different types of special event rates.

Event rates are programmed at the beginning of the season, and even with smart meters, they are not easily changed for last-minute changes to events (e.g., when a baseball game is cancelled due to rain). While the SFMTA can adjust event rates incrementally over time, non-event meter rates in SFpark areas do vary by block and change over time, the SFMTA opted to keep special event rates more stable so they would be easier to communicate and be more easily understood by customers, many of whom do not typically park in that area. The SFMTA did not change special event rates during the 2013 season and made only small adjustments for the 2014 season.

A majority of the special events in this area occur in the evening, so hours of operation were extended to 10pm in the area to cover most of the typical event hours. On non-event evenings, meter rates after 6pm were started at $0.25 per hour and typically stayed at that level reflecting relatively low parking demand.

Motorcycle

As part of the SFpark pilot project the SFMTA uses demand-responsive pricing for metered motorcycle parking in order to achieve availability targets.

Prices at metered motorcycle spaces are adjusted periodically to achieve the target availability rate of 20 to 40 percent at peak hours. During the pilot period, prices at motorcycle parking spaces were changed infrequently because: 1) parking sensors cannot detect motorcycles accurately, so the SFMTA uses manual surveys to obtain motorcycle occupancy data; and 2) the SFMTA did not upgrade motorcycle meters during the SFpark pilot period, so rate changes had to be entered manually in the field. The SFMTA is replacing the motorcycle parking meters in 2014, which will allow for more frequent rate adjustments if needed.
Time limits
Using price rather than time limits to achieve availability

Since San Francisco started using parking meters in 1947, time limits of 1 to 2 hours have been the main tool used to achieve turnover. Availability is the ultimate goal of turnover, so the SFMTA is emphasizing demand-responsive pricing, rather than time limits, to achieve parking availability targets in the SFpark pilot projects.

Expanded meter time limits
Prior to the pilot project, short time limits at metered spaces could be inconvenient and unpredictable, sometimes forcing people to cut their stays short or risk receiving a parking ticket. For Parking Control Officers, time limits are difficult and labor intensive to enforce, requiring the officer to pass the location twice to enforce rather than once to verify parking meter payment status.

For the SFpark pilot project, April 2011 the SFMTA lengthened time limits in most pilot areas to four hours and eliminated time limits altogether in the Fillmore and parts of the South Embarcadero pilot areas.

Download full document at: SFpark.org/docs_expandedtimelimits

Broken meter time limits
A policy allowing cars to park for free at broken parking meters creates an incentive to vandalize or disable meters. If city policy allows vehicles to stay at broken meters up to the time limit, then lengthening or eliminating time limits would also provide the same incentive. In preparation for SFpark, the SFMTA established a two-hour maximum time limit for parking at all inoperable or broken parking meters to reduce this incentive in SFpark pilot areas.

The goals of this policy change were to:

1. Create a uniform, easily understood meter enforcement policy that balances public interest in using available parking spaces with the desire to discourage vandalism.
2. Anticipate the impact of longer time limits at meters for the SFpark pilot project.
3. Ensure fairness and equity between people parking at meters. The two hour time limit at broken meters was meant to discourage people from monopolizing these spaces.

The SFMTA considered prohibiting parking at broken meters, which was a successful policy in Los Angeles, but chose to establish a two-hour maximum broken meter time limit instead. However, a new California state law terminated local authority over this topic and invalidated both policies. This law, AB 61, became effective in January 2014 and stated that vehicles must be permitted to park at “inoperable meters” for the maximum amount of time permitted by that meter.

Download full document at: SFpark.org/docs_brokenmeterlimelimits
Managing parking when and where appropriate

The importance of managing parking when and where there is significant parking demand

Parking meters are simply tools to manage parking demand to achieve certain goals, whether for transportation or economic vitality. Parking meters were first introduced to increase parking availability on busy commercial streets, and they remain a powerful tool to make parking easier to find. Data from the SFpark project shows that managing parking when and where there is significant parking demand delivers sizeable benefits, even without demand-responsive pricing or real-time parking availability information.

Extended parking meter hours study

In 2009, the SFMTA proposed expanding the hours when parking meters are enforced to better match times of high demand when stores are open. This section contains a summary of that proposal, which was not implemented.

In 2009 the SFMTA developed a proposal to operate parking meters on Sundays and evenings. The proposal was intended to align when and where meters operate with when and where parking is difficult to find in commercial areas. The study includes a survey of other jurisdictions' practices, a review of previous reports on parking in San Francisco, and the collection of data on parking occupancy levels, business hours of operation, stakeholder concerns, and residents' opinions. The study found:

- Demand for on-street parking was high in the evenings and on Sundays, resulting in parking occupancies higher than 100 percent due to illegal parking. It was hardest to find available parking spaces when parking at meters was free and unrestricted: after 6pm and on Sundays.
- When San Francisco's meters were first introduced in 1947, many businesses kept traditional hours, usually from 9am to 5pm. Mondays through Saturdays. Many businesses are now open late in the evening and all day on Sundays, creating demand for parking at times when parking meters did not operate at the time of the study.
- Many cities and towns across the country operate their parking meters Monday through Saturday until 10pm, midnight, or 2am, as well as on Sundays.
- Parking availability is the aspect of parking that San Francisco residents valued most highly. Cost, though not unimportant, ranked fifth (out of nine) as a concern.
- A plurality of residents supported metering in the evenings and on Sundays if meter revenues are used to improve pedestrian and bicycle facilities and transit service. Residents who never drive or drive rarely are more likely to support extending the hours than those who drive frequently.

Using this study, the SFMTA recommended that the parking meter hours of operation be extended as follows:

- Sundays: Establish metering hours from 11am to 6pm citywide.
- Mondays through Saturdays: Operate parking meters until 6pm, 9pm, or midnight when and where parking demand warrants.
- Extend meter hours until 9pm Monday through Thursday and until midnight Friday through Saturday at 68 percent of metered spaces.
- Extend meter hours until 9pm on Friday and Saturday at 20 percent of metered spaces (leaving Monday through Thursday until 6pm).
- Extend meter hours until midnight Monday through Saturday in areas where parking availability is low throughout the week, which is 12 percent of metered spaces.
- Operate meters Monday through Saturday until 6pm at one percent of metered spaces.
- Rates: Retain current rates (but use demand-responsive pricing in SFpark pilot areas).
- Time limits: Establish 4-hour parking time limits after 6pm and all day on Sundays.

The following additional recommendations were based primarily on feedback from intercept surveys and stakeholder interviews:

- Make it easier for drivers to pay for parking and avoid parking tickets.
- Offer residents who live adjacent to commercial corridors the option to extend Residential Permit Parking (RPP) enforcement hours to reduce potential parking “spillover” in their neighborhoods. Hours of RPP enforcement could either match or extend beyond metering hours.
- Review metering hours at least every two years using 85 percent occupancy as the criteria and adjust metering hours as necessary to achieve availability goals.
- Reduce hourly meter rates in SFMTA parking lots when and where parking occupancy does not exceed 60 percent and consider lengthening time limits at those lots to improve driver convenience.

Operating parking meters on Sundays

This section excerpts the SFMTA’s evaluation of Sunday parking enforcement. While this policy change was not part of the SFpark pilot project, it offered valuable lessons about effective parking management.

In 2013, the SFMTA began enforcing parking meters on Sundays for the first time, requiring meter payment at all SFMTA meters from noon to 6pm. For many years, parking meters in San Francisco were enforced Monday through Saturday from 9am to 6pm. As the Extended parking meter hours study confirmed, most businesses were closed on Sundays when parking meters were first installed in San Francisco in 1947, but that changed significantly over the last 60 years.

To help open up parking spaces for businesses that are open on Sundays, in January 2013 the SFMTA began operating parking meters on Sundays from 12pm to 6pm with four-hour time limits. This policy was intended to make it easier to find a parking space in commercial areas on Sundays (and thereby improve access, driver convenience, and economic vitality). Based on public feedback, the SFMTA chose to begin meter enforcement at noon rather than 9am as on other days of the week. Customers who park before noon are able to pre-pay for parking so they do not have to return to the meter in the middle of their day (meaning you can park and pay for parking at 9am, but the meter will not begin charging until noon). For the first three weeks after the policy went into effect, SFMTA staff issued informational flyers instead of parking citations on Sundays.
The SFMTA evaluated how well metering on Sundays achieved the following goals:

- Make it easier to find a parking space in commercial areas on Sundays (and thereby improve access, driver convenience, and economic vitality).
- Reduce double parking and circling, which supports goals for reducing delays for transit, greenhouse gas emissions, and congestion, and improving safety for pedestrians, cyclists, and other drivers.
- Off-set the costs of operating the city’s transit system.

The SFMTAs evaluation of metering on Sundays showed that as a result of operating meters on Sundays:

- It is easier to find parking spaces in commercial and mixed use areas on Sundays. Prior to operating meters on Sundays, it was hard to find parking in almost every commercial area in the city. Now parking availability is much higher, so it is easier for drivers—many of whom are likely customers of neighborhood businesses—to access commercial areas. Data from a sample of streets showed that the average parking availability on Sunday doubled during metered hours once meters were enforced, increasing from 15 percent to 31 percent.
- More people can park because there is more turnover. Prior to operating meters on Sundays, some drivers would park in metered spaces on Saturday evening or Sunday morning and not move their car until Monday morning, reducing turnover and the parking availability in commercial areas on Sundays. This behavior decreased with Sunday metering; the number of cars that parked in each space per day increased by at least 20 percent from 0.5 per hour to 0.6 per hour during Sunday afternoons, and the percentage of spaces occupied on Saturday night through Sunday afternoon decreased by two thirds, from 6 percent to 2 percent. Prior to metering on Sundays, half of all cars parked for less than three hours, while half stayed for three or more hours. After metering on Sundays, 76 percent of cars stayed for up to three hours (with 50 percent staying for less than one hour), and less than one quarter of all parked cars stayed for three or more hours.
- More people park in parking garages, opening up more on-street spaces. Sunday meters also encouraged more drivers to go directly to a garage rather than circle for free-on-street parking. SFMTA garage occupancy on Sundays from 12pm to 6pm increased by 13 percent. Getting more drivers off the road and into garages quickly opens up on-street parking spaces for others, effectively increasing the usable parking supply. It also improves the utilization of these important city resources.
- People spend less time circling to find a parking space. Prior to metering on Sundays, data indicate that drivers would circle for an average of over four minutes to find a parking space. After metering on Sundays, the average search time in the same areas is now under two minutes. This reduction improves the experience of driving to visit these areas, and it also reduces congestion and greenhouse gas emissions. The variability of parking search time, or how predictable the parking experience is, also improved. The amount of time a driver reasonably should budget to find a parking space (measured by the 95th percentile) decreased from about 14 minutes to about four minutes once meters were operating on Sundays.
- Increased net revenue helps pay for local transit. Parking provides one source of SFMTA’s revenue, helping to pay for the services SFMTA provides, such as transit service on Sundays. Meter payments and citation fees showed that the average parking availability on Sunday doubled during metered hours once meters were enforced, increasing from 15 percent to 31 percent.
- People spend less time circling to find a parking space. Prior to metering on Sundays, data indicate that drivers would circle for an average of over four minutes to find a parking space. After metering on Sundays, the average search time in the same areas is now under two minutes. This reduction improves the experience of driving to visit these areas, and it also reduces congestion and greenhouse gas emissions. The variability of parking search time, or how predictable the parking experience is, also improved. The amount of time a driver reasonably should budget to find a parking space (measured by the 95th percentile) decreased from about 14 minutes to about four minutes once meters were operating on Sundays.
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Over the course of several years of the SFpark pilot project, the SFMTA developed a proposal to manage parking in these areas, and to include them as expansions of existing SFpark areas to manage this parking as intelligently as possible. During the community process, many community members expressed uneasiness about being part of the pilot until further evaluation of its success. Based on this feedback, the SFMTA proceeded with parking management planning for these areas using its regular policies and practices.

The SFMTA used policy parameters, data, and community input to develop parking management proposals for each neighborhood. For each neighborhood, it conducted a thorough report on the existing conditions, including:

- Block-level data. The SFMTA collected comprehensive data about every block in the proposal area.
- Neighborhood-level research and surveys. The SFMTA gathered data on transportation access, double-parking, parking search time, day-to-day turnover, oversized vehicles, and an out-of-area analysis using license plate data.

Currently, the neighborhood parking plans include significantly less parking management than originally proposed but are still moving forward. From this process, the SFMTA learned several lessons:

- Consensus that there is a parking problem may not translate into consensus on the solutions.
- Communities are often open to considering paying for parking but are sometimes wary of adding new parking meters (to previously unmanaged spaces). Communities voiced a desire not to pay for parking, fear of citations, and inconvenience (from time limits and having to pay).
- In terms of public support, creating newly metered spaces is much harder than adjusting rates in existing metered spaces (which was widely supported).

Parking planning decisions

How the SFMTA makes parking management decisions

To help communicate those policies with communities, the SFMTA created this pamphlet to summarize those parking management policies.

Download full document at: SFpark.org/docs_parkingmanagement

Block-level data collection form

The SFMTA created this form to standardize what data is collected for each block when making parking management decisions, including:

- Parking supply: How many legal parking spaces currently exist?
- Existing parking regulations: What regulations are already in place in the neighborhoods?
- Zoning: What is the zoning of each parcel?
- Land use: What is the current legal land use of each parcel?
- Parking occupancy: What percent of the legal parking supply is occupied during the survey period?

Download full document at: SFpark.org/docs_blockdata
City and SFMTA employee parking
Applying parking management rules equitably

The effectiveness of demand-responsive pricing to manage parking relies on drivers being subject to those prices. In preparation for SFpark, in early 2011 the SFMTA implemented new policies to better manage parking by city vehicles and parking demand from the SFMTA’s own 5,000 employees. Most of these policy changes were approved in their entirety. These proposals were important for overall parking management, and they increased the SFMTA’s parking management credibility.

City employee parking proposal

This section summarizes the 2010 proposal that removed parking payment exemptions for many city employee vehicles.

The SFMTA released a proposal in 2010 to better manage city vehicle parking. In this proposal, rather than being exempt from paying parking meters, all city vehicles (except emergency vehicles with lights flashing) would have had to pay to park either via a prepaid annual permit or via prepaid parking cards. The approved version of the policy applies only to sedans and other passenger vehicles, which are approximately half of the city’s vehicle fleet. The majority of the remainder of the proposal, such as removing the majority of free reserved on-street parking spaces in front of city facilities, was approved by the SFMTA Board and implemented in summer 2011.

Prior to implementation of these measures, there were many types of parking privileges for government employees and officials in San Francisco, both formal and informal, amounting to at least 3,000 free on-street spaces. The SFMTA issued some of these permits, and the Transportation Code allowed some city departments to issue an unlimited number of their own parking permits that gave employees free parking without time limits. Because there was no standard permit and no limit on quantities, these permits were easy to abuse and difficult for SFMTA to enforce.

There were a variety of parking privileges for government employees and officials in place, including:

- Free on-street reserved spaces around some government facilities.
- Free parking placards printed by some city departments and government agencies.
- Areas of non-enforcement of parking violations around government facilities.
- Free and reserved parking spaces in city garages for some city employees and officials.
- Free parking included in some collective bargaining agreements with unionized employees.

Together, these privileges, exemptions, and permits encouraged city and government employees to drive rather than utilize transit and other forms of transportation, undermining the city’s goals for transportation. Because current policy allowed many departments to print their own placards for free parking, the precise number of placards circulating was unknown and uncontrollable. At least 3,000 parking spaces were unavailable for public use, typically clustered around city and government facilities, reducing public access to government services and nearby businesses. The various parking privileges for government employees undermined the city’s parking management and overall transportation goals. Parking price and availability are two of the primary factors in how people decide to travel, whether by car or a more sustainable mode. While some types of parking exemptions may be sensible, such as parking of vehicles related to public safety, free or subsidized parking at work encourages people to drive, and these trips contribute to traffic congestion and greenhouse gas emissions.

A 2005 survey of Bay Area commuters sponsored by the Metropolitan Transportation Commission found large differences in travel behavior between groups of

<table>
<thead>
<tr>
<th>Bay Area commute decisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 2005</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>With free parking</th>
<th>Without free parking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive alone</td>
<td>75%</td>
<td>37%</td>
</tr>
<tr>
<td>Transit</td>
<td>5%</td>
<td>43%</td>
</tr>
</tbody>
</table>

The SFMTA successfully implemented most of the short-term recommendations. The SFMTA created a single city vehicle parking permit and attached an annual price; and now only those permits are considered valid by the Parking Enforcement Division. The SFMTA partially reformed the reserved on-street parking spaces in front of city facilities: a permit was established with an annual price, and departments received a letter giving the option to return those spaces to public parking, which some did. Many of the mid-term policy suggestions are under way.

Download full policy proposal document at: SFpark.org/docs_employeeparking

SFMTA employee parking management

In 2011, the SFMTA proposed a parking management policy for off-street parking to its employees. The proposal aimed to hold SFMTA employees to the same or higher standards for parking management as the people we serve, and to discourage single-occupant work trips by car.

Prior to reform in 2011, a large portion of SFMTA employees had free off-street parking at their work site (e.g., within bus yards or dedicated (i.e., not publicly available) lots or garages). The original proposal would have required all 5,000 SFMTA employees to pay for off-street parking at SFMTA facilities if they drive, but existing labor agreements exempted approximately 800 people from the policy that was adopted and implemented. These free parking provisions encouraged SFMTA employees to drive alone rather than utilize other forms of transportation such as public transit or carpooling, undermining the SFMTA’s goals for transportation as well as the city’s Transit First policy. Parking price and availability are two of the primary factors in how people decide to travel, whether by car or a more sustainable mode. Free or subsidized parking at work encourages people to drive, and these trips contribute to traffic congestion and greenhouse gas emissions.

Free parking for SFMTA employees, particularly for transit operators, has previously been justified by the need to have easy access to parking in order to get transit vehicles out on schedule. The early morning and late night hours of operation and security of vehicles on the street have also been cited as reasons for providing free parking for employees at division yards. While providing parking for SFMTA employees may be helpful for employees who already drive, there is no reason that paid parking would slow down operations or make parking more difficult for employees. Parking supply is very limited at most SFMTA facilities—at some transit yards, personal vehicles cram in around transit vehicles and are shuffled around throughout the day as transit vehicles come and go. Pricing parking appropriately can serve as a parking management strategy to encourage some to carpool or use other modes of transportation, and thereby make it easier for others to find a parking space.

To address these issues, the SFMTA proposed to improve how it managed SFMTA employee parking privileges. The goal of this proposal was to apply the same parking management principles and policies to government employees that are applied to residents, business owners, and visitors. To achieve these goals, the SFMTA proposed to:

- Issue all parking permits. Other city departments and other governmental agencies would no longer be able to issue their own permits. The SFMTA would provide convenient ways to pay for parking via work order for a SFMTA City Business permit or SFMTA parking cards.
- Eliminate free on-street reserved spaces for government employees (e.g., around City Hall).
- Eliminate areas of de-facto non-enforcement around some government facilities (e.g., around the Hall of Justice).
- Eliminate free and reserved parking for government employees and officials in city-owned garages.
- Equalize rates for existing SFMTA-issued permits so that no group receives free parking.
- Assume management of press parking passes from the Police Department to consolidate all parking permits under the SFMTA.

For mid-term implementation, the SFMTA recommended developing policy proposals for these additional areas:

- Remove parking benefits from future labor agreements.
- Offer better city employee transit benefits.
- Improve management of disabled parking placards.
- Improve management of residential parking.
- Endorse existing ordinance that regulates pricing of off-street parking.
Off-street pricing
Demand-responsive pricing to achieve parking availability goals

This section excerpts large sections of the specific rate-setting policies used in the SFpark pilot project (with some minor updates for this book) for off-street garages and lots. These documents are available in their entirety online as part of a transparent, rules-based approach to setting rates to achieve certain goals.

Parking garages

This section contains large excerpts of the policy that outlines how the SFMTA uses occupancy data to make demand-responsive rate adjustments at SFpark parking garages.

At SFpark garages, prices for all rate types are based on the hourly rates, which gradually respond to demand. This demand-responsive pricing is at the heart of the SFpark pilot project and finds the lowest rates possible that achieve parking availability targets. While hourly rates vary from garage to garage (as some garages see higher demand than others), the hourly time frames, types of rates, and ratios used to calculate the rates are the same at all garages.

Hourly rates

1. Rates vary based on time of day
To help ensure that parking is always available in the garages, encourage drivers to use the garages rather than on-street parking, provide incentives to drive and park at off-peak times, and thereby reduce congestion on San Francisco's streets, SFpark garages—just like meters at on-street parking spaces—charge different rates based on the time of day a car is parked. Where parking demand patterns vary significantly, prices differ based on the day of week (e.g., weekday v. weekend).

The SFpark approach relies on demand-responsive time-of-day pricing, whereby the day is divided into distinct time periods during which different parking rates may be charged. The past single-hourly-rate approach to pricing at SFMTA garages does not allow prices to respond to demand. Periodic and gradual changes to parking prices give people time to learn new price signals and, potentially, adjust their travel choices about when and how to make trips.

One goal of the SFpark program is to improve the customer experience by simplifying and unifying the policies, branding, and signage for SFMTA-administered parking garages. To help achieve that goal, the SFMTA implemented a single set of rate periods. Rate periods are bands of time during which the same hourly rate is charged. These rate periods are consistent across all garages—rates vary by garage within the rate periods. Consistency in rate periods also allows garage rates to be easily comparable with on-street metered rates that use the same rate periods. These rate periods are set broadly around workday commuter parking demand patterns so that rates can respond to demand and thereby, in conjunction with an off-peak discount, help to manage congestion.

To determine the rate periods, the SFMTA analyzed data for half of the garages in the SFpark program: Golden Gateway, Moscone Center, Union Square, Ellis-O’Farrell, Civic Center, Performing Arts and Japan Center. This sample provided an effective cross-section of the parking habits of the people who park in San Francisco: downtown commuters, convention-goers, shoppers, government workers and visitors to the courts, performing arts attendees, and visitors to the neighborhood commercial districts.

Utilization of these garages, averaged over the 12-month period, is illustrated in the chart above. The garages fall into three basic usage categories:

- The vast majority of parking happens during traditional workday hours, likely due to business commuters (Golden Gateway and Moscone Center).
- The vast majority of parking is shifted approximately two hours later than traditional workday hours, likely due to the influence of tourists and shoppers (Union Square and Ellis-O’Farrell), and
- A considerable number (usually the majority) of cars are parked during traditional workday hours, but with a distinct influx in the evening hours, likely due to attendance at arts performances or movies, or going to dinner in a neighborhood commercial district (Civic Center, Performing Arts and Japan Center).

To accommodate these distinct but similar parking trends, the rate periods to be used in SFpark garages are set as follows:

The daytime rate periods (9am to Noon, Noon to 3pm, and 3pm to 6pm) are each three hours long, which simplifies the rate structure for customers and garage operators. The rate periods switch between the beginning of one day to the beginning of the next (i.e., midnight), which makes communicating prices each day much easier than having a rate period which crosses from one day into the next. The rate periods also match the bounds of on-street meter operating hours, which are usually 8am to 6pm. Overlaid on these rate periods are off-peak discounts, discussed below, aimed at encouraging parking garage customers to drive at times of day with lower congestion, and to be parked, rather than driving on the roads, when Muni is busiest. Rates charged within the rate periods may
vary from one garage to the next based on demand, and prices when demand is typically low will likely be lower than prices during times of day when demand is typically high. Rate-period consistency between garages and on-street metered spaces makes those rates easily comparable to help drivers better evaluate the value of the two options. Initially, to transition from the current rate structure to time-of-day pricing, rates were set close to the rates that had been charged in the garages based on occupancy data, and were lower than many of the current rates.

2. Rates respond to demand over time

Just like with meters at on-street parking spaces, parking garage rates change gradually and periodically based on demand. To start, changes to the rates charged at SFpark garages are made on a quarterly basis and may be made more frequently during the pilots (but never more often than once per month). Rate changes both respond to and anticipate changes in demand for parking spaces at garages (as measured by garage occupancy) by evaluating demand patterns in the preceding quarter and in the upcoming quarter of the previous year.

The following formula, which balances response to and anticipation of demand at parking garages, is used to determine prices changes for an upcoming quarter:

- Compare garage occupancy for the preceding quarter and garage occupancy for the preceding quarter in the previous year. This number reflects the net change in parking demand from a multitude of factors, including price changes and other exogenous factors such as economic conditions in the Bay Area, etc.
- To take the difference and add it to or subtract it from the garage occupancy for the upcoming quarter in the previous year.

This method responds to changes in overall demand at a garage by using the difference in demand from the previous year, and anticipates seasonal changes in demand by using occupancy from the upcoming quarter of the previous year. Once the formula is applied to reach an occupancy number, the following guides are used in making a price change:

- When occupancy is 40–40 percent, the hourly rate is not changed.
- When occupancy is less than 40 percent, the hourly rate is lowered by $0.50.

For example, suppose we are approaching the beginning of the 3rd Quarter of 2012. For the 9am–Noon rate period, the occupancy data for the relevant quarters are:

- 2012 Q2: 63 percent
- 2011 Q2: 52 percent
- 2011 Q3: 46 percent

The difference between the occupancy for Q2 in 2012 and 2011 is an additional 11 percent. This 11 percent is then added to occupancy for Q3 of 2011 (46 percent), to reach an occupancy figure of 57 percent. Because 57 percent is greater than 50 percent and less than 80 percent, prices for Q3 of 2012 would not be changed.

SFpark’s enabling legislation permits the SFMTA to charge between $1.00 and $3.00 per hour in the garages. The rate floor is further refined as follows: during hours of meter operation (9am-6pm), the minimum hourly charge at a particular garage will be set as $1.00, or $0.50 less than the lowest meter rate within two blocks of the garage, whichever is lower. This rate floor accomplishes two goals: (1) it prevents daytime hourly rates from falling to $1.00 due solely to lack of inherent demand for parking in the area of the garage (which might result from construction, the closing of a building, an economic downturn, or simply the size of the garage); and (2) it explicitly relates garage rates to meter rates, while supporting SFpark’s goal of giving drivers a financial incentive to go directly to garages by setting the garage rate floor below the rate of nearby meters.

SFpark’s formula for implementing rate changes allows the lead time necessary to upgrade garage rate signs. In accordance with the SFpark enabling legislation, the SFMTA notifies the public of rate changes no less than seven calendar days before the change in prices via the SFMTA and SFpark websites.

Rates in the garages are displayed on two different kinds of signs: boards positioned at automobile entrances to the garages, and smaller signs placed at cashier booths, on ticket machines, and at pay stations. The board has been designed so that the rates themselves are printed on a removable panel. The smaller sign has decals that can be placed securely on a hard surface.

To put any new rates into effect by programming software, printing new signs and replacing the signs, in the garages, several different parties must be informed of the new prices. New rates are conveyed in advance of the date the new rates are set to take effect to the following parties:

- The vendors operating the revenue-control equipment in the garages.
- The vendors retained to print signs.
- The garage operators, who are responsible for replacing all rate signs in their garages at each rate change.

3. “Off-peak” discounts encourages customers to drive and park at times of lower demand

SFpark offers off-peak discounts to drivers who enter or exit the garages at times of day with low demand for parking and roadway space. Off-peak discounts are most directly aimed at encouraging commuters to arrive before the morning and/or leave after the evening rush hours, to reduce traffic congestion, which slows other drivers and, most importantly, Muni surface vehicles. In order to receive the discount, a driver must park for at least three hours. This requirement prevents short-term parkers from receiving free parking; time-of-day pricing already provides price incentives to travel at off-peak times for short-term parkers. The off-peak discount is only available to people who pay hourly; it is not available for daily (early bird or daily maximum) or monthly parkers. Customers who receive validated parking and are eligible for an off-peak discount may receive both discounts.

Transit ridership was included in determination of time periods for off peak discounts. Automatic Passenger Count (APC) data shows that the average number of passengers getting on or off a Muni bus peaks at about 8:30 in the morning and about 5:30 in the evening. The average on/off number passes 20 at about 7:30am and does not dip below 20 again until 7:00pm.

Roadway usage data from the San Francisco County Transportation Authority’s Congestion Management Program monitoring report shows that traffic peak times are similar to the peak periods for Muni service. For automobile travel, that report defines the “AM peak period” as “between 7:00am and 9:00am” and the “PM peak period” as “between 4:00pm and 6:00pm.”

In setting the initial off-peak discount times, Muni peak periods were considered against the potential of the off-peak discount periods to reduce congestion. If the off-peak discount times were too late, the board likely will fail to influence enough drivers to realize the goal of reducing congestion. According to the APC data, avoiding the Muni peak period completely would require setting the morning off-peak time before 7:00am, and the evening off-peak time after 8:30pm, periods when parking demand at garages is relatively low, thus reducing the potential to influence the behavior of enough drivers to effectively influence congestion.

The effective discount rate at SFpark garages are as follows: drivers get discounts if they arrive between midnight and 8:30am or leave between 6:30pm and midnight. The effectiveness of these times and the discount amount will be evaluated periodically and adjusted if necessary to better achieve the SFMTA’s goals for parking and transportation management.

SFpark’s enabling legislation allows off-peak discounts between $0.50 and $2.50 per time period. At the outset of the program, off-peak discounts were set at $2.00 (or a total of $4.00 discount if a driver arrives before 7:30am and leaves after 7:00pm). This discount level may be adjusted during the pilot period to help better achieve goals.

4. SFMTA will continue to have special event pricing at garages

In SFpark garages, the SFMTA continues to administer special event rates under existing rules for setting special event rates.

5. “Early bird” entry and exit times are consistent across those garages that offer it

Several SFpark garages offer an early bird rate on weekdays, which provides a discount for entering in the morning and exiting in the evening before certain specified times. Garages that had early bird rates prior to SFpark retain them, but early bird rates were not added to additional garages. To reinforce the intent of using discounts to encourage drivers to travel at off-peak times, the rate period when the early bird rate applies is as follows: a driver must arrive at the garage before 8:50am and exit before the garage closes (or Midnight, for 24-hour garages). For each garage that offers early bird, the early bird rates are set in a range of 33 to 45 percent less than
the daily maximum rates. Drivers who qualify for both the early bird and off-peak discounts are not provided both discounts, but receive the lower of the two charges.

6. Demand-responsive pricing replaces “evening” and “overnight” rates
Several garages offered low overnight or evening flat rates, which required a driver to enter after a certain time and exit before a certain time the next morning. In those same garages under SFpark, the flat rates are eliminated, but the hourly rate at those times is lower than at peak times, achieving an effect similar to evening/overnight flat rates through time-of-day pricing. At first, evening parkers may pay more than they do under current rates, but if demand in the evenings is low, rates will continue to drop. All garages, including those that are not open 24 hours a day, charge for parking at all hours of the day.

7. Consistent “grace periods” and “lag times” to improve customer service
Parking garages typically have “grace periods” to prevent customers from being charged for an entire additional hour or half-hour if they leave the garage just a few minutes after the end of a rate period. For example, if there is no grace period, if a customer intends to park for 60 minutes to avoid paying for 90 minutes of parking and attempts to pay after 59 minutes, but waits in line for three minutes to pay and therefore appears to have parked for 62 minutes, the customer will then be charged for 90 minutes. This is a significant, if not the most prominent, source of customer complaints in SFMTA-administered garages. In SFpark garages, there is a consistent grace period of 2 minutes. As an example, if a customer parks for 1 hour and 32 minutes, that customer is charged only for parking for 1 hour and 30 minutes.

In addition, garages with self-pay systems (in which customers pay at a pay station before returning to their cars, instead of paying an attendant upon exiting the garage), customers require a certain amount of “lag time” after they have paid to get from the pay station, to their cars, and to the garage exit. Currently, all garages with self-pay systems or central cashiers have a 15-minute lag time. SFpark standardizes this practice, so that all garages offer customers a lag time of 15 minutes.

8. Demand-responsive pricing simplifies rate types
In SFpark garages, some rate types were eliminated because they are so little used and/or used in so few garages. Demand-responsive time-of-day pricing offers other opportunities to eliminate rate types and simplify the user experience while still offering similar rates. The garages in the SFpark pilot areas had 22 different rate types, which result in complex signage. Garages in SFpark pilot areas reduce the number of rate types, and reduce the number of rate types that are posted on the entry sign, in order to reduce complexity for customers and make it easier to design and update effective signage that quickly and clearly communicates rates. This makes SFpark garages more friendly and attractive.

The following table shows the rate types that have been retained, replaced or eliminated.

<table>
<thead>
<tr>
<th>Current garage parking rate types (number of garages that used the rate)</th>
<th>SFpark garage parking rate types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hourly (15)</td>
<td>Hourly</td>
</tr>
<tr>
<td>Weekend (2)</td>
<td>Weekend</td>
</tr>
<tr>
<td>Evening (8)</td>
<td>(replaced by demand-responsive hourly pricing)</td>
</tr>
<tr>
<td>Overnight (2)</td>
<td>(replaced by demand-responsive hourly pricing)</td>
</tr>
<tr>
<td>Sunday (2)</td>
<td>Sunday</td>
</tr>
<tr>
<td>Early bird (6)</td>
<td>Early bird and Off-peak discount (for hourly parkers)</td>
</tr>
<tr>
<td>12-hour max (1)</td>
<td>Eliminated</td>
</tr>
<tr>
<td>Max up to 5pm (1)</td>
<td>Eliminated</td>
</tr>
<tr>
<td>24-hour max (15)</td>
<td>Daily maximum</td>
</tr>
<tr>
<td>Junior (1)</td>
<td>Retained but not advertised</td>
</tr>
<tr>
<td>Student (1)</td>
<td>Retained but not advertised</td>
</tr>
<tr>
<td>Monthly (15)</td>
<td>Monthly</td>
</tr>
<tr>
<td>Monthly reserved (15)</td>
<td>Monthly reserved</td>
</tr>
<tr>
<td>Monthly M-F daytime (6)</td>
<td>Retained but not advertised</td>
</tr>
<tr>
<td>Monthly evening (6)</td>
<td>Retained but not advertised</td>
</tr>
<tr>
<td>Monthly carpool/carshare (13)</td>
<td>Monthly carpool/carshare</td>
</tr>
<tr>
<td>Monthly resident (1)</td>
<td>Retained but not advertised</td>
</tr>
<tr>
<td>Daily motorcycle (9)</td>
<td>Daily motorcycle</td>
</tr>
<tr>
<td>Monthly motorcycle (11)</td>
<td>Monthly motorcycle</td>
</tr>
<tr>
<td>Validation (7)</td>
<td>Validation</td>
</tr>
<tr>
<td>Park &amp; Rides validation (1)</td>
<td>Retained but not advertised</td>
</tr>
</tbody>
</table>

Daily rates that are “retained but not advertised” kept their existing prices. Any monthly rates are priced using their approximate current ratios to regular monthly parking rates.

1. During the course of the SFpark pilot, the early bird rate range was updated from 33 percent less than the daily maximum rate to a range of as 33 percent to 45 percent less than the daily maximum rate. This provided more flexibility to garages that relied heavily on early bird parking for usage and revenues.
Examples of hourly charges
In SFpark garages, different hourly rates are charged for different time frames during the day. If a driver enters the garage during one time frame but exits during another, he is charged at one hourly rate for the time parked during the first time frame and a different hourly rate for the time parked during the second time frame (subject to the technical limitations discussed above). The total charge is then rounded down to the nearest quarter to reduce coin handling at garages; thus, a driver whose park time would yield a charge of $16.37 is charged $16.25.

The graphic below illustrates this approach to pricing and how it affects the customer.

Daily maximum and monthly rates
In SFpark garages, daily maximum, monthly, monthly area reserved (in which a certain area of the garage is set aside for monthly parkers) and monthly reserved (in which customers are guaranteed a spot in the garage) rates are based on a formula in relation to the hourly parking rates. This allows daily and monthly parking rates to fluctuate based on demand along with hourly rates.

Under past garage pricing plans, the 24-hour maximum rates averaged 8.6 times the hourly rates charged by the garages; in other words, the 24-hour maximum rates averaged 36 percent of what a customer would have been charged to park her car for 24 hours at the regular hourly rate. Monthly rates were, on average, 10.6 times the 24-hour max rates, or 35 percent of the amount a driver would have been charged to park at the daily maximum rate for 30 days. Monthly reserved rates at the garages were, on average, 50 percent more than regular monthly rates.

To calculate daily maximum and monthly rates, the SFMTA uses a multiplier between 8 and 14 times the average hourly rate. The average hourly rate is calculated using the average of hourly rates charged between 9am and 6pm on weekdays. This multiplier range closely matches past average ratios, and provides the SFMTA with flexibility in responding to market conditions. This approach to setting daily and monthly rates is intended to be a transparent and easy to understand method for setting daily and monthly rates:

- Daily maximum: The maximum daily rate (which is also the lost ticket rate) is 8 to 14 times the average hourly rate. This is approximately a 60 percent discount from the amount a driver would be charged if he were required to pay for 24 hours of parking.
- Monthly rates: The monthly rate is 8 to 14 times the daily maximum rate, which is approximately a 67 percent discount from the amount a driver would be charged if he were required to pay the daily maximum rate for 30 days.
- Monthly area reserved rates: Approximately a 10 percent surcharge above the monthly rate.
- Monthly carpool/carshare rates: 50 percent of the monthly rate.

### Sample garage rates

<table>
<thead>
<tr>
<th>Time of day</th>
<th>Hourly rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midnight-9am</td>
<td>$2.50</td>
</tr>
<tr>
<td>9am-Noon</td>
<td>$3.00</td>
</tr>
<tr>
<td>Noon-3pm</td>
<td>$3.00</td>
</tr>
<tr>
<td>3pm-6pm</td>
<td>$2.50</td>
</tr>
<tr>
<td>6pm-Midnight</td>
<td>$2.50</td>
</tr>
</tbody>
</table>

### Receipt mockups using sample rates

**1. Driver parks from 9:00am to 5:00pm**

![Receipt mockup for parking from 9:00am to 5:00pm]

- **Hours parked**: 9:00am (entry) – Noon
  - **Price per hour**: $3.00
  - **Hours charged**: 3
  - **Total charge**: $9.00
- **Hours parked**: Noon – 3:00pm
  - **Price per hour**: $3.00
  - **Hours charged**: 3
  - **Total charge**: $9.00
- **Hours parked**: 3:00pm – 5:00pm (exit)
  - **Price per hour**: $2.50
  - **Hours charged**: 2
  - **Total charge**: $5.00

**Total charge**: $23.00

**You pay**: $23.00

**2. Driver parks from 8:33am to 9:40am**

![Receipt mockup for parking from 8:33am to 9:40am]

- **Hours parked**: 8:33am (entry) – 9:23am (exit)
  - **Price per hour**: $2.50
  - **Hours charged**: 1
  - **Total charge**: $2.50

**Total charge**: $2.50

**You pay**: $2.50

**3. Driver parks from 2:32pm to 8:17pm**

![Receipt mockup for parking from 2:32pm to 8:17pm]

- **Hours parked**: 2:32pm (entry) – 3:32pm
  - **Price per hour**: $3.00
  - **Hours charged**: 1
  - **Total charge**: $3.00
- **Hours parked**: 3:32pm – 6:32pm
  - **Price per hour**: $2.50
  - **Hours charged**: 3
  - **Total charge**: $7.50
- **Hours parked**: 6:32pm – 8:17pm (exit)
  - **Price per hour**: $2.50
  - **Hours charged**: 2
  - **Total charge**: $5.00

**Off-peak discount**: - $2.00

**Total charge**: $13.50

**You pay**: $13.50
Other important notes about daily and monthly rates:

- Daily maximum rates are rounded to the nearest dollar (rates ending in $0.49 or lower rounded down, rates ending in $0.50 or higher rounded up), while all monthly rates are rounded to the nearest $5 (rates ending in $2.49 or lower rounded down, rates ending in $2.50 or higher rounded up).
- Drivers who pay monthly rates at the garages tend to be repeat customers who are likely to expect consistency in those rates. The SFpark pricing formula provides such consistency by making monthly rates approximately 100 times hourly rates (8 to 14 x average hourly rate = daily maximum, 8 to 14 x daily maximum = monthly rate). Multipliers were adjusted during the program to better achieve parking and transportation goals.

Motorcycle rates
In SFpark garages, motorcycles are charged a flat daily rate that is between a 67 percent and 80 percent discount off the daily maximum rate charged to cars. The rationale for offering this discount is that, in garages, one car space can accommodate three to five motorcycles. This is also consistent with the current average discounts for motorcycles. The actual charges to motorcycles are rounded to the nearest dollar to reduce coin handling. The monthly rates for motorcycles are set as follows: motorcycle daily flat rate times a multiplier between 9 and 13 equals the monthly motorcycle rate.

Off-street metered lots

This section summarizes how the SFMTA uses occupancy data to make demand-responsive rate adjustments at parking meters in SFMTA parking lots.

The off-street metered lots are managed similarly to the on-street metered spaces. They offer demand-responsive rates according to similar occupancy goals and time bands for pricing.

Off-street metered lots may operate for longer hours than nearby on-street meters. In these cases, additional time bands are added.

On blocks that offer both on-street and off-street metered spaces, the off-street meter occupancy levels are evaluated separately from the on-street spaces for all time bands. Rate changes occur in coordination with on-street rate changes.

Download full document at:
SFpark.org/docs_offstreetgarages

Download full document at:
SFpark.org/docs_offstreetlots
Other parking management policies

Accessible parking, residential parking, and on-street car share

There are many pieces to the parking management puzzle that work together to meet a city’s goals. The SFMTA has addressed three primary areas over the last several years: disability parking placard policies and improving residential parking management can help open up parking spaces for those who need them, while utilizing on-street spaces for car share can reduce parking demand.

Accessible parking

The Accessible Parking Policy Advisory Committee reviewed and made recommendations regarding on-street accessible parking policies, including those governing disabled placards and blue zones. This section excerpts the Accessible Parking Policy Advisory Committee’s recommendations report.

On a daily basis, people with disabilities have trouble finding parking in San Francisco, making it more difficult to access their destinations. Current disabled parking placard and blue zone policies are failing to increase access for people with disabilities, reducing parking availability for all drivers. San Francisco’s Accessible Parking Policy Advisory Committee worked together to find a better solution.

In October 2012, the SFMTA worked with the Mayor’s Office on Disability to gather 16 stakeholders representing business, regional Committee members were disability rights advocates, and medical voices. For six months, they joined by others representing business, regional

Committee on Disability to gather 16 stakeholders who would find a better solution.

Parking Policy Advisory Committee worked together to meet a city’s goals. The SFMTA has addressed three primary areas over the last several years: disability parking placard policies and improving residential parking management can help open up parking spaces for those who need them, while utilizing on-street spaces for car share can reduce parking demand.

The Accessible Parking Policy Advisory Committee identified an interconnected program of policy recommendations to increase access to street parking and reduce disabled parking placard misuse. After researching best practices from cities across the country, analyzing San Francisco’s needs, and weighing many options, the Committee came to a broad consensus on the following independent state (CA) and local (SF) policy changes to achieve these goals.

1. Increase blue zones

To reserve more parking spaces for people with disabilities, 4 percent of metered parking spaces should be blue zones. This 70 percent increase would require the SFMTA to install at least 470 new zones. The Mayor’s Office on Disability should reevaluate San Francisco’s blue zone placement guidelines to enable zones in more locations. (SF)

2. Improve enforcement of placard misuse

The SFMTA should develop disabled parking placard enforcement improvements. This could include increasing the number of parking control officers that enforce placards, increasing stings, and other options. (SF) The DMV should make placard holder photos available to parking control officers. (CA)

3. Increase oversight of placard approval

The DMV should upgrade its database to include information about the medical providers who certify placards, and should take steps to ensure that the providers are legitimate. The existing DMV placard application eligibility criteria should be clarified to ensure that placards are issued to people with a functional need for them. (CA)

4. Allow communities to remove the meter payment exemption

Based on experiences in other cities, requiring everyone to pay at the meter is the most effective way to reduce placard misuse and open up parking spaces. In Philadelphia, downtown parking availability increased by over 500 percent when placard holders started paying at the meter. The Committee recommends that this policy should only be allowed as an option in jurisdictions that offer accessible payment options. (CA)

5. Direct revenue to accessibility improvements

The SFMTA should work with the disability community to channel funds from metered blue zones into accessibility improvements that would enhance mobility for people with disabilities. (SF)

6. Allow communities to establish reasonable time limits

In order to help open up parking spaces, placard holders should have four-hour time limits at regular and blue meters, unless the posted time limit is longer. Placard holders should be able stay up to 30 minutes at green short-term loading zones, not including time spent getting in and out of the vehicle. Paid for by qualifying merchants, green zones are intended to support local business and reduce double-parking. At the state level, communities would have the option of establishing time limits for placard holders, but no shorter than four hours at general spaces and no shorter than 30 minutes in green zones. (CA)

In November 10 resolution of support for the above six recommendations, the SFMTA Board of Directors directed staff to develop a discount program for low income people with disabled parking placards, should state law changes move forward allowing communities to remove the meter payment exemption. This additional requirement is in direct response to public feedback that low income people with disabilities who travel by private vehicle may be negatively impacted by the shift from free parking to meter payment.

The Accessible Parking Policy Advisory Committee recommendations report contains details about the committee’s members, process, research, recommendations, outreach, and next steps. For more information, see SFMTA.com/accessibleparking.

Download the full report at: SFpark.org/docsAccessibleParkingReport

Other accessible parking documents

Accessible parking video

This video shows the difficulties faced by people with disabilities in accessing parking, and profiles several of the Accessible Parking Policy Advisory Committee members.

View the video at: http://youtu.be/FOW_U1li0AU

Accessible parking policies and practices in other jurisdictions

This document examines existing accessible parking management practices in twelve jurisdictions outside of San Francisco. It summarizes their strategies for disabled parking placard issuance, meter payment, time limits, enforcement of placard misuse, public education, and administration.

Download the full document at: SFpark.org/docsOtherJurisdictions

Interviews with advocates and city staff in other jurisdictions

A summary of interviews with advocates and city staff in Philadelphia, Arlington, New York, Detroit, and Phoenix.

Download the full document at: SFpark.org/docs_interviews
Accessibility parking policy options evaluation

The Accessible Parking Policy Advisory Committee identified 19 potential policies and practices that they felt were worthy of further evaluation. This document contains an analysis of each idea according to the Committee’s agreed-upon effectiveness and feasibility criteria. Sections include: blue zones, disabled placard issuance, time limits, meter payment, and enforcement.

Download the full document at: SFpark.org/docs_policyoptions

Residential parking

Improving residential parking management could reduce circling and double-parking even more significantly than improvements to metered parking management. Only 9.6 percent of San Francisco’s on-street parking spaces are metered, and it is often harder to find parking in residential areas than metered commercial areas.

As in some cities, San Francisco uses a residential parking permit (RPP) program which sets time limits for non-resident parkers to discourage commuters from parking in residential neighborhoods. Established in 1976, San Francisco’s RPP program helps to address daytime commuter parking issues but it can still be hard to find a parking space in some areas during peak times. There are several reasons why:

- Parking demand, whether from residents or visitors, can exceed the finite supply of parking spaces, especially near commercial areas or in high-density residential areas.
- Peak parking demand may be in the evenings and/or weekends, when RPP restrictions are rarely in effect.
- Non-residents may overstay.
- Parking time limits is more resource intensive than other approaches, making it more difficult to enforce RPP time limits adequately.
- Some residents choose to store their cars on-street rather than in their garages.
- Many residential areas co-exist with commercial business areas, creating potential conflict between parking for residential and business purposes.

This mismatch between supply and demand for parking in some residential areas has consequences for residents, visitors, and businesses, which include:

- Driver frustration. Searching for parking can be time consuming, frustrating, and degrade quality of life.
- Drivers circle for parking. Circling to search for parking wastes fuel and creates unnecessary traffic congestion, noise, air pollution, and greenhouse gas emissions, as well as more opportunities for collisions.
- Drivers park illegally. Some drivers choose to park illegally if they cannot quickly find an open space close to their destination. Illegally-parked cars may block fire hydrants, bike lanes, driveways, or sidewalks, creating quality of life, safety, and accessibility issues.
- Less density. Some residents oppose new development and greater density in their neighborhood because they think it will increase demand for the limited supply of on-street parking spaces, even if the development may be otherwise beneficial for the neighborhood and the city.

The SFMTA was awarded federal funding to investigate better methods for managing residential parking. The SFMTA will explore how it could evolve or change existing practices in San Francisco, doing work that will inform similar policy development in other cities.

On-street car share

Car sharing helps the SFMTA achieve its goals for managing parking and the overall transportation system in San Francisco. This section reviews the SFMTA’s pilot programs dedicating on-street space to car sharing.

Car sharing helps cities achieve goals by reducing car ownership rates, parking demand, vehicle miles travelled, and greenhouse gas emissions, all while maintaining or improving mobility and access for people living and working in the city. So facilitating car sharing is an urgent issue for parking and transportation management.

Car share organizations report that one of their main constraints for expanding car sharing is the difficulty of acquiring parking spaces for car share vehicles. They typically rely on one-off leases with parking lots or garages, which often are not located in all parts of the city. Using on-street parking spaces as car sharing pods (i.e., where users pick up and drop off car sharing vehicles) can encourage car sharing by increasing its visibility, improving proximity to trip origins, and increasing the number of vehicles available. On-street spaces are also uniformly distributed throughout the city so car sharing organizations can expand in areas where they see the most opportunity for growth. As managers of over a quarter million on-street public parking spaces, the SFMTA is in a position to utilize on-street parking space to facilitate and extend car sharing in San Francisco in support of the city’s and the agency’s goals.

Small-scale share pilot evaluation

In late 2011, the SFMTA implemented a pilot of on-street car sharing spaces under an agreement between the City Administrator’s Office and City CarShare. Twelve test spaces were implemented in late 2011 through early 2012. Evaluation of the initial pilot after six months of operation showed that on-street car sharing spaces are technically feasible in San Francisco, and they can be quickly become well-utilized and productive. But converting parking spaces from general parking to dedicated car share is challenging, and community outreach and political support are needed for proposed car-share spaces to be approved. Commercial areas offer high visibility and accessibility, but may present enforcement challenges; enforcement and construction closures were operational issues calling for further refinement and coordination.

Large-scale pilot policy and program

In July 2013 the SFMTA adopted a formal policy to facilitate car sharing in its off-street parking lots and garages, as well as approve an enlarged two-year pilot of on-street car share spaces to build upon lessons learned from the initial small-scale pilot. The enlarged pilot program will make as many as 900 on-street parking spaces available across all districts of the city for use by car share organizations over the two years of the pilot. Participation in the on-street car share pilot is open to qualified car share organizations (as defined in the San Francisco Transportation Code) who commit to further requirements for outreach, data collection, pod placement, and vehicle availability.

Download the full document at: SFpark.org/docs_carshareevaluation

Download the full document at: SFpark.org/docs_carsharepolicy
Implementing the SFpark pilot project broke new ground technologically. As a result, project teams had to overcome unforeseen technological limitations of new and existing equipment, complicating the project’s administrative oversight. The project’s accelerated schedule also challenged municipal procurement, contracting, reimbursement, budgeting, hiring, and approval processes.
Implementation approach

To buy or to build?

For the SFpark pilot project, the SFMTA had an ambitious vision for a relatively complex parking management approach and the system that makes it possible. To implement that vision, the SFMTA chose a particular path for project contracting and administration. Regardless of the contracting approach, a project with this degree of policy and technological complexity requires extensive administrative effort and expertise.

SFpark contracting approach

The SFMTA had several broad options for contracting when considering how to accomplish the SFpark pilot project. At one end of the spectrum, the SFMTA could have attempted to develop and manage the program entirely in-house, developing everything for the project with its own staff, such as using open source tools to build all of its own data acquisition and business intelligence tools, and implement the program entirely without contracted services or goods. At the other end of the spectrum, the SFMTA could have chosen to deliver the entire program through a turnkey approach, hiring a prime contractor to develop and manage the entire program.

The SFMTA used elements of both approaches, contracting some services but maintaining control of day-to-day management and design, in a way that fit the SFMTA’s needs and capacity. Reasons for that decision include a desire to deliver the project expeditiously while cultivating and deepening the skills of SFMTA staff as well as its organizational capacity.

Building internal staff capacity

1. Developing some portions of the pilot project technology in-house was an opportunity to build SFMTA staff capacity and expertise for both technology and contract development and management.
2. Being heavily involved with the hands-on, day-to-day contract specification, procurement, and subcontract management process was a way to deepen the SFMTA’s familiarity with various aspects of the SFpark pilot technology.
3. Playing a strong role in contract and subcontract management was another opportunity to increase SFMTA staff capacity in a way that would have been minimal in a turnkey solution.
4. The SFMTA contracted out some key portions of the project. For example, the SFMTA wanted to employ known and proven experts for sophisticated IT development to plan and develop a data warehouse and business intelligence tool—the SFMTA did not have that skill set in-house. The SFpark development process has been an opportunity to increase the SFMTA’s overall information technology sophistication and begin to apply those lessons to other parts of our agency and operations.

Building internal organizational capacity

1. The SFMTA chose to develop a data management platform of its own so that the SFMTA, rather than a vendor, would own and manage that platform. By creating this agnostic system, the SFMTA can now simply add or remove components such as parking meters, parking sensors, or other data sources.
2. Developing this system was a major organizational challenge, but it also enhanced the SFMTA’s knowledge and ability to manage parking and the overall transportation system in the future.

Buying versus building

1. The SFMTA chose to purchase software tools rather than develop its own. While open source software tools were considered, extensive software development is not one of the SFMTA’s core competencies, especially for data acquisition tools.
2. Understanding and interpreting parking and transportation data is a core part of the SFMTA’s business. There was no off-the-shelf tool available to integrate multiple parking-related feeds (e.g., meter, sensor, pay by phone, and garage) from multiple vendors, so the SFMTA chose to develop those tools in-house by modifying existing software.
3. This more complex system was required to support the rigorous evaluation of the SFpark pilot projects. This amount of data processing may not be necessary for other cities that pursue more operationally-oriented systems.
4. Whether buying or building, it is critical that all choices are consistent with the current technical standards as well as future strategic direction of your organization’s IT group.
Ch. 3: Administration & contract management

Project staffing
The right people for a complex project

The SFMTA needed people with the right abilities and skills to both develop and implement the project and to maintain and operate it in the long term.

Roles and responsibilities

Because of SFpark’s complexity, implementing the pilot project required a larger and deeper variety of roles and skills than anticipated. For example, the effort required to plug all data sources into the data warehouse far exceeded our expectations.

Roles required to implement the SFpark pilot project
- Executive director and advocate
- Program manager
- Project manager
- Parking sensor project manager
- Roadway sensor project manager
- Parking meter project manager
- Parking garage operations manager
- Parking garage implementation manager
- Pilot project evaluation manager
- IT system development manager
- Database administrator
- Business intelligence development manager
- Systems developer
- Procurement manager
- Parking policy analyst
- Ongoing rate adjustments analyst
- Administration and support
- Accounting and billing
- Grants accounting
- Data collection lead
- Project evaluation lead
- Customer service lead

Key skills that were required in the SFpark team
- Project management
- RFP and contract development, procurement
- Vendor management, multivendor integration
- Geographic Information Systems (GIS) map development and data management
- Survey design, data collection
- Performance measurement and evaluation
- Information technology expertise: design and implementation of service-oriented architecture (SOA), knowledge of IT best practices
- Transportation planning and policy research and development
- Communications, marketing
- Knowledge of local government structure, neighborhood and merchant organizations
- Public speaking
- Writing, editing
- Business data modeling
- Business process engineering
- Requirements gathering
- Conflict resolution
- Phased implementation planning expertise
- Smartphone testing
- Screen design, user interface design

Contracts
Procuring necessary goods and services

Implementing the SFpark pilot project required contracts with a variety of vendors as well as working with these vendors to confront project challenges together. In addition to this spirit of partnership, the project’s new technology, variety of vendors, and aggressive schedule required intense contract management and oversight.

Contract management considerations

During procurement
- Clearly specify the deliverables and performance standards (ideally with financial incentives to achieve targeted performance), including the methodology for measuring them, in RFPs and contracts.
- Do not limit yourself with unnecessarily specific statements of work. Focus on the business deliverable rather than a specific technology implementation, as the technology will change.
- Relate payment to performance for both upfront and ongoing deliverables.
- Relate payment to delivery of functionality and not delivery of equipment.
- Rigorously field test and verify all vendor claims and performance in real-world tests during the formal acceptance of the goods or services.
- Require that all backup and redundancy/high-availability features be demonstrated as part of the acceptance process.
- Put in place data management and reporting to make it easy to manage performance-based contracts.

During contract management and delivery
- Include contingency that is adequate and appropriate for a new undertaking in a complex area.
- Always have “plan B and C” strategies.
- Rigorously field test and verify all vendor claims and performance in real-world tests during the formal acceptance of the goods or services.
- Require that all backup and redundancy/high-availability features be demonstrated as part of the acceptance process.
- Put in place data management and reporting to make it easy to manage performance-based contracts.
Funding and finance
How much did SFpark cost, and how will it save time and money for other cities?

The SFpark pilot project was a federally-funded demonstration of a different approach to managing parking. The intent was for the SFpark experience to show other cities what was possible, and to enable them to learn from and improve upon the San Francisco experience.

Costs of SFpark

SFpark was funded primarily through a $19,800,000 grant from the United States Department of Transportation, a $22,000,000 loan from the Bay Area's Metropolitan Transportation Commission, and local matching funds totaling $4,850,000.

<table>
<thead>
<tr>
<th>SFpark program costs</th>
<th>Through March 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automated data feeds, storage and analysis</td>
<td>$12,547,000</td>
</tr>
<tr>
<td>Staffing and project management</td>
<td>$11,666,000</td>
</tr>
<tr>
<td>Parking meters</td>
<td>$7,178,000</td>
</tr>
<tr>
<td>Parking sensors</td>
<td>$6,761,000</td>
</tr>
<tr>
<td>Marketing and communications</td>
<td>$3,947,000</td>
</tr>
<tr>
<td>Variable message parking signs</td>
<td>$3,507,000</td>
</tr>
<tr>
<td>Manual data collection and analysis</td>
<td>$1,055,000</td>
</tr>
<tr>
<td>Roadway sensors</td>
<td>$562,000</td>
</tr>
<tr>
<td>Parking garages</td>
<td>$417,000</td>
</tr>
<tr>
<td>Total</td>
<td>$46,236,000</td>
</tr>
</tbody>
</table>

Automated data feeds, storage, and analysis

Providing real-time data and making data-driven decisions about parking management required the collection, storage, and analysis of large amounts of data. To make this possible, the SFMTA purchased new hardware and software to store data, and the SFpark technical team used that software to develop a somewhat custom data management system that forms the basis of SFpark operations. This system receives data (both real-time and more static updates), processes and organizes stores that data, and provides real-time data feeds.

That system also contains powerful analytical and reporting tools that enable a rigorous evaluation of the pilot. Much more importantly, however, these tools allow SFpark analysts to operate the project (e.g., calculate demand-responsive rate changes), manage performance-based contracts, monitor the parking system, do ad hoc analyses to support SFMTA, and operate the SFpark's parking system (e.g., maintaining a record of all meter configurations, which is the basis for many SFMTA business processes). With this system in place, analyses that once took months (or were impossible) can take seconds or minutes to complete, so SFMTA can now use data to make much more informed decisions and better manage transportation. In this sense, SFpark is a powerful example of what the term "smart cities" can mean. This system was also designed to be readily expandable to support the same kind of data-intensive approach for other aspects of the transportation system so that SFMTA can make more data-driven decisions for things like public transit.

The technical team’s consulting services included several essential tasks, including:

- Integration of data feeds from sensors, meters, roadway sensors, and garages
- Service and support for data feeds, including troubleshooting during the launch and operation of SFpark
- Creation of complete inventory of meter data (including, among other things, rates, type, manufacturer, schedule, and installation date) for tens of thousands of parking spaces
- Pilot project evaluation support
- Support in developing reports and analytical tools for contract management and operations
- Addressing repeated technical issues with meters and sensors

Automated data feeds, storage, and analysis

Business intelligence training

Training for analysts on how to use the Oracle business intelligence analytical and reporting software

Developer staff time

BI development; integration of data feeds from sensors, meters, roadway sensors and garages; service and support for data feeds; creation of parking space inventory; pilot project evaluation support; address technical issues with meters and sensors

Hardware (servers and storage)

Servers and storage area network (SAN) for SFpark data storage

Software licenses

License to use Oracle data management and analytical software

The technical aspect of the project was more costly than expected, but it was an investment that the SFMTA can leverage going forward to better manage transportation. Also, as a federally-funded demonstration, federal funding largely paid for the development of a first-of-its-kind and award-winning data management system, proving what is possible in other cities. As other cities move in this direction, the SFpark experience should help to shorten their timelines and lower their costs.

- Meter and sensor technology has improved, resolving many data quality and data transfer issues that cost SFpark considerable time and money. Much of the SFpark technical team’s time was spent helping to resolve issues with vendor’s equipment as we worked together to launch this first-of-its-kind project. For example, the SFpark team wrote specifications for how the meter, sensor, and garage-data vendors would send data in a way that would meet the needs of the project. These specifications are likely to be adopted (or minimally inform) as industry standards going forward, saving vendors and cities significant resources in the future.
- Integrating data from the first sensor vendor, Streetline, cost approximately $300,000 of the technical team’s time (and delayed the project launch by many months). Streetline and their sensors were later replaced by StreetSmart because Streetline...
Parking equipment, materials, and service

SFpark was a first-of-its-kind program that used the cutting edge in parking technology. In many cases, SFpark’s requirements pushed the limits of the capabilities of that technology, and required intensive testing and ruggedization by the SFpark team.

<table>
<thead>
<tr>
<th>Parking meters</th>
<th>$7,178,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit card fees</td>
<td>$32,000</td>
</tr>
<tr>
<td>SFpark-paid transaction fees for credit card payments at parking meters in pilot areas</td>
<td></td>
</tr>
<tr>
<td>Enforcement officer vehicles</td>
<td>$476,000</td>
</tr>
<tr>
<td>New enforcement vehicles to enforce parking violations in pilot areas</td>
<td></td>
</tr>
<tr>
<td>Installation materials</td>
<td>$138,000</td>
</tr>
<tr>
<td>Acquire materials necessary for parking meter and sign installation</td>
<td></td>
</tr>
<tr>
<td>Production, installation, and data management</td>
<td>$6,532,000</td>
</tr>
<tr>
<td>Production of approximately 6,500 parking meters and their ongoing data management and communications costs</td>
<td></td>
</tr>
<tr>
<td>Parking sensors</td>
<td>$5,761,000</td>
</tr>
<tr>
<td>Production, installation, and maintenance</td>
<td>$5,664,000</td>
</tr>
<tr>
<td>Production, installation, and maintenance of parking sensors for approximately 8,100 parking spaces in SF streets</td>
<td></td>
</tr>
<tr>
<td>Testing</td>
<td>$97,000</td>
</tr>
<tr>
<td>Testing efficacy of parking sensors</td>
<td></td>
</tr>
</tbody>
</table>

Roadway sensors

<table>
<thead>
<tr>
<th>$562,000</th>
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<tbody>
<tr>
<td>$303,000</td>
</tr>
<tr>
<td>$259,000</td>
</tr>
<tr>
<td>$110,000</td>
</tr>
<tr>
<td>$276,00</td>
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</table>

Pricing at garages

<table>
<thead>
<tr>
<th>$417,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>$53,000</td>
</tr>
<tr>
<td>$26,000</td>
</tr>
<tr>
<td>$21,000</td>
</tr>
<tr>
<td>$31,000</td>
</tr>
</tbody>
</table>

Testing and ruggedization by the SFpark technical team acted as the de-facto integrator of meter vendor technology. Where a city has only one meter vendor, this integration task would not be necessary.

To make it easier for other cities to pursue this approach, the SFMTA created a technical “how to” manual that complements this document and is aimed at IT managers in other cities. The intent of that document is to accelerate the schedule and reduce the cost replicating and improving on the SFpark’s work.

Download the full document at: SFpark.org/docs_techmanual

Manual data collection and analysis

SFpark’s data collection efforts included the gathering of extensive amounts of non-automated data before, during, and after the project, including:

- Manual (“intercept”) surveys of neighborhood visitors
- Double-parking
- Parking search time
- Occupancy
- Turnover

SFpark hired two firms to collect and analyze this data: Ewald Wasserman for intercept surveys and Nelson/Nygaard for other data collection and support. The costs for this data collection and analysis is as follows:

<table>
<thead>
<tr>
<th>Manual data collection and analysis</th>
<th>$1,051,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept survey data collection and analysis</td>
<td>$157,000</td>
</tr>
<tr>
<td>Manual data collection, policy support, and evaluation support</td>
<td>$894,000</td>
</tr>
</tbody>
</table>

Marketing and communications

Planning, implementing, and operating a new approach to managing parking required extensive design, communications, outreach, and marketing. The launch of the pilot project included:

- Branding as a special project under the SFMTA umbrella
- Flyer and outreach for every change to the street or to rates
- Press event at launch of program
- Ads on buses and bus shelters
- Hundreds of presentations to community and merchant groups

The SFpark app displays a map showing parking availability and prices in SFpark pilot areas. To avoid a potential patent dispute, the SFMTA purchased a license from a company, the cost of which appears below as “License to display real-time parking info.”

<table>
<thead>
<tr>
<th>Marketing and communications</th>
<th>$3,547,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration and planning</td>
<td>$283,000</td>
</tr>
<tr>
<td>Advising SFpark’s marketing and communications efforts, and website/apps/ map design</td>
<td></td>
</tr>
<tr>
<td>Advertising</td>
<td>$182,000</td>
</tr>
<tr>
<td>Design and produce advertising for SFpark</td>
<td></td>
</tr>
<tr>
<td>Communications and public relations</td>
<td>$879,000</td>
</tr>
<tr>
<td>Support communications, including press releases, public outreach, and publications</td>
<td></td>
</tr>
<tr>
<td>Garage signage/painting, marketing, and upgrades</td>
<td>$548,000</td>
</tr>
<tr>
<td>Assist with marketing strategy and design, produce signage and marketing materials for SFpark garages</td>
<td></td>
</tr>
<tr>
<td>License to display real-time parking info</td>
<td>$212,000</td>
</tr>
<tr>
<td>Obtain license from holder of patent regarding display of parking information</td>
<td></td>
</tr>
<tr>
<td>Mapping for SFpark</td>
<td>$53,000</td>
</tr>
<tr>
<td>Develop map API for SFpark.org</td>
<td></td>
</tr>
<tr>
<td>Printed materials and signage</td>
<td>$583,000</td>
</tr>
<tr>
<td>Print advertisements, posters, communications signage, and other publications</td>
<td></td>
</tr>
<tr>
<td>Support and on-call assistance</td>
<td>$26,000</td>
</tr>
<tr>
<td>Provide support to SFpark project team with all aspects of marketing and communications</td>
<td></td>
</tr>
<tr>
<td>Text message service for garage parking availability</td>
<td>$21,000</td>
</tr>
<tr>
<td>Implement text message service showing parking garage availability and pricing</td>
<td></td>
</tr>
<tr>
<td>User experience, apps and maps</td>
<td>$760,000</td>
</tr>
<tr>
<td>Design all aspects of SFpark customer experience, including apps, maps, signage</td>
<td></td>
</tr>
</tbody>
</table>
Staffing and project management
SFpark required the dedicated work of a core project team over the course of seven years, from initial grant applications and planning to data analysis and evaluation, and also required the contribution of dozens of other SFMTA staff members.

The costs summarized below include work billed to the SFpark program by SFMTA employees—work directly linked to the planning and implementation of the program, such as meter installation, rate adjustments, policy drafting, etc. This does not account for the relatively minor indirect costs included in SFMTA’s administrative overhead, such as accounting duties and oversight by the SFMTA’s executive team.

<table>
<thead>
<tr>
<th>Staffing and project management</th>
<th>$11,666,000</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Administrative</strong></td>
<td>$357,000</td>
</tr>
<tr>
<td>Provide administrative and executive support for project implementation</td>
<td></td>
</tr>
<tr>
<td><strong>Meter Shop</strong></td>
<td>$1,908,000</td>
</tr>
<tr>
<td>Install and maintain all SFpark meters</td>
<td></td>
</tr>
<tr>
<td><strong>Off-Street Parking Division</strong></td>
<td>$50,000</td>
</tr>
<tr>
<td>Consult on policy drafting, provide support for project implementation</td>
<td></td>
</tr>
<tr>
<td><strong>Project team</strong></td>
<td>$2,386,000</td>
</tr>
<tr>
<td>Plan and implement SFpark program</td>
<td></td>
</tr>
<tr>
<td><strong>Contracted project staff, technical analysts, and interns</strong></td>
<td>$6,701,000</td>
</tr>
<tr>
<td>Project planning and implementation, policy and IT development, equipment testing, subcontract management and administration, and evaluation</td>
<td></td>
</tr>
<tr>
<td><strong>Sign and Paint Shops</strong></td>
<td>$174,000</td>
</tr>
<tr>
<td>Consult on changes to streets and signage, provide support for project implementation</td>
<td></td>
</tr>
<tr>
<td><strong>Traffic Engineering</strong></td>
<td>$21,000</td>
</tr>
<tr>
<td>Test new enforcement strategies, provide support for project implementation</td>
<td></td>
</tr>
<tr>
<td><strong>Miscellaneous printing and materials</strong></td>
<td>$69,000</td>
</tr>
<tr>
<td>Printing and materials necessary for day-to-day functions of project implementation</td>
<td></td>
</tr>
</tbody>
</table>

Cost savings and incremental costs
SFpark’s use of advanced parking technology resulted in some cost savings of costs incurred for parking management before the program. In particular:

- **Payment at meters by credit card reduces the cost of collecting coins at meters.** This is calculated using a per-year estimate of reduced coin-collection costs from the coin-collection vendor, multiplied by the number of SFpark meters and the length of time those meters were in operation.
- **Increased use of Pay-By-Phone, in which customers pay the credit card fees, reduced the credit card fees incurred by the SFMTA.** This is calculated as the credit card fee per transaction multiplied by the total number of Pay-By-Phone transactions, multiplied by the number SFpark meters, multiplied by the percentage of Pay-By-Phone transactions that replaced credit card transactions.

<table>
<thead>
<tr>
<th>Cost savings resulting from SFpark, or costs that would have been incurred in the absence of SFpark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced coin collection at meters</td>
</tr>
<tr>
<td>Saved credit card fees from Pay-By-Phone usage</td>
</tr>
<tr>
<td>Rate updates at garages</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

More broadly, many other cities have benefited from the federal investment in SFpark. For example:

- SFpark staff have advised other cities around the world as they considered new approaches to parking management, including New York City, Seattle, Berkeley, and Rio de Janeiro.
- SFpark staff supported the planning of Los Angeles’s ExpressPark program.
- Various cities have taken advantage of San Francisco’s specification for new parking meters that uses lessons learned from the SFpark pilot project in their Request for Proposals for new smart parking meters.

Variable message parking signs
Part of the grant money from the federal government was devoted to installing, wiring, and operating variable message signs to inform drivers of available parking at garages around the City. This involved purchasing and installing signs, running fiber-optic cable to those signs, and connecting the signs to the SFpark off-street parking availability feed.

<table>
<thead>
<tr>
<th>Variable message parking signs</th>
<th>$3,507,000</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Staffing labor</strong></td>
<td>$532,000</td>
</tr>
<tr>
<td><strong>Materials, supplies, construction</strong></td>
<td>$2,975,000</td>
</tr>
</tbody>
</table>
4. EVALUATION

The SFMTA conducted a thorough evaluation of SFpark, summarized in this chapter. As a federally-funded demonstration of a new approach to managing parking, the SFpark project collected an unprecedented data set to enable a thorough evaluation of its effectiveness.
SFMTA evaluation results
An overview of the benefits of the SFpark pilot project

The SFMTA evaluated the SFpark pilot project to see how effectively this approach to managing parking delivered the expected benefits. This section outlines what the SFMTA learned from this evaluation and provides transportation managers in other cities an overview of how parking management can help achieve their goals.

Rate change summary
Over the course of the SFpark pilot project evaluation period, the SFMTA lowered the average hourly rate at meters by 11 cents from $2.69 to $2.58 and average hourly rates at SFpark garages by 42 cents from $3.45 to $3.03.

SFpark improved parking availability
While the SFpark pilot project had many goals, its primary focus was to make it easier to find a parking space. More precisely, the goal was to increase the amount of time that there was parking available on every block and improve the utilization of garages. Besides helping drivers, making it easier to park more of the time was expected to deliver other benefits (e.g., reducing circling, double parking, greenhouse gas emissions, etc.).

Even as the economy, population, and overall parking demand grew, parking availability improved dramatically in SFpark pilot areas. The amount of time that we achieved the target parking occupancy (60 to 80 percent) increased by 31 percent in pilot areas, compared to a 6 percent increase in control areas. On blocks where people paid the meter most of the time (in high payment compliance or "HP" pilot areas) where we would expect pricing to be most effective, achievement of the 60 to 80 percent target occupancy rate nearly doubled.

Even more importantly, the amount of time that blocks were too full to find parking decreased 16 percent in pilot areas while increasing 51 percent in control areas. In other words, SFpark made it easier for drivers to quickly find parking spaces. In areas where people pay at the meter most of the time, the impacts were even more notable, with a 45 percent decrease.

The SFMTA conducted a thorough evaluation of SFpark; summarized here. The full evaluation can be downloaded at the following link.

Download the full evaluation at: SFpark.org/docs_pilotevaluation
**Secondary benefits**

This section outlines the benefits of meeting occupancy goals and making sure that there are open parking spaces.

**It is easier for drivers to find a parking space.** In SFpark pilot areas, the amount of time most people reported that it took to find a space decreased by 43 percent, compared to a 13 percent decrease in control areas.

**Greenhouse gas emissions decreased.** Drivers generated 7 metric tons of greenhouse gas emissions per day looking for parking in pilot areas. This dropped by 30 percent by 2013, compared to a decrease of 6 percent in control areas.

**Peak period congestion decreased.** SFpark encouraged people to drive at non-peak times and improved parking availability when it mattered most. On-street parking availability improved by 22 percent during peak periods, compared to 12 percent during off-peak. In SFpark garages, morning peak entries rose 1 percent while off-peak entries rose 14 percent, and evening peak exits rose 3 percent while off-peak exits rose 15 percent. This suggests that SFpark helped to reduce peak-period congestion, which makes the roads flow more smoothly for drivers and transit.

**Traffic volume decreased.** In both pilot and control areas, where parking availability improved, traffic volume decreased by approximately 8 percent, compared to a 4.5 percent increase in areas where parking availability worsened.

**Traffic speed improved.** While overall traffic speed decreased, it decreased by 3 percent in areas with improved parking availability, compared to a decrease of 6 percent in areas with worsened parking availability.

**Vehicle miles traveled decreased.** As a result of less circling, pilot areas saw a 30 percent decrease in vehicle miles traveled from 8,134 miles per day in 2011 to 5,721 miles per day by 2013. Control areas saw a 6 percent decrease.

**Daily vehicle miles traveled**

<table>
<thead>
<tr>
<th>Before vs. after</th>
<th>Pilot</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance</td>
<td>8,134 miles</td>
<td>5,721 miles</td>
</tr>
<tr>
<td>30% fewer miles traveled</td>
<td>6,834 miles</td>
<td>4,780 miles</td>
</tr>
<tr>
<td>6% decrease</td>
<td>6,834 miles</td>
<td>4,780 miles</td>
</tr>
<tr>
<td>2.5 miles</td>
<td>6,834 miles</td>
<td>4,780 miles</td>
</tr>
<tr>
<td>0% increase</td>
<td>6,834 miles</td>
<td>4,780 miles</td>
</tr>
</tbody>
</table>

**Improved availability supports economic vitality.** While available data does not allow us to confirm a causal relationship, the SFMTA assumes that improving parking availability improves customer access to commercial districts and therefore supports economic vitality.

**Safer streets because of reduced vehicle miles traveled and less distracted driving.** The SFMTA assumes that reducing circling by distracted drivers looking for parking helps to reduce collisions with pedestrians, cyclists, and other cars.
Case study: Fillmore

The Fillmore pilot district illustrates how demand-responsive pricing improved both parking availability and parking utilization. Prices decreased on blocks that were underused, which increased use, and prices increased on blocks that were too full, which tended to lower occupancy into the target range.

With each data-driven rate adjustment, SFpark followed this set of rules:

- When occupancy was 80–100 percent, the hourly rate increased by $0.25
- When occupancy was 60–80 percent, the hourly rate was not changed
- When occupancy was 30–60 percent, the hourly rate decreased by $0.25
- When occupancy was less than 30 percent, the hourly rate decreased by $0.50

In the Fillmore pilot area, the average hourly cost of metered parking increased during the pilot period from $2.00 per hour to $2.37 per hour.
About the evaluation

The SFMTA’s evaluation of the SFpark pilot project was predicated on effective study design, an unprecedented amount of data collection, careful data management, significant staff resources, and support from consultants, leading experts in the transportation and parking management fields, and a federal evaluation team.

An evaluation of this nature and magnitude has inherent limitations and challenges for the study design, data collection, and evaluation. For example, it is not possible to do purely “apples to apples” comparisons between pilot and control areas because every neighborhood is unique. The Downtown and Civic Center pilot areas have no analog that can be used for comparison or benchmarking. While the level of data collection for this project is unprecedented, that cannot overcome the fact that countless (and often immeasurable) factors affect travel behavior and parking demand. In other words, while parking pricing and information are critical factors, they were not the only variables to change in these San Francisco neighborhoods over the course of a two year pilot project.

As a result, one must use considerable sophistication, care, and judgment when evaluating this data, and use caution when trying to definitively establish causality (i.e., that SFpark was or was not responsible for a particular outcome), especially when trying to evaluate the effect of SFpark on more complex and nuanced secondary outcomes.

One of the largest confounding factors for the project evaluation is the fact that the two-year SFpark pilot began as San Francisco was emerging from the economic recession of 2008-2010. This is in addition to other possible confounding factors such as the unknown variations in the level of parking enforcement, the increase in bicycling and ride sharing, improvements to transit service, capital projects impacting San Francisco’s streets, and other changes to the built environment. This evaluation incorporates our best effort to address these challenges and accurately assess the effects of SFpark.

Additional findings: meters are effective parking management tools

Demand-responsive pricing helps to improve parking management and optimize outcomes, but the starkest improvements come from whether or not (or when) parking meters are used as parking management tools. Though not the purpose of the SFpark pilot project, one of the clearest findings of this evaluation is that parking meters are extremely effective at managing parking demand, helping to achieve parking occupancy goals, and thereby achieving other goals such as reducing circling and greenhouse gas emissions.

For example, starting to enforce meters on Sundays in January 2010 resulted in improved parking availability, parking search time, and parking turnover on Sundays. Additionally, the SFMTA introduced new meters on many blocks in 2011, resulting in improved parking availability. Prior to installing meters, parking was too full 90 percent of the time. After installing meters, this dropped to just 15 percent of the time.

Evenings provide additional evidence; parking occupancy spikes approximately 30 minutes before the SFMTA stops operating meters (typically around 6pm) making parking often hard to find in the evening in San Francisco’s commercial areas.

Payment compliance: findings and challenges

While demand-responsive pricing delivers the benefits we expected, those benefits are more pronounced when most people pay at the meter. Data from this evaluation confirmed that many blocks consistently had low payment compliance, which is when cars are parked without paying the meter.

HP blocks, or blocks with high payment compliance where at least 85 percent of occupied time was paid for, saw the biggest improvements in several indicators. This suggests that improving parking enforcement to increase compliance rates has the potential to increase the social and transportation benefits of parking management. This also highlights why it is desirable for cities to strive to ask all drivers to pay at the meter; the more drivers that are exempted from paying the meter, the less that demand-responsive parking pricing will deliver benefits.
Starting with the maxim that you can’t manage what you can’t measure, for the SFpark project the SFMTA collected comprehensive data about San Francisco’s publicly-available parking supply, both on- and off-street, including existing parking regulations. This data was critical for the planning, implementation, and evaluation of the SFpark pilot project.

### Reasons to collect a parking census

The importance of having accurate data about existing parking supply and regulations is hard to overstate. Until the supply data was assembled, the project team did not have ready access to accurate parking supply and regulation data in an electronic format. Project planning and procurements (e.g., quantities of goods purchased) were not as precise as they would have been if accurate supply data had been available at the beginning of the project.

Accurate parking data was also critical for implementing and operating SFpark. For example, final detailed implementation planning for the pilot project equipment (e.g., for installation of parking sensors and meters) could only be completed after knowing how many on-street metered parking spaces there were in each area and the regulations that govern each space. In San Francisco, as in many cities, the regulations of on- and off-street spaces are often complex. This is particularly true downtown, where over the course of a day one metered parking space might be general metered parking, then a metered commercial loading zone, then an unmetered parking space might be general metered parking, then a peak-period white passenger loading zone, and then a peak-period tow-away zone. San Francisco has hundreds of parking meter configurations. Having an accurate inventory of the regulations for each metered space was also necessary for establishing an automated database rather than manual approach to tracking, updating, and managing meter configuration data with parking meter vendors.

Gathering citywide parking supply data took over six years starting in summer 2008, with the regulatory data being continually updated and expanded since 2009. The large majority of data gathering for metered and off-street parking supply occurred from 2008 to 2009. The SFMTA finished counting legal unmetered on-street parking spaces on 100 percent of blocks in the city in spring 2014 (moving from the original 30 percent random sample).

The data collection effort surveyed all of San Francisco’s publicly-available parking supply, including on-street (metered and unmetered) and off-street publicly available (but not private) garages and lots. This effort included:

- Translating existing documents (such as the City Assessor’s parking tax records to determine the initial list of parking garages and lots) into the geographic information systems (GIS) database used to assemble the data
- Reconciling different parking-related databases within the SFMTA
- Extensive field surveys and site visits
- Entering the data into a database

The work was done primarily by interns and subcontractors (approximately 3,000 person hours) and led by SFpark team members who assembled the database with the care, passion, and dedication this type of undertaking requires.

As a result of the census, for the first time the SFMTA has detailed information about the city’s publicly available parking supply. To the best of our knowledge, no other major city has completed a city wide census of its parking supply. To maximize the benefit of this parking data, the SFMTA made it publicly available via dataset.org and SFpark.org.

Moving forward, there are several challenges related to the parking census, including:

1. **Keeping the data up to date.** The SFMTA is working to expand the data set and improve the tools and internal processes used to keep it up to date. This has highlighted the necessity and opportunity to streamline internal business processes to improve how the constant small changes to parking data, from legislation to implementation on the street, are tracked and captured in the SFpark system.

2. **Capturing temporary changes in parking supply.** Parking spaces are often closed temporarily for construction projects, parades, etc. The SFMTA is attempting to increase the percentage of those types of events that are captured in the SFpark system. This is important for providing real-time parking space availability data because ideally the data would not indicate that a particular block has many open parking spaces when in fact those spaces have been temporarily closed for a construction project. Besides improving the accuracy of the real-time data feed, capturing temporary parking space closure data allowed evaluation and analysts to be more precise.

3. **Estimating the number of private parking spaces.** The first priority for project planning and evaluation was information about the publicly available parking supply, but it will also be useful to have data on the city’s private parking supply (e.g., private residential or commercial parking). The SFpark team has developed a methodology it will use to develop an accurate estimate the private parking supply; gathering this data and making this estimate will be the next phase of the parking census effort.

Parking census data is important not just for SFpark and parking management, but also for many other current and future SFMTA and city projects and policies. These broader benefits include:

1. **Knowing the parking supply.** The SFpark project team recently produced a map of the parking supply around a proposed real estate tax当局 (RETA) corridor on Geary Boulevard. Instead of parking consultants to gather the data and produce parking supply maps on an ad hoc project-by-project basis, the SFMTA already had all parking supply data for the corridor on hand and could simply and quickly produce the maps. The SFMTA, other city agencies, and others working in San Francisco can now rapidly assess existing parking supply when planning and implementing projects.

2. **Sharing parking information.** Another benefit of having and sharing this parking data is that it can be the basis of new privately-developed web and mobile applications and other tools not yet imagined. The SFMTA and the people it serves will benefit as a result.

3. **Enabling better demand management for existing parking.** For additional demand management for existing parking beyond SFpark, accurate parking supply data helps the SFMTA and the city think more strategically about where and how to use other transportation demand management strategies and to identify where there are opportunities for shared parking.

4. **Supporting policy decisions.** Accurate data about parking supply also informs civic conversations about parking, whether decisions about where to build new parking, where to reuse some parking for other purposes, whether dedicating some on-street spaces to make room for a bicycle lane or real estate tax当局 corridor, whether dedicating some off-street spaces to make room for a bicycle lane or real estate tax当局 corridor.

5. **Enabling management of parking supply, not just demand.** Perhaps most importantly, knowing the parking supply also enables the SFMTA and the City of San Francisco to not just manage parking demand via SFpark, but also to set policies and goals related to the overall parking supply. In other words, by measuring supply, the City of San Francisco is now in a position to manage it, which is important because parking supply (and its fundamental relation to parking prices and demand) is a large determinant in how people in San Francisco and the region choose to make their trips (i.e., whether by car or transit).
San Francisco neighborhood publicly available parking supply

Parking spaces per square mile

- < 5,000
- < 10,000
- < 15,000
- < 20,000
- < 35,000

1. Neighborhood boundaries drawn to reflect similar land-use patterns. Civic Center – Downtown roughly corresponds to the C-1 parking district.
2. “Paid” is parking available on an hourly or daily basis for a price. “Permit” is parking requiring some form of permit (e.g., employee only or company vehicles only). “Free” is parking available without any cost or restrictions. “Customer” is parking available to customers only.

The full set of GIS data is available here: SFPark.org/censussdata
Download the parking census summary at: SFPark.org/docs_censussummary
Download full city-wide census map at: SFPark.org/docs_censussmap

Parking census summary: publicly available parking in San Francisco

<table>
<thead>
<tr>
<th>Location</th>
<th>On-street</th>
<th>Off-street</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Metered</td>
<td>Unmetered</td>
</tr>
<tr>
<td>Bayview – Hunters Point</td>
<td>122</td>
<td>15,500</td>
</tr>
<tr>
<td>Castro – Mission – Potrero</td>
<td>2,929</td>
<td>30,200</td>
</tr>
<tr>
<td>Central Waterfront</td>
<td>293</td>
<td>10,800</td>
</tr>
<tr>
<td>Civic Center – Downtown</td>
<td>5,244</td>
<td>1,300</td>
</tr>
<tr>
<td>Excelsior – Bernal Heights</td>
<td>1,034</td>
<td>38,200</td>
</tr>
<tr>
<td>Golden Gate Park</td>
<td>0</td>
<td>4,000</td>
</tr>
<tr>
<td>Ingleside – Park Merced</td>
<td>576</td>
<td>29,100</td>
</tr>
<tr>
<td>Marina – Pacific Heights</td>
<td>1,614</td>
<td>14,200</td>
</tr>
<tr>
<td>North Embarcadero</td>
<td>2,488</td>
<td>2,400</td>
</tr>
<tr>
<td>Presidio</td>
<td>0</td>
<td>3,500</td>
</tr>
<tr>
<td>Richmond</td>
<td>1,556</td>
<td>16,900</td>
</tr>
<tr>
<td>Russian Hill – Nob Hill</td>
<td>4,052</td>
<td>8,200</td>
</tr>
<tr>
<td>South of Market</td>
<td>2,939</td>
<td>3,000</td>
</tr>
<tr>
<td>Sunset</td>
<td>1,134</td>
<td>31,000</td>
</tr>
<tr>
<td>Twin Peaks</td>
<td>282</td>
<td>24,400</td>
</tr>
<tr>
<td>Western Addition</td>
<td>2,036</td>
<td>18,300</td>
</tr>
<tr>
<td>Total</td>
<td>26,293</td>
<td>249,700</td>
</tr>
</tbody>
</table>
Data collection plan

The data collected to evaluate the project

The SFpark project collected an unprecedented data set to evaluate the pilot, including some from never-before available data sources. This data enabled a thorough evaluation of the pilot project and should be useful for other areas of transportation research.

Data collection

The following table summarizes the key datasets collected as part of the SFpark project.

<table>
<thead>
<tr>
<th>Data type</th>
<th>Sample data sets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parking sensors</td>
<td>Parking session start/stop, sensor downtime</td>
</tr>
<tr>
<td>Motorcycle occupancy</td>
<td>Manually collected occupancy data (sensors were not used at motorcycle spaces)</td>
</tr>
<tr>
<td>Parking meters</td>
<td>Payment session/time, type, amount, meter downtime</td>
</tr>
<tr>
<td>Parking citations</td>
<td>Type, location, time, Parking Control Officer (PCO) badge number</td>
</tr>
<tr>
<td>Parking garage</td>
<td>Parking garage usage data by hour and by type of parking (hourly v. monthly)</td>
</tr>
<tr>
<td>Parking tax</td>
<td>All publicly available parking facilities in San Francisco pay a 25 percent parking tax. Parking tax receipts, aggregated to prevent identification of individual facilities, was provided by the City Assessor, to help evaluate changes in parking demand in private parking garages and lots.</td>
</tr>
<tr>
<td>Manual surveys</td>
<td>Manually collected data includes surveys of double parking, disabled placard usage, parking search time, parking occupancy in residential areas, and intercept surveys of people on street</td>
</tr>
<tr>
<td>Roadway sensors</td>
<td>Roadway sensors were installed at approximately 60 locations in the pilot and control areas. They provide traffic counts, average speed, and vehicle density.</td>
</tr>
<tr>
<td>Local public transit</td>
<td>Data from automatic passenger counters (APCs) fitted on ~30 percent of the rubber-tired fleet.</td>
</tr>
<tr>
<td>Regional travel demand</td>
<td>Besides data from the Muni system, SFMTA gathered data from the region’s highways (PEMS) and regional rail systems (BART)</td>
</tr>
<tr>
<td>Sales tax</td>
<td>Sales tax data from the City Controller.</td>
</tr>
<tr>
<td>Safety</td>
<td>Collision data from the state’s SWITIRS reporting system</td>
</tr>
<tr>
<td>Exogenous factors</td>
<td>Fuel price, CPI, unemployment, and weather data</td>
</tr>
</tbody>
</table>

Notes about the data that was collected:

- The majority of the data points are linked to a specific geography or location (e.g., a parking event, meter payment, and citation all happen at a particular point in time and space), which facilitated sophisticated analysis and mapping of the data.
- The data collected typically reflects the following hierarchy or order for space and time and is gathered and stored at least at an hourly level. Data may be aggregated geographically and/or temporally to facilitate analysis:

<table>
<thead>
<tr>
<th>Geographically</th>
<th>Temporally</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parking space</td>
<td>Hour</td>
</tr>
<tr>
<td>Block face</td>
<td>Day</td>
</tr>
<tr>
<td>Block</td>
<td>Week</td>
</tr>
<tr>
<td>Area</td>
<td>Month</td>
</tr>
<tr>
<td>District (e.g., Mission)</td>
<td>Quarter</td>
</tr>
<tr>
<td>City</td>
<td>Year</td>
</tr>
</tbody>
</table>

- To aid those using the data to evaluate the pilot project or do research, the project team developed data guides to describe the data quality and availability (i.e., how good the data is), how to understand the data, and when the data set starts in time (e.g., October 1, 2010). All data sets have issues and the SFMTA has provided a transparent assessment of their quality.
- The data is stored in a structured rather than unstructured format. This data has been normalized (in the IT, not financial, sense of the word) and organized after doing a detailed analysis of the separate data entities and their relationships. Structured data is superior because it facilitates subsequent analysis, mapping, and export to other analytical tools.

SFpark study design

The SFpark pilot project was planned to provide sound empirical data that the SFMTA, the US Department of Transportation, researchers, and other cities needed to evaluate this approach to parking management. Key aspects include:

- Use of “control” Parking Management Districts (PMD). Changes in travel behavior in two control areas were monitored so that they could be compared to changes to parking behavior in the pilot areas. Control areas had the same type and level of data collection and parking enforcement as the pilot areas, but without any changes to parking management or regulations (i.e., prices or time limits). The comparison of control and pilot areas was intended to help distinguish the impacts of SFpark from broader citywide or regional trends (e.g., changes to fuel prices).
- Pilot areas of sufficient size. Collecting data in broadly defined pilot project areas was intended to allow the evaluation to determine how parking management policies change overall parking demand and travel behavior, and to reduce the risk that parking demand shifted undetected from one part of a district to another. To help evaluate the overall effect of parking management changes, pilot and control areas had parking sensors at each metered parking space to help assess changes in parking demand in the parking shed.
- Before/after data collection. To collect sufficient “before” data, at least eight weeks of parking demand data (and typically more) was collected before significant changes were made in pilot areas for parking technology or management policies. Following this initial period of “before” data collection, data collection continued from April 2011 (the formal initiation of the pilot project) through June 2013.
- Periodic price changes. Changes to parking prices were made no more frequently than every 30 calendar days (with the exception of special event pricing). This was intended to allow drivers to absorb new price information and have the opportunity to change travel behavior, as well as to facilitate evaluation of price changes.

The plan and methodology for the manual surveys are described in the SFpark survey deployment plan, available at: SFpark.org/docs_surveydeployment
5.

PARKING TECHNOLOGY

SFpark’s real-time parking availability information and demand-responsive rate adjustments would not be possible without a suite of tools, many of which represent significant technological advances.
Parking space inventory tool
Asset management system with integrated parking data

SFpark’s integrated asset management system allows the SFMTA to track its parking inventory and quickly create analyses of parking and related attributes.

Technology overview
While the parking census provided data critical for the SFpark pilot project, the parking space inventory tool created an asset management system which was critical to the implementation and operation of SFpark.

Previously, disparate databases focused on single subjects, such as tracking assets, parking regulations, or rates and hours of operation. Creating the SFpark parking space inventory tool allowed the SFMTA to store information related to geospatial elements, asset management, operating schedules, and hourly rates (both current and historical) for the first time. This system also enabled the SFMTA to incorporate real-time data from parking sensor and smart meters, make frequent and large-scale changes to rates and operating configurations, and conduct in-depth analysis of all these aspects.

Since its implementation in 2010, the parking space inventory has become critical for both operations and analysis. Its functionality includes:

- Maintaining an inventory of all attributes related to a metered parking space, including unique space IDs, parking meter vendor and model, geographic location, hours of operation, regulations, and rates.
- Keeping track of who makes changes to these attributes and when.
- Associating sensor, meter, and citation data to the correct parking space and enabling advanced analytics of all parking data.
- Managing the rate adjustment process, communicating new rates and configurations to meters without sending field staff to update every meter, and reconciling multiple databases to ensure the proper rates are reflected on the street.
- Enabling pay-by-phone. Without a back-end system to integrate all parking space and meter data, pay-by-phone would simply not be possible.
- Ensuring that citations are only issued to valid meters by populating a list of valid meter IDs, which are then loaded onto enforcement’s handheld devices.
- Enabling SFMTA staff to conduct ad-hoc analysis. Previous systems had a series of static reports, and new reports had to be developed by the database vendor. The parking space inventory allows staff to quickly create custom reports that may be necessary to respond to inquires.
- Enabling the SFMTA to make changes to large quantities of meters on specific days (e.g. Special Events pricing during Giants games). Previously, more dynamic policies were not possible because meters had to be updated manually.
- Generating a GIS shapefile daily to allow for up-to-date detailed spatial analysis in ArcGIS.
Meters and meter management systems

Parking meters with wireless communication

SFpark’s new parking meters accept payment by credit card and phone, transmit payment data to a central server in real time, and allow new rates and display information to be programmed and deployed remotely.

Technology overview

Demand-responsive pricing has pushed cutting-edge parking meters to the limit of their capabilities. Below are some of the lessons learned about meter technology and contracting with meter vendors.

Technology

- Smart meter technology is still evolving and has limitations. Additional capabilities (such as conducting credit card transactions) require a more complex meter design than simple electronic meters, and consequently there are additional mechanical and electronic challenges.
- Meter management systems are not yet able to group meters in different ways for reporting purposes. This requires meter vendors to store data that is not directly relevant to meter operation (such as enforcement and coin collection routes) and keep it up to date. Based on the SFpark pilot experience, the SFMTA’s 2013 request for proposals (RFP) included this as a requirement, and vendors are developing the capability.
- Every new feature on smart meters has an impact on battery life which is difficult to predict and in tension with the limitations of solar recharging.
- Meter displays do not have room to convey all the restrictions in an area, and customers still need to check signs and stickers on the street. Meters can only display a limited number of different rates.
- The new smart meters have a more complex design than the mostly mechanical meters, and some components are sensitive.

Implementation

- There are a host of stakeholders who have to interact with the meters and the meter management systems in the back end (e.g., public, maintenance personnel, parking control officers, finance, customer service, adjudication, and coin collection). Current systems do not necessarily serve all users equally well, and changes to the systems to improve usability to one group may affect usability for another group.
- It is necessary to rigorously bench and field test new features and adjustments before implementation.
- Do not make significant changes in batches on the street that are too large to correct if there are issues.
- Even with smart meters, it is still cumbersome to program the meters to behave exactly as San Francisco’s varied parking regulations require. All of the city’s parking rules need to be clearly defined in a form that the vendor can understand. Cities considering implementing a demand-responsive approach to setting meter rates would likely benefit from first reviewing and simplifying their parking regulations.
- Smart meters record exactly when payment is made, so they present an opportunity for analysis of payment trends. For instance, San Francisco can now analyze when and where customers pay for parking during the pre-pay period before meters officially start operating.
- Smart meters report exactly when payment is made, and keep it up to date. Based on the SFpark pilot experience, the SFMTA’s 2013 request for proposals (RFP) included this as a requirement, and vendors are developing the capability.
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Customer experience

- Customer expectations for usability are higher with smart meters. Making meter interfaces so easy to use that it is not necessary to read the instructions is difficult.
- There is a learning curve for customers when adapting to the user interface of new meters, especially multi-space meters.

Business of parking management

- Using smart meters involves new, ongoing expenses for communication and credit card transaction charges.
- Smart meters that accept multiple forms of payment introduce new policy questions. For instance, if a meter’s coin slot is jammed, but it still accepts credit cards, should the meter still be enforced, or is it broken?
- It is no longer necessary to touch every meter in order to make a change to the entire system. This makes it much faster and more cost-effective to make citywide changes to the meters.
- Smart meters record exactly when payment is made, so they present an opportunity for analysis of payment trends. For instance, San Francisco can now analyze when and where customers pay for parking during the pre-pay period before meters officially start operating. That tells us about the demand for parking before the beginning of operating hours.
- The number and configurations of San Francisco’s meter inventory is constantly evolving, and keeping that data up to date is a challenge. Meter vendors must maintain their own versions of the meter database.

Contracting for meters: lessons learned

- Most smart meter technology relies on solar power to extend battery life. This presents a challenge for using these meters in parking garages and other shady locations.
- Payment should be based on functional meters. Factors for financial penalties must be clearly defined and easily measured. For instance, if there is a penalty for more than two percent of meters not working at a given time, make sure the contract clearly defines what “not working” means and how it would be measured.
- The more clarity and specificity in contract, including an extensive definitions section, the smoother the implementation process will be.
- Current smart meter technology includes a lot of programming and software. Include a knowledgeable technology professional on your team to help write your RFP.
- The input of the meter management, operations, and maintenance teams is essential when writing the RFP.
- Local vendor support before, during, and after implementation is critical.
- Small vendors sometimes struggle to produce enough supply to meet the demand of each of their clients, which can affect project schedule.
- The more meter vendors you have, the more complex the project becomes from an accounting standpoint. With multiple vendors, accountants must learn different payment systems, process additional payments, and manage multiple merchant accounts.
- Include the right to switch cellular network providers for meter communications and gateway providers in the contract with smart meter vendors.
Single-space meter installation by SFMTA Meter Shop

Single-space meter installation; Parking Control Officer with a multispace meter
Garage occupancy and payment data tools
Providing availability data and changing rates

San Francisco’s city-owned parking garages had some of the technical tools in place for demand-responsive pricing before SFpark began. However, SFpark places a different set of demands on the garages’ equipment, requiring a higher standard of accuracy and detail.

Technology overview

The current technology in San Francisco’s city-owned garages presents opportunities and limitations, both for payment (known as revenue control) and for occupancy data. Modern parking garages already count how many cars come and go using the gate arm system at entry and exit points. Payment stations accept credit cards and keep detailed track of payments, much like the new coin and card parking meters. Broadcasting this data to the SFpark data warehouse, however, requires servers capable of handling a minute-by-minute data feed on garage computer systems.

Here are some lessons learned from implementing SFpark at the garages:

- Because errors can be introduced to any garage gate arm system while counting cars (for a variety of technical and operational reasons), periodic (e.g., daily) manual occupancy counts are required to ensure data accuracy over time. This sometimes requires a cultural change within garage operators and employees.
- Charging different rates at different times of day requires more detailed revenue reports than the operators typically generate. Consider the different information that will be necessary to make demand-responsive rate changes in the garages, the kinds of information that will be necessary to cross-check whether all monies due were actually collected, and how garage operators can update their reports to meet these needs.
- San Francisco’s garages traditionally charged one hourly rate throughout the day and charged customers for 30-minute rather than 1-hour increments. Introducing different rates at different times of day and allowing customers to pay in smaller time increments has added complexity to the payment process for operators.

- Smaller payment increments (e.g., charging in 30-minute rather than 1-hour increments) improve customer service, but if garages do not attract enough new customers, they may lose some revenue from customers who previously paid for time they did not actually park.
- Our current pay stations are not able to display different rates for different times of day. Instead, rate details are displayed on signs posted on or near the pay stations. Rate decals must be replaced for
each rate change. The rate change process could be streamlined in the future by using pay stations with variable message signs or LCD screens in place of these stickers.

- Our garages are not yet able to issue receipts that convey the new rate structure. Ideally, receipts should include the different rates a customer is charged during their stay, but current technology limits us to displaying a single rate.

- Existing revenue control software may limit the number of different rates and discounts a garage can charge. Early bird rates, daily maximums, off-peak discounts, and validations may be affected.

- Garage customers are accustomed to thinking about how long they park and less about what time of day they park. Outreach materials should help explain this shift to customers.

- To change rates at the garages involved in SFpark, the revenue-control vendor must log into each garage’s computer system separately. This requires that rate changes be undertaken on a garage-by-garage basis and limits the ability to roll out rate changes at multiple garages at one time. Connecting the garages to a central system would resolve this issue.

- Analyzing the fiscal and usage impact as a result of demand responsive pricing requires modeling for vehicle departure times and duration of stay for those vehicles versus volume of parkers per hourly rate.

- Demand-responsive and/or time-of-day rates may not interact well with existing audit and revenue control procedures at the garages. Audit procedures based upon simple single-rate, length-of-stay pricing will have to be updated.

- Data feeds from garages will be dependent upon the quality of the connection between the garage and the central server. Consider creating as secure and robust a connection as possible to minimize interruptions of the data feed.

Garage XML feeds
Garages send data to SFpark via XML feeds: rows of time-stamped data separated into distinct columns. Delivery by XML is the easiest and most accurate way of delivering the large amounts of data (payments, entries/exits, discounts received, etc.) to the SFpark data warehouse. Working with the vendor who maintained garage data, SFpark developed several different XML feeds for different types of data (usage, payment, occupancy, and an overall statistics feed for auditing purposes). SFpark also maintained data guides to describe all the categories of data received and rules for processing of the data.

Download the full garage data guide at:
SFpark.org/docs_garagedata
Parking sensors
A new technology that provides real-time parking availability data

The parking sensor is a new technology that automatically collects parking occupancy data. **SFpark** used this data to calculate demand-responsive meter rates, provide real-time parking availability information, and evaluate the pilot projects.

**Technology overview**

The SFpark pilot project relied on wireless in-ground parking sensors that detect when vehicles arrive and depart. Multiple vendors are currently developing sensor technology, but the basic operations are similar. One or two sensors are installed in each parking space. The sensors used in SFpark had a magnetometer to detect changes in the earth’s electromagnetic field and was calibrated to detect vehicles in the surrounding area. These sensors sent data through a mesh network via pole-mounted communications equipment.

**SFpark deployment**

Parking sensors for the SFpark pilot deployment were provided by StreetSmart Technologies (SST, now known as Fybr). The SFMTA paid for the installation of the magnetometer sensors and a monthly, per-space fee to receive data, and payments were tied to performance. The SFMTA did not own, operate, or manage that equipment, instead purchasing a data feed from the vendor.

The following table lists the sensor equipment installed in ten neighborhoods in San Francisco for the SFpark pilot project:

<table>
<thead>
<tr>
<th>Spaces with sensors</th>
<th>8,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total sensors (spaces have either one or two)</td>
<td>11,700</td>
</tr>
<tr>
<td>Pieces of pole-mounted networking equipment</td>
<td>300</td>
</tr>
</tbody>
</table>

The SFMTA received valid data from all ten neighborhoods from April 1, 2011 through June 30, 2013 for control areas and through December 31, 2013 for pilot areas.

**Issues encountered**

A number of unexpected field issues posed challenges when deploying on-street parking sensors:

- **Noise from the transit system’s overhead power lines and other sources.** Once the sensor network was deployed, SST noticed high levels of direct current electromagnetic interference coming from overhead transit lines and a variety of utility-related facilities (which provided alternating current interference). This electromagnetic noise varied from block to block and even from space to space, requiring some spaces to have two sensors.

- **Early battery degradation.** The sensor batteries were originally expected to last about five years, but specialized software designed to filter out some of the electromagnetic noise reduced this estimate to three years.

- **Street construction.** The SFMTA coordinated internally and with the San Francisco Department of Public Works to remove sensors prior to street paving and other street construction, but there were instances where some sensors were paved over or otherwise destroyed without notification.
Operational control

Once the sensor network became operational, the SFMTA closely monitored the sensors’ data transmissions. The SFMTA employed three methods to monitor the sensor data quality:

• Confirm that each space sends a message at least once a day.
• Track spaces that haven’t sent a message for more than three days.
• Compare current levels of data flow to historical profiles.

Performance measures

The SFMTA manually gathered data to compare to the data received from the sensor feed in four measures to assess sensor performance: occupancy accuracy, turnover accuracy/timeliness, parking session accuracy, and latency. These performance measures were used to evaluate the sensors used in the SFpark pilot project as well as in a trial of equipment produced by several other vendors. Additionally, vendor performance on the occupancy accuracy and turnover accuracy/timeliness tests was tied to monthly payments. These complementary tests helped determine what different uses the data would support.

<table>
<thead>
<tr>
<th>Performance measure</th>
<th>What it measures</th>
<th>Application of data</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupancy accuracy</td>
<td>How reliably sensors accurately report the status of a parking space (vacant or occupied)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Turnover accuracy/timeliness</td>
<td>How reliably and quickly the sensors detect when vehicles enter or exit a space.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Parking session accuracy</td>
<td>How well sensors represented what actually happens on the street.</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Latency</td>
<td>How long it takes for messages from the sensor to be received by the SFMTA data warehouse.</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Contracting for sensors: lessons learned

Parking sensors are an emerging technology that is still early in the product development cycle. This list summarizes the lessons learned working with parking sensor vendors:

• There were many issues getting started. Mutual trust, clear standards, and common understanding of goals were critical for resolving them.
• Always field verify all information provided by vendors.
• Have a strong data organizational system. It is best for each device to have a unique ID for each parking space that is linked to a specific block and parking space number.
• Keep a detailed record of all meetings, due dates, and deliverables.
• Put specific performance standards in the contract and define exactly how they will be measured.
• Calculate billing on standards that are easy to measure yet complex enough to capture all the ways the data will be used. Be sure that accountants can understand them.
• If there are multiple deliverables, stagger payments and make them contingent on delivery of individual items in the contract.
• Make sure vendors program the devices to report their operational status on a regular basis (e.g., daily “heartbeats” are sent by sensors in SFpark). If no one parks at a space for a full day, this report will show that the sensor is still working.
• Design the system to be as vendor-neutral as possible. This may require more planning upfront, but it provides more control and flexibility for changing vendors, if necessary.

Sensor documents

Sensor evaluation

This document describes the technology utilized for the SFpark pilot, how the SFMTA measured parking sensor performance, and the results for sensors used during the SFpark pilot and four emerging technologies.

Download full document at: SFpark.org/docs_sensorevaluation

Parking sensor performance standards and measurement

This document outlines detailed field methodologies and contractual performance standards used during the course of the SFpark pilot.

Download full document at: SFpark.org/docs_sensorperformance

Parking sensor data guide

This document explains how the SFMTA collected and processed parking sensor data.

Download full document at: SFpark.org/docs_sensordata
Real-time data acquisition, data warehousing, and business intelligence tool

The technical foundation of SFpark

The SFMTA collects data from many sources and analyzes that data to operate and evaluate the SFpark pilot project, from adjusting rates and providing real-time parking availability data to evaluating the program components.

Technology overview

To operate and evaluate the SFpark pilot project, the SFMTA employs a data warehouse that enables:

- Analysis of parking occupancy so that SFpark can make data-driven pricing decisions.
- Provision of real-time parking availability information to the public.
- Operation and management of the city’s on-street parking spaces.
- Performance monitoring of meter, sensor, and garage vendors.
- Evaluation of the SFpark program as a whole.

While the SFMTA is the primary user, academics and other municipalities are interested in the data as well. The data warehouse and the associated transactional infrastructure follow the SFMTA’s system standards and extend the agency’s enterprise service oriented architecture to real-time or near real-time parking management, monitoring, and enforcement operations.

Purpose of the data warehouse and business intelligence tool

SFpark uses its data warehouse and business intelligence reporting to:

- Turn data into decision-making information that enables the SFMTA to proactively manage parking. It also hosts the data that assists drivers in the city by making parking easier and more convenient.
- Store data that is used to implement and evaluate SFpark, from both manually and automatically collected sources.
- Normalize all incoming data.
- Identify any inconsistencies in incoming data, e.g., creating historical profiles to define normal levels of sensor data transmissions.
- Provide an architecture that:
  - Is open, flexible, and scalable enough to accommodate likely future growth in magnitude and complexity of data, number of data sources, and type of data sources.
  - Is as simple as possible.
  - Allows for efficient and sophisticated search, analysis, and exportation of data.
  - Makes it as easy as possible to maintain the datasets.
  - Powers a web-based, front-end interface that the SFMTA uses to access and analyze the data. The front end provides:
    - Automated reporting of the data (i.e., via reports that can be pushed to decision makers).
    - Easy generation of ad hoc reports with no programming required.

Lessons learned

Creating the technical infrastructure for SFpark’s data needs was a large undertaking with many lessons learned:

- Don’t do it yourself. Most internal IT organizations do not maintain the staffing levels or skill sets to implement the technology necessary for a SFpark-style program. Bring on an experienced team to build the technical infrastructure and integrate it with existing systems.
- Make sure your technology implementation team is involved in the first stages of the project management life cycle, beginning with contracting and procurement, long before it comes time to purchase necessary data management hardware. Have that team work with your existing IT team to ensure that technology choices fit in with your organization’s existing IT standards and direction.
- Don’t let product vendors (sensors and meters) determine the technical infrastructure. Create a data system that can interface with multiple vendors and will provide maximum control over how the data is managed and turned into information. Insist that project plans be expressed in terms of business deliverables. Vendors will want to give you a construction plan, but you want a feature implementation plan.

Business intelligence tool automated report example

- Easy access for analysts to get data they need and easily combine datasets
- Visual representation of data via maps, timelines, charts, and graphs.
- Real-time alerts to assist vendor management.
- Summary-level information with ability to access data details.

- Make sure your technology implementation team is involved in the first stages of the project management life cycle, beginning with contracting and procurement, long before it comes time to purchase necessary data management hardware. Have that team work with your existing IT team to ensure that technology choices fit in with your organization’s existing IT standards and direction.
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Parking availability applications code

SFpark uses the parking availability data feed for its own web and smartphone applications. These applications reflect SFpark branding, point drivers to blocks and garages with open spaces, and provide rate information.

The code for these applications is publicly available at: SFpark.org/appcode

Integrating SFpark practices into existing processes

Even before the SFpark project introduced new data warehousing and business intelligence tools, the SFMTA had sophisticated processes for managing parking meter inventory and tracking revenue. Transitioning from these legacy systems to a more dynamic reporting and business intelligence system was essential for implementing SFpark policies.

The San Francisco Parking Meter Management System (SFPM) is an Oracle 10G database with a limited number of pre-built reports and a selection of management modules such as inventory, collections, counting, reconciliation, parking meter repair work orders, and administration. The SFMTA Meter Shop and Finance groups use this system to track parking meter inventory, revenues, maintenance information, and to perform reconciliation between physical coin collection and electronic audits.

SFPM is currently the system of record used for revenue reporting and tracking for all San Francisco parking meters. It is integrated with coin counting equipment, and the SFMTA relays on it heavily for tracking the performance of the coin collection contractor. This contractor retrieves data from an electronic lock management system, which is inserted into the SFPM database. Reconciliation between electronic records and coin sorter machine counts are contractually mandated to have a margin of error no larger than one percent.

While appropriate for non-SFpark operations, the SFPM cannot store, analyze, and report on complex meter rate and operating schedules, both current and historical, as well as other information necessary to implement and report on SFpark policy performance. The SFpark business intelligence database will need additional features before it can fully replace the SFPM.
Mobile applications

SFpark provided on- and off-street parking availability and rate information via iPhone and Android apps during the pilot period. When the sensors reached the end of their useful lives in December 2013, the apps no longer provided on-street availability but still displayed real-time rates and garage availability.
Web application

Customers could also access real-time parking availability and pricing information via SFpark.org.
Text message

SFpark also provided garage parking availability information via text message. The SFMTA discontinued this service after nine months due to low usage. People without smart phones or web access could, by then, receive parking availability information by calling the region's 511 system. Following is a sample text message script.

Sample text message script

(2/2)
Lombard Street LOM
Mission-Bartlett MSB
Moscone Center MSC
Performing Arts PFA
Portsmouth Sq PSQ
St. Mary’s Sq MRQ
Sutter-Stockton SUT
Union Sq USQ

(1/4)
Moscone Center Garage
at 3rd St between Folsom & Howard
205 of 752 spaces available

Hours:
M-Th: 6:00AM-12:00AM, F
6:00AM-2:30AM, Sat
8:00AM-2:30AM, Sun

Text garage code for info:
16th & Hoft 16TH
Civic Center CVC
Ellis-O’Farrell EOF
Fifth & Mission 5TH
Golden Gateway GNG
Japan Center Main/Annex
JPN/JPX

(3/4)
5:00am-9:00PM $2/h
6:00PM-12:00AM $2/h
AM Off-Peak Mon-Fri: Enter before

(4/4)
7:30am and exit after 7:00pm $12
Daily Maximum / Lost Ticket $27
Parking guidance
Guiding drivers to available off-street parking

One goal of SFpark is to match drivers with parking spaces to get them off the streets as quickly as possible. In addition to the parking availability apps, on-street wayfinding signage helps drivers find the city’s often underutilized lots and garages.

Variable message signs
As part of the SFpark pilot project, the SFMTA added nine variable message signs (to the city’s existing five) that tell drivers approaching downtown which garages have availability. The sign type is consistent with the city’s existing signs.

Wayfinding signs
The variable message signs are complemented by over 300 static directional wayfinding signs that help direct drivers to municipal garages and lots. All of the static signs were designed to match the look and feel of the rest of the SFpark materials, especially the garage branding. In 2014, the signage system will be refined to make minor improvements and reflect changed traffic patterns. The SFpark team also does an annual field check to make sure that any damaged or destroyed signs are replaced.
6. COMMUNICATIONS

SFPark required strong project communications strategy, planning, and execution. As a high-profile, public-facing project with dozens of customer touch points that fundamentally changed the way a city thinks about parking, establishing a user-friendly brand and providing well-designed materials—from meter decals and garage signage to the mobile apps and web experience—was critical to SFPark’s success.
Communicating SFpark

SFpark. Circle less, live more.

The SFpark pilot project demonstrated new parking policy and technology and tested how they were received by SFMTA’s customers. The SFMTA placed careful attention on framing the project and developing key messages for the project’s outreach, communications, and advertising.

Framing and messaging

As with any major project, the SFMTA had to explain what problems SFpark was addressing and how the pilot was intended to resolve these problems. A clear and stable internal understanding of that rationale made it easier for the project team to develop project materials and deliver a consistent message, as well as for stakeholders to understand the project’s vision, goals, and approach.

Communications efforts around transportation projects are often focused around environmental or social benefits. However, these reasons often fail to motivate people to change their behavior, particularly when the change is seen as inconvenient. Effective communications for SFpark had to take this into account. For example, a communications strategy that focused on driver convenience was more likely to be successful than one focusing on congestion management would have been.

This clear and compelling way of defining the issue and its solution allowed the project and the people representing it to have clear, successful, and consistent messages. Simple messages regarding the purpose and benefits of the project also allowed more focus on explaining the technology and ideas behind SFpark, both of which were new and complex. The project FAQs (at SFpark.org/faq) show how the SFMTA has responded to many specific questions and criticisms.

The frame used for SFpark

New technology and better parking management make parking in San Francisco more convenient.

Problem

Parking is a major concern in San Francisco, and it consistently ranks as one of the city’s biggest quality of life challenges. Parking can be difficult because outdated parking management technology and strategies are similar to what was used when parking meters were introduced in the 1940s.

For drivers, the result is that it can be difficult to find and pay for parking. As drivers circle for parking, they contribute to congestion, waste time and fuel, increase greenhouse gas emissions, and slow down Muni. We can do better.

Solution

New parking technology and management policies enable SFpark to manage our limited parking supply more intelligently, so that it is much more convenient to park. Better parking management benefits everyone—drivers, business owners, transit riders, bicyclists, and pedestrians—while reducing transportation-related greenhouse gas emissions. San Francisco is a natural place for innovation and leadership on public policy issues. SFpark uses innovative parking technology and management strategies to resolve our parking problems, one of our biggest quality of life challenges.

Branding and design

- Giving the project a name and creating a strong SFpark brand distinguished the project as something new and different from the parking management approach that had been used for many years in the city.
- The SFMTA believed that a strong SFpark brand was desirable to help the SFMTA improve the way that our customers relate to SFMTA parking management and the SFMTA overall.
- The goal of the SFpark project brand and product design is for drivers’ interactions with SFpark to be simple, smart, easy to use, and convenient.
- Good user interface and visual design helps create the intended user experience.
- The brand’s voice is deliberate: as clear, friendly, approachable, respectful, and transparent as possible.
- This branding was part of a deliberate decision to adopt a customer-centric approach to parking management.

Overall message for SFpark

San Francisco drivers often have a hard time finding a place to park. When people finally find a parking space, other regulations are often inconvenient—short time limits mean we sometimes can’t park as long as they’d like, and we often can’t pay the meter because we don’t have enough quarters. San Francisco’s parking experience is limited by antiquated parking equipment.

Using new parking technology and management strategies, SFpark makes parking in San Francisco more convenient. The goal is to make parking easier to find (whether at the curb in parking garages) and easier to pay for. Those changes are positive for drivers—less frustrating circling for parking—and they are also better for everyone else; reducing the number of drivers circling for parking can improve Muni’s reliability, reduce greenhouse gas emissions, and improve safety on city streets.

Key messages and talking points

1. SFpark makes parking more convenient.
2. Reducing circling and double-parking benefits everyone.
3. SFpark uses demand-responsive pricing to open up parking spaces on each block and ensure available spaces in city-owned garages.
4. SFpark charges the lowest possible rate to achieve the right level of parking availability.
5. The SFMTA’s primary goal with the project is not to raise parking revenue but rather to make the transportation system work better for everyone.

New Parking Technology  Flexible Approach to Pricing

PARKING TECHNOLOGY + FLEXIBLE PRICING = BETTER PARKING

New SFpark Program

Circle less, live more.

Sustainable Parking

Benefits Everyone.

Parking Pilots

Citywide

Pilots

Muni

Retail

Benefits Everyone.

Citywide

Parking Pilots

Muni

Retail

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Outreach

Open communication and transparency

Changing parking management or technology is a sensitive topic that requires multiple in-depth conversations with various stakeholders, including local government officials, SFMTA colleagues, neighborhood and merchant groups, and drivers.

Steps taken

Initial project introduction

While planning the project, the SFpark project team had hundreds of meetings, both small and large, with community leaders and variety of stakeholders. Among all the outreach that was done for the project, it was particularly important to have initial one-on-one or small group meetings with community and group leaders. We typically went to that person’s office to explain, in a friendly environment, the changes being planned as part of the SFpark pilot project. These initial conversations were a good way to:

- Truly engage with San Francisco opinion leaders
- Have the time necessary to explain the project
- Listen to and understand their concerns
- Ensure they were aware of the project and its goals before they heard the SFpark name for the first time in the news or from some other party
- Establish that relationship before presenting the project to the groups they represented

During that process, the SFMTA built support, credibility, and trust around the SFpark project because those key stakeholders knew they could easily be in touch if they had additional concerns along the way.

Project changes

While implementing the various infrastructure or policy changes, such as parking sensor installations or adjusting meter rates or time limits, the SFpark team typically uses the following steps. A comprehensive list follows (though not every step is taken for each change):

1. During planning stages
   a. Meet with policymakers
   b. Outreach to neighborhood and merchant groups via emails and/or presentations at their meetings
   c. Outreach to SFMTA stakeholders via emails and/or presentations to such groups as parking control officers (PCOs), parking meter repair personnel (PMRs) and customer service providers
2. One to two weeks before implementation
   a. Email relevant policymakers and offer to answer any questions in person or via email
   b. Email SFMTA stakeholders
   c. Distribute flyers to PCOs, PMRs and coin collectors to pass out to public as needed
   d. Email contacts from relevant neighborhood and merchant groups
   e. Do door-to-door outreach to merchants in affected areas, including flyers left for patrons
   f. For garages, place posters at prime locations and flyers given with receipts
   g. Update content on SFpark.org

Ongoing outreach

After changes were implemented, the SFpark team provided periodic project status updates for policy makers, which were available to the media and our customers.
New Coin & Card Meters
Coming to the Financial District
August–September
Pay by coin, credit & debit card and SFMTA parking card.

Meter Upgrade Locations
From August to September, the San Francisco Municipal Transportation Agency (SFMTA) will replace around 415 existing parking meters throughout the Financial District and SFMTA parking card.

Upgrade Meters for the Financial District
For August to September, the San Francisco Municipal Transportation Agency (SFMTA) will replace around 415 existing parking meters with new multi-space meters in eight pilot neighborhoods. The state-of-the-art meters are easy to use and allow drivers to pay with coins, credit/debit cards and SFMTA parking card. Learn more at SFpark.org

Get Fewer Parking Tickets
When the new pricing goes into effect, time limits will also be relaxed, time, and that garages almost always have a space. Demand-responsive pricing will start early 2011. High-demand spaces will gradually go up in price, and SFMTA will adjust meter prices periodically to encourage drivers to park on underused blocks and in garages. While high-demand spaces will gradually go up in price, demand-responsive pricing will ensure at least one space per block is available most of the time, and garages almost always have a space. Demand-responsive pricing will start early 2011.

Smarter Parking Pricing
Smarter Parking Pricing will help drivers find open spaces quickly, real-time parking availability is located on the curb next to your car. Enter your space number first. Your space number is important information. Press OK to confirm. Insert and remove card to change time. If using a credit/debit card, enter space number, then press C. Use and to change time.

Find Parking More Easily
To help drivers find open spaces quickly, real-time parking availability is located on the curb next to your car. Enter your space number first. Your space number is important information. Press OK to confirm. Insert and remove card to change time. If using a credit/debit card, enter space number, then press C. Use and to change time.

Circle Less, Live More
Use multi-space meters throughout the neighborhood. The state-of-the-art meters are easy to use and allow drivers to pay with coins, credit/debit cards and SFMTA parking cards.

SFpark: Putting Theory Into Practice / 123

T-shirt for “meter greeters” who helped customers use new multi-space meters
SFpark launch email sent to mailing list

Dear SFpark,

I’m pleased to let you know that today Mayor Edwin Lee will formally announce the launch of real-time parking data for the San Francisco Municipal Transportation Agency (SFMTA) SFpark project.

Click here to download the SFpark iPhone app

Here, real-time parking availability and pricing information for SFpark spaces will be available via the iPhone app, the SFpark API, and an open data feed for application and website developers.

Click here for more information about App development and the SFpark API

These new tools will help people decide where and when to drive based on parking availability and cost. Later this year, this parking data will also be made available via the new SFMTA data feed.

Click here for a full overview of the SFpark project

In the coming months, the SFMTAs will expand SFpark meter coverage based on demand. The goal is to find the lowest hourly rate possible that is at least one open space per block most of the time.

Click here for more information about SFpark pricing

Other elements of SFpark are already in place or currently being implemented:

- New single and multi-space meters with water-saving features
- Longer parking time limits for bus stops in some areas
- Facility upgrades at City-owned garages

Thank you for your continued interest in the SFpark project.

Sincerely,

Joy Morris
SFpark Project Manager
San Francisco Municipal Transportation Agency (SFMTA)

Note: in addition to this list, you can also keep up to date on SFpark via Twitter, Flickr, and Facebook.
Putting Theory Into Practice

Ch 6. Communications

Garage upgrades

- New signage, paint and lighting will make garages more welcoming and easier to use.
- Demand-responsive pricing to adjust rates based on how full the garage is.
- Transparent pricing that makes it clear how much parking will cost.
- Off-peak discounts to encourage drivers to park during times when there is less demand.
- Regular M-F $130
- Regular $170
- Monthly $40

New Rates

- Effective August 17
- Entry before 7:30am and exit after 7:00pm M-F $2.00
- Exit after 7:00pm M-F $2.00
- Monthly $150
- Monthly (carpool/carshare) $110
- Monthly (reserved parking) $330
- Monthly (carpool/trackside) $310
- Off-peak discounts, enter before 7:30am and exit after 7:00pm M-F $0.00
- Off-peak discounts, enter before 7:30am and exit after 7:00pm M-F $2.00
- Appliance: nightly rate only
- Must park for at least 3 hours
- Transparent pricing: 40% off

SFpark.org/garages


SFpark: Putting Theory Into Practice / 127
Garages can be more convenient in some situations than circling for an open meter. Garages will be generally less expensive than nearby on-street parking. Drivers can save time when they arrive at garages and meters at times when garages never fill up. Too Little Availability

What is SFpark?

SFpark is a demonstration of new on-street technology that can make it easier to find and pay for a parking space. The system is being tested in San Francisco. This pilot area includes more than 4,000 spaces in 56 garages and 2,000 streetside meters.

How It Works

SFpark enables drivers to pay using tokens, cards, or credit and debit cards. Drivers can also use SFpark’s website or mobile phone application to pay for parking. The data feed and is analyzed for demand-responsive pricing and relaxed time limits.

Project Benefits

Better Business

Easier parking improves access to the city and can help businesses. The ability to pay using cards and trains can run faster in ways that benefit all residents and visitors. Drivers, public transit customers, and people walking or biking benefit from less congestion.

Safer Streets

Demand-responsive pricing and relaxed time limits can encourage customers to visit commercial areas. In addition, demand-responsive pricing and relaxed time limits can help prevent double-parking and safer streets.

Improved Access

With extended time limits and additional payment options, people can find a place to park more easily, especially for longer stays. Parking is available everywhere.

Reduced Traffic

Funding for 80 percent of the SFpark demonstration comes from a $19.8 million grant from the U.S. Environmental Protection Agency’s (EPA) Transportation Choices Demonstration Funding Program for transforming high岔 traffic areas into safer streets.

Real-time parking is available to SFpark customers through the website SFpark.org, the 511 “parking” phone number, and by sending text messages on smartphones. Smartphones can also be used to view maps of parking availability at metered spaces and City garages. Rates will be adjusted based on sensor data and trains can run faster in ways that benefit all residents and visitors. Drivers, public transit customers, and people walking or biking benefit from less congestion.

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FAQ

If you have a question that is not answered below, please share it on SFpark.org. SFpark has been monitoring the use of the technology and the way people are using it. The data feed is being used to determine how demand-responsive pricing and relaxed time limits work.

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Press relations
Getting the word out about SFpark

Press relations efforts included events, press releases, and outreach to media. The SFMTA made announcements about SFpark and other parking-related projects via SFMTA press releases, SFpark.org, opt-in email lists, and social media. As a result of these activities, the project has enjoyed significant local, national, and international media coverage.

SFpark and parking-related media activities

<table>
<thead>
<tr>
<th>Story</th>
<th>Month</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>SFMTA hosts the U.S. Secretary of Transportation to announce that SFMTA was selected to receive Urban Partnership Program funding for parking management</td>
<td>October 2007</td>
<td>Press release</td>
</tr>
<tr>
<td>SFMTA and Port of San Francisco bring smart parking meters to the Embarcadero</td>
<td>May 2009</td>
<td>Press release</td>
</tr>
<tr>
<td>SFpark begins sensor installation in pilot areas</td>
<td>March 2010</td>
<td>SFpark.org announcement</td>
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<tr>
<td>SFMTA completes innovative citywide census of San Francisco parking</td>
<td>April 2010</td>
<td>Press release</td>
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<tr>
<td>SFMTA’s SFpark pilot project introduces new coin and card parking meters</td>
<td>July 2010</td>
<td>Press event; Press release</td>
</tr>
<tr>
<td>SFpark project to begin installing multi-space parking meters in the Civic Center on August 10</td>
<td>August 2010</td>
<td>SFpark.org announcement</td>
</tr>
<tr>
<td>SFpark project to begin upgrading parking meters in the Financial District on August 23</td>
<td>August 2010</td>
<td>SFpark.org announcement</td>
</tr>
<tr>
<td>SFMTA’s SFpark project activates new multi-space meters in the Civic Center</td>
<td>September 2010</td>
<td>Press release; SFpark.org announcement</td>
</tr>
<tr>
<td>SFpark protects San Francisco bicycle parking inventory: SFMTA parking project installs new bicycle parking racks on unused parking meter poles</td>
<td>October 2010</td>
<td>Press release; SFpark.org announcement</td>
</tr>
<tr>
<td>SFMTA lowers most SFpark motorcycle parking rates</td>
<td>October 2010</td>
<td>Press release</td>
</tr>
<tr>
<td>SFMTA eliminates free parking for employees and city passenger vehicles</td>
<td>March 2011</td>
<td>SFpark.org announcement</td>
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SFpark and parking-related media activities, cont.

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<tr>
<td>SFpark expands parking sensor program</td>
<td>July 2011</td>
<td>SFpark.org announcement</td>
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<tr>
<td>The SFMTA debuts SFpark garage availability testing service</td>
<td>September 2011</td>
<td>Press release SFpark.org announcement</td>
</tr>
<tr>
<td>SFpark implementation and lessons learned book now available</td>
<td>September 2011</td>
<td>SFpark.org announcement</td>
</tr>
<tr>
<td>SFMTA’s SFpark project to implement first on-street parking spaces for car-sharing</td>
<td>October 2011</td>
<td>Press event SFpark.org announcement</td>
</tr>
<tr>
<td>SFMTA makes second rate adjustment at SFpark meters</td>
<td>October 2011</td>
<td>Press release SFpark.org announcement</td>
</tr>
<tr>
<td>SFpark releases Android app</td>
<td>November 2011</td>
<td>Press release SFpark.org announcement</td>
</tr>
<tr>
<td>SFpark releases updated Citywide census of San Francisco parking</td>
<td>November 2011</td>
<td>SFpark.org announcement</td>
</tr>
<tr>
<td>SFpark posts source code for its parking availability and pricing apps</td>
<td>November 2011</td>
<td>SFpark.org announcement</td>
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<tr>
<td>SFMTA offers tips for safe, convenient holiday shopping</td>
<td>November 2011</td>
<td>Press release SFpark.org announcement</td>
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<td>SFMTA to adjust rates at car and motorcycle meters in SFpark pilot areas</td>
<td>December 2011</td>
<td>SFpark.org announcement</td>
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<tr>
<td>SFpark releases SFMTA tow-away data</td>
<td>December 2011</td>
<td>SFpark.org announcement</td>
</tr>
<tr>
<td>Mayor Lee &amp; SFMTA launch new Innovative Pay by Phone parking meters</td>
<td>December 2011</td>
<td>Press event Press release from Mayor SFpark.org announcement</td>
</tr>
<tr>
<td>SFMTA SFpark study shows 14 percent fewer citations, 27 percent more meter payments with new meters and longer time limits</td>
<td>January 2012</td>
<td>Press release SFpark.org announcement</td>
</tr>
<tr>
<td>San Francisco wins Sustainable Transport Award for SFpark, Pavement to Parks</td>
<td>January 2012</td>
<td>SFpark.org announcement</td>
</tr>
<tr>
<td>SFMTA Releases 2011 Meter Rate and Policy Survey</td>
<td>February 2012</td>
<td>SFpark.org announcement</td>
</tr>
<tr>
<td>SFpark announces 4th meter rate adjustment, new rate adjustment mailing list**</td>
<td>February 2012</td>
<td>SFpark.org announcement</td>
</tr>
<tr>
<td>SFpark Pilot Project Wins Good Government Award</td>
<td>March 2012</td>
<td>SFpark.org announcement</td>
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<tr>
<td>SFMTA upgrades the SFpark.org online parking map using OpenGeo technology</td>
<td>March 2012</td>
<td>SFpark.org announcement</td>
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<tr>
<td>SFMTA lowers some SFpark meter rates to $0.25 per hour</td>
<td>April 2012</td>
<td>Press release SFpark.org announcement</td>
</tr>
<tr>
<td>SFMTA continues to lower rates at many SFpark garages</td>
<td>April 2012</td>
<td>Press release SFpark.org announcement</td>
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<tr>
<td>SFMTA offers tips for safe, convenient holiday shopping</td>
<td>December 2012</td>
<td>Press release</td>
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<td>PayByPhone now available at SFMTA meters citywide</td>
<td>January 2013</td>
<td>Press release SFpark.org announcement</td>
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</table>

Sample SFpark press coverage

New York Times
- Making the Streets of San Francisco Easier to Park On, March 15, 2012

NPR
- Need A Parking Space? Look In Your Hand, August 29, 2011

The Economist
- Spot prices—New systems will make finding parking spaces easier and help to reduce congestion, September 17, 2008

The Guardian
- Five innovative city programmes from North America, September 5, 2013

Atlantic Magazine
- 5 Great U.S. City Parking Apps, October 12, 2011
- Car Talk, April 24, 2010

Sustainable Transport Magazine
- SFpark: San Francisco Knows How to Park It, Winter 2012

San Francisco Examiner
- San Francisco-owned garage rates offering better deals than street meters, November 26, 2012
- SFpark hourly meters actually save motorists money, December 16, 2012

SFSstreetsblog
- Shoup: SFpark Yields Promising Results, Lessons for Demand-Based Pricing, August 7, 2013
- How Handicap-Pander Abuse Threatens SF’s Parking Reforms, August 31, 2012
- The ‘Heart of SFpark’ Complete with Vehicle Sensor Installation, May 1, 2010
- San Francisco First City in the Nation to Count Its Parking Spaces, March 29, 2010

KQED
- SFpark and the “Science of Parking”, KQED Forum, March 27, 2012
- San Francisco’s Parking Census, March 30, 2010

KALW FM
- Parking tips from SFpark, August 31, 2011
- Interview with Donald Shoup and Jay Primus, October 29, 2010
Awards
Local, national, and international accolades

Publications, organizations, and government agencies around the world have recognized the SFpark project, from its technology to its unique pricing policies, for its innovative solutions to urban parking management. The SFMTA is honored to have received or been selected as a finalist for the following awards for SFpark.

2014 Oracle Spatial and Graph Excellence Award, Innovator category
Selected from a worldwide group of candidates, the SFMTA SFpark project received this award for its unique system design that manages the entire demand-responsive parking pricing business lifecycle.

2013 Public Parking Program of the Year
At its 30th annual conference, the California Public Parking Association named SFpark the Public Parking Program of the Year.

2013 Sustainia100 Top 10 Innovations in “Cities” category
SFpark was recognized for its demand-responsive pricing strategy, extensive public data availability, and project knowledge sharing. Based in Copenhagen, Denmark, Sustainia identifies the most innovative sustainability projects, initiatives, and technologies from around the world.

International Parking Institute Top 10 Innovative US Parking Programs 2013
The International Parking Institute (IPI) ranked SFpark as the No. 1 most innovative parking program in the United States. Founded in 1962, IPI is the world’s largest association representing parking professionals and the parking industry.

Harvard Kennedy School’s Top 25 Innovations in Government 2013
Selected by a cohort of policy experts, researchers, and practitioners SFpark was named an Innovations in American Government Award semi-finalist for its ability to “utilize data analytics to enhance government performance” and “achieve a broad suite of social benefits.”

2012 Bay Area MTC Excellence in Motion Award of Merit
The Bay Area Metropolitan Transportation Commission (MTC) gave SFpark an Excellence in Motion Award of Merit for “improving the quality of life for San Francisco residents and visitors by increasing the availability and predictability of parking.” SFpark and Sunday Streets shared the award.

7×7’s Best of San Francisco 2012
SFpark’s pricing and technology was recognized as a “Real-World Technology Innovation” by this San Francisco city culture magazine. Paul Davison writes “it’s part of a broader movement of using sensors to automate things in the real world.”

2012 ITDP Sustainable Transport Award
SFpark, along with Pavement to Parks and recent bicycle improvements, earned San Francisco recognition at the 8th annual Sustainable Transport Awards, given by the Institute for Transportation and Development Policy (ITDP). This was the first year this award recognized a parking program.

2012 Living Labs Global Award
SFpark won the Living Labs Global Award 2012 for the challenge offered by Santiago de Chile. That city sought new solutions to make its on-street parking more intelligent, unlocking environmental, traffic, security, and user experience benefits.

2012 MFAC Good Government Awards
The MFAC Good Government Awards—sponsored by the Municipal Fiscal Advisory Committee (MFAC), a project of San Francisco Planning and Urban Research (SPUR)—recognize outstanding performances by managers working for the City and County of San Francisco. The SFpark team was chosen for implementing its groundbreaking program under tight time constraints.

2012 Excellence.gov Awards—Excellence in Innovation: Mobility
Created in 2001 by the American Council for Technology and Industry Advisory Council (ACT-IAC), the Excellence.gov Awards recognize government programs that use information technology to advance the business of government. SFpark was a finalist in the Excellence in Innovation: Mobility category, which recognizes projects that use mobile computing to serve citizens.

2011 DoD SOA & Semantic Technology Symposium “Best of Show” Awards
The Department of Defense (DoD) Service-Oriented Architecture (SOA) & Semantic Technology Symposium Award focuses on information technology achievements. SFpark was chosen as a finalist for its use of a service-oriented architecture to create real-time data feeds and make them publicly available.

2011 SF Weekly Web Award—Best Local Government Site
The reader-nominated SF Weekly Web Awards celebrate the best of San Francisco’s digerati. From more than 37,000 votes, SFpark.org was a finalist in the category for Best Local Government Site.

2014 Oracle Spatial and Graph Excellence Award, Innovator category
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Advertising
Launching the SFpark pilot project

The ad campaign for the SFpark pilot project launch included a simple message: go to SFpark.org for parking availability and pricing. When and where space was available, such as in bus shelter ads, insets outlined benefits to pedestrians and cyclists as well as drivers.
Wrapped bus parked at City Hall for SFpark launch event
Signage and decals

Thoughtful design at every touch point

Signage and decals are important touch points when our customers use SFpark. Their design was a critical part of having SFpark feel simple, friendly, smart, and easy to use. Consistent visual design of all parts of the SFpark system, from meters and garages to apps and the web, helped the brand and user experience hang together as a coherent whole.
Directional signage, garage signage, and meter decal branding.

Sign above a multispace meter
Web, social media, and apps
Extending SFpark’s communication outreach

SFpark uses the web, social media, and mobile apps to communicate with customers, provide project transparency, and deliver real-time parking information.
SFpark-related tweets during week of launch

RedfinBayside
Reduce the pain.

Pay your parking meter with your phone. We’ve finally caught up to Finland. http://bit.ly/RedfinBayside

SFGov
Andy Ciak
Mayor Lee M. Brown’s Office

Getting around is simple thanks to SFpark’s mobile parking app. Download it for free. Get daily parking updates — when prices change, and when spaces open up. Easily pay with a credit card and never pay a parking ticket again. http://bit.ly/SFGovSFpark

winterjane
Austin, TX

I don’t know about you, but I’m so glad that people are learning how to use SFpark’s mobile parking app. It’s been a game changer. Keep up the good work, SFPD! http://bit.ly/winterjane

StreetEasy
David

Just in time for the launch of SFpark... WiFi Wonders MBA focuses on the right price for parking in http://bit.ly/WiFiWonders

Elaine D, San Francisco

Just in time for the launch of SFpark... WiFi Wonders MBA focuses on the right price for parking in http://bit.ly/WiFiWonders

clicking

Just in time for the launch of SFpark... WiFi Wonders MBA focuses on the right price for parking in http://bit.ly/WiFiWonders

Jackehan
Austin, TX

In S.F., you can now park and go, paying by the autopark sensor in the car & site app to check SFpark for open spaces around you. http://bit.ly/152Jackehan

CityOn
San Francisco, CA

San Francisco MTA announces new SFpark app that helps drivers find parking spaces in the city’s main parking lots. More info at http://bit.ly/152CityOn

RobBenioff
San Francisco, CA

Cool things happen when you open up your deal! Tech


UrlaBugs
San Francisco, CA

URLAbugs SFpark update: daily 6:00 a.m. and I love the idea of the SFpark-Thieves! Thanks for sharing!

adonis
San Francisco, CA

No SFpark percehation, but check http://SFPark.org on #21 for the API via @SFParkSFpark. Renewed Permits.

Transportura
San Francisco, CA


UnionSquareSF
San Francisco, CA

We’re happy to roll out our new parking app for today to make parking less painful in SF. http://bit.ly/152UnionSquareSF

Jay Nath
San Francisco, CA

Real-Time Parking Data Now Available Through SFpark App, Drivers Now Have a New Reason to Park at SFpark.

Krislinken
San Francisco, CA

Real-Time Parking Data Now Available Through SFpark App, Drivers Now Have a New Reason to Park at SFpark.

Gonzalo
San Francisco, CA


fastcompany
San Francisco, CA

Fast Company

Launched last week, (SFPark) SFpark Launches in San Francisco - APPLAND (and Why They’re Really Worth It)

shahandi
San Francisco, CA

A revolution in parking, maybe... homes.apple.com/sf/sfpark/apps/sfpark/?

officemate
San Francisco, CA

I can’t wait to play this. "SFpark" Scenes Open Parking Data: http://bella/magazine/sf/sfpark/sfpark/

jaywhat
San Francisco, CA

Jay what! SFpark!

SFCityAttorney
San Francisco, CA

SFMetro SFpark: users meter data to highlight room parking spots, offers API for developers

mayorsconnect
San Francisco, CA

Mayor of SFpark.org print, a smart new innovation giving you real-time data to find open space around the city.

RanaArbabi
San Francisco, CA

New SF parking scheme rolled out today. http://sfpark.org/about-the-project/

RemashParrott
San Francisco, CA


SFEnergy
San Francisco, CA


bemeez
San Francisco, CA


NotCHandler
San Francisco, CA

NotCHandler, a new SF parking scheme rolled out today http://sfpark.org/about-the-project/

PaulAlterman
San Francisco, CA

Paul Alterman SFpark

RT @8PF: SFpark is launching real-time parking availability and pricing info at SFpark.org tomorrow, April 21. http://bit.ly/152PaulAlterman

LA Wheel
San Francisco, CA

LA Wheel

Park R: Parking Inspiration? SFpark Program Launches This Week; Streetsblog’s Streetsblog takes a look at SF... http://bit.ly/152LAWheel

E Eiichi
San Francisco, CA

E Eiichi
